



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

340 and 350 Series

Corporate Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
<http://www.cisco.com>
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100

Customer Order Number:
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GLOSSARY

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Preface

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

The following topics are covered in this section:

- [Audience, page x](#)
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Audience

This publication is for the person responsible for installing, configuring, and maintaining a Cisco Aironet 340 or 350 Series Wireless LAN Client Adapter on a Windows CE device. This person should be familiar with computing devices and with network terms and concepts.

Purpose

This publication describes the Cisco Aironet client adapters in the 340 and 350 series 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 CE* pertains specifically to client adapter driver and utility version 2.30. If you are using, installing, or upgrading to older versions of client adapter software, refer to the previous version of this manual (-02) for information and instructions.

Organization

This publication contains the following chapters:

- [Chapter 1, “Product Overview,”](#) describes the types of 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 the driver and client utilities.
- [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, “Routine Procedures,”](#) provides procedures for common tasks related to the client adapters, such as upgrading software and restarting the adapter.
- [Chapter 9, “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 the client adapters’ 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 802.11b 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 CE .NET,”](#) explains how to configure and use a client adapter with Windows CE .NET.
- [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 físicos. 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 CE, refer to the following publications:

- *Release Notes for Cisco Aironet Client Utilities and Drivers for Windows CE*
- *Release Notes for Cisco Aironet Client Adapter Firmware*

For more information about related Cisco Aironet products, refer to the following publications:

- *Cisco Aironet Access Point Hardware Installation Guide (340 and 350 Series)*
- *Cisco Aironet Access Point Software Configuration Guide (340 and 350 Series)*
- *Release Notes for Cisco Aironet Access Points*
- *Cisco Aironet 1100 Series Access Point Installation and Configuration Guide*
- *Cisco Aironet 1100 Series Access Point Command Reference*
- *Release Notes for 1100 Series Access Points*
- *Cisco Aironet 1200 Series Access Point Hardware Installation Guide*
- *Cisco Aironet 1200 Series Access Point Software Configuration Guide*
- *Release Notes for 1200 Series Access Points*

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 monthly and may be more current than printed documentation. The CD-ROM package is available as a single unit or through an annual subscription.

Registered Cisco.com users can order the Documentation CD-ROM (product number DOC-CONDOCCD=) 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_inpk/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>

- Registered Cisco.com users can order the Documentation CD-ROM (Customer Order Number DOC-CONDOCCD=) through the online Subscription Store:

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

- 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 your comments by mail by using the response card 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://www.cisco.com>

Technical Assistance Center

The Cisco TAC is available to all customers who need technical assistance with a Cisco product, technology, or solution. Two levels of support are available: the Cisco TAC website and the Cisco TAC Escalation Center. The avenue 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.
- Priority level 3 (P3)—Your network performance is degraded. Network functionality is noticeably impaired, but most business operations continue.
- Priority level 2 (P2)—Your production network is severely degraded, affecting significant aspects of business operations. No workaround is available.
- Priority level 1 (P1)—Your production network is down, and a critical impact to business operations will occur if service is not restored quickly. No workaround is available.

Cisco TAC Website

You can use the Cisco TAC website to resolve P3 and P4 issues yourself, saving both cost and time. The site provides around-the-clock access to online tools, knowledge bases, and software. 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/en/US/support/index.html>

If you have Internet access, we recommend that you open P3 and P4 cases through the Cisco TAC website so that you can describe the situation in your own words 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 level of 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 monthly periodical that provides industry professionals with the latest information about the field of networking. You can access *Packet* magazine at this URL:

http://www.cisco.com/en/US/about/ac123/ac114/about_cisco_packet_magazine.html

- *iQ Magazine* is the Cisco monthly periodical that provides business leaders and decision makers with the latest information about the networking industry. You can access *iQ Magazine* at this URL:

http://business.cisco.com/prod/tree.taf%3fasset_id=44699&public_view=true&kbns=1.html

- *Internet Protocol Journal* is a quarterly journal published by Cisco Systems for engineering professionals involved in the design, development, and operation of 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, with current offerings in network training listed at this URL:

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



Product Overview

This chapter describes the Cisco Aironet 340 and 350 Series 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, page 1-2](#)
- [Hardware Components, page 1-3](#)
- [Software Components, page 1-4](#)
- [Network Configurations Using the Client Adapter, page 1-6](#)

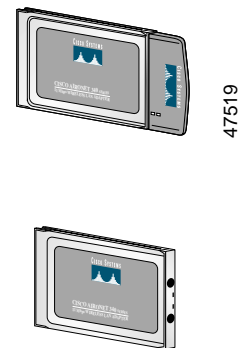
Introduction to the Client Adapters

The Cisco Aironet 340 and 350 Series Wireless LAN Client Adapters are 30- and 100-milliwatt (mW) 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 two types of client adapters:

- **PC card** (model number: AIR-PCM3xx)—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.
- **LM card** (model number: AIR-LMC3xx)—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.



Note

The first *x* in the product model number represents the client adapter series (340 or 350). 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. However, if the second *x* is a 0 but the model number contains K9, the card is 128-bit WEP capable.

Terminology

The following terms are used throughout this document:

- **client adapter**—Refers to both PC cards and LM cards.
- **PC card** or **LM card**—Refers to a specific client 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

The Cisco Aironet 340 and 350 series PC and LM 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.

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.



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 for RF Exposure”](#) section on page C-5 and the [“Channels, Power Levels, and Antenna Gains”](#) section on page D-1.

LEDs

The client adapter has two LEDs that glow or blink to indicate the status of the adapter or to convey error messages. Refer to the [Chapter 9](#) for an interpretation of the LED codes.

Software Components

The client adapter has three major software components: radio firmware, a driver, and client utilities.

Radio Firmware

The firmware, which is contained in the client adapter's Flash memory, controls the adapter's radio. The client adapter is shipped with the firmware installed; however, a more recent version of the firmware may be available from Cisco.com.

**Note**

Firmware version 5.02.19 or greater is recommended for use with client adapter driver and utility version 2.30. [Chapter 8](#) provides instructions for determining the version of your client adapter's firmware and upgrading it if necessary.

Driver

The driver provides an interface between the Windows CE device and the client adapter, thereby enabling Windows CE and the applications it runs to communicate with the adapter. The driver must be installed before the adapter can be used. [Chapter 3](#) provides instructions for installing the driver.

Client Utilities

Two client utilities are available for use with Cisco Aironet client adapters: Aironet Client Utility (ACU) and Wireless Login Module (WLM). These utilities are optional applications that interact with the radio firmware to adjust client adapter settings and display information about the adapter. The client utilities and online help files are installed with the driver.

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 on the next page to familiarize you with its interface. WLM enables you to enter a temporary LEAP username and password for authentication to a RADIUS server. [Chapter 6](#) provides detailed information and instructions on using WLM.

**Note**

If your Windows CE device is running Windows CE .NET, you can configure your client adapter through the operating system instead of through ACU. Refer to [Appendix E](#) for information. However, ACU is recommended for configuring the client adapter.

