CISCO SYSTEMS

Cisco Aironet Wireless LAN Client Adapters Installation and Configuration Guide for Windows

CONTENTS

Preface

The preface provides an overview of the *Cisco Aironet Wireless LAN Client Adapters Installation and Configuration Guide for Windows*, references related publications, and explains how to obtain other documentation and technical assistance, if necessary.

The following topics are covered in this section:

Audience

This publication is for the person responsible for installing, configuring, and maintaining a Cisco Aironet Wireless LAN Client Adapter on a computer running Microsoft Windows 98, 98 SE, NT, 2000, Me, or XP. This person should be familiar with computing devices and with network terms and concepts.

Purpose

This publication describes the Cisco Aironet client adapters and explains how to install, configure, and troubleshoot them.

Note   This version of the *Cisco Aironet Wireless LAN Client Adapters Installation and Configuration Guide for Windows* pertains specifically to versions of the client adapter software that are installed through an Install Wizard file. If you are using, installing, or upgrading to versions of client adapter software that do not use the Install Wizard, refer to version OL-1394-04 of this manual for information and instructions.

Organization

This publication contains the following chapters:

- Chapter 1, "Product Overview," describes the client adapters and their hardware and software components and illustrates two common network configurations.

- Chapter 2, "Preparing for Installation," provides information that you need to know before installing a client adapter, such as safety information and system requirements.

- Chapter 3, "Installing the Client Adapter," provides instructions for installing client adapter software.

- Chapter 4, "Using the Profile Manager," explains how to use the ACU profile manager feature to create and manage profiles for your client adapter.

- Chapter 5, "Configuring the Client Adapter," explains how to change the configuration parameters for a specific profile.

- Chapter 6, "Using EAP Authentication," explains the sequence of events that occurs and the actions you must take when a profile that is set for EAP authentication is selected for use.

- Chapter 7, "Performing Diagnostics," explains how to use ACU to perform user-level diagnostics.

- Chapter 8, "Using the Aironet Client Monitor (ACM)," explains how to use the Aironet Client Monitor (ACM) to access status information about your client adapter and perform basic tasks.

- Chapter 9, "Routine Procedures," provides procedures for common tasks related to the client adapters, such as uninstalling client adapter software and restarting an adapter.

- Chapter 10, "Troubleshooting," provides information for diagnosing and correcting common problems that may be encountered when installing or operating a client adapter.

- Appendix A, "Technical Specifications," lists the physical, radio, power, and regulatory specifications for the client adapters.

- Appendix B, "Translated Safety Warnings," provides translations of client adapter safety warnings in nine languages.

- Appendix C, "Declarations of Conformity and Regulatory Information," provides declarations of conformity and regulatory information for the client adapters.

- Appendix D, "Channels, Power Levels, and Antenna Gains," lists the IEEE 802.11a and IEEE 802.11b channels supported by the world's regulatory domains as well as the maximum power levels and antenna gains allowed per domain.

- Appendix E, "Configuring the Client Adapter through Windows XP," explains how to configure and use your client adapter with Windows XP.

- Appendix F, "Performing a Site Survey," shows people who are responsible for conducting a site survey how they can use ACU to determine the best placement for infrastructure devices within a wireless network.

Conventions

This publication uses the following conventions to convey instructions and information:

- Commands and keywords are in **boldface**.

- Variables are in *italics*.

- Configuration parameters are capitalized.

- Notes, cautions, and warnings use the following conventions and symbols:

Note Means *reader take note*. Notes contain helpful suggestions or references to materials not contained in this manual.

Caution Means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.

Warning **This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. (To see translations of the warnings that appear in this publication, refer to the appendix "Translated Safety Warnings.")**

Waarschuwing **Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van standaard maatregelen om ongelukken te voorkomen. (Voor vertalingen van de waarschuwingen die in deze publicatie verschijnen, kunt u het aanhangsel "Translated Safety Warnings" (Vertalingen van veiligheidsvoorschriften) raadplegen.)**

Varoitus **Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista. (Tässä julkaisussa esiintyvien varoitusten käännökset löydät liitteestä "Translated Safety Warnings" (käännetyt turvallisuutta koskevat varoitukset).)**

Attention   Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant entraîner des blessures. Avant d'accéder à cet équipement, soyez conscient des dangers posés par les circuits électriques et familiarisez-vous avec les procédures courantes de prévention des accidents. Pour obtenir les traductions des mises en garde figurant dans cette publication, veuillez consulter l'annexe intitulée « Translated Safety Warnings » (Traduction des avis de sécurité).

Warnung   Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewußt. (Übersetzungen der in dieser Veröffentlichung enthaltenen Warnhinweise finden Sie im Anhang mit dem Titel "Translated Safety Warnings" (Übersetzung der Warnhinweise).)

Avvertenza   Questo simbolo di avvertenza indica un pericolo. Si è in una situazione che può causare infortuni. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti. La traduzione delle avvertenze riportate in questa pubblicazione si trova nell'appendice, "Translated Safety Warnings" (Traduzione delle avvertenze di sicurezza).

Advarsel   Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du være oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker. (Hvis du vil se oversettelser av de advarslene som finnes i denne publikasjonen, kan du se i vedlegget "Translated Safety Warnings" [Oversatte sikkerhetsadvarsler].)

Aviso   Este símbolo de aviso indica perigo. Encontra-se numa situação que lhe poderá causar danos fisicos. Antes de começar a trabalhar com qualquer equipamento, familiarize-se com os perigos relacionados com circuitos eléctricos, e com quaisquer práticas comuns que possam prevenir possíveis acidentes. (Para ver as traduções dos avisos que constam desta publicação, consulte o apêndice "Translated Safety Warnings" - "Traduções dos Avisos de Segurança").

¡Advertencia!   Este símbolo de aviso significa peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considerar los riesgos que entraña la corriente eléctrica y familiarizarse con los procedimientos estándar de prevención de accidentes. (Para ver traducciones de las advertencias que aparecen en esta publicación, consultar el apéndice titulado "Translated Safety Warnings.")

Varning!   Denna varningssymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador. (Se förklaringar av de varningar som förekommer i denna publikation i appendix "Translated Safety Warnings" [Översatta säkerhetsvarningar].)

Related Publications

For more information about Cisco Aironet Wireless LAN Client Adapters for Windows, refer to the following publications:

- *Release Notes for Cisco Aironet Client Adapter Install Wizard*
- *Release Notes for Cisco Aironet Client Adapter Firmware*

For more information about related Cisco Aironet products, refer to the publications for your infrastructure device. You can access Cisco Aironet technical documentation at this URL:

http://www.cisco.com/en/US/products/hw/wireless/index.html

Obtaining Documentation

Cisco provides several ways to obtain documentation, technical assistance, and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

Cisco.com

You can access the most current Cisco documentation on the World Wide Web at this URL:

http://www.cisco.com/univercd/home/home.htm

You can access the Cisco website at this URL:

http://www.cisco.com

International Cisco websites can be accessed from this URL:

http://www.cisco.com/public/countries_languages.shtml

Documentation CD-ROM

Cisco documentation and additional literature are available in a Cisco Documentation CD-ROM package, which may have shipped with your product. The Documentation CD-ROM is updated regularly and may be more current than printed documentation. The CD-ROM package is available as a single unit or through an annual or quarterly subscription.

Registered Cisco.com users can order a single Documentation CD-ROM (product number DOC-CONDOCCD=) through the Cisco Ordering tool:

http://www.cisco.com/en/US/partner/ordering/ordering_place_order_ordering_tool_launch.html

All users can order monthly or quarterly subscriptions through the online Subscription Store:

http://www.cisco.com/go/subscription

Ordering Documentation

You can find instructions for ordering documentation at this URL:

http://www.cisco.com/univercd/cc/td/doc/es_inpck/pdi.htm

You can order Cisco documentation in these ways:

• Registered Cisco.com users (Cisco direct customers) can order Cisco product documentation from the Networking Products MarketPlace:

http://www.cisco.com/en/US/partner/ordering/index.shtml

• Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco Systems Corporate Headquarters (California, U.S.A.) at 408 526-7208 or, elsewhere in North America, by calling 800 553-NETS (6387).

Documentation Feedback

You can submit comments electronically on Cisco.com. On the Cisco Documentation home page, click **Feedback** at the top of the page.

You can e-mail your comments to bug-doc@cisco.com.

You can submit comments by using the response card (if present) behind the front cover of your document or by writing to the following address:

Cisco Systems
Attn: Customer Document Ordering
170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate your comments.

Obtaining Technical Assistance

Cisco provides Cisco.com, which includes the Cisco Technical Assistance Center (TAC) website, as a starting point for all technical assistance. Customers and partners can obtain online documentation, troubleshooting tips, and sample configurations from the Cisco TAC website. Cisco.com registered users have complete access to the technical support resources on the Cisco TAC website, including TAC tools and utilities.

Cisco.com

Cisco.com offers a suite of interactive, networked services that let you access Cisco information, networking solutions, services, programs, and resources at any time, from anywhere in the world.

Cisco.com provides a broad range of features and services to help you with these tasks:

• Streamline business processes and improve productivity

• Resolve technical issues with online support

• Download and test software packages

- Order Cisco learning materials and merchandise

- Register for online skill assessment, training, and certification programs

To obtain customized information and service, you can self-register on Cisco.com at this URL:

http://tools.cisco.com/RPF/register/register.do

Technical Assistance Center

The Cisco TAC is available to all customers who need technical assistance with a Cisco product, technology, or solution. Two types of support are available: the Cisco TAC website and the Cisco TAC Escalation Center. The type of support that you choose depends on the priority of the problem and the conditions stated in service contracts, when applicable.

We categorize Cisco TAC inquiries according to urgency:

- Priority level 4 (P4)—You need information or assistance concerning Cisco product capabilities, product installation, or basic product configuration. There is little or no impact to your business operations.

- Priority level 3 (P3)—Operational performance of the network is impaired, but most business operations remain functional. You and Cisco are willing to commit resources during normal business hours to restore service to satisfactory levels.

- Priority level 2 (P2)—Operation of an existing network is severely degraded, or significant aspects of your business operations are negatively impacted by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

- Priority level 1 (P1)—An existing network is "down," or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Cisco TAC Website

The Cisco TAC website provides online documents and tools to help troubleshoot and resolve technical issues with Cisco products and technologies. To access the Cisco TAC website, go to this URL:

http://www.cisco.com/tac

All customers, partners, and resellers who have a valid Cisco service contract have complete access to the technical support resources on the Cisco TAC website. Some services on the Cisco TAC website require a Cisco.com login ID and password. If you have a valid service contract but do not have a login ID or password, go to this URL to register:

http://tools.cisco.com/RPF/register/register.do

If you are a Cisco.com registered user, and you cannot resolve your technical issues by using the Cisco TAC website, you can open a case online at this URL:

http://www.cisco.com/tac/caseopen

If you have Internet access, we recommend that you open P3 and P4 cases online so that you can fully describe the situation and attach any necessary files.

Cisco TAC Escalation Center

The Cisco TAC Escalation Center addresses priority level 1 or priority level 2 issues. These classifications are assigned when severe network degradation significantly impacts business operations. When you contact the TAC Escalation Center with a P1 or P2 problem, a Cisco TAC engineer automatically opens a case.

To obtain a directory of toll-free Cisco TAC telephone numbers for your country, go to this URL:

http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml

Before calling, please check with your network operations center to determine the Cisco support services to which your company is entitled: for example, SMARTnet, SMARTnet Onsite, or Network Supported Accounts (NSA). When you call the center, please have available your service agreement number and your product serial number.

Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- The *Cisco Product Catalog* describes the networking products offered by Cisco Systems, as well as ordering and customer support services. Access the *Cisco Product Catalog* at this URL:

  http://www.cisco.com/en/US/products/products_catalog_links_launch.html

- Cisco Press publishes a wide range of networking publications. Cisco suggests these titles for new and experienced users: *Internetworking Terms and Acronyms Dictionary, Internetworking Technology Handbook, Internetworking Troubleshooting Guide,* and the *Internetworking Design Guide.* For current Cisco Press titles and other information, go to Cisco Press online at this URL:

  http://www.ciscopress.com

- *Packet* magazine is the Cisco quarterly publication that provides the latest networking trends, technology breakthroughs, and Cisco products and solutions to help industry professionals get the most from their networking investment. Included are networking deployment and troubleshooting tips, configuration examples, customer case studies, tutorials and training, certification information, and links to numerous in-depth online resources. You can access *Packet* magazine at this URL:

  http://www.cisco.com/go/packet

- iQ Magazine is the Cisco bimonthly publication that delivers the latest information about Internet business strategies for executives. You can access iQ Magazine at this URL:

  http://www.cisco.com/go/iqmagazine

- Internet Protocol Journal is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

  http://www.cisco.com/en/US/about/ac123/ac147/about_cisco_the_internet_protocol_journal.html

- Training—Cisco offers world-class networking training. Current offerings in network training are listed at this URL:

  http://www.cisco.com/en/US/learning/le31/learning_recommended_training_list.html

C H A P T E R 1

Product Overview

This chapter describes the Cisco Aironet Wireless LAN Client Adapters and illustrates their role in a wireless network.

The following topics are covered in this chapter:

Introduction to the Client Adapters

The Cisco Aironet Wireless LAN Client Adapters are radio modules that provide transparent wireless data communications between fixed, portable, or mobile devices and other wireless devices or a wired network infrastructure. The client adapters are fully compatible when used in devices supporting Plug-and-Play (PnP) technology.

The primary function of the client adapters is to transfer data packets transparently through the wireless infrastructure through an access point connected to a wired LAN. The adapters operate similarly to a standard network product except that the cable is replaced with a radio connection and an access point is required to make the connection to the wire. No special wireless networking functions are required, and all existing applications that operate over a network can operate using the adapters.

This document covers the five client adapters described in Table 1-1.

Table 1-1   Client Adapter Types

Client Adapter	Model Number	Description	Illustration
PC card	AIR-PCM3*xx*	An IEEE 802.11b-compliant 2.4-GHz 11-Mbps PCMCIA card radio module that can be inserted into any device equipped with an *external* Type II or Type III PC card slot. Host devices can include laptops, notebook computers, personal digital assistants, and handheld or portable devices. The PC card is available in the 340 and 350 series.	47519
LM card	AIR-LMC3*xx*	An IEEE 802.11b-compliant 2.4-GHz 11-Mbps PCMCIA card radio module that is usually preinstalled in a device equipped with an *internal* Type II or Type III PC card slot. Host devices usually include handheld or portable devices. The LM card is available in the 340 and 350 series.	47893
PCI card	AIR-PCI3*xx*	An IEEE 802.11b-compliant 2.4-GHz 11-Mbps client adapter card radio module that can be inserted into any device equipped with an empty PCI expansion slot, such as a desktop personal computer. The PCI card is available in the 340 and 350 series.	65189
Mini PCI card	AIR-MPI350	An IEEE 802.11b-compliant 2.4-GHz 11-Mbps client adapter card radio module that is preinstalled in a device equipped with an *internal* Type IIIA mini PCI card slot, such as a laptop computer. The mini PCI card is available only in the 350 series.	65190
PC-Cardbus card	AIR-CB20A	An IEEE 802.11a-compliant 5-GHz 54-Mbps client adapter card radio module with a Cardbus interface that can be inserted into any device equipped with an *external* Type II or Type III Cardbus slot. Host devices can include laptops, notebook computers, personal digital assistants, and handheld or portable devices.	74795

> **Note** In the first three product model numbers, the first *x* represents the client adapter series (340 or 350), and the second *x* indicates the wired equivalent privacy (WEP) level of the card, where 0 = no WEP capability, 1 = 40-bit WEP, and 2 = 128-bit WEP. If the last two product model numbers contain K9, the card is 128-bit WEP capable.

Terminology

The following terms are used throughout this document:

- **client adapter**—Refers to all five types of adapters.
- **PC card**, **LM card**, **PCI card**, **mini PCI card**, or **PC-Cardbus card**—Refers to a specific adapter.
- **workstation** (or **station**)—Refers to a computing device with an installed client adapter.
- **infrastructure device**—Refers to a device that connects client adapters to a wired LAN, such as an access point, bridge, or base station. Throughout this document, *access point* is used to represent infrastructure devices in general.

Hardware Components

The client adapter has three major hardware components: a radio, a radio antenna, and two LEDs.

Radio

Different radios are used for the 2.4-GHz and 5-GHz client adapters:

- The Cisco Aironet 340 and 350 series PC, LM, PCI, and mini PCI cards are IEEE 802.11b-compliant client adapters. They contain a direct-sequence spread spectrum (DSSS) radio that operates in the 2.4-GHz Industrial Scientific Medical (ISM) license-free band. The 340 series 30-milliwatt (mW) radio and the 350 series 100-mW radio transmit data over a half-duplex radio channel operating at up to 11 Mbps. These cards operate with other IEEE 802.11b-compliant client devices in ad hoc (or *peer-to-peer*) mode or with Cisco Aironet 340, 350, 1100, and 1200 Series Access Points (with a 2.4-GHz radio) and other IEEE 802.11b-compliant infrastructure devices in infrastructure mode. They are approved for indoor and outdoor use.

  DSSS technology distributes a radio signal over a wide range of frequencies and then returns the signal to the original frequency range at the receiver. The benefit of this technology is its ability to protect the data transmission from interference. For example, if a particular frequency encounters noise or interference or both, enough redundancy is built into the signal on other frequencies that the client adapter usually will still be successful in its transmission.

- The Cisco Aironet AIR-CB20A PC-Cardbus card is an IEEE 802.11a-compliant client adapter. It contains an orthogonal frequency division multiplexing (OFDM) radio that operates in the Unlicensed National Information Infrastructure (UNII) 1 and UNII 2 license-free bands located in the lower 5-GHz portion of the radio frequency spectrum. The 20-mW radio transmits data over a half-duplex radio channel operating at up to 54 Mbps. This card interoperates with other IEEE 802.11a-compliant client devices in ad hoc mode or with Cisco Aironet 1200 Series Access Points (with a 5-GHz radio) and other IEEE 802.11a-compliant infrastructure devices in infrastructure mode. It is approved for indoor use only except in the United States, which allows for outdoor use on channels 52 through 64.

Radio Antenna

The type of antenna used depends on your client adapter:

- PC cards have an integrated, permanently attached diversity antenna. The benefit of the diversity antenna system is improved coverage. The system works by allowing the card to switch and sample between its two antenna ports in order to select the optimum port for receiving data packets. As a result, the card has a better chance of maintaining the radio frequency (RF) connection in areas of interference. The antenna is housed within the section of the card that hangs out of the PC card slot when the card is installed.

- LM cards are shipped without an antenna; however, an antenna can be connected through the card's external connector.

- PCI cards are shipped with a 2-dBi dipole antenna that attaches to the card's antenna connector. However, other types of antennas may be used. PCI cards can be operated through only the primary (or right) antenna port.

- Mini PCI cards are designed to be used with either one or two antennas, which connect to the card's two antenna connectors. If two antennas are used, the radio automatically selects the antenna that presents the best RF signal. If only one antenna is used, the radio finds and uses it regardless of which connector it is plugged into.

- PC-Cardbus cards have an integrated, permanently attached non-diversity antenna that contains two antenna ports, one for transmitting and one for receiving. The card cannot switch and sample between the ports. The antenna is housed within the section of the card that hangs out of the Cardbus slot when the card is installed.

Note   Refer to the Antenna Mode (Transmit and Receive) parameters in Table 5-4 and Table 5-5 for information on setting the client adapter's antenna mode.

Note   External antennas used in combination with a power setting resulting in a radiated power level above 100 mW equivalent isotropic radiated power (EIRP) are not allowed for use within the European community and other countries that have adopted the European R&TTE directive or the CEPT recommendation Rec 70.03 or both. For more details on legal combinations of power levels and antennas in those countries, refer to the "Declaration of Conformity with Regard to the R&TTE Directive 1999/5/EC" section on page C-4 and the "Maximum Power Levels and Antenna Gains" section on page D-4.

LEDs

The client adapters have two LEDs that glow or blink to indicate the status of the adapter or to convey error messages. Refer to Chapter 10 for an interpretation of the LED codes.

Note   Mini PCI cards do not have LEDs.

Software Components

The client adapter has three major software components: radio firmware, a driver, and client utilities. These components are installed together by running a single Install Wizard file that is available from Cisco.com. This file can be run on Windows 98, 98 SE, NT, 2000, Me, or XP and can be used with any of the following client adapter types:

- 340 and 350 series PC, LM, and PCI cards

- 350 series mini PCI cards

- PC-Cardbus (CB20A) cards

Chapter 3 provides instructions on using the Install Wizard to install or upgrade these software components.

> **Note**   Prior to the release of the Install Wizard file, each software component had to be installed separately. This version of the *Cisco Aironet Wireless LAN Client Adapters Installation and Configuration Guide for Windows* pertains specifically to versions of the software that are available through the Install Wizard. If you are using, installing, or upgrading to versions of client adapter software that do not use the Install Wizard, refer to version OL-1394-04 of this manual for information and instructions.

Radio Firmware

The firmware controls the client adapter's radio. The client adapter is shipped with the firmware installed in Flash memory. However, Cisco recommends that you always use the latest version. You can upgrade the client adapter's firmware in three ways:

- Through the Install Wizard—The Install Wizard automatically upgrades the client adapter's firmware to the version included in the Install Wizard file.

- Through the driver—The driver included in the Install Wizard file is also bundled with client adapter firmware. Each time you insert a client adapter or reboot your computer, the driver loads and may install the firmware with which it is bundled (if that firmware is newer than the firmware that is currently installed in the adapter). You can use the Install Wizard's Disable Firmware Checking parameter or ACU's Automatically Load New Firmware When NDIS Driver Is Updated parameter to specify whether the driver upgrades the firmware. Refer to page 3-6 and page 9-10 for more information.

- Through ACU—The Load Firmware icon or Load New Firmware menu option in ACU enables you to upgrade the client adapter's firmware from an image (*.img) file that contains only firmware. Refer to the "Upgrading the Firmware" section on page 9-8 for more information.

Driver

The driver provides an interface between a computer running a Windows operating system and the client adapter, thereby enabling Windows and the applications it runs to communicate with the adapter. The driver must be installed before the adapter can be used.

Client Utilities

Two client utilities are available for use with Cisco Aironet client adapters: Aironet Client Utility (ACU) and Aironet Client Monitor (ACM). These utilities are optional applications that interact with the radio firmware to adjust client adapter settings and display information about the adapter.

ACU enables you to create configuration profiles for your client adapter and perform user-level diagnostics. Because ACU performs a variety of functions, it is documented by function throughout this manual. However, an overview of the utility is provided below to familiarize you with its interface.

ACM, which is accessible from an icon in the Windows system tray, provides a small subset of the features available through ACU. Specifically, it enables you to access status information about your client adapter and perform basic tasks. Chapter 8 provides detailed information and instructions on using ACM.

Note   If your computer is running Windows XP, you can configure your client adapter through the Windows operating system instead of through ACU. Refer to Appendix E for information. However, ACU is recommended for configuring the client adapter.

Overview of ACU

The Aironet Client Utility screen (see Figure 1-1) is ACU's primary screen.

Figure 1-1   Aironet Client Utility Screen

The title bar at the top of the Aironet Client Utility screen shows the profile that is being used by the client adapter.

The status bar at the bottom of the Aironet Client Utility screen reflects the current state of your client adapter. The following states are possible, where *radio_name* is the client adapter type and *ap_name* is the configured name of an access point:

- Your *radio_name* is Associated to *ap_name*

- Your *radio_name* is Not Associated!

- Authentication Started with *ap_name*

- Your *radio_name* is Authenticated to *ap_name*

- Authentication Failed with *ap_name*

- Your *radio_name* is in AdHoc Mode

- Your *radio_name* is being loaded with new firmware!

- The radio in your *radio_name* is turned OFF!

- Unable to read the status from your Wireless LAN Adapter!

- Your *radio_name* has a problem!

Note   Some 340 series cards may improperly display a *radio_name* of 4800.

Note   Aironet Extensions must be enabled on access points running Cisco IOS release 12.2(4)JA or greater in order for the *ap_name* to appear in the status bar.

The information shown in the status bar is updated once per second.

The right side of the status bar shows the current time of day. If you set the clock to display seconds in the Aironet Client Utility Preferences screen, the time includes seconds in addition to hours and minutes.

Note   To enable the clock to display seconds, open ACU, click the **Preferences** icon or select **Preferences** from the Options drop-down menu, check the **Display Seconds on Clock** check box, and click **OK**.

Buttons on the ACU Screens

The buttons on the ACU screens are used to perform specific functions. Table 1-2 describes the most common buttons.

Table 1-2   Buttons on the ACU Screens

Button	Description
Apply	Saves any changes without exiting the screen
Cancel	Exits the screen without saving any changes
Defaults	Displays the default value of each parameter
Help	Provides information on the screen and its parameters
OK	Saves any changes and exits the screen
Start	Initiates a test
Stop	Stops a test that is running

Network Configurations Using Client Adapters

Client adapters can be used in a variety of network configurations. In some configurations, access points provide connections to your network or act as repeaters to increase wireless communication range. The maximum communication range is based on how you configure your wireless network.

This section describes and illustrates the two most common network configurations:

- Ad hoc wireless local area network (LAN)
- Wireless infrastructure with workstations accessing a wired LAN

For examples of more complex network configurations involving client adapters and access points, refer to the documentation for your access point.

Note Refer to Chapter 5 for information on setting the client adapter's network mode.

Ad Hoc Wireless LAN

An ad hoc (or *peer-to-peer*) wireless LAN (see Figure 1-2) is the simplest wireless LAN configuration. In a wireless LAN using an ad hoc network configuration, all devices equipped with a client adapter can be linked together and communicate directly with each other. The use of an infrastructure device, such as an access point, is not required.

Figure 1-2   Ad Hoc Wireless LAN
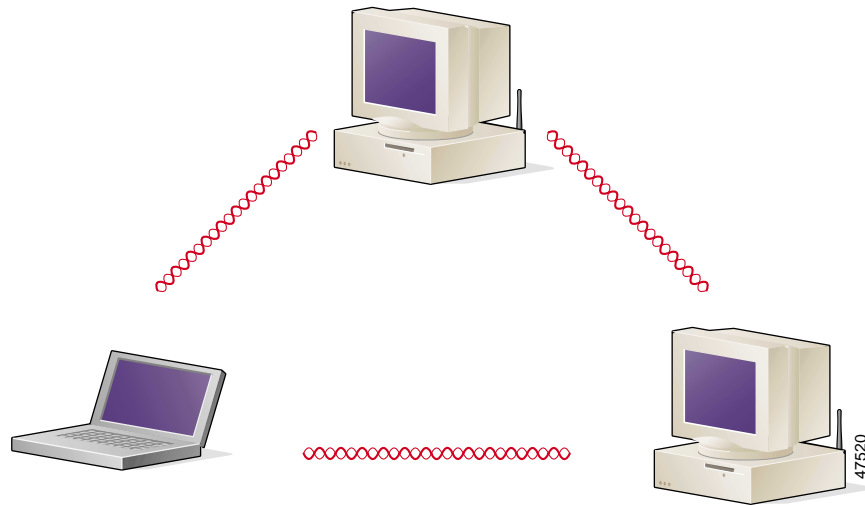
Wireless Infrastructure with Workstations Accessing a Wired LAN

A microcellular network can be created by placing two or more access points on a LAN. Figure 1-3 shows a microcellular network with workstations accessing a wired LAN through several access points.

This configuration is useful with portable or mobile stations because it allows them to be directly connected to the wired network even while moving from one microcell domain to another. This process is transparent, and the connection to the file server or host is maintained without disruption. The mobile station stays connected to an access point as long as it can. However, once the transfer of data packets needs to be retried or beacons are missed, the station automatically searches for and associates to another access point. This process is referred to as *seamless roaming*.

Figure 1-3   Wireless Infrastructure with Workstations Accessing a Wired LAN
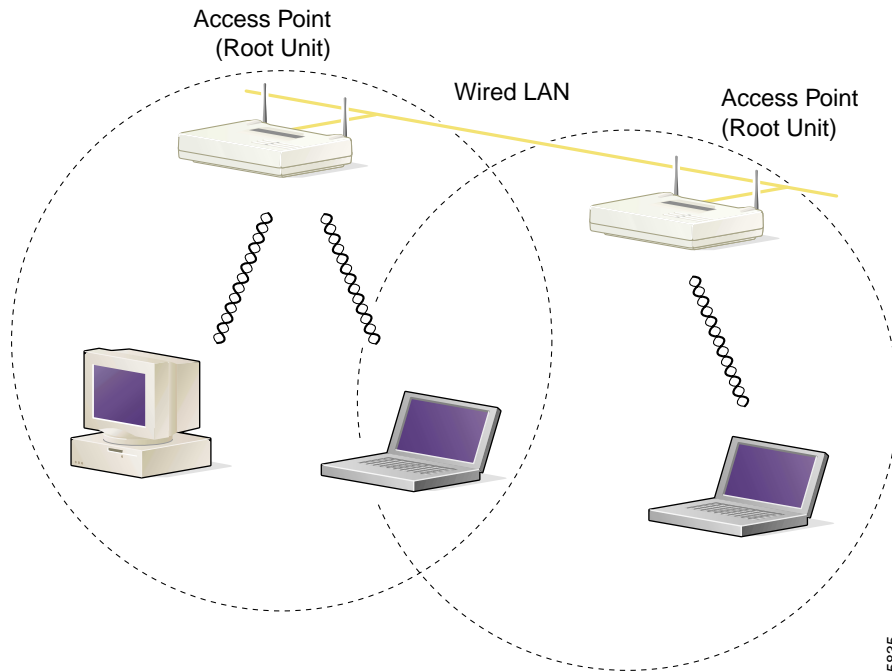
CHAPTER 2

Preparing for Installation

This chapter provides information that you need to know before installing a client adapter.

The following topics are covered in this chapter:

Safety information

Follow the guidelines in this section to ensure proper operation and safe use of the client adapter.

FCC Safety Compliance Statement

The FCC, with its action in ET Docket 96-8, has adopted a safety standard for human exposure to RF electromagnetic energy emitted by FCC-certified equipment. When used with approved Cisco Aironet antennas, Cisco Aironet products meet the uncontrolled environmental limits found in OET-65 and ANSI C95.1, 1991. Proper operation of this radio device according to the instructions in this publication will result in user exposure substantially below the FCC recommended limits.

Safety Guidelines

- Do not touch or move the antenna while the unit is transmitting or receiving.
- Do not hold any component containing a radio such that the antenna is very close to or touching any exposed parts of the body, especially the face or eyes, while transmitting.
- Do not operate the radio or attempt to transmit data unless the antenna is connected; otherwise, the radio may be damaged.
- High-gain, wall-mount, or mast-mount antennas are designed to be professionally installed and should be located at a minimum distance of 12 inches (30 cm) or more from the body of all persons. Please contact your professional installer, VAR, or antenna manufacturer for proper installation requirements.
- Use in specific environments:
  - The use of wireless devices in hazardous locations is limited to the constraints posed by the safety directors of such environments.
  - The use of wireless devices on airplanes is governed by the Federal Aviation Administration (FAA).
  - The use of wireless devices in hospitals is restricted to the limits set forth by each hospital.

Warnings

Observe the following warnings when operating the client adapter:

⚠ **Warning**   **Do not operate your wireless network device near unshielded blasting caps or in an explosive environment unless the device has been modified to be especially qualified for such use.**

⚠ **Warning**   **In order to comply with FCC radio frequency (RF) exposure limits, dipole antennas should be located at a minimum of 7.9 inches (20 cm) or more from the body of all persons.**

⚠ **Warning**   **In order to comply with RF exposure limits established in the ANSI C95.1 standards, it is recommended when using a laptop with a PC card client adapter that the adapter's integrated antenna is positioned more than 2 inches (5 cm) from your body or nearby persons during extended periods of transmitting or operating time. If the antenna is positioned less than 2 inches (5 cm) from the user, it is recommended that the user limit exposure time.**

Translated versions of these safety warnings are provided in Appendix B.

Unpacking the Client Adapter

Follow these steps to unpack the client adapter:

Step 1   Open the shipping container and carefully remove the contents.

Step 2   Return all packing materials to the shipping container and save it.

Step 3   Ensure that all items listed in the "Package Contents" section below are included in the shipment. Check each item for damage.

✎ **Note**   If any item is damaged or missing, notify your authorized Cisco sales representative. Any remote antenna and its associated wiring are shipped separately.

Package Contents

Each client adapter is shipped with the following items:

- Standard 2-dBi dipole antenna (PCI cards only)
- *Quick Start Guide: Cisco Aironet Wireless LAN Client Adapters*
- Cisco Aironet Wireless LAN Client Adapters CD (for 2.4-GHz client adapters) or Cisco Aironet 5-GHz 54-Mbps Wireless Adapters CD (for 5-GHz client adapters)
- Cisco product registration card

System Requirements

In addition to the items shipped with the client adapter, you also need the following in order to install and use the adapter:

- One of the following computing devices running Windows 98, 98 SE, NT, 2000, Me, or XP:
  - Laptop, notebook, or portable or handheld device equipped with a Type II or Type III PC card slot or Cardbus slot
  - Desktop personal computer equipped with an empty PCI expansion slot
  - Handheld or portable device with an embedded LM card
  - Laptop or other computing device with an embedded mini PCI card

> **Note**   PC-Cardbus cards are not supported for use with Windows NT.

> **Note**   Cisco recommends using a display with a minimum resolution of 800 x 600 pixels.

> **Note**   All drivers and supporting software (Card and Socket Services) for the PC card slot or Cardbus slot must be loaded and configured.

- 35 MB of free hard disk space (minimum)
- A maximum of eight network connections if your computer is running Windows 98 or 98 SE

> **Note**   Windows 98 and 98 SE limit your computer's network connections. If you try to install a client adapter when eight network devices (such as a PCMCIA Ethernet card, dial-up adapter, VPN adapter, docking station Ethernet card, etc.) are already connected to your computer, the new adapter cannot establish a network connection.

- Windows NT Service Pack 6 or greater if your computer is running Windows NT
- A Phillips screwdriver (for PCI cards)
- The Microsoft 802.1X supplicant, if your wireless network uses EAP-TLS, PEAP, or EAP-SIM authentication
- If your wireless network uses PEAP authentication with a One-Time Password (OTP) user database:
  - SofToken version 1.3, 2.0, or greater from Secure Computing; SecurID version 2.5 from RSA; or hardware token from OTP vendors
  - Your software token PIN or hardware token password

- If your wireless network uses EAP-SIM authentication:

  - PCSC-compliant smartcard reader installed in your computer's Type II or Type III PC card slot

  - Gemplus SIM+ smartcard inserted in the reader

  - The SIM card's PIN

> **Note** The EAP-SIM supplicant included in the Install Wizard file supports only Gemplus SIM+ cards; however, an updated supplicant is available that supports standard GSM-SIM cards as well as more recent versions of the EAP-SIM protocol. The new supplicant is available for download from the ftpeng FTP server at the following URL:
> ftp://ftpeng.cisco.com/ftp/pwlan/eapsim/CiscoEapSim.dll

- The following information from your system administrator:

  - The logical name for your workstation (also referred to as *client name*)

  - The protocols necessary to bind to the client adapter

  - The case-sensitive service set identifier (SSID) for your RF network

  - If your computer is not connected to a DHCP server, the IP address, subnet mask, and default gateway address of your computer

  - The wired equivalent privacy (WEP) keys of the access points with which your client adapter will communicate, if your wireless network uses static WEP for security

  - The username and password for your network account

Site Requirements

This section discusses the site requirements for both infrastructure and client devices.

For Infrastructure Devices

Because of differences in component configuration, placement, and physical environment, every network application is a unique installation. Therefore, before you install any wireless infrastructure devices (such as access points, bridges, and base stations, which connect your client adapters to a wired LAN), a site survey must be performed to determine the optimum placement of these devices to maximize range, coverage, and network performance. Appendix F, which is provided for people who are responsible for conducting a site survey, explains how ACU's site survey tool can be used to determine the best placement for infrastructure devices within a wireless network.

> **Note** Infrastructure devices are installed and initially configured prior to client devices.

For Client Devices

Because the client adapter is a radio device, it is susceptible to RF obstructions and common sources of interference that can reduce throughput and range. Follow these guidelines to ensure the best possible performance:

- Install the client adapter in an area where large steel structures such as shelving units, bookcases, and filing cabinets will not obstruct radio signals to and from the client adapter.

- Install the client adapter away from microwave ovens. Microwave ovens operate on the same frequency as the client adapter and can cause signal interference.

3

Installing the Client Adapter

This chapter provides instructions for installing the client adapter's firmware, driver, utilities, and security modules.

The following topics are covered in this chapter:

Installing or Upgrading the Client Adapter Software

This section enables you to install or upgrade Cisco Aironet client adapter firmware, drivers, utilities, and security modules from a self-extracting executable file named Windows-Client-Installation-Wizard-*v*.exe, where *v* represents the version number.

Follow the instructions below to install or upgrade client adapter software on a computer running Windows 98, 98 SE, 2000, Me, or XP. If your computer is running Windows NT, follow the instructions on page 3-12.

> **Caution** The Install Wizard automatically upgrades client adapter firmware to the version included in the Install Wizard file. Both of the client adapter's LEDs light continuously while the firmware upgrade occurs. Do not eject the client adapter while the firmware is being upgraded.

> **Note** The Install Wizard file is not yet available on the CD that ships with Cisco Aironet client adapters. If you are installing or upgrading to versions of client adapter software that do not use the Install Wizard file, refer to version OL-1394-04 of this manual for installation, configuration, and operation instructions.

Installing or Upgrading the Client Adapter Software on Windows 98, 98 SE, 2000, Me, or XP

Follow the steps below to install or upgrade client adapter software components on a computer running Windows 98, 98 SE, 2000, Me, or XP.

> **Note** Windows Me and XP come with a driver that is installed automatically the first time you insert a PC, LM, or PCI card. Follow the procedure below to upgrade this driver to the latest one available.

Step 1 Use your computer's web browser to access the following URL: http://www.cisco.com/public/sw-center/sw-wireless.shtml

Step 2 Select **Option #2: Aironet Wireless Software Display Tables**.

> **Note** You can download software from the Software Selector tool instead of the display tables. To do so, select **Option #1: Aironet Wireless Software Selector**, follow the instructions on the screen, and go to Step 6.

Step 3 Select **Cisco Aironet Wireless LAN Client Adapters**.

Step 4 Under Aironet Client Adapter Installation Wizard (For Windows), select **Aironet Client Adapter Installation Wizard for Windows**.

Step 5 Select the Install Wizard file with the greatest version number.

Step 6 Read and accept the terms and conditions of the Software License Agreement.

Step 7 Select the file again to download it.

Step 8 Save the file to your computer's hard drive.

Step 9   Follow the instructions in Chapter 9 to insert the client adapter into your computer, if it is not already inserted. The instructions are different for PC cards, PC-Cardbus cards, and PCI cards.

⚠️

Caution   Do not eject your client adapter at any time during the installation process, including during the reboot.

Step 10   If a driver is not currently installed for your client adapter, the Found New Hardware Wizard screen appears. Click **Cancel**.

Step 11   Find the Install Wizard file using Windows Explorer, double-click it, and extract its files to a folder.

✎

Note   To extract the files, click **Browse** on the WinZip Self-Extractor screen, select the folder in which you want the files to be placed, and click **OK** and **Unzip**. After the files are extracted, click **OK** to close the screen.

Step 12   Close Windows Explorer. The Cisco Aironet Wireless LAN Client Adapter Installation Wizard screen appears (see Figure 3-1).

Figure 3-1   Cisco Aironet Wireless LAN Client Adapter Installation Wizard Screen
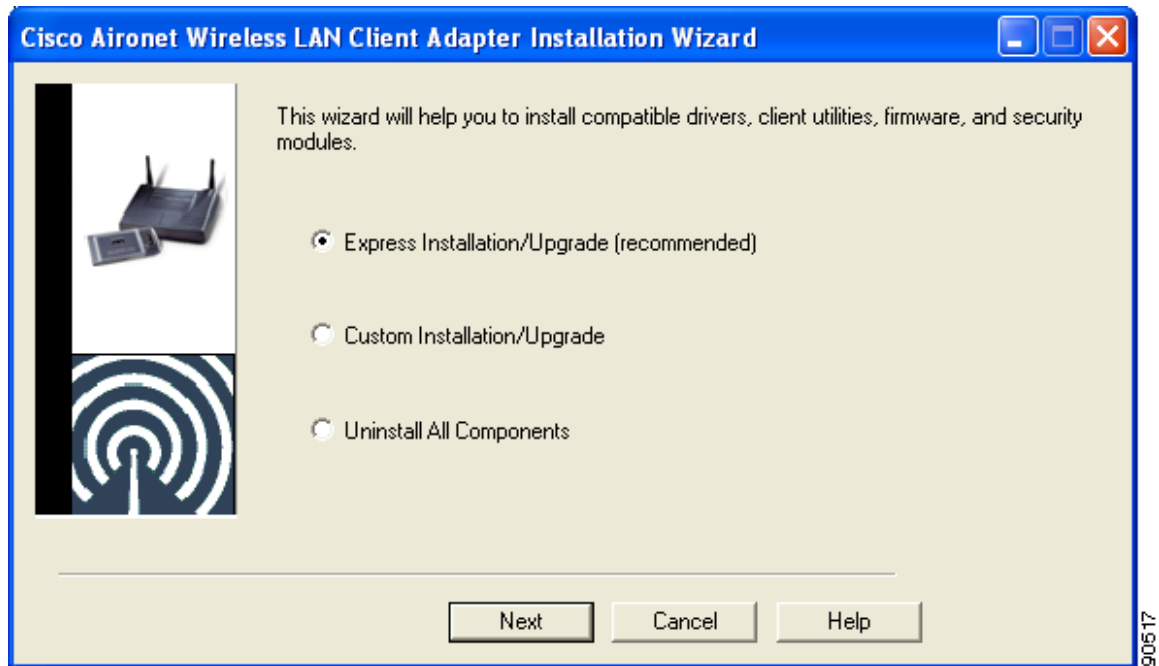
Step 13   Select one of the following options on the Cisco Aironet Wireless LAN Client Adapter Installation Wizard screen and click **Next**:

> **Note**   To ensure compatibility among software components, Cisco recommends that you perform an express installation. If you perform a custom installation, Cisco recommends that you install all components.

- **Express Installation/Upgrade (recommended)**—Silently installs the client adapter firmware, drivers, client utilities, and security modules using the default values listed in Table 3-1.
- **Custom Installation/Upgrade**—Enables you to specify which software components are installed and to change the default values of certain parameters.

Step 14   If a message appears indicating that you may be required to restart your computer at the end of the installation process, click **OK**.

> **Note**   If you click **Cancel**, the installation process terminates.

Step 15   If you selected an express installation, go to Step 17. If you selected a custom installation, the Custom Installation screen appears (see Figure 3-2).

Figure 3-2   Custom Installation Screen
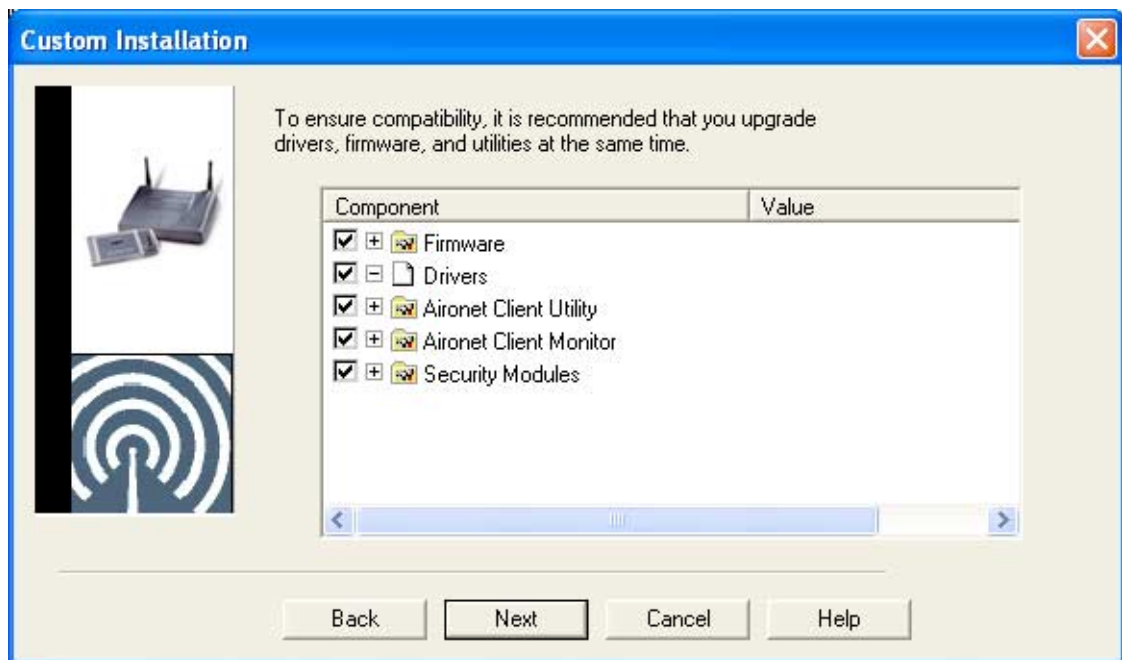
Step 16   Follow the steps below to make selections on this screen.

    a.   Make sure a check mark appears beside every software component that you want to install. For every component that is checked, the Install Wizard will install its version of that component. Every component that is not checked will remain as it currently is on your system.

> **Note**   Click the + sign beside the Security Modules option to reveal the available security components.

> **Note**   Some components are dependent on others. Therefore, when you select or deselect these components, the settings of other components may change. A dependency notice appears when this occurs.

    b.   Click the + sign beside each component to view additional parameters. The current value of each parameter appears in the Value field.

    c.   To change the value of any parameter, click its current value in the Value field. A screen appears that lets you change the existing value.

    d.   Enter or select a new value and click **OK**. Table 3-1 describes each component and its parameters and lists any default value.

Table 3-1   Software Components and Their Parameters

Component or Parameter	Description
Firmware	Installs the firmware version included in the Install Wizard file. **Default:** Checked
Disable Firmware Checking	The Disable Firmware Checking parameter affects the firmware that is bundled with the driver, not the firmware that is included in the Install Wizard. This parameter controls whether the driver (whenever it loads) installs the firmware with which it is bundled. Note The driver loads each time you insert a client adapter or reboot your computer. **Options:** Yes or No **Default:** Yes <table><tr><th>Disable Firmware Checking</th><th>Description</th></tr><tr><td>Yes</td><td>Prevents the driver from installing the firmware with which it is bundled, enabling the client adapter to retain its current firmware version.</td></tr><tr><td>No</td><td>Causes the driver to install the firmware with which it is bundled if that firmware is newer than the firmware that is currently installed in the client adapter.</td></tr></table> Note The Disable Firmware Checking parameter is functionally equivalent to the **Automatically Load New Firmware When NDIS Driver Is Updated** parameter on the ACU Preferences screen. The parameter that is set last is the one that governs how the driver behaves. Refer to the "Preventing the Driver from Upgrading the Firmware" section on page 9-10 for additional information. Note The Disable Firmware Checking parameter is available in Install Wizard version 1.1 or greater.
Drivers	Installs the driver version included in the Install Wizard file. **Default:** Checked
Aironet Client Utility	Installs the ACU version included in the Install Wizard file. **Default:** Checked
Installation Path	Determines the path where the ACU software will be installed. You can change the default by entering a new path. **Default:** C:\Program Files\Cisco Systems\Aironet Client Utility
Program Folder	Determines the program folder where the ACU software will be installed. You can change the default by entering a new folder name. **Default:** Cisco Systems

Table 3-1   Software Components and Their Parameters (continued)

Component or Parameter	Description
Place Icon on Desktop	Causes the installation program to add an ACU icon to your computer's desktop to provide quick access to the utility. **Options:** Yes or No **Default:** Yes
Allow Non-Administrator Users to Save Settings to the Registry	Enables users without administrative rights to modify profiles in ACU and save them to the registry on computers running Windows 2000 or XP. **Options:** Yes or No **Default:** Yes **Note** This option is not available for Windows 98, 98 SE, and Me because these versions of Windows do not support different classes of users.
Aironet Client Monitor	Installs the ACM version included in the Install Wizard file. **Default:** Checked
Installation Path	Determines the path where the ACM software will be installed. You can change the default by entering a new path. **Default:** C:\Program Files\Cisco Systems\Aironet Client Monitor
Program Folder	Determines the program folder where the ACM software will be installed. You can change the default by entering a new folder name. **Default:** Cisco Systems
Auto Start	Determines whether ACM starts automatically every time Windows boots. **Options:** Yes or No **Default:** Yes **Note** If you select No, you can later activate ACM by using Windows Explorer to find the path where the ACM software is installed and double-clicking **ACUMon.exe**.
Start After Install	Determines whether ACM starts automatically after ACM is installed. **Options:** Yes or No **Default:** Yes **Note** If you select No, you can later activate ACM by using Windows Explorer to find the path where the ACM software is installed and double-clicking **ACUMon.exe**.

Table 3-1   Software Components and Their Parameters (continued)

Component or Parameter	Description
Program Feature Overrides	Determines which ACM components are enabled. If any components are not selected now and you later want to use them, you must run this installation program again and enable them. **Components:** See the table below **Options per component:** Enable or Disable **Default per component:** Enable _(see component table below)_
Menu Options (Defaults)	Determines which options are displayed on the ACM pop-up menu. **Menu options:** About Box (Help), Exit Program, Launch Aironet Client Utility, Troubleshooting, Turn Radio On/Off, Reauthenticate, Select Profile, Show Connection Status **Options per menu option:** Show or Hide **Default per menu option:** Show

Component	Description
About Box (Help)	Displays the ACM version number and enables you to access the online help.
Exit Program	Closes ACM for all client adapters.
Launch Aironet Client Utility	Activates ACU, if it is installed.
Troubleshooting	Activates the troubleshooting utility, which enables you to identify and resolve configuration and association problems with your client adapter.
Preferences	Enables you to determine when ACM runs and to select the options that appear on the ACM pop-up menu.
Turn Radio On/Off	Turns the client adapter's radio on or off.
Reauthenticate	Forces your client adapter to try to reauthenticate using the username and password of the current profile.
Select Profile	Enables you to select the active profile for your client adapter.
Auto Profile Selection	Causes the client adapter's driver to automatically select a profile from the list of profiles that were set up in ACU to be included in auto profile selection.
Other Configuration Application	Enables an application other than ACU to configure the client adapter.
Show Connection Status	Provides information on the current status of your client adapter.

Table 3-1   Software Components and Their Parameters (continued)

Component or Parameter	Description
Security Modules	
LEAP	Installs the LEAP supplicant version included in the Install Wizard file. Installing the LEAP supplicant enables you to create a profile in ACU that uses LEAP authentication. If this option is not selected now and you later want to create a profile that uses LEAP, you must run this installation program again and select this option. **Default:** Checked **Note** Refer to Chapter 5 for information on enabling LEAP. **Note** If you select LEAP on a Windows 98 or 98 SE device, a Microsoft hot fix is installed during installation of the LEAP security module to fix two problems related to the use of LEAP. Refer to Chapter 10 for more information on the hot fix. **Note** If you select LEAP on a Windows XP device, Windows XP's fast user switching feature is disabled.
Allow Saved LEAP User Name and Password	Enables you to create a profile in ACU that uses a saved (rather than temporary) username and password for LEAP authentication. When such a profile is used, the saved username and password are used to start the LEAP authentication process, and you are not prompted to enter them. **Options:** Yes or No **Default:** Yes
EAP-SIM	Installs the EAP-SIM supplicant version included in the Install Wizard file. Installing the EAP-SIM supplicant enables the client to support EAP-SIM authentication. If this option is not selected now and you later want to use EAP-SIM, you must run this installation program again and select this option. **Default:** Unchecked **Note** Refer to Chapter 5 for information on enabling EAP-SIM. **Note** To enable EAP-SIM authentication, your computer must run Windows 2000 with the Microsoft 802.1X supplicant installed or Windows XP. **Note** If you installed the new EAP-SIM supplicant from the ftpeng FTP server, make sure the EAP-SIM option is not selected. Otherwise, the EAP-SIM supplicant included in the Install Wizard file overwrites the new supplicant's settings.

Table 3-1   Software Components and Their Parameters (continued)

Component or Parameter	Description
PEAP	Installs the PEAP supplicant version included in the Install Wizard file. Installing the PEAP supplicant enables the client to support PEAP authentication. If this option is not selected now and you later want to use PEAP, you must run this installation program again and select this option.
	Default: Unchecked
	Note Refer to Chapter 5 for information on enabling PEAP.
	Note To enable Cisco PEAP authentication, your computer must run Windows 2000 with the Microsoft 802.1X supplicant installed or Windows XP.
	Note Service Pack 1 for Windows XP and the Microsoft 802.1X supplicant for Windows 2000 include Microsoft's PEAP supplicant, which supports a Windows username and password only and does not interoperate with Cisco's PEAP supplicant. To use Cisco's PEAP supplicant, install the Install Wizard file after Service Pack 1 for Windows XP or the Microsoft 802.1X supplicant for Windows 2000. Otherwise, Cisco's PEAP supplicant is overwritten by Microsoft's PEAP supplicant.

e. When you are finished making selections, click **Next**.

Step 17   The installation process begins, and you are notified as each component is installed. Perform one of the following:

• If the following message appears, click **OK** and then reboot your computer: "The installation will complete and applications will be installed when a wireless LAN client adapter is inserted. If an adapter is already inserted, remove and reinsert the adapter or reboot the machine."

The Found New Hardware screen appears. Depending on your computer's operating system, you may have to click **Next**. The driver and other software components are installed. Then an ACM icon appears in the Windows system tray (unless you changed the default value during installation). Perform one of the following:

  – If a message appears asking if you wish to reboot now, click **Yes**.

Note   To ensure that your client adapter software is installed properly, Cisco recommends that you click **Yes** to reboot your computer now.

  – If a message appears indicating that the system is about to reboot, click **OK** and allow your computer to restart.

• If a message appears asking if you wish to reboot now, click **Yes**.

Note   To ensure that your client adapter software is installed properly, Cisco recommends that you click **Yes** to reboot your computer now.

- If a message appears indicating that the system is about to reboot, click **OK** and allow your computer to restart.

Step 18 If you want to install a second client adapter, allow your computer to reboot completely; then insert the second adapter into your computer. Depending on your computer's operating system, one of the following scenarios occurs:

- The Found New Hardware Wizard screen appears. Depending on your computer's operating system, you may have to click **Next**. The driver and other software components are installed, and another ACM icon appears in the Windows system tray. Click **Yes** or **OK** when a message appears about rebooting your computer.

> **Note** To ensure that your client adapter software is installed properly, Cisco recommends that you reboot your computer now.

- The driver and other software components are installed, and another ACM icon appears in the Windows system tray. Click **Yes** or **OK** when a message appears about rebooting your computer.

> **Note** To ensure that your client adapter software is installed properly, Cisco recommends that you reboot your computer now.

Step 19 If your computer is not connected to a DHCP server and you plan to use TCP/IP, follow the steps below for your operating system. If you have more than one client adapter installed, repeat this step for each adapter.

- **Windows 98, 98 SE, and Me**—Double-click **My Computer**, **Control Panel**, and **Network**. Select **TCP/IP > Cisco Systems Wireless LAN Adapter**. Click **Properties**, select **Specify an IP address**, and enter the IP address, subnet mask, and default gateway address of your computer (which can be obtained from your system administrator). Click **OK**. In the Network window, click **OK**.

- **Windows 2000**—Double-click **My Computer**, **Control Panel**, and **Network and Dial-up Connections**. Right-click **Local Area Connection** *x* (where *x* represents the number of the connection). Click **Properties**, **Internet Protocol (TCP/IP)**, and **Properties**. Click **Use the following IP address** and enter the IP address, subnet mask, and default gateway address of your computer (which can be obtained from your system administrator). Click **OK**. In the Local Area Connection Properties window, click **OK**.

- **Windows XP**—Right-click **Wireless Network Connection** and click **Properties**. Select **Internet Protocol (TCP/IP)** and click **Properties**. Select **Use the following IP address** and enter the IP address, subnet mask, and default gateway address of your computer (which can be obtained from your system administrator). Click **OK**

Step 20 If you are prompted to restart your computer, click **Yes**.

Step 21 Go to the "Verifying Installation" section on page 3-22 to determine if the installation was successful. After you verify installation, go to Chapter 4 if you want to create profiles for your client adapter.

Installing or Upgrading the Client Adapter Software on Windows NT

Follow the steps below to install or upgrade client adapter software components on a computer running Windows NT.

Note PC-Cardbus cards are not supported for use with Windows NT.

Note This procedure requires that your computer has Windows NT Service Pack 6 or greater.

Step 1 Use your computer's web browser to access the following URL:

http://www.cisco.com/public/sw-center/sw-wireless.shtml

Step 2 Select **Option #2: Aironet Wireless Software Display Tables**.

Note You can download software from the Software Selector tool instead of the display tables. To do so, select **Option #1: Aironet Wireless Software Selector**, follow the instructions on the screen, and go to Step 6.

Step 3 Select **Cisco Aironet Wireless LAN Client Adapters**.

Step 4 Under Aironet Client Adapter Installation Wizard (For Windows), select **Aironet Client Adapter Installation Wizard for Windows**.

Step 5 Select the Install Wizard file with the greatest version number.

Step 6 Read and accept the terms and conditions of the Software License Agreement.

Step 7 Select the file again to download it.

Step 8 Save the file to your computer's hard drive.

Step 9 If you are installing a PC or LM card, follow the steps below to obtain an available interrupt request (IRQ):

a. Select **Start** > **Programs** > **Administrative Tools** > **Windows NT Diagnostics**.

b. Click the **Resources** tab.

c. Click the **IRQ** button.

d. The used IRQs are listed in numerical order along the left side of the Resources window. Write down the number of an IRQ that is not being used. You will need this IRQ for Step 21.

Step 10 If you are installing a PC or LM card, double-click **My Computer**, **Control Panel**, and **Devices**. Scroll down and select **Pcmcia**. Click **Startup**, select **Automatic**, and click **OK**.

Step 11 Follow the instructions in Chapter 9 to insert the client adapter into your computer if it is not already inserted. The instructions are different for PC cards and PCI cards.

Caution Do not eject your client adapter at any time during the installation process, including during the reboot.

Step 12 If the Windows NT Wizard screen appears, click **Exit**.

Step 13   Find the Install Wizard file using Windows Explorer, double-click it, and extract its files to a folder.

> ✎
> **Note**   To extract the files, click **Browse** on the WinZip Self-Extractor screen, select the folder in which you want the files to be placed, and click **OK** and **Unzip**. After the files are extracted, click **OK** to close the screen.

Step 14   Close Windows Explorer. The Cisco Aironet Wireless LAN Client Adapter Installation Wizard screen appears (see Figure 3-3).

