



## Open Source Used In Strip 21.2.1

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# 1.1 libtomcrypt 1.17

## 1.1.1 Available under license :

```
# /*
# * SHA-512
# * Implementation derived from LibTomCrypt (Tom St Denis)
# *
# * LibTomCrypt is a library that provides various cryptographic
# * algorithms in a highly modular and flexible manner.
# *
# * The library is free for all purposes without any express
# * guarantee it works.
# *
# * Tom St Denis, tomstdenis@gmail.com, http://libtomcrypt.org
# */
```

# 1.2 lua 5.1.3

## 1.2.1 Available under license :

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## 1.9 sqlite 3.27.0

## 1.10 bzip2 1.0.8

## 1.11 tcl 8.3.4

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The End

# 1.16 hd-parm 9.58

# 1.17 apk-tools 2.10.4-r3

## 1.17.1 Available under license :

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```
/* add.c - Alpine Package Keeper (APK)
*
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*
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*/
```

Found in path(s):

\* /opt/cola/permits/1006906399\_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/add.c

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\* /opt/cola/permits/1006906399\_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/libfetch/fetch.3

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/\* commit.c - Alpine Package Keeper (APK)

\* Apply solver calculated changes to database.

\*

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/\* update.c - Alpine Package Keeper (APK)

\*

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/\*-

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*
* $FreeBSD: fetch.c,v 1.41 2007/12/19 00:26:36 des Exp $
*/
```

Found in path(s):

```
* /opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/libfetch/fetch.c
```

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```
/* apk_hash.h - Alpine Package Keeper (APK)
```

```
*
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*/
```

Found in path(s):

```
* /opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/apk_hash.h
```

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```
/* apk_solver_data.h - Alpine Package Keeper (APK)
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*/
```

Found in path(s):

```
*/opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/apk_solver_data.h
```

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```
/* search.c - Alpine Package Keeper (APK)
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*/
```

Found in path(s):

```
*/opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/search.c
```

No license file was found, but licenses were detected in source scan.

```
/* apk_blob.h - Alpine Package Keeper (APK)
*
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*/
```

Found in path(s):

```
*/opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/apk_blob.h
```

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```
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*
* $FreeBSD: common.c,v 1.53 2007/12/19 00:26:36 des Exp $
*/
```

Found in path(s):

```
* /opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/libfetch/common.c
```

No license file was found, but licenses were detected in source scan.

```
/* io.c - Alpine Package Keeper (APK)
```

```
*
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*/
```

Found in path(s):

\* /opt/cola/permits/1006906399\_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/io.c

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/\* blob.c - Alpine Package Keeper (APK)

\*

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\*

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Found in path(s):

\* /opt/cola/permits/1006906399\_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/version.c

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/\* apk.c - Alpine Package Keeper (APK)

\*

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/\* fetch.c - Alpine Package Keeper (APK)

\*

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Found in path(s):

\* /opt/cola/permits/1006906399\_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/fetch.c

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/\* solver.c - Alpine Package Keeper (APK)

\* Up- and down-propagating, forwarding checking, deductive dependency solver.

\*

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/\* apk\_io.h - Alpine Package Keeper (APK)

\*

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/\* common.c - Alpine Package Keeper (APK)

\*

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```
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*/
```

Found in path(s):

```
* /opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/common.c
No license file was found, but licenses were detected in source scan.
```

```
/* apk_provider_data.h - Alpine Package Keeper (APK)
```

```
*
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*/
```

Found in path(s):

```
* /opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-
2.10.4/src/apk_provider_data.h
No license file was found, but licenses were detected in source scan.
```

```
/* archive.c - Alpine Package Keeper (APK)
```

```
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```

Found in path(s):

```
* /opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/archive.c
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```

```
/* implemented as luaL_typerror until lua 5.1, dropped in 5.2
```

```
* (C) 1994-2012 Lua.org, PUC-Rio. MIT license
*/
```

Found in path(s):

```
* /opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/lua-apk.c
```

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```
/* audit.c - Alpine Package Keeper (APK)
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```

Found in path(s):

```
*/opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/audit.c
```

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```
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```

Found in path(s):

```
*/opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/fix.c
```

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\*  
\* \$FreeBSD: ftp.c,v 1.101 2008/01/23 20:57:59 des Exp \$  
\*/

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\* /opt/cola/permits/1006906399\_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/libfetch/ftp.c  
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```
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*
*_
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* SUCH DAMAGE.
*/
```

Found in path(s):

```
* /opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/libfetch/http.c
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```

```
/*_
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*
* $FreeBSD: common.h,v 1.30 2007/12/18 11:03:07 des Exp $
*/

```

Found in path(s):

```

* /opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/libfetch/common.h
No license file was found, but licenses were detected in source scan.

```

```

/* dot.c - Alpine Package Keeper (APK)

```

```

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*/

```

Found in path(s):

```

* /opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/dot.c
No license file was found, but licenses were detected in source scan.

```

```

/* url.c - Alpine Package Keeper (APK)

```

```

*
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```

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\* /opt/cola/permits/1006906399\_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/url.c

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/\* policy.c - Alpine Package Keeper (APK)

\*

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\*/

Found in path(s):

\* /opt/cola/permits/1006906399\_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/policy.c

No license file was found, but licenses were detected in source scan.

/\* apk\_defines.c - Alpine Package Keeper (APK)

\*

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Found in path(s):

\* /opt/cola/permits/1006906399\_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/apk\_defines.h

No license file was found, but licenses were detected in source scan.

/\* list.c - Alpine Package Keeper (APK)

\*

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Found in path(s):

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No license file was found, but licenses were detected in source scan.

/\* hash.c - Alpine Package Keeper (APK)

\*

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\*/

Found in path(s):

\* /opt/cola/permits/1006906399\_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/hash.c

No license file was found, but licenses were detected in source scan.

/\* apk\_solver.h - Alpine Package Keeper (APK)

\*

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\*/

Found in path(s):

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/\* apk\_version.h - Alpine Package Keeper (APK)

\*

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\*/

Found in path(s):

\* /opt/cola/permits/1006906399\_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/apk\_version.h



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```
/* database.c - Alpine Package Keeper (APK)
*
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*/
```

Found in path(s):

```
*/opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/database.c
```

No license file was found, but licenses were detected in source scan.

```
/* cache.c - Alpine Package Keeper (APK)
*
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*/
```

Found in path(s):

```
*/opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/cache.c
```

No license file was found, but licenses were detected in source scan.

```
/* info.c - Alpine Package Keeper (APK)
*
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*/
```

Found in path(s):

```
*/opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/info.c
```

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```
/* apk_applet.h - Alpine Package Keeper (APK)
```

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Found in path(s):

\* /opt/cola/permits/1006906399\_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/apk\_applet.h  
No license file was found, but licenses were detected in source scan.

/\*-

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\*  
\* \$FreeBSD: file.c,v 1.18 2007/12/14 10:26:58 des Exp \$  
\*/

Found in path(s):

\* /opt/cola/permits/1006906399\_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/libfetch/file.c

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/\*-

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* THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
*
* $FreeBSD: fetch.h,v 1.26 2004/09/21 18:35:20 des Exp $
*/
```

Found in path(s):

```
*/opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/libfetch/fetch.h
```

No license file was found, but licenses were detected in source scan.

```
/* apk_package.h - Alpine Package Keeper (APK)
```

```
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```

Found in path(s):

\* /opt/cola/permits/1006906399\_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/apk\_package.h

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/\* md5.h - Compute MD5 checksum of files or strings according to the

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Found in path(s):

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/\* del.c - Alpine Package Keeper (APK)

\*

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Found in path(s):

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No license file was found, but licenses were detected in source scan.

/\* upgrade.c - Alpine Package Keeper (APK)

\*

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Found in path(s):

\* /opt/cola/permits/1006906399\_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/upgrade.c  
No license file was found, but licenses were detected in source scan.

/\* index.c - Alpine Package Keeper (APK)

\*

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\* /opt/cola/permits/1006906399\_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/index.c  
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/\* verify.c - Alpine Package Keeper (APK)

\*

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/\* apk\_print.h - Alpine Package Keeper (APK)

\*

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Found in path(s):

\* /opt/cola/permits/1006906399\_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/apk\_print.h

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/\* package.c - Alpine Package Keeper (APK)

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Found in path(s):

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/\* print.c - Alpine Package Keeper (APK)

\*

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/\* stats.c - Alpine Package Keeper (APK)

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```
/* manifest.c - Alpine Package Keeper (APK)
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*/
```

Found in path(s):

```
*/opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/manifest.c
No license file was found, but licenses were detected in source scan.
```

```
/* apk_archive.c - Alpine Package Keeper (APK)
*
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*/
```

Found in path(s):

```
*/opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/apk_archive.h
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```

```
/* apk_database.h - Alpine Package Keeper (APK)
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*/
```

Found in path(s):

```
*/opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/apk_database.h
No license file was found, but licenses were detected in source scan.
```

```
/* template.c - Alpine Package Keeper (APK)
*
```

```
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*
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*/
```

Found in path(s):

```
*/opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/template.c
```

No license file was found, but licenses were detected in source scan.

```
/* ver.c - Alpine Package Keeper (APK)
```

```
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*/
```

Found in path(s):

```
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```

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```
/* gunzip.c - Alpine Package Keeper (APK)
```

```
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```

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```
*/opt/cola/permits/1006906399_1678963080.0928936/0/apk-tools-v2-10-4-zip/apk-tools-2.10.4/src/gunzip.c
```

## 1.18 zlib 1.2.11-r3

### 1.18.1 Available under license :

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## 1.19 libtls-standalone 2.9.1-r0

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## 1.32 docker-pycreds 0.4.0

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## 1.33 godbus 5.0.3

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## 1.34 cpio 2.13

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## 1.35 screen 4.8.0-1

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## 1.36 netcat 0.7.1

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## 1.38 logrus 1.6.0

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# 1.40 go-md2man 2.0.0-20190314233015- f79a8a8ca69d

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## 1.41 tre 0.8.0

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## 1.42 bind 9.11.19

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- \* `configure.ac`, `Makefile.am`: The original versions were derived from the ones in the XML Catalog Manager project, version 2.2.

Author: Julio Merino <jmmv@users.sourceforge.net>

\* atf-c/ui.c: The format\_paragraph and format\_text functions were derived from the ones in the Monotone project, revision 3a0982da308228d796df35f98d787c5cff2bb5b6.

Author: Julio Merino <jmmv@NetBSD.org>

\* atf-c++/detail/io.hpp, atf-c++/detail/io.cpp, atf-c++/detail/io\_test.cpp: These files were derived from the file\_handle, systembuf, pipe and pistream classes and tests found in the Boost.Process library.

Author: Julio Merino <jmmv84@gmail.com>

\* admin/check-style.sh, admin/check-style-common.awk, admin/check-style-cpp.awk, admin/check-style-shell.awk: These files, except the first one, were first implemented in the Buildtool project. They were later adapted to be part of Boost.Process and, during that process, the shell script was created.

Author: Julio Merino <jmmv84@gmail.com>

=====  
vim: filetype=text:textwidth=75:expandtab:shiftwidth=2:softtabstop=2  
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<!-- \$Id\$ -->

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<xsl:stylesheet version="1.0"

xmlns:xsl="http://www.w3.org/1999/XSL/Transform"

xmlns:xi="http://www.w3.org/2001/XInclude"

xmlns:db="http://docbook.org/ns/docbook">

<xsl:template name="isc.copyright.format">

<xsl:param name="text"/>

<xsl:value-of select="\$isc.copyright.leader"/>

<xsl:value-of select="normalize-space(substring-before(\$text, '#10;'))"/>

<xsl:text>#10;</xsl:text>

<xsl:variable name="rest" select="substring-after(\$text, '#10;')"/>

<xsl:if test="translate(\$rest, '#9;#32;', '')">

<xsl:call-template name="isc.copyright.format">

<xsl:with-param



```

name="text" select="$rest"/>
  </xsl:call-template>
</xsl:if>
</xsl:template>

<xsl:variable name="isc.copyright.text">
  <xsl:text>
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  </xsl:text>
</xsl:variable>

<xsl:variable name="isc.copyright">
  <xsl:call-template name="isc.copyright.format">
    <xsl:with-param name="text">
      <xsl:for-each select="book/info/copyright | refentry/docinfo/copyright">
        <xsl:text>Copyright (C) </xsl:text>
        <xsl:call-template name="copyright.years">
          <xsl:with-param name="years" select="year"/>
        </xsl:call-template>
        <xsl:text> </xsl:text>
        <xsl:value-of select="holder"/>
        <xsl:value-of select="$isc.copyright.breakline"/>
        <xsl:text>&#10;</xsl:text>
      </xsl:for-each>
      <xsl:value-of select="$isc.copyright.text"/>
    </xsl:with-param>
  </xsl:call-template>
</xsl:variable>
</xsl:stylesheet>

```

<!--

- Local variables:
- mode: sgml
- End:

-->

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## 1.43 bash 5.0.18

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```
<one line to give the library's name and a brief idea of what it does.>  
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```

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Yoyodyne, Inc., hereby disclaims all copyright interest in the library `Frob' (a library for tweaking knobs) written by James Random Hacker.

<signature of Ty Coon>, 1 April 1990  
Ty Coon, President of Vice

That's all there is to it!

## 1.46 pyasn1 0.4.8

### 1.46.1 Available under license :

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Metadata-Version: 1.2

Name: pyasn1

Version: 0.4.8

Summary: ASN.1 types and codecs

Home-page: <https://github.com/etingof/pyasn1>

Author: Ilya Etingof

Author-email: [etingof@gmail.com](mailto:etingof@gmail.com)

Maintainer: Ilya Etingof <[etingof@gmail.com](mailto:etingof@gmail.com)>

License: BSD

Description: Pure-Python implementation of ASN.1 types and DER/BER/CER codecs (X.208)

Platform: any

Classifier: Development Status :: 5 - Production/Stable

Classifier: Environment :: Console

Classifier: Intended Audience :: Developers

Classifier: Intended Audience :: Education

Classifier: Intended Audience :: Information Technology

Classifier: Intended Audience :: System Administrators

Classifier: Intended Audience :: Telecommunications Industry

Classifier: License :: OSI Approved :: BSD License

Classifier: Natural Language :: English

Classifier: Operating System :: OS Independent

Classifier: Programming Language :: Python :: 2

Classifier: Programming Language :: Python :: 2.4  
Classifier:  
Programming Language :: Python :: 2.5  
Classifier: Programming Language :: Python :: 2.6  
Classifier: Programming Language :: Python :: 2.7  
Classifier: Programming Language :: Python :: 3  
Classifier: Programming Language :: Python :: 3.2  
Classifier: Programming Language :: Python :: 3.3  
Classifier: Programming Language :: Python :: 3.4  
Classifier: Programming Language :: Python :: 3.5  
Classifier: Programming Language :: Python :: 3.6  
Classifier: Programming Language :: Python :: 3.7  
Classifier: Topic :: Communications  
Classifier: Topic :: Software Development :: Libraries :: Python Modules

Found in path(s):

\* /opt/cola/permits/1110812511\_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/PKG-INFO  
\* /opt/cola/permits/1110812511\_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/pyasn1.egg-info/PKG-INFO  
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# License: <http://snmplabs.com/pyasn1/license.html>

Found in path(s):

\* /opt/cola/permits/1110812511\_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/tests/codec/ber/\_\_main\_\_.py  
\* /opt/cola/permits/1110812511\_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/tests/test\_debug.py  
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\* /opt/cola/permits/1110812511\_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/tests/codec/ber/test\_encoder.py  
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\* /opt/cola/permits/1110812511\_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/pyasn1/compat/integer.py  
\*  
/opt/cola/permits/1110812511\_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/pyasn1/codec/ber/encoder.py  
\* /opt/cola/permits/1110812511\_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/tests/\_\_main\_\_.py  
\* /opt/cola/permits/1110812511\_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/pyasn1/type/namedval.py  
\* /opt/cola/permits/1110812511\_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/pyasn1/type/constraint.py  
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\* /opt/cola/permits/1110812511\_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/tests/base.py  
\* /opt/cola/permits/1110812511\_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/pyasn1/codec/ber/decoder.py  
\* /opt/cola/permits/1110812511\_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/tests/type/test\_namedval.py  
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\* /opt/cola/permits/1110812511\_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/pyasn1/type/base.py  
\*

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* /opt/cola/permits/1110812511_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/tests/type/__main__.py
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* /opt/cola/permits/1110812511_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/tests/codec/cer/__main__.py
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* /opt/cola/permits/1110812511_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/tests/type/test_tag.py
*
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*
/opt/cola/permits/1110812511_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/pyasn1/codec/cer/decoder.py
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* /opt/cola/permits/1110812511_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/pyasn1/compat/octets.py
*

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\* /opt/cola/permits/1110812511\_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/tests/codec/native/test\_encoder.py

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ASN.1 library for Python

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[![PyPI](https://img.shields.io/pypi/v/pyasn1.svg?maxAge=2592000)](https://pypi.org/project/pyasn1)  
[![Python Versions](https://img.shields.io/pypi/pyversions/pyasn1.svg)](https://pypi.org/project/pyasn1/)  
[![Build status](https://travis-ci.org/etingof/pyasn1.svg?branch=master)](https://secure.travis-ci.org/etingof/pyasn1)  
[![Coverage Status](https://img.shields.io/codecov/c/github/etingof/pyasn1.svg)](https://codecov.io/github/etingof/pyasn1)  
[![GitHub license](https://img.shields.io/badge/license-BSD-blue.svg)](https://raw.githubusercontent.com/etingof/pyasn1/master/LICENSE.txt)

This is a free and open source implementation of ASN.1 types and codecs as a Python package. It has been first written to support particular protocol (SNMP) but then generalized to be suitable for a wide range

of protocols based on

[ASN.1 specification](https://www.itu.int/rec/dologin\_pub.asp?lang=e&id=T-REC-X.208-198811-W!!PDF-E&type=items).

## Features

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\*

Generic implementation of ASN.1 types (X.208)

\* Standards compliant BER/CER/DER codecs

\* Dumps/loads ASN.1 structures from Python types

\* 100% Python, works with Python 2.4 up to Python 3.7

\* MT-safe

\* Contributed ASN.1 compiler [Asn1ate](https://github.com/kimgr/asn1ate)

## Why using pyasn1

-----

ASN.1 solves the data serialisation problem. This solution was designed long ago by the wise Ancients. Back then, they did not have the luxury of wasting bits. That is why ASN.1 is designed to serialise data structures of unbounded complexity into something compact and efficient when it comes to processing the data.

That probably explains why many network protocols and file formats still rely on the 30+ years old technology. Including a number of high-profile Internet protocols and file formats.

Quite a number of books cover the topic of ASN.1.

[Communication between heterogeneous systems](http://www.oss.com/asn1/dubuisson.html)

by

Olivier Dubuisson is one of those high quality books freely available on the Internet.

The pyasn1 package is designed to help Python programmers tackling network protocols and file formats at the comfort of their Python prompt. The tool struggles to capture all aspects of a rather complicated ASN.1 system and to represent it on the Python terms.

## How to use pyasn1

-----

With pyasn1 you can build Python objects from ASN.1 data structures. For example, the following ASN.1 data structure:

```
```bash
Record ::= SEQUENCE {
```

```

id    INTEGER,
room [0] INTEGER OPTIONAL,
house [1] INTEGER DEFAULT 0
}
...

```

Could be expressed in pyasn1 like this:

```

```python
class Record(Sequence):
    componentType = NamedTypes(
        NamedType('id', Integer()),
        OptionalNamedType(
            'room', Integer().subtype(
                implicitTag=Tag(tagClassContext, tagFormatSimple, 0)
            )
        ),
        DefaultedNamedType(
            'house',
            Integer(0).subtype(
                implicitTag=Tag(tagClassContext, tagFormatSimple, 1)
            )
        )
    )
...

```

It is in the spirit of ASN.1 to take abstract data description and turn it into a programming language specific form.

Once you have your ASN.1 data structure expressed in Python, you can use it along the lines of similar Python type (e.g. ASN.1 `SET` is similar to Python `dict`, `SET OF` to `list`):

```

```python
>>> record = Record()
>>> record['id'] = 123
>>> record['room'] = 321
>>> str(record)
Record:
id=123
room=321
>>>
...

```

Part of the power of ASN.1 comes from its serialisation features. You can serialise your data structure and send it over the network.

```

```python
>>> from pyasn1.codec.der.encoder import encode

```

```
>>> substrate = encode(record)
>>> hexdump(substrate)
00000: 30 07 02 01 7B 80 02 01 41
...

```

Conversely, you can turn serialised ASN.1 content, as received from network or read from a file, into a Python object which you can introspect, modify, encode and send back.

```
```python
>>> from pyasn1.codec.der.decoder import decode
>>> received_record, rest_of_substrate = decode(substrate, asn1Spec=Record())
>>>
>>> for field in received_record:
>>>     print('{} is {}'.format(field, received_record[field]))
id is 123
room is 321
house is 0
>>>
>>> record == received_record
True
>>> received_record.update(room=123)
>>> substrate = encode(received_record)
>>> hexdump(substrate)
00000: 30 06 02 01 7B 80 01 7B
...

```

The pyasn1 classes struggle to emulate their Python prototypes (e.g. int, list, dict etc.). But ASN.1 types exhibit more complicated behaviour. To make life easier for a Pythonista, they can turn their pyasn1 classes into Python built-ins:

```
```python
>>> from pyasn1.codec.native.encoder import encode
>>> encode(record)
{'id': 123, 'room': 321, 'house': 0}
...

```

Or vice-versa -- you can initialize an ASN.1 structure from a tree of Python objects:

```
```python
>>> from pyasn1.codec.native.decoder import decode
>>> record = decode({'id':
123, 'room': 321, 'house': 0}, asn1Spec=Record())
>>> str(record)
Record:

```

```
id=123
room=321
>>>
...

```

With ASN.1 design, serialisation codecs are decoupled from data objects, so you could turn every single ASN.1 object into many different serialised forms. As of this moment, pyasn1 supports BER, DER, CER and Python built-ins codecs. The extremely compact PER encoding is expected to be introduced in the upcoming pyasn1 release.

More information on pyasn1 APIs can be found in the [documentation](<http://snmplabs.com/pyasn1/>), compiled ASN.1 modules for different protocols and file formats could be found in the pyasn1-modules [repo](<https://github.com/etingof/pyasn1-modules>).

How to get pyasn1

-----

The pyasn1 package is distributed under terms and conditions of 2-clause BSD [license](<http://snmplabs.com/pyasn1/license.html>). Source code is freely available as a GitHub [repo](<https://github.com/etingof/pyasn1>).

You could `pip install pyasn1` or download it from [PyPI](<https://pypi.org/project/pyasn1>).

If

something does not work as expected, [open an issue](<https://github.com/etingof/pyasn1/issues>) at GitHub or post your question [on Stack Overflow](<https://stackoverflow.com/questions/ask>) or try browsing pyasn1 [mailing list archives](<https://sourceforge.net/p/pyasn1/mailman/pyasn1-users/>).

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```
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```

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```

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=====
```

```
.. include:: ../LICENSE.rst
```

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## ASN.1 library for Python

=====

```
.. toctree::  
    :maxdepth: 1
```

### Abstract Syntax Notation One (ASN.1

[http://en.wikipedia.org/wiki/Abstract\\_Syntax\\_Notation\\_1x](http://en.wikipedia.org/wiki/Abstract_Syntax_Notation_1x)) is a technology for exchanging structured data in a universally understood, hardware agnostic way. Many industrial, security and telephony applications heavily rely on ASN.1.

The `pyasn1` <https://pypi.org/project/pyasn1/> library implements ASN.1 support in pure-Python.

### What is ASN.1

-----

ASN.1 is a large, arguably over-engineered and extremely old data modelling and serialisation tool. It is probably among the first serialisation protocols in the history of computer science and technology.

ASN.1 started its life over 30 years ago as a serialisation mechanism for the first electronic mail (known as X.400). Later on it was split off the e-mail application and become a stand-alone tech still being actively supported by its designers and widely used in industry and technology.

Since then ASN.1 is sort of haunted by its relations with the OSI model -- the first, unsuccessful, version of the Internet. You can read many interesting discussions <https://news.ycombinator.com/item?id=8871453> on that topic.

In the following years, generations of software engineers tackled the serialisation problem many times. We can see that in Google's `ProtoBuffers` <https://developers.google.com/protocol-buffers/> or `FlatBuffers` <https://google.github.io/flatbuffers/>, for example. Interestingly, many new takes on binary protocol design do not depart far from ASN.1 from technical perspective. It's more of a matter of striking a balance between processing overhead, wire format overhead and human readability.

Looking at what ASN.1 has to offer, it has three loosely coupled parts:

- \* Data types: the standard introduces a collection of basic data types (integers, bits, strings, arrays and records) that can be used for describing

arbitrarily complex, nested data structures.

\* Serialisation protocols: the above data structures could be converted into a series of octets for storage or transmission over the wire as well as recovered back into their structured form. The system is fully agnostic to hardware architectures differences.

\* Schema language: ASN.1 data structures could be described in terms of a schema language for ASN.1 compiler to turn it into platform-specific implementation.

#### ASN.1 applications

-----

Being an old and generally successful standard, ASN.1 is widely adopted for many uses. To give you an example, these technologies use ASN.1 for their data exchange needs:

- \* Signaling standards for the public switched telephone network (SS7 family)
- \* Network management standards (SNMP, CMIP)
- \* Directory standards (X.500 family, LDAP)
- \* Public Key Infrastructure standards (X.509, etc.)
- \* PBX control (CSTA)
- \* IP-based Videoconferencing (H.323 family)
- \* Biometrics (BIP, CBEFF, ACBio)
- \* Intelligent transportation (SAE J2735)
- \* Cellular telephony (GSM, GPRS/EDGE, UMTS, LTE)

#### ASN.1 gotchas

-----

Apparently, ASN.1 is hard to implement properly. Quality open-source ASN.1 tools are rare, but ad-hoc implementations are numerous. Judging from the ``statistics <http://cve.mitre.org/cgi-bin/cvekey.cgi?keyword=ASN.1>`` on discovered security vulnerabilities, many people have implemented ASN.1 parsers and oftentimes fell victim to its edge cases.

On the bright side, ASN.1 has been around for a long time, it is well understood and security reviewed.

#### Documentation

-----

.. toctree::

  :maxdepth: 2

  /pyasn1/contents

## Use case

-----

```
.. toctree::  
    :maxdepth: 2
```

/example-use-case

## Download & Install

-----

```
.. toctree::  
    :maxdepth: 2
```

/download

## Changes

-----

All changes and release history is maintained in changelog. There you could also download the latest unreleased pyasn1 tarball containing the latest fixes and improvements.

```
..  
toctree::  
    :maxdepth: 1
```

/changelog

## License

-----

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```
.. toctree::  
    :maxdepth: 2
```

/license

## Getting help

-----

Please, file your `issues` <<https://github.com/etingof/pyasn1/issues>>`\_` and `PRs` <<https://github.com/etingof/pyasn1/pulls>>`\_` at GitHub. Alternatively, you could ask for help at `Stack Overflow` <<http://stackoverflow.com/questions/tagged/pyasn1>>`\_` or search

``pyasn1-users <https://lists.sourceforge.net/lists/listinfo/pyasn1-users>`` \_  
mailing list archive.

Books on ASN.1

-----

The pyasn1 implementation is largely based on reading up the following awesome books:

\* ``ASN.1 - Communication between heterogeneous systems <http://www.oss.com/asn1/dubuisson.html>`` \_ by Olivier Dubuisson

\* ``ASN.1 Complete <http://www.oss.com/asn1/resources/books-whitepapers-pubs/larmouth-asn1-book.pdf>`` \_ by Prof John Larmouth

Here you can get the official standards which is hard to read:

\* ``ITU standards`

`<http://www.itu.int/ITU-T/studygroups/com17/languages/X.680-X.693-0207w.zip>`` \_

On the other end of the readability spectrum, here is a quick and sweet write up:

\* ``A Layman's Guide to a Subset of ASN.1, BER, and DER <ftp://ftp.rsasecurity.com/pub/pkcs/ascii/layman.asc>`` \_ by Burton S. Kaliski

If you are working with ASN.1, we'd highly recommend reading a proper book on the subject.

Found in path(s):

\* `/opt/cola/permits/1110812511_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/docs/source/contents.rst`

## 1.47 python-mimeparse 1.6.0

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```

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-----

Written by: Philip Hazel  
Email local part: Philip.Hazel  
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## 1.63 go-units 0.4.0

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## 1.72 ply 3.11

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# PLY (Python Lex-Yacc)                      Version 3.11

[![Build Status](https://travis-ci.org/dabeaz/ply.svg?branch=master)](https://travis-ci.org/dabeaz/ply)

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## Introduction

=====

PLY is a 100% Python implementation of the common parsing tools lex and yacc. Here are a few highlights:

- PLY is very closely modeled after traditional lex/yacc. If you know how to use these tools in C, you will find PLY to be similar.
- PLY provides *very* extensive error reporting and diagnostic information to assist in parser construction. The original implementation was developed for instructional purposes. As a result, the system tries to identify the most common types of errors made by novice users.
- PLY provides full support for empty productions, error recovery, precedence specifiers, and moderately ambiguous grammars.
- Parsing is based on LR-parsing which is fast, memory efficient, better suited to large grammars, and which has a number of nice properties when dealing with syntax errors and other parsing problems. Currently, PLY builds its parsing tables using the LALR(1) algorithm used in yacc.
- PLY uses Python introspection features to build lexers and parsers. This greatly simplifies the task of parser construction since it reduces the number of files and eliminates the need to run a separate lex/yacc tool before running your program.
- PLY can be used to build parsers for "real" programming languages. Although it is not ultra-fast due to its Python implementation, PLY can be used to parse grammars consisting of several hundred rules (as might be found for a language like C). The lexer and LR parser are also reasonably efficient when parsing typically sized programs. People have used PLY to build parsers for C, C++, ADA, and other real programming languages.

## How to Use

=====

PLY consists of two files : lex.py and yacc.py. These are contained



within the 'ply' directory which may also be used as a Python package. To use PLY, simply copy the 'ply' directory to your project and import lex and yacc from the associated 'ply' package. For example:

```
import ply.lex as lex
import ply.yacc as yacc
```

Alternatively, you can copy just the files lex.py and yacc.py individually and use them as modules. For example:

```
import lex
import yacc
```

The file setup.py can be used to install ply using distutils.

The file doc/ply.html contains complete documentation on how to use the system.

The example directory contains several different examples including a PLY specification for ANSI C as given in K&R 2nd Ed.

A simple example is found at the end of this document

#### Requirements

=====

PLY requires the use of Python 2.6 or greater. However, you should use the latest Python release if possible. It should work on just about any platform. PLY has been tested with both CPython and Jython. It also seems to work with IronPython.

#### Resources

=====

More information about PLY can be obtained on the PLY webpage at:

<http://www.dabeaz.com/ply>

For a detailed overview of parsing theory, consult the excellent book "Compilers : Principles, Techniques, and Tools" by Aho, Sethi, and Ullman. The topics found in "Lex & Yacc" by Levine, Mason, and Brown may also be useful.

The GitHub page for PLY can be found at:

<https://github.com/dabeaz/ply>

An old and

relatively inactive discussion group for PLY is found at:

<http://groups.google.com/group/ply-hack>

#### Acknowledgments

=====

A special thanks is in order for all of the students in CS326 who suffered through about 25 different versions of these tools :-).

The CHANGES file acknowledges those who have contributed patches.

Elias Ioup did the first implementation of LALR(1) parsing in PLY-1.x. Andrew Waters and Markus Schoepflin were instrumental in reporting bugs and testing a revised LALR(1) implementation for PLY-2.0.

#### Special Note for PLY-3.0

=====

PLY-3.0 the first PLY release to support Python 3. However, backwards compatibility with Python 2.6 is still preserved. PLY provides dual Python 2/3 compatibility by restricting its implementation to a common subset of basic language features. You should not convert PLY using 2to3--it is not necessary and may in fact break the implementation.

#### Example

=====

Here is a simple example showing a PLY implementation of a calculator with variables.

```
# -----  
# calc.py  
#  
# A simple calculator with variables.  
# -----  
  
tokens = (  
    'NAME','NUMBER',  
    'PLUS','MINUS','TIMES','DIVIDE','EQUALS',  
    'LPAREN','RPAREN',  
    )  
  
# Tokens  
  
t_PLUS = r\+'  
t_MINUS = r\-'  
t_TIMES = r\*'  
t_DIVIDE = r\/'
```

```

t_EQUALS = r'='
t_LPAREN = r'\('
t_RPAREN = r'\)'
t_NAME = r'[a-zA-Z][a-zA-Z0-9_]*'

def t_NUMBER(t):
    r'\d+'
    t.value = int(t.value)
    return t

# Ignored characters
t_ignore = " \t"

def t_newline(t):
    r'\n+'
    t.lexer.lineno += t.value.count("\n")

def t_error(t):
    print("Illegal character '%s'" % t.value[0])
    t.lexer.skip(1)

# Build the lexer
import ply.lex as lex
lex.lex()

# Precedence
rules for the arithmetic operators
precedence = (
    ('left', 'PLUS', 'MINUS'),
    ('left', 'TIMES', 'DIVIDE'),
    ('right', 'UMINUS'),
)

# dictionary of names (for storing variables)
names = { }

def p_statement_assign(p):
    'statement : NAME EQUALS expression'
    names[p[1]] = p[3]

def p_statement_expr(p):
    'statement : expression'
    print(p[1])

def p_expression_binop(p):
    '''expression : expression PLUS expression
                  | expression MINUS expression
                  | expression TIMES expression'''

```

```

        | expression DIVIDE expression'''
    if p[2] == '+': p[0] = p[1] + p[3]
    elif p[2] == '-': p[0] = p[1] - p[3]
    elif p[2] == '*': p[0] = p[1] * p[3]
    elif p[2] == '/': p[0] = p[1] / p[3]

def p_expression_uminus(p):
    'expression : MINUS expression %prec UMINUS'
    p[0] = -p[2]

def p_expression_group(p):
    'expression : LPAREN
expression RPAREN'
    p[0] = p[2]

def p_expression_number(p):
    'expression : NUMBER'
    p[0] = p[1]

def p_expression_name(p):
    'expression : NAME'
    try:
        p[0] = names[p[1]]
    except LookupError:
        print("Undefined name '%s'" % p[1])
        p[0] = 0

def p_error(p):
    print("Syntax error at '%s'" % p.value)

import ply.yacc as yacc
yacc.yacc()

while True:
    try:
        s = raw_input('calc > ') # use input() on Python 3
    except EOFError:
        break
    yacc.parse(s)

```

## Bug Reports and Patches

=====

My goal with PLY is to simply have a decent lex/yacc implementation for Python. As a general rule, I don't spend huge amounts of time working on it unless I receive very specific bug reports and/or patches to fix problems. I also try to incorporate submitted feature requests and enhancements into each new version. Please visit the PLY

github page

at <https://github.com/dabeaz/ply> to submit issues and pull requests. To contact me about bugs and/or new features, please send email to [dave@dabeaz.com](mailto:dave@dabeaz.com).

-- Dave

Found in path(s):

\* /opt/cola/permits/1160874329\_1620411264.5/0/dabeaz-ply-3-11-0-g0f398b7-1-tar-gz/dabeaz-ply-0f398b7/README.md

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## 1.73 pexpect 4.8.0

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## 1.74 pep8 1.7.1

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Metadata-Version: 1.1

Name: pep8

Version: 1.7.1

Summary: Python style guide checker

Home-page: <http://pep8.readthedocs.org/>

Author: Ian Lee

Author-email: [IanLee1521@gmail.com](mailto:IanLee1521@gmail.com)

License: Expat license

Description-Content-Type: UNKNOWN

Description: pep8 - Python style guide checker

=====

pep8 is a tool to check your Python code against some of the style conventions in `PEP 8`\_.

.. \_PEP 8: <http://www.python.org/dev/peps/pep-0008/>

Features

-----

- \* Plugin architecture: Adding new checks is easy.
- \* Parseable output: Jump to error location in your editor.
- \* Small: Just one Python file, requires only stdlib. You can use just the pep8.py file for this purpose.
- \* Comes with a comprehensive test suite.

## Installation

-----

You can install, upgrade, uninstall pep8.py with these commands::

```
$ pip install pep8
$ pip install --upgrade pep8
$ pip uninstall pep8
```

There's also a package for Debian/Ubuntu, but it's not always the latest version.

## Example usage and output

-----

```
::

$ pep8 --first optparse.py
optparse.py:69:11: E401 multiple imports on one line
optparse.py:77:1: E302 expected 2 blank lines, found 1
optparse.py:88:5: E301 expected 1 blank line, found 0
optparse.py:222:34: W602 deprecated form of raising exception
optparse.py:347:31: E211 whitespace before '('
optparse.py:357:17: E201 whitespace after '{'
optparse.py:472:29: E221 multiple spaces before operator
optparse.py:544:21: W601 .has_key() is deprecated, use 'in'
```

You can also make pep8.py show the source code for each error, and even the relevant text from PEP 8::

```
$ pep8 --show-source --show-pep8 testsuite/E40.py
testsuite/E40.py:2:10: E401 multiple imports on one line
import os, sys
      ^
```

Imports should usually be on separate lines.

Okay: import os\nimport sys

E401: import sys, os

Or you can display how often each error was found::

```
$ pep8 --statistics -qq Python-2.5/Lib
232  E201 whitespace after '['
599  E202 whitespace before ')'
631  E203 whitespace before ','
842  E211 whitespace before '('
2531 E221 multiple spaces before operator
4473 E301 expected 1 blank line, found 0
4006 E302 expected 2 blank lines, found 1
165  E303 too many blank lines (4)
325  E401 multiple imports on one line
3615 E501 line too long (82 characters)
612  W601 .has_key() is deprecated, use 'in'
1188 W602 deprecated form of raising exception
```

Links

-----

```
.. image:: https://api.travis-ci.org/PyCQA/pep8.png?branch=master
   :target: https://travis-ci.org/PyCQA/pep8
   :alt: Build status
```

```
.. image:: https://pypip.in/wheel/pep8/badge.png?branch=master
   :target: https://pypi.python.org/pypi/pep8
   :alt: Wheel Status
```

\* `Read the documentation <<http://pep8.readthedocs.org/>>` \_

\* `Fork me on GitHub <<http://github.com/PyCQA/pep8>>` \_

Changelog

=====

1.7.1 (2017-10-22)

-----

Changes:

\* Prominently note via warning message that the tool is no longer released as ``pep8`` and will only be fixed in the ``pycodestyle`` package

1.7.0 (2016-01-12)



-----  
Announcements:

- \* Repository moved to PyCQA Organization on GitHub:  
<https://github.com/pycqa/pep8>

Changes:

- \* Reverted the fix in #368, "options passed on command line are only ones accepted" feature. This has many unintended consequences in pep8 and flake8 and needs to be reworked when I have more time.
- \* Added support for Python 3.5. (Issue #420 & #459)
- \* Added support for multi-line config\_file option parsing. (Issue #429)
- \* Improved parameter parsing. (Issues #420 & #456)

Bugs:

- \* Fixed BytesWarning on Python 3. (Issue #459)

1.6.2 (2015-02-15)  
-----

Changes:

- \* Added check for breaking around a binary operator. (Issue #197, Pull #305)

Bugs:

- \* Restored config\_file parameter  
in process\_options(). (Issue #380)

1.6.1 (2015-02-08)  
-----

Changes:

- \* Assign variables before referenced. (Issue #287)

Bugs:

- \* Exception thrown due to unassigned ``local\_dir`` variable. (Issue #377)

1.6.0 (2015-02-06)  
-----

## News:

\* Ian Lee <ianlee1521@gmail.com> joined the project as a maintainer.

## Changes:

- \* Report E731 for lambda assignment. (Issue #277)
- \* Report E704 for one-liner def instead of E701.  
Do not report this error in the default configuration. (Issue #277)
- \* Replace codes E111, E112 and E113 with codes E114, E115 and E116  
for bad indentation of comments. (Issue #274)
- \* Report E266 instead of E265 when the block comment starts with  
multiple ```#```. (Issue #270)
- \* Report E402 for import statements not at the top of the file. (Issue #264)
- \* Do not enforce whitespaces around ```**``` operator. (Issue #292)
- \* Strip whitespace from around paths during normalization. (Issue #339 / #343)
- \* Update ```--format``` documentation. (Issue #198 / Pull Request #310)
- \* Add ```.tox/``` to default excludes. (Issue #335)
- \* Do not report E121 or E126 in the default configuration. (Issues #256 / #316)
- \* Allow spaces around the equals sign in an annotated function. (Issue #357)
- \* Allow trailing backslash if in an inline comment. (Issue #374)
- \* If ```--config``` is used, only that configuration is processed. Otherwise,  
merge the user and local configurations are merged. (Issue #368 / #369)

## Bug fixes:

- \* Don't crash if `Checker.build_tokens_line()` returns `None`. (Issue #306)
- \* Don't crash if `os.path.expanduser()` throws an `ImportError`. (Issue #297)
- \* Missing space around keyword parameter equal not always reported, E251.  
(Issue #323)
- \* Fix false positive E711/E712/E713. (Issues #330 and #336)

\* Do not skip physical checks if the newline is escaped. (Issue #319)

\* Flush sys.stdout to avoid race conditions with printing. See flake8 bug:  
<https://gitlab.com/pycqa/flake8/issues/17> for more details. (Issue #363)

1.5.7 (2014-05-29)

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Bug fixes:

\* Skip the traceback on "Broken pipe" signal. (Issue #275)

\* Do not exit when an option in ``setup.cfg`` or ``tox.ini``  
is not recognized.

\* Check the last line even if it does not end with a newline. (Issue #286)

\* Always open files in universal newlines mode in Python 2. (Issue #288)

1.5.6 (2014-04-14)

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Bug fixes:

\* Check the last line even if it has no end-of-line. (Issue #273)

1.5.5 (2014-04-10)

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Bug fixes:

\* Fix regression with E22 checks and inline comments. (Issue #271)

1.5.4 (2014-04-07)

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Bug fixes:

\* Fix negative offset with E303 before a multi-line docstring.  
(Issue #269)

1.5.3 (2014-04-04)

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Bug fixes:

- \* Fix wrong offset computation when error is on the last char of a physical line. (Issue #268)

1.5.2 (2014-04-04)

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Changes:

- \* Distribute a universal wheel file.

Bug fixes:

- \* Report correct line number for E303 with comments. (Issue #60)
- \* Do not allow newline after parameter equal. (Issue #252)
- \* Fix line number reported for multi-line strings. (Issue #220)
- \* Fix false positive E121/E126 with multi-line strings. (Issue #265)
- \* Fix E501 not detected in comments with Python 2.5.
- \* Fix caret position with ``--show-source`` when line contains tabs.

1.5.1 (2014-03-27)

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Bug fixes:

- \* Fix a crash with E125 on multi-line strings. (Issue #263)

1.5 (2014-03-26)

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Changes:

- \* Report E129 instead of E125 for visually indented line with same indent as next logical line. (Issue #126)

- \* Report E265 for space before block comment. (Issue #190)
- \* Report E713 and E714 when operators ``not in`` and ``is not`` are recommended. (Issue #236)
- \* Allow long lines in multiline strings and comments if they cannot be wrapped. (Issue #224).
- \* Optionally disable physical line checks inside multiline strings, using ``# noqa``. (Issue #242)
- \* Change text for E121 to report "continuation line under-indented for hanging indent" instead of indentation not being a multiple of 4.
- \* Report E131 instead of E121 / E126 if the hanging indent is not consistent within the same continuation block. It helps when error E121 or E126 is in the ``ignore`` list.
- \* Report E126 instead of E121 when the continuation line is hanging with extra indentation, even if indentation is not a multiple of 4.

Bug fixes:

- \* Allow the checkers to report errors on empty files. (Issue #240)
- \* Fix ignoring too many checks when ``--select`` is used with codes declared in a flake8 extension. (Issue #216)
- \* Fix regression with multiple brackets. (Issue #214)
- \* Fix ``StyleGuide`` to parse the local configuration if the keyword argument ``paths`` is specified. (Issue #246)
- \* Fix a false positive E124 for hanging indent. (Issue #254)
- \* Fix a false positive E126 with embedded colon. (Issue #144)
- \* Fix a false positive E126 when indenting with tabs. (Issue #204)
- \* Fix behaviour when ``exclude`` is in the configuration file and the current directory is not the project directory. (Issue #247)
- \* The logical checks can return ``None`` instead of an empty iterator. (Issue #250)

\* Do not report multiple E101 if only the first indentation starts with a tab. (Issue #237)

\* Fix a rare false positive W602. (Issue #34)

1.4.6 (2013-07-02)

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Changes:

\* Honor ``# noqa`` for errors E711 and E712. (Issue #180)

\* When both a ``tox.ini`` and a ``setup.cfg`` are present in the project directory, merge their contents. The ``tox.ini`` file takes precedence (same as before). (Issue #182)

\* Give priority to ``--select`` over ``--ignore``. (Issue #188)

\* Compare full path when excluding a file. (Issue #186)

\* New option ``--hang-closing`` to switch to the alternative style of closing bracket indentation for hanging indent. Add error E133 for closing bracket which is missing indentation. (Issue #103)

\* Accept both styles of closing bracket indentation for hanging indent. Do not report error E123 in the default configuration. (Issue #103)

Bug fixes:

\* Do not crash when running AST checks and the document contains null bytes. (Issue #184)

\* Correctly report other E12 errors when E123 is ignored. (Issue #103)

\* Fix false positive E261/E262 when the file contains a BOM. (Issue #193)

\* Fix E701, E702 and E703 not detected sometimes. (Issue #196)

\* Fix E122 not detected in some cases. (Issue #201 and #208)

\* Fix false positive E121 with multiple brackets. (Issue #203)

1.4.5 (2013-03-06)

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- \* When no path is specified, do not try to read from stdin. The feature was added in 1.4.3, but it is not supported on Windows. Use ``-`` filename argument to read from stdin. This usage is supported since 1.3.4. (Issue #170)
- \* Do not require ``setuptools`` in setup.py. It works around an issue with ``pip`` and Python 3. (Issue #172)
- \* Add ``\_\_pycache\_\_`` to the ignore list.
- \* Change misleading message for E251. (Issue #171)
- \* Do not report false E302 when the source file has a coding cookie or a comment on the first line. (Issue #174)
- \* Reorganize the tests and add tests for the API and for the command line usage and options. (Issues #161 and #162)
- \* Ignore all checks which are not explicitly selected when ``select`` is passed to the ``StyleGuide`` constructor.

#### 1.4.4 (2013-02-24)

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- \* Report E227 or E228 instead of E225 for whitespace around bitwise, shift or modulo operators. (Issue #166)
- \* Change the message for E226 to make clear that it is about arithmetic operators.
- \* Fix a false positive E128 for continuation line indentation with tabs.
- \* Fix regression with the ``--diff`` option. (Issue #169)
- \* Fix the ``TestReport`` class to print the unexpected warnings and errors.

#### 1.4.3 (2013-02-22)

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- \* Hide the ``--doctest`` and ``--testsuite`` options when installed.
- \* Fix crash with AST checkers when the syntax is invalid. (Issue #160)

- \* Read from standard input if no path is specified.
- \* Initiate a graceful shutdown on ``Control+C``.
- \* Allow to change the ``checker\_class`` for the ``StyleGuide``.

#### 1.4.2 (2013-02-10)

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- \* Support AST checkers provided by third-party applications.
- \* Register new checkers with ``register\_check(func\_or\_cls, codes)``.
- \* Allow to construct a ``StyleGuide`` with a custom parser.
- \* Accept visual indentation without parenthesis after the ``if``

statement. (Issue #151)

- \* Fix UnboundLocalError when using ``# noqa`` with continued lines. (Issue #158)
- \* Re-order the lines for the ``StandardReport``.
- \* Expand tabs when checking E12 continuation lines. (Issue #155)
- \* Refactor the testing class ``TestReport`` and the specific test functions into a separate test module.

#### 1.4.1 (2013-01-18)

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- \* Allow sphinx.ext.autodoc syntax for comments. (Issue #110)
- \* Report E703 instead of E702 for the trailing semicolon. (Issue #117)
- \* Honor ``# noqa`` in addition to ``# nopep8``. (Issue #149)
- \* Expose the ``OptionParser`` factory for better extensibility.

#### 1.4 (2012-12-22)

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- \* Report E226 instead of E225 for optional whitespace around common



operators (``*``, ``**``,  
``^``, ``+`` and ``-``). This new error  
code is ignored in the default configuration because PEP 8 recommends  
to "use your own judgement". (Issue #96)

\* Lines with a ``# nopep8`` at the end will not issue errors on line  
length E501 or continuation line indentation E12\*. (Issue #27)

\* Fix `AssertionError` when the source file contains an invalid line  
ending ```\r\r\n```. (Issue #119)

\* Read the ```[pep8]``` section of ```tox.ini``` or ```setup.cfg``` if present.  
(Issue #93 and #141)

\* Add the Sphinx-based documentation, and publish it  
on <http://pep8.readthedocs.org/>. (Issue #105)

#### 1.3.4 (2012-12-18)

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\* Fix false positive E124 and E128 with comments. (Issue #100)

\* Fix error on stdin when running with `bpython`. (Issue #101)

\* Fix false positive E401. (Issue #104)

\* Report E231 for nested dictionary in list. (Issue #142)

\* Catch E271 at the beginning of the line. (Issue #133)

\* Fix false positive E126 for multi-line comments. (Issue #138)

\* Fix false positive E221 when operator is preceded by a comma. (Issue #135)

\* Fix ```--diff``` failing on one-line hunk. (Issue #137)

\* Fix the ```--exclude``` switch for directory paths. (Issue #111)

\* Use ```-``` filename to read from standard input. (Issue #128)

#### 1.3.3 (2012-06-27)

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\* Fix regression with continuation line checker. (Issue #98)

### 1.3.2 (2012-06-26)

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- \* Revert to the previous behaviour for `--show-pep8`: do not imply `--first`. (Issue #89)
- \* Add E902 for IO errors. (Issue #87)
- \* Fix false positive for E121, and missed E124. (Issue #92)
- \* Set a sensible default path for config file on Windows. (Issue #95)
- \* Allow `--verbose` in the configuration file. (Issue #91)
- \* Show the enforced `--max-line-length` in the error message. (Issue #86)

### 1.3.1 (2012-06-18)

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- \* Explain which configuration options are expected. Accept and recommend the options names with hyphen instead of underscore. (Issue #82)
- \* Do not read the user configuration when used as a module (except if `config_file=True` is passed to the `StyleGuide` constructor).
- \* Fix wrong or missing cases for the E12 series.
- \* Fix cases where E122 was missed. (Issue #81)

### 1.3 (2012-06-15)

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.. warning::

The internal API is backwards incompatible.

- \* Remove global configuration and refactor the library around a `StyleGuide` class; add the ability to configure various reporters. (Issue #35 and #66)
- \* Read user configuration from `~/config/pep8` and local configuration from `./pep8`. (Issue #22)
- \* Fix E502 for backslash embedded in multi-line string. (Issue #68)

- \* Fix E225 for Python 3 iterable unpacking (PEP 3132). (Issue #72)
- \* Enable the new checkers from the E12 series in the default configuration.
- \* Suggest less error-prone alternatives for E712 errors.
- \* Rewrite checkers to run faster (E22, E251, E27).
- \* Fixed a crash when parsed code is invalid (too many closing brackets).
- \* Fix E127 and E128 for continuation line indentation. (Issue #74)
- \* New option `--format` to customize the error format. (Issue #23)
- \* New option `--diff` to check only modified code. The unified diff is read from STDIN. Example: `hg diff | pep8 --diff` (Issue #39)
- \* Correctly report the count of failures and set the exit code to 1 when the `--doctest` or the `--testsuite` fails.
- \* Correctly detect the encoding in Python 3. (Issue #69)
- \* Drop support for Python 2.3, 2.4 and 3.0. (Issue #78)

1.2 (2012-06-01)

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- \* Add E121 through E128 for continuation line indentation. These checks are disabled by default. If you want to force all checks, use switch `--select=E,W`. Patch by Sam Vilain. (Issue #64)
- \* Add E721 for direct type comparisons. (Issue #47)
- \* Add E711 and E712 for comparisons to singletons. (Issue #46)
- \* Fix spurious E225 and E701 for function annotations. (Issue #29)
- \* Add E502 for explicit line join between brackets.
- \* Fix E901 when printing source with `--show-source`.

\* Report all errors for each checker, instead of reporting only the first occurrence for each line.

\* Option `--show-pep8` implies `--first`.

1.1 (2012-05-24)

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\* Add E901 for syntax errors. (Issues #63 and #30)

\* Add E271, E272, E273 and E274 for extraneous whitespace around keywords. (Issue #57)

\* Add `tox.ini` configuration file for tests. (Issue #61)

\* Add `.travis.yml` configuration file for continuous integration. (Issue #62)

1.0.1 (2012-04-06)

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\* Fix inconsistent version numbers.

1.0 (2012-04-04)

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\* Fix W602 `raise` to handle multi-char names. (Issue #53)

0.7.0 (2012-03-26)

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\* Now `--first` prints only the first occurrence of each error. The `--repeat` flag becomes obsolete because it is the default behaviour. (Issue #6)

\* Allow to specify `--max-line-length`. (Issue #36)

\* Make the shebang more flexible. (Issue #26)

\* Add testsuite to the bundle. (Issue #25)

\* Fixes for Jython. (Issue #49)

- \* Add PyPI classifiers. (Issue #43)
- \* Fix the ``--exclude`` option. (Issue #48)
- \* Fix W602, accept ``raise`` with 3 arguments. (Issue #34)
- \* Correctly select all tests if ``DEFAULT\_IGNORE == ""``.

0.6.1 (2010-10-03)

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- \* Fix inconsistent version numbers. (Issue #21)

0.6.0 (2010-09-19)

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- \* Test suite reorganized and enhanced in order to check more failures with fewer test files. Read the ``run\_tests`` docstring for details about the syntax.
- \* Fix E225: accept ``print >>sys.stderr, "...""`` syntax.
- \* Fix E501 for lines containing multibyte encoded characters. (Issue #7)
- \* Fix E221, E222, E223, E224 not detected in some cases. (Issue #16)
- \* Fix E211 to reject ``v = dic['a'] ['b']``. (Issue #17)
- \* Exit code is always 1 if any error or warning is found. (Issue #10)
- \* ``--ignore`` checks are now really ignored, especially in conjunction with ``--count``. (Issue #8)
- \* Blank lines with spaces yield W293 instead of W291: some developers want to ignore this warning and indent the blank lines to paste their code easily in the Python interpreter.
- \* Fix E301: do not require a blank line before an indented block. (Issue #14)
- \* Fix E203 to accept NumPy slice notation ``a[0, :]``. (Issue #13)
- \* Performance improvements.
- \* Fix decoding and checking non-UTF8 files in Python 3.

- \* Fix E225: reject ``True+False`` when running on Python 3.
- \* Fix an exception when the line starts with an operator.
- \* Allow a new line before closing ``)``, ``}``` or ``]``. (Issue #5)

0.5.0 (2010-02-17)

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- \* Changed the ``--count`` switch to print to sys.stderr and set exit code to 1 if any error or warning is found.
- \* E241 and E242 are removed from the standard checks. If you want to include these checks, use switch ``--select=E,W``. (Issue #4)
- \* Blank line is not mandatory before the first class method or nested function definition, even if there's a docstring. (Issue #1)
- \* Add the switch ``--version``.
- \* Fix decoding errors with Python 3. (Issue #13 [1]\_)
- \* Add ``--select`` option which is mirror of ``--ignore``.
- \* Add checks E261 and E262 for spaces before inline comments.
- \* New check W604 warns about deprecated usage of backticks.
- \* New check W603 warns about the deprecated operator ``<>``.
- \* Performance improvement, due to rewriting of E225.
- \* E225 now accepts:
  - no whitespace after unary operator or similar. (Issue #9 [1]\_)
  - lambda function with argument unpacking or keyword defaults.
- \* Reserve "2 blank lines" for module-level logical blocks. (E303)
- \* Allow multi-line comments. (E302, issue #10 [1]\_)

0.4.2 (2009-10-22)

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\* Decorators on classes and class methods are OK now.

0.4 (2009-10-20)

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\* Support for all versions of Python from 2.3 to 3.1.

\* New and greatly expanded self tests.

\* Added `--count` option to print the total number of errors and warnings.

\* Further improvements to the handling of comments and blank lines.  
(Issue #1 [1]\_ and others changes.)

\* Check all py files in directory when passed a directory (Issue #2 [1]\_). This also prevents an exception when traversing directories with non `*.py` files.

\* E231 should allow commas to be followed by ``)``. (Issue #3 [1]\_)

\* Spaces are no longer required around the equals sign for keyword arguments or default parameter values.

.. [1] These issues refer to the ``previous issue tracker`` \_\_.

.. \_\_: <http://github.com/cburroughs/pep8.py/issues>

0.3.1 (2009-09-14)

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\* Fixes for comments: do not count them when checking for blank lines between items.

\* Added `setup.py` for pypi upload and `easy_installability`.

0.2 (2007-10-16)

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\* Loads of fixes and improvements.

0.1 (2006-10-01)

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\* First release.

Keywords: pep8

Platform: UNKNOWN

Classifier: Development Status :: 5 - Production/Stable

Classifier: Environment :: Console

Classifier: Intended Audience :: Developers

Classifier: License :: OSI Approved :: MIT License

Classifier: Operating System :: OS Independent

Classifier: Programming Language :: Python

Classifier: Programming Language :: Python :: 2

Classifier: Programming Language :: Python :: 3

Classifier: Topic :: Software Development :: Libraries :: Python Modules

Found in path(s):

\* /opt/cola/permits/1160881179\_1620412741.53/0/pep8-1-7-1-1-tar-gz/pep8-1.7.1/PKG-INFO

\*

/opt/cola/permits/1160881179\_1620412741.53/0/pep8-1-7-1-1-tar-gz/pep8-1.7.1/pep8.egg-info/PKG-INFO

No license file was found, but licenses were detected in source scan.

'License :: OSI Approved :: MIT License',

Found in path(s):

\* /opt/cola/permits/1160881179\_1620412741.53/0/pep8-1-7-1-1-tar-gz/pep8-1.7.1/setup.py

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```
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```



Found in path(s):

\* /opt/cola/permits/1160881179\_1620412741.53/0/pep8-1-7-1-1-tar-gz/pep8-1.7.1/docs/index.rst

## 1.75 falcon 2.0.0

### 1.75.1 Available under license :

MIT License

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## 1.76 pyserial 3.5

### 1.76.1 Available under license :

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-----  
Note:

Individual files contain the following tag instead of the full license text.

SPDX-License-Identifier: BSD-3-Clause

This enables machine processing of license information based on the SPDX License Identifiers that are here available: <http://spdx.org/licenses/>

## 1.77 pnp 3.0.0.dev2

### 1.77.1 Available under license :

No license file was found, but licenses were detected in source scan.

```
license='Cisco Proprietary',
```

Found in path(s):

```
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/setup.py
```

No license file was found, but licenses were detected in source scan.

```
[bdist_rpm]
```

```
release = 1
```

```
packager = Network Plug-n-Play <pnp-dev@cisco.com>
```

```
doc_files = README.rst
```

```
no-autoreq = 1
```

```
post-install = pnp/data/cfg/post_install_rpm.sh
```

```
rpm-base = ./rpmbuild
```

binary-only = 1  
description = Plug-n-Play Agent for Cisco Network-PnP  
keep-temp = 1

[egg\_info]  
tag\_build =  
tag\_date = 0

Found in path(s):

\* /opt/cola/permits/1169156025\_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/setup.cfg

No license file was found, but licenses were detected in source scan.

# All rights reserved.

Found in path(s):

\* /opt/cola/permits/1169156025\_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/api/capwap.py

\* /opt/cola/permits/1169156025\_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/api/reload.py

\* /opt/cola/permits/1169156025\_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/system/reload.py

\* /opt/cola/permits/1169156025\_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/api/wlc.py

\* /opt/cola/permits/1169156025\_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/api/monitor.py

\* /opt/cola/permits/1169156025\_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/service/services/topology.py

\*

/opt/cola/permits/1169156025\_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/service/services/tag.py

\* /opt/cola/permits/1169156025\_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/system/script\_exec.py

\* /opt/cola/permits/1169156025\_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/profile/profile.py

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Metadata-Version: 1.2  
Name: pnp  
Version: 3.0.0.dev2  
Summary: Plug-n-Play Agent for Cisco Network-PnP  
Home-page: <https://developer.cisco.com/site/open-plug-n-play/>  
Author: Network Plug-n-Play  
Author-email: [pnp-support@cisco.com](mailto:pnp-support@cisco.com)  
License: Cisco Proprietary  
Description: UNKNOWN  
Keywords: posix pnp agent plug-n-play client  
Platform: UNKNOWN  
Classifier: Operating System :: POSIX :: Linux  
Classifier: Programming Language :: Python :: 3.6  
Requires-Python: >=3.6

Found in path(s):

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## 1.78 tar 1.34

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## 1.84 erlang-otp 22.3.4.17

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## THE BASIC LIBRARY FUNCTIONS

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[PCRE]

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Also included in the distribution is a set of C++ wrapper functions, and a just-in-time compiler that can be used to optimize pattern matching. These are both optional features that can be omitted when the library is built.

## THE BASIC LIBRARY FUNCTIONS

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Written by: Philip Hazel  
Email local part: ph10  
Email domain: cam.ac.uk

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[Misc]

C library code]

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```

-----  
[zlib]

```
/* zlib.h -- interface of
the 'zlib' general purpose compression library
version 1.2.3, July 18th, 2005
```

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Jean-loup  
Gailly      Mark Adler  
jloup@gzip.org      madler@alumni.caltech.edu

The data format used by the zlib library is described by RFCs (Request for Comments) 1950 to 1952 in the files <http://www.ietf.org/rfc/rfc1950.txt> (zlib format), [rfc1951.txt](http://www.ietf.org/rfc/rfc1951.txt) (deflate format) and [rfc1952.txt](http://www.ietf.org/rfc/rfc1952.txt) (gzip format).

\*/

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[dialyzer]

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[edoc, syntax\_tools]

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[eunit]

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[leex]

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[eldap]

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tomb - support for clean goroutine termination in Go.

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Go support for Protocol Buffers - Google's data interchange format

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Support for streaming Protocol Buffer messages for the Go language (golang).

[https://github.com/matttproud/golang\\_protobuf\\_extensions](https://github.com/matttproud/golang_protobuf_extensions)

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Gocheck - A rich testing framework for Go

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Paul Borman <borman@google.com>

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theory

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goproperties - properties file decoder for Go

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```

```
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```
# Please keep the list sorted.
```

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```

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Jan Mercl <0xjnm@gmail.com>
```

```
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```

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```

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```

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```
"MIT": `// Copyright (c) {{.Year}} {{.Owner}}`
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}
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package api

```
import (  
    "io/ioutil"  
    "strings"  
    "time"  
)
```

```
type License struct {  
    // The unique identifier of the license  
    LicenseID string `json:"license_id"`  
  
    // The customer ID associated with the license  
    CustomerID string `json:"customer_id"`  
  
    // If set, an identifier that should be used to lock the license to a  
    // particular site, cluster, etc.  
    InstallationID string `json:"installation_id"`  
  
    // The time at which the license was issued  
    IssueTime time.Time `json:"issue_time"`  
  
    // The time at which the license starts being valid  
    StartTime time.Time `json:"start_time"`  
  
    // The time after which the license expires  
    ExpirationTime time.Time `json:"expiration_time"`  
  
    // The time at which the license ceases to function and can
```

```

// no longer be used in any capacity
TerminationTime time.Time `json:"termination_time"`

// The product the license is valid for
Product string `json:"product"`

// License Specific Flags
Flags map[string]interface{}
`json:"flags"`

// List of features enabled by the license
Features []string `json:"features"`
}

type LicenseReply struct {
    Valid bool
    License *License
    Warnings []string
}

func (op *Operator) LicenseGet(q *QueryOptions) (*LicenseReply, error) {
    var reply LicenseReply
    if _, err := op.c.query("/v1/operator/license", &reply, q); err != nil {
        return nil, err
    } else {
        return &reply, nil
    }
}

func (op *Operator) LicenseGetSigned(q *QueryOptions) (string, error) {
    r := op.c.NewRequest("GET", "/v1/operator/license")
    r.Params.Set("signed", "1")
    r.SetQueryOptions(q)
    _, resp, err := requireOK(op.c.doRequest(r))
    if err != nil {
        return "", err
    }
    defer resp.Body.Close()

    data, err := ioutil.ReadAll(resp.Body)
    if err != nil {
        return "", err
    }

    return string(data), nil
}

// LicenseReset will reset the license to the builtin one if it is still valid.

```

```

// If the builtin license is invalid, the current license stays active.
func
(op *Operator) LicenseReset(opts *WriteOptions) (*LicenseReply, error) {
var reply LicenseReply
r := op.c.newRequest("DELETE", "/v1/operator/license")
r.setWriteOptions(opts)
_, resp, err := requireOK(op.c.doRequest(r))
if err != nil {
return nil, err
}
defer resp.Body.Close()

if err := decodeBody(resp, &reply); err != nil {
return nil, err
}

return &reply, nil
}

func (op *Operator) LicensePut(license string, opts *WriteOptions) (*LicenseReply, error) {
var reply LicenseReply
r := op.c.newRequest("PUT", "/v1/operator/license")
r.setWriteOptions(opts)
r.body = strings.NewReader(license)
_, resp, err := requireOK(op.c.doRequest(r))
if err != nil {
return nil, err
}
defer resp.Body.Close()

if err := decodeBody(resp, &reply); err != nil {
return nil, err
}

return &reply, nil
}

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```

```

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package spec

import (
    "encoding/json"

    "github.com/go-openapi/swag"
)

// License information for the exposed API.
//
// For more information: http://goo.gl/8us55a#licenseObject
type License struct {
    LicenseProps
    VendorExtensible
}

// LicenseProps holds the properties of a License object
type LicenseProps struct {
    Name string `json:"name,omitempty"`
    URL  string
    `json:"url,omitempty"`
}

// UnmarshalJSON hydrates License from json
func (l *License) UnmarshalJSON(data []byte) error {
    if err := json.Unmarshal(data, &l.LicenseProps); err != nil {
        return err
    }
    return json.Unmarshal(data, &l.VendorExtensible)
}

// MarshalJSON produces License as json
func (l License) MarshalJSON() ([]byte, error) {
    b1, err := json.Marshal(l.LicenseProps)
    if err != nil {
        return nil, err
    }
    b2, err := json.Marshal(l.VendorExtensible)
    if err != nil {
        return nil, err
    }
    return swag.ConcatJSON(b1, b2), nil
}

Data model artifacts for Prometheus.
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```

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\* [golang.org/x/tools/go/analysis](https://golang.org/x/tools/go/analysis) - <https://github.com/golang/tools>

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# update-license

This is a small tool that updates the license header for Uber's open source Golang files.

## Installation

...

```
go get go.uber.org/tools/update-license
```

...

## Usage

...

```
update-license go_files...
```

...

## Further Work



- \* Support more licenses by name (MIT, Apache 2.0, etc), file path, url (http GET)
- \* Support custom owner (not just "Uber Technologies, Inc.")
- \* Support more languages than go (cover go, java, js, py to start, along with LICENSE, LICENSE.txt)
- \* Talk about removing custom logic for header comments (ie `@generated`, `Code generated by`), it probably makes more sense just to put the license at the top
- \* Better detection support for existing licenses so they can be removed
- \* Verbose, dry run support

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Protocol Buffers for Go with Gadgets

Go support for Protocol Buffers - Google's data interchange format

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<https://github.com/golang/protobuf>

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## 1.103 protobuf 1.23.0

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# 1.107 ncurses 6.3

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Current ncurses maintainer: Thomas Dickey <[dickey@invisible-island.net](mailto:dickey@invisible-island.net)>

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-- vile: txtmode file-encoding=utf-8

Upstream source <https://invisible-island.net/ncurses/ncurses.html>

This package is used for testing builds of ncurses.

Current ncurses maintainer: Thomas Dickey <[dickey@invisible-island.net](mailto:dickey@invisible-island.net)>

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procfs provides functions to retrieve system, kernel and process metrics from the pseudo-filesystem proc.

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```

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```
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## 1.118 markupsafe 2.1.1

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Metadata-Version: 2.1

Name: MarkupSafe

Version: 2.1.1

Summary: Safely add untrusted strings to HTML/XML markup.

Home-page: <https://palletsprojects.com/p/markupsafe/>

Author: Armin Ronacher

Author-email: [armin.ronacher@active-4.com](mailto:armin.ronacher@active-4.com)

Maintainer: Pallets

Maintainer-email: [contact@palletsprojects.com](mailto:contact@palletsprojects.com)

License: BSD-3-Clause

Project-URL: Donate, <https://palletsprojects.com/donate>

Project-URL: Documentation, <https://markupsafe.palletsprojects.com/>

Project-URL: Changes, <https://markupsafe.palletsprojects.com/changes/>

Project-URL: Source Code, <https://github.com/pallets/markupsafe/>

Project-URL: Issue Tracker, <https://github.com/pallets/markupsafe/issues/>

Project-URL: Twitter, <https://twitter.com/PalletsTeam>

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Platform: UNKNOWN

Classifier: Development Status :: 5 - Production/Stable

Classifier: Environment :: Web Environment

Classifier: Intended Audience :: Developers

Classifier: License

:: OSI Approved :: BSD License

Classifier: Operating System :: OS Independent

Classifier: Programming Language :: Python

Classifier: Topic :: Internet :: WWW/HTTP :: Dynamic Content

Classifier: Topic :: Text Processing :: Markup :: HTML

Requires-Python: >=3.7

Description-Content-Type: text/x-rst

License-File: LICENSE.rst

MarkupSafe

=====

MarkupSafe implements a text object that escapes characters so it is safe to use in HTML and XML. Characters that have special meanings are replaced so that they display as the actual characters. This mitigates injection attacks, meaning untrusted user input can safely be displayed on a page.

Installing

-----

Install and update using ``pip`_`:

.. code-block:: text

```
pip install -U MarkupSafe
```

.. \_pip: <https://pip.pypa.io/en/stable/getting-started/>

## Examples

-----

.. code-block:: pycon

```
>>> from markupsafe import Markup, escape

>>> # escape replaces special characters and wraps in Markup
>>> escape("<script>alert(document.cookie);</script>")
Markup('&lt;script&gt;alert(document.cookie);&lt;/script&gt;')

>>> # wrap in Markup to mark text "safe" and prevent escaping
>>> Markup("<strong>Hello</strong>")
Markup('<strong>hello</strong>')

>>> escape(Markup("<strong>Hello</strong>"))
Markup('<strong>hello</strong>')

>>> # Markup is a str subclass
>>> # methods and operators escape their arguments
>>> template = Markup("Hello <em>{ name }</em>")
>>> template.format(name="World")
Markup('Hello <em>&#34;World&#34;</em>')
```

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-----

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## Links

-----

- Documentation: <https://markupsafe.palletsprojects.com/>
- Changes: <https://markupsafe.palletsprojects.com/changes/>

- 
- PyPI Releases: <https://pypi.org/project/MarkupSafe/>
- Source Code: <https://github.com/pallets/markupsafe/>
- Issue Tracker: <https://github.com/pallets/markupsafe/issues/>
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[metadata]

name = MarkupSafe

version = attr: markupsafe.\_\_version\_\_

url = <https://palletsprojects.com/p/markupsafe/>

project\_urls =

Donate = <https://palletsprojects.com/donate>

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author = Armin Ronacher

author\_email = [armin.ronacher@active-4.com](mailto:armin.ronacher@active-4.com)

maintainer = Pallets

maintainer\_email = [contact@palletsprojects.com](mailto:contact@palletsprojects.com)

description = Safely add untrusted strings to HTML/XML markup.

long\_description = file: README.rst

long\_description\_content\_type = text/x-rst

classifiers =

Development Status :: 5 - Production/Stable

Environment :: Web Environment

Intended Audience ::

Developers

License :: OSI Approved :: BSD License

Operating System :: OS Independent

Programming Language :: Python

Topic :: Internet :: WWW/HTTP :: Dynamic Content

Topic :: Text Processing :: Markup :: HTML

[options]

packages = find:

```
package_dir = src
include_package_data = True
python_requires = >= 3.7
```

```
[options.packages.find]
where = src
```

```
[tool:pytest]
testpaths = tests
filterwarnings =
    error
```

```
[coverage:run]
branch = True
source =
    markupsafe
    tests
```

```
[coverage:paths]
source =
    src
    */site-packages
```

```
[flake8]
select = B, E, F, W, B9, ISC
ignore =
    E203
    E501
    E722
    W503
max-line-length = 80
```

```
[mypy]
files = src/markupsafe
python_version = 3.7
show_error_codes = True
disallow_subclassing_any = True
disallow_untyped_calls = True
disallow_untyped_defs = True
disallow_incomplete_defs = True
no_implicit_optional = True
local_partial_types = True
no_implicit_reexport = True
strict_equality = True
warn_redundant_casts = True
warn_unused_configs = True
warn_unused_ignores = True
warn_return_any
```

```
= True
warn_unreachable = True
```

```
[egg_info]
tag_build =
tag_date = 0
```

Found in path(s):

```
* /opt/cola/permits/1288546271_1649055323.54/0/markupsafe-2-1-1-tar-gz/MarkupSafe-2.1.1/setup.cfg
```

## 1.119 expat 2.4.7

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Found in path(s):

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[metadata]

name = itsdangerous

version = attr: itsdangerous.\_\_version\_\_

url = <https://palletsprojects.com/p/itsdangerous/>

project\_urls =

Donate = <https://palletsprojects.com/donate>

Documentation = <https://itsdangerous.palletsprojects.com/>

Changes = <https://itsdangerous.palletsprojects.com/changes/>

Source Code = <https://github.com/pallets/itsdangerous/>

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Twitter = <https://twitter.com/PalletsTeam>

Chat = <https://discord.gg/pallets>

license = BSD-3-Clause

license\_files = LICENSE.rst

author = Armin Ronacher

author\_email = [armin.ronacher@active-4.com](mailto:armin.ronacher@active-4.com)

maintainer = Pallets

maintainer\_email = [contact@palletsprojects.com](mailto:contact@palletsprojects.com)

description = Safely pass data to untrusted environments and back.

```
long_description = file: README.rst
long_description_content_type = text/x-rst
classifiers =
Development Status :: 5 - Production/Stable
Intended Audience :: Developers
License
:: OSI Approved :: BSD License
Operating System :: OS Independent
Programming Language :: Python
```

```
[options]
```

```
packages = find:
package_dir = = src
include_package_data = True
python_requires = >= 3.7
```

```
[options.packages.find]
```

```
where = src
```

```
[tool:pytest]
```

```
testpaths = tests
filterwarnings =
error
```

```
[coverage:run]
```

```
branch = True
source =
itsdangerous
tests
```

```
[coverage:paths]
```

```
source =
src
*/site-packages
```

```
[flake8]
```

```
select = B, E, F, W, B9, ISC
ignore =
E203
E501
E722
W503
max-line-length = 80
per-file-ignores =
src/itsdangerous/__init__.py: F401
```

```
[mypy]
```

```
files = src/itsdangerous
```

```
python_version = 3.7
show_error_codes = True
disallow_subclassing_any = True
disallow_untyped_calls = True
disallow_untyped_defs = True
disallow_incomplete_defs = True
no_implicit_optional = True
local_partial_types = True
no_implicit_reexport = True
strict_equality = True
warn_redundant_casts = True
warn_unused_configs = True
warn_unused_ignores = True
warn_return_any = True
warn_unreachable = True
```

```
[mypy-itsdangerous.jws]
disallow_untyped_defs
= False
```

```
[egg_info]
tag_build =
tag_date = 0
```

Found in path(s):

```
* /opt/cola/permits/1294198813_1649055045.06/0/itsdangerous-2-1-2-tar-gz/itsdangerous-2.1.2/setup.cfg
```

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Metadata-Version: 2.1

Name: itsdangerous

Version: 2.1.2

Summary: Safely pass data to untrusted environments and back.

Home-page: <https://palletsprojects.com/p/itsdangerous/>

Author: Armin Ronacher

Author-email: [armin.ronacher@active-4.com](mailto:armin.ronacher@active-4.com)

Maintainer: Pallets

Maintainer-email: [contact@palletsprojects.com](mailto:contact@palletsprojects.com)

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Project-URL: Issue Tracker, <https://github.com/pallets/itsdangerous/issues/>

Project-URL: Twitter, <https://twitter.com/PalletsTeam>

Project-URL: Chat, <https://discord.gg/pallets>

Platform: UNKNOWN

Classifier: Development Status :: 5 - Production/Stable

Classifier: Intended Audience :: Developers

Classifier: License :: OSI Approved :: BSD License

Classifier:

Operating System :: OS Independent

Classifier: Programming Language :: Python

Requires-Python: >=3.7

Description-Content-Type: text/x-rst

License-File: LICENSE.rst

ItsDangerous

=====

... so better sign this

Various helpers to pass data to untrusted environments and to get it back safe and sound. Data is cryptographically signed to ensure that a token has not been tampered with.

It's possible to customize how data is serialized. Data is compressed as needed. A timestamp can be added and verified automatically while loading a token.

Installing

-----

Install and update using `pip`\_:

.. code-block:: text

```
pip install -U itsdangerous
```

.. \_pip: <https://pip.pypa.io/en/stable/getting-started/>

A Simple Example

-----

Here's how you could generate a token for transmitting a user's id and name between web requests.

.. code-block:: python

```
from itsdangerous import URLSafeSerializer
auth_s = URLSafeSerializer("secret key", "auth")
```

```
token = auth_s.dumps({"id": 5, "name": "itsdangerous"})
```

```
print(token)
```

```
# eyJpZCI6NSwibmFtZSI6ImI0c2Rhbmdlcm91cyJ9.6YP6T0BaO67XP--9UzTrmurXSmg
```

```
data = auth_s.loads(token)
print(data["name"])
# itsdangerous
```

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-----

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.. \_please donate today: <https://palletsprojects.com/donate>

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-----

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- Changes: <https://itsdangerous.palletsprojects.com/changes/>
- PyPI Releases: <https://pypi.org/project/ItsDangerous/>
- Source Code: <https://github.com/pallets/itsdangerous/>
- Issue Tracker: <https://github.com/pallets/itsdangerous/issues/>
- Website: <https://palletsprojects.com/p/itsdangerous/>
- Twitter: <https://twitter.com/PalletsTeam>
- Chat: <https://discord.gg/pallets>

## Found

in path(s):

```
* /opt/cola/permits/1294198813_1649055045.06/0/itsdangerous-2-1-2-tar-gz/itsdangerous-2.1.2/src/itsdangerous.egg-info/PKG-INFO
```

```
* /opt/cola/permits/1294198813_1649055045.06/0/itsdangerous-2-1-2-tar-gz/itsdangerous-2.1.2/PKG-INFO
```

# 1.121 libxslt 1.1.35

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## 1.125 click 8.1.3

### 1.125.1 Available under license :

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.. \_contrib:

```
=====  
click-contrib  
=====
```

As the userbase of Click grows, more and more major feature requests pop up in Click's bugtracker. As reasonable as it may be for those features to be bundled with Click instead of being a standalone project, many of those requested features are either highly experimental or have unproven practical use, while potentially being a burden to maintain.

This is why click-contrib\_ exists. The GitHub organization is a collection of possibly experimental third-party packages whose featureset does not belong into Click, but also a playground for major features that may be added to Click in the future. It is also meant to coordinate and concentrate effort on writing third-party extensions for Click, and to ease the effort of searching for such extensions. In that sense it could be described as a low-maintenance alternative to extension repositories of other frameworks.

Please

note that the quality and stability of those packages may be different than what you expect from Click itself. While published under a common

organization, they are still projects separate from Click.

.. \_click-contrib: <https://github.com/click-contrib/>

Found in path(s):

\* /opt/cola/permits/1318172402\_1651721571.72/0/click-8-1-3-tar-gz/click-8.1.3/docs/contrib.rst

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Including attribution to #612

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\* /opt/cola/permits/1318172402\_1651721571.72/0/click-8-1-3-tar-gz/click-8.1.3/tests/test\_formatting.py

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Metadata-Version: 2.1

Name: click

Version: 8.1.3

Summary: Composable command line interface toolkit

Home-page: <https://palletsprojects.com/p/click/>

Author: Armin Ronacher

Author-email: [armin.ronacher@active-4.com](mailto:armin.ronacher@active-4.com)

Maintainer: Pallets

Maintainer-email: [contact@palletsprojects.com](mailto:contact@palletsprojects.com)

License: BSD-3-Clause

Project-URL: Donate, <https://palletsprojects.com/donate>

Project-URL: Documentation, <https://click.palletsprojects.com/>

Project-URL: Changes, <https://click.palletsprojects.com/changes/>

Project-URL: Source Code, <https://github.com/pallets/click/>

Project-URL: Issue Tracker, <https://github.com/pallets/click/issues/>

Project-URL: Twitter, <https://twitter.com/PalletsTeam>

Project-URL: Chat, <https://discord.gg/pallets>

Platform: UNKNOWN

Classifier: Development Status :: 5 - Production/Stable

Classifier: Intended Audience :: Developers

Classifier: License :: OSI Approved :: BSD License

Classifier: Operating System :: OS Independent

Classifier:

Programming Language :: Python

Requires-Python: >=3.7

Description-Content-Type: text/x-rst

License-File: LICENSE.rst

\\$ click\\_

=====

Click is a Python package for creating beautiful command line interfaces in a composable way with as little code as necessary. It's the "Command Line Interface Creation Kit". It's highly configurable but comes with

sensible defaults out of the box.

It aims to make the process of writing command line tools quick and fun while also preventing any frustration caused by the inability to implement an intended CLI API.

Click in three points:

- Arbitrary nesting of commands
- Automatic help page generation
- Supports lazy loading of subcommands at runtime

## Installing

-----

Install and update using `pip`:

```
.. code-block:: text
```

```
$ pip install -U click
```

```
.. _pip: https://pip.pypa.io/en/stable/getting-started/
```

## A Simple Example

-----

```
.. code-block:: python
```

```
import click
```

```
@click.command()
```

```
@click.option("--count",
```

```
default=1, help="Number of greetings.")
```

```
@click.option("--name", prompt="Your name", help="The person to greet.")
```

```
def hello(count, name):
```

```
    """Simple program that greets NAME for a total of COUNT times."""
```

```
    for _ in range(count):
```

```
        click.echo(f"Hello, {name}!")
```

```
if __name__ == '__main__':
```

```
    hello()
```

```
.. code-block:: text
```

```
$ python hello.py --count=3
```

```
Your name: Click
```

Hello, Click!

Hello, Click!

Hello, Click!

Donate

-----

The Pallets organization develops and supports Click and other popular packages. In order to grow the community of contributors and users, and allow the maintainers to devote more time to the projects, `please donate today`\_.

.. \_please donate today: <https://palletsprojects.com/donate>

Links

-----

- Documentation: <https://click.palletsprojects.com/>
- Changes: <https://click.palletsprojects.com/changes/>
- PyPI Releases: <https://pypi.org/project/click/>
- Source Code: <https://github.com/pallets/click>
- 
- Issue Tracker: <https://github.com/pallets/click/issues>
- Website: <https://palletsprojects.com/p/click>
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Found in path(s):

- \* /opt/cola/permits/1318172402\_1651721571.72/0/click-8-1-3-tar-gz/click-8.1.3/src/click.egg-info/PKG-INFO
- \* /opt/cola/permits/1318172402\_1651721571.72/0/click-8-1-3-tar-gz/click-8.1.3/PKG-INFO

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[metadata]

name = click

version = attr: click.\_\_version\_\_

url = <https://palletsprojects.com/p/click/>

project\_urls =

Donate = <https://palletsprojects.com/donate>

Documentation = <https://click.palletsprojects.com/>

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Chat = <https://discord.gg/pallets>

license = BSD-3-Clause

license\_files = LICENSE.rst

author = Armin Ronacher  
author\_email = armin.ronacher@active-4.com  
maintainer = Pallets  
maintainer\_email = contact@palletsprojects.com  
description = Composable command line interface toolkit  
long\_description = file: README.rst  
long\_description\_content\_type = text/x-rst  
classifiers =  
Development Status :: 5 - Production/Stable  
Intended Audience :: Developers  
License :: OSI Approved :: BSD License  
Operating System :: OS  
Independent  
Programming Language :: Python

[options]

packages = find:  
package\_dir = = src  
include\_package\_data = True  
python\_requires = >= 3.7

[options.packages.find]

where = src

[tool:pytest]

testpaths = tests  
filterwarnings =  
error

[coverage:run]

branch = True  
source =  
click  
tests

[coverage:paths]

source =  
src  
\*/site-packages

[flake8]

select = B, E, F, W, B9, ISC  
ignore =  
E203  
E501  
E722  
W503  
max-line-length = 80

```
per-file-ignores =
src/click/__init__.py: F401
```

```
[mypy]
files = src/click
python_version = 3.7
show_error_codes = True
disallow_subclassing_any = True
disallow_untyped_calls = True
disallow_untyped_defs = True
disallow_incomplete_defs = True
check_untyped_defs = True
no_implicit_optional = True
local_partial_types = True
no_implicit_reexport = True
strict_equality = True
warn_redundant_casts = True
warn_unused_configs = True
warn_unused_ignores = True
warn_return_any = True
warn_unreachable = True
```

```
[mypy-colorama.*]
ignore_missing_imports = True
```

```
[mypy-importlib_metadata.*]
ignore_missing_imports
= True
```

```
[egg_info]
tag_build =
tag_date = 0
```

Found in path(s):

```
* /opt/cola/permits/1318172402_1651721571.72/0/click-8-1-3-tar-gz/click-8.1.3/setup.cfg
```

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Found in path(s):

```
* /opt/cola/permits/1318172402_1651721571.72/0/click-8-1-3-tar-gz/click-8.1.3/src/click/parser.py
```

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## 1.126 jinja2 3.1.2

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## 1.127 json-c 0.16

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## 1.129 cJSON 2.1.0

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Contributors

=====

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Current Maintainer:

- [Max Bruckner](<https://github.com/FSMaxB>)

- [Alan Wang](<https://github.com/Alanscut>)

Contributors:

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- \* [Benbuck Nason](<https://github.com/bnason-nf>)
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\* [yuta-oxo](https://github.com/yuta-oxo)



- \* [Zach Hindes](https://github.com/zhindes)
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/\*

\* integritysetup - setup integrity protected volumes for dm-integrity

\*

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\*/

# 1.136 smartmontools 7.3

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If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6.

Any executables

containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

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## 1.138 coreutils 9.1

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Version 3, 29 June 2007

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## 1.139 findutils 4.9.0

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## 1.140 cffi 1.15.1

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## 1.141 typing-extensions 4.3.0

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Python was created in the early 1990s by Guido van Rossum at Stichting Mathematisch Centrum (CWI, see <http://www.cwi.nl>) in the Netherlands as a successor of a language called ABC. Guido remains Python's principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for National Research Initiatives (CNRI, see <http://www.cnri.reston.va.us>) in Reston, Virginia where he released several versions of the software.

In May 2000, Guido and the Python core development team moved to BeOpen.com to form the BeOpen PythonLabs team. In October of the same year, the PythonLabs team moved to Digital Creations (now Zope Corporation, see <http://www.zope.com>). In 2001, the Python Software Foundation (PSF, see <http://www.python.org/psf/>) was formed, a non-profit organization created specifically to own Python-related Intellectual Property. Zope Corporation is a sponsoring member of the PSF.

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Release	Derived from	Year	Owner	GPL-compatible? (1)
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0.9.0 thru 1.2		1991-1995	CWI	yes
1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no
2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes
2.1.2	2.1.1	2002	PSF	yes
2.1.3	2.1.2	2002	PSF	yes
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2.1.1	2001-now	PSF	yes	

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# 1.142 python-setuptools 63.2.0

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## 1.145 yarl 1.8.1

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Metadata-Version: 2.1

Name: Flask

Version: 2.2.2

Summary: A simple framework for building complex web applications.

Home-page: <https://palletsprojects.com/p/flask>

Author: Armin Ronacher

Author-email: [armin.ronacher@active-4.com](mailto:armin.ronacher@active-4.com)

Maintainer: Pallets  
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Project-URL: Documentation, <https://flask.palletsprojects.com/>  
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Project-URL: Source Code, <https://github.com/pallets/flask/>  
Project-URL: Issue Tracker, <https://github.com/pallets/flask/issues/>  
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Classifier: Development Status :: 5 - Production/Stable  
Classifier: Environment :: Web Environment  
Classifier: Framework :: Flask  
Classifier: Intended Audience :: Developers  
Classifier: License :: OSI  
Approved :: BSD License  
Classifier: Operating System :: OS Independent  
Classifier: Programming Language :: Python  
Classifier: Topic :: Internet :: WWW/HTTP :: Dynamic Content  
Classifier: Topic :: Internet :: WWW/HTTP :: WSGI  
Classifier: Topic :: Internet :: WWW/HTTP :: WSGI :: Application  
Classifier: Topic :: Software Development :: Libraries :: Application Frameworks  
Requires-Python: >=3.7  
Description-Content-Type: text/x-rst  
Provides-Extra: async  
Provides-Extra: dotenv  
License-File: LICENSE.rst

Flask

=====

Flask is a lightweight `WSGI` web application framework. It is designed to make getting started quick and easy, with the ability to scale up to complex applications. It began as a simple wrapper around `Werkzeug` and `Jinja` and has become one of the most popular Python web application frameworks.

Flask offers suggestions, but doesn't enforce any dependencies or project layout. It is up to the developer to choose the tools and libraries they want to use. There are many extensions provided by the community that make adding new functionality easy.

.. `WSGI`: <https://wsgi.readthedocs.io/>  
.. `Werkzeug`: <https://werkzeug.palletsprojects.com/>  
.. `Jinja`: <https://jinja.palletsprojects.com/>

## Installing

-----

Install and update using `pip`:

.. code-block:: text

```
$ pip install -U Flask
```

.. \_pip: <https://pip.pypa.io/en/stable/getting-started/>

## A Simple Example

-----

.. code-block:: python

```
# save this as app.py
from flask import Flask
```

```
app = Flask(__name__)
```

```
@app.route("/")
def hello():
    return "Hello, World!"
```

.. code-block:: text

```
$ flask run
* Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)
```

## Contributing

-----

For guidance on setting up a development environment and how to make a contribution to Flask, see the `contributing guidelines`.

.. \_contributing guidelines: <https://github.com/pallets/flask/blob/main/CONTRIBUTING.rst>

## Donate

-----

The Pallets organization develops and supports Flask and the libraries it uses. In order to grow the community of contributors and users, and allow the maintainers to devote more time to the projects, please

donate today`\_.

.. \_please donate today: <https://palletsprojects.com/donate>

## Links

-----

- Documentation: <https://flask.palletsprojects.com/>
- Changes: <https://flask.palletsprojects.com/changes/>
- PyPI Releases: <https://pypi.org/project/Flask/>
- Source Code: <https://github.com/pallets/flask/>
- Issue Tracker: <https://github.com/pallets/flask/issues/>
- Website: <https://palletsprojects.com/p/flask/>
- Twitter: <https://twitter.com/PalletsTeam>
- Chat: <https://discord.gg/pallets>

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\* /opt/cola/permits/1386293557\_1662594925.0498831/0/flask-2-2-2-tar-gz/Flask-2.2.2/src/Flask.egg-info/PKG-INFO

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Flask leverages Jinja2 as its template engine. You are obviously free to use

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3. The extension must use an open source license. The Python web

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[metadata]

name = Flask

version = attr: flask.\_\_version\_\_

url = <https://palletsprojects.com/p/flask>

project\_urls =

Donate = <https://palletsprojects.com/donate>

Documentation = <https://flask.palletsprojects.com/>

Changes = <https://flask.palletsprojects.com/changes/>

Source Code = <https://github.com/pallets/flask/>

Issue Tracker = <https://github.com/pallets/flask/issues/>

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license = BSD-3-Clause

author = Armin Ronacher

author\_email = [armin.ronacher@active-4.com](mailto:armin.ronacher@active-4.com)

maintainer = Pallets

maintainer\_email = [contact@palletsprojects.com](mailto:contact@palletsprojects.com)

description = A simple framework for building complex web applications.

long\_description = file: README.rst

long\_description\_content\_type = text/x-rst

classifiers =

Development Status :: 5 - Production/Stable

Environment :: Web Environment

Framework :: Flask

Intended Audience :: Developers

License :: OSI Approved

:: BSD License

Operating System :: OS Independent

Programming Language :: Python

Topic :: Internet :: WWW/HTTP :: Dynamic Content

Topic :: Internet :: WWW/HTTP :: WSGI

Topic :: Internet :: WWW/HTTP :: WSGI :: Application

Topic :: Software Development :: Libraries :: Application Frameworks

[options]

packages = find:

package\_dir = = src

```
include_package_data = True
python_requires = >= 3.7
```

```
[options.packages.find]
where = src
```

```
[options.entry_points]
console_scripts =
    flask = flask.cli:main
```

```
[tool.pytest]
testpaths = tests
filterwarnings =
    error
```

```
[coverage:run]
branch = True
source =
    flask
    tests
```

```
[coverage:paths]
source =
    src
    */site-packages
```

```
[flake8]
select = B, E, F, W, B9, ISC
ignore =
    E203
    E402
    E501
    E722
    W503
max-line-length = 80
per-file-ignores =
    src/flask/__init__.py: F401
```

```
[mypy]
files = src/flask, tests/typing
python_version = 3.7
show_error_codes = True
allow_redefinition = True
disallow_subclassing_any = True
no_implicit_optional = True
local_partial_types
    = True
strict_equality = True
```

```
warn_redundant_casts = True
warn_unused_configs = True
warn_unused_ignores = True
```

```
[mypy-asgiref.*]
ignore_missing_imports = True
```

```
[mypy-blinker.*]
ignore_missing_imports = True
```

```
[mypy-dotenv.*]
ignore_missing_imports = True
```

```
[mypy-cryptography.*]
ignore_missing_imports = True
```

```
[mypy-importlib_metadata]
ignore_missing_imports = True
```

```
[egg_info]
tag_build =
tag_date = 0
```

Found in path(s):

```
* /opt/cola/permits/1386293557_1662594925.0498831/0/flask-2-2-2-tar-gz/Flask-2.2.2/setup.cfg
```

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```
# its Revised BSD License. Copyright © 2015 CERN.
```

Found in path(s):

```
* /opt/cola/permits/1386293557_1662594925.0498831/0/flask-2-2-2-tar-gz/Flask-2.2.2/tests/test_cli.py
```

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```
.. currentmodule:: flask
```

## Blog Blueprint

```
=====
```

You'll use the same techniques you learned about when writing the authentication blueprint to write the blog blueprint. The blog should list all posts, allow logged in users to create posts, and allow the author of a post to edit or delete it.

As you implement each view, keep the development server running. As you save your changes, try going to the URL in your browser and testing them out.

## The Blueprint

-----  
Define the blueprint and register it in the application factory.

```
.. code-block:: python
:caption: ``flaskr/blog.py``

from flask import (
    Blueprint, flash, g, redirect, render_template, request, url_for
)
from werkzeug.exceptions import abort

from flaskr.auth import login_required
from flaskr.db import get_db

bp = Blueprint('blog', __name__)
```

Import and register the blueprint from the factory using  
:meth:`app.register\_blueprint()`  
<Flask.register\_blueprint>`. Place the  
new code at the end of the factory function before returning the app.

```
.. code-block:: python
:caption: ``flaskr/__init__.py``

def create_app():
    app = ...
    # existing code omitted

    from . import blog
    app.register_blueprint(blog.bp)
    app.add_url_rule('/', endpoint='index')

    return app
```

Unlike the auth blueprint, the blog blueprint does not have a  
``url\_prefix``. So the ``index`` view will be at ``/``, the ``create``  
view at ``/create``, and so on. The blog is the main feature of Flaskr,  
so it makes sense that the blog index will be the main index.

However, the endpoint for the ``index`` view defined below will be  
``blog.index``. Some of the authentication views referred to a plain  
``index`` endpoint. :meth:`app.add\_url\_rule()` <Flask.add\_url\_rule>  
associates the endpoint name ``index`` with the ``/`` url so that  
``url\_for('index')`` or ``url\_for('blog.index')`` will  
both work,  
generating the same ``/`` URL either way.



In another application you might give the blog blueprint a `url_prefix` and define a separate `index` view in the application factory, similar to the `hello` view. Then the `index` and `blog.index` endpoints and URLs would be different.

## Index

-----

The index will show all of the posts, most recent first. A `JOIN` is used so that the author information from the `user` table is available in the result.

.. code-block:: python  
:caption: `flaskr/blog.py`

```
@bp.route('/')
def index():
    db = get_db()
    posts = db.execute(
        'SELECT p.id, title, body, created, author_id, username'
        ' FROM post p JOIN user u ON p.author_id = u.id'
        ' ORDER BY created DESC'
    ).fetchall()
    return render_template('blog/index.html', posts=posts)
```

.. code-block:: html+jinja  
:caption: `flaskr/templates/blog/index.html`

```
{% extends 'base.html' %}

{% block header %}
<h1>{{ block title }}Posts{% endblock %}</h1>
{% if g.user %}
  <a class="action" href="{{ url_for('blog.create') }}">New</a>
{% endif %}
{% endblock %}

{% block content %}
{% for post in posts %}
<article class="post">
  <header>
    <div>
      <h1>{{ post['title'] }}</h1>
      <div class="about">by {{ post['username'] }} on {{ post['created'].strftime('%Y-%m-%d') }}</div>
    </div>
  </header>
  <div>
    {{ post['body'] }}
  </div>
</article>
{% endfor %}
{% endblock %}
```

```

    {% if g.user['id'] == post['author_id'] % }
    <a class="action" href="{{ url_for('blog.update', id=post['id']) }}">Edit</a>
    {% endif % }
</header>
<p class="body">{{ post['body'] }}</p>
</article>
{% if not loop.last % }
    <hr>
{% endif % }
{% endfor % }
{% endblock % }

```

When a user is logged in, the ``header`` block adds a link to the ``create`` view. When the user is the author of a post, they'll see an "Edit" link to the ``update`` view for that post. ``loop.last`` is a special variable available inside Jinja for loops. It's used to display a line after each post except the last one, to visually separate them.

.. \_Jinja for loops: <https://jinja.palletsprojects.com/templates/#for>

Create

-----

The ``create`` view works the same as the auth ``register`` view. Either the form is displayed, or the posted data is validated and the post is added to the database or an error is shown.

The ``login\_required`` decorator you wrote earlier is used on the blog views. A user must be logged in to visit these views, otherwise they will be redirected to the login page.

.. code-block:: python

:caption: ``flaskr/blog.py``

```

@bp.route('/create', methods=('GET', 'POST'))
@login_required
def create():
    if request.method == 'POST':
        title = request.form['title']
        body = request.form['body']
        error = None

    if not title:
        error = 'Title

```

is required.'

```
    if error is not None:
        flash(error)
    else:
        db = get_db()
        db.execute(
            'INSERT INTO post (title, body, author_id)
            VALUES (?, ?, ?)',
            (title, body, g.user['id'])
        )
        db.commit()
        return redirect(url_for('blog.index'))

return render_template('blog/create.html')
```

.. code-block:: html+jinja  
:caption: ``flaskr/templates/blog/create.html``

```
{% extends 'base.html' %}

{% block header %}
<h1>{% block title %}New Post{% endblock %}</h1>
{% endblock %}

{% block content %}
<form method="post">
  <label for="title">Title</label>
  <input name="title" id="title" value="{{ request.form['title'] }}" required>
  <label for="body">Body</label>
  <textarea name="body" id="body">{{ request.form['body'] }}</textarea>
  <input type="submit" value="Save">
</form>
{% endblock %}
```

## Update

-----

Both the ``update`` and ``delete`` views will need to fetch a ``post`` by ``id`` and check if the author matches the logged in user. To avoid duplicating code, you can write a function to get the ``post`` and call it from each view.

```
.. code-block:: python
:caption: ``flaskr/blog.py``

def get_post(id, check_author=True):
```

```

post = get_db().execute(
    'SELECT p.id, title, body, created, author_id, username'
    ' FROM post p JOIN user u ON p.author_id = u.id'
    ' WHERE p.id = ?',
    (id,))
).fetchone()

if post is None:
    abort(404, f"Post id {id} doesn't exist.")

if check_author and post['author_id'] != g.user['id']:
    abort(403)

return post

```

:func:`abort` will raise a special exception that returns an HTTP status code. It takes an optional message to show with the error, otherwise a default message is used. ``404`` means "Not Found", and ``403`` means "Forbidden". (``401`` means "Unauthorized", but you redirect to the login page instead of returning that status.)

The ``check\_author`` argument is defined so that the function can be used to get a ``post`` without checking the author. This would be useful if you wrote a view to show an individual post on a page, where the user doesn't matter because they're not modifying the post.

.. code-block:: python

:caption: ``flaskr/blog.py``

```

@bp.route('/<int:id>/update', methods=('GET', 'POST'))
@login_required
def update(id):
    post = get_post(id)

    if request.method == 'POST':
        title = request.form['title']
        body = request.form['body']
        error = None

        if not title:
            error = "Title is required."

        if error is not None:
            flash(error)
        else:
            db = get_db()
            db.execute(

```

```

        'UPDATE post SET title = ?,
body = ?'
        ' WHERE id = ?',
        (title, body, id)
    )
    db.commit()
    return redirect(url_for('blog.index'))

return render_template('blog/update.html', post=post)

```

Unlike the views you've written so far, the `update` function takes an argument, `id`. That corresponds to the `<int:id>` in the route. A real URL will look like `/1/update`. Flask will capture the `1`, ensure it's an `:int`, and pass it as the `id` argument. If you don't specify `int` and instead do `<id>`, it will be a string. To generate a URL to the update page, `url_for` needs to be passed the `id` so it knows what to fill in: `url_for('blog.update', id=post['id'])`. This is also in the `index.html` file above.

The `create` and `update` views look very similar. The main difference is that the `update` view uses a `post` object and an `UPDATE` query instead of an `INSERT`. With some clever refactoring, you could use one view and template for both actions, but for the tutorial it's clearer to keep them separate.

.. code-block:: html+jinja  
:caption: flaskr/templates/blog/update.html

```

{% extends 'base.html' %}

{% block header %}
<h1>{% block title %}Edit "{{ post['title'] }}"{% endblock %}</h1>
{% endblock %}

{% block content %}
<form method="post">
  <label for="title">Title</label>
  <input name="title" id="title"
    value="{{ request.form['title'] or post['title'] }}" required>
  <label for="body">Body</label>
  <textarea name="body" id="body">{{ request.form['body'] or post['body'] }}</textarea>
  <input type="submit" value="Save">
</form>
<hr>
<form action="{{ url_for('blog.delete', id=post['id']) }}" method="post">
  <input class="danger" type="submit" value="Delete" onclick="return confirm('Are you sure?');">

```

```
</form>
{% endblock % }
```

This template has two forms.

The first posts the edited data to the current page (`</id>/update`). The other form contains only a button and specifies an `action` attribute that posts to the delete view instead. The button uses some JavaScript to show a confirmation dialog before submitting.

The pattern `{{ request.form['title'] or post['title'] }}` is used to choose what data appears in the form. When the form hasn't been submitted, the original `post` data appears, but if invalid form data was posted you want to display that so the user can fix the error, so `request.form` is used instead. `:data: request` is another variable that's automatically available in templates.

## Delete

-----

The delete view doesn't have its own template, the delete button is part of `update.html` and posts to the `</id>/delete` URL. Since there is no template, it will only handle the `POST` method and then redirect to the `index` view.