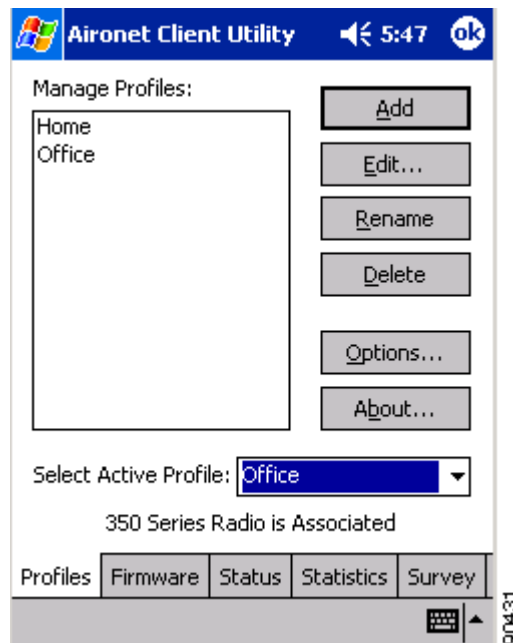
**Note**

All of the screens included in this manual were taken from a PPC 2002 device (except those in Appendix E, which were taken from a Windows CE .NET device). The screens look slightly different on other Windows CE devices.

Overview of ACU

The Profiles screen (see [Figure 1-1](#)) is ACU's primary screen. It appears when you open ACU.

Figure 1-1 Profiles Screen



The five tabs along the bottom of the screen (for PPC devices) or top of the screen (for HPC and Windows CE .NET devices) enable you to activate the following ACU features:

- **Profiles**—Enables you to use the profile manager feature to create and manage profiles for your client adapter. [Chapter 4](#) provides instructions for using this feature.
- **Firmware**—Enables you to load new firmware for your client adapter. [Chapter 8](#) provides instructions for upgrading firmware.
- **Status**—Enables you to view the current status of your client adapter. [Chapter 7](#) provides additional information on viewing the status.
- **Statistics**—Enables you to view transmit, receive, and MIC statistics for your client adapter. [Chapter 7](#) provides additional information on viewing statistics.
- **Survey**—Enables people who are responsible for conducting a site survey to determine the best placement of infrastructure devices within a wireless network. [Appendix F](#) provides instructions for using the site survey feature.

The status bar at the top or bottom of the Profiles screen reflects the current state of your client adapter. The following states are possible: Not Associated, Associated, Authenticated, Ad Hoc Mode, and Cisco Wireless LAN Adapter Not Found.

Buttons on the Client Utility Screens

The buttons on the client utility screens are used to perform specific functions. [Table 1-1](#) describes the most common buttons.

Table 1-1 *Buttons on the Client Utility Screens*

Button	Description
Cancel	Exits the screen without saving any changes
OK	Saves any changes and exits the screen
Start	Initiates a test
Stop	Stops a test that is running
X	Exits the screen without saving any changes
? (available on HPC and Windows CE .NET devices only)	Provides information on the screen and its parameters

Network Configurations Using the Client Adapter

The client adapter 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 hardware installation guide for your access point.



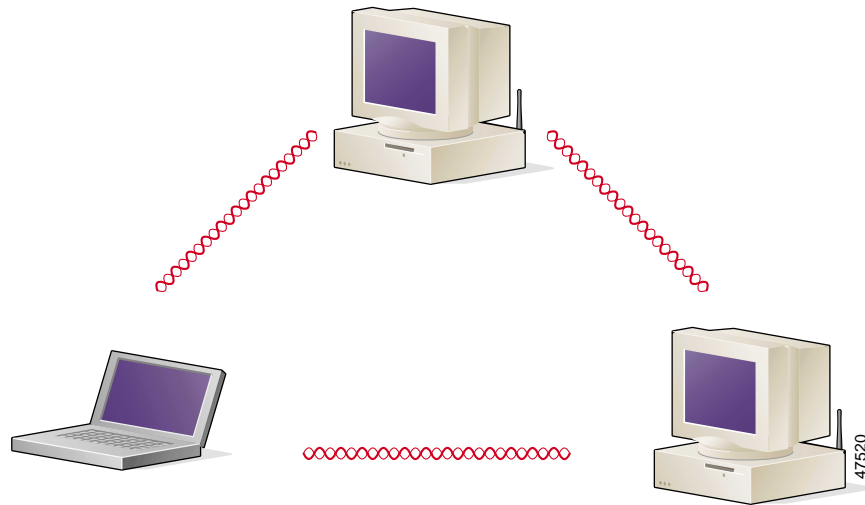
Note

Refer to [Chapter 5](#) for information on setting the client adapter's network (or infrastructure) 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.

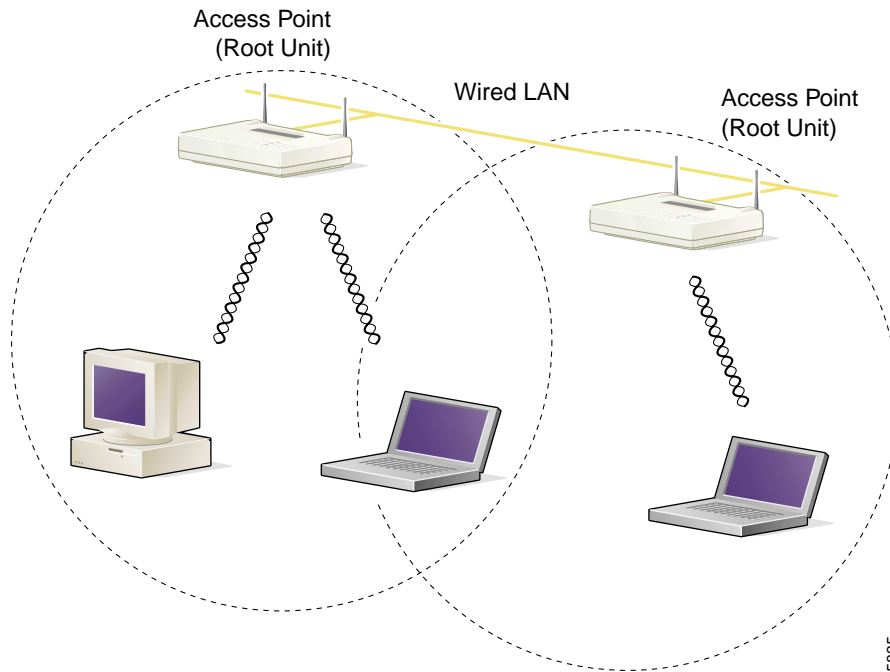
Figure 1-2 Ad Hoc Wireless LAN



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*



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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, page 2-2](#)
- [Unpacking the Client Adapter, page 2-3](#)
- [System Requirements, page 2-4](#)
- [Site Requirements, page 2-5](#)

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:



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.



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.