Figure 3-3   Cisco Aironet Wireless LAN Client Adapter Installation Wizard Screen
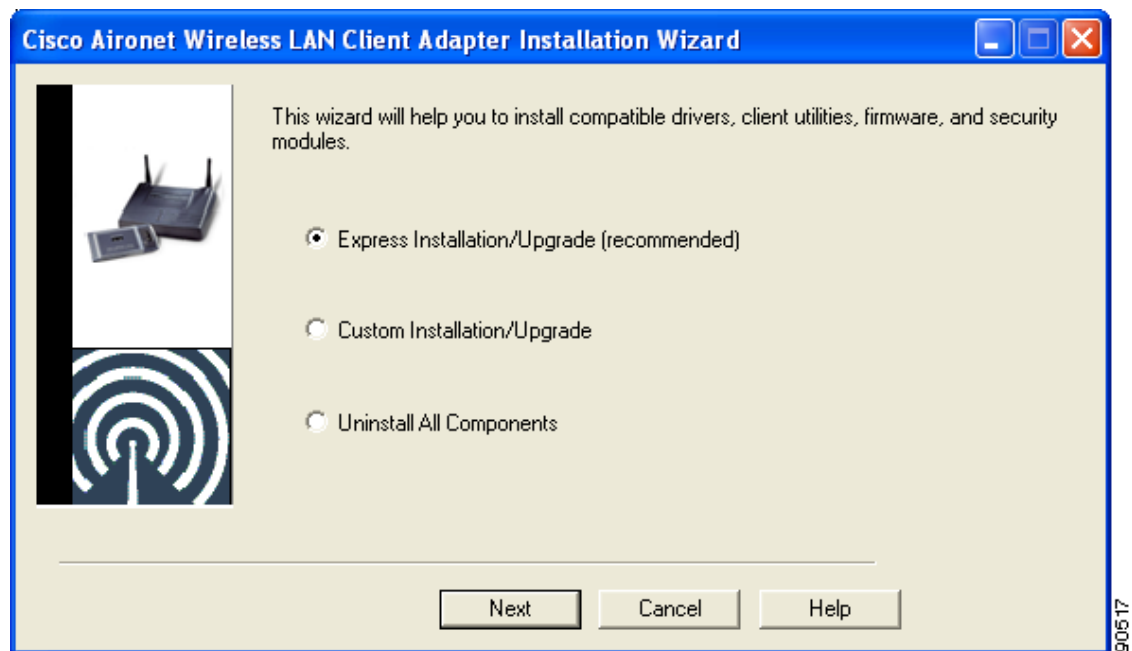
Step 15   Select one of the following options and click **Next**:

> ✎
> **Note**   To ensure compatibility among software components, Cisco recommends that you perform an express installation. If you perform a custom installation, Cisco recommends that you install all components.

*   **Express Installation/Upgrade (recommended)**—Silently installs the client adapter firmware, drivers, client utilities, and security modules using the default values listed in Table 3-2.
*   **Custom Installation/Upgrade**—Enables you to specify which software components are installed and to change the default values of certain parameters.

Step 16   A screen appears with a list of available drivers (see Figure 3-4).

Figure 3-4   Installable Drivers Screen
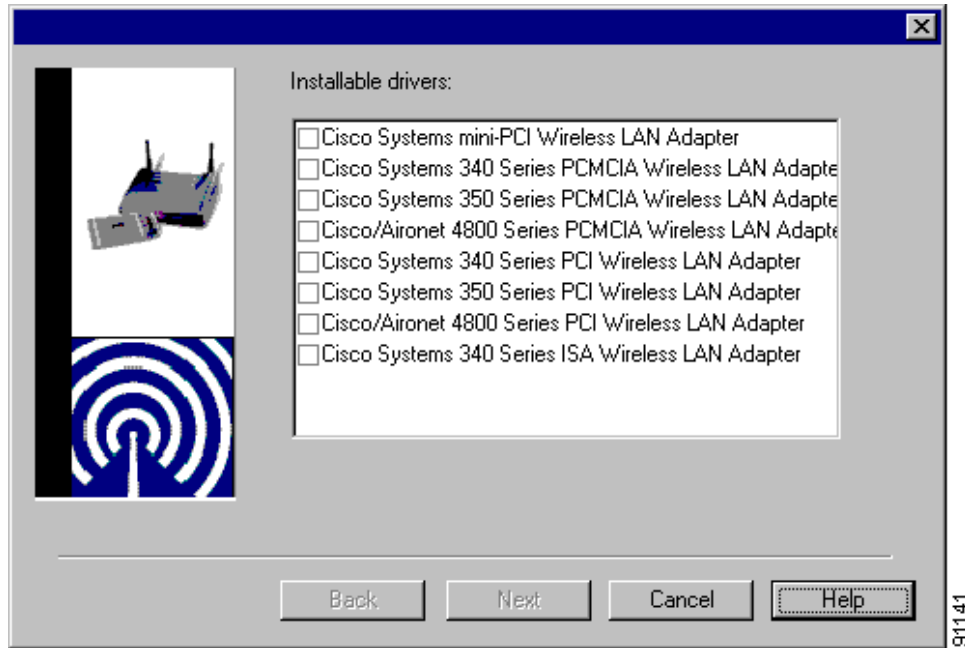
Step 17   Select the driver that corresponds to your client adapter type and click **Next**.

✏

Note   You must select a driver even if one is not being installed.

Step 18   If you selected an express installation, go to Step 20. If you selected a custom installation, the Custom Installation screen appears (see Figure 3-5).

Figure 3-5   Custom Installation Screen
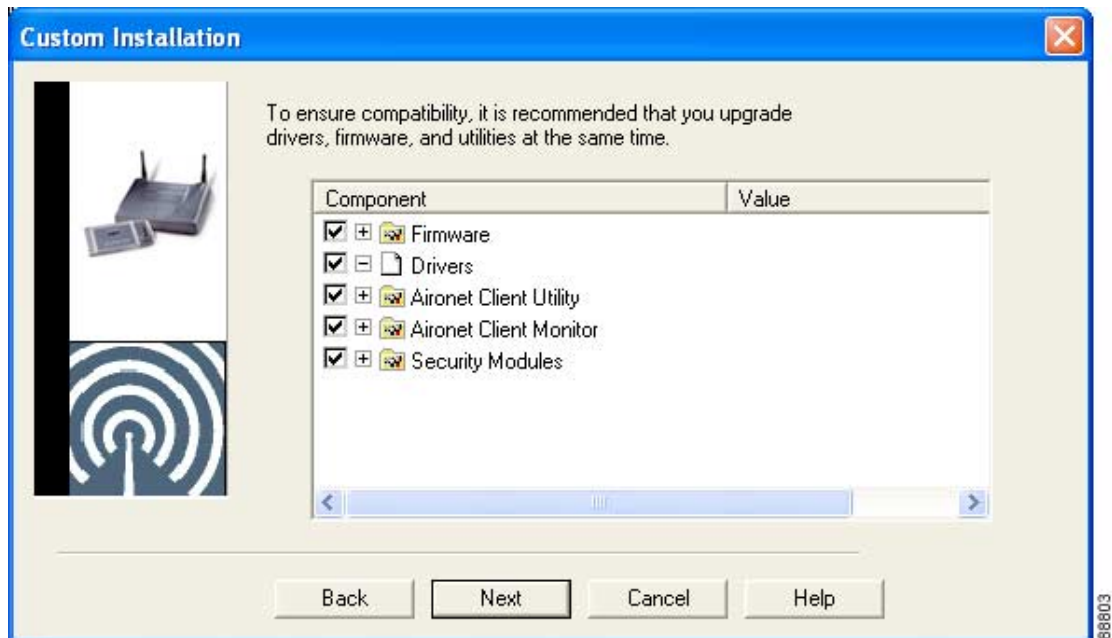
Step 19   Follow the steps below to make selections on this screen.

    a.   Make sure a check mark appears beside every software component that you want to install. For every component that is checked, the Install Wizard will install its version of that component. Every component that is not checked will remain as it is on your system.

> **Note**   Click the + sign beside the Security Modules option to reveal the available security components.

> **Note**   Some components are dependent on others. Therefore, when you select or deselect these components, the settings of other components may change. A dependency notice appears when this occurs.

    b.   Click the + sign beside each component to view additional parameters. The current value of each parameter appears in the Value field.

    c.   To change the value of any parameter, click its current value in the Value field. A screen appears that lets you change the existing value.

    d.   Enter or select a new value and click **OK**. Table 3-2 describes each component and its parameters and lists any default value.

Table 3-2   Software Components and Their Parameters

Component or Parameter	Description
Firmware	Installs the firmware version included in the Install Wizard file. **Default:** Checked
Disable Firmware Checking	The Disable Firmware Checking parameter affects the firmware that is bundled with the driver, not the firmware that is included in the Install Wizard. This parameter controls whether the driver (whenever it loads) installs the firmware with which it is bundled. **Note** The driver loads each time you insert a client adapter or reboot your computer. **Options:** Yes or No **Default:** Yes

Disable Firmware Checking	Description
Yes	Prevents the driver from installing the firmware with which it is bundled, enabling the client adapter to retain its current firmware version.
No	Causes the driver to install the firmware with which it is bundled if that firmware is newer than the firmware that is currently installed in the client adapter.

Note   This parameter is functionally equivalent to the Automatically Load New Firmware When NDIS Driver Is Updated parameter on the ACU Preferences screen. The parameter that is set last is the one that governs how the driver behaves. Refer to the "Preventing the Driver from Upgrading the Firmware" section on page 9-10 for additional information.

Note   The Disable Firmware Checking parameter is available in Install Wizard version 1.1 or greater.

Drivers	Installs the driver version included in the Install Wizard file. **Default:** Checked
Aironet Client Utility	Installs the ACU version included in the Install Wizard file. **Default:** Checked
Installation Path	Determines the path where the ACU software will be installed. You can change the default by entering a new path. **Default:** C:\Program Files\Cisco Systems\Aironet Client Utility
Program Folder	Determines the program folder where the ACU software will be installed. You can change the default by entering a new folder name. **Default:** Cisco Systems

Table 3-2   Software Components and Their Parameters (continued)

Component or Parameter	Description
Place Icon on Desktop	Causes the installation program to add an ACU icon to your computer's desktop to provide quick access to the utility. **Options:** Yes or No **Default:** Yes
Allow Non-Administrator Users to Save Settings to the Registry	Enables users without administrative rights to modify profiles in ACU and save them to the registry. **Options:** Yes or No **Default:** Yes
Aironet Client Monitor	Installs the ACM version included in the Install Wizard file. **Default:** Checked
Installation Path	Determines the path where the ACM software will be installed. You can change the default by entering a new path. **Default:** C:\Program Files\Cisco Systems\Aironet Client Monitor
Program Folder	Determines the program folder where the ACM software will be installed. You can change the default by entering a new folder name. **Default:** Cisco Systems
Auto Start	Determines whether ACM starts automatically every time Windows boots. **Options:** Yes or No **Default:** Yes
Start After Install	Determines whether ACM starts automatically after ACM is installed. **Options:** Yes or No **Default:** Yes

Table 3-2   Software Components and Their Parameters (continued)

Component or Parameter	Description
Program Feature Overrides	Determines which ACM components are enabled. If any components are not selected now and you later want to use them, you must run this installation program again and enable them. **Components:** See the table below **Options per component:** Enable or Disable **Default per component:** Enable <table><tr><td>Component</td><td>Description</td></tr><tr><td>About Box (Help)</td><td>Displays the ACM version number and enables you to access the online help.</td></tr><tr><td>Exit Program</td><td>Closes ACM for all client adapters.</td></tr><tr><td>Launch Aironet Client Utility</td><td>Activates ACU, if it is installed.</td></tr><tr><td>Troubleshooting</td><td>Activates the troubleshooting utility, which enables you to identify and resolve configuration and association problems with your client adapter.</td></tr><tr><td>Preferences</td><td>Enables you to determine when ACM runs and to select the options that appear on the ACM pop-up menu.</td></tr><tr><td>Turn Radio On/Off</td><td>Turns the client adapter's radio on or off.</td></tr><tr><td>Reauthenticate</td><td>Forces your client adapter to try to reauthenticate using the username and password of the current profile.</td></tr><tr><td>Select Profile</td><td>Enables you to select the active profile for your client adapter.</td></tr><tr><td>Auto Profile Selection</td><td>Causes the client adapter's driver to automatically select a profile from the list of profiles that were set up in ACU to be included in auto profile selection.</td></tr><tr><td>Other Configuration Application</td><td>Enables an application other than ACU to configure the client adapter.</td></tr><tr><td>Show Connection Status</td><td>Provides information on the current status of your client adapter.</td></tr></table>
Menu Options (Defaults)	Determines which options are displayed on the ACM pop-up menu. **Menu options:** About Box (Help), Exit Program, Launch Aironet Client Utility, Troubleshooting, Turn Radio On/Off, Reauthenticate, Select Profile, Show Connection Status **Options per menu option:** Show or Hide **Default per menu option:** Show

Table 3-2   Software Components and Their Parameters (continued)

Component or Parameter	Description
Security Modules	
LEAP	Installs the LEAP supplicant version included in the Install Wizard file. Installing the LEAP supplicant enables you to create a profile in ACU that uses LEAP authentication. If this option is not selected now and you later want to create a profile that uses LEAP, you must run this installation program again and select this option. **Default:** Checked **Note** Refer to Chapter 5 for information on enabling LEAP.
Allow Saved LEAP User Name and Password	Enables you to create a profile in ACU that uses a saved (rather than temporary) username and password for LEAP authentication. When such a profile is used, the saved username and password are used to start the LEAP authentication process, and you are not prompted to enter them. **Options:** Yes or No **Default:** Yes
EAP-SIM	Installs the EAP-SIM supplicant version included in the Install Wizard file. Installing the EAP-SIM supplicant enables the client to support EAP-SIM authentication. If this option is not selected now and you later want to use EAP-SIM, you must run this installation program again and select this option. **Default:** Unchecked **Note** The Microsoft 802.1X supplicant does not support EAP-SIM authentication on Windows NT; therefore, EAP-SIM cannot be enabled for this operating system. **Note** If you installed the new EAP-SIM supplicant from the ftpeng FTP server, make sure the EAP-SIM option is not selected. Otherwise, the EAP-SIM supplicant included in the Install Wizard file overwrites the new supplicant's settings.
PEAP	Installs the PEAP supplicant version included in the Install Wizard file. Installing the PEAP supplicant enables the client to support PEAP authentication. If this option is not selected now and you later want to use PEAP, you must run this installation program again and select this option. **Default:** Unchecked **Note** The Microsoft 802.1X supplicant does not support Cisco PEAP authentication on Windows NT; therefore, Cisco PEAP cannot be enabled for this operating system.

e. When you are finished making selections, click **Next**.

Step 20   The wizard starts to copy files, and the Cisco Aironet Wireless LAN Adapter Setup screen appears (see Figure 3-6).

Figure 3-6   Cisco Aironet Wireless LAN Adapter Setup Screen
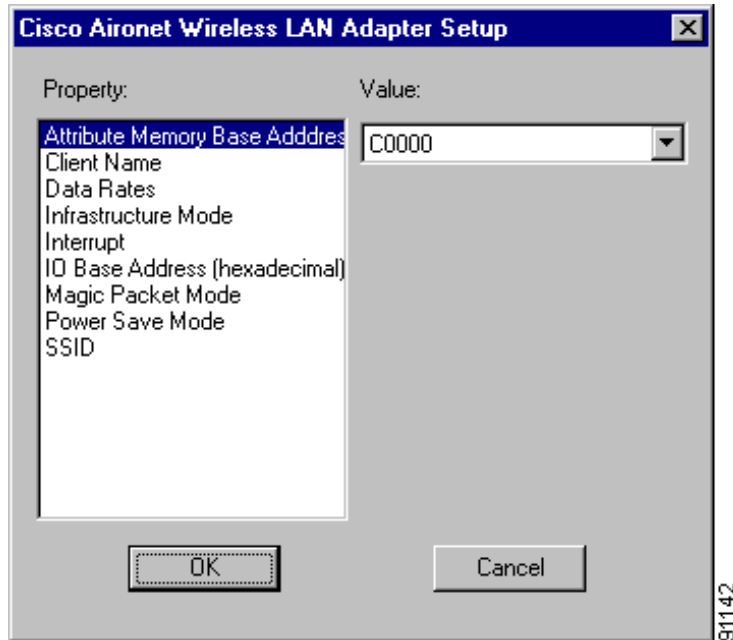
Step 21   If you are installing a PC or LM card, select **Interrupt** in the Property list and an unused interrupt (from Step 9) in the Value field and click **OK**. If you are installing a PCI or mini PCI card, click **OK**.

Step 22   Messages appear as binding configurations are stored. Then the Microsoft TCP/IP Properties screen appears (see Figure 3-7).

Figure 3-7   Microsoft TCP/IP Properties Screen
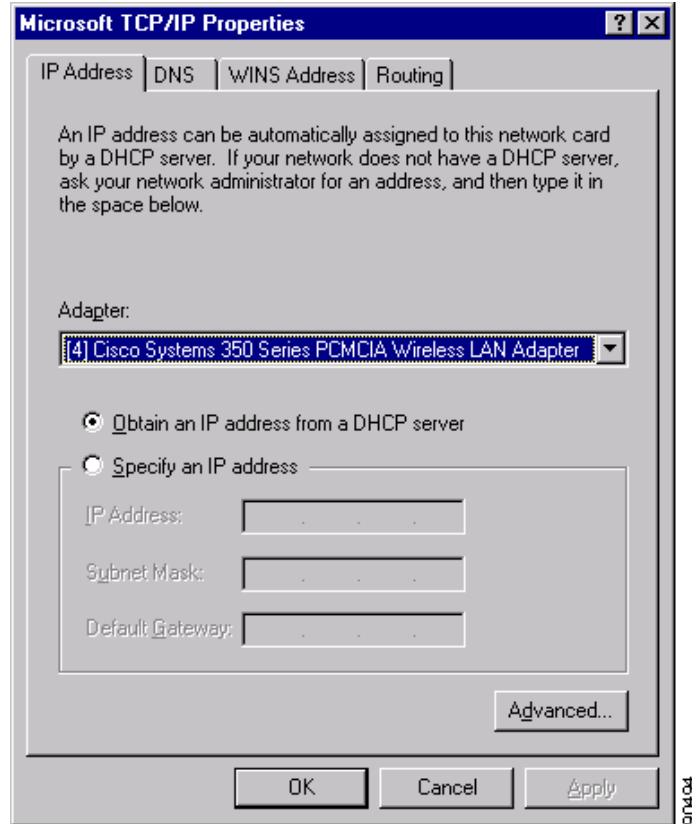
Step 23   On the IP Address tab, find and select the client adapter that you are installing under Adapter.

Step 24   Perform one of the following:

- If your computer is connected to a DHCP server, select **Obtain an IP address from a DHCP server**. When asked if you want to enable DHCP, click **Yes** and **OK**.

- If your computer is not connected to a DHCP server and you plan to use TCP/IP, select **Specify an IP address** and enter the IP address, subnet mask, and default gateway address of your computer (which can be obtained from your system administrator). Click **OK**.

The installation process begins, and you are notified as each component is installed.

Step 25   Windows NT must be rebooted in order for your changes to take effect. Click **Yes** when a message appears asking if you wish to reboot now.

⚠
Caution   To prevent unpredictable results, Cisco recommends that you click **Yes** to reboot your computer now.

Step 26 If you want to install a second client adapter, allow your computer to completely reboot; then repeat the steps in this section for the second adapter.

> **Note** In Step 13, find the Install Wizard files using Windows Explorer. Then double-click the **Setup.exe** file.

Step 27 Go to the "Verifying Installation" section below to determine if the installation was successful. After you verify installation, go to Chapter 4 if you want to create profiles for your client adapter.

Verifying Installation

To verify that you have properly installed the client adapter software, check the client adapter's LEDs. If the installation was successful, the client adapter's green LED blinks.

> **Note** If your installation was unsuccessful or you experienced problems during or after installation, refer to Chapter 10 for troubleshooting information.

Now that your client adapter is properly installed, you are ready to go to Chapter 4 to create profiles for your client adapter, unless you are running Windows XP or have more than one client adapter installed.

- If you are running Windows XP, go to the "Deciding How to Configure Your Client Adapter (Windows XP Only)" section below.

- If you have more than one client adapter installed, go to the "Selecting Among Several Installed Client Adapters" section on page 3-24.

Deciding How to Configure Your Client Adapter (Windows XP Only)

Windows XP is the only operating system that enables you to configure your client adapter without using ACU. Therefore, if your computer is running Windows XP, you must decide whether to configure your client adapter through Windows XP or ACU. To help you with your decision, Table 3-3 compares the Windows XP and ACU client adapter features.

Table 3-3   Comparison of Windows XP and ACU Client Adapter Features

Feature	Windows XP	ACU
Configuration parameters	Limited	Extensive
Capabilities		
Create profiles	No	Yes
Upgrade radio firmware	No	Yes
Restart client adapter without rebooting or ejecting card	No	Yes
Turn radio on or off	No	Yes

Table 3-3   Comparison of Windows XP and ACU Client Adapter Features (continued)

Feature	Windows XP	ACU
Security		
Static WEP	Yes	Yes
LEAP authentication with dynamic WEP	No	Yes
Host-based EAP authentication with static or dynamic WEP	Yes	Yes
Diagnostics		
Status screen	Limited	Extensive
Statistics screen (transmit & receive)	No	Yes
Site survey tool	No	Yes
RF link test tool	No	Yes
Link status meter (graphical display)	No	Yes

Perform one of the following:

- If you are planning to configure your client adapter through ACU instead of through Windows XP, follow the steps below:

   a. Double-click **My Computer**, **Control Panel**, and **Network Connections**.

   b. Right-click **Wireless Network Connection** and click **Properties**.

   c. Select the **Wireless Networks** tab and uncheck the **Use Windows to configure my wireless network settings** check box.

   d. Select the **Authentication** tab.

   > **Note**   In Service Pack 1 for Windows XP, the Authentication tab has moved from its previous location. To access it, click the **Wireless Networks** tab, select the network that you are configuring in the Preferred network list, and click **Properties**.

   e. Uncheck the **Enable network access control using IEEE 802.1X** check box.

   f. Follow the instructions in Chapter 4 and Chapter 5 to configure your client adapter through ACU.

- If you are planning to configure your client adapter through Windows XP instead of through ACU, go to Appendix E and follow the instructions there.

- If you are planning to configure your client adapter through Windows XP but you want to use ACU's diagnostic tools, go to Appendix E to configure the adapter through Windows XP; then follow the instructions in Chapter 7 to use ACU's diagnostic tools.

Selecting Among Several Installed Client Adapters

If more than one client adapter is installed in your computer, follow the instructions below to specify the one for which you want to set up profiles in ACU.

Step 1 Double-click the **Aironet Client Utility (ACU)** icon on your desktop or double-click **My Computer** > **Control Panel** > **Aironet Client Utility** to open ACU. The Select A Wireless LAN Adapter Card screen appears (see Figure 3-8).

> **Note** The Select A Wireless LAN Adapter Card screen appears when you start ACU if more than one card is inserted in your computer or no cards are inserted but more than one card is installed.

Figure 3-8   Select A Wireless LAN Adapter Card Screen

Step 2 Select the card you wish to configure from the list of available cards and click **OK**.

Step 3 Go to Chapter 4 to create profiles for this card.

C H A P T E R   **4**

Using the Profile Manager

This chapter explains how to use ACU's profile manager feature to create and manage profiles for your client adapter.

The following topics are covered in this chapter:

- Overview of Profile Manager, page 4-2
- Opening Profile Manager, page 4-2
- Creating a New Profile, page 4-3
- Including a Profile in Auto Profile Selection, page 4-4
- Selecting the Active Profile, page 4-6
- Modifying a Profile, page 4-7
- Importing and Exporting Profiles, page 4-9
- Granting or Denying Access to Non-Administrative Users, page 4-10

Overview of Profile Manager

ACU's profile manager feature allows you to create and manage up to 16 *profiles* (or saved configurations) for your client adapter. These profiles enable you to use your client adapter in different locations, each of which requires different configuration settings. For example, you may want to set up profiles for using your client adapter at the office, at home, and in public areas such as airports. Once the profiles are created, you can easily switch between them without having to reconfigure your client adapter each time you enter a new location.

Profiles are stored in the part of the registry reserved for the client adapter driver and, therefore, are tied to radio type. Consequently, if you set up profiles for a 340 series PC card and later upgrade to a 350 series PC card, all of the profiles will be lost. Similarly, all profiles are lost if you uninstall the client adapter's software components. To prevent your profiles from becoming lost, Cisco recommends that you back up your profiles using the profile manager's import/export feature. See the "Importing and Exporting Profiles" section on page 4-9 for details.

Opening Profile Manager

To open ACU's profile manager, double-click the **Aironet Client Utility (ACU)** icon on your desktop or double-click **My Computer** > **Control Panel** > **Aironet Client Utility** to open ACU. Then click the **Profile Manager** icon or select **Profile Manager** from the Commands drop-down menu. The Profile Manager screen appears (see Figure 4-1).

Figure 4-1   Profile Manager Screen
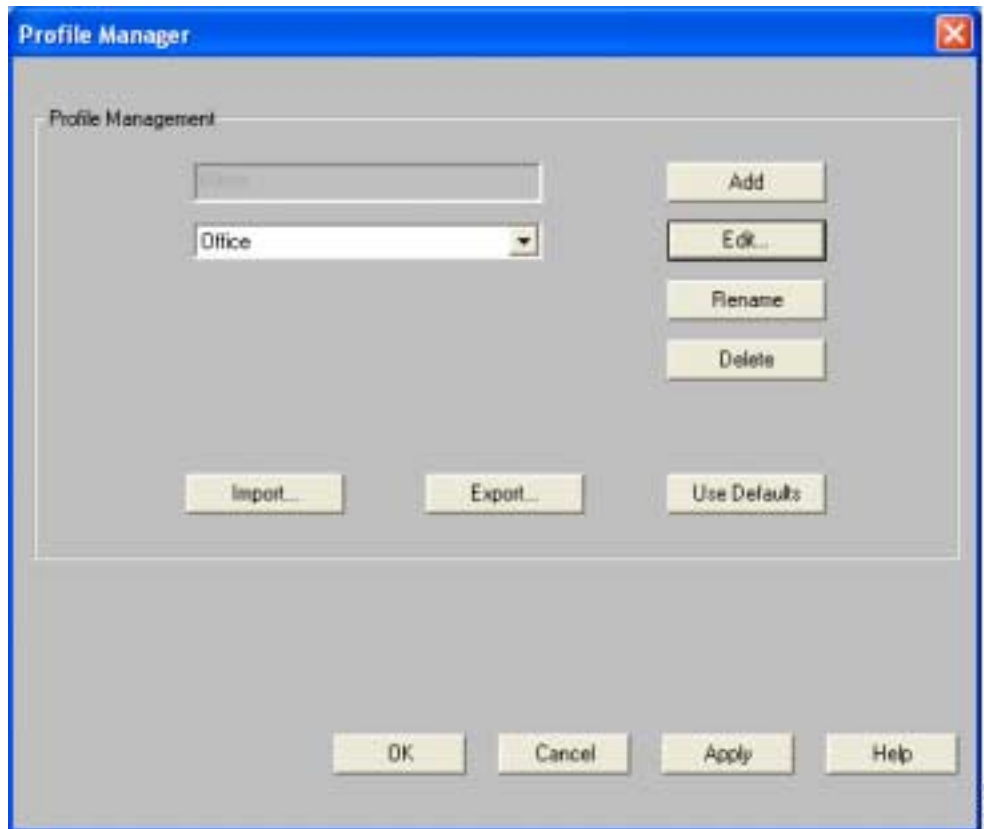
Profile manager allows you to perform the following tasks related to the management of profiles:

- Create a new profile, see below

- Include a profile in auto profile selection, page 4-4

- Select the active profile, page 4-6

- Edit a profile, page 4-7

- Set a profile to default values, page 4-8

- Rename a profile, page 4-8

- Delete a profile, page 4-8

- Import a profile, page 4-9

- Export a profile, page 4-9

Follow the instructions on the page indicated for the task you want to perform.

Note   If your system administrator used an administrative tool to deactivate certain parameters, these parameters are disabled on the Profile Manager screen and cannot be selected.

Creating a New Profile

Follow the steps below to create a new profile.

Step 1   Click **Add** on the Profile Manager screen. A cursor appears in the Profile Management edit box.

Step 2   Enter the name for your new profile (for example, Office, Home, etc.).

Step 3   Press **Enter**. The Properties screens appear with the name of your new profile in parentheses.

Step 4   Perform one of the following:

- If you want this profile to use the default values, click **OK**. The profile is added to the list of profiles on the Profile Manager screen.

- If you want to change any of the configuration parameter settings, follow the instructions in Chapter 5. The profile is added to the list of profiles on the Profile Manager screen.

Step 5   Click **OK** or **Apply** to save your profile.

Note   The profiles for PC-Cardbus cards are tied to the slot in which the card is inserted. Therefore, you must always insert your PC-Cardbus card into the same slot, create profiles for both slots, or export the profiles from one slot and import them for the other slot.

Including a Profile in Auto Profile Selection

After you have created profiles for your client adapter, you can choose to include them in the profile manager's auto profile selection feature. Then when auto profile selection is enabled, the client adapter automatically selects a profile from the list of profiles that were included in auto profile selection and uses it to establish a connection to the network.

Follow the steps below to include any of your profiles in auto profile selection and to establish the order in which the profiles will be selected for use.

Step 1 Open ACU; click the **Select Profile** icon or select **Select Profile** from the Commands drop-down menu. The Select Profile screen appears (see Figure 4-2).

Figure 4-2   Select Profile Screen
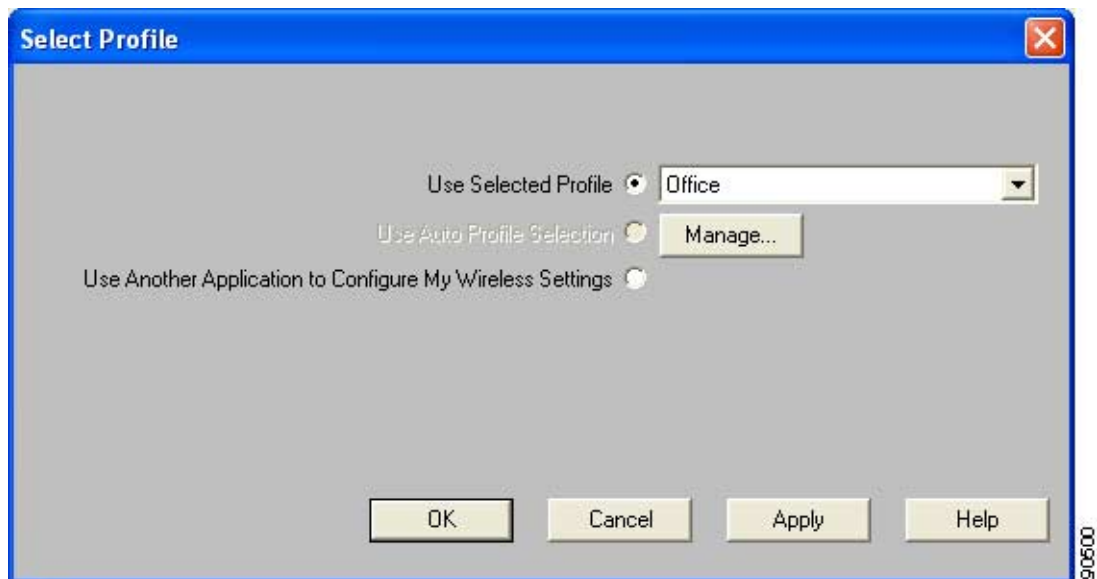
Step 2 Click the **Manage** button next to the Use Auto Profile Selection option. The Auto Profile Selection Management screen appears (see Figure 4-3).

Figure 4-3   Auto Profile Selection Management Screen
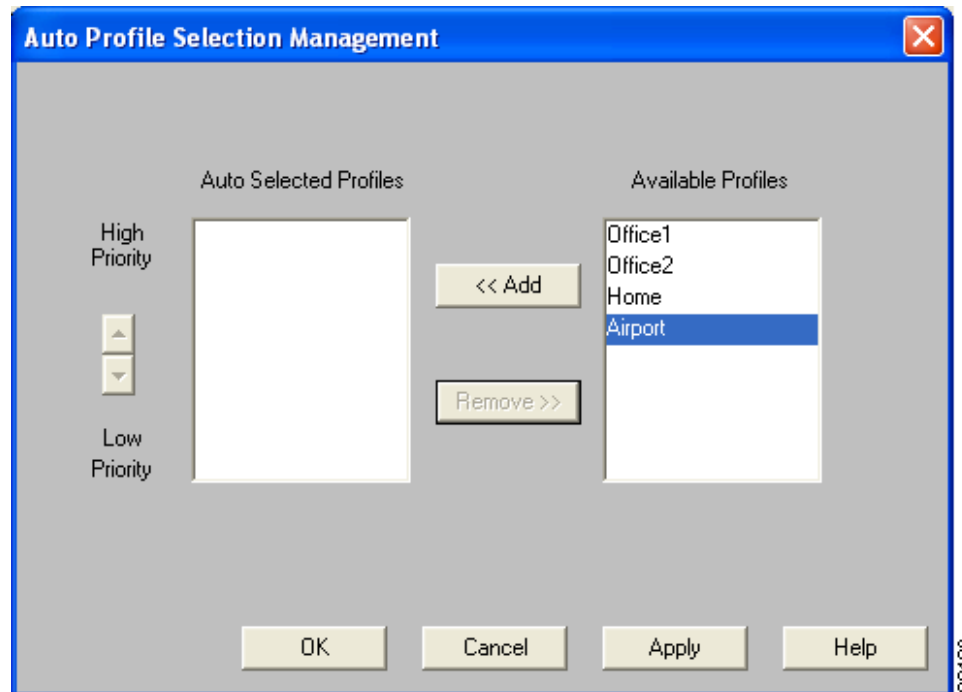
Step 3   All the profiles that you created are listed in the Available Profiles box. Highlight each one that you want to include in auto profile selection and click the **Add** button. The profiles move to the Auto Selected Profiles box.

The following rules apply to auto profile selection:

- You must include at least two profiles in the Auto Selected Profiles Box.

- The profiles must specify an SSID; otherwise, they cannot be selected in the Available Profiles box.

- Profiles cannot specify multiple SSIDs; otherwise, they cannot be selected in the Available Profiles box.

- Each profile that is included in auto profile selection must have a unique SSID. For example, if Profile A and Profile B both have "ABCD" as their SSID, only Profile A or Profile B can be included in auto profile selection.

Note   If you ever want to remove a profile from auto profile selection, highlight the profile in the Auto Selected Profiles box and click the **Remove** button. The profile moves to the Available Profiles box.

Step 4   The first profile in the Auto Selected Profiles box has the highest priority while the last profile has the lowest priority. To change the order (and priority) of your auto-selectable profiles, highlight the profile that you want to move and click the **High Priority** or **Low Priority** arrow to move the profile up or down, respectively.

When auto profile selection is enabled, the client adapter scans for an available network. The profile with the highest priority and the same SSID as one of the found networks is the one that is used to connect to the network. If the connection fails, the client adapter tries the next highest priority profile that matches the SSID and so on.

Step 5   Click **OK** to save your changes.

Selecting the Active Profile

Follow the steps below to specify the profile that the client adapter is to use.

> **Note**   Because EAP-TLS, PEAP, and EAP-SIM authentication are enabled in the operating system and not in ACU, you cannot switch between these authentication types simply by switching profiles in ACU. You can create a profile in ACU that uses host-based EAP, but you must enable the specific authentication type in Windows (provided Windows is using the Microsoft 802.1X supplicant). In addition, Windows can be set for only one authentication type at a time; therefore, if you have more than one profile in ACU that uses host-based EAP and you want to use another authentication type, you must change authentication types in Windows after switching profiles in ACU.

> **Note**   You can use ACM instead of ACU's Profile Manager to select the active profile. Refer to Chapter 8 for instructions.

Step 1   Open ACU; click the **Select Profile** icon or select **Select Profile** from the Commands drop-down menu. The Select Profile screen appears (see Figure 4-2).

Step 2   Select one of the following options:

- **Use Selected Profile**—This option enables you to select one profile for the client adapter to use. If you choose this option, you also must select the desired profile from the drop-down box.

   If the client adapter cannot associate to an access point or loses association while using the selected profile, the adapter does not attempt to associate using another profile. To associate, you must select a different profile or select Use Auto Profile Selection.

   > **Note**   If no profiles have been set for your client adapter, the Use Selected Profile drop-down box is disabled but displays "Driver Advanced Tab Settings."

- **Use Auto Profile Selection**—This option causes the client adapter's driver to automatically select a profile from the list of profiles that were set up to be included in auto profile selection.

    If the client adapter loses association for more than 10 seconds (or for more than the time specified by the LEAP authentication timeout value on the LEAP Settings screen if LEAP is enabled), the driver switches automatically to another profile that is included in auto profile selection. The adapter will not switch profiles as long as it remains associated or reassociates within 10 seconds (or within the time specified by the LEAP authentication timeout value). To force the client adapter to associate to a different access point, you must select a new profile using the Use Selected Profile option.

    > **Note** This option is available only if two or more profiles are included in auto profile selection.

    > **Note** Login scripts are not reliable if you use auto profile selection with LEAP. If you LEAP authenticate and achieve full network connectivity before or at the same time as you log into the computer, the login scripts will run. However, if you LEAP authenticate and achieve full network connectivity after you log into the computer, the login scripts will not run.

- **Use Another Application to Configure My Wireless Settings**—This option enables an application other than ACU to configure the client adapter. Examples of such applications include Windows XP and Boingo.

    > **Note** You must select this option if you are configuring your card through Windows XP but want to use ACU's diagnostic tools. Refer to Appendix E for information on configuring your client adapter through Windows XP.

Step 3 Click **OK** or **Apply** to save your selection. The client adapter starts using a profile based on the option selected above.

Modifying a Profile

This section provides instructions for modifying an existing profile. Follow the steps in the corresponding section below to edit, set to default values, rename, or delete a profile.

Editing a Profile

Step 1 Open ACU; click the **Profile Manager** icon or select **Profile Manager** from the Commands drop-down menu. The Profile Manager screen appears (see Figure 4-1).

Step 2 From the Profile Management drop-down box, select the profile that you want to edit.

Step 3 Click **Edit**. The Properties screens appear with the name of the profile in parentheses.

Step 4 Follow the instructions in Chapter 5 to change any of the configuration parameters for this profile.

Step 5 Click **OK** or **Apply** to save your configuration changes.

Setting a Profile to Default Values

Step 1 Open ACU; click the **Profile Manager** icon or select **Profile Manager** from the Commands drop-down menu. The Profile Manager screen appears (see Figure 4-1).

Step 2 From the Profile Management drop-down box, select the profile that you want to set to default values.

Step 3 Click **Use Defaults**.

Step 4 When prompted, click **Yes** to confirm your decision.

Step 5 Click **OK** or **Apply** to save your change. The profile is saved with default values.

Renaming a Profile

Step 1 Open ACU; click the **Profile Manager** icon or select **Profile Manager** from the Commands drop-down menu. The Profile Manager screen appears (see Figure 4-1).

Step 2 From the Profile Management drop-down box, select the profile that you want to rename.

Step 3 Click **Rename**. The Profile Management edit box becomes enabled.

Step 4 Enter a new name for the profile.

Step 5 Click **OK** or **Apply** to save your change. The profile is renamed and added to the list of profiles.

Deleting a Profile

Step 1 Open ACU; click the **Profile Manager** icon or select **Profile Manager** from the Commands drop-down menu. The Profile Manager screen appears (see Figure 4-1).

Step 2 From the Profile Management drop-down box, select the profile that you want to delete.

Step 3 Click **Delete**.

Step 4 When prompted, click **Yes** to confirm your decision.

Step 5 Click **OK** or **Apply** to save your change. The profile is deleted.

Importing and Exporting Profiles

This section provides instructions for importing and exporting profiles. You may want to use the import/export feature for the following reasons:

- To back up profiles before changing client adapter types or uninstalling client adapter software components
- To export profiles for a PC-Cardbus card in one Cardbus slot and import them for use with a second Cardbus slot
- To set up your computer with a profile from another computer
- To export one of your profiles and use it to set up additional computers

Follow the steps in the corresponding section below to import or export profiles.

Importing a Profile

Step 1   If the profile that you want to import is on a floppy disk, insert the disk into your computer's floppy drive.

Step 2   Open ACU; click the **Profile Manager** icon or select **Profile Manager** from the Commands drop-down menu. The Profile Manager screen appears (see Figure 4-1).

Step 3   Click **Import**. The Import Profile screen appears.

Step 4   Find the directory where the profile is located.

Step 5   Click the profile so it appears in the File name box at the bottom of the Import Profile screen.

Step 6   Click **Open**. The imported profile appears in the list of profiles on the Profile Manager screen.

Exporting a Profile

Step 1   Insert a blank floppy disk into your computer's floppy drive, if you wish to export a profile to a floppy disk.

Step 2   Open ACU; click the **Profile Manager** icon or select **Profile Manager** from the Commands drop-down menu. The Profile Manager screen appears (see Figure 4-1).

Step 3   From the Profile Management drop-down box, select the profile that you want to export.

Step 4   Click **Export**. The Save Profile As screen appears. The default filename is *ProfileName*.pro, where *ProfileName* is the name of the selected profile, and the default directory is the directory in which ACU is installed.

Step 5   If you want to change the profile name, enter a new name in the File name edit box.

Step 6   Select a different directory (for example, your computer's floppy disk drive or a location on the network) from the Save in drop-down box.

Step 7   Click **Save**. The profile is exported to the specified location.

Step 8   Follow the instructions in the "Importing a Profile" section to import the profile on another computer.

Granting or Denying Access to Non-Administrative Users

If you used the Install Wizard to perform a custom installation, you were able to specify the value of the Allow Non-Administrator Users to Save Settings to the Registry parameter. When this parameter is set to Yes, it enables users without administrative rights to modify profiles in ACU and save them to the registry on computers running Windows NT, 2000, or XP. (This option is not available for Windows 98, 98 SE, and Me because these versions of Windows do not support different classes of users.) When this parameter is set to No, access to non-administrative users is denied.

ACU has a similar parameter that you can use to change the selection you made during installation, provided you have administrative rights. Follow the steps below if you want to change the current setting of this parameter.

Step 1 Open ACU.

Step 2 Click the **Preferences** icon or select **Preferences** from the Options drop-down menu. The Aironet Client Utility Preferences screen appears (see Figure 4-4).

Figure 4-4   Aironet Client Utility Preferences Screen
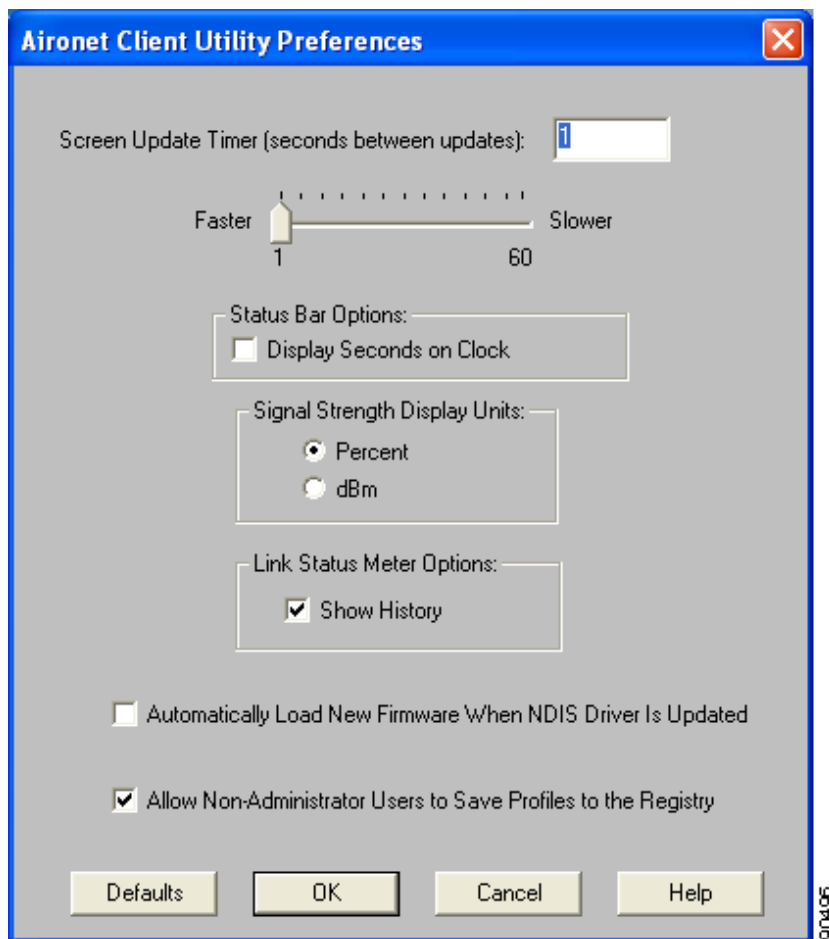
Step 3   Perform one of the following:

- Check the **Allow Non-Administrator Users to Save Profiles to the Registry** check box if you want to allow regular-class users to modify and save profiles.

- Uncheck the **Allow Non-Administrator Users to Save Profiles to the Registry** check box if you want to prevent regular-class users from modifying and saving profiles.

Step 4   Click **OK** to save your changes.

■ **Granting or Denying Access to Non-Administrative Users**

Configuring the Client Adapter

This chapter explains how to set the configuration parameters for a specific profile.

The following topics are covered in this chapter:

Overview

When you choose to create a new profile or edit an existing profile on the Profile Manager screen, the Properties screens appear with the name of your profile in parentheses. These screens enable you to set the configuration parameters for that profile.

Note If you do not change any of the configuration parameters, the default values are used.

Note If you are planning to set parameters on more than one of the Properties screens, wait until you are finished with all of the screens before clicking OK. When you click OK, you are returned to the Profile Manager screen.

Each of the Properties screens (listed below) contains parameters that affect a specific aspect of the client adapter:

- **System Parameters**—Prepares the client adapter for use in a wireless network
- **RF Network**—Controls how the client adapter transmits and receives data
- **Advanced (Infrastructure)**—Controls how the client adapter operates within an infrastructure network
- **Advanced (Ad Hoc)**—Controls how the client adapter operates within an ad hoc (peer-to-peer) network
- **Network Security**—Controls how a client adapter associates to an access point, authenticates to the wireless network, and encrypts and decrypts data

Table 5-1 enables you to quickly locate the instructions for setting each Properties screen's parameters.

Table 5-1   Locating Configuration Instructions

Parameter Category	Page Number
System	page 5-3
RF network	page 5-7
Advanced infrastructure	page 5-14
Advanced ad hoc	page 5-17
Network security	page 5-20

Setting System Parameters

The System Parameters screen (see Figure 5-1) enables you to set parameters that prepare the client adapter for use in a wireless network. This screen appears after you create and save a new profile or click Edit on the Profile Manager screen.

Figure 5-1   System Parameters Screen
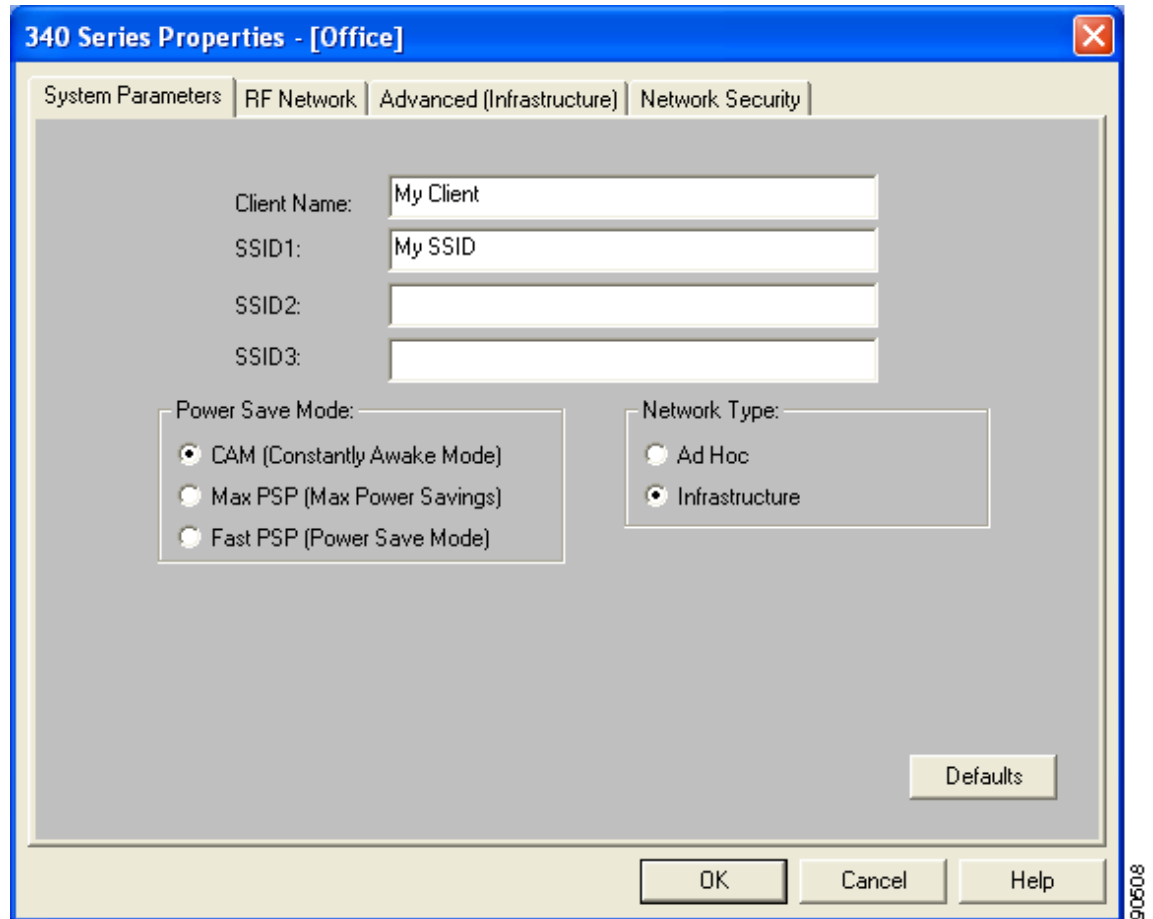
Table 5-2 lists and describes the client adapter's system parameters. Follow the instructions in the table to change any parameters.

Table 5-2   System Parameters

Parameter	Description
Client Name	A logical name for your workstation. It allows an administrator to determine which devices are connected to the access point without having to memorize every MAC address. This name is included in the access point's list of connected devices. **Range:** You can key in up to 16 ASCII characters **Default:** A blank field Note Each computer on the network should have a unique client name.
SSID1	The service set identifier (SSID) identifies the specific wireless network that you want to access. **Range:** You can key in up to 32 ASCII characters (case sensitive) **Default:** A blank field Note If you leave this parameter blank, your client adapter can associate to any access point on the network that is configured to allow broadcast SSIDs (see the AP Radio Hardware page in the access point management system). If the access point with which the client adapter is to communicate is not configured to allow broadcast SSIDs, the value of this parameter must match the SSID of the access point. Otherwise, the client adapter is unable to access the network.
SSID2	An optional SSID that identifies a second distinct network and enables you to roam to that network without having to reconfigure your client adapter. **Range:** You can key in up to 32 ASCII characters (case sensitive) **Default:** A blank field Note If a profile specifies more than one SSID, it cannot be included in auto profile selection. Note This field is unavailable for any profiles that are included in auto profile selection.
SSID3	An optional SSID that identifies a third distinct network and enables you to roam to that network without having to reconfigure your client adapter. **Range:** You can key in up to 32 ASCII characters (case sensitive) **Default:** A blank field Note If a profile specifies more than one SSID, it cannot be included in auto profile selection. Note This field is unavailable for any profiles that are included in auto profile selection.

Table 5-2   System Parameters (continued)

Parameter	Description
Power Save Mode	Sets your client adapter to its optimum power consumption setting. **Options:** CAM, Max PSP, or Fast PSP **Default:** CAM (Constantly Awake Mode) <table><tr><th>Power Save Mode</th><th>Description</th></tr><tr><td>CAM (Constantly Awake Mode)</td><td>Keeps the client adapter powered up continuously so there is little lag in message response time. Consumes the most power but offers the highest throughput. Is recommended for desktop computers and devices that use AC power.</td></tr><tr><td>Max PSP (Max Power Savings)</td><td>Causes the access point to buffer incoming messages for the client adapter, which wakes up periodically and polls the access point to see if any buffered messages are waiting for it. The adapter can request each message and then go back to sleep. Conserves the most power but offers the lowest throughput. Is recommended for devices for which power consumption is the ultimate concern (such as small battery-powered devices). **Note** When you set Max PSP mode and close ACU, the following message appears the next time you open ACU: "Maximum Power Save Mode will be temporarily disabled while you are running this application." While ACU is open, Fast PSP mode is active. When you close ACU, the card returns to Max PSP mode.</td></tr><tr><td>Fast PSP (Power Save Mode)</td><td>Switches between PSP mode and CAM mode, depending on network traffic. This mode switches to CAM when retrieving a large number of packets and switches back to PSP after the packets have been retrieved. Is recommended when power consumption is a concern but you need greater throughput than that allowed by Max PSP.</td></tr></table>

Table 5-2   System Parameters (continued)

Parameter	Description
Network Type	Specifies the type of network in which your client adapter is installed. **Options:** Ad Hoc or Infrastructure **Default:** Infrastructure <table><tr><td>Network Type</td><td>Description</td></tr><tr><td>Ad Hoc</td><td>Often referred to as *peer to peer.* Indicates that your wireless network consists of a few wireless devices that are not connected to a wired Ethernet network through an access point. For example, an ad hoc network can be set up between computers in a conference room so users can share information in a meeting.</td></tr><tr><td>Infrastructure</td><td>Indicates that your wireless network is connected to a wired Ethernet network through an access point.</td></tr></table>

Go to the next section to set additional parameters or click **OK** to return to the Profile Manager screen. On the Profile Manager screen, click **OK** or **Apply** to save your changes.

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Setting RF Network Parameters

The RF Network screen (see Figure 5-2) enables you to set parameters that control how and when the client adapter transmits and receives data. To access this screen, select the **RF Network** tab from the Properties screens.

Figure 5-2   RF Network Screen
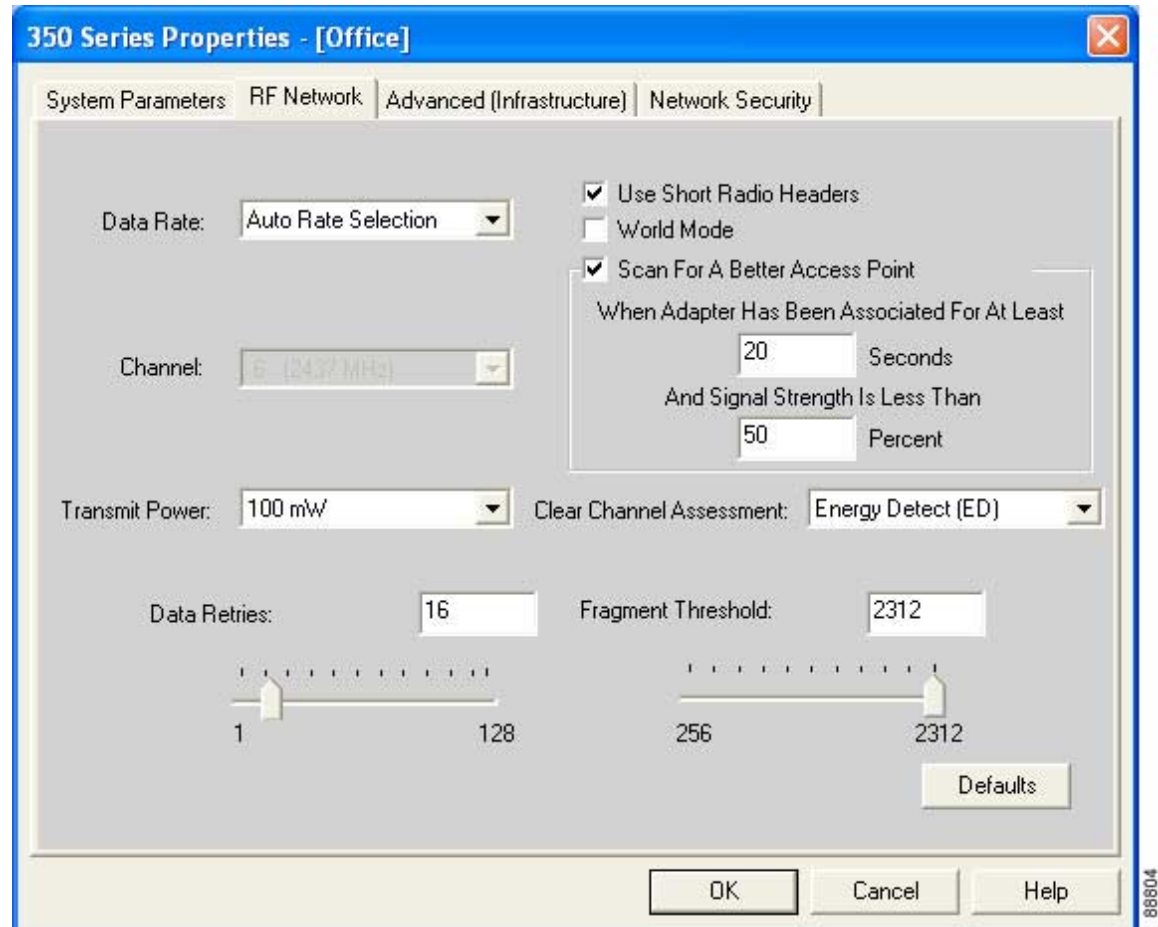
Table 5-3 lists and describes the client adapter's RF network parameters. Follow the instructions in the table to change any parameters.

Table 5-3   RF Network Parameters

Parameter	Description
Data Rate	Specifies the rate at which your client adapter should transmit or receive packets to or from access points (in infrastructure mode) or other clients (in ad hoc mode). Auto Rate Selection is recommended for infrastructure mode; setting a specific data rate is recommended for ad hoc mode. **Options:** Auto Rate Selection, 1 Mbps Only, 2 Mbps Only, 5.5 Mbps Only, or 11 Mbps Only (2.4-GHz client adapters); Auto Rate Selection, 6 Mbps Only, 9 Mbps Only, 12 Mbps Only, 18 Mbps Only, 24 Mbps Only, 36 Mbps Only, 48 Mbps Only, or 54 Mbps Only (5-GHz client adapters) **Default:** Auto Rate Selection

Data Rate		Description
2.4-GHz Client Adapters	**5-GHz Client Adapters**	
Auto Rate Selection	Auto Rate Selection	Uses the 11-Mbps (for 2.4-GHz client adapters) or 54-Mbps (for 5-GHz client adapters) data rate when possible but drops to lower rates when necessary.
1 Mbps Only	6 Mbps Only	Offers the greatest range but the lowest throughput.
2 Mbps Only and 5.5 Mbps Only	9 Mbps Only to 48 Mbps Only	Progressively offers less range but greater throughput than the 1 Mbps Only (for 2.4-GHz client adapters) or 6 Mbps Only (for 5-GHz client adapters) option.
11 Mbps Only	54 Mbps Only	Offers the greatest throughput but the lowest range.