```
.. code-block:: python
:caption: flaskr/blog.py
```

```
@bp.route('/<int:id>/delete',
methods=('POST',))
@login_required
def delete(id):
    get_post(id)
    db = get_db()
    db.execute('DELETE FROM post WHERE id = ?', (id,))
    db.commit()
    return redirect(url_for('blog.index'))
```

Congratulations, you've now finished writing your application! Take some time to try out everything in the browser. However, there's still more to do before the project is complete.

Continue to `:doc:install`.

Found in path(s):

```
* /opt/cola/permits/1386293557_1662594925.0498831/0/flask-2-2-2-tar-gz/Flask-2.2.2/docs/tutorial/blog.rst
```

# 1.150 more-itertools 8.14.0

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## 1.153 python-setuptools 65.0.2

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## 1.158 pyrsistent 0.18.1

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## 1.160 importlib-metadata 4.12.0

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# 1.168 parted 3.5

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\* /opt/cola/permits/1409587106\_1679473714.082842/0/libnl3-imports-r8-libnl3-3-7-0-1-el8-tar-gz/libnl3-imports-r8-libnl3-3.7.0-1.el8/SPECS/libnl3.spec

## 1.170 glib 2.72.3

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## 1.171 libusb 1.0.26

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## 1.173 elfutils 0.187

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The

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## 1.174 iptables 1.8.8

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 *
 * IPQ library for userspace.
 *
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/opt/cola/permits/1409587079\_1683835556.5462122/0/iptables-1-1-8-3-1-x86-64-pkg-tar-xz/usr/share/man/man1/iptables-xml-1-gz/iptables-xml.1

\* /opt/cola/permits/1409587079\_1683835556.5462122/0/iptables-1-1-8-3-1-x86-64-pkg-tar-xz/usr/share/man/man8/iptables-8-gz/iptables.8

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\* /opt/cola/permits/1409587079\_1683835556.5462122/0/iptables-1-1-8-3-1-x86-64-pkg-tar-xz/usr/share/man/man8/iptables-restore-8-gz/iptables-restore.8

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```
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# $OpenBSD: pf.os,v 1.27 2016/09/03 17:08:57 sthen Exp $
# passive OS fingerprinting
# -----
#
# SYN signatures. Those signatures work for SYN packets only (duh!).
#
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# (C) Copyright 2003 by Mike Frantzen <frantzen@w4g.org>
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#
#
# This fingerprint database is adapted from Michal Zalewski's p0f passive
# operating system package. The last database sync was from a Nov 3 2003
# p0f.fp.
#
#
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# Each line in this file specifies a single fingerprint. Please read the
# information below carefully before attempting to append any signatures
# reported as UNKNOWN to this file to avoid mistakes.
#
# We use the following set metrics for fingerprinting:
#
# - Window size (WSS) - a highly OS dependent setting used for TCP/IP
# performance control (max. amount of data to be sent without ACK).
# Some systems use a fixed value for initial packets. On other
# systems, it is a multiple of MSS or MTU (MSS+40). In some rare
# cases, the value is just arbitrary.
#
# NEW SIGNATURE: if p0f reported a special value of 'Snn', the number
# appears to be
# a multiple of MSS (MSS*nn); a special value of 'Tnn'
# means it is a multiple of MTU ((MSS+40)*nn). Unless you notice the
# value of nn is not fixed (unlikely), just copy the Snn or Tnn token
# literally. If you know this device has a simple stack and a fixed
# MTU, you can however multiply S value by MSS, or T value by MSS+40,
# and put it instead of Snn or Tnn.
#
# If WSS otherwise looks like a fixed value (for example a multiple
# of two), or if you can confirm the value is fixed, please quote
# it literally. If there's no apparent pattern in WSS chosen, you
# should consider wildcarding this value.
#
# - Overall packet size - a function of all IP and TCP options and bugs.
#
# NEW SIGNATURE: Copy this value literally.
#
# - Initial TTL - We check the actual TTL of a received packet. It can't
# be higher than the initial TTL, and also shouldn't be dramatically
# lower (maximum distance is defined as 40 hops).
#
# NEW SIGNATURE: *Never* copy TTL from a p0f-reported
# signature literally.
# You need to determine the initial TTL. The best way to do it is to
# check the documentation for a remote system, or check its settings.
# A fairly good method is to simply round the observed TTL up to
# 32, 64, 128, or 255, but it should be noted that some obscure devices
# might not use round TTLs (in particular, some shoddy appliances use
# "original" initial TTL settings). If not sure, you can see how many
# hops you're away from the remote party with traceroute or mtr.
#
# - Don't fragment flag (DF) - some modern OSes set this to implement PMTU
# discovery. Others do not bother.
#
# NEW SIGNATURE: Copy this value literally.
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#
# - Maximum segment size (MSS) - this setting is usually link-dependent. POf
# uses it to determine link type of the remote host.
#
# NEW SIGNATURE: Always wildcard this value, except for rare cases when
# you have an appliance with a fixed value, know the system supports only
# a very limited number of
# network interface types, or know the system
# is using a value it pulled out of nowhere. Specific unique MSS
# can be used to tell Google crawlbots from the rest of the population.
#
# - Window scaling (WSCALE) - this feature is used to scale WSS.
# It extends the size of a TCP/IP window to 32 bits. Some modern
# systems implement this feature.
#
# NEW SIGNATURE: Observe several signatures. Initial WSCALE is often set
# to zero or other low value. There's usually no need to wildcard this
# parameter.
#
# - Timestamp - some systems that implement timestamps set them to
# zero in the initial SYN. This case is detected and handled appropriately.
#
# - Selective ACK permitted - a flag set by systems that implement
# selective ACK functionality.
#
# - The sequence of TCP all options (MSS, window scaling, selective ACK
# permitted, timestamp, NOP). Other than the options previously
# discussed, pOf also checks for timestamp option (a silly
# extension to broadcast your
# uptime ;-), NOP options (used for
# header padding) and sackOK option (selective ACK feature).
#
# NEW SIGNATURE: Copy the sequence literally.
#
# To wildcard any value (except for initial TTL or TCP options), replace
# it with '*'. You can also use a modulo operator to match any values
# that divide by nnn - '%nnn'.
#
# Fingerprint entry format:
#
# www:ttt:D:ss:OOO...:OS:Version:Subtype:Details
#
# wwww - window size (can be *, %nnn, Snn or Tnn). The special values
# "S" and "T" which are a multiple of MSS or a multiple of MTU
# respectively.
# ttt - initial TTL
# D - don't fragment bit (0 - not set, 1 - set)
# ss - overall SYN packet size

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# OOO - option value and order specification (see below)
# OS - OS genre (Linux, Solaris, Windows)
# Version - OS Version (2.0.27 on x86, etc)
# Subtype - OS subtype or patchlevel (SP3, lo0)
# details - Generic OS details
#
# If OS genre starts with '*', p0f will not show distance,
link type
# and timestamp data. It is useful for userland TCP/IP stacks of
# network scanners and so on, where many settings are randomized or
# bogus.
#
# If OS genre starts with @, it denotes an approximate hit for a group
# of operating systems (signature reporting still enabled in this case).
# Use this feature at the end of this file to catch cases for which
# you don't have a precise match, but can tell it's Windows or FreeBSD
# or whatnot by looking at, say, flag layout alone.
#
# Option block description is a list of comma or space separated
# options in the order they appear in the packet:
#
# N - NOP option
# Wnnn - window scaling option, value nnn (or * or %nnn)
# Mnnn - maximum segment size option, value nnn (or * or %nnn)
# S - selective ACK OK
# T - timestamp
# T0 - timestamp with a zero value
#
# To denote no TCP options, use a single '!'.
#
# Please report any additions to this file, or any inaccuracies or
# problems spotted, to the maintainers: lcamtuf@coredump.cx,
#
frantzen@openbsd.org and bugs@openbsd.org with a tcpdump packet
# capture of the relevant SYN packet(s)
#
# A test and submission page is available at
# http://lcamtuf.coredump.cx/p0f-help/
#
#
# WARNING WARNING WARNING
# -----
#
# Do not add a system X as OS Y just because NMAP says so. It is often
# the case that X is a NAT firewall. While nmap is talking to the
# device itself, p0f is fingerprinting the guy behind the firewall
# instead.
#

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# When in doubt, use common sense, don't add something that looks like
# a completely different system as Linux or FreeBSD or LinkSys router.
# Check DNS name, establish a connection to the remote host and look
# at SYN+ACK - does it look similar?
#
# Some users tweak their TCP/IP settings - enable or disable RFC1323
# functionality, enable or disable timestamps or selective ACK,
# disable PMTU discovery, change MTU and so on. Always compare a new rule
# to other fingerprints for this system, and verify the system
# isn't
# "customized" before adding it. It is OK to add signature variants
# caused by a commonly used software (personal firewalls, security
# packages, etc), but it makes no sense to try to add every single
# possible /proc/sys/net/ipv4 tweak on Linux or so.
#
# KEEP IN MIND: Some packet firewalls configured to normalize outgoing
# traffic (OpenBSD pf with "scrub" enabled, for example) will, well,
# normalize packets. Signatures will not correspond to the originating
# system (and probably not quite to the firewall either).
#
# NOTE: Try to keep this file in some reasonable order, from most to
# least likely systems. This will speed up operation. Also keep most
# generic and broad rules near the end.
#

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#####
# Standard OS signatures #
#####

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# ----- AIX -----

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# AIX is first because its signatures are close to NetBSD, MacOS X and
# Linux 2.0, but it uses a fairly rare MSSes, at least sometimes...
# This is a shoddy
# hack, though.

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45046:64:0:44:M*: AIX:4.3::AIX 4.3

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16384:64:0:44:M512: AIX:4.3:2-3:AIX 4.3.2 and earlier

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16384:64:0:60:M512,N,W%2,N,N,T: AIX:4.3:3:AIX 4.3.3-5.2

```

```

16384:64:0:60:M512,N,W%2,N,N,T: AIX:5.1-5.2::AIX 4.3.3-5.2

```

```

32768:64:0:60:M512,N,W%2,N,N,T: AIX:4.3:3:AIX 4.3.3-5.2

```

```

32768:64:0:60:M512,N,W%2,N,N,T: AIX:5.1-5.2::AIX 4.3.3-5.2

```

```

65535:64:0:60:M512,N,W%2,N,N,T: AIX:4.3:3:AIX 4.3.3-5.2

```

```

65535:64:0:60:M512,N,W%2,N,N,T: AIX:5.1-5.2::AIX 4.3.3-5.2

```

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65535:64:0:64:M*,N,W1,N,N,T,N,N,S: AIX:5.3:ML1:AIX 5.3 ML1

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# ----- Linux -----

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# S1:64:0:44:M*:A: Linux:1.2::Linux 1.2.x (XXX quirks support)
512:64:0:44:M*: Linux:2.0:3x:Linux 2.0.3x
16384:64:0:44:M*: Linux:2.0:3x:Linux 2.0.3x

# Endian snafu! Nelson says "ha-ha":
2:64:0:44:M*: Linux:2.0:3x:Linux 2.0.3x (MkLinux) on Mac
64:64:0:44:M*: Linux:2.0:3x:Linux 2.0.3x (MkLinux) on Mac

S4:64:1:60:M1360,S,T,N,W0: Linux:google::Linux (Google crawlbot)

S2:64:1:60:M*,S,T,N,W0: Linux:2.4::Linux 2.4 (big boy)
S3:64:1:60:M*,S,T,N,W0: Linux:2.4:.18-21:Linux
2.4.18 and newer
S4:64:1:60:M*,S,T,N,W0: Linux:2.4::Linux 2.4/2.6 <= 2.6.7
S4:64:1:60:M*,S,T,N,W0: Linux:2.6:.1-7:Linux 2.4/2.6 <= 2.6.7

S4:64:1:60:M*,S,T,N,W5: Linux:2.6::Linux 2.6 (newer, 1)
S4:64:1:60:M*,S,T,N,W6: Linux:2.6::Linux 2.6 (newer, 2)
S4:64:1:60:M*,S,T,N,W7: Linux:2.6::Linux 2.6 (newer, 3)
T4:64:1:60:M*,S,T,N,W7: Linux:2.6::Linux 2.6 (newer, 4)

S10:64:1:60:M*,S,T,N,W4: Linux:3.0::Linux 3.0

S3:64:1:60:M*,S,T,N,W1: Linux:2.5::Linux 2.5 (sometimes 2.4)
S4:64:1:60:M*,S,T,N,W1: Linux:2.5-2.6::Linux 2.5/2.6
S3:64:1:60:M*,S,T,N,W2: Linux:2.5::Linux 2.5 (sometimes 2.4)
S4:64:1:60:M*,S,T,N,W2: Linux:2.5::Linux 2.5 (sometimes 2.4)

S20:64:1:60:M*,S,T,N,W0: Linux:2.2:20-25:Linux 2.2.20 and newer
S22:64:1:60:M*,S,T,N,W0: Linux:2.2::Linux 2.2
S11:64:1:60:M*,S,T,N,W0: Linux:2.2::Linux 2.2

# Popular cluster config scripts disable timestamps and
# selective ACK:
S4:64:1:48:M1460,N,W0: Linux:2.4:cluster:Linux 2.4 in cluster

#
This needs to be investigated. On some systems, WSS
# is selected as a multiple of MTU instead of MSS. I got
# many submissions for this for many late versions of 2.4:
T4:64:1:60:M1412,S,T,N,W0: Linux:2.4::Linux 2.4 (late, uncommon)

# This happens only over loopback, but let's make folks happy:
32767:64:1:60:M16396,S,T,N,W0: Linux:2.4:lo0:Linux 2.4 (local)
S8:64:1:60:M3884,S,T,N,W0: Linux:2.2:lo0:Linux 2.2 (local)
```

# Opera visitors:

16384:64:1:60:M\*,S,T,N,W0: Linux:2.2:Opera:Linux 2.2 (Opera?)

32767:64:1:60:M\*,S,T,N,W0: Linux:2.4:Opera:Linux 2.4 (Opera?)

# Some fairly common mods:

S4:64:1:52:M\*,N,N,S,N,W0: Linux:2.4:ts:Linux 2.4 w/o timestamps

S22:64:1:52:M\*,N,N,S,N,W0: Linux:2.2:ts:Linux 2.2 w/o timestamps

# ----- FreeBSD -----

16384:64:1:44:M\*: FreeBSD:2.0-2.2::FreeBSD 2.0-4.2

16384:64:1:44:M\*: FreeBSD:3.0-3.5::FreeBSD 2.0-4.2

16384:64:1:44:M\*: FreeBSD:4.0-4.2::FreeBSD 2.0-4.2

16384:64:1:60:M\*,N,W0,N,N,T: FreeBSD:4.4::FreeBSD 4.4

1024:64:1:60:M\*,N,W0,N,N,T: FreeBSD:4.4::FreeBSD

4.4

57344:64:1:44:M\*: FreeBSD:4.6-4.8:noRFC1323:FreeBSD 4.6-4.8 (no RFC1323)

57344:64:1:60:M\*,N,W0,N,N,T: FreeBSD:4.6-4.9::FreeBSD 4.6-4.9

32768:64:1:60:M\*,N,W0,N,N,T: FreeBSD:4.8-4.11::FreeBSD 4.8-5.1 (or MacOS X)

32768:64:1:60:M\*,N,W0,N,N,T: FreeBSD:5.0-5.1::FreeBSD 4.8-5.1 (or MacOS X)

65535:64:1:60:M\*,N,W0,N,N,T: FreeBSD:4.8-4.11::FreeBSD 4.8-5.2 (or MacOS X)

65535:64:1:60:M\*,N,W0,N,N,T: FreeBSD:5.0-5.2::FreeBSD 4.8-5.2 (or MacOS X)

65535:64:1:60:M\*,N,W1,N,N,T: FreeBSD:4.7-4.11::FreeBSD 4.7-5.2

65535:64:1:60:M\*,N,W1,N,N,T: FreeBSD:5.0-5.2::FreeBSD 4.7-5.2

# XXX need quirks support

# 65535:64:1:60:M\*,N,W0,N,N,T:Z:FreeBSD:5.1-5.4::5.1-current (1)

# 65535:64:1:60:M\*,N,W1,N,N,T:Z:FreeBSD:5.1-5.4::5.1-current (2)

# 65535:64:1:60:M\*,N,W2,N,N,T:Z:FreeBSD:5.1-5.4::5.1-current (3)

# 65535:64:1:44:M\*:Z:FreeBSD:5.2::FreeBSD 5.2 (no RFC1323)

# 16384:64:1:60:M\*,N,N,N,N,N,N,T:FreeBSD:4.4:noTS:FreeBSD 4.4 (w/o timestamps)

# ----- NetBSD -----

16384:64:0:60:M\*,N,W0,N,N,T: NetBSD:1.3::NetBSD

1.3

65535:64:0:60:M\*,N,W0,N,N,T0: NetBSD:1.6:opera:NetBSD 1.6 (Opera)

16384:64:0:60:M\*,N,W0,N,N,T0: NetBSD:1.6::NetBSD 1.6

16384:64:1:60:M\*,N,W0,N,N,T0: NetBSD:1.6:df:NetBSD 1.6 (DF)

65535:64:1:60:M\*,N,W1,N,N,T0: NetBSD:1.6::NetBSD 1.6W-current (DF)

65535:64:1:60:M\*,N,W0,N,N,T0: NetBSD:1.6::NetBSD 1.6X (DF)

32768:64:1:60:M\*,N,W0,N,N,T0: NetBSD:1.6:randomization:NetBSD 1.6ZH-current (w/ ip\_id randomization)

# ----- OpenBSD -----

16384:64:0:60:M\*,N,W0,N,N,T: OpenBSD:2.6::NetBSD 1.3 (or OpenBSD 2.6)  
16384:64:1:64:M\*,N,N,S,N,W0,N,N,T: OpenBSD:3.0-4.8::OpenBSD 3.0-4.8  
16384:64:0:64:M\*,N,N,S,N,W0,N,N,T: OpenBSD:3.0-4.8:no-df:OpenBSD 3.0-4.8 (scrub no-df)  
57344:64:1:64:M\*,N,N,S,N,W0,N,N,T: OpenBSD:3.3-4.0::OpenBSD 3.3-4.0  
57344:64:0:64:M\*,N,N,S,N,W0,N,N,T: OpenBSD:3.3-4.0:no-df:OpenBSD 3.3-4.0 (scrub no-df)

65535:64:1:64:M\*,N,N,S,N,W0,N,N,T: OpenBSD:3.0-4.0:opera:OpenBSD 3.0-4.0 (Opera)

16384:64:1:64:M\*,N,N,S,N,W3,N,N,T: OpenBSD:4.9::OpenBSD  
4.9

16384:64:0:64:M\*,N,N,S,N,W3,N,N,T: OpenBSD:4.9:no-df:OpenBSD 4.9 (scrub no-df)

16384:64:1:64:M\*,N,N,S,N,W6,N,N,T: OpenBSD:6.1::OpenBSD 6.1

16384:64:0:64:M\*,N,N,S,N,W6,N,N,T: OpenBSD:6.1:no-df:OpenBSD 6.1 (scrub no-df)

# ----- DragonFly BSD -----

57344:64:1:60:M\*,N,W0,N,N,T: DragonFly:1.0:A:DragonFly 1.0A  
57344:64:0:64:M\*,N,W0,N,N,S,N,N,T: DragonFly:1.2-1.12::DragonFly 1.2-1.12  
5840:64:1:60:M\*,S,T,N,W4: DragonFly:2.0-2.1::DragonFly 2.0-2.1  
57344:64:0:64:M\*,N,W0,N,N,S,N,N,T: DragonFly:2.2-2.3::DragonFly 2.2-2.3  
57344:64:0:64:M\*,N,W5,N,N,S,N,N,T: DragonFly:2.4-2.7::DragonFly 2.4-2.7

# ----- Solaris -----

S17:64:1:64:N,W3,N,N,T0,N,N,S,M\*: Solaris:8:RFC1323:Solaris 8 RFC1323

S17:64:1:48:N,N,S,M\*: Solaris:8::Solaris 8

S17:255:1:44:M\*: Solaris:2.5-2.7::Solaris 2.5 to 7

S6:255:1:44:M\*: Solaris:2.6-2.7::Solaris 2.6 to 7

S23:255:1:44:M\*: Solaris:2.5:1:Solaris 2.5.1

S34:64:1:48:M\*,N,N,S: Solaris:2.9::Solaris

9

S44:255:1:44:M\*: Solaris:2.7::Solaris 7

4096:64:0:44:M1460: SunOS:4.1::SunOS 4.1.x

S34:64:1:52:M\*,N,W0,N,N,S: Solaris:10:beta:Solaris 10 (beta)

32850:64:1:64:M\*,N,N,T,N,W1,N,N,S: Solaris:10::Solaris 10 1203

# ----- IRIX -----

49152:64:0:44:M\*: IRIX:6.4::IRIX 6.4

61440:64:0:44:M\*: IRIX:6.2-6.5::IRIX 6.2-6.5

49152:64:0:52:M\*,N,W2,N,N,S: IRIX:6.5:RFC1323:IRIX 6.5 (RFC1323)

49152:64:0:52:M\*,N,W3,N,N,S: IRIX:6.5:RFC1323:IRIX 6.5 (RFC1323)

61440:64:0:48:M\*,N,N,S: IRIX:6.5:12-21:IRIX 6.5.12 - 6.5.21

49152:64:0:48:M\*,N,N,S: IRIX:6.5:15-21:IRIX 6.5.15 - 6.5.21

49152:60:0:64:M\*,N,W2,N,N,T,N,N,S: IRIX:6.5:IP27:IRIX 6.5 IP27

# ----- Tru64 -----

32768:64:1:48:M\*,N,W0: Tru64:4.0::Tru64 4.0 (or OS/2 Warp 4)

32768:64:0:48:M\*,N,W0: Tru64:5.0::Tru64 5.0

8192:64:0:44:M1460: Tru64:5.1:noRFC1323:Tru64 6.1 (no RFC1323) (or QNX 6)

61440:64:0:48:M\*,N,W0: Tru64:5.1a:JP4:Tru64 v5.1a JP4 (or OpenVMS  
7.x on Compaq 5.x stack)

# ----- OpenVMS -----

6144:64:1:60:M\*,N,W0,N,N,T: OpenVMS:7.2::OpenVMS 7.2 (Multinet 4.4 stack)

# ----- MacOS -----

# XXX Need EOL tcp opt support

# S2:255:1:48:M\*,W0,E::MacOS:8.6 classic

# XXX some of these use EOL too

16616:255:1:48:M\*,W0: MacOS:7.3-7.6:OTTCP:MacOS 7.3-8.6 (OTTCP)

16616:255:1:48:M\*,W0: MacOS:8.0-8.6:OTTCP:MacOS 7.3-8.6 (OTTCP)

16616:255:1:48:M\*,N,N,N: MacOS:8.1-8.6:OTTCP:MacOS 8.1-8.6 (OTTCP)

32768:255:1:48:M\*,W0,N: MacOS:9.0-9.2::MacOS 9.0-9.2

65535:255:1:48:M\*,N,N,N,N: MacOS:9.1::MacOS 9.1 (OT 2.7.4)

# ----- Windows -----

# Windows TCP/IP stack is a mess. For most recent XP, 2000 and

# even 98, the patchlevel, not the actual OS version, is more

# relevant to the signature. They share the same code, so it would

# seem. Luckily for us, almost all Windows 9x boxes have an

# awkward MSS of 536, which I use to tell one from another

# in most difficult cases.

8192:32:1:44:M\*: Windows:3.11::Windows

3.11 (Tucows)

S44:64:1:64:M\*,N,W0,N,N,T0,N,N,S: Windows:95::Windows 95

8192:128:1:64:M\*,N,W0,N,N,T0,N,N,S: Windows:95:b:Windows 95b

# There were so many tweaking tools and so many stack versions for

# Windows 98 it is no longer possible to tell them from each other

# without some very serious research. Until then, there's an insane  
# number of signatures, for your amusement:

S44:32:1:48:M\*,N,N,S: Windows:98:lowTTL:Windows 98 (low TTL)  
8192:32:1:48:M\*,N,N,S: Windows:98:lowTTL:Windows 98 (low TTL)  
%8192:64:1:48:M536,N,N,S: Windows:98::Windows 98  
%8192:128:1:48:M536,N,N,S: Windows:98::Windows 98  
S4:64:1:48:M\*,N,N,S: Windows:98::Windows 98  
S6:64:1:48:M\*,N,N,S: Windows:98::Windows 98  
S12:64:1:48:M\*,N,N,S: Windows:98::Windows 98  
T30:64:1:64:M1460,N,W0,N,N,T0,N,N,S: Windows:98::Windows 98  
32767:64:1:48:M\*,N,N,S: Windows:98::Windows 98  
37300:64:1:48:M\*,N,N,S: Windows:98::Windows 98  
46080:64:1:52:M\*,N,W3,N,N,S: Windows:98:RFC1323:Windows  
98 (RFC1323)  
65535:64:1:44:M\*: Windows:98:noSack:Windows 98 (no sack)  
S16:128:1:48:M\*,N,N,S: Windows:98::Windows 98  
S16:128:1:64:M\*,N,W0,N,N,T0,N,N,S: Windows:98::Windows 98  
S26:128:1:48:M\*,N,N,S: Windows:98::Windows 98  
T30:128:1:48:M\*,N,N,S: Windows:98::Windows 98  
32767:128:1:52:M\*,N,W0,N,N,S: Windows:98::Windows 98  
60352:128:1:48:M\*,N,N,S: Windows:98::Windows 98  
60352:128:1:64:M\*,N,W2,N,N,T0,N,N,S: Windows:98::Windows 98

# What's with 1414 on NT?

T31:128:1:44:M1414: Windows:NT:4.0:Windows NT 4.0 SP6a  
64512:128:1:44:M1414: Windows:NT:4.0:Windows NT 4.0 SP6a  
8192:128:1:44:M\*: Windows:NT:4.0:Windows NT 4.0 (older)

# Windows XP and 2000. Most of the signatures that were  
# either dubious or non-specific (no service pack data)  
# were deleted and replaced with generics at the end.

65535:128:1:48:M\*,N,N,S: Windows:2000:SP4:Windows 2000 SP4, XP SP1  
65535:128:1:48:M\*,N,N,S: Windows:XP:SP1:Windows 2000 SP4, XP SP1  
%8192:128:1:48:M\*,N,N,S: Windows:2000:SP2+:Windows  
2000 SP2, XP SP1 (seldom 98 4.10.2222)  
%8192:128:1:48:M\*,N,N,S: Windows:XP:SP1:Windows 2000 SP2, XP SP1 (seldom 98 4.10.2222)  
S20:128:1:48:M\*,N,N,S: Windows:2000::Windows 2000/XP SP3  
S20:128:1:48:M\*,N,N,S: Windows:XP:SP3:Windows 2000/XP SP3  
S45:128:1:48:M\*,N,N,S: Windows:2000:SP4:Windows 2000 SP4, XP SP 1  
S45:128:1:48:M\*,N,N,S: Windows:XP:SP1:Windows 2000 SP4, XP SP 1  
40320:128:1:48:M\*,N,N,S: Windows:2000:SP4:Windows 2000 SP4  
  
S6:128:1:48:M\*,N,N,S: Windows:2000:SP2:Windows XP, 2000 SP2+  
S6:128:1:48:M\*,N,N,S: Windows:XP::Windows XP, 2000 SP2+  
S12:128:1:48:M\*,N,N,S: Windows:XP:SP1:Windows XP SP1  
S44:128:1:48:M\*,N,N,S: Windows:2000:SP3:Windows Pro SP1, 2000 SP3

S44:128:1:48:M\*,N,N,S: Windows:XP:SP1:Windows Pro SP1, 2000 SP3  
64512:128:1:48:M\*,N,N,S: Windows:2000:SP3:Windows SP1, 2000 SP3  
64512:128:1:48:M\*,N,N,S: Windows:XP:SP1:Windows SP1, 2000 SP3  
32767:128:1:48:M\*,N,N,S: Windows:2000:SP4:Windows SP1, 2000 SP4  
32767:128:1:48:M\*,N,N,S: Windows:XP:SP1:Windows SP1, 2000  
SP4

8192:128:1:52:M\*,N,W2,N,N,S: Windows:Vista::Windows Vista/7

# Odds, ends, mods:

S52:128:1:48:M1260,N,N,S: Windows:2000:cisco:Windows XP/2000 via Cisco  
S52:128:1:48:M1260,N,N,S: Windows:XP:cisco:Windows XP/2000 via Cisco  
65520:128:1:48:M\*,N,N,S: Windows:XP::Windows XP bare-bone  
16384:128:1:52:M536,N,W0,N,N,S: Windows:2000:ZoneAlarm:Windows 2000 w/ZoneAlarm?  
2048:255:0:40:.: Windows:.NET::Windows .NET Enterprise Server

44620:64:0:48:M\*,N,N,S: Windows:ME::Windows ME no SP (?)  
S6:255:1:48:M536,N,N,S: Windows:95:winsock2:Windows 95 winsock 2  
32768:32:1:52:M1460,N,W0,N,N,S: Windows:2003:AS:Windows 2003 AS

# No need to be more specific, it passes:

# \*:128:1:48:M\*,N,N,S:U:-Windows:XP/2000 while downloading (leak!) XXX quirk

# there is an equiv similar generic sig w/o the quirk

# ----- HP/UX -----

32768:64:1:44:M\*: HP-UX:B.10.20::HP-UX B.10.20  
32768:64:0:48:M\*,W0,N: HP-UX:11.0::HP-UX 11.0  
32768:64:1:48:M\*,W0,N: HP-UX:11.10::HP-UX 11.0  
or 11.11  
32768:64:1:48:M\*,W0,N: HP-UX:11.11::HP-UX 11.0 or 11.11

# Whoa. Hardcore WSS.

0:64:0:48:M\*,W0,N: HP-UX:B.11.00:A:HP-UX B.11.00 A (RFC1323)

# ----- RiscOS -----

# We don't yet support the ?12 TCP option

#16384:64:1:68:M1460,N,W0,N,N,T,N,N,?12: RISCOS:3.70-4.36::RISC OS 3.70-4.36  
12288:32:0:44:M536: RISC OS:3.70:4.10:RISC OS 3.70 inet 4.10

# XXX quirk

# 4096:64:1:56:M1460,N,N,T:T: RISC OS:3.70:freenet:RISC OS 3.70 freenet 2.00

```

# ----- BSD/OS -----

# Once again, power of two WSS is also shared by MacOS X with DF set
8192:64:1:60:M1460,N,W0,N,N,T: BSD/OS:3.1::BSD/OS 3.1-4.3 (or MacOS X 10.2 w/DF)
8192:64:1:60:M1460,N,W0,N,N,T: BSD/OS:4.0-4.3::BSD/OS 3.1-4.3 (or MacOS X 10.2)

# ----- NewtonOS -----

4096:64:0:44:M1420: NewtonOS:2.1::NewtonOS 2.1

# ----- NeXTSTEP -----

S4:64:0:44:M1024: NeXTSTEP:3.3::NeXTSTEP 3.3
S8:64:0:44:M512: NeXTSTEP:3.3::NeXTSTEP 3.3

# -----
BeOS -----

1024:255:0:48:M*,N,W0: BeOS:5.0-5.1::BeOS 5.0-5.1
12288:255:0:44:M1402: BeOS:5.0::BeOS 5.0.x

# ----- OS/400 -----

8192:64:1:60:M1440,N,W0,N,N,T: OS/400:VR4::OS/400 VR4/R5
8192:64:1:60:M1440,N,W0,N,N,T: OS/400:VR5::OS/400 VR4/R5
4096:64:1:60:M1440,N,W0,N,N,T: OS/400:V4R5:CF67032:OS/400 V4R5 + CF67032

# XXX quirk
# 28672:64:0:44:M1460:A:OS/390:?

# ----- ULTRIX -----

16384:64:0:40:.: ULTRIX:4.5::ULTRIX 4.5

# ----- QNX -----

S16:64:0:44:M512: QNX::QNX demodisk

# ----- Novell -----

16384:128:1:44:M1460: Novell:NetWare:5.0:Novel Netware 5.0
6144:128:1:44:M1460: Novell:IntranetWare:4.11:Novell IntranetWare 4.11
6144:128:1:44:M1368: Novell:BorderManager::Novell BorderManager ?

6144:128:1:52:M*,W0,N,S,N,N: Novell:Netware:6:Novell Netware 6 SP3

```



```

# ----- SCO -----
S3:64:1:60:M1460,N,W0,N,N,T: SCO:UnixWare:7.1:SCO
  UnixWare 7.1
S17:64:1:60:M1380,N,W0,N,N,T: SCO:UnixWare:7.1:SCO UnixWare 7.1.3 MP3
S23:64:1:44:M1380: SCO:OpenServer:5.0:SCO OpenServer 5.0

# ----- DOS -----

2048:255:0:44:M536: DOS:WATTCP:1.05:DOS Arachne via WATTCP/1.05
T2:255:0:44:M984: DOS:WATTCP:1.05Arachne:Arachne via WATTCP/1.05 (eepro)

# ----- OS/2 -----

S56:64:0:44:M512: OS/2:4::OS/2 4
28672:64:0:44:M1460: OS/2:4::OS/2 Warp 4.0

# ----- TOPS-20 -----

# Another hardcore MSS, one of the ACK leakers hunted down.
# XXX QUIRK 0:64:0:44:M1460:A:TOPS-20:version 7
0:64:0:44:M1460: TOPS-20:7::TOPS-20 version 7

# ----- FreeMiNT -----

S44:255:0:44:M536: FreeMiNT:1:16A:FreeMiNT 1 patch 16A (Atari)

# ----- AMIGA -----

# XXX TCP option 12
# S32:64:1:56:M*,N,N,S,N,N,?12::AMIGA:3.9 BB2 with Miami stack

# ----- Plan9 -----

65535:255:0:48:M1460,W0,N: Plan9:4::Plan9 edition
4

# ----- AMIGAOS -----

16384:64:1:48:M1560,N,N,S: AMIGAOS:3.9::AMIGAOS 3.9 BB2 MiamiDX

#####
# Appliance / embedded / other signatures #
#####

# ----- Firewalls / routers -----

S12:64:1:44:M1460: @Checkpoint::Checkpoint (unknown 1)
S12:64:1:48:N,N,S,M1460: @Checkpoint::Checkpoint (unknown 2)

```

4096:32:0:44:M1460: ExtremeWare:4.x::ExtremeWare 4.x

# XXX TCP option 12

# S32:64:0:68:M512,N,W0,N,N,T,N,N,?12:::Nokia:IPSO w/Checkpoint NG FP3

# S16:64:0:68:M1024,N,W0,N,N,T,N,N,?12:::Nokia:IPSO 3.7 build 026

S4:64:1:60:W0,N,S,T,M1460: FortiNet:FortiGate:50:FortiNet FortiGate 50

8192:64:1:44:M1460: Eagle:::Eagle Secure Gateway

S52:128:1:48:M1260,N,N,N,N: LinkSys:WRV54G::LinkSys WRV54G VPN router

# ----- Switches and other stuff -----

4128:255:0:44:M\*: Cisco::Cisco Catalyst 3500, 7500 etc

S8:255:0:44:M\*: Cisco:12008::Cisco 12008

60352:128:1:64:M1460,N,W2,N,N,T,N,N,S: Alteon:ACEswitch::Alteon  
ACEswitch

64512:128:1:44:M1370: Nortel:Contivity Client::Nortel Conectivity Client

# ----- Caches and whatnots -----

S4:64:1:52:M1460,N,N,S,N,W0: AOL:web cache::AOL web cache

32850:64:1:64:N,W1,N,N,T,N,N,S,M\*: NetApp:5.x::NetApp Data OnTap 5.x

16384:64:1:64:M1460,N,N,S,N,W0,N: NetApp:5.3:1:NetApp 5.3.1

65535:64:0:64:M1460,N,N,S,N,W\*,N,N,T: NetApp:5.3-5.5::NetApp 5.3-5.5

65535:64:0:60:M1460,N,W0,N,N,T: NetApp:CacheFlow::NetApp CacheFlow

8192:64:1:64:M1460,N,N,S,N,W0,N,N,T: NetApp:5.2:1:NetApp NetCache 5.2.1

20480:64:1:64:M1460,N,N,S,N,W0,N,N,T: NetApp:4.1::NetApp NetCache4.1

65535:64:0:60:M1460,N,W0,N,N,T: CacheFlow:4.1::CacheFlow CacheOS 4.1

8192:64:0:60:M1380,N,N,N,N,N,N,T: CacheFlow:1.1::CacheFlow CacheOS 1.1

S4:64:0:48:M1460,N,N,S: Cisco:Content Engine::Cisco Content Engine

27085:128:0:40:: Dell:PowerApp cache::Dell PowerApp (Linux-based)

65535:255:1:48:N,W1,M1460: Inktomi:crawler::Inktomi crawler

S1:255:1:60:M1460,S,T,N,W0: LookSmart:ZyBorg::LookSmart  
ZyBorg

16384:255:0:40:: Proxyblocker::Proxyblocker (what's this?)

65535:255:0:48:M\*,N,N,S: Redline::Redline T|X 2200

32696:128:0:40:M1460: Spirent:Avalanche::Spirent Web Avalanche HTTP benchmarking engine

# ----- Embedded systems -----

S9:255:0:44:M536: PalmOS:Tungsten:C:PalmOS Tungsten C

S5:255:0:44:M536: PalmOS:3::PalmOS 3/4

S5:255:0:44:M536: PalmOS:4::PalmOS 3/4

S4:255:0:44:M536: PalmOS:3:5:PalmOS 3.5

2948:255:0:44:M536: PalmOS:3:5:PalmOS 3.5.3 (Handera)

S29:255:0:44:M536: PalmOS:5::PalmOS 5.0

16384:255:0:44:M1398: PalmOS:5.2:Clie:PalmOS 5.2 (Clie)

S14:255:0:44:M1350: PalmOS:5.2:Treo:PalmOS 5.2.1 (Treo)

S23:64:1:64:N,W1,N,N,T,N,N,S,M1460: SymbianOS:7::SymbianOS 7

8192:255:0:44:M1460: SymbianOS:6048::Symbian OS 6048 (Nokia 7650?)

8192:255:0:44:M536: SymbianOS:9210::Symbian OS (Nokia 9210?)

S22:64:1:56:M1460,T,S: SymbianOS:P800::Symbian OS ? (SE P800?)

S36:64:1:56:M1360,T,S: SymbianOS:6600::Symbian

OS 60xx (Nokia 6600?)

# Perhaps S4?

5840:64:1:60:M1452,S,T,N,W1: Zaurus:3.10::Zaurus 3.10

32768:128:1:64:M1460,N,W0,N,N,T0,N,N,S: PocketPC:2002::PocketPC 2002

S1:255:0:44:M346: Contiki:1.1:rc0:Contiki 1.1-rc0

4096:128:0:44:M1460: Sega:Dreamcast:3.0:Sega Dreamcast Dreamkey 3.0

T5:64:0:44:M536: Sega:Dreamcast:HKT-3020:Sega Dreamcast HKT-3020 (browser disc 51027)

S22:64:1:44:M1460: Sony:PS2::Sony Playstation 2 (SOCOM?)

S12:64:0:44:M1452: AXIS:5600:v5.64:AXIS Printer Server 5600 v5.64

3100:32:1:44:M1460: Windows:CE:2.0:Windows CE 2.0

#####

# Fancy signatures #

#####

1024:64:0:40:.. \*NMAP:syn scan:1:NMAP syn scan (1)

2048:64:0:40:.. \*NMAP:syn scan:2:NMAP syn scan (2)

3072:64:0:40:.. \*NMAP:syn scan:3:NMAP syn scan (3)

4096:64:0:40:.. \*NMAP:syn scan:4:NMAP syn scan (4)

# Requires quirks support

```
# 1024:64:0:40::A:*NMAP:TCP sweep probe (1)
# 2048:64:0:40::A:*NMAP:TCP sweep probe (2)
# 3072:64:0:40::A:*NMAP:TCP sweep
probe (3)
# 4096:64:0:40::A:*NMAP:TCP sweep probe (4)
```

```
1024:64:0:60:W10,N,M265,T: *NMAP:OS:1:NMAP OS detection probe (1)
2048:64:0:60:W10,N,M265,T: *NMAP:OS:2:NMAP OS detection probe (2)
3072:64:0:60:W10,N,M265,T: *NMAP:OS:3:NMAP OS detection probe (3)
4096:64:0:60:W10,N,M265,T: *NMAP:OS:4:NMAP OS detection probe (4)
```

```
32767:64:0:40:: *NAST:::NASTsyn scan
```

```
# Requires quirks support
# 12345:255:0:40::A:-p0f:sendsyn utility
```

```
#####
```

```
# Generic signatures - just in case #
```

```
#####
```

```
#:64:1:60:M*,N,W*,N,N,T: @FreeBSD:4.0-4.9::FreeBSD 4.x/5.x
```

```
#:64:1:60:M*,N,W*,N,N,T: @FreeBSD:5.0-5.1::FreeBSD 4.x/5.x
```

```
*:128:1:52:M*,N,W0,N,N,S: @Windows:XP:RFC1323:Windows XP/2000 (RFC1323 no tstamp)
```

```
*:128:1:52:M*,N,W0,N,N,S: @Windows:2000:RFC1323:Windows XP/2000 (RFC1323 no tstamp)
```

```
*:128:1:52:M*,N,W*,N,N,S: @Windows:XP:RFC1323:Windows XP/2000 (RFC1323 no tstamp)
```

```
*:128:1:52:M*,N,W*,N,N,S: @Windows:2000:RFC1323:Windows XP/2000 (RFC1323
```

```
no tstamp)
```

```
*:128:1:64:M*,N,W0,N,N,T0,N,N,S: @Windows:XP:RFC1323:Windows XP/2000 (RFC1323)
```

```
*:128:1:64:M*,N,W0,N,N,T0,N,N,S: @Windows:2000:RFC1323:Windows XP/2000 (RFC1323)
```

```
*:128:1:64:M*,N,W*,N,N,T0,N,N,S: @Windows:XP:RFC1323:Windows XP (RFC1323, w+)
```

```
*:128:1:48:M536,N,N,S: @Windows:98::Windows 98
```

```
*:128:1:48:M*,N,N,S: @Windows:XP::Windows XP/2000
```

```
*:128:1:48:M*,N,N,S: @Windows:2000::Windows XP/2000
```

```
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```

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\* /opt/cola/permits/1409587079\_1683835556.5462122/0/iptables-1-1-8-3-1-x86-64-pkg-tar-  
xz/usr/share/man/man8/xtables-translate-8-gz/xtables-translate.8

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xz/usr/share/man/man3/ipq-set-mode-3-gz/ipq\_set\_mode.3

\*

/opt/cola/permits/1409587079\_1683835556.5462122/0/iptables-1-1-8-3-1-x86-64-pkg-tar-  
xz/usr/share/man/man3/ipq-message-type-3-gz/ipq\_message\_type.3

\* /opt/cola/permits/1409587079\_1683835556.5462122/0/iptables-1-1-8-3-1-x86-64-pkg-tar-  
xz/usr/share/man/man3/ipq-errstr-3-gz/ipq\_errstr.3

\* /opt/cola/permits/1409587079\_1683835556.5462122/0/iptables-1-1-8-3-1-x86-64-pkg-tar-  
xz/usr/share/man/man3/libipq-3-gz/libipq.3

\* /opt/cola/permits/1409587079\_1683835556.5462122/0/iptables-1-1-8-3-1-x86-64-pkg-tar-  
xz/usr/share/man/man3/ipq-read-3-gz/ipq\_read.3

\* /opt/cola/permits/1409587079\_1683835556.5462122/0/iptables-1-1-8-3-1-x86-64-pkg-tar-  
xz/usr/share/man/man3/ipq-create-handle-3-gz/ipq\_create\_handle.3

## 1.175 prettytable 3.4.1

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```
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```

The hypothetical commands

```
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```

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```
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```
/* nicstar.c v0.22 Jawaid Bazyar (bazyar@hypermall.com)
* nicstar.c, M. Welsh (matt.welsh@cl.cam.ac.uk)
*
* Hacked October, 1997 by Jawaid Bazyar, Interlink Advertising Services Inc.
* http://www.hypermall.com/
* 10/1/97 - commented out CFG_PHYIE bit - we don't care when the PHY
* interrupts us (except possibly for removal/insertion of the cable?)
* 10/4/97 - began heavy inline documentation of the code. Corrected typos
* and spelling mistakes.
* 10/5/97 - added code to handle PHY interrupts, disable PHY on
* loss of link, and correctly re-enable PHY when link is
* re-established. (put back CFG_PHYIE)
*
* Modified to work with the IDT7721 nicstar -- AAL5 (tested) only.
*
* R. D. Rechenmacher <ron@fnal.gov>, Aug. 6, 1997
*
* Linux driver for the IDT77201 NICStAR PCI ATM controller.
* PHY component is expected to be 155 Mbps S/UNI-Lite or IDT 77155;
* see init_nicstar() for PHY initialization to change this. This driver
* expects the Linux ATM stack to support scatter-gather
  lists
* (skb->atm.iovcnt != 0) for Rx skb's passed to vcc->push.
*
* Implementing minimal-copy of received data:
* IDT always receives data into a small buffer, then large buffers
* as needed. This means that data must always be copied to create
* the linear buffer needed by most non-ATM protocol stacks (e.g. IP)
* Fix is simple: make large buffers large enough to hold entire
* SDU, and leave <small_buffer_data> bytes empty at the start. Then
* copy small buffer contents to head of large buffer.
* Trick is to avoid fragmenting Linux, due to need for a lot of large
* buffers. This is done by 2 things:
* 1) skb->destructor / skb->atm.recycle_buffer
*    combined, allow nicstar_free_rx_skb to be called to
*    recycle large data buffers
* 2) skb_clone of received buffers
* See nicstar_free_rx_skb and linearize_buffer for implementation
* details.
*
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\* along with this program; if not, write to the Free Software  
\* Foundation, Inc., 675 Mass Ave, Cambridge, MA 02139, USA.  
\*  
\* M. Welsh, 6 July 1996  
\*  
\*  
\*/

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a

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## 1.187 expat 2.5.0

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## 1.188 charset-normalizer 3.0.0

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## 1.189 fdisk 2.38.1

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NR START END SECTORS SIZE NAME UUID

1	32	7679	7648	3.7M	8f8378c0-01
2	7680	16383	8704	4.3M	8f8378c0-02
5	7936	12799	4864	2.4M	

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# 1.190 grpc 1.38.1

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xxHash Library

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xxhsum command line interface

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Upstream-Contact: Yann Collet <[Cyan4973@github.com](mailto:Cyan4973@github.com)>

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# 1.198 chardet 5.0.0

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\*

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Julian Seward, jseward@acm.org  
bzip2/libbzip2 version 1.0.8 of 13 July 2019

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///

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///

```
[#mpl]
# MPL Support, <boost/mp11/mpl.hpp>
:toc:
:toc-title:
:idprefix:
```

The header `<boost/mp11/mpl.hpp>`, when included, defines the necessary support infrastructure for `mp_list` and `std::tuple` to be valid link:../../../../libs/mpl[MPL] sequences.

NOTE: `mpl.hpp` is not included by `<boost/mp11.hpp>`.

It's also possible to only enable support for `mp_list` by including `<boost/mp11/mpl_list.hpp>`, and for `std::tuple` by including `<boost/mp11/mpl_tuple.hpp>`. This may be required because some libraries, such as Boost.Fusion, contain their own MPL support for `std::tuple`, which conflicts with Mp11's one.

.Converting an existing MPL Sequence into an `mp_list`

...

```
using L = mpl::copy<Sequence, mpl::back_inserter<mp11::mp_list<>>>::type;
```

...

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<head></head>
<body>
  <h3>
    Copyright Test
  </h3>
  <p class="copyright">
    1963, 1964, 1965 Jane Doe
  </p>
  <p class="copyright">
    2018 Joe Blow, John Coe
  </p>
  <p class="copyright">
    1977, 1985 Someone else
  </p>
</body>
</html>
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<article id="copyright_test" last-revision="DEBUG MODE Date: 2000/12/20 12:00:00 $"
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  <title>Copyright Test</title>
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## 1.204 gnutls 3.7.8

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## 1.205 systemd 251

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## 1.206 gpt-fdisk 1.0.9

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```
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- cipher/sha256-avx2-bmi2-amd64.S
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- cipher/sha512-avx2-bmi2-amd64.S
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- random/jitterentropy-noise.c
- random/jitterentropy-noise.h
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- random/jitterentropy-sha3.h
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## Making and Installing Lsof 4

```
*****
| The latest release of lsof is always available via anonymous ftp |
| from lsof.itap.purdue.edu. Look in pub/tools/unix/lsof.      |
*****
```

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=====  
Pre-built Lsof Binaries  
=====

Avoid using pre-built Lsof binaries if you can; build your own instead.

I do not support Lsof binaries built and packaged by third parties nor Lsof binaries built from anything but the latest Lsof revision. (See the Bug Reports section for more information on the details of Lsof support.)

One important reason for those support restrictions is that when Lsof is built its Configure script tunes Lsof to the features available on the building system, often embodied in supporting header files and libraries. If the building system doesn't have support for a particular feature, Lsof won't be built to support the feature on any system.

The Veritas VxFS file system is a good example of a feature that requires build-time support.

UNIX dialect version differences -- Solaris 8 versus 9, AIX 4.3.3 versus 5.2, etc. -- can also render a pre-built lsof binary useless on a different version. So can kernel bit size.

There are so many potential pitfalls to using an lsof binary improperly that I strongly recommend lsof be used only where it is built.

=====  
Making Lsof  
=====

```
$ cd <lsof source directory>
$ ./Configure <your dialect's abbreviation>
$ make
```

(Consult the 00FAQ and 00XCONFIG files of the lsof distribution for information about using make command invocations and environment variables to override lsof default Makefile strings.)

This lsof distribution can be used with many UNIX dialects. However, it must be configured specifically for each dialect. Configuration is done in three ways: 1) by changing definitions in the machine.h header file of the UNIX dialect of interest; 2) by defining environment variable values prior to calling Configure (see the 00XCONFIG file, the Environment Variables and Environment Variables Affecting the Configure Script sections of this file); and 3) by running the Configure shell script found in the top level of the distribution directory.

You may not need to change any machine.h definitions, but you might want to look at them anyway. Pay particular attention to the definitions that are discussed in the Security section of this file. Please read that section.

The Configure script calls three other scripts in the lsof distribution: AFSConfig; Inventory; and Customize. The AFSConfig script is called for selected dialects (AIX, HP-UX, NEXTSTEP, and Solaris) to locate AFS header files and determine the AFS version. See The AFSConfig Script section of this file for more information.

The Inventory script checks the completeness of the lsof distribution.

Configure calls Inventory after it has accepted the dialect abbreviation, but before it configures the top-level directory for the dialect. See The Inventory Script section of this file for more information.

Configure calls the Customize script after it has configured the top-level lsof directory for the declared dialect. Customize helps you modify some of the important compile-time definitions of machine.h. See the The Customize Script section.

You should also think about where you will install lsof and its man page, and whom you will let execute lsof. Please read the Installing Lsof section of this file for information on installation considerations.

Once you have inspected the machine.h file for the dialect for which you want to build lsof, and made any changes you need, run the Configure script, supplying it with the abbreviation for the dialect. (See the following table.) Configure selects the appropriate options for the dialect and runs the Mksrc shell script in the dialect sub-directory to construct the appropriate source files in the top-level distribution directory.

Configure may also run the MkKernOpts script in the dialect sub-directory to propagate kernel build options to the dialect Makefile. This is done for only a few dialects -- e.g., DC/OSx, and Reliant UNIX.

Configure creates a dialect-specific Makefile. You may want to inspect or edit this Makefile to make it conform to local conventions. If you want the Makefile to install lsof and its man page, you will have to create an appropriate install rule.

Lsof may be configured using UNIX dialect abbreviations from the following table. Alternative abbreviations are indicated by a separating `|'. For example, for SCO OpenServer you can use either the `osr" or the `sco" abbreviation:

```
$ Configure osr
or
$ Configure sco
```

Abbreviations UNIX Dialect

-----

aix IBM AIX 5.[23] and 5.3-ML1 using IBM's C Compiler

aixgcc IBM AIX 5.[12] and 5.3-ML1 using gcc  
 darwin Apple Darwin 7.x and 8.x for Power Macintosh systems  
 decosf DEC OSF/1, Digital UNIX, Tru64 UNIX 4.0 and 5.1  
 digital\_unix Digital UNIX, DEC OSF/1, Tru64 UNIX 4.0 and 5.1  
 du Digital UNIX, DEC OSF/1, Tru64 UNIX 4.0 and 5.1  
 freebsd FreeBSD 4.x, 4.1x, 5.x and [67].x  
 hpux HP-UX 11.00, 11.11 and 11.23, using HP's C  
 Compiler, both /dev/kmem-based and PSTAT-based  
 hpuxgcc HP-UX 11.00, 11.11 and 11.23, using gcc, both  
 /dev/kmem-based and PSTAT-based  
 linux Linux 2.1.72 and above for x86-based systems  
 netbsd NetBSD 1.[456], 2.x and 3.x  
 next NEXTSTEP 3.[13]  
 nextstep NEXTSTEP 3.[13]  
 ns NEXTSTEP 3.[13]  
 nxt NEXTSTEP 3.[13]  
 openbsd OpenBSD  
 2.[89] and 3.[0-9]  
 openstep OPENSTEP 4.x  
 os OPENSTEP 4.x  
 osr SCO OpenServer Release 5.0.6, using the C compiler  
 from the SCO developer's kit  
 osrgcc SCO OpenServer Release 5.0.6, using gcc  
 osr6 SCO Openserver 6.0.0, using the SCO C compiler  
 sco SCO OpenServer Release 5.0.6, using the C compiler  
 from the SCO developer's kit  
 scogcc SCO OpenServer Release 5.0.6, using gcc  
 solaris Solaris 2.x, 7, 8, 9 and 10 using gcc  
 solarisc Solaris 2.x, 7, 8, 9 and 10 using Sun's cc  
 tru64 Tru64 UNIX, DEC OSF/1, Digital UNIX 4.0 and 5.1  
 unixware SCO|Caldera UnixWare 7.1.4  
 uw SCO|Caldera UnixWare 7.1.4

If you have an earlier version of a dialect not named in the above list, lsof may still work on your system. I have no way of testing that myself. Try configuring for the named dialect -- e.g., if you're using Solaris 2.1, try configuring for Solaris 2.5.1.

After you have configured lsof for your UNIX dialect and have selected options

via the Customize script (See the The Customize Script section.) , use the make command to build lsof -- e.g.,

\$ make

Other Configure Script Options

=====

There are three other useful options to the Configure script besides the dialect abbreviation:

-clean      may be specified to remove all traces of a dialect configuration, including the Makefile, symbolic links, and library files.

-h           may be specified to obtain a list of  
-help      Configure options, including dialect abbreviations.

-n           may be specified to stop the Configure script from calling the Customize and Inventory scripts.

Caution: -n also suppresses the AFSConfig step.

#### Environment Variables

=====

Lsof configuration, building, and execution may be affected by environment variable settings. See the Definitions That Affect Compilation section in the 00PORTING file, the General Environment Variables section in the 00XCONFIG file, the Dialect-Specific Environment Variables section in the 00XCONFIG file, and the Environment Variables Affecting the Configure Script section of this file for more information.

Note in the General Environment Variables section of the 00XCONFIG file that there are five environment variables that can be used to pre-define values in lsof's -v output: LSOF\_BLDCMT, LSOF\_HOST, LSOF\_LOGNAME, LSOF\_SYSINFO, and LSOF\_USER.

#### Security

=====

If the symbol HASSECURITY is defined, a security mode is enabled, and lsof will allow only the root user to list all open files. Non-root users may list only open files whose processes have the same user ID as the real user ID of the lsof process (the one that its user logged on with).

However, if `HASNOSOCKSECURITY` is also defined, anyone may list anyone else's open socket files, provided their listing is enabled with the `-i` option.

`Lsof` is distributed with the security mode disabled -- `HASSESECURITY` is not defined. (When `HASSESECURITY` is not defined, the definition of `HASNOSOCKSECURITY` has no meaning.) You can enable the security mode by defining `HASSESECURITY` in the `Makefile` or in the `machine.h` header file for the specific dialect you're using -- e.g. `dialects/aix/machine.h`.

The `Customize` script, run by `Configure` when it has finished its work, gives you the opportunity to define `HASSESECURITY` and `HASNOSOCKSECURITY`. (See the `The Customize Script` section.)

The `Lsof -h` output indicates the state `HASSESECURITY` and `HASNOSOCKSECURITY` had when `Lsof` was built, reporting:

```
"Only root can list all files;"
if HASSECURITY was defined and HASNOSOCKSECURITY wasn't
defined;
```

```
"Only root can list all files, but anyone can list socket files."
if HASSECURITY and HASNOSOCKSECURITY were both defined;
```

```
"Anyone can list all files;"
if HASSECURITY wasn't defined. (The definition of
HASNOSOCKSECURITY doesn't matter when HASSECURITY isn't
defined.)
```

You should carefully consider the implications of using the default security mode.

When `Lsof` is compiled in the absence of the `HASSESECURITY` definition, anyone who can execute `Lsof` may be able to see the presence of all open files. This may allow the `Lsof` user to observe open files -- e.g., log files used to track intrusions -- whose presence you would rather not disclose.

As distributed, `Lsof` writes a user-readable and user-writable device cache file in the home directory of the real user ID executing `Lsof`. There are other options for constructing the device cache file path, and they each have security implications.

The `00DCACHE` file in the `Lsof` distribution discusses device cache file path construction in great detail. It tells how to disable the various device cache file path options, or how to disable the entire device cache file feature by removing the `HASDCACHE` definition

from the dialect's machine.h file. There is also information on the device cache file feature in the 00FAQ file. (The 00DCACHE and 00FAQ files are part of the lsof distribution package.)

The

Customize script, run by Configure after it has finished its work, gives you the opportunity to change the compile-time options related to the device cache file. (See The Customize Script section.)

Since lsof may need setgid or setuid-root permission (See the Setgid Lsof Dialects and Setuid-root Lsof Dialects sections.), its security should always be viewed with skepticism. Lest the setgid and setuid-root permissions allow lsof to read kernel name list or memory files, declared with the -k and -m options, that the lsof user can't normally access, lsof uses access(2) to establish its real user's authority to read such files when it can't surrender its power before opening them. This change was added at the suggestion of Tim Ramsey.

lsof surrenders setgid permission on most dialects when it has gained access to the kernel's memory devices. There are exceptions to this rule, and some lsof implementations need to run setuid-root. (The Setgid Lsof Dialects and Setuid-root Lsof Dialects sections contains a list of lsof implementations and the permissions recommended in the distribution's Makefiles.)

The surrendering of setgid permission is controlled by the WILLDROPGID definition in the dialect machine.h header files.

In the end you must judge for yourself and your installation the risks that lsof presents and restrict access to it according to your circumstances and judgement.

#### Run-time Warnings

=====

lsof can issue warning messages when it runs -- e.g., about the state of the device cache file, about an inability to access an NFS file system, etc. Issuance of warnings are enabled by default in the lsof distribution.

Issuance of warnings may be disabled by default by defining WARNINGSTATE in the dialect's machine.h. The Customize script may also be used to change the default warning message issuance state. (See The Customize Script section.)

The ``-w" option description of the ``-h" option (help) output will indicate the default warning issuance state. Whatever the state may be, it can be reversed with ``-w".

#### Device Access Warnings

=====

When lsof encounters a /dev (or /devices) directory, one of its sub-directories, or one of their files that it cannot access with opendir(3) or stat(2), it issues a warning message and continues. Lsof will be more likely to issue such a warning when it has been installed with setgid(<some group name>) permission; it won't have trouble if it has been installed with setuid(root) permission or is being run under the root login.

The lsof caller can inhibit or enable the warning with the -w option, depending on the issuance state of run-time warnings. (See the Run-time Warnings section.)

The warning messages do not appear when lsof obtains device information from a device cache file that it has built and believes to be current or when warning message issuance is disabled by default. (See the "Caches -- Name and Device" section for more information on the device cache file.)

The lsof builder can inhibit the warning by disabling the definition of WARNDEVACCESS in the dialect's machine.h or disable all warnings by defining WARNINGSTATE. WARNDEVACCESS is defined by default for most dialects. However, some dialects have some device directory elements that are private -- e.g., HP-UX -- and it is more convenient for the lsof user if warning messages about them are inhibited.

Output from lsof's -h option indicates the status of WARNDEVACCESS. If it was defined when lsof was compiled, this message will appear:

```
/dev warnings = enabled
```

If WARNDEVACCESS was not defined when lsof was compiled, this message will appear instead:

```
/dev warnings = disabled
```

The Customize script, run by Configure after it has finished its work, gives you the opportunity to change the WARNDEVACCESS



definition. (See The Customize Script section.)

## NFS Blocks

=====

Lsof is susceptible to NFS blocks when it tries to lstat() mounted file systems and when it does further processing -- lstat() and readlink() -- on its optional file and file system arguments.

Lsof tries to avoid being stopped completely by NFS blocks by doing the lstat() and readlink() functions in a child process, which returns the function response via a pipe. The lsof parent limits the wait for data to arrive in the pipe with a SIGALRM, and, if the alarm trips, terminates the child process with a SIGINT and a SIGKILL.

This is as reliable and portable a method for breaking NFS deadlocks as I have found, although it still fails under some combinations of NFS version, UNIX dialect, and NFS file system mount options. It generally succeeds when the "intr" or "soft" mount options are used; it generally fails when the "hard" mount option is used.

When lsof cannot kill the child process, a second timeout causes it to stop waiting for the killed child to complete. While the second timeout allows lsof to complete, it may leave behind a hung child process. Unless warnings are inhibited by default or with the -w option, lsof reports the possible hung child.

NFS block handling was updated with suggestions made by Andreas Stolcke. Andreas suggested using the alternate device numbers that appear in the mount tables of some dialects when it is not possible to stat(2) the mount points.

The -b option was added to direct lsof to avoid the stat(2) and readlink(2) calls that might block on NFS mount points and always use the alternate device numbers. If warning message issuance is enabled and you don't want warning messages about what lsof is doing, use the -w option, too.

The -O option directs lsof to avoid doing the potentially blocking operations in child processes. Instead, when -O is specified, lsof does them directly. While this consumes far less system overhead, it can cause lsof to hang, so I advise you to use -O sparingly.

## Caches -- Name and Device

=====

Robert Ehrlich suggested that lsof obtain path name components for open files

from the kernel's name cache. Where possible, lsof dialect implementations do that. The -C option inhibits kernel name cache examination.

Since AFS apparently does not use the kernel's name cache, where lsof supports AFS it is unable to identify AFS files with path name components.

Robert also suggested that lsof cache the information it obtains via stat(2) for nodes in /dev (or /devices) to reduce subsequent running time. Lsof does that, too.

In the default distribution the device cache file is stored in .lsof\_hostname, mode 0600, in the home directory of the login of the user ID that executes lsof. The suffix, hostname, is the first component of the host's name returned by gethostname(2). If lsof is executed by a user ID whose home directory is NFS-mounted from several hosts, the user ID's home directory may collect several device cache files, one for each host from which it was executed.

Lsof senses accidental or malicious damage to the device cache file with extensive integrity checks, including the use of a 16 bit CRC.

It also tries to sense changes in /dev (or /devices) that indicate the device cache file is out of date.

There are other options for forming the device cache file path. Methods the lsof builder can use to control and employ them are documented in the separate 00DCACHE file of the lsof distribution.

## Raw Sockets

=====

On many UNIX systems raw sockets use a separate network control block structure. Display of files for applications using raw sockets -- ping, using ICMP, for example -- need special support for displaying their information. This support is so dialect-specific and information to provide it so difficult to find that not all dialect revisions of lsof handle raw sockets completely.

## Other Compile-time Definitions

=====  
The machine.h and dlsof.h header files for each dialect contains definitions that affect the compilation of lsof. Check the Definitions That Affect Compilation section of the 00PORTING file of the lsof distribution for their descriptions. (Also see The Customize Script section.)

#### The AFSConfig Script

=====

Lsof supports AFS on some combinations of UNIX dialect and AFS version. See the AFS section of this document for a list of supported combinations.

When configuring for dialects where AFS is supported, the Configure script calls the AFSConfig script to determine the location of AFS header files and the AFS version. Configure will not call AFSConfig, even for the selected dialects, unless the file /usr/vice/etc/ThisCell exists.

The AFS header file location is recorded in the AFSHeaders file; version, AFSVersion. Once these values have been recorded, Configure can be told to skip the calling of AFSConfig by specifying its (Configure's) -n option.

#### The Inventory Script

=====

The lsof distribution contains a script, called Inventory, that checks the distribution for completeness. It uses the file 00MANIFEST in the distribution as a reference point.

After the Configure script has accepted the dialect abbreviation, it normally calls the Inventory script to make sure the distribution is complete.

After Inventory has run, it creates the file ".ck00MAN" in the top-level directory to record for itself the fact that the inventory has been check. Should Inventory be called again, it senses this file and asks the caller if another check is in order, or if the check should be skipped.

The -n option may be supplied to Configure to make it bypass the

calling of the Inventory script. (The option also causes Configure to avoid calling the Customize script.)

The lsof power user may want to define (touch) the file ".neverInv". Configure avoids calling the Inventory script when ".neverInv" exists.

### The Customize Script

=====

Normally when the Configure script has finished its work, it calls another shell script in the lsof distribution called Customize. (You can tell Configure to bypass Customize with its -n option.)

Customize leads you through the specification of these important compile-time definitions for the dialect's machine.h header file:

HASDCACHE device cache file control  
HASENVDC device cache file environment  
variable name  
HASPERSDC personal device cache file path  
format  
HASPERSDCPATH name of environment variable that  
provides an additional component  
of the personal device cache file  
path  
HASSYSDC system-wide device cache file path  
HASKERNIDCK the build-time to run-time kernel  
identity check  
HASSECURITY the security option  
HASNOSOCKSECURITY the open socket listing option when  
HASSECURITY is defined  
WARNDEVACCESS /dev (or /devices) warning message  
control  
WARNINGSTATE warning message issuance state

The Customize script accompanies its prompting for entry of new values for these definitions with brief descriptions of each of them. More information on these definitions may be found in this file or in the 00DCACHE and 00FAQ files of the lsof distribution.

You don't need to run Customize after Configure. You can run it later or you can edit machine.h directly.

The -n option may be supplied to Configure to make it bypass the

calling of the Customize script. (The option also causes Configure to avoid calling the Inventory script.)

The Lsof power user may want to define (touch) the file ".neverCust". Configure avoids calling the Customize script when ".neverCust" exists.

Customize CAUTION: the Customize script works best when it is applied to a newly configured Lsof source base -- i.e., the machine.h header file has not been previously modified by the Customize script. If you have previously configured Lsof, and want to rerun the Customize script, I recommend you clean out the previous configuration and create a new one:

```
$ Configure -clean
$ Configure <dialect_abbreviation>
...
Customize in response to the Customize script prompts.
```

#### Cautions

=====

Lsof is a tool that is closely tied to the UNIX operating system version. It uses header files that describe kernel structures and reads kernel structures that typically change from OS version to OS version, and even within a version as vendor patches are applied.

**DON'T TRY TO USE AN LSOF BINARY, COMPILED FOR ONE UNIX OS VERSION, ON ANOTHER. VENDOR PATCHES INFLUENCE THE VERSION IDENTITY.**

On some UNIX dialects Lsof versions may be even more restricted by architecture type.

The bottom line is use Lsof where you built it. If you intend to use a common Lsof binary on multiple systems, make sure all systems run exactly the same OS version and have exactly the same patches.

#### Warranty

=====

Lsof is provided as-is without any warranty of any kind, either expressed or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. The entire risk as to the quality and performance of Lsof is with you. Should Lsof prove defective, you assume the cost

of all  
necessary servicing, repair, or correction.

#### License

=====

Lsof has no license. Its use and distribution are subject to these terms and conditions, found in each lsof source file. (The copyright year in or format of the notice may vary slightly.)

/\*

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\*

\* Written by Victor A. Abell

\*

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\*

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\*/

#### Bug Reports

=====

Now that the obligatory disclaimer is out of the way, let me hasten to add that I accept lsof bug reports and try hard to respond to them. I will also consider and discuss requests for new features, ports to new dialects, or ports to new OS versions.

PLEASE DON'T SEND BUG REPORTS ABOUT LSOF TO THE UNIX DIALECT OR DIALECT OPTION VENDOR.

At worst such bug reports will confuse the vendor; at best, the vendor will forward the bug report to me.

PLEASE DON'T SEND BUG REPORTS ABOUT LSOF BINARIES BUILT OR DISTRIBUTED BY SOMEONE ELSE, BECAUSE I CAN'T SUPPORT THEM.

Before you send me a bug report, please do these things:

- \* Make sure you try the latest lsof revision.

- + Download the latest revision from:

`ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof`

- + Verify the signatures of what you have downloaded;

- + While connected to `lsof.itap.purdue.edu`, check for patches:

`ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/patches`

- + If patches exist, install them in the latest revision you just downloaded. Then build the latest revision and see if it fixes your bug.

- \* If you're having trouble compiling lsof with gcc, try the UNIX dialect vendor's compiler. I don't have access to gcc on all test systems, so my support for it is hit-and-miss, and so is my ability to respond to gcc compilation problem reports.

- \* Check the lsof frequently asked questions file, 00FAQ, to see if there's a question and answer relevant to your problem.

- \* Make sure you're running the lsof you think you are by

checking the path to it with `which(1)`. When in doubt, use an absolute path to lsof. Make sure that lsof binary has sufficient permissions to do what you ask, including internal permissions given it (e.g., restrictions on what files lsof may report for whom) during its build.

When you send a bug report, make sure you include output from your running of lsof's Configure script. If you were able to compile a

running lsof, please also include:

- \* Output from which(1) that shows the absolute path to the lsof binary in question;
- \* Output from running lsof with its -h and -v options at lsof's absolute path;
- \* Output from "ls -l" directed to lsof's absolute path.

If you weren't able to compile a running lsof, please send me: the compiler error output; identification of the lsof revision you're using (contents of the lsof version.c file); identification of your system (full uname output or output from whatever other tool identifies the system); and compiler identification (e.g., gcc -v output).

Either set of output will help me understand how lsof was configured and what UNIX dialect and lsof revision is involved.

Please send all bug reports, requests, etc. to me via e-mail at <abe@purdue.edu>. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

#### The 00FAQ File

=====

The lsof distribution contains an extensive frequently asked questions file on lsof features and problems. I recommend you consult it before sending me e-mail. Use your favorite editor or pager to search 00FAQ -- e.g., supplying as a search argument some fixed text from an lsof error message.

#### The lsof-l Mailing List

=====

Information about lsof, including notices about the availability of new revisions, may be found in mailings of the lsof-l listserv. For more information about it, including instructions on how to subscribe, read the 00LSOF-L file of the lsof distribution.

#### Field Output Example Scripts

=====



Example AWK and Perl 4 or 5 scripts for post-processing lsof field output are located in the scripts sub-directory of the lsof distribution. The scripts sub-directory contains a README file with information about the scripts.

### Field Output C Library

=====

The lsof test suite (See "Testing Lsof."), checks basic lsof operations using field output. The test suite has its own library of C functions for common test program operations, including processing of field output. The library or selections of its functions could be adapted for use by C programs that want to process lsof field output. See the library in the file LTlib.c in the tests/ sub-directory

### Testing Lsof

=====

Lsof has an automated test suite in the tests/ sub-directory that can be used to test some basic lsof features -- once lsof has been configured and made. Tests are arranged in three groups: basic tests that should run on all dialects; standard tests that should run on all dialects; and optional tests that may not run on all dialects or may need special resources to run. See 00TEST for more information.)

CAUTION!!! Before you attempt to use the test suite make sure that the lsof you want to test can access the necessary kernel resources -- e.g., /dev/mem, /dev/kmem, /proc, etc. Usually you want to test the lsof you just built, so this is an important check. (See 00TEST.)

To run the basic and standard tests, using the lsof in the parent directory of tests/, do this:

```
$ cd tests
$ make test
  or $ make std
  or $ make standard
```

The basic and standard tests may be run as silently as possible, using the lsof in the parent directory of tests/, with:

```
$ cd tests
```

```
$ make auto
```

This is the "automatic" test mode, designed for use by scripts that build lsof. The caller is expected to test the make exit code to determine if the tests succeeded. The caller should divert standard output and standard error to /dev/null to suppress make's error exit message.

The optional tests may be run, using the lsof in the parent directory of tests/, with:

```
$ cd tests
$ make opt
  or $ make optional
```

It's possible to execute individual tests, too. See the 00TEST file of this distribution for more information on the tests, what they do, and how to run and possibly customize each test.

It's possible to run the tests, using an lsof other than the one in the parent directory of /tests, too. See 00TEST for information about using the LT\_LSOF\_PATH environment variable to do that.

```
=====
Dialect Notes
=====
```

```
AFS
===
```

Lsof recognizes AFS files on the following combinations of UNIX dialect and AFS versions:

```
AIX 4.1.4 (AFS 3.4a)
Linux 1.2.13 (AFS 3.3)
NEXTSTEP 3.2 (AFS 3.3) (untested on recent lsof revisions)
Solaris 2.6 (AFS 3.4a)
Ultrix 4.2 RISC (AFS 3.2b) (no longer available)
```

Lsof has not been tested under other combinations -- e.g. HP-UX 10.10 and AFS 3.4a -- and probably won't even compile there. Often when a UNIX dialect version or AFS version changes, the new header files come into conflict, causing compiler objections.

AIX

===

Specify the aix Configure abbreviation for AIX 4.1.[45], 4.2[.1], 4.3[.123], 5L, and 5.[123].

Specify aixgcc on AIX above 4.1 to use the gcc compiler. (Gcc can't be used to compile lsof on AIX 4.1 and below because of kernel structure alignment differences between it and xlc.) Gcc results sometimes depend on the version of the gcc compiler that is used.

Compilation of lsof with gcc on AIX 4.3[.123], 5L, and 5.[123] has been sparsely tested with varying degrees of success: it has been reported to succeed on AIX 4.3.3 and 32 bit Power AIX 5.1; to fail on ia64 AIX 5.1 and 64 bit Power AIX 5.1; and to succeed on 32 and 64 bit Power AIX 5.2. Lsof compilation with gcc hasn't been tested on AIX 5.3.

At revision 4.61 and above lsof is configured and built to match the bit size of the kernel of Power architecture AIX 5.1 systems. Lsof binaries built for 32 and 64 bit kernels are not interchangeable. See 00FAQ for more information.

The Configure script uses /usr/bin/oslevel to determine the AIX version for AIX less than 5 and ``uname -rv" for AIX 5 and higher. If /usr/bin/oslevel isn't executable on AIX less than 5, the Configure script issues a warning message and uses ``uname -rv" to determine the AIX version.

When Configure must use ``uname -rv" on AIX less than 5 to determine the AIX version, the result will lack a correct third component -- e.g., the `4' of ``4.1.4". If your AIX less than 5 system lacks an executable oslevel, I suggest you edit the Configure-produced Makefile and complete the \_AIXV definition in the CFGF string.

By default lsof avoids using the kernel's readx() function, causing it to be unable to report information on some text and library file references. The ``-X" option allows the lsof user to ask for the information readx() supplies.

Lsof avoids readx() to avoid the possibility of triggering a kernel problem, known as the Stale Segment ID kernel bug. Kevin Ruderman reported this bug to me. The bug shows up when the kernel's dir\_search() function hangs, hanging the application process that called it so completely that the application process can neither be killed nor stopped. The hang is the consequence of another

process (perhaps lsof) making legitimate use of the kernel's readx() function to access the kernel memory that dir\_search() is examining. IBM has indicated they have no plans to fix the bug.

A fuller discussion of this bug may be found in the 00FAQ file of the lsof distribution. There you will find a description of the Stale Segment ID bug, the APAR on it, and a discussion of the sequence of events that exposes it.

I added the ``-X" function so you can tell lsof to use readx(), but if you use ``-X", you should be alert to its possibly serious side effects. Although readx() is normally disabled, its state is controlled with the HASXOPT, HASXOPT\_ROOT, and HASXOPT\_VALUE definitions in dialects/aix/machine.h, and you can change its default state by changing those definitions. You can also change HASXOPT\_ROOT via the Customize script.

You can also compile lsof with readx() use permanently enabled or disabled -- see the comments about the definitions in the dialects/aix/machine.h header file. You may want to permanently disable lsof's use of readx() if you plan to make lsof publicly executable. You can also restrict -X to processes whose real UID is root by defining HASXOPT\_ROOT.

I have never seen lsof cause the Stale Segment ID bug to occur and haven't had a report that it has, but I believe there is a possibility it could.

AFS support for AIX was added with help help from Bob Cook and Jan Tax who provided test systems.

Henry Grebler and David J. Wilson helped with lsof for AIX 4.2.

Bill Pemberton provided an AIX 4.3 test system. Andrew Kephart and Tom Weaver provided AIX 4.3 technical assistance. Niklas Edmundsson did 4.3.1 testing. Doug Crabill provided an AIX 4.3.2 test system. Jeff W. Stewart provided an AIX 4.3.3 test system.

The SMT file type for AIX 4.1.[45], 4.2[.1], and 4.3[.12] is my fabrication. See the 00FAQ file more information on it.

Loc Le and Nasser Momtaheni of IBM provided test systems for AIX 5L and 5.1. Lsof for AIX 5L and 5.1 needs setuid-root permission to process the -X option on systems whose architecture type is ia64.

Dale Talcott of Purdue provided AIX 5.1 and 5.2 test systems. Dale and

John Jackson of Purdue provided an AIX 5.3 test system.

## Apple Darwin

=====

The Apple Darwin port was provided by Allan Nathanson for version 1.2. Allan also arranged for access to a test system for maintenance and regression testing. Dale Talcott provided a test system, too.

Allan supplied patches for updates to 1.4, 5.x, 6.x, 7.x and 8.x.

## BSDI BSD/OS

=====

As of lsof revision 4.77 support for BSDI BSD/OS has been discontinued.

Lsof revision 4.76 with BSDI BSD/OS support may be found on [lsof.itap.purdue.edu](http://lsof.itap.purdue.edu) in `pub/tools/unix/lsof/src`.

## DEC OSF/1, Digital UNIX, Tru64 UNIX

=====

Robert Benites, Dean Brock, Angel Li, Dwight McKay, Berkley Shands, Ron Young and Steve Wilson have kindly provided test systems. Jeffrey Mogul has provided technical assistance. Dave Morrison and Lawrence MacIntyre did Digital UNIX V3.2 testing.

Lsof supports the ADVFS/MSFS layered file system product. Lsof can locate all the open files of an ADVFS/MSFS file system when its path is specified, provided the file system is listed in `/etc/fstab` with an ```advfs"` type. (This `/etc/fstab` caveat applies only to Digital UNIX 2.0.) At Digital UNIX 4.0 and Tru64 UNIX, using code provided by David Brock, lsof 4.20 and above can locate ADVFS file paths.

Testing of lsof on DEC OSF/1 and Digital UNIX 4.0 ended with lsof revision 4.74. Hence, the lsof documentation has dropped the claim that it works there.

For a distribution of lsof 4.74 that was tested on DEC OSF/1 and Digital UNIX 4.0, check `pub/tools/unix/lsof/OLD/src` on the lsof ftp home, [lsof.itap.purdue.edu](http://lsof.itap.purdue.edu).

Lsof revisions past 4.74 have only been tested on Tru64 UNIX 5.1.

## FreeBSD

=====

Bill Bormann of Purdue University provided access to several FreeBSD test systems. Ade Barkah, John Clear, Ralph Forsythe, Michael Haro, Kurt Jaeger, and William McVey have also provided FreeBSD test systems.

The FreeBSD distribution header files are augmented by header files in the `dialects/freebsd/include` directory.

Larry Rosenman maintains the `lsf` FreeBSD port package.

## HP-UX

=====

`lsf` has two HP-UX bases: `/dev/kmem` for HP-UX 11.0 and earlier; and `PSTAT` for HP-UX 11.11 and later. The `lsf` Configure script will pick the appropriate base.

To use the CCITT x.25 socket support for HP-UX, you must have the x.25 header files in `/etc/conf/x25`

Pasi Kaara helped with the HP-UX port, especially with its CCITT x.25 socket support.

## Richard

Allen provided HP-UX 10.x and 11.x test systems, as did Mark Bixby, and Elias Halldor Agustsson. Marc Winkler helped test the 10.20 port. Richard J. Rauenzahn provided a 64 bit HP-UX 11 test system and an HP-UX 11.11 development system.

AFS support for HP-UX was added thanks to help from Chaskiel Moses Grundman, who provided a test system.

The `/dev/kmem`-based HP-UX 11.00 support is extremely fragile. It depends on privately developed kernel structure definitions. (See `../dialects/hpux/hpux11` for the header files making the definitions.) Those header files and their definitions will not be updated by HP-UX 11.00 patches, making it likely that any patch changing a kernel structure critical to `lsf` will break `lsf` in some way.

It's possible to build a 64 bit `lsf` for 64 bit HP-UX 11.00 with `gcc`, but you must have a `gcc` compiler capable of producing 64 bit executables. See the `00FAQ` file for more information.

The `PSTAT`-based `lsf` for HP-UX 11.11 and later is much more solid.

I

am indebted to the vision of HP for providing an lsof kernel API through the PSTAT implementation. Specifically I appreciate the help of HP staff members Carl Davidson, Louis Huemiller, Rich Rauenzahn, and Sailu Yallapragada that made PSTAT-based HP-UX lsof possible.

IPv6

====

Lsof has IPv6 support that has been tested for these UNIX dialects: AIX 4.3.x; Apple Darwin 5.[12] and 6.0; the INRIA and KAME FreeBSD IPv6 implementations; PSTAT-based HP-UX; /proc-based Linux; the INRIA and KAME NetBSD implementations; and Solaris 8 and 9. Lsof has IPv6 support that hasn't been tested for: OpenBSD (KAME); OpenUNIX 8; Tru64 Unix 5.[01]; and UnixWare 7.1.[34].

Please let me know if your UNIX dialect has IPv6 support and I'll see if it can be supported by lsof.

Linux

=====

Tim Korb, Steve Logue, Joseph J. Nuspl Jr., and Jonathan Sergent have provided Linux test systems.

Michael Shields helped add and test automatic handling of ELF/COFF form names in /System.map, Marty Leisner and Keith Parks have helped test many lsof revisions. Marty has provided valuable suggestions, Linux hints, and code, too.

The 00FAQ file gives some Linux tips, including information on coping with system map file problems.

To determine the state of the Linux 2.1.x C library lseek() function, the lsof Configure script runs a test program that must have permission to read /dev/kmem. The test determines if the lseek() function properly handles kernel offsets, which appear to be negative because their high order bit is set. If the lseek() test reveals a faulty lseek(), Configure activates the use of a private lseek() function for kernel offset positioning. See the Linux problems section of the 00FAQ file of the lsof distribution for more information.

## NetBSD

=====

Greg Earle and Paul Kranenburg have assisted with the NetBSD ports. Paul has provided test systems. Ray Phillips provided a NetBSA Alpha test system. Andrew Brown also provided a test system.

The NetBSD dialect version of lsof is compiled using the dialect sources it shares with OpenBSD in the n+obsd dialect sub-directory.

## NEXTSTEP and OPENSTEP

=====

Virtual memory header files that allow lsof to display text references were derived from the contents of /usr/include/vm of NEXTSTEP 2.0. NeXT did not ship the virtual memory header files with other NEXTSTEP or OPENSTEP versions.

You may use the RC\_FLAGS environment variable to declare compiler options outside the Makefile. A common use of this variable is to define the architecture types to be included in a "fat" executable. See the comments in dialects/next/Makefile for an example.

## OpenBSD

=====

David Mazieres has provided OpenBSD test systems. The OpenBSD dialect version of lsof is compiled using the dialect sources it shares with NetBSD in the n+obsd dialect sub-directory.

Kenneth Stailey has provided OpenBSD testing and advice.

John Dzuber (Zube) reports, "lsof 4.33 compiles and runs on OpenBSD 2.3 for the pmax architecture (decstation 3100)."

I have not tested lsof on OpenBSD 3.8, but David Mazieres reports revision 4.76 worked on OpenBSD 3.8.

## Pyramid DC/OSx and Reliant UNIX

=====

As of lsof revision 4.52 support for all Pyramid dialects has been discontinued. Lsof revision 4.51 with Pyramid support may be



obtained upon request. Send the request to [abe@purdue.edu](mailto:abe@purdue.edu).

These two UNIX dialects are very similar and share dialect-specific source files from the pyramid sub-directory.

The Reliant Unix Pyramid C compiler issues warning messages that I haven't found a convenient way to suppress. You can ignore warning messages about casts and conversions that lose bits. The message "warning: undefining \_\_STDC\_\_" is intentionally caused by the lsof MkKernOpts configuration script to suppress warning messages about cast and conversion problems in standard system header files, such as <stdio.h> and <string.h>.

Bruce Beare and Kevin Smith provided test systems.

#### Caldera OpenUNIX

=====

Larry

Rosenman provided an OpenUNIX 8 test system. Matthew Thurmaier provided technical assistance, along with these people from Caldera: Jack Craig, Robert Lipe, and Bela Lubkin.

Robert Lipe supplied changes to lsof for OpenUNIX 8.0.1. Those changes were also incorporated in UnixWare 7.1.3 when it became the release name for OpenUNIX 8.0.1.

Support for lsof on OpenUNIX ended at lsof revision 4.74. The last lsof revision, 4.74, tested on OpenUNIX, may be found at the lsof "home" ftp site, [lsof.itap.purdue.edu](ftp://lsof.itap.purdue.edu), in `pub/tools/unix/lsof/OLD/src`.

#### SCO OpenServer

=====

Dion Johnson, Bela Lubkin, and Nathan Peterson of SCO gave me copies of SCO OpenServer and the SCO OpenServer Development System 3.0 and provided technical advice for the lsof port.

Hugh Dickins, Bela Lubkin, Craig B. Olofson, and Nathan Peterson provided version 5.0 and gave technical advice for porting lsof to it. Bela provided the 5.0.4 changes. D. Chris Daniels provided a 5.0.4 test system,

Lee Penn provided one for 5.0.5, and John Dubois for 5.0.6.

The <netdb.h> header file was accidentally omitted from some SCO

OpenServer Development System releases. The Configure script will sense its absence and substitute an equivalent from the BSD distribution. The BSD <netdb.h> and the <sys/cdefs.h> header file it includes are located in the dialects/os/include sub-directory tree.

To compile lsof from its distribution sources you must have the TCP/IP and NSF headers in /usr/include. While those are optional OpenServer packages, I have access to no system that doesn't have them, so I'm unable to build lsof for such a configuration. However, it should be possible to modify the lsof Configure script and sources so lsof would compile and work without those optional packages.

If you have an OpenServer system configured without the TCP/IP and NFS packages, and want to tackle the job of building lsof for it, contact me via e-mail at <abe@purdue.edu>. I'll identify the Configure script, header file, and source file changes you will need to make. (Caution: this is not a simple task, or I would have already done it.)

The optional osrgcc and scogcc Configure abbreviations construct Makefiles for compiling lsof with gcc.

The UnixWare 7.1.4 sources are used for OpenServer Release 6.0.0. Hence there is a separate Configure abbreviation for it, "osr6". Richard of SCO provided a test system and technical assistance.

SCO|Caldera UnixWare

=====

D. Chris Daniels, John Hughes, Ken Laing, Andrew Merrill, Lee Penn, and Matthew Thurmaier provided test systems. Bela Lubkin provided technical assistance. Larry Rosenman provided 7.1.[34] test systems.

Solaris 2.x, 7, 8, 9 and 10

=====

SEE THE CAUTIONS SECTION OF THIS DOCUMENT.

The latest Solaris revision of lsof 4 might work under Solaris 2.[1-4] and 2.5[.1] and 7 but hasn't been tested there. I have no test systems for those Solaris versions.

Lsof will compile with gcc and the Sun C compiler

under Solaris.

If you want to use the Sun compiler, use the solariscc Configure abbreviation. If you use a gcc version less than 2.8 on Solaris, make sure the gcc-specific includes have been updated for your version of Solaris -- i.e., run the gcc fixincludes script.

Solaris 7, 8, 9 and 10 support for 64 bit kernels depends on a Sun WorkShop or Forte C compiler version that supports the "-xarch=v9" flag -- usually 5.0 or greater. Gcc versions 2.95 and above \*may\* be configured and built for 64 bit support, but it takes some extra work, the resulting compiler may be fragile, and the gcc developers discourage it. I've built 64 bit capable gcc compilers for Solaris 7, 8 and 9 from gcc versions 2.95 through 3.0.1 and produced working lsof executables with them. More information on 64 bit gcc for Solaris may be found in the 00FAQ file.

Solaris 10 ZFS support is questionable, because Sun does not distribute the ZFS kernel structure definition header files. The lsof Configure script and source code use some risky work-arounds. ZFS file system support was made possible with help from Horst Scheuermann.

Dave Curry and Steve Kirsch provided resources for Solaris 2.x ports. Casper Dik and Gerry Singleton consulted and provided valuable assistance.

Henry Katz, Joseph Kowalski, Charles Stephens, Mike Sullivan, and Mike Tracy provided technical assistance.

AFS support was added to Solaris lsof with help from Curt Freeland, Heidi Hornstein, Michael L. Lewis, Terry McCoy, Phillip Moore, and Sushila R. Subramanian.

Casper Dik provided valuable assistance for the Solaris 8 support.

Sun has graciously provided me access to BETA versions of Solaris 2.5, 2.6, 7, 8, and 9.

John Dzuberá provided Solaris 7 and 8 test systems.

Mike Miscevic provided Solaris 10 test systems.

Ultrix

=====

As of lsof revision 4.52 support for Ultrix is no longer available, because I no longer have an Ultrix test system.

Terry Friedrichsen, Dwight McKay, and Jeffrey Mogul helped me with this port.

DECnet support was added to Ultrix lsof with the help of John Beacom, who kindly provided a test system. The Configure script decides that DECnet support is available if /usr/lib/libdnet.a and /usr/include/netdnet/dn.h exist and are readable.

#### Veritas VxFS and VxVM

=====

Lsof supports some versions of Veritas VxFS and VxVM on some UNIX dialects. Consult the lsof Configure script for the specific dialect, and consult the lsof dialect-specific source files for the UNIX dialect of interest. Veritas support will usually be found in a source file named dnode[1-9].c.

Since Veritas rarely has a version number that can be extracted with shell commands, lsof doesn't use it. Instead, when lsof supports Veritas, the Configure script will form compile-time definitions starting with HASVXFS. Check the lsof 00PORTING documentation file for more information.

Lsof Veritas support requires that the supporting Veritas header files be installed -- e.g., in /usr/include/sys/fs.

(The location will depend in the dialect's header file conventions.)

Some information on lsof support for Veritas extensions may be found in the lsof 00DIST file. (The ChangeLog file points to 00DIST.)

Chris Kordish and Andy Thomas have provided Solaris VxFS test systems.

=====

#### User-contributed Dialect Support

=====

There are some user-contributed dialect versions of lsof; more information on them can be found at:

<ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/contrib>

Check the 00INDEX file there for details.

=====  
Dialects No Longer Supported  
=====

Because I don't have access to test systems, these UNIX dialects are no longer supported by lsof:

- CDC EP/IX
- /dev/kmem-based Linux
- MIPS RISC/os
- Motorola V/88
- Pyramid DC/OSx
- Pyramid Reliant UNIX
- Sequent DYNIX
- SGI IRIX
- SunOS 4.x
- Ultrix
- UnixWare below 7.0

Remnants of the support lsof once provided for these dialects may be found in:

<ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/OLD/dialects>

=====  
Installing Lsof  
=====

The distributed Makefiles do not have actions that will install lsof. I've come to the conclusion there is no standard for installing lsof or its man page, so I no longer distribute make rules for installing them. You should adjust the Makefile for your local preferences.

The Makefile does have an install rule that will cause lsof to compile by virtue of its dependency clause. Some Makefiles also have a dependency that causes the production of a man page that is ready to install. However, the actions of the install rule will not cause the lsof executable or its man page to be installed in any UNIX system-wide directory.

Instead, after the compilation and optional man page production are completed, the install rule will produce a brief description

of what actions you might add to the install rule. The description will suggest the possible modes, ownerships, permissions, and destinations your install rule might employ to install the lsof executable and man page.

As you form your install rule, keep in mind that lsof usually needs some type of special permission to do its job. That may be permission to read memory devices such as /dev/kmem, /dev/mem, or /dev/swap, or it may be authorization to read entries in the /proc file system.

Memory device access can usually be provided by setting the modes of the lsof executable so that its effective group identifier when it runs is the same as the group that has permission to read the memory devices -- i.e., it is setgid-group. The privileged group is usually kmem, sys, or system.

Don't overlook using ACLs -- e.g., on AIX or Solaris 8 -- to give lsof permission to access memory devices. ACLs, coupled to a separate group like kmem, can be safer than giving lsof setgid authorization to a commonly used system group.

When lsof needs to read /proc file system entries, it must be installed with modes that make its effective user identifier root when it runs -- i.e., it must be setuid-root. If lsof must be installed setuid-root (only the AIX 5L, PSTAT-based HP-UX, and /proc-based Linux, ports need such power.), then access to memory devices is automatic (or not needed in the case of /proc-based Linux).

Your choice of permissions for lsof may also be affected by your desire to allow anyone to use it or your need to restrict its usage to specific individuals. You will have to be guided by local policy and convention in this case.

The next two sections, Setgid Lsof Dialect Versions and Setuid-root Lsof Dialect Versions, list recommended install permissions.

The system directory where you install the lsof executable is also open to choice. A traditional place for a tool like lsof is /usr/local/etc, but recent changes in directory structure organization suggest that somewhere in /opt may be more suitable.

Bear one other factor in mind when choosing a location for the lsof executable -- it usually is a shared executable, requiring access to shared libraries. Thus, locations like /sbin or /usr/sbin are

probably unsuitable.

Once you've chosen a location for the executable you may find that the location for the man page follows -- e.g., if the executable goes in /usr/local/etc, then the man page goes in /usr/local/man. If the executable location doesn't imply a location for the man page, you'll have to let local custom guide you.

#### Setuid-root Lsof Dialect Versions

=====

These dialect versions should be installed with setuid-root permission -- i.e., the lsof binary should be owned by root and its setuid execution bit (04000) should be set.

AIX 5L and above for full use of the -X option  
Apple Darwin 8.x for Power Macintosh systems  
PSTAT-based HP-UX 11.11 and 11.23  
/proc-based Linux (generally 2.1.72 and above)

#### Setgid Lsof Dialect Versions

=====

These dialect versions should be installed with setgid permission, owned by the group that can read kernel memory devices such as /dev/drum, /dev/kmem, /dev/ksyms, /dev/mem, /dev/swap. ACLs may be another mechanism (e.g., under AIX or Solaris 8) you can use to grant read permission to the kernel memory devices.

AIX 4.1.[45], 4.2[.1], and 4.3[.123]  
Apple Darwin 7.x for Power Macintosh systems  
DEC OSF/1, Digital UNIX, Tru64 UNIX 2.0, 3.2, 4.0, and 5.[01]  
FreeBSD 2.1.6, 2.2[.x], 3.x, 4.x, 5.x, [6789].x and 1[012].x  
NetBSD 1.[456], 2.x and 3.x  
NEXTSTEP 3.[13]  
OpenBSD 2.[89] and 3.[0-9]  
OPENSTEP 4.x  
Caldera OpenUNIX 8  
SCO OpenServer 5.0.[46]  
SCO UnixWare 7.0 and 7.1.[0134]  
Solaris 2.6, 8, 9 and 10  
Ultrix 4.2 (no longer available)

=====

Porting Lsof 4 to a New UNIX Dialect

=====  
If you're brave enough to consider this, look at the 00PORTING file. Please contact me before you start. I might be able to help you or even do the port myself.

Don't overlook  
the contrib/ directory in pub/tools/unix/lsof on my ftp server, lsof.itap.purdue.edu. It contains user-contributed ports of lsof to dialects I don't distribute, because I can't test new revisions of lsof on them.

=====  
Quick Start to Using lsof  
=====

For information on how to get started quickly using lsof, consult the 00QUICKSTART file of the lsof distribution. It cuts past the formal density of the lsof man page to provide quick examples of using lsof to solve common open file display problems.

=====  
Cross-configuring lsof  
=====

Using environment variables it is possible to Configure (and possibly build) lsof for one UNIX dialect on a different one -- e.g., you are running Configure on a Linux 2.3 system and you want to Configure and build lsof for Linux 2.4.

See the 00XCONFIG file of the lsof distribution for a discussion of how to do this.

=====  
Environment  
Variables Affecting the Configure Script  
=====

Configure script actions can be modified by introducing values to the script via environment variables. In many cases the environment variable values take the place of test operations the Configure script makes.

For more information on environment variables that can affect Configure, consult the 00XCONFIG file of the lsof distribution.



See the General Environment Variables sections for descriptions of ones that affect all dialects. Consult the Dialect-Specific Environment Variables section for ones that might affect the dialect you are trying to configure.

Vic Abell <abe@purdue.edu>

February 14, 2018

Found in path(s):

```
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsf-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsf-org-lsof-67d8c82/00README
```

No license file was found, but licenses were detected in source scan.