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:

- *Quick Start Guide: Cisco Aironet Wireless LAN Client Adapters*
- Cisco Aironet Wireless LAN Client Adapters CD
- Cisco product registration card

System Requirements

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

- One of the following Windows CE devices equipped with a Type II or Type III PC card slot:
 - Pocket PC (PPC) running Windows CE 3.0 with an ARM, StrongARM, MIPS, SH3, or X86 processor
 - Handheld PC (HPC) running Windows CE 3.0 with an ARM, StrongARM, MIPS, SH4, or X86 processor
 - A computing device running Windows CE .NET 4.0 or 4.1 with an ARM, StrongARM, or X86 processor



Note ViewSonic devices running Windows CE .NET are not supported.



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

- Laptop or PC with a CD-ROM drive and running a Windows operating system and ActiveSync
- Serial or USB connection to the Windows CE device
- A PPC 2002 device, if your wireless network uses EAP-TLS or PEAP authentication
- Certificate Authority (CA) and user certificates for EAP-TLS authentication or CA certificate for PEAP authentication
- If your wireless network uses PEAP authentication with a One-Time Password (OTP) user database:
 - The hardware token from an OTP vendor
 - Your hardware token password
- The following information from your system administrator:
 - The logical name for your Windows CE device (also referred to as *client name*)
 - The case-sensitive service set identifier (SSID) for your RF network
 - The primary and secondary Domain Name System (DNS) and Windows Internet Name Service (WINS) to be assigned to your Windows CE device
 - If your Windows CE device is not connected to a DHCP server, the IP address, subnet mask, and default gateway address to be assigned to your device
 - 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
 - Your username and password for LEAP or PEAP authentication, if your wireless network uses one of these authentication types
 - Your username for EAP-TLS authentication, if your wireless network uses EAP-TLS authentication

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.



Installing the Client Adapter

This chapter provides instructions for installing the client adapter driver and client utilities.

The following topics are covered in this chapter:

- [Finding the Windows CE Version, page 3-2](#)
- [Installing the Driver and Client Utilities, page 3-2](#)
- [Verifying Installation, page 3-5](#)
- [Deciding How to Configure Your Client Adapter \(Windows CE .NET Only\), page 3-6](#)

Finding the Windows CE Version

The messages that appear during the installation of the client adapter driver and utilities (as well as the client utility screens themselves) vary depending on your Windows CE device. Follow the instructions below to find the version of Windows CE that your device is using.

- If your Windows CE device is a Pocket PC (PPC) device, select **Start > Settings > the System tab > About**. The Windows CE version is shown.



Note If the build number is 11178 or greater, the device is a PPC 2002.

- If your Windows CE device is a Handheld PC (HPC) device, select **Start > Settings > Control Panel > System**; then select the **System** tab. The core system version indicates the version of Windows CE that the device is running (such as 3.0).
- If your Windows CE device is a CE .NET device, select **Start > Settings > Control Panel > System**. The Windows CE version is shown under System on the General tab.

Installing the Driver and Client Utilities

The WinCE-PCMCIA-LMC-v230.exe file is a self-extracting zip file that extracts all of the files necessary to install the driver and client utilities (version 2.30). The main installation utility extracted from this file is ceInstall.exe.

Follow the steps below to install the driver and client utilities for your client adapter.



Note

This procedure is meant to be used the first time the driver and client utilities are installed on a Windows CE device. If Cisco Aironet client adapter software is already installed on your Windows CE device, follow the instructions in [Chapter 8](#) to first uninstall any existing software and then follow the instructions here to upgrade to new software.



Note

Firmware version 5.02.19 or greater is recommended for use with client adapter driver and utility version 2.30. [Chapter 8](#) provides instructions for finding the version of your client adapter's firmware and upgrading it if necessary.



Note

The driver and client utilities must be installed before you insert a client adapter into a Windows CE device.



Note

Client adapter software version 2.30 is not yet available on the CD that ships with Cisco Aironet client adapters. If you are installing older versions of client adapter drivers and utilities, refer to the previous version of this manual (-02) for installation, configuration, and operation instructions.

Step 1 Connect your Windows CE device to a laptop or PC running Microsoft ActiveSync. This is typically done using a serial or USB cable.

A message appears on the Windows CE device indicating that it is connecting to the host. After the Windows CE device is connected, the New Partnership window appears on the laptop or PC. This window asks if you want to set up a partnership.



Note Cisco recommends that you install the latest version of ActiveSync.

Step 2 Perform one of the following:

- If you want to establish a partnership that enables you to synchronize files between the laptop or PC and the Windows CE device, select **Yes**, click **Next**, and follow the instructions on the screen to specify the files to be synchronized and to finish setting up the partnership.
- If you do not want to synchronize files and want to connect as a “guest,” select **No** and click **Next**. The screen indicates that you are connected as a guest.

Step 3 Use the laptop or PC’s web browser to access the following URL:

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

Step 4 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 9](#).

Step 5 Select **Cisco Aironet Wireless LAN Client Adapters**.

Step 6 Find the section for Windows CE client adapter drivers and utilities.

Step 7 Select the link for Windows CE 3.0 or Windows CE .NET, depending on your device’s operating system.

Step 8 Select the **WinCE-PCMCIA-LMC-v230.exe** file.

Step 9 Read and accept the terms and conditions of the Software License Agreement.

Step 10 Select the **WinCE-PCMCIA-LMC-v230.exe** file to download it.

Step 11 Save the file to the hard drive of your laptop or PC.

Step 12 Find the file using Windows Explorer, double-click it, and extract its files to a folder.



Note Make sure you keep all of the extracted files together in one folder. Moving them to different locations may prevent the software from operating correctly.

Step 13 Double-click the **ceInstall.exe** file.

Step 14 If you are using a PPC 2002 device, the Install 802.1X Support screen appears. If you are planning to use EAP-TLS or PEAP authentication, click **Yes**. Otherwise, click **No**.



Note If you select Yes, the PPC 2002 802.1X backport, which provides support for 802.1X security, is installed. The backport then becomes part of the base Windows CE operating system and cannot be uninstalled.

- Step 15** If you are using a PPC 2002 device, the Cisco PEAP screen appears. If you are planning to use Cisco PEAP authentication, make sure the **Install Cisco PEAP Support** check box is checked and click **Next**. Otherwise, uncheck the **Install Cisco PEAP Support** check box and click **Next**.



Note If you uncheck the **Install Cisco PEAP Support** check box, the Microsoft PEAP supplicant (rather than the Cisco PEAP supplicant) is installed.

- Step 16** If you are not using a PPC 2002 device, the Cisco Aironet Wireless LAN Adapter Setup screen appears. Click **Next** to start the Windows CE Application Manager (CeAppMgr), which is installed with ActiveSync. CeAppMgr interrogates the Windows CE device to determine its processor type.



Note If a Windows CE device is not connected to the laptop or PC (as instructed in [Step 1](#)), click **Exit** to quit the setup program and connect a Windows CE device or click **Next** to continue the installation. If you select **Exit**, click **OK** to shut down CeAppMgr and start again beginning with [Step 1](#). If you select **Next**, a message appears indicating that the software will be downloaded the next time a mobile device is connected. Click **OK**. The next time a Windows CE device is connected to the laptop or PC via ActiveSync, CeAppMgr starts automatically, and you are prompted to install the software.