Note Your client adapter's data rate must be set to Auto Rate Selection or must match the data rate of the access point (in infrastructure mode) or the other clients (in ad hoc mode) with which it is to communicate. Otherwise, your client adapter may not be able to associate to them.

Table 5-3   RF Network Parameters (continued)

Parameter	Description
Use Short Radio Headers	Checking this check box sets your client adapter to use short radio headers. However, the adapter can use short radio headers only if the access point is also configured to support them and is using them. If any clients associated to an access point are using long headers, then *all* clients in that cell must also use long headers, even if both this client and the access point have short radio headers enabled.

Short radio headers improve throughput performance; long radio headers ensure compatibility with clients and access points that do not support short radio headers.

Default: Checked

Note   This parameter is available only for 2.4-GHz client adapters.

Note   This parameter is referred to as *Preambles* on the access point screens. |
| World Mode | Checking this check box enables the client adapter to adopt the maximum transmit power level and the frequency range of the access point to which it is associated, provided the access point is also configured for world mode. This parameter is available only in infrastructure mode and is designed for users who travel between countries and want their client adapters to associate to access points in different regulatory domains.

Default: Unchecked

Note   This parameter is available only for 2.4-GHz client adapters.

Note   When World Mode is enabled, the client adapter is limited to the maximum transmit power level allowed by the country of operation's regulatory agency. |
| Scan For A Better Access Point | Checking this check box causes the client to look for a better access point if the signal strength of its associated access point is less than the specified value after the specified time and to switch associations if it finds one.

Example: If the default values of 20 seconds and 50% are used, the client begins monitoring the strength of the signal received from its associated access point 20 seconds after becoming associated. The monitoring continues once per second. If the client detects a signal strength reading below 50%, it scans for a better access point.

Range: 5 to 255 seconds; 0 to 75% signal strength

Defaults: Checked, 20 seconds, 50% signal strength

Note   The ability to specify the time and signal strength is available in ACU version 6.1 or greater, which is included in Install Wizard version 1.1 or greater. |

Table 5-3   RF Network Parameters (continued)

Parameter	Description
Channel	Specifies the frequency that your client adapter will use as the channel for communications. These channels conform to the IEEE 802.11 Standard for your regulatory domain. • In infrastructure mode, this parameter is set automatically and cannot be changed. The client adapter listens to the entire spectrum, selects the best access point to associate to, and uses the same frequency as that access point. • In ad hoc mode, the channel of the client adapter must be set to match the channel used by the other clients in the wireless network. If the client adapter does not find any other ad hoc adapters, this parameter specifies the channel with which the adapter will start its cell. **Range:** Dependent on client adapter radio and regulatory domain **Example for 2.4-GHz client adapters:** 1 to 11 (2412 to 2462 MHz) in North America **Example for 5-GHz client adapters:** 36, 40, 44, 48, 52, 56, 60, and 64 (5180, 5200, 5220, 5240, 5260, 5280, 5300, and 5320 MHz) in North America **Default:** Dependent on client adapter radio and regulatory domain **Example for 2.4-GHz client adapters:** 6 (2437 MHz) in North America **Example for 5-GHz client adapters:** 36 (5180 MHz) in North America **Note** Refer to Appendix D for a list of channel identifiers, channel center frequencies, and regulatory domains for each channel.

Table 5-3   RF Network Parameters (continued)

Parameter	Description
Transmit Power	Defines the power level at which your client adapter transmits. This value must not be higher than that allowed by your country's regulatory agency (FCC in the U.S., DOC in Canada, ETSI in Europe, MKK in Japan, etc.). **Options:** Dependent on the power table programmed into the client adapter; see the table below **Default:** The maximum power level programmed into the client adapter and allowed by your country's regulatory agency <table><tr><th>Possible Power Levels</th><th>Client Adapter Type</th></tr><tr><td>30 mW or 1 mW</td><td>340 series PC cards</td></tr><tr><td>30 mW, 15 mW, 5 mW, or 1 mW</td><td>340 series LM cards and PCI cards</td></tr><tr><td>100 mW, 50 mW, 30 mW, 20 mW, 5 mW, or 1 mW</td><td>350 series client adapters</td></tr><tr><td>20 mW, 10 mW, or 5 mW</td><td>PC-Cardbus card</td></tr></table> **Note** Reducing the transmit power level conserves battery power but decreases radio range. **Note** When World Mode is enabled, the client adapter is limited to the maximum transmit power level allowed by the country of operation's regulatory agency. **Note** If you are using an older version of a 340 or 350 series client adapter, your power level options may be different than those listed here.

Table 5-3   RF Network Parameters (continued)

Parameter	Description
Clear Channel Assessment	Specifies the method that determines whether the channel on which your client adapter will operate is clear prior to the transmission of data. **Options:** Firmware Default (*XXX*), Carrier/Correlation (Car/Cor), Energy Detect (ED), or ED or Car/Cor **Default:** Firmware Default (*XXX*)

Method	Description
Firmware Default (*XXX*)	The Clear Channel Assessment (CCA) mechanism will report that the channel is busy based on the default value of the client adapter's firmware. The firmware's CCA default value is shown in parentheses. **Note** The CCA default value for PCM, LMC, and PCI card firmware is Car/Cor; the default value for mini PCI card firmware is ED.
Carrier/Correlation (Car/Cor)	The CCA mechanism will report that the channel is busy upon detection of a direct-sequence spread spectrum (DSSS) signal. This signal may be above or below the ED threshold.
Energy Detect (ED)	The CCA mechanism will report that the channel is busy upon detection of any energy above the ED threshold.
ED or Car/Cor	The CCA mechanism will report that the channel is busy upon detection of a DSSS signal or any energy above the ED threshold.

Note This parameter is available only for 2.4-GHz client adapters.

Table 5-3   RF Network Parameters (continued)

Parameter	Description
Data Retries	Defines the number of times a packet is resent if the initial transmission is unsuccessful. **Range:** 1 to 128 **Default:** 16 (2.4-GHz client adapters) or 32 (5-GHz client adapters) Note If your network protocol performs its own retries, set this to a smaller value than the default. This way notification of a "bad" packet is sent up the protocol stack quickly so the application can retransmit the packet if necessary.
Fragment Threshold	Defines the threshold above which an RF data packet is split up or fragmented. If one of those fragmented packets experiences interference during transmission, only that specific packet would need to be resent. Throughput is generally lower for fragmented packets because the fixed packet overhead consumes a higher portion of the RF bandwidth. **Range:** 256 to 2312 **Default:** 2312

Go to the next section to set additional parameters or click **OK** to return to the Profile Manager screen. On the Profile Manager screen, click **OK** or **Apply** to save your changes.

Setting Advanced Infrastructure Parameters

Note   You can set advanced infrastructure parameters only if your client adapter has been set to operate in an infrastructure network. See the Network Type parameter in Table 5-2.

The Advanced (Infrastructure) screen (see Figure 5-3) enables you to set parameters that control how the client adapter operates within an infrastructure network. To access this screen, select the **Advanced (Infrastructure)** tab from the Properties screens.

Figure 5-3   Advanced (Infrastructure) Screen
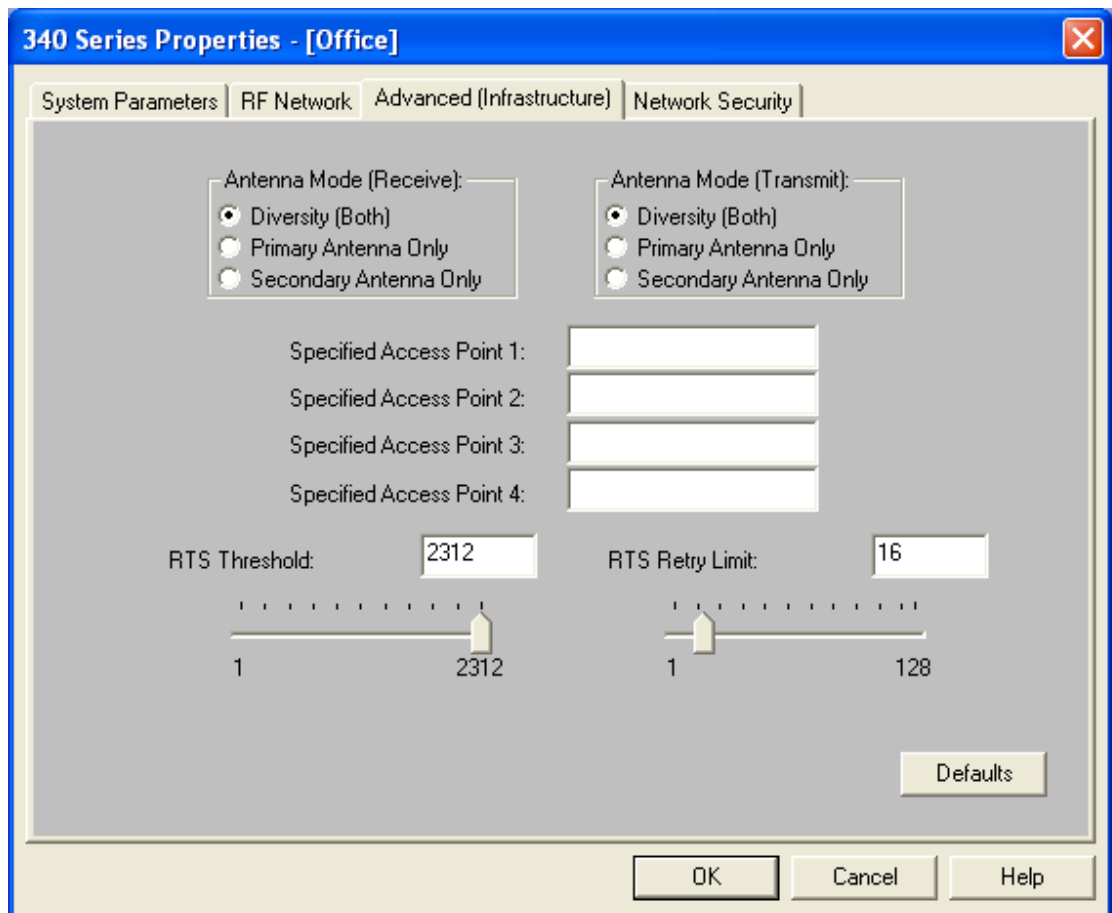
Table 5-4 lists and describes the client adapter's advanced infrastructure parameters. Follow the instructions in the table to change any parameters.

Table 5-4   Advanced (Infrastructure) Parameters

Parameter	Description
Antenna Mode (Receive)	Specifies the antenna that your client adapter uses to receive data.
	• PC card—The PC card's integrated, permanently attached antenna operates best when used in diversity mode. Diversity mode allows the card to use the better signal from its two antenna ports.
	Options: Diversity (Both), Primary Antenna Only, Secondary Antenna Only
	Default: Diversity (Both)
	• LM card—The LM card is shipped without an antenna; however, an antenna can be connected through the card's external connector. If a snap-on antenna is used, diversity mode is recommended. Otherwise, select the mode that corresponds to the antenna port to which the antenna is connected.
	Options: Diversity (Both), Primary Antenna Only, Secondary Antenna Only
	Default: Diversity (Both)
	• PCI card—The PCI card must use the Primary Antenna Only option.
	Default: Primary Antenna Only
	• Mini PCI card—The mini PCI card, which can be used with one or two antennas, operates best in diversity mode. Diversity mode allows the card to use the better signal from its two antenna connectors.
	Options: Diversity (Both), Primary Antenna Only, Secondary Antenna Only
	Default: Diversity (Both)
	Note This parameter is available only for 2.4-GHz client adapters.
	Note The Primary Antenna Only and Secondary Antenna Only options were formerly named Right Antenna Only and Left Antenna Only, respectively.
Antenna Mode (Transmit)	Specifies the antenna that your client adapter uses to transmit data. See the Antenna Mode (Receive) parameter above for information on the options available for your client adapter.
	Note This parameter is available only for 2.4-GHz client adapters.

Table 5-4   Advanced (Infrastructure) Parameters (continued)

Parameter	Description
Specified Access Point 1- 4	Specifies the MAC addresses of up to four preferred access points with which the client adapter can associate. If the specified access points are not found or the client adapter roams out of range, the adapter may associate to another access point.
	You can enter the MAC addresses of the access points in the edit boxes or choose not to specify access points by leaving the boxes blank.
	Default: Blank fields
	Note This parameter should be used only for access points that are in repeater mode. For normal operation, leave these fields blank because specifying an access point slows down the roaming process.
RTS Threshold	Specifies the size of the data packet that the low-level RF protocol issues to a request-to-send (RTS) packet.
	Setting this parameter to a small value causes RTS packets to be sent more often. When this occurs, more of the available bandwidth is consumed and the throughput of other network packets is reduced, but the system is able to recover faster from interference or collisions, which may be caused from a high multipath environment characterized by obstructions or metallic surfaces.
	Range: 0 to 2312
	Default: 2312
	Note Refer to the IEEE 802.11 Standard for more information on the RTS/CTS mechanism.
RTS Retry Limit	Specifies the number of times the client adapter resends a request-to-send (RTS) packet if it does not receive a clear-to-send (CTS) packet from the previously sent RTS packet.
	Setting this parameter to a large value decreases the available bandwidth whenever interference is encountered but makes the system more immune to interference and collisions, which may be caused from a high multipath environment characterized by obstructions or metallic surfaces.
	Range: 1 to 128
	Default: 16 (2.4-GHz client adapters) or 32 (5-GHz client adapters)
	Note Refer to the IEEE 802.11 Standard for more information on the RTS/CTS mechanism.

Go to the next section to set additional parameters or click **OK** to return to the Profile Manager screen. On the Profile Manager screen, click **OK** or **Apply** to save your changes.

Setting Advanced Ad Hoc Parameters

Note   You can set advanced ad hoc parameters only if your client adapter has been set to operate in an ad hoc network. See the Network Type parameter in Table 5-2.

The Advanced (Ad Hoc) screen (see Figure 5-4) enables you to set parameters that control how the client adapter operates within an ad hoc network. To access this screen, select the **Advanced (Ad Hoc)** tab from the Properties screens.

Figure 5-4   Advanced (Ad Hoc) Screen
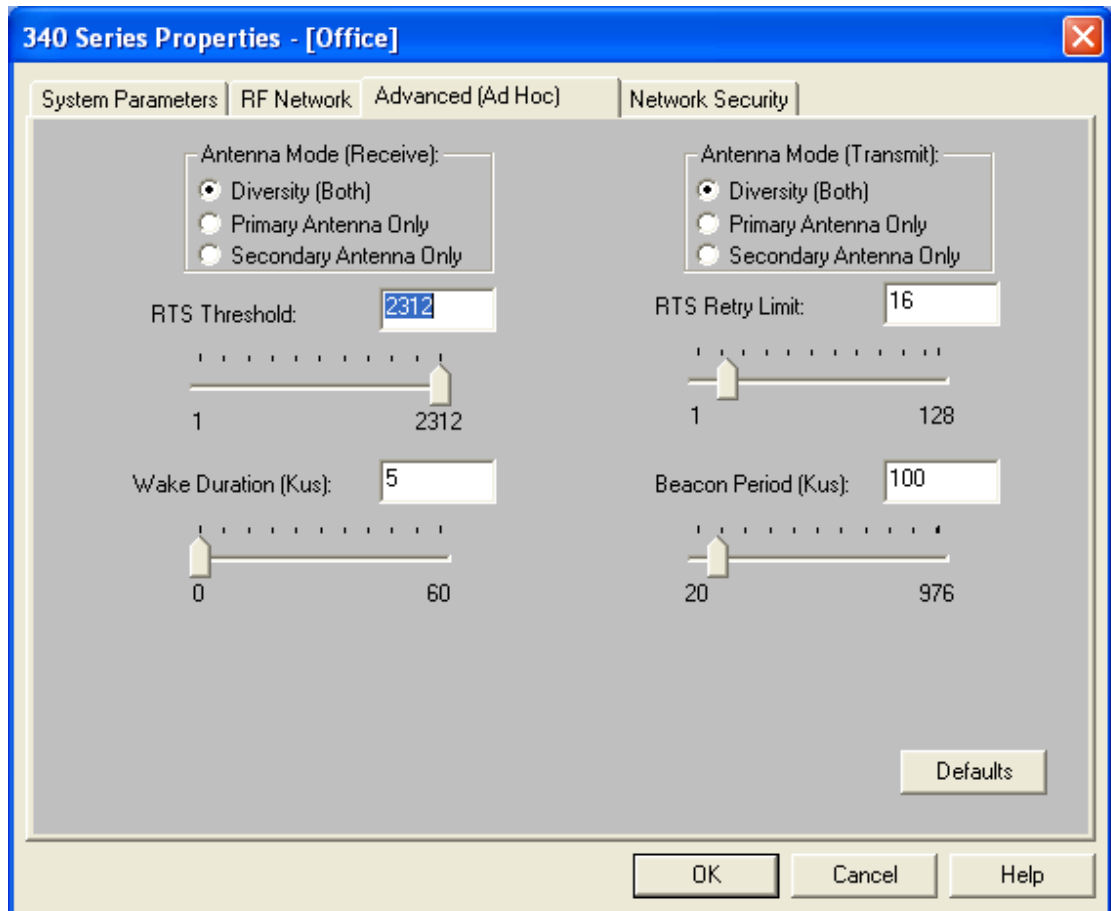
Table 5-5 lists and describes the client adapter's advanced ad hoc parameters. Follow the instructions in the table to change any parameters.

Table 5-5   Advanced (Ad Hoc) Parameters

Parameter	Description
Antenna Mode (Receive)	Specifies the antenna that your client adapter uses to receive data. • PC card—The PC card's integrated, permanently attached antenna operates best when used in diversity mode. Diversity mode allows the card to use the better signal from its two antenna ports. **Options:** Diversity (Both), Primary Antenna Only, Secondary Antenna Only **Default:** Diversity (Both) • LM card—The LM card is shipped without an antenna; however, an antenna can be connected through the card's external connector. If a snap-on antenna is used, diversity mode is recommended. Otherwise, select the mode that corresponds to the antenna port to which the antenna is connected. **Options:** Diversity (Both), Primary Antenna Only, Secondary Antenna Only **Default:** Diversity (Both) • PCI card—The PCI card must use the Primary Antenna Only option. **Default:** Primary Antenna Only • Mini PCI card—The mini PCI card, which can be used with one or two antennas, operates best in diversity mode. Diversity mode allows the card to use the better signal from its two antenna connectors. **Options:** Diversity (Both), Primary Antenna Only, Secondary Antenna Only **Default:** Diversity (Both) Note This parameter is available only for 2.4-GHz client adapters. Note The Primary Antenna Only and Secondary Antenna Only options were formerly named Right Antenna Only and Left Antenna Only, respectively.
Antenna Mode (Transmit)	Specifies the antenna that your client adapter uses to transmit data. See the Antenna Mode (Receive) parameter above for information on the options available for your client adapter. Note This parameter is available only for 2.4-GHz client adapters.

Table 5-5   Advanced (Ad Hoc) Parameters (continued)

Parameter	Description
RTS Threshold	Specifies the size of the data packet that the low-level RF protocol issues to a request-to-send (RTS) packet. Setting this parameter to a small value causes RTS packets to be sent more often. When this occurs, more of the available bandwidth is consumed and the throughput of other network packets is reduced, but the system is able to recover faster from interference or collisions, which may be caused from a high multipath environment characterized by obstructions or metallic surfaces. **Range:** 0 to 2312 **Default:** 2312 **Note** Refer to the IEEE 802.11 Standard for more information on the RTS/CTS mechanism.
RTS Retry Limit	Specifies the number of times the client adapter resends a request-to-send (RTS) packet if it does not receive a clear-to-send (CTS) packet from the previously sent RTS packet. Setting this parameter to a large value decreases the available bandwidth whenever interference is encountered but makes the system more immune to interference and collisions, which may be caused from a high multipath environment characterized by obstructions or metallic surfaces. **Range:** 1 to 128 **Default:** 16 (2.4-GHz client adapters) or 32 (5-GHz client adapters) **Note** Refer to the IEEE 802.11 Standard for more information on the RTS/CTS mechanism.
Wake Duration (Kµs)	Specifies the amount of time following a beacon that the client adapter stays awake to receive announcement traffic indication message (ATIM) packets, which are sent to the adapter to keep it awake until the next beacon. Refer to the Power Save Mode parameter in Table 5-2. **Range:** 0 Kµs (in CAM mode); 5 to 60 Kµs (in Max PSP or Fast PSP mode) **Default:** 5 Kµs **Note** If your client adapter is set to CAM mode, you must set the wake duration to 0 Kµs. If your client adapter is set to Max PSP or Fast PSP mode, you must set the wake duration to a minimum of 5 Kµs. **Note** Kµs is a unit of measurement in software terms. K = 1024, µ = 10^{-6}, and s = seconds, so Kµs = .001024 seconds, 1.024 milliseconds, or 1024 microseconds.

Table 5-5   Advanced (Ad Hoc) Parameters (continued)

Parameter	Description
Beacon Period (Kµs)	Specifies the duration between beacon packets, which are used to help clients find each other in ad hoc mode. **Range:** 20 to 976 Kµs **Default:** 100 Kµs

Go to the next section to set additional parameters or click **OK** to return to the Profile Manager screen. On the Profile Manager screen, click **OK** or **Apply** to save your changes.

Setting Network Security Parameters

The Network Security screen (see Figure 5-5) enables you to set parameters that control how the client adapter associates to an access point, authenticates to the wireless network, and encrypts and decrypts data. To access this screen, select the **Network Security** tab from the Properties screens.

Figure 5-5   Network Security Screen
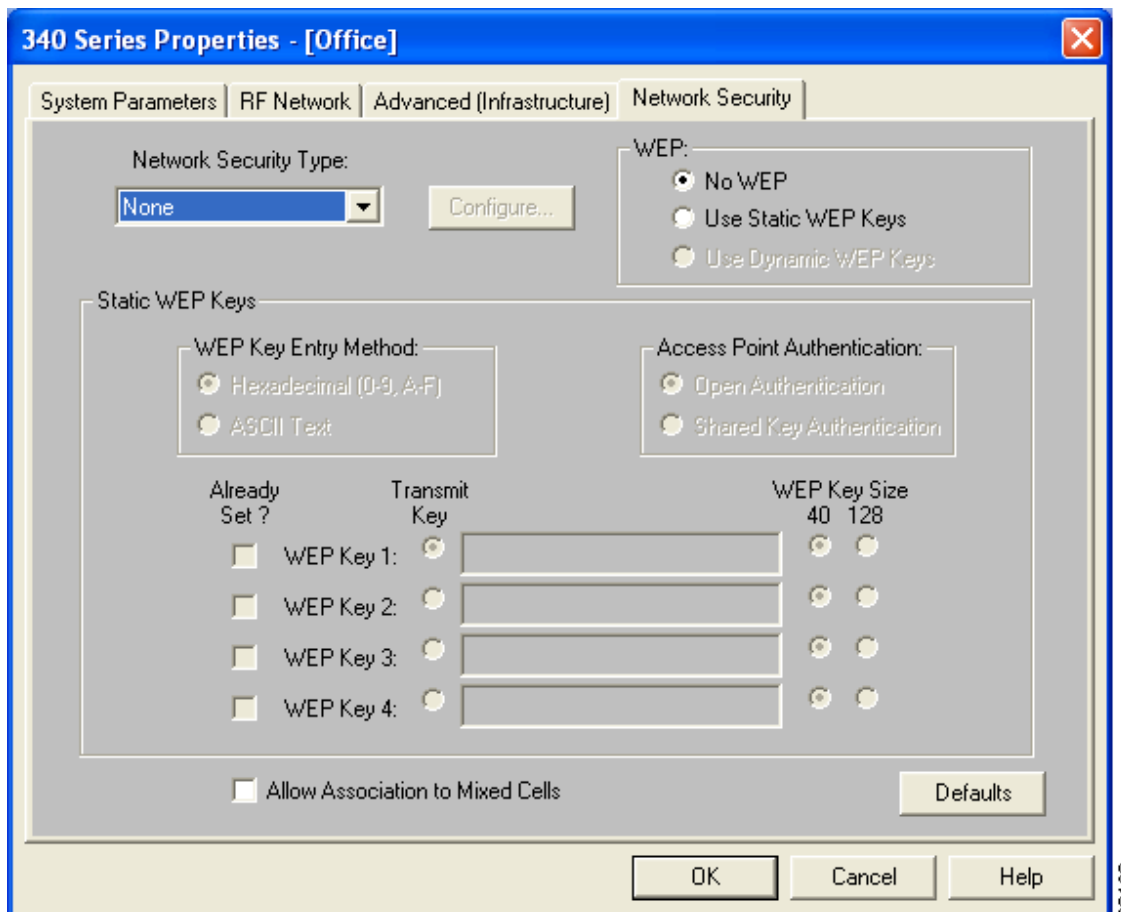
This screen is different from the other Properties screens in that it presents several security features, each of which involves a number of steps. In addition, the security features themselves are complex and need to be understood before they are implemented. Therefore, this section provides an overview of the security features as well as procedures for using them.

However, before you determine the appropriate security settings for your client adapter, you must decide how to set the **Allow Association to Mixed Cells** parameter, which appears at the bottom of the Network Security screen and is not associated to any of the security features. See the "Setting the Allow Association to Mixed Cells Parameter" section below.

Setting the Allow Association to Mixed Cells Parameter

The Allow Association to Mixed Cells parameter indicates whether the client adapter can associate to an access point that allows both WEP and non-WEP associations. Follow the steps below to set this parameter.

Step 1   Perform one of the following:

- Check the **Allow Association to Mixed Cells** check box if the access point with which the client adapter is to associate has WEP set to Optional and WEP is enabled on the client adapter. Otherwise, the client is unable to establish a connection with the access point.

- Uncheck the **Allow Association to Mixed Cells** check box if the access point with which the client adapter is to associate does not have WEP set to Optional. This is the default setting.

> **Note** For security reasons, Cisco recommends that WEP-enabled and WEP-disabled clients not be allowed in the same cell because broadcast packets are sent unencrypted, even to clients running WEP.

Step 2   Perform one of the following:

- If you do not want to change any other parameters on the Network Security screen, click **OK** to return to the Profile Manager screen; then click **OK** or **Apply** to save your changes

- If you want to change some of the other parameters on the Network Security screen, go to the next section.

Overview of Security Features

You can protect your data as it is transmitted through your wireless network by encrypting it through the use of wired equivalent privacy (WEP) encryption keys. With WEP encryption, the transmitting device encrypts each packet with a WEP key, and the receiving device uses that same key to decrypt each packet.

The WEP keys used to encrypt and decrypt transmitted data can be statically associated with your adapter or dynamically created as part of the EAP authentication process. The information in the "Static WEP Keys" and "EAP (with Dynamic WEP Keys)" sections below can help you to decide which type of WEP keys you want to use. Dynamic WEP keys with EAP offer a higher degree of security than static WEP keys.

WEP keys, whether static or dynamic, are either 40 or 128 bits in length. 128-bit WEP keys offer a greater level of security than 40-bit WEP keys.

Note   Refer to the "Additional WEP Key Security Features" section on page 5-25 for information on three security features that can make your WEP keys even more secure.

Static WEP Keys

Each device (or profile) within your wireless network can be assigned up to four static WEP keys. If a device receives a packet that is not encrypted with the appropriate key (as the WEP keys of all devices that are to communicate with each other must match), the device discards the packet and never delivers it to the intended receiver.

Static WEP keys are write-only and temporary; therefore, they cannot be read back from the client adapter, and they are lost when power to the adapter is removed or the Windows device is rebooted. Although the keys are temporary, you do not need to re-enter them each time the client adapter is inserted or the Windows device is rebooted. This is because the keys are stored (in an encrypted format for security reasons) in the registry of the Windows device. When the driver loads and reads the client adapter's registry parameters, it also finds the static WEP keys, unencrypts them, and stores them in volatile memory on the adapter.

The Network Security screen enables you to view the current WEP key settings for the client adapter and then to assign new WEP keys or overwrite existing WEP keys as well as to enable or disable static WEP. Refer to the "Using Static WEP" section on page 5-29 for instructions.

EAP (with Dynamic WEP Keys)

The new standard for wireless LAN security, as defined by the Institute of Electrical and Electronics Engineers (IEEE), is called *802.1X for 802.11*, or simply *802.1X*. An access point that supports 802.1X and its protocol, Extensible Authentication Protocol (EAP), acts as the interface between a wireless client and an authentication server, such as a Remote Authentication Dial-In User Service (RADIUS) server, to which the access point communicates over the wired network.

Two 802.1X authentication types can be selected in ACU for use with Windows operating systems:

- **EAP-Cisco Wireless** (or **LEAP**)—This authentication type is available for Windows 98, 98 SE, NT, 2000, Me, and XP, as well as non-Windows systems. Support for LEAP is provided not in the Windows operating system but in your client adapter's firmware and the Cisco software that supports it. RADIUS servers that support LEAP include Cisco Secure ACS version 2.6 and greater, Cisco Access Registrar version 1.7 and greater, and Funk Software's Steel-Belted RADIUS version 3.0 and greater.

   LEAP is enabled or disabled for a specific profile through ACU, provided the LEAP security module was selected during installation. After LEAP is enabled, a variety of configuration options are available, including how and when a username and password are entered to begin the authentication process.

   The username and password are used by the client adapter to perform mutual authentication with the RADIUS server through the access point. The username and password are stored in the client adapter's volatile memory; therefore, they are temporary and need to be re-entered whenever power is removed from the adapter, typically due to the client adapter being ejected or the system powering down.

> **Note**   If the LEAP security module was not selected during installation, the LEAP option is unavailable in ACU. If you want to be able to enable and disable LEAP, you must run the installation program again and select **LEAP**.

- **Host Based EAP**—Selecting this option enables you to use any 802.1X authentication type for which your operating system has support. For example, if your operating system uses the Microsoft 802.1X supplicant, it provides native support for EAP-TLS authentication and general support for PEAP and EAP-SIM authentication.

> **Note**   To use EAP-TLS, PEAP, or EAP-SIM authentication, you must install the Microsoft 802.1X supplicant, ACU, and the PEAP or EAP-SIM security module; configure your client adapter using ACU; enable the authentication type in Windows; and enable Network-EAP on the access point.

  - **EAP-TLS**—EAP-TLS is enabled or disabled through the operating system and uses a dynamic session-based WEP key, which is derived from the client adapter and RADIUS server, to encrypt data. Once enabled, a few configuration parameters must be set within the operating system.

    RADIUS servers that support EAP-TLS include Cisco Secure ACS version 3.0 or greater and Cisco Access Registrar version 1.8 or greater.

> **Note**   EAP-TLS requires the use of a certificate. Refer to Microsoft's documentation for information on downloading and installing the certificate.

  - **Protected EAP** (or **PEAP**)—PEAP authentication is designed to support One-Time Password (OTP), Windows NT or 2000 domain, and LDAP user databases over a wireless LAN. It is based on EAP-TLS authentication but uses a password or PIN instead of a client certificate for authentication. PEAP is enabled or disabled through the operating system and uses a dynamic session-based WEP key, which is derived from the client adapter and RADIUS server, to encrypt data. If your network uses an OTP user database, PEAP requires you to enter either a hardware token password or a software token PIN to start the EAP authentication process and gain access to the network. If your network uses a Windows NT or 2000 domain user database or an LDAP user database (such as NDS), PEAP requires you to enter your username, password, and domain name in order to start the authentication process.

    RADIUS servers that support PEAP authentication include Cisco Secure ACS version 3.1 or greater.

> **Note**   Service Pack 1 for Windows XP and the Microsoft 802.1X supplicant for Windows 2000 include Microsoft's PEAP supplicant, which supports a Windows username and password only and does not interoperate with Cisco's PEAP supplicant. To use Cisco's PEAP supplicant, install the Install Wizard file after Service Pack 1 for Windows XP or the Microsoft 802.1X supplicant for Windows 2000. Otherwise, Cisco's PEAP supplicant is overwritten by Microsoft's PEAP supplicant.

- **EAP-SIM**—EAP-SIM authentication is designed for use in public wireless LANs and requires clients equipped with PCSC-compliant smartcard readers. The EAP-SIM supplicant included in the Install Wizard file supports only Gemplus SIM+ cards; however, an updated supplicant is available that supports standard GSM-SIM cards as well as more recent versions of the EAP-SIM protocol. The new supplicant is available for download from the ftpeng FTP server at the following URL:

ftp://ftpeng.cisco.com/ftp/pwlan/eapsim/CiscoEapSim.dll

Please note that the above requirements are necessary but not sufficient to successfully perform EAP-SIM authentication. Typically, you are also required to enter into a service contract with a WLAN service provider, who must support EAP-SIM authentication in its network. Also, while your PCSC smartcard reader may be able to read standard GSM-SIM cards or chips, EAP-SIM authentication usually requires your GSM cell phone account to be provisioned for WLAN service by your service provider.

EAP-SIM is enabled or disabled through the operating system and uses a dynamic session-based WEP key, which is derived from the client adapter and RADIUS server, to encrypt data. EAP-SIM requires you to enter a user verification code, or *PIN*, for communication with the SIM card. You can choose to have the PIN stored in your computer or to be prompted to enter it after a reboot or prior to every authentication attempt.

RADIUS servers that support EAP-SIM include Cisco Access Registrar version 3.0 or greater.

Note Because EAP-TLS, PEAP, and EAP-SIM authentication are enabled in the operating system and not in ACU, you cannot switch between these authentication types simply by switching profiles in ACU. You can create a profile in ACU that uses host-based EAP, but you must enable the specific authentication type in Windows (provided Windows uses the Microsoft 802.1X supplicant). In addition, Windows can be set for only one authentication type at a time; therefore, if you have more than one profile in ACU that uses host-based EAP and you want to use another authentication type, you must change authentication types in Windows after switching profiles in ACU.

When you enable Network-EAP or Require EAP on your access point and configure your client adapter for LEAP, EAP-TLS, PEAP, or EAP-SIM, authentication to the network occurs in the following sequence:

1. The client associates to an access point and begins the authentication process.

Note The client does not gain full access to the network until authentication between the client and the RADIUS server is successful.

2. Communicating through the access point, the client and RADIUS server complete the authentication process, with the password (LEAP and PEAP), certificate (EAP-TLS), or internal key stored on the SIM card and in the service provider's Authentication Center (EAP-SIM) being the shared secret for authentication. The password or internal key is never transmitted during the process.

3. If authentication is successful, the client and RADIUS server derive a dynamic, session-based WEP key that is unique to the client.

4. The RADIUS server transmits the key to the access point using a secure channel on the wired LAN.

5. For the length of a session, or time period, the access point and the client use this key to encrypt or decrypt all unicast packets (and broadcast packets if the access point is set up to do so) that travel between them.

Refer to the "Enabling LEAP" section on page 5-31 for instructions on enabling LEAP or to the "Enabling Host-Based EAP" section on page 5-34 for instructions on enabling EAP-TLS, PEAP, or EAP-SIM.

> **Note**   Refer to the IEEE 802.11 Standard for more information on 802.1X authentication and to the following URL for additional information on RADIUS servers: http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/12cgcr/secur_c/scprt2/scrad.htm

Additional WEP Key Security Features

The three security features discussed in this section (MIC, TKIP, and broadcast key rotation) are designed to prevent sophisticated attacks on your wireless network's WEP keys. These features do not need to be enabled on the client adapter; they are supported automatically in the firmware and driver versions included in the Install Wizard file. However, they must be enabled on the access point.

> **Note**   Access point firmware version 11.10T or greater is required to enable these security features. Refer to the documentation for your access point for instructions on enabling these security features.

Message Integrity Check (MIC)

MIC prevents bit-flip attacks on encrypted packets. During a bit-flip attack, an intruder intercepts an encrypted message, alters it slightly, and retransmits it, and the receiver accepts the retransmitted message as legitimate. The MIC adds a few bytes to each packet to make the packets tamper-proof.

The Status screen indicates if MIC is being used, and the Statistics screen provides MIC statistics.

> **Note**   If you enable MIC on the access point, your client adapter's driver must support these features; otherwise, the client cannot associate.

Temporal Key Integrity Protocol (TKIP)

This feature, also referred to as *WEP key hashing*, defends against an attack on WEP in which the intruder uses the initialization vector (IV) in encrypted packets to calculate the WEP key. TKIP removes the predictability that an intruder relies on to determine the WEP key by exploiting IVs. It protects both unicast and broadcast WEP keys.

> **Note**   If you enable TKIP on the access point, your client adapter's firmware must support these features; otherwise, the client cannot associate.

Broadcast Key Rotation

EAP authentication provides dynamic unicast WEP keys for client devices but uses static broadcast, or multicast, keys. When you enable broadcast WEP key rotation, the access point provides a dynamic broadcast WEP key and changes it at the interval you select. When you enable this feature, only wireless client devices using LEAP, EAP-TLS, PEAP, or EAP-SIM authentication can associate to the access point. Client devices using static WEP (with open or shared key authentication) cannot associate.

Reporting Access Points that Fail LEAP Authentication

Client adapter firmware version 5.02.20 or greater and the following access point firmware versions support a new feature that is designed to detect access points that fail LEAP authentication:

- 12.00T or greater (340, 350, and 1200 series access points)
- 12.2(4)JA or greater (1100 series access points)

An access point running one of these firmware versions records a message in the system log when a client running firmware version 5.02.20 or greater discovers and reports another access point in the wireless network that has failed LEAP authentication.

The process takes place as follows:

1. A client with a LEAP profile attempts to associate to access point A.

2. Access point A does not handle LEAP authentication successfully, perhaps because the access point does not understand LEAP or cannot communicate to a trusted LEAP authentication server.

3. The client records the MAC address for access point A and the reason why the association failed.

4. The client associates successfully to access point B.

5. The client sends the MAC address of access point A and the reason code for the failure to access point B.

6. Access point B logs the failure in the system log.

Note   This feature does not need to be enabled on the client adapter or access point; it is supported automatically in the firmware of both devices. However, both the client and access point must use these firmware versions or greater.

Fast Secure Roaming

Some applications that run on a client device may require fast roaming between access points. Voice applications, for example, require seamless roaming to prevent delays and gaps in conversation. Support for fast secure roaming is now available for LEAP-enabled clients in client adapter firmware version 5.20.17.

During normal operation, LEAP-enabled clients mutually authenticate with a new access point by performing a complete LEAP authentication, including communication with the main RADIUS server. However, when you configure your wireless LAN for fast secure roaming, LEAP-enabled clients securely roam from one access point to another without the need to reauthenticate with the RADIUS server. Using Cisco Centralized Key Management (CCKM), an access point that is configured for wireless domain services (WDS) uses a fast rekeying technique that enables client devices to roam from one access point to another in under 150 milliseconds (ms). Fast secure roaming ensures that there is no perceptible delay in time-sensitive applications such as wireless Voice over IP (VoIP), enterprise resource planning (ERP), or Citrix-based solutions.

This feature does not need to be enabled on the client adapter; it is supported automatically in client adapter firmware version 5.20.17 or greater (which is included in Install Wizard version 1.1 or greater). However, it must be enabled on the access point.

Note   Access point firmware version 12.2(11)JA or greater is required to enable fast roaming. Refer to the documentation for your access point for instructions on enabling this feature.

Note   If the Microsoft 802.1X supplicant is installed on your computer, you must disable one or two Windows parameters in order for this feature to operate correctly. Refer to Step 10 in the "Enabling LEAP" section for details.

Synchronizing Security Features

In order to use any of the security features discussed in this section, both your client adapter and the access point to which it will associate must be set appropriately. Table 5-6 indicates the client and access point settings required for each security feature. This chapter provides specific instructions for enabling the security features on your client adapter. Refer to the documentation for your access point for instructions on enabling any of these features on the access point.

Table 5-6   Client and Access Point Security Settings

Security Feature	Client Setting	Access Point Setting
Static WEP with open authentication	Create a WEP key and enable Use Static WEP Keys and Open Authentication	Set up and enable WEP and enable Open Authentication
Static WEP with shared key authentication	Create a WEP key and enable Use Static WEP Keys and Shared Key Authentication	Set up and enable WEP and enable Shared Key Authentication
LEAP authentication	Enable LEAP	Set up and enable WEP and enable Network-EAP
EAP-TLS authentication		
If using ACU to configure card	Enable Host Based EAP and Use Dynamic WEP Keys in ACU and select Enable network access control using IEEE 802.1X and Certificates (or Smart Card or Other Certificate) as the EAP Type in Windows	Set up and enable WEP and enable Network-EAP
If using Windows XP to configure card	Select Enable network access control using IEEE 802.1X and Smart Card or other Certificate as the EAP Type	Set up and enable WEP and enable Require EAP and Open Authentication
PEAP authentication		
If using ACU to configure card	Enable Host Based EAP and Use Dynamic WEP Keys in ACU and select Enable network access control using IEEE 802.1X and PEAP as the EAP Type in Windows	Set up and enable WEP and enable Network-EAP
If using Windows XP to configure card	Select Enable network access control using IEEE 802.1X and PEAP as the EAP Type	Set up and enable WEP and enable Require EAP and Open Authentication

Table 5-6   Client and Access Point Security Settings (continued)

Security Feature	Client Setting	Access Point Setting
EAP-SIM authentication		
If using ACU to configure card	Enable Host Based EAP and Use Dynamic WEP Keys in ACU and select Enable network access control using IEEE 802.1X and SIM Authentication as the EAP Type in Windows	Set up and enable WEP with full encryption and enable Network-EAP
If using Windows XP to configure card	Select Enable network access control using IEEE 802.1X and SIM Authentication as the EAP Type	Set up and enable WEP with full encryption and enable Require EAP and Open Authentication
MIC	No settings required; automatically enabled by the driver included in the Install Wizard file	Set up and enable WEP with full encryption, set MIC to MMH, and set Use Aironet Extensions to Yes
TKIP	No settings required; automatically enabled by the firmware included in the Install Wizard file	Set up and enable WEP, set TKIP to Cisco, and set Use Aironet Extensions to Yes
Broadcast key rotation	Enable LEAP, EAP-TLS, PEAP, or EAP-SIM and use the firmware included in the Install Wizard file	Set up and enable WEP and set Broadcast WEP Key Rotation Interval to any value other than zero (0)
Reporting access points that fail LEAP authentication	No settings required; automatically enabled in firmware version 5.02.20 or greater	No settings required; automatically enabled in the following firmware versions: 12.00T or greater (340, 350, and 1200 series access points) or 12.2(4)JA or greater (1100 series access points)
Fast secure roaming	Enable LEAP and use firmware version 5.20.17 or greater	Use firmware version 12.2(11)JA or greater, select a cipher suite, and enable open authentication with EAP and CCKM Note To allow both 802.1X clients and non-802.1X clients to use the SSID, enable optional CCKM.

Using Static WEP

This section provides instructions for entering new static WEP keys or overwriting existing static WEP keys.

Entering a New Static WEP Key

Follow the steps below to enter a new static WEP key for this profile.

Step 1   Select **None** from the Network Security Type drop-down box on the Network Security screen.

Step 2   Select **Use Static WEP Keys** under WEP.

Step 3   Select one of the following WEP key entry methods:

- **Hexadecimal (0-9, A-F)**—Specifies that the WEP key will be entered in hexadecimal characters, which include 0-9, A-F, and a-f.

- **ASCII Text**—Specifies that the WEP key will be entered in ASCII text, which includes alpha characters, numbers, and punctuation marks.

> ✎
> **Note**   ASCII text WEP keys are not supported on the Cisco Aironet 1200 Series Access Points, so you must select the Hexadecimal (0-9, A-F) option if you are planning to use your client adapter with these access points.

Step 4   Select one of the following access point authentication options, which defines how your client adapter will attempt to authenticate to an access point:

- **Open Authentication**—Enables your client adapter, regardless of its WEP settings, to authenticate and attempt to communicate with an access point. Open Authentication is the default setting.

- **Shared Key Authentication**—Enables your client adapter to communicate only with access points that have the same WEP key. This option is available only if Use Static WEP Keys is selected.

    In shared key authentication, the access point sends a known unencrypted "challenge packet" to the client adapter, which encrypts the packet and sends it back to the access point. The access point attempts to decrypt the encrypted packet and sends an authentication response packet indicating the success or failure of the decryption back to the client adapter. If the packet is successfully encrypted/decrypted, the user is considered to be authenticated.

> ✎
> **Note**   Cisco recommends that shared key authentication not be used because it presents a security risk.

Step 5   For the static WEP key that you are entering (1, 2, 3, or 4), select a WEP key size of 40 or 128 on the right side of the screen. 128-bit client adapters can use 40- or 128-bit keys, but 40-bit adapters can use only 40-bit keys. If 128 bit is not supported by the client adapter, this option is unavailable.

Step 6   Obtain the static WEP key from your system administrator and enter it in the blank field for the key you are creating. Follow the guidelines below to enter a new static WEP key:

- WEP keys must contain the following number of characters:
    - 10 hexadecimal characters or 5 ASCII text characters for 40-bit keys

        Example: 5A5A313859 (hexadecimal) or ZZ18Y (ASCII)

    - 26 hexadecimal characters or 13 ASCII text characters for 128-bit keys

        Example: 5A583135333554595549333534 (hexadecimal) or ZX1535TYUI354 (ASCII)

> **Note**   You must enter hexadecimal characters for 5-GHz client adapters if these adapters will be used with Cisco Aironet 1200 Series Access Points.

- Your client adapter's WEP key must match the WEP key used by the access point (in infrastructure mode) or clients (in ad hoc mode) with which you are planning to communicate.

- When setting more than one WEP key, the keys must be assigned to the same WEP key numbers for all devices. For example, WEP key 2 must be WEP key number 2 on all devices. When multiple WEP keys are set, they must be in the same order on all devices.

> **Note**   After you enter a WEP key, you can write over it, but you cannot edit or delete it.

Step 7   Click the **Transmit Key** button to the left of the key you want to use to transmit packets. Only one WEP key can be selected as the transmit key.

Step 8   Click **OK** to return to the Profile Manager screen; then click **OK** or **Apply** to save your changes.

Overwriting an Existing Static WEP Key

Follow the steps below to overwrite an existing static WEP key.

> **Note**   You can overwrite existing WEP keys, but you cannot edit or delete them.

Step 1   Look at the current WEP key settings in the middle of the Network Security screen. A checkmark appears in the Already Set? box for all existing static WEP keys.

> **Note**   For security reasons, the codes for existing static WEP keys do not appear on the screen.

Step 2   Decide which existing static WEP key you want to overwrite.

Step 3   Click within the blank field of that key.

Step 4   Enter a new key, following the guidelines outlined in Step 6 of the "Entering a New Static WEP Key" section on page 5-29.

Step 5   Make sure the **Transmit Key** button to the left of your key is selected, if you want this key to be used to transmit packets.

Step 6   Click **OK** to return to the Profile Manager screen; then click **OK** or **Apply** to save your changes

Disabling Static WEP

If you ever need to disable static WEP for a particular profile, select **No WEP** under WEP on the Network Security screen, click **OK**, and click **OK** or **Apply** on the Profile Manager screen.

> **Note**   Selecting **LEAP** from the Network Security Type drop-down box on the Network Security screen disables static WEP automatically.

Enabling LEAP

Before you can enable LEAP authentication, your network devices must meet the following requirements:

- Client adapters must support WEP and use the firmware, drivers, utilities, and security modules included in the Install Wizard file.

    > **Note**   To use the reporting access points that fail LEAP authentication and fast secure roaming features, client adapters must use the software included in Install Wizard version 1.1 or greater.

- Access points to which your client adapter may attempt to authenticate must use the following software versions or greater: firmware version 12.00T (340, 350, and 1200 series access points) or IOS release 12.2(4)JA (1100 series access points).

    > **Note**   To use the reporting access points that fail LEAP authentication and fast secure roaming features, access points must use the firmware versions listed on page 5-26.

- All necessary infrastructure devices (for example, access points, servers, etc.) must be properly configured for LEAP authentication.

Follow the steps below to enable LEAP authentication for this profile.

Step 1   Select **LEAP** from the Network Security Type drop-down box on the bottom of the Network Security screen.

> **Note**   The LEAP option is available only if you selected the LEAP security module during installation.

> **Note**   When you select this option, dynamic WEP is set automatically.

Step 2   Click **Configure** to the right of the Network Security Type drop-down box. The LEAP Settings screen appears (see Figure 5-6).

Figure 5-6   LEAP Settings Screen

Step 3   Select one of the following LEAP username and password setting options:

- **Use Temporary User Name and Password**—Requires you to enter the LEAP username and password each time the computer reboots in order to authenticate and gain access to the network.

- **Use Saved User Name and Password**—Does not require you to enter a LEAP username and password each time the computer reboots. Authentication occurs automatically as needed using a saved username and password (which are registered with the RADIUS server).

Note   The Use Saved User Name and Password option is available only if the Allow Saved LEAP User Name and Password option was enabled (set to Yes) during installation.

Step 4   Perform one of the following:

- If you selected Use Temporary User Name and Password in Step 3, select one of the following
options:

    – **Use Windows User Name and Password**—Causes your Windows username and password to
    also serve as your LEAP username and password, giving you only one set of credentials to
    remember. After you log in, the LEAP authentication process begins automatically. This option
    is the default setting.

    – **Automatically Prompt for LEAP User Name and Password**—Requires you to enter a
    separate LEAP username and password (which are registered with the RADIUS server) in
    addition to your regular Windows login in order to start the LEAP authentication process.

    – **Manually Prompt for LEAP User Name and Password**—Requires you to manually invoke
    the LEAP authentication process as needed using the Manual LEAP Login option from the
    Commands drop-down menu. You are not prompted to enter a LEAP username and password
    during the Windows login. This option might be used to support a software token one-time
    password system or other systems that require additional software that is not available at login.

- If you selected Use Saved User Name and Password in Step 3, follow the steps below:

    a.   Enter a username and password in the appropriate fields.

    > **Note**   Usernames and passwords are limited to 32 ASCII characters each. However, if a
    > domain name is entered in the Domain field, the sum of the username and domain name
    > is limited to 31 ASCII characters.

    b.   Re-enter the password in the Confirm Password field.

    c.   If you wish to specify a domain name that will be passed to the RADIUS server along with your
    username, enter it in the Domain field.

Step 5   If you work in an environment with multiple domains and, therefore, want your Windows login domain
to be passed to the RADIUS server along with your username, check the **Include Windows Logon
Domain with User Name** check box. The default setting is checked.

> **Note**   If you selected to use a saved username and password but do not check the **Include Windows
> Logon Domain with User Name** check box, the Domain field becomes unavailable, and a
> domain name is not passed to the RADIUS server.

Step 6   If you want to force the client adapter to disassociate after you log off so that another user cannot gain
access to the wireless network using your credentials, check the **No Network Connection Unless User
Is Logged In** check box. The default setting is checked.

Step 7   In the LEAP Authentication Timeout Value field, enter the amount of time (in seconds) before a LEAP
authentication is considered to be failed and an error message appears.

Range: 45 to 300 seconds

Default: 90 seconds

Step 8   Click **OK** to exit the LEAP Settings screen.

Step 9   Click **OK** to exit the Network Security screen and return to the Profile Manager screen. On the Profile
Manager screen, click **OK** or **Apply** to save your changes.

Step 10   Follow the steps below if the Microsoft 802.1X supplicant is installed on your computer and you want to take advantage of the fast secure roaming feature:

   a.   Perform one of the following steps, depending on your computer's operating system:

   – If your computer is running Windows 98, 98 SE, NT, or Me, run the Microsoft 802.1X Authentication Client application. Then go to Step c.

   – If your computer is running Windows 2000, double-click **My Computer, Control Panel**, and **Network and Dial-up Connections**. Right-click **Local Area Connection**. Click **Properties**. The Local Area Connection Properties screen appears.

   – If your computer is running Windows XP, double-click **My Computer**, **Control Panel**, and **Network Connections**. Right-click **Wireless Network Connection**. Click **Properties**. The Wireless Network Connection Properties screen appears. Uncheck the **Use Windows to configure my wireless network settings** check box.

   b.   Click the **Authentication** tab.

   ✎
   Note   In Service Pack 1 for Windows XP, the Authentication tab has moved from its previous location. To access it, click the **Wireless Networks** tab, select the network that you are configuring in the Preferred network list, and click **Properties**.

   c.   Uncheck the **Enable network access control using IEEE 802.1X** check box.

Step 11   Refer to Chapter 6 for instructions on authenticating using LEAP.

Enabling Host-Based EAP

Before you can enable host-based EAP authentication, your network devices must meet the following requirements:

   • Client adapters must support WEP and use the firmware, drivers, utilities, and security modules included in the Install Wizard file.

   • Access points to which your client adapter may attempt to authenticate must use the following software versions or greater: firmware version 12.00T (340, 350, and 1200 series access points) or IOS release 12.2(4)JA (1100 series access points).

   • The Microsoft 802.1X supplicant must be installed on your Windows device.

   • All necessary infrastructure devices (for example, access points, servers, gateways, user databases, etc.) must be properly configured for the authentication type you plan to enable on the client.

Follow the steps below to enable host-based EAP authentication (EAP-TLS, PEAP, or EAP-SIM) for this profile.

   ✎
   Note   Because EAP-TLS, PEAP, and EAP-SIM authentication are enabled in the operating system and not in ACU, you cannot switch between these authentication types simply by switching profiles in ACU. You can create a profile in ACU that uses host-based EAP, but you must enable the specific authentication type in Windows (provided Windows uses the Microsoft 802.1X supplicant). In addition, Windows can be set for only one authentication type at a time; therefore, if you have more than one profile in ACU that uses host-based EAP and you want to use another authentication type, you must change authentication types in Windows after switching profiles in ACU.

Step 1   Select **Host Based EAP** from the Network Security Type drop-down box on the Network Security screen.

Step 2   Select **Use Dynamic WEP Keys** under WEP.

Step 3   Click **OK** to return to the Profile Manager screen.

Step 4   Click **OK** or **Apply** on the Profile Manager screen to save your changes.

Step 5   Perform one of the following, depending on your computer's operating system:

- If your computer is running Windows 98, 98 SE, NT, or Me, run the Microsoft 802.1X Authentication Client application. Then go to Step 7.

- If your computer is running Windows 2000, double-click **My Computer, Control Panel**, and **Network and Dial-up Connections**. Right-click **Local Area Connection**. Click **Properties**. The Local Area Connection Properties screen appears.

- If your computer is running Windows XP, double-click **My Computer**, **Control Panel**, and **Network Connections**. Right-click **Wireless Network Connection**. Click **Properties**. The Wireless Network Connection Properties screen appears.

Note   These instructions assume you are using Windows XP's classic view rather than its category view.

Step 6   Click the **Authentication** tab. The following screen appears (see Figure 5-7).

Note   In Service Pack 1 for Windows XP, the Authentication tab has moved from its previous location. To access it, click the **Wireless Networks** tab, select the network that you are configuring in the Preferred network list, and click **Properties**.

Figure 5-7   Wireless Network Connection Properties Screen (Authentication Tab) - Windows 2000 and XP Only
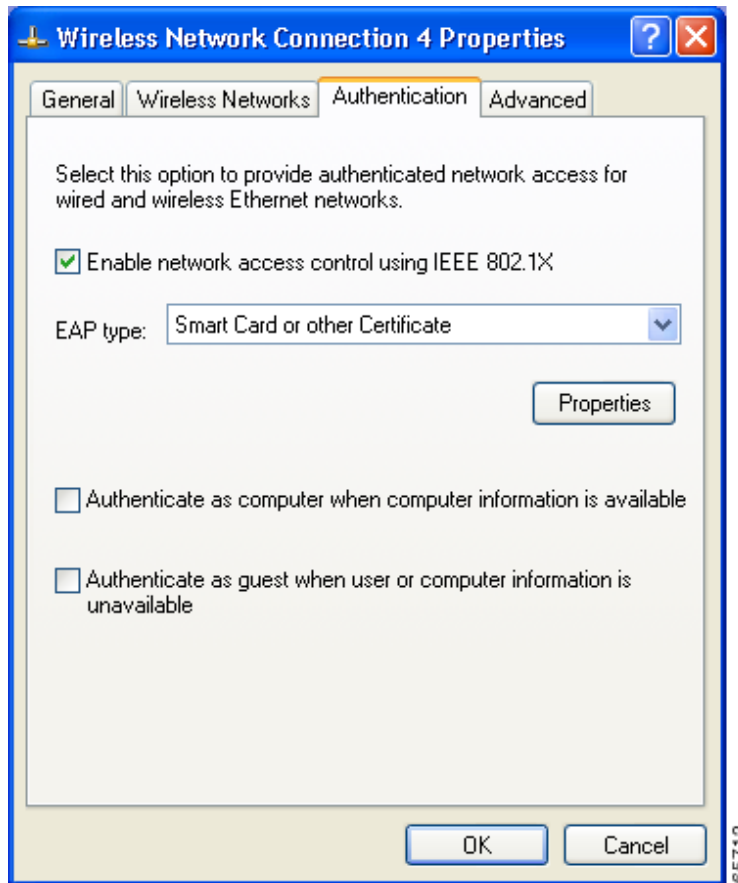
Step 7   Check the **Enable network access control using IEEE 802.1X** check box.

Step 8   Perform one of the following, depending on the authentication type you want to use:

- If you are planning to use EAP-TLS, go to the "Enabling EAP-TLS" section below.

- If you are planning to use PEAP, go to the "Enabling PEAP" section on page 5-39.

- If you are planning to use EAP-SIM, go to the "Enabling EAP-SIM" section on page 5-41.

Enabling EAP-TLS

Follow the steps below to enable EAP-TLS.

Step 1   For EAP type, select **Certificates** (on Windows 98, 98 SE, NT, or Me) or **Smart Card or other Certificate** (on Windows 2000 or XP).

Step 2   Click **Properties**. The Certificate Properties screen (see Figure 5-8) or the Smart Card or other Certificate Properties screen appears (see Figure 5-9).