```
/*
```

```
* Copyright 2000 Purdue Research Foundation, West Lafayette, Indiana  
* 47907. All rights reserved.
```

```
*
```

```
* Written by Victor A. Abell
```

```
*
```

```
* This software is not subject to any license of the American Telephone  
* and Telegraph Company or the Regents of the University of California.
```

```
*
```

```
* This software has been adapted from sntprintf.c in sendmail 8.9.3. It  
* is subject to the sendmail copyright statements listed below, and the  
* sendmail licensing terms stated in the sendmail LICENSE file comment  
* section of this file.
```

```
*
```

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* any computer system, and to alter it and redistribute it freely, subject  
* to the following restrictions:
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*
```

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* 1. Neither the authors nor Purdue University are responsible for any  
* consequences of the use of this software.
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*
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* explicit
```

```
claim or by omission. Credit to the authors and Purdue
```

```
* University must appear in documentation and sources.
```

```
*
```

```
* 3. Altered versions must be plainly marked as such, and must not be  
* misrepresented as being the original software.
```

```
*
```

```
* 4. This notice may not be removed or altered.
```

```
*/
```

```
/* Extended regular expression matching and search library,  
version 0.12.
```

```
(Implements POSIX draft P1003.2/D11.2, except for some of the
```

internationalization features.)

Copyright (C) 1993-1999, 2000 Free Software Foundation, Inc.

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You should have received a copy of the GNU Library General Public License along with the GNU C Library; see the file COPYING.LIB. If not, write to the Free Software Foundation, Inc., 59 Temple Place - Suite 330, Boston, MA 02111-1307, USA. \*/

Found in path(s):

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/lib/regex.c

No license file was found, but licenses were detected in source scan.

/\*

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\*

\* THIS IS UNPUBLISHED PROPRIETARY SOURCE CODE OF THE  
\* SANTA CRUZ OPERATION INC.

\*

\* The copyright notice above does not evidence any actual or intended  
\* publication of such source code.

\*/

Found in path(s):

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/uw/uw7/sys/fs/namenode.h

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/uw/uw7/sys/fs/fifonode.h

No license file was found, but licenses were detected in source scan.

/\*

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\*

\* Written by Victor A. Abell

\*

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 \* University must appear in documentation and sources.  
 \*  
 \* 3. Altered versions must be plainly marked as such, and must not be  
 \* misrepresented as being the original software.  
 \*  
 \* 4. This notice may not be removed or altered.  
 \*/

Found in path(s):

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/aix/dnode2.c

No license file was found, but licenses were detected in source scan.

#### Notes for the distribution of lsof version 4

```
*****
| The latest release of lsof is always available from
| https://github.com/lsof-org/lsof/releases
|
| From 4.92.1, git is introduced to manage changes.
| You can consult the details of changes with git.
*****
```

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4.32, May 13, 1998  
4.33, May 22, 1998  
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4.36, August 4, 1998  
4.37, September 15, 1998  
4.38, November 25, 1998

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4.40, January 25, 1999  
4.41, February 27, 1999  
4.42, March 30, 1999  
4.43,  
May 11, 1999  
4.44, June 24, 1999  
4.45, July 30, 1999  
4.46, October 23, 1999  
4.47, November 29, 1999  
4.48, January 14, 2000  
4.49, April 3, 2000  
4.50, June 29, 2000  
4.51, August 21, 2000  
4.52, November 8, 2000  
4.53, December 6, 2000  
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4.55, February 15, 2001  
4.56, May 3, 2001  
4.57, July 19, 2001  
4.58, September 13, 2001  
4.59, October 20, 2001  
4.60, November 9, 2001  
4.61, January 22, 2002  
4.62, March 7, 2002  
4.63, April 23, 2002  
4.64, June 26, 2002  
4.65, October 10, 2002  
4.66, December 22, 2002  
4.67, March 27, 2003  
4.68, June 18, 2003  
4.69, October 16, 2003  
4.70, January 16, 2004  
4.71, March 11, 2004  
4.72, July 13, 2004  
4.73, October 21, 2004  
4.74, January 17, 2005  
4.75, May 16, 2005  
4.76, August 30, 2005  
4.77, April 10, 2006  
4.78, April 24, 2007  
4.79, April 15, 2008  
4.80, May 12, 2008  
4.81, October 21, 2008  
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4.93.2 May 8, 2019  
4.94.0 November 11, 2020

#### Dialects Supported

=====

Lsof (for LiSt Open Files) lists files opened by processes on selected Unix systems. Version 4 is a source reorganization of version 3, itself a major revision of version 2. Version 4 has been tested on:

Apple Darwin 9 and Mac OS X 10.[567]  
FreeBSD 10.3, 11.0, 12.0 and 13.0 for AMD64-based systems  
Solaris 9

(The pub/tools/unix/lsof/contrib directory on lsof.itap.purdue.edu contains information on other ports.)

If your favorite Unix dialect is not in the list, or if your version of it is more recent than the ones listed, please contact me at <abe@purdue.edu>.

Version 3 of lsof was tested on:

AIX 3.2.5, 4.1.[1234], and 4.2  
BSDI BSD/OS 2.0, 2.0.1, and 2.1 for x86-based systems  
DC/OSx  
1.1 for Pyramid systems  
Digital UNIX (DEC OSF/1) 2.0, 3.0, 3.2, and 4.0  
EP/IX 2.1.1 for the CDC 4680  
FreeBSD 1.1.5.1, 2.0, 2.0.5, 2.1, 2.1.5 for x86-based systems  
HP-UX 8.x, 9.x, 10.01, 10.10, and 10.20  
IRIX 5.2, 5.3, 6.0, 6.0.1, and 6.[124]  
Linux through 2.0.27 for x86-based systems  
NetBSD 1.0, 1.1, and 1.2 for x86 and SPARC-based

systems  
NEXTSTEP 2.1 and 3.[0123]  
OpenBSD 1.2 and 2.0 for x86-based systems  
Reliant UNIX 5.43 for Pyramid systems  
RISC/os 4.52 for MIPS R2000-based systems  
SCO OpenServer Release 1.1, 3.0, and 5.0.x for x86-based  
systems  
SCO UnixWare 2.1 and 2.1.1 for x86-based systems  
Sequent PTX 2.1.[1569], 4.0.[23], 4.1.[024], 4.2[.1],  
and 4.3  
Solaris 2.[12345], 2.5.1, and 2.6-Beta  
SunOS 4.1.x  
Ultrix 4.2, 4.3, 4.4, and 4.5

Version 3 and its predecessor, version 2, may be found at:

<ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/OLD>

## How Lsof Works

=====

Using available kernel data access methods -- `getproc()`, `getuser()`,  
`kvm_*`(),  
`nlist()`, `pstat()`, `read()`, `readx()`, `/proc` -- lsof reads  
process table entries, task table entries, user areas and file  
pointers to reach the underlying structures that describe files  
opened by processes.

Lsof interprets most file node structures -- `advfsnodes`, `autonodes`,  
`cnodes`, `cdrnodes`, `devnodes`, `fifonodes`, `gnodes`, `hsnodes`, `inodes`,  
`mfsnodes`, `pcnodes`, `procnodes`, `rnodes`, `snodes`, `specnodes`, `s5inodes`,  
`tmpnodes`. It understands NFS connections. It recognizes FIFOs,  
multiplexed files, Unix and Internet sockets. It knows about  
streams. It understands `/proc` file systems for some dialects. On  
many dialects it recognizes execution text and library references.  
It knows about AFS on some Unix dialects.

## Lsof Output

=====

The lsof output describes:

- \* the identification number of the process (PID) that has opened  
the file;
  
- \* the process group identification number (PGID) of the process

(optional);

\* the process identification number of the parent process (PPID)

(optional);

\* the command the process is executing;

\* the owner of the process;

\* for all files in use by the process, including the executing text file and the shared libraries it is using:

\* the file descriptor number of the file, if applicable;

\* the file's access mode;

\* the file's lock status;

\* the file's device numbers;

\* the file's inode number;

\* the file's size or offset;

\* the name of the file system containing the file;

\* any available components of the file's path name;

\* the names of the file's stream components;

\* the file's local and remote network addresses;

\* the TLI network (typically UDP) state of the file;

\* the TCP state, read queue length, and write queue length of the file;

\* the file's TCP window read and write lengths (Solaris only);

\* other file or dialect-specific values.

## Getting Started Quickly

=====

If



you want to get started using lsof quickly, or see some examples of how lsof can be used, consult the 00QUICKSTART file of the lsof distribution.

The 00QUICKSTART file won't help you build or install lsof, but it will cut through the density of the lsof man page, giving you more readily an idea of what you can do with lsof.

For information on building and installing lsof, consult the 00README file of the lsof distribution.

## Limiting, Filtering, and Selecting Lsof Output

=====

Lsof accepts options to limit, filter, and select its output.

These are the possible criteria:

- \* Process ID (PID) number -- to list the open files for a given process;
- \* Process Group ID (PGID) -- to list the open files for all the processes of a given process group;
- \* User ID number or login name -- to list the open files for all the processes of a given user;
- \* Internet address -- to list the open files using a given Internet address (host name), protocol, or port (number or name); or to list all open Internet files;
- \* command name;
- \* file descriptor name or number;
- \* list all open NFS files;
- \* list all open Unix domain socket files;
- \* list all uses of a specific file;
- \* list all open files on a file system.

Selection options are normally ORed -- i.e., an open file meeting any of the criteria is listed. The selection options may be ANDed so that an open file will be listed only if it meets all the criteria.

In the absence of any selection criteria, lsof lists files open to all processes.

#### Parsing Lsof Output with Another Program

=====

The lsof -F option directs it to produce "field" output that can easily be parsed by another program. The lsof distribution contains sample awk, perl 4, and perl 5 scripts in its scripts subdirectory that show how to post-process field output.

#### Repeat Mode

=====

Lsof can be directed to produce output, delay for a specified time, then repeat the output, cycling until stopped by an interrupt or quit signal. This mode is useful for monitoring the status of some file operation -- e.g., an ftp transfer or a tape backup operation.

Repeat mode is more efficient when combined with lsof's selection options, since they limit lsof overhead.

It's possible to use lsof's field output options to supply repeat mode output to another process for its manipulation. The scripts subdirectory of the lsof distribution has sample Perl scripts showing how to consume lsof repeat mode output from a pipe.

#### Distribution Restrictions

=====

Lsof may be used and distributed freely, subject to these limitations:

1. Neither the author nor Purdue University is responsible for any consequences of the use of this software.
2. The origin of this software must not be misrepresented, either by explicit claim or by omission. Credit to the author and Purdue University must appear in documentation and sources.
3. Altered versions must be plainly marked as such, and must not be misrepresented as being the original software.

4. This notice may not be removed from or altered in the lsof source files.

#### Cautions

=====

Lsof is a tool that is closely tied to the Unix operating system version. It uses header files that describe kernel structures and reads kernel structures that typically change from OS version to OS version.

DON'T TRY TO USE AN LSOF BINARY, COMPILED FOR ONE UNIX OS VERSION, ON ANOTHER.

On some Unix dialects, notably SunOS and Solaris, lsof versions may be even more restricted by architecture type. An lsof binary, compiled for SunOS 4.1.3 on a sun4c machine, for example, won't work on a sun4m machine.

AN LSOF BINARY, COMPILED FOR ONE SOLARIS 1.X ARCHITECTURE, ISN'T GUARANTEED TO WORK ON A DIFFERENT SOLARIS 1.X ARCHITECTURE.

#### Distribution Contents

=====

The lsof distribution is checked for completeness when it is constructed and by the Inventory script when you run the Configure script. (See The Inventory Script section of the 00README file of this distribution.)

Lsof is organized in these parts:

- \* The main lsof directory, containing common sources, configuration and setup scripts and three subdirectories: dialects/, lib/, and scripts/.

Lsof is compiled in the main lsof directory after configuration. The selected dialect sources are copied or linked from the specified subdirectory. (Symbolic linking is the standard method.)

Common lsof definitions may be found in lsof.h; common function prototypes, proto.h; and common storage, store.c.

- \* The dialects/ subdirectory contains subdirectories with

sources specific to UNIX dialect implementations -- e.g., the dialects/sun/ subdirectory contains sources for the SunOS (Solaris 1.x) and Solaris (2.x) implementations of lsof. The dialects subdirectories also contain Makefiles and scripts for assisting dialect source configuration.

Dialect configuration definitions may be found in dlsof.h; other dialect definitions, dlsof.h; dialect prototypes, dproto.h; and dialect storage, dstore.c.

\* The lib/ subdirectory contains sources for common lsof functions. Not all dialects use the functions -- some have their own versions of them. The lib/ functions are enabled and customized with #define's in the dialect machine.h header files.

\* The scripts/ subdirectory contains sample scripts for processing lsof field (-F) output. The scripts are written in AWK, Perl 4, and Perl 5.

The 00PORTING file of the lsof distribution has more information on lsof components, configuration, and construction.

#### Warranty

=====

Lsof is provided as-is without any warranty of any kind, either expressed or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

The entire risk as to the quality and performance of lsof is with you. Should lsof prove defective, you assume the cost of all necessary servicing, repair, or correction.

#### Bug Reports

=====

Now that the obligatory disclaimer is out of the way, let me hasten to add that I accept lsof bug reports and try hard to respond to them. I will also consider and discuss requests for new features, ports to new dialects, or ports to new OS versions.

PLEASE DON'T SEND A BUG REPORT ABOUT LSOF TO THE UNIX DIALECT VENDOR.

At worst such a bug report will confuse the vendor; at best, the vendor will forward the bug report to me.

Please send all bug reports, requests, etc. to me via email at <abe@purdue.edu>.

#### The lsof-l Mailing List

=====

Information about lsof, including notices about the availability of new revisions, may be found in mailings of the lsof-l listserv. For more information about it, including instructions on how to subscribe, read the 00LSOF-L file of the lsof distribution.

#### Version 3 Release Notes

=====

See 00DIST in the last lsof 3 revision 3.88, for its complete set of release notes. Lsof revision 3.88 may be found at:

<ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/OLD>

3.0 May 24, 1994

This is the first official release of lsof 3.

...

3.88 February 17, 1997

```
+=====+
| This is the last version 3 revision. |
+=====+
```

Added documentation files -- 00.README.FIRST[\_<version>] and 00RELEASE.SUMMARY\_<version> -- to the distribution.

#### What's new in Version 4

=====

The main goal of version 4 was to eliminate the confusing common/fragment source file technique. Changing the version number also provided an opportunity to restart the numbering, which at 3.88 had risen to a large value.

The sources that appeared in the dialects/common subdirectory of version 3 in fragment files have been incorporated into the version 4 liblsof.a library as \*.c files. This results in significant changes to many source files, scripts, and Makefiles of all dialect versions. It allows elimination of some source files -- ddev.c, dfile.c, dmnt.c -- for dialects now obtaining functions from liblsof.a that formerly came from making dialect source files by combining fragment files.

The version 4 liblsof.a sources are stored in the lib/ subdirectory of the main lsof directory. The liblsof.a functions are activated and conditioned in their source files by values #define'd in the dialect dlsof.h and machine.h header files.

Dialects that provide a private version of a library function refrain from #define'ing the symbol that would activate the library function code.

#### Version 4 Release Notes

=====

4.0 February 24, 1997

+=====+  
| This is the first lsof 4 revision. |  
+=====+

Reorganized sources:

eliminated code fragment files  
and created a library in their place. Modified or  
deleted many dialect source and header files.  
Changed documentation accordingly.

Added a warning to sgi/Makefile and 00FAQ that advises  
against using the IRIX C compiler -n32 option when  
compiling lsof. Thanks go to Peter Ilieve  
<peter@memex.co.uk> for bringing this to my attention.

Dropped IRIX 5.2 in mid-stream, because my 5.2 test  
system was upgraded to 5.3.

4.01 March 3, 1997

Added TFS support for Pyramid dialects.

Added test to Configure and to the IRIX dnode.c  
for the different cnode struct that appears in

<cache/cachefs\_fs.h> on the 6.2 IMPACT distribution.  
Heddy Boubaker <boubaker@amfou.cenatls.cena.dgac.fr>  
alerted me to the cnode change and helped test this  
lsof adjustment.

Shut down the lsof child process before doing a -r  
sleep(). A comment from Dan Mercer <dam@mmm.com>  
prompted this.

4.02 March 21, 1997

Based on a report from Pasi Kaara  
<Pasi.Kaara@atk.tpo.fi>,  
disabled HP-UX CCIT support in lsof for HP-UX  
versions 10 and above. Pasi's report also led to  
changes in the HP-UX machine.h to support use of  
gcc to compile lsof for HP-UX 10.20 and warnings  
against using `cc -Aa` or `gcc -ansi` to compile  
lsof under HP-UX 10.x.

With help from Richard Allen <ra@hp.is> taught  
HP-UX 10.x lsof to name file systems better by  
using the virtual file system device number. Elias  
Halldor Agustsson <elias@rhi.hi.is> provided a test  
system.

Changed NEXTSTEP and UNIXWARE Makefiles to use  
safer quoting when generating version.h. The change  
was suggested by Bob Farmer <ucs\_brf@unx1.shsu.edu>.

Added SHELL=/bin/sh string to all Makefiles.

Added support for Linux 2.1.28 on a test system,  
kindly provided by Jonathan Sergent <sergent@purdue.edu>.  
Configure tests the Linux 2.1.x's C library lseek()  
function for proper handling of kernel offsets.  
If lseek() appears suspect, Configure activates  
the  
use of a private lseek() function. Changed  
the private nlist() function to nlist\_private()  
and taught it to use the query\_module() syscall in  
place of the deprecated get\_kernel\_syms() one.  
Added rudimentary AX.25 support for Pierfrancesco  
Caci <ik5pvx@infogroup.it> who helped test it.  
Updated the old get\_kernel\_syms() code to recognize  
and skip module name entries.

Prompted by Marty Leisner <leisner@sdsp.mc.xerox.com>.

eased the requirement that service name lookup for the -i option be accompanied by a protocol name. The name is not needed if both TCP and UDP names yield the same port number.

Added xusers.awk script from Dan Mercer <damercer@mmm.com> to the distribution scripts/ subdirectory.

Changed Configure script to use LSOF\_VERS for all UNIX dialect version numbers and to pass LSOF\_VERS to the dialect Mksrc functions. Also added the ability for a dialect stanza to declare a different dialect Makefile source. Modified dialect Mksrc files  
-- e.g., linux and sun -- accordingly.

Added support for BSD/OS 3.0 with help from Jim Reid <jim@mpn.cp.philips.com>. Terry Kennedy <TERRY@spcvxa.spc.edu> kindly provided a test system. During the port corrected a bug that prevented proper handling of revoked files.

#### 4.03 April 7, 1997

At the suggestion of Dan Mercer <damercer@mmm.com>, made HP-UX building of lsof aware of differences between the HP-UX bundled and unbundled C compilers.

Added the ability for the lsof builder to define the default warning message issuance state. By default the issuance of warning messages is disabled; defining WARNINGSTATE in machine.h disables it. The Customize script was updated to handle WARNINGSTATE. Dan Mercer suggested this.

Eliminated compiler complaint about improperly cast get\_NI\_value() argument in ncache\_load() in lib/rnch.c.

Corrected zeromem() argument error in SCO dproc.c.  
Sped up parent directory cache lookup slightly.

Updated for PTX 4.4,  
including additional VxFS (EFS)  
file system support.

#### 4.04 April 17, 1997

At the suggestion of Bela Lubkin <belal@sco.COM> changed device cache handling to be more tolerant of a device cache file whose [cm]times are older



than the ones on /dev or /devices. The change required adding information to Solaris device cache file clone lines, so the first time lsof 4.04 is run under Solaris it will complain about a bad cached clone device in a previous device cache file, then regenerate it.

Added boot file path detection for SCO OSR 5 and above, based on information supplied by Bela.

Fixed two bugs in DEC OSF/1 lsof -- an error in reporting locks and a missing continue statement in readdev() after a failure to open a directory. Jan Ole Suhr <josuhr@informatik.tu-clausthal.de> reported the second bug and supplied a fix.

Fixed XFS problems with IRIX 6.2 by abandoning the idea that SGI will distribute XFS header files and defining an lsof-private xfs\_inode structure. John Paul Morrison <John.Paul.Morrison@MultiActive.com> helped develop and test the 5.3 definition. John R. Vanderpool <fish@daacdev1.gsfc.nasa.gov> helped develop and test the 6.2 definition.

Remove obsolete comments about common/\*.frag files.

Updated Linux lsof for Linux version 2.1.35.

4.04 April 18, 1997

Supplement Regenerated the 4.04 distribution to correct a non-device-cache #define misplacement in the Solaris and SunOS dlsof.h. Alexandre Oliva <oliva@dcc.unicamp.br> reported the problem.

4.05 April 24, 1997

Corrected an error in 00DCACHE.

Made sure SCO /etc/ps/booted.systems is closed.

Based on an observation by Bela Lubkin <belal@sco.COM> that the lsof child had needless file descriptors open, closed all but the open pipes between the lsof parent and child.

Decommissioned CDC EP/IX support; I no longer have a test system.

Based on a suggestion from Patrick Connor  
<connor@phreak.csd.sgi.com>, added -xansi to  
CFLAGS  
for IRIX 5.3 and 6.[234].

Also at Patrick's suggestion changed Configure to  
propagate exact SunOS 4.1.x version to the main  
and library Makefiles. This allowed the sunos413  
and sunos413cc Configure abbreviations to be  
shortened to sunos and sunoscc.

Updated obsolete argument uses (-H changed to -n)  
in count\_pf.perl\* and watch\_a\_file.perl scripts.

Adjusted Solaris 2.6 lsof for Beta\_Update with tips  
from Casper Dik <casper@holland.Sun.COM>.

Fixed a Solaris 2.4 TCP address reporting bug.

4.06 April 30, 1997

Added a step to the Makefile clean rules that does  
a make clean in the lib subdirectory; suggested by  
Casper Dik <casper@holland.Sun.COM>. (Configure's  
-clean argument already did this.)

Fixed an incorrect awk argument in the sunos\*)  
Configure stanza, reported by Alexandre Oliva  
<oliva@dcc.unicamp.br>.

Added CD9660 (aka ISO) file system support to  
FreeBSD, NetBSD, and OpenBSD with mods and help  
from Kenneth Stailey <kstailey@disclosure.com>.  
(BSDI  
already had CD9660 support.) While at it,  
added file descriptor system support to BSDI and  
FreeBSD.

Added /kern file system support to OpenBSD. The  
support wasn't extended to BSDI, FreeBSD, or NetBSD,  
because it requires Kenneth Stailey's changes to  
/sys/miscfs/kernfs/kernfs.h.

Updated IRIX 6.3 support after getting access to  
a test system, provided by John Paul Morrison  
<John.Paul.Morrison@MultiActive.com>. Improved  
the handling of IRIX 5.1 and greater FIFOs.

4.07 May 12, 1997

Based on AIX problem reports from David Capshaw <David.Capshaw@SEMATECH.Org>, changed the aix\* Configure script stanza to avoid -bnolibpath for gcc (which the GNU loader doesn't grok) and AIX below 4.1.4 (where -bnolibpath hasn't been tested or is known to be unimplemented), and to refuse to use gcc for compiling lsof in AIX versions below 4.1 (because of possible structure alignment problems). Updated 00FAQ appropriately.

Added OpenBSD support for EXT2FS. This support has yet to be tested.

Tested lsof under OpenBSD 2.1.

Activated /kern file system support for NetBSD when Configure senses that /sys/miscfs/kernfs/kernfs.h defines the kern\_target structure. This support has not been tested under NetBSD, although it has been tested under OpenBSD.

Made some simple changes to the BSDI machine.h, suggested by Jeffrey C. Honig <jch@bsdi.com>.

Improved handling of alternate dialect Configure abbreviations -- aix and aixgcc, hpux and hpuxgcc, solaris and solariscc, and sunos and sunoscc.

4.08 May 23, 1997

Cleaned up dialect Makefile's, starting with a suggestion from Christopher Schanzle <chris@cam.nist.gov>.

Improved Configure's -clean processing.

Corrected bugs in Solaris lock reporting.

Changed NetBSD Configure stanza to put -I/usr/include before -I/sys.

4.09 June 1, 1997

Adjusted for latest FreeBSD 3.0 release. This required adding a new kernel name cache module for reading BSD-form hashed kernel name cache entries, rnmh.c, to the lsof library, and adding a #define to each machine.h to select it.

Activated rnmh.c for BSDI 2.1, BSDI 3.0, NetBSD 1.2, and OpenBSD 2.1.

#### 4.10 June 8, 1997

Adjusted for Linux 2.1.x (x > 35) kernels with hashed task structure pointers. Marty Leisner <leisner@sdsp.mc.xerox.com> and Jonathan Sergent <sergent@io.com> tested the adjustment.

Replaced readdev() stat() calls with lstat() to reduce device table and cache entries with the same device number and inode values. Added code to remove all remaining duplicates. This fixes a Linux problem reported by Jonathan Sergent and makes device node name output predictable.

Corrected a bug in UnixWare stream file handling that prevented searching for the stream file by its associated character device name.

Added Pyramid code to determine Reliant UNIX clone major device number differently from that of DC/OSx.

#### 4.11 June 12, 1997

Changed Configure to sense that the PTX inp\_[fl]addr members of the inpcb structure of <netinet/in\_pcb.h> have a struct type and set HASINADDRSTR for use in PTX dnode.c and dsock.c tests.

Changed PTX version 4.1.4 tests to use 4.1.3 instead. Carson Wilson <carson@mcs.com> reported the need to do this and tested the change.

Fixed a block device table indexing bug in lib/rdev.c, reported by Carson Wilson. The same bug was squashed in pyramid/ddev.c.

Added code to the Pyramid Reliant UNIX kread() function to compensate for an address boundary error in the kernel's /dev/kmem driver.

Verified that lsof compiles and works under AIX 4.2.1. Added an AIX test for the presence of NFS header files, defined HAS\_NFS and adjusted AIX dialect sources accordingly.

Based on a suggestion from Gaylord Holder

<holder@phy.ucsf.EDU>, added DEC OSF/1 code to auto-detect the booted file, whence kernel symbol addresses are obtained.

#### 4.12 June 24, 1997

Corrected a device number sign extension problem in the reading and writing of device cache file. The problem was reported by Bela Lubkin <belal@sco.com> and he suggested a fix.

Fixed an SCO stream device lookup problem. The report and solution came from Bela Lubkin

Enhanced the Configure script to enable cross-configuration of lsof, based on suggestions from Marty Leisner <leisner@sdsp.mc.xerox.com>. A new documentation file, 00XCONFIG, describes the process.

Made Pyramid OBJFS support conditional on the presence of supporting header files. Corrected the Pyramid MkKernOpts script so it generates the necessary -D's for the Nile/Jolt architecture. Richard Coley <rcoley@pyra.co.uk> helped.

Added another IRIX xfs\_inode variant for 6.2, 32 bits, no XFS rollup patch.

Tested under UnixWare 2.1.2.

#### 4.13 July 9, 1997

Taught Pyramid lsof to grok ttyfs vnodes with help from Richard Coley <rcoley@pyra.co.uk>. Fixed some minor bugs in Pyramid FIFO reporting. Eliminated use of the Pyramid UCB compatibility library at Richard's suggestion.

Eliminated reporting of "strange" inode numbers for SCO OSR 3.2v5.0.x HPPS files with help from Bela Lubkin <belal@sco.com>

Modified port to service name lookup to use a small number of getservbyport() calls before reading the entire map with getservent(). Changed port reporting to represent a zero as '\*' to be consistent with other prt number reporting tools like netstat. Casper Dik <casper@holland.Sun.COM> suggested these

changes -- the getserv\*() one to improve performance for large NIS service name maps.

Changed all readdev() functions to make the absence of block devices a warning instead of a fatal error after Brian Redman <ber@ms.com> reported his IRIX 6.4 system had no block devices. (It really did have block devices, but readdev()'s lstat() use caused it to miss them in a directory symbolically linked from /dev/dsk->/hw/disk.) Fixed Brian's real problem by changing the IRIX readdev() to use stat() on /dev nodes if a Configure test shows /hw is readable. Extended the potential to do the same to all readdev() functions.

For consistency and convenience changed some Configure abbreviations and dialect subdirectory names: "decosf" abbreviation and "osf" dialect subdirectory name to "du"; "netbsd" dialect subdirectory name to "n+obsd"; "next3" abbreviation and "next" dialect subdirectory name to "ns"; "sco" abbreviation and dialect subdirectory name to "osr"; "sgi" dialect subdirectory name to "irix"; and "unixware" abbreviation and dialect subdirectory name to "uw".

Added #if/#endif clauses to the AIX rmdupdev() function to avoid clone processing for AIX versions less than 4.1.4. The problem was reported by Toralf Foerster <toralf.foerster@io-warnemuende.de>, who supplied corrective code.

Added support for new style NetBSD inode with i\_ffs and i\_e2fs union members.

Improved Configure and 00FAQ information on Digital UNIX configuration subdirectory with suggestions from Brad Krebs <brad@EECS.Berkeley.EDU>.

4.14 July 22, 1997

Reorganized the Solaris handling of the inode structure header file, ufs\_inode.h, to eliminate VxFS structure definition conflicts for Solaris 2.4, based on information from Greg Earle <earle@netbsd4me.jpl.nasa.gov>.

Cleaned up some typos and confusion in Configure's help output, based on comments from Bela Lubkin <belal@sco.com>

Added a 00DIALECTS file, containing UNIX dialect version numbers, that can be used by Configure and the man page.

#### 4.15 August 15, 1997

Aligned `Configure -help` output better. Removed Configure's 2.6 Beta test adjustments.

Added improved Solaris VxFS configuration and handling, based on information from Greg Earle <earle@netbsd4me.jpl.nasa.gov>.

Added socket state -- TCO or TPI -- for socket files at the suggestion of Ian Fitchet <I.D.Fitchet@ftel.co.uk>.

#### 4.16 September 25, 1997

Added reporting of TCP/TPI queue lengths and window sizes ala netstat to NAME column. Added -T option to select or de-select TCP/TPI info reporting. (Window sizes are only reported for Solaris.) Fixed anomalies along the way in SIZE/OFF processing for some dialects.

Fixed service name argument processor to allow minus signs as part of the name. Consequently this disallows names with embedded minus signs from being specified as the start of a range.

Added 00FAQ entries explaining why lsof won't find a file being edited with vi, why window sizes aren't reported for all dialects, and what the "no more information" message means.

Forced Pyramid CC to be /usr/ccs/bin/cc to avoid accidental use of the BSD variant in /usr/ucb/cc.

Added support for Linux glibc2, including a Configure test; cross-Configure support (00XCONFIG); and much unfortunate and risky sleight-of-hand in lsof Linux dialect header and source files, forced upon lsof by incompatibilities

between Linux kernel and glibc2  
header files.

Included in scripts/identd.perl5 a Perl 5 implementation  
of an identd server, using lsof, provided by Kapil  
Chowksey <kchowksey@hss.hns.com>.

Updated IRIX 6.4 xfs\_inode guess.

#### 4.17 October 14, 1997

Added -V option for verbose search result reporting.  
Verbose reports are prepared for failure to locate  
file names, command names, Internet addresses or  
files, login names, NFS files, PIDs, PGIDs, and UIDs.

Augmented Linux NFS file test to cope with kernels  
whose NFS code is in a loadable module. Need for  
the test was pointed out by Jonathan Sergent  
<sergent@csociety.ecn.purdue.edu>. The change  
required that Linux have private dmnt.c source,

Completed a Linux 2.1.57 port on a system provided  
by Jonathan Sergent.

#### 4.18 October 25, 1997

Eliminated memory leaks in alloc\_lfile(), lkup\_port(),  
and NEXTSTEP's process\_text() function.

Added recognition of OpenBSD 2.2 in Configure,  
supplied  
by Kenneth Stailey <kstailey@disclosure.com>.

Consolidated print\_file() functions to use the one  
in lib/prtf.c. Made it configurable and changed  
it to size print columns dynamically.

!!! WARNING !!!

WITH DYNAMICALLY SIZED PRINT COLUMNS LSOFF 4.18  
PRODUCES OUTPUT SIGNIFICANTLY DIFFERENT FROM THAT  
OF PREVIOUS REVISIONS. LINES ARE GENERALLY SHORTER  
AND THERE IS GENERALLY LESS BLANK SPACE BETWEEN  
COLUMNS AND THE ITEMS IN THEM. THERE ARE NO LONGER  
ANY SPACES BETWEEN DEVICE NUMBER ELEMENTS, ONLY  
COMMAS.

!!! WARNING !!!



Added special types and print specification modifiers for file size and offset to handle UNIX dialects with 64 bit sizes and offsets. Paul Eggert <eggert@twinsun.com> reported the need for this addition.

With Paul Eggert's help picked lint from the lsof library, the main level lsof sources, and the Sun dialect sources.

Added documentation, including the file 00LSOF-L, about the lsof-1 LISTSERV.

Added support for Reliant UNIX on the RM600. Bob Passarella <rmpassar@pyramid.com> supplied the changes. Kevin Smith <kevin@pyramid.com> helped arrange test systems. While incorporating Bob's changes, modified lib/rnch.c to handle kernel ncache structs whose name is accessed via a char \*, rather than in a char array.

Changed #include order of <sys/socketvar.h> for Solaris 2.x. W. Richard Stevens <rstevens@kohala.com> pointed out the need to do this.

4.19 October 30, 1997

Changed Pyramid Reliant RM600 proc scan to skip SSYS (p\_flag) processes, since they don't seem to have a readable u\_cdir vnode.

Enabled Pyramid Reliant UNIX kread() work-around for DC/OSx, too, since its read(/dev/kmem) kernel driver seems to share the page boundary bug this work-around circumvents.

Changed SzOffFtm\_d and SzOffFtm\_dv (new formats at 4.18 to print size and offset) from signed to unsigned. Setting them signed at 4.18 was an oversight.

Plugged a memory leak that caused the loss of 130 bytes per repeat-mode pass. Fixed it with a simple work-around in main(). Lionel Cons <Lionel.Cons@cern.ch> reported the leak.

4.20 November 11, 1997

Tested under BSDI 3.1.

Added support for Reliant UNIX Mesh IPC files with help from Billy Ho <bho@pyramid.com>.

Added support to Digital UNIX lsof that uses the libmfs tag\_to\_path() function (when it exists) to look up AdvFS path names. The idea and sample code came from Dean Brock <brock@cs.unca.edu>. Converted Dean's code into more general purpose support for private name cache lookups via the HASPRIVNMCACHE #define in the dialect machine.h file and code conditional on it in the printname() function.

Taught Digital UNIX lsof to recognize NFS3 file systems. Corrected Digital UNIX lsof DEVICE column alignment.

4.21 December 1, 1997

Squashed bug, introduced at revision 4.18, that resulted in double reporting of each selected PID when terse mode (-t) was specified.

Corrected minor bug, also introduced at 4.18, that might cause an extra print\_proc() pass when one PID has been specified.

Added -R to lsof options in scripts/idrlogin.perl\*. The option should have been there -- it was supposed to be mandatory for PGID reporting -- but a bug, corrected in revision 4.18, previously made -R unnecessary.

Enabled configuring for BSDI BSD/OS 4.0 per a suggestion from Jeff Honig <jch@bsdi.com>.

Enabled replacement of scoff\_t with off64\_t (scoff\_t is used to type r\_size and r\_localsize in the rnode struct) for IRIX 5.3 systems that have the NFS kernel rollup patch (1477). This compensates for SGI's failure to distribute an updated <sys/fs/rnode.h> with their patch.

Validated under Linux 2.0.3[12], Linux 2.1.64, and NetBSD 1.3.

Added FreeBSD root directory reporting, courtesy

of Dan Nelson <dnelson@emsphone.com>.

4.22 December 15, 1997

Made adjustments for Linux 2.1.7[02].

Improved NAME information for Linux UNIX domain sockets.

Added

option `+|-M` to control the reporting of portmapper registration information in square brackets after the TCP or UDP port or service name. Kenneth Stailey <kstailey@disclosure.com> suggested the feature and provided sample code from OpenBSD. Reporting is disabled by default in the distribution and may be enabled with `+M`; if `lsof` is compiled with `HASPMAPENABLED` (e.g., from `machine.h`), reporting will be enabled by default and can be disabled with `-M`.

Changed the `-w` option to `+|-w` to match the syntax of the `+|-M` option and to eliminate any options that flip meaning when a symbol is defined at compile time. For both `+|-M` and `+|-w`, specifying ``-'` when the default state is disabled or specifying ``+'` when the default state is enabled causes no problems.

!!!WARNING The `-w` option has changed in `lsof` 4.22. WARNING!!!

Made the `+|-` prefix legal for most options, but didn't document it in the man page or help panel. Most options that disable something -- e.g., `-b`, `-C`, `-n`, `-P` -- now disable when the prefix is ``-'` and enable when it is ``+'`. Since the states these options disable are enabled by default, I chose to avoid documentation complexity and confusion by not mentioning that they can be used with the ``+'` prefix.

Condensed the help panel.

Made sure Digital UNIX Configure stanza puts normal include path (e.g., `/usr/include`) before system include paths.

Added IPX socket information reporting to Linux

with help from Jonathan Sergent <sergent@purdue.edu>.

4.23 January 16, 1998

Fixed conflict arising from the quondam replacement of the Sun Solaris <netdb.h> with a BIND/BSD version.

With help from Jonathan Sergent <sergent@purdue.edu> developed a /proc file system based Linux lsof.

It needs some Linux 2.1.x release to work -- I'm not sure which, but I tested under 2.1.72, 2.1.76, and 2.1.79. The Configure script selects special sources for this lsof, so the full lsof distribution now

contains both /dev/kmem and /proc based sources for Linux lsof. An optional kernel mod, written by Jonathan, enhances the /proc-based lsof ability to recognize IPX socket files. Reorganized and augmented the Linux sections in 00FAQ to explain the two types of Linux lsof.

Defined DOSTAT\_FUNCTION for dostat() in misc.c to select the function, stat() or lstat(), it will use.

DOSTAT\_FUNCTION is normally undefined, defaults to lstat(), and is only defined for the /proc-based Linux lsof in its dlsof.h.

Made conditional on the presence of IRIX 6.4 XFS rollup patch #6 an XFS node change introduced in revision 4.16. Identified the patch with help from John R. Vanderpool <fish@daacdev1.gsfc.nasa.gov>.

Added NFS node compensation for NetBSD 1.3. The code and suggestion for it was supplied by Jean-Luc Richier <richier@imag.fr>.

Added diagnostic messages to the /dev/kmem-based Linux Mksrc script to report errors during the construction of the kernel name cache header file, knccache.h. Added 00FAQ information on knccache.h.

Added a new Linux test host, running 2.0.33 and Glibc, provided by Steve Logue <stevel@mail.cdsnet.net>.

Ported to PTX 4.1.3 and 4.4.2. Adjusted lib/rnch.c for 4.4.2 to allow customization of additional ncache struct element names.

4.24 January 28, 1998

Changed /proc-based Linux lsof offset test to use "/" instead of "/etc/passwd".

To assist Jim Mintha <jim@geog.ubc.ca> with the packaging of lsof for Debian Linux, added a DEBIAN\_LINUX\_LSOF #define to trigger the activation of special system map file location code in the /dev/kmem-based dproc.c.

Applied modification to dialects/bsdi/dlsof.h from Ingimar Robertson <iar@skyr.is>, enabling lsof to compile for BSDI BSD/OS 2.0.

Corrected a documentation error in 00DCACHE, pointed out by Thomas Anders <anders@hmi.de>. The error was created when the -V option was added at lsof 4.17.

Made IRIX 5.3 through 6.3 lsof aware of IRIX SCSI tape devices (e.g., /dev/tape). Dave Olson of SGI and Randolph J. Herber of FNAL provided valuable advice, and Igor Schein <ischein@air-boston.com> helped test.

Added a machine.h symbol (NEVER\_HASDCACHE) that prevents Customize from offering to change HASDCACHE. The symbol may appear anywhere in machine.h -- e.g., in a comment. Included the symbol in a comment of the HASDCACHE section of the /proc-based Linux lsof machine.h, and accompanied it with warnings against #define'ing HASDCACHE. Did the same thing for WARNDEVACCESS (NEVER\_WARNDEVACCESS is the suppressant.)

4.25 February 7, 1998

Corrected an IRIX mis-cast of file offset (position). Igor Schein <ischein@air-boston.com> reported the problem. This was offered as a patch to 4.24. Picked some lint Igor pointed out.

At Igor's suggestion added an optional decimal digit size argument to the -o option. This argument specifies how many file offset decimal digits can follow

"0t" before lsof switches to a "0x..." form.

The argument size specification doesn't count the two characters of the "0t". A size of 0 means

unlimited. The default is OFFDEC DIG (8), preserving compatibility with existing lsof output; it can be changed by the lsof builder. When size is specified with -o it does not force offset display; -o without a size still must be used to do that.

Added an IRIX 6.2, 32 bit system, XFS node patch, courtesy of Ulrich Bernhard <rzubu@rzu.unizh.ch>.

For my own convenience enabled Configure to use /usr/local/bin/gcc for NEXTSTEP. This allows circumvention of a gcc 2.8.0 ranlib problem on my test 3.1 `040 cube.

Added flags recommended by the RISC/os and Ultrix compilers for the updated (and longer) main.c.

Updated FreeBSD cd9660\_node.h Configure test.

4.26 February 17, 1998

Added shared process group processing for IRIX 5.3, and IRIX 6.1 and above, based on investigation of a bug report from Igor Schein <ischein@air-boston.com>.

Igor helped test this addition.

Improved handling of file system name arguments. It's now done in a manner similar to fuser. The -f argument forces path names to be considered as simple files, rather than as file system names. The +f flag forces them to be considered as file system names. Normally path arguments are considered file system names when they match a mounted-on directory in the system's mount table, or when they match a mounted file system's block device. Igor Schein helped test this change.

Igor also suggests that the proper compilation of the IRIX 6.4 proc structure after patch 2536 has been installed may need -DPIOMEMOPS. So lsof's MkKernOpts script was updated to propagate that option from CCOPTS in /var/sysgen/system/irix.sm, even though patch 2536 doesn't add -DPIOMEMOPS to it. Added a 00FAQ item on this patch.

Added a fatal warning message about names forced to be file system names (with +f)

that have no  
match in the mount table.

Improved the -V message for files and file systems  
for which no open files were found. Added reporting  
of /proc file and file system search failures.

Did some code reorganization to combine the multiple  
ck\_file\_arg() functions into one. Moved the new  
function from the library to the top level and put  
it in arg.c; moved the usage function from arg.c  
to a new top-level source file, usage.c, to balance  
top-level source file size. The new usage.c depends  
on version.h; arg.c no longer does.

Added flag recommended by the DU compiler for the  
updated (and longer) main.c.

4.27 March 6, 1998

At the request of Igor Schein <ischein@air-boston.com>  
added a conditional repeat mode option, using the  
`+' prefix to the `r' option. +r operates as does  
-r with the exception that it exits the first time  
no open files have been listed during a cycle.  
The exit code will be zero when any open files have  
been listed; one,  
if none were ever listed.

Ported lsof to HP-UX 11.0 with the help of Richard  
Allen. This port hasn't been tested on a 64 bit  
kernel; I'm sure it won't work there without more  
mods. It may not work on PA 2 architectures; I've  
only tested it under PA 1 and a separate, busy  
tester reported PA 2 problems that I've been unable  
to investigate.

In anticipation of getting access to a 64 bit HP-UX  
kernel and the pending start of the Solaris 2.7  
Beta test (It will have 64 bit kernel addressing.),  
started adding support for 64 bit kernel pointers.  
This includes: ubiquitous use of the KA\_T cast  
for kernel pointers; a format to print them,  
KA\_T\_FMT\_X; a function to print them, print\_kptr();  
and modifications to most kernel-related functions  
-- e.g., process\_file(), process\_node(),  
process\_socket(), readvfs() -- to process kernel  
addresses as KA\_T types.

Fixed minor bug in handling path name arguments that end with a `/'.

Removed support for RISC/os;  
its test system is no  
longer available.

Made modifications to insure that lsof output doesn't contain non-printable characters. All such characters are now printed in the printf form "\x%02x". Several new common functions were installed in misc.c to support "safe" printing. This second major modification in 4.27 to common and dialect code could have introduced bugs not yet detected.

4.28 March 10, 1998

Refined unprintable format to use \b, \f, \r, \n, \t, and ^\* (for CTRL) forms. Corrected omission of safestrprt() use for field output command name. These changes were offered as patches to 4.27.

Made space an unprintable character (\x20) in the COMMAND column; printable elsewhere, including the NAME column, field output, and error messages.

Made sure FD column is parseable as a single entity -- i.e., has no embedded space. Thus, if the access mode is unknown but there is a known lock mode, (a very rare case) the access mode will be printed as  
`-'.

Picked lint with gcc 2.8.0 under Solaris 2.6.

With the help of Dave Olson of SGI identified a proc struct element that should have been added to <sys/proc.h> by IRIX 6.4 patch 2536. Added a work-around for it to the lsof Configure script. Igor Schein <ischein@air-boston.com> identified that the patch caused a proc structure length complaint from lsof. Removed an obsolete 00FAQ item on the patch, installed at lsof 4.26, explaining that no solution was yet available.

Added a 00FAQ item on how BIND installs its own header files, including <netdb.h>, which may cause the rpercent struct definition to vanish. Solaris



has an automatic lsof work-around, but that hasn't been (and probably can't be) propagated to all dialects supported by lsof. The 00FAQ item recommends re-installation of the vendor header files that BIND has replaced. (Others include <rpcent.h>, <sys/bitypes.h>, and <sys/ctypes.h>.)

Made AIX AFS fixes.

4.29 March 26,  
1998

Corrected bug in Internet address matching. The matching formerly stopped if the foreign address matched, thus failing to check the local address for a match. That led to a possible false "Internet address not located" warning (i.e., in response to -V) about the local address, when both foreign and local addresses were specified with -i. This correction was offered as a patch to 4.28.

Changed readmnt() usage in an attempt to defer mount readlink() and stat() delays until they are necessary.

Corrected two bugs in the Digital UNIX readdev() function. Made the correction available as a patch to 4.28 and regenerated the 4.28 DU binaries.

Added a missing argument to a print-kptr() call in the HP-UX dsock.c. The missing argument causes a fatal gcc error. The problem was reported by Eyal Shaynis <eyal.shaynis@telrad.co.il>. The fix was offered as a 4.28 patch.

Adjusted for Digital UNIX 4.0D; the spec\_node structure is now defined in <sys/specdev.h>. Kris Chandrasekhar <Kris.Chandrasekhar@digital.com> identified the need for the adjustment.

Incorporated a bug fix from Brian McAllister <mcallister@mit.edu> to the DU readmnt() function. This fix was offered as a patch to 4.28.

Added "safe" printing to a SunOS clone device error message.

Corrected bug in tabling of Linux /proc-based lock

info.

Corrected bug in handling of SunOS TLI streams.  
Dan Farmer <zen@trouble.org> reported the problem.

Added a Solaris 2.6 work-around to keep the BIND  
<sys/bitypes.h> from colliding with the Solaris  
<sys/int\_types.h>.

Strengthened the Configure test for /proc-based  
Linux lsof, based on a report from Marty Leisner  
<leisner@sdsp.mc.xerox.com>.

Tested on OpenBSD 2.3.

Made AIX changes that allow use with 3.2.5. The  
changes were suggested and tested by Brett Hogden  
<hogden@rge.com>.

Added Solaris 2.6 AFS support. Disabled reporting  
of some node numbers for Solaris 2.5 and above open  
AFS  
files. The node number computation algorithms  
used for SunOS 4.1.x and Solaris less than 2.5 no  
longer always work under Solaris 2.5 and above.

4.30 April 9, 1998

Corrected a pid structure member naming error for  
UnixWare < 2.1.2. The problem was reported by  
Richard van Meurs <vanmeurs.anva@atriserv.nl>. He  
supplied the correction. This was offered as a  
patch to 4.29.

Had a report from Igor Schein <ischein@air-boston.com>  
that IRIX 6.4 patch 2839 is another SGI kernel  
patch, along with 2536, that changes the size of  
the proc structure in the kernel without changing  
the proc structure in <sys/proc.h>. Upon further  
investigation found that the effect of these patches  
on the proc structure is not consistent. Therefore,  
dropped the Configure patch test for IRIX 6.4 and  
made the code in irix/dproc.c slightly more tolerant  
of proc structure size differences for IRIX 6.4.  
Igor help test the change.

Corrected Solaris >= 2.5 AFS inode number  
generation.  
Craig Everhart <Craig\_Everhart@transarc.com> helped

find the cause of the problem. This was offered as a patch to 4.29.

Refined the Linux /dev/kmem-based glibc evasion for the timeval structure to make it work with glibc version 2.0.7. This required defining a new global symbol, TIMEVAL\_LSOF, default timeval, that the /dev/kmem-based Linux lsof can set to its private glibc timeval name, distinct from the kernel timeval name.

Added support for Alpha to the /dev/kmem-based Linux lsof. Alexandre Oliva <oliva@dcc.unicamp.br> provided a test system. Added an item to 00FAQ about lsof, the Alpha processor, and Linux.

Added a 00FAQ item about lsof year 2000 compliance. Basically it says lsof is probably compliant, because its only date or time computations are done with time\_t values, but I haven't done any specific Y2K validation. I don't have plans to do any.

Added support for UnixWare 7. Chris Daniels <chrisd@dlpco.com> provided a test system and Don Draper <dond@sco.COM> provided technical information. Added BFS and SFS file system support to lsof for UW 2.1.[12] and 7.

Updated Solaris VxFS support for VxFS 3.2.1. Greg Earle <earle@netbsd4me.jpl.nasa.gov> reported the need for the update. Greg and Roger Klorese <rogerk@veritas.com> provided technical information. Scott McClung <mcclung@primenet.com> tested.

Changed IRIX XFS patch detection in anticipation of learning there are multiple XFS patches for IRIX 6.4 that require different versions of the lsof-invented xfs\_inode structure.

4.31 April 21, 1998

Added a VxFS #if/#endif wrap to a section of the HP-UX dnode.c that wasn't properly protected. The problem was reported by Peter Klosky <PKlosky@bdm.com>. This was offered as a patch to 4.30.

Added support for Solaris 2.7 (first Beta release). Mike Sullivan <Mike.Sullivan@Eng.Sun.COM> provided

technical advice and helped test. Charles Stephens  
<cfs@jurassic.eng.Sun.COM>  
also helped test.

Fixed bug in /proc-based Linux that caused it to  
access /proc/mounts excessively. Marty Leisner  
<leisner@sdsp.mc.xerox.com> provided a syscall  
trace that identified the bug. The fix was offered  
as a patch to 4.30.

Adjusted the IRIX 6.4 private structure definition  
for the XFS node to accommodate patch 2970. Igor  
Schein <ischein@air-boston.com> identified the  
patch and the required adjustment.

4.32 May 11, 1998

Corrected Solaris 2.7 code for reporting PCFS  
(floppy disk) node numbers. Casper Dik  
<casper@holland.sun.com> supplied the fix. The  
fix was offered as a patch to 4.31.

Corrected a bug in conditional repeat mode handling  
pointed out by Igor Schein <ischein@air-boston.com>.  
This was offered as a patch to 4.31.

Improved reporting of AIX open(/dev/memory device)  
errors.

Corrected a Solaris < 2.5 KA\_T declaration error,  
pointed out by Robert Kiessling <robert@easynet.de>.  
Changed KA\_T from a #define  
to a typedef for all  
dialects to prevent future problems of this kind.

Changed the sample Perl 5 script big\_brother.perl5  
to report a four digit year from localtime().

Added support for AIX 4.3[.1]. Bill Pemberton  
<wfp5p@tiger.itc.virginia.edu> provided a test  
system. Andrew Kephart <akephart@austin.ibm.com>  
and Tom Weaver <tvweaver@austin.ibm.com> provided  
technical assistance. Niklas Edmundsson  
<nikke@ing.umu.se> did 4.3.1 testing.

Added -qmaxmem option to CFLAGS for an AIX compilation  
with an xlc version 4.x compiler.

Adjusted Linux socket handling for changes in the

AX25 members of the sock struct. Richard Green <rtg@tir.com> pointed out the problem. Tested /dev/kmem-based lsof under Linux 2.0.34.

#### 4.33 May 22, 1998

Added generic IPv6 support to common lsof sources and specific IPv6 support to AIX sources. Andrew Kephart <akephart@austin.ibm.com> supplied the additions and helped with testing. Bill Pemberton <wfp5p@tigger.itc.virginia.edu> provided a test system. The modification affected sources for every dialect, whether it supports IPv6 or not, by changing the interfaces to the common Internet address function `ent_inaddr()`.

Added support for the NetBSD UVM virtual memory system. Paul Kranenburg <pk@cs.few.eur.nl> supplied technical details.

Bracketed HP-UX 11 use of <sys/spinlock.h> with `#if/#endif _KERNEL`.

Corrected printing of PCB address in DEVICE column for IRIX.

#### 4.34 June 26, 1998

Updated 00FAQ to discuss TCP and UDP ports private to the AIX kernel and 00README to describe how ACLs can be used to give lsof permission to read the kernel memory devices. Add information to 00FAQ and 00README about other OpenBSD architectures where lsof is reported to compile and run. Added section to 00FAQ discussing how an incorrect loader path environment variable value can prevent lsof from loading correctly.

Improved Solaris namefs and doorfs support so that it is now possible to search for an open VDOOR file by the path name of its fattached file system object. Igor Schein <igor@txc.com> requested the ability to do such a search. Even with the change, lsof can't always identify path names for open VDOOR files.

Also at Igor's request, improved reporting of information on open Solaris VCHR files that share

a common vnode, and Solaris UNIX domain socket files.

Corrected print\_kptr() argument error in PTX dnode.c, reported by Mark Price <mprice@sequent.com>. Compensated for ncache element naming differences, introduced at PTX 4.4.2; Kurtis D. Rader <krader@sequent.com> reported the problem.

Changed output column title from INODE to NODE to better reflect the column's contents of node IDs for more than just inodes.

Improved Configuration and processing for Solaris AFS. Corrected AIX AFS 3.4 afs\_rwlock\_t simulation.

Corrected a cast problem with two AIX knlist() calls, thus quieting an AIX 4.2.1 compiler argument type warning. Jon Champlin <champlin@us.ibm.com> reported the problem.

Added support to most dialect versions (exception: /proc-based Linux) to warn when the identity of the kernel where lsof was compiled doesn't match the running identity. The warning can be suppressed with -w. Note: determining AIX state requires calling oslevel, a potentially slow operation. Jon Champlin <champlin@us.ibm.com> suggested this addition.

!!!! WARNING !!!!   !!!! WARNING !!!!   !!!! WARNING !!!!

Those using the lsof cross-configuration capability (see 00XCONFIG), should be aware that the kernel identity test feature introduces two new basic cross configuration environment variables, LSOF\_ARCH and LSOF\_VSTR.

!!!! WARNING !!!!   !!!! WARNING !!!!   !!!! WARNING !!!!

Identified a situation where a Solaris UNIX domain socket name is known and can be searched for by name; added the necessary code.

4.35 July 17, 1998

Made the kernel identity

check an option with the HASKERNIDCK #define in machine.h. Enabled altering of HASKERNIDCK with the Customize script. Added a clause to the help output that indicates the build-time HASKERNIDCK status.

Added more information to the NAME column for Solaris UNIX domain sockets. Made them searchable by their clone device path name. Igor Schein <igor@txc.com> requested this.

Completed the HP-UX 11 port with support for its optional 64 bit kernel. Rich Rauenzahn <rrouenza@cup.hp.com> provided a test system. Corrected errors with HP-UX 11 lock reporting and private kernel structure and type definitions. Added support for HP-UX NFS3 files.

Limited mount table warnings -- e.g., when -b is used -- to one set per mount point.

Fixed some mount table scanning and usage bugs, including one in Solaris, reported by Kjetil Torgrim Homme <kjetilho@ifi.uio.no>.

#### 4.36 August 4, 1998

Made corrections and additions to IPv6 support and to AF\_ROUTE socket handling, supplied by Jean-Luc Richier <Jean-Luc.Richier@imag.fr>. Jean-Luc's additions provide IPv6 support for the Inria IPv6 implementations on FreeBSD and NetBSD.

Fixed two Solaris 2.5, 2.5.1, 2.6 and 2.7 TCP and UDP host name or IP address reporting bugs, reported by James Mathiesen <James-Mathiesen@deshaw.com>. This fix was offered as a patch to 4.35.

Updated the Customize script to cause ENTER to use all defaults. Amir J. Katz <amir@ndsoft.com> suggested this and helped test the changes.

Updated Solaris ICMP and IP stream handling, based on a report from Igor Schein <igor@txc.com>.

Fixed a bug in the Digital UNIX mount table handling, reported by Bob Ward <bward@thehartford.com>. While working on the bug, found and updated some

obsolete AdvFS code. This fix was offered as a patch to 4.35.

4.37 September 15, 1998

Deactivated SGI IRIX support and archived revision 4.36 sources and binaries in pub/tools/unix/lsf/OLD.

Improved performance of FD searching. This was offered as a patch to 4.36.

Amir J. Katz <amir@ndsoft.com> pointed out that ranlib isn't needed for AIX or Solaris. Made appropriate Configure script changes.

Fixed a file offset reporting bug for HP-UX VCHR and VBLK device nodes located on a VxFS root. Doug Siebert <douglas-siebert@iowa.edu> reported the bug. The fix was offered as a patch to 4.36.

Resolved an HP-UX root device name reporting bug, partly caused by an out-dated local copy of the <sys/mount.h> mount structure, by generating a local header file with the structure that can be compiled without needing \_KERNEL defined. Doug Siebert also reported this bug.

Changed some dialect source code -- Digital UNIX, Solaris, SunOS, and UnixWare -- to make more consistent with ps the user ID lsof reports in the USER column. Added a 00FAQ entry about it. Igor Schein <igor@txc.com> reported the Solaris and SunOS lsof inconsistencies with what ps(1) reports.

Ported lsof to Pyramid ReliantUNIX 5.44.

Added brackets as comments to case, do, done, else, endif, esac, if, and while statements in Configure to assist in navigating its clauses.

Added more Linux 2.0.x glibc work-arounds.

Added support for UnixWare 7.0.1.

Ralph Forsythe <ralph@contact-paging.com> provided a new FreeBSD test system.



4.38 November 25, 1998

Added support for recent FreeBSD 3.0 distributions. A 3.0 test system was provided by David O'Brien <obrien@NUXI.com>. This was offered as a patch to 4.37.

Updated the scripts/idrlogin.perl\* files to look for sshd processes in addition to rlogind and telnetd ones.

Added support for DU 5.0 Beta. Berkley Shands <berkley@cs.wustl.edu> provided a test system.

Added support for OpenBSD 2.4 with changes supplied by Kenneth Stailey <kstailey@disclosure.com>.

Changed the Solaris 2.7 tests and documentation to Solaris 7.

Made some changes to the header files for NEXTSTEP 3.3 and added support for OPENSTEP 4.x with help from Michael A. Hovan III <mhovan@BLaCKSMITH.com> and Carl Lindberg <Carl\_Lindberg@BLaCKSMITH.com>. The combined dialect subdirectory is named n+os. One of Carl's changes propagates RC\_CFLAGS to the library Makefile. Timothy J. Luoma <luomat@peak.org> helped test under NEXTSTEP 3.3 and OPENSTEP 4.2.

Made UW 7.x version sensitive to the presence of ptf7038. Added peer PCB address to Unix domain socket Name column, even when a path name has been located. Information for these changes was supplied by Francis Le Bourse <flebourse@intelcom.fr>. Lee Penn <lee@dlpco.com> provided a test system.

Tested lsof under OSR 5.0.5 on a test system also provided by Lee Penn.

Made path name argument processing more tolerant of errors per a suggestion from Julian Gordon <julian@cadence.com>.

Acquired a new UnixWare 2.x test system, generously provided by Computer Classroom, Inc. -- Matthew Thurmaier <matt@compclass.com>, Ken Laing <ken@compclass.com>, and Andrew Merril

<andrew@compclass.com>. Updated Configure to accept a UnixWare version of 2.1.3.

Updated kmem-based lsof for Linux 2.0.36.

Updated NetBSD sources for a change in a UVM virtual mapping header file.

Corrected a cache allocation bug in Sun format kernel name cache handling. The bug only shows up when the kernel name cache is inaccessible.

4.39 December 29, 1998

Corrected problems with large device number handling for 64 bit Solaris 7. The problems were reported by Steve Bellenot <bellenot@math.fsu.edu>. Steve helped test the fixes. The fixes were offered as two patches to lsof 4.38.

Improved FreeBSD Configure operations for header files that must be obtained from the kernel source tree, based on a suggestion from David O'Brien <obrien@NUXI.com>.

For Bela Lubkin <filbo@deephought.armory.com> made optional with +f[cfn] the display of file structure address, shared use count, and node structure address.

/proc-based Linux doesn't implement this feature, because it doesn't read kernel structures from kernel memory. Modified the PTX -X option to take advantage of the new file structure display option. Added shared.perl5 to the scripts/ subdirectory to provide an example of how +f[fn] might be used to track shared file descriptors and files.

Added more /dev/kmem-based Linux glibc evasions, provided by Jeff Johnson <jbj@redhat.com> and Maciej Lesniewski <nimir@kis.p.lodz.pl>. Jeff helped test them on various Linux architectures.

Tested on AIX 4.3.2; no changes were required. Doug Crabill <dgc@purdue.edu> provided a test system.

Fixed -c option to detect missing command name when following option begins with `+'.

4.40 January 25, 1999

Added support for using the CDS compiler for Reliant Unix 5.44 and above. Made Reliant Unix MIPC support optional, dependent on the presence of <sys/mipc.h>.

Based on a report from Michael Schmitz

<MSchmitz@lbl.gov>

that /dev/kmem-based lsof misbehaves on a Linux 2.0.x m68k kernel without module support, made the absence of query\_module() or get\_kernel\_syms() Linux kernel support a fatal error. Updated relevant sections of 00FAQ to reflect the change.

Added the ability to force the Linux Configure stanza to use the /proc or /dev/kmem source base via a LINUX\_BASE environment variable specification. This is a cross-configuration assist.

Added "+D <dir>" and "+d <dir>" options for directory searching. +D searches the entire tree, starting at <dir>, including <dir>, its contents, and its subdirectory branches; +d searches only <dir> and its contents, but not its subdirectory branches. Improved lsof's searching of the specified name list to compensate for anticipated long lists from +d and +D.

Made an egrep in the Solaris Configure stanza usable by the standard and XPG4 egrep's. Kenneth Stailey <kstailey@disclosure.com> pointed out the improvement.

Fixed bugs in /dev/kmem-based Linux and UnixWare Unix domain socket name searching.

Changed a Linux Alpha #include to be conditional on the presence of its named header file, so that lsof will compile on Red Hat 5.1 and 5.2 (Linux kernel 2.0.35) where the header file is absent. The problem was reported by Alexandre Oliva <oliva@dcc.unicamp.br>.

Fixed an AIX 4.3+ bug in procinfo struct space allocation, reported by Jeff Stewart <jws@purdue.edu>. This was offered as a patch to 4.39.

Added an lstatsafely() function to offer the same

isolation for lstat() calls that statsafely() offers for stat() calls. This made DOSTAT\_FUNCTION no longer necessary, so deleted it.

With help from Laurent P. Montaron <lpm@sequent.com> ported lsof to PTX 4.4.4. Laurent did a monumental job of identifying TCP/IP changes by their TCP version, rather than by their PTX (With mix 'n match PTX and TCP/IP versions, the PTX version often has no bearing on the TCP/IP version.), and changed the Configure script and pre-processor #if/#else/#endif blocks to match. He also updated Unix domain socket handling for PTX TCP/IP versions 4.5 and above.

Updated CLIENT handle acquisition of fill\_portmap() in print.c to use the more modern RPC function clnt\_create() in place of clnttcp\_create() where possible. PTX 4.4.4 requires clnt\_create().

4.41 February 27, 1999

Added FreeBSD 3.1 and 4.0 support with help from Sheldon Hearn <axl@iafrica.com>, David O'Brien <obrien@NUXI.com>, and John Polstra <jdp@polstra.com>.

Corrected bungled AIX 4.3+ patch that went into lsof 4.40.

Reorganized the Configure script to improve Makefile construction. A specific impetus for this was to allow FreeBSD system-wide make flags to be propagated to the lsof Makefiles, but other goals were to make sure that the DEBUG= make entry can over-ride standard CFLAGS values, and to better manage the identification of compilers and their versions.

Two compiler-related values may now be supplied in environment variables: 1) the compiler path in LSOF\_CC; and 2) the compiler version in LSOF\_CCV. 00XCONFIG documents them.

Added support for Pyramid Reliant Unix bsdfs, mssockfs, and sockfs file systems.

Added an optional LSOF\_CINFO string to Configure, producing a CINFO string in selected Makefiles, producing a #define LSOF\_CINFO in selected version.h

header files. The purpose of this is to allow  
Configure the option to propagate information to  
the lsof -v output. It is now used for Linux to  
identify the code base, and for HP-UX 10.30 and  
11.0 and Solaris 7 to identify the kernel bit size.

Added system information to NEXTSTEP and OPENSTEP  
-v output, from the second line of hostinfo's  
output.

Fixed a login name buffer overflow problem in the  
processing of -u option values. This was offered  
as a patch to 4.40. !!!THIS IS A SERIOUS STACK  
OVERFLOW BUG; A LINUX EXPLOIT  
EXISTS FOR IT THAT  
OPENS A BASH SHELL WITH LSOF'S AUTHORITY -- E.G,  
SETGID(KMEM) POWER!!!

Improved the Solaris mount table filter so the  
volume manager's fake mount point, "/vol", is  
ignored and doesn't supplant "/" in NAME column  
path assemblies. Igor Schein <igor@txc.com> reported  
this bug and provided important help in finding  
it. This was offered as a patch to 4.40.

Changed the Linux /dev/kmem-based lock ownership  
test to answer a problem reported by Tom Christiansen  
<tchrist@jherreg.perl.com>. This was offered as a  
patch to 4.40.

Installed an HP-UX 11 patch, suggested by Kevin  
Vajk <kvajk@cup.hp.com>, that adjusts a private  
lsof kernel header file, derived via Q4, to correspond  
to an HP-UX patch bundle.

Made NetBSD 1.3I sockproto structure adjustment.

4.42 March 30, 1999

Fixed a typo in the HP-UX dfile.c that caused +fF  
and +fN output controls to swap effect.

Enabled for OpenBSD 2.5 per notice from Kenneth  
Stailey <kstailey@kstailey.tzo.com>

Made  
more VM accommodations for FreeBSD 4.0.

Improved file system search reporting to include

path name components when they're available, instead of mindlessly reporting the file system name in the NAME column. Guy Dallaire <gdallair@geocities.com> brought the need for this change to my attention.

Updated Solaris 2.6 VxFS for Veritas Oracle Database Edition 2.0, VxFS version 3.3, and VxVm version 2.5.4, based on a report from Chris Kordish <chris.kordish@East.Sun.COM>. Chris kindly provided a test system.

Improved HP-UX ipc\_s patch detection in Configure, response in ../dialects/hpux/hpux11/ipc\_s.h, and documentation in 00FAQ, Kevin Vajk <kvajk@cup.hp.com> helped test.

Added to Customize the option to suppress HASKERNIDCK selection for specified dialects. Suppressed it for /proc-based Linux lsof, and removed its test and code from there. Tin Le <tin@netimages.com> alerted me to the need for this update.

Ported to official Digital UNIX 5.0 release.

Changed DU lsof to use the knlist(3) function when no kernel file has been specified with -k. This change was suggested by Erich Wimmer <Erich.Wimmer@digital.com>.

Updated Configure for latest NetBSD (1.3I?) with UVM support the default.

4.43 May 11, 1999

Corrected a typo in the Solaris gcc discussion in 00FAQ. Made changes to the Solaris 2.5[.1] private tcp\_s structure. Both changes were done in response to reports from Igor Schein <igor@txc.com>, who tested the Solaris 2.5 change.

Made more IPv6 adjustments to lsof for Tru64 UNIX (Digital UNIX) 5.0, based on information obtained from Compaq by Berkley Shands <berkley@cs.wustl.edu>.

Corrected HP-UX error message about HP-UX 11 q4 usage. Amir Katz <amir@ndsoft.com> reported the correction.

Fixed a Glibc 2.1 conflict in /proc-based Linux lsof.

Fixed a man page typo reported by Vlad Harchev  
<hvv@hippo.ru>.

Changed some Solaris 2.7 references to Solaris 7  
in  
Configure and 00XPORTING.

Added a Solaris example to the echo statements that  
are the install rule in the SunOS/Solaris Makefile.

Added a field to the file structure output --  
FILE-FLAG (file structure open flags, f\_flag[s],  
and process file flags, typically u\_pofile) --  
enabled with +f[gG]. Its field output character  
is 'G'.

Figured out another piece of the HP-UX 11 patched  
ipc\_s structure puzzle with the help of Keith Kalet  
<KEITH\_KALET@HP-USA-om41.om.hp.com>.

Fixed a PTX real vnode to real inode interpretation  
bug.

Added link count to lsof output. Eric Dumazet  
<dumazet@risgw.ris.fr> requested and helped test  
it. The new +L option enables and filters it.  
Its field output character is `k'.

Updated Configure script to recognize NetBSD 1.4.

Updated AFSConfig to handle default answers to  
questions.

Incorporated patch from Jonathan Sergent <sergent@io.com>  
that enables /proc-based Linux lsof to run on both  
32 and 64 bit kernels.

Updated  
Configure script with a patch from David  
O'Brien <obrien@NUXI.com> that recognizes FreeBSD 3.2.

4.44 June 24, 1999

Corrected use of nlink member of hsnode for SunOS  
4.1.x High Sierra File System files. John Dzuber  
<zube@tlaloc.stat.colostate.edu> reported the  
problem and helped test the fix. Also fixed a  
SunOS segmentation fault bug. These fixes were

offered as a patch to 4.43.

Improved handling of /proc-based Linux UNIX PCB address.

Fixed a NEXTSTEP and OPENSTEP bug that made repeat option (-r) processing malfunction. This fix was offered as a patch to 4.43.

Fixed Configure so it doesn't use -O in the Cflags for the bundled HP-UX C compiler. Jim Ankenbrandt <jankenbrandt@penton.com> reported the problem.

Corrected output ordering of parent PID and process group ID when both -R and -g are specified.

Enhanced the pdev.c and pdvn.c library modules for wider use. These dialect versions use the new library modules: DEC OSF/1, Digital UNIX, and Tru64 UNIX; Pyramid DC/OSx and Reliant UNIX; SCO OSR and UnixWare; and Sequent PTX.

Added basic clone device support to /dev/kmem-based HP-UX lsof for HP-UX 10.30 and higher.

Added raw socket support to /proc-based Linux lsof.

Changed NODE-ADDR column title to NODE-ID in anticipation of using more general identification information in the column.

Ported to UnixWare 7.1, using a test system kindly provided by Matt Thurmaier <matt@compclass.com> and Don Draper <dond@sco.com>.

Updated for NetBSD 1.4C VM changes, and a new current and root working directory structure.

Made minor adjustment for latest Tru64 UNIX 5.0 Beta release.

4.45 July 30, 1999

Fixed quoting problem in DEC OSF/1, Digital Unix, and Tru64 UNIX Makefile's install rule. The problem was reported by Berkley Shands <berkley@cs.wustl.edu>.

Fixed bug in Tru64 UNIX 4 lsof that caused FDs to be skipped. These fixes were offered in a patch



to 4.44.

Fixed a repeat-mode  
/proc-based Linux lsof bug,  
reported by Sami Farin <sfarin@ratol.fi>. This  
was offered as a patch to 4.44.

Picked lint, some reported by Sami Farin.

Corrected a 00DCACHE documentation error in a sample  
shell script. The problem was reported by Chad R.  
Larson <chad@larsons.org>. Changed commented-out  
entries in machine.h files so they require more  
thought and work when the comments are removed,  
based on a remark by Chad.

Compensated for the practice of Solaris 7 and above  
to record the dev= value in /etc/mnttab in 32 bit  
mode, even on 64 bit systems. This was offered as  
a patch to 4.44.

Added a C library test for /proc-based Linux lsof,  
so that the #include files can be adjusted for a  
non-Glibc environment. The need for this was  
reported by Andrew Hill <andrewh@tirin.openworld.co.uk>.  
This was offered as a patch to 4.44.

Added support for Auspex LFS 1.8.1 and 1.9.2 to  
SunOS 4.1.4 lsof. The support was requested by  
Quentin Fennessy  
<quentin@dvorak.amd.com>, who  
provided information and did testing.

Enabled IPv6 support code for NetBSD and OpenBSD,  
conditional on Configure script tests. Wolfgang  
Rupprecht <wolfgang@wsrcc.com> supplied the NetBSD  
code and tested it. The OpenBSD code I constructed  
has been compiled but not tested.

Updated the identd Perl 5 script, based on a report  
from Wendy Lin <af5@taiyang.cc.purdue.edu> that  
the space in its response line in front of the user  
name violates RFC 1413.

Added IPv6 support to /proc-based Linux lsof.  
Jonathan Sergeant <sergent@ETLA.NET> and Andrew  
Thomas Sydelko <sydelko@ecn.purdue.edu> kindly  
provided a test system.

Updated man page description of AIX multiplexed files to indicate that they might be /dev/ptc or /dev/pts, depending on the AIX version. The correction was suggested by Onno van der Linden <onno@simplex.nl>.

Sylvain Robitaille <syl@alcor.concordia.ca> reports lsof passes his Y2K tests.

4.46 October  
23, 1999

Corrected /proc-based Linux lsof to detect that an IPv6 address is a mapped IPv4 address. The problem was reported and analyzed by Arkadiusz Miskiewicz <misiek@misiek.eu.org>, who also tested the fix.

Added a libc5 library /dev/kmem-based Linux lsof circumvention, supplied by Jason Lingohr <lingman@lucid.net.au>.

Corrected a bug in -t (terse) AIX output, reported by Wendy Lin <af5@taiyang.cc.purdue.edu>. I introduced the bug at revision 4.43 when adding FILE\_FLAG reporting. This was offered as a patch to 4.45.

Added a work-around for a problem in the OpenBSD 2.3 <sys/pipe.h> header file. Volker Borchert <bt@tekon.de> provided and tested it.

Improved description of cross-building lsof for a 64 bit Solaris 7 system on a 32 bit system with suggestions from Phillip Edwards <Philip.Edwards@sn.wpaafb.af.mil>.

Fixed a gawk POSIX-mode pattern error in the Linux /dev/kmem-based Mksrc script, based on a tip from Ambrose C. Li <acli@mingpaoxpress.com>.

Fixed  
a bug in the Tru64 UNIX IPv6 handling, courtesy of a report from Casper Dik <casper@holland.sun.com>.

Enabled support for OpenBSD 2.6.

Enabled support for BSDI BSD/OS 4.1, based on a report from Jeffrey C Honig <jch@bsd.com> that

only a Configure script change is necessary.

Enabled Configure script to use gcc for building lsof for a 64 bit Solaris 7 and 8 kernels, if the gcc version is 2.95 or above.

Improved -i option handling for systems with IPv6 support so that it will search for a host name in both IPv4 and IPv6 families, when that is possible. As a companion modification, changed -V processing to report a single error when a multiple host name match is requested. Casper Dik <casper@holland.Sun.COM> helped test.

Fixed a DEC OSF/1, Digital UNIX, Tru64 UNIX repeat mode bug, reported by Mayer Ilovitz <mayer@cooper.edu>. Mayer helped test the fix. The fix was offered as a patch to 4.45.

Changed Solaris socket file recognition scheme, so it is (nearly) the same through Solaris 8, where the previous clone device scheme no longer works.

With significant assistance from Casper Dik, added support for Solaris 8 Beta and Beta refresh. The IPv6 support in Solaris 8 is still in some flux, so there are temporary compensations for the differences between Beta IPv6 support and Beta refresh IPv6 support. Casper and I hope those differences disappear by FCS.

Improved the delivery of information on Solaris 2.5.1, 2.6, 7, and 8 door files.

Fixed a repeat mode bug that surfaces when /etc/passwd changes between cycles. The bug report and diagnostic help were supplied by Igor Schein <igor@txc.com>. The fix was offered as a patch to 4.45.

Added support for INRIA IPv6 to NetBSD. Jean-Luc Richier <Jean-Luc.Richier@imag.fr> provided patches and a test system on which to verify them.

Added support for AIX 4.3.3. Jeff W. Stewart <jws@anaconda.cc.purdue.edu> provided a test system.

Made adjustments for FreeBSD 4.0-current.

Improved reporting of information for AIX sockets that lack protocol control blocks.

4.47 November 29, 1999

Based on a query from Jean-Pierre Radley <jpr@jpr.com>, changed the lsof top-level Makefile to propagate CFGF to the library Makefile. (DEBUG was already being propagated.) Added osrgcc and scogcc Configure abbreviations (to use gcc) for Jean-Pierre.

In response to a query from Igor Schein <igor@txc.com>, improved the Configure script test for Solaris 7 and 8 that decides if the compiler can produce 64 bit executables.

Made an ugly hack, based on making a private rnode structure definition from q4 output, to compensate for HP-UX 10.20 and lower recent NFS3 patches. HP didn't supply an updated <nfs/rnode.h> with the patches. The problem was reported by Will Partain <partain@mekb2.sps.mot.com>. Elias Halldor Agustsson <elias@hi.is> helped identify the patches as PHNE\_18173, PHNE\_19426, PHNE\_19937, and PHNE\_20091, and provided a test system.

Switched BSDI test system from 2.1 and 3.1 to 4.0.1, courtesy of Terry Kennedy <terry@tmk.com>.

Added some more dev\_t hacks for Alpha FreeBSD 4.0.

Added support for IPv6 on BSD 4.x. The support hasn't yet been tested, just compiled.

Added support for the mnt file system (mntfs or /etc/mnttab) on Solaris 8. Tested on Solaris 8 BETA-Refresh.

Made selection of optional fields (e.g., PPID with -FR) in a field output specification select the optional field, too, so that the option selector for the field (e.g., -R) isn't also required. This change was made in response to an inquiry from John DuBois <spcedt@armory.com>. This may require some revision to scripts that parse all field output; two scripts in the lsof distribution's scripts/

subdirectory had to be updated.

Corrected handling of Linux IPv4 addresses mapped in IPv6 addresses.

Tested under OpenBSD 2.6.

4.48 January

14, 2000

Modified `-i` argument processing of colon-separated IPv6 addresses to recognize an IPv4 address mapped in an IPv6 address and handle it as an IPv4 address.

This was offered as a patch to 4.47.

Added a defined symbol (`NOWARNBLKDEV`) to control (inhibit) the issuance of a warning when no block devices are found. This was done anticipating its need in FreeBSD 4.x, but that dialect version no longer has any block devices, so `HASBLKDEV` was disabled for it instead. `NOWARNBLKDEV` was left in place for possible use in the future.

Enabled KAME IPv6 Configure support for FreeBSD when `<netinet6/in6.h>` is found.

Disabled use of `gcc` to compile `lsof` for 64 bit HP-UX 11.

Updated `Configure` to recognized FreeBSD 3.4.

Based on suggestions from Bernt Christandl `<beb@MPA-Garching.MPG.DE>` improved AFS configuration for AIX and Solaris, and updated AIX AFS 3.5 support.

Johannes Tax `<tax@bluedog.oit.unc.edu>`, Hung T.

Pham `<hung_pham@unc.edu>`, and Curt

Freeland

`<curt@grumpy.cse.nd.edu>` provided test systems.

Updated `lsof`'s private `rnode` definition for AIX 4.3.3, since IBM still doesn't ship the `<oncpus/nfs/rnode.h>` header file and the `rnode` structure definition in `<nfs/rnode.h>` doesn't match what the kernel uses. This was offered as a patch to 4.47.

Weakened the test in the Linux `/proc`-based `lsof` of the field count of data lines in `/proc/net/{tcp,udp}`.

It appears that recent 2.3.x Linux kernels have

added untitled fields to these files. The bug report came from Gabor Liptak <gaborliptak@usa.net>.

Adjusted for a FreeBSD 4.0 change in the definition of [\_]KERNEL. David O'Brien <obrien@NUXI.com> reported the problem and provided a test system.

Removed the HASPPID bracket from Fppid (the -R option state variable) so that the field select table will compile even when HASPPID is not defined. This problem was introduced at revision 4.47 with code that causes some field output characters to set option states. The problem was reported by David Bacon <bacon@birch.eecs.lehigh.edu>.

4.49 April 3, 2000

Made clearer in man page that "Lxx" FDs are AIX loader table references. Also updated the 00FAQ discussion of the Stale Segment ID bug to include AIX 4.3.x.

Modified support for NetBSD 1.4Q to include the <sys/buf.h> header file to cope with an MFS change.

Added support for OpenBSD UVM virtual memory.

Added support for AIX systems with > 2GB of memory. Chris Sylvain <csylvain@itg.ummc.umaryland.edu> reported the problem and provided the solution. Chris also supplied some minor code cleanup. This was offered as a patch to 4.48.

Based on new information from Igor Schein <igor@txc.com> made additional compensation in Configure script for 64 bit Solaris 7 and 8 gcc.

Added some 00FAQ info on the effect ordering of the +fg and -FG options has on output format.

Improved NetBSD IPv6 configuration, based on a suggestion from Thomas Klausner <wiz@danbala.ifoer.tuwien.ac.at>.

Added code to convert IPv4-mapped-in-IPv6 addresses to IPv4 addresses.

Updated the information in 00FAQ and the HP-UX 11

binary directory README files on the HP-UX 11 ipis\_s patch with new information supplied by Eric McWhorter <emcwhorter@xsis.xerox.com>.

Added documentation on changes to HASFSTYPE and HASNCACHE, and the new HASPRIVPRIPP.

Adjusted Configure for FreeBSD 5.0. Made additional, necessary changes to Configure and the BSDI sources to eliminate load errors.

Added KAME IPv6 support to FreeBSD at the request of Ollivier Robert <roberto@eurocontrol.fr>, who provided a test system.

Corrected the script that generates the CHECKSUMS files for binaries to correctly name the detached PGP certificate. The documentation bug was reported by Michael Hennecke <hennecke@rz.uni-karlsruhe.de>.

4.50 June 29, 2000

Added a NetBSD alpha test host, courtesy of Ray Phillips <r.phillips@mailbox.uq.edu.au>.

An lsof

4.49 binary, built on Ray's 1.4.1 system was made available prior to the 3.50 release.

Upgraded the system map file tests in /dev/kmem-based Linux lsof, making the use of DEBIAN\_LINUX\_LSOFF unnecessary. Tested the changes on a system made available by Vincent Kujala <kujala@geog.ubc.ca> and Jim Mintha <jim@ic.uva.nl>.

Forced AIX to use the large-file-enabled versions of lstat (lstat64) and stat (stat64) if <sys/stat.h> contains stat64. This should allow lsof to stat() AIX files > 2GB even when the builder has not defined the "large file enabled programming environment." Configure tests <sys/stat.h> and puts -DHASSTAT64 in the Makefile's CFLAGS to make this happen. Fernando A.B. Whitaker <whitaker@cenapad.unicamp.br> reported the problem. This was offered as a patch to 4.48.

Enabled Configure script to handle OpenBSD 2.7. Angelos D. Keromytis <angelos@dsl.cis.upenn.edu> reported the availability of OpenBSD 2.7 and supplied the Configure

script patch.

Improved handling of DOOR and fattach()'d files in Solaris.

Changed message about missing kernel symbol file from "not yet determined" to "none found".

Updated FreeBSD, NetBSD, NEXTSTEP, OpenBSD, and OPENSTEP support to report "no PCB" and the values of the SO\_CANTSENDMORE and SO\_CANTRCVMORE state flags when a socket structure has no inpcb pointer.

This modification was made to AIX lsof at revision 4.46. Added an entry to 00FAQ about sockets that have no inpcb pointer.

Upgraded support for FreeBSD 5.0-CURRENT. Ben Smithurst <ben@scientia.demon.co.uk> supplied patches and did testing. David O'Brien <obrien@NUXI.com> supplied a test system. The update included dropping the FcTTY part of file descriptor file system support, conditional on a Configure script test. I propagated those changes to BSDI, NetBSD, and OpenBSD in anticipation of their having the modification in the future. David also arranged with Michael Haro <mharo@area51.fremont.ca.us> for a FreeBSD 3.4 test system.

In response to an lsof 3.72 bug report from Jim Mewes <jim@corp.phone.com>, added more kernel address filtering to the lsof function, kread(), that reads Solaris kernel data.

In response to a report from Marc Duponcheel <marc@offline.be>, added tests to the /proc-based Linux lsof to ignore file systems of types "autofs" and "pipfs".

Based on a report and information supplied by Casper Dik <casper@holland.Sun.COM>, updated the ncache\_load() function in lib/rnch.c with new code that deals with a post Solaris 8 change in kernel name cache (DNLC) handling. Casper tested the update, which should be invisible to Solaris versions without the new DNLC code.

Added support for Solaris VxFS QIO files, based on



a report from Kieran Broadfoot <kieran.broadfoot@gs.com>.  
Kieran help test the support.

Added support for PTX 4.4.6 and 4.5[.1] with help  
from the usual cast of good people at Sequent.

Added  
support for 64 bit file sizes and offsets on  
BSDI, FreeBSD, NetBSD, and OpenBSD, based on a  
report from Dan Nelson <dnelson@emsphone.com>.  
Dan supplied a patch and did FreeBSD testing.

Added Configure script recognition of NetBSD 1.5,  
based on a report from Andrew Brown <atatat@atatdot.net>.  
Thomas Klausner <wiz@danbala.ifoer.tuwien.ac.at> updated  
the NetBSD port package to use a pre-release of this  
addition.

At the last minute saw a notice via deja.com's  
UseNet search service that FreeBSD 3.5 had been  
released and lsof didn't grok it. Added recognition  
of 3.5 to lsof's Configure script, but didn't have  
the opportunity to test lsof on 3.5.

4.51 August 21, 2000

Added Configure script support for the upcoming  
Solaris 9 release based on suggestions from Casper  
Dik <Casper.Dik@holland.sun.com>.

Changed sample Perl scripts to assume that  
/usr/local/bin/perl is Perl 5 and Perl 4 may be  
found in /usr/local/bin/perl4.

Updated Configure  
to recognize FreeBSD 4.1 and made  
a FreeBSD pre-release distribution available.

Bela Lubkin <belal@sco.COM> tested lsof on the  
upcoming SCO OSR 5.0.6 release and reports that  
lsof appears to work properly.

Updated the AIX compiler test in Configure to  
recognize its version 5.

Updated AIX 4.3.3 support with automatic recognition  
of the proper rnode structure, based on machine  
bit width. Also added code to detect when processing  
the -X option that lsof has been compiled with the

"other" AIX 4.3.3 user structure and to apply compensations. When a compensation method works, it's applied during subsequent -X processing; when none works, further -X processing is disabled.

Added Tru64 UNIX 5.1 support. Updated Tru64 UNIX library text file support to recognize new kernel support for AdvFS library files. Berkley Shands <berkley@cs.wustl.edu> and Klaus Saggerer USG [saggerer@zk3.dec.com> helped put me in contact with Chang Song <song@zk3.dec.com>, the developer of 5.1's new kernel name cache and he helped me develop new code in lsof to access it.

Corrected reporting of PTX fattach()'d address.

Changed Configure and dlsof.h for NetBSD and OpenBSD to use /usr/include/uvm header files when available. Andrew Brown <atatat@atadot.net>, Thomas Klausner <wiz@danbala.ifoer.tuwien.ac.at>, and Wolfgang Rupprecht <wolfgang@wsrcc.com> pointed out the need to do this for NetBSD. Andrew provided access to a NetBSD 1.5 system for verifying the changes.

Installed snprintf() support, including a private version in the lsof library for those UNIX dialects without the function. Changed all sources to use it instead of sprintf() and strcpy().

Fixed a memory leak in the readvfs() functions of BSDI, DEC/OSF1, Digital UNIX, FreeBSD, NetBSD, OpenBSD, and Tru64 UNIX.

Tested on Linux 2.4.

Modified the Pyramid MkKernOpts script to compensate for `uname -s` configuration alternatives. Robert Dahlem <Robert.Dahlem@ffm2.siemens.de> supplied the modification.

Obtained access to an FCS Solaris 8 64 bit system and built lsof on it, using Sun Workshop C 5.0 and gcc 2.96 20000814 (experimental). Both compilers produce a working lsof.

4.52 November 8, 2000

Completed work on an HP-UX 11.11 port that uses a pstat(2) interface provided by HP. To distinguish it from its predecessors for HP-UX, this lsof version is called PSTAT-based and the predecessor versions are now called /dev/kmem-based. I am indebted to the far-sightedness and support of these good people at HP for making PSTAT-based lsof possible: Carl Davidson, Louis Huemiller, Rich Rauenzahn, and Sailu Yallapragada. The PSTAT-based sources are in lsof\_4.52/dialects/hpux/pstat, the /dev/kmem-based ones in lsof\_4.52/dialects/hpux/kmem.

Ported to IBM Monterey for Merced|Itanium, aka AIX 5L. It configures via the Configure script's "aix" abbreviation and has been tested on AIX 5L Beta 3.

Jay Beck,

Steve Dibbell, Loc Le, Nasser Momtaheni, and Malcom Zung of IBM provided generous support. Since AIX 5L is still in Beta testing, this port can't be considered complete.

Added Configure support for OpenBSD 2.8. David Mazieres <dm@cs.nyu.edu> provided a test system.

Based on a report from Marc Christensen <marc@mecworks.com> added sockfs to the mount scan exemption list for /proc-based Linux lsof.

Added large file, CDFS, and DOSFS for UnixWare 7.x. Added UnixWare device memory mapping support. All UnixWare changes were supplied by Eric Dumazet <edumazet@cosmosbay.com> Eric also supplied some miscellaneous bug fixes.

Deferred name cache loading until printname() needs to use the name cache.

Terminated Pyramid, SunOS 4.1.x, and Ultrix support, because test systems are no longer available. Final Pyramid and Ultrix source code distributions for lsof revision 4.51 may be found on lsof.itap.purdue.edu in pub/tools/unix/lsof/OLD/src. The no longer supported SunOS 4.1.x source code is still distributed with the Solaris source code.

Added code to set Solaris node address to real vnode

address, when applicable.

John Speno <speno@lopan.isc-net.upenn.edu> provided information that enabled me to update the Tru64 AdvFS (MSFS) node definition for AdvFS version 5.

Added Tru64 5.x CFS support with help from Kris Chandrasekhar <Kris.Chandrasekhar@compaq.com>, Diane Lebel <lebel@zk3.dec.com>, and John Speno. The support only provides information about cached file attributes.

Installed a Configure patch for HP-UX 11 supplied by Kenneth Stailey <kstailey@disclosure.com> that adds another command to q4 input.

Tested on FreeBSD 4.2.

Will Day <willday@rom.oit.gatech.edu> and Frank Winkler <frank.winkler@germany.sun.com> graciously supplied Solaris 8 binaries.

Added Solaris 9 text file support, supplied by Casper Dik <Casper.Dik@holland.sun.com>.

4.53 December 6, 2000

Added the AIX 5L j2\_lock.h to the distribution with a Configure script step to use it when it's missing from /usr/include/j2.

Removed SunOS 4.1.x support.

Removed Linux 2.0.x /dev/kmem support.

Fixed VBLK and VCHR special device file reporting to handle /dev information more accurately.

Added a Apple Darwin / Mac OS X 1.2 port, provided by Allan Nathanson <ajn@apple.com>. Allan also arranged for a test system so I can maintain this port. An additional test system was provided by Dale Talcott.

Dropped claims of support for all UnixWare versions except 7.1.0, since that is the only version on which I can test lsof. Even though lsof 4.53 is deprecated for UnixWare 2.1.3, installed a patch

for it with testing done by A. Channing Clark  
<clark.channing@heb.com>.

Dropped claims of support for all SCO OpenServer  
versions except 5.0.5, since that is the only  
version on which I can test lsof.

4.54 January 19, 2001

Added compensation for a change that made the  
FreeBSD  
mount structure invisible. I can only test  
back to 3.2 and the compensation works there, so  
it's been #ifdef'd for 3.2 and above. David O'Brien  
<obrien@FreeBSD.org> provided the necessary clue.

Based on a report from Valdis Kletnieks  
<Valdis.Kletnieks@vt.edu>, changed all IPv6 support  
to report a TYPE of IPv6 for sockets with IPv4  
addresses mapped in IPv6 addresses. The previous  
lsof behavior was to report their TYPE as IPv4.

Restored the Linux Glibc test to Configure, removed  
at revision 4.53, based on a report from John Dzuberka  
<zube@cs.colostate.edu>, that RedHat Linux 6.0 still  
needs the test.

Made setting of link count for Solaris more selective.

Limited Readlink() recursion to MAXSYMLINKS. The bug  
was reported by Jan Dvorak <johnydog@go.cz>.

Dropped the \*claim\* that lsof runs on Solaris 2.5.1.  
It may well do so, but I no longer have access to a  
test system.

Fixed an #endif comment typo, reported by Igor Schein.

Fixed a typo  
in a cast for a Tru64 UNIX 5.1 function  
and updated Configure for Tru64 UNIX 5.0 and 5.1 with  
information from Jesse Perry <jesse.perry@compaq.com>.

Corrected non-fatal typos in the AdvFS support in  
dnode.c for Tru64 UNIX.

Added msdos file system support for NetBSD and OpenBSD.  
Andrew Brown <atatat@atadot.net> requested and helped  
test it.

4.55 February 15, 2001

Based on a report from Bernd Eckenfels <eck@lina.inka.de> added support in lsof for files in /proc/<PID>/maps that have been deleted.

Changed PGRP output title to PGID, conforming to the most common current abbreviation for Process Group ID (PGID). While some systems continue to use \*pgrp for internal kernel variable names, most systems that support the display of PGID via ps(1) now title it PGID. The lsof -g and -G options operations are unchanged in function; only titles and descriptions have changed. Also changed internal variable names from \*PGRP and \*pgrp to \*PGID and \*pgid where possible.

Dropped the \*claim\* that lsof runs on HP-UX 9.x. It may well do so, but I no longer have access to a test system.

In response to a suggestion from Jeff Howie <jeff.howie@federated.ca> added support for command name selection by regular expression. A new form of the -c option value is used to identify and specify a regular expression.

Restore the \*claim\* that lsof works on UnixWare 7.0, since I re-acquired a test system.

4.56 May 3, 2001

Corrected some problems Amir Katz <Amir\_Katz@bmc.com> found with Insure++, one in lib/dvch.c, the rest in Solaris sources. Amir's report also helped me find an error in an snpf() call that caused (the unsupported) Solaris 2.5.1 lsof to crash. Wally Winzer, Jr. <wally.winzer@ChampUSA.COM> helped test.

Added support for UnixWare 7.1.1 and above in-kernel UNIX sockets. John Hughes <john@Calva.COM> kindly provided code and access to a test system. John also provided a test system and advice for adding UnixWare 7.1.1 NonStop Cluster and CFS support. More help with that effort came from Kurt Gollhardt (SCO), Barbara Howe (SCO), Bela Lubkin (SCO), and Dewan Rashid <Dewan.Rashid@ir.com>.

Archived a set of compilation hints (patches) from Bill Melvin <Bill.Melvin@esc.edu> that make it possible to compile the old, unsupported lsof 3.08 sources on UnixWare 1.x without NFS or CDFS support.

Installed support supplied by Allan Nathanson <ajn@apple.com> for the Darwin "Gold Master" release, Mac OS X 10.0 (aka Darwin 1.3 in its public source version). Added Allan's CVS repository suggestions to the script that gets additional header files from an open source repository.

Tested an HP-UX 11.11 kernel patch from Sailu Yallapragada that enables reporting of TCP/IP information for telnetd processes that use the telnet multiplexor. I don't yet know the kernel patch ID.

Made the Solaris inclusion of <inet/mi.h> conditional on the Solaris version. (It's apparently not needed at 2.6 and above.) Bill Watson <bill.watson@uk.sun.com> brought this to my attention.

Added alternate Linux 2.4.x lock extent test, supplied by Jim Mintha <jim@ic.uva.nl>.

Rearranged the lines and pre-processor tests in regex.h, lib/regex.c, and lib/snprintf.c so that undef can be used to eliminate copyright and GPL statements when the files aren't being used for a particular dialect. (USE\_LIB\_\* definitions in a dialect's machine.h header file determine if one or more of those three files are to be used.)

Added preliminary support for Solaris 8 with VxFS 3.4. This support will be refined as I get information from Veritas about how they will distribute the kernel header files lsof needs. Those header files were omitted from the standard VxFS 3.4 distribution. Technical assistance and testing were provided by Calle Dybedahl <cdy@algonet.se>, Gary Millen <gary.millen@veritas.com>, Rainer Orth <ro@TechFak.Uni-Bielefeld.DE>, Peter C. Vernam <pvernam@draper.com>, and Donna Yobs <Donna.Yobs@veritas.com>

Tested on FreeBSD 4.3-STABLE.

Dropped the \*claim\* that lsof works on UNIX dialects where I no longer have test systems: BSDI 2.1, 3.[01] and 4.0; DEC OSF/1, Digital UNIX and True 64 UNIX 2.0 and 3.2; FreeBSD 2.1.[67], 2.2[.x], 3.[012345] and 4.[01]; HP-UX 10.20; NetBSD 1.[234]; SCO OpenServer 5.0.5; and SCO UnixWare 7.0

Tested on Solaris 9 BETA, s81\_36.

4.57 July 19, 2001

Help (-h) and version (-v) output now have URLs for the newly created and timeliest lsof FAQ (00FAQ in the lsof distribution) at:

<ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/FAQ>

and the man page for the current lsof distribution at:

[ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/lsof\\_man](ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/lsof_man)

Based on a report from Steve Laubscher <slaubs@woodward.com>, modified dlsof.h for PTX 4.6[.1] to avoid a temporary dnlc\_t definition needed at PTX 4.5.1.

Corrected test for old Linux kernels in Configure.  
Henri Karrenbeld <ishtar@cal044202.student.utwente.nl> brought the error to my attention. Limited Linux claims to 2.1.72 and above in the documentation.

Improved HP-UX 11 Configure stanza and stream socket handling.

Constructed a work-around for the HP-UX 11 optional OnlineJFS package. The work-around sadly requires lsof to have a private version of the vx\_inode structure, since the OnlineJFS package doesn't update <sys/fs/vx\_inode.h>. Troyan Krastev <Troyan.Krastev@ricoh-usa.com> brought the bug to my attention and Michael Bracewell <michael@ra.TSS.PeachNet.EDU> provided a test system where I developed the work-around.



Added locale support to lsof's isprint() test,  
based on a suggestion from Dan Mercer <damercer@mmm.com>.  
lsof will use setlocale(), when that function and  
its supporting <locale.h> header file are available.

Added OpenBSD 2.9 support.

Based on a report from Aaron Rhodes <arhodes@psionic.com>  
and  
with testing help from Aaron, made the lsof  
4.56 revision compile and work on OpenBSD 2.6.  
While that OpenBSD version is no longer supported,  
Aaron's report exposed a Configure script bug  
affecting OpenBSD versions lsof does support.

Updated for FreeBSD 5.0-CURRENT. Szilveszter Adam  
<sziszi@petra.hos.u-szeged.hu> help test. The lsof  
FreeBSD ports packager, David O'Brien <obrien@FreeBSD.org>,  
assisted.

Tested on AIX 5.1. Loc Le and Nasser Momtaheni of  
IBM provided test systems.

4.58 September 13, 2001

Added options to safestrprt() and safestrprtn() to  
surround the string with "" and to suppress the  
printing of an ending '\n'. Use of these functions  
in device cache file error message reporting answers  
a suggestion for better error reporting from John  
Jackson <jrj@purdue.edu>.

Fixed a Solaris 2.6 and above problem related to  
searching for "large" (O\_LARGEFILE) files by name;  
lsof was using the wrong version of [l]stat(2).  
The bug was reported  
by Daniel Trinkle  
<trinkle@cs.purdue.edu>.

Added AIX 4.1.4 and above XTI socket support.

Added OSR Xenix Shared Data and Semaphore file type  
support with modifications supplied by Bela Lubkin.

Updated OPENSTEP support with modifications from Carl  
E. Lindberg <lindberg@clindberg.org>. The changes  
enable the correct reporting of executable and  
library open files ("txt" type).

Limited claims of OpenServer support to the versions where I currently test, 5.0.4 and 5.0.6. (Lsof probably works on 5.0.5.)

Enabled processing of -C option for PSTAT-based HP-UX lsof.

Enabled and tested on FreeBSD 4.4.

Corrected a file system test example in 00QUICKSTART, based on a report from Jun Biao WANG <wangjunb@cn.ibm.com>.

Made available for re-distribution a user-contributed port of lsof 4.51 to Reliant UNIX 5.45. Thomas Mauterer <Thomas.Mauterer@philosys.de> contributed the port.

4.59 October 20, 2001

With the closing of the Sequent Synergy Links Lab

by IBM, terminated lsof support for PTX. The last tested PTX lsof revision, 4.58, is available on lsof.itap.purdue.edu in .../lsof/OLD/src.

Adjusted for FreeBSD 5.0-CURRENT NFS header file changes, based on a report from Jos Backus <josb@cncdsl.com>.

Corrected a bug in the way Linux lsof identifies the owner of a process. Lionel Cons <lionel.cons@cern.ch> reported the problem and tested the fix. Added code to avoid stat(2) calls on regular Linux files whenever possible. Lionel reported the need to do this (AFS files) and tested the new code.

Added new output field for raw device number in hex. The field is identified with 'r'. This field is NOT selected when -F or -F0 is specified so that its appearance won't disturb existing scripts that process field output.

Added support for OpenUNIX 8. A test system was provided by Larry Rosenman <ler@lerctr.org>. Matthew Thurmaier <matt@compclass.com> and many people from Caldera provided technical assistance.

Added an additional UVM test to the NetBSD Configure

stanza. Andrew Brown <atatat@atadot.net> supplied the test; it recognizes NetBSD 1.5Y UVM changes to the vnode structure recently committed by Chuck Silvers.

Applied Configure and get-xnu-headers.sh script changes supplied by Allan Nathanson <ajn@apple.com> for Darwin 1.4.

Added for Bela Lubkin <belal@mammoth.ca.caldera.com> OSR-specific environment variables to supply values to the Configure script. The variables are described in 00XCONFIG.

Added an IP version selector to the -i option parameters.

4.60 November 9, 2001

Added special handling to and corrected bugs in the matching of IPv4 in IPv6 addresses to -i6:<...> selectors.

Made 00FAQ corrections and updates, based on discussions with Igor Schein <igor@txc.com>.

Modified Configure script to detect a 64 bit capable gcc compiler and permit it to be used to build 64 bit (PA-RISC 2) lsof for HP-UX 11.00. Tested with HP's gcc package, which Rich Rauenzahn of HP kindly installed on a test system at HP. Stefan Marquardt <stefan.marquardt@hagebau.de> helped test.

Made lsof's method of killing its child process more robust, based on a suggestion from Bela Lubkin <belal@caldera.com>.

Modified all dialect Makefile segments to accept select -v #define's from the environment -- a builder's comment, host, logname, system information and user name. This was done for Bela Lubkin, so he can "tune" the -v output when he packages lsof in the upcoming Caldera OSR 5.0.7 release.

Changed Perl scripts in scripts/ to put the lsof path consistently in \$LSOF. Also added a fix from Bela Lubkin to scripts/big\_brother.perl5 that allows it to tolerate SCO OSR "ago" clauses in open UDP

file information. Strengthened emphasis in scripts/00README that the scripts are examples that shouldn't be expected to run on all UNIX dialects without modification.

At Bela Lubkin's suggestion changed the device cache file format examples in 00DCACHE and 00FAQ to avoid "%U%". That's an SCCS escape sequence.

Added support for OpenBSD 3.0.

Added +DAportable to CFLAGS for 32 bit HP-UX 11. Amir Katz <Amir\_Katz@bmc.com> suggested the addition.

4.61 January 22, 2002

Updated field output example Perl scripts in the scripts/ subdirectory to discover the lsof path, starting at .. and proceeding through the PATH environment variable's directories.

Added minor OSR Configure script fixes, provided by Bela Lubkin <belal@caldera.com>.

In response to a report from Joshua Wright <Joshua.Wright@jwu.edu> modified NetBSD and OpenBSD Configure stanzas and sources so that lsof can be built when there is no system source tree (e.g., /usr/src/sys).

In response to a report from Peter Valchev <pvalchev@openbsd.org> improved the UVM test in the OpenBSD Configure stanza.

Updated Configure script to recognize FreeBSD 4.5. Updated for FreeBSD 5.0 procfs and pseudofs changes.

Updated HP-UX stanza to see if the compiler named in the LSOF\_CC environment variable is the bundled compiler. If it is, "-O" is omitted from the compiler flags.

Updated Digital UNIX 4.x and Tru64 UNIX error message related to kernel name list failures. Added an FAQ section about how a kloadsvr daemon failure can cause knlist(3) to fail. The condition was reported by Douglas B. Jones <douglas@gpc.peachnet.edu>

Based on a report from Mark W. Eichin <eichin@thok.org> made Linux lsof capable of handling and reporting file sizes greater than 32 bits.

Tested on Solaris 9 BETA-Refresh.

Corrected a bug in the matching of IPv4 addresses, mapped in IPv6 addresses, to an IPv4 parameter to an -i option.

Ported to 64 bit Power AIX 5.1 kernel with advice from David Clissold <cliss@austin.ibm.com> and Marc Stephenson <marc@austin.ibm.com>, and on a test system provided by Loc Le <lple@us.ibm.com>.

4.62 March 7, 2002

Updated

OOREADME to reflect the usefulness of gcc for building AIX lsof. Documented a report from Brian L. Gentry <BGentry@nationsrent.com> of success on AIX 4.3.3. I documented my success on 32 bit Power AIX 5.1 and my lack of success on ia64 AIX 5.1 and 64 bit Power AIX 5.1.

Improved UnixWare >=7.1.1 reporting of UNIX socket NAME field information for NonStop Cluster systems with a patch provided by John Hughes <john@Calva.COM>. Offered John's improvement as a patch to lsof 4.61.

Corrected bugs in handling of open files on block devices by OSR lsof. The bugs were reported by Bela Lubkin <filbo@deephought.armory.com>.

Fixed bug in writing >32 bit device numbers for block devices to the device cache file.

Added support for reporting block special nodes not in /dev (or /devices). That required "like device special" be changed to "like block special" and "like character special". (OOFAQ was updated.)

Based on a report from Peter Valchev <pvalchev@openbsd.org> improved the definition of the source for NetBSD and OpenBSD kernel symbols (the nlist() source file). NetBSD now defaults to getbootfile(3) if it is available, /netbsd otherwise. OpenBSD now

defaults to /dev/ksyms if it is available, /bsd otherwise.

Made possible compilation under BSD/OS (BSDI) 5.0 with changes to Configure, dialects/bsdi/dlsof, dialects/bsdi/dproc.c and lib/rnmh.c. The changes were suggested by Steven Hinkle <hinkle@bsdi.com>. Note that these changes do not substantiate a claim that lsof works on BSDI 5.0, because I haven't tested it there.

Updated OpenUNIX private <sys/fs/memfs\_mnode.h>, based on a report from Larry Rosenman <ler@lerctr.org> that it had been updated by Caldera patch OU800PK3. Unfortunately the patch only corrects some of the problems with the header file, so it is still necessary to distribute a private patched version of it with the lsof sources.

Applied a man page correction reported by Frederic Delanoy <max\_ok@yahoo.com>.

Corrected cast bugs related to using the HP-UX bundled C compiler on HP-UX 11.11.

#### 4.63 April 23, 2002

Added HPUX\_BOOTFILE environment variable for use by the Configure script in determining HP-UX kernel configuration information -- e.g., the state of the ipis\_s structure in the HP-UX 11 kernel. The change was suggested by Marc Bejarano <beej@alum.mit.edu>. Marc also suggested some changes to the HP-UX section in 00FAQ that discusses Configure's use of q4 for HP-UX 11.

Fixed a bug in the Solaris lsof file system matching code. It was not reporting that VCHR files in /devices were in / when /devices was in /, too.

Corrected bugs in device number, file size, file offset, and raw device number field output generation.

Added recognition of OpenBSD 3.1 to the Configure script with a suggestion from Peter Valchev <pvalchev@sightly.net>. Note that this change does not constitute a claim that lsof

works on OpenBSD

3.1, because I haven't tested it there.

Built an automated test suite. (See 00TEST and the tests/ sub-directory of the lsof main directory). Bela Lubkin requested it. Dale Talcott, John Hughes, and Larry Rosenman helped me validate it on their systems.

During the development of the test suite I discovered the following lsof bugs or missing features, and corrected or supplied them.

- \* Corrected the reporting of locks for:
  - o Digital UNIX 4.0d and Tru64 Unix 5.[01];
  - o HP-UX 10.30 and 11.00;
  - o OpenUNIX 8;
  - o UnixWare 7.1.1.
  
- \* Enabled HP-UX 10.30 and 11.00 to report open NFS file link counts.
  
- \* Corrected the reporting of UNIX domain socket names for Apple Darwin, FreeBSD 4.5 and above, NetBSD 1.4.1 and above, and for OpenBSD 3.0 and above.
  
- \* Enabled HP-UX 11.11 to stat(2) large files.
  
- \* Fixed handling of combination 32 and 64 bit device numbers in AIX 64 bit architectures.

Updated the AIX 4.3.3 NFS mode recognition code, first installed at revision 4.51. It looks like some IBM update has restored a single rnode structure independent of the machine bit width.

Updated the NetBSD and OpenBSD sources so NetBSD can process DTYPE\_PIPE files, as OpenBSD was already able to do.

Updated Darwin get-xnu-headers.sh script to reflect information about a recent reorganization of the Darwin CVS hierarchy, supplied by Allan Nathanson <ajn@apple.com>.

Added defense against the standard I/O descriptor

attack.

4.64 June 26, 2002

Corrected some FreeBSD pre-processor directives.

David O'Brien <obrien@NUXI.com> pointed them out.

Updated lsof's main() function to: 1) close all open file descriptors above 2 before starting; and 2) to set a non-interfering umask. Moved GET\_MAX\_FD test from misc.c to proto.h, so that main() could use it. Added multiple-include protection to proto.h.

Moved FAQ's test suite Q's & A's to a more appropriate section. Added a Q&A on HASSECURITY option and its affect on searching for open files. (That was already in the man page.)

Updated hpux/kmem/dnode.c for HP-UX < 11 compilation with information from John Dzuber <Zube@CS.ColoState.EDU>. While lsof doesn't support HP-UX < 11 any more, I try to avoid disabling it there when possible, and a locking fix for HP-UX >= 11 in lsof 4.63 inadvertently disabled compilation of lsof for HP-UX < 11. Fixed long-standing bug in HP-UX 10.20 lock reporting.

Removed language from the test suite programs that requires an ANSI-C compiler. This allowed the test suite to be validated with cc and gcc on the unsupported HP-UX 10.20.

At the suggestion of Manuel Bouyer <bouyer@antioche.eu.org> switched NetBSD and OpenBSD lsof from using nlist() to using kvm\_nlist(). Made the same change for BSDI, Darwin, and FreeBSD.

Validated test suite on OPENSTEP 4.2.

In response to a suggestion from Jeff Stoner <jstoner@blackboard.com> enhanced support for the FD list of the -d option to allow it to be either an exclusion or inclusion list, using the '^' prefix to denote exclusions.

Made adjustments for FreeBSD 4.6 and 5.0-CURRENT.



Fixed a FreeBSD /etc/make.conf CFLAGS extraction bug, reported by Kris Kennaway <kris@obsecuity.org>, and new a bug in the fix, reported by Eric Cronin <ecronin@eecs.umich.edu>

Added nullfs support for FreeBSD, NetBSD, and OpenBSD at the request of Andrew Brown <atatat@atadot.net>.

Modified all readmnt() functions to ignore mounted-on directory names that don't begin with '/'.

Tested on NetBSD 1.6A and OpenBSD 3.1.

Upgraded to Solaris 9 FCS with two changes to the BETA-Refresh support: 1) an adjustment to dnode.c for a change in the so\_so (sonode) structure; and 2) addition of Solaris 9 FCS specific DNLC code. David Comay <David.Comay@Eng.Sun.COM> sent me the dnode.c change and Casper Dik <Casper.Dik@sun.com> helped with the new DNLC support code.

Applied OpenUNIX changes that permit lsof to compile and run on the upcoming 8.0.1 release. The changes were supplied by Robert Lipe <robertl@caldera.com>. Larry Rosenman <ler@lerctr.org> provided a test system.

Added Solaris fd file system support.

4.65 October 10, 2002

Adjusted for change in FreeBSD 5.0-CURRENT inode structure, reported by David O'Brien <obrien@NUXI.com>. Adjusted for changes in FreeBSD 5.0-CURRENT <sys/vnode.h>. One change was reported by Anders Nordby <anders@FreeBSD.org>. Adjusted for FreeBSD 5.0-CURRENT on sparc64 architecture.

Enhanced the error reporting of Solaris lsof when it detects a kvm\_open() failure, and added a 00FAQ entry on the cause, based on a report from Peter J. Bertocini <pjb@anl.gov>.

Enabled compiling of lsof for NetBSD 1.5 with the NULL file system, using a patch from Andrew Brown <atatat@atadot.net>.

Removed a hack in the LTbigf test program that was

once needed when it was compiled on Solaris 9 BETA- Refresh with gcc. The hack isn't needed on Solaris 9 FCS. Janet Hempstead <jan@library.carleton.ca> brought the need for this change to my attention.

Applied a patch, supplied by Andrew Brown <atatat@atadot.net>, that updates lsof for NetBSD version 1.6F. Corrected handling of the NetBSD nullfs.

Updated to BSDI BSD/OS 4.3 on a test system kindly provided by Terry Kennedy <terry@tmk.com>.

Updated to FreeBSD 4.7.

Updated to Apple Darwin 1.5, 5.x and 6.x with patches supplied by Allan Nathanson <ajn@apple.com>. The patches include IPv6 support.

Updated Configure to use the -bnolibpath loader option when building lsof on a PowerPC, running AIX 5 or greater. Valdis Kletnieks <Valdis.Kletnieks@vt.edu> informed me this was needed. Lsof for AIX 5.x was initially developed on the IA64, where -bnolibpath can't be used and I didn't think to restore it to PowerPC loads when AIX 5.x became available for that architecture.

Updated to UnixWare 7.1.3 on a test system provided by Larry Rosenman <ler@lerctr.org>. Removed claims that lsof works on OpenUNIX 8.0.1, because UnixWare 7.1.3 is the release name of OpenUNIX 8.0.1.

Based on a comment that his e-mail address was wrong in the lsof distribution from Kenneth Stailey <kstailey@disclosure.com>, removed all e-mail addresses from lsof documentation files except this one, 00DIST. The addresses in 00DIST are used to send revision release notices to those who contributed to a revision, but the addresses in this file for previous revisions and in other documentation files sometimes grow stale and are never validated.

4.66 December 22, 2002

Acquired Solaris 7 and 8 test systems, courtesy of John Dzuberka <Zube@CS.ColoState.EDU>. Updated

00TEST and tests/TestDB accordingly.

Clarified FreeBSD 5.0 architecture claims at the suggestion of David O'Brien <obrien@NUXI.com>. Also implemented David's suggestion to change Intel to x86.

Installed

changes to DNLC handling in OSR lsof in preparation for handling changes in the OSR 5.0.7 DNLC cache. Information about the changes and patches to handle them were supplied by Bela Lubkin <filbo@deephought.armory.com>.

Upgraded True 64 UNIX support to the 5.1B release on a test system provided by Berkley Shands <berkley@cse.wustl.edu> Had to use relaxed ANSI compilation because of an error in a system header file and other lsof source usages.

Implemented the HASNOSOCKSECURITY compile-time option. When it and HASSECURITY are defined, lsof will be built to list only the user's open files, but will also list anyone else's open socket files, provided the "-i" option selects their listing. Updated the Customize script to ask about setting HASNOSOCKSECURITY. Left it undefined in all dialect machine.h header files. This change was requested by Kenneth Stailey <kstailey@speakeasy.net> for use with ntop.

Added support for OpenBSD 3.2 and its kernel trace file.

Improved lsof help (-h) and version (-v) information reporting.

Fixed a FreeBSD 4.7 and above off-by-two UNIX domain socket path termination bug, reported by Ken Stailey <kstailey@speakeasy.net>

4.67 March 27, 2003

Began the transition of the lsof ftp server host name from vic.cc.purdue.edu to lsof.itap.purdue.edu. That reflects Purdue organizational changes. This first step makes the new name an alias to the old one. The old name, vic.cc.purdue.edu, will remain

usable for an extended period.

Corrected a revision number reference in section 17.17 of 00FAQ on the appearance of Solaris negative DNLC caching handling.

Updated 00FAQ discussion of compilers for 64 bit Solaris.

Validated test suite for 64 bit Solaris 8 and gcc.

At the request of Alek O. Komarnitsky <alek@komar.org> added the "+c <width>" option to enable optional changing of the COMMAND column output maximum width from the default to <width>.

The default maximum width remains CMDL, as defined in lsof.h.

Fixed three AIX kernel bit size detection bugs, one in the AIX Configure script stanza, the second and third in the AIX dproc.c get\_kernel\_access() function. The bugs were reported by Pierre-Yves Fontaniere <pyf@cc.in2p3.fr>, who tested the fixes.

Added kernel event queue file support for FreeBSD, NetBSD and OpenBSD. Andrew Brown <atatat@atadot.net> supplied the code.

Updated to AIX 5.2 on a test system provided by Dale Talcott <dtalcott@purdue.edu>. Had to build work-arounds for two missing AIX 5.2 header files, <j2/j2\_snapshot> and <proc/proc\_public.h>. Corrected an off-by-one UNIX socket addressing bug. Taught AIX lsof to handle both jfs and jfs2 files at the same time. Adjusted for an IBM mistake in the sizing of the fdsinfo structure in <procinfo.h> Toshiya Nakamura <TOSHIYAN@jp.ibm.com> helped test,

Updated to FreeBSD 4.8. Corrected another bug in FreeBSD UNIX domain socket name handling.

Corrected gcc build problems on HP-UX 11i, reported by Yuliy Minchev <yuliy@mobilnet.bg>.

Updated BSDI BSD/OS support to 4.3.1.

Augmented a lock ID test on NetBSD to check if the

ID is an LWP pointer.

4.68 June 18, 2003

Enhanced Configure script's cleanup operations.

Added support for OpenBSD 3.3, based on a report from Peter Valchev <pvalchev@sightly.net>.

Improved the description of the detached PGP signature certificate file in the main lsof README file, based on a suggestion from Diana Stockdale <diana@mpl.ucsd.edu>.

Installed a work-around for FreeBSD 5.0-CURRENT on Alpha to avoid a compiler register use complaint.

Corrected a 'c' option error message. Gnele <blaadeleng@yahoo.com> reported the problem.

Upgraded EXT2FS and UFS support for NetBSD and OpenBSD to handle new inode information, and the fast UFS1 and UFS2 file systems.

With the help of Andrew Brown <atatat@atadot.net> determined the NetBSD snapshot (1.6F) at which <sys/mount.h> could be included under `_KERNEL`, thus eliminating the lsof netexport.h hack. The same change applies to OpenBSD versions 3.3 and above.

Applied a patch from Armin Gruner <ag@muc.de> that corrects the use of the HASPROCFS definition in the FreeBSD dialect sources.

Corrected spelling errors in 00FAQ and in the generated 00.README.FIRST\_<version> file of the distribution archive. John Jackson <jrj@purdue.edu> and Ray Phillips <r.phillips@jkmrc.uq.edu.au> spotted and reported the errors.

Corrected a spelling error in a comment and incorrect use of an alarm function in the LTsock test program.

At the suggestion of Stuart Anderson <sba@srl.caltech.edu> added preliminary (and incomplete) SAM-FS file system support to Solaris lsof. Completion awaits availability of SAM-FS internals.

Fixed a Solaris device name printing bug, reported by Ric Anderson <ric@tick.Telcom.Arizona.EDU>, only visible when HASDCACHE is not defined. Ric helped test the fix.

Fixed an AIX kernel bit size handling bug related to the NFS node (rnode) structure.

Corrected a print\_kptr() function call error in the AIX AFS code, reported by David Steiner <david.r.steiner@Dartmouth.EDU>. Upon further reflection and because I no longer have appropriate AIX AFS test systems, disabled AIX AFS support in the Configure script for AIX versions above 4.3.3.0 or AIX AFS versions above 3.5.

Added support for FreeBSD 5.1.

With advice from Allan Nathanson <ajn@apple.com> adjusted the Darwin get-xnu-headers.sh script to access the kernel header files needed by lsof from a new form of the Apple open source repository.

Installed Linux and lsof library bug fixes and improvements, supplied by Marian Jancar <mjancar@suse.cz>. One Linux improvement handles mount strings that have octal escapes in them, eg., \040 for embedded blanks. Marian tested the changes.

4.69 October 16, 2003

Received and applied an OpenBSD patch from Peter Valchev <pvalchev@sightly.net> that replaces a ctob() call with a sysconf() call. Peter claims sysconf() is needed for OpenBSD on SPARC. (It is not needed for NetBSD on SPARC.)

With the upgrade of my only Solaris 7 test system to, Solaris 8, dropped the \*claim\* that lsof works on Solaris 7. That doesn't mean it won't work there, so those who want lsof for Solaris 7 probably should be able to build it there and it probably will work there.

Revised lsof's DNLC handling for BSD derivatives, including: BSDI; Darwin; DEC OSF/1; Digital UNIX and Tru64 UNIX; FreeBSD; NetBSD; and OpenBSD. The latest NetBSD distribution's dropping of the vnode capability ID (v\_id) required the revision.

Adjusted to the latest FreeBSD 5.1-CURRENT.

Added NetBSD support for using `kvm_getproc2()`.

Added a patch from Andrew Brown <atatat@atadot.net> to handle NetBSD enum conflicts and changes in the <miscfs/kernfs/kernfs.h> and <miscfs/procfs/procfs.h> header files.

Added a "#define \_KERNEL" to the AIX `dnode2.c` source file for compatibility with a new <j2/j2\_inode.h> AIX 5.2 header file version. The addition was supplied by Dick Dunbar <Dick.Dunbar@Siebel.com> and was offered as a patch to `lsof` 4.68/

Added support for a second type of Solaris SAMFS. Stuart Anderson <sba@srl.caltech.edu> provided the support. SAMFS support in `lsof` SOLARIS remains scanty, because Sun won't release any details on its kernel structures.

Dropped the \*claim\* that `lsof` works on AIX 4.3.3, because I was unable to test it there. That doesn't mean it won't work there, so those who want `lsof` for AIX 4.3.3 probably should be able to build it there and it probably will work there.

Updated for Solaris 10 on test systems provided by Mike Miscevic <miscevic@hotpop.com>. Casper Dik <casper@holland.sun.com> provided significant help. During the Solaris 10 port found and fixed an `lofs` handling bug that prevented reporting of open `lofs` file lock status.

Updated the DNLC test, `LTdnlc`, to provide a possible explanation about file systems on which the test might fail.

Modified the procedure for obtaining missing Darwin XNU kernel header files. The new one requires more manual intervention, but is the best that can be done with the way Apple open sources are now organized. 00FAQ explains the new procedures for those not used to downloading Apple open source files.

Added support for Apple Darwin 7.0 (Mac OS X 10.3) with patches supplied by Allan Nathanson <ajn@apple.com>. Dropped the \*claim\* that lsof builds and works on Apple Darwin below 6.0.

Validated lsof on FreeBSD 4.9, using a test system provided by Ben Lewis <bl@purdue.edu>.

Validated lsof on FreeBSD 5.1-CURRENT for Amd64. David O'Brien <obrien@FreeBSD.org> provided a test system.

Changed the NetBSD Configure stanza to do header file searches in /usr/include by default. The LSOF\_INCLUDE and NETBSD\_SYS environment variables may still be used to specify other search paths. Discussions with Andrew Brown and Wolfgang S. Rupprecht <wolfgang@wsrcc.com> led to the change.

4.70 January 16, 2004

Improved shell-portability of the linux stanza of the Configure script with a patch from Paul Jarc <prj@po.cwru.edu>.

Added a "silent" rule to tests/Makefile for Paul. Updated, extended and clarified the test suite documentation in 00FAQ and 00TEST.

Fixed Solaris 10 dlsof.h typo, reported by Mike Miscevic <miscevic@hotpop.com>. The typo prevents lsof from loading cleanly in Solaris 10 builds past 40.

Fixed a Solaris HSFS node number reporting bug and added a structure definition work-around for Solaris 10.

Converted PGP signing to GPG. My previous PGP key can be used, but the gpg "--allow-non-selfsigned-uid" option may have to be used when it is imported into a GPG key ring.

Added bz2 compression.

Updated for OpenBSD 3.4.

Added



a work-around for a missing header file in the  
s10\_44 Solaris 10 build.

Added support for FreeBSD 5.2-BETA and 5.2-CURRENT.

Updated Linux AX25 support with modifications supplied  
by Lutz Poetschulat <dl9cu@db0zwi.de>.

Added raw IPv6 support to Linux lsof.

Improved handling of parameters after "-i@".

Improved file name test in LTdnlc.c.

Added loop count controls to the reading of Solaris  
lock chains. The change was implemented as a result of  
a report from Steve Gonczi <steve@relicore.com>.

Based on a report from John Jackson <jrj@purdue.edu>,  
enabled a Solaris 10 <sys/lgrp.h> work-around for  
Solaris 9, too. (Patch 112233 installs an lgrp.h on  
Solaris 9 that needs the work-around.)

With help from Andrew Brown <atatat@atadot.net> and  
John Heasley <heas@netbsd.org> added log-structured  
file system (LFS) support for NetBSD and OpenBSD.

Added AMD64 to the list of FreeBSD 5.x-CURRENT  
supported architectures. FreeBSD.org provides a test  
system,  
courtesy of (I believe) David O'Brien  
<obrien@FreeBSD.org>.

Added a cast to lseek() in the HP-UX /dev/kmem-based  
kread() function to make it work properly with the  
bundled HP C compiler.

4.71 March 11, 2004

Added text file support to Apple Darwin lsof and  
enabled the lsof executable portion of the LTbasic  
test. Added support for Darwin kernel queue, POSIX  
semaphore and POSIX shared memory files. Tested on  
Darwin 7.2 (aka Mac OS 10.3.2).

Added process\_kqueue() function prototypes for FreeBSD,  
NetBSD and OpenBSD.

Picked some lint in AIX sources, lib/rnmh.c and

tests/LTsock.c.

Added "-x [fl]" cross-over option, which enables +d and +D processing to cross over symbolic links and/or file system mount points. Discussion with Johan Lindquist <johan@smilfinken.net> and Eric Williams (aka The Ghost In The Machine) <ewill3@earthlink.net> on Linux news groups revealed the need for the option.

Updated support for UnixWare 7.1.4.

Added support for the optional reporting of socket options, socket states and TCP flags for most currently supported dialects. John Smith <lbalbalba@hotmail.com> and Tristan Nefzger <tn@bhtrader.com> requested the information. The dialects and their versions for which this feature has become available include:

- AIX 4.3.2 and 5.[12]
- Apple Darwin 7.2
- BSDI BSD/OS 4.3.1
- Digital UNIX and Tru64 UNIX 4.0
- FreeBSD 4.9 and 5.2
- HP-UX 11 and 11.11 (aka 11i)
- NetBSD 1.6ZH
- OpenBSD 3.4
- OPENSTEP 4.2
- OpenUNIX 8
- SCO OpenServer Release 5.0.6
- Solaris 2.6, 8, 9 and 10
- UnixWare 7.1.[134]

Modified the Configure stanza for HP-UX 11 with better q4 detection. Steve Bonds <3vhmxxm02@sneakemail.com> supplied the modification.

Applied a patch from Mike Miscevic <miscovic@hotpop.com> to enable lsof to compile with the zone support in the Solaris 10 s10\_b51 release. Added information on lsof zone behavior to 00FAQ.

Added a "-z [z]" option to Solaris 10 lsof. It enables the listing of zone name and can also be used to select the listing of processes and their files from specified zones.

4.72 July 13, 2004

Corrected Solaris 10 ZONE column title display bug with a patch from Joep Vesseur <Joep.Vesseur@Sun.COM>. Joep's fix was offered as a patch to 4.71.

Based on a report from Jean-Pierre Radley <jpr@jpr.com> about an unexpected GNU uname Configure interaction on OSR, and working from information received from Bela Lubkin, changed the OSR Configure stanza to use /bin/uname instead of uname. Added an FAQ entry about Configure version detection problems.

Added the +m and "+m m" options in response to a dialog with Robert T. Brown <rbrown@netmentor.com>. The options allow the creation of a mount table supplement file which can be used on selected dialects to get device numbers when stat(2) and lstat(2) can't deliver them. (That's generally the result of an inaccessible NFS server.) Currently the new options are supported only on Linux.

Made cpumask\_t typedef \_KERNEL compensation for FreeBSD 5.2-CURRENT. Refined it for 5.2.1-RELEASE with testing help from Scott Ellentuch <tuc@tsg.com>.

Added support for FreeBSD 4.10. Larry Rosenman <ler@lerctr.org> kindly provided a test system.

Added support for NetBSD 2.0 with patches supplied by Andrew Brown <atatat@atadot.net>. Andrew also provided two test systems.

Made handling of Linux maps file more robust, based on a report from Jan Blunck <J.Blunck@tu-harburg.de>. As a side benefit, made handling of generated stat(2) information more flexible.

As a result of a discussion with Jason Fortezzo <fortezzo@mechanicalism.net>, adjusted lsof for Solaris to obtain the maximum user name length from ut\_name of the utmpx structure, if <utmpx.h> exists.

Tested under OpenBSD 3.5.

Updated 00README information about using gcc (via the Configure aixgcc abbreviation)

to compile lsof on

AIX. Ann Janssen <ajanssen@nebook.com> made me aware the information was out of date.

Added an AIX SIGDANGER handler and some 00FAQ sections on lsof memory usage after a discussion with Tom Qin <tom.qin@citigroup.com> about lsof memory usage.

Added scripts/sort\_res.perl5, contributed by Fabian Frederick <fabian.frederick@gmx.fr>. The script displays lsof output sorted by size and path name.

Improved handling of files on Linux NFS mount points that use the root\_squash option, based on discussions with Paul Szabo <psz@maths.usyd.edu.au>.

Updated FreeBSD 5.2-CURRENT support, based on a problem report from Filippo Natali <filippo@widestore.net>.

Corrected improper FreeBSD 5.x-CURRENT #if condition, reported by Kim Culhan <kimc@kim.net>.

Added a Configure script work-around for AIX 5.2 lsof with JFS2, compiled by gcc >= 3.3. The work-around was supplied by Florian M. Weps <fmw@hactrn.ch>.

4.73 October 21, 2004

Added

an `__XPG4_CHAR_CLASS__` #define before #include'ing <ctype.h> on Solaris to restore lsof's ability to display special characters such as acute-e.

Added wide-character (e.g., UTF-8) support where possible, prompted by a request from Kyungjoon Lee <kjoonlee@gmail.com>. Some older dialects -- e.g., NetBSD 1.4.1 -- don't support wide characters, so the wide character support is enabled by definitions in each dialect's machine.h. Dialects with wide-character support are listed in 00FAQ.

Make a FreeBSD 5.2-CURRENT adjustment for <sys/pipe.h>, supplied by Sergey A. Osokin <osa@FreeBSD.ORG>.

Implemented a Linux feature request made by Jakub Jelinek <jakub@redhat.com> that enhances lsof's ability to locate UNIX domain sockets whose paths are named as arguments. Jakub supplied suggested code.

Dropped \*claims\* that lsof works on AIX below 5.1, SCO  
Dropped \*claims\* that lsof works on AIX below 5.1, SCO  
Openserver 5.0.4, Tru64 UNIX 5.0, and UnixWare  
below

7.1.4. Lsof will probably build and work on those UNIX  
dialect versions, but I no longer have any way to test  
lsof on them.

Added support for FreeBSD 5.3 and 6.0. The FreeBSD  
5.3 support hasn't been tested.

Added FD test code that will allow dialect versions to  
test FD option selections. Used the new code in the  
PSTAT-based HP-UX lsof to enable it to avoid scanning  
the mount table when its information is not needed.  
The addition was made in response to a query from  
Harvey Garner <Harvey.Garner@championusa.com> about  
lsof performance in a busy NFS environment.

Upgraded lsof's AIX support level to AIX 5.3, based on  
a report from Dick Dunbar <Dick.Dunbar@Siebel.com>. (I  
have not tested lsof under AIX 5.3.) Based on Dick's  
recommendation and local testing changed the C for AIX  
version 6 and higher -qmaxmem option value to -1.

Made LSOF\_AR environment variable more useful and  
documented it in 00XCONFIG.

Corrected the use of sum(1) to  
generate signatures for  
the lsof distribution and binaries to match the  
documentation that claims it is sum -r output. Jin  
Guojun <jin@george.lbl.gov> noticed and reported the  
problem.

Tested under OpenBSD 3.6.

Added checksum and GPG certificate files for the bz2,  
gz and Z lsof distribution archives. The new files  
reside with the distribution archives and supplement  
the signature information already inside the archives.

Validated on Solaris 10, i8xpc, build s10\_63.

4.74 January 17, 2005

Fixed a Solaris segment fault bug on systems that lack  
a /dev/allkmem device. Offered the fix as a patch to  
lsof 4.73. The bug was reported by Donald Zoch

<donald.zoch@amd.com>.

Updated lsof for FreeBSD 6.0 and higher for a change in <sys/vnode.h>, based on a report from Sergey A. Osokin <osa@FreeBSD.ORG>. Made the update available in a 4.74 'A' edition pre-release.

Filed an HP bug report about missing pstat(2) CWD info for LOFS on HP-UX 11.11 and higher.

The missing CWD info was noticed by Ermin Borovac <e.borovac@bom.gov.au>. Added info to 00FAQ about the problem, which can cause the lsof test suite's LTbasic test to fail.

Updated the q4-generated tcp\_s.h in the lsof distribution and added socket option support for HP-UX 11.00. Erwin Reyns <ereyns@europarl.eu.int> helped test.

Updated for Solaris 10, build s10\_69, with a patch supplied by Mike Miscevic <miscevic@hotpop.com>.

Added v\_path support to Solaris 10 lsof. That relieves it of having to read and decode the kernel DNLC, and delivers full paths more reliably.

Added specialized NFS4 support to Solaris 10 lsof.

Applied Solaris 10 patches to lsof supplied by Casper Dik <casper@holland.sun.com>.

Updated lsof for NetBSD 2.99.10 and tested it on a system provided by Andrew Brown <atatat@atadot.net>.

Added support for the FreeBSD 6.0-CURRENT f\_vnode pointer in the file structure.

Added BSDI, FreeBSD, NetBSD and OpenBSD support for the \*effnlink member of the inode structure. This makes the lsof LTnlink test run faster on all modified dialects and correctly on OpenBSD.

Added ptyfs support for NetBSD, using modifications provided by Andrew Brown.

Changed the netbsd Configure stanza to look by default for system header files in both /usr/include and

/usr/src. (The NETBSD\_SYS environment variable can still be used to select an alternate for /usr/src.)

Corrects two FreeBSD 4.10 RPC/XDR type definitions.

Added an FAQ Q&A about setuid and setgid restrictions in HP-UX 11.11. The information in the answer was supplied by Frank Sanders <frank.sanders@siemens.com>.

Added abbreviations for AXI FCIO and FSNAPSHOT file flags. Holger VanKoll <Holger.VanKoll@swisscom.com> reported the missing FCIO.

Adjusted lsof's private AIX 64 bit rnode structure for 64 bit AIX 5.2 systems. (IBM doesn't distribute a correct <nfs/rnode.h> for it.)

Corrected a Linux socket inode printing bug reported by Igor Schein <igor@txc.com>.

Updated for FreeBSD 4.11. The support compiles but hasn't been tested.

Back-ported a FreeBSD 6.0-CURRENT fix to FreeBSD 5.3-RELEASE-p1. That was done to solve a compilation problem reported by Radko Keves <rado@daemon.sk>.

4.75 May 16, 2005

Dropped the \*claim\* that lsof works on DEC OSF/1 and Digital UNIX, since my last 4.0 test system has been removed. The last tested distribution of lsof on DEC OSF/1 and Digital UNIX was revision 4.74. It has been archived on lsof.itap.purdue.edu in pub/tools/unix/lsof/OLD/src.

Added negation forms to the values in the -g (PGID) and -p (PID) lists. Negated PGID and PID values, like negated UID or login name values, are applied without ORing or ANDing and take effect before any other selection criteria are applied.

At the request of Marcin Gozdalik <gozdal@gmail.com> added a -X option for Linux. The option inhibits the reading of the /proc/net/tcp\* and /proc/net/udp\* files.

Based

on a report from David Gutierrez  
<davegu1@hotmail.com> changed DEC OSF/1 process table  
allocation to request memory in smaller increments.

Based on a report from jayjwa <jayjwa@atr2.ath.cx>  
updated the Customize script to use "tail -n 1" where  
possible.

Enabled support for FreeBSD 5.4.

Improved the BSDI, FreeBSD, NetBSD, OpenBSD and Solaris  
kvm\_open() and kvm\_openfiles() error messages.

Enabled support for NetBSD 2.99.12.

Improved HP-UX Configure stanza with help from Piet  
Starreveld <pstarrev@csc.com>. Picked some lint Piet  
found.

Enabled IPv6 support for HP-UX > 11. Piet Starreveld  
helped test it on 11.23, among others.

Updated for HP-UX 11.23 on the ia64 architecture.

Updated to latest FreeBSD 6.0-CURRENT, using a test  
system provided by Andrzej Tobola <ato@iem.pw.edu.pl>.

Added support for SCO OSR 6.0.0 and UnixWare 7.1.4 with  
help from Richard at SCO.

Corrected a Linux bug in NFS handling, reported by Karel  
Zak  
<kzak@redhat.com>. Karel supplied a patch.

Improved the code for accessing an AIX 3.2 and higher  
sockaddr\_un structure, thus eliminating a segmentation  
fault possibility.

Updated for AIX 5.3.

Added preliminary (DEBUG) support for the AIX SANFS  
file system.

Fixed a bug in the Solaris 10 processing of the vnode's  
v\_path pointer with code supplied by Edward Jajko  
<ejajko@portal.com>. The fix was offered as a patch to  
4.74.



Dropped support for OpenUNIX 8, since a test system is no longer available. Archived an OpenUNIX-only distribution of the last revision (4.74) tested on OpenUNIX in pub/tools/unix/lsof/OLD/src.

Tested under Openbsd 3.7.

Tested under Darwin 7.7.0.

Enabled building on amd64 Solaris 10 with hints from Marc Aurele La France <tsi@ualberta.ca>. Marc provided a test system.

Supplied a missing quote in the FreeBSD Configure stanza. Carl Cook <Info@quantum-sci.com> reported the problem.

Removed "-O" option from tests/Makefile so that the HP-UX bundled compiler won't complain.

4.76 August 30, 2005

Corrected an example and spelling errors in man page.

Updated for Apple Darwin 8.x with changes supplied by Allan Nathanson <ajn@apple.com>. Allan also provided a test system.

Completed documentation of CLRLFILEADD in all machine.h files.

At the request of Chris Markle <cmarkle@sendmail.com> added partial listen queue length to socket options displayed when -Tf is specified. Partial queue length is not reported for all dialects. (OOFAQ lists the ones where it is reported.)

Updated for FreeBSD 7.0 with information supplied by Andrzej Tobola <ato@iem.pw.edu.pl>.

Updated Solaris VxFS support for VxFS versions 4 and above with technical advice from Craig Harmer <craig\_harmer@symantec.com>, Gary Millen <gary\_millen@symantec.com> and Chuck Silvers <charles\_silvers@symantec.com>. Testing help was provided by Michael Antlitz <mantlitz@prophasys.com>, Steve

Ginsberg <steve@dhapdigital.com> and Kenneth Stailey <kstailey@yahoo.com>.

Fixed a Solaris address space map processing bug. Janardhan Molumuri <mjanardhan@gmail.com> reported the bug and help me identify it. Made the fix available as a patch to 4.75.

Added support for Solaris 10 port and CTFS files. The CTFS support is incomplete, because I don't know how to get inode number, size and link count. (There's a new 00FAQ entry about that.)

Investigated a report from Christopher J Warweg <warwegc@GAO.GOV> that the CHECKSUMS for the lsof 4.75 binary for 64 bit Solaris 8 was incorrect. It was my packaging error. I rebuilt and repackaged the binary.

Enabled support for Linux map file names with embedded spaces.

4.77 April 10, 2006

Added -X option support for Solaris 10 and above. When -X is specified lsof will report cached v\_node path names for unlinked files, followed by "(deleted)". Improved cached vnode path name handling by adding "(?)" to the end of path names of questionable accuracy. Updated 00FAQ to reflect these changes.

Updated for FreeBSD 7.0-CURRENT.

Fixed name addition spacing bug, reported by Stuart Anderson <anderson@ligo.caltech.edu>. Also updated Solaris 10 SAMFS support at Stuart's request.

Added missing "break;" and another HASSTATVFS test to the NetBSD and OpenBSD dnode.c. Bill Behr <bbeh@networkstoragecorp.com> reported those needs.

Fixed an HP-UX 11 file descriptor "chunk" size problem, reported by Per Allansson <per@appgate.com>. Per helped devise the fix and tested it. This fix was offered as a patch to lsof 4.76.

Updated for FreeBSD 6.0-STABLE and FreeBSD 6.1-PRERELEASE.

Updated scripts/sort\_res.perl5 with changes supplied by Frederick Fabian <fabian.frederick@skynet.be>, the author of the script.

Corrected +|-M man page documentation error, reported by Roger Cornelius <rac@tenzing.org>.

Improved FreeBSD user device random seed generation in response to a problem report from Danny Braniss <danny@cs.huji.ac.il>.

Eliminated three syntax error bugs and other compiler complaints from the PSTAT-based lsof. H. Merijn Brand <h.m.brand@xs4all.nl> reported the problems and tested the fixes.

Eliminated compiler complaints in the test suite.

Investigated problems with the building of lsof on PA-RISC HP-UX 11.23, based on a report from John Orndorff <John.Orndorff@sungard.com>. Found that neither the HP bundled C compiler nor gcc would build lsof, but the the HP unbundled ANSI C compiler would. Concluded that HP bundled C compiler can't handle <gssapi/gssapi.h>. Devised a work-around to gcc's omission of the rpercent structure definition of <netdb.h> that allows it to compile lsof's print.c, but the resulting binary doesn't run reliably. Documented the situation in 00FAQ.

Changed reporting of unknown file types. The number of an unknown type is now reported as four octets. The change was made in response to a Linux lsof bug report from Karel Zak <kzak@redhat.com>.

Dropped the \*claim\* that lsof works on BSDI BSD/OS since my last test system has been removed. The last tested distribution of lsof for BSDI BSD/OS was revision 4.76. It has been archived on lsof.itap.purdue.edu in pub/tools/unix/lsof/OLD/src.

As a result of discussing the lsof source tar's MD5 checksum with Andrew Bell <andrew.bell.ia@gmail.com>, changed the description of a suitable MD5 tool in the lsof distribution's documentation to name the openssl "dgst" command.

Enabled compilation on Solaris 10 1/06 with a fix sent by Jason Fortezzo <fortezza@mechanicalism.net>. Made the fix available as a patch to 4.76.

Adjusted to FreeBSD 5.5-PRERELEASE.

Corrected a bug in the lsof library's process\_file() function to enable the locating of AIX XTI sockets by their TCP/IP address values. The bug was reported by Michel Dubois <Dubois@sears.ca>.

Based on a bug report from Karel Zak <kzak@redhat.com> added command name length checking to as many dialects as possible (Linux for Karel) for the "-c c" option.

Updated for OpenBSD 3.[89]. Tested the 3.9 update on a system provided by David Mazieres. I have not tested on OpenBSD 3.8, but David reports lsof 4.76 worked there.

Ended regression testing of lsof on 32 bit Solaris 8 with the ending of access to a test system. Lsof continues to be tested on 64 bit Solaris 8.

4.78 April 24, 2007

Added more information to the lsof FAQ about missing link counts and sizes on Linux files.

Simplified Linux stat() and lstat() usage.

Relocated #define's that prevent OpenBSD compilation on systems without a /proc file system. Pieter Bowman <bowman@math.utah.edu> reported the problem.

Added code to avoid processing Linux /proc/<PID>/maps file entries with zero device and node numbers. Some such entries now have names associated with them that are not path names -- e.g., "[heap]", "[stack]" or "[vdso]". Scott Worley <sworley@chkno.net> reported lsof's mishandling of such entries.

Added SELinux security context support, provided by James Antill <james.antill@redhat.com>. I have not tested this, but James and Karel Zak <kzak@redhat.com> have.

Added the #include of <sys/types.h> to Solaris lsof to enabled compilation on Solaris 10 6/06. Peter Harvey Peter.Harvey@Sun.COM diagnosed the problem and supplied a patch.

Added better support for JFS2 on AIX 5.2 and 5.3, based on bug reports and help from Thomas Braunbeck <BRAUNBEC@de.ibm.com> and Tom Whitty <TWHITTY@cerner.com>.

Documented that lsof supports AIX 5.3 only up through maintenance level 1 (ML1).

Enabled Solaris lsof to locate the AFS vnode operation address for OpenAFS 1.4.1. The fix was supplied by Robert Jelinek <Robert.Jelinek@MorganStanley.com>.

Enabled support for Solaris 10 ZFS. If the necessary ZFS header files aren't found, lsof offers the option to drop ZFS support, to use internal, possibly inaccurate structure definitions, or to supply a path to the missing header files. Horst Scheuermann <Horst.Scheuermann@uni-trier.de> provided a development system and helped test the support.

Corrected a typo in the man page, reported by Eric S. Raymond <esr@thyrsus.com>.

Changed the spelling of macroes to macros in lsof source and documentations files, based on a suggestion from Josh Soref <timeless@gmail.com> and verification with the OED.

The following dialects are no longer supported: 32 bit AIX 5.2, HP-UX 11, OpenStep 4.2, Solaris 2.6, Solaris 8, True Unix 64 and UnixWare 7.1.4. Lsof may work on them, but I no longer have test systems for them. Support for OpenBSD ends at its version 3.9 for lack of interest in the port.

4.79 April 15, 2008

\*\*\*\*\* IMPORTANT NOTE \*\*\*\*\*

\*

\*

\* Lsof support has been reduced to the following

\*

\* dialects: AIX, FreeBSD, Linux and Solaris, and \*

\* only in selected versions of those dialects. \*  
\* The selected versions are listed in this file \*  
\* and in other lsof documentation. \*  
\* \*  
\* I have made this move because of retirement \*  
\* and because I no longer have many test systems \*  
\* available to me. \*  
\* \*  
\* Vic Abell \*  
\* \*  
\*\*\*\*\*

Fixed a Solaris VXFS permission problem when accessing the VXFS inode offsets. The bug was reported by Gregory A. Ivanov <ivga@mts.ru>. Gregory tested the fix.

Moved an #include <string.h> later in FreeBSD dlsof.h to enable compilation on recent FreeBSD releases. The change was supplied by Roy Marples <uberlord@gentoo.org>.

Improved Linux /proc file stream reading speed by applying an expanded version of a patch from Eric Dumazet <dada1@cosmosbay.com> that allocates a page size buffer to each stream. Improved TCP, TCP6, UDP and UDP6 hashing by determining the hash bucket count from the /proc/net sockstat and sockstat6 files. The improvement was suggested by Eric and he provided sample code. Eric also tested both improvements.

Modified Configure script to build lsof on FreeBSD 6.2. Tested it on a system provided by Larry Rosenman <ler@lerctr.org>.

Fixed a Linux maps file processing bug that prevented path names from having an embedded colon. James Lingard <jchl@arastra.com> reported the bug and helped with its fix.

Based on reports from Eric Dumazet and Samuel Thibault <samuel.thibault@ens-lyon.org> added support for the Linux 2.6.22 kernel's /proc/<PID>/fdinfo files -- i.e., file offset and flags. Samuel Thibault provided a test system.

Fixed a Linux UNIX socket

memory leak, reported by Philip Shin <pshin@xceedium.com>. Phillip supplied the fix.

With generous assistance from HP added support for an HP-UX 11.23 patch that makes TLI/XTI socket address information available.

Fixed a header file problem for FreeBSD 6.2 on the Alpha architecture. The problem was reported by Pekka Honkanen <phonkane@cc.hut.fi>. Pekka tested the fix.

Based on a report and using suggested fixes from Karel Zak <kzak@redhat.com>, made these changes to Linux lsof: corrected a getpidcon() error message; insured that inode numbers are handled correctly for their unsigned long long type; and improved SELinux handling. At the request of Alon Bar-Lev <alonbl@gentoo.org> added the LINUX\_HASSELINUX environment variable to enable or inhibit SELinux support unconditionally.

Updated Configure for FreeBSD 8.0-CURRENT and tested lsof on AMD64 there.

Added a patch provided by Oles Hnatkevych <don\_oles@able.com.ua> for FreeBSD systems where the root file system is on a CD9660 device.

Added compensation for the disappearance of FMARK and FDEFER from the FreeBSD 8.0-CURRENT <sys/file.h>.

Updated FreeBSD lsof with ZFS support. Larry Rosenman <ler@lerctr.org>, Erwin Lansing <erwin@FreeBSD.org>, Wesley Shields <wxs@atarininja.org> and Dmitry Morozovsky <marck@rinet.ru> provided test systems.

Fixed a socket file identification problem reported by Pavol Rusnak <stick@gk2.sk>. Pavol also reported the cause of the problem.

Added the ability to format the repeat mode marker line with strftime(3), where the dialect supports the localtime(3) and strftime(3) C library functions. The addition was suggested by Mike Depot <mdepot@comcast.net>, who also tested it. The addition required creating a new main lsof source module, util.c, that contains functions whose compilation conflicts with the general header file tree defined by lsof.h and dlsof.h.

Based on reports from Andrei V. Lavreniyuk  
<andy.lavr@reactor-xg.kiev.ua>  
and Pav Lucistnik  
<pav@FreeBSD.org> updated the FreeBSD 7.0 and above  
file lock handling to use new locking structures. The  
update requires a terrible hack to get a definition for  
the lock owner structure from a kernel source module  
into a local lsof header file.

4.80 May 12, 2008

Updated for a FreeBSD 7.0 and above byte level locking  
change. The problem was reported by Conrad J. Sabatier  
<conrads@cox.net>, who helped test the update. Wesley  
Shields <wxs@FreeBSD.org> provided an 8.0-CURRENT test  
system.

Propagated the FreeBSD 7.0 and above locking changes to  
FreeBSD 6.x, based on a report from Edwin Groothuis  
<edwin@FreeBSD.org>.

Added warnings for unsupported dialects or versions.

Added Linux support for the UDPLITE protocol. Eric  
Dumazet <dada1@cosmosbay.com> supplied a patch.

Added a missing quote to the Configure script's  
FreeBSD stanza.

Added a usage.o rule to the HP-UX PSTAT-based  
Makefile. I mistakenly  
deleted the rule at revision

4.79. The missing rule was reported by Kawaljeet Kaur  
<kawaljeet.malviya@gmail.com> who tested the corrected  
Makefile.

4.81 October 21, 2008

Updated the Darwin libproc sources with changes from  
Allan Nathanson <ajn@apple.com>. Tested them on a iMac  
mini, provided by Apple Inc.

Changed dummy declarations in library source files to  
eliminate complaints about unused variables and empty  
object files. This change may not work on dialects I  
can no longer test; it has been tested on some versions  
of AIX, Darwin, FreeBSD, Linux and Solaris.

At the request of Hal Brooks <hal@uga.edu> added support



for Linux /proc/net/packet files. Hal tested it.

Added socket file only performance enhancements to Linux and PSTAT-based HP-UX lsof.

Added htonl call around improper usage of INADDR\_LOOPBACK; report from an Apple engineer forwarded by Allan Nathanson <aj\_n@apple.com>.

Adjusted for FreeBSD-8.0 change in device number handling.

The adjustment should work for FreeBSD 5 and above, should the 8.0 change be propagated downward. The problem was reported by Pav Lucistnik <pav@FreeBSD.org>. An updated test system was provided by Erwin Lansing <erwin@FreeBSD.org>.

Reduced AIX support to version 5.3, since test systems with older versions are no longer available to me.

At the request of Marjo F. Mercado <mmercado@xceedium.com> and Phil Shin <pschin@xceedium.com> applied some speed improvements to lsof, particularly when the files of interest are /Internet files -- i.e., selected with lsof's "-i" option. Added a two new options to assist the improvements: 1) "-c^<command>" to tell lsof to exclude the named command(s); and 2) "-stcp|ud>:[^]state'" to tell lsof to include in its reporting or exclude (^) from its reporting Internet files in the named states (e.g., LISTEN, ^CLOSE\_WAIT, IDLE, etc.) For the most part these changes apply only to AIX, Darwin, FreeBSD, PSTAT-based HP-UX, Linux and Solaris, since those are the only places I could test them. They are controlled by the HASTCPUDPSTATE definition in each dialect's machine.h header file. Marjo and Phil provided HP-UX 11.23 and 11.31 test systems.

Fixed a stat(2) problem on HP-UX 11.31 while testing the speed improvements.

Adjusted for kernel header file changes in FreeBSD 8.0-CURRENT. Larry Rosenman <ler@lerctr.org> provided a test system.

Added a warning for Solaris systems where VxFS node info can't be obtained from the VxFS utility library. The warning was requested by Tom Matthews <Tom.MATTHEWS@rbs.com>.

Corrected mishandling of file system path name arguments

that have trailing slashes, except, of course, the root file system, "/". Allan Nathanson <ajn@apple.com> reported the bug.

4.82 March 25, 2009

Corrected an over-zealous exclusion test that caused Isuf to report nothing when it was given no arguments and built with HASSECURITY and HASNOSOCKSECURITY enabled.

Joshua Kinard <kumba@gentoo.org> reported the bug and supplied information for reproducing it.

Based on a report from Dan Trinkle <trinkle@cs.purdue.edu> corrected use of <sys/utsname.h> for 32 bit Solaris 10 and above compilations. Simultaneously eliminated a casting complaint in arg.c and updated Configure to use the appropriate 64 bit compilation option (-xarch=v9 or -m64) with the Solaris Sun C compiler.

Updated for FreeBSD 7.1-PRERELEASE with information supplied by Larry Rosenman <ler@lerctr.org>.

Updated the Darwin libproc sources with changes from Allan Nathanson <ajn@apple.com>. Tested them on a iMac mini, provided by Apple Inc. Allan also provided man page corrections.

Updated the FreeBSD Makefile to use the \${MAKE} variable for ZFS dnod2.c module compilation, based on a suggestion from Alexis Ballier <aballier@gentoo.org>.

Improved the Solaris VxFS library location test, based on a suggestion from Jason Fortezzo <fortezza@mechanicalism.net>. Jason tested the change.

Updated Solaris 10 ZFS support for ZFS version 4 and ZFS pool version 10, using a test system kindly provided by Vladislav Nespor <vladislav.nespor@id.ethz.ch>. Renata Maria Dart <renata@slac.stanford.edu> tested on ZFS version 4, verifying that the update works there, too. (ZFS pool version 10 is apparently the ZFS version shipped with the 10/08 update to Solaris. The original ZFS support targeted ZFS version 3.)

I still consider ZFS support in Solaris Isuf a hack, because it depends on a znode structure definition that I developed using dbx. Sun is remiss in not distributing

the ZFS header files used to build the distributed kernel.

Because of the znode structure definition hack, I can't guarantee that lsof ZFS support will work for any other versions of ZFS.

Solaris 10: adjusted to a change in the way devices are stored in the kernel; fixed a problem in zone handling; and added rudimentary sharedfs support. Carson Gaspar <carson@taltos.org> reported the device number problem, provided a test system, and tested the changes. Peter Vines <psv2b@eservices.virginia.edu> reported the zone handling problem and tested the fix.

Adapted to FreeBSD 8.0-CURRENT changes in device number computation. Problem was reported by Erwin Lansing <erwin@FreeBSD.org>. Larry Rosenman <ler@lerctr.org> provided a test system.

Corrected Solaris Configure test for appropriate VxFS library when using gcc to compile lsof.

Updated for loss of KAME IPv6 FreeBSD accommodations.

Adapted to FreeBSD 7.2. Made Configure script recognized FreeBSD 6.3.

4.83 January 18, 2010

Converted Solaris 10 and above ZFS support to use the CTF debugger library, libctf. Code was supplied by Robert Byrnes <Robert.Byrnes@deshaw.com>.

Corrected a typo in the testing of the LINUX\_HASSELINUX environment variable in the Configure script. The error was reported by Mike Frysinger <vapier@gentoo.org>.

At Mike's request made Configure script accept LSOF\_RANLIB (ranlib command), LSOF\_CFGF (additional configuration flags) and LSOF\_CFGL (additional library specifications) from the environment.

Enabled compilation of Solaris 10 lsof after a recent Sun patch which changed the PC file system's structure. Peter Vernam <pvernam@draper.com> reported the problem and helped with the fix.

Made the sort of configuration CFLAGS in the CkTestDB

script impervious to locale settings.

Ported to Solaris 11, using a test system kindly provided by David Day <dday76@gmail.com>.

Adjusted to the disappearance of <nfs/rpcv2.h> in FreeBSD 8.0-BETA1.

Changed Solaris node type lookup to a hashed method and added some ability for it to handle duplicate vnodeop names in /dev/ksyms.

Updated for FreeBSD 9.0-CURRENT. Andrzej Tobola <ato@iem.pw.edu.pl> provided a test system. Extends the fix to FreeBSD 6.0 and above via a Configure test and a compile-time definition. The need for the extension was reported by Erik Trulsson <ertr1013@student.uu.se>>

Made corrections to FAQ typographical errors, suggested by Josh Soref <timeless@gmail.com>.

Added \_\_UCLIBC\_\_ test to Linux dlsof.h so lsof would compile on an Intel ARM XScale processor. The addition was provided by Doug Kehn <rdkehr@yahoo.com>.

Added test for <utmpx.h> to FreeBSD configuration. Improved its use in lsof.h. The changes were supplied by Martin Wilke <miwi@FreeBSD.org>.

4.84 July 29, 2010

Fixed a man page nroff command error with a correction supplied by Josh Soref <timeless@gmail.com>.

Made Configure script recognize FreeBSD 7.3. Larry Rosenman <ler@lerctr.org> provided a test system.

Improved task support, initially for Linux only, with help provided by Jerome Marchand <jmarchan@redhat.com> and Miklos Szeredi <mszeredi@suse.cz>. The support includes a new compile-time definition, HASTASKS, and a new run time option, "-K" to select task reporting.

While adding help output support for "-K", reorganized the printing of help columns to make it much easier to add a new option description.

Updated the Solaris PC file system structure patch in revision 4.83 so it will compile with gcc.

Disabled the Solaris lgrp\_root work-around in the Solaris machine.h so it won't cause compilation problems on Solaris 11. It no longer causes compilation problems on my Solaris 9 and 10 test systems, but some older Solaris 9 and 10 versions may still need it, so the work-around was left in the Sun machine.h and a FAQ entry was created about it.

Updated for Solaris 11 b134, using a test system kindly provided by Carson Gaspar <carson@taltos.org>. Made provisions for the next ZFS version. Added info about the failure of the LTnlink test on ZFS file systems.

Corrected typo in Configure script, reported by Dmitry Berezin <dmitryb@oit.rutgers.edu>.

4.85 September 27, 2011

John

Dzuber <Zube@CS.ColoState.EDU> kindly provided a patched Solaris 9 test system with the lgrp\_root conflict and I was able to devise an automatic work-around for the conflict. The special note in ../dialects/sun/machine.h was removed and the 17.28.1 FAQ entry was modified to reflect the update.

Added a Solaris 11 work-around for a typedef problem with <sys/mutex.h>. Carson Gaspar <carson@taltos.org> reported the problem and supplied the work-around.

Added support for FreeBSD 7.4 and 8.2; tested on systems provided by Larry Rosenman <ler@lerctr.org>.

Added support for 32 bit Solaris 11 lsof with mods supplied by Jan Wortelboer <J.H.P.Wortelboer@uva.nl>.

Added Solaris 11 support for using an alternate genunix location. Bill Goodridge <bill@its.brooklyn.cuny.edu> reported the alternate location.

Added further Linux cross configuration support to lsof's Configure script. The additional support was supplied by Grant Erickson <erick205@umn.edu>.

See the descriptions of the LINUX\_\* environment variables in 00XCONFIG for more information. Tested lsof on Linux kernel 2.6.32 and picked some lint that surfaced during the test.

Added fixes and changes for Apple Mac OS X 10.6, provided by Allan Nathanson <ajn@apple.com>. Allan also provided a test system.

Tested on FreeBSD 6.4 i386, using a test system provided by Terry Kennedy <TERRY@tmk.com>. Updated for recent FreeBSD ZFS changes on an 8.2 amd64 test system also provided by Terry.

Changed documentation to indicate FreeBSD 7.x is no longer supported, since I no longer have a test system.

Made some changes to the lsof man page, suggested by Navid <evi1m4chine@googlemail.com>.

Added compensation for Solaris 10 systems that have patch 144488-10. The patch requires that the new header file <sys/socket\_proto.h> be included while `_KERNEL` is defined. Brett Bartick <Brett.bartick@nomura.com> reported the problem first, followed by Stuart Anderson <anderson@ligo.caltech.edu>.

Michael Hocke <michael.hocke@nyu.edu> suggested a work-around which I refined to limit it to the specific Solaris 10 instance and then tested on a system provided by Charles Stephens <cfs@cowlabs.com>

Added the `+|-e` option for Linux. It exempts file systems named by path from function calls that might block in the kernel -- i.e., `stat(2)` and `lstat(2)`, and when the `+e` form is used, `readlink(2)`. The new packager of lsof for the Linux Fedora and RHEL distributions, Peter Schiffer <pschiffe@redhat.com>, asked for the feature so it could be used with Clearcase file systems, whose implementation can block `stat(2)` calls. I consider this feature very risky and easy to misuse -- e.g., specifying the file system as `/'` would exempt all file systems. I don't intend to propagate this option to any other UNIX dialect that lsof currently supports.

Made FreeBSD 9 adjustment.

Fixed a Linux bug that prevented the display of paths for abstract UNIX sockets. Masatake Yamato <yamato@redhat.com> reported the bug and supplied a patch.

Added compensation for the removal of RPC header files from Glibc 2.14 for Linux. Marek Behun <kabel@blackhole.sk> reported the problem and supplied a patch.

Added support for Linux Netlink protocol. Masatake Yamato requested the support and supplied a patch. Peter Schiffer <pschiffe@redhat.com> provided a test system.

Corrected Linux UDP6-lite path. The error was reported by Masatake Yamato and he also supplied a patch.

4.86 April 10, 2012

Lsof for AIX is no longer supported on any versions of that operating system.

Added information about the clang compiler for FreeBSD to the FAQ.

Corrected an arg.c bug in the accumulation of +|-e option values, reported by Peter Schiffer <pschiffe@redhat.com>. This correction was supplied as a patch to revision 4.85.

Enabled FreeBSD 10 support and tested it there on a system provided by Larry Rosenman <ler@lerctr.org>.

Updated for latest Solaris 11 with patches supplied by Carson Gaspar <carson@taltos.org>. Carson supplied a test system.

Adjusted Linux file system search method to compensate for NFS mounts that have duplicate device numbers. The problem was reported by Peter Schiffer <pschiffe@redhat.com>, who provided a test system.

At the request of Peter Schiffer <pschiffe@redhat.com>, added support for Linux SCTP socket files. Peter provided a test system. Applied a warning patch supplied by Peter.

Added support for Mac OS X 10.7 (Lion), provided by Allan Nathanson <ajn@apple.com>. Allan also supplied a test system.

Enabled FreeBSD 8.3 support and tested it there on a system provided by Larry Rosenman <ler@lerctr.org>.

Corrected the FAQ information on ZFS with Solaris 10 after Steven Blackmon <stblackm@cisco.com> and Prasad Jampala <jampalp@cisco.com> pointed out that it was incorrect -- i.e., outdated by the libctf changes at

revision 4.83.

Added code to handle a Linux NFS-mounted root. Jia He <hejianet@linux.vnet.ibm.com> reported the need for this.

4.87 January 2, 2013

Added an entry to 00FAQ about lsof behavior when the HASSECURITY and HASNOSOCKSECURITY options are defined. Carson Gaspar <carson@taltos.org> pointed out the need for this clarification.

Added a work-around for a missing definition of mach\_port\_t in Darwin 9 (Mac OS/X 10.5.8). The work-around was supplied by Jim Reid <jim@rfc1035.com>.

Added support for Linux anon\_inodefs, provided by Masatake YAMATO <yamato@redhat.com>.

Documented a Solaris 9 and 10 portmap reporting problem (+M) in 00FAQ. The problem was reported by Clint Roberts <Clint.Roberts@tti.us.com>. I have no solution to the problem, but discuss a possible work-around in the answer to this 00FAQ question: "Why doesn't lsof report portmap registrations for some Solaris versions?"

Added FreeBSD support for the oldnfs and newnfs file system types. Daniel Braniss <danny@cs.huji.ac.il> reported the need for the addition.

Added ICMP socket support for Linux with code provided by Masatake YAMATO <yamato@redhat.com>.

Corrected the reporting of process group ID for libproc versions of Mac OS X with a patch from Jeff Trawick <trawick@gmail.com>. The patch has not been applied to Darwin kmem versions, because of little call for them and inadequate test system access. The patch has been tested on Mac OS X 10.8 (Mountain Lion), courtesy of a test system provided by Allan Nathanson <ajn@apple.com>.

Added thread support to those FreeBSD versions that have ki\_numthreads in their kinfo\_proc structure. This also activates the -K option for those FreeBSD versions. Jeff Trawick reported problems with FreeBSD lsof when threads are present and this addition solves those problems.

Made changes to 00FAQ and the distribution, suggested by



Warren Young <warren@etr-usa.com>. The 00FAQ changes center on sections that discuss the -s option. The changes to the distribution include a ChangeLog file that is either a pointer to or a copy of 00DIST, the distribution notes.

Added support to FreeBSD for using the clang compiler.

Added Linux support for using the getxattr() call to obtain socket protocol identification when it can't be obtained from the /proc/net files that lsof examines. Masatake YAMATO <yamato@redhat.com> developed the kernel patch to getxattr() and supplied the lsof patch.

4.88 October 13, 2014

Reduced to 50 the number of open file descriptors lsof attempts to close while trying to protect itself from a file descriptor exec() attack. This limits the overhead lsof incurs on systems that have large file descriptor limits, yet provides sufficient open descriptors for the library functions lsof calls.

Updated for changes in FreeBSD 10 with advice from Eyegene Ryabinkin <rea@freebsd.org>. Taught Configure to recognize FreeBSD

8.4.

Herein am noting that lsof for Solaris 10 or 11 is no longer supported. I no longer have test systems. Some support is still available from Casper Dik <Casper.Dik@oracle.com> and a Solaris 11 patch he provided is included in this revision.

Initialized local variables in the Linux process\_id() function. Jia He <jiakernel@gmail.com> reported the problem.

Added support for FreeBSD 11.

Updated FreeBSD ZFS Configure stanza to supply a dummy opt\_kdtrace.h when needed.

Added tmpfs file system support for FreeBSD.

Since a test system is no longer available, dropped the claim of FreeBSD 4.9 support.

Added the +|-E options for Linux. -E displays endpoint info; +E displays endpoint info and endpoint files. Masatake YAMATO <yamato@redhat.com> requested this support and suggested code

to implement it.

Fixed a Linux bug handling processes whose command includes a non-printing character, particularly a NEWLINE character, and clarified printing of single '\\' characters in command and file names. Stephane Chazelas <stephane.chazelas@gmail.com> reported the problem.

Added support for Linux RDMA and CRYPTO protocol names and UNIX socket type with code from Masatake YAMATO <yamato@redhat.com>.

Fixed field output to insure that the field descriptor field is always selected, since it identifies the file set. The bug was reported by Gary Plewa <gary.m.plewa-1@lowes.com>.

4.89 July 7, 2015

Applied correction from Casper Dik <Casper.Dik@oracle.com> to his patch for Solaris 11 that I applied incorrectly in revision 4.88.

Updated for latest version of FreeBSD 11.0-CURRENT.

Compensated for a missing FreeBSD 10.0 typedef of bool on the i386 architecture. Allen Hewes <rallenh@hotmail.com> provided a test system. Andrey Chernov <ache@freebsd.org> provided useful advice.

Improved tests/Add2TestDB script with a patch from Peter Schiffer <pschiffe@redhat.com>. Added patches from Peter to eliminate

Linux gcc warnings. Updated Lsof.8 with improvements supplied by Bjarni Ingi Gislason <bjarniig@rhi.hi.is>.

Changed FreeBSD global CFLAGS extraction per Terry Kennedy <TERRY@tmk.com>. Also made sure -DNEEDS\_BOOL\_TYPEDEF is #define'd when the resulting CFLAGS doesn't contain it. Terry reported that need.

Improved Linux test for tcp.h in response to a report from Cato Auestad <cato@cato.ninja>. Cato did the testing.

Fixed Linux UNIX socket search by name bug reported by Stephane Chazelas <stephane.chazelas@gmail.com>.

Added Linux display of UNIX socket endpoint information with code provided by Masatake YAMATO <yamato@redhat.com>. Peter Schiffer <pschiffe@redhat.com> provided a test system.

Insured that type definitions from <vm/vm.h> were again made visible to lsof on FreeBSD 11 after a system header file change hid them.

4.90 February 14, 2018