- Step 17** When the Installing Applications dialog box appears asking if you want to install the client adapter using the default application installation directory, click **Yes**. The default directory is \Windows\Start Menu\Programs\Cisco on PPC devices and \Windows\Programs\Cisco on HPC and Windows CE .NET devices.

A message and a progress bar appear indicating that the client adapter (and 802.1X backport if you are using a PPC 2002 device) is being installed.

The driver and help files are copied to the \Windows directory, and the client utilities are installed in the \Windows\Start Menu\Programs\Cisco directory on PPC devices or the \Windows\Programs\Cisco directory on HPC and Windows CE .NET devices. Shortcuts to ACU and WLM are automatically added to the desktop on HPC and Windows CE .NET devices.

- Step 18** When the installation process is complete on the laptop or PC, a message appears asking you to view the screen of the Windows CE device to see if any additional steps are required to complete the installation. Click **OK** to terminate the installation process on the laptop or PC.

- Step 19** Complete any required steps on the Windows CE device.

- Step 20** Disconnect the Windows CE device.

- Step 21** If you are using a PPC 2002 device and you installed the 802.1X backport, reset your Windows CE device now. (You should have been notified earlier that a reset would be required after installation.)

- Step 22** Insert the client adapter into the PC card slot of the Windows CE device. Refer to [Chapter 8](#) for specific instructions on inserting the client adapter.

The Windows CE device should configure the client adapter, and the green LED on the adapter should blink. If this does not happen, remove the client adapter, reset the Windows CE device, and reinsert the client adapter.

- Step 23** The Cisco Wireless LAN Adapter Settings dialog box appears. (If the dialog box does not appear, select one of the following:
- **Start > Settings > the Connections tab > Network Adapters > Cisco Wireless LAN Adapter > Properties** on PPC devices,
 - **Start > Settings > Control Panel > Network > the Adapters tab > Cisco Wireless LAN Adapter > Properties** on HPC devices, or
 - **Start > Settings > Network and Dial-up Connections > the Cisco Wireless LAN Client Adapter icon** on Windows CE .NET devices.)
- Step 24** Perform one of the following:
- If your device is connected to a DHCP server, select **Obtain an IP address via DHCP** or **Use server-assigned IP address** and tap **OK**.
 - If your device is not connected to a DHCP server, select **Specify an IP address** or **Use specific IP address** and follow the steps below:
 - a. Enter the IP address, subnet mask, and default gateway address you want to assign to your device. They can be obtained from your system administrator.
 - b. Select the **Name Servers** tab and enter the primary and secondary DNS and WINS you want to assign to your device. They can be obtained from your system administrator.
 - c. Tap **OK**.
- Step 25** The driver and client utility installation is complete. Go to the “[Verifying Installation](#)” section below to determine if the installation was successful.
-

Verifying Installation

To verify that you have properly installed the driver and client utilities, 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 driver installation, refer to [Chapter 9](#) 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 your device is running Windows CE .NET. If your device is running Windows CE .NET, go to the “[Deciding How to Configure Your Client Adapter \(Windows CE .NET Only\)](#)” section below.

Deciding How to Configure Your Client Adapter (Windows CE .NET Only)

Windows CE .NET is the only Windows CE operating system that enables you to configure your client adapter without using ACU. Therefore, if your device is running Windows CE .NET, you must decide whether to configure your client adapter through the operating system or ACU. To help you with your decision, [Table 3-1](#) compares the Windows CE .NET and ACU client adapter features.

Table 3-1 Comparison of Windows CE .NET and ACU Client Adapter Features

Feature	Windows CE .NET	ACU
Configuration parameters	Limited	Extensive
Capabilities		
Create profiles	Yes	Yes
Upgrade radio firmware	No	Yes
Security		
Static WEP	Yes	Yes
LEAP authentication with dynamic WEP	No	Yes
Diagnostics		
Status screen	Limited	Extensive
Statistics screen (transmit & receive)	No	Yes
Site survey tool	No	Yes

Perform one of the following:

- If you are planning to configure your client adapter through ACU instead of through Windows CE .NET, follow the steps below:
 - a. Select **Start > Settings > Network and Dial-up Connections** > the **Cisco Wireless LAN Client Adapter** icon > the **Wireless Networks** tab.
 - b. Uncheck the **Use Windows to configure my wireless network settings** check box.
 - c. 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 CE .NET instead of through ACU, go to [Appendix E](#) and follow the instructions there.
- If you are planning to configure your client adapter through Windows CE .NET but you want to use ACU's diagnostic tools, go to [Appendix E](#) to configure the adapter through Windows CE .NET; then follow the instructions in [Chapter 7](#) to use ACU's diagnostic tools.



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](#)
- [Selecting the Active Profile, page 4-3](#)
- [Modifying a Profile, page 4-4](#)

Overview of Profile Manager

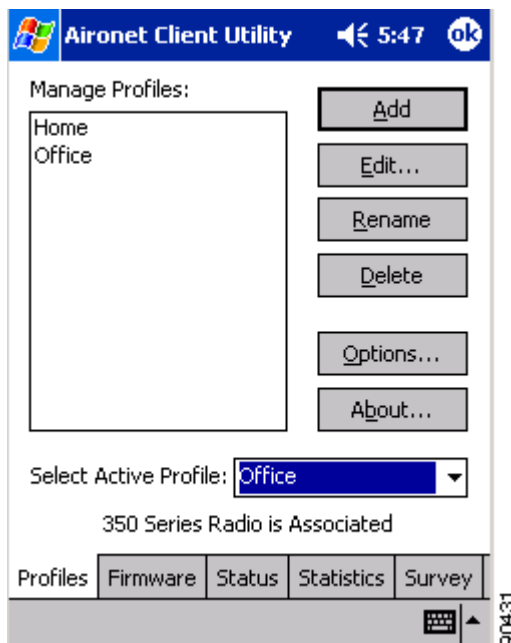
ACU's profile manager feature allows you to create and manage up to 8 *profiles* (or named groupings of saved configuration parameters) for your client adapter. These profiles enable you to use your client adapter in different locations, each of which requires different configuration settings. For example, 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 registry of the Windows CE device. They are lost only if the Windows CE device is defaulted (hard reset) or if both the primary and backup batteries run out of power.

Opening Profile Manager

To open ACU's profile manager, double-tap the **ACU** icon on your desktop or select **Start > Programs > Cisco > ACU**. The Profiles screen appears (see [Figure 4-1](#)).

Figure 4-1 Profiles Screen



Profile manager enables you to perform the following tasks related to the management of profiles:

- Create a new profile, [page 4-3](#)
- Select the active profile, [page 4-3](#)
- Edit a profile, [page 4-4](#)
- Rename a profile, [page 4-4](#)
- Delete a profile, [page 4-5](#)

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

Creating a New Profile

Follow the steps below to create a new profile.

Step 1 Tap the **Add** button on the Profiles screen. A new profile named Profile x (where x is the number of the profile) appears in the Manage Profiles box.