Figure 5-8   Certificate Properties Screen - Windows 98, 98 SE, NT, and Me Only
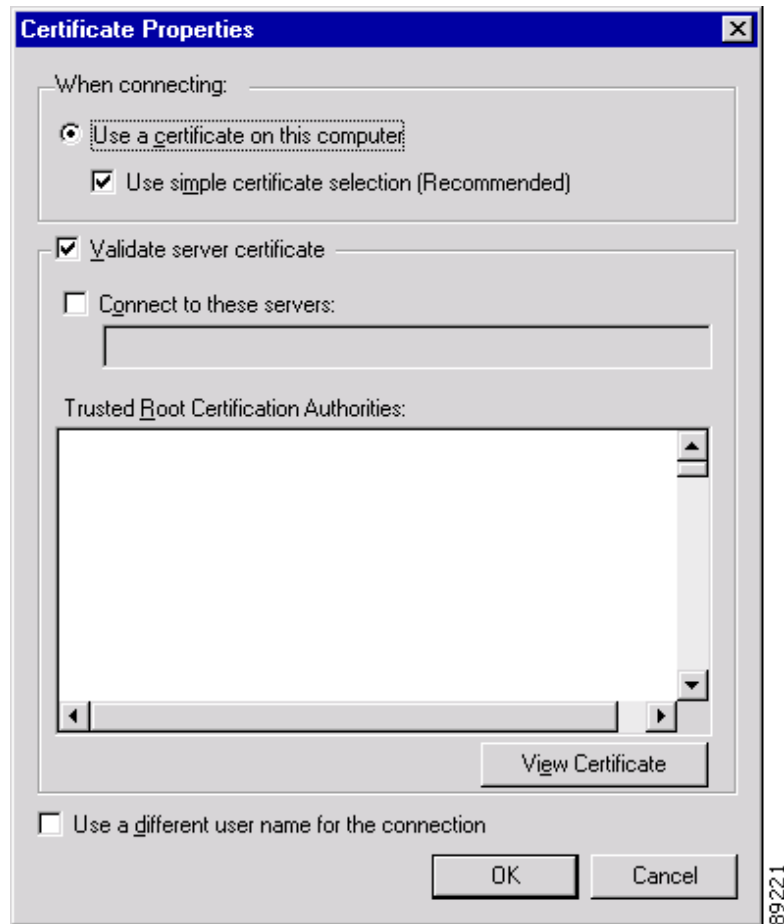
Figure 5-9   Smart Card or other Certificate Properties Screen - Windows 2000 and XP Only
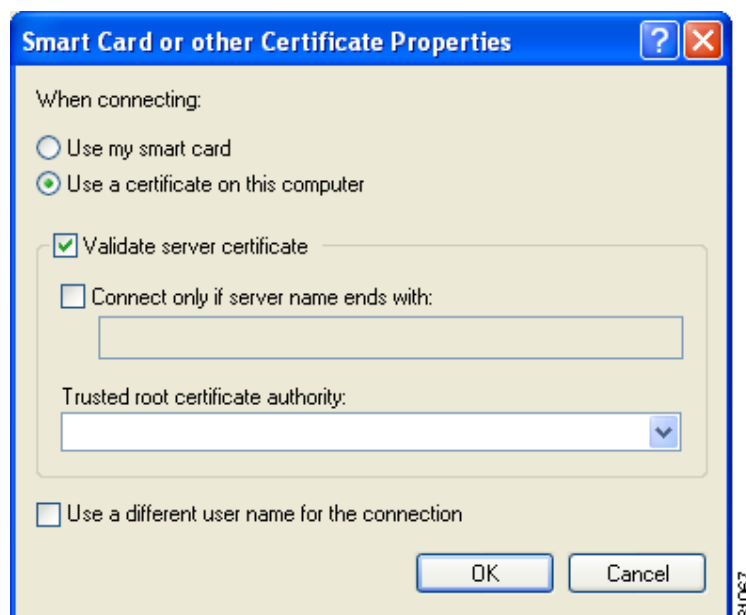
Step 3   Select the **Use a certificate on this computer** option.

Step 4   If your computer is running Windows 98, 98 SE, NT, or Me, make sure the **Use simple certificate selection (Recommended)** check box is selected.

Step 5   Check the **Validate server certificate** check box if server certificate validation is required.

Step 6   If you want to specify the name of the server to connect to, check the **Connect to these servers** or **Connect only if server name ends with** check box and enter the appropriate server name or server name suffix in the field below.

> **Note**   If you enter a server name and the client adapter connects to a server that does not match the name you entered, you are prompted to accept or cancel the connection during the authentication process.

> **Note**   If you leave this field blank, the server name is not verified, and a connection is established as long as the certificate is valid.

Step 7   Perform one of the following:

- If your computer is running Windows 98, 98 SE, NT, or Me, select the certificate authority from which the server certificate was downloaded in the Trusted Root Certification Authorities field.

- If your computer is running Windows 2000 or XP, make sure that the name of the certificate authority from which the server certificate was downloaded appears in the Trusted root certificate authority field.

> **Note**   If you leave this field blank, you are prompted to accept a connection to the root certification authority during the authentication process.

Step 8   Click **OK** twice to save your settings. The configuration is complete.

Step 9   Refer to Chapter 6 for instructions on authenticating using EAP-TLS.

Enabling PEAP

Follow the steps below to enable PEAP.

Step 1 For EAP type, select **PEAP**.

Step 2 Click **Properties**. The PEAP Properties screen appears (see Figure 5-10).

Figure 5-10   PEAP Properties Screen
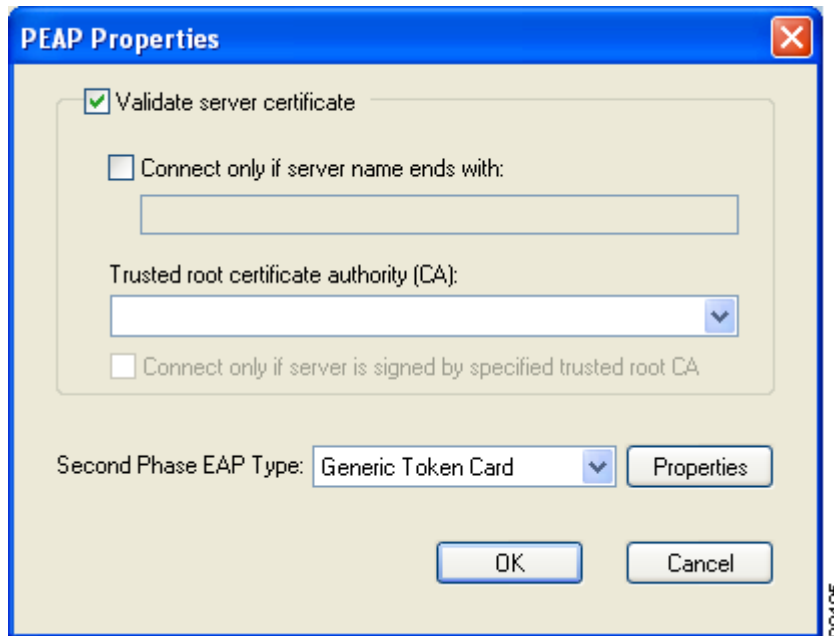
Step 3 Check the **Validate server certificate** check box if server certificate validation is required (recommended).

Step 4 If you want to specify the name of the server to connect to, check the **Connect only if server name ends with** check box and enter the appropriate server name suffix in the field below.

> **Note** If you enter a server name and the client adapter connects to a server that does not match the name you entered, you are prompted to accept or cancel the connection during the authentication process.

> **Note** If you leave this field blank, the server name is not verified, and a connection is established as long as the certificate is valid.

Step 5   Make sure that the name of the certificate authority from which the server certificate was downloaded appears in the Trusted root certificate authority (CA) field. If necessary, click the arrow on the drop-down menu and select the appropriate name.

> **Note**   If you leave this field blank, you are prompted to accept a connection to the root certification authority during the authentication process.

Step 6   Check the **Connect only if server is signed by specified trusted root CA** check box if you want to ensure that the certificate server uses the trusted root certificate specified in the field above. This prevents the client from establishing connections to rogue access points.

Step 7   Currently Generic Token Card is the only second phase EAP type available. Click **Properties**. The Generic Token Card Properties screen appears (see Figure 5-11).

Figure 5-11   Generic Token Card Properties Screen
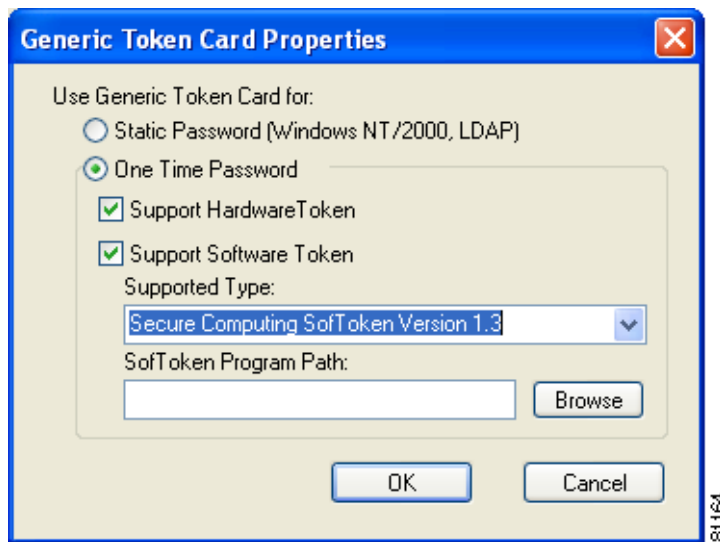
Step 8   Select either the **Static Password (Windows NT/2000, LDAP)** or the **One Time Password** option, depending on your user database.

Step 9   Perform one of the following:

- If you selected the **Static Password (Windows NT/2000, LDAP)** option in Step 8, go to Step 10.

- If you selected the **One Time Password** option in Step 8, check one or both of the following check boxes to specify the type of tokens that will be supported for one-time passwords:

  – **Support Hardware Token**—A hardware token device obtains the one-time password. You must use your hardware token device to obtain the one-time password and enter the password when prompted for your user credentials.

  – **Support Software Token**—The PEAP supplicant works with a software token program to retrieve the one-time password. You have to enter only the PIN, not the one-time password. If you check this check box, you must also select from the Supported Type drop-down box the software token software that is installed on the client (such as Secure Computing SofToken Version 1.3, Secure Computing SofToken II 2.0, or RSA SecurID Software Token v 2.5), and if Secure Computing SofToken Version 1.3 is selected, you must locate the software program path using the Browse button.

> **Note**   The SofToken Program Path field is unavailable if a software token program other than Secure Computing SofToken Version 1.3 is selected.

Step 10   Click **OK** three times to save your settings. The configuration is complete.

Step 11   Refer to Chapter 6 for instructions on authenticating using PEAP.

Enabling EAP-SIM

Follow the steps below to enable EAP-SIM.

Step 1   For EAP type, select **SIM Authentication**.

Step 2   Click **Properties**. The SIM Authentication Properties screen appears (see Figure 5-12).

Figure 5-12   SIM Authentication Properties Screen

Step 3   To access any resources (data or commands) on the SIM, the EAP-SIM supplicant must provide a valid PIN to the SIM card, which must match the PIN stored on the SIM. Select one of the following options to specify how the EAP-SIM supplicant should handle the SIM card's PIN:

- **Ask for my PIN once after I turn my computer on (recommended)**—The software does not permanently store the PIN. It prompts you for the PIN once, on the first authentication of every session, where a *session* is defined as the time between power-up and shutdown or reboot.

- **Ask for my PIN every time the network asks for authentication**—The software never stores the PIN; it prompts you for the PIN every time an EAP-SIM authentication is performed. This option is not recommended if your client will be roaming between access points or if session timeouts are implemented (such as for accounting and security purposes).

- **Let me give my PIN to the computer now and never ask me again; PIN will be encrypted and stored on computer (not recommended)**—You need to enter the PIN only once, in the Enter PIN edit box below this option. The software stores the PIN in the registry and retrieves it from there when required. If you select this option, you must enter the PIN now. The PIN is validated when an authentication attempt is made.

> **Note**   This option is not recommended because it enables others to use the SIM without knowing the PIN.

Step 4   Click **OK** twice to save your settings. The configuration is complete.

Step 5   If you are prompted to restart your client adapter, turn off your client adapter's radio, wait a few seconds, and then turn the radio back on. Refer to the "Turning Your Client Adapter's Radio On or Off" section on page 9-15 for instructions.

Step 6   Refer to Chapter 6 for instructions on authenticating using EAP-SIM.

Disabling LEAP or Host-Based EAP

If you ever need to disable LEAP or host-based EAP for a particular profile, follow the instructions below for your EAP authentication type.

Disabling LEAP

To disable LEAP for a particular profile, select **None** from the Network Security Type drop-down box on the Network Security screen in ACU, click **OK**, and click **OK** or **Apply** on the Profile Manager screen.

Disabling Host-Based EAP

To disable host-based EAP (EAP-TLS, PEAP, or EAP-SIM) for a particular profile, follow the steps below:

Step 1   Select **None** from the Network Security Type drop-down box on the Network Security screen in ACU and click **OK**.

Step 2   Click **OK** or **Apply** on the Profile Manager screen.

Step 3   Perform one of the following, depending on your computer's operating system:

- If your computer is running Windows 98, 98 SE, NT, or Me, run the Microsoft 802.1X Authentication Client application. Then go to Step 5.

- If your computer is running Windows 2000, double-click **My Computer, Control Panel**, and **Network and Dial-up Connections**. Right-click **Local Area Connection**. Click **Properties**. The Local Area Connection Properties screen appears.

- If your computer is running Windows XP, double-click **My Computer**, **Control Panel**, and **Network Connections**. Right-click **Wireless Network Connection**. Click **Properties**. The Wireless Network Connection Properties screen appears.

Step 4   Click the **Authentication** tab.

Note   In Service Pack 1 for Windows XP, the Authentication tab has moved from its previous location. To access it, click the **Wireless Networks** tab, select the network that you are configuring in the Preferred network list, and click **Properties**.

Step 5   Uncheck the **Enable network access control using IEEE 802.1X** check box.

Step 6   Click **OK**.

CHAPTER **6**

Using EAP Authentication

This chapter explains the sequence of events that occurs and the actions you must take when a profile that is set for EAP authentication is selected for use.

The following topics are covered in this chapter:

Overview

This chapter explains the sequence of events that occurs as soon as you or ACU's auto profile selection feature selects a profile that uses EAP authentication as well as after you eject and reinsert the client adapter, reboot the computer, log on while this profile is selected, or are informed that your username and password have expired. The chapter contains seven sections based on the profile's authentication type and its username and password settings:

- LEAP with the Windows username and password, page 6-3
- LEAP with an automatically prompted login, page 6-6
- LEAP with a manually prompted login, page 6-9
- LEAP with a saved username and password, page 6-13
- EAP-TLS, page 6-15
- PEAP, page 6-16
- EAP-SIM, page 6-19

Also provided are an overview of LEAP (below) and instructions for restarting the authentication process when necessary (page 6-21).

Follow the instructions for your profile's authentication type and credential settings to successfully authenticate.

Note   If any error messages appear during authentication, refer to Chapter 10 for explanations and recommended actions.

Using LEAP

Step 1   When LEAP authentication begins, the LEAP Authentication Status screen appears (see Figure 6-1).

Note   The LEAP Authentication Status screen might appear behind any open applications.

Figure 6-1   LEAP Authentication Status Screen
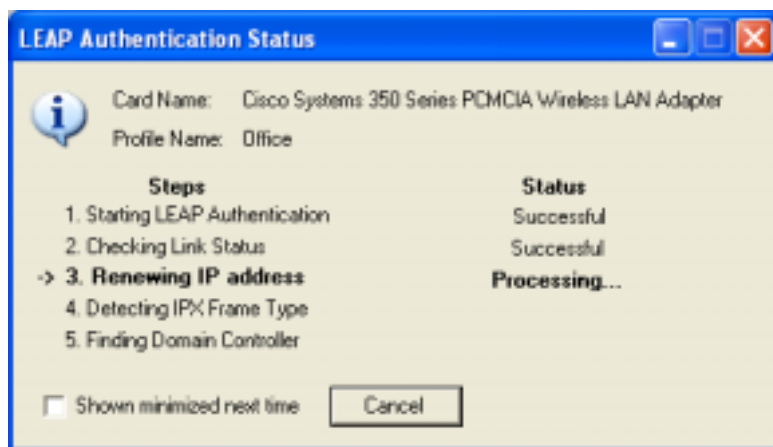
This screen provides information about the status of LEAP authentication. Table 6-1 lists and explains the stages of LEAP authentication. As each stage is completed, a status message (such as *Successful)* appears in the Status field. If any error messages appear, refer to the "LEAP Authentication Error Messages" section on page 10-18 for an explanation and the recommended action to take.

Table 6-1   Stages of LEAP Authentication

Stage	Explanation
Starting LEAP Authentication	The client adapter associates to an access point, and the LEAP authentication process begins.
Checking Link Status	The client adapter is LEAP authenticated, and the network connection is verified.
Renewing IP Address	If DHCP is enabled, the IP address is released and renewed.
Detecting IPX Frame Type	On Windows 2000 and XP, the IPX frame type is reset if AutoDetect is enabled.
Finding Domain Controller	If you are logging into a domain and the active profile specifies that the domain name be included, an attempt is made to find the domain controller to make sure subsequent access to the domain is successful.

Step 2 If you do not want the LEAP Authentication Status screen to appear each time the client adapter attempts to LEAP authenticate, check the **Shown minimized next time** check box in the bottom left corner of the screen. On future LEAP authentication attempts, the LEAP Authentication Status screen appears minimized in the Windows system tray.

Note To make the LEAP Authentication Status screen reappear once it has been minimized, click the **LEAP Authentication Status** tab in the Windows system tray and uncheck the **Shown minimized next time** check box. The LEAP Authentication Status screen should now appear for all future LEAP authentication attempts.

Using LEAP with the Windows Username and Password

After Profile Selection or Card Insertion

After you (or auto profile selection) select a profile that uses LEAP authentication and specifies that your Windows username and password also serve as your LEAP username and password or you eject and reinsert the client adapter while this profile is selected, the following events occur:

1. The LEAP Authentication Status screen appears.

2. If your client adapter authenticates, the screen shows that each stage was successful and then disappears. ACM now shows *Authenticated*, and the Server Based Authentication field on the ACU Status screen shows *LEAP Authenticated*.

If the authentication attempt fails, an error message appears after the LEAP timeout period has expired. Refer to the "LEAP Authentication Error Messages" section on page 10-18 for the necessary action to take.

After a Reboot or Logon

After your computer reboots or you log on, follow the steps below to LEAP authenticate.

Step 1 When the Windows login screen appears (see Figure 6-2 and Figure 6-3), enter your Windows username and password and click **OK**. The domain name is optional.

✎
Note   If your computer is running Windows NT, 2000, or XP and has Novell Client 32 software installed, a separate LEAP login screen appears before the Novell login screen. If this occurs, enter your Windows and Novell username and password in the login screens and click **OK**.

Figure 6-2   Windows Login Screen (Windows 98, 98 SE, and Me)
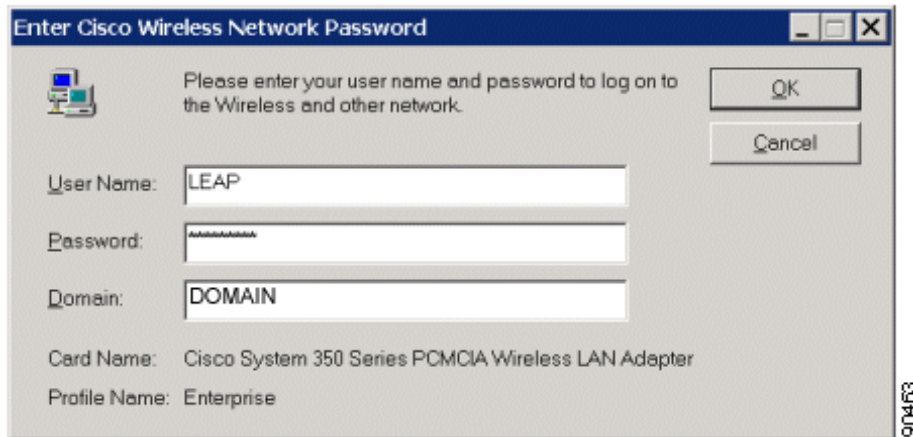
Figure 6-3   Windows Login Screen (Windows NT)
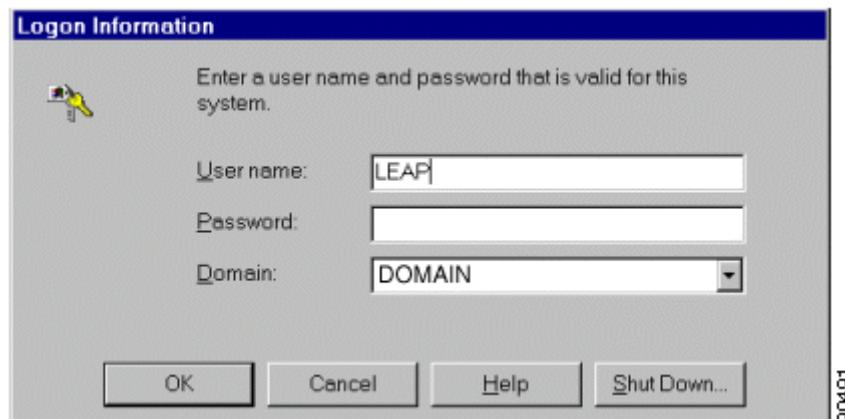
Note   The Windows login screens shown above appear on computers running Windows 98, 98 SE, and Me (Figure 6-2) and Windows NT (Figure 6-3), respectively. The login screen looks slightly different on computers running Windows 2000 and XP.

The LEAP Authentication Status screen appears.

Step 2   If your client adapter authenticates, the screen shows that each stage was successful and then disappears. ACM now shows *Authenticated*, and the Server Based Authentication field on the ACU Status screen shows *LEAP Authenticated*.

If the authentication attempt fails, an error message appears after the LEAP timeout period has expired. Refer to the "LEAP Authentication Error Messages" section on page 10-18 for the necessary action to take.

Step 3   Windows continues to log you onto the system.

After Your LEAP Credentials Expire

If the LEAP credentials (username and password) for your current profile expire or become invalid, follow the steps below to reauthenticate.

Note   If your computer is running Windows NT, 2000, or XP and you change your Windows password using the standard Windows Change Password function, the client updates the LEAP password automatically and maintains its connection to the access point if the current profile uses the Windows username and password. If your computer is running Windows 98, 98 SE, or Me and you change your Windows password, the client loses association from the access point, and you are prompted to enter your new credentials.

Step 1   Click **OK** when the following message appears: "The user name and password entered are no longer valid and have failed the LEAP authentication process. Please enter a new user name and password."

Step 2   When the Windows login screen appears, enter your new username and password and click **OK**. The client adapter should authenticate using your new credentials.

Note   If you click Cancel rather than OK on the Windows login screen, the following message appears: "The profile will be disabled until you select the Reauthenticate option, Windows restarts, or the card is ejected and reinserted. Are you sure?" If you click No, the Windows login screen reappears and allows you to enter your new credentials. If you click Yes, the current profile is disabled until you select Reauthenticate from ACM or the Commands drop-down menu in ACU, reboot your computer, or eject and reinsert the card. The Current Profile field on the ACU Status screen lists the profile as being *Disabled*.

Using LEAP with an Automatically Prompted Login

After Profile Selection or Card Insertion

After you (or auto profile selection) select a profile that uses LEAP authentication but specifies that you be automatically prompted to enter a separate LEAP username and password or you eject and reinsert the client adapter while this profile is selected, follow the steps below to LEAP authenticate.

> **Note**   This procedure is applicable the first time an automatically prompted LEAP profile is selected. After you follow the steps below to enter your LEAP credentials, you can switch profiles without having to re-enter your credentials until you reboot your computer, eject and reinsert your client adapter, or change the profile in any way (including its priority in auto profile selection).

Step 1   When the LEAP login screen appears (see Figure 6-4), enter your LEAP username and password and click **OK**. The domain name is optional.

Figure 6-4   LEAP Login Screen

> **Note**   The LEAP login screen shown above appears on computers running Windows NT, 2000, or XP. The LEAP login screen looks slightly different on computers running other Windows operating systems.

The LEAP Authentication Status screen appears.

Step 2   If your client adapter authenticates, the screen shows that each stage was successful and then disappears. ACM now shows *Authenticated*, and the Server Based Authentication field on the ACU Status screen shows *LEAP Authenticated*.

If the authentication attempt fails, an error message appears after the LEAP timeout period has expired. Refer to the "LEAP Authentication Error Messages" section on page 10-18 for the necessary action to take.

After a Reboot or Logon

After your computer reboots or you log on, follow the steps below to LEAP authenticate.

Step 1   When the LEAP login screen appears (see Figure 6-5), enter your LEAP username and password and click **OK**. The domain name is optional.

Figure 6-5   LEAP Login Screen
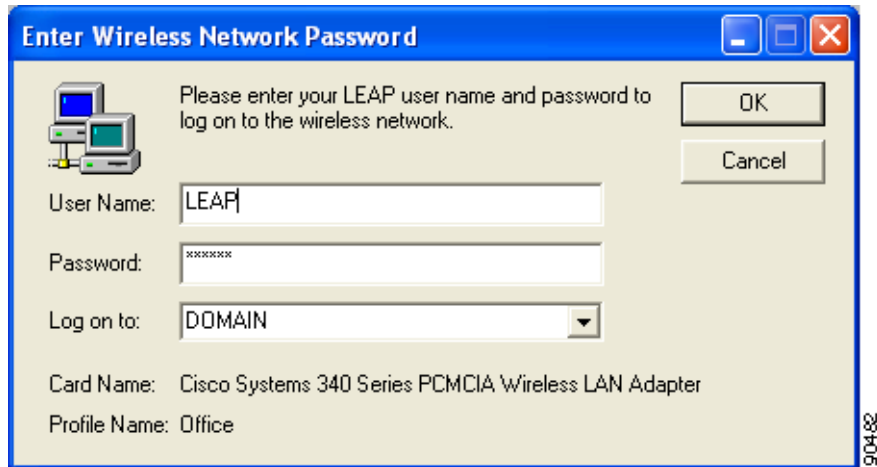
Note   The LEAP login screen shown above appears on computers running Windows NT, 2000, or XP. The LEAP login screen looks slightly different on computers running other Windows operating systems.

Note   The LEAP login screen should appear before the Windows login screen on computers running Windows 98, 98 SE, or Me. If the Windows screen appears first, follow the instructions in the "LEAP Login Screen Does Not Appear Before Windows Login Screen (Windows 98, 98 SE, and Me Only)" section on page 10-13. On computers running Windows NT, 2000, or XP, the LEAP login screen appears after the Windows login screen.

The LEAP Authentication Status screen appears.

Step 2   If your client adapter authenticates, the screen shows that each stage was successful and then disappears. ACM now shows *Authenticated*, and the Server Based Authentication field on the ACU Status screen shows *LEAP Authenticated*.

If the authentication attempt fails, an error message appears after the LEAP timeout period has expired. Refer to the "LEAP Authentication Error Messages" section on page 10-18 for the necessary action to take.

Step 3   When the network login screen appears (see Figure 6-6 and Figure 6-7), enter your network username and password and click **OK**.

Note Figure 6-6 shows an example network login screen that may appear on computers running Windows 98, 98 SE, and Me. Your screen may look different. Figure 6-7 shows the network login screen that appears on Windows 2000 systems. The login screen looks slightly different on computers running Windows NT and XP.

Figure 6-6   Network Login Screen (Windows 98, 98 SE, and Me)
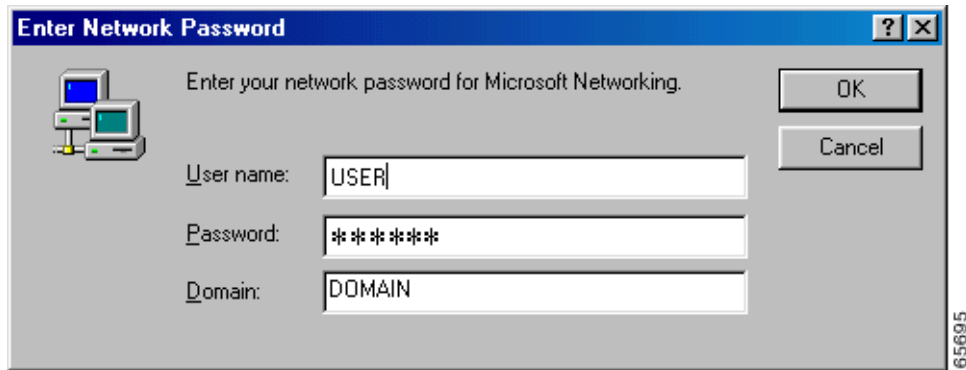
Figure 6-7   Network Login Screen (Windows 2000)

After Your LEAP Credentials Expire

If the LEAP credentials (username and password) for your current profile expire or become invalid, follow the steps below to reauthenticate.

Step 1   Click **OK** when the following message appears: "The user name and password entered are no longer valid and have failed the LEAP authentication process. Please enter a new user name and password."

Step 2   When the LEAP login screen appears, enter your new username and password and click **OK**. The client adapter should authenticate using your new credentials.

> **Note**   If you click Cancel rather than OK on the LEAP login screen, the following message appears: "The profile will be disabled until you select the Reauthenticate option, Windows restarts, or the card is ejected and reinserted. Are you sure?" If you click No, the LEAP login screen reappears and allows you to enter your new credentials. If you click Yes, the current profile is disabled until you select Reauthenticate from ACM or the Commands drop-down menu in ACU, reboot your computer, or eject and reinsert the card. The Current Profile field on the ACU Status screen lists the profile as being *Disabled*.

Using LEAP with a Manually Prompted Login

After Profile Selection

After you (or auto profile selection) select a profile that uses LEAP authentication but specifies that the process be manually invoked, follow the steps below to LEAP authenticate.

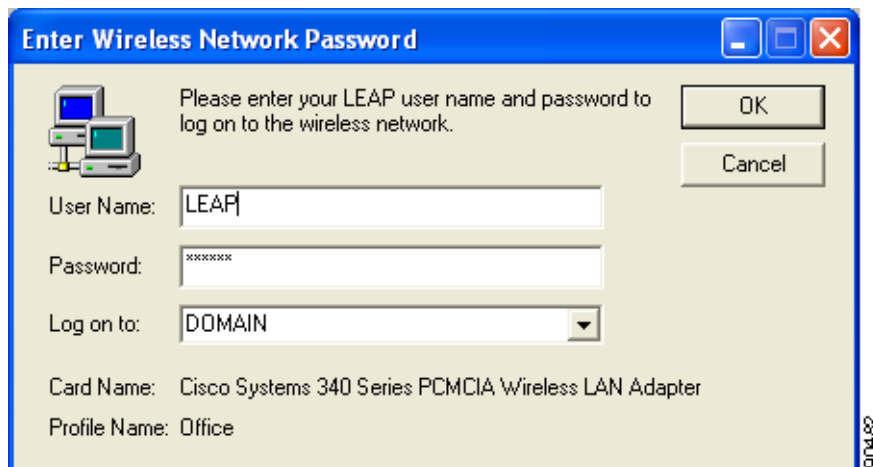> **Note**   This procedure is applicable the first time a manual LEAP profile is selected. After you follow the steps below to enter your LEAP credentials, you can switch profiles without having to re-enter your credentials until you reboot your computer, eject and reinsert your client adapter, or change the profile in any way (including its priority in auto profile selection).

Step 1   Perform one of the following:

- If you select a manual LEAP profile from the Use Selected Profile drop-down box, the LEAP login screen appears (see Figure 6-8).

Figure 6-8   LEAP Login Screen
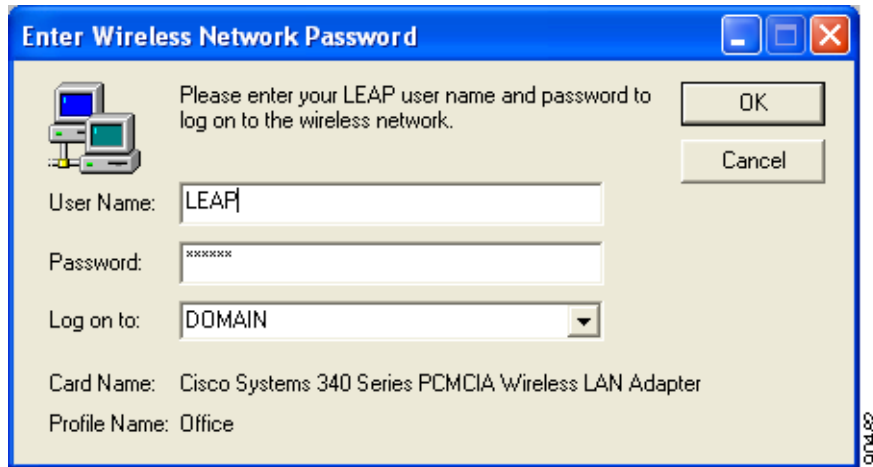
Enter your LEAP username and password and click **OK**. The domain name is optional.

Note   The LEAP login screen shown above appears on computers running Windows NT, 2000, or XP. The LEAP login screen looks slightly different on computers running other Windows operating systems.

- If auto profile selection selects a manual LEAP profile, you must select the **Manual LEAP Login** option from the Commands drop-down menu (see Figure 6-9).

Figure 6-9   Commands Drop-Down Menu
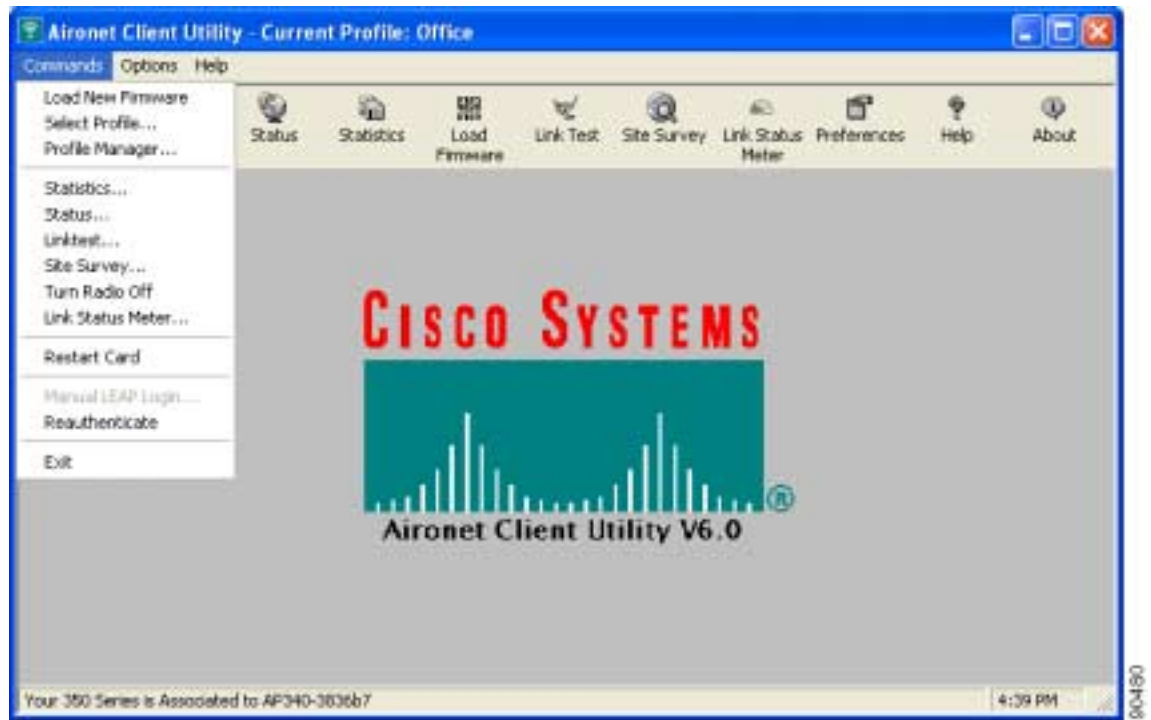
When the LEAP login screen appears (see Figure 6-8), enter your LEAP username and password and click **OK**. The domain name is optional.

Step 2   The LEAP Authentication Status screen appears. If your client adapter authenticates, the screen shows that each stage was successful and then disappears. ACM now shows *Authenticated*, and the Server Based Authentication field on the ACU Status screen shows *LEAP Authenticated*.

If the authentication attempt fails, an error message appears after the LEAP timeout period has expired. Refer to the "LEAP Authentication Error Messages" section on page 10-18 for the necessary action to take.

After a Reboot, Logon, or Card Insertion

After your computer reboots, you log on, or you eject and reinsert the client adapter, the adapter does not automatically attempt to authenticate. You must manually invoke the authentication process. To do so, follow the steps below.

Step 1   If you rebooted your computer or logged on, complete your standard Windows login.

Step 2   Open ACU.

Step 3   Select the **Manual LEAP Login** option from the Commands drop-down menu (see Figure 6-10).

Figure 6-10   Commands Drop-Down Menu

Step 4   When the LEAP login screen appears (see Figure 6-11), enter your LEAP username and password and click **OK**. The domain name is optional.

Figure 6-11   LEAP Login Screen
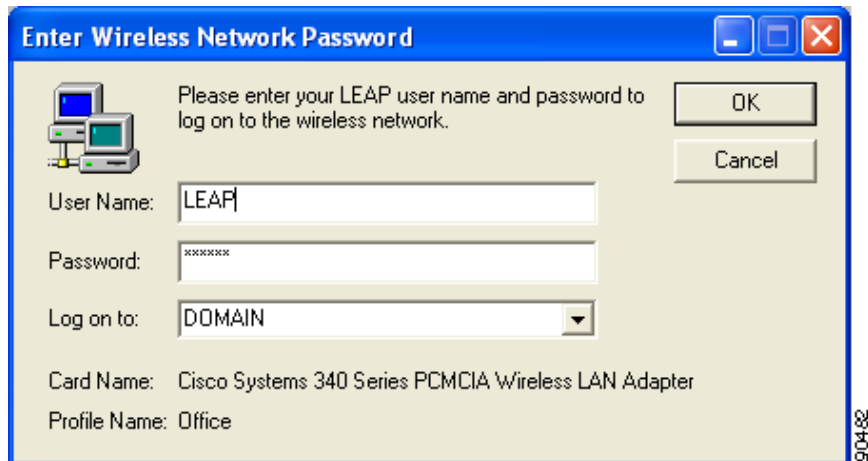
Note   The LEAP login screen shown above appears on computers running Windows NT, 2000, or XP. The LEAP login screen looks slightly different on computers running other Windows operating systems.

The LEAP Authentication Status screen appears.

Step 5 If your client adapter authenticates, the screen shows that each stage was successful and then disappears. ACM now shows *Authenticated*, and the Server Based Authentication field on the ACU Status screen shows *LEAP Authenticated*.

If the authentication attempt fails, an error message appears after the LEAP timeout period has expired. Refer to the "LEAP Authentication Error Messages" section on page 10-18 for the necessary action to take.

After Your LEAP Credentials Expire

If the LEAP credentials (username and password) for your current profile expire or become invalid, follow the steps below to reauthenticate.

Step 1 Click **OK** when the following message appears: "The user name and password entered are no longer valid and have failed the LEAP authentication process. Please enter a new user name and password."

Step 2 When the LEAP login screen appears, enter your new username and password and click **OK**. The client adapter should authenticate using your new credentials.

Note If you click Cancel rather than OK on the LEAP login screen, the following message appears: "The profile will be disabled until you select the Reauthenticate option, Windows restarts, or the card is ejected and reinserted. Are you sure?" If you click No, the LEAP login screen reappears and allows you to enter your new credentials. If you click Yes, the current profile is disabled until you select Reauthenticate from ACM or the Commands drop-down menu in ACU, reboot your computer, or eject and reinsert the card. The Current Profile field on the ACU Status screen lists the profile as being *Disabled*.

Using LEAP with a Saved Username and Password

After Profile Selection or Card Insertion

After you (or auto profile selection) select a profile that uses LEAP authentication with a saved LEAP username and password or you eject and reinsert the client adapter while this profile is selected, the following events occur:

1. The LEAP Authentication Status screen appears.

2. If your client adapter authenticates, the screen shows that each stage was successful and then disappears. ACM now shows *Authenticated*, and the Server Based Authentication field on the ACU Status screen shows *LEAP Authenticated*.

   If the authentication attempt fails, an error message appears after the LEAP timeout period has expired. Refer to the "LEAP Authentication Error Messages" section on page 10-18 for the necessary action to take.

After a Reboot or Logon

After your computer reboots or you log on, the following events occur:

1. After you enter your Windows username and password, the LEAP authentication process begins automatically using your saved LEAP username and password.

   > **Note** If you unchecked the **No Network Connection Unless User Is Logged In** check box on the LEAP Settings screen, the LEAP authentication process begins before the Windows login screen appears.

2. If your client adapter authenticates, the screen shows that each stage was successful and then disappears. ACM now shows *Authenticated*, and the Server Based Authentication field on the ACU Status screen shows *LEAP Authenticated*.

   If the authentication attempt fails, an error message appears after the LEAP timeout period has expired. Refer to the "LEAP Authentication Error Messages" section on page 10-18 for the necessary action to take.

3. Windows continues to log you onto the system.

After Your LEAP Credentials Expire

If the LEAP credentials (username and password) for your current profile expire or become invalid, follow the steps below to reauthenticate.

Step 1   Click **OK** when the following message appears: "The saved user name and password entered for this profile are no longer valid and have failed the LEAP authentication process. Please enter a new user name and password. Remember to change them permanently in the profile using the ACU Profile Manager."

Step 2   When the LEAP login screen appears, enter your new username and password and click **OK**. The client adapter should authenticate using your new credentials.

> **Note** If you click Cancel rather than OK on the LEAP login screen, the following message appears: "The profile will be disabled until you select the Reauthenticate option, Windows restarts, or the card is ejected and reinserted. Are you sure?" If you click No, the LEAP login screen reappears and allows you to enter your new credentials. If you click Yes, the current profile is disabled until you select Reauthenticate from ACM or the Commands drop-down menu in ACU, reboot your computer, or eject and reinsert the card. The Current Profile field on the ACU Status screen lists the profile as being *Disabled*.

Step 3   Edit the profile in ACU by changing the saved username and password on the LEAP Settings screen.

Step 4   Click **OK** three times to save the changes to your profile.

Using EAP-TLS

After Profile Selection or Card Insertion

After you (or auto profile selection) select a profile that uses host-based EAP authentication and you configure the card in Windows (provided Windows is using the Microsoft 802.1X supplicant) for EAP-TLS authentication or you eject and reinsert the client adapter while this profile is selected, follow the steps below to EAP authenticate.

Step 1 If your computer is running Windows XP and a pop-up message appears above the Windows system tray informing you that you need to accept a certificate to begin the EAP authentication process, click the message and follow the instructions provided to accept the certificate.

> **Note** You should not have to accept a certificate for future authentication attempts. After you accept one, the same certificate is used subsequently.

Step 2 If a message appears indicating the root certification authority for the server's certificate, and it is the correct certification authority, click **OK** to accept the connection. Otherwise, click **Cancel**.

Step 3 If a message appears indicating the server to which your client adapter is connected, and it is the correct server to connect to, click **OK** to accept the connection. Otherwise, click **Cancel**.

Step 4 The client adapter should now EAP authenticate. To verify authentication, double-click **My Computer**, **Control Panel**, and **Network Connections**. The status appears to the right of your Wireless Network Connection. Click **View** and **Refresh** to obtain the current status. If the client adapter is authenticated, the status reads *Authentication succeeded*.

After a Reboot or Logon

After your computer reboots or you log on using your Windows username and password, the EAP authentication process begins automatically and the client adapter should EAP authenticate.

To verify authentication, double-click **My Computer**, **Control Panel**, and **Network Connections**. The status appears to the right of your Wireless Network Connection. Click **View** and **Refresh** to obtain the current status. If the client adapter is authenticated, the status reads *Authentication succeeded*.

Using PEAP

After Profile Selection, Card Insertion, Reboot, or Logon

After you (or auto profile selection) select a profile that uses host-based EAP authentication and you configure the card in Windows (provided Windows is using the Microsoft 802.1X supplicant) for PEAP authentication, follow the steps in one of the sections below, depending on your user database, to EAP authenticate.

> **Note**   These instructions are applicable after profile selection, card ejection and re-insertion, reboot, or logon.

Windows NT or 2000 Domain Databases or LDAP Databases Only

Step 1   If your computer is running Windows XP, a pop-up message appears above the Windows system tray informing you that you need to select a certificate or other credentials to access the network. Click this message.

Step 2   If a message appears indicating the root certification authority for the server's certificate and it is the correct certification authority, click **OK** to accept the connection. Otherwise, click **Cancel**.

Step 3   If a message appears indicating the server to which your client adapter is connected and it is the correct server to connect to, click **OK** to accept the connection. Otherwise, click **Cancel**.

Step 4   Perform one of the following:

- If your computer is running Windows 2000, the Static Password screen appears (see Figure 6-12).

- If your computer is running Windows XP, a pop-up message appears above the Windows system tray prompting you to process your logon information for your wireless network. Click this message. The Static Password screen appears (see Figure 6-12).

Figure 6-12   Static Password Screen

Step 5   Enter your PEAP authentication username and password (which are registered with the RADIUS server).

Step 6   If applicable, select your domain name from the drop-down list or type it in.

Step 7   Click **OK**. The client adapter should now EAP authenticate. To verify authentication, double-click **My Computer**, **Control Panel**, and **Network Connections**. The status appears to the right of your Wireless Network Connection. Click **View** and **Refresh** to obtain the current status. If the client adapter is authenticated, the status reads *Authentication succeeded*.

Step 8   If you also have a locally cached Windows password, you must change it manually in Windows to synchronize your passwords. To do so, press **Ctrl**-**Alt**-**Delete**, select **Change Password**, and enter your old password once and your new password twice.

OTP Databases Only

Step 1   If your computer is running Windows XP, a pop-up message appears above the Windows system tray informing you that you need to select a certificate or other credentials to access the network. Click this message.

Step 2   If a message appears indicating the root certification authority for the server's certificate and it is the correct certification authority, click **OK** to accept the connection. Otherwise, click **Cancel**.

Step 3   If a message appears indicating the server to which your client adapter is connected and it is the correct server to connect to, click **OK** to accept the connection. Otherwise, click **Cancel**.

Step 4   Perform one of the following:

- If your computer is running Windows 2000, the One Time Password screen appears (see Figure 6-13).

- If your computer is running Windows XP, a pop-up message appears above the Windows system tray prompting you to process your logon information for your wireless network. Click this message. The One Time Password screen appears (see Figure 6-13).

Figure 6-13   One Time Password Screen

Step 5   Enter your PEAP authentication username in the User Name field.

Step 6 Select either the **Hardware Token** or **Software Token** option. If you select the Software Token option, the Password field on the One Time Password screen changes to the PIN field.

> **Note** The Hardware Token and Software Token options are available only if you selected both of them on the Generic Token Card Properties screen during configuration. Otherwise, only the option you selected will be available.

Step 7 Enter either your hardware token password or your software token PIN.

Step 8 Click **OK**. The client adapter should now EAP authenticate. To verify authentication, double-click **My Computer**, **Control Panel**, and **Network Connections**. The status appears to the right of your Wireless Network Connection. Click **View** and **Refresh** to obtain the current status. If the client adapter is authenticated, the status reads *Authentication succeeded*.

After Your Password Expires (Windows NT or 2000 Domain Databases Only)

If you are using a Windows NT or 2000 domain database with PEAP and the password for your current user ID expires, follow the steps below to change your password.

Step 1 When the Change Password screen appears (see Figure 6-14) to indicate that your password has expired, enter your old password in the Old Password field.

Figure 6-14   Change Password Screen

Step 2 Enter your new password in both the New Password and Confirm New Password fields.

> **Note** The password is also changed in the Windows NT or 2000 domain user database.

Step 3 Click **OK**. The client adapter should authenticate using your new password. To verify authentication, double-click **My Computer**, **Control Panel**, and **Network Connections**. The status appears to the right of your Wireless Network Connection. Click **View** and **Refresh** to obtain the current status. If the client adapter is authenticated, the status reads *Authentication succeeded*.

After Your PIN Expires (OTP Databases Only)

If you are using an OTP database with PEAP and the PIN for your current user ID expires, follow the steps below to change your PIN.

Step 1   When the Change PIN screen appears (see Figure 6-15) to indicate that your PIN has expired, enter your old PIN in the Old PIN field.

Figure 6-15   Change PIN Screen
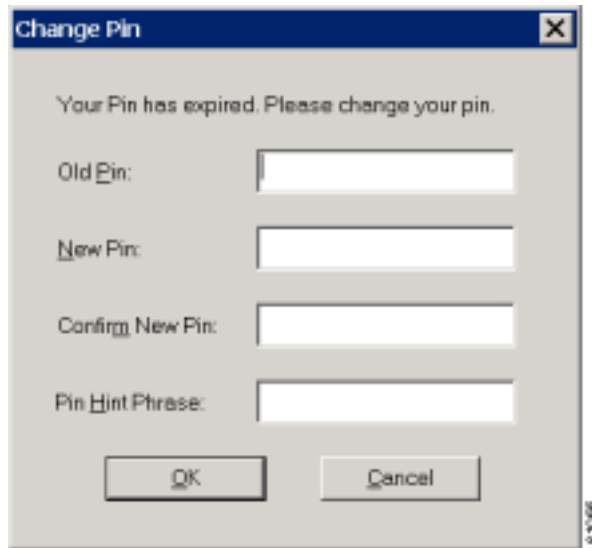
Step 2   Enter your new PIN in both the New PIN and Confirm New PIN fields.

Step 3   Enter a word that will help you to remember your PIN in the PIN Hint Phrase field.

Step 4   Click **OK**. The client adapter should authenticate using your new PIN. To verify authentication, double-click **My Computer**, **Control Panel**, and **Network Connections**. The status appears to the right of your Wireless Network Connection. Click **View** and **Refresh** to obtain the current status. If the client adapter is authenticated, the status reads *Authentication succeeded*.

Note   You should use the new PIN for future authentication attempts.

Using EAP-SIM

After you (or auto profile selection) select a profile that uses host-based EAP authentication and you configure the card in Windows (provided Windows is using the Microsoft 802.1X supplicant) for EAP-SIM authentication, the authentication process varies depending on the configuration option you selected for the SIM card's PIN.

If You Are Prompted for the PIN

If you chose to be prompted for the PIN after a power-up or reboot or at every authentication request, follow the steps below to EAP authenticate.

Note   These instructions are applicable after profile selection, card ejection and re-insertion, reboot, or logon.

Step 1   Perform one of the following:

- If your computer is running Windows 2000, the Enter PIN screen appears (see Figure 6-16).
- If your computer is running Windows XP, a pop-up message appears above the Windows system tray informing you that you need to enter your credentials to access the network. Click this message. The Enter PIN screen appears (see Figure 6-16).

Figure 6-16   Enter PIN Screen

Step 2   Enter your PIN and click **OK**. The computer now retrieves information from the SIM card. If you enter the PIN incorrectly, an error message appears.

Note   If you exceed the maximum number of retries for entering the PIN, the card locks up.

Step 3   The client adapter should now EAP authenticate. To verify authentication, double-click **My Computer**, **Control Panel**, and **Network Connections**. The status appears to the right of your Wireless Network Connection. Click **View** and **Refresh** to obtain the current status. If the client adapter is authenticated, the status reads *Authentication succeeded*.

Note   ACU and the Windows Wireless Network Connection icon in the Windows XP system tray may indicate a connection status when authentication is still in the pending state or the authentication server fails to respond.

If the PIN Is Stored on the Computer

If you chose to store the PIN in the computer's registry, the EAP authentication process begins automatically, and the client adapter should EAP authenticate and use the saved PIN to access the SIM card.

> **Note**   These instructions are applicable after profile selection, card ejection and re-insertion, reboot, or logon.

> **Note**   If the stored PIN is wrong and therefore rejected by the SIM, the EAP-SIM supplicant temporarily changes the prompt mode to the default setting (Ask for my PIN once after I turn my computer on) in order to prevent the SIM from locking up. Unless changed manually, this setting stays in effect until your computer is powered off. Change your stored PIN on the SIM Authentication Properties screen.

To verify authentication, double-click **My Computer**, **Control Panel**, and **Network Connections**. The status appears to the right of your Wireless Network Connection. Click **View** and **Refresh** to obtain the current status. If the client adapter is authenticated, the status reads *Authentication succeeded.*

> **Note**   ACU and the Windows Wireless Network Connection icon in the Windows XP system tray may indicate a connection status when authentication is still in the pending state or the authentication server fails to respond.

Restarting the Authentication Process

If your client adapter was unable to authenticate using the specified username and password and you have exhausted the retry limit (for example, LEAP tries only once to prevent you from being locked out of the system), the current profile is disabled until you change the username or password, reboot your computer, or eject and re-insert the client adapter. To force your client adapter to try to reauthenticate using the username and password of the current profile, select **Reauthenticate** from ACM or the Commands drop-down menu in ACU.

Performing Diagnostics

This chapter explains how to use ACU to perform user-level diagnostics.

The following topics are covered in this chapter:

Overview of ACU Diagnostic Tools

In addition to enabling you to configure your client adapter for use in various types of networks, ACU provides tools that enable you to assess the performance of the client adapter and other devices on the wireless network. ACU diagnostic tools perform the following functions:

- Display your client adapter's current status and configured settings
- Display statistics pertaining to your client adapter's transmission and reception of data
- Display a graphical image of your client adapter's RF link
- Run an RF link test to assess the performance of the RF link between your client adapter and its associated access point

Table 7-1 enables you to quickly locate instructions for using each of the diagnostic tools.

Table 7-1   Locating Diagnostic Instructions

Diagnostic Tool	Page Number
Status	7-4
Statistics	7-11
Link status meter	7-16
RF link test	7-17

Setting Parameters that Affect ACU Diagnostic Tools

Several parameters affect the operation of ACU diagnostic tools. Follow the steps below to set these parameters.

Step 1   Open ACU.

Step 2   Click the **Preferences** icon or select **Preferences** from the Options drop-down menu. The Aironet Client Utility Preferences screen appears (see Figure 7-1).

Figure 7-1   Aironet Client Utility Preferences Screen
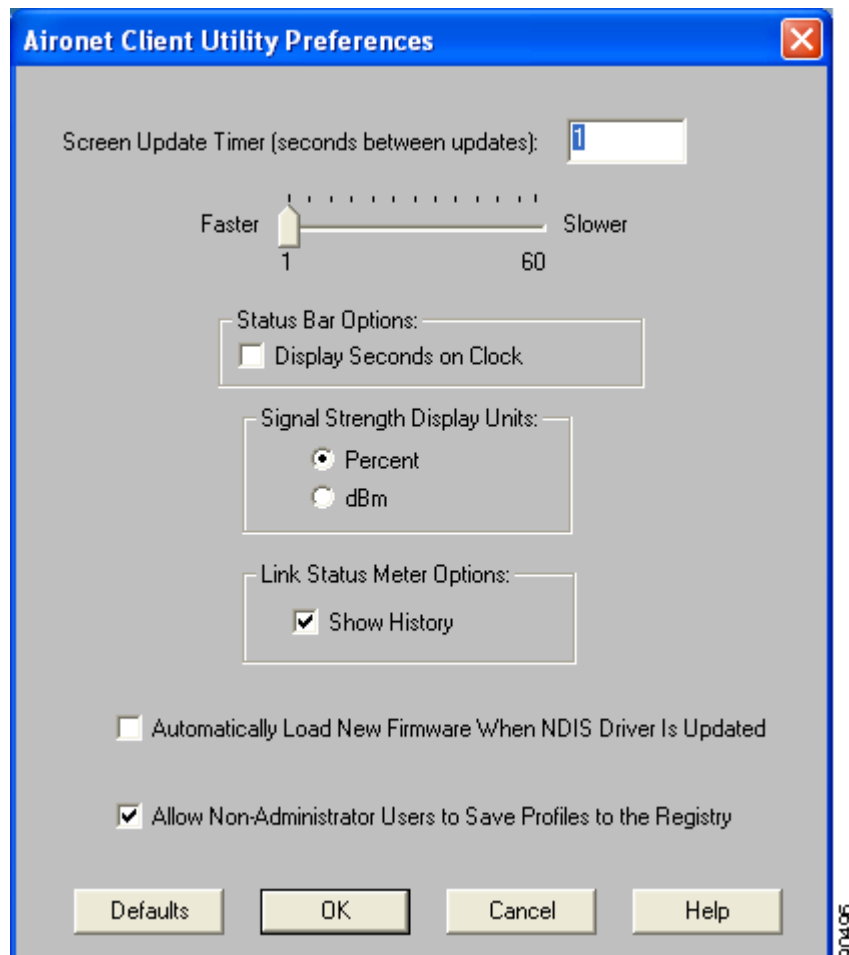
Step 3   Table 7-2 lists and describes the parameters that affect the operation of ACU diagnostic tools. Follow the instructions in the table to change any parameters.

Table 7-2   Parameters Affecting ACU Diagnostic Tools

Parameter	Description
Screen Update Timer (seconds between updates)	Specifies how often the Status and Statistics screens are updated. You can type a number in the edit box or use the slider to change this value. **Range:** 1 to 60 seconds between updates (in 1-second increments) **Default:** 1 second between updates
Signal Strength Display Units	Specifies the units used to display signal strength on the Status, Linktest, and Site Survey screens. **Default:** Percent | Units	Description
Percent	Displays the signal strength as a percentage.
dBm	Displays the signal strength in decibels with respect to milliwatts.	
Show History	Checking this check box causes the Link Status Meter graphical display to show a recent history of the RF performance between your client adapter and its associated access point. Black dots on the graphical display show the performance of the last 50 signals. **Default:** Checked

Step 4   Click **OK** to save your changes.

Viewing the Current Status of Your Client Adapter

ACU enables you to view the current status of your client adapter as well as many of the settings that have been configured for the adapter.

To view your client adapter's status and settings, open ACU; then click the **Status** icon or select **Status** from the Commands drop-down menu. The Status screen appears. Figure 7-2 shows the Status screen with the signal strength values displayed as percentages, and Figure 7-3 shows the bottom of the same screen with the signal strength values displayed in decibels with respect to milliwatts (dBm).

Note   The name of the current profile appears in parentheses at the top of the screen.