```
!!!NOTE!!
!  
!  
! It is likely that this is the last lsof revision I !  
! will issue, unless serious bugs are detected, Stay !  
! tuned to lsof-l for information about future support !  
! of lsof. !  
! !  
! I thank all the many contributors to lsof over the !  
! many years (20+?) I have been distributing lsof !  
! versions 1, 2, 3 and 4. !  
! !  
! Vic Abell <abe@purdue.edu> !  
! !  
!!!NOTE!!
```

Taught the Configure script to create a dummy opt\_random.h for FreeBSD systems whose <sys/random.h> includes it.

Added support for the FreeBSD ZFUSE file system.

Corrected the quoting in a Darwin putchar() statement in the dfile.c source file. Andrew Janke <floss@apjanke.net> reported my error.

Added support for the FreeBSD DTYPE\_PTS file descriptor and for unknown descriptors that reference the kernel's badfileops operation switch. Enabled FreeBSD 12.0 support. Tested the changes on systems provided by Larry Rosenman <ler@lerctr.org>.

Enhanced -K option with the form "-K i" to direct lsof to (i)gnore tasks. A query from Rachel Kroll <rkroll@fb.com> suggested this option. Linux task reports now include both process and task command names, making lsof's "-c <name>" option work correctly.

Added a patch to prevent NFS blocking in Linux supplied by Kristyna Streitova <kstreitova@suse.com>.

Installed a FreeBSD patch that prevents examining a TCP state

structure during a race condition. The patch was supplied by Bryan Drewery <bdrewery@FreeBSD.org>.

Updated FreeBSD for new UFS inode structure that lacks an `i_dev` member in the most recent 12.0-CURRENT. Larry Rosenman <ler@lerctr.org> reported the problem and provided a test system.

Added `#define KLD_MODULE` to `dlsof.h` and `dnode2.c` to prevent <machine/cpuconf.h> from generating an "ARM\_NARCH is 0" error. This is needed so `lsof` can access kernel structures. Larry Rosenman supplied the addition.

Added recognition of the FreeBSD 11 file system name "nullfs". Jamie Landeg-Jones <jamie@catflap.org> supplied the fix.

Added a patch from Larry Rosenman <ler@lerctr.org> that is needed on FreeBSD 12 so the `lsof` compilation can obtain the `inpcb` and `tcpcb` structures from their respective header files.

Updated FreeBSD `dmnt.c` for the `ino64` changes.

Inserted a patch for Solaris 12.x to avoid compilation errors from <sys/aio\_req.h>, based on information provided by Jorn Clausen <jorn.clausen@uni-bielefeld.de>. Jorn tested the patch.

Added performance enhancement that uses the FreeBSD `closefrom()` and `dup2()` C library functions when available. The enhancement was supplied by Conrad Meyer <cem@freebsd.org>.

Corrected FreeBSD `lsof`'s gathering of ZFS file device numbers.

Updated `lsof` test library for FreeBSD.

Updated socket options information collection from the socket structure per changes supplied by Gleb Smirnoff <glebius@FreeBSD.org>.

Added patch to `dlsof.h` that avoids a `_KERNEL` conflict with `bzero`. Mateusz Guzik <mjguzik@gmail.com> supplied the patch.

Corrected test library to handle 64 bit FreeBSD device numbers.

Added `#defines` for FreeBSD 12, src r324225, from Gleb Smirnoff <glebius@FreeBSD.org>.

Incorporated Linux pseudoterminal endpoint processing (+|-E) provided by Masatake YAMATO <yamato@redhat.com> with access to test systems provided by Peter Schiffer <pschiffe@redhat.com>.

Corrected Linux command extraction for commands that include parentheses -- e.g., "(sd-pam)".

4.91 March 26, 2018

A bug has been reported in the PTY endpoint processing of Linux Isuf 4.90 by Peter Wu <peter@lekensteyn.nl>, making it necessary for me to release another revision of Isuf.

This revision applies two fixes that correct the Linux PTY endpoint processing bug. Masatake YAMATO <yamato@redhat.com> supplied the fixes.

4.92 July 14, 2018

THIS IS A FREEBSD-ONLY DISTRIBUTION!

Fixes Configure script section that creates the FreeBSD lockf\_owner.h header file; fixes <string.h> conflicts with FreeBSD kernel header files. Mateusz Gusik supplied part of the fix.

Released Isuf to GitHub with Purdue releases documented in support/GitHub-release.

Vic Abell <abe@purdue.edu>

July 14, 2018

4.92.1 May 6, 2019

```
!!!NOTE!!
!                                     !
! The maintainership is switched from Vic to Isuf-org !
! at GitHub team officially.                !
! We thank Vic for working on Isuf over the years.    !
!                                     !
! Isuf-org at GitHub
team (https://github.com/Isuf-org) !
!!!NOTE!!
```

This is just for testing "Release" feature of GitHub.  
Many documentations are not updated yet.

URLs in -v output and -h output are updated.

#### 4.93.0 May 7, 2019

[freebsd] Made FreeBSD 13 adjustment.  
[darwin] Fix a typo causing a build error.  
Fix a potential memory leak.  
[linux] use tircp for rpc if libc doesn't provide rpc.h.  
Fix a typo in man page.  
[linux] fix memory leaks detected by valgrind about unix endpoint information.  
Update the description about -fg and -fG options on linux.

#### 4.93.1 May 7, 2019

Fix a broken symbolic link.

#### 4.93.2 May 8, 2019

Update the version number embedded in lsof executable.

#### 4.94.0 November 11, 2020

(All changes in this version are ported from lsof-org/lsof-linux repository at GitHub).

Introduced a new test harness. The harness can run test cases specific to a dialect. It is designed for running test cases on CI environment like Travis-CI. However, it is runnable locally with following command line:  
\$ ./check.sh DIALECT  
after making lsof executable.

[linux] Fixed a bug +|-E options output for pipe. If two processes use the same fd number for a pipe connecting them, the option didn't print the information about it.

[linux] Fixed a bug +|-E options output for PTY. If two processes use the same fd number for a PTY connecting them, the option didn't print the information about it.

[linux] Fixed a bug +|-E options output for PTY.  
The code for detecting a slave device was incorrect.

[linux] Fixed a potential bug +|-E options output for PTY. A structure field for the feature was not initialized.

[linux] Added a code for decoding O\_PATH flag in +fg option.

[linux] Added a code for decoding O\_CLOEXEC flag as CX in +fg option.

[linux] Added a code for decoding O\_TMPFILE flag as TMPF in +fg option.

[linux] Added Linux display of INET socket endpoint information with +|-E option. The option handles INET sockets using IPC.

[linux] Added support for POSIX MQ of Linux implementation. A POSIX message queue (MQ) is represented in a fd on Linux. lsof reported it as a regular file. lsof with this change reports it as a file with PSXMQ type if mqueue file system is mounted.

[linux] Added Linux display of POSIX message queue endpoint information with +|-E option. mqueue file system must be mounted to display the information.

[linux] Added Linux display of INET6 socket endpoint information with +|-E option. The option handles INET6 sockets using IPC.

[FreeBSD] update to include <sys/\_lock.h> on recent -CURRENT since it is no longer implicitly included via header pollution.

[linux] Added Linux display of eventfd endpoint information with +|-E option. The option handles eventfd using IPC.

[FreeBSD] include <stdbool.h> for recent change requiring refcount(9).

Enhanced -r option.

With `c<N>' specifier, lsof can stop itself when the number of iterations reaches at <N>.

[linux] Fixed accessing an uninitialized local variable. Detected by valgrind.

[linux] fix a crash when printing the endpoint for unaccepted unix socket with +E option.

This closes the github issue #74 reported by @jolmg.

[linux] abort execution when failing in memory allocation for socket private data.

[linux] decode the name of DCCP socket type.

[linux] decode more netlink protocol numbers (RDMA, CRYPTO, and SMC).

[linux] print the connection state of unix domain socket  
Lsof can print the state of TCP socket like:

```
nc 22247 yamato 3u IPv4 471409 0t0 TCP localhost:38802->localhost:9999 (ESTABLISHED)
```

This change extends this feature to support unix domain sockets.

LISTEN, UNCONNECTED, CONNECTING, CONNECTED, DISCONNECTING, and UNKNOWN can be taken as a state.

An example of output:

```
evince 17333 yamato 1u unix 0x0000000054183795  
0t0 89141 type=STREAM (CONNECTED)
```

This feature is enabled by default.

To turn off printing state information, use -T option.



Don't display command usage even when a file (or directory) listed in command line doesn't exist.

This closes the github issue #90 reported by @rowlap.

[FreeBSD] merge all the FreeBSD specific fixes from the FreeBSD sysutils/lsof port

[linux] allow reproducible builds

In a reproducible build all varied information is removed. This change does so, by checking if the standard SOURCE\_DATE\_EPOCH variable is set. If it is, we are attempting a reproducible build and will strip varying information.

About the standard, see <https://reproducible-builds.org/specs/source-date-epoch/>  
Provided in github pull request #93 by @T4cC0re.

[freebsd] update for r363214

- no user visible changes

Added the way to include (or exclude) all numbered file descriptors in -d option. "fd" is a pseudo file descriptor name for the purpose.

See the following output on Linux; lsof doesn't print cwd, rtd, txt, and mem files.

```
# ./lsof -p $$ -a -d fd
COMMAND  PID USER  FD  TYPE DEVICE SIZE/OFF NODE NAME
bash    866421 root   0u  CHR 136,1   0t0  4 /dev/pts/1
bash    866421 root   1u  CHR 136,1   0t0  4 /dev/pts/1
bash    866421 root   2u  CHR 136,1   0t0  4 /dev/pts/1
bash    866421 root  255u  CHR 136,1   0t0  4 /dev/pts/1
```

docs: fixed minor grammatical error in instructions in Customize file

The change is provided by @hardikpnsp.

man page: improve phrasing and add examples

The change is provided by Martin D Kealey.

man page: improve explanation of -t implying -w

The change is provided by Martin D Kealey.

test cases, [linux]: fix tests for large inode-numbers ( $i \geq 2^{32}$ )  
The change is provided by Henry Peteet.

[linux] handle ffff:ffff in ipv6 addr correctly  
The listen address and port of an AF\_INET6 socket were not display  
if  
the socket listened at an ipv6 address including ffff:ffff.

Here is a command session demonstrating the bug:

```
# ip -6 addr add abcd:ef10:ffff:ffff:ffff:ffff:ffff:ff62 dev lo
# nc -6 -l abcd:ef10:ffff:ffff:ffff:ffff:ffff:ff62 8888 &
[1] 6762
# ./lsof -p 6762 -a -d fd -P -n
COMMAND PID  USER  FD  TYPE DEVICE SIZE/OFF  NODE NAME
nc      6762 yamato  0u  CHR 136,6  0t0   9 /dev/pts/6
nc      6762 yamato  1u  CHR 136,6  0t0   9 /dev/pts/6
nc      6762 yamato  2u  CHR 136,6  0t0   9 /dev/pts/6
nc      6762 yamato  3u  sock  0,9    0t0 5833594 protocol: TCPv6
```

The last line should be:

```
nc      6762 yamato  3u  IPv6 5833594  0t0  TCP [abcd:ef10:ffff:ffff:ffff:ffff:ffff:ff62]:8888 (LISTEN)
```

The original code decoding an ipv6 address uses UIN32\_MAX constant  
incorrect way.

@zhrf2020 reported this bug in #102.  
@zhrf2020 provided the initial version of fix, #109.

man  
page,[linux]: enumerate abbreviated flags printed with '+f g' option

Make -Fo option work  
-Fo option is for printing file offset. For regular files,  
the option didn't work.

Here is a command session demonstrating the fix:

```
# ./lsof -Fo -o0 | grep ^o | sort | uniq -c
90586 o0t0
  87 o0t101
  84 o0t103
```

...

@JustAnotherArchivist reported this bug in #118.

man page: fix definition of the `o` field on programmatic output  
The change is provided by @JustAnotherArchivist who reported the original issue in #118.

[linux]: show the pid monitored by a pidfd  
With this change, lsof prints pidfd in the following form:

```
[pidfd:%d]
```

where %d represents the pid monitored by the pidfd.

Example output:

```
# ./lsof -p 12573 -p 12710 | grep pidfd
dbus-brok 12573 jet 11u a_inode      0,13    0 13312 [pidfd:12575]
dbus-brok 12710 jet 10u a_inode      0,13    0 13312 [pidfd:12711]
```

fd

11 of pid 12573 monitors pid 12575.

fd 10 of pid 12710 monitors pid 12711.

This change closed #116.

Don't select the file descriptor field by default.

The version 4.88 introduced the change for selecting the file descriptor field by default. However, the change is not suitable for users who wants to print only PID field.

@po5857 suggests the use case and the way to improve the man page.

[linux]: enumerate fds monitored by an eventpoll fd  
With this change, lsof prints an eventpoll fd in the following form:

```
[eventpoll:<fd0>,<fd1>,....,<fdn>...]
```

Here fdX is a file descriptor monitored by the eventpoll fd.

If an eventpoll fd monitors too many file descriptors, lsof truncates the list of fds. "..." at the end of list implies the truncation.

Example output:

```
# sudo ./lsof -p 1 -a -d 10,11,12
```

```
COMMAND PID USER  FD   TYPE DEVICE SIZE/OFF  NODE NAME
systemd  1 root 10u  a_inode 0,13    0 11624 [eventpoll:11,12]
systemd
1 root 11r  REG  0,4    0 17680 /proc/1/mountinfo
systemd  1 root 12r  a_inode 0,13    0 11624 inotify
```

systemd monitors fd 11 and fd 12 via eventpoll fd 10.

[linux]: implement "make check"

The target runs check.bash.

4.95.0 April 28, 2022

[n+obsd] fix syntax error

Corrected end of comment.

This change closes #138.

@albert-github reported this issue in #138,

and provided the fix in #140

Don't ignore failures in test/Makefile

Tobias Geerinckx-Rice <me@tobias.gr> provides the fix.

Update perl scripts for the past few decades of progress

Generally, perl is available on base systems - people who are manually installing perl into /usr/local/bin are the exception rather than the rule. In addition, Perl 5 was release in 1994, so Perl 4 isn't relevant any more. We've also standardized on the .pl extension, rather than .perl5 or whatever.

Provided by @dilinger (Andres Salomon) in #149.

A commit in the pull request includes work of Nicholas Bamber.

Drop LSOFF\_CCDATE across all dialects to ensure reproducible builds

Simplify things for reproducible builds by just getting rid of the embedded date/time string. With LSOFF\_CCDATE gone, keeping SOURCE\_DATE\_EPOCH around doesn't make much sense, so drop that as well. Folks doing reproducible builds should still override the LSOFF\_HOST, LSOFF\_LOGNAME, LSOFF\_SYSINFO, and LSOFF\_USER variables (as they were previously doing before SOURCE\_DATE\_EPOCH).

Provided by @dilinger (Andres Salomon) in #150.

[FreeBSD] get the ISO9660 filesystem working again

The ISO9660 filesystem broke starting with FreeBSD 7 due to the header

location changing. Fix the header search path to get it to be detected again. Fix the header inclusion order. Also add the new way of finding dev\_t on more recent FreeBSD versions.  
Provided by Damjan Jovanovic in #151.

[FreeBSD] add support for msdosfs on FreeBSD  
Provided by Damjan Jovanovic in #151.

Fix FD field description.

In

811dc78 the output format was changed to not printf the `f` field by default, however the field description in `lsof\_fields.h`, as seen in `-F?` output still included the `(always selected)` text.  
Provided by @algorythmic (Grisha Levit) in #158.

Adjust alignment of buffer passed to stat().  
The original code passes char[] buffer to stat(). This can be cause a SIGBUS. #160 reported an actual crash on armv7a + glibc-2.33 platform. See also [https://sourceware.org/bugzilla/show\\_bug.cgi?id=27993](https://sourceware.org/bugzilla/show_bug.cgi?id=27993).  
Reported by @10ne1 in #160.

Clean up source code and documentats.

- remove trailing whitespace,
- fix some issues in scripts found through shellcheck, and
- fix spelling

Provided by @a1346054 in #163.

man page: fix hyphen issues

Properly use '-' and '\-' in the man page, ensuring that users can cut & paste commandline options without issue. Original patch from Raoul Gunnar Borenus <borenus@dfn.de>, and submitted/expanded by @dilinger (Andres Salomon) in #168.

[FreeBSD] update for FreeBSD 13 & 14, and various internal changes submitted by @DmitryAndric & @emaste.

[FreeBSD] remove various old FreeBSD versions from support submitted by @emaste

[FreeBSD] configure: suggest variable to set if FreeBSD sys not found  
submitted by @emaste

Fix broken LSOF\_CFLAGS\_OVERRIDE.  
Provided by Fabrice Fontaine in #172.

[linux] Remove sysvlegacy function.  
Provided by Fabrice Fontaine in #195.

[linux] use close\_range instead of calling close repeatedly  
At the starting up, lsof closes its file descriptors greater than 2 by calling close(2) repeatedly. As reported in #186, it can take long time. Linux 5.9 introduced close\_range(2). The new system call can close multiple file descriptors faster. @qianzhangyl reported the original issue (#186).

Add -Q option for adjusting exit status when failed to find a search item (#129)

In the original code, lsof returned 1 when it failed to find a search item.

With the new option, lsof returns 0 in the case.

Document -Q option in manpage/00QUICKSTART, and adjust -h output by @dilinger (Andres Salomon) in #129.

Improve readability of complex adverbial clause by adding a comma.

Provided by Danny Fowler in #156.

The lsof-org team at GitHub  
April 28, 2022

Found in path(s):

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/00DIST

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 \*

\* @(#)netdb.h 5.15 (Berkeley) 4/3/91  
 \*/

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\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/tests/LTdnlc.c  
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\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/tests/LTszoff.c  
\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/tests/LTunix.c  
\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/tests/LTbigf.c  
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\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/tests/LTnlink.c

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```
#!/usr/bin/perl
#
# list_fields.pl -- sample Perl script to list lsof full field output
# (i.e., -F output without -O)
#
# This script has been tested under perl versions 4.036 and 5.001e.
#
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# Initialize variables.

$fhdr = 0;    # fd hdr. flag
$fdst = 0;    # fd state
$access = $devch = $devn = $fd = $inode = $lock = $name = ""; # | file descr.
$offset = $proto = $size = $state = $stream = $type = ""; # | variables
$pidst = 0;   # process state
$cmd = $login = $grp = $pid = $ppid = $uid = ""; # process var.

# Process the ``ls -F" output a line at a time, gathering
# the variables for a process together before printing them;
# then gathering the variables for each file descriptor
# together before printing them.

while (<>) {
    chop;
    if (/^p(.*)/) {

# A process set begins with a PID field whose ID character is `p'.

$tpid = $1;
if ($pidst) { &list_proc }
$pidst = 1;
$pid = $tpid;
if ($fdst) { &list_fd; $fdst = 0; }
next;
    }
}

# Save process-related values.

```

```

if (/^g(.*)/) { $pgrp = $1; next; }
if (/^c(.*)/) { $cmd = $1; next; }
if (/^u(.*)/) { $uid = $1; next; }
if (/^L(.*)/) { $login = $1; next; }
if (/^R(.*)/) { $ppid = $1; next; }

# A file descriptor set begins with a file descriptor field whose ID
# character is `f`.

```

```

    if (/^f(.*)/) {
$dfd = $1;
if ($pidst) { &list_proc }
if ($fdst) { &list_fd }
$fd = $dfd;
$fdst = 1;
next;
    }

```

```

# Save file set information.

```

```

if (/^a(.*)/) { $access = $1; next; }
if (/^C(.*)/) { next; }
if (/^d(.*)/) { $devch = $1; next; }
if (/^D(.*)/) { $devn = $1; next; }
if (/^F(.*)/) { next; }
if (/^G(.*)/) { next; }
if (/^i(.*)/) { $inode = $1; next; }
if (/^k(.*)/) { next; }
if (/^l(.*)/) { $lock = $1; next; }
if (/^N(.*)/) { next; }
if (/^o(.*)/) { $offset = $1; next; }
if (/^P(.*)/) { $proto = $1; next; }
if (/^s(.*)/) { $size = $1; next; }
if (/^S(.*)/) { $stream = $1; next; }
if (/^t(.*)/)
{ $type = $1; next; }
    if (/^T(.*)/) {
if ($state eq "") { $state = "(" . $1; }
else { $state = $state . " " . $1; }
next;
    }
    if (/^n(.*)/) { $name = $1; next; }
    print "ERROR: unrecognized: \"$_\"\n";
}

```

```

# Flush any stored file or process output.

```

```

if ($fdst) { &list_fd }
if ($pidst) { &list_proc }
exit(0);

## list_fd -- list file descriptor information
#   Values are stored inelegantly in global variables.

sub list_fd {
    if ( ! $fhdr ) {

        # Print header once.

        print "  FD  TYPE  DEVICE  SIZE/OFF  INODE NAME\n";
        $fhdr = 1;
    }
    printf " %4s%1.1s%1.1s %4.4s", $fd, $access, $lock, $type;
    $tmp = $devn; if ($devch ne "") { $tmp = $devch }
    printf " %10.10s", $tmp;
    $tmp = $size; if ($offset ne "") { $tmp = $offset }
    printf " %10.10s", $tmp;
    $tmp = $inode; if ($proto ne "") { $tmp = $proto }
    printf " %10.10s", $tmp;
    $tmp = $stream; if ($name ne "") { $tmp = $name }
    print " ", $tmp;
    if ($state
ne "") { printf " %s\n", $state; } else { print "\n"; }

# Clear variables.

    $access = $devch = $devn = $fd = $inode = $lock = $name = "";
    $offset = $proto = $size = $state = $stream = $type = "";
}

# list_proc -- list process information
#   Values are stored inelegantly in global variables.

sub list_proc {
    print "COMMAND  PID  PGRP  PPID  USER\n";
    $tmp = $uid; if ($login ne "") { $tmp = $login }
    printf "%-9.9s %6d %6d %6d %s\n", $cmd, $pid, $pgrp, $ppid, $tmp;

# Clear variables.

    $cmd = $login = $pgrp = $pid = $uid = "";
    $fhdr = $pidst = 0;
}

```

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\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsf-org-lsf-4-95-0-0-g67d8c82-tar-gz/lsf-org-lsf-67d8c82/dialects/darwin/libproc/dproto.h

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\* /opt/cola/permits/1682050831\_1684512792.1459703/0/Isf-org-Isf-4-95-0-0-g67d8c82-tar-gz/Isf-org-Isf-67d8c82/dialects/darwin/libproc/dmmt.c

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\*

\*/opt/cola/permits/1682050831\_1684512792.1459703/0/lsf-org-lsf-4-95-0-0-g67d8c82-tar-gz/lsf-org-lsf-67d8c82/print.c

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\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/uw/dnode3.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/usage.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/NEW/usage.c

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```

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```
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/scripts/sort_res.pl
```

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```
#!/usr/bin/perl
#
# list_NULf.pl -- sample Perl 5 script to list lsof NUL-terminated
#   full field output (i.e., -FO output)
#
# This script has been tested under perl version 5.001e.
#
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# Initialize variables.

$fhdr = 0;    # fd hdr. flag
$fdst = 0;    # fd state
$access = $devch = $devn = $fd = $inode = $lock = $name = ""; # | file descr.
```



```

$offset = $proto = $size = $state = $stream = $type = ""; # | variables
$pidst = 0; # process state
$cmd = $login = $pgrp = $pid = $ppid = $uid = ""; # process var.

```

```

# Process the `ls -F' output a line at a time, gathering
# the variables for a process together before printing them;
# then gathering the variables for each file descriptor
# together before printing them.

```

```

while (<>) {
    chop;
    @F = split('\0', $_, 999);
    if ($F[0] =~ /^p/) {

```

```

# A process set begins with a PID field whose ID character is `p'.

```

```

if ($pidst) { &list_proc }
if ($fdst) { &list_fd; $fdst = 0; }
foreach $i (0 ..
($#F - 1)) {

    PROC: {
if ($F[$i] =~ /^c(.*)/) { $cmd = $1; last PROC }
if ($F[$i] =~ /^g(.*)/) { $pgrp = $1; last PROC }
if ($F[$i] =~ /^p(.*)/) { $pid = $1; last PROC }
if ($F[$i] =~ /^u(.*)/) { $uid = $1; last PROC }
if ($F[$i] =~ /^L(.*)/) { $login = $1; last PROC }
if ($F[$i] =~ /^R(.*)/) { $ppid = $1; last PROC }
print "ERROR: unrecognized process field: \"$F[$i]\"\n";
    }
}
$pidst = 1;
next;
}

```

```

# A file descriptor set begins with a file descriptor field whose ID
# character is `f'.

```

```

if ($F[0] =~ /^f/) {
if ($pidst) { &list_proc }
if ($fdst) { &list_fd }
foreach $i (0 .. ($#F - 1)) {

    FD: {
if ($F[$i] =~ /^a(.*)/) { $access = $1; last FD; }
if ($F[$i] =~ /^C(.*)/) { last FD; }
if ($F[$i] =~ /^f(.*)/) { $fd = $1; last FD; }
if ($F[$i] =~ /^F(.*)/) { last FD; }

```

```

if ($F[$i] =~ /^d(.*)/) { $devch = $1; last FD; }
if ($F[$i] =~ /^D(.*)/) { $devn = $1; last FD; }
if ($F[$i] =~ /^G(.*)/) { last FD; }
if ($F[$i] =~ /^l(.*)/) { $inode
= $1; last FD; }
if ($F[$i] =~ /^k(.*)/) { last FD; }
if ($F[$i] =~ /^l(.*)/) { $lock = $1; last FD; }
if ($F[$i] =~ /^N(.*)/) { last FD; }
if ($F[$i] =~ /^o(.*)/) { $offset = $1; last FD; }
if ($F[$i] =~ /^P(.*)/) { $proto = $1; last FD; }
if ($F[$i] =~ /^s(.*)/) { $size = $1; last FD; }
if ($F[$i] =~ /^S(.*)/) { $stream = $1; last FD; }
if ($F[$i] =~ /^t(.*)/) { $type = $1; last FD; }
if ($F[$i] =~ /^T(.*)/) {
    if ($state eq "") { $state = "(" . $1; }
    else { $state = $state . " " . $1; }
    last FD;
}
if ($F[$i] =~ /^n(.*)/) { $name = $1; last FD; }
print "ERROR: unrecognized file set field: \"$F[$i]\"\\n";
}
}
$fdst = 1;
next;
}
print "ERROR: unrecognized: \"$_\"\\n";
}

```

# Flush any stored file or process output.

```

if ($fdst) { &list_fd }
if ($pidst) { &list_proc }
exit(0);

```

## list\_fd -- list file descriptor information

# Values are stored inelegantly in global variables.

```

sub list_fd {
    if (! $fhdr) {

        # Print header
        once.

        print "  FD  TYPE  DEVICE  SIZE/OFF  INODE NAME\\n";
        $fhdr = 1;
    }
    printf "  %4s%1.1s%1.1s %4.4s", $fd, $access, $lock, $type;

```

```

$tmp = $devn; if ($devch ne "") { $tmp = $devch }
printf " %10.10s", $tmp;
$tmp = $size; if ($offset ne "") { $tmp = $offset }
printf " %10.10s", $tmp;
$tmp = $inode; if ($proto ne "") { $tmp = $proto }
printf " %10.10s", $tmp;
$tmp = $stream; if ($name ne "") { $tmp = $name }
print " ", $tmp;
if ($state ne "") { printf " %s)\n", $state; } else { print "\n"; }

# Clear variables.

$access = $devch = $devn = $fd = $inode = $lock = "";
$name = $offset = $proto = $size = $state = $stream = $type = "";
}

# list_proc -- list process information
#   Values are stored inelegantly in global variables.

sub list_proc {
    print "COMMAND    PID  PGRP  PPID  USER\n";
    $tmp = $uid; if ($login ne "") { $tmp = $login }
    printf "%-9.9s %6d %6d %6d %s\n", $cmd, $pid, $pgrp,
    $ppid, $tmp;

# Clear variables.

    $cmd = $login = $pgrp = $pid = $uid = "";
    $fhdr = $pidst = 0;
}

Found in path(s):
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/scripts/list_NULf.pl
No license file was found, but licenses were detected in source scan.

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- \*/

Found in path(s):

- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsf-org-lsf-4-95-0-0-g67d8c82-tar-gz/lsf-org-lsf-67d8c82/dialects/hpux/kmem/dnode.c
- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsf-org-lsf-4-95-0-0-g67d8c82-tar-gz/lsf-org-lsf-67d8c82/dialects/sun/dproc.c
- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsf-org-lsf-4-95-0-0-g67d8c82-tar-gz/lsf-org-lsf-67d8c82/dialects/darwin/kmem/dproto.h
- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsf-org-lsf-4-95-0-0-g67d8c82-tar-gz/lsf-org-lsf-67d8c82/dialects/hpux/kmem/dproto.h
- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsf-org-lsf-4-95-0-0-g67d8c82-tar-gz/lsf-org-lsf-67d8c82/dialects/n+obsd/dsock.c
- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsf-org-lsf-4-95-0-0-g67d8c82-tar-gz/lsf-org-lsf-67d8c82/dialects/n+os/dstore.c
- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsf-org-lsf-4-95-0-0-g67d8c82-tar-gz/lsf-org-lsf-67d8c82/proc.c
- \*
- /opt/cola/permits/1682050831\_1684512792.1459703/0/lsf-org-lsf-4-95-0-0-g67d8c82-tar-gz/lsf-org-lsf-67d8c82/dialects/n+obsd/dlsof.h
- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsf-org-lsf-4-95-0-0-g67d8c82-tar-gz/lsf-org-lsf-67d8c82/dialects/sun/dnode.c
- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsf-org-lsf-4-95-0-0-g67d8c82-tar-gz/lsf-org-lsf-67d8c82/dialects/darwin/kmem/dnode.c
- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsf-org-lsf-4-95-0-0-g67d8c82-tar-gz/lsf-org-lsf-67d8c82/dialects/n+obsd/dstore.c
- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsf-org-lsf-4-95-0-0-g67d8c82-tar-gz/lsf-org-lsf-67d8c82/dialects/darwin/kmem/dmnt.c
- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsf-org-lsf-4-95-0-0-g67d8c82-tar-gz/lsf-org-lsf-67d8c82/dialects/freebsd/dproc.c
- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsf-org-lsf-4-95-0-0-g67d8c82-tar-gz/lsf-org-lsf-67d8c82/dialects/darwin/kmem/ddev.c
- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsf-org-lsf-4-95-0-0-g67d8c82-tar-gz/lsf-org-lsf-67d8c82/dialects/aix/ddev.c
- \*

/opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/hpux/kmem/machine.h

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/du/dsock.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/OLD/misc.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/hpux/kmem/dfile.c

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\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/freebsd/dnode.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/aix/dnode.c

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\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/sun/dlsof.h

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/du/dproto.h

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/darwin/kmem/dstore.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/du/dnode.c

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\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/OLD/lsof.h

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/aix/dsock.c

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\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/freebsd/dlsof.h

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/store.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/n+os/machine.h

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/opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/du/dmnt.c

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\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/OLD/proc.c

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\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/sun/dsock.c

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\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/darwin/kmem/dlsof.h

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\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/sun/ddev.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/sun/dproto.h

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/n+obsd/dproc.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/n+obsd/machine.h

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/misc.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/du/dlsof.h

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/lsof.h

\*

/opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/sun/dstore.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/hpux/kmem/dstore.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/n+os/dlsof.h

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/n+os/dnode.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/n+obsd/dproto.h

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/sun/machine.h

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/freebsd/machine.h

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*/
```

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```
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-
67d8c82/dialects/darwin/libproc/dproc.c
```

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*/
/* Definitions for data structures and routines for the regular
expression library, version 0.12.
Copyright (C) 1985,1989-1993,1995-1998, 2000 Free Software Foundation, Inc.
```

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```
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/regex.h
```

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/\*

\* GetOpt() -- Local get option

\*

\* Liberally adapted from the public domain AT&T getopt() source,  
\* distributed at the 1985 UNIFORM conference in Dallas

\*

\* The modifications allow '?' to be an option character and allow  
\* the caller to decide that an option that may be followed by a  
\* value doesn't have one -- e.g., has a default instead.

\*/

Found in path(s):

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/main.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/OLD/main.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/OLD/main.c.old

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\* /opt/cola/permits/1682050831\_1684512792.1459703/0/Isuf-org-Isuf-4-95-0-0-g67d8c82-tar-gz/Isuf-org-Isuf-67d8c82/scripts/list\_fields.awk

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/Isuf-org-Isuf-4-95-0-0-g67d8c82-tar-gz/Isuf-org-Isuf-67d8c82/scripts/shared.pl

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\* GetOpt() -- Local get option

\*

\* Borrowed from lsof's main.c source file.

\*

\* Liberally adapted from the public domain AT&T getopt() source,  
\* distributed at the 1985 UNIFORM conference in Dallas

\*

\* The modifications allow '?' to be an option character and allow  
\* the caller to decide that an option that may be followed by a  
\* value doesn't have one -- e.g., has a default instead.

\*/

Found in path(s):

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/tests/LTlib.c

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Notes for the distribution of lsof version 3

\*\*\*\*\*

| The latest release of lsof is always available via anonymous ftp |  
| from vic.cc.purdue.edu. Look in pub/tools/unix/lsof. |

\*\*\*\*\*

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3.49, October 25, 1995  
3.50, October 31, 1995  
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3.61, March 9, 1996  
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3.82, December 11, 1996  
3.83, December 30, 1996  
3.84, January 13, 1997  
3.85, January 17, 1997  
3.86, January 30, 1997  
3.87, February 11, 1997  
3.88, February 17, 1997

Dialects Supported

=====

Lsof (for LiSt Open Files) lists files opened

by processes on  
selected Unix systems. It's a major revision of lsof version 2,  
and has been tested on:

AIX 3.2.5, 4.1.[1234], the IBM RISC/System 6000  
and 4.2  
BSDI BSD/OS 2.0, 2.0.1, Intel-based systems  
and 2.1  
DC/OSx 1.1 Pyramid systems  
EP/IX 2.1.1 the CDC 4680  
FreeBSD 1.1.5.1, 2.0, Intel-based systems  
2.0.5, 2.1, 2.1.5,  
2.2, and 3.0  
HP-UX 8.x, 9.x, 10.01, HP systems (some combinations)  
10.10, and 10.20  
IRIX 5.2, 5.3, 6.0, 6.0.1, SGI systems  
and 6.[1234]  
Linux through 2.0 Intel-based systems  
NetBSD 1.0, 1.1, and 1.2 Intel and SPARC-based systems  
NEXTSTEP 2.1 and 3.[0123] all NEXTSTEP architectures  
OpenBSD 1.2 and 2.0 Intel-based systems  
OSF/1 2.0, 3.0, 3.2, and the DEC Alpha  
4.0-BETA  
Reliant UNIX 5.43 Pyramid systems  
RISC/os 4.52 MIPS R2000-based systems  
SCO OpenServer 1.1, 3.0, Intel-based systems  
and 5.[024]  
SCO UnixWare 2.1 and 2.1.1 Intel-based systems  
Sequent PTX 2.1.[1569], Sequent systems  
4.0.[23],  
4.1.[024],  
4.2[.1], and 4.3  
Solaris 2.[123456], 2.5.1, Sun 4 and i86pc systems  
and 2.6-Beta  
SunOS 4.1.[1234] Sun 3 and 4  
Ultrix 4.2, 4.3, 4.4, DEC RISC and VAX  
and 4.5

(The pub/tools/unix/lsof/contrib directory on vic.cc.purdue.edu  
contains information on other ports.)

If your favorite Unix dialect is not in the list, or if your version  
of it is more recent than the ones listed, please contact me at  
<abe@vic.cc.purdue.edu>.

How Lsof Works

=====



Using available kernel data access methods -- getproc(), getuser(), kvm\_\*( ), nlist(), pstat(), read(), readx(), /proc -- lsof reads process table entries, user areas and file pointers to reach the underlying structures that describe files opened by processes.

Lsof interprets most file node structures -- advfsnodes, autonodes, cnodes, cdrnodes, devnodes, fifonodes, gnodes, hsnodes, inodes, mfsnodes, pcnodes, procnodes, rnodes, snodes, specnodes, s5inodes, tmpnodes. It understands NFS connections. It recognizes FIFOs, multiplexed files, Unix and Internet sockets. It knows about streams. It understands /proc file systems for some dialects. On many dialects it recognizes execution text and library references. It knows about AFS on some Unix dialects.

### Lsof Output

=====

The lsof output describes:

- \* the identification number of the process (PID) that has opened the file;
- \* the process group identification number (PGRP) of the process (optional);
- \* the process identification number of the parent process (PPID) (optional);
- \* the command the process is executing;
- \* the owner of the process;
- \* for all files in use by the process, including the executing text file and the shared libraries it is using:
  - \* the file descriptor number of the file, if applicable;
  - \* the file's access mode;
  - \* the file's lock status;
  - \* the file's device numbers;
  - \* the file's inode number;

- \* the file's size or offset;
- \* the name of the file system containing the file;
- \* any available components of the file's path name;
- \* the names of the file's stream components;
- \* the file's local and remote network addresses;
- \* other file or dialect-specific values.

### Getting Started Quickly

=====

If you want to get started using `lsnf` quickly, or see some examples of how `lsnf` can be used, consult the `00QUICKSTART` file of the `lsnf` distribution.

The `00QUICKSTART` file won't help you build or install `lsnf`, but it will cut through the density of the `lsnf` man page, giving you more readily an idea of what you can do with `lsnf`.

For information on building and installing `lsnf`, consult the `00README` file of the `lsnf` distribution.

### Limiting, Filtering, and Selecting `lsnf` Output

=====

`lsnf` accepts options to limit, filter, and select its output.

These are the possible criteria:

- \* Process ID (PID) number -- to list the open files for a given process;
- \* Process Group ID (PGRP) -- to list the open files for all the processes of a given process group;
- \* User ID number or login name -- to list the open files for all the processes of a given user;
- \* Internet address -- to list the open files using a given Internet address (host name), protocol, or port (number or name); or to list all open Internet files;

- \* command name;
- \* file descriptor name or number;
- \* list all open NFS files;
- \* list all open Unix domain socket files;
- \* list all uses of a specific file;
- \* list all open files on a file system.

Selection options are normally ORed -- i.e., an open file meeting any of the criteria is listed. The selection options may be ANDed so that an open file will be listed only if it meets all the criteria.

In the absence of any selection criteria, lsof lists files open to all processes.

#### Parsing Lsof Output with Another Program

=====

The

lsof -F option directs it to produce "field" output that can easily be parsed by another program. The lsof distribution contains sample awk, perl 4, and perl 5 scripts in its scripts subdirectory that show how to post-process field output.

#### Repeat Mode

=====

Lsof can be directed to produce output, delay for a specified time, then repeat the output, cycling until stopped by an interrupt or quit signal. This mode is useful for monitoring the status of some file operation -- e.g., an ftp transfer or a tape backup operation.

Repeat mode is more efficient when combined with lsof's selection options, since they limit lsof overhead.

It's possible to use lsof's field output options to supply repeat mode output to another process for its manipulation. The scripts subdirectory of the lsof distribution has sample Perl scripts showing how to consume lsof repeat mode output from a pipe.

## Distribution Restrictions

=====

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## Cautions

=====

Lsof is a tool that is closely tied to the Unix operating system version. It uses header files that describe kernel structures and reads kernel structures that typically change from OS version to OS version.

DON'T TRY TO USE AN LSOF BINARY, COMPILED FOR ONE UNIX OS VERSION, ON ANOTHER.

On some Unix dialects, notably SunOS and Solaris, lsof versions may be even more restricted by architecture type. An lsof binary, compiled for SunOS 4.1.3 on a sun4c machine, for example, won't work on a sun4m machine. Although I have no evidence that they exist, the potential for similar restrictions exists in Solaris versions of lsof.

AN LSOF BINARY, COMPILED FOR ONE SOLARIS ARCHITECTURE, ISN'T GUARANTEED TO WORK ON A DIFFERENT SOLARIS ARCHITECTURE.

## Distribution Contents

=====

The lsof distribution is checked for completeness when it is

constructed and by the Inventory script when you run the Configure script. (See The Inventory Script section of the 00README file of this distribution.)

If you're worried you don't have everything, run the Inventory script. Here's an approximate picture of what you should have:

`lsof_<version>:`

```
00CREDITS  00PORTING  Customize lsof_fields.h  proc.c
00DCACHE  00QUICKSTART  Inventory main.c      proto.h
00DIST    00README    arg.c  misc.c    scripts/
00FAQ    AFSConfig  dialects/  node.c    store.c
00MANIFEST  Configure  lsof.h  print.c   version
```

`lsof_<version>/dialects:`

```
aix/   epix/   linux/  osf/   riscos/ sun/
bsd/   freebsd/ netbsd/ ptx/   sco/   ultrix/
common/ hpux/   next/   pyramid/ sgi/   unixware/
```

`lsof_<version>/dialects/common:`

```
00Manifest dvch.frag lkud.frag prtf.frag rnam.frag
ckfa.frag fchi.frag pcdn.frag rdev.frag rnch.frag
cvfs.frag isfn.frag prfp.frag rmnt.frag rvfs.frag
```

Specific dialects sub-directories may differ slightly, depending on the needs of the dialect, but they should all contain:

`lsof_<version>/dialects/next:`

```
Makefile ddev.c dlsof.h dnode.c dproto.h dstore.c
Mksrc*  dfile.c dmnt.c dproc.c dsock.c machine.h
```

`lsof_<version>/scripts:`