Step 2 To change the profile name from Profile x to something of your own choosing (for example, Office, Home, etc.), enter the name now.



Note You can enter up to 80 characters, but due to limited screen size, long profile names may not be completely displayed.

Step 3 Perform one of the following:

- If you want this profile to use the default values, tap on a blank part of the screen. The profile is added to the list of profiles in the Manage Profiles box.
- If you want to change any of the configuration parameter settings, tap the **Edit** button. The Properties screen appears with the name of the profile in quotation marks. Follow the instructions in [Chapter 5](#) to change any of the configuration parameters for this profile.

Step 4 To create another profile, repeat the previous steps.

Selecting the Active Profile

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



Note

Because EAP-TLS and PEAP authentication are not enabled 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 the Authentication Manager. In addition, only one authentication type can be set 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 the authentication type in the Authentication Manager after switching profiles in ACU.

Step 1 Go to the Profiles screen (see [Figure 4-1](#)).

Step 2 From the Select Active Profile drop-down menu, select the profile that you want your client adapter to use to attempt to establish a connection to an access point.



Note

The <External Settings> profile option on Windows CE .NET devices disables ACU profiles and enables the operating system or an application other than ACU to configure the client adapter. You must select this option if you want to configure your card through the operating system but use ACU's diagnostic tools. Refer to [Appendix E](#) for information on configuring your client adapter through Windows CE .NET.

The client adapter immediately starts using the profile that you select. 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.

Modifying a Profile

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

Editing a Profile

-
- Step 1** Go to the Profiles screen (see [Figure 4-1](#)).
 - Step 2** From the Manage Profiles box, select the profile that you want to edit and tap the **Edit** button or double-tap the profile. The Properties screen appears with the name of the profile in quotation marks.
 - Step 3** Follow the instructions in [Chapter 5](#) to change any of the configuration parameters for this profile.
-

Renaming a Profile

-
- Step 1** Go to the Profiles screen (see [Figure 4-1](#)).
 - Step 2** From the Manage Profiles box, select the profile that you want to rename and tap the **Rename** button or tap the profile twice (pausing longer than for a double-tap). The profile becomes highlighted.
 - Step 3** Enter a new name for the profile.



Note You can enter up to 80 characters, but due to limited screen size, long profile names may not be completely displayed.

- Step 4** Tap on a blank part of the screen to save your change. The profile is renamed and added to the list of profiles.
-

Deleting a Profile

-
- Step 1** Go to the Profiles screen (see [Figure 4-1](#)).
- Step 2** From the Manage Profiles box, select the profile that you want to delete.



Note You cannot delete the active profile.

- Step 3** Tap the **Delete** button.
- Step 4** When prompted to confirm your decision, tap **Yes**. The profile is deleted.
-



Configuring the Client Adapter

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

The following topics are covered in this chapter:

- [Configuring Your Client Adapter, page 5-2](#)
- [Overview of Security Features, page 5-9](#)
- [Using Static WEP, page 5-14](#)
- [Using LEAP, page 5-16](#)
- [Using Host-Based EAP, page 5-17](#)

Configuring Your Client Adapter

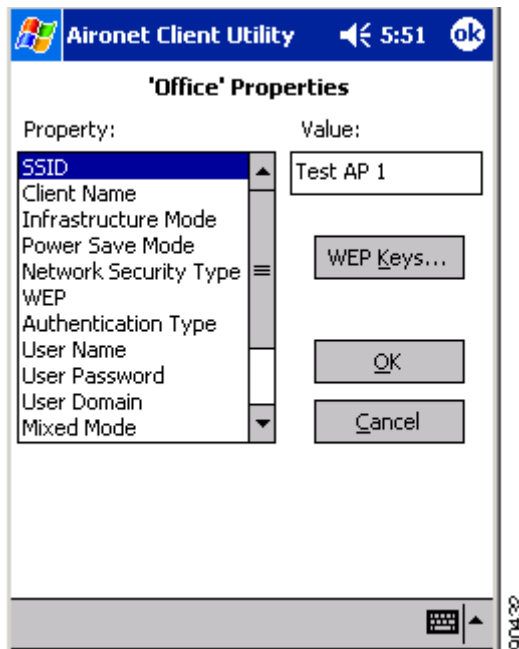
When you choose to create a new profile or edit an existing profile on the Profiles screen, the Properties screen appears with the name of your profile in quotation marks. This screen enables you to set the configuration parameters for that profile. Follow the steps below to access the Properties screen and complete the configuration process.


Note

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

- Step 1** When you create or select a profile on the Profiles screen and tap the **Edit** button, the Properties screen appears (see [Figure 5-1](#)).

Figure 5-1 Properties Screen



The Property box lists the configuration parameters that can be changed, and the Value box contains the highlighted parameter's current value. The Value box can appear as a drop-down menu with several possible values from which to choose or as a blank field in which characters are to be entered.

- Step 2** [Table 5-1](#) lists and describes the client adapter's configuration parameters. Follow the instructions in the table to initially set or change any parameters.


Note

The security parameters (Network Security Type, WEP, User Name, User Password, and User Domain) are listed at the end of the table because they require further action.

Table 5-1 Client Adapter Configuration Parameters

Parameter	Description						
SSID	<p>The service set identifier (SSID) identifies the specific wireless network that you want to access.</p> <p>Range: You can key in up to 32 characters (case sensitive)</p> <p>Default: A blank field</p> <p>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 cannot access the network.</p>						
Client Name	<p>A logical name for your Windows CE device. 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.</p> <p>Range: You can enter up to 16 characters</p> <p>Default: A blank field</p> <p>Note Each computer on the network should have a unique client name.</p>						
Infrastructure Mode	<p>Specifies the type of network in which your client adapter is installed.</p> <p>Options: Yes or No</p> <p>Default: Yes</p> <table border="1"> <thead> <tr> <th>Infrastructure Mode</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Yes</td> <td>Indicates that your wireless network is connected to a wired Ethernet network through an access point.</td> </tr> <tr> <td>No</td> <td>Often referred to as <i>ad hoc</i> or <i>peer-to-peer mode</i>. Indicates that your wireless network consists of a few wireless devices that are not connected to a wired Ethernet network through an access point.</td> </tr> </tbody> </table>	Infrastructure Mode	Description	Yes	Indicates that your wireless network is connected to a wired Ethernet network through an access point.	No	Often referred to as <i>ad hoc</i> or <i>peer-to-peer mode</i> . Indicates that your wireless network consists of a few wireless devices that are not connected to a wired Ethernet network through an access point.
Infrastructure Mode	Description						
Yes	Indicates that your wireless network is connected to a wired Ethernet network through an access point.						
No	Often referred to as <i>ad hoc</i> or <i>peer-to-peer mode</i> . Indicates that your wireless network consists of a few wireless devices that are not connected to a wired Ethernet network through an access point.						