Figure 7-2   Status Screen (with Signal Strength as a Percentage)
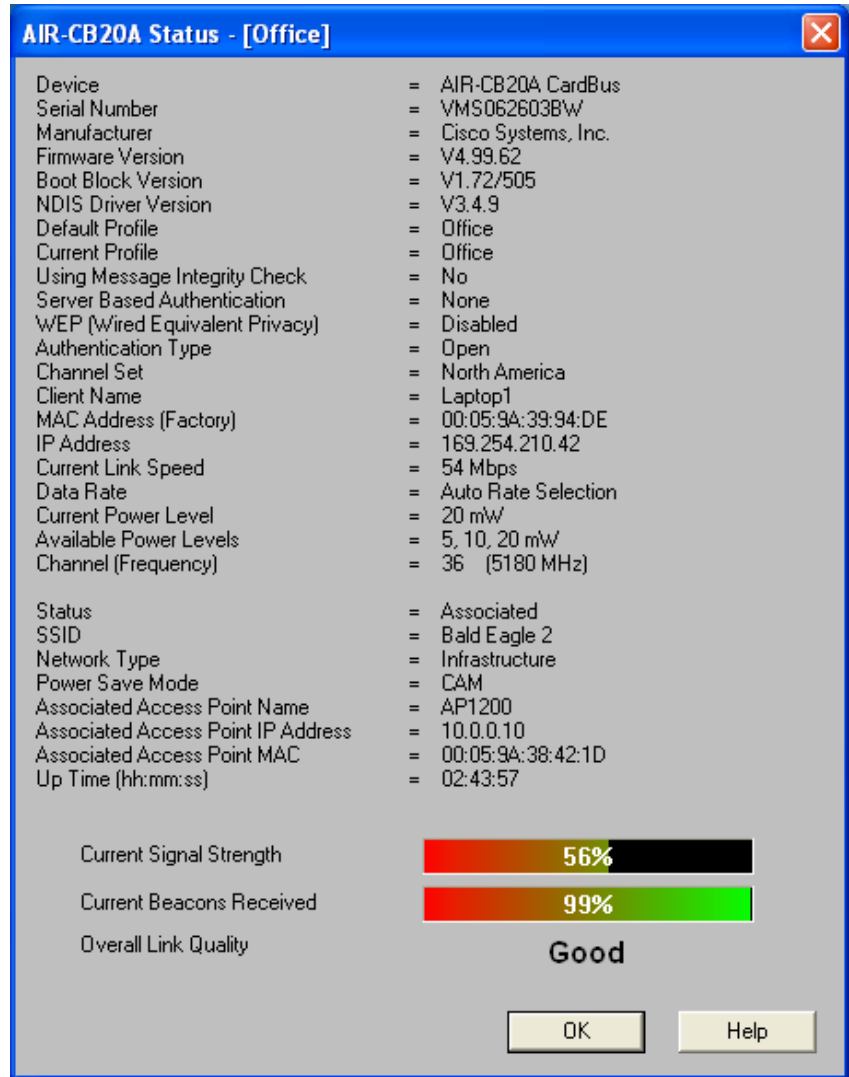
Figure 7-3   Bottom of Status Screen (with Signal Strength in dBm)
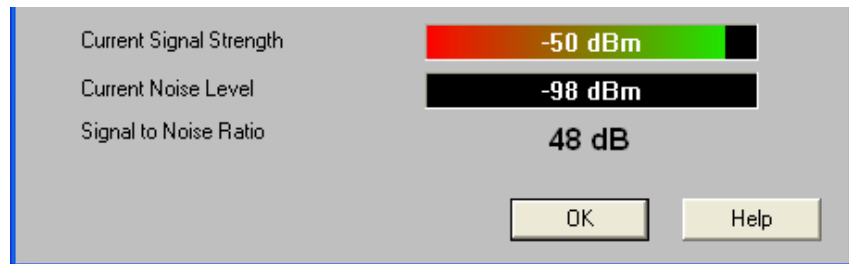
Table 7-3 interprets each element of the Status screen.

Table 7-3   Client Adapter Status

Status	Description
Device	A description of your client adapter.
Serial Number	The serial number of your client adapter.
	Note The serial number appears only if the number has been programmed into your card.
Manufacturer	The manufacturer of your client adapter.
Firmware Version	The version of the firmware that is currently running on your client adapter.
Boot Block Version	The version of the boot block firmware that is currently in your client adapter. The boot block firmware contains identification information for the client adapter and functions to start up the radio and pass control to the main firmware, which (unlike the boot block) can be modified and upgraded by the user.
NDIS Driver Version	The version of the NDIS device driver that is currently installed on your computer.
Default Profile	The network configuration (or profile) shown in the Use Selected Profile drop-down box on the Profile Manager screen. This is the profile that you have selected as the active profile.
	Note The current profile may be different than the default profile if you are using auto profile selection. The client adapter will not switch profiles as long as it remains associated to the access point or reassociates within 10 seconds (or within the time specified by the LEAP authentication timeout value if LEAP is enabled). Refer to Chapter 4 for information on creating and using profiles.
Current Profile	The network configuration (or profile) your client adapter is currently using.
	Note The current profile may be different than the default profile if you are using auto profile selection. The client adapter does not switch profiles as long as it remains associated to the access point or reassociates within 10 seconds (or within the time specified by the LEAP authentication timeout value if LEAP is enabled). Refer to Chapter 4 for information on creating and using profiles.
	Note If your current profile becomes disabled due to an invalid LEAP username and password, this field lists the profile as *Disabled*.
Using Short Radio Headers	Indicates whether your client adapter is actually using short radio headers.
	Value: Yes or No
	Note This setting appears only for 2.4-GHz client adapters.
	Note Refer to the Use Short Radio Headers parameter in Table 5-3 for information on using short radio headers.

Table 7-3   Client Adapter Status (continued)

Status	Description
Using Message Integrity Check	Indicates whether your client adapter is using message integrity check (MIC) to protect packets sent to and received from the access point. MIC prevents bit-flip attacks on encrypted packets. During a bit-flip attack, an intruder intercepts an encrypted message, alters it slightly, and retransmits it, and the receiver accepts the retransmitted message as legitimate. **Note** MIC is supported automatically by the client adapter's driver, but it must be enabled on the access point. **Value:** Yes or No
Server Based Authentication	Indicates the configuration of the access point to which your client adapter is associated. **Value:** None, WEP Key In Use, Cell Is Secure, or LEAP Authenticated *(see sub-table below)*
WEP (Wired Equivalent Privacy)	Your client adapter's current WEP status. **Value:** Enabled, Not Enabled, or Need Firmware Upgrade **Note** Refer to the "Setting Network Security Parameters" section on page 5-20 for information on enabling WEP.
Authentication Type	Indicates whether the client adapter must share the same WEP keys as the access point in order to communicate or can communicate with the access point regardless of its WEP settings. **Value:** Open or Shared Key **Note** Refer to the "Setting Network Security Parameters" section on page 5-20 for information on setting the authentication type.

Server Based Authentication	Description
None	The access point is configured for No Encryption.
WEP Key In Use	The access point is configured for Optional encryption.
Cell Is Secure	The access point is configured for Full Encryption. **Note** If the client's current profile does not have Allow Association to Mixed Cells enabled, the client can associate only to access points that use full encryption.
LEAP Authenticated	The client is using LEAP and is authenticated to an access point that has WEP and Network-EAP enabled.

Table 7-3   Client Adapter Status (continued)

Status	Description
Antenna Selection	The antenna mode that your client adapter is currently using. **Value:** Diversity, Primary Only, Secondary Only (Primary Only is the only option available for PCI client adapters) **Note** This setting appears only for 2.4-GHz client adapters. **Note** The Primary Only and Secondary Only values were formerly named Right Only and Left Only, respectively. Refer to the Antenna Mode (Receive) and Antenna Mode (Transmit) parameters in Table 5-4 and Table 5-5 for information on setting the antenna mode.
Channel Set	The regulatory domain for which your client adapter is currently configured, such as Americas. (For the Japan channel set, the Call ID is also displayed.) This value is not user selectable. **Note** Refer to Appendix D for a list of channel identifiers, channel center frequencies, and regulatory domains for each channel.
Client Name	The name your client adapter uses when it associates to an access point. **Note** Refer to the Client Name parameter in Table 5-2 for information on setting the client name.
MAC Address	The MAC address assigned to your client adapter at the factory.
IP Address	The IP address of your client adapter.
Current Link Speed	The rate at which your client adapter is currently transmitting data packets. **Value:** 1, 2, 5.5, or 11 Mbps (2.4-GHz client adapters); 6, 9, 12, 18, 24, 36, 48, or 54 Mbps (5-GHz client adapters)
Data Rate	The rate at which your client adapter has been configured to transmit or receive data packets. **Value:** 1 Mbps, 2 Mbps, 5.5 Mbps, 11 Mbps, or Auto Rate Selection (2.4-GHz client adapters); 6 Mbps, 9 Mbps, 12 Mbps, 18 Mbps, 24 Mbps, 36 Mbps, 48 Mbps, 54 Mbps, or Auto Rate Selection (5-GHz client adapters) **Note** Refer to the Data Rate parameter in Table 5-3 for information on setting the client adapter's data rate.
Current Power Level	The power level at which your client adapter is currently transmitting. The maximum level is dependent upon the radio installed in your client adapter and your country's regulatory agency. **Value:** 1, 5, 15, or 30 mW (340 series client adapters); 1, 5, 20, 30, 50, or 100 mW (350 series client adapters); 5, 10, or 20 mW (5-GHz client adapters) **Note** Refer to the Transmit Power parameter in Table 5-3 for information on setting the client adapter's power level.

Table 7-3   Client Adapter Status (continued)

Status	Description
Available Power Levels	The power levels at which your client adapter is capable of transmitting. The maximum level is dependent upon the radio installed in your client adapter and your country's regulatory agency. **Value:** 1, 5, 15, or 30 mW (340 series client adapters); 1, 5, 20, 30, 50, or 100 mW (350 series client adapters); 5, 10, or 20 mW (5-GHz client adapters) **Note** Refer to the Transmit Power parameter in Table 5-3 for information on the client adapter's available power levels.
Channel (Frequency)	The frequency that your client adapter is currently using as the channel for communications. **Value:** Dependent on client adapter radio and regulatory domain **Note** Refer to the Channel parameter in Table 5-3 for information on selecting the frequency for your client adapter.
Status	The operational mode of your client adapter. **Value:** Error, Not Associated, Associated, Authenticating, Authenticated, Authentication Failed, or Ad Hoc Mode
SSID	The name of the network to which your client adapter is currently associated. **Note** Refer to the SSID1 parameter in Table 5-2 for information on the client adapter's SSID.
Network Type	The type of network in which your client adapter is being used. **Value:** Infrastructure or Ad Hoc **Note** Refer to the Network Type parameter in Table 5-2 for information on setting the network type.
Power Save Mode	The client adapter's current power consumption setting. **Value:** CAM, Max PSP, or Fast PSP **Note** Refer to the Power Save Mode parameter in Table 5-2 for information on setting the client adapter's power save mode.
Associated Access Point Name	The name of the access point to which your client adapter is associated. It is shown only if the client adapter is in infrastructure mode, the access point was configured with a name, and Aironet Extensions are enabled (on access points running Cisco IOS release 12.2(4)JA or greater).
Associated Access Point IP Address	The IP address of the access point to which your client adapter is associated. It is shown only if the client adapter is in infrastructure mode, the access point was configured with an IP address, and Aironet Extensions are enabled (on access points running Cisco IOS release 12.2(4)JA or greater). **Note** If Aironet Extensions are disabled, the IP address of the associated access point is shown as 0.0.0.0.

Table 7-3   Client Adapter Status (continued)

Status	Description
Associated Access Point MAC Address	The MAC address of the access point to which your client adapter is associated. It is shown only if the client adapter is in infrastructure mode. **Note** This field displays the MAC address of the access point's Ethernet port (for access points that do not run Cisco IOS) or the MAC address of the access point's radio (for access points that run Cisco IOS). The MAC address of the Ethernet port on access points that run Cisco IOS is printed on a label on the back of the device.
Beacon Period	Specifies the duration between beacon packets, which are used to help clients find each other in ad hoc mode. **Range:** Approximately 20 to 999 milliseconds (ms) **Note** The beacon period is shown only if your client adapter is in ad hoc mode.
Up Time (hh:mm:ss)	The amount of time (in hours:minutes:seconds) that the client adapter has been receiving power. If the adapter has been running for more than 24 hours, the time is displayed in days, hours:minutes:seconds.
Current Signal Strength	The signal strength for all received packets. The higher the value and the more green the bar graph is, the stronger the signal. **Range:** 0 to 100% or –95 to –45 dBm
Current Signal Quality (2.4-GHz client adapters)	The signal quality for all received packets. The higher the value and the more green the bar graph is, the clearer the signal. **Range:** 0 to 100% **Note** This setting appears only for 2.4-GHz client adapters and only if you selected signal strength to be displayed as a percentage. See the Signal Strength Display Units parameter in Table 7-2 for information.
Current Noise Level (2.4-GHz client adapters)	The level of background radio frequency energy in the 2.4-GHz band. The lower the value and the more green the bar graph is, the less background noise present. **Range:** –100 to –45 dBm **Note** This setting appears only for 2.4-GHz client adapters and only if you selected signal strength to be displayed in dBm. See the Signal Strength Display Units parameter in Table 7-2 for information.

Table 7-3   Client Adapter Status (continued)

Status	Description
Current Beacons Received (5-GHz client adapters)	The percentage of beacon packets received versus those expected to be received. The higher the value and the more green the bar graph is, the clearer the signal.
	Example: The access point sends out 10 beacons per second, so you would expect the client adapter to receive 50 beacon packets in 5 seconds. If it receives only 40 packets, the percentage of beacons received would be 80%.
	Range: 0 to 100%
	Note This setting appears only for 5-GHz client adapters.
Overall Link Quality	The client adapter's ability to communicate with the access point, which is determined by the combined result of the adapter's signal strength and signal quality.
	Value: Not Associated, Poor, Fair, Good, or Excellent
	Note This setting appears for 2.4-GHz client adapters (but only if you selected signal strength to be displayed as a percentage) and for 5-GHz client adapters. See the Signal Strength Display Units parameter in Table 7-2 for information.
Signal to Noise Ratio (2.4-GHz client adapters)	The difference between the signal strength and the current noise level. The higher the value, the better the client adapter's ability to communicate with the access point.
	Range: 0 to 90 dB
	Note This setting appears only for 2.4-GHz client adapters and only if you selected signal strength to be displayed in dBm. See the Signal Strength Display Units parameter in Table 7-2 for information.

Viewing Statistics for Your Client Adapter

ACU enables you to view statistics that indicate how data is being received and transmitted by your client adapter.

To view your client adapter's statistics, open ACU; then click the **Statistics** icon or select **Statistics** from the Commands drop-down menu. The Statistics screen appears (see Figure 7-4).

Note   The name of the current profile appears in parentheses at the top of the screen.

Note   The receive and transmit statistics are host statistics. That is, they show packets and errors received or sent by the Windows device. Link status tests from the access point or site survey tool are performed at the firmware level; therefore, they have no effect on the statistics shown in the Statistics screen.

Figure 7-4   Statistics Screen
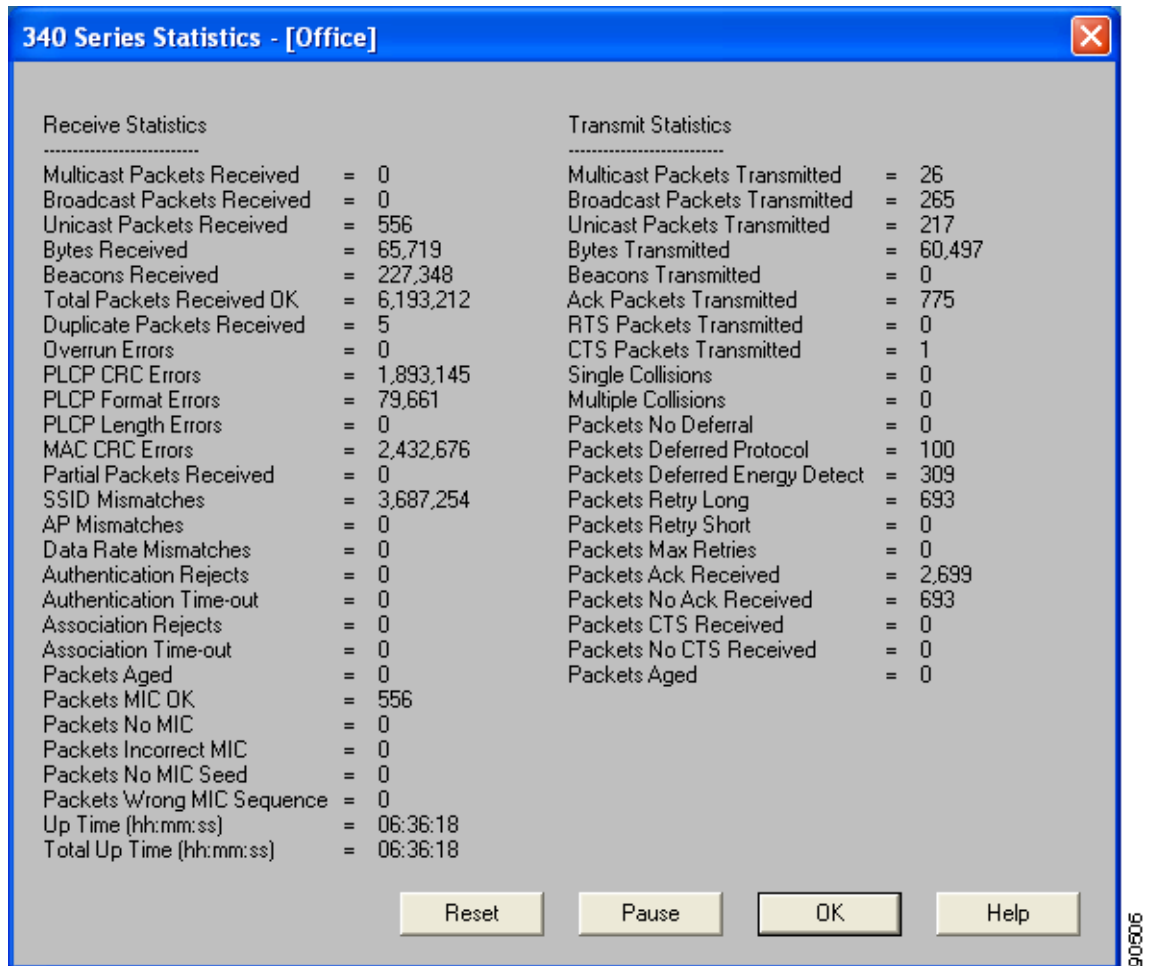
The statistics are calculated as soon as your client adapter is started or the Reset button is selected and are continually updated at the rate specified by the Screen Update Timer. Instructions for changing the Screen Update Timer setting are provided in Table 7-2.

Table 7-4 describes each statistic that is displayed for your client adapter.

Table 7-4   Client Adapter Statistics

Statistic	Description
Receive Statistics	
Multicast Packets Received	The number of multicast packets that were received successfully.
Broadcast Packets Received	The number of broadcast packets that were received successfully.
Unicast Packets Received	The number of unicast packets that were received successfully.
Bytes Received	The number of bytes of data that were received successfully.
Beacons Received	The number of beacon packets that were received successfully.
Total Packets Received OK	The number of all packets that were received successfully.
Duplicate Packets Received	The number of duplicate packets that were received successfully.

Table 7-4   Client Adapter Statistics (continued)

Statistic	Description
Overrun Errors	The number of packets received when no receive buffers were available. These errors usually occur when the host does not read the received packets from the client adapter fast enough.
PLCP CRC Errors	The number of times the client adapter started to receive an 802.11 physical layer convergence protocol (PLCP) header but the rest of the packet was ignored due to a cyclic redundancy check (CRC) error in the header. **Note** CRC errors can be attributed to packet collisions caused by a dense population of client adapters, overlapping access point coverage on a channel, high multipath conditions from bounced signals, or the presence of other 2.4-GHz signals from devices such as microwave ovens, wireless handset phones, etc.
PLCP Format Errors	The number of times an 802.11 PLCP header was received with a valid CRC but the rest of the packet was ignored due to an unknown value in the header.
PLCP Length Errors	The number of times an 802.11 PLCP header was received but the rest of the packet was ignored due to an illegal header length.
MAC CRC Errors	The number of packets that had a valid 802.11 PLCP header but contained a CRC error in the data portion of the packet. **Note** CRC errors can be attributed to packet collisions caused by a dense population of client adapters, overlapping access point coverage on a channel, high multipath conditions from bounced signals, or the presence of other 2.4-GHz signals from devices such as microwave ovens, wireless handset phones, etc.
Partial Packets Received	The number of fragments that were discarded because the entire packet was not received successfully.
SSID Mismatches	The number of times the client adapter tried to associate to an access point but was unable to because the adapter's SSID was not the same as the access point's.
AP Mismatches	The number of times the client adapter tried to associate to an access point but was unable to because the access point was not the adapter's specified access point. **Note** Refer to the Specified Access Point 1- 4 parameter in Table 5-4 for information on specifying access points.
Data Rate Mismatches	The number of times the client adapter tried to associate to an access point but was unable to because the adapter's data rate was not supported by the access point. **Note** Refer to the Data Rate parameter in Table 5-3 for information on supported data rates.
Authentication Rejects	The number of times the client adapter tried to authenticate to an access point but was rejected.

Table 7-4   Client Adapter Statistics (continued)

Statistic	Description
Authentication Time-out	The number of times the client adapter tried to authenticate to an access point but was unable to because the access point did not respond fast enough (timed out).
Association Rejects	The number of times the client adapter tried to associate to an access point but was rejected.
Association Time-out	The number of times the client adapter tried to associate to an access point but was unable to because the access point did not respond fast enough (timed out).
Packets Aged	The number of packets received successfully but discarded by the client adapter because either all fragments were not received within 10 seconds or the host did not read the packet from the adapter within 10 seconds.
Packets MIC OK	The number of packets that were received successfully with a valid message integrity check (MIC). **Note** This field is not displayed if MIC is not enabled on the access point.
Packets No MIC	The number of packets that were discarded due to no MIC being found. **Note** This field is not displayed if MIC is not enabled on the access point.
Packets Incorrect MIC	The number of packets that were discarded due to an incorrect MIC value. **Note** This field is not displayed if MIC is not enabled on the access point.
Packets No MIC Seed	The number of packets that were discarded due to no MIC seed being received. **Note** This field is not displayed if MIC is not enabled on the access point.
Packets Wrong MIC Sequence	The number of packets that were discarded due to the MIC sequence number being wrong. **Note** This field is not displayed if MIC is not enabled on the access point.
Up Time (hh:mm:ss)	The amount of time (in hours:minutes:seconds) since the Reset button was selected. If the client adapter has been running for more than 24 hours, the time is displayed in days, hours:minutes:seconds.
Total Up Time (hh:mm:ss)	The amount of time (in hours:minutes:seconds) that the client adapter has been receiving power. The total up time continues to increment even if the Reset button is selected. If the adapter has been running for more than 24 hours, the time is displayed in days, hours:minutes:seconds.

Table 7-4   Client Adapter Statistics (continued)

Statistic	Description
Transmit Statistics	
Multicast Packets Transmitted	The number of multicast packets that were transmitted successfully.
Broadcast Packets Transmitted	The number of broadcast packets that were transmitted successfully.
Unicast Packets Transmitted	The number of unicast packets that were transmitted successfully.
Bytes Transmitted	The number of bytes of data that were transmitted successfully.
Beacons Transmitted	The number of beacon packets that were transmitted successfully (in ad hoc mode only).
Ack Packets Transmitted	The number of acknowledgment (Ack) packets that were transmitted in response to successfully received unicast packets.
RTS Packets Transmitted	The number of request-to-send (RTS) packets that were transmitted successfully.
CTS Packets Transmitted	The number of clear-to-send (CTS) packets that were transmitted in response to a successfully received RTS packet.
Single Collisions	The number of packets that had to be retransmitted once due to a collision.
Multiple Collisions	The number of packets that had to be retransmitted more than once due to additional collisions.
Packets No Deferral	The number of packets that were able to be transmitted immediately without being delayed due to energy detect or protocol deferral.
Packets Deferred Protocol	The number of packets that were delayed due to 802.11 protocol reasons (such as not enough time left to send the packet).
Packets Deferred Energy Detect	The number of packets that were delayed because RF energy was already detected. This condition is usually caused by another radio transmitting a packet or by some other RF source jamming the signal (such as a microwave oven).
Packets Retry Long	The number of normal data packets that were retransmitted.
Packets Retry Short	The number of request-to-send (RTS) packets that were retransmitted.
Packets Max Retries	The number of packets that failed to be transmitted successfully after exhausting the maximum number of retries.
Packets Ack Received	The number of transmitted packets that had their corresponding acknowledgment (Ack) packet received successfully.
Packets No Ack Received	The number of transmitted packets that did not have their corresponding Ack packet received successfully.
Packets CTS Received	The number of clear-to-send (CTS) packets that were received in response to an RTS packet.

Table 7-4   Client Adapter Statistics (continued)

Statistic	Description
Packets No CTS Received	The number of packets for which no CTS packet was received in response to an RTS packet.
Packets Aged	The number of packets that were discarded by the client adapter because they were not transmitted successfully within 5 seconds.

Viewing the Link Status Meter

ACU's link status meter can be used to assess the performance of your client adapter's RF link. If this tool is used to assess the RF link at various locations, you can avoid areas where performance is weak and eliminate the risk of losing the connection between your client adapter and an access point.
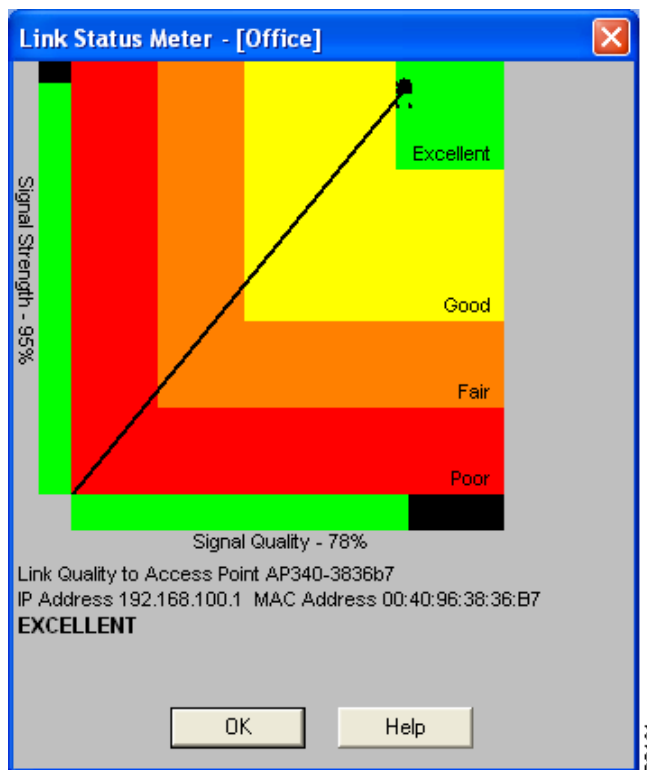
To open the link status meter, open ACU; then click the **Link Status Meter** icon or select **Link Status Meter** from the Commands drop-down menu. The Link Status Meter screen appears (see).

Note   The name of the current profile appears in parentheses at the top of the screen.

Figure 7-5   Link Status Meter Screen

The Link Status Meter screen provides a graphical display of the following:

- **Signal strength**—The strength of the client adapter's radio signal at the time packets are being received. It is displayed as a percentage along the vertical axis.

- **Signal quality**—The quality of the client adapter's radio signal at the time packets are being received. It is displayed as a percentage along the horizontal axis.

The combined result of the signal strength and signal quality is represented by a diagonal line (see Figure 7-5). Where the line falls on the graphical display determines whether the RF link between your client adapter and its associated access point is poor, fair, good, or excellent. The name, IP address, and MAC address of the access point that is associated to your client adapter are indicated at the bottom of the display.

Note   The access point name and IP address are shown only if the client adapter is in infrastructure mode, the access point was configured with a name and an IP address, and Aironet Extensions are enabled (on access points running Cisco IOS release 12.2(4)JA or greater).

Note   The access point MAC address is shown only if the client adapter is in infrastructure mode. This field displays the MAC address of the access point's Ethernet port (for access points that do not run Cisco IOS) or the MAC address of the access point's radio (for access points that run Cisco IOS). The MAC address of the Ethernet port on access points that run Cisco IOS is printed on a label on the back of the device.

Note   ACU's Status screen also shows signal strength and signal quality. However on the Status screen, these data are represented by histograms.

If you want to see a recent history of the RF performance between your client adapter and its associated access point, check the **Show History** check box on the Aironet Client Utility Preferences screen. Black dots on the graphical display show the performance of the last 50 signals.

Running an RF Link Test

ACU's link test tool sends out pings to assess the performance of the RF link. The test is designed to be performed multiple times at various locations throughout your area and is run at the data rate set on ACU's RF Network Properties screen (see the Data Rate parameter in Table 5-3). The results of the link test can be used to determine RF network coverage and ultimately the required number and placement of access points in your network. The test also helps you to avoid areas where performance is weak, thereby eliminating the risk of losing the connection between your client adapter and its associated access point.

Because the link test operates above the RF level, it does more than test the RF link between two network devices. It also checks the status of wired sections of the network and verifies that TCP/IP and the proper drivers have been loaded.

The following prerequisites are required before you can run an RF link test:

- The TCP/IP protocol must be installed on your system.

Note See the Help section of your Windows operating system for information on installing and setting up TCP/IP.

- An IP address must be configured for the access point (or other computer in ad hoc mode).
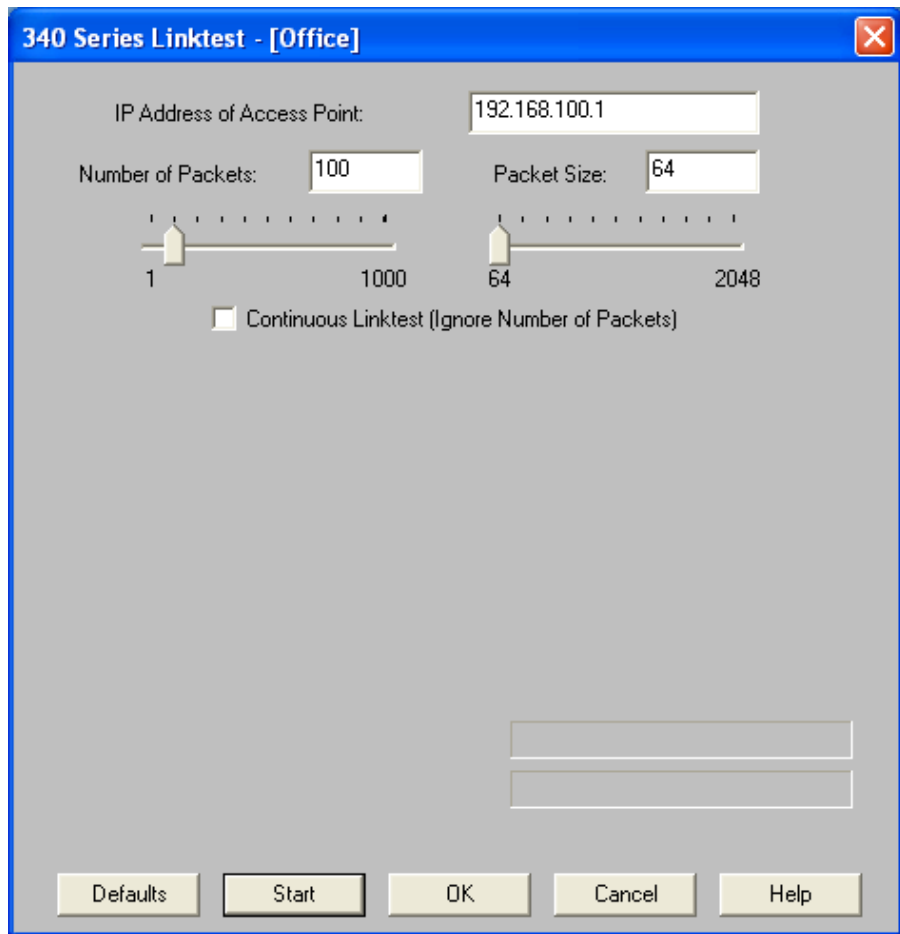
Follow the steps below to run an RF link test.

Step 1 Open ACU; then click the **Link Test** icon or select **Linktest** from the Commands drop-down menu. The Linktest screen appears (see Figure 7-6).

Note The name of the current profile appears in parentheses at the top of the screen.

Figure 7-6   Linktest Screen

Step 2   In the IP Address of Access Point field, enter the IP address of the access point or other wireless device with which you want to test the RF link.

Step 3   You can set the link test to run until it has attempted to send a specific number of packets or to run until you stop it. Follow one of the steps below to determine how long the link test will run:

- Select the number of packets that the link test should attempt to send. You can type a number in the Number of Packets field or use the slider to select this value. (The Number of Packets parameter is ignored if the **Continuous Linktest** check box is checked.)

  Range: 1 to 1000

  Default: 4

- Check the **Continuous Linktest** check box to allow the link test to run continuously.

  Default: Unchecked

Step 4   Select the size of the data packet that is to be sent to the access point. You can type a number in the Packet Size field or use the slider to select this value.

Range: 64 to 2048

Default: 100

> **Note**   The Windows TCP/IP stack fragments (splits up) packets that are greater than 512 bytes. Therefore, the number of transmitted packets does not match the number of received packets (even if none are lost) if the packet size is greater than 512 bytes.

Step 5   Click the **Start** button to run the link test. While the test is running, statistics are displayed and updated periodically.

Figure 7-7 shows the Linktest screen with the signal strength values displayed as percentages, and Figure 7-8 shows the bottom of the same screen with the signal strength values displayed in dBm.

Figure 7-7   Linktest Screen (with Test Running and Signal Strength as a Percentage)
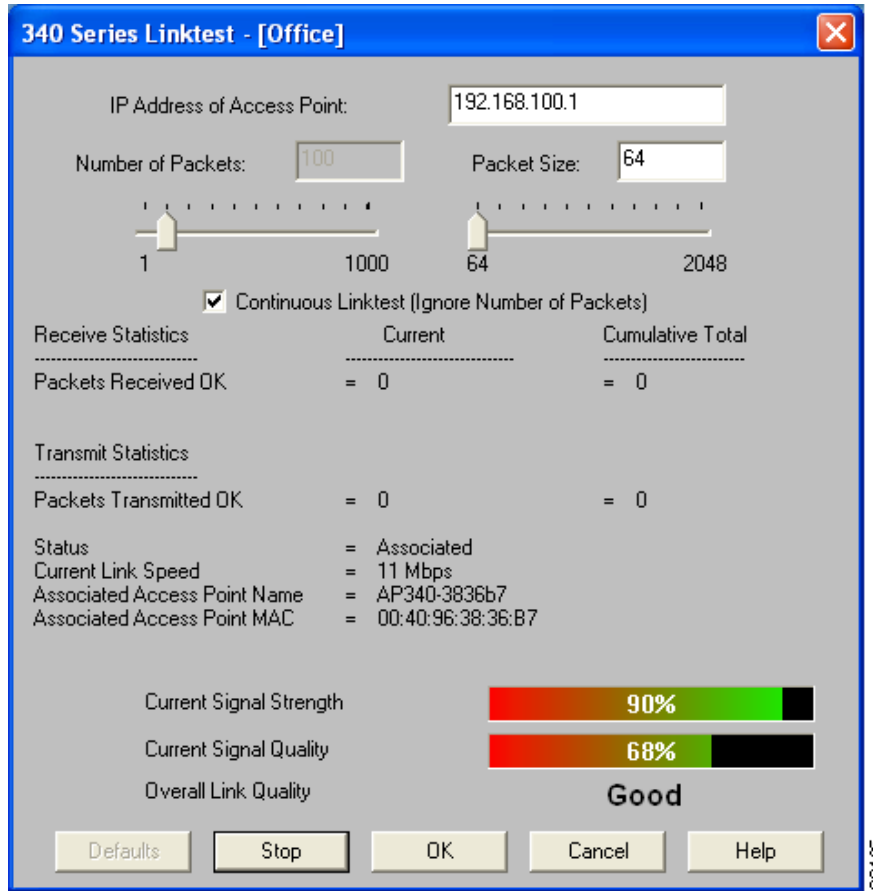

Figure 7-8   Bottom of Linktest Screen (with Test Running and Signal Strength in dBm)
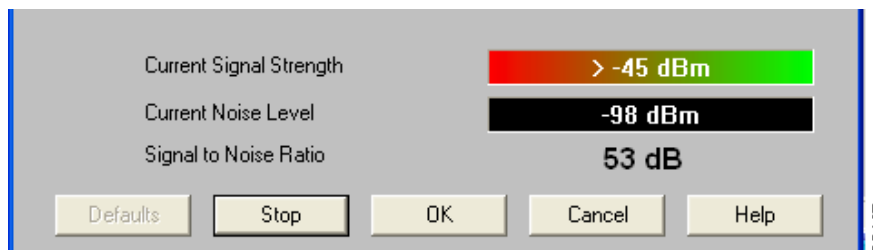
Table 7-5 interprets the statistics that are displayed on the Linktest screen while the link test is running.

Table 7-5   Linktest Statistics

Linktest Statistic	Description
Packets Received OK	The number of packets of the specified size that have been received successfully.
Packets Transmitted OK	The number of packets of the specified size that have been transmitted successfully.
Status	The operational mode of your client adapter. **Value:** Error, Configured, Associated, Not Associated, or Ad Hoc Mode
Current Link Speed	The rate at which your client adapter is currently transmitting data packets. **Value:** 1, 2, 5.5, or 11 Mbps (2.4-GHz client adapters); 6, 9, 12, 18, 24, 36, 48, or 54 Mbps (5-GHz client adapters)
Associated Access Point Name	The name of the access point to which your client adapter is associated. It is shown only if the client adapter is in infrastructure mode, the access point was configured with a name, and Aironet Extensions are enabled (on access points running Cisco IOS release 12.2(4)JA or greater).
Associated Access Point MAC Address	The MAC address of the access point to which your client adapter is associated. It is shown only if the client adapter is in infrastructure mode. **Note** This field displays the MAC address of the access point's Ethernet port (for access points that do not run Cisco IOS) or the MAC address of the access point's radio (for access points that run Cisco IOS). The MAC address of the Ethernet port on access points that run Cisco IOS is printed on a label on the back of the device.
Current Signal Strength	The signal strength for all received packets. The higher the value and the more green the bar graph is, the stronger the signal. **Range:** 0 to 100% or –95 to –45 dBm
Current Signal Quality (2.4-GHz client adapters)	The signal quality for all received packets. The higher the value and the more green the bar graph is, the clearer the signal. **Range:** 0 to 100% **Note** This setting appears only for 2.4-GHz client adapters and only if you selected signal strength to be displayed as a percentage. See the Signal Strength Display Units parameter in Table 7-2 for information.

Table 7-5   Linktest Statistics (continued)

Linktest Statistic	Description
Current Noise Level (2.4-GHz client adapters)	The level of background radio frequency energy in the 2.4-GHz band. The lower the value and the more green the bar graph is, the less background noise present. **Range:** –100 to –45 dBm **Note** This setting appears only for 2.4-GHz client adapters and only if you selected signal strength to be displayed in dBm. See the Signal Strength Display Units parameter in Table 7-2 for information.
Current Beacons Received (5-GHz client adapters)	The percentage of beacon packets received versus those expected to be received. The higher the value and the more green the bar graph is, the clearer the signal. **Example:** The access point sends out 10 beacons per second, so you would expect the client adapter to receive 50 beacon packets in 5 seconds. If it receives only 40 packets, the percentage of beacons received would be 80%. **Range:** 0 to 100% **Note** This setting appears only for 5-GHz client adapters.
Overall Link Quality	The client adapter's ability to communicate with the access point, which is determined by the combined result of the adapter's signal strength and signal quality. **Value:** Not Associated, Poor, Fair, Good, or Excellent **Note** This setting appears for 2.4-GHz client adapters (but only if you selected signal strength to be displayed as a percentage) and for 5-GHz client adapters. See the Signal Strength Display Units parameter in Table 7-2 for information.
Signal to Noise Ratio (2.4-GHz client adapters)	The difference between the signal strength and the current noise level. The higher the value, the better the client adapter's ability to communicate with the access point. **Range:** 0 to 90 dB **Note** This setting appears only for 2.4-GHz client adapters and only if you selected signal strength to be displayed in dBm. See the "Signal Strength Display Units" parameter in Table 7-2 for information.

Step 6 If you did not set the link test to run continuously, the test ends after the specified number of packets is sent, and the Stop button changes back to the Start button. To stop the link test at any time, click **Stop**, **OK**, or **Cancel**.

Using the Aironet Client Monitor (ACM)

This chapter explains how to use the Aironet Client Monitor (ACM) to access status information about your client adapter and perform basic tasks.

The following topics are covered in this chapter:

- Overview of ACM, page 8-2
- The ACM Icon, page 8-2
- Tool Tip Window, page 8-3
- Pop-Up Menu, page 8-5

Overview of ACM

ACM is an optional application that provides a small subset of the features available through ACU. Specifically, it enables you to access status information about your client adapter and perform basic tasks. ACM is accessible from an icon in the Windows system tray, making it easily accessible and convenient to use.

The ACM icon appears only if a client adapter is installed in your computer and you did not disable ACM during installation. If more than one client adapter is installed, an ACM icon appears in the system tray for each adapter.

ACM provides information and options in the following ways:

- In the appearance of the icon itself
- Through a tool tip window that appears when you hover the cursor over the icon
- Through a pop-up menu that appears when you right-click the icon

The ACM Icon

The appearance of the ACM icon indicates the connection status of your client adapter. ACM reads the client adapter status and updates the icon every 2 seconds. Table 8-1 interprets the different appearances of the ACM icon.

Note Windows 98, 98 SE, 2000, and XP may display their own wireless network connection status icon in the system tray. Cisco recommends that you turn off the Windows icon and use the ACM icon to monitor your wireless connection.

Table 8-1   Interpreting the ACM Icon

Icon	Description
	The client adapter's radio is turned off.
	The client adapter is not associated to an access point.
	The client adapter is associated to an access point, but the user is not authenticated.
	The client adapter is associated to an access point, and the link quality is excellent or good.
	The client adapter is associated to an access point, and the link quality is fair.
	The client adapter is associated to an access point, and the link quality is poor.

Tool Tip Window

When you hover the cursor over the ACM icon, the Tool Tip window appears (see Figure 8-1).

Figure 8-1   Tool Tip Window

This window provides information on the current status of your client adapter. Table 8-2 lists and describes each element of the Tool Tip window.

Table 8-2   Tool Tip Window Elements

| Status Element	Description
Active profile	The network configuration (or profile) that your client adapter is currently using.
	Note If auto profile selection is enabled, the profile name is preceded by the word *Auto*.
	Note If an application other than ACU was used to configure the client adapter, *Other Configuration Application* appears.
SSID	The name of the network to which your client adapter is currently associated.
	Note Refer to the SSID1 parameter in Table 5-2 for information on setting the client adapter's SSID.

Table 8-2   Tool Tip Window Elements (continued)

Status Element	Description
Connection status	The operational mode of your client adapter. **Value:** Radio Off, Not Associated, Associated, Authenticating, Authenticated, or Authentication Failed

Connection Status	Description
Radio Off	The client adapter's radio is turned off.
Not Associated	The client adapter has not established a connection to an access point.
Associated	The client adapter has established a connection to an access point.
Authenticating	The client adapter is associated to an access point, and the authentication process has begun but not yet succeeded.
Authenticated	The client adapter is associated to an access point, and the user is authenticated.
Authentication Failed	The client adapter is associated to an access point, but the attempt to authenticate the user has failed. **Note** This status may appear very briefly or not all as the authentication failure may result in the client adapter becoming disassociated, in which case the status reads "Not Associated."

Status Element	Description
Link quality	The client adapter's ability to communicate with the access point, which is determined by the combined result of the adapter's signal strength and signal quality. **Value:** Excellent, Good, Fair, or Poor
Link speed	The rate at which your client adapter is currently transmitting data packets. **Value:** 1, 2, 5.5, or 11 Mbps (2.4-GHz client adapters); 6, 9, 12, 18, 24, 36, 48, or 54 Mbps (5-GHz client adapters)
Client adapter type	A description of your client adapter.
Client adapter IP address	The IP address of your client adapter.

Pop-Up Menu

When you right-click the ACM icon, the ACM pop-up menu appears (see Figure 8-2).

Figure 8-2   ACM Pop-Up Menu
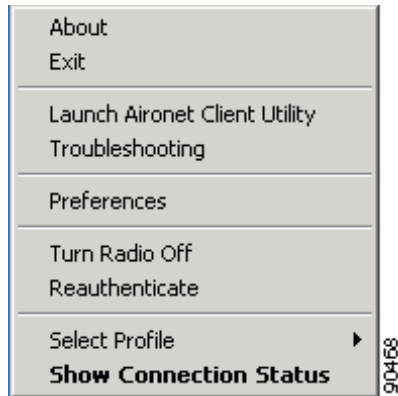
The following sections describe each ACM pop-up menu option.

> **Note**   If you used the Aironet Client Monitor Preferences screen or your system administrator used an administrative tool to deactivate certain ACM menu options, these options do not appear in the menu and therefore cannot be selected.

About

When you select this option, the About screen appears (see Figure 8-3).

Figure 8-3   ACM About Screen

The About screen displays the version number of ACM that your computer is running and enables you to access the online help. To access the online help, click the **Help** button. An overview of ACM appears.

Exit

This option closes ACM for all client adapters.

![Note icon]

Note   To reactivate ACM, use Windows Explorer to find the path where the ACM software is installed. (The default location is C:\Program Files\Cisco Systems\Aironet Client Monitor.) Then double-click **ACUMon.exe**.

Launch Aironet Client Utility

This option activates ACU. It is available only if ACU is installed. If more than one ACM icon appears in the Windows system tray, ACU initializes itself to use the client adapter associated with the icon that initiated the launch.

Troubleshooting

This option activates the Cisco Wireless LAN Adapter Troubleshooting Utility, which enables you to identify and resolve configuration and association problems with your client adapter. Refer to the "Using the Troubleshooting Utility" section on page 10-4 for detailed instructions on using this utility.

Preferences

When you select this option, the Aironet Client Monitor Preferences screen appears (see Figure 8-4).

Figure 8-4   Aironet Client Monitor Preferences Screen
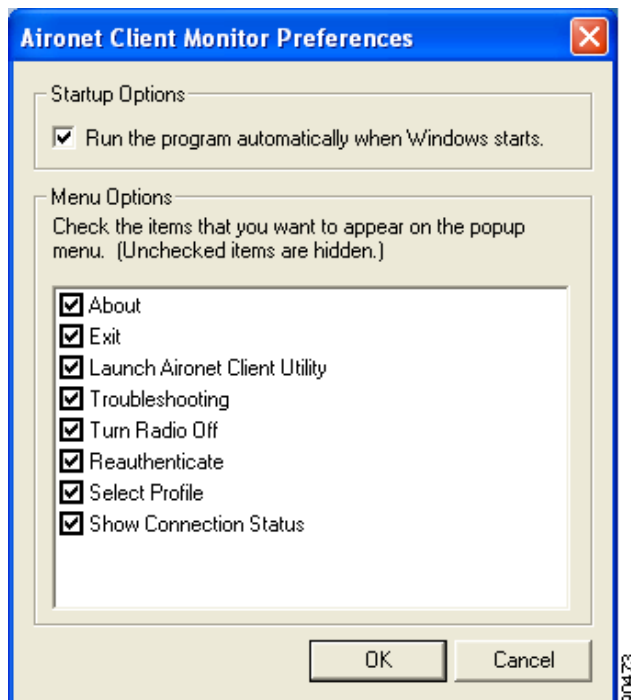
This screen enables you to determine when ACM runs and to select the options that appear on the ACM pop-up menu. The selections you make apply to every instance of ACM. For example, if you deselect the Troubleshooting option, it will not appear in the pop-up menu for any ACM icon.

Follow the steps below to make your selections.

Step 1 If you want ACM to run automatically when Windows starts, make sure the **Run the program automatically when Windows starts** check box is checked. Otherwise, uncheck this check box.

> **Note** If you do not select this option and later want to run ACM, you must use Windows Explorer to find the path where the ACM software is installed. (The default location is C:\Program Files\Cisco Systems\Aironet Client Monitor.) Then double-click **ACUMon.exe**.

Step 2 In the Menu Options portion of the screen, make sure the check boxes of all the options that you want to appear in the ACM pop-up menu are checked. Any options that are not checked will not be included in the menu.

> **Note** The Preferences option cannot be deselected. It always appears in the ACM pop-up menu.

Step 3 Click **OK** to save your changes.

Turn Radio On/Off

This option enables you to turn the client adapter's radio on or off. Turning the radio off prevents the adapter from transmitting RF energy. You might want to turn off the client adapter's radio in the following situations:

- You are not transmitting data and want to conserve battery power.
- You have EAP-SIM authentication set up to occur transparently (the SIM card is left in the reader and the PIN is stored in the computer), and you do not want to be billed for air time upon entering an area that enables the client to authenticate.
- You are using a laptop on an airplane and want to prevent the adapter's transmissions from potentially interfering with the operation of certain devices.

When the radio is on, it periodically sends out probes even if it is not associated to an access point, as required by the 802.11 specification. Therefore, it is important to turn it off around devices that are susceptible to RF interference.

> **Note** Your client adapter is not associated while the radio is off.

> **Note** If your client adapter's radio is turned off before your computer enters standby or hibernate mode or before you reboot the computer, the radio remains off when the computer resumes. You must turn the radio back on to resume operation.

If the radio is on, select **Turn Radio Off** to turn off the radio.

If the radio is off, select **Turn Radio On** to turn on the radio.

Reauthenticate

This option enables you to force your client adapter to try to reauthenticate using the username and password of the current profile.

If your client adapter was unable to authenticate using the specified username and password and you have exhausted the retry limit (for example, LEAP tries only once to prevent you from being locked out of the system), the current profile is disabled until you change the username or password, reboot your computer, eject and reinsert the client adapter, or select the Reauthenticate option.

Select Profile

This option enables you to select the active profile for your client adapter.

> **Note** Because EAP-TLS, PEAP, and EAP-SIM authentication are enabled in the operating system, you cannot switch between these authentication types simply by switching profiles in ACM. You can select a profile in ACM that uses host-based EAP, but you must enable the specific authentication type in Windows (provided Windows is using the Microsoft 802.1X supplicant). In addition, Windows can be set for only one authentication type at a time; therefore, if more than one profile in ACM uses host-based EAP and you want to use another authentication type, you must change authentication types in Windows after switching profiles in ACM.

When you select Select Profile from the ACM pop-up menu, a profiles submenu appears (see Figure 8-5).

Figure 8-5   Profiles Submenu
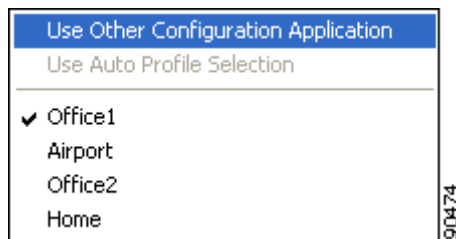
From this menu, you can choose among the following options:

- **Use Other Configuration Application**—Enables an application other than ACU to configure the client adapter. Examples of such applications include Windows XP and Boingo.

- **Use Auto Profile Selection**—Causes the client adapter's driver to automatically select a profile from the list of profiles that were set up in ACU to be included in auto profile selection.

  If the client adapter loses association for more than 10 seconds (or for more than the time specified by the LEAP authentication timeout value on the LEAP Settings screen if LEAP is enabled), the driver switches automatically to another profile that is included in auto profile selection. The adapter

will not switch profiles as long as it remains associated or reassociates within 10 seconds (or within the time specified by the LEAP authentication timeout value). To force the client adapter to associate to a different access point, you must select a new profile.

> **Note** This option is available only if two or more profiles are included in auto profile selection.

> **Note** Login scripts are not reliable if you use auto profile selection with LEAP. If you LEAP authenticate and achieve full network connectivity before or at the same time as you log into the computer, the login scripts will run. However, if you LEAP authenticate and achieve full network connectivity after you log into the computer, the login scripts will not run.

- **A specific profile**—When you select a profile from the list of available profiles, the client adapter attempts to establish a connection to an access point using the parameters that were configured for that profile.

  If the client adapter cannot associate to the access point or loses association while using the selected profile, the adapter does not attempt to associate using another profile. To associate, you must select a different profile or select Use Auto Profile Selection.

Simply click the desired profile to select it. A check mark appears beside the profile, and the client adapter attempts to establish a connection using the selected profile.

Show Connection Status

When you select this option, the Connection Status screen appears (see Figure 8-6).

Figure 8-6   Connection Status Screen
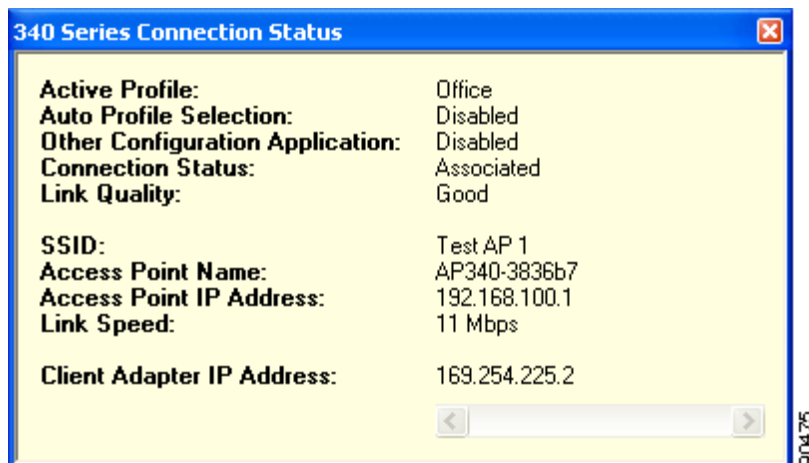
This screen provides information on the current status of your client adapter. Table 8-3 interprets each element of the Connection Status screen.

Note   You can also access the Connection Status screen by double-clicking the ACM icon.

Table 8-3   Connection Status Screen Elements

Status Element	Description
Active Profile	The network configuration (or profile) that your client adapter is currently using.
Auto Profile Selection	Indicates whether your client adapter is using auto profile selection. **Value:** Enabled or Disabled
Other Configuration Application	Indicates whether an application other than ACU is being used to configure your client adapter. **Value:** Enabled or Disabled
Connection Status	The operational mode of your client adapter. **Value:** Radio Off, Not Associated, Associated, Authenticating, Authenticated, or Authentication Failed
Link Quality	The client adapter's ability to communicate with the access point, which is determined by the combined result of the adapter's signal strength and signal quality. **Value:** Excellent, Good, Fair, or Poor

Connection Status	Description
Radio Off	The client adapter's radio is turned off.
Not Associated	The client adapter has not established a connection to an access point.
Associated	The client adapter has established a connection to an access point.
Authenticating	The client adapter is associated to an access point, and the authentication process has begun but not yet succeeded.
Authenticated	The client adapter is associated to an access point, and the user is authenticated.
Authentication Failed	The client adapter is associated to an access point, but the attempt to authenticate the user has failed. **Note** This status may appear very briefly or not all as the authentication failure may result in the client adapter becoming disassociated, in which case the status reads "Not Associated."

Table 8-3   Connection Status Screen Elements (continued)

Status Element	Description
SSID	The name of the network to which your client adapter is currently associated. **Note** Refer to the SSID1 parameter in Table 5-2 for information on setting the client adapter's SSID.
Access Point Name	The name of the access point to which your client adapter is associated. It is shown only if the client adapter is in infrastructure mode, the access point was configured with a name, and Aironet Extensions are enabled (on access points running Cisco IOS release 12.2(4)JA or greater).
Access Point IP Address	The IP address of the access point to which your client adapter is associated. It is shown only if the client adapter is in infrastructure mode, the access point was configured with an IP address, and Aironet Extensions are enabled (on access points running Cisco IOS release 12.2(4)JA or greater). **Note** If Aironet Extensions are disabled, the IP address of the associated access point is shown as 0.0.0.0.
Link Speed	The rate at which your client adapter is currently transmitting data packets. **Value:** 1, 2, 5.5, or 11 Mbps (2.4-GHz client adapters); 6, 9, 12, 18, 24, 36, 48, or 54 Mbps (5-GHz client adapters)
Client Adapter IP Address	The IP address of your client adapter.

Routine Procedures

This chapter provides procedures for common tasks related to the client adapter.

The following topics are covered in this chapter:

Inserting and Removing a Client Adapter

This section provides instructions for inserting and removing PC cards, PC-Cardbus cards, and PCI cards. Instructions are not provided for LM cards and mini PCI cards because they are pre-installed inside computing devices and are not meant to be installed or removed by the user.

⚠ **Caution**   These procedures and the physical connections they describe apply generally to conventional PC card slots, Cardbus slots, and PCI expansion slots. In cases of custom or nonconventional equipment, be alert to possible differences in PC card slot, Cardbus slot, and PCI expansion slot configurations.

Inserting a Client Adapter

Follow the instructions in one of the sections below to insert a PC card, PC-Cardbus card, or PCI card into a computing device.

Inserting a PC Card or PC-Cardbus Card

Step 1   Before you begin, examine the card. One end has a dual-row, 68-pin connector. The card is keyed so it can be inserted only one way into the PC card slot or Cardbus slot.

✎ **Note**   The PC card slot or Cardbus slot is on the left or right side of the computer, depending on the model.

Step 2   Perform one of the following:

- Turn on your computer, let the operating system boot up completely, and follow the remaining steps in this section to insert the card.
- Turn off your computer, follow the remaining steps in this section to insert the card, and reboot your computer.

⚠ **Caution**   Do not force the card into your computer's PC card slot or Cardbus slot. Forcing it will damage both the card and the slot. If the card does not insert easily, remove the card and reinsert it.

Step 3   Hold the card with the Cisco logo facing up and insert it into the PC card slot or Cardbus slot, applying just enough pressure to make sure it is fully seated (see Figure 9-1).

Figure 9-1   Inserting a PC Card or PC-Cardbus Card into a Computing Device
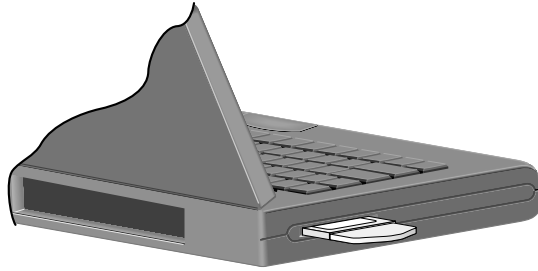
![Note] **Note** The profiles for PC-Cardbus cards are tied to the slot in which the card is inserted. Therefore, you must always insert your PC-Cardbus card into the same slot or create profiles for both slots.

Inserting a PCI Card

Step 1 Turn off the PC and all its components.

Step 2 Remove the computer cover.

![Note] **Note** On most Pentium PCs, PCI expansion slots are white. Refer to your PC documentation for slot identification.

Step 3 Remove the screw from the top of the CPU back panel above an empty PCI expansion slot. This screw holds the metal bracket on the back panel.

![Caution] **Caution** Static electricity can damage your PCI card. Before removing the adapter from the anti-static packaging, discharge static by touching a metal part of a grounded PC.

Step 4 Examine the PCI card. The antenna connector and the LEDs face out of your computer and are visible when you put the cover back on. The bottom edge of the card is the connector you will insert into an empty expansion slot in your computer. See Figure 9-2.