```
00MANIFEST    count_pf.perl*  list_fields.awk
00README      count_pf.perl5* list_fields.perl*
big_brother.perl5 list_NULf.perl5* watch_a_file.perl*
```

Warranty

=====

Lsof

is provided as-is without any warranty of any kind, either expressed or implied, including, but not limited to, the implied

warranties of merchantability and fitness for a particular purpose. The entire risk as to the quality and performance of lsof is with you. Should lsof prove defective, you assume the cost of all necessary servicing, repair, or correction.

## Bug Reports

=====

Now that the obligatory disclaimer is out of the way, let me hasten to add that I accept lsof bug reports and try hard to respond to them. I will also consider and discuss requests for new features, ports to new dialects, or ports to new OS versions.

PLEASE DON'T SEND A BUG REPORT ABOUT LSOF TO THE UNIX DIALECT VENDOR.

At worst such a bug report will confuse the vendor; at best, the vendor will forward the bug report to me.

Please send all bug reports, requests, etc. to me via email at <abe@purdue.edu>.

## What's new in Version 3

=====

I had three goals in mind for version 3:

1. Make it faster.

Lsof 3 defers as many lookup operations -- /dev scan, mount table scan, /etc/services scan -- until they're needed.

I used prof on lsof and used its information to reduce lsof's overhead.

2. Make it easier to maintain and port to other systems, and eliminate complicated nestings of #if/#else/#endif pre-processor statements.

3. Add a few features:

- o ANDing of options;
- o Sorting of output by Process ID;

- o Searching for Unix domain sockets by name -- to a limited extent.
- o Process group ID support. (This was a late addition.)

As a result of goal 2, the organization of lsof version 3 differs greatly from version 2. The main directory contains totally common functions, a dialect subdirectory contains subdirectories of code specific to each Unix dialect that is supported. There is also a dialects/common subdirectory that contains code fragments that are used by more than one, but not all dialects.

A top-level Configure script constructs the complete set of sources for a given dialect and the Makefile at the top-level. Configure is self-documenting. When it is finished, Configure calls a second script, Customize, that assists with the modification of a few important compile-time options.

#### Version 3 Release Notes

=====

##### 3.0 May 24, 1994

This is the first official release of lsof 3.

##### 3.01 May 27, 1994

Corrected the `#ifdef` condition for `HASPWSTAYOPEN` under Sequent Dynix 3.0.12.

Fixed bug that prevented the display of current working and root directory path names under SunOS 4.1.x, even when the user area contained pointers to them.

Changed the strategy for allocating space to the local proc table in EP/IX, NEXTSTEP, Solaris, and SunOS.

Closed the distance between reading the Solaris proc structure and its companion pid structure in an effort to avoid using a stale pid structure pointer. A stale pid structure pointer sometimes causes a segmentation violation in `kvm_read()`.

Added code to the SunOS `kread()` function to filter out non-kernel addresses that might lead `kvm_read()`

to a segmentation violation. The Configure script was updated to create a header file, kernelbase.h, with the necessary kernel memory boundary value; and to remove the header file when the -clean option is specified. The Configure script now passes the target name to the Mksrc shell script. It's used by sun/Mksrc to determine the source for kernelbase.h.

### 3.02 June 2, 1994

Added #if's to of kernelbase.h for Solaris and SunOS. This eliminates a redeclaration complaint from old versions of SunOS.

Added code to process\_file() in all dialects to display "no more information" when f\_count in the file structure is zero.

### 3.03 July 8, 1994

Added support for displaying process group IDs. This includes two new options: -j to select PGRP display; and -g<list> to specify a list of PGRPs whose files are to be displayed. (-j was chosen to match a similar option in some ps(1)'s.)

Philippe-Andre Prindeville <philipp@res.enst.fr> suggested this addition.

### 3.04 July 15, 1994

Corrected handling of port name component of -i option on systems where htons() is required.

Corrected casting of UID arguments -- needed when UID is a short and the compiler wants the minimum argument size to be larger.

### 3.05 July 26, 1994

Added printing of DECnet socket information for the Ultrix 4.2 and 4.3 dialects. John Beacom <beacom@wisnud.physics.wisc.edu> kindly provided the test system. A new Configure abbreviation, ultrix42dn, must be used to activate the DECnet support.

### 3.06 September 2, 1994

The major news in this revision are the V/88 R32V3 and R40V4.2 ports for Motorola M88K systems. Chance Neale <cneale@panix.com> kindly provided test systems



and Mike Feldman <feldman@charm.urbana.mcd.mot.com>  
provided technical assistance.

Version 3.06 contains other, minor modifications:

\* The Configure

script has been isolated from the

environment, thanks to a report of a CC=xl  
problem from Johnny Tolliver <jxt@ca04.cad.ornl.gov>.  
Johnny also suggested a better form for the install  
commands in the Makefile's install rule. This  
change affected all the dialect Mksrc scripts.

A new HP-UX abbreviation (hpuxx25) was added  
for systems that have the /etc/conf/x25 include  
files. The old HP-UX abbreviation (hpux) no  
longer references /etc/conf or defines HPUX\_CCITT.

\* The command "lsof `tty`" now works most places (maybe  
not always for SGI IRIX, but I tried) thanks to a bug  
report from Casper Dik <casper@fwi.uva.nl>.

\* A mode has been added to disable forking when  
debugging. The V/88 R40V4.2 debugger needed that.

\* Printing of stream NAMEs was standardized (IRIX  
was different) and an attempt was made to avoid  
stream NAMEs like /dev/ttyx4->/dev/ttyx4.

\* A new documentation file, 00FAQ, accompanies  
the  
distribution. It contains frequently asked  
questions about lsof, and the best answers I can  
manage to give.

\* I have a new HP-UX test system, courtesy of Dave  
Curry <davy@ecn.purdue.edu> and George Goble  
<ghg@ecn.purdue.edu> of Purdue's Engineering Computer  
Network. I want to thank J. Nelson Howell  
<nelson@zeus.mgmt.purdue.edu> of Purdue's School of  
Management for his prior support of lsof development  
under HP-UX.

3.07 September 8, 1994

This revision contains a small security enhancement.  
Tim Ramsey <tar@ksu.ksu.edu> pointed out that lsof's  
setgid or setuid power might allow it's user to  
read an alternate kernel name list or memory file

via the -c and -k options that the real UID might not have authority to read. In revision 3.07 lsof uses access(2) to check the real UID's authority to read files named with -c and -k.

### 3.08 September 23, 1994

This revision contains support for Novell's UnixWare, versions 1.1,

1.1.1, and 1.1.2. Peter Lord

<plord@novell.co.uk> made this possible by providing a copy of UnixWare and supplying technical advice.

Binaries and sources for this version will be available from Novell sources. See the Novell UnixWare section of the distribution's 00README file for details.

This version adds /proc file system support to the dialects derived from SYSV R4 (except EP/IX 2.1.1): FreeBSD, IRIX 5.2, Solaris, UnixWare, and V/88 R40V4.2.

This version compiles under IRIX 4.0.5 again, correcting a problem introduced at version 3.06 in the "lsof `tty`" fix.

HP-UX now skips file systems whose mount type is "ignore". The presence of the -c option is now controlled by the HASCOPT definition in machine.h. The HASSWAPPOR option is now documented and implemented correctly. Hans Petter Christiansen <hpchr@dxcern.cern.ch> suggested these changes.

### 3.09 October 18, 1994

This revision recognizes the DEC Alpha OSF/1 V3.0, IBM AIX 4.1, and

Solaris 2.4 dialects. It has

support for the SunOS 4.1.3 PC file system and two bug fixes: an IRIX, V/88, and Solaris file argument processing bug; and a V/88 include error.

Alex Kreis <akreis@us.oracle.com> made the initial request for DEC OSF/1 V3.0 support and provided help with testing. Ron Young <ron@screamer.nevada.edu> graciously provided a test host. James Woodward <woodward@zk3.dec.com> provided invaluable clues to V3.0 kernel organization. Others who read the alpha-osf-managers mailing list made generous offers of test facilities, and I thank them, too. The

decosf3 abbreviation was added to the Configure script, and the script was modified to request the name of the system configuration subdirectory of /sys where the configuration-specific header files reside for the decosf1, decosf2, and decosf3 configuration abbreviations.

Mark Peek <mark\_peek@taligent.com> provided and tested the AIX 4.1 changes.

Casper Dik <casper@fwi.uva.nl>  
provided and tested  
the Solaris 2.4 changes.

Friedel Loinger <friedel@wise.tau.ac.il> suggested the addition of support for the SunOS 4.1.3 PC file system ("pcfs").

Andreas Stolcke <stolcke@ICSI.Berkeley.EDU> supplied a fix to a file argument processing bug that causes lsof to crash when supplied the path of an NFS mounted file. The bug affects lsof versions for Motorola V/88 R40V4.2, SGI IRIX 5.2, and Solaris 2.[123].

Corrected an error in the path to include prdata.h in dlsof.h for Motorola V/88 R40V4.2.

### 3.10 October 21, 1994

This revision adds support for the cache and PC file systems to Solaris. It fixes these bugs: a problem with the display of Motorola V/88 R40V4.2 device numbers; and a failure of Readlink() to resolve symbolic links completely in all cases.

Some major internal restructuring was necessary to be able to display negative inode numbers for SunOS PC file system nodes, while displaying them as unsigned numbers for Solaris, hence all dialect versions were affected.

### 3.11 October 28, 1994

This revision adds support for Linux version 1.0.9. Tim Korb <jtk@arthur.cs.purdue.edu> kindly provided a development system in the Computer Science Department at Purdue. It is likely that the Linux revision will have to be adjusted for each installation,

and it is probable that this revision will not run under later versions of Linux. See the 00FAQ and 00README files for more information on Linux tuning.

### 3.12 October 29, 1994

This revision supports Linux version 1.1.47 -- the Yggdrasil Plug-and-Play Linux Fall '94 release. Both Linux versions now obtain kernel symbol addresses from the /zSystem.map file.

November 4, 1994

Hendrik G. Seliger <hank@Blimp.automat.uni-essen.de> reports that lsof compiles and seems to work under Linux 1.1.61. He used the linux1147 Configure abbreviation. Marty Leisner <leisner@sdsp.mc.xerox.com> reports that the linux1147 Configure abbreviation produces a working lsof for Linux 1.1.64, too.

### 3.13 November 11, 1994

This revision contains Pyramid DC/OSx support, provided by Anthony Shortland <Anthony.Shortland@FMR.com>.

Marty Leisner <leisner@sdsp.mc.xerox.com> reported a segmentation violation failure in Linux lsof. In response I changed its task structure access to use /dev/kmem instead of mmap'ing kernel memory. This avoids a possible segmentation violation when bad pointers are obtained from kernel memory. I also enabled the setting of Linux INET and Unix select flags so that the -n and -U options work -- I forgot to do that when I did the Linux port.

Marty Leisner reports that the linux1147 Configure abbreviation produces a working lsof for Linux 1.1.64, too.

Francois Pindard <pinard@iro.umontreal.ca> provided a correction to the Linux install rule.

### 3.14 November 16, 1994

This revision adjusts the Configure script stanzas for DEC OSF/1, Motorola V/88, Pyramid DC/OSx, and Ultrix. It also contains additional support for DC/OSx and Ultrix.

Bruce Beare <bjb@pyramid.com> and Robert Vernon

<bob@pyramid.com.au> helped me understand Pyramid nomenclature. Robert Vernon provided DC/OSx support for the RxFS file system and added machine series auto-detection to the Configure script. Alex Podlecki <a.podlecki@att.com> helped test the updated DC/OSx distribution.

Chris Timmons <skynyrd@tahoma.cwu.edu> provided information on RISC and VAX Ultrix 4.4 that led to correct prefixing of nlist() names. I updated the Configure script to detect Ultrix version, machine hardware type, and the presence of DECnet support.

I also updated the OSF/1 and V/88 Configure scripts to determine configuration parameters automatically.

### 3.15 November 25, 1994

Corrected DEC OSF/1 V2.0 support of the ADVFS file system.

Bernt Christandl <beb@mpe-garching.mpg.de> and Alex Kreis <akreis@us.oracle.com> helped test. No OSF/1 V1.x system with ADVFS was available for testing.

### 3.16 December 2, 1994

Fixed some device number handling bugs in DEC OSF/1 V2.0 and V3.0 support.

### 3.17 January 25, 1994

Isf now supports SGI IRIX 5.3, thanks to changes supplied by Dave Olson <olson@anchor.engr.sgi.com>; and SCO OpenDesktop or OpenServer releases 1.1 and 3.0, thanks to support from Dion Johnson <dionj@sco.com>, Bela Lubkin <belal@sco.com>, and Nathan Peterson <nathanp@sco.com>.

Dave Olson pointed out an IRIX stream handling bug in `sgi/dnode.c`. When I investigated it, I found that it had implications wider than SGI IRIX. The eventual fix provided the display of inode numbers for character devices when the inode number must be obtained from `/dev`. IRIX, Solaris, and SunOS benefit from the fix.

I added version detection to the Configure script, so there is now just one Configure abbreviation for IRIX versions 4.05, 5.2, and 5.3 -- ``irix''.

(The Configure abbreviation for the SCO dialect ``sco".)

Ian

Darrow <ian@sq.com> pointed out that lsof wouldn't Configure or work properly under Solaris on an i86pc. Sorting out the difficulties made clear that the HASSWAPPOR definition should be removed from every machine.h file and that ntohs() should be used in every dsock.c on every port supplied to printinaddr().

Andreas Stolcke <stolcke@ICS.Berkeley.EDU> pointed out a method that sometimes allows lsof to report on files open to a crashed or unavailable remote NFS server. This led to the addition of code, where possible, to estimate the device number of mount points that cannot be stat()'d. The alternate device number can come from /etc/mstab or /etc/mnttab, or from the dialect's version of them. On systems that use /etc/mstab or /etc/mnttab, it is sometimes possible to add the device number manually to the mount options field in the form ``dev=xxxx". Some internal changes in the way lsof handles device numbers were necessary to prevent ones whose dev\_t typedef is a signed short from causing sign extension when promoted to integers as function arguments.

David Addison <addy@meiko.co.uk> and Robert Ehrlich <Robert.Ehrlich@inria.fr> pointed out that lsof errs when reporting device numbers and other node information for some special Sun files. I rewrote most of sun/dnode.c to correct the problem; Robert rewrote it again; and I rewrote it once more. David and Robert helped me test it under Solaris 2.[34] and SunOs 4.1.[23].

While using code from the Motorola V/88 port for the SCO port, I found and fixed some NFS bugs in the V/88 port.

3.18 January 31, 1995

I added the -b and -w options. The -b option causes lsof to avoid the functions lstat(2), readlink(2), and stat(2) that might block in the kernel -- e.g., when they reference an inaccessible NFS file system. Instead it uses alternate device numbers obtained

from the mount table, where possible.

The -w option causes lsof to suppress warning messages -- e.g., when the -b option has been specified. The suppression of warning messages was formerly bundled into the -t option. The -t option now selects -w.

I figured out how to make alternate AIX 3.2.5 device numbers from the kernel mount structure. The new -b option therefore works under AIX 3.2.5.

With the help of Chance Neale <cneale@panix.com> I fixed bugs in the Motorola V/88 R32V3 NFS support.

I added a solariscc Configure abbreviation for those who want to use Sun's C compiler.

3.19 February 10, 1995

Robert Ehrlich <Robert.Ehrlich@inria.fr> pointed out that lsof might be able to gather more complete path name information from the kernel's name cache. Name cache access may be inhibited with the new -C option. Revision 3.19 implements name cache access for:

- DEC OSF/1 [23].0
- Dynix (Purdue 3.0.12)
- EP/IX 2.1.1
- FreeBSD 1.1.5.1
- HP-UX 9.01
- Motorola V/88 R40V4.2
- NEXTSTEP 3.1

SGI IRIX 5.3

- Solaris 2.[34]
- SunOS 4.1.x
- Ultrix 2.2 and 4.2

Revision 3.19 does NOT implement name cache access for:

===

AIX           The knlist() function won't  
return cache addresses --  
some IBM wisdom to "protect"  
their customers.

Linux My only access is to 1.0.9,

and it doesn't seem to have  
a kernel name cache.

Motorola V/88 It doesn't have a unified  
R32V3 name cache.

Novell UnixWare I don't have a test system.

Pyramid DC/OSx I don't have a test system.

SCO OpenDesktop It doesn't have a unified  
OpenServer name cache.

SGI IRIX 4.0.5H I saw no unified name cache  
in the header files before  
my 4.05H system was converted  
to 5.2.

SGI IRIX 5.2 I don't have a test system.

Another Robert Ehrlich suggestion led to the  
establishment of a device cache file feature. The  
new -D option gives control of it. This feature  
speeds lsof dramatically  
on some dialects after  
lsof has been called once and the cache has been  
built. (Calling stat(2) on several hundred or  
thousand /dev nodes can take a long time.) The  
feature can be disabled or modified in the machine.h  
header file and the dialects/\*/ddev.c source file  
when lsof is built.

3.20 February 23, 1995

Upgraded Linux socket handling for versions 1.1.75  
or greater with help from Marty Leisner  
<leisner@sdsp.mc.xerox.com> and Linus Torvalds  
<Linus.Torvalds@cs.Helsinki.FI>. There is now a  
single Configure script abbreviation for linux.

Updated for Motorola V/88 R40V4.3 with help from  
Mike Feldman feldman@charm.urbana.mcd.mot.com>  
and Chance Neale <cneale@panix.com>.

Updated for SGI IRIX 6.0 with help from Przemek  
Klosowski <przemek@rrdjazz.nist.gov and Dave Olson  
<olson@anchor.engr.sgi.com>.

Corrected access of device cache file that needs



to be updated so that someone other than the file owner can rewrite it. Deleted the chmod() failure warning.

Updated

Configure and the Sun Makefile to specify absolute paths to the Sun install program.

3.21 March 3, 1995

Removed BSDI BSD/386 support, because I no longer have a test system, and I needed to have separate sources for two of the three dialects (FreeBSD, and NetBSD) once served by the BSDI BSD/386 sources. FreeBSD sources are now in the freebsd subdirectory; NetBSD, in netbsd.

With the help of Greg Earle <earle@isolar.Tujunga.CA.US> and Paul Kranenburg <pk@cs.few.eur.nl> installed new NetBSD support for versions 1.0 and 1.0A. The NetBSD 0.9 support was removed. The 1.0A support has been tested on Intel and SPARC-based systems.

3.22 March 9, 1995

Fixed a bug in name cache handling that occasionally caused lsof to cause a segmentation violation on FreeBSD. Although the bug didn't do that anywhere else, recreated the binaries of all dialect versions that use the affected code from rnam.frag and rnch.frag.

3.23 March 24,  
1995

Removed forgotten HASSWAPPOR reference from HP-UX machine.h and inserted ntohs() calls in the printinaddr() calls of dsock.c for HP-UX and NEXTSTEP.

Added support for NEXTSTEP 3.3, courtesy of Allan Nathanson <ajn@NeXT.com>

3.24 March 31, 1995

Changed Configure script to handle DEC OSF/1 V3.2. Removed leading zero from DEC OSF/1 and ADVFS version values. Added dialects/osf/dec\_a/3.2 header file directory, courtesy of Dave Morrison <dmorriso@us.oracle.com>, who also tested the 3.24 DEC/OSF1 V3.2 lsof.

3.25 April 5, 1995

Ported to RISC/os on a R2030 (R2000-based) system,

provided by Zdenko Tomasic <zdenko@harvey.cam.rice.edu>.

Tightened security on the device cache file; lsof always tries to change its ownerships to the effective IDs after creating it. This was suggested by Stefan Kelm <kelm@cert.dfn.de>.

Ported to FreeBSD 2.0, starting with work done by Kurt Jaeger <pi@complx.stgt.sub.org> on lsof revision 3.16. Ade Barkah <mbarkah@hemi.com> and William McVey <wam@cs.purdue.edu> provided test systems.

3.26 April 20, 1995

Ported to SCO OpenDesktop or OpenServer 5.0 (aka Everest and 3.2v5.0.0). Hugh Dickins <hughd@sco.COM>, Bela Lubkin <belal@sco.COM>, Craig B. Olofson <craigo@sco.COM>, and Nathan Peterson <nathan@sco.com>, provided me an early-release version of 3.2v5.0.0 and gave technical advice.

Added length checking of the Namech buffer to the printinaddr() function.

3.27 May 2, 1995

Corrected typo in AIX install rule, courtesy of a report from John Colgrave <colgrave@hursley.ibm.com>.

At the suggestion of Greg Earle <earle@isolar.Tujunga.CA.US> added a function to print the name of the unknown protocol (the AF\_\* symbol), when there is no specific processing for it in dsock.c. This change affected most dialects: exceptions are DC/OSx, Linux, Motorola V/88, and UnixWare.

3.28 May 26, 1995

Added support for Sequent PTX 2 and PTX 4. The PTX 2.1.6 and PTX 4.0.2 test systems and technical advice were provided by Gerrit Huizenga <gerrit@sequent.com>, Peter Jordan <petej@sequent.com>, Kevin Smallwood <kcs@sequent.com>, and Mike Spitzer <mks@sequent.com>. (Thomas A. Endo) <tendo@netcom.com> and (David Putz). <PutzDW@PO1.LMB.unisys.com> tested under PTX 2.1.5. Bob Foertsch <foertsch@uiuc.edu> tested under PTX 4. Kevin Smallwood tested under 2.1.1. Others who helped include Shane Kenney

<shane@sequent.com>, Stephan Rossi <rossi@mtu.edu>, Douglas R. Smith <drsmith@us.oracle.com>, and Joel White <jdwhite@netcom.com>.

Changed the local dev structure's name to l\_dev to avoid conflicts with the PTX dev structure. Added a common/rdev1.frag -- a variant of rdev.frag. It's used by EP/IX, PTX, RISC/os, and V/88.

Changed printname() to check Namech first and print it if it contains something. This eliminates some hacks in the handling of names for streams, but generates some duplicate device name look-up code in the dnode.c files of some dialects.

3.29 June 2, 1995

Added clone device support to Motorola V/88 R40V4.3.

Added a generic ``-X" option for dialect-specific use. Used it in AIX to allow use of readx(). Lsof no longer uses readx() by default, because its use can cause an AIX 3.2.x and 4.1.x kernel error to appear. Kevin Ruderman <rudi@acs.bu.edu> reported this bug to me and the possibility that lsof might trigger it.

The error, known as the Stale Segment ID bug, hangs the kernel in its dir\_search() function, thus hanging the application process that called it so tightly that the application process can neither be killed nor stopped. The bug does not directly affect lsof, but may cause the hang when the kernel is searching directories for other processes. 00FAQ and 00README describe the Stale Segment ID bug in more detail. Consult dialects/aix/machine.h for options on enabling or disabling readx() by default, or permanently enabling or disabling it with the HASXOPT and HASXOPT\_VALUE definitions.

When not using readx(), AIX lsof may not report fully on all text and loader references. Changes to the kernel getuser() function in AIX 4.1.1 appear to have eliminated the text file and loader file reference information that once led lsof to use readx(); of course, without that information, lsof can no longer report on the executing text file or

shared libraries in 4.1.1.

Changed the Configure script to use a single abbreviation, aix, for AIX. Configure now uses /usr/bin/oslevel to determine the AIX version; in the absence of /usr/bin/oslevel, Configure issues a warning and assumes the version is 3.2.0. Source code changes were made to dialects/aix/\*.ch to accommodate the new form of the \_AIXV value.

3.30 June 8, 1995

Added -c to the installation of the man page in the Ultrix Makefile's install rule. Thanks go to Jules van Weerden <Jules.vanWeerden@let.ruu.nl> for noticing this omission.

Made FreeBSD 2.0 changes: 1) added automatic sensing of the FreeBSD 2.0 boot file path, using the getbootfile(3) function (suggested by Ade Barkah); 2) changed kvm\_getprocs(3) function call to use KERN\_PROC\_ALL symbol from <sys/sysctl.h>, thus eliminating incorrect use of the <sys/kinfo.h> and <sys/kinfo\_proc.h> header files; and 3) removed <sys/kinfo.h> and <sys/kinfo\_proc.h> header files from the dialects/freebsd/include/2/sys subdirectory of distribution.

Tested under AIX 4.1.2.

3.31 June 16, 1995

Added the NOUSAGEONERR definition to allow lsof to be compiled with the displaying of usage information after option error messages disabled. Lsof is distributed without the NOUSAGEONERR definition -- i.e., usage output is displayed after option error messages.

Worked on documentation in the 00\* files and the man page, adding tables of contents, making usage more consistent, trying to insure proper dialect titles, and inserting some notes about distribution restrictions (few) and warranty (none).

Fixed Motorola V88 R32V3 bug in handling Internet files. This bug was introduced some time ago, but I have only recently been able to test under R32V3

again.

### 3.32 June 23, 1995

Added the ability to the Linux `nlist()` function to automatically detect that the kernel binary is COFF or ELF form. Also corrected the `UID_ARG` cast from `int` to `u_int`. These changes were suggested by Michael Shields <shields@tembel.org>. Joseph J. Nuspl Jr. <nuspl@nvwls.cc.purdue.edu> provided a test system.

Updated `lsof` for HP-UX 10. Richard Allen <ra@rhi.hi.is> provided a test system. The `hpux` stanza in the HP-UX configure script was updated to sense the HP-UX version automatically, and to sense the availability of CCITT header files in `/etc/conf/x25`.

### 3.33 June 28, 1994

Added options to select "field" output that can be parsed by a subsequent program. (The `-f`, `-F`, and `-0` options form the selection set.) Provided sample `awk` and `Perl` scripts for parsing and displaying field output. This feature was suggested by Dan Bernstein <djb@silverton.berkeley.edu>.

Tested under `PTX 4.0.3`.

### 3.34 June 30, 1995

Changed display of file offset to decimal in the form `"0t12345678"` if it is less than 100,000,000. The offset is displayed in hexadecimal in the form `"0x12abcdef"` if it is larger than 99,999,999.

Changed inode field output from signed to unsigned decimal. Updated the `list_fields.{awk,perl}` and `list_NULf.perl5` scripts.

Documented the truncated inode output form (leading ``*'`` and 5 digits) for inodes that are too large for the output field; thanks go to Leonard Sitongia <sitongia@zia.hao.ucar.edu> for pointing out that this wasn't documented.

### 3.35 July 9, 1995

Added loopback file system support to Solaris with advice from Casper Dik <casper@Holland.Sun.COM>.

Removed the NOUSAGEONERR compile option in favor of producing a shortened usage message when option errors are detected.

Marty Leisner <leisner@sdsp.mc.xerox.com> provided code to validate the Linux system map file (/System.map or /zSystem.map). If lsof detects that the system map file doesn't match the booted kernel, it complains and quits.

Updated host name cache to include dot forms -- e.g., when the host name can't be obtained via gethostbyaddr(). This prevents subsequent lookup delays for the same address.

### 3.36 July 20, 1995

Updated kernel name cache handling to assume a default size for pointer-linked caches (DEC OSF/1, FreeBSD, NetBSD, and SGI IRIX 5.3) when the kernel's cache size variable has a value of zero. A warning is issued, but lsof proceeds to read and use the name cache.

Folded rdev1.frag into rdev.frag by supporting a HASDNAMLEN #define for those dialects whose DIRTYTYPE structure has a d\_namlen definition.

Updated Linux distribution to avoid using d\_namlen from struct dirent if the Linux version is 1.2.10 or greater. This avoidance might work on earlier version of Linux, too, but I have no way of telling.

Added support for FreeBSD 2.0.5. Ade Barkah <mbarkah@hemi.com> provided a test system.

Added WARNDEVACCESS definition to machine.h control the default issuance of device directory and subdirectory access errors.

Changed options:

- m (mount warning) option deleted
- c (core file) option changed to -m
- c option redesignated as command selector
- d (device warning) option deleted
- d option redesignated as file descriptor selector
- O (order) option changed to less-overhead option
- r option added to enable repeat mode

Added a repeat mode in which lsof will display output, sleep for the number of seconds defined by the repeat-mode option, -r <seconds>, and then display output again, doing this repetitively until it receives an interrupt or quit signal. This option is much more efficient for monitoring a file than calling lsof repeatedly from a shell script, since it entails only one set of lsof startup operations.

The CANDOCHILD compile-time option has been removed. The -O run-time option will do the same thing.

### 3.37 July 27, 1995

Fixed incorrect setting of low-overhead flag from -O option.

Marty Leisner reports that d\_namlen is not needed under Linux 1.2.8. Changed the #if test that sets HASDNAMLEN accordingly.

Made more changes to option processing: combined -f, -F, and -0 into -F (-0 becomes a field identifier value for -F); now allow -F, -g, -r, and -S to have an optional value; made -F? (help) and -F0 (all fields plus NUL terminator) special forms of -F; and added support for --. These option processing changes are handled with a local getopt() function (named GetOpt()) to avoid confusion).

Made yet another attempt to create "standard" install and deinstall SunOS/Solaris Makefile rules.

Corrected improper use of examine\_lproc() when in repeat mode.

### 3.38 August 3, 1995

Modified Linux and PTX to show TCP's "send next" sequence number as the offset for TCP socket files.

Added some version tests for Linux 1.3.0, provided by Roman Gollent <roman@portal.stwing.upenn.edu>.

Added some more PTX tests around code that shouldn't be active when the NFS layered product is unavailable.

Mark Vasoll <vasoll@a.cs.okstate.edu> provided them.

### 3.39 August 10, 1995

Added generic support for dialect-specific elements in the lfile structure. The HASLFILEADD and SETLFILEADD macros are used in lsof.h to define the elements and in proc.c to preset them. Field identifiers `1' through `9' are allocated to dialect-specific files. The HASFIELDAP<x> strings define the -F? help text for the FieldSel[] table of store.c, and LISTLFILEAP<x> are macros, used in the print\_proc() function of proc.c, to list fields. (<x> is the field identifier.) Other private element and field processing should be done in dialect-specific modules.

Used {HAS,SET}LFILEADD, HASFIELDAP[12], and LISTLFILEAP[12] to define and list link count and inode address lfile elements under PTX. Used the -X option to control when the values are displayed.

### 3.40 August 25, 1995

Added support for Solaris 2.5-BETA, including rudimentary support for door files and extensive support for fattach'ed files with the help of Henry Katz <hkatz@panix.com>, Joseph Kowalski <jek3@jurassic.Eng.Sun.COM>, and Mike Tracy <mtrac@jurassic-45.Eng.Sun.COM>.

Changed most dialects to use slightly safer fchown() on the device cache file. Changed dvch.frag to avoid creating a device cache file that is owned by root. Cleared caches when reading of device cache file fails and removed extra NL from device cache error messages.

After receiving yet another complaint about Makefile install rules, I decided to remove all install and deinstall rules from the distribution Makefiles.

The Makefiles now contain a set of comments (echo commands) that describe what the install rule might be. The lsof user is now free to construct install and deinstall rules that meet local conventions and preferences.

### 3.41 September 5, 1995



Changed Linux kernel symbol handling to avoid the stripping of leading `\_' characters that was installed in revision 3.32. (Recent Linux kernels have some symbols that are the same except for the leading `\_.')

The Linux kernel loader format is now determined by testing for "\_system\_utsname" (COFF) and "system\_utsname" (ELF) in the symbols returned by the get\_kernel\_syms() syscall. If neither or both symbols are present, a warning is issued and COFF format is assumed. If the loader format is COFF, then kernel symbols important to lsof are assumed to have a leading `\_'.

Because recent Linux releases add a parameter hashing suffix to kernel symbols, lsof removes it before comparing kernel symbol names and addresses to those in /[z]System.map.

Marty

Leisner, Keith Parks <emkxp01@mtcc.demon.co.uk>, and Michael Shields helped me with the Linux changes.

After much discussion of the security of the device cache file on the bugtraq mailing list, I adopted a suggestion from Dave Sill <de5@sws5.CTD.ORNL.GOV>. His suggestion removes the world-writable device cache file from /tmp and creates instead a mode 0600 device cache file in the home directory of the real user ID that is executing lsof. Lsof issues a warning message when it does this. (The warning can be suppressed with -w.) The HASDCACHE definition becomes a relative path. When lsof is run from root, it will create a device cache file in root's home directory, e.g., / or /root, but the file will be readable and writable only by root. This should make the device cache file much more secure.

Added support for SGI IRIX 6.1. Dave Olson provided technical support and Przemek Klosowski supplied a test system. Since Przemek's system formerly supported my testing of lsof for IRIX 6.0, its update to 6.1 means I have not tested lsof under IRIX 6.0 since revision 3.39.

Changed name list structure element initialization for V/88 to make gcc happy. Albert Chin-A-Young <china@cig.mot.com> suggested this.

#### 3.42 September 7, 1995

Changed device cache file naming process to add a suffix formed of an underscore, followed by the first component of the host name returned by `gethostname(2)`. This allows `lsf` to create separate device cache files for each host from which it is run for the same UID when the UID's home directory is shared by the hosts via NFS.

#### 3.43 September 12, 1995

Enabled SCO searching for stream files and Release 5.0 Unix domain socket files by name.

Defined `HASDOPTPATH` for dialects that can supply a path with `-Db`, `-Dr`, and `-Du`. Defined it for all but `DC/OSx`, `UnixWare`, and `V/88`. Used it in the `ctrl_dcache()` function of `arg.c` to enable and disable `-Db`, `-Dr`, and `-Du`.

Used `is_readable()` in `dvch.frag` when opening the device cache file for reading.

#### 3.44 September 19, 1995

Added test for `setuid-root` state so that some security-sensitive code now disabled by `#define`'s can be dynamically disabled.

Enhanced, extended, improved, secured, and documented formation and use of the device cache file path. More options, more carefully controlled are now available. A separate documentation file, `00DCACHE`, accompanies the distribution to explain the device cache file path handling.

Where possible, `lsf` now drops `setgid` permission as soon as possible. Two exceptions are the Solaris and SunOS versions of `lsf` which need to close and re-open `kvm` access. `Setuid-root` `lsf` implementations must retain that permission to access files in `/proc`.

Improved the `README.lsf_<revision>` file that appears in the `lsf` wrapper tar file with help from Jon A. Tankersley <tank@amoco.com>.

Added Veritas file system support to the HP-UX dialect port.

Albert Chin-A-Young tested lsof under Motorola V/88 R40V4.1 and provided #if/#else/#endif changes.

#### 3.45 September 20, 1995

Enabled setgid permission surrender for Solaris and SunOS dialects.

#### 3.46 October 5, 1995

Added more conversions to HASPERSDC, based on suggestions from John Gardiner Myers <jgm+@CMU.EDU>. They make it possible to locate the personal device cache file in /tmp, for example. A new -D function, `?', reports device cache file name formation information.

Gained access to AIX 4.1.3, compiled lsof there, and found that it seems to work.

Tested lsof under FreeBSD 2.1.0-950726-SNAP. John Clear <jac@dragonfly.vet.purdue.edu> kindly provided a test system.

Added a Customize script that helps with the job of modifying some important (e.g., security-related) compile-time options. Configure calls Customize, but can be told not to with the -n|-nocust options.

Fixed over-sensitivity to unexpected kernel file structure pointer values in HP-UX version that led to premature exit. Lionel Cons <cons@dxcern.cern.ch> pointed out the problem.

With the help of Leif Hedstrom <leif@infoseek.com> identified a pair of conflicting Solaris 2.4 patches that prevent lsof from working. A work-around is described in section 00FAQ.

#### 3.47 October 16, 1995

Enabled suppression of an HP-UX pstat() warning message. Added big\_brother.per15 to field output scripts/ subdirectory. Both changes are courtesy

of Lionel Cons <Lionel.Cons@cern.ch>.

Added a test for automount detritus in the SCO mount table.

Added kernel name cache support to SCO dialect. Modified most name cache support to report full path names without the intervening `` -- " when possible.

Added an Inventory script to check the contents of the distribution, using a new file, 00MANIFEST. The Configure script normally calls Inventory. Changed the -n option to Configure to avoid calling the Customize and Inventory scripts and dropped the -nocust option. The presence of .neverCust suppresses the calling of Customize; .neverInv, Inventory. The Inventory script creates .ck00MAN when it completes, so that subsequent calls to Inventory won't check the inventory again -- although the caller is given the opportunity to have the inventory rechecked.

Added PTX 4.1.0 support, courtesy of a test system supplied by Kevin Smallwood <kcs@sequent.com>.

Picked lint for gcc in the V/88 dproc.c from hints provided by Albert Chin-A-Young <chinay@cig.mot.com>.

3.48 October 20, 1995

Improved root directory detection during name cache lookup.

Remove the Novell UnixWare and Pyramid DC/OSx ports from the distribution, because I have not been able to test them for 40 or more revisions. Their pieces may now be found on vic.cc.purdue.edu in pub/tools/unix/lsof/OLD/{binaries,dialects}.

Corrected an error in Customize that caused it to incorrectly redefine HASSYSDC to HASSYSDCPATH. This was reported by Michael Beirne <beirne@dcdrv0.fnal.gov>.

Made sure that lsof will compile when HASDCACHE is undefined. A problem with a reference to the DChelp symbol was reported by Vasco Pedro <vp@fct.unl.pt>

and resolved by always defining DChelp.

Corrected handling of -c and -m options.

Corrected the reading of the SCO /etc/mnttab. Bela Lubkin <belal@sco.com> helped me understand its special multi-line format. The "nothing/nowhere" lines are continuations of the file system directory and device names when either are > 31 characters.

Corrected SCO version list in Configure help output.

Update special SCO name cache code to make it more robust.

Add support for IRIX 6.0.1 with the help of Eberhard Mater <system@grzap1.rz.go.dlr.de>.

### 3.49 October 25, 1995

Removed need for dialects/sgi/irix601hdr subdirectory, replacing it with one created by dialects/sgi/Mksrc and composed of symbolic links to dialects/sgi/irix6hdr. Eberhard Mater did the testing.

Added file system inode number to the local file structures of the DEC OSF/1, DYNIX, EP/IX, HP-UX, NeXT, PTX, RISCos, SGI, Sun, and V/88 dialects. Added code to name cache, node, and VFS functions to set the file system inode number and use it for faster recognition of files on the file system mount point.

Added kernel name cache support to Linux. This has been tested only under release 1.2.13.

### 3.50 October 31, 1995

Updated 00FAQ: reorganized and renumbered sections; added some DEC OSF/1 sections; section about the Solaris and SunOS Sun KERNELBASE.

Added an alternative readdir() function, called ReadDir(), to dialects/osf/ddev.c This function was supplied by Duncan McEwan <duncan@comp.vuw.ac.nz>, who discovered that the getdirentries() function in DEC OSF/1 versions 3.[02] returns an incorrect length for the /dev/fd directory when it is a file system mount point. Modified the Configure script

to  
define USELOCALREADDIR for 3.[02] to enable  
using this local function.

Modified the Solaris/SunOS Mksrc to create a dummy  
(empty) kernelbase.h for Solaris 2.5 (5.5).

3.51 November 8, 1995

Modified the Configure script to declare the kernel  
state definitions appropriate to IRIX 6.1 on IP21  
and IP26 platforms. News of the need for this came  
from Kate Fissell <Kate.Fissell@IUS4.IUS.CS.CMU.EDU>  
and Dave Olson <olson@anchor.engr.sgi.com>.

Modified the SGI IRIX dproc.c to provide more  
information when the kernel's idea of the size of  
a proc structure doesn't match sizeof(struct proc).  
This mismatch can occur if the wrong kernel state  
definitions are used to condition the header files  
(e.g., <sys/proc.h>) included when compiling dproc.c.

Made the -i option with no arguments equivalent to  
the -n option -- i.e., they both select the listing  
of all open Internet files.

Supplied a missing "you" in the Customize script  
introduction. John Jackson <jrj@cc.purdue.edu>  
noticed  
the omission.

Modified the Customize script to put long messages  
in here documents rather than echo statements, so  
that changing and reformatting them is easier.  
John Jackson offered this helpful suggestion.

Fixed a port number cast bug in Solaris 2.[45],  
courtesy of information and code supplied by Allan  
Black <allan@scotnet.co.uk>.

Automated the detection of Solaris 2.4 patches  
101945-32 and 102303-02 that cause the installed  
kernel's user structure to differ from the one  
defined by <sys/user.h> because of a patch to  
<sys/auxv.h> that wasn't applied when the kernel  
was built. The Configure script invokes an alternate  
auxv.h file and warns that it is doing so.

Fixed a problem with Inventory script that shows up

on systems where echo is not an sh built-in. The bug was reported by Scott Ballew <smb@cc.purdue.edu>.

3.52 November 27, 1995

Added support for Linux versions 1.3.22 and above, courtesy of changes supplied by Keith Parks <emkxp01@mtcc.demon.co.uk>.

Changed -d option processing to allow specification of a comma-separated list of file descriptors.

Modified SCO support to allow NFS code to be optional at the request of Dave Gilbert <agere!dgilbert%peapod.com@zool.interaccess.com>.

Enabled HP-UX 10.x version to display device and inode numbers for FIFOs. The problem was reported by Jeff Earickson <jaearick@colby.edu>.

3.53 December 8, 1995

Enhanced NeXTSTEP FIFO reporting.

Fixed a formatting problem in the man page, reported by Angel Li <angel@flipper.rsmas.miami.edu>.

Added support for DEC OSF/1 4.0-BETA. Angel Li provided the test system.

Added a -v option to display lsof version information. Marty Leisner <leisner@sdsp.mc.xerox.com> suggested this.

Replaced touch with echo in Inventory script to avoid DEC OSF/1 4.0 complaint.

Tested under PTX 4.1.2.

3.54 December 15, 1995

Added support for IRIX 6.2-BETA. The support for older IRIX versions changed considerably in the process. Revision 3.54 has been tested under these older IRIX versions: 5.3 and 6.1. Angel Li <angel@flipper.rsmas.miami.edu> provided a test system and Jim Brown <jim@guanabana.rsmas.miami.edu> helped.

Tested under AIX 4.1.4.

Decommissioned the DYNIX port -- I no longer have access to a test system.

Added the HASXOPT\_ROOT define to allow the lsof builder to restrict the use of the dialect-specific X option (AIX and PTX currently) to processes whose real user ID is root. Updated the Customize script to provide an easy mechanism to change HASXOPT\_ROOT. AIX uses HASXOPT\_ROOT; PTX does not. This change was suggested by R. Lindsay Todd <toddr@rpi.edu>.

3.55 December 22, 1995

Eliminated need for modified DEC OSF/1 headers by using #undef and #define statements. Chip Stettler <STETTLERC@wlmpl.wilm.ge.com> helped test.

Added quick start documentation file, 00QUICKSTART, containing examples and explanations of lsof use.

Verified that lsof works under the released Solaris 2.5.

3.56 January 2, 1996

Corrected lock reporting for Solaris 2.[345].

Corrected Linux malloc() kernel symbol handling bug, reported by Keith Parks <emkxp01@mtcc.demon.co.uk>.

Corrected AIX loader text file selection bug; it caused all process IDs to be listed when the -t option and one file system name was specified. The bug was reported by Christopher C. Evert <cevert@wii.com>.

Made sure Solaris Kb variable is zeroed before first use.

3.57 January 12, 1996

Updated SunOS port to obtain lock information from v\_filocks and the lock\_list struct to which it points.

Changed -H to -n. The function formerly performed by -n can be done by using -i with no address.



Updated Linux FIFO support so that the display for FIFOs contains device number, inode number, and NAME. Johannes Kroeger <jkroeger@squirrel.owl.de> reported the lack of these items in the Linux FIFO display.

Added  
RCS identification to header files, Makefiles,  
and common fragments.

Added BSDI BSD/OS support for 2.0, 2.0.1, and 2.1-BETA.  
Terry Kennedy <terry@spcvxa.spc.edu> kindly provided a  
2.1-BETA test system and did the 2.0.1 testing.

Modified the Inventory script to compensate for dialects  
that have an expr that doesn't set its exit code when  
string matches fail.

Converted internal representations of file offset and  
size to unsigned long.

Corrected bug in NetBSD lock handling.

Corrected bug in FreeBSD file system type name handling.

Keith Parks <emkxp01@mtcc.demon.co.uk> reports lsof  
3.57 compiles and runs under Linux 1.3.56.

3.58 February 7, 1996

Changed Solaris 2.3 configuration to pass the level  
of patch 101318 to the source code. This allows  
a Solaris 2.3 lock handling difference to be  
accommodated.

Updated 00QUICKSTART to reflect -n and -H changes  
made in revision 3.57. (Oops!)

Changed Configure script to compile lsof for SCO  
versions  
beyond 3.2v5.0.0 as it is compiled for  
3.2v5.0.0. Bill Campbell <bill@celestial.com>  
reported he has done this successfully.

Added information to 00FAQ about a Linux kernel  
symbol problem (section 3.7.6) and included a  
<linux/random.h> patch to work around it. The patch  
was supplied by Keith Parks <emkxp01@mtcc.demon.co.uk>.

3.59 February 21, 1996

In response to a query from Louis Rayman <lou@asahi.ps.quotron.com>, added special support for Solaris "sockmod" streams, used for Unix domain sockets, that allows their file system device type and inode number to be displayed. It also allows lsof to search for them by name or type (-U).

Added range handling to -d argument.

Added the display of CDFS file size to DEC OSF/1 output.

Added an include of <rpc/xdr.h> to keep gcc on HP-UX 10 happy. Blair Zajac <blair@olympia.gps.caltech.edu> suggested it.

Added Ultrix 4.5 to support list, courtesy of a notification from Gregory Neil Shapiro <gshapiro@WPI.EDU>.

Added AFS support for Solaris 2.4 at the request of Michael L. Lewis <mlewis@morgan.com> and Phillip Moore <wpm@morgan.com>. Phillip helped me locate a test host, generously provided by Heidi Hornstein <heidi@cmf.nrl.navy.mil> with support from Chaskiel Moses Grundman <cg2v+@andrew.cmu.edu> and Sushila R. Subramanian <sushi@cmf.nrl.navy.mil>. Lsof is configured for AFS with a new script, AFSConfig.

Used a SunOS 4.1.4 test system, provided by Chaskiel, to extend Solaris AFS support to cover SunOS. Used another test system, provided by Chaskiel, to extend AFS support to NEXTSTEP 3.2.

Tested lsof under AFS on yet another Chaskiel-provided system, running Linux 1.2.13 and AFS 3.3, and found that lsof needed no changes to recognize its AFS files.

Used a test system, provided by Curt Freeland <curt@grumpy.cse.nd.edu> and Terry McCoy <terry@anubis.cc.nd.edu> to extend Solaris AFS support to Solaris 2.5 with AFS 3.4-Alpha.

Added the [-A A] option for specifying the name list file that contains dynamic kernel module addresses. This is defined for the NEXTSTEP, SunOS, and Solaris implementations.

Added stty isig handling (where appropriate) to the Customize and Inventory scripts.

Added support to Solaris for the nfs3 file system type. Its absence was reported by Patrick D. Sullivan <pds@snt.bellsouth.com>.

In response to a report from Tigran Aivazian <bs\_s641@ceres.king.ac.uk> corrected bug in Linux local nlist() function and based the default kernel loader format on a Configure test for CONFIG\_KERNEL\_ELF in /usr/src/linux/include/linux/autoconf.h.

Fixed a bug in name cache exploration for BSD-derived dialects -- e.g., FreeBSD.

Updated for NetBSD 1.1.

3.60 February 27, 1996

Improved Unix domain socket reporting for Solaris. Louis Rayman <lou@asahi.ps.quotron.com> helped test.

Added warning messages about absence of Linux CONFIG\_MODULES definition in autoconf.h, leading to lack of get\_kernel\_syms() support. Tigran Aivazian <bs\_s641@ceres.king.ac.uk> supplied the information.

3.61 March 8, 1996

Added AFS support for AIX and HP-UX and verified that the lsof Ultrix version needs no additions for AFS. Chaskiel Moses Grundman <cg2v+@andrew.cmu.edu> provided the HP-UX and Ultrix test systems. Jan Tax <jan\_tax@unc.edu> provided an AIX 4.1.4 test system. Bob Cook <bobcook@SLAC.Stanford.EDU> provided 3.2.5 and 4.1.4 test systems.

Fixed minor problems and made improvements to NEXTSTEP, Solaris, and SunOS AFS support. Changed the AFSConfig script to ask for AFS version.

During the Hp-UX AFS work, added the hpuxgcc abbreviation to the Configure script for configuring lsof to be compiled with gcc under lsof.

Fixed a NetBSD mount structure array referencing bug, reported by Peter Svensson <petersv@df.lth.se>.

Dropped support for Motorola V/88, because I no longer have access to test systems.

Added rudimentary support for the IRIX XFS file system type, pending more information.

3.61 March 12, 1996

Corrected misuse of the LSOF\_DINC shell variable in the Configure script for HP-UX and Solaris. Larry Rogers <lrr@cert.org> pointed out this problem. Also removed an obsolete irix52 abbreviation from Configure.

I didn't consider this change sufficient to warrant a new version number, but just rebuilt the 3.61 distribution.

3.62 March 26, 1996

Updated AFS comments in 00README.

Supplied missing break statement in a N\_VXFS case clause in the HP-UX dnode.c.

Added Veritas file support to PTX, courtesy of code supplied by Laurent Montaron <lpm@sequent.com> and help from Kevin Smallwood <kcs@sequent.com>. Created two new source modules (dnode[12].c) to separate PTX header file node definitions and thus eliminate symbol conflicts. Laurent did most of the testing.

Added tests to BSDI, FreeBSD, HP-UX, IRIX, NetBSD, NEXTSTEP, PTX, Solaris and SunOS lsof versions that allow them to report on unknown file system types.

Added IRIX 6.0.1 #if/#else/#endif support in response to a report and suggested modifications from Scott Presnell <srp@zgi.com>.

With the help of Dave Olson <olson@anchor.engr.sgi.com> improved the IRIX 6.2-BETA XFS support.

3.62 March 27, 1996

Corrected SunOS incompatibility with last-minute addition of Solaris MVFS support. The problem was

reported by Larry W. Virden <lvirden@cas.org>.

I didn't consider this change sufficient to warrant a new version number, but just rebuilt the 3.62 distribution.

### 3.63 April 11, 1996

Upgraded Solaris MVFS support. In the process, enlarged Solaris and SunOS DEVICE output column.

Changed SunOS 4.1.x Configure to make -DNOCONST Makefile definition dependent on SC version.

At the suggestion of John DiMarco <jdd@cdf.toronto.edu> suppressed two warning messages: the device cache file creation warning when -Db has been specified; and the one issued when -D? is used with a non-writable system-wide device cache file and there is no other writable path. Also at John's suggestion redid the manner in which child processes are used to avoid kernel calls that might block; the net effect of the change is that normally one child process is required, rather than one per kernel call.

Refined the NetBSD test for <nfs/nfsproto.h> with a Configure script change.

Modified Configure script to compute AIX version with ``uname -rv" when /usr/bin/oslevel can't be executed. Stephen C. Woods <scw@seas.ucla.edu> suggested this.

Disabled conflicting prototype definitions in the local netdb.h used when the SCO 3.0 netdb.h is missing. Disabled #include of <strings.h> unless the SCO version is 5.0 or above. Don Kirouac <dkirouac@minicom.com> pointed out these problems.

### 3.63 April 15, 1996

Improved Configure's SunOS 4.1.x CC test for compiler support of the const keyword and avoided Configure's ``test -f {Customize,Inventory}" (because the Ultrix test doesn't grok -x) in response to a report from Larry Schwimmer <rosebud@cyclone.Stanford.EDU>.

I didn't consider this change sufficient to warrant

a new version number, but just rebuilt the 3.63 distribution.

### 3.64 April 26, 1996

Added a negate option for entries of the -u list.

Kurt Hillig <khillig@Chem.LSA.umich.edu> suggested it.

Added a check for legal protocols in the -i option.

Adjusted the Configure and SGI MkKernOpts scripts to handle more IRIX situations per instructions from Dave Olson <olson@anchor.engr.sgi.com>.

Added support for HP-UX 10.10, courtesy of a test system provided by Mark Bixby <markb@cccd.edu>.

### 3.65 May 20, 1995

Corrected errors, reported by Arne H. Juul <arnej@pvv.unit.no>, in use of IRIX stat structure.

Added support for the IRIX 6.2 cacheefs, following a report from Peter Van Epp <vanep@sfu.ca>.

Added clone support for AIX 4.1.4 and above.

Adjusted the IRIX configuration to work properly for 64 bit IRIX 6.2 systems. Richard Chycoski <richard@sfu.ca> and Peter Van Epp <vanep@sfu.ca> provided a test system.

### 3.66 June 19, 1996

Improved the HP-UX VXFS test in the Configure script, based on a report from Robert Hall <rjh6810@misty.ca.boeing.com>.

Added SCO information to 00FAQ. Added information about lsof slowness and nameserver.

Added an untested Configure abbreviation for Solaris 2.5.1.

Ambrose Li <ambrose@www.mingpaoxpress.com> supplied a Linux change that avoids a conflict with the `d_namlen` definition in versions 1.99.8 and above.

Added compiler version identification to the

Configure script for AIX and Solaris cc.

Added support for FreeBSD 2.2-960612-SNAP. Ade Barkah <mbarkah@hemi.com> provided a test system.

3.67 Jul 1, 1996

Made miscellaneous documentation corrections.

Added support for gcc under AIX 4.1 and above, including an aixgcc Configure abbreviation, and a work-around

for an long long alignment problem.

Stuart D. Gathman <stuart@bmsi.com> and Waldemar Zurowski <bilbo@pwr.wroc.pl> helped me to understand the gcc problem and devise the work-around.

3.68 July 17, 1996

Malgorzata Roos <groos@rzusun.unizh.ch>: pointed out the AIX lsof didn't report the inode number for named pipes (FIFOs) and wouldn't locate them by name; `_and_` supplied a fix. (Now `_that's_` the kind of bug report I like. :-)

Update Configure script to clean out aix41\* subdirectories created by the AIX gcc work-around.

Taught IRIX lsof how to report the correct device number, inode number, and size for named NFS pipes.

Taught HP-UX 9.x lsof how to report size/offset and inode number for named NFS pipes. (HP-UX 10.x already knows.)

Taught DEC OSF/1 (errr, Digital Unix) lsof to report device and inode numbers correctly for named pipes. Because `stat(2)` under DEC OSF/1 V3.2 doesn't report the device number correctly for named pipes, lsof can't locate them by name, but it can do that under DEC OSF/1 V2.0.

Taught EP/IX 2.1.1 lsof to report device and inode numbers correctly for named pipes.

Taught versions of lsof for PTX 2.1.6 and 4.1.2 to report device and inode numbers correctly for named pipes.

Taught RISC/os 4.52 lsof to report device and inode numbers correctly for named pipes.

Taught versions of lsof for Ultrix 4.2 and above to report inode numbers and file systems names correctly for named pipes (FIFOs).

Added safety check when trying to get a sockaddr\_un structure from a BSDI, FreeBSD, or NetBSD mbuf.

Improved documentation on install permissions in 00README at the suggestion of Paul Wickman <Paul.Wickman@amd.com>.

Installed support for the DTYPE\_PIPE file structure in FreeBSD 2.2. Changed the FreeBSD version symbol from \_FREEBSDV to FREEBSDV.

Added support for NetBSD 1.2.

3.69 July 30, 1996

Added block device name caching and reporting for all dialects.

Improved

(I think) IRIX 6.2 64 bit configuration.

Eliminated C name space pollution by removing the leading `\_` from all dialect version symbols that had it: \_AIXV, \_BSDIV, \_OSF1V, \_ADVFSV, \_EPIXV, \_HPUXV, \_IRIXV, \_PTXV, \_RISCOSV, and \_SCOV.

Changed decosf stanza in Configure script to automatically detect the subdirectory of /sys (or /usr/sys) that contain's the configuration header files for the machine. Added a 00FAQ entry about this.

3.70 August 9, 1996

Set the execute bits on scripts/big\_brother.perl5.

Changed -H in scripts/watch\_a\_file.perl to -n.

Retained all the command name characters that are available in the proc or user struct for field output. Improved sample install rules for BSDI and HP-UX. Strengthened HP-UX CCITT test in the Configure script. Gildas Perrot <perrot@francenet.fr> suggested these changes.



Improved Solaris local TCP address reporting, based on a bug report from John Caruso <jcaruso@csg.com>.

Improved HP-UX VFS handling, and corrected a bug in VFS handling, based on bug reports from David Capshaw <David.Capshaw@SEMATECH.Org>.

Added support to -i argument handling to allow port lists and ranges, and service name lists to be specified. John DuBois <spcecdt@armory.com> suggested this.

Dropped support for IRIX 4.0.5H. Revived support for IRIX 5.2, courtesy of a test system from Dan Trinkle <trinkle@cs.purdue.edu>.

### 3.71 August 15, 1996

Improved handling of port ranges specified with the -i option. Improved performance when the only option is -i.

### 3.72 August 28, 1996

Fixed bugs and typos in SCO mount table handling.

Added support for OpenBSD (only the i386 architecture type has been tested), using the NetBSD dialect sources. David Mazieres <dm@amsterdam.lcs.mit.edu> provided a test system.

Added fdesc file system support to FreeBSD, NetBSD and OpenBSD. Changed the way proc file system support is activated with additions to the Configure script and changes to the dialect machine.h files. Dropped the distribution of the FreeBSD <procfs/procfs.h> header file.

Added support for PTX 4.1.4.

### 3.73 September 5, 1996

Added information to 00FAQ for missing CCITT HP-UX header file x25L3.h. Pasi Kaara <ppk@atk.tpo.fi> provided the information.

Changed AIX header file #include pattern to prevent gcc's loader from complaining about multiply defined etherbroadcastaddr[], fddi\_broadcastaddr[], and

ie5\_broadcastaddr[] CONST u\_char arrays from <net/net\_globals.h>. (The AIX loader doesn't complain.) David Capshaw <David.Capshaw@SEMATECH.Org> reported this problem.

Removed the HASPWSTAYOPEN definition; it was only used for two dialects that are no longer supported.

Corrected a bug in UID cacheing that appeared during long repeat-mode (-r) operations. The bug was reported by Peter Van Epp <vanep@sfu.ca>. When in repeat mode the UID cache will be cleared when /etc/passwd changes.

Fixed a bug in FreeBSD support that causes a segmentation fault on VBAD vnodes.

Deleted ultrix22 from Configure and RHF from Ultrix source files. Dropped 2.2 from support list.

#### 3.74 September 6, 1996

Corrected a bug in FreeBSD's proc table handling, reported by David O'Brien <obrien@Nuxi.cs.ucdavis.edu>.

#### 3.75 September 9, 1996

Added FreeBSD proc table handling fix from revision 3.74 to BSDI, NetBSD, and OpenBSD dialects.

Improved Solaris VFS handling.

Added pipe handling to OpenBSD. Changed Configure script to define OPENBSDV for OpenBSD and used that definition to include the pipe support in the NetBSD sources. The Configure script defines NETBSDV for NetBSD. So far neither dialect has any #if/#else/#endif blocks that depend on version number.

Added support for AIX 4.2.

#### 3.76 September 21, 1996

Plugged a memory leak in command handling, introduced in revision 3.70. The bug was reported by Peter Van Epp <vanep@sfu.ca>.

Fixed a bug in the reporting of size for IRIX 5.3 EFS files, introduced in revision 3.69 by the name

space pollution abatement. The `_IRIXV` definition was used in the IRIX 5.x private `efs_inode.h` header file to configure the inode structure for IRIX 5.3, so I changed the tests to use IRIXV.

Changed information on the AIX Stale Segment ID bug to reflect the fact that IBM now says they won't fix it. They have closed the APAR.

Disabled the AIX gcc long long alignment hack under AIX 4.2, because it doesn't work there. Installed a fatal error message in Configure that gcc can't be used to compile lsof under AIX 4.2 until a work-around can be developed.

Upgraded BSDI, FreeBSD (2.0 and above), NetBSD (1.1B and above), and OpenBSD lock reporting. David Mazieres <dm@amsterdam.lcs.mit.edu> reported the need for the upgrade.

Made similar lock reporting upgrades to (versions tested are in parentheses): AIX (4.1.4 and 4.2); DEC OSF/1 (2.0 and 3.2d); EP/IX (2.1.1); HP-UX (9.x and 10.10); IRIX (5.2, 5.3, and 6.2); Linux; NEXTSTEP (3.1); PTX (2.1.6 and 4.2); RISCos; SCO (releases 3.0 and 5.0); Solaris (2.5); SunOS (4.1.3); and Ultrix (4.2).

Updated man page and 00FAQ with more information on lock reporting.

Updated PTX lsof for 4.2. Upgraded HP-UX lsof for 10.20. Used a test system, provided by Richard Allen <ra@rhi.hi.is>, and received testing assistance from Marc Winkler <marc@healthchex.com>.

Changed handling of Internet addresses to avoid DNS lookup operations when the address has clearly not been selected. John DuBois <johnd@sco.COM> suggested this.

3.77 October 2, 1996

Changed SCO Configure stanza to call nm by its full path, thus avoiding possible confusion. The change was suggested by Jean-Pierre Radley <jpr@jpr.com>.

Added changes to allow lsof to be compiled by gcc

under AIX 4.2 -- enabled some gcc-specific typedef's in the AIX machine.h and disabled the Configure script's rejection of aixgcc for AIX

#### 4.2. The

typedef's were supplied by Henry Grebler <henryg@optimization.com.au>.

Based on information supplied by Henry and David J. Wilson <davidw@optimization.com.au>, invented a description and processing for an unknown file struct that is established by AIX 4.2 (at least) for X processes when DISPLAY=:0.0. For convenience I gave its type the DTYPE\_PIPE definition, but that may be incorrect.

Fixed some Solaris 2.[34] errors in locking code, added at 3.76, that I couldn't test. Rainer Orth <ro@TechFak.Uni-Bielefeld.DE> reported the problem and supplied the fixes.

Made Configure script supply NeXTSTEP 3.x version in Makefile so that the shadow vnode locking code, introduced in 3.76, would be disabled for NeXTSTEP 3.0. Rainer Orth discovered this problem, too.

Added reporting of UNIX domain socket inode numbers for Linux version 2.0 and above. The addition was supplied by Matthew Burt <BurtM@poole.siemens.co.uk>.

Enhanced file searching to report all instances of references to automounted file systems, even when they're direct mounts not yet realized. Enhanced Solaris 2.5 lsof to grok autofs nodes. Victoria H. Lau <vlau@msmail2.hac.com> pointed out the need for these enhancements and helped test them.

Changed AIX lock length test so it will work with gcc under AIX 4.2.

Changed PTX HAS\_VXFS symbol, indicating presence of VxFS, to HASVXFS for consistency with the HP-UX form of the symbol.

3.78 October 14, 1996

Changed strtol() call in private Linux nlist() function to strtoul(). Linux kernel addresses at 2.1.0 have their top bit set and appear to be

negative to strtol(). This information was provided by Marty Leisner <leisner@sdsp.mc.xerox.com>. Marty also notes that other, unknown-as-of-yet problems prevent lsof from working under 2.1. He is investigating, since I don't have access to a 2.1 system.

Added definitions to machine.h for a private file struct type (HASPRIVFILETYPE and PRIVFILETYPE) that can be accommodated without changing prfp.frag, much as HASPIPEFN works for PIPE file struct types.

Used the new private file struct type support to support the AIX f\_type=0xf that DISPLAY=:0.0 causes. Changed its output TYPE from PIPE to SMT; displayed file size as buffer size less free bytes in buffer; enabled recognition under AIX 4.1.4. Mike Feldman <feldman@charm.urbana.mcd.mot.com> and others helped me identify this file as a Shared Memory Transport (SMT) socket.

Corrected a function prototype in the HP-UX dnode.c for HP-UX 10 and greater; gcc objected; HP's cc did not. Christian Krackowizer <kra1@technodat.co.at> reported the problem.

Made AFSCONFIG script more capable of locating the cell's root directory. Updated AFS documentation in 00FAQ and 00README. Both were suggested by Timothy Miller <tsm@cs.brown.edu>.

Installed update to big\_brother.perl5 script from Lionel Cons <Lionel.Cons@cern.ch>.

3.79 October  
29, 1996

Added support for IRIX 6.4, courtesy of a test system provided by Angel Li <angel@rrsl.rsmas.miami.edu>. Fixed FIFO and NFS3 bugs in IRIX 6.2 lsof in the process. Lsof has not been tested under IRIX 6.3, but the Configure script has a stanza for it.

Changed device functions to use stat() instead of lstat(). Used WARNDEVACCESS to suppress stat(2) failure messages.

Tested under OpenBSD 2.0.

3.80 November 8, 1996

Corrected comments in 00README about using the sunos413 and sunos413cc Configure abbreviations.

Made some Configure and Customize script changes, suggested by Bruce Jerrick <bruce@cse.ogi.edu>.

Added missing elements to definition of local Solaris 2.3 lock\_descriptor structure so that dnode.c will compile and work properly under it. Corrected a bug in Solaris 2.[34] lock descriptor handling.

3.81 November 14, 1996

Corrected error in the "invented" HP-UX 10.20 proc struct. The erroneous struct definition named the set-UID member as the UID member, resulting in occasional incorrect UID attributions in lsof output.

At the suggestion of Larry Schwimmer <schwim@cyclone.stanford.edu>, changed AFSCConfig to use awk to get the cell name from /usr/etc/vice/ThisCell, thus avoiding a problem when the cell name line has more than one word.

Added -DSWASH to IRIX 6.2 options propagated from the kernel build CCOPTS to lsof's Makefile. Randolph J. Herber <herber@dcdtrjh.fnal.gov> did the detective work that revealed the need for this. IRIX 6.2 patch 1488 added -DSWASH and its effects.

3.82 December 11, 1996

Updated Configure script for FreeBSD 3.0 and SCO OpenServer 5.0.[24]. FreeBSD Configure script change was supplied by David E. O'Brien <obrien@NUXI.com> and SCO Configure script change was supplied by Bela Lubkin <belal@sco.COM>.

Tested lsof under FreeBSD 3.0, courtesy of a test system provided by Ade Barkah <mbarkah@hemi.com>.

Added changes to support SCO OpenServer 5.0.4

(Comet), supplied by Bela Lubkin <belal@sco.COM>.

Added support for UnixWare 2.1. D. Chris Daniels <chrisd@dlpco.com> provided a test system and Bela Lubkin provided technical assistance.

Added support for Pyramid DC/OSx 1.1 and Reliant UNIX 5.43. Bruce Beare <bjb@pyramid.com> and Kevin Smith <kevin@pyramid.com> provided test systems and technical assistance. This dialect version must run setuid-root, since it accesses proc and user structures via the /proc file system.

Tested under PTX 2.1.9 and added support for PTX 4.2.1.

At Bela Lubkin's suggestion added a commercial to the lsof man page, -h option, and -v option output, telling where to get the latest revision. This entailed large scale rearrangement of the -h output to keep it as short as possible. It also involved shortening the -X explanation for PTX.

Made sure that address segment access errors didn't incorrectly force the listing of a process. This fix was needed by the Sun, Pyramid, and UnixWare ports.

Corrected bug in the way the local device table is sorted.

3.83 December 30, 1996

Added support for Solaris 2.6 (Beta) with help from Casper Dik <casper@holland.Sun.COM>, May Jackson <methalya.jackson@eng.sun.com>, Joseph Kowalski <jek3@Eng.Sun.COM>, and the Solaris 2.6 Beta test program.

Fixed an inode file system type processing bug in SCO OpenServ 5.0 and greater, reported by Robert Lipe <robertl@arnet.com>.

Fixed bugs in SCO kernel name cache probing, courtesy of code and suggestions from Bela Lubkin <belal@sco.COM>.

Revised kernel name list handling to remove the need for changing two files (dlsof.h and dstore.c) when altering, removing, or adding name list symbols. All dialects were affected.

Added support for SCO OpenServer event "clones."  
Robert Lipe need for their support and Bela Lubkin  
provided technical assistance in identifying them.

Added display of bound name to Solaris UNIX  
domain  
socket file handling.

Correct bug in SunOS address space ("txt" file)  
handling.

Tested under UnixWare 2.1.1.

Changed SGI IRIX lsof to use the kernel's proc  
struct size when striding through its proc table  
(IRIX versions below 6.4). The proc struct size  
difference warning is still issued, and lsof still  
uses the proc struct size and proc struct from  
<sys/proc.h> to read and process proc table  
information. Added a note to 00FAQ about this.

Deferred Internet host and port name lookups to  
print time, thus avoiding lookups for files that  
are not listed.

3.84 January 13, 1997

Updated the Pyramid private configuration script,  
MkKernOpts, to propagate the R4000 definition for  
DC/OSx systems so equipped. Anthony Shortland  
<anthony.shortland@FMR.COM> pointed out the need  
for this and Kevin Smith <kevin@pyramid.com> provided  
access to a test system.

Added information to 00FAQ about UDP ports for  
which lsof can't find users, because the  
ports are  
reserved to the kernel and aren't associated with  
open files.

3.85 January 17, 1987

The DEC OSF/1 kernel name cache can be processed  
as a simple table, rather than a linked list, so  
changed the interface to rnam.frag accordingly.

Added a new optional output field, parent process  
ID (PPID). The -R option (for paRent) selects it,  
and the `R' field identifier labels it. Updated



some scripts to handle it and developed two new scripts, idrlogin.perl and idrlogin.perl5, to use it in locating network (rlogind and telnetd) source addresses for shell processes. Added some information about the new scripts to 00QUICKSTART.

3.86 January 30, 1997

Add explanation of why device warning messages disappear when the device cache file is used.

Changed Linux Configure stanza to check more places for the [z]System.map file and warn if the one located differs in date from /vmlinuz. Bjorn S. Nilsson <NILSSON@nbivms.nbi.dk> suggested this for easier configuration at Linux 2.0.28.

Changed Linux Configure stanza to check for the presence of fl\_fd, fl\_file, and fl\_whence in the file\_lock structure of <linux.fs.h> and define symbols appropriately.

Changed Linux lock testing to test task structure pointer (fl\_owner) from file\_lock struct as well as (possibly) the file struct pointer (fl\_file) or file descriptor number (fl\_fd) to identify the lock owner, depending on what HAS\_FL\_\* symbols were defined by Configure's file\_lock structure examination. Added section to Linux Problems in 00FAQ about this.

Corrected 00FAQ reference in Configure's Solaris 2.4 stanza.

3.87 February 11, 1997

Corrected setting of VxFS device number for HP-UX and PTX.

Added VM map flag test #if/#else/#endif for recent versions of FreeBSD 3.0, supplied by Chris Timmons <skynyrd@opus.cts.cwu.edu>.

Added a #define that removes a conflict between a signal() prototype in the IRIX 6.4 <sys/systm.h> and one in its <sys/signal.h>, exposed when cachefs support is enabled. Wolfgang Hecht <hecht@zedat.fu-berlin.de> identified the need for this addition and helped test it. Refined IRIX

proc struct size test, warning, and use.

Revised Linux system map file handling (yet again)  
to search for the file at execution time, rather  
than in the Configure script. Marty Leisner  
<leisner@sdsp.mc.xerox.com> suggested this.

Added VxFS support to Solaris lsof with help from  
Peter Radig <radig@DresdnerBank.de>. Philip Kizer  
<pckizer@tamu.edu> helped test.

Added support for PTX 4.3, thanks to access provided  
by Peter Jordan <petej@sequent.com>.

3.87 February 11, 1997  
supplement Updated FreeBSD kernel name list handling.

3.88 February 17, 1997  
Added documentation files -- 00.README.FIRST[\_<version>]  
and 00RELEASE.SUMMARY\_<version> -- to the distribution.

Vic Abell <abe@purdue.edu>  
Purdue University Computing Center  
February 17, 1997

Found in path(s):

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-  
67d8c82/OLD/lsof3\_00DIST

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\* Written by Victor A. Abell

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- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/Isf-org-Isf-4-95-0-0-g67d8c82-tar-gz/Isf-org-Isf-67d8c82/dialects/hpux/pstat/dstore.c
- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/Isf-org-Isf-4-95-0-0-g67d8c82-tar-gz/Isf-org-Isf-67d8c82/dialects/hpux/pstat/machine.h
- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/Isf-org-Isf-4-95-0-0-g67d8c82-tar-gz/Isf-org-Isf-67d8c82/dialects/hpux/pstat/dsock.c
- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/Isf-org-Isf-4-95-0-0-g67d8c82-tar-gz/Isf-org-Isf-67d8c82/dialects/hpux/pstat/dfile.c
- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/Isf-org-Isf-4-95-0-0-g67d8c82-tar-gz/Isf-org-Isf-67d8c82/dialects/hpux/pstat/dproto.h
- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/Isf-org-Isf-4-95-0-0-g67d8c82-tar-gz/Isf-org-Isf-67d8c82/dialects/hpux/pstat/dproc.c

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\*

\* \$Id: pfsnode.h,v 1.1 1993/12/12 12:26:39 davidg Exp \$

\*/

Found in path(s):

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsf-org-lsf-4-95-0-0-g67d8c82-tar-gz/lsf-org-lsf-67d8c82/dialects/freebsd/include/procfs/pfsnode.h

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\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsf-org-lsf-4-95-0-0-g67d8c82-tar-gz/lsf-org-lsf-67d8c82/dialects/freebsd/dnode1.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsf-org-lsf-4-95-0-0-g67d8c82-tar-gz/lsf-org-lsf-

67d8c82/dialects/osr/dsock.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-

67d8c82/dialects/osr/dfile.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-

67d8c82/dialects/darwin/kmem/dnode1.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-

67d8c82/dialects/hpux/kmem/dnode1.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-

67d8c82/dialects/osr/dproto.h

\*

/opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-

67d8c82/dialects/osr/machine.h

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-

67d8c82/dialects/osr/dnode.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-

67d8c82/dialects/osr/dmnt.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-

67d8c82/dialects/osr/dproc.c

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-

67d8c82/dialects/osr/dlsof.h

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-

67d8c82/dialects/n+obsd/dnode1.c

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From: Sandel, Ken L. <sandel@purdue.edu>

Sent: Tuesday, July 10, 2018 14:28

To: Victor Abell

Subject: RE: One more question regarding GitHub release

Vic,

For clarity I approved the release.

Ken

Ken L. Sandel  
Senior Director, Sponsored Program Services  
Senior Intellectual Property Officer  
Purdue University  
610 Purdue Mall  
Hovde Hall Room 328  
West Lafayette, IN 47907  
sandel@purdue.edu  
(765) 494-1063 (office)  
(765) 426-2530 (cell)

From: Kasper, Joseph R. <JRKasper@prf.org>

Sent: Tuesday, July 10, 2018 11:23 AM

To: Victor Abell <vabell@isof.comcastbiz.net>

Cc: Sandel, Ken L. <sandel@purdue.edu>

Subject: RE: One more question regarding GitHub release

Hi Vic,

My apologies for not following up. Mr. Sandel approves the release on GitHub under the copyright notice text currently in use.

Best,

Joe

Joseph R. Kasper, Ph.D.  
Senior Business Development Manager & Director of Marketing  
Office of Technology Commercialization  
765-588-3486  
jrkasper@prf.org  
Purdue  
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West Lafayette, IN 47906  
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From: Victor Abell <vabell@lsof.comcastbiz.net>  
Sent: Monday, July 9, 2018 8:26 PM  
To: Kasper, Joseph R. <JRKasper@prf.org>  
Subject: RE: One more question regarding GitHub release

Joe,

Has there been any word from Ken about the release of lsof to GitHub?

Vic

From: Kasper, Joseph R. [mailto:JRKasper@prf.org]  
Sent: Thursday, June 28, 2018 1:15 PM  
To: Victor Abell  
Subject: RE: One more question regarding GitHub release

Hi  
Vic,

One more request. Ken would like a copy of the email from Gerry. If for any reason you are not comfortable sending it to me, please contact Ken directly (765-494-1063, sandel@purdue.edu).

If this last piece of information is satisfactory to Ken, I expect to get his approval.

Thanks for your cooperation throughout this process.

Best,  
Joe

From: Victor Abell <vabell@lsof.comcastbiz.net>  
Sent: Thursday, June 28, 2018 7:43 AM  
To: Kasper, Joseph R. <JRKasper@prf.org>  
Subject: RE: One more question regarding GitHub release

Joe,

I sent e-mail to Gerry McCartney and in his answer he says he has no objection.

Vic

From: Kasper, Joseph R. [mailto:JRKasper@prf.org]  
Sent: Tuesday, June 26, 2018 4:03 PM  
To: Victor Abell  
Subject: RE: One more question regarding GitHub release

Hi Vic,

Thanks for the extra detail. I think it would put Kens mind at ease if you have Gerrys blessing. Let me know if youll reach out to him.

Best,  
Joe

From: Victor Abell <vabell@lsof.comcastbiz.net>  
Sent:  
Tuesday, June 26, 2018 3:57 PM  
To: Kasper, Joseph R. <JRKasper@prf.org>  
Subject: RE: One more question regarding GitHub release

Joe,

I have had no communication with ITaP about the move to GitHub. The extent of their involvement with lsof has been minimal the Visiting Scholar appointment and the maintenance of a distribution system.

I know Gerry McCartney well. Would it be helpful if I contacted him about the GitHub move?

Vic



From: Kasper, Joseph R. [mailto:JRKasper@prf.org]  
Sent: Tuesday, June 26, 2018 3:44 PM  
To: Vic Abell; Victor Abell  
Subject: One more question regarding GitHub release

Hi Vic,

Ken Sandel, Senior IP Officer, just got back to me. He wants to know if the leadership of ITaP supports the contribution to Github. Please let me know. If you have any communication to this effect that you can forward to me, it would be helpful.

Best,  
Joe

Joseph R. Kasper, Ph.D.  
Business Development Manager  
Purdue Research Foundation  
Office of Technology Commercialization  
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jrkasper@prf.org  
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- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/Isf-org-Isf-4-95-0-0-g67d8c82-tar-gz/Isf-org-Isf-67d8c82/dialects/freebsd/dnode2.c
- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/Isf-org-Isf-4-95-0-0-g67d8c82-tar-gz/Isf-org-Isf-67d8c82/dialects/freebsd/dzfs.h
- \* /opt/cola/permits/1682050831\_1684512792.1459703/0/Isf-org-Isf-4-95-0-0-g67d8c82-tar-gz/Isf-org-Isf-67d8c82/util.c

No license file was found, but licenses were detected in source scan.

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Found in path(s):

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/darwin/libproc/dlsof.h

\* /opt/cola/permits/1682050831\_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/darwin/libproc/dfile.c

No license file was found, but licenses were detected in source scan.

## Frequently Asked Questions about lsof

```
*****
| The latest release of lsof is always available via anonymous ftp |
| from lsof.itap.purdue.edu. Look in pub/lsof.README for its     |
| location.   |
*****
```

---

This file contains frequently asked questions about lsof and answers to them.

Vic Abell <abe@purdue.edu>

October 13, 2014

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---

## 1.0 General Concepts

### 1.1 Lsof -- what is it?

Lsof is a UNIX-specific tool. Its name stands for LiSt Open Files, and it does just that. It lists information about files that are open by the processes running on a UNIX system.

See the lsof man page, the 00DIST file, the 00QUICKSTART file, and the 00README file of the lsof distribution for more information.

### 1.2 Where do I get lsof?

Lsof is available via anonymous ftp from [lsof.itap.purdue.edu](ftp://lsof.itap.purdue.edu). Look in the pub/tools/unix/lsof sub-directory.

<ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof>

Bzip2'd, compressed and gzip'd tar files with GPG certificates are available.

#### 1.2.1 Are there mirror sites?

On March 21, 2013 these sites appeared to have the latest lsof revision:

<ftp://ftp.fu-berlin.de/pub/unix/tools/lsof>

<ftp://sunsite.ualberta.ca/pub/Mirror/lsof>

<http://www.mirrorservice.org/sites/lsof.itap.purdue.edu/pub/tools/unix/lsof/>

<ftp://ftp.mirrorservice.org/sites/lsof.itap.purdue.edu/pub/tools/unix/lsof/>

<rsync://rsync.mirrorservice.org/lsof.itap.purdue.edu/pub/tools/unix/lsof/>

#### 1.2.2 Are lsof executables available?

Some lsof executables are available in the subdirectory `pub/tools/unix/lsof/binaries`. These are neither guaranteed to be current nor cover every dialect and machine architecture.

I don't recommend you use pre-compiled lsof binaries; I recommend you obtain the sources and build your own binary. Even if you're a Sun user without a Sun C compiler, you can use gcc to compile lsof.

If you must use a binary file, please be conscious of the security and configuration implications in using an executable of unknown or different origin. The lsof binaries are accompanied by GPG certificates. Please use them!

Three additional cautions apply to executables:

1. Don't try to use an lsof executable, compiled for one version of a UNIX dialect, on another. Patches can make the dialect version different.
2. If you want to use an lsof binary on multiple systems, they must be running the same dialect OS version and have the same patches and feature support.

#### 1.2.3 How do I check the validity of an lsof distribution?

There are two ways to check the validity of an lsof distribution:

1. Follow the instructions in the CHECKSUMS\_<revision> file found with the lsof distribution.

Checking with GPG is the best method.

2. Follow the instructions in the "Security" section of the README.lsof\_<revision> file found inside the lsof distribution.

Again, checking with GPG is the best method.

1.2.4 Why can't I get the sum(1) result reported in README.lsof\_<revision>?

The "Security" section of the README.lsof\_<revision> file found inside the lsof distribution gives md5, sum, and GPG certificate information.

The simplest, the sum(1) signature, seems to be the trickiest. That's because there are different sum(1) methods, BSD systems usually have cksum(1) instead of sum(1), and different systems compute the block size value differently.

First, the lsof sum results are computed with the old, "alternate" algorithm. On newer systems, you can use sum's "-r" option to get that computation result.

Second, on BSD systems you usually must use cksum(1) instead of sum(1), because they have no sum(1). To tell cksum(1) to use the old, "alternate" algorithm, use its "-o1" option.

Third, the second value that sum reports, the block count, may be computed differently on different systems -- usually block size is considered to be 512 or 1,024. The lsof block counts were computed on a system with a sum(1) option that considers block size to be 512. The BSD system cksum(1) -o1 option considers block size to be 1,024. If your sum(1) or cksum(1) doesn't report a block count that matches the sum(1) signature given in README.lsof\_<revision>, check its man page to see what block size it uses, then adjust its reported block count appropriately.

1.2.5 Why won't gpg accept the lsof-signing PGP public key?

An older PGP key that once signed lsof distributions is

included in lsof revisions prior to 4.70. The PGP key is indeed my key, but is incompatible with GPG. It was created about ten years ago and is still acceptable to PGP versions 2.6.2 through 6.5.2.

Lsof revisions 4.70 and above are signed with a copy of my PGP key that has been made acceptable for use with GPG by importing it under GPG's "--allow-non-selfsigned-uid" option.

You can find my GPG compatible key in lsof revisions 4.70 and above and at:

```
ftp://lsof.itap.purdue.edu/pub/Victor_A_Abell.gpg
```

If you have an older lsof revision with my PGP key, there are two possible ways to use it:

- \* Use it with a PGP version from 2.6.2 through 6.5.2.

- \* Use GPG's "--allow-non-selfsigned-uid" option when you import my PGP key into your GPG key ring.

```
$ gpg --allow-non-selfsigned-uid --import Victor_A_Abell.gpg
```

### 1.3 Where can I get more lsof documentation?

A significant set of documentation may be found in the lsof distribution (See "Where can I get lsof?"). There is a manual page, copious documentation in files whose names begin with 00, and a copy of this FAQ in the file 00FAQ (perhaps slightly less recent than this file if you're reading it via a web browser.)

Two URLs provide some documentation that appears in the lsof distribution:

FAQ: <ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/FAQ>

man page: [ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/lsof\\_man](ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/lsof_man)

### 1.4 How do I report an lsof bug?

If you believe you have discovered a bug in lsof, you can report it via e-mail to <[abe@purdue.edu](mailto:abe@purdue.edu)>. Do NOT report lsof bugs to the UNIX dialect vendor. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your



letter as Spam.

Before you send me a bug report, please read the "Bug Reports" section of the 00README file of the lsof distribution. It lists the steps you should take before and when reporting a suspected bug.

#### 1.5 Where can I get the lsof FAQ?

This lsof FAQ is available in the file 00FAQ in the lsof distribution and at the URL:

`ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/FAQ`

##### 1.5.1 How timely is the on-line FAQ?

The on-line FAQ is sometimes too timely. :-)

I

update it as soon as new information is available. That may include information about support that won't appear in the lsof source distribution until the next revision. If you encounter something like that, please send me e-mail at <abe@purdue.edu>. I may be able to point you at a pre-release distribution that contains the support of interest. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

#### 1.6 Is there a test suite?

Yes, as of lsof revision 4.63 there's an automated lsof test suite in the tests/ sub-directory of the lsof top-level directory.

More information on using the test suite, what it does, how to use it and how to configure it may be found in the 00TEST file of the lsof distribution. That file also explains where the test suite has been tested.

Frequently asked questions about the test suite will be asked and answered here in the FAQ. (See "Test Suite Problems.")

After lsof has been configured with the Configure script, lsof can be made and tested with:

```
$ make
$ cd tests
```

```
$ make
```

Under normal conditions -- i.e., unless the lsof tree has been cleaned or purged severely -- all tests or individual tests may be run by:

```
$ cd test
```

```
$ make
```

or

```
$ <run a single test> (See 00TEST.)
```

#### 1.7 Is lsof vulnerable to the standard I/O descriptor attack?

Lsof revisions 4.63 and above are not vulnerable.

Lsof revisions 4.62 and below are vulnerable, but no damage scenarios have so far been demonstrated.

The standard I/O descriptor attack is a local programmed assault on setuid and setgid programs that tricks them into opening a sensitive file with write access on a standard descriptor, usually stderr (2), and writing error messages to stderr. If the attacker can control the content of the error message, the attacker may gain elevated privileges.

The attack was first described in Pine Internet Advisory PINE-CERT-20020401, available at:

<http://www.pine.nl/advisories/pine-cert-20020401.txt>

If you are using an lsof revision below 4.63, you should remove any setuid or setgid permissions you might have given its executable. Then you should upgrade to lsof revision 4.63.

#### 1.8 Can I alter lsof's make(1) behavior?

Yes. There are at least two ways to do that.

You can put replacements for lsof Makefile strings in your environment. If you specify the -e make option, make will give environment variable values precedence over strings from the Makefile. For example, to change the compiler string CC from the environment, you might do this with the Bourne shell:

```
$ CC=foobar; export CC
```

```
$ make -e
```

You can also replace lsof Makefile strings in the make command invocation. Here's the previous example done that way:

```
$ make CC=foobar
```

Changing the CFGF, CFGL, and DEBUG strings used in lsof Makefiles, either from the environment or from the make invocation, can significantly alter lsof make(1) behavior.

I

commonly use DEBUG to change the -O option to -g so I can build an lsof executable for debugging -- e.g.,

```
$ make DEBUG=-g
```

(Look for DEBUG in this FAQ for other examples of its use.)

Consult the Makefiles to see what CFGL, CFGF, and other lsof Makefile strings contain, and to see what influence their alteration might have on lsof make(1) behavior.

#### 1.9 Is there an lsof license?

No.

The only restriction on the use or redistribution of lsof is contained in this copyright statement, found in every lsof source file. (The copyright year in or format of the notice may vary slightly.)

```
/*
```

```
* Copyright 2002 Purdue Research Foundation, West Lafayette,  
* Indiana 47907. All rights reserved.
```

```
*
```

```
* Written by Victor A. Abell
```

```
*
```

```
* This software is not subject to any license of the American  
* Telephone and Telegraph Company or the Regents of the  
* University of California.
```

```
*
```

```
* Permission is granted to anyone to use this software for  
* any purpose on any  
computer system, and to alter it and
```

```
* redistribute it freely, subject to the following
```

```
* restrictions:
```

```
*
```

- \* 1. Neither the authors nor Purdue University are responsible
- \* for any consequences of the use of this software.
- \*
- \* 2. The origin of this software must not be misrepresented,
- \* either by explicit claim or by omission. Credit to the
- \* authors and Purdue University must appear in documentation
- \* and sources.
- \*
- \* 3. Altered versions must be plainly marked as such, and must
- \* not be misrepresented as being the original software.
- \*
- \* 4. This notice may not be removed or altered.
- \*/

## 1.10 Language locale support

### 1.10.1 Does lsof support language locales? How do I use the support?

Most UNIX dialect versions of lsof support 8 bit language locale characters -- e.g., the ability to print 8 bit characters that have accents and other marks over them.

See the answer to the "Does lsof support wide characters in language locales?" question for information on when lsof's language locale support covers characters wider than 8 bits.

To see if lsof supports language locales for your dialect, look in the dialect's machine.h header file for the HASSETLOCALE definition. If it is present and not disabled, then lsof has language locale support for the dialect.

To enable lsof's language locale support, you must specify in a locale environment variable (e.g., LANG) a language locale known to your system that supports the printing of marked characters -- e.g., en\_US. (On some dialects locale(1) may be used to list the known language locales.)

Note that LANG=C and LANG=POSIX are NOT language locales that support the printing of marked characters.

If the language locale doesn't support the printing of marked characters, lsof's OUTPUT of them follows the rules for non-printable characters described in the OUTPUT section of lsof(8).

Consult your dialect's setlocale(3) man page for the names of environment variables

other than LANG -- e.g., LC\_ALL,  
LC\_TYPE, etc. -- which may be used to define language locales.

#### 1.10.2 Does lsof support wide characters in language locales?

When lsof's language locale support is enabled with the HASSETLOCALE definition, for selected dialects lsof will also print wide characters (e.g., from UTF-8) when iswprint(3) reports them to be printable.

Wide character support is available when HASWIDECHAR is defined in a dialect's machine.h header file. As of this writing on July 22, 2004, the following dialect versions have wide character support:

- AIX >= 4.3.2
- Apple Darwin >= 7.3.0
- FreeBSD >= 5.2
- HP-UX >= 11.00
- /proc-based Linux
- NetBSD >= 1.6
- SCO OpenServer >= 5.0.6
- Solaris >= 2.6
- Tru64 UNIX 5.1

#### 1.11 Are any files in the lsof distribution copyrighted?

Yes. Most files carry the copyright of the Purdue Research Foundation and may be redistributed under the terms that accompany the copyright notice. Those terms may also be found in the answer to the question, "Is there an lsof license?")

A few files carry other copyright notices. Some are BSD notices and they explain the terms under which they are included in the lsof distribution.

Those that carry vendor copyright notices have been reproduced in their original or modified forms with permission from the copyright owners. That permission is indicated in the README files that accompany the files.

#### 1.12 Are there other lsof-related resources?

There are other resources available, connected to lsof. Among them are FreeBSD and Linux packages whose products use lsof and two particularly interesting resources.

The two interesting resources are a Gnome Tool Kit (GTK) GUI for lsof and a Perl wrapper module.

The GTK GUI is called Glsof and was developed by Gnele. It can be found at:

<http://www.sourceforge.net>

The Perl wrapper module by Marc Beyer can be found at:

<http://search.cpan.org/dist/Unix-Lsof/>

### 1.13 What

does the "WARNING: unsupported dialect or version" mean?

The lsof configure script issues that message for UNIX dialects or their versions where I have been unable to test the current revision of lsof. The message doesn't mean that lsof won't work, just that I have no direct evidence that it will.

If the COnfigure script succeeds, except for the warning, try compiling lsof. If that succeeds, try the lsof test suite.

## 2.0 Lsof Ports

### 2.1 What ports exist?

The pub/lsof/README file carries the latest port information:

AIX 5.[23] and 5.3  
FreeBSD 4.9 and 6.4 for x86-based systems  
FreeBSD 8.[234], 9.0, 10.0 and 11.0 for AMD64-based systems  
Linux 2.1.72 and above for x86-based systems  
Solaris 9, 10 and 11

In the above list the only UNIX dialects present are ones for which I test the current lsof revision. Lsof may still support unlisted dialect versions -- e.g., HP-UX 10.20, Solaris 7, etc. -- but I don't have access to systems where I could test lsof on them, so I can't claim lsof works on them. If your dialect isn't in the list, you should try building lsof on it anyway.

Lsof version 4 predecessors, versions 2 and 3, may support older version of some dialects. Contact me via e-mail at <abe@purdue.edu> if you're interested in their distributions. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

## 2.2 What about a new port?

The 00PORTING file in the distribution gives hints on doing a port. I will consider doing a port in exchange for permanent access to a test host. I require permanent access so I can test new lsof revisions, because I will not offer distributions of dialect ports I cannot upgrade and test.

### 2.2.1 User-contributed Ports

Sometimes I receive contributions of ports of lsof to systems where I can't test future revisions of lsof. Hence, I don't incorporate these contributions into my lsof distribution.

However, I do make descriptions of these contributions available. You can find them in the 00INDEX and README files at:

`ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/contrib`

Consult the 00INDEX file in the contrib/ directory for a list of the available contributions and consult README there for information on how to obtain them.

## 2.3 Why isn't there an AT&T SVR4 port?

I haven't produced an AT&T SVR4 port because I haven't seen a UNIX dialect that is strictly limited to the AT&T System V, Release 4 source code. Every one I have seen is a derivative with vendor additions.

The vendor additions are significant to lsof because they affect the internal kernel structures with which lsof does business. While some vendor derivatives of SVR4 are similar, each one I have encountered so far has been different enough from its siblings to require special source code.

If you're interested in an SVR4 version of lsof, here are some existing ports you might consider:

DC/OSx (This obsolete port is only available upon special request.)

Reliant UNIX (This obsolete port is only available upon special request.)

SCO|Caldera UnixWare (This is the most likely choice.)

Solaris

## 2.4 Why isn't there an SGI IRIX port?

Lsof support for IRIX was terminated at lsof revision 4.36, because it had become increasingly difficult for me to obtain information on the IRIX kernel structures lsof needs to access.

At IRIX 6.5 I decided the obstacles were too large for me to overcome, and I stopped supporting lsof on IRIX. I have sources to the last revision of lsof (4.36) for IRIX, but that version of lsof does not work on IRIX 6.5 and is vulnerable to the standard I/O descriptor attack. (See the "Is lsof vulnerable to the standard I/O descriptor attack?" Q&A for more information.) Contact me to discuss obtaining those sources.

If you wish to pursue the issue, don't contact me, contact SGI. This case was opened with SGI on the subject:

Case ID: 0982584

Category: Unix

Priority: 30-Moderate Impact

Problem Summary:

kernel structure header files needed for continued lsof support

Problem Description:

Email In 07/17/98 19:09:23

## 2.5 Why does lsof's Configure script report "WARNING: unsupported dialect or version"?

Lsof's Configure script issues this message when it encounters a dialect or its version that lsof once supported, but no longer does. Usually I drop support for a dialect or version when I can no longer test lsof on it.

However, it's worth trying to compile and use lsof. Be sure to run the test suite. (See the answer to the "Is there a test suite?" question for information on the test suite.)

If you have problems with an unsupported dialect or version, contact me via e-mail at <abe@purdue.edu> and I may be able to help.



Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

### 3.0 Lsof Problems

#### 3.1 Configuration Problems

##### 3.1.1 Why

can't Configure determine the UNIX dialect version?

The lsof Configure script uses UNIX shell commands, often in a command pipeline, to determine the UNIX dialect version. (Consult the dialect stanza in Configure to determine which commands are used.) If Configure can't determine the dialect version, probably one of the commands is not behaving as Configure expects.

Symptoms of the failure include Configure warning messages and incorrect version definitions in the Makefile CFLAGS.

If you suspect that the lsof Configure script is failing to determine the dialect version correctly, try running the commands from Configure stanza one at a time. That will usually reveal the source of the problem. Be particularly mindful that the PATH environment variable can cause commands to be executed from non-standard directories.

If you can't determine the source of the problem, there is a work-around. You can supply the UNIX dialect version in the LSOF\_VSTR environment variable.

Use Configure as a guide to forming what it expects in LSOF\_VSTR. There is also some information on LSOF\_VSTR in the 00XCONFIG documentation file of the lsof distribution.

#### 3.2 Compilation Problems

##### 3.2.1 Why does the compiler complain about missing header files?

When you use make to build lsof, the compiler may complain that it can't find header files -- e.g.,

```
$ make
(cd lib; make DEBUG="-O" CFGF="-DAIXA=0 -DAIXV=4330 \
-DLSOF_VSTR=\"4.3.3.0\"")
gcc -DAIXA=0 -DAIXV=4330 -DLSOF_VSTR="4.3.3.0" -O \
-c ckkv.c
```

In file included from ckkv.c:33: ../machine.h:70: \  
sys/types.h: A file or directory in the path name \  
does not exist. \  
^

That type of complaint doesn't represent an lsof problem. It represents a problem with a missing system header file that probably should be found in /usr/include or in the system source tree.

As a first step try using find(1) to locate the problem header file. If it's a system header file and can't be found, here are some possible causes:

1. The file set, RPM or package containing the header files has not been installed. Instructions for doing that are specific to the UNIX dialect and beyond the scope of this document.

2. If the compiler is gcc, the private gcc header files:

- \* May not have been installed;
- \* May have been installed incorrectly;
- \* May not have been updated properly after the last compiler or system update;
- \* Ones from a previous installation may not have been removed.

A path leading to the gcc private header files can be found with `gcc -v`. Consult the gcc documentation for instructions on proper installation of the private gcc header files.

3. On some dialects -- e.g., FreeBSD, NetBSD, OpenBSD -- lsof may need to use header files that are located in the system source tree -- /sys or /usr/src/sys, for example. Make sure the system source tree has been installed.

### 3.2.2 Why does gcc complain about the contents of header files distributed by the system's vendor?

When you use make to build lsof and gcc to compile it, gcc may complain that it finds errors in system header files

-- e.g.,

```
$ make
(cd lib; make DEBUG="-O" CFGF="-Dsolaris=80000 \
-DHASPR_GWINDOWS -m64 -DHASIPv6 -DHAS_VSOCK \
-DLSOF_VSTR="\5.8\"")
gcc -Dsolaris=80000 -DHASPR_GWINDOWS -m64 -DHASIPv6 \
-DHAS_VSOCK -DLSOF_VSTR="5.8" -O -c dvch.c
In file included from /usr/include/sys/proc.h:31, \
    from /homes/abe/gnu/gcc-3.2.1/lib/gcc-lib/sparcv9-sun-solaris2/\
3.2.1/include/sys/user.h:267, from /usr/include/kvm.h:13, \
from ../dlsf.h:53, from ../lsof.h:172, from dvch.c:43: \
/homes/abe/gnu/gcc-3.2.1/lib/gcc-lib/sparcv9-sun-solaris2/\
3.2.1/include/sys/task.h:59: parse error before "uint_t"
```

Errors like the above are most likely not problems in the system's header files, but in the private copies of them that were created when gcc was made or installed. Note the presence of `"../gcc-3.2.1/lib/gcc-lib/sparcv9-sun-solaris2/3.2.1/include/..."` in the paths for `user.h` and `task.h`. It indicates both header files are gcc-specific.

To solve errors like this requires comparing the header files in the vendor's `/usr/include` tree to the gcc-specific ones in gcc's private `gcc-lib/.../include` tree. It may be necessary to regenerate gcc-specific header files, correct them or remove them. See the gcc distribution for the appropriate tools.

A possible temporary work-around is to direct gcc to use the vendor's header files instead of its temporary ones by declaring `-I/usr/include` in the compilation flags.

### 3.2.3 Other header file problems

Don't overlook any vendor tools that might validate the vendor header files installed on the system -- e.g., the Solaris `pkgchk` tool can be used to check the header files that were installed from the `SUNWhea` package.

For other header file problems contact me at [<abe@purdue.edu>](mailto:abe@purdue.edu). Please follow the reporting guidelines in the "How do I report an lsof bug?" section of this FAQ.

### 3.3 Why doesn't lsof report full path names?

Lsof reports the full path name when it is specified as a search argument for open files that match the argument. However, if the argument is a file system mounted-on directory, and lsof finds additional path name components from the kernel name cache, it will report them.

Lsof reports path name for file system types that have path name lookup features -- e.g., some versions of AdvFS for Digital and Tru64 UNIX. The Linux /proc-based lsof reports full path names, because the Linux /proc file system provides them. Lsof on recent builds of Solaris 10 also report full path names, because those Solaris kernels record the full path name in the vnode structure.

Otherwise, lsof uses the kernel name cache, where it exists and can be accessed, and reports some or all path name components (e.g., the sys and proc.h components of /usr/include/sys/proc.h) for these dialects:

Apple Darwin  
DC/OSx  
FreeBSD  
HP-UX, /dev/kmem and PSTAT based  
Linux, /dev/kmem-based  
NetBSD  
NEXTSTEP  
OpenBSD  
OPENSTEP  
Reliant UNIX  
SCO OpenServer  
SCO|Caldera UnixWare  
Solaris 2.x, 7, 8 and 9 (except for some VxFS versions;  
see the "Why doesn't Solaris  
lsof report VxFS path name  
components?" section for more  
information)  
Solaris 10 (early builds) Tru64 UNIX

As far as I can determine, AFS path lookups don't share in kernel name cache operations, so lsof can't identify open AFS path name components. Apparently Solaris VxFS versions 4 and above don't share in kernel name cache operations, either, so lsof can't display path name components for those open files.

Since the size of the kernel name cache is limited and the cache is in constant flux, it does not always contain the names

of all components in an open file's path; sometimes it contains none of them.

Lsof reports the file system directory name and whatever components of the file's path it finds in the cache, starting with the last component and working backwards through the directories that contain it. If lsof finds no path components, lsof reports the file system device name instead.

When lsof does report some path components in the NAME column, it prefixes them with the file system directory name, followed by " -- ", followed by the components -- e.g., /usr -- sys/path.h for /usr/include/sys/path.h. The " -- " is omitted when lsof finds all the path name components of a file's name.

The PSTAT-based HP-UX lsof relies on kernel name cache contents, too, even though its information comes to lsof via pstat() function calls. Consequently, PSTAT-based HP-UX lsof won't always report full paths, but may use the " -- " partial path name notation, or may occasionally report no path name at all but just the file system mounted-on directory and device names.

Lsof can't obtain path name components from the kernel name caches of the following dialects:

#### AIX

Only the Linux kernel records full path names in the structures it maintains about open files; instead, most kernels convert path names to device and node number doublets and use them for subsequent file references once files have been opened.

To convert the device and node number doublet into a complete path name, lsof would have to start at the root node (root directory) of the file system on which the node resides, and search every branch for the node, building possible path names along the way. That would be a time-consuming operation and require access to the raw disk device (usually implying setuid-root permission).

If the prospect of all that local disk activity doesn't concern you, think about the cost when the device is NFS-mounted.

Try using the file system mount point and node number lsof reports as parameters to find

-- e.g.,

```
$ find <mount_point> -inum <node_number> -print
```

and you may get an appreciation of what a file system directory tree search would cost.

### 3.3.1 Why do lsof -r reports show different path names?

When you run lsof with its repeat ("`-r") option, you may notice that the extent to which it reports path names for the same files may vary from cycle to cycle. That happens because other processes are making kernel calls affecting the cache and causing entries to be removed from and added to it.

### 3.3.2 Why does lsof report the wrong path names?

Under some circumstances lsof may report an incorrect path name component, especially for files in a rapidly changing directory like /tmp.

In a rapidly changing directory, like /tmp, if the kernel doesn't clear the cache entry when it removes a file, a new file may be given the same keys and lead lsof to believe that the old cache entry with the same keys belongs to the new file.

Lsof tries to avoid this error by purging duplicate entries from its copy of the kernel name cache when they have the same device and inode number, but different names.

This error is less likely to occur in UNIX dialects where the keys to the name cache are node address and possibly a capability ID. The Apple Darwin, Digital UNIX, FreeBSD, HP-UX, NEXTSTEP, OPENSTEP, Solaris, Tru64 UNIX, and UnixWare dialects use node address. Apple Darwin, FreeBSD, NetBSD, OpenBSD, Tru64 UNIX, and also use a capability ID to further identify name cache entries.

### 3.3.3 Why doesn't lsof report path names for unlinked (rm'd) files?

When lsof gets path name components from the kernel's name cache, it does not report the path names of a file that has

been unlinked from its parent directory -- e.g., deleted via `rm`, or the `unlink()` system call -- even when some process may still hold the file open; `ls` reports only the file system's mounted-on directory and device. That's because path name components are removed from the kernel name cache when the file is unlinked.

Unlinked open files are sometimes used by applications for temporary, but invisible storage (i.e., `ls` won't show them, and no other process can open them.) However, they may occasionally consume disk space to excess and cause concern for a system administrator, who will be unable to locate them with `find`, `ls`, `du`, or other tools that rely on finding files by examining the directory tree.

By using `ls`'s `+L` option you can see the link count of open files -- in the `NLINK` column. An unlinked file will have an `NLINK` value of zero. By using the option `+L1` you can tell `ls` to display only files whose link count is less than one (i.e., zero).

There are some UNIX dialect-specific exceptions to `ls`'s inability to report unlinked path names. They are described in the answer to the "When will `ls` report path names for deleted files?" question.

### 3.3.4 Why doesn't `ls` report the "correct" hard linked file path name?

When `ls` reports a rightmost path name component for a file with hard links, the component may come from the kernel's name cache. Since the key which connects an open file to the kernel name cache may be the same for each differently named hard link, `ls` may report only one name for all open hard-linked files. Sometimes that will be "correct" in the eye of the beholder; sometimes it will not. Remember, the file identification keys significant to the kernel are the device and node numbers, and they're the same for all the hard linked names.

### 3.3.5 When will `ls` report path names for deleted files?

`ls` will report path names for deleted files for two dialects: Linux and later builds of Solaris 10.

Deleted Linux path names are reported by default and have

"(deleted)" at their ends.

The display of Solaris 10 deleted path names may be selected with the `-X` option. When selected they are also reported with "(deleted)" at their ends.

### 3.4 Why is lsof so slow?

Lsof may appear to be slow if network address to host name resolution is slow. This can happen, for example, when the name server is unreachable, or when a Solaris PPP cache daemon is malfunctioning.

To see if name lookup is causing lsof to be slow, turn it off with the ```-n`" option.

Port service name lookup or portmap registration lookup may also be causes of slow-down. To suppress port service name lookup, specify the ```-P`" option.

Lsof doesn't usually make direct portmap calls -- only when `+M` is specified, or when `HASPMAPENABLED` is defined during lsof construction. (The lsof help panel, produced with ``lsof -h`` will display the default portmap registration reporting state.) The quickest first step in checking if lsof is slow because of the portmapper is to use lsof's ```-M`" option.

Lsof may be slow if UID to login name lookups are slow. Suppress them with ```-l`".

On dialects where lsof uses the kernel name cache, try disabling its use with ```-C`". (You can tell if lsof uses the kernel name cache by looking for ```-C`" in lsof's ```-h`" output.) Of course, disabling kernel name cache use will mean that lsof won't report full or partial path names, just file system and character device names.

If you're just interested in the open files of one process, try using the ```-p <Process-ID>`" option to limit lsof to that process. (The ```-p`" option may also be followed with a list of Process-IDs.)

If you're interested in including or excluding certain commands, try lsof's `"-c[^]cmd"` option.

If you're interested in certain Internet TCP and UDP states



(e.g., ESTABLISHED) or in excluding some (e.g., CLOSE\_WAIT), try lsof's "-s p:s" option, available where shown on the lsof help output, obtained with -h or -?. More information on it may be found in the answer to the "How are protocol state name exclusion and inclusion used?" question.

Your UNIX dialect may not support "-s p:s" and its associated performance improvements to Internet-only file processing. You can find more information on those topics in the answer to the "Why doesn't my dialect support state name exclusion and inclusion?" question.

Older AIX lsof may be slow to start because of its oslevel identity comparison. (Newer AIX lsof uses uname(2).) See the "Why does AIX lsof start so slowly?" and "Why does lsof warn "compiled for x ... y; this is z.?" sections for more information.

### 3.5 Why doesn't lsof's setgid or setuid permission work?

If you install lsof on an NFS file system that has been mounted with the nosuid option, lsof may not be able to use the setgid or setuid permission you give it, complaining it can't open the kernel memory device -- e.g., /dev/kmem.

The only solution is to install lsof on a file system that doesn't inhibit setgid or setuid permission.

### 3.6 Does lsof have security problems?

I don't think so. However, lsof does usually start with setgid permission, and sometimes with setuid-root permission. Any program that has setgid or setuid-root permission, should always be regarded with suspicion.

Lsof drops setgid power, holding it only while it opens access to kernel memory devices (e.g., /dev/kmem, /dev/mem, /dev/swap). That allows lsof to bypass the weaker security of access(2) in favor of the stronger checks the kernel makes when it examines the right of the lsof process to open files declared with -k and -m. Lsof also restricts some device cache file naming options when it senses the process has setuid-root power.

On a few dialects lsof requires setuid-root permission during its full execution in order to access files in the

/proc file system. These dialects include:

DC/OSx 1.1 for Pyramid systems

Reliant UNIX 5.4[34] for Pyramid systems

When lsof runs with setuid-root permission it severely restricts all file accesses it might be asked to make with its options.

The device cache file (typically .lsof\_hostname in the home directory of the real user ID that executes lsof) has 0600 modes. (The suffix, hostname, is the first component of the host's name returned by gethostname(2).) However, even when lsof runs setuid-root, it makes sure the file's ownerships are changed to that of the real user and group. In addition, lsof checks the file carefully before using it (See the question "How do I disable the device cache file feature or alter it's behavior?" for a description of the checks.); discards the file if it fails the scrutiny; complains about the condition of the file; then rebuilds the file.

See the 00DCACHE file of the lsof distribution for more information about device cache file handling and the risks associated with the file.

### 3.7 Will lsof show remote hosts using files via NFS?

No. Remember, lsof displays open files for the processes of the host on which it runs. If the host on which lsof is running is an NFS server, the remote NFS client processes that are accessing files on the server leave no process records on the server for lsof to examine.

### 3.8 Why doesn't lsof report locks held on NFS files?

Generally lock information held by local processes on remote NFS files is not recorded by the UNIX dialect kernel. Hence, lsof can't report it.

One exception is some patch levels of Solaris 2.3, and all versions of Solaris 2.4 and above. Lsof for those dialects does report on locks held by local processes on remotely mounted NFS files.

#### 3.8.1 Why does lsof report a one byte lock on byte zero as a full

file lock?

When a process has a lock of length one, starting at byte zero, lsof can't distinguish it from a full file lock.

That's because most UNIX dialects represent both locks the same way in their file lock (flock or eflock) structures.

3.9 Why does lsof report different values for open files on the same file system (the automounter phenomenon)?

On UNIX dialects where file systems may be mounted by an automounter with the "direct" type, lsof may sometimes report difference

DEVICE, SIZE/OFF, INODE and NAME values when asked to report files open on the file system.

This happens because some files open on the file system -- e.g., the current directory of a shell that changed its directory to the file system as the file system's first reference -- may be characterized in the kernel with temporary automounter node information. The cd doesn't cause the file system to be mounted.

A subsequent reference to the file system -- e.g., an ls of any place in it -- will cause the file system to be mounted. Processes with files open to the mounted file system are characterized in the kernel with data that reflects the mounted file system's parameters.

Unfortunately some kernels (e.g., some versions of Solaris 2.x) don't revisit the process that did only a change-directory for the purpose of updating the data associated with the open directory file. The file continues to be characterized with temporary automounter information until it does another directory change, even a trivial "cd .".

Lsof will report on both reference types, when supplied the file system name as an argument, but the data lsof reports will reflect what it finds in the kernel. For the different types lsof will display different data, including different major and minor device numbers in the DEVICE column, different lengths in the SIZE/OFF column, different node numbers in the INODE column, and slightly different file system names in the NAME column.

In contrast, fuser, where available, can only report on one reference type when supplied the file system name as

an argument. Usually it will report on the one that is associated with the mounted file system information. If the only reference type is the temporary automounter one, fuser will often be silent about it.

### 3.10 Why don't lsof and netstat output match?

Lsof and netstat output don't match because lsof reports the network information it finds in open file system objects -- e.g., socket files -- while netstat often gets its information from separate kernel tables.

The information available to netstat may describe network activities never or no longer associated with open files, but necessary for proper network state machine operation.

For example, a TCP connection in the FIN\_WAIT\_[12] state may no longer have an associated open file, because the connection has been closed at the application layer and is now being closed at the TCP/IP protocol layer.

#### 3.10.1 Why can't lsof find accesses to some TCP and UDP ports?

Lsof stands for LiSt Open Files. If there is no open file connected to a TCP or UDP port, lsof won't find it. That's the most common reason why lsof doesn't find a port netstat might report open.

One reason I've found on some UNIX dialects is that their kernels set aside TCP and UDP ports for communicating with support activities, running in application layer servers -- the automounter daemons, and the NFS biod and nfsd daemons are examples. Netstat may report the ports are in use, but lsof doesn't.

Another reason is that netstat may also be able to report a port is open on a particular dialect, because it uses a source of data different from what lsof uses -- e.g., netstat might examine kernel tables or use streams messages to MIB2, while lsof relies on the information it finds in open file structures and their descendants.

Sometimes it's possible to search the data netstat and lsof use. For example, on Linux /proc/tcp and /proc/udp can be examined. There might an entry there for a particular protocol and port, but if the line on which the port appears

doesn't have an inode number that matches an inode number of an open file, lsof won't be able to identify the process using the port.

This is a tough question to which there is no easy answer.

### 3.11 Why does lsof update the device cache file?

At the end of the lsof output you may see the message:

```
lsof: WARNING: /Homes/abe/.lsof_vic  
was updated.
```

In this message /Homes/abe/.lsof\_vic is the path to the private device cache file for login abe. (See 00DCACHE.)

Lsof issues this message when it finds it necessary to recheck the system device directory (e.g., /dev or /devices) and rebuild the device cache file during the open file scan. Lsof may need to do these things it finds that a device directory node has changed, or if it cannot find a device in the cache.

### 3.12 Why doesn't lsof report state for UDP socket files?

Lsof reports UDP TPI connection state -- TS\_IDLE (Idle), TS\_BOUND (Bound), etc. -- for some, but not all dialects. TPI state is stream-based TCP/IP information that isn't available in many dialects.

A fairly weak general rule is if netstat(1) reports UDP TPI state, lsof may be able to report it, too. But don't be surprised if lsof fails to report UDP TPI state for your dialect. Other factors influence lsof's ability to report UDP TPI state, including the availability of state number data in kernel structures, and state number to state name conversion data.

### 3.13 I am editing a file with vi; why doesn't lsof find the file?

Classic implementations of vi usually don't keep open the file being edited. (Newer ones may do so in order to maintain an advisory lock.) Instead classic vi opens the file, makes a temporary copy (usually in /tmp or /usr/tmp), and does its work in that file. When you save the file being edited from a classic vi implementation, it reopens and rewrites the file.

During a classic vi session, except for the brief periods when vi is reading or rewriting the file, lsof won't find an open reference to the file from the vi process, because there is none.

### 3.14 Why doesn't lsof report TCP/TPI window and queue sizes for my dialect?

lsof only reports TCP/TPI window sizes for Solaris, because only its netstat reports them. The intent of providing TCP/TPI information in lsof NAME column output is to make it easier to match netstat output to lsof output.

In general lsof only reports queue sizes for both TCP and UDP (TPI) connections on BSD-derived UNIX dialects, where both sets of values appear in kernel socket queue structures. SYSV-derived UNIX dialects whose TCP/IP implementations are based on streams generally provide only TCP queue sizes, not UDP (TPI) ones.

While you may find that netstat on some SYSV-derived UNIX dialects with streams TCP/IP may report UDP (TPI) queue sizes, you will probably also find that the sizes are always zero -- netstat supplies a constant zero for UDP (TPI) queue sizes to make its headers align the same for TCP and UDP (TPI) connections. Solaris seems to get it right -- i.e., its netstat does not report UDP (TPI) queue sizes.

When in doubt, I chose to avoid reporting UDP (TPI) queue sizes for UNIX dialects whose netstat-reported values I knew to be a constant zero or whose origin I couldn't determine. OSR is a dialect in this category.

#### 3.14.1 Why doesn't lsof report socket options, socket states, and TCP flags and values for my dialect?

The lsof -T argument, 'f', that selects the reporting of socket options, socket states and TCP flags was implemented at lsof revision 4.71 for the following UNIX dialects, providing the indicated information:

AIX 4.3.2 and 5.1 and above

All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.

Apple Darwin 7.2 and above

All socket options and values, socket states, and TCP

flags and values described in lsof(8) are reported.

Digital UNIX and Tru64 UNIX 4.0

All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.

FreeBSD 4.9 and above

All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.

HP-UX 11.00 (/dev/kmem-based lsof)

All socket options and values are reported. No socket states are reported. Only the

TF\_NODELAY TCP flag and the TF\_MSS value are reported.

HP-UX 11.11 and iiiiv2 (PSTAT-based lsof)

All socket options and values, and socket states are reported. No TCP flags or values are reported.

Linux

No socket options and values, socket states, or TCP flags and values are reported. The support for "-Tf" could not be added to Linux, because socket options, socket states, and TCP flags and values are not available via the /proc file system.

NetBSD 1.6G and above

All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.

OpenBSD 3.4 and above

All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.

OPENSTEP 4.2

All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.

OpenUNIX 8

All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.

SCO OpenServer Release 5.0.6

All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.

Solaris 2.6, 8 and above

The socket option display is limited to BROADCAST, DEBUG, DGRAM\_ERRIND, DONTRROUTE and OOBINLINE. Socket values are limited to KEEPALIVE and LINGER. No socket states are reported. The TCP DELACK, NODELAY and SENTFIN flags are reported. The TCP MSS value is reported.

UnixWare 7.1.[134]

All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.

### 3.14.2 Why doesn't lsof report the partial listen queue connection count for my dialect?

The reporting of partial listen queue connections was added to -Tf processing at lsof revision 4.76. Currently it is reported for these dialects:

#### AIX 4.3.2

This dialect is no longer supported, so no attempt was made to add partial listen queue length support for it.

#### AIX 5.1 and above

Partial listen

queue information is available.

#### Apple Darwin 7.2 and above

Partial listen queue information is available.

#### Digital UNIX 4.0

This dialect is no longer supported, so no attempt was made to add partial listen queue length support for it.

#### FreeBSD 4.9 and above

Partial listen queue information is available.

#### HP-UX 11.00 (/dev/kmem-based lsof)

No partial listen queue information is available.

#### HP-UX 11.11 and iiiiv2 (PSTAT-based lsof)

No partial listen queue information is available.

#### Linux

No partial listen queue information is available.

#### NetBSD 1.6G and above

Partial listen queue information is available.

#### OpenBSD 3.4 and above

Partial listen queue information is available.

#### OPENSTEP 4.2

Partial listen queue information is available.

#### OpenUNIX 8

This dialect is no longer supported, so no attempt was made to add partial listen queue length support for it.

#### SCO OpenServer Release 5.0.6

No partial listen queue information is available.

#### Solaris 2.6, 8 and above

Partial listen queue information is available.

#### Tru64 UNIX 5.0

This dialect is no longer supported, so no attempt was made to add partial listen queue length support for it.

#### Tru64 UNIX 5.1



Partial listen queue information is available.

UnixWare 7.1.[134]

Partial listen queue information is available.

### 3.15 What does "no more information" in the NAME column mean?

When lsof can find no successor structures -- a gnode, inode, socket, or vnode -- connected to the file structure of an open descriptor of a process, it reports "no more information" in the NAME column. The TYPE, DEVICE, SIZE/OFF, and INODE columns will be blank.

Because the file structure is supposed to contain a pointer to the next structure of a file's processing support, if the pointer is NUL, lsof can go no further.

Some UNIX dialects have file structures for system processes -- e.g., the sched process -- that have no successor structure pointers. The "no more information" NAME will commonly appear for these processes in lsof output.

It may also be the case that lsof has read the file structure while it is being assembled and before a successor structure pointer value has been set. The "no more information" NAME will again result.

Unless lsof output is filled with "no more information" NAME column messages, the appearance of a few should be no cause for alarm.

### 3.16 Why doesn't lsof find a process that ps finds?

If lsof fails to display open files for a process that ps indicates exists, there may be several reasons for the difference.

The process may be a "zombie" for which ps displays the "(defunct)" state. In that case, the process has exited and has no open file information lsof can display. It does still have a process structure, sufficient for the needs of ps.

Another possible explanation is that kernel tables and structures may have been changing when lsof looked for the process,

making lsof unable to find all relevant process structures. Try repeating the lsof request.

### 3.17 Why doesn't -V report a search failure?

The usual reason that -V won't report a search failure is that lsof located the search item, but was prevented from listing it by an option that doesn't participate in search failure reporting.

For example, this lsof invocation:

```
$ lsof -V -i TCP@foobar -a -d 999
```

won't report it can't find the Internet address TCP@foobar, even if there is an open file connected to that address, unless the open file also has a file descriptor number of 999 (the ``-a -d 999" options).

Compile-time options can also affect -V results in much the same way. For example, if HASSECURITY and HASNOSOCKSECURITY are defined at compile time, this lsof invocation, run by a non-root user:

```
$ lsof -V -c inetd
```

won't report that it can't find the inetd command, even if there is a process running the inetd command, because the HASSECURITY and HASNOSOCKSECURITY options prevent the listing of all but the socket files of another user, and no socket file selector (e.g., "-i") was specified.

### 3.18 Portmap problems

#### 3.18.1 Why isn't a name displayed for the portmap registration?

When portmap registration reporting is enabled, any time there is a registration for a local TCP or UDP port, lsof displays it in square brackets, following the port number or service name -- e.g., ``:1234[name]" or ``:name[100083]".

The TCP or UDP port number or service number (what follows the `:') is displayed under the control of the lsof -P option. The registration identity is held by the portmapper and may be a name or a number, depending on how the registration's owner declared it. Lsof reports what the

portmap holds and cannot derive a registration name from a registration number.

Lsof can be compiled with registration reporting enabled or disabled by default, under the control of the `HASPMAPENABLED` #define (usually in `machine.h`).

The lsof help panel (``lsof -h``) will show the default. Lsof is distributed with reporting disabled by default.

### 3.18.2 How can I display only portmap registrations?

Lsof doesn't have an option that will display only TCP or UDP ports with portmap registrations. The `+M` option only enables the reporting of registration information when Internet socket files are displayed; `+M` doesn't select the displaying of Internet socket files -- the `-i` option does that.

This simple lsof pipe to `grep` will do the job:

```
$ lsof -i +M | grep "[
```

This works because `-i` selects Internet socket files, `+M` enables portmap registration reporting, and only output lines with opening square brackets will have registrations.

When portmap registration reporting is enabled by default, because the lsof builder constructed it that way, `+M` is not necessary. (The lsof help panel, produced with ``lsof -h`` will display the default portmapper registration reporting state.) However, specifying `+M` when reporting is already enabled is acceptable, as is specifying `-M` when reporting is already disabled.

Digression: lsof will accept ``+`` or ``-`` as a prefix to most options. (That isn't documented in the man page or help panel to reduce confusion and complexity.) The `-i` option is as acceptable as `+i`, so the above example could be written a little more tersely as:

```
$ lsof +Mi | grep "[
```

But be careful to use the ``Mi`` ordering, since ``iM`` implies `M` is an address argument to ``i``.

### 3.18.3 Why doesn't lsof report portmap registrations for some ports?

Lsof reports portmap registrations for local TCP and UDP ports only. It identifies local ports this way:

- \* The port appears in the local address section of the kernel structure that contains it.
- \* The port appears in the foreign address section of a kernel structure whose local and foreign Internet addresses are the same.
- \* The port appears in the foreign address section of a kernel address structure whose Internet address is INADDR\_LOOPBACK (127.0.0.1).

Following these rules, lsof ignores foreign portmapped ports. That's done for reasons of efficiency and possible security prohibitions. Contacting all remote portmappers could take a long time and be blocked by network difficulties (i.e., be inefficient). Many firewalls block portmapper access for security reasons.

Lsof may occasionally ignore portmap registration information for a legitimate local port by virtue of its local port rules. This can happen when a port appears in the foreign part of its kernel structure and the local and foreign Internet addresses don't match (perhaps because they're on different interfaces), and the foreign Internet address isn't INADDR\_LOOPBACK (127.0.0.1).

#### 3.18.4 Why doesn't lsof report portmap registrations for some Solaris versions?

In some versions of Solaris -- 9 and 10 are known to exhibit this problem -- lsof is unable to display portmap registrations.

This portmap registration reporting failure occurs when the Solaris netconfig field (in /etc or etc/inet) has its first two non-comment lines enabling tcp6 and udp6. When netconfig is configured in that fashion, lsof's attempt to read the portmap via an RPC function fails.

I don't have an explanation for the failure, but this comment in the netconfig(4) man page appears to have some bearing on the problem:

```
# The following two entries starting with udp6 and tcp6 are
# meant to be used for IPv6. If you have Ipv6 enabled on your
# machine then you can uncomment these two lines to enable
# RPC and NFS to use the Ipv6 stack.
...
#udp6 tpi_clts    v inet6 udp /dev/udp6 -
#tcp6 tpi_cots_ord v inet6 tcp /dev/tcp6 - "
```

My interpretation of that comment is that there is a different RPC interface to the portmap when IPv6 is enabled. However, I can't find any documentation on it in the RPC man pages. If anyone has information on it, please send it to me at <abe@purdue> and put "lsof Solaris portmap" in the subject line.

A work-around may be to move the ucp6 and tcp6 lines after the udp and tcxp lines in netconfig. I don't know if that change has any unacceptable consequences, but it works for me on my Solaris 9 test system, and I have a report that it also works on Solaris 10.

### 3.19 Why is `lsof | wc` bigger than my system's open file limit?

There is a strong temptation to count open files by piping lsof output to wc. If your purpose is to compare the number you get to some Unix system parameter that defines the number of open files your system can have, resist the temptation.

One reason is that lsof reports a number of "files" that don't occupy Unix file table space -- current working directories, root directories, jail directories, text files, library files, memory mapped files are some. Another reason is that lsof can report a file shared by more than one process that itself occupies only one file table slot.

If you want to know the number of open files that occupy file table slots, use the +ff option and process the lsof output's FILE\_ADDR column information with standard Unix tools like cut, grep, sed, and sort.

You might also consider using use lsof's field output with +ff, selecting the file struct address with -FF, and processing the output with an AWK or Perl script. See the list\_fields.awk, list\_fields.perl, and shared.perl5 scripts

in the scripts/ subdirectory of the lsof distribution for hints on file struct post-processing filters.

### 3.20 Why doesn't lsof report file offset (position)?

Lsof won't report a file offset (position) value if the -s option (without parameters) has been specified, or if the dialect doesn't support the displaying of file offset (position). (Note that on selected dialects the help output, obtained with -h or -?, may show that the -s option can also be supplied the "p:s" parameters; for more information on that addition, see the answer to the "How are protocol state name exclusion and inclusion used?" question.)

That lsof is reporting only file size is indicated by the fact that the appropriate column header says SIZE instead of SIZE/OFF.

If lsof doesn't support the displaying of file offset (position) -- e.g., for Linux /proc-based lsof -- the -h or -? output panel won't list the -o option.

Sometimes the availability of file offset information depends on the dialect's kernel. This is particularly true for socket file offsets.

Maintenance of offsets for pseudo-terminal devices varies by UNIX dialect and is related to how the dialect kernel implements pseudo-terminal support. Kernels like AIX, for example, that short-circuit the transfer of data between socket and pseudo devices to reduce TCP/IP daemon interrupt rates won't advance offsets in the TCP/IP daemon socket files. Instead they will advance offsets in the open standard I/O files of the shell child process where the pseudo-terminal devices are used.

When in doubt about the behavior of lsof in reporting file offset information, do some carefully measured experiments, consult the lsof sources, or contact me at <abe@purdue.edu> to discuss the matter. Please follow the reporting guidelines in the "How do I report an lsof bug?" section of this FAQ.

#### 3.20.1 What does lsof report for size when the file doesn't really have one?

When a file has no true size -- e.g., it's a socket, a

FIFO, or a pipe -- lsof tries to report the information it finds in the kernel that describes the contents of associated kernel buffers.

Thus, for example, size for most TCP/IP files is socket buffer size. The size of the socket read buffer is reported for read-only files; the size of the write buffer for write-only files; and the sum of the buffers sizes for read-write files.

### 3.21 Problems with path name arguments

#### 3.21.1 How do I ask lsof to search a file system?

You can ask lsof to search for all open files on a file system by specifying its mounted path name as an lsof argument -- e.g.,

```
$ lsof /
```

Output of the mount command will show file system mounted path names. It will also show the mounted-on device path for the file system.

If the mounted-on device is a block device (the permission field in output of `ls -l <device>` starts with a ``b/`), you can specify its name, too -- e.g.,

```
$ lsof /dev/sd0a
```

If the mounted-on device isn't a block device -- for example, some UNIX dialects call a CD-ROM device a character device (ls output starts with a ``c'`) -- you can force lsof to assume that the specified device names a file system with the `+f` option -- e.g.,

```
$ lsof +f -- /dev/sd0a
```

(Note: you must use ```--`" after `+f` or `-f` if a file name follows immediately, because `+f` and `-f` can be followed by characters that specify flag output selections.)

When you use `+f` and lsof can't match the device to a file system, lsof will issue a complaint.

The `+f` option

may be used in some dialects to ask lsof to search for an NFS file system by its server name and server mount point. If the mount application reports an NFS file system mounted-on value that way, then this sample lsof request should work.

```
$ lsof +f -- fleet:/home/fleet/u5
```

Finally, you can use -f if you don't want a mounted file system path name to be considered a request to report all open files on the file system. This is useful when you want to know if anyone is using the file system's mounted path name. This example directs lsof to report on open access to the '/' directory, including when it's being used as a current working or root directory.

```
$ lsof -f -- /
```

The lsof -f option performs the same function as -f does in some fuser implementations. However, since the lsof -c option was chosen for another purpose before the -f option was added to lsof, +f was selected as the analogue to the fuser -c option. (Sorry for the potential confusion.)

### 3.21.2 Why

doesn't lsof find all the open files in a file system?

Lsof may not find all the open files in a file system for several reasons.

First, some processes with files open on the file system may have been changing status when lsof examined the process table, and lsof "missed" them. Remember, the kernel changes much faster than lsof can respond to the changes.

Second, be sure you have specified the file system correctly. Perhaps you specified a file instead. You can use lsof's -V option to have lsof report in detail on what it couldn't find. Make sure the report for the file system you specified says "file system." Here's some -V output:

```
$ /lsof -V /tmp ./lsof.h ./lsof
COMMAND PID USER  FD  TYPE DEVICE SIZE/OFF INODE NAME
lsof   2688  abe  txt  VREG 18,1,7 1428583 226641 ./lsof
lsof   2689  abe  txt  VREG 18,1,7 1428583 226641 ./lsof
lsof: no file use located: ./lsof.h
```

You can also use lsof's +f option to force it to consider



a

path name as a file system. If lsof can't find a file system by the specified name, it will issue a complaint -- e.g.,

```
$ lsof +f -- /usr
lsof: not a file system: /usr
```

(/usr is a directory in the / file system.)

### 3.21.3 Why does the lsof exit code report it didn't find open files when some files were listed?

Sometimes lsof will list some open files, yet return a non-zero exit code, suggesting it hasn't found all the specified files.

The first thing you should do when you suspect lsof is incorrect is to repeat the request, adding the -V option. In the resulting report you may find that your file system specification really wasn't a file system specification, just a file specification.

Finally, if you specify two files or two file systems twice, lsof will credit all matches to the first of the two and believe that there were no matches for the second. It's possible to specify a single file system twice with different path names by using both its mounted directory path name and mounted-one device name.

```
$ lsof +f -V spcuna:/sysprog /sysprog
COMMAND PID USER  FD  TYPE DEVICE SIZE/OFF INODE NAME
ksh     11092  abe  cwd  VDIR 39,0,1  1536 226562 /sysprog
(spcuna:/sysprog)
...
lsof: no file system use located: spcuna:/sysprog
```

All matches were credited to /sysprog; none to spcuna:/sysprog.

### 3.21.4 Why won't lsof find all the open files in a directory?

When you give lsof a simple directory path name argument (not a file system mounted-on name), you are asking it to search for processes that have the directory open as a file, or as a process-specific directory -- e.g., root or current working directory.

If you want to list instances of open files inside the directory, you need to specify the individual path names of those files, or use the `ls -lR` and `ls -ld` options.

See the answer to the question "Why are the `+D` and `+d` options so slow?" before you use `+D` or `+d` casually.

See the answer to the question "Why do the `+D` and `+d` options produce warning messages?" for an explanation of some process authority limitations of `+D` and `+d`.

### 3.21.5 Why are the `+D` and `+d` options so slow?

The `+D` and `+d` options cause `ls` to build a path name search list for a specified directory. `+D` causes `ls` to descend the directory to its furthest subdirectory, while `+d` restricts it to the top level. In both cases, the specified directory itself is included in the search list. In both symbolic links are ignored.

Building such a search list can take considerable time, especially when the specified directory contains many files and subdirectories -- `ls` must call the system `readlink()` and `stat()` functions for each file and directory. Storing the search list can cause `ls` to use more than its normal amount of dynamic memory -- each file recorded in the search list consumes dynamic memory for its path name, characteristics, and search linkages. Using the list means `ls` must search it for every open file in the system.

Building the search list for a directory specified on some file systems can be slow -- e.g., for an NFS directory with many files. Some file systems have special logging features that can introduce additional delays to the building of the search list -- e.g., NFS logging, or logging on a Solaris UFS file system. The bottom line is that slow search list construction may not be so much an `ls` problem as a file system problem. (Hint: if you're using Solaris UFS logging, consider specifying the "logging,noatime" option pair to reduce the number of atime writes to the UFS logging queue and disk.)

A somewhat risky way to speed up `ls`'s building of the search list is to use `ls`'s `--O` option. It forces `ls` to do all system calls needed to build the search list directly, rather than in a child process. While direct

system calls are much faster, they can block in the kernel -- e.g., when an NFS server stops responding -- stopping lsof until the kernel operation unblocks.

As an example of the load +D can impose, consider that an `lsof +D /` on a lightly loaded NeXT '040 cube with a 1GB root file system disk took 4+ minutes of real time. It also generated several hundred error messages about files and directories the lsof process didn't have permission to access with `stat(2)`.

The bottom line is that +D and +d should be used cautiously. +D is more costly than +d for deeply nested directory trees, because of the full directory descent it causes. So use +d where possible. And you might need to consider the performance of the file system that holds the directory you name with +d or +D.

In view of these warnings, when is it appropriate to use +D or +d? Probably the most appropriate time is when you would specify the directory's contents to lsof with a shell globbing construct -- e.g., `lsof *`. If that's what you need to do, `lsof +d .` is probably more efficient than having the shell produce a directory list, form it into an argument vector, and pass the vector to lsof for it to unravel.

See the answer to the question "Why do the +D and +d options produce warning messages?" for an explanation of some process authority limitations of +D and +d.

### 3.21.6 Why do the +D and +d options produce warning messages?

+D and +d option processing is limited by the authority of the lsof process -- i.e., lsof can only examine (with `lstat(2)` and `stat(2)`) files the owner of the process can access.

If the ownership, group membership, or permissions of the specified directory, file within it, or directory within it prevents the owner of the lsof process from using `lstat(2)` or `stat(2)` on it, lsof will issue a warning message, naming the path and giving the system's (`lstat(2)`'s or `stat(2)`'s) reason (errno explanation text) for refusing access.

As an example, assume user abc has a subdirectory in /tmp,

owned by abc and readable, writable and searchable by only its owner. If user def asks lsof to search for all /tmp references with +D or +d, lsof will be unable to lstat(2) or stat(2) anything in abc's private subdirectory, and will issue an appropriate warning.

Lsof warnings can usually be suppressed with the -w option. However, using -w with +D or +d means that there will be no indication why lsof couldn't find an open reference to a restricted directory or something contained in it.

Hint: if you need to use +D or +d and avoid authority warnings, and if you have super-user power, su and use lsof with +D or +d as root.

### 3.22 Why can't my C compiler find the rpcnt structure definition?

When you try to compile lsof your compiler may complain that the rpcnt structure is undefined. The complaints may look like this:

```
>print.c: In function `fill_portmap':
>print.c:213: dereferencing pointer to incomplete type
>...
```

The most likely cause is that someone has allowed a BIND installation to update /usr/include/netdb.h (or perhaps /usr/include/rpc/netdb.h), removing the rpcnt structure definition that lsof expects to find there.

Only Solaris has an automatic work-around. (See dlsof.h in dialects/sun.). The Solaris work-around succeeds because there is another header file, <rpc/rpcnt.h>, with the rpcnt structure definition, and there is a Solaris C pre-processor test that can tell when the BIND <netdb.h> is in place and hence <rpc/rpcnt.h> must be included.

Doubtlessly there are similar work-arounds possible in other UNIX dialects whose header files have been "touched" by BIND, but in general I recommend restoration of the vendor's <netdb.h> and any other header files BIND might have replaced. (I think BIND replaces <resolv.h>, <sys/bitypes.h>, <sys/cdefs.h> -- and maybe others.)

### 3.23 Why doesn't lsof report fully on file "foo" on UNIX dialect "bar?"

Lsof sometimes won't report much information on a given file, or may even report an error message in its NAME column. That's usually because the file is of a special type -- e.g., in a file system specific to the UNIX dialect -- and I haven't used a system where the file appeared during my testing.

If you encounter such a situation, send me e-mail at <abe@purdue.edu> and we may be able to devise an addition to lsof that will report on the file in question. Please follow the reporting guidelines in the "How do I report an lsof bug?" section of this FAQ. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

### 3.24 Why do I get a complaint when I execute lsof that some library file can't be found?

On systems where the LIBPATH (or the equivalent) environment variable is used to record the library search path in executable files when they are built, an incorrect value may make it impossible for the system to find the shared libraries needed to load lsof for execution.

This may be particularly true on systems like AIX  $\geq$  4.1.4, where the lsof

Makefile takes the precautionary step of using the -bnolibpath loader flag to insure that the path to the private static lsof library is not recorded in the lsof binary. Should LIBPATH be invalid when lsof is built, it will be recorded in the lsof binary as the default library path search order and lead to an inability to find libraries when lsof is executed.

So, if you get missing library complaints when you try to execute lsof, check LIBPATH, or whatever environment variable is used on your system to define library search order in executable files. Use the tools at your disposal to look at the library paths recorded in the lsof binary -- e.g., chatr on HP-UX, dump on AIX, ldd on Solaris.

Make sure, too, that when the correct library search path has been recorded in the executable file, the required library files exist at one or more of the search paths.

### 3.25 Why does lsof complain it can't open files?

When lsof begins execution, unless it has been asked to report only help or version information, typically it will attempt to access kernel memory and symbol files -- e.g., /unix, /dev/kmem. Even though lsof needs only permission to open these files for reading, read access to them might be restricted by ownerships and permission modes.

So the first step to diagnosing lsof problems with opening files is to use ls(1) to examine the ownerships and permission modes of the files that lsof wants to open. You may find that lsof needs to be installed with some type of special ownership or permission modes to enable it to open the necessary files for reading. See the "Installing Lsof" section of OOREADME for more information.

### 3.26 Why does lsof warn "compiled for x ... y; this is z."?

Unless warnings are suppressed (with -w) or the kernel identity check symbol (HASKERNIDCK) definition has been deleted, all but one lsof dialect version (exception: /proc-based Linux lsof) compare the identity of the running kernel to that of the one for which lsof was constructed. If the identities don't match, lsof issues a warning like this:

```
lsof: WARNING: compiled for Solaris release 5.7; this is 5.6.
```

Two kernel identity differences can generate this warning -- the version number and the release number.

Build and running identity differences are usually significant, because they usually indicate kernels whose structures are different -- kernel structures commonly change at dialect version releases. Since lsof reads data from the kernel in the form of structures, it is sensitive to changes in them. The general rule is that an lsof compiled for one UNIX dialect version will not work correctly when run on a different version.

There are three work-arounds: 1) use -w to suppress the warning -- and risk missing other warnings; 2) permanently disable the identity check by deleting the definition of HASKERNIDCK in the dialect's machine.h header file -- with the same risk; or 3) rebuild lsof on the system

where it  
is to be run. (Deleting HASKERNIDCK can be done with the  
Customize script or by editing machine.h.)

Generally checking kernel identity is a quick operation  
for lsof. However, it is potentially slow under AIX, where  
lsof must run /usr/bin/oslevel. To speed up lsof, use -w  
to suppress the /usr/bin/oslevel test. See "Why does AIX  
lsof start so slowly?" for more information.

### 3.27 How can I disable the kernel identity check?

The kernel identity check is controlled by the HASKERNIDCK  
definition. When it is defined, most dialects (exclusion:  
/proc-based Linux lsof) will compare the build-time kernel  
identity with the run-time one.

To disable the kernel identity check, disable the HASKERNIDCK  
definition in the dialect's machine.h header file. The  
Customize script can be used to do that in its section  
about the kernel identity check.

Caution: while disabling the kernel identity check may  
result in smaller lsof startup overhead, it comes with the  
risk of  
executing an lsof that may produce warning messages,  
error messages, incorrect output, or no output at all.

### 3.28 Why don't ps(1) and lsof agree on the owner of a process?

Generally the user ID lsof reports in its USER column is  
the process effective user ID, as found in the process  
structure. Sometimes that may not agree with what ps(1)  
reports for the same process.

There are sundry reasons for the difference. Sometimes  
ps(1) uses a different source for process information,  
e.g., the /proc file system or the psinfo structure.  
Sometimes the kernel is lax or confused (e.g., Solaris  
2.5.1) about what ID to report as the effective user ID.  
Sometimes the system carries only one user ID in its process  
structure (some BSD derivatives), leaving lsof no choice.

The differences between lsof and ps(1) user identifications  
should be small and normally it will be apparent that the  
confusion is over a process whose application has changed  
to an effective user ID different from

the real one.

### 3.29 Why doesn't lsof find an open socket file whose connection state is past CLOSE\_WAIT?

TCP/IP connections in states past CLOSE\_WAIT -- e.g., FIN\_WAIT\_1, CLOSING, LAST\_ACK, FIN\_WAIT\_2, and TIME\_WAIT -- don't always have open files associated with them. When they don't, lsof can't identify them. When the connection state advances from CLOSE\_WAIT, sometimes the open file associated with the connection is deleted.

### 3.30 Why don't machine.h definitions work when the surrounding comments are removed?

The machine.h header files in dialect subdirectories have some commented-out definitions like:

```
/* #define HASSYSDC "/your/choice/of/path */
```

You can't simply remove the comments and expect the definition to work. That's intended to make you think about what value you are assigning to the symbol. The assigned value might have a system-specific convention. HASSYSDC, for example, might be /var/db/lsof.dc for FreeBSD, but it might be /var/adm/lsof.dc for Solaris.

Symbols defined in the lsof documentation are described in 00PORTING, other machine.h comments, and other lsof documentation files. HASSYSDC, for example, is discussed in 00DCACHE. When comments and documentation don't suffice, consult the source code for hints on how the symbol is used.

### 3.31 What do "can't read inpcb at 0x...", "no protocol control block", "no PCB, CANTSENDMORE, CANTRCVMORE", etc. mean?

Sometimes lsof will report "can't read inpcb at 0x00000000", "no protocol control block", "no PCB, CANTSENDMORE, CANTRCVMORE" or a similar message in the NAME column for open TCP socket files. These messages mean the file's socket structure lacks a pointer to the INternet Protocol Control Block (inpcb) where lsof expects to find connection addresses -- local and foreign ports, local and foreign IP addresses. The socket file has probably been submitted to the shutdown(2) function for processing.



In some implementations lsof issues the "no PCB, CANTSENDMORE, CANTRCVMORE" message, which tries to explain the absence of a protocol control block by showing the socket state settings that have been made by the shutdown(2) function.

If a non-zero address follows the "0x" in the "can't read inpcb" message, it means lsof couldn't read inpcb contents from the indicated address in kernel memory.

### 3.32 What do the "unknown file system type" warnings mean?

Lsof may report a message similar to"

```
unknown file system type, v_op: 0x10472f10
```

in the NAME column for some files.

This means that lsof has encountered a vnode for the file whose operation switch address (from v\_op) references a file system type for which there is no support in lsof. After lsof identifies the file system type, it uses pre-compiled code to locate the file system specific node for the file where lsof finds information like file size, device number, node number, etc.

To get some idea of what the file system type might be, use nm on your kernel symbol file to locate the symbol name that corresponds to the v\_op address -- e.g., on Solaris do:

```
$ nm -x /dev/ksyms | grep 0x10472f10
0x10472f10 ... |file_system_name_vnodeops
```

Where "file\_system\_name" is the clue to the unsupported file system.

Lsof doesn't use the v\_op address to identify file system types on all dialects. Sometimes it uses an index number it finds in the vnode. It will translate that symbol to a short name in the warning message -- e.g., "nfs3" -- if possible.

### 3.33 Installation

#### 3.33.1 How do I install lsof?

There is no "standard" way to install lsof. Too much depends on local conditions for me to be able to provide working install rules in the lsof make files. (The skeleton install rules you will find just give "hints.") See the "Installing lsof" section of 00README for a fuller explanation.

To install lsof you will need to consider these questions:

- \* Who should be able to use lsof? (See HASSECURITY and HASNOSOCKSECURITY in the "Security" section of 00README.)
- \* Where should lsof be installed? This is a decision mostly dictated by local conditions. Somewhere in /usr/local -- etc/ or sbin/ -- is a common choice.
- \* What permissions should I give the lsof executable? The answer to this varies by dialect. The make files have install rules that give hints. The "Installing lsof" section of 00README gives information, too.
- \* What if I want to install lsof in a shared file system for machines that require different lsof configurations? See the next question and answer, "How do I install a common lsof when I have machines that need differently constructed lsof binaries?"

### 3.33.2 How do I install a common lsof when I have machines that need differently constructed lsof binaries?

A dilemma that faces some system administrators when they install lsof in a shared file system -- e.g., NFS -- is that they must have different lsof executables for different systems.

The answer is to build an lsof wrapper script that is executed in place of lsof. The script can use system commands to determine which lsof binary should be executed.

Consider this example. You have HP-UX machines with 32 and 64 bit kernels that share the /usr/local/sbin directory where you want to install lsof. Consequently, on each system you must use a different lsof executable, built for the system's bit size. (That's because lsof reads kernel structures, sized by the kernel's bit size.)

One answer is to install three things in /usr/local/sbin:

1) a 32 bit lsof as lsof32; 2) a 64 bit lsof as lsof64; and 3) an lsof script. The script might look like this one, based on work by Amir J. Katz:

```
#!/bin/sh
x=`/usr/bin/getconf KERNEL_BITS` # returns 32 or 64
if /usr/bin/test "X$x" = "X32"
then
  lsof32 $*
else
  if /usr/bin/test "X$x" = "X64"
  then
    lsof64 $*
  else
    echo "Can't determine which lsof executable to use;"
    echo
    "getconf KERNEL_BITS says: $x"
    exit 1
  fi
fi
```

Solaris users should consult "How do I install lsof for Solaris 7, 8 or 9?" for information on a similar trick using the Solaris isaexec command.

Users of other dialects might be able to use a command like uname(1) that can identify a distinguishing feature of the system to be incorporated in pre-installed lsof executable names. For example, use `uname -r` and install binaries with suffixes that match `uname -r` output.

### 3.34 Why do lsof 4.53 and above reject device cache files built by earlier lsof revisions?

When lsof revisions 4.53 run and encounter a device cache file built by an earlier revision, it will reject the file and build a new one. The rejection will be advertised with these messages:

```
lsof: WARNING: no /dev device in <name>: 2 sections
...
lsof: WARNING: created device cache file: <name>
```

This happens because the header line of the device cache file was changed at revision 4.53 to contain the number of the device on which the device directory resides. The old device cache file header line -- the "2 sections" line in

the above warning message, node reads "2 sections, dev=600".

This is not a serious problem, since lsof automatically rebuilds the device cache file with the correct header line.

### 3.35 What do "like block special" and "like character special" mean in the NAME column?

When lsof comes across an open block or character file whose device, raw device and inode place it somewhere other than /dev (or /devices), lsof doesn't report the /dev (or /devices) name in the NAME column. Instead lsof reports the file system name and device or path name in the NAME column and parenthetically adds "like block special <path>" or "like character special <path>".

The value for <path> will point to a block or character device in /dev (or /devices) whose raw device number matches that of the open file being reported, but whose device number or node number (or both) don't match.

Such an open file is connected to a device node that has been created in a directory other than /dev (or /devices.) See `mknod(8)` for information on how such nodes are created. (Generally one needs root power to create device nodes with `mknod`.)

### 3.36 Why does an lsof make fail because of undefined symbols?

When lsof is compiled via the `make` step and the final load step fails because of missing symbols, the problem may not be lsof. The problem may be that `ld`, called by the compiler as part of the `make` step, can't find some library that lsof needs.

First check the last compiler line of the make operation -- e.g., the last line with `cc` or `gcc` in it before the undefined symbol report -- for loader arguments, i.e., ones beginning with `-l`. Except for `-llsof` the rest name system libraries. (`-L./lib` precedes `-llsof` to tell the loader its location.)

Check that all the named system libraries exist. Look in `/lib` and `/usr/lib` as a start, but that may not be the only place system libraries live. Consult your dialect's

documentation, e.g., the compiler and loader man pages, for other possible locations.

If some system library doesn't exist, that may mean it was never installed or was removed. You'll have to re-install the missing library.

You may find that all the system libraries lsof uses exist. Your next step might be to use nm and grep to see if any of them contain the undefined symbols.

```
$ nm library | grep symbol
```

If the undefined symbol exists in some library named by the lsof make step, then you might have a problem with some environment variable that controls the load step. The most common is LD\_LIBRARY\_PATH. It may have a setting that causes ld to ignore a directory containing a library lsof names. If this is the case, try unsetting LD\_LIBRARY\_PATH in the environment of the ld process -- e.g., do:

```
$ unset LD_LIBRARY_PATH  
or  
% unsetenv LD_LIBRARY_PATH
```

Consult your ld man page for other environment variables that might affect library searching -- e.g., LIBPATH, LPATH, SHLIB\_PATH, etc.

If the undefined function doesn't exist in any libraries lsof names, check other libraries. See if the function has a man page that names its library. If the latter is true, please let me know, because that is an lsof problem I need to fix.

If none of these solutions work for you, send me some documentation via e-mail at <abe@purdue.edu>. Include `uname -a` output, the output of the lsof `Configure ...` and `make` steps, and the contents of the environment in force when the `make` step was executed -- e.g., `env` or `printenv` output. If you've located the libraries lsof names, send me that information, too. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

### 3.37 Command Regular Expressions (REs)

#### 3.37.1 What are basic and extended regular expressions?

Lsof's `--c` option allows the specification of regular expressions (REs), enclosed in two slash (/) characters and followed by these modifiers:

- b the RE is a basic RE.
- i ignore case.
- x the RE is an extended RE (the default).

Note: the characters of the regular expression may need to be quoted to prevent their expansion by the shell.

Example: this RE is an extended RE that matches exactly four characters, whose third may be an upper ('O') or lower case ('o') oh:

```
-c /^..o.$/i
```

For simplicity's sake, an RE that is acceptable to `egrep(1)` is usually called an extended RE.

REs suitable for the old line editor, `ed(1)`, are often called basic REs (and sometimes also called obsolete).

These are some ways basic REs usually differ from extended REs. (There are other differences.)

\* `\|`, `\+`, `\?`, `\{`, and `\}` are ordinary characters.

\* `^` is an ordinary character except at the beginning of the RE.

\* `$` is an ordinary character except at the end of the RE.

\* `*` is an ordinary character if it appears at the beginning of the RE.

For more information on REs and the distinction between basic and extended REs, consult your dialect's man pages for `ed(1)`, `egrep(1)`, `sed(1)`, and possibly `regex(5)` or `regex(7)`.

### 3.37.2 Why can't I put a slash in a command regular expression?

Since a UNIX command name is the last part of a path to

the command's executable, the lsof command regular expression (RE) syntax uses slash (/) to mark the beginning and end of an RE. Slash may not appear in the RE and the backslash escape is ineffective for "hiding" it.

More likely than not, if you try to put a slash in an lsof command RE, you'll get this response:

```
$ lsof -s./\ / ...
lsof: invalid regexp modifier: /
```

Lsof is complaining the the first character it found after the second slash isn't an lsof command RE modifier -- 'b', 'i', or 'x'.

### 3.37.3 Why does lsof say my command regular expression wasn't found?

When you use both forms of lsof's

-c option --

``-c <command>" and ``-c /RE/[m]" -- and ask that lsof do a verbose search (``-V"), you may be surprised that lsof will say that the regular expression wasn't found.

This can happen if the ``-c <command>" form matches first, because then the ``-c/RE/[m]" test will never have been applied. For example:

```
$ ./lsof -c/ls -c/^..o.$/ -V -adcwd
COMMAND PID USER  FD  TYPE DEVICE SIZE/OFF  NODE NAME
lsof    7850 abe  cwd  VDIR  6,0  2048 96442 / (/dev/sd0a)
lsof: no command found for regex: ^..o.$
```

The ``-c/ls" option matched first, so the ``-c/^..o.\$/" option wasn't tested.

### 3.38 Why doesn't lsof report on shared memory segments?

Lsof reports on shared memory segments only if they're associated with an open file. That's consistent with lsof's mission -- to List Open Files. Shared memory segments with no file associations aren't open files.

That's not to say that a report on shared memory segments and their associated processes wouldn't be useful. But it calls for a new tool, not more baggage for lsof.

### 3.39 Why does lsof report two instances of itself?

When you ask lsof to report all open files and it has permission to do so, you may see two lsof processes in the output. The processes are connected via pipes -- e.g., here's an HP-UX 11 example.

```
COMMAND  PID USER  FD  TYPE  DEVICE ...
...
lsof    29450  abe   7w  PIPE 0x48732408 ...
lsof    29450  abe   8r  PIPE 0x48970808 ...
...
lsof    29451  abe   6r  PIPE 0x48732408 ...
lsof    29451  abe   9w  PIPE 0x48970808 ...
```

The first process will usually be the lsof you initiated; the second, an lsof child process that is used to isolate its parent process from kernel functions that can block -- e.g., readlink() or stat().

Information to and from the kernel functions is exchanged via the two pipes. When the parent process detects that the child process has become blocked, it attempts to kill the child. Depending on the UNIX dialect that may succeed or fail, but the parent won't be blocked in any event.

See the "BLOCKS AND TIMEOUTS" and "AVOIDING KERNEL BLOCKS" sections of the lsof man page for more information on why the child process is used and how you can specify lsof options to avoid it. (Caution: that may be risky.)

#### 3.40 Why does lsof report '\n' in device cache file error messages?

Lsof revisions prior to 4.58 may report '\n' in error messages it delivers about problems in the device cache file -- e.g.,

```
lsof: WARNING: no ...: 4 sections\n
```

That's deliberately done to show the exact contents of the device cache file line about which lsof is complaining, including its terminating NL (New Line) '\n' character. In the above example the line in the device cache file causing the lsof complaint contains "4 sections" and ends with a '\n'.

At revision 4.58 and above, device cache error messages like the one in the above example have been changed



to  
read:

```
lsof: WARNING: no ...: line "4 sections"
```

The terminal '\n' is no longer reported, the line contents are enclosed in double quote marks (""), and the word "line" has been added as a prefix to denote that what follows is a line from the device cache file.

### 3.41 Kernel Symbol and Address Problems

#### 3.41.1 What does "lsof: WARNING: name cache hash size length error: 0" mean?

When run on some systems, lsof may issue this warning:

```
lsof: WARNING: name cache hash size length error: 0
```

That is an example from a FreeBSD system where lsof reads the kernel's `_nchash` variable and finds its value is zero.

Similar warnings include:

```
WARNING: kernel name cache size:  
WARNING: can't read kernel's name cache:  
WARNING: no name cache address  
WARNING: name cache hash size length error:  
WARNING: unusable name cache size:
```

These warnings are issued when lsof is attempting to read the kernel's name cache information. They are usually the result of a mis-match between the addresses for kernel symbols lsof gets via `nlist(2)` and the addresses in use by the kernel.

Lsof usually gets kernel symbol addresses from what it believes to be the kernel boot file. In FreeBSD, for example, that's the path returned by `getbootfile(3)`, usually `/kernel`. The boot file can have other names in other UNIX dialects -- `/unix`, `/vmunix`, `/bsd`, `/netbsd`, `/mach`, `/stand/vmunix`, etc.

Lsof will get incorrect (mismatched) addresses from the boot file if it has been replaced by a newer one which hasn't yet been booted -- e.g., if this is done in FreeBSD:

```
# mv /kernel /kernel.OLD
# mv /kernel.NEW /kernel
```

Until the FreeBSD system is rebooted, the booted kernel is /kernel.OLD, but getbootfile() says it is /kernel. If symbol addresses important to lsof in /kernel.OLD and /kernel don't match, the lsof WARNING messages result.

### 3.41.2 Why does lsof produce "garbage" output?

Kernel name cache warnings may not be the only sign that lsof is using incorrect symbol addresses to read kernel values. If there's no reasonable test lsof can make on what it reads from the kernel, it may issue other warnings or even report nonsensical results.

The warnings may appear on STDERR, such as:

```
lsof: can't read proc table info
```

Or the warnings may appear in the NAME column as messages saying lsof can't read or interpret some kernel structure -- e.g.,

```
... NAME
... can't read file struct from 0x12345
```

One possible work-around is to point lsof's kernel symbol address gathering at the proper boot file. That can be done with lsof's -k option -- e.g.,

```
$ lsof -k /kernel.OLD
```

The best work-around is to make sure the standard boot file is properly sited -- e.g., if you've moved a new /kernel in place, boot it.

### 3.42 Why does lsof report open files when run as super user that it doesn't report when run with lesser privileges?

The most likely cause is that the HASSECURITY option was selected when the lsof executable was built.

If HASSECURITY is defined when lsof is built, and lsof is run with the privileges of a non-ROOT user, it will only list open files belonging to the user. The same lsof

executable, when run with root user privileges, will list all open files.

However, if HASSECURITY and HASNOSOCKSECURITY are both defined when lsof is built, lsof will list open files belonging to the user and will also list anyone else's open socket files, provided their listing is selected with the "-i" option.

So first ask yourself if the process whose open files lsof won't list belong to a user other than the one under which you're running lsof, and are not open socket files. If either is true, use lsof's help (-h or -?) option and look for a line near the bottom of the help panel that says:

```
"... can list all files..."
```

If the leading "..." says "Only root" then HASSECURITY was defined when lsof was built. If the trailing "..." says "...", but anyone can list socket files" then HASNOSOCKSECURITY was also defined.

Should you want an lsof not built with HASSECURITY defined, rerun the lsof Configure script. If you let Configure do customization, make sure you answer 'n' when it asks if you want to enable HASSECURITY and HASNOSOCKSECURITY. If you don't need to do customization, you can rebuild lsof with the "-n" option to Configure. Here's an example of such a rebuild sequence:

```
$ Configure -clean
$ Configure -n <dialect-abbreviation>
$ make
```

More information on the HASSECURITY and HASNOSOCKSECURITY options may be found in the "Security" section of the README file of the lsof distribution.

### 3.43 Test Suite Problems

#### 3.43.1 Errors all tests can report:

##### 3.43.1.1 Why do tests complain "ERROR!!! can't execute ../lsof"?

All tests in the test suite expect an executable lsof file to exist in the tests parent directory, ../lsof.

If there's none there, the tests/Makefile has a rule to make it, but there are probably circumstances where that rule may fail.

The work-around is to re-Configure and re-make lsof, then run the test suite.

#### 3.43.1.2 Why do tests complain "ERROR!!! can't find ..." a file?

Many tests create (or use from a supplied environment variable path) a test file and use lsof to find it. When lsof can't find the file, the tests report the error with messages of the form:

```
ERROR!!! can't find ... : <some file path>
or
ERROR!!! lsof couldn't find ...
```

These type of error messages mean that the lsof field output delivered to the test didn't contain a file that the test could identify as the one it intended lsof to find. It might also mean that the process information -- command name, PID or parent PID -- didn't match what the test expected.

This could imply a bug in the test or a bug in lsof. Try using lsof to find a known file that is open. For example, while in the tests sub-directory, do this:

```
$ sleep 30 < Makefile
$ ../lsof Makefile
```

If lsof doesn't report that Makefile is open, then the fault may be with lsof. If lsof reports the file is open, search further in the test code for the failure cause.

#### 3.43.1.3 Why do some tests fail to compile?

If a test suite program fails to compile, it may be because I've never had an opportunity to compile the test on the particular UNIX version you are using.

See Appendix B in OOTEST for a list of the UNIX dialects where the test suite has been validated.

#### 3.43.1.4 Why do some tests always fail?

There are several tests in the optional group that have conflicting or special requirements:

LTbigf needs a dialect and file system that support large files.

LTlock won't work if the tests/ sub-directory is on an NFS file system.

LTnfs won't work if the tests/ sub-directory is not on an NFS file system.

So for two tests in particular, LTlock and LTnfs, one will generally fail.

Some failing tests can be run successfully by supplying to them a path to the appropriate type of file system with the -p option.

3.43.1.5 Why does the test suite say it hasn't been validated on my dialect?

When you use the default rule of the test suite's Makefile, it may issue this complaint:

```
$ cd tests
$ make
!!!WARNING!!!
```

This dialect or its particular version may not have been validated with the lsof test suite. Consequently some tests may fail or may not even compile.

```
!!!WARNING!!!
```

You are then given the opportunity to answer 'y' to have the test suite operation continue.

This message means that the tests/TestDB file in the tests sub-directory doesn't show that the test suite has been run with the combination of compiler flags found in tests/config.cflags. The tests might not run; they may encounter compiler failures.

See 00TEST for more information on the UNIX dialects where the test suite has been validated and on the workings of

TestDB and its supporting scripts.

When

the tests/Makefile "auto" rule is used, the message is more terse and the condition is fatal.

This suite has not been validated on:

<dialect\_description>

No opportunity to continue is offered.

The tests/Makefile "silent" rule will skip checking for the validation footprint.

#### 3.43.1.6 Why do the tests complain they can't stat() or open() /dev/mem or /dev/kmem?

When the tests detect that lsof for the dialect reads its information from kernel memory (i.e., the LT\_KMEM definition is present in tests/config.cflags), and when the lsof executable path is ../lsof, the tests make sure they can stat() and open() for read access the relevant kernel memory devices, /dev/kmem and possibly /dev/mem.

If those stat() or open() operations fail, the tests issue an error message and quit. The message explains why the system rejected the operation in terms of system "errno" symbols and messages. More often than not the explanation will be that the process lacks permission to access the indicated device node.

One work-around is to give the lsof executable being tested the necessary permission -- e.g., via chgrp, chmod, etc. -- and set its path in the LT\_LSOF\_PATH environment variable. (See 00TEST.)

Another work-around is to make sure the process that runs the tests has the necessary permissions -- e.g., run it as root, or enable the process login to access the resources. For example, I can run the tests on my personal work-station because /dev/kmem and /dev/mem are readable by the "kmem" group and my login is in that group.

#### 3.43.2 LTbigf test issues

### 3.43.2.1 Why does the LTbigf test say that the dialect doesn't support large files?

Large file support is defined dialect by dialect in the lsof source files and Configure script. If large file support isn't defined there, it isn't defined in the LTbigf test.

If you think that's wrong for a particular dialect, contact me via e-mail at <abe@purdue.edu>. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

### 3.43.2.2 Why does LTbigf complain about operations on its config.LTbigf\* file?

The LTbigf must be able to write a large file test (size > 32 bits) and seek within it and the process file ulimit size must permit the operation. If the default location for the test file, tests/, isn't on a file system enabled for large file operations or if the process ulimit file block size is too small, lsof will get file operation errors, particularly when seeking

There may be a work-around. Specify the path to a file LTbigf can write in a file system enabled for large file operations a the -poption. Make sure that the ulimit file block size permits writing a large file. For example, presuming /scratch23 is large-file-enabled, and presuming you have permission to raise the ulimit file block size, this shell commands will allow the LTbigf test to run on AIX:

```
$ ./LTbigf -p /scratch23/abe/bigfile
```

(Note: syntax for the ulimit command varies by dialect and by shell. Discovering the proper variant is left to the reader.)

More information on this subject can be found in the LTbigf description in the 00TEST file. Of course, the LTbigf.c source file in tests/ is the ultimate source of information,

### 3.43.2.3 Why does LTbigf warn that lsof doesn't return file offsets?

On some dialects (e.g., Linux) lsof can't report file

offsets, because the data access method underlying lsof doesn't provide them. If LTbigf knows that lsof can't report file offsets for the dialect, it issues this warning:

```
LTbigf ... WARNING!!! lsof can't return file offsets
for this dialect, so offset tests have
been disabled.
```

LTbigf then performs the size test and skips the offset tests.

For more information see 00TEST and the "Why doesn't /proc-based lsof report file offsets (positions)?" Q&A of this file.

3.43.3 Why does the LTbasic test complain "ERROR!!! lsof this ..." and "ERROR!!! lsof that ..."?

The LTbasic test program uses lsof to examine a running lsof process. It looks for the lsof current working directory, executable (if possible), and kernel memory file (if applicable).

Failures to find those things result in the LTbasic error messages. More information on how LTbasic produces the error messages may be found in the LTbasic.c source file.

On HP-UX 11.11 and higher, for example, if the test's current working directory is on a loopback (LOFS) file system, LTbasic won't be able to find the current working directory of the lsof process because of a bug in the HP-UX kernel.

The solution for that HP-UX problem is to install an HP-UX patch. See the answer to the "Why doesn't PSTAT-based lsof report a CWD that is on a loopback (LOFS) file system?" question for more information on the patch.

3.43.4 NFS test issues

3.43.4.1 Why does the LTnfs test complain "couldn't find NFS file ..."?

The LTnfs test must work with an NFS test file.

After it opens the file it asks lsof to find it on an NFS file system. If the file isn't on an NFS file system, lsof won't find it, and the NFS test script complains and fails.



The work-around is to use -p option to supply a path to a regular NFS file (not a directory) that is on an NFS file system that LTnfs can read. Presuming /share/bin/file is such a file and can be opened for reading by the LTnfs test, this sample shell command could be used to run the LTnfs test successfully:

```
$ ./LTnfs -p /share/bin/file
```

(If the NFS file system is enabled for large files, the NFS test will produce the error message described in the following Q&A.)

### 3.43.5 LTnlink test issues

#### 3.43.5.1 Why does the LTnlink test complain that its test file is on an NFS file system?

The LTnlink test may complain:

```
LTnlink ... WARNING!!! test file <path> is NFS mounted.
```

and then issue an explanation and a hint about using the -p option.

The LTnlist test does this because of the way NFS file links are managed when an NFS file is unlinked and the unlinking process still has the file open. Unlike with files on a local file system, when an NFS file that is still open is unlinked, its link count is not reduced.

The file name is changed to a name of the form .nfsxxxx and the link count is left unchanged until the process holding the file open closes it. That's done by NFS so it can keep proper track of the file on NFS clients and servers.

Since the link count isn't reduced when the LTnlink test program closes the NFS test file it still has open, lsof won't find it for LTnlink with a link count of zero. Consequently, LTnlink disables that test section and issues its warning.

The warning suggests that the unlink test section can be run by giving LTnlink a path to a test file with the -p option. That path must name a file LTnlink can write and unlink. Presuming /scratch23/abe/nlinkfile is on a local file system and the LTnlink test can write

to it and unlink  
it, this sample shell command can be used to run the complete  
LTnlink test successfully:

```
$ LTnlink -p /scratch23/abe/nlinkfile
```

### 3.43.5.2 Why does LTnlink delay and report "waiting for link count update: ..."?

On some UNIX dialects and file system combinations the updating of link count after a file has been unlinked can be delayed. Consequently, lsof won't be able to report the updated link count to LTnlink for a while.

When lsof doesn't report the proper link count to LTnlink, it sleeps and repeats the lsof call, using the "waiting for link count update: ..." message as a signal that it is waiting for the expected lsof response. The wait cycle duration is limited to approximately one minute.

### 3.43.5.3 Why does LTnlink fail because of an unlink error?

LTnlink may fail with an error similar to:

```
LTnlink ... ERROR!! unlink(<name>) failed: (Permission denied).
```

That message will be followed by a short explanation.

The error means that the kernel support for the file system on which the file <name> resides does not allow a process to unlink a file while it has the file open. (When LTnlink is run without the "-p path" option, it creates a <name> that begins with "./config.LTnlink" and ends with the LTnlink process ID number.)

An unlink failure of this type runs counter to original UNIX file system behavior, but it has been observed on some file system types, especially on the ZFS file system.

The work-around is to run LTnlink on a file system that allows a process to unlink a file it has open. Usually /tmp has that support. So, try running LTnlink this way:

```
$ ./LTnlink -p /tmp/<name>
```

where <name> is a unique name in /tmp of your choosing. To be safe, create a subdirectory in /tmp, named by your login:

```
$ rm -f /tmp/<login>
$ mkdir /tmp/<login>
$ ./LTnlink -p /tmp/<login>/<name>
```

### 3.43.6 LTdnlc test issues

#### 3.43.6.1 Why won't the LTdnlc test run?

Lsof is unable to access the DNLC cache on AIX, because the kernel symbols for the DNLC aren't exported. Contact IBM to learn why that decision was made.

The LTdnlc test won't work on Apple Darwin because lsof can't obtain reliable DNLC information.

The LTdnlc test may fail on other dialects. Failure causes include: a busy system with a DNLC that is changing rapidly; path name components too large for the DNLC; a file system -- e.g., NFS, /tmp, loopback -- which doesn't fully participate in the DNLC; or DNLC limitations (Many DNLC implementations will only store path name components if they are 31 characters or less.)

If you suspect the file system doesn't fully participate in kernel DNLC processing, as a work-around rebuild and test lsof on one that does.

#### 3.43.6.2 What does the LTdnlc test mean by "... <path> found: 100.00%"?

Even when it succeeds the LTdnlc test will report:

```
LTdnlc ... /export/home/abe/src/lsof4/tests found: 100.00%
```

This message means that the LTdnlc test asked lsof to find the file at the indicated path five times and lsof found the full path name in the indicated percentage of calls. The LTdnlc test considers it a failure if the percentage falls below 50.0%

#### 3.43.6.3 Why does the DNLC test fail?

The DNLC test may fail when some component of the lsof tests/ sub-directory can't be cached by the kernel DNLC. Some kernels have a limit on the length of individual components (typically) 32.

### 3.43.7 Why hasn't the test suite been qualified for 64 bit HP-UX 11 when lsof is compiled with gcc?

When I attempted to qualify lsof for HP-UX 11, compiled with gcc 3.0, the LTsock test failed. I traced the failure to a gcc compilation error. Because LTsock is an important test, I didn't feel that the test suite was qualified if it failed.

LTsock compiles and runs correctly on 64 bit HP-UX 11 when compiled with HP's ANSI-C.

### 3.43.8 LTzoff test issues

#### 3.43.8.1 Why does LTzoff warn that lsof doesn't return file offsets?

On some dialects (e.g., Linux) lsof can't report file offsets, because the data access method underlying lsof doesn't provide them. If LTzoff knows that lsof can't report file offsets for the dialect, it issues this warning:

```
LTzoff ... WARNING!!! lsof can't return file offsets
for this dialect, so offset tests have
been disabled.
```

LTzoff then performs the size test and skips the offset tests.

For more information see 00TEST and the "Why doesn't /proc-based lsof report file offsets (positions)?" Q&A of this file.

### 3.43.9 LTlock test issues

#### 3.44 File descriptor list (the ``-d" option) problems

##### 3.44.1 Why does lsof reject a ``-d" FD list?

lsof rejects ``-d" FD lists that contain both exclusions and inclusions with messages like:

```
lsof: exclude in an include list: ^1
lsof: include in an exclude list: 2
```

That's because ``-d" FD lists are processed as ORed lists, so it makes no sense for them to contain both exclusions

and inclusions.

I.e., if a `--d` FD list were to contain `^cwd,1`, the `^cwd` member is useless, because the `1` member dominates by saying "include only FD 1". That effectively excludes `^cwd` FD.

Note that lists may have multiple members of the same type, exclude or include. They are processed as an ORed set. If an FD isn't excluded by any member of an exclude list, it is selected. If an FD is included by any member of an include list, it is selected.

#### 3.44.2 Why are file descriptors other than those in my FD list reported?

The FD list that follows `--d` excludes or includes file descriptors, but unless the `--a` (AND) option is specified, the FD list selections are ORed to the other selections.

For example, the following `lssof` command will cause all file descriptors to be listed for the `lssof` command, and all but the `cwd` descriptor for all other commands, probably not what was intended.

```
$ lssof -clssof -d^cwd
```

Hint: use `--a` -- e.g.,

```
$ lssof -clssof -a -d^cwd
```

#### 3.45 How can I supply device numbers for inaccessible NFS file systems?

When `lssof` can't get device numbers for inaccessible NFS file systems via `stat(2)` or `lstat(2)`, it attempts to get them from the mount table's `dev=xxx` options. Successes are reported with a warning message that indicates the source of the device number and that output might be incomplete as a consequence of the warnings.

Some system mount tables -- e.g., Linux `/proc/mounts` -- don't have a `dev=xxx` option. In that case, and provided `lssof` for the dialect supports them, you can use the `+m` option to create a mount table supplement file and the `" +m m "` option to use it.

First check the `lsuf -h` (help) output to see if the `+m` and `"+m m"` options are supported. If they are, use `+m` to create a mount table supplement file when all mounted file systems are accessible. Use `"+m m"` later to make the supplement available when some mounted file systems might not be available.

Here's an example that creates a mount supplement file in `$HOME/mnt-sup` and later makes it available to `lsuf`.

```
$ rm -f $HOME/mnt-sup
$ lsuf +m > $HOME/mnt-sup
...
$ lsuf +m $HOME/mnt-sup <other lsuf options>
```

If `lsuf` has to get the device number from the supplement, it will issue an informative warning message. The warning can be suppressed with `lsuf's -w` option.

Caution! Since the mount table supplement file is static, it is its supplier's responsibility to update it as file system mounts change.

For more information, consult the `lsuf` man page. The "ALTERNATE DEVICE NUMBERS" section has useful information on how `lsuf` acquires device numbers when `stat(2)` or `lstat(2)` fail.

### 3.46 Why won't `lsuf` find open files on over-mounted file systems?

When a file system, `/xyz` for example, is mounted on the same mount point as another file system, `/abc` for example, running `lsuf` with an argument of the path of the first file system's mount point -- the over-mounted one, `/abc` -- probably will not reveal any files open on `/abc`.

That's because `lsuf` looks for open files on a file system by looking for files with the file system's device number. The two file systems usually have different device numbers and `lsuf` determines the device number search key from the supplied name of the second file system.

A general work-around exists only for Linux. On that UNIX dialect, when you know the over-mounted file system's mount point path, you can ask `lsuf` to report on all open files and `grep` that output for the path of the over-mounted file system mount point.

### 3.47 What can be done when lsof reports no more space?

Many lsof methods cache information in memory, using the dialects malloc() library function. When malloc() can't allocate the requested amount of memory, lsof exits with warning messages similar to this AIX message:

```
lsof: no more dev-ch space at pid 2257750: 0x82a8e600
```

Lsof then exits immediately and produces no more output.

A possible work-around is to increase the memory foot print of the shell that runs lsof. That is often done with the ulimit(1) shell command.

### 3.48 What if the lsof build encounters ar and ld problems?

The lsof main and library Makefiles use the library archiver, ar, and the system loader, ld, applications. Improperly located, installed or configured versions of them may cause the lsof build to encounter errors with them.

The application producing the error should identify itself in its error messages.

The first thing to check the path of the application that is being used. Try `which ar` or `which ld` to see if perhaps the PATH used during the build might be causing the wrong archiver or loader to be used.

If the problem is with the use of the wrong archiver, and it's not possible to correct the PATH to it, try using the LSOF\_AR environment variable to specify the path to and arguments for the correct archiver. See 00XCONFIG for more information and note that LSOF\_AR must specify the path to the archive application and the arguments for it, less the terminating library and module name arguments.

If the problem is with the loader, there is no lsof work-around. That's because lsof calls the loader via the C compiler, so the problem must be fixed at the compiler (system) level.

### 3.49 Why does lsof -i report an open socket file for a process, but lsof -p on that process' ID report nothing?

The lsof in use was probably built with the HASSECURITY and HASNOSOCKSECURITY options and the process in question does not belong to the user of lsof.

The HASSECURITY option limits lsof output to processes owned by the user invoking lsof and the HASNOSOCKSECURITY option weakens that slightly to allow output of open socket file information for all processes.

For example, if process PID 12345 is owned by some user other than the one invoking lsof, and lsof has been compiled with the HASSECURITY and HASNOSOCKSECURITY options, the following lsof command will display the open socket files of process 12345:

```
$ lsof -p 12345 -a -i
```

This security restriction is described in the lsof(8) manual page.

## 4.0 AIX Problems

### 4.1 What is the Stale Segment ID bug and why is -X needed?

Kevin Ruderman reports that he has been informed by IBM that processes using the AIX 3.2.x, 4.1[.12345], 4.2[.1], and 4.3.x kernel's readx() function can cause other AIX processes to hang because of what appears to be file system corruption.

This failure, known as the Stale Segment ID bug, is caused by an error in the AIX kernel's journaled segment memory handler that causes the kernel's dir\_search() function erroneously to believe directory entries contain zeroes. The process using the readx() call need not be doing anything wrong. Usually the system must be under such heavy load that the segment ID being used in the readx() call has been freed and then reallocated to another process since it was obtained from kernel memory.

Lsof uses the readx() function to access library entry structures, based on the segment ID it finds in the proc structure of a process. Since IBM probably will never fix the kernel bug, I've added an AIX-specific option to lsof that controls its use of the readx() function.



By default lsof readx() use is disabled; specifying the ``-X" option enables readx() use.

If you want to change the default readx() behavior of AIX lsof, change the HASXOPT, HASXOPT\_ROOT, and HASXOPT\_VALUE definitions in dialects/aix/machine.h. You can also use these definitions to enable or disable readx() -- consult the comments in machine.h. You may want to disable readx() use permanently if you plan to make lsof publicly executable.

When HASXOPT\_ROOT is defined, lsof will restrict use of the -X option to processes whose real UID is root; if HASXOPT\_ROOT isn't defined, any user may specify the -X option. The Customize script offers the option to change HASXOPT\_ROOT when HASXOPT is defined and HASXOPT\_ROOT is named in any dialect's machine.h header file.

I have never seen lsof cause a problem with its use of readx(), but I believe there is some chance it could, given the right circumstances.

#### 4.1.1 Stale Segment ID APAR

Here are the details of the Stale Segment ID bug and IBM's response, provided by Kevin Ruderman.

##### AIX V3

APAR=ix49183

user process hangs forever in kernel due to file system corruption

STAT=closed prs TID=tx2527 ISEV=2 SEV=2

(A "closed prs" is one closed with a Permanent ReStriction.)

RCOMP=575603001 aix v3 for rs/6 RREL=r320

##### AIX V4 (internal defect, no apar #)

prefix p

name 175671

abstract KERMP: loop for ever in dir\_search()

Problem description:

1. Some user application -- e.g., lsof -- gets the segment ID (SID) for the process private segment of a target process from the process table.

2. The target process exits, deleting the process private segment.
3. The SID is reallocated for use as a persistent segment.
4. The user application runs again and tries to read the user area structure from /dev/mem, using the SID it read from the process table.
5. The loads done by the driver for /dev/mem cause faults in the directory; new blocks are allocated; the size changed; and zero pages created.
6. The next application that looks for a file in the affected directory hangs in the kernel's dir\_search() function because of the zero pages. This occurs because the kernel's dir\_search() function loops through the variable length entries one at a time, moving from one to the next by adding the length of the current entry to its address to get the address of the next entry. This process should end when the current pointer passes the end of the known directory length.

However, while the directory length has increased, the entry length data has not, so when dir\_search() reaches the zero pages, it loops forever, adding a length of

zero to the current pointer, never passing the end of the directory length. The application process is hung; it can't be killed or stopped.

IBM closed the problem with a PRS code (Permanent Restriction) under AIX Version 3 and had targeted a fix for AIX 4.2. They have recently (I became aware of it September 10, 1996) cancelled the defect report altogether and have indicated they are not going to fix the defect.

#### 4.2 Gcc Work-around for AIX 4.1x

When gcc is used to compile lsof for AIX 4.1x, it doesn't align one element of the user structure correctly. Xlc sees the U\_irss element as a type "long long" and aligns it on an 8 byte boundary. That's because the default mode of xlc is -qlonglong; when -qlonglong is enabled, the \_LONG\_LONG symbol is also defined.

Gcc sees U\_irss as a two element array of type long, because

`_LONG_LONG` isn't defined. Hence gcc aligns the `U_irss` element array on a 4 byte boundary, rather than an 8 byte one, making the gcc incantation of the user structure 4 bytes shorter than xlc's.

When the length of gcc's user structure is supplied as argument 4 to the undocumented `getuser()` function of the AIX kernel, `getuser()` rejects it as an incorrect size and returns `EINVAL`.

Lsof has a work-around for this problem. It involves a special test in the `Configure` script when the "aixgcc" `Configure` abbreviation is used -- e.g.,

```
$ Configure -n aixgcc
```

The test is to compile a small program with gcc and check the alignment of `U_irss`. If it's not aligned on an 8 byte boundary, the `Configure` script makes a special copy of `<sys/user.h>` in `./dialects/aix/aix<AIX_version>` whose `U_irss` will align properly, and generates compile time options to use it.

While I have tested this work-around only with 4.1.4, it should work with earlier versions of AIX 4.1. It does not work for AIX 4.2; a different work-around is employed there. (See the next section.)

If you want to use this technique to compile other AIX 4.1x programs with gcc for using `getuser()`, check the `Configure` script.

Stuart D. Gathman identified this gcc AIX alignment problem.

#### 4.3 Gcc and AIX 4.2[.1]

Alignment problems with gcc and AIX 4.2[.1] inside the user structure are more severe, because there are some new 64 bit types in AIX that gcc doesn't yet (as of 2.7.x) support. The `<sys/user.h>` `U_irss` element problem, discussed in 4.3 above, doesn't exist in 4.2[.1].

The AIX `lsof` `machine.h` header file has a work-around, provided by Henry Grebler, that bypasses gcc alignment problems. Later versions of gcc (e.g., 2.8.x) will probably bypass the problems as well.

4.4 Why won't lsof's Configure allow the use of gcc for AIX below 4.1?

Gcc can't reliably be used to compile lsof for AIX versions below AIX 4.1 because of possible kernel structure element alignment differences between it and xlc.

4.5 What is an AIX SMT file type?

When you run AIX X clients with the DISPLAY environment variable set to ``:0.0" they communicate with the AIX X server via files whose kernel file structure has an undefined type (`f_type == 0xf`) -- at least there's no definition for it in `<sys/file.h>`.

These are Shared Memory Transport (SMT) sockets, an artifact of AIXWindows, designed for more efficient data transfers between the X server and its clients.

Henry Grebler and David J. Wilson alerted me to the existence of these files. Mike Feldman and others helped me identify them as SMT sockets.

The curious reader can find more about SMT sockets in `/usr/lpp/X11/README.SMT`.

4.6 Why does AIX lsof start so slowly?

When AIX lsof starts it compares the running kernel's identity to the one for which it was built, using `/usr/bin/oslevel`. That comparison can sometimes take a long time to complete, depending on the system's maintenance level and how recently it was examined with `oslevel`.

AIX revisions 4.67 and above for AIX 5 and above don't use `oslevel` to determine the kernel identity. They use `uname(2)` instead, and it is much faster.

You can skip the `oslevel` test by suppressing warning messages with lsof's `-w` option. Doing that carries with it the risk of missing other warning messages, however.

You can also disable the kernel identity check by disabling the definition of the `HASKERNIDCK` symbol by editing AIX `machine.h` header file or by using the `Customize` script to

disable it.

See the "Why does lsof warn "compiled for x ... y; this is z.?" section for more information.

#### 4.7 Why does exec complain it can't find libc.a[shr.o]?

When you try to execute lsof you may get this complaint:

```
exec(): 0509-036 Cannot load program ./lsof because of
the following errors:
0509-022 Cannot load library libc.a[shr.o].
0509-026 System error: A file or directory in
the path name does not exist.
```

This is probably the result of making lsof when the LIBPATH environment variable contained a directory path that doesn't contain libc.a. You can see what LIBPATH contained when

lsof was made by using the dump application on lsof. For example, if LIBPATH contained /foo/bar when lsof was made, you will see this (partial) dump output:

```
$ dump -H lsof
...
***Import File Strings***
INDEX PATH          BASE    ...
0    /foo/bar
```

To correct the problem, revisit the lsof source directory and remake lsof this way:

```
$ unset LIBPATH; make (sh or ksh)
or
% unsetenv LIBPATH; make (csh or tcsh)
```

#### 4.8 What does lsof mean when it says, "no PCB, CANTSENDMORE, CANTRCVMORE" in a socket file's NAME column?

When an AIX application calls shutdown(2) on an open socket file, but hasn't called close(2) on the file, the file will remain visible to lsof as an open socket file without any extended protocol information.

Lsof reports that state in the NAME column by saying that there is "no PCB" (Protocol Control Block) for the protocol (e.g., TCP in the NODE column). If the open socket file has

the state variables `SO_CANTSENDMORE` and `SO_CANTRCVMORE` set -- i.e., from the `shutdown(2)` call -- `lsof` reports them with the `CANTSENDMORE` and `CANTRCVMORE` notes in the `NAME` column.

4.9 When the `-X` option is used on AIX 4.3.3, why does `lsof` disable it, saying "WARNING: user struct mismatch; -X option disabled?"

The `-X` option causes `lsof` to read the loader information of the user structure from virtual memory via the `readx()` system call. It does that with the user structure definition from `<sys/user.h>` that was compiled into the `lsof` executable.

On AIX 4.3.3 there are two different user structure definitions in two separate `<sys/user.h>` header files, distributed at different times by IBM. If `lsof` was compiled with one and the kernel on which `lsof` is being run was compiled with the other, `lsof` normally won't get correct loader information when it calls `readx()`.

In an attempt to compensate for that difference, `lsof` makes an independent check of the loader information by getting the user structure's open file count via `readx()` and comparing it to the open file count obtained independently via `getprocs()`. When the two counts don't match, `lsof` tries to read the count (and re-read the loader information) with two offsets, based on observed differences between the two user structures.

When one of the three attempts produces a correct open file count, `lsof` uses its corresponding offset on subsequent readings of the loader information.

When none of the three attempts produces a correct open file count, `lsof` issues the `WARNING` message and disables `-X` processing.

To eliminate this problem, obtain an `lsof` binary that matches the kernel of the AIX 4.3.3 system where you want to run `lsof`. Compiling `lsof` on the target system is the preferred way to get a matching binary.

4.10 Why doesn't the `-X` option work on my AIX 5L or 5.[123] system?

If your AIX 5L or 5.[123] system uses the ia64 architecture, `lsof` needs `setuid-root` permission to be

able to do the  
processing that -X requires.

Check the output of ``uname -a`` to determine the architecture type.

The work-around is to give lsof setuid-root permission.

#### 4.11 Why doesn't /usr/bin/oslevel report the correct AIX version?

The oslevel man page says, "The oslevel command reports the level of the operating system using a subset of all filesets installed on your system."

You can see which fileset is below the expected level with oslevel's -l option. For example, if you believe your system is at AIX level 4.3.3, but oslevel reports 4.3.2, use this oslevel command to find the filesets below 4.3.3:

```
$ /usr/bin/oslevel -l 4.3.3.0
```

If you don't know what level argument to supply to oslevel's -l option, use oslevel's -q option first.

##### 4.11.1 Why doesn't /usr/bin/oslevel report the correct AIX version on AIX 5.1?

The subset list for oslevel on AIX 5.1 seems to include at least two filesets, xlsmp.msg.en\_US.rte and xlsmp.rte, that do not install from AIX 5.1 media with a 5.1.0.0 level.

Hence, oslevel reports 5.0.0.0 instead of the expected 5.1.0.0.

If either xlsmp.msg.en\_US.rte or xlsmp.rte is installed, lsof's Configure script and run-time tests will identify the AIX version incorrectly. The run-time test will issue a complaint message of this form:

```
lsof: WARNING: compiled for AIX version xxx; this is yyy.
```

You can correct the Configure test by pre-defining the oslevel value, setting the correct value in the LSOF\_VSTR environment variable before running the Configure script -- e.g., to pre-define AIX 5.1 when using ksh, do this:

```
$ LSOF_VSTR=5.1.0.0 Configure -n aix
```

You can't affect `oslevel` output without uninstalling `xlsmp.msg.en_US.rte` and `xlsmp.rte`. If you can't do that, you'll have to put up with the run-time complaint.

#### 4.12 Why does `lsf` for AIX 5.1 or above Power architecture complain about kernel bit size?

When you run an `lsf` binary on an AIX 5.1 or above Power system, it might complain:

```
lsf: FATAL: compiled for a 32 bit kernel.
```

```
The bit size of this kernel is 64.
```

or

```
exec: 0509-036 Cannot load program ./lsf because of  
the following errors:
```

```
0509-032 Cannot run a 64-bit program on a 32-bit  
machine.
```

Starting at `lsf` revision 4.61, `lsf` binaries for Power architecture systems running AIX 5.1 or above are closely tied to the kernel bit size. `lsf` must do that so it can read and understand kernel structures.

`lsf`'s `Configure` script tunes the `lsf` configuration so that the binary built in the `make(1)` step is adjusted to the kernel bit size.

An `lsf` binary knows the bit size for which it was constructed, tests the bit size of the kernel under which it is running, and objects if the two sizes don't match. To see the bit size for which `lsf` was constructed, run it with its `-v` option and look for these lines in the output:

```
configuration info: 32 bit kernel
```

or

```
configuration info: 64 bit kernel
```

(Note: these lines will appear only in `-v` output for AIX 5.1 and above `lsf` binaries, built for Power architecture.)

You can see the kernel bit size test method in the `aix` stanza of the `lsf` `Configure` script and in the `get_kernel_access()` function of the `lsf .../dialects/aix/dproc.c` source file.

There is more information on pre-defining the kernel bit size when building `lsf` in `Configure`, `00PORTING`, and



00XCONFIG.

The only work-around is to use an lsof binary built to match the running kernel bit size.

4.13 What can't gcc be used to compile lsof on the ia64 architecture for AIX 5 and above?

Gcc can't be used to compile lsof on the ia64 architecture for AIX 5 and above because I haven't had access to a system that has a working gcc compiler. The gcc compiler on my one and only ia64 AIX 5.1 test system, provided by IBM, didn't work at all.

4.14 Why does lsof get a segmentation fault when compiled with gcc for a 64 bit Power architecture AIX 5.1 kernel?

When lsof is configured with the lsof "aixgcc" Configure abbreviation, the resulting lsof executable may cause a segmentation violation when it is run. I've observed this with gcc version 2.9-aix43-010414-7.

As far as I have been able to tell, the segmentation fault is the result of a gcc compilation, loading, or library error. Watching lsof run with gcc's companion debugger, gdb, shows no error in the lsof source code that might explain the fault.

The only work-around I know is to use the IBM C compiler in place of gcc -- i.e., use the "aix" lsof Configure abbreviation.

4.15 Why does lsof ignore AFS on my AIX system?

The lsof Configure script quits on AIX when AFS is present, the AIX version is greater than 4.3.3.0 or the AFS version is greater than 3.5. That's because I have no test systems available for those AIX and AFS version combinations.

When the lsof Configure script detects an AIX and AFS version combination that is unsupported, it will report:

```
!!!FATAL: Lsof does not support
AFS on this combination of
  AIX and AFS versions. To disable AFS, set the
  value of the AIX_HAS_AFS environment variable to
  "no".
```

The only work-around is to set the AIX\_HAS\_AFS environment variable as explained in the error message:

```
$ AIX_HAS_NSF=no; export AIX_HAS_NFS
$ ./Configure -n aix
```

#### 4.16 Why does lsof report "system paging space is low" and exit?

When AIX paging space runs low, the AIX kernel sends a SIGDANGER signal to processes, warning them that they should reduce their memory usage.

When lsof receives that signal, it issues the following fatal error message and exits:

```
lsof: FATAL: system paging space is low.
```

A possible work-around is to limit the amount of information lsof must cache in its process memory with the "-c", "-g", "-l" and "-p" options.

Also see the answer to the "What can be done when lsof reports no more space?" question.

#### 4.17 Why does lsof have a compilation problem on AIX 5.3 above maintenance level 1?

On some AIX 5.3 systems with maintenance levels 2 and higher installed, lsof 4.77 and below may not compile properly. The compiler complains the snapshotObject structure definition, needed by <j2/j2\_inode.h>, is missing.

That problem is fixed in the 4.78 revision.

## 5.0 Apple Darwin Problems

### 5.1 What do /dev/kmem-based and libproc-based mean?

Lsof for Apple Darwin currently uses /dev/kmem to read kernel data structures from which it gathers and reports open file information. That version of lsof is called /dev/kmem-based lsof.

At an upcoming release lsof will use a library called libproc to obtain information about open files. That version of lsof

will be called libproc-based lsof.

The /dev/kmem-based lsof sources may be found in the kmem subdirectory of the dialects/darwin branch of the lsof source tree. When the supporting version of Apple Darwin is released, the libproc-based lsof sources will be found in .../dialects/darwin/libproc.

## 5.2 /dev/kmem-based Apple Darwin Questions

### 5.2.1 Why does Configure ask for a path to the Darwin XNU kernel header files?

When lsof was ported to Apple Darwin by Allan Nathanson at revision 4.53, some kernel header files needed by lsof weren't being exported by the developers. (That's still true at lsof revision 4.76.)

At first a shell script that Allan provided would get the missing header files by checking them out from the CVS root. Although the script was updated from time to time, eventually the re-organization of Darwin sources has made it impossible to update the script to do an automatic download of the missing header files.

At lsof revision 4.69 and above it is necessary for the Darwin lsof builder to download the Darwin XNU kernel headers before attempting to build lsof. The download may be done via a web browser, starting at this URL:

<http://www.opensource.apple.com/darwinsource/index.html>

Once there, select the link to the Mac OS X version that matches the one on the system where lsof is to be built.

Follow that link's "[ Source ]" link. Once there, select the tar.gz link of the xnu\* entry near the bottom of the page. That entry should have a name that matches the xnu\* name shown by ``uname -a`` -- e.g., if `uname` reports:

```
$ uname -a
... root:xnu/xnu-517.7.21 ...
```

Then the appropriate xnu\* entry is xnu-517.7.21. Clicking its link should lead to an "Apple Open Source" page requesting an Apple ID and password.

Enter them if they're available. If an Apple ID and password are not available, get them by following the instructions on the page -- i.e., follow the [signin.apple.com](http://signin.apple.com) link.

Once a valid Apple ID and its password have been entered, the download will begin. Select the saving of the downloaded `xnu*.tar.gz` file in an appropriate place on the Mac OS X system.

Once the download completes, install it. Use `gunzip` to decompress the download and `tar` to extract the archive -- e.g.,

```
$ gunzip -c xnu-517.7.21.tar.gz  
| tar xf -
```

Remember the absolute path to the extracted archive. That is its installed place. E.g., if the `xnu-517.7.21.tar` archive was extracted to the `lsf` builder's home directory, its full installation path will be something like:

```
~/xnu-517.7.21
```

Now run the `lsf` Configure script. When it asks for the path to the installed Darwin XNU kernel header files, supply the path to the `gunzip'd` and extracted `xnu*` archive -- e.g., `~/xnu-517.7.21`.

The path to the Darwin XNU kernel headers may also be supplied to the Configure script in the `DARWIN_XNUDIR` environment variable, eliminating the need to enter it interactively -- e.g.,

```
$ DARWIN_XNUDIR=~/xnu-344.49 ./Configure -n darwin
```

#### 5.2.1.1 Why does Configure complain that Darwin XNU kernel header files are missing?

These are some reasons why the `lsf` Configure script might claim that Darwin XNU header files are missing:

- \* The wrong path to them was specified.
  
- \* The files and directories in the path are not readable and searchable -- i.e., check the modes and ownerships.
  
- \* The downloaded archive doesn't match the Mac OS X

version of the system.

If in doubt, revisit the Darwin XNU kernel header file download instructions in the answer to the question "Why does Configure ask for a path to the Darwin XNU kernel header files?"

If Configure still can't find Darwin XNU kernel header files, contact me via e-mail at <abe@purdue.edu> for help. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

#### 5.2.2 Why doesn't Apple Darwin lsof report text file information?

At the first port of lsof to Apple Darwin, revision 4.53, insufficient information was available -- logic and header files -- to permit the installation of VM space scanning for text files. As of lsof 4.70 it is still not available.

Text file support will be added to Apple Darwin lsof after the necessary information becomes available.

#### 5.2.3 Why doesn't Apple Darwin lsof support IPv6?

At the first port of lsof to Apple Darwin, revision 4.53, Apple Darwin lacked IPv6 support. IPv6 became available in Apple Darwin version 1.5 and support for it was added to lsof then.

#### 5.2.4 Why does lsof complain about a mismatch between the release for which lsof was compiled and the booted Mac OS X release?

When lsof is started on the "Gold Master" Darwin release (aka Mac OS X), it complains:

```
lsof: compiled for 1.0 release; this is 1.3.2.
```

This happens because the lsof binary released with Mac OS X was built on a system whose release number (1.0) doesn't match that of the released system -- usually 1.3.x. lsof makes this check because UNIX dialect OS changes are often accompanied by header file changes that affect lsof.

In this specific case, this error can be ignored. If you don't want to do that, get the lsof distribution and build lsof so its built-on and running-on Mac OS X release numbers match.

### 5.2.5 Why does

lsof for Apple Darwin 8 and higher report

"stat(...): ..." in the NAME column?

Lsof for Apple Darwin 8 may report messages like these in the NAME column:

```
stat(/private/var/run/asl_prune): No such file or directory  
or  
stat(/private/var/db/netinfo/local.nidb/Config): Permission denied
```

Those messages indicate that lsof was unable to collect open file information for the paths enclosed in "stat(...)" with the stat(2) function, because the function encountered the reported error.

A work-around for the "Permission denied" error is to run lsof with elevated privileges -- e.g., when logged on as the super user.

If the stat(2) error message is "No such file or directory", the file probably has been unlinked (removed) and there is no lsof work-around.

### 5.2.6 What are the limitations of Apple Darwin lsof link count reporting?

Lsof for Apple Darwin cannot report link count information reliably.

For Apple Darwin below 8 link count information is not always available

in the kernel node structures available to lsof.

When link count information is available, however, it includes link counts of zero. Thus, using lsof's +L1 option may result in the finding of some files whose link counts are zero.

Lsof can report only some link count information for Apple Darwin 8 and above. Link count information is only available for files where lsof can assemble the full file path and has permission to apply stat(2) to it. (See the answer to the "Why does lsof for Apple Darwin 8 and higher report "stat(...): ..." in the NAME column?" question for more information on stat(2) failures.)

Apple Darwin 8 and above files that have been unlinked and thus have a link count of zero cannot be found by stat(2) -- i.e.,

stat(2) returns a "No such file or directory" error. As a result lsof never displays link counts of zero and the use of lsof's +L1 option to find them always fails.

### 5.2.7 Why does Apple Darwin report process group IDs incorrectly?"

The kmem version of lsof for Apple Darwin does not report process group IDs correctly when requested to do so with its ``-g" option. This is a bug that surfaced after the libproc version was released and access to kmem test systems has prevented patching the bug.

If you are using the kmem version and would like a fix for this problem, please send e-mail to me <abe@purdue.edu>. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

## 5.3 Libproc-based Apple Darwin Questions

## 6.0 BSD/OS BSDI Problems

### 6.0.5 Statement of deprecation

As of lsof revision 4.76 support for BSDI BSD/OS has been dropped. The 4.76 distribution of lsof for BSDI BSD/OS may be found on lsof.itap.purdue.edu in pub/tools/unix/lsof/OLD/src.

## 7.0 DEC OSF/1, Digital UNIX, and Tru64 UNIX Problems

### 7.1 Why does lsof complain about non-existent /dev/fd entries?

When you run lsof for Digital UNIX 3.2, lsof may complain:

```
lsof: can't lstat /dev/fd/xxx:  
No such file or directory  
lsof: can't lstat /dev/fd/yyy: No such file or directory
```

(Or it may warn about other missing /dev/fd paths.) When you do an ``ls /dev/fd" none of the missing paths are listed.

This is caused by a bug in the DEC library function getdirentries(). For some reason, when /dev/fd is a file system mount point, getdirentries() returns an incorrect size for it to readdir(). (Lsof calls readdir() in its ddev.c readdev() function.) Because of the incorrect size,

readdir() goes past the end of the /dev/fd directory buffer, encounters random paths and returns them to lsof. Lsof then attempts to lstat(2) the random paths, gets error replies from lstat(2), and complains about the paths.

Duncan McEwan discovered this error and has reported it to DEC. Duncan also supplied an alternate readdir() function as a work-around. I've incorporated his readdir() in dialects/osf/ddev.c (as the static ReadDir() function) with some slight modifications, and enabled its use when the USELOCALREADDIR symbol is defined.

The Configure script defines USELOCALREADDIR for Digital UNIX version and 3.2. If you don't want to use Duncan's local readdir() function, edit the Makefile and remove -DUSELOCALREADDIR from the CFGF string. When DEC releases a corrected getdirentries() function, I'll modify the Configure script to stop defining USELOCALREADDIR.

## 7.2 Why does the Digital UNIX V3.2 ld complain about Ots\* symbols?

When you compile lsof on your Digital UNIX V3.2 system, ld may complain:

```
ld:
Unresolved:
knlist
_OtsRemainder32Unsigned
_OtsDivide64Unsigned
_OtsRemainder64Unsigned
_OtsDivide32Unsigned
_OtsMove
_OtsDivide32
_OtsRemainder32
*** Exit 1
```

Chris Eleveld reports this happens on Digital UNIX V3.2 systems after the Fortran compiler has been installed.

The best work-around seems to be to remove -lml from the CFGF string in the Makefile produced by Configure -- i.e., change:

```
CFGF= -lml
to
CFGF=
```



According to the V3.2 man page for `nlist(3)`, this shouldn't work, but my testing shows that it does. Although I haven't been able to test this second work-around, you might try adding `-lots` to `CFGL`, rather than removing `-lml` -- i.e., change:

```
CFGL= -lml
to
CFGL= -lml -lots
```

WARNING: my testing also shows that the V2.0 `nlist(3)` man page means what it says when it calls for `-lml` -- `lsof` loaded without `-lml` under V2.0 can't locate the `proc` (process) table address.

DON'T REMOVE `-lml` FROM THE DIGITAL UNIX V2.0 MAKEFILE.

If you run into this problem, please let me know what problem you encountered and how you solved it.

### 7.3 Why can't `lsof` locate named pipes (FIFOs) under V3.2?

While `lsof` for V3.2 can report on named pipes (FIFOs), it can't find them by name. That appears to happen because of the way the V3.2 kernel `lstat(2)` function reports named pipe device numbers.

The V3.2 kernel reports the device number as `0xffffffff`, while the kernel structures for named pipes that `lsof` examines contain the device number of the file system on which the named pipe resides.

Consequently, `lsof` can't match the device and inode number pair it receives from applying `lstat(2)` to the named pipe with any device and inode number pair it finds when scanning kernel structures.

I don't have a work-around. You can, of course, ask for full `lsof` output and use a post-processing filter (e.g., `grep`) to locate the named pipe of interest.

This problem doesn't exist under V2.0.

### 7.4 Why does `lsof` use the wrong configuration header files? For example, why can't the `lsof` compilation find `cpus.h`?

DEC OSF/1, Digital UNIX, and Tru64 UNIX configuration header files describe the hardware and software environment for which your kernel boot file was constructed. For example, `/sys/<name>/cpus.h` defines the number of CPUs in its `NCPUS` `#define`.

Lsof searches for the configuration header file subdirectory in `/sys` (`/usr/sys` for Digital UNIX version 4.0 and Tru64 UNIX) by converting the first host name component to capital letters -- e.g., TOMIS is derived from `tomis.bio.purdue.edu`. If that subdirectory exists, lsof uses header files from it. (Configure reports what subdirectory is being used.)

If Configure doesn't find a host-name derived subdirectory, it prompts you for the entry of a subdirectory name. If you can't find one, quit Configure and run the kernel generation process to create a proper configuration subdirectory. If you don't identify a proper configuration subdirectory and you try to compile lsof, the compiler will complain about missing header files -- e.g., a missing `cpus.h`.

Once you have located or generated a proper configuration subdirectory, rerun Configure. If you have generated a configuration subdirectory whose name is derived from the host name, Configure will find and use it. If not, you will have to specify its name to Configure.

## 7.5 Why

does lsof indicate incomplete paths with "`--`" for Tru64 UNIX 5.1 files?

When lsof can't find a component of a path in the kernel's name cache (aka DNLC), or can't determine that the left-most component has as its parent the file system root, it uses an "incomplete path" notation. That notation begins with the file system root name, followed by "`--`", followed by the consecutive path name components lsof was able to find in the DNLC -- e.g., `/ -- init`.

Because the DNLC was significantly redesigned in Tru64 UNIX 5.1, lsof's handling of the cache had to be completely redone. As part of the DNLC redesign a name cache entry parameter lsof formerly used to locate the file system root of a path was removed. With help from Chang Song I've been able to implement an alternate method for detecting the root of these file system types: AdvFS (MSFS), CDFS, DVDFS,

FDFS, NFS, NFS3, and UFS.

When `lsdf` doesn't know how to identify the root for a file system type, it will resort to the "`--`" incomplete path notation.

7.6 Why doesn't `lsdf` report link count, node number, and size for some Tru64 5.x CFS files?

`lsdf` reports link count, node number, and size for open CFS files as recorded in their kernel node structure's cached attributes. Sometimes not all attributes are cached on the system where `lsdf` runs, so `lsdf` cannot report them.

7.7 Why does `lsdf` say it can't read the kernel name list or proc table on Digital UNIX 4.x or Tru64 UNIX?

By default on Digital UNIX 4 and Tru64 UNIX `lsdf` reads the addresses for kernel symbols with the `knlist(3)` function. That function can fail, for example, when the `kloadsrv` daemon isn't running or is malfunctioning. When that happens, `lsdf` may abort with one of these error messages:

```
lsdf: can't read kernel name list from knlist(3): ...
```

or

```
lsdf: can't read proc table info
```

The first message suggests a complete `knlist(3)` or `kloadsrv` failure; the second, a partial one.

If you know the name of the file from which the running system was booted, e.g., `/vmunix`, you can use `lsdf`'s `-k` option to direct it to read kernel symbol addresses from the name list of that file --

```
$ lsdf -k /vmunix ...
```

If that works, then `knlist(3)` is malfunctioning and you need to fix it.

## 8.0 FreeBSD Problems

### 8.1 Why doesn't `lsdf` report on open kernfs files?

`lsdf` doesn't report on open FreeBSD kernfs files because

the structures lsof needs aren't defined in the kernfs.h header file in /sys/misc/kernfs.

## 8.2 Why doesn't lsof work on my FreeBSD system?

If lsof doesn't work on your FreeBSD system, first make sure you have the latest lsof revision. See the answer to the "Where do I get lsof?" question for information on how to get the latest lsof revision.

Once you have gotten the latest lsof revision, Configure and make it. If Configure fails -- e.g., it complains about an unknown FreeBSD version -- then lsof probably hasn't been ported to your FreeBSD version yet, and there's no need to go any further. Follow the answer to the "How do I report an lsof bug" to report the Configure complaint to me.

If you are able to Configure and make lsof, run its test suite. (See the answer to the "Is there a test suite?" question for more information on how to use lsof's test suite.)

If lsof still fails, make sure your kernel sources, kernel header files, kernel boot file, standard header files and libraries are synchronized. They should all be built from the same CVS refresh. (Don't forget to do a "make buildworld" followed by a "make installworld".) If they aren't, then the KVM library or lsof may be using kernel structure definitions that don't match the booted kernel; or lsof may fail to compile properly because of header files in /usr/src/sys/sys and /usr/include/sys that don't match.

If you have synchronized your kernel, header files and libraries, and still can't get lsof to work, follow the steps in the answer to the "How do I report an lsof bug" question to report the problem to me.

## 8.3 Why doesn't lsof work on the RELEASE version of CURRENT?

Lsof tracks the CURRENT release of the current leading edge FreeBSD version, because my access to leading edge FreeBSD is limited to FreeBSD.org reference systems, all running the CURRENT release.

Sometimes that tracking leads to changes in lsof that won't

work on an earlier RELEASE version of the current leading edge version.

When that happens, please send e-mail to me <abe@purdue.edu>. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

#### 8.4 Why does kvm\_open() complain it can't find some file?

If lsof issues this complaint:

```
lsof: kvm_open(execfile=/boot/kernel/kernel,
corefile=/dev/mem: No such file or directory
```

Your FreeBSD system might not have a /dev/mem device. If not, create one -- e.g., as root do:

```
# mknod /dev/mem c <major> 0
# chmod 440 /dev/mem
# chgrp kmem
/dev/mem
```

For <major> use /dev/kmem's major device number.

You may have to run kldload, too -- again as root do:

```
# kldload mem
```

#### 8.5 FreeBSD ZFS Problems

##### 8.5.1 Why does FreeBSD lsof report "WARNING: no ZFS support has been defined."?

Lsof issues that message when it detects a file on a ZFS file system, but has not been built with support for ZFS. Lsof's Configure script detects support can be added for ZFS when it finds this file:

```
/usr/src/sys/contrib/opensolaris/uts/common/fs/zfs/sys/zfs_znode.h
```

That header file and others in the OpenSolaris files in /usr/src enable lsof to extract information about ZFS files from the kernel structures associated with them.

##### 8.6 Why can't Configure create lsof\_owner.h for FreeBSD 6 and above?

Lsof may report:

```
Creating ./lockf_owner.h from /usr/src/sys/kern/kern_lockf.c
FATAL ERROR: can't read /usr/src/sys/kern/kern_lockf.c
FATAL ERROR: ./lockf_owner.h creation failed (see 00FAQ)
or
```

```
Creating ./lockf_owner.h
from /usr/src/sys/kern/kern_lockf.c
FATAL ERROR: ./lockf_owner.h creation failed (see 00FAQ)
```

Those messages mean that lsof's Configure script failed to create a local header file, `./lockf_owner.h`, needed to use the new kernel file locking code of some versions of FreeBSD 6 and above.

The changes that implement that new locking code alter the lockf structure in `<sys/lockf.h>` and introduce a new structure, `lockf_entry`, to that header file. When Configure detects the presence of the `lockf_entry` definition in `<sys/lockf.h>`, it tries to construct the local header file, `./lockf_owner.h`.

Configure has to do that because an unfortunate side effect of the new kernel file locking code is that `<sys/lockf.h>` doesn't contain the `lockf_owner` structure definition referenced in its own lockf structure. Lsof needs to access elements of that `lockf_owner` structure to determine if a lock belongs to the process that has a file open.

The missing `lockf_owner` structure definition is in the kernel source file, typically `/usr/src/sys/kern/kern_lockf.c`. Configure tries to extract the `lockf_owner` structure definition from `kern_lockf.c` into lsof's local header file, `./lockf_owner.h`. If Configure can't do that, it reports:

```
FATAL ERROR: ./lockf_owner.h creation failed
```

If Configure can't even read `kern_lockf.c`, it first reports:

```
FATAL ERROR: can't read /usr/src/sys/kern/kern_lockf.c
```

The work-around for this problem is to update the FreeBSD kernel `/usr/src` tree (e.g., do a CVSup or csup) on the system where lsof is to be built and then do a "make buildworld" followed by a "make installworld".

#### 8.6.1 Why are there lockf structure compiler errors for FreeBSD 6.0 and higher lsof?

If, when compiling lsof, the compiler complains with error

messages like:

```
dnode.c: In function 'get_lock_state':  
dnode.c:113: error: 'struct lockf' has no member named 'lf_flags'  
dnode.c:115: error: 'struct lockf' has no member named 'lf_id'  
...
```

Then

Lsof is being built on a system that has new kernel file locking code and Lsof's Configure script failed to build a local lockf\_owner.h header file with a structure definition Lsof needs.

See the "Why can't Configure create lsof\_owner.h for FreeBSD 6 and above?" section for more information and a work-around.

#### 8.6.2 Why don't /usr/src/sys/sys/lockf.h and /usr/include/sys/lockf.h match?

This mismatch can cause the errors explained in the answer to the "Why are there lockf structure compiler errors for FreeBSD 6.0 and higher Lsof?" question.

If /usr/src/sys/sys/lockf.h has been updated with a CVSup or csup, the new lockf.h won't be propagated to /usr/include/sys until the "make buildworld" and "make installworld" steps have been completed.

#### 8.7 FreeBSD and clang

As of Lsof revision 4.87, Lsof may be compiled with clang.

##### 8.7.1 Why does clang complain about VOP\_FSYNC?

There is an error in the Solaris ZFS compatibility vnode.h header file with use of VOP\_FSYNC before it is defined. No work-around is possible that will eliminate the clang compile-time warning message about the invalid declaration of the VOP\_FSYNC function.

#### 9.0 HP-UX Problems

##### 9.1 What do /dev/kmem-based and PSTAT-based mean?

Lsof for HP-UX 11.0 and below uses /dev/kmem to read kernel data structures from which it gathers and reports open file

information. That version of lsof is called /dev/kmem-based lsof.

Starting with HP-UX 10.10, finding definitions for the necessary kernel structures became more difficult as HP no longer distributed header files in /usr/include that defined all kernel structures. So I started "inventing" structure definitions by using Q4 to display them.

By HP-UX 11, the process of invention became extremely intensive to support. Following a patch to the ipc\_s structure in early 1999, my invented definition of that structure became incorrect. Although I was able to devise a work-around test for the patch with Q4, it was clear that my inventions were bound to cause more problems.

Discussion with HP about the patch led to my proposing that an lsof API in the HP-UX kernel was the proper solution. Much to my surprise, HP agreed. I believe Carl Davidson was the prime mover behind that decision, but I know others participated, among them Louis Huemiller, Rich Rauenzahn, and Sailu Yallapragada. I am indebted to these folks and HP for their willingness to do this work.

The API was added to the PSTAT interface in a project named PEGl, Pstat Enhancements for Glance and Lsof. Louis and Sailu did the bulk of the design and implementation work and testing began in March, 2000

HP-UX 11.11 is the first version that provides PSTAT support for lsof. HP-UX versions in between 11.0 and 11.11 -- all Beta versions as far as I can determine -- have no lsof support.

See the "PSTAT-based HP-UX lsof Questions" section for questions and answers specific to PSTAT-based HP-UX lsof. The next section, "Why doesn't a /dev/kmem-based HP-UX lsof compilation use -O?" covers /dev/kmem-based HP-UX lsof.

The /dev/kmem-based lsof sources may be found in the kmem subdirectory of the dialects/hpux branch of the lsof source tree. The PSTAT-based lsof sources may be found in .../dialects/hpux/pstat.

## 9.2 /dev/kmem-based HP-UX lsof Questions



The sources for /dev/kmem-based lsof for HP-UX may be found in lsof\_<revision>/dialects/hpux/kmem.

Lsof's Configure shell script decides to use these sources when it finds that the /usr/include/sys/pstat subdirectory doesn't exist.

Lsof can be forced to use the /dev/kmem sources by setting "/dev/kmem" in the HPUX\_BASE environment variable. Consult the Configure shell script and 00XPORTING for more information.

### 9.2.1 Why doesn't a /dev/kmem-based HP-UX lsof compilation use -O?

If you only have the standard (bundled) HP-UX C compiler and haven't purchased and installed the optional one, then you can't use cc's -O option. The HP-UX cc(1) man page says this:

#### "Options

Note that in the following list, the cc and c89 options -A , -G , -g , -O , -p , -v , -y , +z , and +Z are not supported by the C compiler provided as part of the standard HP-UX operating system. They are supported by the C compiler sold as an optional separate product."

Lsof's Configure script tries to detect what C compiler product you have installed by examining your compiler. If that examination reveals a standard (bundled) compiler, lsof avoids using -O.

If the Configure compiler test fails, the C compiler will complain that it doesn't support -O. You can suppress that complaint with this make invocation:

```
$ make DEBUG=""
```

### 9.2.2 Why doesn't the /dev/kmem-based CCITT support work under 10.x?

Pasi Kaara, who originally provided the HP-UX CCITT support, reports that it no longer works under HP-UX 10.x. Consequently, at lsof revision 4.02 it has been disabled.

### 9.2.3 Why can't /dev/kmem-based lsof be compiled with `cc -Aa` or `gcc -ansi` under HP-UX 10.x?

Some HP-UX 10.x header files, needed by lsof, can't be

compiled properly in ANSI\_C mode; structure element definition and alignment problems result. The `f_offset` member of the file structure, for example, is incorrect.

This ANSI-C obstacle extends to using the `-Aa` option of the HP C compiler and the `-ansi` option of `gcc`.

#### 9.2.4 Why does `/dev/kmem`-based `lsof` complain about no C compiler?

`lsof`'s `Configure` script looks in `/bin` and `/usr/ccs/bin` for an HP C compiler, because it needs to know if the compiler is the standard (bundled) one or the optional separate product. If it finds no compiler in either place, `Configure` quits after complaining:

```
No executable cc in /bin or /usr/ccs/bin
```

If you don't have a C compiler in either of these standard places, you should consider installing it. If you have `gcc` installed, you can use it by declaring the ```hpuxgcc"` abbreviation to `lsof`'s `Configure` script.

If you have a C compiler in a non-standard location, you can use the `HPUX_CC[DIR]` environment variables to name the path to it. Consult the `00XCONFIG` file of the `lsof` distribution for more information.

#### 9.2.5 Why does `Configure` complain about `q4` for `/dev/kmem`-based `lsof` for HP-UX 11?

When you run `Configure` on an HP-UX 11 system, it may complain:

```
!!!ERROR!!! !!!ERROR!!! !!!ERROR!!! !!!ERROR!!!  
Configure can't use /usr/contrib/bin/q4 to examine the ipis_s  
structure. You must do that yourself, report the result in  
the HPUX_IPC_S_PATCH environment variable, then repeat the  
Configure step. Consult the Configure script's use of  
/usr/contrib/bin/q4 and the 00XCONFIG file for information  
on ipis_s testing and the setting of HPUX_IPC_S_PATCH.  
!!!ERROR!!! !!!ERROR!!! !!!ERROR!!! !!!ERROR!!!
```

This message states that `Configure` cannot use `q4` from `/usr/contrib/bin` to examine the kernel's boot image for the `ipis_s` structure. Maybe `q4` hasn't been installed, or perhaps `Configure` can't execute it.

Lsof needs to gather information about ipis\_s to determine if the ipis\_s structure is defined in the kernel boot image, if the ipis\_s structure of the kernel boot image has an ipis\_msgsqueued member, and if the ipc\_s structure of the kernel boot image uses has an ipc\_ipis member.

The ipis\_s structure isn't described in any header file HP-UX releases with HP-UX 11. It appears in the private lsof header file `.../dialects/hpux/kmem/hpux11/ipc_s.h`. Lsof gets local and remote connection addresses (IP and port numbers) from ipc\_s, so an incorrect ipc\_s definition may cause incorrect reporting of TCP/IP connection addresses. It definitely will cause incorrect reporting on 32 bit kernels. In any case lsof should be compiled with a correct ipis\_s definition no matter the kernel bit size, so the Configure script always tests for it when the HP-UX version is 11.

For lsof's Configure script to gather the necessary ipis\_s information q4 needs to be installed in `/usr/contrib/bin` and the kernel boot image, `/stand/vmunix`, needs to have been processed with pxdB. If either is untrue, lsof issues the above error message, perhaps preceded by q4 messages. (Note: lsof's use of q4 may also fail if q4 can't execute `nm -- e.g.`, it can't find `/usr/bin/nm`, or there is a conflicting, private version of nm earlier in the path.)

If `/stand/vmunix` hasn't been processed by pxdB, the q4 messages will include:

```
q4: (error) vmunix not pxdB'd
or
q4: (warning) /stand/vmunix has not been processed by pxdB.
```

It's possible to make a suitable private copy of `/stand/vmunix` for configuring lsof. That requires `/opt/langtools/bin/pxdB` or the q4 version of pxdB from `/usr/contrib/bin/q4pxdB`. The path to the result is supplied to the lsof Configure script in the `HPUX_BOOTFILE` environment variable. Configure still requires `/usr/contrib/bin/q4`.

The following sample Bourne shell commands make a private copy of `/stand/vmunix` in `/tmp`, process it with pxdB or q4pxdB, and supply its path to lsof's Configure script in `HPUX_BOOTFILE`.