Table 5-1 Client Adapter Configuration Parameters (continued)

Parameter	Description								
Power Save Mode	<p>Sets your client adapter to its optimum power-consumption setting.</p> <p>Options: CAM, Fast PSP, or Max PSP</p> <p>Default: Fast PSP (Power Save Mode)</p>								
	<table border="1"> <thead> <tr> <th>Power Save Mode</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>CAM (Constantly Awake Mode)</td> <td> <p>Keeps the client adapter powered up continuously so there is little lag in message response time.</p> <p>Consumes the most power but offers the highest throughput. Is recommended for desktop computers and devices that use AC power.</p> </td> </tr> <tr> <td>Fast PSP (Power Save Mode)</td> <td> <p>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.</p> <p>Is recommended when power consumption is a concern but you need greater throughput than that allowed by Max PSP.</p> </td> </tr> <tr> <td>Max PSP (Max Power Savings)</td> <td> <p>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.</p> <p>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).</p> </td> </tr> </tbody> </table>	Power Save Mode	Description	CAM (Constantly Awake Mode)	<p>Keeps the client adapter powered up continuously so there is little lag in message response time.</p> <p>Consumes the most power but offers the highest throughput. Is recommended for desktop computers and devices that use AC power.</p>	Fast PSP (Power Save Mode)	<p>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.</p> <p>Is recommended when power consumption is a concern but you need greater throughput than that allowed by Max PSP.</p>	Max PSP (Max Power Savings)	<p>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.</p> <p>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).</p>
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Table 5-1 Client Adapter Configuration Parameters (continued)

Parameter	Description						
Authentication Type	<p>Defines how your client adapter will attempt to authenticate to an access point.</p> <p>Options: Open or Shared Key</p> <p>Default: Open</p>						
	<table border="1"> <thead> <tr> <th>Authentication</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Open Authentication</td> <td>Enables your client adapter, regardless of its WEP settings, to authenticate and attempt to communicate with an access point. If LEAP or host-based EAP is enabled on your client adapter, Open Authentication is the only available option.</td> </tr> <tr> <td>Shared Key Authentication</td> <td> <p>Enables your client adapter to communicate only with access points that have the same WEP key. This option is available only if Static WEP Keys is selected.</p> <p>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.</p> </td> </tr> </tbody> </table>	Authentication	Description	Open Authentication	Enables your client adapter, regardless of its WEP settings, to authenticate and attempt to communicate with an access point. If LEAP or host-based EAP is enabled on your client adapter, Open Authentication is the only available option.	Shared Key Authentication	<p>Enables your client adapter to communicate only with access points that have the same WEP key. This option is available only if Static WEP Keys is selected.</p> <p>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.</p>
	Authentication	Description					
	Open Authentication	Enables your client adapter, regardless of its WEP settings, to authenticate and attempt to communicate with an access point. If LEAP or host-based EAP is enabled on your client adapter, Open Authentication is the only available option.					
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<p>Note Cisco recommends that shared key authentication not be used because it presents a security risk.</p>							
Mixed Mode	<p>Indicates whether the client adapter can associate to an access point that allows both WEP and non-WEP associations.</p> <ul style="list-style-type: none"> • 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, you must enable Mixed Mode on the adapter. Otherwise, the client adapter cannot establish a connection with the access point. • If the access point with which the client adapter is to associate does not have WEP set to Optional, Mixed Mode should be set to Disabled on the adapter. <p>Options: Enabled or Disabled</p> <p>Default: Disabled</p> <p>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.</p>						

Table 5-1 Client Adapter Configuration Parameters (continued)

Parameter	Description												
World Mode	<p>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.</p> <p>Options: Enabled or Disabled</p> <p>Default: Disabled</p> <p>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.</p>												
Data Rates	<p>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).</p> <p>Auto is recommended for infrastructure mode; setting a specific data rate is recommended for ad hoc mode.</p> <p>Options: Auto, 1 Mb Only, 2 Mb Only, 5.5 Mb Only, or 11 Mb Only</p> <p>Default: Auto</p> <table border="1"> <thead> <tr> <th>Data Rate</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Auto</td> <td>Uses the 11-Mbps data rate when possible but drops to lower rates when necessary</td> </tr> <tr> <td>1 Mb Only</td> <td>Offers the greatest range but the lowest throughput</td> </tr> <tr> <td>2 Mb Only</td> <td>Offers less range but greater throughput than the 1 Mbps Only option</td> </tr> <tr> <td>5.5 Mb Only</td> <td>Offers less range but greater throughput than the 2 Mbps Only option</td> </tr> <tr> <td>11 Mb Only</td> <td>Offers the greatest throughput but the lowest range</td> </tr> </tbody> </table> <p>Note Your client adapter's data rate must be set to Auto 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.</p>	Data Rate	Description	Auto	Uses the 11-Mbps data rate when possible but drops to lower rates when necessary	1 Mb Only	Offers the greatest range but the lowest throughput	2 Mb Only	Offers less range but greater throughput than the 1 Mbps Only option	5.5 Mb Only	Offers less range but greater throughput than the 2 Mbps Only option	11 Mb Only	Offers the greatest throughput but the lowest range
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1 Mb Only	Offers the greatest range but the lowest throughput												
2 Mb Only	Offers less range but greater throughput than the 1 Mbps Only option												
5.5 Mb Only	Offers less range but greater throughput than the 2 Mbps Only option												
11 Mb Only	Offers the greatest throughput but the lowest range												

Table 5-1 Client Adapter Configuration 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: Max (the maximum level programmed into the client adapter and allowed by your country's regulatory agency)								
	<table border="1"> <thead> <tr> <th>Power Levels</th> <th>Client Adapter Type</th> </tr> </thead> <tbody> <tr> <td>Max, 100 mW, 50 mW, 30 mW, 20 mW, 5 mW, or 1 mW</td> <td>350 series PC and LM cards</td> </tr> <tr> <td>Max, 30 mW, or 1 mW</td> <td>340 series PC cards</td> </tr> <tr> <td>Max, 30 mW, 15 mW, 5 mW, or 1 mW</td> <td>340 series LM cards</td> </tr> </tbody> </table>	Power Levels	Client Adapter Type	Max, 100 mW, 50 mW, 30 mW, 20 mW, 5 mW, or 1 mW	350 series PC and LM cards	Max, 30 mW, or 1 mW	340 series PC cards	Max, 30 mW, 15 mW, 5 mW, or 1 mW	340 series LM cards
	Power Levels	Client Adapter Type							
	Max, 100 mW, 50 mW, 30 mW, 20 mW, 5 mW, or 1 mW	350 series PC and LM cards							
	Max, 30 mW, or 1 mW	340 series PC cards							
Max, 30 mW, 15 mW, 5 mW, or 1 mW	340 series LM cards								
Note Reducing the transmit power level conserves battery power but decreases radio range.									
Note If the client adapter is running, ACU queries the adapter and displays the settings programmed into the adapter. If the client adapter is not running, ACU displays power level options based on the last known radio type.									
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.									
Offline Channel Scan	Causes the client adapter to periodically scan for a better access point with the same SSID if the signal strength falls below 50%. Options: Enabled or Disabled Default: Enabled								

Table 5-1 Client Adapter Configuration Parameters (continued)