Figure 9-2   Inserting a PCI Card into a PC
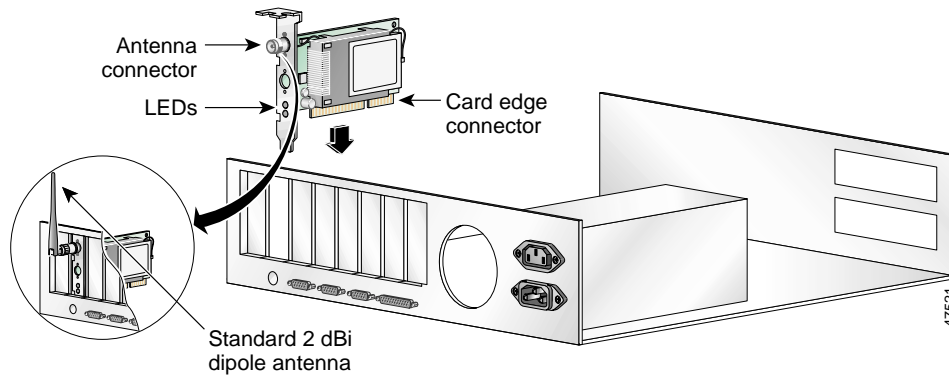
Step 5   Tilt the card to allow the antenna connector and LEDs to slip through the opening in the CPU back panel.

Step 6   Press the card into the empty slot until the connector is firmly seated.

⚠

Caution   Do not force the card into the expansion slot as this could damage both the card and the slot. If the card does not insert easily, remove it and reinsert it.

Step 7   Reinstall the screw on the CPU back panel and replace the computer cover.

Step 8   Attach the 2-dBi antenna to the card's antenna connector until it is finger-tight. Do *not* overtighten.

Step 9   For optimal reception, position the antenna so it is straight up.

Step 10   Boot up your PC.

Removing a Client Adapter

Follow the instructions in one of the sections below to remove a PC card, PC-Cardbus card, or PCI card from a computing device, when necessary.

Removing a PC Card or PC-Cardbus Card

To remove a PC card or PC-Cardbus card after it is successfully installed and configured (such as when your laptop is to be transported), completely shut down your computer and pull the card directly out of the PC card slot or Cardbus slot. When the card is reinserted and the computer is rebooted, your connection to the network should be re-established.

✎

Note   If you need to remove your PC card or PC-Cardbus card but do not want to shut down your computer, double-click the **Unplug or Eject Hardware** icon in the Windows system tray, select the Cisco Aironet client adapter you want to remove under Hardware devices, click **Stop**, and click **OK** twice. Then pull the card directly out of the card slot.

Removing a PCI Card

Because PCI client adapters are installed inside desktop computers, which are not designed for portable use, you should have little reason to remove the adapter. However, instructions are provided below in case you ever need to remove your PCI card.

Step 1 Completely shut down your computer.

Step 2 Disconnect the client adapter's antenna.

Step 3 Remove the computer cover.

Step 4 Remove the screw from the top of the CPU back panel above the PCI expansion slot that holds your client adapter.

Step 5 Pull up firmly on the client adapter to release it from the slot and carefully tilt the adapter to allow it to clear the opening in the CPU back panel.

Step 6 Reinstall the screw on the CPU back panel and replace the computer cover.

Client Adapter Software Procedures

This section provides instructions for the following procedures:

- Finding the Install Wizard version, see below
- Upgrading the client adapter software, page 9-6
- Uninstalling the client adapter software, page 9-6
- Finding the driver version, page 9-7
- Firmware procedures, page 9-8
- ACU procedures, page 9-12
- ACM procedures, page 9-15

Finding the Install Wizard Version

Follow the instructions in this section to find the version of the Install Wizard that is currently installed for your client adapter.

Step 1 Open Windows Explorer.

Step 2 Find the Install Wizard files.

Step 3 Right-click the **Setup.exe** file.

Step 4 Click **Properties**.

Step 5 Click the **Version** tab. The version of the currently installed Install Wizard file is shown in the File version field.

Upgrading the Client Adapter Software

The same procedure that is used to initially install client adapter software can also be used to upgrade to a more recent version. Refer to Chapter 3 for instructions on upgrading your client adapter's software.

Note   The client adapter's firmware can also be upgraded through ACU. Refer to the "Upgrading the Firmware" section on page 9-8 for details.

Uninstalling the Client Adapter Software

This section provides instructions for uninstalling any Cisco Aironet client adapter drivers, utilities, and security modules that are installed on your computer. Only the client adapter's firmware remains installed. This procedure is necessary if you want to remove any installed client adapter software components from your computer or downgrade to previous versions.

Note   If you want to downgrade to earlier versions of client adapter software, follow the steps below to uninstall the current software components. Then install the older software.

Note   When you uninstall the client adapter software, any existing profiles are removed. If you want to save your profiles for later use, follow the instructions in Chapter 4 to export your profiles before uninstalling the software components.

Note   This procedure does not uninstall the PC, LM, or PCI card driver that was bundled with Windows Me and XP. It uninstalls only drivers to which you have upgraded. When you follow the steps below to uninstall an upgraded driver and then eject and reinsert the card, Windows finds the original driver and reinstalls it automatically.

Step 1   Perform one of the following:

- If you want to remove the client adapter from your computer, shut down your computer, remove the client adapter, and reboot your computer.

- If you want to leave your client adapter inserted in your computer or if your client adapter is an LM or mini PCI card and cannot be removed, go to Step 2.

Step 2   Select **Start** > **Run**.

Step 3   Browse to the location of the Install Wizard software, select the **Setup.exe** file, and click **Open** and **OK**.

The Cisco Aironet Wireless LAN Client Adapter Installation Wizard screen appears (see Figure 9-3).

Figure 9-3   Cisco Aironet Wireless LAN Client Adapter Installation Wizard screen
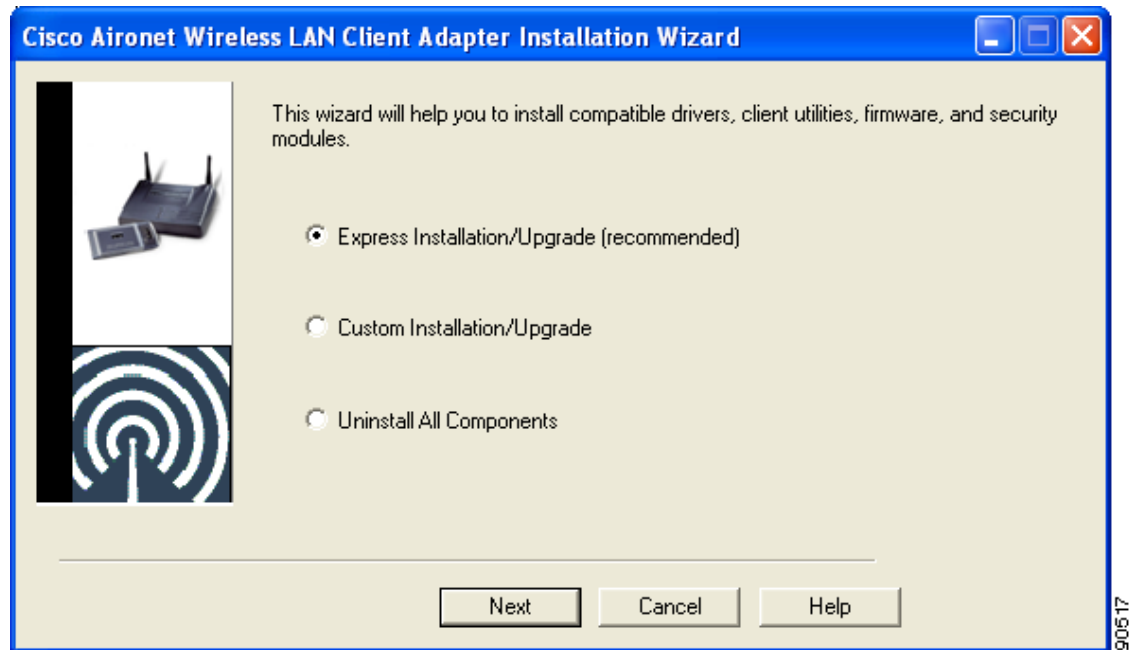
Step 4   Select **Uninstall All Components** and click **Next**.

Step 5   When prompted to confirm your decision, click **Yes**. The process to uninstall the files begins. You are notified throughout the process as each component is uninstalled.

Step 6   When the process completes, you are notified that the system is about to reboot. Close any open applications and click **OK**.

Step 7   If you did not remove the client adapter from your computer, the Found New Hardware Wizard screen appears after your computer reboots. Click **Cancel**.

> **Note**   The Found New Hardware Wizard screen does not appear on computers running Windows NT.

Step 8   This procedure does not remove the Install Wizard file or its uncompressed files. If you want to remove them from your computer, find the files using Windows Explorer and delete them.

Finding the Driver Version

Follow the instructions in this section to find the version of the driver that is currently installed for your client adapter.

Step 1   Open ACU.

Step 2   Click the **Status** icon or select **Status** from the Commands drop-down menu. The Status screen displays the current version of your client adapter's driver in the NDIS Driver Version field.

Firmware Procedures

This section provides instructions for the following procedures:

- Finding the Firmware Version, see below
- Upgrading the Firmware, see below
- Preventing the Driver from Upgrading the Firmware, page 9-10

Finding the Firmware Version

Follow the instructions in this section to find the version of firmware that is currently installed for your client adapter.

Step 1 Open ACU.

Step 2 Click the **Status** icon or select **Status** from the Commands drop-down menu. The Status screen displays the current version of your client adapter's firmware in the Firmware Version field.

Upgrading the Firmware

Caution To minimize the risk of a power failure during the firmware flashing process, which could render your client adapter inoperable, Cisco recommends that your computer be plugged into AC power or have a fully charged battery at the start of flashing. If a power failure does occur, follow the instructions in the "Technical Assistance Center" section of the Preface to contact TAC for assistance.

You can upgrade your client adapter's firmware using either the Install Wizard or ACU. If you use the wizard, the firmware loads from the Install Wizard file and is installed along with other software components. If you use ACU, the firmware installs from an image (*.img) file that contains only firmware.

Note To ensure compatibility between software components, Cisco recommends that you use the Install Wizard to upgrade the firmware along with the other software components.

Using the Install Wizard

To upgrade the firmware using the Install Wizard, follow the instructions in the "Installing or Upgrading the Client Adapter Software" section on page 3-2.

Using ACU

> **Note** When you upgrade your client adapter's firmware using ACU, the Automatically Load New Firmware When NDIS Driver Is Updated parameter on the Aironet Client Utility Preferences screen becomes disabled (or unchecked) automatically to prevent the newly loaded firmware from being overwritten by the driver. If you ever want to enable this parameter, you must recheck the check box.

To upgrade the firmware using ACU, follow the steps below.

Step 1 Use the computer's web browser to access the following URL:
http://www.cisco.com/public/sw-center/sw-wireless.shtml

Step 2 Select **Option #2: Aironet Wireless Software Display Tables**.

> **Note** You can download software from the Software Selector tool instead of the display tables. To do so, select **Option #1: Aironet Wireless Software Selector**, follow the instructions on the screen, and go to Step 7.

Step 3 Select **Cisco Aironet Wireless LAN Client Adapters**.

Step 4 Under Individual Files, find the client adapter firmware.

Step 5 Click the link that corresponds to your client adapter's model number (such as 340 or 350 series).

Step 6 Select the latest firmware file for your specific client adapter type (such as CB or MPI).

> **Note** The firmware for PC, LM, and PCI cards is labeled *PCMCIA-LMC-PCI*, the firmware for mini PCI cards is labeled *mini PCI* or *MPI*, and the firmware for PC-Cardbus cards is labeled *CB*.

> **Note** If your wireless network uses EAP authentication, access points to which your client adapter will attempt to authenticate must use the following firmware versions or greater: 11.23T (340 and 350 series access points), 12.2(4)JA (1100 series access points), or 11.54T (1200 series access points).

Step 7 Read and accept the terms and conditions of the Software License Agreement.

Step 8 Select the firmware file again to download it.

Step 9 Save the file to a floppy disk or to your computer's hard drive.

Step 10 Find the file using Windows Explorer, double-click it, and extract the image file to a folder.

> **Note** To extract the file, click **Browse** on the WinZip Self-Extractor screen, select the folder in which you want the file to be placed, and click **OK** and **Unzip**. After the file is extracted, click **OK** to close the screen.

Step 11 Make sure the client adapter is installed in your computer and is operational.

Step 12 Open ACU; click the **Load Firmware** icon or select **Load New Firmware** from the Commands drop-down menu. The Load New Firmware screen appears (see Figure 9-4).

Figure 9-4   Load New Firmware Screen
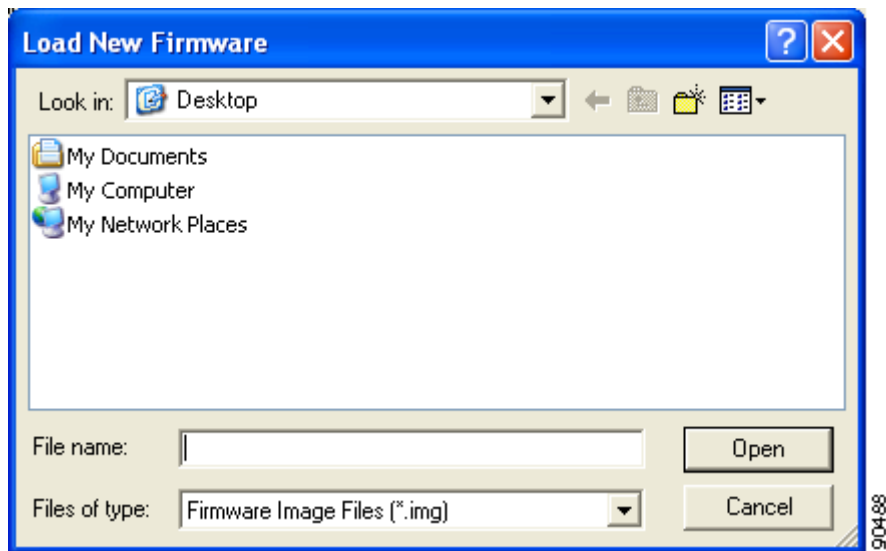
Step 13   Find the location of the new firmware in the Look in box.

Step 14   Click the firmware image file (*.img) so that it appears in the File name box at the bottom of the screen.

Step 15   Click the **Open** button. A progress bar appears while the selected image is loaded into the client adapter's Flash memory.

Step 16   Click **OK** when the "Firmware Upgrade Complete!" message appears. The OK button cannot be selected until the process is complete or an error occurs. If an error occurs, refer to the "Error Messages" section in Chapter 10.

Preventing the Driver from Upgrading the Firmware

The Automatically Load New Firmware When NDIS Driver Is Updated parameter on the Aironet Client Utility Preferences screen affects the firmware that is bundled with the driver, not the firmware that is included in the Install Wizard. This parameter controls whether the driver (whenever it loads) installs the firmware with which it is bundled. (The driver loads each time you insert a client adapter or reboot your computer.)

Note   To complete this procedure, you must have used the Install Wizard to install ACU.

Note   The Automatically Load New Firmware When NDIS Driver Is Updated parameter is functionally equivalent to the Disable Firmware Checking parameter in the Install Wizard. The parameter that is set last is the one that governs how the driver behaves. Refer to Chapter 3 for additional information.

Step 1   Open ACU.

Step 2   Click the **Preferences** icon or select **Preferences** from the Options drop-down menu. The Aironet Client Utility Preferences screen appears (see Figure 9-5).

Figure 9-5   Aironet Client Utility Preferences Screen
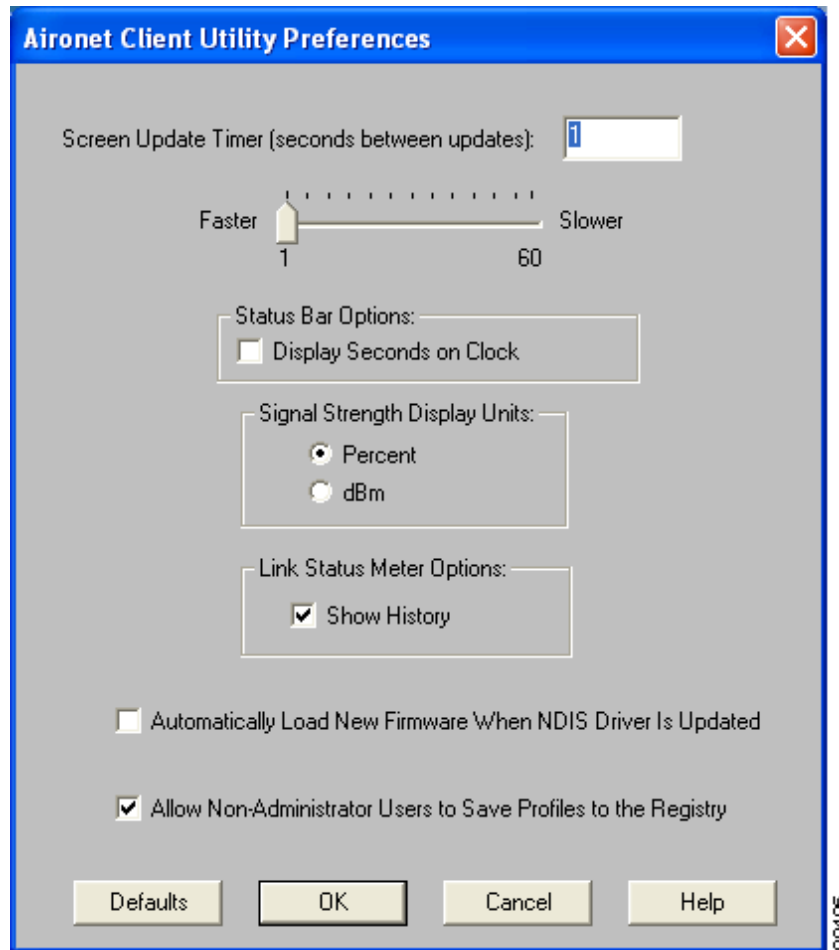
Step 3   If you want to prevent the driver (when it loads) from installing the firmware with which it is bundled, thereby allowing the client adapter to retain its current firmware version, make sure the **Automatically Load New Firmware When NDIS Driver Is Updated** check box is not checked.

Note   If you want the driver (when it loads) to install the firmware with which it is bundled if it is newer than the firmware that is currently installed in the client adapter, make sure the **Automatically Load New Firmware When NDIS Driver Is Updated** check box is checked.

Note   When you upgrade your client adapter's firmware using ACU, the Automatically Load New Firmware When NDIS Driver Is Updated parameter becomes unchecked automatically to prevent the newly loaded firmware from being overwritten by the driver. If you want to enable this parameter, you must recheck the check box.

> **Note** The Automatically Load New Firmware When NDIS Driver Is Updated parameter is dependent on the radio type (and the Cardbus slot for PC-Cardbus cards). Therefore, if you insert a client adapter of a different card type (such as a 340 instead of a 350) or insert the same PC-Cardbus card into a different slot, whether or not the driver installs the firmware with which it is bundled depends on how this parameter (or the Disable Firmware Checking parameter) was last set for that card type or card slot.

Step 4   Click **OK**.

ACU Procedures

This section provides instructions for the following procedures:

- Opening ACU, below

Opening ACU

To open ACU, perform one of the following:

- Double-click the **Aironet Client Utility** (**ACU**) icon on your desktop.
- Select **Aironet Client Utility (ACU)** from the folder in the Windows Start Menu that you chose during installation [the default location is **Start** > **Program Files** > **Cisco Systems** > **Aironet Client Utility (ACU)**].
- Double-click **My Computer** > **Control Panel** > **Aironet Client Utility**.

Exiting ACU

To exit ACU, select **Exit** from the Commands drop-down menu (see Figure 9-6).

Figure 9-6   Commands Drop-Down Menu

Modifying ACU Installation Settings

If you need to change any of the settings that you selected during installation (for example, placing the ACU icon on the desktop or allowing a saved LEAP username and password), you must run the Install Wizard again and modify the parameter values. Refer to Chapter 3 for instructions.

Finding the Version of ACU

Follow the instructions in this section to find the version of ACU that is currently installed.

Step 1   Open ACU.

Step 2   Click the **About** icon or select the **About Aironet Client Utility** option from the Help drop-down menu. The About Aironet Client Utility screen appears (see Figure 9-7).

Figure 9-7   About Aironet Client Utility Screen

Adding the ACU Icon to or Removing it from the Desktop

By default, an ACU icon is added to your computer's desktop when you install the Install Wizard.

- If you wish to remove the ACU icon from the desktop, run the Install Wizard again and set the Place Icon on Desktop parameter to **No** or right-click the icon, click **Delete**, and click **Yes** to confirm your decision.

- If you want to add the ACU icon to the desktop, set the Place Icon on Desktop parameter to **Yes** in the Install Wizard.

Accessing Online Help

To access ACU's online help, open ACU. Then click the **Help** icon or select **Contents** from the Help drop-down menu. An overview of ACU appears.

From the Overview of the Aironet Client Utility screen, you can access additional information.

- To access information on specific menu options, click **Contents**. Double-click **Aironet Client Utility Commands**, the desired menu (such as Options Menu), and the desired topic (such as Preferences).

- To access information on specific parameters, click **Contents**. Double-click **Configurable Parameters**, the client adapter, a parameter category (such as System Parameters), and the desired parameter (such as SSID).

- To access information on specific diagnostic topics, click **Contents**. Double-click **Run Time Diagnostic Information**, a diagnostic category (such as Running a Linktest), and the desired topic (such as Packet Size).

- To search for a specific topic, click **Index**, select an index entry, and click **Display**.

- To search for a specific word or phrase, click **Contents** or **Index**, click the **Find** tab, and follow the instructions in the Find Setup Wizard window.

ACM Procedures

Refer to Chapter 8 for instructions on using ACM.

Restarting the Client Adapter

ACU enables you to reinitialize (or restart) the client adapter without having to reboot your computer or eject and reinsert the adapter. For instance, if your client adapter is experiencing poor throughput, you might want to restart the client adapter to try to force it to disassociate from the access point to which it is currently associated in the hope that it reassociates to an access point with a stronger signal.

Note   Restarting the client adapter may cause you to lose your wireless network connection.

Follow the steps below to restart the client adapter.

Step 1   Open ACU.

Step 2   Select the **Restart Card** option from the Commands drop-down menu (see Figure 9-6).

Step 3   When prompted to confirm your decision, click **Yes**. The driver stops the client adapter's radio, writes the configuration (although no parameter settings have been changed), and restarts the radio. The status bar at the bottom of the ACU screen shows the client adapter losing association and then reassociating.

Turning Your Client Adapter's Radio On or Off

Your client adapter's radio can be turned on or off. Turning the radio off prevents the adapter from transmitting RF energy. You might want to turn off the client adapter's radio in the following situations:

- You are not transmitting data and want to conserve battery power.
- You have EAP-SIM authentication set up to occur transparently (the SIM card is left in the reader and the PIN is stored in the computer), and you do not want to be billed for air time upon entering an area that enables the client to authenticate.
- You are using a laptop on an airplane and want to prevent the adapter's transmissions from potentially interfering with the operation of certain devices.

When the radio is on, it periodically sends out probes even if it is not associated to an access point, as required by the 802.11 specification. Therefore, it is important to turn it off around devices that are susceptible to RF interference.

Note   Your client adapter is not associated while its radio is off.

Note   If your client adapter's radio is turned off before your computer enters standby or hibernate mode or before you reboot the computer, the radio remains off when the computer resumes. You must turn the radio back on to resume operation.

You can use ACU or ACM to turn the client adapter's radio on or off. Follow the instructions below to use ACU or refer to the "Turn Radio On/Off" section on page 8-7 to use ACM.

If your client adapter's radio is on, open ACU and select **Turn Radio Off** from the Commands drop-down menu (see Figure 9-6) to turn off the radio. The status bar at the bottom of the ACU screen indicates that the radio is turned off.

If your client adapter's radio is off, open ACU and select **Turn Radio On** from the Commands drop-down menu (see Figure 9-6) to turn on the radio.

Uninstalling the Microsoft Hot Fix

When LEAP is selected during installation on a Windows 98 or 98 SE device, a Microsoft hot fix is also installed to fix two problems related to the use of LEAP. If you ever need to uninstall the hot fix, select **Start** > **Run**, enter C:\Windows\Inf\Qfe\W98.se\241052un.inf, and click **OK**.

Troubleshooting

This chapter provides information for diagnosing and correcting common problems that may be encountered when installing or operating the client adapter.

The following topics are covered in this chapter:

Accessing the Latest Troubleshooting Information

This chapter provides basic troubleshooting tips for your client adapter. For more up-to-date and complex troubleshooting information, refer to the TAC web site at:

http://www.cisco.com/en/US/support/index.html

Select **Wireless Troubleshooting Center** under Tools & Utilities.

Interpreting the Indicator LEDs

Note   Mini PCI cards do not have LEDs.

The client adapter shows messages and error conditions through its two LEDs:

- **Link Integrity/Power LED (green)**—This LED lights when the client adapter is receiving power and blinks slowly when the adapter is linked with the network.
- **Link Activity LED (amber)**—This LED blinks quickly when the client adapter is receiving or transmitting data and blinks in a repeating pattern to indicate an error condition.

Table 10-1 interprets the LED messages during normal operation. Table 10-2 interprets the LED error condition messages.

Table 10-1   LED Normal Operating Messages

Green LED	Amber LED	Condition
Blinking quickly	Blinking quickly	Power is on, self-test is OK, and client adapter is scanning for a network.
Blinking slowly	Blinking quickly	Client adapter is associated to an access point.
Continuously on or blinking slowly	Blinking quickly	Client adapter is transmitting or receiving data while associated to an access point.
Off	Blinking quickly	Client adapter is in power save mode.
On continuously	Blinking quickly	Client adapter is in ad hoc mode.

Table 10-2   LED Error Condition Messages

Green LED	Amber LED	Condition/Recommended Action
Off	Off	Client adapter is not receiving power, or an error has occurred.
Off	1 blink at 2-second rate	RAM failure. Refer to the "Obtaining Technical Assistance" section in the Preface for technical support information.
Off	2-second pause, 2 fast blinks, 1-second pause, 1 blink	A configuration error has occurred (for example, static WEP is enabled in ACU, but the client adapter has not been programmed with a valid WEP key). Recheck your client adapter's configuration settings.

Table 10-2   LED Error Condition Messages (continued)

Green LED	Amber LED	Condition/Recommended Action
Off	2 fast blinks, 2-second pause	Flash boot block checksum failure. Refer to the "Obtaining Technical Assistance" section in the Preface for technical support information.
Off	3 fast blinks, 2-second pause	Firmware checksum failure. Reload the firmware.
Off	4 fast blinks, 2-second pause	MAC address error (error reading MAC chip). Reload the firmware.
Off	5 fast blinks, 2-second pause	Physical layer (PHY) access error. Refer to the "Obtaining Technical Assistance" section in the Preface for technical support information.
Off	6 fast blinks, 2-second pause	Incompatible firmware. Load the correct firmware version.

Troubleshooting the Client Adapter

This section provides troubleshooting tips should you encounter problems with your client adapter. Use Table 10-3 to quickly locate specific troubleshooting information.

Table 10-3   Locating Troubleshooting Information

Troubleshooting Information	Page Number
Using the troubleshooting utility	10-4
Client adapter recognition problems	10-7
Resolving resource conflicts	10-8
Problems associating to an access point	10-11
Problems authenticating to an access point	10-11
Problems connecting to the network	10-11
Prioritizing network connections (Windows 2000 and XP only)	10-11
Losing association upon resuming from suspend mode (Windows NT and mini PCI cards only)	10-12
Parameters missing from Profile Manager screen	10-12
Windows Wireless Network Connection icon shows unavailable connection (Windows XP only)	10-12
LEAP login screen does not appear before Windows login screen (Windows 98, 98 SE, and Me only)	10-13
Microsoft hot fix (Windows 98 and 98 SE only)	10-13

Using the Troubleshooting Utility

The Cisco Wireless LAN Adapter Troubleshooting Utility enables you to identify and resolve configuration and association problems with your client adapter. It is meant to be used only when the client adapter is in infrastructure mode as it assesses the connection between the adapter and an access point.

Follow the instructions in one of the subsections below to use the utility to diagnose your client adapter's operation, save a detailed report to a text file, or access online help.

Diagnosing Your Client Adapter's Operation

Step 1   Perform one of the following to activate the troubleshooting utility:

- Open ACU; select **Troubleshooting** from the Options drop-down menu.

- Right-click the ACM icon; select **Troubleshooting** from the pop-up menu.

The Cisco Wireless LAN Adapter Troubleshooting screen appears (see Figure 10-1).

Figure 10-1   Cisco Wireless LAN Adapter Troubleshooting Screen
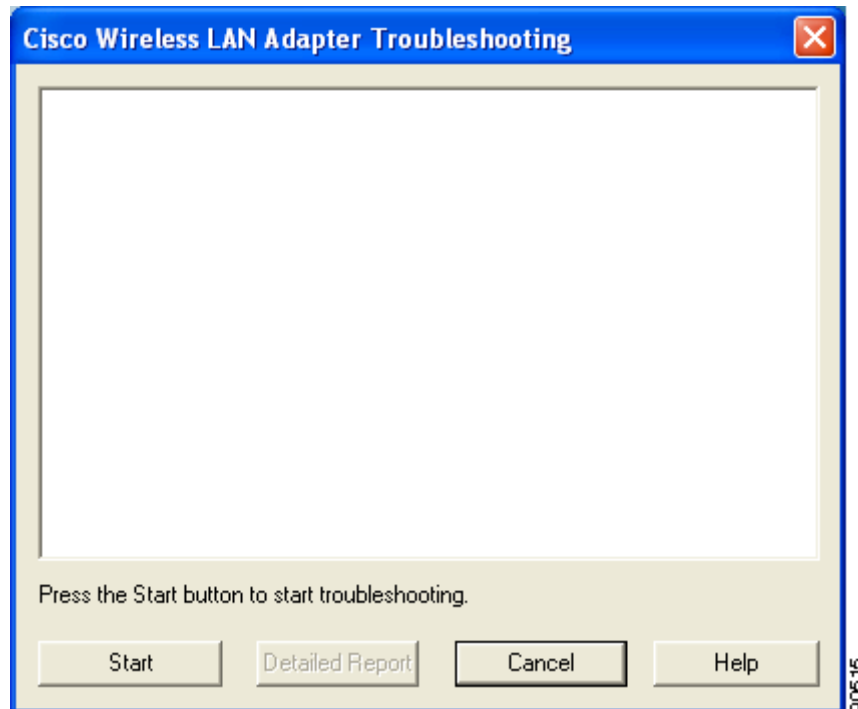
Step 2   Click **Start**. The utility performs the following series of eight tests to check the operation of your client adapter and to pinpoint specific problems if they exist:

1. Checking driver installation
2. Checking client adapter insertion
3. Checking the client adapter's radio (to see if it is turned on)
4. Checking the client adapter's association to an access point
5. Checking authentication
6. Checking the receive interrupt
7. Checking network settings
8. Checking the client adapter's connection to the access point

The utility runs until it completes successfully or a problem is discovered. It then displays the results (see Figure 10-2).

Figure 10-2   Cisco Wireless LAN Adapter Troubleshooting Screen (with Test Results)

One of the following status messages appears for each test:

- **GOOD**—The test completed successfully.
- **ERROR**—The test failed because the client adapter is not configured properly to establish a connection with an access point.
- **WARNING**—The test failed for one of the following reasons:
  - The utility is unable to access the client's IP address. Either an incorrect IP address was entered, or an IP address was not received from the DHCP server. Contact your system administrator.
  - The utility is unable to access the access point's IP address. Contact your system administrator.
  - The exact cause cannot be determined. Contact your system administrator.

> **Note** You can click **Stop** at any time to stop the testing process, or you can click **Restart** once the testing process has stopped to run the test again.

> **Note** If auto profile selection is enabled but the client adapter is not associated or authenticated, the utility repeats the testing process continually so the client adapter can be tested with new profiles.

Step 3 To view more detailed information, click **Detailed Report**. A report appears that explains the purpose of each test and the results for your client adapter.

> **Note** The report contains valuable information that, if necessary, could be used by TAC to analyze any problems. Follow the instructions in the next section if you want to save the report to a text file.

Step 4 If a problem is discovered, the report provides some possible repair suggestions. Follow the repair instructions carefully and run the troubleshooting utility again.

Step 5 Click **Close** to exit the detailed report.

Step 6 Click **Cancel** to exit the troubleshooting utility.

Saving the Detailed Report to a Text File

Follow the steps below to save the detailed troubleshooting report to your computer's hard drive.

Step 1 Click **Save** on the detailed report screen. The Save As screen appears. A filename of the following format appears automatically in the File name field: TS*yymmddhhmm*, where *yymmddhhmm* represents the date and time that the troubleshooting utility was started. For example, TS0211211230 indicates that the utility was started on 11/21/02 at 12:30.

> **Note** You can change the filename by typing a new name in the File name field.

Step 2   Use the Save in box at the top of the screen to specify the location on your computer's hard drive where the file will be saved. The default location is My Documents.

> **Note**   If you specify a different location, the new location becomes the default location going forward.

Step 3   Click **Save**. The file is saved as a text file in the location specified.

Accessing Online Help

Follow the steps below to access general troubleshooting information about your client adapter.

Step 1   Click **Help** on the Cisco Wireless LAN Adapter Troubleshooting screen. An overview of the troubleshooting utility appears.

Step 2   Click **Help Topics** at the top of the screen. From the Help Topics screen, you can access additional information.

- To access information on specific topics, double-click **Troubleshooting Tips** on the Contents page, the desired topic (such as Radio LEDs), and the desired subtopic (such as LED Error Condition Messages).
- To search for a specific topic, click the **Index** tab, select an index entry, and click **Display**.
- To search for a specific word or phrase, click the **Find** tab, and follow the instructions in the Find Setup Wizard window.

Step 3   Click **Cancel** to exit the Help Topics screen.

Client Adapter Recognition Problems

> **Note**   This section does not apply to mini PCI cards.

If your client adapter is not being recognized by your computer's PCMCIA adapter, check your computer's BIOS and make sure that the PC card controller mode is set to PCIC compatible.

> **Note**   A computer's BIOS varies depending on the manufacturer. For support on BIOS-related issues, consult your computer's manufacturer.

Resolving Resource Conflicts

> **Note** This section does not apply to mini PCI cards.

If you encounter problems while installing your client adapter on a computer running a Windows operating system, you may need to specify a different interrupt request (IRQ) or I/O range for the adapter.

The default IRQ for the client adapter is IRQ 10, which may not work for all systems. Follow the steps for your specific operating system to obtain an available IRQ.

During installation the adapter's driver installation script scans for an unused I/O range. The installation can fail if the I/O range found by the driver installation script is occupied by another device but not reported by Windows. An I/O range might not be reported if a device is physically present in the system but not enabled under Windows. Follow the steps for your specific operating system to obtain an available I/O range.

Resolving Resource Conflicts in Windows 98, 98 SE, and Me

Step 1 Double-click **My Computer**, **Control Panel**, and **System**.

Step 2 Click the **Device Manager** tab.

Step 3 Double-click **Network Adapters**.

Step 4 Select the Cisco Systems Wireless LAN Adapter.

Step 5 Click the **Properties** button.

Step 6 In the General screen, the Device Status field indicates if a resource problem exists. If a problem is indicated, click the **Resources** tab.

Step 7 Uncheck the **Use automatic settings** check box.

Step 8 Under Resource Settings or Resource Type, click **Input/Output Range**.

Step 9 Look in the Conflicting Device list at the bottom of the screen. If it indicates that the range is being used by another device, click the **Change Setting** button.

Step 10 Scroll through the ranges in the Value dialog box and select one that does not conflict with another device. The Conflict Information window at the bottom of the screen indicates if the range is already being used.

Step 11 Click **OK**.

Step 12 Under Resource Settings or Resource Type, click **Interrupt Request**.

Step 13 Look in the Conflicting Device list at the bottom of the screen. If it indicates that the IRQ is being used by another device, click the **Change Setting** button.

Step 14 Scroll through the IRQs in the Value dialog box and select one that does not conflict with another device. The Conflict Information window at the bottom of the screen indicates if the IRQ is already being used.

Step 15 Click **OK**.

Step 16 Reboot your computer.

Resolving Resource Conflicts in Windows NT

Step 1   Select **Start** > **Programs** > **Administrative Tools** > **Windows NT Diagnostics**.

Step 2   Click the **Resources** tab.

Step 3   Click the **IRQ** button.

Step 4   The used IRQs are listed in numerical order along the left side of the Resources window. Write down the number of an IRQ that is not being used; you will need it for Step 11.

Step 5   Click the **I/O Port** button.

Step 6   The used I/O ranges are listed in numerical order along the left side of the Resources window under Address. Write down an I/O range that is not being used (for example, if range 0100-013F is followed by 0170-0177 in the list, then 0140-0169 is an available range); you will need it for Step 13.

Step 7   Double-click **My Computer**, **Control Panel**, and **Network**.

Step 8   Click the **Adapters** tab and select the Cisco Aironet Wireless LAN Adapter.

Step 9   Click **Properties**.

Step 10   Select **Interrupt** under Property.

Step 11   Select the number of the unused interrupt from Step 4 in the Value drop-down box.

Step 12   Select **IO Base Addres**s under Property.

Step 13   Select a value that is within the unused range you determined in Step 6. For example, if your unused range is 0140-0169, you could select 0150.

Step 14   Click **OK**.

Resolving Resource Conflicts in Windows 2000

Step 1   Double-click **My Computer**, **Control Panel**, and **System**.

Step 2   Click the **Hardware** tab and **Device Manager**.

Step 3   Double-click **Network Adapters** and the Cisco Systems Wireless LAN Adapter.

Step 4   In the General screen, the Device Status field indicates if a resource problem exists. If a problem is indicated, click the **Resources** tab.

Step 5   Uncheck the **Use automatic settings** check box.

Step 6   Under Resource Settings or Resource Type, click **Input/Output Range**.

Step 7   Look in the Conflicting Device list at the bottom of the screen. If it indicates that the range is being used by another device, click the **Change Setting** button.

Step 8   Scroll through the ranges in the Value dialog box and select one that does not conflict with another device. The Conflict Information window at the bottom of the screen indicates if the range is already being used.

Step 9   Click **OK**.

Step 10   Under Resource Settings or Resource Type, click **Interrupt Request**.

Step 11   Look in the Conflicting Device list at the bottom of the screen. If it indicates that the IRQ is being used by another device, click the **Change Setting** button.

Step 12   Scroll through the IRQs in the Value dialog box and select one that does not conflict with another device. The Conflict Information window at the bottom of the screen indicates if the IRQ is already being used.

Step 13   Click **OK**.

Step 14   Reboot your computer.

Resolving Resource Conflicts in Windows XP

Note   These instructions assume you are using Windows XP's classic view, not its category view.

Step 1   Double-click **My Computer**, **Control Panel**, and **System**.

Step 2   Click the **Hardware** tab and **Device Manager**.

Step 3   Under Network Adapters, double-click the Cisco Systems Wireless LAN Adapter.

Step 4   In the General screen, the Device Status field indicates if a resource problem exists. If a problem is indicated, click the **Resources** tab.

Step 5   Uncheck the **Use automatic settings** check box.

Step 6   Under Resource Settings, click **I/O Range**.

Step 7   Look in the Conflicting Device list at the bottom of the screen. If it indicates that the range is being used by another device, click the **Change Setting** button.

Step 8   Scroll through the ranges in the Value dialog box and select one that does not conflict with another device. The Conflict Information window at the bottom of the screen indicates if the range is already being used.

Step 9   Click **OK**.

Step 10   Under Resource Settings, click **IRQ**.

Step 11   Look in the Conflicting Device list at the bottom of the screen. If it indicates that the IRQ is being used by another device, click the **Change Setting** button.

Step 12   Scroll through the IRQs in the Value dialog box and select one that does not conflict with another device. The Conflict Information window at the bottom of the screen indicates if the IRQ is already being used.

Step 13   Click **OK**.

Step 14   Reboot your computer.

Problems Associating to an Access Point

Follow the instructions below if your client adapter fails to associate to an access point.

- If possible, move your workstation a few feet closer to an access point and try again.
- Make sure that the client adapter is securely inserted in your computer's client adapter slot.
- If you are using a PCI client adapter, make sure that the antenna is securely attached.
- Make sure that the access point is turned on and operating.
- Check that all parameters are set properly for both the client adapter and the access point. These include the SSID, EAP authentication, WEP activation, network type, channel, etc.
- Follow the instructions in the previous section to resolve any resource conflicts. If you are using Windows NT, you may also want to try disabling the Ethernet port.
- If the client adapter still fails to establish contact, refer to the "Obtaining Technical Assistance" section in the Preface for technical support information.

Problems Authenticating to an Access Point

If your client adapter is a 40-bit card and LEAP or EAP is enabled, the adapter can associate but not authenticate to access points using 128-bit encryption. To authenticate to an access point using 128-bit encryption, you have two options:

- Purchase a 128-bit client adapter. This is the most secure option.
- Disable static WEP for the client adapter and configure the adapter and the access point to associate to mixed cells. This option presents a security risk because your data is not encrypted as it is sent over the RF network.

Problems Connecting to the Network

After you have installed the appropriate firmware, driver, client utilities, and security modules, contact your IS department if you have a problem connecting to the network. Proxy server, network protocols, and further authentication information might be needed to connect to the network.

Prioritizing Network Connections (Windows 2000 and XP Only)

If your computer is running Windows 2000 or XP and more than one network adapter is enabled (such as a Cisco Aironet client adapter and an Ethernet card), you can select which one to use by assigning a priority to your network connections.

Note   This procedure does not apply to Windows 98, 98 SE, NT, and Me because these operating systems allow only one network adapter to be enabled at a time.

Follow the steps below to prioritize your network connections.

Step 1   Right-click the **My Network Places** icon on your desktop.

Step 2   Click **Properties**.

Step 3   Select the **Advanced** menu option at the top of the screen.

Step 4   Select **Advanced Settings**. Your network connections are listed in the Connections box on the Adapters and Bindings tab.

Step 5   Use the arrows beside the Connections box to move the network connection that you want to use to the top.

Step 6   Click **OK**.

Losing Association upon Resuming from Suspend Mode (Windows NT and Mini PCI Cards Only)

Because Windows NT does not support resuming of mini PCI cards, your client adapter loses its association to an access point upon resuming from suspend mode. If this occurs, restart your client adapter to reassociate.

Parameters Missing from Profile Manager Screen

If some parameters are unavailable on the Profile Manager screen, your system administrator may have used an administrative tool to deactivate these parameters. In this case, these parameters cannot be selected.

Windows Wireless Network Connection Icon Shows Unavailable Connection (Windows XP Only)

If your computer is running Windows XP and you configured your client adapter using ACU, the Windows Wireless Network Connection icon in the Windows system tray may be marked with a red *X* and show an unavailable connection even though a wireless connection exists. This condition is caused by a conflict between ACU and Windows XP's wireless network settings. Simply ignore the Windows icon and use the ACM icon to check the status of your client adapter's wireless connection.

Chapter 10   Troubleshooting

Error Messages

LEAP Login Screen Does Not Appear Before Windows Login Screen (Windows 98, 98 SE, and Me Only)

If you are using Windows 98, 98 SE, or Me and your client adapter is configured to use LEAP authentication with an automatically prompted login, the LEAP login screen should appear before the Windows screen after you reboot. If the Windows screen appears first, follow the steps below.

Step 1   On the Windows desktop, right-click the **My Network Places** icon.

Step 2   Click **Properties**.

Step 3   On the Network - Configuration screen, click the arrow on the right side of the Primary Network Logon box.

Step 4   Select **Cisco Aironet Wireless Logon** and click **OK**.

Step 5   When prompted to restart your computer, click **Yes**.

Microsoft Hot Fix (Windows 98 and 98 SE Only)

When the LEAP security module is selected during installation on a Windows 98 or 98 SE device, a Microsoft hot fix is also installed to fix two problems related to the use of LEAP. You can obtain a description of this hot fix and the problems it resolves at the following Microsoft URL:

http://support.microsoft.com/support/kb/articles/Q247/8/05.asp

Note   Only the English version of the hot fix is installed. Foreign language versions of these operating systems require a hot fix specific to those languages. Contact Microsoft Product Support Services to obtain the hot fix for languages other than English. Without the hot fix installed, you may be prompted to enter your credentials at the Windows login prompt twice. To work around this problem, enter your login credentials again.

Error Messages

This section provides a list of error messages that may appear during the installation, configuration, or use of your client adapter. The error messages are divided into four sections (general, LEAP authentication, PEAP authentication, and EAP-SIM authentication). The messages are listed in alphabetical order within each section, and an explanation as well as a recommended user action are provided for each message. Table 10-4 enables you to quickly locate the error messages you need.

Table 10-4   Locating Error Messages

Error Message Category	Page Number
General	10-14
LEAP authentication	10-18
PEAP authentication	10-21
EAP-SIM authentication	10-26

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General Error Messages

This section lists general error messages that may appear at any time and are not related to authentication attempts.

Error Message `Bad Firmware Image File (filename)`

Explanation The selected firmware file is corrupt and will not be sent to the client adapter.

Recommended Action Select a different firmware file and try to load it.

Error Message `Card Removed at xx:xx`

Explanation The client adapter was ejected from the computer.

Recommended Action Reinsert the client adapter if you wish to resume wireless communications.

Error Message `An error occurred while trying to make the selected profile active.`

Explanation An error occurred when you selected a profile in ACM.

Recommended Action Check the profile's configuration parameters in ACU or select a new profile.

Error Message `Error Reading filename`

Explanation A problem occurred while the computer was reading the firmware file from the disk.

Recommended Action Re-copy the firmware file to a floppy disk or to your computer's hard drive and try to load it again or select a different firmware file and try to load it.

Error Message `Error Writing to Flash Memory`

Explanation A problem occurred while the firmware was being flashed.

Recommended Action Eject the client adapter and reinsert it. If the client adapter functions properly, the firmware was flashed successfully. If the client adapter does not function or functions improperly, your client adapter may need to be returned for service. Refer to the "Technical Assistance Center" section in the Preface for information on contacting TAC.

Error Message `Firmware Incompatible with Hardware`

Explanation The selected firmware file does not work with the client adapter.

Recommended Action Select a different firmware file and try to load it.

Error Message `Firmware Upgrade Failed`

Explanation A problem occurred while the firmware was being flashed.

Recommended Action Eject the client adapter and reinsert it. If the client adapter functions properly, the firmware was flashed successfully. If the client adapter does not function or functions improperly, your client adapter may need to be returned for service. Refer to the "Technical Assistance Center" section in the Preface for information on contacting TAC.

Error Message `The installation will complete and applications will be installed when a wireless LAN client adapter is inserted. If an adapter is already inserted, remove and reinsert the adapter or reboot the machine.`

Explanation The installation program was most likely run without a client adapter inserted in the computer.

Recommended Action Insert a client adapter into your computer's client adapter slot. The installation program will then complete. If a client adapter was already inserted in your computer, eject and reinsert the adapter or reboot your computer.

Error Message `LEAP support has not been installed on this computer. You will not be able to authenticate with this or any other profile configured to use LEAP.`

Explanation A LEAP profile was selected for use in ACM, but the LEAP security module was not selected during installation. Therefore, the client adapter will not be able to authenticate using this profile (or any other profile that is configured for LEAP).

Recommended Action Run the installation program again and enable the LEAP security module.

Error Message `Maximum power save mode will be temporarily disabled while you are running this application!`

Explanation The client adapter cannot be run in Max PSP mode while ACU is running.

Recommended Action No user action is required. The client adapter automatically runs in Fast PSP mode while ACU is running.

Error Message `No Cisco Aironet client adapters have been installed on this computer.`

Explanation ACM started but found no installed client adapters.

Recommended Action Follow the instructions in Chapter 3 to install a client adapter.

Error Message `No Wireless LAN Client Adapters Found`

Explanation A client adapter is not inserted in the computer.

Recommended Action Insert a client adapter if you wish to start wireless communications.

Error Message `No Wireless LAN Client Adapters Installed!`

Explanation An attempt was made to start ACU without a client adapter being inserted in the computer. ACU cannot execute if a client adapter is not inserted because it needs to be able to read from and write to the adapter.

Recommended Action Insert a client adapter and start ACU.

Error Message `Please close ACU in order to use it with the Wireless LAN Adapter you selected using the System Tray Icon.`

Explanation Only one instance of ACU can be running at a time. However, an attempt was made to activate ACU for a second client adapter when ACU was already running.

Recommended Action Click **OK**, close ACU, and then activate ACU for the desired adapter.

Error Message `This program is already running.`

Explanation ACM started when another instance of ACM was already running.

Recommended Action No action is required. The new instance of ACM exits.

Error Message `Reauthenticate Failed`

Explanation The Reauthenticate option was selected from the Commands drop-down menu in ACU, but the reauthentication attempt failed.

Recommended Action Re-enter your username and password and try to authenticate again or select another EAP profile.

Error Message `Restarting the client adapter will cause you to lose your network connection. Are you sure you want to restart your client adapter?`

Explanation The Restart Card option was selected from the Commands drop-down menu in ACU, which may cause you to lose your network connection.

Recommended Action If you want to reinitialize your client adapter, click **Yes**. Otherwise, click **No**.

Error Message `Unable to Open `*`filename`*

Explanation The selected firmware file cannot be found.

Recommended Action Re-copy the firmware file to a floppy disk or to your computer's hard drive and try to load it again or select a different firmware file and try to load it.

Error Message `Wireless Connection Unavailable. (Windows XP only)`

Explanation ACU was used to configure the client adapter on Windows XP, but the **Use Windows to configure my wireless network settings** check box in Windows XP is checked. This message appears even if the client adapter is associated to an access point.

Recommended Action Uncheck the **Use Windows to configure my wireless network settings** check box in Windows XP to force Windows to display the correct status.

Error Message `You cannot run a link test because your client adapter is not associated.`

Explanation An attempt was made to run a link test while the client adapter was not associated to an access point or other wireless device.

Recommended Action Run the link test after the client adapter is associated to an access point or another wireless device.

Error Message `You cannot run a link test because your client adapter's radio is turned off.`

Explanation An attempt was made to run a link test while the client adapter's radio was off.

Recommended Action Turn on the client adapter's radio by selecting **Radio On** from the Commands drop-down menu in ACU; then run the link test.

Error Message `You must specify an IP address before running a link test.`

Explanation An attempt was made to run a link test although the IP address of the access point or other wireless device with which to test the RF link was not specified.

Recommended Action In the Linktest screen's IP Address of Access Point field, enter the IP address of the access point or other wireless device with which you want to test the RF link.

Error Message `You need to be an administrator or a user with administrative rights to install Aironet Client Utility. Please log on as a different user and try again.`

Explanation A non-administrative user attempted to install ACU. The ACU installation process terminates.

Recommended Action Log on as a different user and attempt the installation process again.

Error Message `Your Wireless LAN Adapter is not inserted!`

Explanation One of two conditions is present: 1) a client adapter is not inserted in your computer or 2) ACU was started with one variety of client adapter inserted (such as a PCM342), the adapter was subsequently ejected, and another variety was inserted (such as a PCM352).

Recommended Action Perform one of the following: 1) insert a client adapter into your computer if one is not present or 2) shut down ACU and restart it.

LEAP Authentication Error Messages

This section lists error messages that may occur during LEAP authentication.

Error Message `The client adapter doesn't support LEAP. Please make sure that you have installed the correct client adapter and updated your firmware.`

Explanation LEAP authentication failed because the client adapter's firmware does not support LEAP.

Recommended Action Make sure that you have installed the correct client adapter and are using the firmware included in the Install Wizard file.

Error Message `The client adapter doesn't support WEP, so LEAP cannot be run. Please make sure that you have installed the correct client adapter and purchased WEP support.`

Explanation LEAP authentication failed because the client adapter's firmware does not support WEP.

Recommended Action Make sure that you have installed the correct client adapter and are using the firmware included in the Install Wizard file.

Error Message `The combination of domain name and user name exceeds the maximum number of characters (32) that LEAP supports. Please uncheck Include Windows Logon Domain with User Name in ACU or use shorter names.`

Explanation The combination of characters entered for the username and domain name in the Windows login screen or the LEAP login screen exceeds the maximum number supported by LEAP, which is 32.

Recommended Action Perform one of the following:

– Uncheck the **Include Windows Logon Domain with User Name** check box in the LEAP Settings screen of ACU.

– Enter a set of credentials (username, password, and domain name) with fewer characters.

Error Message `The current profile is not configured for LEAP.`

Explanation The Manual LEAP Login option was selected in ACU, but the active profile is not configured for LEAP. The LEAP authentication process aborts.

Recommended Action If you want the client adapter to LEAP authenticate, select a profile that is configured for LEAP.

Error Message `The LEAP password entered exceeds the maximum number of characters (32) that LEAP supports. Please use a shorter password.`

Explanation The password that was entered exceeds the maximum number of characters supported by LEAP, which is 32.

Recommended Action Re-enter the password, making sure it contains fewer than 32 characters.

Error Message `The xxx profile was disabled because LEAP authentication failed during your last logoff. You can re-enable the profile by selecting the Reauthenticate option.`

Explanation A profile that was configured for LEAP failed an authentication attempt during the last logoff process and was disabled. Because error messages cannot be displayed during the logoff process, this message appears after the next logon.

Recommended Action Select **Reauthenticate** from ACM or the Commands drop-down menu in ACU to re-enable the profile.

Error Message `The profile will be disabled until you select the Reauthenticate option, Windows restarts, or the card is ejected and reinserted. Are you sure?`

Explanation The username and password for your current profile have expired or are no longer valid. When the LEAP login screen appeared, prompting you to enter your new username and password, you selected Cancel. The profile was disabled to prevent accidental authentication attempts in the future.

Recommended Action Click **No**, enter your new username and password when the LEAP login screen reappears, and click **OK**. The client adapter should authenticate using your new credentials. If the profile uses saved credentials, edit the profile in ACU by changing the username and password on the LEAP Settings screen and save your changes. (If you click **Yes**, the profile is disabled until you select **Reauthenticate** from ACM or the Commands drop-down menu in ACU, reboot your system, or eject and reinsert the card.)

⚠
Caution   If your backend server is set to allow only a limited number of failed authentication attempts, your user account may be locked if you continue trying with an invalid set of user credentials.

Error Message `A recently installed program has disabled the Welcome screen and Fast User Switching. To restore these features, you must uninstall the program. The following file name might help you identify the program that made the change: cswGina.dll. (Windows XP only)`

Explanation The LEAP security module was selected during installation on a Windows XP computer; then the Change the way users log on or off option was selected under Windows XP's User Accounts.

Recommended Action If the LEAP security module is selected during installation, you cannot use Windows XP's fast user switching feature. If you want to use fast user switching and do not want to use LEAP, you must run the installation program again and deselect the **LEAP** security module.

Error Message `The saved user name and password entered for this profile are no longer valid and have failed the LEAP authentication process. Please enter a new user name and password. Remember to change them permanently in the profile using the ACU Profile Manager.`

Explanation The username and password for your current profile, which uses saved credentials, have expired or are no longer valid; therefore, your client adapter is unable to LEAP authenticate.

Recommended Action When the LEAP login screen appears, enter your new username and password and click **OK**. The client adapter should authenticate using your new credentials. Then edit the profile in ACU by changing the username and password on the LEAP Settings screen and save your changes.

Error Message `To run LEAP successfully, you will have to apply Microsoft Q241052 Update for the language version of your operating system as documented on` http://support.microsoft.com/support/kb/articles/Q247/8/05.asp. `Please contact Microsoft Product Support Services to obtain the fix.`

Explanation When the LEAP security module is selected during installation on a Windows 98 or 98 SE device, a Microsoft hot fix is also installed to fix two problems related to the use of LEAP. However, only the English version of the hot fix is installed. Foreign language versions of these operating systems require a hot fix specific to those languages.

Recommended Action Contact Microsoft Product Support Services to obtain the hot fix for languages other than English. Without the hot fix installed, you may be prompted to enter your credentials at the Windows login prompt twice. To work around this problem, enter your login credentials again.

Error Message `Unable to LEAP authenticate. Please make sure you have entered the correct user name and password and try again.`

Explanation LEAP authentication failed.

Recommended Action Perform one of the following:

- Re-enter the LEAP username and password or cancel the LEAP authentication.
- To start another LEAP authentication process, select **Reauthenticate** from ACM or the Commands drop-down menu in ACU, log off and log in again, or select **Manual LEAP Login** from the Commands drop-down menu in ACU.

Error Message `Unable to LEAP authenticate in the specified amount of time. The network infrastructure might be down. You may also want to increase the LEAP timeout value for this profile.`

Explanation The client adapter was unable to LEAP authenticate within the amount of time specified by the LEAP authentication timeout value.

Recommended Action Increase the LEAP authentication timeout value on the LEAP Settings screen. Then re-enter the LEAP username and password.

Error Message `The user name and password entered are no longer valid and have failed the LEAP authentication process. Please enter a new user name and password.`

Explanation The username and password for your current profile have expired or are no longer valid; therefore, your client adapter is unable to LEAP authenticate.

Recommended Action When the LEAP login screen appears, enter your new username and password and click **OK**. The client adapter should authenticate using your new credentials.

Error Message `The user name entered is not valid or exceeds the maximum number of characters (32) that LEAP supports.`

Explanation The username that was entered is not valid or exceeds the maximum number of characters supported by LEAP, which is 32.

Recommended Action Re-enter the username, making sure it contains fewer than 32 characters.

PEAP Authentication Error Messages

This section lists error messages that may occur during PEAP authentication. The messages are divided into six subsections based on the type of database that is used with PEAP. Use Table 10-5 to quickly locate the error messages for your database.

Table 10-5   Locating PEAP Authentication Error Messages

Error Message Category	Page Number
All PEAP-supported databases	10-21
Windows NT or 2000 domain databases	10-22
All OTP databases	10-23
OTP databases using Secure Computing SofToken version 1.3	10-24
OTP databases using Secure Computing SofToken II version 2.0	10-25
OTP databases using RSA SecurID version 2.5	10-26

For All PEAP-Supported Databases

Error Message `PEAP failed initialization. Please make sure that PEAP is installed correctly and Trusted Root Certificate Authority certificate is installed correctly.`

Explanation The PEAP authentication process failed during initialization, most likely because the specified root certificate is missing from the system.

Recommended Action Make sure that PEAP and the Trusted Root Certificate Authority certificate are installed correctly.

Error Message `You have connected to a server that is signed by Root Certification Authority` *xxx*`, which is different than the specified trusted CA. Do you want to accept this connection? Warning: Connecting to a server signed with untrusted CA might compromise your security.`

> **Explanation** The client adapter has established a connection to a certificate server other than the specified trusted CA.

> **Recommended Action** If you want the client adapter to connect to this server even though it may present a security risk, click **Yes**. Otherwise, click **No**.

Error Message `You have connected to server xxx. Do you want to accept the connection? Warning: Connecting to an unsecured server might compromise your security.`

> **Explanation** The client adapter has established a connection to the server specified.

> **Recommended Action** If you want the client adapter to connect to this server even though it may present a security risk, click **Yes**. Otherwise, click **No**.

For Windows NT or 2000 Domain Databases

Error Message `New Password and Confirm New Password entered do not match. Please try it again.`

> **Explanation** You entered different values in the New Password and Confirm New Password fields on the Change Password screen. They must be identical.