```
$ cp /stand/vmunix /tmp/vmunix.lsof
```

```
$ /opt/langtools/bin/pxdb /tmp/vmunix.lsof
```

or

```
$ /usr/contrib/bin/q4pxdb /tmp/vmunix.lsof
```

... pxdb messages ...

```
$ HPUX_BOOTFILE=/tmp/vmunix.lsof Configure -n hpux
```

It may also be necessary to use q4 outside the lsof Configure script. In that case q4 can be used to determine the state of ipis\_s and ipc\_s with these q4 commands:

```
$ /usr/contrib/bin/q4 /stand/vmunix
```

...

```
q4> fields -c struct ipc_s
```

...

```
q4> fields -c struct ipis_s
```

Look in the q4 output for the ipc\_ipis member of the ipc\_s structure, and look in the q4 output for the ipis\_s structure for the ipis\_msgsqueued member. If ipc\_s has ipc\_ipis but ipis\_s lacks ipis\_msgsqueued, set HPUX\_IPC\_S\_PATCH environment variable to "1". If ipc\_s has ipc\_ipis and ipis\_s has ipis\_msgsqueued, set HPUX\_IPC\_S\_PATCH to "2" -- e.g.,

```
$ HPUX_IPC_S_PATCH=1
```

```
Configure -n hpux
```

or

```
$ HPUX_IPC_S_PATCH=2 Configure -n hpux
```

If ipc\_s has no ipc\_ipis member, set HPUX\_IPC\_S\_PATCH to "N" -- e.g., use this Configure step:

```
$ HPUX_IPC_S_PATCH=N Configure -n hpux
```

9.2.6 When compiling /dev/kmem-based lsof for HP-UX 11 what do the "aCC runtime: ERROR..." messages mean?

When the lsof Makefile asks the HP-UX unbundled compiler to load lsof, it may complain:

```
/bin/cc -o lsof -DHPUXV=1100 -DHASVXFS -DHPUXKERNBITS=64 \
-I/home/abe/src/lsof4/dialects/hpux/kmem/hpux11 +DD64 \
-DHAS_IPC_S_PATCH=2 -I/home/abe/src/lsof4/dialects/hpux/kmem \
-DLSOF_VSTR="B.11.00" -g dfile.o dmnt.o dnode.o dnode1.o \
dnode2.o dproc.o dsock.o dstore.o arg.o main.o misc.o \
node.o print.o proc.o store.o usage.o -L./lib -llsof -lelf \
```

```
-lnsl
aCC runtime: ERROR: Unexpected use of shared libraries
aCC runtime: ERROR: Read aCC manpage, +A option
/usr/lib/nls/loc/locales.1//is_IS.iso88591
```

This is a bug in the HP-UX national language support.  
(Notice the last message with "locales" in it?) Complain to HP -- then use this work-around before executing make:

```
$ unset LANG
$ make
```

9.2.7 Why doesn't /dev/kmem-based lsof for HP-UX 11 report VxFS file link counts, node numbers, and sizes correctly?

This is usually the result of running an lsof binary whose revision number is less than 4.57 on a system that has OnlineJFS support installed. It can also happen with lsof 4.57 binaries when the OnlineJFS support with which they were built doesn't match the OnlineJFS status of the system on which they are run.

The OnlineJFS status of lsof 4.57 and higher binaries can be determined by running:

```
$ lsof -v 2>&1 | grep HASONLINEJFS
```

If that shell pipe produces output, lsof was compiled with OnlineJFS support enabled; no output, disabled.

If OnlineJFS is installed on an HP-UX 11 system the /sbin/fs/vxfs/subtype executable exists and outputs "vxfs3.3" when run.

The problem occurs because the optional OnlineJFS support installation doesn't update <sys/fs/vx\_inode.h>. Consequently lsof can be compiled with an incorrect definition of the vx\_inode structure and look for link counts, node numbers, and sizes in the wrong places in the structure.

The current response I have gotten from HP is that no <sys/fs/vx\_inode.h> update will be provided for OnlineJFS.

I've addressed this problem temporarily with a work-around (hack) in lsof revision 4.57.

## 9.2.8 Why can't /dev/kmem-based lsof be built with gcc for 64 bit HP-UX 11?

When Configure is given the "hpuxgcc" abbreviation, the HP-UX version is 11, and the kernel bit size is 64, the lsof Configure script may abort with the messages:

```
!!!!!!!!!!!!!!!!!!!! FATAL ERROR !!!!!!!!!!!!!!!!!!!!!
```

```
APPARENTLY GCC CANNOT BUILD 64 BIT EXECUTABLES.  
A COMPILER MUST BE USED THAT CAN. SEE 00FAQ  
FOR MORE INFORMATION.
```

(This is the "more information" in 00FAQ.)

This means the Configure script compiled a test program with gcc the result wasn't an ELF-64 binary. Lsof tries two gcc modes, one with no options and another with the -mlp64 option, before it concludes gcc can't be used.

See the "How can I acquire a gcc for building lsof for 64 bit HP-UX 11?" answer for information on where you might be able to get a gcc for HP-UX 11 that can produce ELF-64 executables.

### 9.2.8.1 How can I acquire a gcc for building lsof for 64 bit HP-UX 11?

Check this HP URL:

[http://h21007.www2.hp.com/dspp/tech/tech\\_TechSoftwareDetailPage\\_IDX/1,1703,547,00.html](http://h21007.www2.hp.com/dspp/tech/tech_TechSoftwareDetailPage_IDX/1,1703,547,00.html)

(That's one very long link; be careful you cut 'n paste it all.)

In November 2001 that URL led to a web page whose title was "gcc for hp-ux 11." The page offered a link for downloading a 64 bit gcc 3.0 compiler for HP-UX 11.0 and 11i. Rich Rauenzahn of HP installed that compiler on an HP test system he allows me to use and I successfully built a 64 bit lsof with it.

The HP package may install the 64 bit capable gcc in /usr/local/pa20\_64/bin/gcc, so you may have to adjust your path or set the LSOFC environment variable to compensate.

## 9.2.9 Why does /dev/kmem-based lsof for HP-UX 11 report "unknown file

system type" for some open files?

The lsof binary being used probably doesn't have support for the VxFS file system.

To confirm that, check ``lsof -v`` output for "-DHASVXFS". If it's not present, lsof doesn't have VxFS support.

You also need to establish that lsof really is complaining about VxFS files by checking the kernel boot file for the symbol associated with the hexadecimal address reported in the "unknown file system type" message -- e.g., "v\_op: 0x8711c8." Use `nm(1)` to do that:

```
$ nm -x /stand/vmunix | grep 8711c8
```

If `nm` reports the symbol associated with the address is `vx_vnodeops`, then lsof is complaining about an open VxFS file.

The solution in that case is to build lsof yourself (The bundled C compiler will do it.), making sure that lsof's Configure script detects the presence of VxFS. Configure does that by finding these two header files:

```
/usr/include/sys/fs/vx_hpux.h  
/usr/include/sys/fs/vx_inode.h
```

If the system where you are building lsof doesn't have those header files, but does have VxFS, you might be able to install the header files by installing the HP JournalFS package from the CoreOS CD -- in particular the file set JournalFS.VXFS-PRG and its associated patch, PHKL\_18543. (My thanks to Steve Bonds for that information.)

Finally, if you find that lsof isn't complaining about VxFS when it complains about an unknown file system type, send e-mail to me <abe@purdue.edu> for further assistance. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

#### 9.2.10 Why does the ANSI-C compiler complain about comments in HP-UX 11 header files?

When compiling lsof on HP-UX 11, the HP ANSI-C compiler's pre-processor, `cpp`, may complain about comments in HP-UX header files

-- e.g.,

```
cpp: "/usr/include/sys/cdfs.h", line 232: warning 2028:  
Found comment inside comment started on line 232.
```

```
cpp: "/usr/include/sys/cdnode.h", line 196: warning 2028:  
Found comment inside comment started on line 196.
```

```
cpp: "/usr/include/nfs/snode.h", line 30: warning 2028:  
Found comment inside comment started on line 30
```

This is not a problem with lsof. It is a problem with the HP-UX header files; they have non-compliant ANSI-C comment sequences in them -- e.g.,

```
<sys/cdfs.h>: 232  
/* struct cdfs *cdfs_link; /* linked list of file systems */
```

The initial "/\*" is not terminated by an ending "\*/" before the appearance of a second "/\*".

9.2.11 Why does dnodel.c cause the HP-UX 11 compiler to complain that <sys/fs/vx\_inode.h> is missing or incorrect?

If CFLAGS in the lsof Makefile for an HP-UX 11 compilation includes HASONLINEJFS, indicating the system has OnlineJFS support, lsof needs the <sys/fs/vx\_inode.h> header file.

Sometimes it is missing from /usr/include/sys/fs.

<sys/fs/vx\_inode.h> is a header file that must be obtained from Veritas. If that proves impossible, please contact me via e-mail at <abe@purdue.edu>. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

### 9.3 PSTAT-based HP-UX lsof Questions

The sources for PSTAT-based lsof for HP-UX may be found in lsof\_<revision>/dialects/hpux/pstat.

lsof's Configure shell script decides to use these sources when it finds that the /usr/include/sys/pstat subdirectory exists.

lsof can be forced to use the PSTAT-based sources by setting "pstat" in the HPUX\_BASE environment variable. Consult the Configure shell script and O0XPORTING for more information.



### 9.3.1 Why does PSTAT-based lsof complain about pst\_static and other PSTAT structures?

When lsof starts it may issue one of these fatal error messages:

```
lsof: FATAL: can't determine PSTAT static size
lsof: FATAL: can't read <n> bytes of pst_static
```

```
lsof: FATAL: pst_static doesn't contain <name>_size
lsof: FATAL: <name>_size should be <n>
```

These messages indicate that lsof's tests for the proper level of PSTAT support have failed. The structure names, given in <name>, and sizes, given in <n>, identify the support deficiency more precisely.

You may need to upgrade the PSTAT support in your kernel to be able to use PSTAT-based lsof.

### 9.3.2 Why does PSTAT-based lsof complain it can't read pst\_\* structures?

Lsof may put messages like the following in the NAME column of its output.

```
can't read cwd pst_filedetails: Permission denied
can't read mem pst_filedetails: Permission denied
can't read rtd pst_filedetails: Permission denied
can't read txt pst_filedetails: Permission denied
can't read pst_filedetails: Permission denied
can't read 3 stream structures: Permission denied
can't read pst_socket: Permission denied
```

These messages indicate that the lsof binary lacks the authority to read the name structures for processes other than ones belonging to the UID under which lsof is running. Authority to read the structures of other processes is limited to root processes -- i.e., lsof must have setuid-root permission if it is to list open files for arbitrary processes.

If you want to eliminate these errors, you must run lsof as root or install it with setuid-root permission.

### 9.3.3 Why does PSTAT-based lsof rebuild the device cache file after each reboot?

After each HP-UX rebuild, the first time a user runs lsof it will report:

```
lsof: WARNING: device cache mismatch: /dev/tun...  
lsof: WARNING: created device cache file: /<user_path>
```

This happens because the device numbers on /dev/tun\* device nodes are recalculated at each reboot. When lsof detects a change in the device number of a /dev/tun\* file, it rebuilds its local device cache file.

#### 9.3.4 Why doesn't PSTAT-based lsof report TCP addresses for telnetd's open socket files?

When lsof can't report TCP addresses for telnetd's open socket files it is because an unpatched PSTAT kernel interface doesn't report the addresses to lsof.

This has been addressed in PSTAT kernel patch PHKL\_24047. It is available from the HP IT Resource Center at:

<http://itrc.hp.com>

In the page's "maintenance / support" box select the "individual patches" link. Once at its page, select the "hp-ux" link. On that page select the "Series 800" or "Series 700" radio button and select "11.11" from the pull-down list to the right of the button. Under "search or browse the path list" select "Search by Patch IDs" from the pull down list, enter PHKL\_24047 in the following text box, and select search. That should lead to information about PHKL\_24047 and a link for downloading it. (You may have to log in first and you may have to create a login identity by registering before you can log in.)

Some time in March 2006 the PHKL\_24047 patch was "lost" by the HP-UX networking lab. It has been "found" again in August 2006 and will be re-released as a GRO patch "some time." I don't yet know when that will be. You must contact HP to learn about the availability of the GRO patch.

#### 9.3.5 Why does PSTAT-based lsof cause an HP-UX 11.11 kernel panic?

When PSTAT-based lsof runs on some HP-UX 11.11 kernels,

the kernel may panic. Symptoms include:

Console message:

```
0xFBE000301100EF00 00000000 0000EF00 -  
type 31 = legacy PA HEX chassis-code
```

/var/adm/syslog:

```
... vmunix: Trap Type 15 (Data page fault)  
... vmunix: Instruction Address (pcsq.pcoq) = 0x...
```

The panic is caused by a bug in the way PSTAT's `pstat_getstream()` function obtains module names from streams managed by the `otsam` stream driver (part of OSI Transport Services). `Lsof` calls `pstat_getstream()` when it encounters an open `otsam` stream file. An HP-UX 11.11 system uses `otsam` if `otsam` appears in `/stand/system`.

HP-UX 11.11 patch `PHKL_24507` (available some time after July 15, 2001) fixes the `pstat_getstream()` bug. See the information in the answer to the "Why doesn't PSTAT-based `lsof` report TCP addresses for `telnetd`'s open socket files?" question for information on how to obtain the patch.

### 9.3.6 Why doesn't PSTAT-based `lsof` report a CWD that is on a loopback (LOFS) file system?

When PSTAT-based `lsof` reports on processes whose current working directory (CWD) is on a loopback file system, `lsof` can't report the open CWD file. The reason is that the HP-UX 11.11 and above kernel's loopback file system code is not passing the CWD file ID to the kernel's `pstat(2)` code. Hence `lsof` is given no information on the `lofs` CWD.

The problem was first reported to me by Ermin Borovac and an internal bug report was filed with the HP-UX file system group on October 26, 2004. That report has now been answered by the patch `PHKL_33200 -- s700_800 11.11 lofs cumulative patch`. The HP IT Resource Center (<http://itrc.hp.com>) is a source for the patch.

### 9.3.7 Why

do some `swinstall` packages for PSTAT-based HP-UX 11.11 packages complain about `setgid` and `setuid` bits?

First, let me explain that I do not provide `lsof` `swinstall` packages for `lsof`. Others provide them and they should be contacted about problems with their packages.

However, I have become aware of a problem with one package about which I have some information I can share. The problem shows up in these swinstall messages:

```
ERROR: Unknown owner and/or group for file
"/usr/local/bin/lsof". SUID and/or SGID bit was
not set.
ERROR: Failed installing fileset "lsof.lsof-RUN,r=4.73".
Check the above output for details.
```

The swpackage SUID/SGID functionality was restricted by changes for POSIX compliance, breaking backward compatibility. The patch PHCO\_27671 allows SUID/SGID for uid/gid of 0 only, as a compromise between backward compatibility and POSIX conformance.

If the setuid bit is to be set on the executable, the UID and GID of the executable must be 0 (zero).

### 9.3.8 Why won't the bundled C compiler build PSTAT-based lsof for PA-RISC HP-UX 11.23?

A PA-RISC HP-UX 11.23 bundled C compiler dated May 2005 or later will not build PSTAT-based lsof. It will deliver error messages related to the system's <gssapi/gssapi.h> header file.

There is nothing wrong with that header file or lsof. The problem is that the bundled C compiler can't cope with the gssapi.h header file.

The work-around is to use the HP ANSI C compiler. Using gcc is not a satisfactory work-around. See the answer to the "Why won't gcc build PSTAT-based lsof for PA-RISC HP-UX 11.23?" question for more information.

### 9.3.9 Why won't gcc build PSTAT-based lsof for PA-RISC HP-UX 11.23?

Gcc will not even compile PSTAT-based lsof revisions below 4.77 for PA-RISC HP-UX 11.23 dated May 2005 or later. It reports errors in lsof's print.c fill\_portmap() function about missing members of the rpercent structure. That happens because gcc defines \_XOPEN\_SOURCE\_EXTENDED which disables the definition of the rpercent structure in <netdb.h>.

Using the HP bundled C compiler is not a viable work-around.

That is explained in the answer to the "Why won't the bundled C compiler build PSTAT-based lsof for PA-RISC HP-UX 11.23?"

While an lsof revision 4.77 or higher can be compiled with gcc, the results are unreliable. lsof will compile, but it occasionally produces segment faults when it runs. I have not been able to reproduce the failure reliably or locate a debugger that will work with the gcc-compiled lsof.

The only reliable work-around is to use the HP ANSI C compiler.

9.3.10 Why does PSTAT-based lsof complain, "FATAL: pst\_stream\_size should be: 672; is 72" on HP-UX 11.11 and above?

This message indicates a mismatch between the PSTAT header files used to build lsof (<sys/pstat.h> and those in the /usr/include/sys/pstat subdirectory), and those that built the running kernel.

Unfortunately the June 2008 patch set for HP-UX 11.23 creates this inconsistency, because it does not contain all the patches needed to match the kernel with the PSTAT header files. Even more serious is that the missing patches update the kernel's PSTAT support to provide TCP/UDP endpoint information to lsof from TCP/TLI streams.

The patch inconsistency comes about because, while the following patch is installed,

PHKL\_36577 1.0 PM-PSTAT section 2 manpage changes

other kernel patches are not.

The PHKL\_36577 patch updates the PSTAT header files and manual pages to match kernel changes that other patches with the following numbers (or patches that contain or supersede them) contain:

PHNE\_36575 1.0 Cumulative STREAMS Patch  
PHNE\_37670 1.0 cumulative ARPA Transport patch  
PHNE\_37851 1.0 NFS cumulative patch

Those patches implement the kernel changes that support the delivery of information promised in patch PHKL\_36577.

The work-around is to install the missing patches.

## 9.4 Why

won't the HP-UX depot install?

I don't distribute lsof depots, so I can't support them.

From time to time depots prepared by various sites -- e.g., usually HP-UX software collection sites -- will contain errors that cause installation of the depot to fail.

Do not contact me when this happens. Instead, contact the administrator of the site that prepared the depot.

As should be clear from the bulk of the lsof documentation, I do not recommend you use pre-built lsof binaries in any form. Instead, I recommend you obtain the lsof source distribution and build lsof yourself.

## 10.0 Linux

### 10.1 What do /dev/kmem-based and /proc-based lsof mean?

At approximately Linux 2.1.72 and exactly at lsof revision 4.23 support for Linux forks. The first fork, containing the oldest lsof form is based on access to kernel memory structures, and is called /dev/kmem-based lsof. A /dev/kmem-based lsof is heavily intertwined with the Linux kernel version, its header files, and its system map file. Typically a /dev/kmem-based lsof needs only setgid permission to local all open file information.

After approximately Linux 2.1.72 and at revision 4.23 lsof obtains all its information from the /proc file system. That lsof is called the /proc-based lsof. A /proc-based lsof does not read kernel memory, needs neither kernel header files nor the system map file, and is less likely to be affected by Linux kernel changes. However, it does require setuid-root permission to list all open files, and it can't report file offsets (positions).

After revision 4.52 the /dev/kmem-based Linux sources for lsof are no longer distributed. Information about them may be found in the 00INDEX and README files at:

<ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/OLD/src>

## 10.2 /proc-based Lsof Questions

### 10.2.1 Why doesn't /proc-based lsof report file offsets (positions)?

/proc-based lsof revisions 4.79 and above can only report file offsets (positions) for the files of Linux kernels 2.6.22 and above.

During its initialization /proc-based lsof tests to see if offset information can be obtained. If it cannot, lsof disables offset reporting. If the -o option was selected, lsof also issues this warning:

```
lsof: WARNING: can't report offset; disregarding -o.
```

### 10.2.2 Why does /proc-based lsof report "can't identify protocol" for some socket files?

/proc-based lsof may report:

```
COMMAND PID ... TYPE ... NODE NAME
pump 226 ... sock ... 309 can't identify protocol
```

This means that it can't identify the protocol (i.e., the AF\_\* designation) being used by the open socket file. Lsof identifies protocols by matching the node number associated with the /proc/<PID>/fd entry to the node numbers found in selected files of the /proc/net sub-directory. Currently /proc-based lsof examines these protocol files:

```
/proc/net/ax25 (untested)
/proc/net/icmp
/proc/net/ipx (needs kernel patch)
/proc/net/netlink
```

```
/proc/net/packet
/proc/net/raw
/proc/net/raw6
/proc/net/sctp/assocs
/proc/net/sctp/eps
/proc/net/sockstat
/proc/net/sockstat6
/proc/net/tcp
/proc/net/tcp6
/proc/net/udp
/proc/net/udp6
```

```
/proc/net/udplite
/proc/net/udplite6
/proc/net/unix
```

If /proc-based lsof says it can't identify the protocol for an open socket file, you may be able to identify the protocol yourself by using `grep` to look for the specific node number in the files of `/proc/net` -- e.g.,

```
$ grep <node_number> /proc/net/*
```

You may not be able to find the desired node number, because not all kernel protocol modules fully support /proc/net information.

If you find a matching node number in a /proc/net file that is not currently being processed by lsof, contact me via e-mail at <abe@purdue.edu>. I'll discuss adding support to /proc-based lsof for the protocol of the /proc/net file with you. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

The code that matches node numbers of open IPX protocol socket files to those in /proc/net/ipx requires Jonathan Sergent's Linux 2.1.79 patch to /usr/src/linux/net/ipx/af\_ipx.c. The patch, suitable for input to Larry Wall's patch program, may be found in the lsof distribution file:

```
.../dialects/linux/proc/patches/net_ipx_af_ipx.c.patch
```

### 10.2.3 Why does /proc-based lsof warn about unsupported formats?

Lsof may issue the following warning:

```
lsof: WARNING: unsupported format: /proc/net/<file>
```

if the header line of the indicated <file> in /proc/net -- ax25, ipx, raw, tcp, udp, or unix -- doesn't match what lsof expects to find.

When the header line of a /proc/net file isn't what lsof expects, lsof probably can't parse the rest of the file correctly and doesn't try. As a result, lsof can't report any NAME column information (e.g., local and remote addresses) for socket files bound to the indicated network protocol.



If you get this warning, please send me e-mail at <abe@purdue.edu>. Include the contents of the file lsof claims has an unsupported format. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

#### 10.2.4 Why does /proc-based lsof report "(deleted)" after a path name?

The "(deleted)" notation following a path name in /proc-based lsof's NAME column comes from the /proc/<PID>/fd/<FD> entry for the open file. It's the Linux kernel's way of indicating the file is open but has been unlinked (rm'd).

#### 10.2.5 Why doesn't /proc-based lsof report full open file information for all processes?

/proc-based lsof can only report on processes whose /proc files it has permission to read. /proc normally grants permission to read all its files only to root or to the owning user ID.

Without permission to read most /proc files, lsof can only report full information for processes belonging to the user who is running

lsof. /proc-based lsof may be able to report some information for all processes, depending on the permissions of their associated /proc files, but usually /proc-based lsof won't be able to access the files in /proc/<PID>/fd/ that describe regular open files.

If you want /proc-based lsof to report on all processes, you must install it with setuid-root permission.

#### 10.2.6 Why won't Customize offer to change HASDCACHE or WARNDEVACCESS for /proc-based lsof?

/proc-based lsof doesn't read device information from /dev or the device cache file, so it makes no sense to change the state of device cache processing or /dev node accessibility warnings.

#### 10.2.7 /proc-based lsof Linux NFS questions

##### 10.2.7.1 Why can't lsof find files on an accessible NFS file system?

On occasion lsof may be unable to identify that an open file is on an NFS file system. This is most likely the result of a bug in the way the Linux kernel supplies information to the reader of /proc/mounts (lsof) --

sometimes  
that pseudo-file is truncated by the kernel.

One way to see if this is the case is to search for the  
NFS file system in /proc/mounts -- e.g.,

```
$ grep <NFS_file_system_mount_point> /proc/mounts
```

If you get no output or the third word of the output isn't  
"nfs", then lsof won't consider the file system an NFS file  
system.

A second test is to look at the end of /proc/mounts --  
e.g.,

```
$ tail /proc/mounts
```

If tail reports "# truncated" then /proc/mounts is incomplete  
because of a Linux kernel bug. The bug is documented at:

<http://www.xss.co.at/sysinfo/mounts.html>

The bug is fixed in Linux kernel 2.4.18, and possibly in  
some earlier Linux kernel versions.

#### 10.2.7.2 Why can't lsof find files on an inaccessible NFS file system?

If lsof issues this message about a Linux file system,  
mounted from an NFS server:

```
lsof: WARNING: can't stat() nfs file system /xxx/yyy
```

Then lsof won't be able to find any open files on the file  
system.

That's because  
of an inadequacy in the Linux /proc file  
system. Its /proc/mounts file doesn't give the device  
doublet (major and minor numbers) of the file system as do  
many UNIX systems (e.g., Solaris). The only way lsof can  
get the device doublet for a Linux file system is to call  
stat(2) on the file system path, which fails if the NFS  
server isn't accessible.

When lsof doesn't know the device doublet of a file system,  
it can't find open files on the inaccessible file system,  
because it can't match the doublets of open files to the  
doublet of the inaccessible file system.

This topic is covered extensively in lsof(8) in its ALTERNATE DEVICE NUMBERS and BLOCKS AND TIMEOUTS sections.

10.2.8 Why doesn't /proc-based Linux lsof report socket options and values, socket state flags, and TCP options and values?

The Linux /proc file system doesn't report socket options and values, socket states, and TCP options and values to lsof.

10.2.9 Does /proc-based Linux lsof use a device cache?

No.

The Linux /proc/<PID>/fd/\* entries provide device names to lsof via readlink(2). It is not necessary to enable device cache processing for /proc-based Linux lsof via the Customize script or modifications to the Linux machine.h header file.

10.2.10 Why doesn't /proc-based Linux lsof report any or all file structure values for its +fcfgn option?

/proc-based lsof revisions 4.79 and above can only report some file structure values for Linux kernels below 2.6.22.

When running on Linux kernels at 2.6.22 and above lsof 4.79 can report some file flag values -- i.e., in response to the +fg or +fG options. The flag values are obtained from the /proc/<PID>/fdinfo/ files introduced at Linux kernel 2.6.22.

/proc-based Linux lsof tests its availability to obtain file flag values at initialization. If values are not available, lsof disables file flag reporting. If the flags were requested with +fg or +fG, lsof displays this warning:

```
lsof: WARNING: can't report
file flags; disregarding +f.
```

As a special note, when Linux lsof can report flag bits, it will not report 'R' for a read-only file. There is no read-only flag bit O\_\* symbol in <fcntl.h> (or <bits/fcntl.h>) and lsof reports only bits that are set. The absence of O\_RDWR and O\_WRONLY flag bits implies the file is read-only.

10.3 Special Linux file types

10.3.1 Why is ``DEL" reported as a Linux file type?

Lsof usually reports entries from the Linux `/proc/<PID>/maps` file with `mem` in the TYPE column. However, when lsof can't stat(2) a path in the process' `maps` file and the `maps` file entry contains `(deleted)`, indicating the file was deleted after it had been opened, lsof reports the file type as `DEL`.

### 10.3.2 Why is `unknown` reported as a Linux file type?

Lsof may report a Linux file's type as `unknown` in the TYPE column when lsof can't obtain complete stat(2) results for the file.

Usually the NAME column will contain a `(stat: xxx)` error message, but that could have been suppressed with the lsof `-w` option.

## 10.4 Linux `mem` Entry Problems

### 10.4.1 What do `path dev=xxx` and `path inode=yyy` mean in the NAME column of Linux `mem` file types?

When the device or inode number in the process' `maps` file entry doesn't match the stat(2) results from the file path, lsof reports the inconsistent information from the stat(2) of the path parenthetically after the path in the NAME column in one of these forms:

`(path dev=xxx)` only the device number, `xxx`, from a stat(2) of the `maps` file entry path differs from the `maps` file entry value reported in the DEVICE column.

`(path inode=yyy)` only the inode number, `yyy`, from a stat(2) of the `maps` file entry path differs from the `maps` file entry value reported in the NODE column.

`(path dev=xxx inode=yyy)` Both device and inode numbers differ.

Lsof reports the

``maps" file device number in the DEVICE column and the inode number in the NODE column.

When device and inode mismatches occur, lsof suppresses the reporting of link count and size. See the answer to the "Why is neither link count nor size reported for some Linux ``DEL" and ``mem" file types?" question for more information.

Device and inode inconsistencies can occur when a file at a ``maps" path is replaced after the process has started, or when a different file system with similar path names is mounted on top of the original file system.

The device inconsistency parenthetical messages can be suppressed with lsof's ``-w" option.

#### 10.4.2 Why is neither link count nor size reported for some Linux ``DEL" and ``mem" file types?

Link count and size are not reported for some entries from the process' ``maps" file because a stat(2) of the entry file path failed or stat(2) delivered device or inode numbers that don't match the ones in the ``maps" entry.

When the stat(2) device or inode numbers don't match those in the ``maps" file entry, it is likely that the stat(2) results don't apply to the file that was originally mapped by the process and whose path appears in the ``maps" file entry, so lsof tries to avoid reporting possibly incorrect information.

See the answer to the "What do ``path dev=xxx" and ``path inode=yyy" mean in the NAME column of Linux ``mem" file types?" for more information on how mismatched stat(2) device and inode numbers are reported.

### 10.5 Special Linux NAME column messages

#### 10.5.1 What does ``(stat: xxx)" mean in the NAME column of Linux files?

When lsof tried to stat(2) the path in the NAME column, the stat(2) system call failed and produced an error message of ``xxx".

This situation usually occurs if the lsof process lacks permission to stat(2) the path -- e.g., the lsof executable lacks root permission, or lsof is attempting to stat(2) a path

on an NFS device mounted with the `root_squash` option.

The message can be suppressed with lsof's `--w` option.

#### 10.5.2 What does `(readlink: xxx)` mean in the NAME column of Linux files?

When lsof tried to convert the `/proc/<PID>/fd` path, reported in the NAME column, to its full and more meaningful path, the `readlink(2)` system call used to do the conversion failed. The `readlink(2)` failure message is `(xxx)`.

This situation usually occurs if the lsof process lacks permission to `readlink(2)` some part of the path -- e.g., the lsof executable lacks root permission, or lsof is attempting to `stat(2)` a path on an NFS device mounted with the `root_squash` option.

The message can be suppressed with lsof's `--w` option.

#### 10.6 Why is `NOFD` reported as a Linux file type?

When lsof lacks permission to use `opendir()` on the `fd/` subdirectory of a process' `/proc/<PID>` directory, it reports a single file of the type `NOFD` (for no file descriptors).

Lsof reports the `/proc/<PID>/path` in the NAME column, followed by `(opendir: xxx)`, where `(xxx)` is the error message returned by `opendir()`.

The `NOFD` entry can be suppressed with lsof's `--w` option.

#### 10.7 Why does Linux lsof report a NAME column value that begins with `/proc`?

When lsof has problems processing a `/proc/<PID>` entry -- e.g., it can't convert the entry to a full and more meaningful path name, or it can't access the `/proc/<PID>/fd` subdirectory with `opendir()` -- it will report the `/proc/<PID>` path in the NAME column.

#### 10.8 Linux `/proc/net/tcp*` and `/proc/net/udp*` issues

##### 10.8.1 Why use the Linux `-X` option?

If you're not interested in TCP/IP socket information for a

particular use of lsof, adding the -X option will make lsof run more quickly, because -X inhibits the reading of the /proc/net/tcp\* and /proc/net/udp\* files. For example, you may only be interested in knowing what process has a particular file open.

When the Linux system has a large number of open TCP/IP socket files, the time savings provided by -X can be significant.

#### 10.8.2 Why does lsof say ``-i is useless when -X is specified"?

If -X is specified, lsof can't report much information on open TCP/IP socket files. However, lsof's -i option requests that information. Hence, the two options conflict and can't be used together.

#### 10.8.3 Why does lsof say ``can't identify protocol (-X specified)"?

If the Linux lsof -X option is specified and an open socket file can't be identified without accessing the /proc/net/tcp\* and /proc/net/udp\* files, lsof will report that it can't identify the socket's protocol and that the failure may be caused by the -X specification

### 11.0 NetBSD Problems

#### 11.1 Why doesn't lsof report on open kernfs files?

Lsof doesn't report on open NetBSD kernfs files because the structures lsof needs aren't defined in the kernfs.h header file in /sys/misc/kernfs.

#### 11.2 Why doesn't lsof report on open files on: file descriptor file systems; /proc file systems; 9660 (CD-ROM) file systems; MS-DOS (floppy disk) file systems; or kernel file systems?

Lsof is not able to report on open files on certain file system if /usr/src/sys/msdosfs didn't exist when the lsof Configure script ran and lsof was made. /usr/src/sys/msdosfs contains header files lsof needs for collecting data on certain file system files.

You can tell if an lsof executable above) lacks support for a file system if the following test of `lsof -v` produces nothing:

```
$ lsof -v 2>&1 | grep <support_enabled_definition>
```

The <support-enabled\_definition> will be:

File System Type Definition Note

-----

File descriptor HASFDESCFS

/proc HASPROCFS

9660 HAS9660FS

MS-DOS HASMSDOSFS (lsof 4.61 and above)

Kernel HASKERNFS

The work-around is to install /usr/src/sys, rerun the lsof Configure script, and remake lsof.

### 11.3 Why does lsof produce confusing results for nullfs file systems?

Consider this report from /sbin/mount:

```
/usr/home  
on /home type null (local)
```

(According to /sbin/mount /usr/home is the mounted-on device and /home is the mounted-on directory.)

When lsof is asked to report on open files on /home, it will report them as files on /usr/home instead. That's an artifact of the NetBSD kernel's dynamic name lookup cache (DNLC) and the way the kernel handles nullfs mounted-on directories.

While lsof will report all open files on /home when given /home as a file system directory argument, even though reporting them as located on /usr/home, lsof will not find the same files when asked to report on all open files on /usr/home when given /usr/home as a file system device argument. That's because from the mount perspective /usr/home is equivalent to a device, but from the device perspective it is still a directory.

So, what this lsof command reports:

```
$ lsof /home  
... NAME  
... /usr/home/...
```



Won't be duplicated by this lsof command:

```
$ lsof /usr/home
```

Another way

to look at this confusing /home and /usr/home example is to consider what stat(2) reports. For /home stat(2) reports a device doublet that matches what lsof finds in open file node structures, while the device doublet stat(2) reports for /usr/home won't match what lsof finds. Nor does the mode reported by stat(2) indicate a block devices, as is the expected case.

There is no simple answer to this confusion, nor is there even a simple explanation. Simply be aware that when supplying file system arguments to lsof on NetBSD, use the mounted-on directory name for a nullfs as the lsof argument, and don't be surprised when the NAME column reports the mounted-on device name.

## 11.4 NetBSD header file problems

### 11.4.1 Why can't the compiler find some NetBSD header files?

If the compiler's pre-processor complains it can't find some header files when it compiles lsof source files, /usr/include and /usr/src may not have all the header files lsof needs.

As a work-around use the NETBSD\_SYS environment variable to specify to lsof the location of the additional header files -- e.g.,

```
% setenv NETBSD_SYS /my_source  
% ./Configure -n netbsd
```

or

```
$ NETBSD_SYS=/mys_source ./Configure -n netbsd
```

Caution: using this work-around may cause the lsof Configure script to activate or omit different features, depending on where it finds the header files that determine the state of the features.

### 11.4.2 Why does NetBSD lsof produce incorrect output?

If the NetBSD system's kernel was built from header files that don't match those in /usr/include -- e.g., //usr/src has the

ones from which the kernel was built -- lsof may build, but won't produce correct output.

As a possible work-around, try directing the C compiler to select header files from /usr/src before it selects them from /usr/include. That can be done with the DEBUG make string -- e.g.,

```
$ make DEBUG="-I/usr/src -I/usr/include"
```

If that work-around fails, try using the LSOF\_INCLUDE and NETBSD\_SYS environment variables to swap /usr/include and /usr/src when running the Configure script, then use the make DEBUG string when running make -- e.g.,

```
$ LSOF_INCLUDE=/usr/src; export LSOF_INCLUDE
$ NETBSD_SYS=/usr/include; export NETBSD_SYS
$ ./Configure -n netbsd
$ make DEBUG="-I/usr/src -I/usr/include"
```

### 11.5 Why isn't lsof feature xxx enabled for NetBSD?

Lsof's Configure script enables NetBSD features by locating and examining header files associated with the features, and based on what it finds, setting compile-time definitions in Makefiles. (See 00PORTING for a list of the definitions.)

When Configure doesn't find header files or doesn't find appropriate values in header files, that may mean the header file tree lsof is searching is incomplete or out of date.

Lsof normally looks for NetBSD header files in /usr/include. It can also be directed to look in other directories -- e.g., /sys -- if told to do so with the contents of the LSOF\_INCLUDE and NETBSD\_SYS environment variables.

To determine what header file enables a missing feature, check the NetBSD stanza in the Configure script. Then check the locations it checks for the indicated header files and contents.

See 00XCONFIG for more information on LSOF\_INCLUDE and NETBSD\_SYS.

### 12.0 NEXTSTEP and OPENSTEP Problems

## 12.1 Why can't lsof report on 3.1 lockf() or fcntl(F\_SETLK) locks?

Lsof has code to test for locks defined with lockf() or fcntl(F\_SETLK) under NEXTSTEP 3.1, but that code has never been tested. I couldn't test it, because my NEXTSTEP 3.1 lockf() and fcntl(F\_SETLK) functions return "Invalid argument" every way I have tried to invoke them.

If your NEXTSTEP 3.1 system does allow you to use lockf() and fcntl(F\_SETLK) and lsof doesn't report locks set with them, then the code in ../dialects/next/dnode.c probably isn't correct. Please contact me via e-mail at <abe@purdue.edu> and tell me how you got your lockf() and fcntl(F\_SETLK) system calls to work. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

## 12.2 Why doesn't lsof compile for NEXTSTEP with AFS?

I no longer have a NEXTSTEP test system that has AFS. Changes to lsof since I once had a test system have caused me to change the AFS code in NEXTSTEP without being able to test the changes.

If you need AFS support for NEXTSTEP and can't get it to compile, please contact me. Perhaps we can jointly fix the problems.

## 13.0 OpenBSD Problems

### 13.1 Why doesn't lsof support kernfs on my OpenBSD system?

Lsof supports the kernel file system on OpenBSD versions whose /sys/miscfs/kernfs/kernfs.h (or <miscfs/kernfs/kernfs.h> header file correctly defines the kern\_target structure. The lsof Configure script's openbsd stanza checks for the presence of the structure's kt\_name element and activates kernfs support for the CFLAGS -DHASKERNFS definition only when it finds kt\_name.

The kernfs.h header file is scheduled to be updated in the OpenBSD 2.1 release, according to Kenneth Stailey, who authored its changes.

## 13.2 Will lsof work on OpenBSD on non-x86-based architectures?

I've not tested lsof on an OpenBSD system that uses a non-x86-based architecture, but I've had one report that lsof 4.33 compiles and works on OpenBSD for the pmax architecture (decstation 3100).

## 13.3 <sys/pipe.h> problems

### 13.3.1 Why does the compiler claim nbpg isn't defined?

When compiling lsof on some (older) OpenBSD SPARC versions, the compiler may complain:

```
In file included from ../dlsof.h:191,
  from ../lsof.h:166,
  from fino.c:52:
/usr/include/sys/pipe.h:83: `nbpg' undeclared here
(not in a function)
/usr/include/sys/pipe.h:83: size of array `ms' has
non-integer type
```

This happens because <sys/pipe.h> uses NBPG from <machine/param.h> to size the `ms' array, and some OpenBSD systems define NBPG in terms of a kernel integer variable, nbpg.

Lsof revisions 4.46 and above have a hack to dlsof.h, developed by Volker Borchert that avoids the compiler problem for SPARC OpenBSD 2.3. The hack might work for other OpenBSD SPARC versions, but hasn't been tested there.

If you want to enable the hack for your OpenBSD SPARC version, modify this code in ../dialects/n+obsd/dlsof.h:

```
# if defined(OPENBSDV)
# if OPENBSDV==2030 && defined(__sparc__)
# if defined(nbpg)
#undef nbpg
# endif /* defined(nbpg) */
#define nbpg 4096 /* WARNING!!! ... */
# endif /* OPENBSDV==2030 && defined(__sparc__) */
#include <sys/pipe.h>
#endif /* defined(OPENBSDV) */
```

You will probably want to change the second #if test to match your OpenBSD version. You may also want to change

what value is assigned to nbpg. See the next section, "What value should I assign to nbpg?"

### 13.3.2 What value should I assign to nbpg?

If you need to enable the nbpg hack, described in "Why does the compiler claim nbpg isn't defined?", you may also need to assign a value other than 4096 to nbpg. 4096 works for the sun4c processor and should work for sun4m, but 8192 may be needed for sun4.

Check <machine/param.h> and other OpenBSD documentation to determine the correct nbpg assignment.

### 13.4 Why doesn't lsof report on open MS-DOS file system (floppy disk) files?

Lsof is not able to report on open MS-DOS file system files if /usr/src/sys/msdosfs didn't exist when the lsof Configure script ran and lsof was made. /usr/src/sys/msdosfs contains header files lsof needs for collecting data on MS-DOS file system files.

You can tell if an lsof executable (revisions 4.61 and above) lacks MS-DOS file system support if the following command reports nothing:

```
$ lsof -v 2>&1 | grep HASMSDOSFS
```

The work-around is to install /usr/src/sys, rerun the lsof Configure script, and remake lsof.

### 13.5 Why isn't lsof feature xxx enabled for OpenBSD?

Lsof's Configure script enables OpenBSD features by locating and examining header files associated with the features, and based on what it finds, setting compile-time definitions in Makefiles. (See 00PORTING for a list of the definitions.)

When Configure doesn't find header files or doesn't find appropriate values in header files, that may mean the header file tree lsof is searching is incomplete or out of date.

Lsof normally looks for OpenBSD header files in /usr/include and /sys. It can also be directed to look in other directories if told to do so with the contents of the

LSOF\_INCLUDE and NETBSD\_SYS environment variables.

To determine what header file enables a missing feature, check the OpenBSD stanza in the Configure script. Then check the locations it checks for the indicated header files and contents.

See 00XCONFIG for more information on LSOF\_INCLUDE and NETBSD\_SYS.

## 14.0 Output Problems

### 14.1 Why do the lsof column sizes change?

Lsof dynamically sizes its output columns each time it runs to make sure that each column takes the minimum space. Column parsing -- e.g., with awk -- is possible, because each column is guaranteed to be separated from the preceding one by at least one space, and no column except the last (NAME) contains embedded spaces.

### 14.2 Why does the offset have ``0t' and ``0x" prefixes?

The offset value that appears in the SIZE/OFF column has ``0t' and ``0x" prefixes to distinguish it from size values that may appear in the same column.

Normally if the offset value is less than 100,000,000 (8 digits), it appears in decimal with a ``0t' prefix; over 99,999,999, in hexadecimal with a ``0x" prefix.

A decimal offset is handy, for example, when tracking the progress of an outbound ftp transfer. When lsof reports on the ftp process, it will report the size of the file being sent with its open descriptor; it will report the progress of the transfer via the offset of the outbound open ftp data socket descriptor.

The ``-o [n]" option may be used to specify the maximum number of decimal digits to be printed after ``0t" before lsof switches to the hexadecimal digits after ``0x". As already noted, the default decimal digit count is 8.

### 14.3 What are the values printed in the FILE\_FLAG column and why is 0x<value> sometimes included?

The two comma separated lists, separated by a semicolon, printed in the FILE-FLAG column (when the "+fg" option is specified), are short-hand names or hexadecimal values for the bits lsof finds in the f\_flag or f\_flags member of file structures for files (the first list, the one before the semicolon), and process open files flags found in various kernel structures, often named "pofile" (the second list, the one after the semicolon).

Lsof determines the short-hand names from symbols in the <fcntl.h>, <linux/fs.h>, <sys/fcntl.h>, <sys/fcntlcom.h>, <sys/file.h>, and <sys/user.h> header files.

See the discussion of FILE-FLAG in the OUTPUT section of the lsof man page, and the FF\_\* and POF\_\* symbols in lsof.h for a list of the names.

Bits with no names defined for them are represented by an 0x<value> member of the comma-separated list -- a hexadecimal integer. When "+fG" is specified (instead of "+fg"), lsof will list all flag values as two hexadecimal integers, separated by a semicolon.

When "-FG" is specified to get the flags in an output field, the format defaults to hexadecimal. You can get names instead by following "-FG" with "+fg" -- e.g.,

```
$ lsof -FG +fg ...
```

However, when you precede "-FG" with "+fg" -- e.g.,

```
$ lsof +fg -FG
```

the format will be hexadecimal; order is important.

#### 14.3.1 Why doesn't lsof display FILE\_FLAG values for my dialect?

All versions of lsof except the /proc-based Linux lsof report FILE-FLAG values. Lsof can't obtain FILE-FLAG information from the Linux /proc interface.

### 14.4 Network Addresses

#### 14.4.1 Why does lsof's -n option cause IPv4 addresses, mapped to IPv6,

to be displayed in IPv6 notation?

When you use the `-n` option to tell `lsof` to display numeric network addresses, and an IPv4 address has been mapped to IPv6, `lsof` displays the address in IPv6 format and puts "ipv4" in the TYPE column. That combination indicates the IPv4 address has been mapped to IPv6.

For example, the IPv4 address 1.2.3.4, when mapped to an IPv6 address, will be displayed by `lsof` as:

```
[::ffff:1.2.3.4]
```

The enclosing brackets are `lsof`'s signal that this is an IPv6 address. Inside the brackets is a standard IPv6 address, reported by `inet_ntop()`. The first two colons, signifying zeroes in the first 64 bits of the IPv6 address, and the hexadecimal `ffff` in the next 32 bits, indicate that the last 32 bits contains a mapped IPv4 address, which is then displayed in IPv4 dot notation.

14.5 Why does `lsof` output `\x`, `^x`, or `\xnn` for characters sometimes?

`lsof` displays only printable ASCII characters. `lsof` considers a character printable if `isprint(3)` says it is. If `isprint(3)` says a character isn't printable, the `lsof` man page explains:

```
"... Non-printable characters are printed in one of three forms: the C ``\[bfrnt]" form; the control character `^' form (e.g., ``^@""); or hexadecimal leading ``\x" form (e.g., ``\xab"). Space is non-printable in the COMMAND column (``\x20") and printable elsewhere."
```

14.5.1 Why is space considered a non-printable character in command names?

Space is considered an unprintable character in command names because it is sometimes possible to hide the full command name from scripts that parse `ps(1)` output by embedding a space in the name.

14.6 Why doesn't `lsof` print all the characters of a command name?

By default `lsof` prints the first nine characters of the



names of commands associated with processes. If more characters are required, the "w" value of the "+c w" option may be used to specify a larger width.

If "w" is zero (0) lsof will print all characters of all command names up to the limit of the number of characters supplied by the particular UNIX dialect. When reporting command names, lsof replaces non-printable characters as discussed in the answer to " Why does lsof output \x, ^x, or \xnn for characters sometimes?"

See the answer to the "Why is space considered a non-printable character in command names?" question for an explanation of why spaces are replaced by the "\x20" representation in command names.

The number of command name characters supplied to lsof by UNIX dialects in files and structures varies by dialect. For example, Linux 2.4.27 supplies lsof the first 15 characters of command names and Solaris 9 supplies 16. Thus, even if "w" is zero (0), lsof can't report more characters for command names on those two UNIX dialects than they provide lsof.

14.7 Why does lsof reject some -c command names, saying their lengths are "> what system provides (nn)"?

The command name length that a specific system provides varies from dialect to dialect. As noted in the answer to the "Why doesn't lsof print all the characters of a command name?" question, Linux and Solaris provide a limited number of command name characters.

When more characters are specified in the parameter to the -c option, lsof considers it an error and issues a fatal error message -- e.g.,

lsof: "-c xxxxyyyy" length (8) > what system provides (7)

The only work-around is to specify no more characters to -c than the system provides to lsof.

14.8 Why does lsof sometimes print TYPE numbers instead of names?

When lsof can't convert a type number to a name for printing in the TYPE column, it will report the number as four octets.

## 14.9 Marker line format problems

### 14.9.1 Why won't lsof accept a marker line format?

lsof's Configure script must find the `localtime(3)` and `strftime(3)` functions in the dialect's C library in order to enable support for marker line formats.

Check the output of lsof's `-v` option for the presence of `-DHAS_STRFTIME` in the compiler flags. If it isn't there, Configure didn't find the necessary two C library functions.

If you think lsof should have found the functions, make a copy of the C test program in the Configure script that it uses to find the functions. Then use the copy, or a more informative modification of it, to learn why Configure can't find the functions. You can find that program by searching for `strftime`.

### 14.9.2 Why does lsof reject the NL (%n) marker line format?

When repeat mode and field output (with `-F`) have both been specified, lsof won't allow new line (NL) formats to be specified with ```%n```. That's because the marker line is always guaranteed to be a single line.

There is no work-around to this restriction.

## 14.10 How are protocol state name exclusion and inclusion used?

Protocol state name inclusion and exclusion with the ```-s p:s``` option and its arguments have some issues to consider. Note: the ```-s p:s``` option is only available when the help output, obtained with `-h` or `-?`, shows it; it was a recent addition to lsof and is supported only on dialects where it could be tested.

First, there is the problem of determining what state names, if any, the dialect produces. Try running this lsof command to find them:

```
$ lsof -i
```

Knowing the state names of interest, the next problem is to decide on the lsof options and their parameters that will produce the desired output. Here some examples are probably

the most useful.

To list only TCP socket files in LISTEN and CLOSE\_WAIT states, use:

```
$ lsof -itcp -stcp:listen,close_wait
```

or

```
$ lsof -iTCP -sTCP:LISTEN,CLOSE_WAIT
```

Case isn't important to lsof in protocol and state names.

To exclude TCP socket files in CLOSE\_WAIT state, use:

```
$ lsof -itcp -stcp:^close_wait
```

Note the `^`` preceding `close_wait`; it selects exclusion. You can mix included and excluded names in a comma separated list, but you may not include and exclude the same name for the same protocol.

To list TCP files in LISTEN state and UDP files in Idle state, use:

```
$ lsof -i -stcp:listen -sudp:idle
```

Note: if you don't accompany the ```-s p:s"` list option and arguments with the `-i` option, lsof will list all other regular files, while applying the specified inclusion and exclusion specifications to network files. Generally, then, you want to use `-i` with `-s`.

#### 14.10.1 Why doesn't my dialect support state name exclusion and inclusion?

When state name inclusion and exclusion was added, I had access to test systems for AIX, Darwin, FreeBSD, Linux, PSTAT-based HP-UX and Solaris.

Therefore, I was unable to add and test the support to any other UNIX dialects.

If a dialect has the support, then the `HASTCPUDPSTATE` definition in its `machine.h` header file will be active; if not, it will be absent or commented out.

If your dialect doesn't have the support and you want it added, you will have to provide me Internet

access to a test host, where

I can compile lsof and have the credentials to test the changes the support requires. If that's possible for you, please contact me via e-mail at <abe@purdue.edu>. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

## 15.0 Pyramid Version Problems

### 15.0.5 Statement of deprecation

As of lsof revision 4.52 support for all Pyramid versions has been dropped. Contact me via e-mail at <abe@purdue.edu> if you are interested in obtaining the last lsof Pyramid distribution. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

## 16.0 SCO Problems

### 16.1 SCO OpenServer Problems

#### 16.1.1 How can I avoid segmentation faults when compiling lsof?

If you have an older SCO OpenServer compiler, it may get a segmentation fault when compiling some lsof modules. That appears to happen because of the `-Ox` optimization action requested in the lsof Makefile.

Try

changing `-Ox` to `-O` with this make invocation:

```
$ make DEBUG=-O
```

Bela Lubkin supplied this tip and Steve Williams verified it.

#### 16.1.2 Where is libsocket.a?

If you compile lsof and the loader says it can't find the socket library, libsocket.a, called by the `-lsocket` option in the lsof compile flags, you probably are running an SCO OpenServer release earlier than 5.0 and don't have the TCP/IP Development System package installed.

You may have the necessary header files, because you have the TCP/IP run-time package installed, but if you don't

have the TCP/IP Development System package installed, you won't have libsocket.a.

Your choices are to install the TCP/IP Development System package or upgrade to OpenServer Release 5.0. You will find libsocket.a in 5.0 -- you'll find all the libraries and header files there, in fact -- and you can use gcc to compile lsof if you don't want to install the 5.0 Development System package.

### 16.1.3 Why do I get "warning C4200" messages when I compile lsof?

When you compile lsof under OSR 3.2v4.2 (and perhaps under earlier versions as well), you may get many compiler warning messages of the form:

```
node.c(183) : warning C4200: previous declarator is not
compatible with default argument promotion
```

In my opinion this is a bug in the OSR compiler. Because the compiler cannot handle full ANSI-C prototypes, it assumes default types for function parameters as it encounters untyped in a function prototype -- e.g., in this function declaration from node.c,

```
readrnode(ra, r)
KA_T ra;
struct rnode *r;
{
...

```

the compiler assigns default int types to the ra and r arguments.

Then, when the compiler encounters the fully typed parameters after the function skeleton and sees parameters with types that don't match the assumptions it previously made, it whines about its own assumptions.

You can ignore these messages.

## 16.2 SCO|Caldera UnixWare Problems

### 16.2.1 Why doesn't lsof compile on my UnixWare 7.1.1 or above system?

When you Configure lsof with the "uw" abbreviation and try to compile it for UnixWare 7.1.1, you may get compiler error messages like this:

```
UX:acomp: ERROR: "dproc.c", line 98:  
undefined struct/union member: p_pgidp
```

This suggests that you probably have a non-stop cluster UnixWare 7.1.1 system. Its <sys/proc.h> header file differs from the one on the system where I did the lsof port to UnixWare 7.1.1. I currently don't have access to a non-stop cluster system to be able to develop changes to lsof that would make it compile and work there.

If you have a non-stop cluster UnixWare 7.1.1 system, want lsof for it, and can offer me a test account on the system, please contact me via e-mail at <abe@purdue.edu>. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

If you have a system with nsc\_cfs and can offer me a test account on it, please contact me via e-mail at <abe@purdue.edu>. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

16.2.2 Why does lsof complain about node\_self() on my UnixWare 7.1.1 or above system?

If lsof exits immediately after issuing this message:

```
can't identify process NSC node; node_self(): <message>
```

It means that lsof has been built to run on a NonStop Cluster (NSC) UnixWare 7.1.1 or higher system and can't get the number of the node on which it is running. Lsof uses the node number to determine the path to the kernel boot file.

You can tell if lsof has been built for NSC by looking for "-DHAS\_UW\_NSC" in lsof's "-v" option output.

If the system on which you're trying to run lsof isn't running an NSC kernel, you will need to build a non-NSC lsof.

16.2.3 Why does UnixWare 7.1.1 or above complain about -lcluster, node\_self(), or libcluster.so?

When you build, compile, and load lsof for UnixWare 7.1.1 and above, ld may complain that it can't find the -lcluster library or that the node\_self symbol is undefined. When you try to run an existing lsof binary it may complain that libcluster.so can't be found.

These messages mean the tests made by Configure on your system led it to believe your system is running a NonStop Cluster (NSC) kernel, or the lsof binary you're trying to use was built on a NonStop Cluster system. If an lsof binary was built for NSC, this shell command produces output:

```
$ strings <lsof_binary> | grep HAS_UW_NSC
```

If that's not the case, and you can rebuild lsof, set the UW\_HAS\_NSC environment variable to "N" and do this:

```
$ Configure -n clean
$ UW_HAS_NSC=N
$ export UW_HAS_NSC
$ Configure -n uw
$ make
```

You can also edit Makefile and lib/Makefile. Remove -DHAS\_UW\_NSC from the CFGF strings. Remove -lcluster from the CFGL strings. Then run make again.

If you have an existing NSC lsof binary and you want one for a non-NSC system, you will have to build lsof yourself on the system where you want to use it. (That's always a good idea anyway.)

#### 16.2.4 Why does UnixWare 7.1.1 or above lsof complain it can't read the kernel name list?

If lsof complains:

```
can't read kernel name list from <path>
```

It means that lsof can't find the booted kernel image file at <path>. On NonStop Cluster (NSC) UnixWare 7.1.1 or higher systems lsof determines the booted file path by examining this file:

```
/stand/node_self/boot
```

If examining that file doesn't lead to an NSC path, lsof uses:

```
/stand/1/unix
```

On non-NSC systems lsof expects the booted kernel image to be in /stand/unix.

If your booted kernel image is in a different place, use lsof's "-k <path>" option to specify its path.

16.2.5 Why doesn't lsof report link count, node number, and size for some UnixWare 7.1.1 or above CFS files?

Lsof reports link count, node number, and size for open CFS files as recorded in their kernel node structure's cached attributes. Sometimes not all attributes are cached on the node where lsof runs, so lsof cannot report them.

16.2.6 Why doesn't lsof report open files on all UnixWare 7.1.1 NonStop Cluster (NSC) nodes?

Lsof can only report on files open on the node on which it runs, because the information lsof reports comes from the private kernel memory of the node. This may mean that asking lsof to find a specific open file, or use of a specific Internet address or port, may not report all open instances on nodes other than the one used to run lsof.

You can use the NSC onnode(1) command to run lsof on specific nodes, or the onall(1) command to run lsof on all nodes -- e.g.,

```
$ onall lsof [options] 2>&1 | less
```

or

```
$ onnode node-number lsof [options] 2>&1 | less
```

Note that, when lsof is run all nodes, the path name component assembly results it reports in its NAME column may vary, because the dynamic name cache from which lsof gets the components is private to the kernel of each node.

Also



note the use of shell redirection in the examples to merge the standard error file information from onnode and onall with lsof's standard output file output. That will put the onnode and onall node announcements in proper sequence with lsof's output.

#### 16.2.7 Why doesn't lsof report the UnixWare 7.1.1 NonStop Cluster (NSC) node a process is using?

To induce lsof to report the node on which a process runs would be a significant, non-standard modification to lsof. It has much wider implications than merely the printing of a number in an output column. I'm not currently (April 2001) prepared to undertake such a modification.

If you want node-specific NSC information about open files, run lsof under the control of onall(1) or onnode(1).

```
$ onall lsof [options] 2>&1 | less
```

or

```
$ onnode node-number lsof [options] 2>&1 | less
```

#### 16.2.8 Why does the compiler complain about missing UnixWare 2.1[.x] header files?

SCO|Caldera didn't ship the following header files with UnixWare 2.1 through 2.1.3:

```
<fs/proc/prdata.h>  
<fs/procfs/prdata.h>  
<sys/fs/fifonode.h>  
<sys/fs/namenode.h>
```

Lsof needs those header files for its compilation. Contact SCO|Caldera to get copies of those header files.

If you can't get the header files from SCO|Caldera, please contact me via e-mail at <abe@purdue.edu>. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

### 17.0 Sun Problems

#### 17.0.5 Statement of deprecation

Lsof support for SunOS 4.1.x was last tested at revision 4.51.

Contact me via e-mail at <abe@purdue.edu> if you're interested in obtaining it. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

#### 17.1 My Sun gcc-compiled lsof doesn't work -- why?

Gcc can be used to build lsof successfully. However, an improperly installed Sun gcc compiler will usually not produce a working lsof.

If your Sun gcc-compiled lsof doesn't report anything, or reports "can't read proc table," or gcc refuses to compile lsof without error, check that the gcc step that "fixes" Sun header files was run on the system where you're using gcc to compile lsof. As an alternative, if you have the SunPro C 5.0 compiler or later available, use it to compile lsof -- e.g., use the solariscc Configure abbreviations.

#### 17.2 How can I make lsof compile with gcc under Solaris 2.[456], 2.5.1, 7, 8 or 9?

Presuming your gcc-specific header files are wrong for Solaris, edit the lsof Configure-generated Makefile and lib/Makefile and make this change:

```
CFGF= -Dsolaris=20400 ...  
to  
CFGF= -Dsolaris=20400 -D__STDC__=0 -I/usr/include ...
```

or change:

```
CFGF= -Dsolaris=20500 ...  
to  
CFGF= -Dsolaris=20500 -D__STDC__=0 -I/usr/include ...
```

or change:

```
CFGF= -Dsolaris=20501 ...  
to  
CFGF= -Dsolaris=20501 -D__STDC__=0 -I/usr/include ...
```

This is only a temporary work-around. You really should instruct gcc to update your gcc-specific header files or install a recent gcc (e.g., 3.2), which has no need for private copies of Solaris include files.

### 17.3 Why does Solaris Sun C complain about system header files?

You're probably trying to use `/usr/ucb/cc` if you get compiler complaints like:

```
cc -O -Dsun -Dsolaris=20300 ...
"/usr/include/sys/machsig.h", line 81: macro BUS_OBJERR
redefines previous macro at "/usr/ucbinclude/sys/signal.h",
line 444
```

Note the reference to `"/usr/ucbinclude/sys/signal.h"`. It reveals that the BSD Compatibility Package C compiler is in use. `lsof` requires the ANSI C version of the Solaris C compiler, usually found in `/usr/opt/bin/cc` or `/opt/SUNWspro/bin/cc`.

Try adding a `CC` string to the `lsof` Makefile that points to the Sun ANSI C version of the Sun C compiler -- e.g.,

```
CC= /usr/opt/bin/cc
or
CC= /opt/SUNWspro/bin/cc.
```

### 17.4 Why doesn't `lsof` work under my Solaris 2.4 system?

If `lsof` doesn't work under your Solaris 2.4 system -- e.g., it produces no output, little output, or the output is missing command names or file descriptors -- you may have a pair of conflicting Sun patches installed.

Solaris patch 101945-32 installs a kernel that was built with a `<sys/auxv.h>` header file whose `NUM_*_VECTORS` definitions don't match the ones in the `<sys/auxv.h>` updated by Solaris patch 102303-02.

`NUM_*_VECTORS` in the kernel of patch 101945-32 are smaller than the ones in the `<sys/auxv.h>` of patch 102303-02. The consequence is that when `lsof` is compiled with the `<sys/auxv.h>` whose `NUM_*_VECTORS` definitions are larger than the ones used to compile the patched kernel, `lsof`'s user structure does not align with the one that the kernel employs.

If you have these two patches installed, contact Sun and complain about the mis-match.

You may be able to work around the problem by editing `/usr/include/sys/auxv.h` to have the following `NUM_*_VECTORS`

definitions:

```
#define NUM_GEN_VECTORS 4
#define NUM_SUN_VECTORS
8
```

The Configure script issues a prominent WARNING that you should try the work-around.

I thank Leif Hedstrom for identifying the offending patches.

#### 17.5 Where are the Solaris header files?

If you try to compile lsof under Solaris and get a compiler complaint that it can't find system header files, perhaps you forgot to add the header file package, SUNWhea.

#### 17.6 Where is the Solaris /usr/src/uts/<architecture>/sys/machparam.h?

When you try to Configure lsof for Solaris 2.[23456], 2.5.1, and 7 -- e.g., on a `uname -m` == sun4m system -- Configure complains:

```
grep: /usr/src/uts/sun4m/sys/machparam.h:
No such file or directory
grep: /usr/src/uts/sun4m/sys/machparam.h:
No such file or directory
```

And when you try to compile the configured lsof, cc or gcc complains:

```
dproc.c:530: `KERNELBASE' undeclared (first use this function)
```

The explanation is that somehow your Solaris system doesn't have the header files in /usr/src/uts it should have. Perhaps someone removed the directory to save space. Perhaps you're using a gcc installation, copied from another system. In any event, you will have to load the header files from the SUNWhea package of your Solaris distribution.

KERNELBASE is an important symbol to lsof -- it keeps lsof from sending an illegal kernel value to kvm\_read() where a segmentation violation might result (a bug in the kvm library). Lsof can get illegal kernel values because it reads kernel values slowly with kvm\_read() calls that the kernel is changing rapidly.

Lsof doesn't need KERNELBASE at Solaris 2.5 and above, because it has a KERNELBASE value whose address lsof can find with /dev/ksyms and whose value it can read with kvm\_read(). Under Solaris 2.5 /usr/src/uts has moved to /usr/platform.

#### 17.7 Why does Solaris lsof say "can't read proc table"?

When lsof collects data on processes, using the kvm\_\*() functions to scan the kernel's proc structure table, it checks to make sure it has identified a reasonable number of them -- a minimum of three. When lsof can't identify three processes during a scan, it repeats the scan.

When five scans fail to yield three processes, lsof issues the fatal message:

```
lsof: can't read proc table
```

and exits.

Usually lsof fails to identify three processes during a scan because its idea of the form of the proc structure differs from that being used by the kernel. Since the proc structure is defined in <sys/proc.h> and other /usr/include header files, the root cause of a proc structure discrepancy usually can be found in the composition of /usr/include.

One common way that /usr/include header files can be incorrect is that gcc was used to compile lsof, gcc used its special (i.e., "fixed") header files instead of the ones in /usr/include, and the special gcc header files weren't updated when Solaris was. Answers to these questions:

My Sun gcc-compiled lsof doesn't work -- why?

How can I make lsof compile with gcc under Solaris 2.[456], 2.5.1, 7, 8 or 9?

Why does Solaris Sun C complain about system header files?

discuss the gcc header file problem and offer suggestions on how to fix it or work around it.

It may also be that you are trying to run a version of lsof that was compiled on an older version of Solaris. For

example, an lsof executable, compiled for Solaris 2.4, will produce the "can't read proc table" message if you try to run it under Solaris 2.5. If you have compiled lsof under Solaris 2.5 and it still won't work, see if the header files in /usr/include have been updated to 2.5, or still represent a previous version of Solaris.

Another source of header file discrepancies to consider is the Solaris patch level and whether a binary kernel patch was not matched with a corresponding header file update. See the "Why doesn't lsof work under my Solaris 2.4 system?" question for an example of one in Solaris 2.4 -- there may be other such patch conflicts I don't know about.

#### 17.8 Why does Solaris lsof complain about a bad cached clone device?

When lsof revisions below 4.04 have been run on a Solaris system and have been allowed to create a device cache file, the running of revisions 4.04 and above on the same systems may produce this complaint:

```
lsof: bad cached clone device: ...  
lsof: WARNING: created device cache file: ...
```

This is the result of a change in the device cache file that took place at lsof revision 4.04. The change introduced a node number into the clone device lines of the device cache file and was done in such a way that lsof could detect device cache files whose clone lines don't have node numbers (lines created by previous lsof revisions) and recognize the need to regenerate the device cache file.

#### 17.9 Why doesn't Solaris make generate .o files?

Solaris /usr/ccs/bin/make won't generate .o files from .c files if /usr/share/lib/make/make.rules is missing. It may be found in and installed from the SUNWsport package.

#### 17.10 Why does lsof report some Solaris 2.3 and 2.4 lock types as `N'?

For Solaris 2.3 with patch P101318 installed at level 45 or above, and for all versions of Solaris 2.4, NFS locks are represented by a NFS-specific kernel lock structure that sometimes lacks a read or write lock type indicator. When lsof encounters such a lock structure, it reports the lock type as `N'.

## 17.11 Why does lsof Configure say "WARNING: no cc in ..."?

When lsof's Configure script is executed with the solariscc abbreviation it tries to make sure it's using the Sun C compiler and not the UCB substitute from /usr/ucb/cc. Thus, it looks for cc in the "standard" Sun compiler location, /opt/SUNWspro/bin.

If Configure can't find cc there, it issues the warning:

```
lsof: WARNING: no cc in /opt/SUNWspro/bin;  
using cc without path.
```

and uses cc for the compiler name, letting the shell find cc with its PATH environment variable.

You can tell Configure where to find your cc with the SOLARIS\_CC\_DIR cross-configuration environment variable. (See 00XCONFIG for more information on SOLARIS\_CC\_DIR). For example, use this Configure shell command:

```
SOLARIS_CC_DIR=/usr/special/bin Configure -n solariscc
```

(SOLARIS\_CC\_DIR should be the full path to the directory containing your cc.)

## 17.12 Solaris 7, 8 and 9 Problems

### 17.12.1 Why does lsof say the compiler isn't adequate for Solaris 7, 8 or 9?

Solaris 7, 8 and 9 kernels come in two flavors, 32 and 64 bit. 64 bit kernels run on machines that support the SPARC v9 instruction set architecture. Separate executables for some programs, -- e.g., ones using libkvm like lsof -- must be built for 32 and 64 bit kernels.

Previous Sun (e.g., SC4.0) and earlier gcc compilers will build lsof for 32 bit kernels, but they won't build it for 64 bit kernels. Compilers that will build lsof for 64 bit Solaris 7, 8 and 9 kernels are the Sun WorkShop Compilers C 5.0 and above, and recent gcc versions, e.g., 3.2.

When given the "-xarch=v9" flag, the C 5.0 compiler and above, and associated loader and 64 bit libraries will

build a 64 bit lsof executable; when given the "-m64" or "-mcpu=v9" (deprecated) flags, an appropriate gcc compiler will build a 64 bit lsof executable.

When the lsof Configure script detects a 64 bit kernel is in use (e.g., by executing ``/bin/isainfo -kv``), and when it finds that the specified compiler is inappropriate, it complains with these messages:

For gcc:

```
!!!!WARNING!!!=====!!!WARNING!!!=====!!!WARNING!!!!
"!                               !"
"! LSOF NEEDS TO BE CONFIGURED FOR A 64 BIT KERNEL, BUT !"
"! THIS GCC DOESN'T SUPPORT THE BUILDING OF 64 BIT  !"
"! SOLARIS EXECUTABLES. LSOF WILL BE CONFIGURED FOR A !"
"! 32 BIT echo KERNEL.                               !"
"!                               !"
!!!!WARNING!!!=====!!!WARNING!!!=====!!!WARNING!!!!
```

For

Sun C:

```
!!!WARNING!!!=====!!!WARNING!!!=====!!!WARNING!!!
!                               !
! LSOF NEEDS TO BE CONFIGURED FOR A 64 BIT KERNEL, BUT |
! THE VERSION OF SUN C AVAILABLE DOESN'T SUPPORT THE  !
! -xarch=v9 FLAG. LSOF WILL BE CONFIGURED FOR A 32 BIT !
! KERNEL.                               !
!                               !
!!!WARNING!!!=====!!!WARNING!!!=====!!!WARNING!!!
```

17.12.2 Why does Solaris 7, 8 or 9 lsof say "FATAL: lsof was compiled for..."?

Solaris 7, 8 or 9 lsof may say:

```
lsof: FATAL: lsof was compiled for a xx bit kernel,
but this machine has booted a yy bit kernel.
```

Where: xx = 32 or 64

yy = 64 or 32

(xx and yy won't match.)

This message indicates that lsof was compiled for one size kernel and is being asked to execute on a different size one. That's not possible for programs



like lsof that use  
libkvm.

Depending on the instruction sets for which you need Solaris 7, 8 or 9 lsof, you may need two or more versions of lsof, compiled for each kernel size, installed for use with /usr/lib/isaexec. See the "How do I install lsof for Solaris 7, 8 or 9?" section of this document for more information on that.

#### 17.12.3 How do I build lsof for a 64 bit Solaris kernel under a 32 bit Solaris kernel?

If your Solaris system has an appropriate compiler (e.g., WorkShop Compilers C 5.0 and above, or a recent gcc like 3.2) and the 64 bit libraries have been installed, you can force lsof's Configure script to build a 64 bit version of lsof with:

```
$ SOLARIS_KERNBITS=64 Configure -n solarisc
```

The SOLARIS\_KERNBITS environment variable is part of the lsof cross-configuration support, described in the 00XCONFIG file of the lsof distribution.

#### 17.12.4 How do I install lsof for Solaris 7, 8 or 9?

If you are installing lsof where it will be used only under the bit size kernel for which it was built, no special installation is required.

If, however, you are installing different versions of lsof for different bit sizes -- e.g., for use on a 64 bit NFS server and from its 32 bit clients -- you should read the man page for isaexec(3C) and install lsof according to its instructions.

The executable at the directory where lsof is to be found should be a hard link to /usr/lib/isaexec or a copy of it. In the directory there must be instruction architecture subdirectories -- e.g., .../sparc/ and .../sparcv9/. The lsof for 64 bit size kernels is installed in the .../sparcv9/ subdirectory; the one for 32 bit size kernels, in .../sparc/.

For example, if you're installing 32 and 64 bit lsof executables in /usr/local/etc, you would:

```
# cd /usr/local/etc
# ln /usr/lib/isaexec lsof
# mkdir sparc sparcv9
# install the 32 bit lsof as sparc/lsof
# install the 64 bit lsof as sparcv9/lsof
# chmod, chown, and chgrp sparc/lsof and
```

sparcv9/lsof appropriately

Lsof permissions and ownerships are the same whether one or more lsof executables are being installed, with or without the /usr/lib/isaexec hard link.

17.12.5 Why does my Solaris 7, 8 or 9 system say it cannot execute lsof?

When you attempt to execute lsof, your Solaris 7, 8 or 9 shell may complain:

```
ksh: ./lsof: cannot execute
```

If the lsof executable exists and has the proper execution permissions, this error may be the result of trying to execute an lsof, built for a 64 bit kernel, on a 32 bit kernel.

This will tell you about the lsof executable:

```
$ file lsof
lsof: ELF 64-bit MSB executable SPARCV9 Version 1,
dynamically linked, not stripped
```

The "64-bit" notation indicates the binary was built for a 64 bit kernel. To see the running kernel bit size, use this command:

```
$ isainfo -kv
32-bit sparc kernel modules
```

The "32-bit" notation indicates a 32 bit kernel has been booted.

The only work-around is to obtain, or Configure and make, an lsof for the appropriate kernel bit size. If you Configure and make lsof on the kernel where you wish to run it the proper compiler, the lsof Configure step will generate Makefiles that can be used with make to build an

appropriate lsof executable.

To compile a 64 bit lsof, you must have an appropriate compiler -- i.e., Sun WorkShop Compilers C 5.0 or higher or a recent gcc like 3.2.

17.12.6 What gcc will produce 64 bit Solaris 7, 8 and 9 executables?  
8 and 9 executables?

Properly built and installed recent gcc versions -- e.g., 3.2 -- will build lsof for 64 bit Solaris kernels.

If you update your gcc version to 3.2 or later, make sure the private gcc header files become current -- i.e., clear out any private header files from a previous gcc or Solaris installation before installing the new ones, or build to a new --prefix root and replace the old root with it after the build and installation are complete.

17.12.7 Why does lsof on my Solaris 7, 8 or 9 system say, "can't read namelist from /dev/ksyms?"

You're probably trying to use an lsof executable built for an earlier Solaris release on a 64 bit Solaris 7, 8 or 9 kernel. The output from ``lsof -v`` will tell you the build environment of your lsof executable. You should also have gotten a warning message that lsof is compiled for a different Solaris version than the one under which it is running -- something like this:

```
lsof: WARNING: compiled for Solaris release X; this is Y
```

You need to build lsof on the system where you want to use it. For 64 bit Solaris 7, 8 and 9 you need a compiler that can generate 64 bit Solaris executables -- e.g., the Sun Workshop 5 C compiler or later, or a recent gcc version like 3.2. See the "Why does lsof say the compiler isn't adequate for Solaris 7, 8 or 9?" section and the ones following it for a discussion of building lsof for 64 bit Solaris 7, 8 or 9.

17.13 Solaris and COMMON

17.13.1 What does COMMON mean in the NAME column for a Solaris VCHR file?

When lsof puts COMMON or (COMMON) in the NAME column of a Solaris VCHR file, it means that the file is handled by the special file system functions of the kernel through a common vnode.

17.13.2 Why does a COMMON Solaris VCHR file sometimes seem to have an incorrect minor device number?

When lsof reports on an open file in a Solaris special file system that uses a COMMON vnode, and the file is a VCHR file, lsof tries to locate the associated device node by looking for matches on the major and minor device numbers first.

If no major and minor match results, lsof then looks for a match on pseudo and clone device files. (See /devices/pseudo.) Those device nodes are matched specially by either their major or minor device numbers, but not both. Hence, when lsof finds a match under those special conditions, it may report a value in its output DEVICE column that differs from one of the major and minor numbers of the device node.

Here's an example from a sun4m Solaris 7 system:

```
$ ls -li /devices/pseudo/pm@0:pm
151261 crw-rw-rw- 1 root  sys  117, 0 ...
$ lsof /devices/pseudo/pm@0:pm
COMMAND ... DEVICE ...  NODE NAME
powerd    117,1 ... 151261 /devices/pseudo/pm@0:pm (COMMON)
Xsun     ... 117,0 ... 151261 /devices/pseudo/pm@0:pm
```

Note that the DEVICE value for the file with (COMMON) in its name field has a different minor device number (1) from what ls reports (0), while the DEVICE value for the file without (COMMON) matches the ls output exactly. Both match on the major device number, 117. The minor device number mis-match is a result of the way the Solaris kernel handles special file system common vnodes, and it's the reason lsof puts (COMMON) after the name to signal that a mis-match is possible.

17.14 Why don't lsof and Solaris pfiles reports always match?

/usr/proc/bin/pfiles for Solaris 2.6, 7, 8, and 9 also reports information on open files for processes. Sometimes the information it reports differs from what lsof reports.

There are several reasons why this might be true. First, because pfiles is a Sun product, based on Sun kernel features, its developers have a better chance of knowing exactly how open file information is organized. I sometimes have to guess at how kernel file structure linkages are constructed by gleaning hints from header files.

Second, lsof is aimed at providing information, specifically device and node numbers, that can be used to identify named file system objects -- i.e., path names. Thus, lsof tries to make sure its device and node numbers match those reported by stat(2). Pfiles doesn't always report numbers that match stat(2) -- e.g., for files using clone and pseudo devices via common vnodes like the nlist() /dev/ksyms usage.

Here's the Solaris 7 COMMON VCHR example again with additional pfiles output:

```
$ ls -li /devices/pseudo/pm@0:pm
151261 crw-rw-rw-
1 root  sys  117, 0 ...
$ lsof /devices/pseudo/pm@0:pm
vic1: 10 = lsof /dev/pm
COMMAND ... DEVICE ...  NODE NAME
powerd ... 117,1 ... 151261 /devices/pseudo/pm@0:pm (COMMON)
Xsun ... 117,0 ... 151261 /devices/pseudo/pm@0:pm
$ pfiles ...
0: S_IFCHR ... dev:32,24 ino:61945 ... rdev:117,1
...
14: S_IFCHR ... dev:32,24 ino:151261 ... rdev:117,0
```

Note that the NODE number, reported by lsof, matches what ls(1) and stat(2) report, while the ino value pfiles reports doesn't. Lsof also indicates with the (COMMON) notation that the DEVICE number is a pseudo one, derived from the character device's value. The lsof DEVICE value matches the pfiles rdev value, correct behavior for a character device, but pfiles gives no sign that it's not possible to find that character device number in /devices with ls(1) or stat(2).

17.15 Why does lsof say, "kvm\_open(namelist=default, core=default): Permission denied?"

Lsof needs permission to read from the /dev/kmem and /dev/mem memory devices. Access to them is opened via a call to

the `kvm_open()` library function and it reports the indicated message.

You must give `lsof` permission to read the memory devices. The super user can almost always do that, but other `lsof` users can do it if some group -- e.g., `sys` -- has permission to read the memory devices, and the `lsof` binary is installed with the group's ownership and with the `setgid` permission bit enabled.

#### 17.16 Why is `lsof` slow on my busy Solaris UFS file system?

`lsof` may be slow on a busy Solaris UFS file system when UFS logging has been enabled with the "logging" mount option. That option can significantly increase disk operations under certain conditions -- e.g., when a lot of files are accessed quickly.

When only the "logging" option is specified to mount, all file accesses (atime updates) are logged to the UFS logging queue. Each atime update requires two writes to the disk to complete it.

If you want to do UFS logging -- and there are reliability advantages to it -- consider using the "logging,noatime" mount options instead. That will shift atime updates from the logging queue to fewer and independent asynchronous operations, consequently making the UFS logging queue a smaller bottleneck.

Consult `mount_ufs(1M)` for more information on the logging and noatime options.

(My thanks to Casper Dik for this tip on improving the performance of UFS logging.)

#### 17.17 Why is `lsof` so slow on my Solaris 8 or 9 system?

Solaris 8 has a post-release feature upgrade modifying kernel name cache (DNLC) handling that can slow `lsof` throughput dramatically. The feature, sometimes called negative DNLC caching, is standard in Solaris 9.

As best I can tell, when you install the Solaris 8 MU1 package, you get negative DNLC caching. If this pipe produces any output, your system has negative DNLC caching.

```
$ nm /dev/ksyms | grep negative_cache_vnode
```

The reason negative

DNLC caching perturbs lsof is that a single vnode address (found in the `negative_cache_vnode` kernel variable) is used to mark entries in the DNLC that are not (the negative part) found on disk.

Since a single vnode address (the DNLC key lsof uses) can represent many (I've seen upwards of 30,000.) DNLC entries, their presence overloads lsof's internal DNLC hashing function. An overloaded hash function is a slow hash function, and lsof's slows to a crawl when it encounters thousands of keys that produce the same value when the lsof DNLC hash function is applied to them.

The solution is simple -- ignore negative DNLC cache keys. They don't represent path name components lsof can use. Lsof revisions 4.50 and above have an addition that ignores them and the performance of those lsof revisions improves significantly when presented with negative DNLC cache keys.

If you don't have an lsof revision at 4.51 or later, there's a work-around. Use lsof's `--C` option. It disables lsof's DNLC caching. Of course, that also inhibits the reporting of any path name components from the kernel DNLC. When `--c` is used, lsof will continue to report file system and character device paths.

## 17.18 Solaris and VxFS

### 17.18.1 Why doesn't lsof support VxFS 3.4 on Solaris 2.6, and above?

Lsof will not support VxFS version 3.4 on Solaris 2.6 and above unless some files from VxFS Update 2 have been installed. VxFS 3.4 FCS and VxFS 3.4 update 1 lack the header files lsof normally uses to obtain information from the VxFS 3.4 kernel node structure, `vx_inode`. VxFS 3.4 Update 2 provides a method whereby lsof can obtain the necessary `vx_inode` information from the `vxfsu_get_ioffsets()` function in Veritas utility libraries.

The utility libraries (32 bit and 64 bit versions) may be found in `/opt/VRTSvxfs/lib`. An ancillary header file may be found in `/opt/VRTSvxfs/include/sys/fs/vx_libutil.h`. Documentation of the `vxfsu_get_ioffsets(3)` function may be found in

/opt/VRTS/man/man3/vxfsu\_get\_ioffsets.3.

Those files of VxFS 3.4 Update 2 may be downloaded from:

[ftp://ftp.veritas.com/pub/support/vxfs\\_34.i64243.tar](ftp://ftp.veritas.com/pub/support/vxfs_34.i64243.tar)

The vxfs\_34.i64243.tar archive will unpack into an i64243 directory containing these files:

```
$ ls i64243
README
libvxfsutil.sol26.sums
libvxfsutil.sol26.tar.Z
libvxfsutil.sol27.sums
libvxfsutil.sol27.tar.Z
libvxfsutil.sol28.sums
libvxfsutil.sol28.tar.Z
```

Read README. Select the \*.tar.Z file appropriate for your Solaris version. Its contents will unpack into /opt/VRTS and /opt/VRTSvxfs, so you will need sufficient permission -- e.g., do it as root -- to unpack the uncompressed archive. Once you've done that, it's a good idea to compare the checksums of the archive you unpacked with the ones recorded in the appropriate \*.sums file. Use `sum -r` to verify the checksums.

For example, if you want the Solaris 8 version, uncompress and unpack libvxfsutil.sol28.tar.Z -- e.g.,

```
$ su
...
# cd i6423
# zcat libvxfsutil.sol28.tar.Z | tar xf -
```

That should create these new files and subdirectories with the indicated checksums:

```
File or subdirectory  sum -r

/opt/VRTSvxfs/include/vxfsutil.h 03938
/opt/VRTSvxfs/lib/libvxfsutil.a 51794
/opt/VRTSvxfs/lib/sparcv9/
/opt/VRTSvxfs/lib/sparcv9/libvxfsutil.a 07420
/opt/VRTS/man/man3/
/opt/VRTS/man/man3/vxfsu_get_ioffsets.3 62480
```



Once these files are in place, run Isof's Configure script for the solaris or solariscc abbreviation. Configure will locate the appropriate VxFS 3.4 Update 2 files and set up for the making of an Isof that will properly display open VxFS 3.4 file information.

17.18.2 Why does Isof report "vx\_inode: vxfsu\_get\_ioffsets error" for open Solaris 2.6 and above VxFS 3.4 and above files?

Even when Isof supports VxFS 3.4 and above on Solaris 2.6 and above, it may report "vx\_inode: vxfsu\_get\_ioffsets error" in the NAME column for all VxFS files.

The usual cause is that Isof doesn't have permission to read the file at the end of the /dev/vxportal symbolic link. If, for example, Isof has been installed setgid(sys), then the /dev/vxportal symbolic link destination should be owned by the sys group and readable by it.

Update 2 for VxFS 3.4 sets the modes of the /dev/vxportal symbolic link destination to 0640 and the group ownership to sys. But I have had a report that the modes are wrong in a VxFS 4.0 installation.

Another cause may be that the system has more than one version of VxFS installed (Only one can be active.), and Isof's Configure script did not choose the header files and libraries for the active VxFS version. Configure opts for VxFS 4.0 and above header files and libraries (in /opt/VRTS) in preference to those for VxFS below 4.0 (in /opt/VRTSvxfs).

Look for the directories /opt/VRTS and /opt/VRTSvxfs. If you have /opt/VRTS, make sure its header and library symbolic links point to those of the active VxFS version.

If you have both directories, look at the CFLAGS that Configure constructed for making Isof and see which directory path follows a -I option. If that doesn't match the directory path of the active VxFS version, try pointing Configure at the correct directory with the SOLARIS\_VXFSINCL environment variable -- e.g.,

```
$ SOLARIS_VXFSINCL=/opt/.../include ./Configure -n solaris
```

17.18.3 Why does Solaris Configure claim there is no VxFS library?

The lsof Configure script, when configuring for Solaris, may report:

```
FATAL: no VxFS .../libvxfsutil.a
```

That fatal error message indicates lsof has found the VxFS utility library's header files, but can't find the library itself in the expected location adjacent to the header files.

One possible cause is an incorrect symbolic link from /opt/VRTS/lib/sparcv9/libvxfsutil.a to the library's real location. (Some VxFS distributions declared the link incorrectly.) Use `ls -lL`` on that path to see if it exists.

If it doesn't exist, the link may be missing an additional leading `../` component.

If the problem is a missing `../` from the library's link, you can correct the link or check with Veritas/Symantec for the patch that corrects it.

If the problem is not a missing `../`, and you know the libvxfsutil.a location, you can define its path in the SOLARIS\_VXFSLIB environment variable before running the lsof Configure script. (See 00XCONFIG for information about using the SOLARIS\_VXFSLIB environment variable.)

If you have no libvxfsutil.a, you must obtain it from Veritas/Symantec or find it in your VxFS installation package.

#### 17.18.4 Why doesn't Solaris lsof report VxFS path name components?

Solaris lsof will report path name components for VxFS versions that use the common Solaris Dynamic Name Lookup Cache (DNLC) or on some file systems of VxFS versions that support the VxFS Reverse Name Lookup (RNL) facility.

VxFS versions 3.3 (approximately) and below use the common

Solaris DNLC. (I haven't been able to determine exactly when VxFS stopped using the DNLC.) For versions above that boundary, but below 4.0, lsof can't report path name components.

At VxFS 4.0 and above, lsof can be compiled to use the VxFS RNL facility for reporting path names. If `"-DHASVXFSRNL"` appears in the compiler flags section of lsof `"-v"` option output, then the lsof Configure script detected the VxFS RNL facility and lsof has been compiled to use it.

Lsof's use of the RNL facility can fail when the VxFS file system disk layout version is below 6. In that case, lsof can report no path name components. For more information, see the `vxfs_inotopath(3)` manual page. any of the following commands will show the disk layout version for a VxFS file system, when supplied the block device or mount point on which the file system is mounted.

```
fstyp -v <block_device>  
or  
mkfs -m <block_device>  
or  
vxupgrade <mount_point>
```

You must have permission to read the block device -- e.g., be the root user.

You may also be able to upgrade an older disk layout to one that will work with the RNL. See the `vxupgrade(1M)` man page for more information on that.

When lsof can't report VxFS path name components, it reports the file system mount point and the path name of device on which it is mounted. The device path name is enclosed in parentheses.

#### 17.18.5 Why does Solaris 10 lsof report scrambled VxFS paths?

Solaris 10 lsof may report a bogus, scrambled path for an open VxFS file, when lsof obtains the path from a vnode's cached path. Veritas/Symantec reports that their Solaris 10 implementation has bugs in the way it handles the Solaris 10 vnode cached path and those bugs will be fixed in an upcoming patch some time after August 15, 2005.

When Solaris 10 lsof reports a path for an open VxFS file obtained via the VxFS Reverse Name Lookup facility, the path will be correct.

Also see the answers to the questions "Why does Solaris 10 lsof sometimes report the wrong path name?" and "Why doesn't Solaris lsof report VxFS path name components?"

#### 17.19 Large file problems

17.19.1 Why does lsof complain it can't stat(2) a Solaris 2.5.1 large file?

When given an argument that is the path to a Solaris 2.5.1 file, enable for large file operations with the O\_LARGEFILE open(2) option, lsof complains that it can't stat(2) the file. That's because lsof isn't using a stat(2) call and associated structure enabled for large files.

This error has been fixed, starting at lsof revision 4.58 for Solaris 2.6 and above. That fix won't work on Solaris 2.5.1 and I no longer have access to a Solaris 2.5.1 test system to develop a separate fix.

The work-around is to avoid specifying a O\_LARGEFILE path as an argument to lsof on Solaris 2.5.1. Instead use a combination of lsof and grep to achieve the same results, albeit more clumsily.

17.20 Why does lsof get a segmentation fault on 64 bit Solaris 8 using NIS+?

I have received a report from Gary Craig that lsof produces a segmentation fault on his 64 bit Solaris 8 system using NIS+. Via an independent test program we have exonerated lsof and tracked the fault to the NIS+ `__nis_server_name()` function in the C name server library, `-lnsl`.

Lsof causes the `__nis_server_name()` NIS+ function to be called by calling `getservent()` to read entries of the port number to service name map.

The only Sun bug ID that appears to describe the problem is 4304244, although its text is unclear enough to leave room for doubt.

Until Sun eliminates the `__nis_server_name()` segmentation fault cause, a work-around for lsof is to use its `"-P"` option, causing lsof to avoid port to service name lookups.

17.21 Will lsof crash the Solaris kernel?

I've received and investigated one report that it has when the Sun hardware (a QME interface) was faulty. Today (May 23, 2002) I've learned that Sun has reports of kernel crashes caused by `adb`,

lsof, and mdb.

The Sun investigation pinpointed a problem in the /dev/kmem kernel driver and there is a Sun bug report, 4344513, about the problem. There is a fix in Solaris 9, and patches for Solaris 7 and 8 (SPARC and x86).

To see if your Solaris system is fixed, look for a /devices/pseudo/\*allkmem node.

Extensive address filtering was added to lsof revision 4.50 to forestall what I then (July 2001) believed to be only the possibility that lsof might crash Solaris. However, the filtering isn't perfect, since a filtered address might become invalid after lsof has filtered it but before lsof has delivered it to /dev/kmem. That filtering work is described in ../dialects/sun/solaris\_kaddr\_filters, also available at:

[ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/solaris\\_kaddr\\_filters](ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/solaris_kaddr_filters)

The best and safest work-around is to upgrade to Solaris 9 or install an appropriate patch or its equivalent from this list:

| Solaris | SPARC | x86   |
|---------|-------|-------|
| Version | Patch | Patch |

|       |           |           |
|-------|-----------|-----------|
| ===== | =====     | =====     |
| 7     | 106541-20 | 106542-20 |
| 8     | 108528-14 | 108529-14 |

17.22 Why does lsof on Solaris 7, 8, or 9 report a kvm\_open() failure?

When lsof is started on some Solaris 7, 8, and 9 systems it may report:

```
lsof: kvm_open(namelist=default, corefile=default): \
No such file or directory
```

Lsof revisions 4.65 and later will first report:

```
lsof: cannot stat /dev/allkmem
```

The second message, not delivered in lsof revisions below 4.65, explains the cause of the kvm\_open() failure; it can't find /dev/allkmem.

/dev/allkmem is a device added to Solaris 7 and 8 in patches and in the Solaris 9 FCS. See the preceding "Will lsof crash the Solaris kernel?" section for more information on /dev/allkmem and the patches.

The `kvm_open(3KVM)` function in the KVM library of patched Solaris 7 and 8 systems and in Solaris 9 expects to find /dev/allkmem and exits on error when it does not.

If you have installed the patch that updated your KVM library to a version that expects /dev/allkmem to be present and it is not, you may need to reconfigure your system's devices with `devfsadm(1M)` or enter "boot -r" to the OpenBoot monitor's prompt (usually "ok").

## 17.23 Solaris and SAM-FS

### 17.23.1 Why does Solaris lsof report "(limited SAM-FS info)"?

Lsof 4.68 and above report "(limited SAM-FS info)" on Solaris in the NAME column after the path or file system name for all files it finds on SAM-FS file systems.

That's because no more information is known about the composition of the nodes that follow SAM-FS vnodes. If you can provide that information, please contact me via e-mail at <abe@purdue.edu>. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

### 17.23.2 Why can't lsof locate named SAM-GS files?

Solaris lsof 4.68 and above can't locate files on SAM-FS file systems when the files are named as lsof arguments because lsof doesn't know how to locate open SAM-FS file device and node number information. (See also "Why does Solaris lsof report "(limited SAM-FS info)?"

## 17.24 Lsof and Solaris 10 zones

### 17.24.1 How can I make lsof list the Solaris zone?

Use the lsof "-z [z]" option.

### 17.24.2 Why doesn't lsof work in a Solaris 10 zone?

When run from within a Solaris 10 zone, lsof will usually report:

```
lsof: can't stat(/devices): No such file or directory
```

That's because a Solaris zone usually has no /devices subdirectory, a restriction of the zone implementation intended to limit the ability of zone processes to control global system resources, including physical devices.

While a zone may have a /dev subdirectory, that subdirectory usually lacks the /dev/allkmem, /dev/mem and /dev/kmem devices lsof and the KVM library it uses require.

The work-around is to run lsof in the global zone. When it is run in a global zone lsof will be able to report on processes running in any zone, including the global zone.

#### 17.24.3 Why does lsof complain it can't stat() Solaris 10 zone file systems?

When run from the global zone on Solaris 10 lsof may complain:

```
lsof: WARNING: can't stat() 15 zone file systems;
      using dev= options
```

The warning message means lsof found the reported number of file system entries in the mount table for which it didn't have permission to get stat(2) results, but which had "zone=" and "dev=" mount table options.

That is a normal restriction of Solaris 10 zones. Since the lsof warning message indicates it was able to find "dev=" options for the file systems, lsof will probably work correctly.

One work-around is to relax the restrictions on zone mount points, so that lsof can stat() them. While that may be possible by changing directory modes or group ownerships, it is probably not a good idea, because it weakens the restrictions zones are intended to provide.

Another work-around is to suppress the warning message with lsof's "-w" option. The down side of that is that it causes the

suppression of all warning messages, leading to the possibility that some non-stat() warning messages will be suppressed.

## 17.25 Solaris 10 problems

### 17.25.1 Why does Solaris 10 lsof sometimes report the wrong path name?

When a path name component is renamed -- e.g., with mv(1) -- Solaris 10 lsof may report the old component for an open file that used the component in its path before the rename. That's because Solaris 10 lsof reports the path name cached in the open file's vnode and the Solaris 10 kernel doesn't update the open vnode's cached path name when a component of it is changed.

When an open file is deleted -- e.g., with rm(1) -- the path name by which it was opened remains cached in the vnode. Lsof can be instructed to display that path name with the -X option. The path name might be incorrect because of the rename problem described above. See the answer to the 'What does "(deleted)" mean in the NAME column of a Solaris 10 open file?' question for more information.

Lsof is sometimes able to detect that cached path name is incorrect. In that case lsof may report only the mounted-on directory and device of the file system or it may report that the path name is of questionable accuracy by appending a trailing "(?)" to it in the NAME column.

See the answer to the "Why does Solaris 10 lsof sometimes report only the mounted-on directory and device?" and 'What does "(?)" mean in the NAME column of a Solaris 10 open file?' questions for more information.

### 17.25.2 Why does Solaris 10 lsof sometimes report only the mounted-on directory and device?

For some regular open files lsof may report only the mounted-on directory and device of the file system on which the file resides. That's because lsof was able to determine that the path name cached in the open file's vnode is incorrect.

Lsof detects the cached path name is incorrect by applying stat(2) to it, provided that no error was detected when stat(2) was applied to the file system mounted-on directory during lsof setup. If a mounted-on directory stat(2) error was detected



during setup, lsof does no cached path name analysis and simply reports it.

When the application of stat(2) to the cached path name returns a no-entry reply (the ENOENT error number), lsof concludes the path no longer exists (i.e., has been unlinked) and reports the mounted-on directory and device of the file system. That behavior can be modified with the -X option in lsof revisions 4.77 and above. See the answer to the 'What does "(deleted)" mean in the NAME column of a Solaris 10 open file?' for more information.

When the application of stat(2) to the cached path name returns a permission error reply (the EACCES or EPERM error numbers), lsof reports the cached path name and adds a trailing "(?)" to indicate the reported path name is of questionable accuracy. See the answer to the question 'What does "(?)" mean in the NAME column of a Solaris 10 open file?' for more information.

If the application of stat(2) to the cached path name yields any other error reply, lsof reports the mounted-on directory and device of the file system.

When the application of stat(2) to the cached path name succeeds, lsof compares the reported device and node numbers to what it has obtained for the open file from kernel structures. If they match, lsof reports the cached path name. If they don't match, lsof instead reports the mounted-on directory and device of the file system.

A work-around that allows lsof to apply stat(2) successfully to cached path names is to give lsof sufficient permission to do it -- i.e., run lsof as the root user.

17.25.3 What does "(deleted)" mean in the NAME column of a Solaris 10 open file?

When the -X option is specified to Solaris 10 lsof, it will report in its NAME column the path name cached for a deleted file in its vnode. The path name will be followed by "(deleted)".

Note that the path name cached in a file's vnode is the path name by which the file was opened. It is not updated by the Solaris kernel when any path name component is changed. Hence, it may not represent the final path name the open file had.

See the answer to the "Why does Solaris 10 lsof sometimes report the wrong path name?" question for more information on how changing a path name component affects the correctness of a what lsof reports.

17.25.4 What does "(?)" mean in the NAME column of a Solaris 10 open file?

When lsof encounters a path name cached in the open file's vnode that stat(2) reports lsof lacks permission to access, lsof adds "(?)" to the path name reported in the NAME column to indicate the path name is of questionable accuracy.

See the answers to the "Why does Solaris 10 lsof sometimes report the wrong path name?" and "Why does Solaris 10 lsof sometimes report only the mounted-on directory and device?" questions for more information on why lsof may report a path name of questionable accuracy.

A work-around that allows lsof to apply stat(2) successfully to cached path names is to give lsof sufficient permission to do it -- i.e., run lsof as the root user.

17.26 Solaris contract file problems

17.26.1 Why doesn't lsof report size, link count and node number for Solaris 10 contract files?

Lsof doesn't report size, link count or node number for Solaris 10 contract files because I don't know how to obtain them from contract file kernel structures.

17.26.2 Why can't lsof locate a Solaris 10 contract file by path name?

Because lsof can't find the node number of Solaris contract files, it can't match the device and node numbers it gets from applying stat(2) to the contract file path name with what it finds in kernel data.

17.27 Solaris 10 and above ZFS problems

17.27.1 Why does Configure warn that ZFS support is not enabled?

To provide ZFS support it is necessary that lsof have access to the definitions of ZFS structures used by the kernel.

Those definitions are made available to lsof when it runs by the libctl library.

If lsof's Configure script finds that ZFS is indicated by the presence of the <sys/fs/zfs.h> header file, but the libctl library is not indicated via the <libctl.h> header file, the script concludes that ZFS support is not possible and issues the following warning:

```
WARNING: ZFS support not enabled; libctf.h missing.
```

Install libctf support to remedy this problem.

## 17.28 Problems with Solaris 9 and above

### 17.28.1 Why does the compiler complain about lgrp\_root on Solaris 9 and above?

When compiling lsof 4.84 on later Solaris 9 and 10 systems, the compiler may report the following error:

```
/usr/include/sys/lgrp.h", line ...: identifier redeclared: lgrp_root
```

This error results from a conflict between usage of lgrp\_root in both <sys/lgrp.h> and <sys/lgrp\_user.h> when \_KMEMUSER or \_KERNEL is #define'd before <sys/lgrp.h> is #include'd. This problem is noted in Sunsolve bug ID 5064229.

The work-around is to use lsof revision 4.85 sources.

## 18.0 Lsof Features

### 18.1 Why doesn't lsof report on /proc entries on my system?

/proc file system support is generally available only for BSD, SYSV R4 dialects, and Tru64 UNIX (Digital UNIX, DEC OSF/1). It's also available for Linux, and Pyramid DC/OSx and Reliant UNIX.

Even on some SYSV R4 dialects I encountered many problems while trying to incorporate /proc file system support.

The chief problem is that some vendors don't distribute the header file that describes the /proc file system node

-- usually called prdata.h.

## 18.2 How do I disable the device cache file feature or alter its behavior?

To disable the device cache file feature for a dialect, remove the HASDCACHE definition from the machine.h file of the dialect's machine.h header file. You can also use HASDCACHE to change the default prefix (`.lsof`) of the device cache file.

Be sure you consider disabling the device cache file feature carefully.

Having a device cache file significantly reduces lsof startup overhead by eliminating a full scan of /dev (or /devices) once the device cache file has been created. That full scan also overloads the kernel's name cache with the names of the /dev (or /devices) nodes, reducing the opportunity for lsof to find path name components of open files.

If you're worried about the presence of mode 0600 device cache files in the home directories of the real user IDs that execute lsof, consider these checks that lsof makes on the file before using it:

1. To read the device cache file, lsof must gain permission from access(2).
2. The device cache file's modes must be 0600 (0644 if lsof is reading a system-wide device cache file) and its size non-zero.
3. There must be a correctly formatted section count line at the beginning of the file.
4. Each section must have a header line with a count that properly numbers the lines in the section.  
Legal sections are device, clone, pseudo-device, and CRC.
5. The lines of a section must have the proper format.
6. All lines are included in a 16 bit CRC, and it is recorded in a non-checksummed section line at the end of the file.

7. The checksum computed when the file is read must match the checksum recorded when the file was written.

8. The checksum section line must be followed by end-of-information.

9. Lsof must be able to get matching results from `stat(2)` on a randomly chosen entry of the device section.

For more information on the device cache file, read the `00DCACHE` file of the lsof distribution.

#### 18.2.1 What's the risk with a perverted device cache file?

Even with the checks that lsof makes on the device cache file, it's conceivable that an intruder could modify it so it would pass lsof's tests.

The only serious consequence I know of this change is the removal of a file whose major device number identifies a socket

from some user ID's device cache file. When such a device has been removed from the device cache file, and when lsof doesn't detect the removal, lsof may not be able to identify socket files when executed by the affected user ID. Only certain dialects are at risk to this attack -- e.g., SCO OpenServer and Solaris 2.x, 7, 8, and 9.

If you're tracking a network intruder with lsof, that could be important to you. If you suspect that someone has corrupted the device cache file you're using, I recommend you use lsof's `-Di` option to tell it to ignore it and use the contents of `/dev` (or `/devices`) instead; or remove the device cache file (usually `.lsof_hostname`, where `hostname` is the first component of the host's name returned by `gethostname(2)`) from the user ID's home directory and let lsof create a new one for you.

#### 18.2.2 How do I put the full host name in a personal device cache file path?

Lsof constructs the personal device cache file path name from a format specified in the `HASPERSDC #define` in the dialect's `machine.h` header file. As distributed `HASPERSDC` declares the path to be ``.lsof_'` plus the first component

of the host name with the format ``.lsof_%L``.

If you want to change the way `lsof` constructs the personal device cache file path name, you can change the `HASPERSDC` `#define` and recompile `lsof`. If, for example, you `#define` `HASPERSDC` to be ``.lsof_%l`` (note the lower case `l`), Configure and remake `lsof`, then the personal device cache file path will be ``.lsof_`` plus the host name returned by `gethostname(2)`.

See the `00DCACHE` file of the `lsof` distribution for more information on the formation of the personal device cache file path and the use of the `HASPERSDC` `#define`.

### 18.2.3 How do I put the personal device cache file in `/tmp`?

Change the `HASPERSDC` definition in your dialect's `machine.h` header file.

When you redefine `HASPERSDC`, make sure you put at least one user identification conversion in it to keep separate the device cache files for each user of `lsof`. Also give some thought to including the ```%0`` conversion to define an alternate path for `setuid-root` and root processes.

Here's a definition that puts a personal device cache file in `/tmp` with the name ``.lsof_login_hostname_pers``.