Parameter	Description
WEP	<p>Specifies the type of wired equivalent privacy (WEP) that your client adapter will use.</p> <p>Options: No WEP, Static WEP Keys, or Dynamic WEP Keys</p> <p>Default: No WEP</p>
WEP	Description
No WEP	Disables WEP for your client adapter.
Static WEP Keys	<p>Enables static WEP for your client adapter after you enter a valid WEP key.</p> <p>Note Go to Step 3 for instructions on entering a static WEP key and enabling WEP.</p>
Dynamic WEP Keys	<p>Enables WEP keys to be derived automatically during EAP authentication.</p> <p>If you set the Network Security Type to LEAP, Dynamic WEP Keys is set automatically. If you set the Network Security Type to Host Based EAP, you must set the WEP parameter to Dynamic WEP Keys.</p> <p>Note Go to Step 3 for instructions on setting dynamic WEP keys.</p>
Network Security Type	<p>Specifies the type of 802.1X authentication that your client adapter will use.</p> <p>Options: None, LEAP, or Host Based EAP</p> <p>Default: None</p>
Network Security Type	Description
None	Disables 802.1X authentication for your client adapter.
LEAP	<p>Enables LEAP authentication for your client adapter.</p> <p>Note Go to Step 3 for instructions on using LEAP.</p>
Host Based EAP	<p>Enables your client adapter to use any 802.1X authentication type for which your operating system has support (such as EAP-TLS or PEAP).</p> <p>Note Go to Step 3 for instructions on enabling and using host-based EAP.</p>

Table 5-1 Client Adapter Configuration Parameters (continued)

Parameter	Description
User Name	If you are planning to use saved LEAP credentials rather than entering them in WLM, this parameter specifies the username that is to be saved and used automatically for LEAP authentication. This parameter is unavailable if the Network Security Type is not set to LEAP. Note Go to Step 3 for instructions on entering the LEAP username.
User Password	If you are planning to use saved LEAP credentials rather than entering them in WLM, this parameter specifies the password that is to be saved and used automatically for LEAP authentication. This parameter is unavailable if the Network Security Type is not set to LEAP. Note Go to Step 3 for instructions on entering the LEAP password.
User Domain	If you are planning to use saved LEAP credentials rather than entering them in WLM, this parameter specifies the domain name (if required) that is to be saved and used automatically for LEAP authentication. This parameter is unavailable if the Network Security Type is not set to LEAP. Note Go to Step 3 for instructions on entering the LEAP domain name.

- Step 3** If you plan to use any of the security features (static WEP, LEAP, EAP-TLS, or PEAP), read the [“Overview of Security Features”](#) section below and follow the instructions for the security feature you want to activate.
- Step 4** Tap **OK** on the Properties screen to save any changes you have made. If the profile you just edited is the active profile and your client adapter is inserted, the changes are applied immediately.

Overview of Security Features

When you use your client adapter with Windows CE, 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 [“Dynamic WEP Keys with EAP”](#) 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 5-11 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; however, you do not need to re-enter them each time the client adapter is inserted or the Windows CE device is reset. This is because the keys are stored (in an encrypted format for security reasons) in the registry of the Windows CE 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 ACU Properties 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 5-14](#) for instructions.

Dynamic WEP Keys with EAP

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 CE devices:

- **EAP-Cisco Wireless (or LEAP)**—Support for LEAP is provided not in the Windows CE 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 in ACU, and either a saved LEAP username and password are entered in ACU or a temporary LEAP username and password are entered in WLM. The username and password are used by the client adapter to perform mutual authentication with the RADIUS server through the access point. The temporary LEAP username and password are stored in the client adapter's volatile memory and need to be re-entered whenever a LEAP profile is selected, the client adapter is ejected and reinserted, or the Windows CE device is reset.

- **Host Based EAP**—Selecting this option enables you to use any 802.1X authentication type for which your Windows CE device has support. Currently only PPC 2002 devices with the 802.1X backend support EAP-TLS and PEAP authentication.
 - **EAP-TLS**—EAP-TLS is enabled or disabled through the Authentication Manager and uses a dynamic session-based WEP key, which is derived from the client adapter and RADIUS server, to encrypt data. EAP-TLS requires the use of certificates for authentication.

RADIUS servers that support EAP-TLS include Cisco Secure ACS version 3.0 or greater and Cisco Access Registrar version 1.8 or greater.
 - **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 instead of a client certificate for authentication. PEAP is enabled or disabled through the Authentication Manager and uses a dynamic

session-based WEP key, which is derived from the client adapter and RADIUS server, to encrypt data. PEAP requires you to enter your username and password in order to start the authentication process and gain access to the network.

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

When you enable Network-EAP or Require EAP on your access point and configure your client adapter for LEAP, EAP-TLS, or PEAP, 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 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) or certificate (EAP-TLS) being the shared secret for authentication. The password 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 “Using LEAP” section on page 5-16 for instructions on enabling LEAP or to the “Using Host-Based EAP” section on page 5-17 for instructions on enabling EAP-TLS or PEAP.



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 firmware version 5.02.19 or greater and driver version 2.30 or greater. However, they must be enabled on the access point.



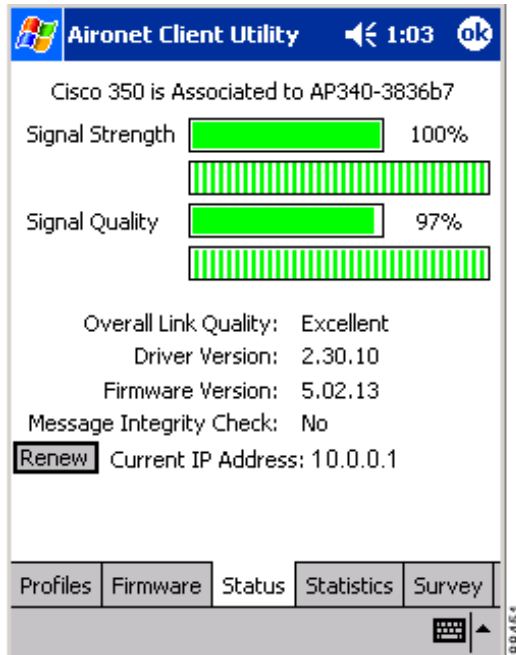
Note Access point firmware version 11.10T or greater is required to enable these security features. Refer to the software configuration guide for your access point for instructions on enabling these features.

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. MIC adds a few bytes to each packet to make the packets tamper-proof.

The ACU Status screen indicates if MIC is supported by the client adapter's driver and is enabled on the access point. See [Figure 5-2](#).

Figure 5-2 ACU Status Screen



Note If you enable MIC on the access point, your client adapter's driver must support MIC; 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 TKIP; 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, or PEAP authentication can associate to the access point. Client devices using static WEP (with open or shared key authentication) cannot associate.

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 5-2](#) 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 software configuration guide for your access point for instructions on enabling any of these features on the access point.