> **Recommended Action** Re-enter your new password in both fields.

Error Message `The old password you supplied doesn't match what you entered previously. Please try it again.`

> **Explanation** The password entered in the Old Password field on the Change Password screen does not match the password that was used previously.

> **Recommended Action** Re-enter your old password in the Old Password field.

Error Message `Your domain password has been successfully changed on the server. To synchronize any Windows password that might be locally cached, you must also manually change the password in Windows.`

> **Explanation** You have successfully changed your domain password using the Static Password screen. However, if you also have a locally cached Windows password, you must manually change it to synchronize it with your domain password.

> **Recommended Action** Press **Ctrl**-**Alt**-**Delete**, select **Change Password**, and enter your old password once and your new password twice.

For All OTP Databases

Error Message `Failed to change your PIN. Error code` *xxx*`. Run Software Token program to fix it.`

Explanation Your attempt to change your PIN using the Change PIN screen failed due to a problem with the software token program.

Recommended Action Run the software token program and then try to change your PIN again.

Error Message `Invalid PIN. Please try again.`

Explanation The PIN that you entered is invalid.

Recommended Action Re-enter your PIN.

Error Message `New PIN and Confirm New PIN do not match. Please try them again.`

Explanation You entered different values in the New PIN and Confirm New PIN fields on the Change PIN screen. They must be identical.

Recommended Action Re-enter your new PIN in both fields.

Error Message `New PIN is invalid. Please try it again.`

Explanation The PIN that you entered in the New PIN field on the Change PIN screen is invalid.

Recommended Action Re-enter your new PIN.

Error Message `The old PIN you supplied is invalid. Please try it again.`

Explanation The old PIN that you entered on the Change PIN screen is invalid.

Recommended Action Re-enter your old PIN.

Error Message `Please check either Support Hardware Token or Support Software Token. One of them must be selected.`

Explanation While the client adapter was being configured for PEAP authentication, the One Time Password option was selected on the Generic Token Card Properties screen, but neither the Support Hardware Token nor the Support Software Token option was selected.

Recommended Action Check either the **Support Hardware Token** check box or the **Support Software Token** check box or both.

Error Message `Your PIN has expired. Please change your PIN.`

Explanation The PIN that you have been using to authenticate has expired.

Recommended Action Follow the instructions in the "After Your PIN Expires (OTP Databases Only)" section on page 6-19 to change your PIN.

For OTP Databases Using Secure Computing SofToken Version 1.3

Error Message `Could not find SofToken.exe in the program path specified. Please make sure SofToken is installed correctly and the correct program path is entered.`

Explanation SofToken.exe is not located at the path you entered on the Generic Token Card Properties screen.

Recommended Action Make sure that SofToken is installed correctly; then re-enter the program path.

Error Message `Error getting data from SofToken server. Please make sure SofToken is installed correctly and the correct program path is entered.`

Explanation An error occurred while attempting to get data from the SofToken server.

Recommended Action Make sure that SofToken is installed correctly and the correct program path is entered.

Error Message `Initialization of SofToken library failed. Please make sure SofToken is installed correctly and the correct program path is entered.`

Explanation An error occurred with the SofToken program.

Recommended Action Make sure that SofToken is installed correctly and the correct program path is entered.

Error Message `The program path entered exceeds the maximum length allowed (255).`

Explanation The program path entered on the Generic Token Card Properties screen contains more characters than the field allows.

Recommended Action Re-enter the path using a maximum of 255 characters. If necessary, move SofToken.exe to a directory with a shorter path.

Error Message `Program path must be specified for SofToken Version 1.3.`

Explanation Secure Computing SofToken Version 1.3 was selected from the Supported Type drop-down box on the Generic Token Card Properties screen, but the SofToken program path was not entered.

Recommended Action Enter the path to the SofToken program in the SofToken Program Path field.

Error Message `SofToken is not set up to allow processing from SofToken calls. Calls have been disabled from the SofToken Manager, the SofToken program does not have any valid users yet, or the last person to use SofToken was not initialized correctly.`

Explanation The SofToken program is not set up to process SofToken API calls.

Recommended Action Make sure that SofToken is configured to enable SofToken calls and verify that you are set up as a valid user.

Error Message `Unable to launch SofToken.exe. Please make sure SofToken is installed correctly and the correct program path is entered.`

Explanation An error occurred with the SofToken program.

Recommended Action Make sure that SofToken is installed correctly and the correct program path is entered.

Error Message `Unable to load SofToken library. Please make sure that SofToken is installed correctly.`

Explanation An error occurred with the SofToken program.

Recommended Action Make sure that SofToken is installed correctly and the correct program path is entered.

For OTP Databases Using Secure Computing SofToken II Version 2.0

Error Message `Error getting the OTP password for the user. Run SofToken II to ensure the user is set up correctly.`

Explanation An error occurred while attempting to obtain the OTP password for the user.

Recommended Action Run the SofToken II program to make sure that the user is set up properly.

Error Message `Failed to load data from the OTP database for User ID: xxxx. Run SofToken II to ensure the user is set up correctly.`

Explanation An error occurred while attempting to load data from the OTP database for the specified user.

Recommended Action Run the SofToken II program to make sure that the specified user is set up properly.

Error Message `Here is the hint you entered when you created your PIN: xxxx.`

Explanation You entered an invalid PIN.

Recommended Action Use the hint to help you remember your PIN; then re-enter it.

Error Message `Unable to load SofToken II library. Please make sure that SofToken II is installed correctly.`

Explanation An error occurred with the SofToken II program.

Recommended Action Make sure that SofToken II is installed correctly.

For OTP Databases Using RSA SecurID Version 2.5

Error Message `Error getting password from RSA SecurID Software Token.`

Explanation An error occurred while attempting to obtain the user password from the RSA SecurID program.

Recommended Action Run the RSA SecurID program to make sure that the user is set up properly.

Error Message `Unable to load RSA library. Please make sure that RSA SecurID Software Token is installed correctly.`

Explanation An error occurred with the RSA SecurID program.

Recommended Action Make sure that RSA SecurID is installed correctly.

Error Message `Unable to open RSA Token service.`

Explanation An error occurred with the RSA SecurID program.

Recommended Action Make sure that RSA SecurID is installed correctly.

EAP-SIM Authentication Error Messages

This section lists error messages that may occur during EAP-SIM authentication.

Error Message `Client_handleResponseIdentity error.`

Explanation When asked to perform an authentication, the EAP-SIM supplicant encountered an error retrieving your network username from the SIM card. This error may occur if an invalid SIM card (such as one intended for mobile phone use) is inserted in the card reader or if Windows encounters a processing error.

Note The eight-digit hexadecimal error code in the message may assist technical support in troubleshooting your problem.

Recommended Action Make sure that you have a valid SIM card that was provided to you for wireless network access and that it is inserted properly. If the problem occurs several times in a row, reboot your computer.

Error Message `For the changes to take effect, please restart your WLAN card (or your computer) NOW.`

Explanation The changes you made on the SIM Authentication Properties screen can take effect only if you perform a complete reauthentication. Otherwise, your wireless network connection may appear to be stuck in the "Validating identity" state.

Recommended Action Turn off your client adapter's radio, wait a few seconds, and then turn the radio back on. Refer to the "Turning Your Client Adapter's Radio On or Off" section on page 9-15 for instructions.

Error Message `GetUserPin returned error.`

Explanation Windows encountered an error while prompting for or retrieving the PIN.

> **Note** The eight-digit hexadecimal error code in the message may assist technical support in troubleshooting your problem.

Recommended Action Wait until the system tries to authenticate the client adapter again (approximately 30 to 60 seconds) and enter a valid PIN. Do not click Cancel or otherwise interfere with the normal operation of Windows. If the problem persists, reboot your computer.

Error Message `Maximum length of PIN is 8 characters.`

Explanation You tried to enter a PIN that is longer than eight characters. SIM card PINs are restricted to a maximum length of eight alphanumeric characters.

Recommended Action Delete one or more characters from the PIN field or delete all of the characters you entered and retype the complete PIN.

Error Message `Network authentication aborted.`

Explanation When you were asked to enter a PIN, you clicked the Cancel button and cancelled the authentication process. The EAP-SIM supplicant will not attempt to authenticate to the network.

> **Note** The system will try to authenticate automatically within 30 to 60 seconds.

Recommended Action If you want to authenticate to the network and establish a wireless network connection, enter the valid PIN for your SIM card. If you do not want to establish a connection, consider turning off or ejecting the client adapter; otherwise, the system will reprompt you every 30 to 60 seconds.

Error Message `Network rejected user authentication.`

Explanation The service provider's network has rejected your authentication attempt. This is most likely due to an expired or invalid SIM card or an invalidated account. However, it could also occur if the service provider at your current location does not allow access to the network for subscribers of your service provider.

Recommended Action Make sure that your account is in good standing and that you have a valid SIM card. Switch to a SIM card that is valid at the current location and try again.

Error Message `Please check your smartcard reader and insert your SIM card.`

Explanation When asked to perform an authentication, the EAP-SIM supplicant could not get the smartcard reader to initialize within a reasonable time (that is, 90 seconds for the first try and 5 minutes for subsequent tries). Most likely, the reader is not plugged in correctly, or the computer no longer recognizes it.

Note The eight-digit hexadecimal error code in the message may assist technical support in troubleshooting your problem.

Recommended Action Follow the steps below.

Step 1 Install a smartcard reader if you have not done so.

Step 2 If a reader is installed, make sure that it is inserted completely into the PCMCIA slot (PCMCIA model) or that the connector cable is inserted properly into the serial or USB connector (serial/USB port model).

Step 3 Make sure that the system recognizes your reader. It should be listed under Smart card readers in Windows device manager. If your reader is not listed, eject and reinsert the reader (PCMCIA model) or disconnect and reconnect the cable (serial/USB port model).

Step 4 If the computer still does not recognize your reader, reboot the computer with the reader installed.

Error Message `Please check your smartcard reader and SIM card, then try again.`

Explanation The EAP-SIM supplicant has detected a general smartcard-related error (that is, not one of the specific errors included in this section) and has aborted the authentication process.

Note The eight-digit hexadecimal error code in the title may assist technical support in troubleshooting your problem.

Recommended Action Follow the steps below.

Step 1 Make sure that your smartcard reader is installed properly and that your SIM card is inserted properly.

Step 2 Follow the Recommended Action instructions for the "Please check your smartcard reader and try again" error message below.

Step 3 Follow the Recommended Action instructions for the "Please insert your SIM card and try again" error message on page 10-30.

Step 4   If you are sure that the reader and card are both inserted properly, wait until the system tries to authenticate again. This should occur within 30 to 60 seconds.

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Caution   Never remove your SIM card until the system has completed the authentication process.

Step 5   If the problem persists, try restarting the client adapter or rebooting your computer.

Error Message   `Please check your smartcard reader and try again.`

Explanation   Windows could not detect a smartcard reader in the system. You may not have installed a reader, or this may happen after resuming Windows from suspend or hibernation.

Recommended Action   Follow the steps below.

Step 1   Install a smartcard reader if you have not done so.

Step 2   If a reader is installed, make sure that it is inserted completely into the PCMCIA slot (PCMCIA model) or that the connector cable is inserted properly into the serial or USB connector (serial/USB port model).

Step 3   Make sure that the system recognizes your reader. It should be listed under Smart card readers in Windows device manager. If your reader is not listed, eject and reinsert the reader (PCMCIA model) or disconnect and reconnect the cable (serial/USB port model).

Step 4   If the computer still does not recognize your reader, reboot the computer with the reader installed.

Error Message   `Please contact your service provider to unblock your card.`

Explanation   You have exceeded your SIM card's retry limit by entering too many incorrect PINs in a row.

Recommended Action   Contact your service provider's customer service center to get the card unblocked. The phone number may be printed on your SIM card.

Error Message   `Please do not switch SIM cards after authenticating.`

Explanation   The EAP-SIM supplicant has detected that the network username stored on the currently inserted SIM card differs from the username that was used in a previous authentication. Due to this mismatch, authentication may fail.

Recommended Action   If the currently inserted SIM card is recognized by the network, authentication may succeed or fail, depending on the network configuration. If your client adapter is authenticated, you may ignore this message. Otherwise, replace the SIM card currently inserted with the SIM card that was used for your first authentication and wait until the system tries to authenticate your client adapter again (approximately 30 to 60 seconds). You may also restart the client adapter or reboot your computer with the new SIM card to try again.

Error Message `Please enter a PIN (1 to 8 characters).`

Explanation When you were prompted for a PIN, you clicked the OK button before entering the PIN.

Recommended Action Enter the PIN required to access your SIM card. If you do not want to authenticate at this time or do not have your PIN available, click the **Cancel** button instead.

Error Message `Please insert your SIM card and try again.`

Explanation The system could not detect a SIM card in the smartcard reader.

Recommended Action Make sure that your SIM card is inserted into the reader properly. It should be inserted into the reader all the way and not into the empty space in the PCMCIA slot. Try removing and reinserting the card. You should feel it latch into place and notice a slight resistance when attempting to remove it.

Error Message `SimOpenSession error.`

Explanation When asked to retrieve your network username, the EAP-SIM supplicant was unable to establish a connection to the SIM card. This can occur if a SIM card is not inserted in the reader, the SIM card is not inserted properly, or the wrong SIM card is inserted.

Recommended Action Make sure that you are using a valid SIM card (that is, the SIM card provided to you for wireless network access, not a SIM card intended for mobile phone use). If that does not correct the error, make sure that your SIM card is inserted into the reader properly. It should be inserted into the reader all the way and not into the empty space in the PCMCIA slot. Try removing and reinserting the card. You should feel it latch into place and notice a slight resistance when attempting to remove it.

Error Message `Time-out waiting for smartcard reader initialization.`

Explanation When asked to perform an authentication, the EAP-SIM supplicant could not get the smartcard reader to initialize within a reasonable time (90 seconds for the first try and 5 minutes for subsequent tries). Most likely, the reader is not plugged in correctly, or the computer no longer recognizes it.

Note The eight-digit hexadecimal error code in the message may assist technical support in troubleshooting your problem.

Recommended Action Follow the steps below.

Step 1 Install a smartcard reader if you have not done so.

Step 2 If a reader is installed, make sure that it is inserted completely into the PCMCIA slot (PCMCIA model) or that the connector cable is inserted properly into the serial or USB connector (serial/USB port model).

Step 3   Make sure that the system recognizes your reader. It should be listed under Smart card readers in Windows device manager. If your reader is not listed, eject and reinsert the reader (PCMCIA model) or disconnect and reconnect the cable (serial/USB port model).

Step 4   If the computer still does not recognize your reader, reboot the computer with the reader installed.

Error Message `Wrong PIN entered (X tries left).`

Explanation The SIM card could not validate the PIN you have entered. You must have entered the wrong PIN.

Recommended Action Make sure that you enter the correct PIN. If your PIN contains letters, enter them in the correct case as the PIN is case sensitive. Check that the Caps Lock key has not been pressed inadvertently. Also, make sure that you have inserted the correct SIM card.

Note   Most SIM cards limit the number of times in a row that you can enter an incorrect PIN. The error message indicates how many attempts you have left. Entering the correct PIN resets the limit to its original value. However, if the number of retries is exhausted, the SIM card locks up and becomes useless.

Error Messages

Technical Specifications

This appendix provides technical specifications for the Cisco Aironet Wireless LAN Client Adapters.

The following topics are covered in this appendix:

Table A-1 lists the technical specifications for the Cisco Aironet Wireless LAN Client Adapters.

Note   If a distinction is not made between radio or client adapter type, the specification applies to all Cisco Aironet Wireless LAN Client Adapters.

Table A-1   Technical Specifications for Cisco Aironet Wireless LAN Client Adapters

Physical Specifications	
Size	
PC card and PC-Cardbus card	4.5 in. L x 2.1 in. W x 0.2 in. H (11.3 cm L x 5.4 cm W x 0.5 cm H)
LM card	3.4 in. L x 2.1 in. W x 0.2 in. H (8.6 cm L x 5.4 cm W x 0.5 cm H)
PCI card	5.8 in. L x 3.2 in. W x 0.5 in. H (14.7 cm L x 8.1 cm W x 1.3 cm H)
Mini PCI card	2.3 in. L x 2.0 in. W x 0.2 in. H (6.0 cm L x 5.1 cm W x 0.5 cm H)
Weight	
PC card and LM card	1.3 oz (0.037 kg)
PCI card	4.6 oz (0.13 kg)
Mini PCI card	0.5 oz (0.014 kg)
PC-Cardbus card	1.5 oz (0.043 kg)
Enclosure	
PC card and PC-Cardbus card	Extended Type II PC card
LM card	Standard Type II PC card with RF connectors
Connector	
PC card and LM card	68-pin PCMCIA
PCI card	PCI card edge
PC-Cardbus card	68-pin Cardbus
Status indicators	Green and amber LEDs (except mini PCI card); see Chapter 10
Operating temperature	
340 series client adapters	32°F to 158°F (0°C to 70°C)
350 series client adapters	-22°F to 158°F (-30°C to 70°C)
5-GHz client adapters	-22°F to 158°F (-30°C to 70°C)
Storage temperature	-40°F to 185°F (-40°C to 85°C)
Humidity (non-operational)	95% relative humidity
ESD	15 kV (human body model)

Table A-1   Technical Specifications for Cisco Aironet Wireless LAN Client Adapters (continued)

Radio Specifications	
Type	
2.4-GHz client adapters	Direct-sequence spread spectrum (DSSS) IEEE 802.11b compliant
5-GHz client adapters	Orthogonal frequency division multiplexing (OFDM) IEEE 802.11a compliant
Power output	
Note Refer to Appendix D for limitations on radiated power (EIRP) levels in the European community and other countries.	
Note If you are using an older version of a 340 or 350 series client adapter, your power level options may be different than those listed here.	
340 series PC card	30 mW (15 dBm) 1 mW (0 dBm)
340 series LM card and PCI card	30 mW (15 dBm) 15 mW (12 dBm) 5 mW (7 dBm) 1 mW (0 dBm)
350 series client adapters	100 mW (20 dBm) 50 mW (17 dBm) 30 mW (15 dBm) 20 mW (13 dBm) 5 mW (7 dBm) 1 mW (0 dBm)
PC-Cardbus card	20 mW (13 dBm) 10 mW (10 dBm) 5 mW (7 dBm) **Note** These values are based on the FCC peak measurement method as defined in FCC 15.407(a)(4).
Operating frequency	
2.4-GHz client adapters	2.400 to 2.497 GHz (depending on the regulatory domain in which the client adapter is used)
5-GHz client adapters	5.15 to 5.25 GHz in the UNII 1 band* 5.25 to 5.35 GHz in the UNII 2 band* *Depending on the regulatory domain in which the client adapter is used
Usable channels	
2.4-GHz client adapters	2412 to 2484 MHz in 5-MHz increments
5-GHz client adapters	5170 to 5320 MHz in 20-MHz increments

Table A-1   Technical Specifications for Cisco Aironet Wireless LAN Client Adapters (continued)

Interference rejection	
2.4-GHz client adapters	35 dB adjacent channel rejection
5-GHz client adapters	16 dB @ 6 Mbps adjacent channel rejection 15 dB @ 9 Mbps adjacent channel rejection 13 dB @ 12 Mbps adjacent channel rejection 11 dB @ 18 Mbps adjacent channel rejection 8 dB @ 24 Mbps adjacent channel rejection 4 dB @ 36 Mbps adjacent channel rejection 0 dB @ 48 Mbps adjacent channel rejection –1 dB @ 54 Mbps adjacent channel rejection
Data rates	
2.4-GHz client adapters	1, 2, 5.5, and 11 Mbps
5-GHz client adapters	6, 9, 12, 18, 24, 36, 48, and 54 Mbps
Modulation	Binary phase shift keying (BPSK) - 1 Mbps Quaternary phase shift keying (QPSK) - 2 Mbps Complementary code keying (CCK) - 5.5 and 11 Mbps Orthogonal frequency division multiplexing (OFDM) - 6 to 54 Mbps
Receiver sensitivity	
340 series client adapters	–90 dBm @ 1 Mbps –88 dBm @ 2 Mbps –87 dBm @ 5.5 Mbps –83 dBm @ 11 Mbps
350 series client adapters	–94 dBm @ 1 Mbps –91 dBm @ 2 Mbps –89 dBm @ 5.5 Mbps –85 dBm @ 11 Mbps
5-GHz client adapters	–85 dBm @ 6 Mbps –84 dBm @ 9 Mbps –82 dBm @ 12 Mbps –80 dBm @ 18 Mbps –77 dBm @ 24 Mbps –73 dBm @ 36 Mbps –69 dBm @ 48 Mbps –68 dBm @ 54 Mbps
Receiver delay spread (multipath)	
2.4-GHz client adapters	500 ns @ 1 Mbps 400 ns @ 2 Mbps 300 ns @ 5.5 Mbps 140 ns @ 11 Mbps (350 series client adapters) 70 ns @ 11 Mbps (340 series client adapters)

Table A-1   Technical Specifications for Cisco Aironet Wireless LAN Client Adapters (continued)

Range	
340 series client adapters	**Outdoor** 1500 ft (457.2 m) @ 1 Mbps 1200 ft (365.8 m) @ 2 Mbps 800 ft (243.8 m) @ 5.5 Mbps 400 ft (121.9 m) @ 11 Mbps **Indoor** 300 ft (91.4 m) @ 1 Mbps 225 ft (68.6 m) @ 2 Mbps 150 ft (45.7 m) @ 5.5 Mbps 100 ft (30.5 m) @ 11 Mbps **Note** The above range numbers assume the use of a snap-on antenna with the LM card.
350 series client adapters	**Outdoor** 2000 ft (609.6 m) @ 1 Mbps 1500 ft (457.2 m) @ 2 Mbps 1000 ft (304.8 m) @ 5.5 Mbps 800 ft (243.8 m) @ 11 Mbps **Indoor** 350 ft (106.7 m) @ 1 Mbps 250 ft (76.2 m) @ 2 Mbps 200 ft (61 m) @ 5.5 Mbps 150 ft (45.7 m) @ 11 Mbps **Note** The above range numbers assume the use of a snap-on antenna with the LM card.
5-GHz client adapters	**Outdoor** 1200 ft (365.8 m) @ 6 Mbps 700 ft (213.4 m) @ 18 Mbps 120 ft (36.6 m) @ 54 Mbps **Indoor** 200 ft (61.0 m) @ 6 Mbps 150 ft (45.7 m) @ 18 Mbps 70 ft (21.3 m) @ 54 Mbps **Note** The above range numbers assume that the client adapter is being used with a Cisco Aironet 1200 Series Access Point with a patch antenna. Different range characteristics are likely when using the client adapter with a non-Cisco access point or a Cisco Aironet 1200 Series Access Point with an omni-directional antenna.
Antenna	
PC card	Integrated diversity antenna
LM card	Two MMCX antenna connectors
PCI card	RP-TNC connector
Mini PCI card	Ultra-miniature SMT U.FL antenna connectors
PC-Cardbus card	Integrated patch antenna

Table A-1   Technical Specifications for Cisco Aironet Wireless LAN Client Adapters (continued)

Power Specifications	
Operational voltage	
PC, LM, and PCI card	5.0 V (± 0.25 V)
Mini PCI card	3.0 to 3.6 V
PC-Cardbus card	3.3 V (± 0.33 V)
Receive current steady state	
PC card and LM card	Typically 250 mA
PCI card	Typically 350 mA
Mini PCI card	Typically 330 mA
PC-Cardbus card	Typically 580 mA
Transmit current steady state	
340 series PC card and LM card	Typically 350 mA @ 15 dBm
340 series PCI card	Typically 450 mA @ 15 dBm
350 series PC card and LM card	Typically 450 mA @ 20 dBm
350 series PCI card	Typically 550 mA @ 20 dBm
350 series mini PCI card	Typically 570 mA @ 20 dBm
PC-Cardbus card	Typically 520 mA
Sleep mode steady state	
340 series PC card and LM card	Typically 15 mA
340 series PCI card	Typically 110 mA
350 series PC card, LM card, and mini PCI card	Typically 15 mA
350 series PCI card	Typically 115 mA
PC-Cardbus card	Typically 20 mA
Safety and Regulatory Compliance Specifications	
Safety	Designed to meet: • UL 1950 Third Ed. • CSA 22.2 No. 950-95 • IEC 60950 Second Ed., including Amendments 1-4 with all deviations • EN 60950 Second Ed., including Amendments 1-4

Table A-1   Technical Specifications for Cisco Aironet Wireless LAN Client Adapters (continued)

EMI and susceptibility	FCC Part 15.107 & 15.109 Class B ICES-003 Class B (Canada) EN 55022 B AS/NZS 3548 Class B VCCI Class B EN 55024 EN 301.489-1 and EN-301.489-17
Radio approvals	FCC Part 15.247 (2.4-GHz client adapters) FCC Part 15.407 (5-GHz client adapters) Canada RSS-139-1 (2.4-GHz client adapters), RSS-210 Japan Telec 33B (2.4-GHz client adapters) Japan ARIB STD-T71 (5-GHz client adapters) EN 300.328 (2.4-GHz client adapters) EN 301.893 (5-GHz client adapters)
RF exposure	OET-65C RSS-102 ANSI C95.1

Translated Safety Warnings

This appendix provides translations of the safety warnings that appear in this publication.

The following topics are covered in this appendix:

Explosive Device Proximity Warning

Warning	**Do not operate your wireless network device near unshielded blasting caps or in an explosive environment unless the device has been modified to be especially qualified for such use.**
Waarschuwing	**Gebruik dit draadloos netwerkapparaat alleen in de buurt van onbeschermde ontstekers of in een omgeving met explosieven indien het apparaat speciaal is aangepast om aan de eisen voor een dergelijk gebruik te voldoen.**
Varoitus	**Älä käytä johdotonta verkkolaitetta suojaamattomien räjäytysnallien läheisyydessä tai räjäytysalueella, jos laitetta ei ole erityisesti muunnettu sopivaksi sellaiseen käyttöön.oen.**
Attention	**Ne jamais utiliser un équipement de réseau sans fil à proximité d'un détonateur non blindé ou dans un lieu présentant des risques d'explosion, sauf si l'équipement a été modifié à cet effet.**
Warnung	**Benutzen Sie Ihr drahtloses Netzwerkgerät nicht in der Nähe ungeschützter Sprengkapseln oder anderer explosiver Stoffe, es sei denn, Ihr Gerät wurde eigens für diesen Gebrauch modifiziert und bestimmt.**
Avvertenza	**Non utilizzare la periferica di rete senza fili in prossimità di un detonatore non protetto o di esplosivi a meno che la periferica non sia stata modificata a tale proposito.**
Advarsel	**Ikke bruk den trådløse nettverksenheten nært inntil uisolerte fenghetter eller i et eksplosivt miljø med mindre enheten er modifisert slik at den tåler slik bruk.**
Aviso	**Não opere o dispositivo de rede sem fios perto de cápsulas explosivas não protegidas ou num ambiente explosivo, a não ser que o dispositivo tenha sido modificado para se qualificar especialmente para essa utilização.**
¡Advertencia!	**No utilizar un aparato de la red sin cable cerca de un detonador que no esté protegido ni tampoco en un entorno explosivo a menos que el aparato haya sido modificado con ese fin.**
Varning!	**Använd inte den trådlösa nätverksenheten i närheten av oskyddade tändhattar eller i en explosiv miljö om inte enheten modifierats för att kunna användas i sådana sammanhang.**

Dipole Antenna Installation Warning

Warning   In order to comply with FCC radio frequency (RF) exposure limits, dipole antennas should be located at a minimum of 7.9 inches (20 cm) or more from the body of all persons.

Waarschuwing   Om te voldoen aan de FCC radiofrequentie (RF) blootstellingslimieten dienen dipoolantennes zich minstens 20 cm of meer van de lichamen van alle personen bevinden.

Varoitus   FCC:n antamien radiotaajuuksille altistumista koskevien rajoitusten mukaan dipoliantennien on sijaittava vähintään 20 cm:n päässä kaikista henkilöistä.

Attention   Pour se conformer aux limites d'exposition à la fréquence radio préconisées par la FCC (Federal Communications Commission), les antennes dipôles doivent se situer à un minimum de 20 cm de toute personne.

Warnung   Um die in den FCC-Richtlinien festgelegten Expositionshöchstgrenzen für Radiofrequenzen (RF) nicht zu überschreiten, sollten Dipolantennen mindestens 20 cm (7,9 Zoll) vom Körper aller Person entfernt aufgestellt werden.

Avvertenza   Per conformarsi ai limiti FCC di esposizione a radiofrequenza (RF), le antenne a dipolo devono stare ad una distanza minima di 20 cm dal corpo di ogni persona.

Advarsel   I henhold til eksponeringsgrensene for radiofrekvenser (RF), skal dipole antenner befinne seg på en avstand av minst 20 cm eller mer fra mennesker.

Aviso   Para estar de acordo com as normas FCC de limites de exposição para freqüência de rádio (RF), as antenas dipolo devem estar distantes no mínimo 20 cm (7,9 pol) do corpo de qualquer pessoa.

¡Advertencia!   Para cumplir con los límites de exposición de radio frecuencia (RF) de la Comisión Federal de Comunicaciones (FCC) es preciso ubicar las antenas dipolo a un mínimo de 20 cm (7,9 pulgadas) o más del cuerpo de las personas.

Varning!   För att följa FCC-exponeringsgränserna för radiofrekvens (RF), bör dipolsantenner placeras på minst 20 cm avstånd från alla människor.

Warning for Laptop Users

Warning   In order to comply with RF exposure limits established in the ANSI C95.1 standards, it is recommended when using a laptop with a PC card client adapter that the adapter's integrated antenna is positioned more than 2 inches (5 cm) from your body or nearby persons during extended periods of transmitting or operating time. If the antenna is positioned less than 2 inches (5 cm) from the user, it is recommended that the user limit exposure time.

Waarschuwing   In het kader van een in de ANSI C95.1 norm vastgelegde limiet voor blootstelling aan straling veroorzaakt door radiofrequenties, dient u bij langdurig gebruik van een laptop met client adapter pc-kaart een afstand van meer dan 5 centimeter aan te houden tussen de geïntegreerde antenne van de adapter en uzelf en enige andere personen. Als deze afstand niet kan worden aangehouden, dient u de tijd dat het apparaat gebruikt wordt te beperken.

Varoitus   ANSI C95.1 -standardin radiotaajuuksille asettamien altistumisrajojen mukaisesti on suositeltavaa, että käytettäessä kannettavaa tietokonetta, jossa on PC-kortti-asiakas-adapteri, adapterin integroitu antenni on käännetty yli viisi cm pois vartalosta tai lähellä olevista henkilöistä pitkäaikaistenlähetys- tai käyttöjaksojen aikana. Jos antenni on käännetty alle viisi 5 cm käyttäjästä, on suositeltavaa, että käyttäjä rajoittaa altistumisaikaa.

Attention   Afin de respecter les limitations en matière d'exposition aux fréquences radioélectriques définies par les normes ANSI C95.1, il est recommandé aux utilisateurs d'ordinateurs portables dotés d'adaptateurs client pour carte PC ou aux personnes se trouvant à proximité de se placer à plus de 5 cm de l'antenne de l'adaptateur lors de longues périodes de transmission ou de fonctionnement. Si l'utilisateur se trouve à moins de 5 cm de l'antenne, il est préférable de limiter le temps d'exposition.

Warnung   In Übereinstimmung mit den in den Sicherheitsstandards ANSI C95.1 verzeichneten Höchstwerten für den Kontakt mit Radiofrequenz (RF) wird für die Benutzung eines Laptops mit PC-Adapterkarten für Clients empfohlen, bei längerer Inbetriebnahme oder Datenübertragung die integrierte Antenne des Adapters mindestens 5 cm vom Benutzer und anderen sich in der Nähe aufhaltenden Personen entfernt aufzustellen. Befindet sich die Antenne weniger als 5 cm vom Benutzer entfernt, sollte die Benutzungsdauer des Geräts eingeschränkt werden.

Avvertenza   In conformità con i limiti sull'esposizione a frequenze radio stabiliti nelle direttive ANSI C95.1, quando si utilizza un computer portatile con una scheda PC dotata di adattatore client è consigliabile mantenere l'antenna integrata dell'adattatore a più di 5 cm di distanza durante periodi di esposizione prolungati. Se l'antenna è posizionata a meno di 5 cm di distanza dall'utente, è consigliabile limitare i tempi di esposizione alle frequenze.

Advarsel   Du må overholde begrensningene for RF-eksponering som er fastsatt i ANSI C95.1-standardene. Derfor anbefaler vi, når du bruker en bærbar PC med et klientkort i PC-format, at kortets innebygde antenne plasseres mer enn 5 cm fra deg eller personer i nærheten under lengre perioder med overføring eller bruk. Hvis antennen er plassert mindre enn 5 cm fra brukeren, anbefaler vi at brukeren begrenser eksponeringstiden.

Aviso   **Para estar em conformidade com os limites de exposição RF estabelecidos nas normas ANSI C95.1 recomenda-se que, aquando da utilização de um laptop com um adaptador de cliente PC card, a antena integrada do adaptador esteja posicionada a mais de 5 cm do seu corpo ou de pessoas na vizinhança durante longos períodos de tempo de transmissão ou operação. Se a antena estiver posicionada a menos de 5 cm do utilizador, recomenda-se que o utilizador limite o tempo de exposição.**

¡Advertencia!   **Para cumplir los límites de exposición a radiofrecuencia (RF) que se establecen en la norma ANSI C95.1, al utilizar un equipo portátil con un adaptador cliente de tarjeta PC, sitúe la antena del adaptador al menos a 2 pulgadas(5 cm) del usuario o de las personas adyacentes durante periodos largos de transmisión o funcionamiento. Si la distancia es inferior a 2 pulgadas (5 cm), se recomienda limitar el tiempo de exposición.**

Varning!   **För att följa de regler för radiosändare som utfärdats enligt ANSI-standarden C95.1, rekommenderar vi att PC Card-adapterns inbyggda antenn befinner sig minst 5 cm från dig själv och andra personer när du använder en bärbar dator med PC Card-adapter under en längre tid. Om antennen befinner sig mindre än 5 cm från användaren, rekommenderar vi inte användning under längre tid.**

Warning for Laptop Users

Declarations of Conformity and Regulatory Information

This appendix provides declarations of conformity and regulatory information for the Cisco Aironet Wireless LAN Client Adapters.

The following topics are covered in this appendix:

Manufacturer's Federal Communication Commission Declaration of Conformity Statement

**Tested To Comply
With FCC Standards**

FOR HOME OR OFFICE USE
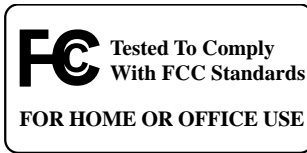
Models: AIR-PCM341, AIR-PCM342, AIR-LMC341, AIR-LMC342, AIR-PCI341, AIR-PCI342, AIR-PCM351, AIR-PCM352, AIR-LMC351, AIR-LMC352, AIR-PCI351, AIR-PCI352, AIR-PCM350-A-K9, AIR-PCM350-40-A-K9, AIR-LMC350-A-K9, AIR-LMC350-40-A-K9, AIR-PCI350-A-K9, AIR-PCI350-10-A-K9, AIR-MPI350-*xx*-A-K9 (where *xx* is the OEM code), AIR-CB20A-A-K9, AIR-CB20A-A-K9-4

FCC Certification Number: LDK102038 (AIR-PCM34x),
LDK102035 (AIR-LMC34x and AIR-PCI34x),
LDK102040 (AIR-xxx35x),
LDK102042 (AIR-MPI350),
LDK102044 (AIR-CB20A)

Manufacturer: Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA

This device complies with Part 15 rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and

2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits of a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and radiates radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference. However, there is no guarantee that interference will not occur. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to correct the interference by one of the following measures:

• Reorient or relocate the receiving antenna.

• Increase separation between the equipment and receiver.

• Connect the equipment to an outlet on a circuit different from which the receiver is connected.

• Consult the dealer or an experienced radio/TV technician.

⚠

Caution   The Part 15 radio device operates on a non-interference basis with other devices operating at this frequency when using integrated antennas or those listed in Table C-1. Any changes or modification to the product not expressly approved by Cisco could void the user's authority to operate this device.

⚠

Caution   Within the 5.15-to-5.25-GHz band, UNII devices are restricted to indoor operations to reduce any potential for harmful interference to co-channel Mobile Satellite Systems (MSS) operations.

Table C-1   2.4-GHz Antennas

Cisco Part Number	Model	Gain
AIR-ANT3338	Parabolic dish	21
AIR-ANT1949	Yagi	13.5
AIR-ANT4121	Omni-directional	12.0
AIR-ANT3549	Patch	8.5
AIR-ANT2012	Spatial diversity	6.5
AIR-ANT1729	Patch	6.0
AIR-ANT2506	Omni-directional	5.1
AIR-ANT3213	Omni-directional	5.0
AIR-ANT1728	Omni-directional	5.0
AIR-ANT3195	Patch	3.0
AIR-ANT4941	Dipole	2.2
AIR-ANT5959	Omni-directional	2.0

✎

Note   AIR-ANT3338 is approved for use only with LM cards.

Department of Communications – Canada

Canadian Compliance Statement

This Class B Digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numerique de la classe B respecte les exigences du Reglement sur le material broilleur du Canada.

This device complies with Class B Limits of Industry Canada. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and

2. This device must accept any interference received, including interference that may cause undesired operation.

Cisco Aironet 2.4-GHz 11-Mbps client adapters are certified to the requirements of RSS-139-1 and RSS-210 for 2.4-GHz spread spectrum devices, and Cisco Aironet 5-GHz 54-Mbps client adapters are certified to the requirements of RSS-210 for 5-GHz devices. The use of these devices in a system operating either partially or completely outdoors may require the user to obtain a license for the system according to the Canadian regulations. For further information, contact your local Industry Canada office.

European Community, Switzerland, Norway, Iceland, and Liechtenstein

Declaration of Conformity with Regard to the R&TTE Directive 1999/5/EC

English:	This equipment is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Deutsch:	Dieses Gerät entspricht den grundlegenden Anforderungen und den weiteren entsprecheneden Vorgaben der Richtlinie 1999/5/EU.
Dansk:	Dette udstyr er i overensstemmelse med de væsentlige krav og andre relevante bestemmelser i Directiv 1999/5/EF.
Español:	Este equipo cumple con los requisitos esenciales asi como con otras disposiciones de la Directive 1999/5/EC.
Έλληνας:	Αυτός ο εξοπλισμός συμμορφώνεται με τις ουσιώδεις απαιτήσεις και τις λοιπές διατάξεις της Οδηγίας 1999/5/EK.
Français:	Cet appareil est conforme aux exigencies essentialles et aux autres dispositions pertinantes de la Directive 1999/5/EC.
Íslenska:	Þessi búnaður samrýmist lögboðnum kröfum og öðrum ákvæðum tilskipunar 1999/5/ESB.
Italiano:	Questo apparato é conforme ai requisiti essenziali ed agli altri principi sanciti dalla Direttiva 1999/5/EC.
Nederlands:	Deze apparatuur voldoet aan de belangrijkste eisen en andere voorzieningen van richtlijn 1999/5/EC.
Norsk:	Dette utstyret er i samsvar med de grunnleggende krav og andre relevante bestemmelser i EU-directiv 1999/5/EC.
Português:	Este equipamento satisfaz os requisitos essenciais e outras provisões da Directiva 1999/5/EC.
Suomalainen:	Tämä laite täyttää direktiivin 1999/5/EY oleelliset vaatimukset ja on siinä asetettujen muidenkin ehtojen mukainen.
Svenska:	Denna utrustning är i överensstämmelse med de väsentliga kraven och andra relevanta bestämmelser i Direktiv 1999/5/EC.

The Declaration of Conformity related to this product can be found at the following URL: http://www.ciscofax.com.

2.4-GHz Client Adapters

For the 340 series, the following standards were applied:

- Radio: ETS 300.328
- EMC: ETS 300.826
- Safety: EN 60950

The following CE mark is affixed to the 340 series equipment:

$$\mathsf{C}\,\mathsf{E}\;0682\;\textcircled{\textbf{!}}$$

For the 350 series, the following standards were applied:

- Radio: EN 300.328-1, EN 300.328-2
- EMC: EN 301 489-1, EN 301 489-17
- Safety: EN 60950

The following CE mark is affixed to the 350 series equipment (except for the 350 series mini PCI card, or AIR-MPI350):

$$\mathsf{C}\,\mathsf{E}\;0650\;\textcircled{\textbf{!}}$$

The above CE mark is required as of April 8, 2000 but might change in the future.

The following CE mark is affixed to the 350 series mini PCI card (AIR-MPI350):

$$\mathsf{C}\,\mathsf{E}\;\textcircled{\textbf{!}}$$

Note   This equipment is intended to be used in all EU and EFTA countries. Outdoor use may be restricted to certain frequencies and/or may require a license for operation. For more details, contact your customer service representative.

Note   Combinations of power levels and antennas resulting in a radiated power level above 100 mW equivalent isotropic radiated power (EIRP) are considered as not compliant with the above mentioned directive and are not allowed for use within the European community and other countries that have adopted the European R&TTE directive 1999/5/EC or the CEPT recommendation Rec 70.03 or both. For more details on legal combinations of power levels and antennas, refer to the "Maximum Power Levels and Antenna Gains" section on page D-4.

5-GHz Client Adapters

For the 5-GHz client adapters, the following standards were applied:

· Radio: EN 301.893

· EMC: EN 301.489-1, EN 301.489-17

· Safety: EN 60950

The following CE mark is affixed to the 5-GHz equipment:

$\mathsf{C}\,\epsilon\;0682\;\textcircled{\small !}$
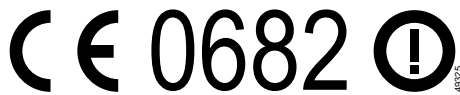
Declaration of Conformity for RF Exposure

The radio module has been evaluated under FCC Bulletin OET 65C and found compliant to the requirements as set forth in CFR 47 Sections 2.1091, 2.1093, and 15.247 (b) (4) addressing RF Exposure from radio frequency devices.

Guidelines for Operating Cisco Aironet Wireless LAN Client Adapters in Japan

This section provides guidelines for avoiding interference when operating Cisco Aironet Wireless LAN Client Adapters in Japan. These guidelines are provided in both Japanese and English.

Japanese Translation

この機器の使用周波数帯では、電子レンジ等の産業・科学・医療用機器のほか
工場の製造ライン等で使用されている移動体識別用の構内無線局（免許を要する
無線局）及び特定小電力無線局（免許を要しない無線局）が運用されています。

1   この機器を使用する前に、近くで移動体識別用の構内無線局及び特定小電力
    無線局が運用されていないことを確認して下さい。

2   万一、この機器から移動体識別用の構内無線局に対して電波干渉の事例が発
    生した場合には、速やかに使用周波数を変更するか又は電波の発射を停止した
    上、下記連絡先にご連絡頂き、混信回避のための処置等(例えば、パーティシ
    ョンの設置など)についてご相談して下さい。

3   その他、この機器から移動体識別用の特定小電力無線局に対して電波干渉の
    事例が発生した場合など何かお困りのことが起きたときは、次の連絡先へお問
    い合わせ下さい。

連絡先 : 03-5549-6500

English Translation

This equipment operates in the same frequency bandwidth as industrial, scientific, and medical devices such as microwave ovens and mobile object identification (RF-ID) systems (licensed premises radio stations and unlicensed specified low-power radio stations) used in factory production lines.

1. Before using this equipment, make sure that no premises radio stations or specified low-power radio stations of RF-ID are used in the vicinity.

2. If this equipment causes RF interference to a premises radio station of RF-ID, promptly change the frequency or stop using the device; contact the number below and ask for recommendations on avoiding radio interference, such as setting partitions.

3. If this equipment causes RF interference to a specified low-power radio station of RF-ID, contact the number below.

Contact Number: 03-5549-6500

APPENDIX D

Channels, Power Levels, and Antenna Gains

This appendix lists the IEEE 802.11a and IEEE 802.11b channels supported by the world's regulatory domains as well as the maximum power levels and antenna gains allowed per domain.

The following topics are covered in this appendix:

- Channels, page D-2
- Maximum Power Levels and Antenna Gains, page D-4

Channels

IEEE 802.11a

The channel identifiers, channel center frequencies, and regulatory domains of each IEEE 802.11a 20-MHz-wide channel are shown in Table D-1.

Table D-1   Channels for IEEE 802.11a

Channel Identifier	Frequency (in MHz)	Regulatory Domains			
		Americas (-A)	Japan (-J)	Singapore (-S)	Taiwan (-T)
34	5170	–	X	–	–
36	5180	X	–	X	–
38	5190	–	X	–	–
40	5200	X	–	X	–
42	5210	–	X	–	–
44	5220	X	–	X	–
46	5230	–	X	–	–
48	5240	X	–	X	–
52	5260	X	–	–	X
56	5280	X	–	–	X
60	5300	X	–	–	X
64	5320	X	–	–	X
149	5745	–	–	–	–
153	5765	–	–	–	–
157	5785	–	–	–	–
161	5805	–	–	–	–

Note All channel sets are restricted to indoor usage except the Americas (-A), which allows for indoor and outdoor use on channels 52 through 64 in the United States.

IEEE 802.11b

The channel identifiers, channel center frequencies, and regulatory domains of each IEEE 802.11b 22-MHz-wide channel are shown in Table D-2.

Table D-2   Channels for IEEE 802.11b

Channel Identifier	Frequency (in MHz)	Regulatory Domains			
		Americas (-A)	EMEA (-E)	Israel (-I)	Japan (-J)
1	2412	X	X	–	X
2	2417	X	X	–	X
3	2422	X	X	–	X
4	2427	X	X	–	X
5	2432	X	X	X	X
6	2437	X	X	X	X
7	2442	X	X	X	X
8	2447	X	X	X	X
9	2452	X	X	–	X
10	2457	X	X	–	X
11	2462	X	X	–	X
12	2467	–	X	–	X
13	2472	–	X	–	X
14	2484	–	–	–	X

Note   Mexico is included in the Americas regulatory domain; however, channels 1 through 8 are for indoor use only while channels 9 through 11 can be used indoors and outdoors. Users are responsible for ensuring that the channel set configuration is in compliance with the regulatory standards of Mexico.

Maximum Power Levels and Antenna Gains

IEEE 802.11a

An improper combination of power level and antenna gain can result in equivalent isotropic radiated power (EIRP) above the amount allowed per regulatory domain. Table D-3 indicates the maximum power levels and antenna gains allowed for each IEEE 802.11a regulatory domain.

Table D-3   Maximum Power Levels Per Antenna Gain for IEEE 802.11a

Regulatory Domain	Maximum Power Level (mW) with 6-dBi Antenna Gain
Americas (-A) (160 mW EIRP maximum on channels 34-48, 800 mW EIRP maximum on channels 52-64)	20
Japan (-J) (10 mW/MHz EIRP maximum)	20
Singapore (-S) (100 mW EIRP maximum)	20
Taiwan (-T) (800 mW EIRP maximum)	20

IEEE 802.11b

An improper combination of power level and antenna gain can result in equivalent isotropic radiated power (EIRP) above the amount allowed per regulatory domain. Table D-4 indicates the maximum power levels and antenna gains allowed for each IEEE 802.11b regulatory domain.

Table D-4   Maximum Power Levels Per Antenna Gain for IEEE 802.11b

Regulatory Domain	Antenna Gain (dBi)	Maximum Power Level (mW)
Americas (-A) (4 W EIRP maximum)	0	100
	2.2	100
	5.2	100
	6	100
	8.5	100
	12	100
	13.5	100
	21	20

Table D-4   Maximum Power Levels Per Antenna Gain for IEEE 802.11b (continued)

Regulatory Domain	Antenna Gain (dBi)	Maximum Power Level (mW)
EMEA (-E) (100 mW EIRP maximum)	0	100
	2.2	50
	5.2	30
	6	30
	8.5	5
	12	5
	13.5	5
	21	1
Israel (-I) (100 mW EIRP maximum)	0	100
	2.2	50
	5.2	30
	6	30
	8.5	5
	12	5
	13.5	5
	21	1
Japan (-J) (10 mW/MHz EIRP maximum)	0	50
	2.2	30
	5.2	30
	6	30
	8.5	n/a
	12	n/a
	13.5	5
	21	n/a

Maximum Power Levels and Antenna Gains

Configuring the Client Adapter through Windows XP

This appendix explains how to configure and use the client adapter with Windows XP.

The following topics are covered in this appendix:

Overview

This appendix provides instructions for minimally configuring the client adapter through Windows XP (instead of through ACU) as well as for enabling one of the four security options that are available for use with this operating system. The "Overview of Security Features" section below describes each of these options so that you can make an informed decision before you begin the configuration process.

In addition, the appendix also provides basic information on using Windows XP to specify the networks to which the client adapter associates and to view the current status of your client adapter.

Note If you require more information about configuring or using your client adapter with Windows XP, refer to Microsoft's documentation for Windows XP.

Overview of Security Features

When you use your client adapter with Windows XP, you can protect your data as it is transmitted through your wireless network by encrypting it through the use of wired equivalent privacy (WEP) encryption keys. With WEP encryption, the transmitting device encrypts each packet with a WEP key, and the receiving device uses that same key to decrypt each packet.

The WEP keys used to encrypt and decrypt transmitted data can be statically associated with your adapter or dynamically created as part of the EAP authentication process. The information in the "Static WEP Keys" and "EAP (with Dynamic WEP Keys)" sections below can help you to decide which type of WEP keys you want to use. Dynamic WEP keys with EAP offer a higher degree of security than static WEP keys.

WEP keys, whether static or dynamic, are either 40 or 128 bits in length. 128-bit WEP keys offer a greater level of security than 40-bit WEP keys.

Static WEP Keys

Each device within your wireless network can be assigned up to four static WEP keys. If a device receives a packet that is not encrypted with the appropriate key (as the WEP keys of all devices that are to communicate with each other must match), the device discards the packet and never delivers it to the intended receiver.

Static WEP keys are write-only and temporary; therefore, they cannot be read back from the client adapter, and they are lost when power to the adapter is removed or the Windows device is rebooted. Although the keys are temporary, you do not need to re-enter them each time the client adapter is inserted or the Windows device is rebooted. This is because the keys are stored (in an encrypted format for security reasons) in the registry of the Windows device. When the driver loads and reads the client adapter's registry parameters, it also finds the static WEP keys, unencrypts them, and stores them in volatile memory on the adapter.

EAP (with Dynamic WEP Keys)

The new standard for wireless LAN security, as defined by the Institute of Electrical and Electronics Engineers (IEEE), is called *802.1X for 802.11*, or simply *802.1X*. An access point that supports 802.1X and its protocol, Extensible Authentication Protocol (EAP), acts as the interface between a wireless client and an authentication server, such as a Remote Authentication Dial-In User Service (RADIUS) server, to which the access point communicates over the wired network.

Three 802.1X authentication types are available when configuring your client adapter through Windows XP:

- **EAP-TLS**—This authentication type is enabled or disabled through the operating system and uses a dynamic session-based WEP key, which is derived from the client adapter and RADIUS server, to encrypt data.

  RADIUS servers that support EAP-TLS include Cisco Secure ACS version 3.0 or greater and Cisco Access Registrar version 1.8 or greater.

  Note   EAP-TLS requires the use of a certificate. Refer to Microsoft's documentation for information on downloading and installing the certificate.

- **Protected EAP** (or **PEAP**)—PEAP authentication is designed to support One-Time Password (OTP), Windows NT or 2000 domain, and LDAP user databases over a wireless LAN. It is based on EAP-TLS authentication but uses a password or PIN instead of a client certificate for authentication. PEAP is enabled or disabled through the operating system and uses a dynamic session-based WEP key, which is derived from the client adapter and RADIUS server, to encrypt data. If your network uses an OTP user database, PEAP requires you to enter either a hardware token password or a software token PIN to start the EAP authentication process and gain access to the network. If your network uses a Windows NT or 2000 domain user database or an LDAP user database (such as NDS), PEAP requires you to enter your username, password, and domain name in order to start the authentication process.

  RADIUS servers that support PEAP authentication include Cisco Secure ACS version 3.1 or greater.

  Note   To use PEAP authentication, you must install the PEAP security module during installation or Service Pack 1 for Windows XP. This Service Pack includes Microsoft's PEAP supplicant, which supports a Windows username and password only and does not interoperate with Cisco's PEAP supplicant. To use Cisco's PEAP supplicant, install ACU after Service Pack 1 for Windows XP. Otherwise, Cisco's PEAP supplicant is overwritten by Microsoft's PEAP supplicant.

- **EAP-SIM**—EAP-SIM authentication is designed for use in public wireless LANs and requires clients equipped with PCSC-compliant smartcard readers. The EAP-SIM supplicant included in the Install Wizard file supports only Gemplus SIM+ cards; however, an updated supplicant is available that supports standard GSM-SIM cards as well as more recent versions of the EAP-SIM protocol. The new supplicant is available for download from the ftpeng FTP server at the following URL:

  ftp://ftpeng.cisco.com/ftp/pwlan/eapsim/CiscoEapSim.dll

  Please note that the above requirements are necessary but not sufficient to successfully perform EAP-SIM authentication. Typically, you are also required to enter into a service contract with a WLAN service provider, who must support EAP-SIM authentication in its network. Also, while your PCSC smartcard reader may be able to read standard GSM-SIM cards or chips, EAP-SIM authentication usually requires your GSM cell phone account to be provisioned for WLAN service by your service provider.

  EAP-SIM is enabled or disabled through the operating system and uses a dynamic session-based WEP key, which is derived from the client adapter and RADIUS server, to encrypt data. EAP-SIM requires you to enter a user verification code, or *PIN*, for communication with the SIM card. You can choose to have the PIN stored in your computer or to be prompted to enter it after a reboot or prior to every authentication attempt.

  RADIUS servers that support EAP-SIM include Cisco Access Registrar version 3.0 or greater.

When you enable Require EAP on your access point and configure your client adapter for EAP-TLS, PEAP, or EAP-SIM using Windows XP, authentication to the network occurs in the following sequence:

1. The client adapter associates to an access point and begins the authentication process.

> **Note** The client does not gain full access to the network until authentication between the client and the RADIUS server is successful.

2. Communicating through the access point, the client and RADIUS server complete the authentication process, with the password (PEAP), certificate (EAP-TLS), or internal key stored on the SIM card and in the service provider's Authentication Center (EAP-SIM) being the shared secret for authentication. The password or internal key is never transmitted during the process.

3. If authentication is successful, the client and RADIUS server derive a dynamic, session-based WEP key that is unique to the client.

4. The RADIUS server transmits the key to the access point using a secure channel on the wired LAN.

5. For the length of a session, or time period, the access point and the client use this key to encrypt or decrypt all unicast packets (and broadcast packets if the access point is set up to do so) that travel between them.

> **Note** Refer to the IEEE 802.11 Standard for more information on 802.1X authentication and to the following URL for additional information on RADIUS servers:
> http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/12cgcr/secur_c/scprt2/scrad.htm

Configuring the Client Adapter

Follow the steps below to configure your client adapter using Windows XP.

> **Note** If you installed ACU but intend to use Windows XP to configure the client adapter, open ACU and make sure the **Use Another Application to Configure My Wireless Settings** option is selected on the Select Profile screen.

> **Note** These instructions assume you are using Windows XP's classic view rather than its category view.

Step 1 Make sure the client adapter's firmware and driver have been installed and the client adapter is inserted in the Windows XP device.

Step 2 Double-click **My Computer**, **Control Panel**, and **Network Connections**.

Step 3 Right-click **Wireless Network Connection**.

Step 4 Click **Properties**. The Wireless Network Connection Properties screen appears.

Step 5 Select the **Wireless Networks** tab. The following screen appears (see Figure E-1).

Figure E-1   Wireless Network Connection Properties Screen (Wireless Networks Tab)
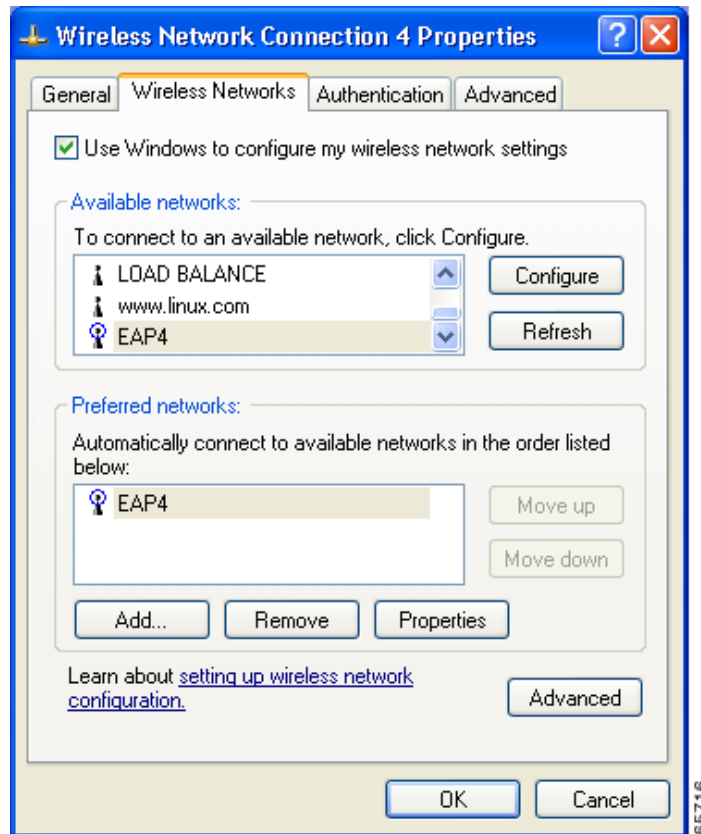
Step 6   Make sure that the **Use Windows to configure my wireless network settings** check box is checked.

Step 7   Select the SSID of the access point to which you want the client adapter to associate from the list of available networks and click **Configure**. If the SSID of the access point you want to use is not listed or you are planning to operate the client adapter in an *ad hoc network* (a computer-to-computer network without access points), click **Add**.

Note   The Allow Broadcast SSID to Associate option on the access point must be enabled for the SSID to appear in the list of available networks.

The Wireless Network Properties screen appears (see Figure E-2).