```
#define HASPERSDC "/tmp/.lsof_%u_%l_pers"
```

Thus the `/tmp` personal device cache file path for login `"abe"` on host `"lsof.itap.purdue.edu"` would be:

```
/tmp/.lsof_abe_lsof.itap.purdue.edu_pers
```

You can add the User ID (UID) with the `"%U"` conversion and the first host name component with the ```%L`` conversion.

**CAUTION:** be careful using absolute paths like `/tmp` lest `lsof` processes that are `setuid-root` or whose real UID is root be used to exploit some security weakness via `/tmp`. Elect instead to add an alternate path for those processes with the ```%0`` conversion. Here's an extension of the previous `HASPERSDC` format for `/tmp` that declares an alternate path:

```
#define HASPERSDC "/tmp/.lsof_%u_%l_pers%0%h/.lsof_%L"
```

When the lsof process is setuid-root or its real UID is root, presuming root's home directory is `~/` and the host's name is `lsof.itap.purdue.edu`, the extended format yields:

```
/.lsof_vic
```

### 18.3 Why doesn't lsof know about AFS files on my favorite dialect?

Lsof currently supports AFS for these dialects:

- AIX 4.1.4 (AFS 3.4a)
- Linux 1.2.13 (AFS 3.3)
- NEXTSTEP 3.2 (AFS 3.3)
- Solaris 2.[56] (AFS 3.4a)

It may recognize AFS files on other versions of these dialects, but I have no way to test that. Lsof may report correct information for AFS files on other dialects, but I can't test that either.

AFS support must be custom crafted for each UNIX dialect and then tested. If lsof supports your favorite dialect, but doesn't recognize its AFS files, probably I don't have access to a test system. If you want AFS support badly for your dialect, consider helping me do the development and testing.

#### 18.3.1 Why doesn't lsof report node numbers for all AFS volume files, or how do I reveal dynamic module addresses to lsof?

When AFS is implemented via dynamic kernel modules -- e.g., in NEXTSTEP -- lsof can't obtain the addresses of AFS variables in the kernel that it uses to identify AFS vnodes. It can guess that a vnode is assigned to an AFS file and it can obtain other information about AFS files, but it has trouble computing AFS volume node numbers.

To determine node numbers for AFS volumes other than the root volume, `/afs`, lsof needs access to a hashed volume structure pointer table. When it can't find the address of that table, because AFS support is implemented via dynamic kernel modules, lsof will return blanks in the INODE column for AFS volume files. Lsof can identify the root volume's node number (0), and can compute the node numbers for all other AFS files.

If you have a name list file that contains the addresses of the AFS dynamic modules -- e.g., you saved module symbols when you created a loadable module kernel with modload(8) by specifying -sym -- lsof may be able to find the kernel addresses it needs in that file.

Lsof looks up AFS dynamic kernel addresses for these dialects at these default paths:

```
NEXTSTEP 3.2 /usr/vice/etc/afs_loadable
```

A different path to a name list file with AFS dynamic kernel addresses may be specified with the -A option, when the -A option description appears in lsof's -h or -? (help) output.

If any addresses appear in the -A name list file that also appear in the regular kernel name list file -- e.g., /vmunix -- they must match, or lsof will silently ignore the -A addresses on the presumption that they are out of date.

Found in path(s):

```
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/00FAQ
```

## 1.210 binutils 2.39.0

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"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

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c) You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.

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(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must

be optional: if the application does not supply it, the square root function must still compute square roots.)

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This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

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If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the

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If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

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b) Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

c) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

d) Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

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a) Accompany the combined library with a copy of the same work

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## END OF TERMS AND CONDITIONS

### Appendix: How to Apply These Terms to Your New Libraries

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```
<one line to give the library's name and a brief idea of what it does.>  
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```

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<signature of Ty Coon>, 1 April 1990  
Ty Coon, President of Vice

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Version 3, 29 June 2007

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The precise terms and conditions for copying, distribution and modification follow.

## TERMS AND CONDITIONS

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## 1. Source Code.

The "source code" for a work means the preferred form of the work for making modifications to it. "Object code" means any non-source form of a work.

A "Standard Interface" means an interface that either is an official standard defined by a recognized standards body, or, in the case of interfaces specified for a particular programming language, one that is widely used among developers working in that language.

The

"System Libraries" of an executable work include anything, other than the work as a whole, that (a) is included in the normal form of packaging a Major Component, but which is not part of that Major Component, and (b) serves only to enable use of the work with that Major Component, or to implement a Standard Interface for which an implementation is available to the public in source code form. A "Major Component", in this context, means a major essential component (kernel, window system, and so on) of the specific operating system (if any) on which the executable work runs, or a compiler used to produce the work, or an object code interpreter used to run it.

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#### 6. Conveying Non-Source Forms.

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b) Convey the object code in, or embodied in, a physical product (including a physical distribution medium), accompanied by a written offer, valid for at least three years and valid for as long as you offer spare parts or customer support for that product model, to give anyone who possesses the object code either (1) a copy of the Corresponding Source for all the software in the product that is covered by this License, on a durable physical medium customarily used for software interchange, for a price no more than your reasonable cost of physically performing this conveying of source, or (2) access to copy the Corresponding Source from a network server at no charge.

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d) Convey the object code by offering access from a designated place (gratis or for a charge), and offer equivalent access to the Corresponding Source in the same way through the same place at no further charge. You need not require recipients to copy the Corresponding Source along with the object code. If the place to copy the object code is a network server, the Corresponding Source may be on a different server (operated by you or a third party) that supports equivalent copying facilities, provided you maintain clear directions next to the object code saying where to find the Corresponding Source. Regardless of what server hosts the Corresponding Source, you remain obligated to ensure that it is available for as long as needed to satisfy these requirements.

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(This file is under construction.) -\*- text -\*-

If you've contributed to gas and your name isn't listed here, it is not meant as a slight. I just don't know about it. Email me, [nickc@redhat.com](mailto:nickc@redhat.com) and I'll correct the situation.

This file will eventually be deleted: The general info will go into the documentation, and info on specific files will go into an AUTHORS file, as requested by the FSF.

+++++

Dean Elsner wrote the original gas for vax. [more details?]

Jay Fenlason maintained gas for a while, adding support for gdb-specific debug information and the 68k series machines, most of the preprocessing pass, and extensive changes in messages.c, input-file.c, write.c.

K. Richard Pixley maintained gas for a while, adding various enhancements and many bug fixes, including merging support for several processors, breaking gas up to handle multiple object file format backends (including heavy rewrite, testing, an integration of the coff and b.out backends), adding configuration including heavy testing and verification of cross assemblers and file splits and renaming, converted gas to strictly ansi C including full prototypes, added support for m680[34]0 & cpu32, considerable work on i960 including a

coff port (including considerable amounts of reverse engineering), a sparc opcode file rewrite, decstation, rs6000, and hp300hpux host ports, updated "know" assertions and made them work, much other reorganization, cleanup, and lint.

Ken Raeburn wrote the high-level BFD interface code to replace most of the code in format-specific I/O modules.

The original Vax-VMS support was contributed by David L. Kashtan. Eric Youngdale and Pat Rankin have done much work with it since.

The Intel 80386 machine description was written by Eliot Dresselhaus.

Minh Tran-Le at IntelliCorp contributed some AIX 386 support.

The Motorola 88k machine description was contributed by Devon Bowen of Buffalo University and Torbjorn Granlund of the Swedish Institute of Computer Science.

Keith

Knowles at the Open Software Foundation wrote the original MIPS back end (tc-mips.c, tc-mips.h), and contributed Rose format support that hasn't been merged in yet. Ralph Campbell worked with the MIPS code to support a.out format.

Support for the Zilog Z8k and Hitachi H8/300, H8/500 and SH processors (tc-z8k, tc-h8300, tc-h8500, tc-sh), and IEEE 695 object file format (obj-ieee), was written by Steve Chamberlain of Cygnus Solutions. Steve also modified the COFF back end (obj-coffbfd) to use BFD for some low-level operations, for use with the Hitachi, 29k and Zilog targets.

John Gilmore built the AMD 29000 support, added .include support, and simplified the configuration of which versions accept which pseudo-ops. He updated the 68k machine description so that Motorola's opcodes always produced fixed-size instructions (e.g. jsr), while synthetic instructions remained shrinkable (jbsr). John fixed many bugs, including true tested cross-compilation support, and one bug in relaxation that took a week and required the proverbial one-bit fix.

Ian Lance Taylor of Cygnus Solutions merged the Motorola and MIT syntaxes for the 68k, completed support for some COFF targets (68k, i386 SVR3, and SCO Unix), wrote the ECOFF support based on Michael Meissner's mips-tfile program, wrote the PowerPC and RS/6000 support, and made a few other minor patches. He handled the binutils releases for versions 2.7 through 2.9.

David Edelsohn contributed fixes for the PowerPC and AIX support.

Steve Chamberlain made gas able to generate listings.

Support for the HP9000/300 was contributed by Glenn Engel of HP.

Support for ELF format files has been worked on by Mark Eichin of Cygnus Solutions (original, incomplete implementation), Pete Hoogenboom at the University of Utah (HPPA mainly), Michael Meissner of the Open Software Foundation (i386 mainly), and Ken Raeburn of Cygnus Solutions (sparc, initial 64-bit support).

Several engineers at Cygnus Solutions have also provided many small bug fixes and configuration enhancements.

The initial Alpha support was contributed by Carnegie-Mellon University. Additional work was done by Ken Raeburn of Cygnus Solutions. Richard Henderson then rewrote much of the Alpha support.

Ian Dall updated the support code for the National Semiconductor 32000 series, and added support for Mach 3 and NetBSD running on the PC532.

Klaus Kaempf ported the assembler and the binutils to openVMS/Alpha.

Steve Haworth contributed the support for the Texas Instruction c30 (tms320c30).

H.J. Lu has contributed many patches and much testing.

Alan Modra reworked much of the i386 backend, improving the error checking, updating the code, and improving the 16 bit support, using patches from the work of Martynas Kunigelis and H.J. Lu.

Many others have contributed large or small bugfixes and enhancements. If you've contributed significant work and are not mentioned on this list, and want to be, let us know. Some of the history has been lost; we aren't intentionally leaving anyone out.

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## 1.212 diffutils 3.9

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Version 3, 29 June 2007

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```
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```

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# 1.215 gobject-introspection 1.72.0

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<signature of Ty Coon>, 1 April 1990

Ty Coon, President of Vice

That's all there is to it!

gobject-introspection has two licenses; one for the typelib library,  
and one for the tools.

\* The typelib libraries (girepository/) are licensed under the LGPLv2+.  
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<https://gitlab.gnome.org/GNOME/gobject-introspection/issues>.

# 1.216 pathlib 2.3.7

## 1.216.1 Available under license :

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Metadata-Version: 2.1

Name: pathlib2

Version: 2.3.7

Summary: Object-oriented filesystem paths

Home-page: <https://github.com/jazzband/pathlib2>

Author: Matthias C. M. Troffaes

Author-email: [matthias.troffaes@gmail.com](mailto:matthias.troffaes@gmail.com)

License: MIT

Platform: UNKNOWN

Classifier: Development Status :: 5 - Production/Stable

Classifier: Intended Audience :: Developers

Classifier: License :: OSI Approved :: MIT License

Classifier: Operating System :: OS Independent

Classifier: Programming Language :: Python

Classifier: Programming Language :: Python :: 2

Classifier: Programming Language :: Python :: 3

Classifier: Programming Language :: Python :: 2.7

Classifier: Programming Language :: Python :: 3.5

Classifier: Programming Language :: Python :: 3.6

Classifier: Programming Language :: Python :: 3.7

Classifier: Programming Language :: Python :: 3.8

Classifier: Programming Language :: Python :: 3.9

Classifier: Topic :: Software Development :: Libraries

Classifier:

Topic :: System :: Filesystems

License-File: LICENSE.rst

The `old pathlib <<https://bitbucket.org/pitrou/pathlib>>` \_  
module on bitbucket is in bugfix-only mode.

The goal of pathlib2 is to provide a backport of  
`standard pathlib <<http://docs.python.org/dev/library/pathlib.html>>` \_  
module which tracks the standard library module,  
so all the newest features of the standard pathlib can be  
used also on older Python versions.

Download

-----

Standalone releases are available on PyPI:

<http://pypi.python.org/pypi/pathlib2/>

Development

-----

The main development takes place in the Python standard library: see  
the `Python developer's guide <<http://docs.python.org/devguide/>>` \_.

In particular, new features should be submitted to the  
`Python bug tracker <<http://bugs.python.org/>>` \_.

Issues that occur in this backport, but that do not occur not in the  
standard Python pathlib module can be submitted on  
the `pathlib2 bug tracker <<https://github.com/jazzband/pathlib2/issues>>` \_.

Documentation

-----

Refer

to the

`standard pathlib <<http://docs.python.org/dev/library/pathlib.html>>` \_  
documentation.

Known Issues

-----

For historic reasons, pathlib2 still uses bytes to represent file paths internally.  
Unfortunately, on Windows with Python 2.7, the file system encoder (`mcbcs`)  
has only poor support for non-ascii characters,  
and can silently replace non-ascii characters without warning.  
For example, `u".encode(sys.getfilesystemencoding())` results in `????`  
which is obviously completely useless.

Therefore, on Windows with Python 2.7, until this problem is fixed upstream, unfortunately you cannot rely on pathlib2 to support the full unicode range for filenames. See `issue #56 <<https://github.com/jazzband/pathlib2/issues/56>>` for more details.

```
.. |github| image:: https://github.com/jazzband/pathlib2/actions/workflows/python-package.yml/badge.svg
:target: https://github.com/jazzband/pathlib2/actions/workflows/python-package.yml
:alt: github
```

```
.. |codecov| image:: https://codecov.io/gh/jazzband/pathlib2/branch/develop/graph/badge.svg
:target: https://codecov.io/gh/jazzband/pathlib2
:alt: codecov
```

```
.. |jazzband| image:: https://jazzband.co/static/img/badge.svg
:alt: Jazzband
:target: https://jazzband.co/
```

Found in path(s):

```
* /opt/cola/permits/1682050824_1684512778.5675108/0/pathlib2-2-3-7-tar-gz/pathlib2-2.3.7/pathlib2.egg-info/PKG-INFO
```

```
* /opt/cola/permits/1682050824_1684512778.5675108/0/pathlib2-2-3-7-tar-gz/pathlib2-2.3.7/PKG-INFO
```

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```
* /opt/cola/permits/1682050824_1684512778.5675108/0/pathlib2-2-3-7-tar-gz/pathlib2-2.3.7/LICENSE.rst
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Found in path(s):

- \* /opt/cola/permits/1682050824\_1684512778.5675108/0/pathlib2-2-3-7-tar-gz/pathlib2-2.3.7/tests/test\_pathlib2.py
- \* /opt/cola/permits/1682050824\_1684512778.5675108/0/pathlib2-2-3-7-tar-gz/pathlib2-2.3.7/setup.py
- \* /opt/cola/permits/1682050824\_1684512778.5675108/0/pathlib2-2-3-7-tar-gz/pathlib2-2.3.7/pathlib2/\_\_init\_\_.py

# 1.217 nghttp2 1.49.0

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## 1.218 glibc 2.36

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include/bsd/err.h  
include/bsd/stdlib.h  
include/bsd/sys/param.h  
include/bsd/unistd.h  
src/bsd\_getopt.c  
src/err.c  
src/fgetln.c  
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include/bsd/sys/bitstring.h  
include/bsd/sys/queue.h  
include/bsd/sys/time.h  
include/bsd/timeconv.h  
include/bsd/vis.h  
man/bitstring.3bsd  
man/errc.3bsd  
man/explicit\_bzero.3bsd  
man/fgetln.3bsd  
man/fgetwln.3bsd  
man/fpurge.3bsd  
man/funopen.3bsd  
man/getbsize.3bsd  
man/heapsort.3bsd  
man/nlist.3bsd

man/pwcache.3bsd  
man/queue.3bsd  
man/radixsort.3bsd  
man/reallocarray.3bsd  
man/reallocf.3bsd  
man/setmode.3bsd  
man/strmode.3bsd  
man/strnstr.3bsd  
man/strtoi.3bsd  
man/strtou.3bsd  
man/unvis.3bsd  
man/vis.3bsd  
man/wcslcpy.3bsd  
src/getbsize.c  
src/heapsort.c  
src/merge.c  
src/nlist.c  
src/pwcache.c  
src/radixsort.c  
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man/fmtcheck.3bsd

man/humanize\_number.3bsd

man/stringlist.3bsd

man/timeval.3bsd

src/fmtcheck.c

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man/tree.3bsd

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man/readpassphrase.3bsd

man/strncpy.3bsd

man/strtonum.3bsd

src/arc4random.c

src/arc4random\_linux.h

src/arc4random\_uniform.c

src/arc4random\_unix.h

src/arc4random\_win.h

src/closefrom.c

src/freezero.c

src/getentropy\_aix.c

src/getentropy\_bsd.c

src/getentropy\_hpux.c

src/getentropy\_hurd.c

src/getentropy\_linux.c

src/getentropy\_osx.c

src/getentropy\_solaris.c

src/getentropy\_win.c

src/readpassphrase.c

src/reallocarray.c

src/reallocarray.c

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test/explicit\_bzero.c

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Any

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Version 3, 29 June 2007

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## 1.224 tipc-utils 2.0.5

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```
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* tipc_ts_server.c  
*  
* Short description: Portable TIPC Test Suite -- common server routines  
*  
* -----  
*  
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\* /opt/cola/permits/1715483989\_1686310530.9530988/0/tipc-tipcutils-2-0-5-2-zip/tipc-tipcutils-  
f257000dd3be95dbd61dad4596a636f8692b5f9e/ptts/tipc\_ts\_server.c

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/\* -----

\*/

\* tipc-pipe.c

\*/

\* Short description: TIPC CLI utility, similar to netcat.

\*/

\* -----

\*/

\* Written by Constantine Shulyupin const@makelinux.com for Compass EOS

\*/

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\* /opt/cola/permits/1715483989\_1686310530.9530988/0/tipc-tipcutils-2-0-5-2-zip/tipc-tipcutils-  
f257000dd3be95dbd61dad4596a636f8692b5f9e/tipc-pipe/tipc-pipe.c

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\* tipc-config.c: TIPC configuration management tool

\*

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f257000dd3be95dbd61dad4596a636f8692b5f9e/tipc-config/tipc-config.c

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```
/* -----  
*  
* server_tipc.c  
*  
* Short description: TIPC benchmark demo (server side)  
*  
* -----  
*  
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* -----  
*/
```

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in path(s):

\* /opt/cola/permits/1715483989\_1686310530.9530988/0/tipc-tipcutils-2-0-5-2-zip/tipc-tipcutils-

f257000dd3be95dbd61dad4596a636f8692b5f9e/demos/benchmark/server\_tipc.c

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```
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*  
* tipc_ts_client.c  
*  
* Short description: Portable TIPC Test Suite -- common client routines  
*  
* -----  
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f257000dd3be95dbd61dad4596a636f8692b5f9e/ptts/tipc_ts_client.c
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/* -----  
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* tipc_ts_adapt.h
*
* Short description: Portable TIPC Test Suite -- wrapper declarations for Linux
*
* -----
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f257000dd3be95dbd61dad4596a636f8692b5f9e/ptts/tipc_ts_adapt.h
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```

/* -----
*
* tipc_ts_client_linux.c
*
* Short description: Portable TIPC Test Suite -- client wrapper for Linux
*
* -----

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*
* client_tipc.c
*
* Short description: TIPC connection demo (client side)
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* -----
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 f257000dd3be95dbd61dad4596a636f8692b5f9e/demos/connection\_demo/client\_tipc.c  
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 \*  
 \* client\_tipc.c  
 \*  
 \* Short description: TIPC hello world demo (client side)  
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 \*  
 \* server\_tipc.c  
 \*  
 \* Short description: TIPC subscription demo (server side)  
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 \*  
 \* client\_tipc.c  
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 \* Short description: TIPC subscription demo (client side)  
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\*

\* tipc\_ts.h

\*

\* Short description: Portable TIPC Test Suite -- common declarations

\*

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f257000dd3be95dbd61dad4596a636f8692b5f9e/ppts/tipc\_ts.h

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\*  
\* client\_tipc.c

\* Short description: TIPC benchmark demo (client side)

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\*

\* client\_tipc.c

\*

\* Short description: TIPC multicast demo (client side)

\*

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\*

\* server\_tipc.c

\*

\* Short description: TIPC connection demo (server side)

\*

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\*

\* server\_tipc.c

\*

\* Short description: TIPC stream demo (server side)

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```

*
* tipc_ts_server_linux.c
*
* Short description: Portable TIPC Test Suite -- server wrapper for Linux
*
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/* -----

```

Name: inventory\_sim.c

Short description: TIPC distributed inventory simulation (Linux version)

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#### DESCRIPTION

This file is a demo program that illustrates how TIPC can be used to support distributed applications. It takes advantage of TIPC's socket-based messaging, as well as its port naming and port name subscription capabilities.

The demo is a simulation

of a store that stocks a variety of numbered items which are sold to customers upon request. By default, items and customers are created randomly (although there are limits on the number of each that can be present in the store at any given time). From time to time new items are delivered to the store; independently of this, customers enter the store, each looking for a specific item. If a desired item can be obtained before a customer gets tired of waiting for it, a sale is recorded; otherwise, a walk-out is recorded. If multiple customers attempt to obtain the same item, only one succeeds; the others are notified of their failure and try again.

Each item and customer is implemented as a separate task. An item makes itself available by creating a socket whose port name identifies the item number.

A customer determines the availability of an item by creating a subscription for the item name and waiting for notification that the item exists; the

customer then obtains the item  
by sending a message to the socket for the item  
and receiving a successful reply. A logging task is used to record all  
significant events encountered by the item and customer tasks during the  
simulation, as well as to display the simulation status and statistics on a  
periodic basis.

This simulation is most effective when it is run on multiple CPUs at the same  
time, which has the effect of creating a network of stores sharing a global  
inventory. Since the port name published by an item is visible throughout the  
TIPC cluster, customers are able to obtain items from other CPUs if they are  
not available locally. The more CPUs involved in the simulation, the more  
items are available and the less likely a customer will be to walk out of a  
store because the item they desire is unavailable.

When a simulation is terminated the logging task waits for all customers to  
leave, then creates a janitor task to dispose of the unsold items that remain.  
TIPC's name subscription capability allows  
the janitor to distinguish the items  
belonging to its own store from those in other stores.

The simulation can be temporarily halted to permit inspection of the various  
tasks used, or to assist in debugging problems. This is achieved by  
publishing the name of a virtual item (item 0), which instructs the logging  
task on each CPU to temporarily suspend processing; this causes all customer  
and item tasks on the CPU to become blocked when they next attempt to log  
an event. (Note: Pausing the simulation may result in warning messages from  
customers about non-responsive items; this is normal behavior resulting from  
the way the pause capability is implemented, and is no cause for concern.)

The demo gives the user control over the number of item and customer tasks  
used in the simulation, as well as the ability to increase the speed of  
processing and to control the amount of output generated. By default, a  
simulation running at normal speed displays all transaction info, while a  
simulation  
running at an accelerated rate displays only the periodic summary.  
The simulation can also be run in a deterministic manner by creating a store  
having no items or customers, and then generating individual item and customer  
tasks manually.

#### Building the demo

-----

The demo is built as a normal TIPC application. The accompanying Makefile  
builds a "inventory\_sim" executable and creates softlinks to a set of aliases  
(eg. newSim, killSim, ...) that are used to invoke the main executable to do  
specific operations.

#### Running the demo

-----

The simulation is run by issuing the following shell commands:

```
newSim [#items [#customers [speed [verbosity]]]]
    - open store
killSim      - close store and clean up
stopSim      - pause simulation of all stores
startSim     - unpause simulation of all stores
newItem [item [count]] - create item (repeat as specified)
newCust [item [count]] - create customer for item (repeat as specified)
helpSim
    - display this menu
```

A missing (or 0) argument value causes the simulation to choose an appropriate default. In certain cases, an argument value that is < 0 can also be used to disable a specific feature of a command.

The output messages generated by the simulation should be self-explanatory.

#### Examples

-----

- 1) Run default simulation: `./newSim`
- 2) Run simulation at 10x normal speed: `./newSim 0 0 10`
- 3) Run simulation manually: `./newSim -1 -1 [create empty store]`  
`./newItem 3 [create item]`  
`./newCust 3 [create customer]`  
`*/`

Found in path(s):

```
* /opt/cola/permits/1715483989_1686310530.9530988/0/tipc-tipcutils-2-0-5-2-zip/tipc-tipcutils-
f257000dd3be95dbd61dad4596a636f8692b5f9e/demos/inventory_sim/inventory_sim.c
```

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```
/* -----
```

```
*
```

```
* server_tipc.c
```

```
*
```

```
* Short description: TIPC hello world demo (server side)
```

```
* -----
```

```
*
```

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- \* -----
- \*/

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```
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*
* tipc_ts_common.c
*
* Short description: Portable TIPC Test Suite -- common client+server routines
*
* -----
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*
* -----
*/

```

Found in path(s):

```

* /opt/cola/permits/1715483989_1686310530.9530988/0/tipc-tipcutils-2-0-5-2-zip/tipc-tipcutils-
f257000dd3be95dbd61dad4596a636f8692b5f9e/ptts/tipc_ts_common.c

```

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```

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*
* server_tipc.c
*
* Short description: TIPC stream demo (server side)
*
* -----
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\*  
\* -----  
\*/

Found in  
path(s):

\* /opt/cola/permits/1715483989\_1686310530.9530988/0/tipc-tipcutils-2-0-5-2-zip/tipc-tipcutils-  
f257000dd3be95dbd61dad4596a636f8692b5f9e/demos/stream\_demo/client\_tipc.c

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/\* -----

\*  
\* server\_tipc.c

\* Short description: TIPC multicast demo (server side)

\*  
\* -----

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# 1.225 ipcalc 0.2.3

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```

```
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```

```
Ty Coon, President of Vice
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# 1.228 sepolicy 3.4

## 1.228.1 Available under license :

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```

Found in path(s):

```
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy-bash-completion.sh
```

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Found in path(s):

```
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/templates/var_log.py
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/communicate.py
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/templates/etc_rw.py
*
/opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/templates/var_spool.py
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/network.py
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-
zip/sepolicy/sepolicy/templates/executable.py
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/templates/rw.py
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/templates/script.py
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* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/templates/var_cache.py
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy.py
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/templates/var_run.py
*
```

```
/opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/templates/semodule.py
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/transition.py
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/manpage.py
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/gui.py
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/templates/var_lib.py
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/interface.py
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/templates/tmp.py
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/booleans.py
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/templates/network.py
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-
zip/sepolicy/sepolicy/templates/test_module.py
*
```

```
/opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/generate.py
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/templates/boolean.py
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/templates/unit_file.py
```

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Found in path(s):

```
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```

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```
header_comment_section=""
# vim: sw=4:ts=4:et
"""
```

```
base_section=""
```

```
%define selinux_policyver VERSION
```

```
Name: MODULENAME_selinux
Version: 1.0
Release: 1%{ ?dist}
Summary: SELinux policy module for MODULENAME
```

```
Group: System Environment/Base
License: GPLv2+
# This is an example. You will need to change it.
```

URL: http://HOSTNAME  
Source0: MODULENAME.pp  
Source1: MODULENAME.if  
Source2: DOMAINNAME\_selinux.8  
Source3: DOMAINNAME\_u

Requires: policycoreutils, libselinux-utils  
Requires(post): selinux-policy-base >= %{selinux\_policyver}, policycoreutils  
Requires(postun): policycoreutils  
""

mid\_section=""  
BuildArch: noarch

%description  
This package installs and sets up the SELinux policy security module for MODULENAME.

%install  
install -d %{buildroot}%{\_datadir}/selinux/packages  
install -m 644 %{SOURCE0} %{buildroot}%{\_datadir}/selinux/packages  
install -d %{buildroot}%{\_datadir}/selinux/devel/include/contrib  
install  
-m 644 %{SOURCE1} %{buildroot}%{\_datadir}/selinux/devel/include/contrib/  
install -d %{buildroot}%{\_mandir}/man8/  
install -m 644 %{SOURCE2} %{buildroot}%{\_mandir}/man8/DOMAINNAME\_selinux.8  
install -d %{buildroot}/etc/selinux/targeted/contexts/users/  
install -m 644 %{SOURCE3} %{buildroot}/etc/selinux/targeted/contexts/users/DOMAINNAME\_u

%post  
semodule -n -i %{\_datadir}/selinux/packages/MODULENAME.pp  
if /usr/sbin/selinuxenabled ; then  
  /usr/sbin/load\_policy  
  %relabel\_files  
  /usr/sbin/semange user -a -R DOMAINNAME\_r DOMAINNAME\_u  
fi;  
exit 0

%postun  
if [ \$1 -eq 0 ]; then  
  semodule -n -r MODULENAME  
  if /usr/sbin/selinuxenabled ; then  
    /usr/sbin/load\_policy  
    %relabel\_files  
    /usr/sbin/semange user -d DOMAINNAME\_u  
  fi;  
fi;  
exit 0



```
%files
%attr(0600,root,root) % {_datadir}/selinux/packages/MODULENAME.pp
% {_datadir}/selinux/devel/include/contrib/MODULENAME.if
% {_mandir}/man8/DOMAINNAME_selinux.8.*
/etc/selinux/targeted/contexts/users/DOMAINNAME_u
```

```
%changelog
```

```
*
```

```
TODAYSDATE YOUR NAME <YOUR@EMAILADDRESS> 1.0-1
```

```
- Initial version
```

```
""""
```

```
define_relabel_files_begin ="""\
```

```
\n
```

```
%define relabel_files() \\  
""""
```

```
define_relabel_files_end ="""\
```

```
restorecon -R FILENAME; \\  
""""
```

Found in path(s):

```
* /opt/cola/permits/1751470076_1710945132.3504305/0/sepolicy-3-4-zip/sepolicy/sepolicy/templates/spec.py
```

## 1.229 libwebsockets 4.3.2

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- minimal-examples/\*
- lws/\*

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Jean-loup Gailly      Mark Adler  
jloup@gzip.org      madler@alumni.caltech.edu

...

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```

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```
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under certain conditions; type `show c' for details.
@end smallexample
```

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`Gnomovision' (which makes passes at compilers) written by James Hacker.

@var{signature of Ty Coon}, 1 April 1989
Ty Coon, President of Vice
@end example
```

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```

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## 1.235 util-linux 2.38.1

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```
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This is free software, and you are welcome to redistribute
it
under certain conditions; type `show c' for details.
```

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```
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`Gnomovision' (which makes passes at compilers) written by James Hacker.
```

```
<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice
```

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```
#!/usr/bin/env bash
# MIT licenses will each have a unique MD5 sum since they contain a unique copyright.
# This script will read the license file into memory, strip out the copyright, and then
# generate an MD5 that is not unique and can be matched against a known MIT MD5 sum.
set -e
```

```
calculate_md5_sum() {
  local FILE="$1"

  # Read the contents of the file into a variable
  local raw_license_text=$(<"$FILE")

  # Convert to lowercase
  local lowercase_license_text="${raw_license_text,,}"

  # Remove anything before the beginning of the license
  local stripped_license_text=$(awk '/permission is hereby granted,/{p=1} p' <<< "$lowercase_license_text")
```

```

# Replace line breaks (Windows or Linux) with a single space
local replaced_linebreaks=$(tr '\r\n' ' ' <<< "$stripped_license_text")

# Replace multiple spaces with a single space
local normalized_license_text=$(tr -s ' ' <<< "$replaced_linebreaks")

# Strip away any non-printable, non-whitespace characters
local clean_unprintable_license_text=$(tr
-cd '[:print:][:space:]' <<< "$normalized_license_text")

# Remove punctuation and special characters
local clean_license_text=$(echo "$clean_unprintable_license_text" | sed 's/[^a-zA-Z ]//g')

# Calculate the MD5 sum of the cleaned license text
local MD5SUM=$(echo -n "$clean_license_text" | md5sum | awk '{print $1}')

# Output the MD5 sum
echo "$MD5SUM"
}

# Check if the FILE argument is provided
if [ -z "$1" ]; then
echo "Please provide a FILE as an argument."
exit 1
fi

# Invoke the function with the provided FILE argument
calculate_md5_sum "$1"
WEV @@ WEV[B "1
x ?"U@,5 @mISmIN<GimCN7g1uIE
43mI,5WEV @@ WEV @mImImIAmImImI0mImImI*mImI
A0mImImI...
lost+found...

;9GimCN7g

!"#$%&'()*+,-
./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~

!"#$%&'()*+,-
./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~

!"#$%&'()*+,-
./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~

!"#$%&'()*+,-
./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~WEV @@
WEV[B "1

```

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## 1.236 python 3.10.6

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Python was created in the early 1990s by Guido van Rossum at Stichting Mathematisch Centrum (CWI, see <http://www.cwi.nl>) in the Netherlands as a successor of a language called ABC. Guido remains Python's principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for National Research Initiatives (CNRI, see <http://www.cnri.reston.va.us>) in Reston, Virginia where he released several versions of the software.

In May 2000, Guido and the Python core development team moved to BeOpen.com to form the BeOpen PythonLabs team. In October of the same year, the PythonLabs team moved to Digital Creations, which became Zope Corporation. In 2001, the Python Software Foundation (PSF, see <https://www.python.org/psf/>) was formed, a non-profit organization created specifically to own Python-related Intellectual Property. Zope Corporation was a sponsoring member of the PSF.

All

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| Release        | Derived from | Year      | Owner | GPL-compatible? (1) |
|----------------|--------------|-----------|-------|---------------------|
| 0.9.0 thru 1.2 |              | 1991-1995 | CWI   | yes                 |

|                |           |           |            |         |
|----------------|-----------|-----------|------------|---------|
| 1.3 thru 1.5.2 | 1.2       | 1995-1999 | CNRI       | yes     |
| 1.6            | 1.5.2     | 2000      | CNRI       | no      |
| 2.0            | 1.6       | 2000      | BeOpen.com | no      |
| 1.6.1          | 1.6       | 2001      | CNRI       | yes (2) |
| 2.1            | 2.0+1.6.1 | 2001      | PSF        | no      |
| 2.0.1          | 2.0+1.6.1 | 2001      | PSF        | yes     |
| 2.1.1          | 2.1+2.0.1 | 2001      | PSF        | yes     |
| 2.1.2          | 2.1.1     | 2002      | PSF        | yes     |
| 2.1.3          | 2.1.2     | 2002      | PSF        | yes     |
| 2.2 and above  | 2.1.1     | 2001-now  |            |         |
| PSF            | yes       |           |            |         |

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## 1.237 busybox 1.35.0

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Julian Seward, Cambridge, UK.  
jseward@bzip.org  
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## 1.239 e2fsprogs 1.43

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Index: tdbsa/tdb.c

=====  
--- tdbsa.orig/tdb.c

+++ tdbsa/tdb.c

@@ -4,11 +4,11 @@ Rev: 23371

Last Changed Date: 2007-06-06 20:14:06 -0400 (Wed, 06 Jun 2007)

\*/

/\*

- Unix SMB/CIFS implementation.  
+ trivial database library - standalone version

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-

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```

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```

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This package was added to the e2fsprogs debian source package by Theodore Ts'o <tytso@mit.edu> on Sat Mar 15 15:33:37 EST 2003

It is part of the main e2fsprogs distribution, which can be found at:

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Upstream Author: Theodore Ts'o <tytso@mit.edu>

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#

# This is a Makefile stub which handles the creation of BSD shared  
# libraries.

#

# In order to use this stub, the following makefile variables must be defined.

#

# BSDLIB\_VERSION = 1.0

# BSDLIB\_IMAGE = libce

# BSDLIB\_MYDIR = et

# BSDLIB\_INSTALL\_DIR = \$(SHLIBDIR)

#

all:: image

```

real-subdirs:: Makefile
@echo " MKDIR pic"
@mkdir -p pic

BSD_LIB = $(BSDLIB_IMAGE).so.$(BSDLIB_VERSION)
BSDLIB_PIC_FLAG = -fpic

image: $(BSD_LIB)

$(BSD_LIB): $(OBJS)
(cd pic; ld -Bshareable -o $(BSD_LIB) $(LDFLAGS) $(OBJS))
$(MV) pic/$(BSD_LIB) .
$(RM) -f ../$(BSD_LIB)
(cd ..; $(LN) $(LINK_BUILD_FLAGS) \
`echo $(my_dir) | sed -e 's;lib/;;' /$(BSD_LIB) $(BSD_LIB))

install-shlibs install:: $(BSD_LIB)
@echo " INSTALL_PROGRAM $(BSDLIB_INSTALL_DIR)/$(BSD_LIB)"
@$(INSTALL_PROGRAM) $(BSD_LIB) \
$(DESTDIR)$$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)
@-$(LDCONFIG)

install-strip: install

install-shlibs-strip: install-shlibs

uninstall-shlibs uninstall::
$(RM) -f $(DESTDIR)$$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)

clean::
$(RM)
-rf pic
$(RM) -f $(BSD_LIB)
$(RM) -f ../$(BSD_LIB)

```

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Theodore Ts'o  
23-June-2007

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```

```
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This is the Debian GNU/Linux prepackaged version of the EXT2 file system utilities (e2fsck, mke2fs, etc.). The EXT2 utilities were written by Theodore Ts'o <tytso@mit.edu> and Remy Card <card@masi.ibp.fr>.

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This package was added to the e2fsprogs debian source package by Theodore Ts'o <tytso@mit.edu> on Fri Dec 14 22:24:35 EST 2007

It is part of the main e2fsprogs distribution, which can be found at:

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## 1.240 c-ares 1.18.1

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# 1.241 tcpdump 4.99.1

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```
# -*- perl -*-
```

```
$testlist = [  
  # This specific test fails on OpenBSD because the .pcap file uses DLT_RAW,  
  # which OpenBSD treats as DLT_LOOP. The macro is set on all three BSDs.  
  {  
    config_unset => 'HAVE_NET_IF_PFLOG_H',  
    name => 'heap-overflow-1',  
    input => 'heap-overflow-1.pcap',  
    output => 'heap-overflow-1.out',  
    args => '-v'  
  },  
];
```

```
1;
```

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\*/

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\*

/opt/cola/permits/1820789344\_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftp/extern.h

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*
*-----*/
```

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```
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hpa-5.2/config.h
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*/
```



Found in path(s):

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\*

/opt/cola/permits/1820789344\_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftp/main.c

\* /opt/cola/permits/1820789344\_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/common/tftpsubs.c

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\* LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY

\* OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF

\* SUCH DAMAGE.

\*/

Found

in path(s):

```
* /opt/cola/permits/1820789344_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftpd/tftpd.c
```

No license file was found, but licenses were detected in source scan.

```
/* ----- *
*
* Copyright 2001 H. Peter Anvin - All Rights Reserved
*
* This program is free software available under the same license
* as the "OpenBSD" operating system, distributed at
* http://www.openbsd.org/.
*
* ----- */
```

Found in path(s):

```
* /opt/cola/permits/1820789344_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftpd/tftpd.h
```

No license file was found, but licenses were detected in source scan.

Summary: The client for the Trivial File Transfer Protocol (TFTP).

Name: tftp

Version: 5.2

Release: 1

License: BSD

Group: Applications/Internet

Source0: <http://www.kernel.org/pub/software/network/tftp/tftp-hpa-%{version}.tar.gz>

BuildRequires: tcp\_wrappers-devel

BuildRoot: %{\_tmppath}/%{name}-root

%description

The Trivial File Transfer Protocol (TFTP) is normally used only for booting diskless workstations. The tftp package provides the user interface for TFTP, which allows users to transfer files to and from a remote machine. This program and TFTP provide very little security, and should not be enabled unless it is expressly needed.

%package server

Group: System Environment/Daemons

Summary: The server for the Trivial File Transfer Protocol (TFTP).

Requires: xinetd

%description server

The Trivial File Transfer Protocol (TFTP) is normally used only for booting diskless workstations. The tftp-server package provides the server for TFTP, which allows users to transfer files to and from a remote machine. TFTP provides very little security, and should not be

enabled unless it is expressly needed. The TFTP server is run from /etc/xinetd.d/tftp, and is disabled by default on Red Hat Linux systems.

```
%prep
%setup -q -n tftp-hpa-%{version}

%build

%configure
make %{?_smp_mflags}

%install
rm -rf ${RPM_BUILD_ROOT}
mkdir -p ${RPM_BUILD_ROOT}%{_bindir}
mkdir -p ${RPM_BUILD_ROOT}%{_mandir}/man{1,8}
mkdir -p ${RPM_BUILD_ROOT}%{_sbindir}

make INSTALLROOT=${RPM_BUILD_ROOT} \
  SBINDIR=%{_sbindir} MANDIR=%{_mandir} \
  install
install -m755 -d ${RPM_BUILD_ROOT}%{_sysconfdir}/xinetd.d/ ${RPM_BUILD_ROOT}/tftpboot
install -m644 tftp-xinetd ${RPM_BUILD_ROOT}%{_sysconfdir}/xinetd.d/tftp

%post server
/sbin/service xinetd reload > /dev/null 2>&1 || :

%postun server
if [ $1 = 0 ]; then
  /sbin/service xinetd reload > /dev/null 2>&1 || :
fi

%clean
rm -rf ${RPM_BUILD_ROOT}

%files
%defattr(-,root,root)
%{_bindir}/tftp
%{_mandir}/man1/*

%files
server
%defattr(-,root,root)
%config(noreplace) %{_sysconfdir}/xinetd.d/tftp
%dir /tftpboot
%{_sbindir}/in.tftpd
%{_mandir}/man8/*

%changelog
```

- \* Tue Sep 14 2004 H. Peter Anvin <hpa@zytor.com>
  - removed completely broken "Malta" patch.
  - integrated into build machinery so rpm -ta works.
  
- \* Fri Feb 13 2004 Elliot Lee <sopwith@redhat.com>
  - rebuilt
  
- \* Wed Jun 04 2003 Elliot Lee <sopwith@redhat.com>
  - rebuilt
  
- \* Fri Apr 11 2003 Elliot Lee <sopwith@redhat.com>
  - 0.33
  - Add /tftpboot directory (#88204)
  
- \* Mon Feb 24 2003 Elliot Lee <sopwith@redhat.com>
  - rebuilt
  
- \* Sun Feb 23 2003 Tim Powers <timp@redhat.com>
  - add BuildPreReq on tcp\_wrappers
  
- \* Wed Jan 22 2003 Tim Powers <timp@redhat.com>
  - rebuilt
  
- \* Mon Nov 11 2002 Elliot Lee <sopwith@redhat.com> 0.32-1
  - Update to 0.32
  
- \* Wed Oct 23 2002 Elliot Lee <sopwith@redhat.com> 0.30-1
  - Fix #55789
  - Update to 0.30
  
- \* Thu Jun 27 2002 Elliot Lee <sopwith@redhat.com>
  - Try applying HJ's patch from #65476
  
- \* Fri Jun 21 2002 Tim Powers <timp@redhat.com>
  - automated rebuild
  
- \* Mon Jun 17 2002 Elliot Lee <sopwith@redhat.com>
  - Update to 0.29
  
- \* Thu May 23 2002 Tim Powers <timp@redhat.com>
  - automated rebuild
  
- \* Wed Jan 09 2002 Tim Powers <timp@redhat.com>
  - automated rebuild
  
- \* Tue Dec 18 2001 Elliot Lee <sopwith@redhat.com> 0.17-15
  - Add patch4: netkit-tftp-0.17-defaultport.patch for bug #57562

- Update to tftp-hpa-0.28 (bug #56131)
- Remove include/arpa/tftp.h to fix #57259
- Add resource limits in tftp-xinetd (#56722)
  
- \* Sun Jun 24 2001 Elliot Lee <sopwith@redhat.com>
- Bump release + rebuild.
  
- \* Tue Jun 12 2001 Helge Deller <hdeller@redhat.de> (0.17-13)
- updated tftp-hpa source to tftp-hpa-0.17
- tweaked specfile with different defines for tftp-netkit and tftp-hpa version
- use hpa's tftpd.8 man page instead of the netkits one
  
- \* Mon May 07 2001 Helge Deller <hdeller@redhat.de>
- rebuilt in 7.1.x
  
- \* Wed Apr 18 2001 Helge Deller <hdeller@redhat.de>
- fix tftp client's put problems (#29529)
- update
- to tftp-hpa-0.16
  
- \* Wed Apr 4 2001 Jakub Jelinek <jakub@redhat.com>
- don't let configure to guess compiler, it can pick up eggs
  
- \* Thu Feb 08 2001 Helge Deller <hdeller@redhat.de>
- changed "wait" in xinetd file to "yes" (hpa-tftpd forks and exits) (#26467)
- fixed hpa-tftpd to handle files greater than 32MB (#23725)
- added "-l" flag to hpa-tftpd for file-logging (#26467)
- added description for "-l" to the man-page
  
- \* Thu Feb 08 2001 Helge Deller <hdeller@redhat.de>
- updated tftp client to 0.17 stable (#19640),
- drop dependency on xinetd for tftp client (#25051),
  
- \* Wed Jan 17 2001 Jeff Johnson <jbj@redhat.com>
- xinetd shouldn't wait on tftp (which forks) (#23923).
  
- \* Sat Jan 6 2001 Jeff Johnson <jbj@redhat.com>
- fix to permit tftp put's (#18128).
- startup as root with chroot to /tftpboot with early reversion to nobody is preferable to starting as nobody w/o ability to chroot.
- %%post is needed by server, not client. Add %%postun for erasure as well.
  
- \* Wed Aug 23 2000
- Nalin Dahyabhai <nalin@redhat.com>
- default to being disabled
  
- \* Thu Aug 17 2000 Jeff Johnson <jbj@redhat.com>
- correct group.

- \* Tue Jul 25 2000 Nalin Dahyabhai <nalin@redhat.com>
  - change user from root to nobody
  
- \* Sat Jul 22 2000 Jeff Johnson <jbj@redhat.com>
  - update to tftp-hpa-0.14 (#14003).
  - add server\_args (#14003).
  - remove -D\_BSD\_SOURCE (#14003).
  
- \* Fri Jul 21 2000 Nalin Dahyabhai <nalin@redhat.com>
  - cook up an xinetd config file for tftpd
  
- \* Wed Jul 12 2000 Prospector <bugzilla@redhat.com>
  - automatic rebuild
  
- \* Sun Jun 18 2000 Jeff Johnson <jbj@redhat.com>
  - FHS packaging.
  - update to 0.17.
  
- \* Fri May 5 2000 Matt Wilson <msw@redhat.com>
  - use \_BSD\_SOURCE for hpa's tftpd so we get BSD signal semantics.
  
- \* Fri Feb 11 2000 Bill Nottingham <notting@redhat.com>
  - fix description
  
- \* Wed Feb 9 2000 Jeff Johnson <jbj@redhat.com>
  - compress man pages (again).
  
- \* Wed Feb 02 2000 Cristian Gafton <gafton@redhat.com>
  - man pages are compressed
  - fix description and summary
  
- \* Tue  
Jan 4 2000 Bill Nottingham <notting@redhat.com>
  - split client and server
  
- \* Tue Dec 21 1999 Jeff Johnson <jbj@redhat.com>
  - update to 0.16.
  
- \* Sat Aug 28 1999 Jeff Johnson <jbj@redhat.com>
  - update to 0.15.
  
- \* Wed Apr 7 1999 Jeff Johnson <jbj@redhat.com>
  - tftpd should truncate file when overwriting (#412)
  
- \* Sun Mar 21 1999 Cristian Gafton <gafton@redhat.com>
  - auto rebuild in the new build environment (release 22)

\* Mon Mar 15 1999 Jeff Johnson <jbj@redhat.com>

- compile for 6.0.

\* Fri Aug 7 1998 Jeff Johnson <jbj@redhat.com>

- build root

\* Mon Apr 27 1998 Prospector System <bugs@redhat.com>

- translations modified for de, fr, tr

\* Mon Sep 22 1997 Erik Troan <ewt@redhat.com>

- added check for getpwnam() failure

\* Tue Jul 15 1997 Erik Troan <ewt@redhat.com>

- initial build

Found in path(s):

\* /opt/cola/permits/1820789344\_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftp.spec

No license file was found, but licenses were detected in source scan.

Summary: The client for the Trivial File Transfer Protocol (TFTP).

Name: tftp

Version: @@VERSION@@

Release: 1

License: BSD

Group: Applications/Internet

Source0: <http://www.kernel.org/pub/software/network/tftp/tftp-hpa-%{version}.tar.gz>

BuildRequires: tcp\_wrappers-devel

BuildRoot: %{\_tmppath}/%{name}-root

%description

The Trivial File Transfer Protocol (TFTP) is normally used only for booting diskless workstations. The tftp package provides the user interface for TFTP, which allows users to transfer files to and from a remote machine. This program and TFTP provide very little security, and should not be enabled unless it is expressly needed.

%package server

Group: System Environment/Daemons

Summary: The server for the Trivial File Transfer Protocol (TFTP).

Requires: xinetd

%description server

The Trivial File Transfer Protocol (TFTP) is normally used only for booting diskless workstations. The tftp-server package provides the server for TFTP, which allows users to transfer files to and from a remote machine. TFTP provides very little security, and should not be

enabled unless it is expressly needed. The TFTP server is run from /etc/xinetd.d/tftp, and is disabled by default on Red Hat Linux systems.

```
%prep
%setup -q -n tftp-hpa-%{version}

%build

%configure
make %{?_smp_mflags}

%install
rm -rf ${RPM_BUILD_ROOT}
mkdir -p ${RPM_BUILD_ROOT}%{_bindir}
mkdir -p ${RPM_BUILD_ROOT}%{_mandir}/man{1,8}
mkdir -p ${RPM_BUILD_ROOT}%{_sbindir}

make INSTALLROOT=${RPM_BUILD_ROOT} \
  SBINDIR=%{_sbindir} MANDIR=%{_mandir} \
  install
install -m755 -d ${RPM_BUILD_ROOT}%{_sysconfdir}/xinetd.d/ ${RPM_BUILD_ROOT}/tftpboot
install -m644 tftp-xinetd ${RPM_BUILD_ROOT}%{_sysconfdir}/xinetd.d/tftp

%post server
/sbin/service xinetd reload > /dev/null 2>&1 || :

%postun server
if [ $1 = 0 ]; then
  /sbin/service xinetd reload > /dev/null 2>&1 || :
fi

%clean
rm -rf ${RPM_BUILD_ROOT}

%files
%defattr(-,root,root)
%{_bindir}/tftp
%{_mandir}/man1/*

%files
server
%defattr(-,root,root)
%config(noreplace) %{_sysconfdir}/xinetd.d/tftp
%dir /tftpboot
%{_sbindir}/in.tftpd
%{_mandir}/man8/*

%changelog
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  - removed completely broken "Malta" patch.
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- Fri Jun 21 2002 Tim Powers <timp@redhat.com>
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  - Update to 0.29
  
- \* Thu May 23 2002 Tim Powers <timp@redhat.com>
  - automated rebuild
  
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  - Add patch4: netkit-tftp-0.17-defaultport.patch for bug #57562

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- \* Tue Jul 25 2000 Nalin Dahyabhai <nalin@redhat.com>
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  - update to tftp-hpa-0.14 (#14003).
  - add server\_args (#14003).
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- \* Sun Jun 18 2000 Jeff Johnson <jbj@redhat.com>
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  - update to 0.17.
  
- \* Fri May 5 2000 Matt Wilson <msw@redhat.com>
  - use \_BSD\_SOURCE for hpa's tftpd so we get BSD signal semantics.
  
- \* Fri Feb 11 2000 Bill Nottingham <notting@redhat.com>
  - fix description
  
- \* Wed Feb 9 2000 Jeff Johnson <jbj@redhat.com>
  - compress man pages (again).
  
- \* Wed Feb 02 2000 Cristian Gafton <gafton@redhat.com>
  - man pages are compressed
  - fix description and summary
  
- \*
  
- Tue Jan 4 2000 Bill Nottingham <notting@redhat.com>
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- \* Tue Dec 21 1999 Jeff Johnson <jbj@redhat.com>
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- \* Sun Mar 21 1999 Cristian Gafton <gafton@redhat.com>
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- build root

\* Mon Apr 27 1998 Prospector System <bugs@redhat.com>

- translations modified for de, fr, tr

\* Mon Sep 22 1997 Erik Troan <ewt@redhat.com>

- added check for getpwnam() failure

\* Tue Jul 15 1997 Erik Troan <ewt@redhat.com>

- initial build

Found in path(s):

\* /opt/cola/permits/1820789344\_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftp.spec.in

No license file was found, but licenses were detected in source scan.

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.\" documentation and/or other materials provided with the distribution.

.\" 3. Neither the name of the University nor the names of its contributors

.\" without specific prior written permission.

Found in path(s):

\* /opt/cola/permits/1820789344\_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftpd/tftpd.8.in

No license file was found, but licenses were detected in source scan.

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## This program is free software available under the same license

Found in path(s):

\* /opt/cola/permits/1820789344\_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/MCONFIG.in

No license file was found, but licenses were detected in source scan.

/\* ----- \*/  
\*

```
* Copyright 2001-2007 H. Peter Anvin - All Rights Reserved
*
* This program is free software available under the same license
* as the "OpenBSD" operating system, distributed at
* http://www.openbsd.org/.
*
* ----- */
```

Found in path(s):

```
* /opt/cola/permits/1820789344_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-
hpa-5.2/tftpd/remap.h
* /opt/cola/permits/1820789344_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-
hpa-5.2/tftpd/misc.c
* /opt/cola/permits/1820789344_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-
hpa-5.2/tftpd/remap.c
```

No license file was found, but licenses were detected in source scan.

```
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.\" Redistribution and use in source and binary forms, with or without
.\" modification, are permitted provided that the following conditions
.\" are met:
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.\" notice, this list of conditions and the following disclaimer in the
.\" documentation and/or other materials provided with the distribution.
.\" 3. Neither the name of the University nor the names of its contributors
.\" without specific prior written permission.
```

Found in path(s):

```
* /opt/cola/permits/1820789344_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-
hpa-5.2/tftp/tftp.1.in
```

No license file was found, but licenses were detected in source scan.

```
/* ----- *
*
* Copyright 2001-2006 H. Peter Anvin - All Rights Reserved
*
* This program is free software available under the same license
* as the "OpenBSD" operating system, distributed at
* http://www.openbsd.org/.
*
* ----- */
```

Found in path(s):

```
* /opt/cola/permits/1820789344_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-
hpa-5.2/tftpd/recvfrom.c
```

\* /opt/cola/permits/1820789344\_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftpd/recvfrom.h

# 1.243 libvirt 5.5.0

## 1.243.1 Available under license :

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Version 2.1, February 1999

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decide to use it. You  
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<signature of Ty Coon>, 1 April 1989  
Ty Coon, President of Vice

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Version 1.1 - 26 February 2007

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## 1.244 unbound 1.4.22

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## 1.245 vim 8.2

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\*uganda.txt\* For Vim version 8.2. Last change: 2019 Dec 07

VIM REFERENCE MANUAL by Bram Moolenaar

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SUMMARY

\*iccf\* \*ICCF\*

Vim is Charityware. You can use and copy it as much as you like, but you are encouraged to make a donation for needy children in Uganda. Please see [kcc] below or visit the ICCF web site, available at these URLs:

<http://iccf-holland.org/>

<http://www.vim.org/iccf/>

<http://www.iccf.nl/>

You can also sponsor the development of Vim. Vim sponsors can vote for features. See [\[sponsor\]](#). The money goes to Uganda anyway.

The Open Publication License applies to the Vim documentation, see [\[manual-copyright\]](#).

=== begin of license ===

## VIM LICENSE

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- 1) This license text must be included unmodified.
- 2) The modified Vim must be distributed in one of the following five ways:
  - a) If you make changes to Vim yourself, you must clearly describe in the distribution how to contact you. When the maintainer asks you (in any way) for a copy of the modified Vim you distributed, you must make your changes, including source code, available to the maintainer without fee. The maintainer reserves the right to include your changes in the official version of Vim. What the maintainer will do with your changes and under what license they will be distributed is negotiable. If there has been no negotiation

then this license, or a later version, also applies to your changes.

The current maintainer is Bram Moolenaar <[Bram@vim.org](mailto:Bram@vim.org)>. If this changes it will be announced in appropriate places (most likely [vim.sf.net](http://vim.sf.net), [www.vim.org](http://www.vim.org) and/or [comp.editors](http://comp.editors)). When it is completely impossible to contact the maintainer, the obligation to send him your changes ceases. Once the maintainer has confirmed that he has received your changes they will not have to be sent again.

- b) If you have received a modified Vim that was distributed as mentioned under a) you are allowed to further distribute it unmodified, as mentioned at I). If you make additional changes the text under a) applies to those changes.

- c) Provide all the changes, including source code, with every copy of the modified Vim you distribute. This may be done in the form of a context diff. You can choose what license to use for new code you add. The changes and their license must not restrict

others from

making their own changes to the official version of Vim.

d) When you have a modified Vim which includes changes as mentioned under c), you can distribute it without the source code for the changes if the following three conditions are met:

- The license that applies to the changes permits you to distribute the changes to the Vim maintainer without fee or restriction, and permits the Vim maintainer to include the changes in the official version of Vim without fee or restriction.
- You keep the changes for at least three years after last distributing the corresponding modified Vim. When the maintainer or someone who you distributed the modified Vim to asks you (in any way) for the changes within this period, you must make them available to him.
- You clearly describe in the distribution how to contact you. This contact information must remain valid for at least three years after last distributing the corresponding

modified Vim, or as long as possible.

e) When the GNU General Public License (GPL) applies to the changes, you can distribute the modified Vim under the GNU GPL version 2 or any later version.

3) A message must be added, at least in the output of the ":version" command and in the intro screen, such that the user of the modified Vim is able to see that it was modified. When distributing as mentioned under 2)e) adding the message is only required for as far as this does not conflict with the license used for the changes.

4) The contact information as required under 2)a) and 2)d) must not be removed or changed, except that the person himself can make corrections.

III) If you distribute a modified version of Vim, you are encouraged to use the Vim license for your changes and make them available to the maintainer, including the source code. The preferred way to do this is by e-mail or by uploading the files to a server and e-mailing the URL.

If the number of changes is small (e.g., a modified Makefile) e-mailing a context diff will do. The e-mail address to be used is <maintainer@vim.org>

IV) It is not allowed to remove this license from the distribution of the Vim sources, parts of it or from a modified version. You may use this license for previous Vim releases instead of the license that they came with, at your option.

=== end of license ===

Note:

- If you are happy with Vim, please express that by reading the rest of this file and consider helping needy children in Uganda.
- If you want to support further Vim development consider becoming a [sponsor]. The money goes to Uganda anyway.
- According to Richard Stallman the Vim license is GNU GPL compatible. A few minor changes have been made since he checked it, but that should not make a difference.
- If you link Vim with a library that goes under the GNU GPL, this limits further distribution to the GNU GPL. Also when you didn't actually change anything in Vim.
- Once a change is included that goes under the GNU GPL, this forces all further changes to also be made under the GNU GPL or a compatible license.
- If you distribute a modified version of Vim, you can include your name and contact information with the "--with-modified-by" configure argument or the MODIFIED\_BY define.

=====

Kibaale Children's Centre \*kcc\* \*Kibaale\* \*charity\*

Kibaale Children's Centre (KCC) is located in Kibaale, a small town in the south of Uganda, near Tanzania, in East Africa. The area is known as Rakai District. The population is mostly farmers. Although people are poor, there is enough food. But this district is suffering from AIDS more than any other part of the world. Some say that it started there. Estimations are that 10 to 30% of the Ugandans are infected with HIV. Because parents die, there are many orphans. In this district about 60,000 children have lost one or both parents, out of a population of 350,000. And this is still continuing.

The children need a lot of help. The KCC is working hard to provide the needy with food, medical care and education. Food and medical care to keep them healthy now, and education so that they can take care of themselves in the future. KCC works on a Christian base, but help is given to children of any religion.

The key to solving the problems in this area is education. This has been neglected in the past years with president Idi Amin and the following civil wars. Now that the government is stable again, the children and parents have to learn how to take care of themselves and how to avoid infections. There is also help for people who are ill and hungry, but the primary goal is to prevent people from getting ill and to teach them how to grow healthy food.

Most of the orphans are living in an extended family. An uncle or older sister is taking care of them. Because these families are big and the income (if any) is low, a child is lucky if it gets healthy food. Clothes, medical care and schooling is beyond its reach. To help these needy children, a sponsorship program was put into place. A child can be financially adopted. For a few dollars a month KCC sees to it that the child gets indispensable items, is healthy, goes to school and KCC takes care of anything else that needs to be done for the child and the family that supports it.

Besides helping the child directly, the environment where the child grows up needs to be improved. KCC helps schools to improve their teaching methods. There is a demonstration school at the centre and teacher trainings are given. Health workers are being trained, hygiene education is carried out and households are stimulated to build a proper latrine. I helped setting up a production site for cement slabs. These are used to build a good latrine. They are sold below cost price.

There is a small clinic at the project, which provides children and their family with medical help. When needed, transport to a hospital is offered. Immunization programs are carried out and help is provided when an epidemic is breaking out (measles and cholera have been a problem).

\*donate\*

Summer 1994 to summer 1995 I spent a whole year at the centre, working as a volunteer. I have helped to expand the centre and worked in the area of water and sanitation. I learned that the help that the KCC provides really helps. When I came back to Holland, I wanted to continue supporting KCC. To do this I'm raising funds and organizing the sponsorship program. Please consider one of these possibilities:

1. Sponsor a child in primary school: 17 euro a month (or more).
2. Sponsor a child in secondary school: 25 euro a month (or more).
3. Sponsor the clinic: Any amount a month or quarter
4. A one-time donation

Compared with other organizations that do child sponsorship the amounts are very low. This is because the money goes directly to the centre. Less than 5% is used for administration. This is possible because this is a small organization that works with volunteers. If you would like to sponsor a child, you should have the intention to do this for at least one year.

How do you know that the money will be spent right? First of all you have my personal guarantee as the author of Vim. I trust the people that are working at the centre, I know them personally. Furthermore, the centre has been co-sponsored and inspected by World Vision, Save the Children Fund and is now



under the supervision of Pacific Academy Outreach Society. The centre is visited about once a year to check the progress (at our own cost). I have visited the centre myself many times, starting in 1993. The visit reports are on the ICCF web site.

If you have any further questions, send me e-mail: <Bram@vim.org>.

The address of the centre is:

Kibaale Children's Centre  
p.o.  
box 1658  
Masaka, Uganda, East Africa

Sending money: \*iccf-donations\*

Check the ICCF web site for the latest information! See [|iccf|](#) for the URL.

USA: The methods mentioned below can be used.

Sending a check to the Nehemiah Group Outreach Society (NGOS) is no longer possible, unfortunately. We are looking for another way to get you an IRS tax receipt.

For sponsoring a child contact KCF in Canada (see below). US checks can be sent to them to lower banking costs.

Canada: Contact Kibaale Children's Fund (KCF) in Surrey, Canada. They take care of the Canadian sponsors for the children in Kibaale. KCF forwards 100% of the money to the project in Uganda. You can send them a one time donation directly. Please send me a note so that I know what has been donated because of Vim. Ask KCF for information about sponsorship.

Kibaale Children's Fund c/o Pacific Academy  
10238-168 Street  
Surrey, B.C. V4N 1Z4  
Canada  
Phone: 604-581-5353

If

you make a donation to Kibaale Children's Fund (KCF) you will receive a tax receipt which can be submitted with your tax return.

Holland: Transfer to the account of "Stichting ICCF Holland" in Lisse.

This will allow for tax deduction if you live in Holland.

Postbank, nr. 4548774  
IBAN: NL95 INGB 0004 5487 74

Germany: It is possible to make donations that allow for a tax return.

Check the ICCF web site for the latest information:

<http://iccf-holland.org/germany.html>

World: Use a postal money order. That should be possible from any country, mostly from the post office. Use this name (which is in my passport): "Abraham Moolenaar". Use Euro for the currency if possible.

Europe: Use a bank transfer if possible. Your bank should have a form that you can use for this. See "Others" below for the swift code and IBAN number.

Any other method should work. Ask for information about sponsorship.

Credit Card: You can use PayPal to send money with a Credit card. This is

the most widely used Internet based payment system. It's really simple to use. Use this link to find more info:

[https://www.paypal.com/en\\_US/mrb/pal=XAC62PML3GF8Q](https://www.paypal.com/en_US/mrb/pal=XAC62PML3GF8Q)

The e-mail address for sending the money to is:

[Bram@iccf-holland.org](mailto:Bram@iccf-holland.org)

For amounts above 400 Euro (\$500) sending a check is preferred.

Others: Transfer to one of these accounts if possible:

Postbank, account 4548774

Swift code: INGB NL 2A

IBAN: NL95 INGB 0004 5487 74

under the name "stichting ICCF Holland", Lisse

If that doesn't work:

Rabobank Lisse, account 3765.05.117

Swift code: RABO NL 2U

under the name "Bram Moolenaar", Lisse

Otherwise, send a check in euro or US dollars to the address below. Minimal amount: \$70 (my bank does not accept smaller amounts for foreign check, sorry)

Address to send checks to:

Bram Moolenaar

Finsterruetihof 1

8134 Adliswil

Switzerland

This address is expected to be valid for a long time.

vim:tw=78:ts=8:noet:ft=help:norl:

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Version 2.1, February 1999

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Section 6 states terms for distribution of such executables.

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If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

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Any executables

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# 1.246 rsync 3.2.5

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Version 3, 29 June 2007

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# 1.248 dnsmasq 2.87

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## 1.252 d-bus 1.14.6

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## 1.253 socat 1.7.4.4

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THE BASIC LIBRARY FUNCTIONS

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Written by: Philip Hazel  
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## THE BASIC LIBRARY FUNCTIONS

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Email local part: ph10  
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Version 3, 29 June 2007

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## 1.261 python-pip 22.2.2

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ca-bundle.crt -- Bundle of CA Root Certificates

Certificate data from Mozilla as of: Thu Nov 3 19:04:19 2011#

This is a bundle of X.509 certificates of public Certificate Authorities (CA). These were automatically extracted from Mozilla's root certificates file (certdata.txt). This file can be found in the mozilla source tree:

<http://mxr.mozilla.org/mozilla/source/security/nss/lib/ckfw/builtins/certdata.txt?raw=1#>

It contains the certificates in PEM format and therefore can be directly used with curl / libcurl / php\_curl, or with an Apache+mod\_ssl webserver for SSL client authentication.

Just configure this file as the SSLCACertificateFile.#

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@(#) \$RCSfile: certdata.txt,v \$

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## A. HISTORY OF THE SOFTWARE

=====

Python was created in the early 1990s by Guido van Rossum at Stichting Mathematisch Centrum (CWI, see <http://www.cwi.nl>) in the Netherlands as a successor of a language called ABC. Guido remains Python's principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for National Research Initiatives (CNRI, see <http://www.cnri.reston.va.us>) in Reston, Virginia where he released several versions of the software.

In May 2000, Guido and the Python core development team moved to BeOpen.com to form the BeOpen PythonLabs team. In October of the same year, the PythonLabs team moved to Digital Creations (now Zope Corporation, see <http://www.zope.com>). In 2001, the Python Software Foundation (PSF, see <http://www.python.org/psf/>) was formed, a non-profit organization created specifically to own Python-related Intellectual Property. Zope Corporation is a sponsoring member of the PSF.

All Python releases are Open Source (see <http://www.opensource.org> for the Open Source Definition). Historically, most, but not all, Python releases have also been GPL-compatible; the table below summarizes the various releases.

| Release        | Derived from | Year      | Owner      | GPL-compatible? (1) |
|----------------|--------------|-----------|------------|---------------------|
| 0.9.0 thru 1.2 |              | 1991-1995 | CWI        | yes                 |
| 1.3 thru 1.5.2 | 1.2          | 1995-1999 | CNRI       | yes                 |
| 1.6            | 1.5.2        | 2000      | CNRI       | no                  |
| 2.0            | 1.6          | 2000      | BeOpen.com | no                  |
| 1.6.1          | 1.6          | 2001      | CNRI       | yes (2)             |
| 2.1            | 2.0+1.6.1    | 2001      | PSF        | no                  |
| 2.0.1          | 2.0+1.6.1    | 2001      | PSF        | yes                 |
| 2.1.1          | 2.1+2.0.1    | 2001      | PSF        | yes                 |
| 2.2            | 2.1.1        | 2001      | PSF        | yes                 |
| 2.1.2          | 2.1.1        | 2002      | PSF        | yes                 |
| 2.1.3          |              |           |            |                     |
| 2.1.2          | 2002         | PSF       | yes        |                     |
| 2.2.1          | 2.2          | 2002      | PSF        | yes                 |
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|       |       |           |     |     |
|-------|-------|-----------|-----|-----|
| 2.3.2 | 2.3.1 | 2002-2003 | PSF | yes |
| 2.3.3 | 2.3.2 | 2002-2003 | PSF | yes |
| 2.3.4 | 2.3.3 | 2004      | PSF | yes |
| 2.3.5 | 2.3.4 | 2005      | PSF | yes |
| 2.4   | 2.3   | 2004      | PSF | yes |
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| 2.6.2 | 2.6.1 | 2009      | PSF | yes |
| 2.6.3 | 2.6.2 | 2009      | PSF | yes |
| 2.6.4 | 2.6.3 | 2009      | PSF | yes |
| 2.6.5 | 2.6.4 | 2010      | PSF | yes |
| 3.0   | 2.6   | 2008      | PSF | yes |
| 3.0.1 | 3.0   | 2009      | PSF | yes |
| 3.1   | 3.0.1 | 2009      | PSF | yes |
| 3.1.1 | 3.1   | 2009      | PSF | yes |
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| 1.6            | 1.5.2        | 2000      | CNRI       | no                  |
| 2.0            | 1.6          | 2000      | BeOpen.com | no                  |
| 1.6.1          | 1.6          | 2001      | CNRI       | yes (2)             |
| 2.1            | 2.0+1.6.1    | 2001      | PSF        | no                  |
| 2.0.1          | 2.0+1.6.1    | 2001      | PSF        | yes                 |

|               |           |      |     |     |
|---------------|-----------|------|-----|-----|
| 2.1.1         | 2.1+2.0.1 | 2001 | PSF | yes |
| 2.1.2         | 2.1.1     | 2002 | PSF | yes |
| 2.1.3         | 2.1.2     | 2002 | PSF | yes |
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| 2.1.1         | 2001-now  | PSF  |     | yes |

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## 1.263 python-pip 22.2.1

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This package contains a modified version of ca-bundle.crt:

ca-bundle.crt -- Bundle of CA Root Certificates

Certificate data from Mozilla as of: Thu Nov 3 19:04:19 2011#

This is a bundle of X.509 certificates of public Certificate Authorities (CA). These were automatically extracted from Mozilla's root certificates file (certdata.txt). This file can be found in the mozilla source tree:

<http://mxr.mozilla.org/mozilla/source/security/nss/lib/ckfw/builtins/certdata.txt?raw=1#>

It contains the certificates in PEM format and therefore can be directly used with curl / libcurl / php\_curl, or with an Apache+mod\_ssl webserver for SSL client authentication.

Just configure this file as the SSLCACertificateFile.#

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@(#) \$RCSfile: certdata.txt,v \$

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#### A. HISTORY OF THE SOFTWARE

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Python was created in the early 1990s by Guido van Rossum at Stichting Mathematisch Centrum (CWI, see <http://www.cwi.nl>) in the Netherlands as a successor of a language called ABC. Guido remains Python's principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for National Research Initiatives (CNRI, see <http://www.cnri.reston.va.us>) in Reston, Virginia where he released several versions of the software.

In May 2000, Guido and the Python core development team moved to BeOpen.com to form the BeOpen PythonLabs team. In October of the same year, the PythonLabs team moved to Digital Creations (now Zope Corporation, see <http://www.zope.com>). In 2001, the Python Software Foundation (PSF, see <http://www.python.org/psf/>) was formed, a non-profit organization created specifically to own Python-related Intellectual Property. Zope Corporation is a sponsoring member of the PSF.

All Python releases are Open Source (see <http://www.opensource.org> for the Open Source Definition). Historically, most, but not all, Python releases have also been GPL-compatible; the table below summarizes the various releases.

| Release | Derived | Year | Owner | GPL- |
|---------|---------|------|-------|------|
|---------|---------|------|-------|------|

|                | from      |           |            | compatible? (1) |
|----------------|-----------|-----------|------------|-----------------|
| 0.9.0 thru 1.2 |           | 1991-1995 | CWI        | yes             |
| 1.3 thru 1.5.2 | 1.2       | 1995-1999 | CNRI       | yes             |
| 1.6            | 1.5.2     | 2000      | CNRI       | no              |
| 2.0            | 1.6       | 2000      | BeOpen.com | no              |
| 1.6.1          | 1.6       | 2001      | CNRI       | yes (2)         |
| 2.1            | 2.0+1.6.1 | 2001      | PSF        | no              |
| 2.0.1          | 2.0+1.6.1 | 2001      | PSF        | yes             |
| 2.1.1          | 2.1+2.0.1 | 2001      | PSF        | yes             |
| 2.2            | 2.1.1     | 2001      | PSF        | yes             |
| 2.1.2          | 2.1.1     | 2002      | PSF        | yes             |
| 2.1.3          |           |           |            |                 |
| 2.1.2          | 2002      | PSF       |            | yes             |
| 2.2.1          | 2.2       | 2002      | PSF        | yes             |
| 2.2.2          | 2.2.1     | 2002      | PSF        | yes             |
| 2.2.3          | 2.2.2     | 2003      | PSF        | yes             |
| 2.3            | 2.2.2     | 2002-2003 | PSF        | yes             |
| 2.3.1          | 2.3       | 2002-2003 | PSF        | yes             |
| 2.3.2          | 2.3.1     | 2002-2003 | PSF        | yes             |
| 2.3.3          | 2.3.2     | 2002-2003 | PSF        | yes             |
| 2.3.4          | 2.3.3     | 2004      | PSF        | yes             |
| 2.3.5          | 2.3.4     | 2005      | PSF        | yes             |
| 2.4            | 2.3       | 2004      | PSF        | yes             |
| 2.4.1          | 2.4       | 2005      | PSF        | yes             |
| 2.4.2          | 2.4.1     | 2005      | PSF        | yes             |
| 2.4.3          | 2.4.2     | 2006      | PSF        | yes             |
| 2.4.4          | 2.4.3     | 2006      | PSF        | yes             |
| 2.5            | 2.4       | 2006      | PSF        | yes             |
| 2.5.1          | 2.5       | 2007      | PSF        | yes             |
| 2.5.2          | 2.5.1     | 2008      | PSF        | yes             |
| 2.5.3          | 2.5.2     | 2008      | PSF        | yes             |
| 2.6            | 2.5       | 2008      | PSF        | yes             |
| 2.6.1          | 2.6       | 2008      | PSF        | yes             |
| 2.6.2          | 2.6.1     | 2009      | PSF        | yes             |
| 2.6.3          | 2.6.2     | 2009      | PSF        | yes             |
| 2.6.4          | 2.6.3     | 2009      | PSF        | yes             |
| 2.6.5          | 2.6.4     | 2010      | PSF        | yes             |
| 3.0            | 2.6       | 2008      | PSF        | yes             |
| 3.0.1          | 3.0       | 2009      | PSF        | yes             |
| 3.1            | 3.0.1     | 2009      | PSF        | yes             |
| 3.1.1          | 3.1       | 2009      | PSF        | yes             |
| 3.1.2          | 3.1       | 2010      | PSF        | yes             |
| 3.2            | 3.1       | 2010      | PSF        | yes             |

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A. HISTORY OF THE SOFTWARE

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Python was created in the early 1990s by Guido van Rossum at Stichting  
Mathematisch Centrum (CWI, see <http://www.cwi.nl>) in the Netherlands  
as a successor of a language called ABC. Guido remains Python's  
principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for  
National Research Initiatives (CNRI, see <http://www.cnri.reston.va.us>)  
in Reston, Virginia where he released several versions of the  
software.

In May 2000, Guido and the Python core development team moved to  
BeOpen.com to form the BeOpen PythonLabs team. In October of the same  
year, the PythonLabs team moved to Digital Creations (now Zope  
Corporation, see <http://www.zope.com>). In 2001, the Python Software  
Foundation (PSF, see <http://www.python.org/psf/>) was formed, a  
non-profit organization created specifically to own Python-related  
Intellectual Property. Zope Corporation is a sponsoring member

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the PSF.

All Python releases are Open Source (see <http://www.opensource.org> for the Open Source Definition). Historically, most, but not all, Python releases have also been GPL-compatible; the table below summarizes the various releases.

| Release        | Derived from | Year      | Owner      | GPL-compatible? (1) |
|----------------|--------------|-----------|------------|---------------------|
| 0.9.0 thru 1.2 |              | 1991-1995 | CWI        | yes                 |
| 1.3 thru 1.5.2 | 1.2          | 1995-1999 | CNRI       | yes                 |
| 1.6            | 1.5.2        | 2000      | CNRI       | no                  |
| 2.0            | 1.6          | 2000      | BeOpen.com | no                  |
| 1.6.1          | 1.6          | 2001      | CNRI       | yes (2)             |
| 2.1            | 2.0+1.6.1    | 2001      | PSF        | no                  |
| 2.0.1          | 2.0+1.6.1    | 2001      | PSF        | yes                 |
| 2.1.1          | 2.1+2.0.1    | 2001      | PSF        | yes                 |
| 2.1.2          | 2.1.1        | 2002      | PSF        | yes                 |
| 2.1.3          | 2.1.2        | 2002      | PSF        | yes                 |
| 2.2 and above  |              |           |            |                     |
| 2.1.1          | 2001-now     | PSF       |            | yes                 |

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(2) According to Richard Stallman, 1.6.1 is not GPL-compatible, because its license has a choice of law clause. According to CNRI, however, Stallman's lawyer has told CNRI's lawyer that 1.6.1 is "not incompatible" with the GPL.

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## 1.264 python-certifi 2022.09.14

### 1.264.1 Available under license :

This package contains a modified version of ca-bundle.crt:

ca-bundle.crt -- Bundle of CA Root Certificates

Certificate data from Mozilla as of: Thu Nov 3 19:04:19 2011#

This is a bundle of X.509 certificates of public Certificate Authorities (CA). These were automatically extracted from Mozilla's root certificates file (certdata.txt). This file can be found in the mozilla source tree:

<https://hg.mozilla.org/mozilla-central/file/tip/security/nss/lib/ckfw/builtins/certdata.txt>

It contains the certificates in PEM format and therefore can be directly used with curl / libcurl / php\_curl, or with an Apache+mod\_ssl webserver for SSL client authentication.

Just configure this file as the SSLCACertificateFile.#

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@(#) \$RCSfile: certdata.txt,v

\$ \$Revision: 1.80 \$ \$Date: 2011/11/03 15:11:58 \$

## 1.265 tftp-hpa 5.2

### 1.265.1 Available under license :

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```

Found in path(s):

\* /opt/cola/permits/1833546142\_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftpd/tftpd.8.in

No license file was found, but licenses were detected in source scan.

Summary: The client for the Trivial File Transfer Protocol (TFTP).

Name: tftp

Version: 5.2

Release: 1

License: BSD

Group: Applications/Internet

Source0: <http://www.kernel.org/pub/software/network/tftp/tftp-hpa-%{version}.tar.gz>

BuildRequires: tcp\_wrappers-devel

BuildRoot: %{\_tmppath}/%{name}-root

%description

The Trivial File Transfer Protocol (TFTP) is normally used only for booting diskless workstations. The tftp package provides the user interface for TFTP, which allows users to transfer files to and from a remote machine. This program and TFTP provide very little security, and should not be enabled unless it is expressly needed.

%package server

Group: System Environment/Daemons

Summary: The server for the Trivial File Transfer Protocol (TFTP).

Requires: xinetd

%description server

The Trivial File Transfer Protocol (TFTP) is normally used only for booting diskless workstations. The tftp-server package provides the server for TFTP, which allows users to transfer files to and from a remote machine. TFTP provides very little security, and should not be enabled unless it is expressly needed. The TFTP server is run from /etc/xinetd.d/tftp, and is disabled by default on Red Hat Linux systems.

%prep

%setup -q -n tftp-hpa-%{version}

%build

%configure

make %{?\_smp\_mflags}

%install

rm -rf \${RPM\_BUILD\_ROOT}

mkdir -p \${RPM\_BUILD\_ROOT}%{\_bindir}



```

mkdir -p ${RPM_BUILD_ROOT}%{_mandir}/man{1,8}
mkdir -p ${RPM_BUILD_ROOT}%{_sbindir}

make INSTALLROOT=${RPM_BUILD_ROOT} \
  SBINDIR=%{_sbindir} MANDIR=%{_mandir} \
  install
install -m755 -d ${RPM_BUILD_ROOT}%{_sysconfdir}/xinetd.d/ ${RPM_BUILD_ROOT}/tftpboot
install -m644 tftp-xinetd ${RPM_BUILD_ROOT}%{_sysconfdir}/xinetd.d/tftp

%post server
/sbin/service xinetd reload > /dev/null 2>&1 || :

%postun server
if [ $1 = 0 ]; then
  /sbin/service xinetd reload > /dev/null 2>&1 || :
fi

%clean
rm -rf ${RPM_BUILD_ROOT}

%files
%defattr(-,root,root)
%{_bindir}/tftp
%{_mandir}/man1/*

%files
server
%defattr(-,root,root)
%config(noreplace) %{_sysconfdir}/xinetd.d/tftp
%dir /tftpboot
%{_sbindir}/in.tftpd
%{_mandir}/man8/*

%changelog
* Tue Sep 14 2004 H. Peter Anvin <hpa@zytor.com>
- removed completely broken "Malta" patch.
- integrated into build machinery so rpm -ta works.

* Fri Feb 13 2004 Elliot Lee <sopwith@redhat.com>
- rebuilt

* Wed Jun 04 2003 Elliot Lee <sopwith@redhat.com>
- rebuilt

* Fri Apr 11 2003 Elliot Lee <sopwith@redhat.com>
- 0.33
- Add /tftpboot directory (#88204)

```

- \* Mon Feb 24 2003 Elliot Lee <sopwith@redhat.com>  
- rebuilt
  
- \* Sun Feb 23 2003 Tim Powers <timp@redhat.com>  
- add BuildPreReq on tcp\_wrappers
  
- \* Wed Jan 22 2003 Tim Powers <timp@redhat.com>  
- rebuilt
  
- \* Mon Nov 11 2002 Elliot Lee <sopwith@redhat.com> 0.32-1  
- Update to 0.32
  
- \* Wed Oct 23 2002 Elliot Lee <sopwith@redhat.com> 0.30-1  
- Fix #55789  
- Update to 0.30
  
- \* Thu Jun 27 2002 Elliot Lee <sopwith@redhat.com>  
- Try applying HJ's patch from #65476
  
- \* Fri Jun  
21 2002 Tim Powers <timp@redhat.com>  
- automated rebuild
  
- \* Mon Jun 17 2002 Elliot Lee <sopwith@redhat.com>  
- Update to 0.29
  
- \* Thu May 23 2002 Tim Powers <timp@redhat.com>  
- automated rebuild
  
- \* Wed Jan 09 2002 Tim Powers <timp@redhat.com>  
- automated rebuild
  
- \* Tue Dec 18 2001 Elliot Lee <sopwith@redhat.com> 0.17-15  
- Add patch4: netkit-tftp-0.17-defaultport.patch for bug #57562  
- Update to tftp-hpa-0.28 (bug #56131)  
- Remove include/arpa/tftp.h to fix #57259  
- Add resource limits in tftp-xinetd (#56722)
  
- \* Sun Jun 24 2001 Elliot Lee <sopwith@redhat.com>  
- Bump release + rebuild.
  
- \* Tue Jun 12 2001 Helge Deller <hdeller@redhat.de> (0.17-13)  
- updated tftp-hpa source to tftp-hpa-0.17  
- tweaked specfile with different defines for tftp-netkit and tftp-hpa version  
- use hpa's tftpd.8 man page instead of the netkits one
  
- \* Mon May 07 2001 Helge Deller <hdeller@redhat.de>  
- rebuilt in 7.1.x

- \* Wed Apr 18 2001 Helge Deller <hdeller@redhat.de>
  - fix tftp client's put problems (#29529)
  - update
  - to tftp-hpa-0.16
  
- \* Wed Apr 4 2001 Jakub Jelinek <jakub@redhat.com>
  - don't let configure to guess compiler, it can pick up eggs
  
- \* Thu Feb 08 2001 Helge Deller <hdeller@redhat.de>
  - changed "wait" in xinetd file to "yes" (hpa-tftpd forks and exits) (#26467)
  - fixed hpa-tftpd to handle files greater than 32MB (#23725)
  - added "-l" flag to hpa-tftpd for file-logging (#26467)
  - added description for "-l" to the man-page
  
- \* Thu Feb 08 2001 Helge Deller <hdeller@redhat.de>
  - updated tftp client to 0.17 stable (#19640),
  - drop dependency on xinetd for tftp client (#25051),
  
- \* Wed Jan 17 2001 Jeff Johnson <jbj@redhat.com>
  - xinetd shouldn't wait on tftp (which forks) (#23923).
  
- \* Sat Jan 6 2001 Jeff Johnson <jbj@redhat.com>
  - fix to permit tftp put's (#18128).
  - startup as root with chroot to /tftpboot with early reversion to nobody is preferable to starting as nobody w/o ability to chroot.
  - %%post is needed by server, not client. Add %%postun for erasure as well.
  
- \* Wed Aug 23 2000
  - Nalin Dahyabhai <nalin@redhat.com>
  - default to being disabled
  
- \* Thu Aug 17 2000 Jeff Johnson <jbj@redhat.com>
  - correct group.
  
- \* Tue Jul 25 2000 Nalin Dahyabhai <nalin@redhat.com>
  - change user from root to nobody
  
- \* Sat Jul 22 2000 Jeff Johnson <jbj@redhat.com>
  - update to tftp-hpa-0.14 (#14003).
  - add server\_args (#14003).
  - remove -D\_BSD\_SOURCE (#14003).
  
- \* Fri Jul 21 2000 Nalin Dahyabhai <nalin@redhat.com>
  - cook up an xinetd config file for tftpd
  
- \* Wed Jul 12 2000 Prospector <bugzilla@redhat.com>
  - automatic rebuild

- \* Sun Jun 18 2000 Jeff Johnson <jbj@redhat.com>
  - FHS packaging.
  - update to 0.17.
  
- \* Fri May 5 2000 Matt Wilson <msw@redhat.com>
  - use `_BSD_SOURCE` for hpa's tftpd so we get BSD signal semantics.
  
- \* Fri Feb 11 2000 Bill Nottingham <notting@redhat.com>
  - fix description
  
- \* Wed Feb 9 2000 Jeff Johnson <jbj@redhat.com>
  - compress man pages (again).
  
- \* Wed Feb 02 2000 Cristian Gafton <gafton@redhat.com>
  - man pages are compressed
  - fix description and summary
  
- \* Tue
  - Jan 4 2000 Bill Nottingham <notting@redhat.com>
    - split client and server
  
- \* Tue Dec 21 1999 Jeff Johnson <jbj@redhat.com>
  - update to 0.16.
  
- \* Sat Aug 28 1999 Jeff Johnson <jbj@redhat.com>
  - update to 0.15.
  
- \* Wed Apr 7 1999 Jeff Johnson <jbj@redhat.com>
  - tftpd should truncate file when overwriting (#412)
  
- \* Sun Mar 21 1999 Cristian Gafton <gafton@redhat.com>
  - auto rebuild in the new build environment (release 22)
  
- \* Mon Mar 15 1999 Jeff Johnson <jbj@redhat.com>
  - compile for 6.0.
  
- \* Fri Aug 7 1998 Jeff Johnson <jbj@redhat.com>
  - build root
  
- \* Mon Apr 27 1998 Prospector System <bugs@redhat.com>
  - translations modified for de, fr, tr
  
- \* Mon Sep 22 1997 Erik Troan <ewt@redhat.com>
  - added check for `getpwnam()` failure
  
- \* Tue Jul 15 1997 Erik Troan <ewt@redhat.com>
  - initial build

Found in path(s):

\* /opt/cola/permits/1833546142\_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftp.spec

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Found in path(s):

\* /opt/cola/permits/1833546142\_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp/tftp.1.in

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Found in path(s):

\* /opt/cola/permits/1833546142\_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/config.h

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Found in path(s):

```
* /opt/cola/permits/1833546142_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftpd/remap.h
* /opt/cola/permits/1833546142_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftpd/remap.c
* /opt/cola/permits/1833546142_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftpd/misc.c
```

No license file was found, but licenses were detected in source scan.

Summary: The client for the Trivial File Transfer Protocol (TFTP).

Name: tftp

Version: @@VERSION@@

Release: 1

License: BSD

Group: Applications/Internet

Source0: <http://www.kernel.org/pub/software/network/tftp/tftp-hpa-%{version}.tar.gz>

BuildRequires: tcp\_wrappers-devel

BuildRoot: %{\_tmppath}/%{name}-root

%description

The Trivial File Transfer Protocol (TFTP) is normally used only for booting diskless workstations. The tftp package provides the user interface for TFTP, which allows users to transfer files to and from a remote machine. This program and TFTP provide very little security, and should not be enabled unless it is expressly needed.

%package server

Group: System Environment/Daemons

Summary: The server for the Trivial File Transfer Protocol (TFTP).

Requires: xinetd

%description server

The Trivial File Transfer Protocol (TFTP) is normally used only for booting diskless workstations. The tftp-server package provides the server for TFTP, which allows users to transfer files to and from a remote machine. TFTP provides very little security, and should not be enabled unless it is expressly needed. The TFTP server is run from /etc/xinetd.d/tftp, and is disabled by default on Red Hat Linux systems.

%prep

%setup -q -n tftp-hpa-%{version}

%build

%configure

make %{?\_smp\_mflags}

```

%install
rm -rf ${RPM_BUILD_ROOT}
mkdir -p ${RPM_BUILD_ROOT}%{_bindir}
mkdir -p ${RPM_BUILD_ROOT}%{_mandir}/man{1,8}
mkdir -p ${RPM_BUILD_ROOT}%{_sbindir}

make INSTALLROOT=${RPM_BUILD_ROOT} \
    SBINDIR=%{_sbindir} MANDIR=%{_mandir} \
install
install -m755 -d ${RPM_BUILD_ROOT}%{_sysconfdir}/xinetd.d/ ${RPM_BUILD_ROOT}/tftpboot
install -m644 tftp-xinetd ${RPM_BUILD_ROOT}%{_sysconfdir}/xinetd.d/tftp

%post server
/sbin/service xinetd reload > /dev/null 2>&1 || :

%postun server
if [ $1 = 0 ]; then
    /sbin/service xinetd reload > /dev/null 2>&1 || :
fi

%clean
rm -rf ${RPM_BUILD_ROOT}

%files
%defattr(-,root,root)
%{_bindir}/tftp
%{_mandir}/man1/*

%files
server
%defattr(-,root,root)
%config(noreplace) %{_sysconfdir}/xinetd.d/tftp
%dir /tftpboot
%{_sbindir}/in.tftpd
%{_mandir}/man8/*

%changelog
* Tue Sep 14 2004 H. Peter Anvin <hpa@zytor.com>
- removed completely broken "Malta" patch.
- integrated into build machinery so rpm -ta works.

* Fri Feb 13 2004 Elliot Lee <sopwith@redhat.com>
- rebuilt

* Wed Jun 04 2003 Elliot Lee <sopwith@redhat.com>
- rebuilt

```

- \* Fri Apr 11 2003 Elliot Lee <sopwith@redhat.com>
  - 0.33
  - Add /tftpboot directory (#88204)
  
- \* Mon Feb 24 2003 Elliot Lee <sopwith@redhat.com>
  - rebuilt
  
- \* Sun Feb 23 2003 Tim Powers <timp@redhat.com>
  - add BuildPreReq on tcp\_wrappers
  
- \* Wed Jan 22 2003 Tim Powers <timp@redhat.com>
  - rebuilt
  
- \* Mon Nov 11 2002 Elliot Lee <sopwith@redhat.com> 0.32-1
  - Update to 0.32
  
- \* Wed Oct 23 2002 Elliot Lee <sopwith@redhat.com> 0.30-1
  - Fix #55789
  - Update to 0.30
  
- \* Thu Jun 27 2002 Elliot Lee <sopwith@redhat.com>
  - Try applying HJ's patch from #65476
  
- \*
- Fri Jun 21 2002 Tim Powers <timp@redhat.com>
  - automated rebuild
  
- \* Mon Jun 17 2002 Elliot Lee <sopwith@redhat.com>
  - Update to 0.29
  
- \* Thu May 23 2002 Tim Powers <timp@redhat.com>
  - automated rebuild
  
- \* Wed Jan 09 2002 Tim Powers <timp@redhat.com>
  - automated rebuild
  
- \* Tue Dec 18 2001 Elliot Lee <sopwith@redhat.com> 0.17-15
  - Add patch4: netkit-tftp-0.17-defaultport.patch for bug #57562
  - Update to tftp-hpa-0.28 (bug #56131)
  - Remove include/arpa/tftp.h to fix #57259
  - Add resource limits in tftp-xinetd (#56722)
  
- \* Sun Jun 24 2001 Elliot Lee <sopwith@redhat.com>
  - Bump release + rebuild.
  
- \* Tue Jun 12 2001 Helge Deller <hdeller@redhat.de> (0.17-13)
  - updated tftp-hpa source to tftp-hpa-0.17
  - tweaked specfile with different defines for tftp-netkit and tftp-hpa version



- use hpa's tftpd.8 man page instead of the netkits one
  
- \* Mon May 07 2001 Helge Deller <hdeller@redhat.de>
  - rebuilt in 7.1.x
  
- \* Wed Apr 18 2001 Helge Deller <hdeller@redhat.de>
  - fix tftp client's put problems (#29529)
  - 
  - update to tftp-hpa-0.16
  
- \* Wed Apr 4 2001 Jakub Jelinek <jakub@redhat.com>
  - don't let configure to guess compiler, it can pick up eggs
  
- \* Thu Feb 08 2001 Helge Deller <hdeller@redhat.de>
  - changed "wait" in xinetd file to "yes" (hpa-tftpd forks and exits) (#26467)
  - fixed hpa-tftpd to handle files greater than 32MB (#23725)
  - added "-l" flag to hpa-tftpd for file-logging (#26467)
  - added description for "-l" to the man-page
  
- \* Thu Feb 08 2001 Helge Deller <hdeller@redhat.de>
  - updated tftp client to 0.17 stable (#19640),
  - drop dependency on xinetd for tftp client (#25051),
  
- \* Wed Jan 17 2001 Jeff Johnson <jbj@redhat.com>
  - xinetd shouldn't wait on tftp (which forks) (#23923).
  
- \* Sat Jan 6 2001 Jeff Johnson <jbj@redhat.com>
  - fix to permit tftp put's (#18128).
  - startup as root with chroot to /tftpboot with early reversion to nobody is preferable to starting as nobody w/o ability to chroot.
  - %%post is needed by server, not client. Add %%postun for erasure as well.
  
- \* Wed Aug 23 2000 Nalin Dahyabhai <nalin@redhat.com>
  - default to being disabled
  
- \* Thu Aug 17 2000 Jeff Johnson <jbj@redhat.com>
  - correct group.
  
- \* Tue Jul 25 2000 Nalin Dahyabhai <nalin@redhat.com>
  - change user from root to nobody
  
- \* Sat Jul 22 2000 Jeff Johnson <jbj@redhat.com>
  - update to tftp-hpa-0.14 (#14003).
  - add server\_args (#14003).
  - remove -D\_BSD\_SOURCE (#14003).
  
- \* Fri Jul 21 2000 Nalin Dahyabhai <nalin@redhat.com>

- cook up an xinetd config file for tftpd
  
- \* Wed Jul 12 2000 Prospector <bugzilla@redhat.com>
  - automatic rebuild
  
- \* Sun Jun 18 2000 Jeff Johnson <jbj@redhat.com>
  - FHS packaging.
  - update to 0.17.
  
- \* Fri May 5 2000 Matt Wilson <maw@redhat.com>
  - use \_BSD\_SOURCE for hpa's tftpd so we get BSD signal semantics.
  
- \* Fri Feb 11 2000 Bill Nottingham <notting@redhat.com>
  - fix description
  
- \* Wed Feb 9 2000 Jeff Johnson <jbj@redhat.com>
  - compress man pages (again).
  
- \* Wed Feb 02 2000 Cristian Gafton <gafton@redhat.com>
  - man pages are compressed
  - fix description and summary
  
- \*
- Tue Jan 4 2000 Bill Nottingham <notting@redhat.com>
  - split client and server
  
- \* Tue Dec 21 1999 Jeff Johnson <jbj@redhat.com>
  - update to 0.16.
  
- \* Sat Aug 28 1999 Jeff Johnson <jbj@redhat.com>
  - update to 0.15.
  
- \* Wed Apr 7 1999 Jeff Johnson <jbj@redhat.com>
  - tftpd should truncate file when overwriting (#412)
  
- \* Sun Mar 21 1999 Cristian Gafton <gafton@redhat.com>
  - auto rebuild in the new build environment (release 22)
  
- \* Mon Mar 15 1999 Jeff Johnson <jbj@redhat.com>
  - compile for 6.0.
  
- \* Fri Aug 7 1998 Jeff Johnson <jbj@redhat.com>
  - build root
  
- \* Mon Apr 27 1998 Prospector System <bugs@redhat.com>
  - translations modified for de, fr, tr
  
- \* Mon Sep 22 1997 Erik Troan <ewt@redhat.com>

- added check for getpwnam() failure

\* Tue Jul 15 1997 Erik Troan <ewt@redhat.com>

- initial build

Found in path(s):

\* /opt/cola/permits/1833546142\_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftp.spec.in

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\*

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Found in path(s):

\* /opt/cola/permits/1833546142\_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftpd/recvfrom.h

\* /opt/cola/permits/1833546142\_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftpd/recvfrom.c

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Found in path(s):

\* /opt/cola/permits/1833546142\_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftpd/tftpd.h

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Found in path(s):

\* /opt/cola/permits/1833546142\_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/MCONFIG.in

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in path(s):

\* /opt/cola/permits/1833546142\_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-

5.2/tftpd/tftpd.c

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- \* /opt/cola/permits/1833546142\_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftp/extern.h
- \* /opt/cola/permits/1833546142\_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/common/tftpsubs.h

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- \*
  - /opt/cola/permits/1833546142\_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftp/main.c
  - \* /opt/cola/permits/1833546142\_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftp/tftp.c

# 1.266 traceroute 2.1.0

## 1.266.1 Available under license :

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Version 2, June 1991

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Preamble

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```
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```

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the Free Software Foundation; either version 2 of the License, or  
(at your option) any later version.
```

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```
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This is free software, and you are welcome to redistribute  
it  
under certain conditions; type `show c' for details.
```

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```
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'Gnomovision' (which makes passes at compilers) written by James Hacker.
```

```
<signature of Ty Coon>, 1 April 1989
```

Ty Coon, President of Vice

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Version 2.1, February 1999

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# 1.267 gawk 5.1.1

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The

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THE BASIC LIBRARY FUNCTIONS  
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