Figure E-2   Wireless Network Properties Screen
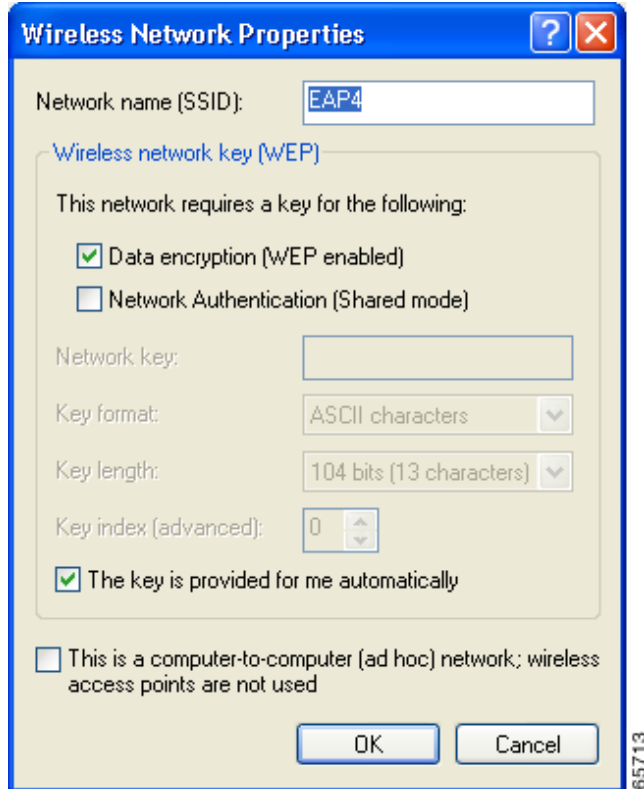
Step 8 Perform one of the following:

- If you selected an SSID from the list of available networks, make sure the SSID appears in the Network name (SSID) field.

- If you clicked Add, enter the case-sensitive SSID of the access point or the ad hoc network to which you want the client adapter to associate in the Network name (SSID) field.

Step 9 Check the **Data encryption (WEP enabled)** check box if you are planning to use static or dynamic WEP.

Step 10 Check the **Network Authentication (Shared mode)** check box if you want to use shared key, rather than open, authentication with the access point.

Open authentication enables your client adapter, regardless of its WEP settings, to authenticate and attempt to communicate with an access point.

Shared key authentication enables your client adapter to communicate only with access points that have the same WEP key. Cisco recommends that shared key authentication not be used because it presents a security risk.

✎

Note If you are planning to use EAP-TLS authentication, do not check this check box. EAP-TLS does not work with shared key authentication because shared key authentication requires the use of a WEP key, and a WEP key is not set for EAP-TLS until after the completion of EAP authentication.

Step 11   Follow the steps below to enter up to four WEP keys, if you are planning to use static WEP.

> ✎
> **Note**   If you are planning to use EAP-TLS, PEAP, or EAP-SIM authentication, which uses dynamic WEP, go to Step 12.

    a.   Obtain the WEP key for the access point (in an infrastructure network) or other clients (in an ad hoc network) from your system administrator and enter it in the Network key field. In order to communicate, the client adapter must use the same WEP key as the access point or other clients.

    b.   Select one of the following WEP key formats:

        –   **ASCII characters**—Specifies that the WEP key will be entered in ASCII text, which includes alpha characters, numbers, and punctuation marks.

        –   **Hexadecimal digits**—Specifies that the WEP key will be entered in hexadecimal characters, which include 0-9, A-F, and a-f.

> ✎
> **Note**   ASCII text WEP keys are not supported on Cisco Aironet 1200 Series Access Points, so you must select the Hexadecimal digits option if you are planning to use your client adapter with these access points.

    c.   Select one of the following WEP key lengths:

        –   **104 bits (13 characters/26 digits)**—You can select this option (or the 40 bits option) if your client adapter supports 128-bit WEP.

        –   **40 bits (5 characters/10 digits)**—You must select this option if your client adapter supports only 40-bit WEP.

    d.   In the Key index (advanced) field, select the number of the WEP key you are creating (**0**, **1**, **2**, or **3**).

> ✎
> **Note**   The WEP key must be assigned to the same number on both the client adapter and the access point (in an infrastructure network) or other clients (in an ad hoc network).

    e.   Repeat the previous steps if you want to enter another WEP key.

Step 12   Check the **The key is provided for me automaticall**y check box if you are planning to use EAP-TLS, PEAP, or EAP-SIM, which uses dynamic WEP keys.

Step 13   Check the **This is a computer-to-computer (ad hoc mode) network; wireless access points are not used** check box if you are planning to operate the client adapter in an ad hoc network.

Step 14   Click **OK** to save your settings and to add this SSID to the list of preferred networks (see Figure E-1). The client adapter automatically attempts to associate to the network(s) in the order in which they are listed.

Step 15   Perform one of the following if you are planning to use EAP authentication:

    •   If you are planning to use EAP-TLS authentication, follow the instructions in the "Enabling EAP-TLS Authentication" section below.

    •   If you are planning to use PEAP authentication, follow the instructions in the "Enabling PEAP Authentication" section on page E-10.

    •   If you are planning to use EAP-SIM authentication, follow the instructions in the "Enabling EAP-SIM Authentication" section on page E-14.

Enabling EAP-TLS Authentication

Follow the steps below to prepare the client adapter to use EAP-TLS authentication, provided you have completed the initial configuration.

Step 1 Click the **Authentication** tab on the Wireless Network Connection Properties screen. The following screen appears (see Figure E-3).

✎

Note In Service Pack 1 for Windows XP, the Authentication tab has moved from its previous location. To access it, click the **Wireless Networks** tab, select the network that you are configuring in the Preferred network list, and click **Properties**.

Figure E-3   Wireless Network Connection Properties Screen (Authentication Tab)
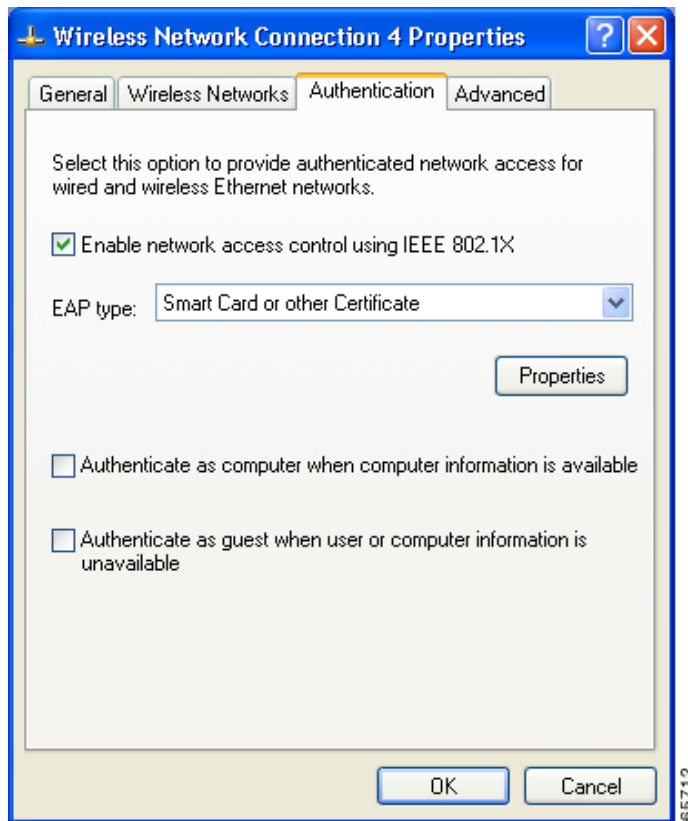
Step 2 Check the **Enable network access control using IEEE 802.1X** check box.

Step 3 For EAP type, select **Smart Card or other Certificate**.

Step 4 Click **Properties**. The Smart Card or other Certificate Properties screen appears (see Figure E-4).

Figure E-4   Smart Card or other Certificate Properties Screen
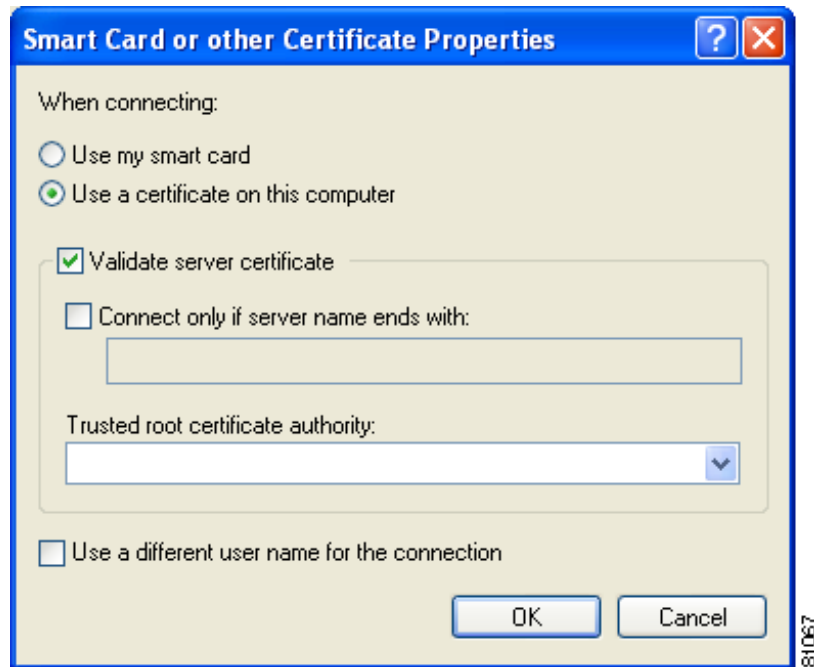
Step 5   Select the **Use a certificate on this computer** option.

Step 6   Check the **Validate server certificate** check box if server certificate validation is required.

Step 7   If you want to specify the name of the server to connect to, check the **Connect only if server name ends with** check box and enter the appropriate server name suffix in the field below.

> **Note**   If you enter a server name and the client adapter connects to a server that does not match the name you entered, you are prompted to accept or cancel the connection during the authentication process.

> **Note**   If you leave this field blank, the server name is not verified, and a connection is established as long as the certificate is valid.

Step 8   Make sure that the name of the certificate authority from which the server certificate was downloaded appears in the Trusted root certificate authority field.

> **Note**   If you leave this field blank, you are prompted to accept a connection to the root certification authority during the authentication process.

Step 9   Click **OK** twice to save your settings. The configuration is complete.

Step 10   If a pop-up message appears above the system tray informing you that you need to accept a certificate to begin the EAP authentication process, click the message and follow the instructions provided to accept the certificate.

> ✎
>
> **Note**   You should not be prompted to accept a certificate for future authentication attempts. After you accept one, the same certificate is used subsequently.

Step 11   If a message appears indicating the root certification authority for the server's certificate, and it is the correct certification authority, click **OK** to accept the connection. Otherwise, click **Cancel**.

Step 12   If a message appears indicating the server to which your client adapter is connected, and it is the correct server to connect to, click **OK** to accept the connection. Otherwise, click **Cancel**.

The client adapter should now EAP authenticate.

> ✎
>
> **Note**   Whenever the computer reboots and you enter your Windows username and password, the EAP authentication process begins automatically and the client adapter should EAP authenticate.

Step 13   To verify authentication, double-click **My Computer**, **Control Panel**, and **Network Connections**. The status appears to the right of your Wireless Network Connection. Click **View** and **Refresh** to obtain the current status. If the client adapter is authenticated, the status reads *Authentication succeeded*.

Enabling PEAP Authentication

Follow the steps below to prepare the client adapter to use PEAP authentication, provided you have completed the initial configuration.

Step 1   Click the **Authentication** tab on the Wireless Network Connection Properties screen. The following screen appears (see Figure E-5).

> ✎
>
> **Note**   In Service Pack 1 for Windows XP, the Authentication tab has moved from its previous location. To access it, click the **Wireless Networks** tab, select the network that you are configuring in the Preferred network list, and click **Properties**.

Figure E-5   Wireless Network Connection Properties Screen (Authentication Tab)
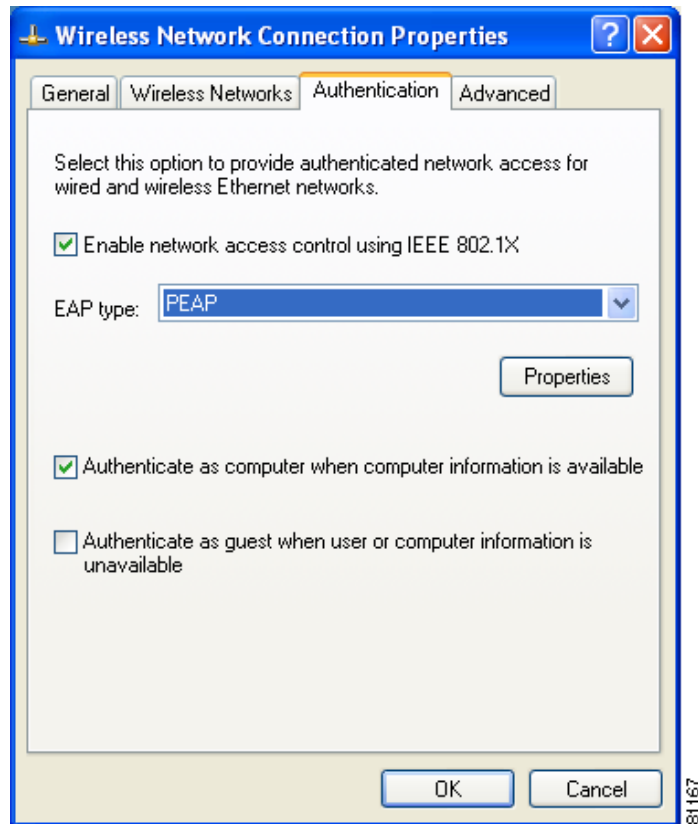
Step 2   Check the **Enable network access control using IEEE 802.1X** check box.

Step 3   For EAP type, select **PEAP**. Click **Properties**. The PEAP Properties screen appears (see Figure E-6).

Figure E-6   PEAP Properties Screen
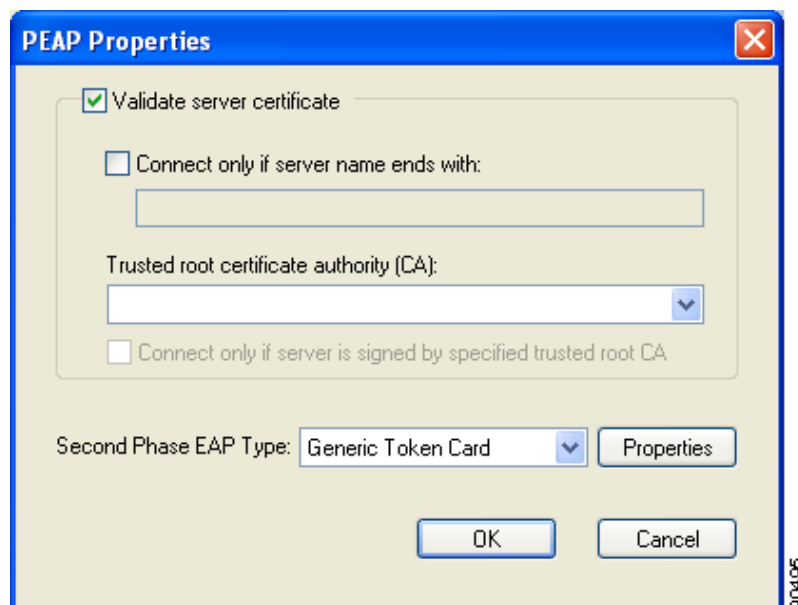
Step 4   Check the **Validate server certificate** check box if server certificate validation is required (recommended).

Step 5   If you want to specify the name of the server to connect to, check the **Connect only if server name ends with** check box and enter the appropriate server name suffix in the field below.

> **Note**   If you enter a server name and the client adapter connects to a server that does not match the name you entered, you are prompted to accept or cancel the connection during the authentication process.

> **Note**   If you leave this field blank, the server name is not verified, and a connection is established as long as the certificate is valid.

Step 6   Make sure that the name of the certificate authority from which the server certificate was downloaded appears in the Trusted root certificate authority (CA) field. If necessary, click the arrow on the drop-down menu and select the appropriate name.

> **Note**   If you leave this field blank, you are prompted to accept a connection to the root certification authority during the authentication process.

Step 7   Check the **Connect only if server is signed by specified trusted root CA** check box if you want to ensure that the certificate server uses the trusted root certificate specified in the field above. This prevents the client from establishing connections to rogue access points.

Step 8   Currently Generic Token Card is the only second phase EAP type available. Click **Properties**. The Generic Token Card Properties screen appears (see Figure E-7).

Figure E-7   Generic Token Card Properties Screen
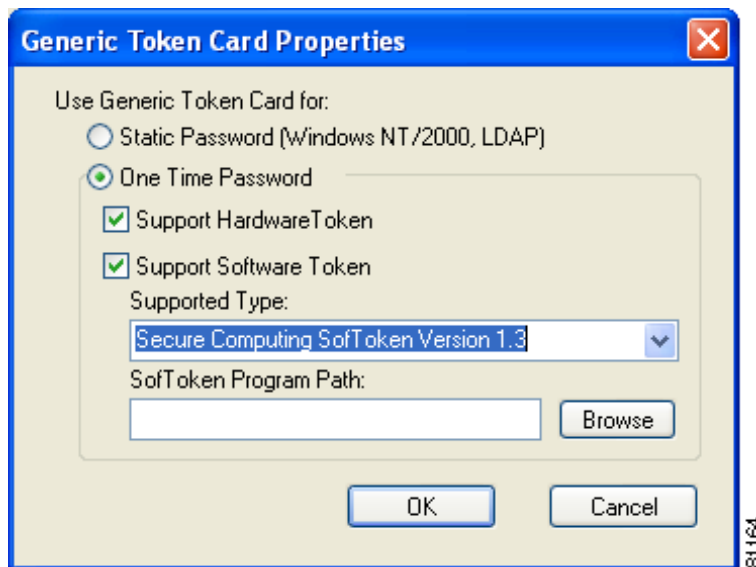
Step 9   Select either the **Static Password (Windows NT/2000, LDAP)** or the **One Time Password** option, depending on your user database.

Step 10   Perform one of the following:

- If you selected the **Static Password (Windows NT/2000, LDAP)** option in Step 9, go to Step 11.

- If you selected the **One Time Password** option in Step 9, check one or both of the following check boxes to specify the type of tokens that will be supported for one-time passwords:

    – **Support Hardware Token**—A hardware token device obtains the one-time password. You must use your hardware token device to obtain the one-time password and enter the password when prompted for your user credentials.

    – **Support Software Token**—The PEAP supplicant works with a software token program to retrieve the one-time password. You have to enter only the PIN, not the one-time password. If you check this check box, you must also select from the Supported Type drop-down box the software token software that is installed on the client (such as Secure Computing SofToken Version 1.3, Secure Computing SofToken II 2.0, or RSA SecurID Software Token v 2.5), and if Secure Computing SofToken Version 1.3 is selected, you must find the software program path using the Browse button.

> **Note**   The SofToken Program Path field is unavailable if a software token program other than Secure Computing SofToken Version 1.3 is selected.

Step 11   Click **OK** three times to save your settings. The configuration is complete.

Step 12   Refer to the "Using PEAP" section on page 6-16 for instructions on authenticating using PEAP.

Enabling EAP-SIM Authentication

Follow the steps below to prepare the client adapter to use EAP-SIM authentication, provided you have completed the initial configuration.

Step 1   Click the **Authentication** tab on the Wireless Network Connection Properties screen. The following screen appears (see Figure E-8).

> ✎
>
> **Note**   In Service Pack 1 for Windows XP, the Authentication tab has moved from its previous location. To access it, click the **Wireless Networks** tab, select the network that you are configuring in the Preferred network list, and click **Properties**.

Figure E-8   Wireless Network Connection Properties Screen (Authentication Tab)
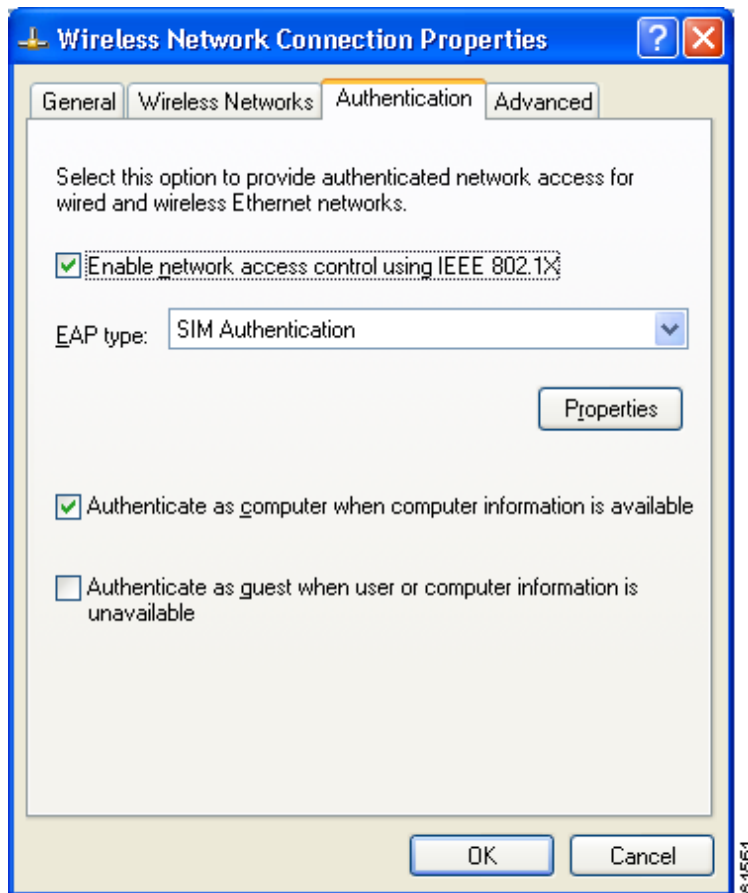
Step 2   Check the **Enable network access control using IEEE 802.1X** check box.

Step 3   For EAP type, select **SIM Authentication**.

Step 4   Click **Properties**. The SIM Authentication Properties screen appears (see Figure E-9).

Figure E-9   SIM Authentication Properties Screen

Step 5   To access any resources (data or commands) on the SIM, the EAP-SIM supplicant must provide a valid PIN to the SIM card, which must match the PIN stored on the SIM. Select one of the following options to specify how the EAP-SIM supplicant should handle the SIM card's PIN:

- **Ask for my PIN once after I turn my computer on (recommended)**—The software does not permanently store the PIN. It prompts you for the PIN once, on the first authentication of every session, where a *session* is defined as the time between power-up and shutdown or reboot.

- **Ask for my PIN every time the network asks for authentication**—The software never stores the PIN; it prompts you for the PIN every time an EAP-SIM authentication is performed. This option is not recommended if your client will be roaming between access points or if session timeouts are implemented (such as for accounting and security purposes).

- **Let me give my PIN to the computer now and never ask me again; PIN will be encrypted and stored on computer (not recommended)**—You need to enter the PIN only once, in the Enter PIN edit box below this option. The software stores the PIN in the registry and retrieves it from there when required. If you select this option, you must enter the PIN now. The PIN is validated when an authentication attempt is made.

> ✎ **Note**   This option is not recommended because it enables others to use the SIM without knowing the PIN.

Step 6   Click **OK** twice to save your settings. The configuration is complete.

If you chose to store the PIN in the computer's registry, the EAP authentication process begins automatically, and the client adapter should EAP authenticate and use the saved PIN to access the SIM card.

> **Note**   If the stored PIN is wrong and therefore rejected by the SIM, the EAP-SIM supplicant temporarily changes the prompt mode to the default setting (Ask for my PIN once after I turn my computer on) in order to prevent the SIM from locking up. Unless changed manually, this setting stays in effect until your computer is powered off. Change your stored PIN on the SIM Authentication Properties screen.

If you chose to be prompted for the PIN after a power-up or reboot or at every authentication request, a pop-up message appears above the Windows system tray informing you that you need to enter your credentials to access the network. Click the message, enter your PIN, and click **OK**. The client adapter should now EAP authenticate.

Step 7   To verify authentication, double-click **My Computer**, **Control Panel**, and **Network Connections**. The status appears to the right of your Wireless Network Connection. Click **View** and **Refresh** to obtain the current status. If the client adapter is authenticated, the status reads *Authentication succeeded*.

> **Note**   ACU and the Windows Wireless Network Connection icon in the Windows XP system tray may indicate a connection status when authentication is still in the pending state or the authentication server fails to respond.

Associating to an Access Point Using Windows XP

Windows XP causes the client adapter's driver to automatically attempt to associate to the first network in the list of preferred networks (see Figure E-1). If the adapter fails to associate or loses association, it automatically switches to the next network in the list of preferred networks. The adapter does not switch networks as long as it remains associated to the access point. To force the client adapter to associate to a different access point, you must select a different network from the list of available networks (and click **Configure** and **OK**).

Viewing the Current Status of Your Client Adapter

To view the status of your client adapter, click the icon of the two connected computers in the Windows system tray. The Wireless Network Connection Status screen appears (see Figure E-10).

Figure E-10   Wireless Network Connection Status Screen
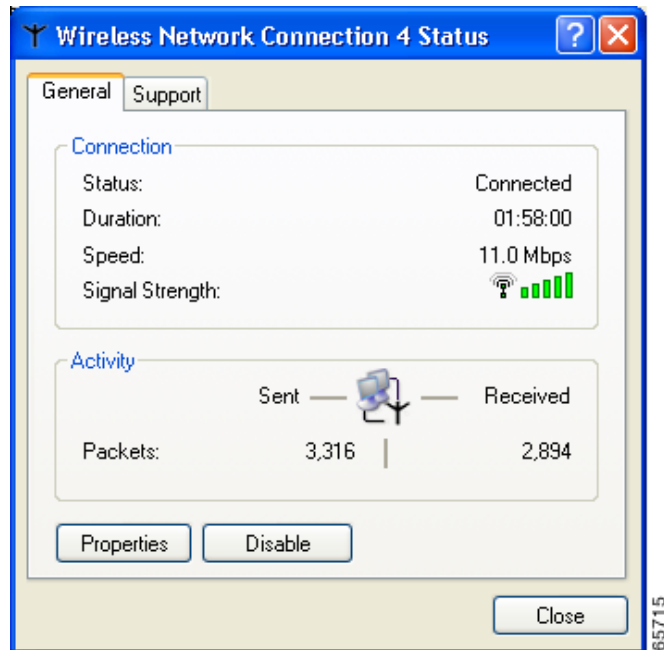
Performing a Site Survey

This appendix explains how ACU's site survey tool can be used when conducting a site survey.

The following topics are covered in this appendix:

- Overview, page F-2
- Specifying Signal Strength Units, page F-3
- Using Passive Mode, page F-3
- Using Active Mode, page F-7
- Forcing the Client Adapter to Reassociate, page F-13

Overview

> ✎
> **Note**   This appendix applies only to people who are responsible for conducting a site survey to determine the best placement of infrastructure devices within a wireless network.

ACU's site survey tool can assist you in conducting a site survey. The tool operates at the RF level and is used to determine the best placement and coverage (overlap) for your network's infrastructure devices. During a site survey, the current status of the network is read from the client adapter and displayed four times per second so you can accurately gauge network performance. The feedback that you receive can help you to eliminate areas of low RF signal levels that can result in a loss of connection between the client adapter and its associated access point (or other infrastructure device).

The site survey tool can be operated in two modes:

- **Passive Mode**—This is the default site survey mode. It does not initiate any RF network traffic; it simply listens to the traffic that the client adapter hears and displays the results. Follow the instructions in the "Using Passive Mode" section on page F-3 to activate the passive mode.

- **Active Mode**—This mode causes the client adapter to actively send or receive low-level RF packets to or from its associated access point and provides information on the success rate. It also enables you to set parameters governing how the site survey is performed (such as the data rate). Follow the instructions in the "Using Active Mode" section on page F-7 to activate the active mode.

Guidelines

Keep the following guidelines in mind when preparing to perform a site survey:

- Perform the site survey when the RF link is functioning with all other systems and noise sources operational.

- Execute the site survey entirely from the mobile station.

- When using the active mode, conduct the site survey with all variables set to operational values.

Additional Information

Also consider the following operating and environmental conditions when performing a site survey:

- **Data rates**—Sensitivity and range are inversely proportional to data bit rates. Therefore, the maximum radio range is achieved at the lowest workable data rate, and a decrease in receiver threshold sensitivity occurs as the radio data increases.

- **Antenna type and placement**—Proper antenna configuration is a critical factor in maximizing radio range. As a general rule, range increases in proportion to antenna height.

- **Physical environment**—Clear or open areas provide better radio range than closed or filled areas. Also, the less cluttered the work environment, the greater the range.

- **Obstructions**—A physical obstruction such as metal shelving or a steel pillar can hinder the performance of wireless devices. Avoid placing these devices in a location where a metal barrier is between the sending and receiving antennas.

- **Building materials**—Radio penetration is greatly influenced by the building material used in construction. For example, drywall construction allows greater range than concrete blocks, and metal or steel construction is a barrier to radio signals.

> **Note**   Refer to the documentation for your infrastructure device for additional information on factors affecting placement.

Specifying Signal Strength Units

Follow the steps below to specify how signal strength units are displayed on the site survey screens.

Step 1   Open ACU.

Step 2   Click the **Preferences** icon or select **Preferences** from the Options drop-down menu. The Aironet Client Utility Preferences screen appears.

Step 3   Under Signal Strength Display Units, select one of the following options:

- **Percent**—Displays the signal strength as a percentage.

- **dBm**—Displays the signal strength in decibels with respect to milliwatts.

Step 4   Click **OK** to save your changes.

Using Passive Mode

Step 1   Open ACU; then click the **Site Survey** icon or select **Site Survey** from the Commands drop-down menu. The Site Survey - Passive Mode screen appears, provided a client adapter is installed in your computer and is running.

Figure F-1 shows the Site Survey - Passive Mode screen with the signal strength values displayed as percentages, and Figure F-2 shows the top of the same screen with the signal strength values displayed in dBm.

> **Note**   The name of the current profile appears in parentheses at the top of the screen.

Figure F-1   Site Survey - Passive Mode Screen (with Signal Strength as a Percentage)
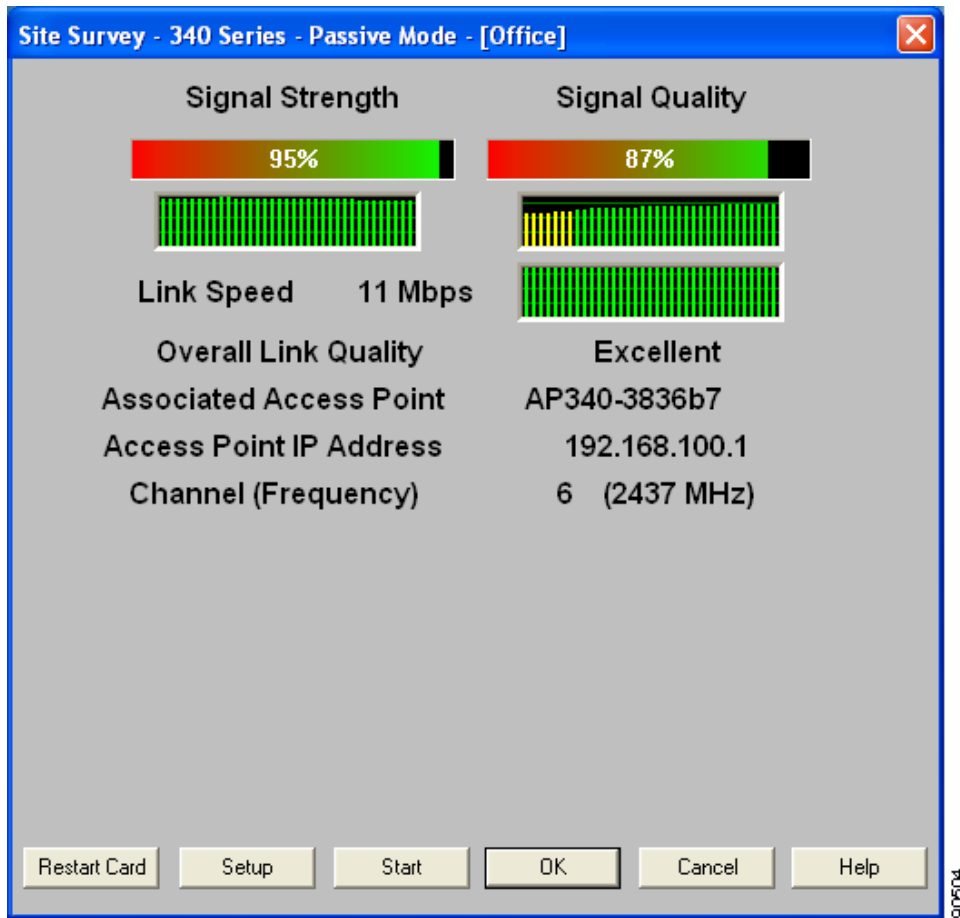
Figure F-2   Top of Site Survey - Passive Mode Screen (with Signal Strength in dBm)
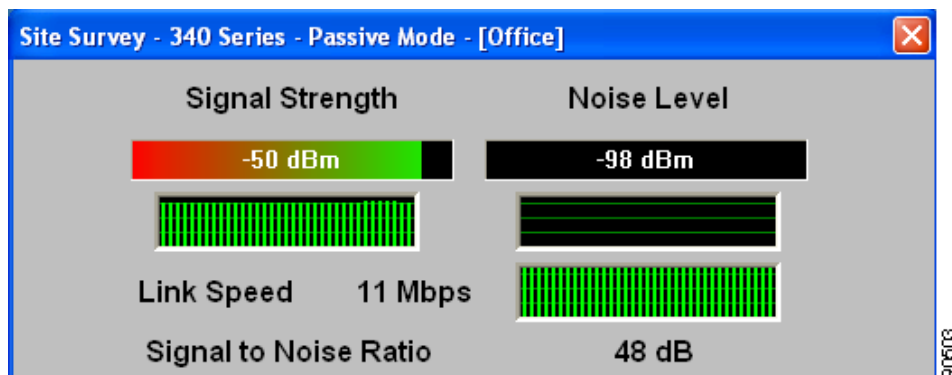
Table F-1 interprets the information that is displayed on the Site Survey - Passive Mode screen.

Table F-1   Site Survey Passive Mode Statistics

Statistic	Description
Signal Strength	The signal strength for all received packets. The higher the value and the more green the bar graph is, the stronger the signal.
	The histogram below the bar graph provides a visual interpretation of the current signal strength. Differences in signal strength are indicated by the following colors: green (strongest), yellow (middle of the range), and red (weakest).
	Range: 0 to 100% or –95 to –45 dBm
Signal Quality (2.4-GHz client adapters)	The signal quality for all received packets. The higher the value and the more green the bar graph is, the clearer the signal.
	The histogram below the bar graph provides a visual interpretation of the current signal quality. Differences in signal quality are indicated by the following colors: green (highest quality), yellow (average), and red (lowest quality).
	Range: 0 to 100%
	Note This setting appears only for 2.4-GHz client adapters and only if you selected signal strength to be displayed as a percentage. See the "Specifying Signal Strength Units" section on page F-3 for information.
Noise Level (2.4-GHz client adapters)	The level of background radio frequency energy in the 2.4-GHz band. The lower the value and the more green the bar graph is, the less background noise present.
	The histogram below the bar graph provides a visual interpretation of the current level of background noise. Differences in background noise level are indicated by the following colors: green (low noise), yellow (middle of the range), and red (high noise).
	Range: –100 to –45 dBm
	Note This setting appears only for 2.4-GHz client adapters and only if you selected signal strength to be displayed in dBm. See the "Specifying Signal Strength Units" section on page F-3 for information.
Beacons Received (5-GHz client adapters)	The percentage of beacon packets received versus those expected to be received. The higher the value and the more green the bar graph is, the clearer the signal.
	Example: The access point sends out 10 beacons per second, so you would expect the client adapter to receive 50 beacon packets in 5 seconds. If it receives only 40 packets, the percentage of beacons received would be 80%.
	Range: 0 to 100%
	Note This setting appears only for 5-GHz client adapters.

Table F-1   Site Survey Passive Mode Statistics (continued)

Statistic	Description
Link Speed	In passive mode, the site survey tool monitors transmitted network traffic, and the data rate reflects the rate at which the packets are being transmitted.
	The Link Speed histogram provides a visual interpretation of the current rate at which your client adapter is transmitting packets. Differences in link speed are indicated by the following colors: green (fastest), yellow (middle of the range), and red (slowest).
	Value: 1, 2, 5.5, or 11 Mbps (2.4-GHz client adapters); 6, 9, 12, 18, 24, 36, 48, or 54 Mbps (5-GHz client adapters)
Overall Link Quality	The client adapter's ability to communicate with the access point.
	Value: Not Associated, Poor, Fair, Good, or Excellent
	Note This setting appears for 2.4-GHz client adapters (but only if you selected signal strength to be displayed as a percentage) and for 5-GHz client adapters. See the "Specifying Signal Strength Units" section on page F-3 for information.
Signal to Noise Ratio (2.4-GHz client adapters)	The difference between the signal strength and the noise level. The higher the value, the better the client adapter's ability to communicate with the access point.
	Range: 0 to 90 dB
	Note This setting appears only for 2.4-GHz client adapters and only if you selected signal strength to be displayed in dBm. See the "Specifying Signal Strength Units" section on page F-3 for information.
Associated Access Point	The access point to which your client adapter is associated. It is shown only if the client adapter is in infrastructure mode, the access point was configured with a name, and Aironet Extensions are enabled (on access points running Cisco IOS release 12.2(4)JA or greater).
Access Point IP Address	The IP address of the access point to which your client adapter is associated. It is shown only if the client adapter is in infrastructure mode, the access point was configured with an IP address, and Aironet Extensions are enabled (on access points running Cisco IOS release 12.2(4)JA or greater).
	Note If Aironet Extensions are disabled, the IP address of the associated access point is shown as 0.0.0.0.

Table F-1   Site Survey Passive Mode Statistics (continued)

Statistic	Description
Channel (Frequency)	The frequency that your client adapter is currently using as the channel for communications.
	Value: Dependent on client adapter radio and regulatory domain

Step 2   If you want to activate the site survey active mode, go to the "Using Active Mode" section on page F-7. Otherwise, click **OK** or **Cancel** to exit the site survey application.

Using Active Mode

Follow the steps below to activate the site survey active mode and obtain current information about your client adapter's ability to transmit and receive RF packets.

Step 1   From the Site Survey - Passive Mode screen (see Figure F-1), click the **Setup** button. The Site Survey Active Mode Setup screen appears (see Figure F-3).

Figure F-3   Site Survey Active Mode Setup Screen
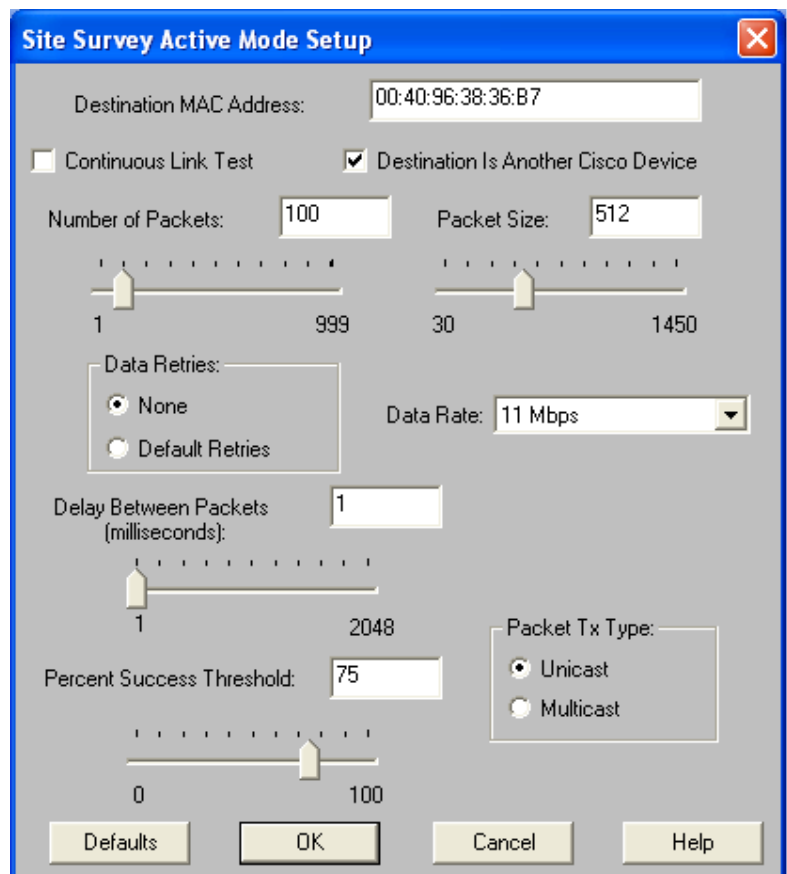
Table F-2 lists and describes the parameters that affect how the site survey is performed. Follow the instructions in the table to set any parameters.

Table F-2   Site Survey Active Mode Parameters

Parameter	Description
Destination MAC Address	The MAC address of the access point (in infrastructure mode) or other clients (in ad hoc mode) that are used in the test.
	Default: The MAC address of the access point (in infrastructure mode) to which your client adapter is associated
	Note During the test, the client adapter does not roam to other access points so that the size of a single cell can be determined.
Continuous Link Test	Checking this check box causes the test to run until you click **OK** or **Stop**. The test loops repeatedly for the number of packets specified in the Number of Packets field.
	Default: Unchecked
Destination Is Another Cisco/Aironet Device	Checking this check box indicates that the device you named in the Destination MAC Address field is a Cisco Aironet access point (in infrastructure mode) or client (in ad hoc mode). In this case, packets sent to the client from the Cisco Aironet device contain additional information, such as lost to source, lost to target, and percent retries, and this information is displayed in the Site Survey - Active screen.
	If the device specified in the Destination MAC Address field is not a Cisco Aironet device, do not check this check box. In this case, the test sends out loopback packets, which originate from and return to the client adapter.
	Default: Checked
Number of Packets	The number of packets that are sent during the test.
	Range: 1 to 999
	Default: 100
Packet Size	The size of the packets that are sent during the test. Select a size that is typical during normal system use.
	Range: 30 to 1450
	Default: 512
Data Retries	The number of times a transmission is retried if an acknowledgment (Ack) is not returned by the destination device.
	Default: None

Retry Value	Description
None	No retries will occur.
Default Retries	The firmware's default value for retries (16 for 2.4-GHz client adapters; 32 for 5-GHz client adapters) will be used.

Table F-2   Site Survey Active Mode Parameters (continued)

Parameter	Description
Data Rate	The bit rate at which packets are transmitted. Rate shifting does not occur during the test because the echo test built into the radio firmware does not support it. **Value:** 1, 2, 5.5, or 11 Mbps (2.4-GHz client adapters); 6, 9, 12, 18, 24, 36, 48, or 54 Mbps (5-GHz client adapters) **Default:** 11 Mbps (2.4-GHz client adapters); 54 Mbps (5-GHz client adapters)
Delay Between Packets	The delay (in milliseconds) between successive transmissions. **Range:** 1 to 2048 ms **Default:** 50 ms
Percent Success Threshold	The percentage of packets that are not lost. This parameter controls the red line on the Percent Successful histogram. Percentages greater than or equal to this value are displayed as green bars; percentages below this value are displayed as yellow bars. **Range:** 0 to 100% **Default:** 75
Packet Tx Type	The packet type that is transmitted during the test. **Default:** Unicast <table><tr><td>Packet Type</td><td>Description</td></tr><tr><td>Unicast</td><td>When unicast packets are used, the system expects to receive an acknowledgment from the destination, and retries can occur.</td></tr><tr><td>Multicast</td><td>When multicast packets are used, no packet retries occur during the test.</td></tr></table>

Step 2 After setting any parameters, click **OK** to save the settings. The Site Survey - Passive Mode screen appears (see Figure F-1).

Step 3 Click the **Start** button to run the site survey test. The Site Survey - Active Mode screen appears.

Figure F-4 shows the Site Survey - Active Mode screen with the signal strength values displayed as percentages, and Figure F-5 shows the top of the same screen with the signal strength values displayed in dBm.

Figure F-4   Site Survey - Active Mode Screen (with Signal Strength as a Percentage)

Figure F-5   Top of Site Survey - Active Mode Screen (with Signal Strength in dBm)
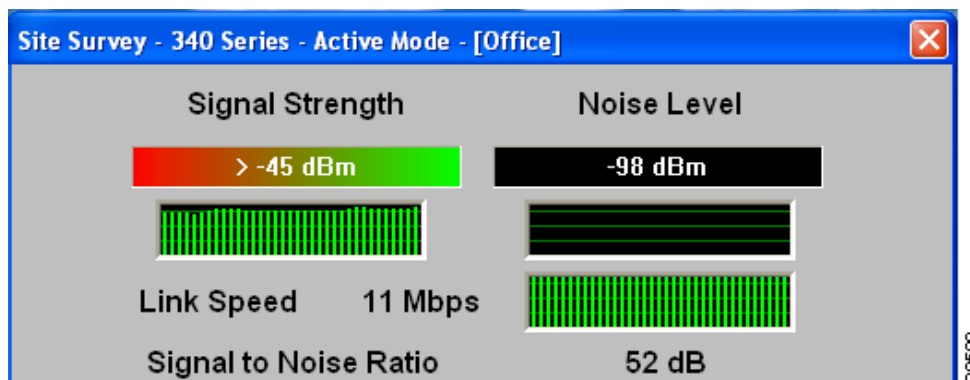
Table F-3 interprets the information that is displayed on the Site Survey - Active Mode screen while the site survey test is running.

Table F-3   Site Survey Active Mode Statistics

Statistic	Description
Signal Strength	The signal strength for all received packets. The higher the value and the more green the bar graph is, the stronger the signal.
	The histogram below the bar graph provides a visual interpretation of the current signal strength. Differences in signal strength are indicated by the following colors: green (strongest), yellow (middle of the range), and red (weakest).
	Range: 0 to 100% or –95 to –45 dBm
Signal Quality (2.4-GHz client adapters)	The signal quality for all received packets. The higher the value and the more green the bar graph is, the clearer the signal.
	The histogram below the bar graph provides a visual interpretation of the current signal quality. Differences in signal quality are indicated by the following colors: green (highest quality), yellow (average), and red (lowest quality).
	Range: 0 to 100%
	Note This setting appears only for 2.4-GHz client adapters and only if you selected signal strength to be displayed as a percentage. See the "Specifying Signal Strength Units" section on page F-3 for information.
Noise Level (2.4-GHz client adapters)	The level of background radio frequency energy in the 2.4-GHz band. The lower the value and the more green the bar graph is, the less background noise present.
	The histogram below the bar graph provides a visual interpretation of the current level of background noise. Differences in background noise level are indicated by the following colors: green (low noise), yellow (middle of the range), and red (high noise).
	Range: –100 to –45 dBm
	Note This setting appears only for 2.4-GHz client adapters and only if you selected signal strength to be displayed in dBm. See the "Specifying Signal Strength Units" section on page F-3 for information.
Beacons Received (5-GHz client adapters)	The percentage of beacon packets received versus those expected to be received. The higher the value and the more green the bar graph is, the clearer the signal.
	Example: The access point sends out 10 beacons per second, so you would expect the client adapter to receive 50 beacon packets in 5 seconds. If it receives only 40 packets, the percentage of beacons received would be 80%.
	Range: 0 to 100%
	Note This setting appears only for 5-GHz client adapters.

Table F-3   Site Survey Active Mode Statistics (continued)

Statistic	Description
Link Speed	The rate at which your client adapter is transmitting packets to or from its associated access point.
	The Link Speed histogram provides a visual interpretation of the current rate at which your client adapter is transmitting packets. Differences in link speed are indicated by the following colors: green (fastest), yellow (middle of the range), and red (slowest).
	Value: 1, 2, 5.5, or 11 Mbps (2.4-GHz client adapters); 6, 9, 12, 18, 24, 36, 48, or 54 Mbps (5-GHz client adapters)
Overall Link Quality	The client adapter's ability to communicate with the access point.
	Value: Not Associated, Poor, Fair, Good, or Excellent
	Note This setting appears for 2.4-GHz client adapters (but only if you selected signal strength to be displayed as a percentage) and for 5-GHz client adapters. See the "Specifying Signal Strength Units" section on page F-3 for information.
Signal to Noise Ratio (2.4-GHz client adapters)	The difference between the signal strength and the noise level. The higher the value, the better the client adapter's ability to communicate with the access point.
	Range: 0 to 90 dB
	Note This setting appears only for 2.4-GHz client adapters and only if you selected signal strength to be displayed in dBm. See the "Specifying Signal Strength Units" section on page F-3 for information.
Associated Access Point	The access point to which your client adapter is associated. It is shown only if the client adapter is in infrastructure mode, the access point was configured with a name, and Aironet Extensions are enabled (on access points running Cisco IOS release 12.2(4)JA or greater).
Access Point IP Address	The IP address of the access point to which your client adapter is associated. It is shown only if the client adapter is in infrastructure mode, the access point was configured with an IP address, and Aironet Extensions are enabled (on access points running Cisco IOS release 12.2(4)JA or greater).
	Note If Aironet Extensions are disabled, the IP address of the associated access point is shown as 0.0.0.0.
Channel (Frequency)	The frequency that your client adapter is currently using as the channel for communications.
	Value: Dependent on client adapter radio and regulatory domain
Percent Complete	The percentage of packets that have been transmitted based on the number specified in the Number of Packets field.

Table F-3   Site Survey Active Mode Statistics (continued)

Statistic	Description
Percent Successful	The percentage of packets that were transmitted successfully.
	The Percent Successful histogram provides a visual interpretation of the percentage of packets that are not lost. The value you set for the Percent Success Threshold is indicated by the red line. Percentages greater than or equal to this value are displayed as green bars; percentages below this value are displayed as yellow bars.
	Note Refer to the Percent Success Threshold parameter in Table F-2 for more information.
Lost to Target	The number of packets that were not transmitted successfully to the access point.
Lost to Source	The number of packets that were not received successfully from the access point.

Step 4   When you click the **Stop** button or when the Percent Complete reaches 100%, the active mode changes back to the passive mode.

Step 5   Click **OK** or **Cancel** to exit the site survey application.

Forcing the Client Adapter to Reassociate

The client adapter will attempt to maintain its association to an access point for as long as it can. Therefore if you are on a fringe area while conducting a site survey, you may want to reinitialize (or restart) the client adapter in an attempt to force it to disassociate from the access point to which it is currently associated and reassociate to another access point.

Note   Restarting the client adapter may cause you to lose your wireless network connection.

Follow the steps below to attempt to force the client adapter to disassociate from its current access point and reassociate to another during a site survey.

Step 1   Click the **Restart Card** button on the bottom of the Site Survey screen.

Step 2   When prompted to confirm your decision, click **Yes**. The driver stops the client adapter's radio, writes the configuration (although no parameter settings have been changed), and restarts the radio.

■ **Forcing the Client Adapter to Reassociate**

802.1X	Also called *802.1X for 802.11*. 802.1X is the new standard for wireless LAN security, as defined by the Institute of Electrical and Electronics Engineers (IEEE). An access point that supports 802.1X and its protocol, Extensible Authentication Protocol (EAP), acts as the interface between a wireless client and an authentication server, such as a Remote Authentication Dial-In User Service (RADIUS) server, to which the access point communicates over the wired network.
802.11	The IEEE standard that specifies carrier sense media access control and physical layer specifications for 1- and 2-megabit-per-second (Mbps) 2.4-GHz wireless LANs.
802.11a	The IEEE standard that governs the deployment of 5-GHz OFDM systems. It specifies the implementation of the physical layer for wireless UNII bands (see UNII, UNII 1, and UNII 2) and provides four channels per 100 MHz of bandwidth.
802.11b	The IEEE standard that specifies carrier sense media access control and physical layer specifications for 5.5- and 11-Mbps 2.4-GHz wireless LANs.

A

access point	A wireless LAN data transceiver that uses radio waves to connect a wired network with wireless stations.
ad hoc network	A wireless network composed of stations without access points.
alphanumeric	A set of characters that contains both letters and numbers.
associated	A station is configured properly to allow it to wirelessly communicate with an access point.

B

bandwidth	Specifies the amount of the frequency spectrum that is usable for data transfer. It identifies the maximum data rate that a signal can attain on the medium without encountering significant power loss.
BPSK	Binary phase shift keying. A modulation technique used by IEEE 802.11-compliant wireless LANs for transmission at 1 Mbps.
broadcast key rotation	A security feature for use with dynamic WEP keys. If your client adapter uses LEAP, EAP-TLS, PEAP, or EAP-SIM authentication and you enable this feature, the access point changes the dynamic broadcast WEP key that it provides at the interval you select.

C

CCK
Complementary code keying. A modulation technique used by IEEE 802.11b-compliant wireless LANs for transmission at 5.5 and 11 Mbps.

client
A radio device that uses the services of an access point to communicate wirelessly with other devices on a local area network.

CSMA
Carrier sense multiple access. A wireless LAN media access method specified by the IEEE 802.11 specification.

cyclic redundancy check (CRC)
A method of checking for errors in a received packet.

D

data rates
The range of data transmission rates supported by a device. Data rates are measured in megabits per second (Mbps).

dBi
A ratio of decibels to an isotropic antenna that is commonly used to measure antenna gain. The greater the dBi value, the higher the gain and the more acute the angle of coverage.

DHCP
Dynamic Host Configuration Protocol. A protocol available with many operating systems that automatically issues IP addresses within a specified range to devices on the network. The device retains the assigned address for a specific administrator-defined period.

dipole
A type of low-gain (2.2-dBi) antenna consisting of two (often internal) elements.

DSSS
Direct-sequence spread spectrum. A type of spread spectrum radio transmission that spreads its signal continuously over a wide frequency band.

duplicate packets
Packets that were received twice because an acknowledgement got lost and the sender retransmitted the packet.

E

EAP
Extensible Authentication Protocol. EAP is the protocol for the optional IEEE 802.1X wireless LAN security feature. An access point that supports 802.1X and EAP acts as the interface between a wireless client and an authentication server, such as a Remote Authentication Dial-In User Service (RADIUS) server, to which the access point communicates over the wired network.

Ethernet
The most widely used wired local area network. Ethernet uses carrier sense multiple access (CSMA) to allow computers to share a network and operates at 10, 100, or 1000 megabits per second (Mbps), depending on the physical layer used.

F

file server	A repository for files so that a local area network can share files, mail, and programs.
firmware	Software that is programmed on a memory chip and kept in a computer's semi-permanent memory.
fragmentation threshold	The size at which packets are fragmented and transmitted a piece at a time instead of all at once. The setting must be within the range of 64 to 2312 bytes.
full duplex	A means of communication whereby each node receives and transmits simultaneously (two-way). See also half duplex.

G

gateway	A device that connects two otherwise incompatible networks together.
GHz	Gigahertz. One billion cycles per second. A unit of measure for frequency.

H

half duplex	A means of communication whereby each node receives and transmits in turn (one-way). See also full duplex.
hexadecimal	A set of characters consisting of ten numbers and six letters (0-9, A-F, and a-f).

I

IEEE	Institute of Electrical and Electronics Engineers. A professional society serving electrical engineers through its publications, conferences, and standards development activities. The body responsible for the Ethernet 802.3 and wireless LAN 802.11 specifications.
infrastructure	The wired Ethernet network.
infrastructure device	A device (such as an access point, bridge, or base station) that connects client adapters to a wired LAN.
IP address	The Internet Protocol (IP) address of a station.
IP subnet mask	The number used to identify the IP subnetwork, indicating whether the IP address can be recognized on the LAN or if it must be reached through a gateway.
IPX	Internetwork Packet Exchange. The NetWare network layer protocol used for transferring data from servers to workstations.
isotropic	An antenna that emits its signal in a spherical pattern.

L

LEAP LEAP, or *EAP-Cisco Wireless*, is the 802.1X authentication type that is available for use with operating systems that do not have EAP support. Support for LEAP is provided in the client adapter's firmware and the Cisco software that supports it, rather than in the operating system. With LEAP, a username and password are used by the client adapter to perform mutual authentication with the RADIUS server through an access point.

M

MAC address The Media Access Control (MAC) address is a unique serial number assigned to a networking device by the manufacturer.

MIC Message integrity check. MIC prevents bit-flip attacks on encrypted packets. During a bit-flip attack, an intruder intercepts an encrypted message, alters it slightly, and retransmits it, and the receiver accepts the retransmitted message as legitimate. The client adapter's driver must support MIC functionality, and MIC must be enabled on the access point.

modulation Any of several techniques for combining user information with a transmitter's carrier signal.

multicast packets Packets transmitted to multiple stations.

multipath The echoes created as a radio signal bounces off of physical objects.

O

OFDM Orthogonal frequency division multiplexing. A multicarrier modulation method for broadband wireless communications.

overrun packets Packets that were discarded because the access point had a temporary overload of packets to handle.

P

packet A basic message unit for communication across a network. A packet usually includes routing information, data, and sometimes error detection information.

Q

QPSK Quadruple phase shift keying. A modulation technique used by IEEE 802.11-compliant wireless LANs for transmission at 2 Mbps.

R

radio channel   The frequency at which a radio operates.

range   A linear measure of the distance that a transmitter can send a signal.

receiver sensitivity   A measurement of the weakest signal a receiver can receive and still correctly translate it into data.

RF   Radio frequency. A generic term for radio-based technology.

roaming   A feature of some access points that allows users to move through a facility while maintaining an unbroken connection to the LAN.

RP-TNC   A connector type unique to Cisco Aironet radios and antennas. Part 15.203 of the FCC rules covering spread spectrum devices limits the types of antennas that may be used with transmission equipment. In compliance with this rule, Cisco Aironet, like all other wireless LAN providers, equips its radios and antennas with a unique connector to prevent attachment of non-approved antennas to radios.

RTS threshold   The packet size at which an access point issues a request to send (RTS) before sending the packet.

S

spread spectrum   A radio transmission technology that spreads the user information over a much wider bandwidth than otherwise required in order to gain benefits such as improved interference tolerance and unlicensed operation.

SSID   Service set identifier. A unique identifier that stations must use to be able to communicate with an access point. The SSID can be any alphanumeric entry up to a maximum of 32 characters.

T

TKIP   Temporal Key Integrity Protocol. Also referred to as *WEP key hashing*. A security feature that defends against an attack on WEP in which the intruder uses the initialization vector (IV) in encrypted packets to calculate the WEP key. TKIP removes the predictability that an intruder relies on to determine the WEP key by exploiting IVs.

transmit power   The power level of radio transmission.

U

unicast packets   Packets transmitted in point-to-point communication.

UNII   Unlicensed National Information Infrastructure. An FCC regulatory domain for 5-GHz wireless devices. UNII bands are 100 MHz wide and divided into four channels when using 802.11a OFDM modulation.

UNII 1	A UNII band dedicated to in-building wireless LAN applications. UNII 1 is located at 5.15 to 5.25 GHz and allows for a maximum transmit power of 40 mW (or 16 dBm) with an antenna up to 6 dBi. UNII 1 regulations require a nonremovable, integrated antenna.
UNII 2	A UNII band dedicated to in-building wireless LAN applications. UNII 2 is located at 5.25 to 5.35 GHz and allows for a maximum transmit power of 200 mW (or 23 dBm) with an antenna up to 6 dBi. UNII 2 regulations allow for an auxiliary, user-installable antenna.

W

WEP	Wired equivalent privacy. An optional security mechanism defined within the 802.11 standard designed to protect your data as it is transmitted through your wireless network by encrypting it through the use of encryption keys.
workstation	A computing device with an installed client adapter.

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