Table 5-2 Client and Access Point Security Settings

Security Feature	Client Setting	Access Point Setting
Static WEP with open authentication	Create a WEP key and enable 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 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	Enable Host Based EAP and Dynamic WEP Keys in ACU and select TLS as the EAP Type in the Authentication Manager	Set up and enable WEP and enable Network-EAP
PEAP authentication	Enable Host Based EAP and Dynamic WEP Keys in ACU and select Cisco PEAP (or PEAP) as the EAP Type in the Authentication Manager	Set up and enable WEP and enable Network-EAP
MIC	Use driver version 2.30 or greater	Set up and enable WEP with full encryption, set MIC to MMH, and set Use Aironet Extensions to Yes
TKIP	Use firmware version 5.02.19 or greater	Set up and enable WEP, set TKIP to Cisco, and set Use Aironet Extensions to Yes
Broadcast key rotation	Use firmware version 5.02.19 or greater and enable LEAP, EAP-TLS, or PEAP	Set up and enable WEP and set Broadcast WEP Key Rotation Interval to any value other than zero (0)

Using Static WEP

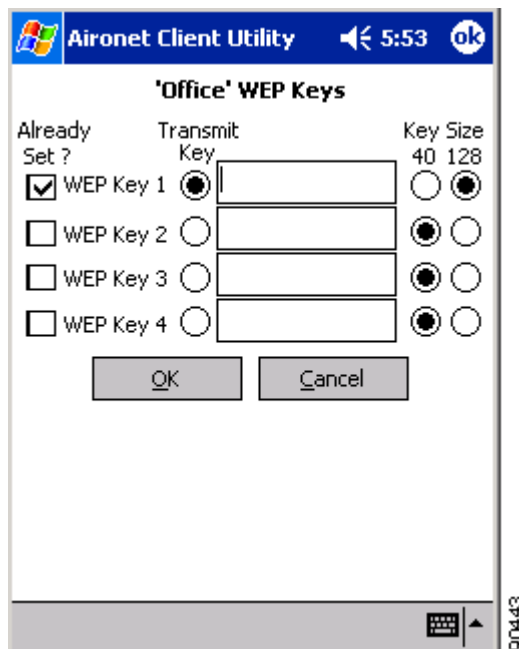
This section provides instructions for entering new static WEP keys or overwriting existing static WEP keys.

Enabling Static WEP and Entering a New Static WEP Key

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


- Step 1 From the Properties screen, select **Network Security Type** under Property and **None** from the list of options in the Value box.
- Step 2 Select **WEP** under Property and **Static WEP Keys** from the list of options in the Value box.
- Step 3 Tap the **WEP Keys** button. The WEP Keys screen appears (see [Figure 5-3](#)).

Figure 5-3 WEP Keys Screen




This screen allows you to create up to four static WEP keys.

- Step 4 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 grayed out, and you are unable to select it.

- Step 5** 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 can consist of the following hexadecimal characters: 0-9, A-F, and a-f.
 - WEP keys must contain the following number of characters:
 - 10 hexadecimal characters for 40-bit keys
Example: 12345abcde
 - 26 hexadecimal characters for 128-bit keys
Example: AB34CD78EFab01cd23ef456789
 - 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 6** Tap 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 7** Tap **OK** to write your WEP key(s) to the client adapter's volatile memory and the registry of the Windows CE device or tap **Cancel** to exit the WEP Keys screen without updating the keys.
- Step 8** Tap **OK** to save your changes.

Overwriting an Existing Static WEP Key

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

- Step 1** From the Properties screen, tap the **WEP Keys** button. The WEP Keys screen appears (see [Figure 5-3](#)). A check mark 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. Also, you can write over existing keys, but you cannot edit or delete them.
- Step 2** Decide which existing static WEP key you want to overwrite.
- Step 3** Tap within the blank field of that key.
- Step 4** Enter a new key, following the guidelines outlined in [Step 5](#) of the “[Enabling Static WEP and Entering a New Static WEP Key](#)” section on page 5-14.

- 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** Tap **OK** to write your new static WEP key to the client adapter's volatile memory and the registry of the Windows CE device or tap **Cancel** to exit the WEP Keys screen without overwriting any keys.
- Step 7** Tap **OK** to save your changes.
-

Disabling Static WEP

Follow the steps below if you ever need to disable static WEP.



Note

Selecting LEAP for the Network Security Type disables static WEP automatically.

- Step 1** Double-tap the **ACU** icon or select **Start > Programs > Cisco > ACU**. The Profiles screen appears.
- Step 2** Select the profile that you want to change from the Manage Profiles box and tap the **Edit** button.
- Step 3** Select **WEP** under Property and **No WEP** from the list of options in the Value box.
- Step 4** Tap **OK** to save your changes.
-

Using LEAP

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

- Client adapters must support WEP, and firmware version 5.02.19 or greater is recommended.
- 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).
- All necessary infrastructure devices (for example, access points, servers, etc.) must be properly configured for LEAP authentication.

Enabling LEAP

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

- Step 1** From the Properties screen, select **Network Security Type** under Property and **LEAP** from the list of options in the Value box. When LEAP is enabled, the following parameters on the Properties screen are changed automatically:
- WEP is set to Dynamic WEP Keys.
 - Authentication Type is set to Open.

- Step 2** Perform one of the following:
- If you want to use a temporary username and password (which must be entered whenever a LEAP profile is selected, the client adapter is ejected and reinserted, or the Windows CE device is reset in order to authenticate and gain access to the network), go to [Step 3](#).
 - If you want to use a saved username and password (which do not need to be entered whenever a LEAP profile is selected, the client adapter is ejected and reinserted, or the Windows CE device is reset because authentication occurs automatically as needed using your saved credentials), enter your LEAP username, password, and optional domain name in the User Name, User Password, and User Domain edit boxes.
- Step 3** Tap **OK** to enable LEAP.
- Step 4** Refer to the [“Using LEAP” section on page 6-2](#) for instructions on authenticating using LEAP.
-

Disabling LEAP

Follow the steps below if you ever need to disable LEAP for a particular profile.

- Step 1** Double-tap the **ACU** icon or select **Start > Programs > Cisco > ACU**. The Profiles screen appears.
- Step 2** Select the profile that you want to change from the Manage Profiles box and tap the **Edit** button.
- Step 3** Select **Network Security Type** under Property and **None** from the list of options in the Value box.
- Step 4** Tap **OK** to save your changes.
-

Using Host-Based EAP

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

- The Windows CE device must be a PPC 2002 device.



Note Support for EAP-TLS and PEAP authentication will be available for Windows CE .NET devices in a future release.

- Client adapters must support WEP, and firmware version 5.02.19 or greater is recommended.
- 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).
- 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.

Obtaining CA and User Certificates

EAP-TLS and PEAP authentication require the use of certificates. EAP-TLS requires both a Certificate Authority (CA) certificate and a user certificate while PEAP requires only a CA certificate. After you import the necessary certificates, you should not have to repeat this procedure until the certificates expire (at a time that is predetermined by the certificate server).



Note [Chapter 8](#) provides instructions for viewing and removing certificates, if necessary.

If you have not yet obtained a CA certificate (for EAP-TLS or PEAP) and a user certificate (for EAP-TLS), follow the steps below.

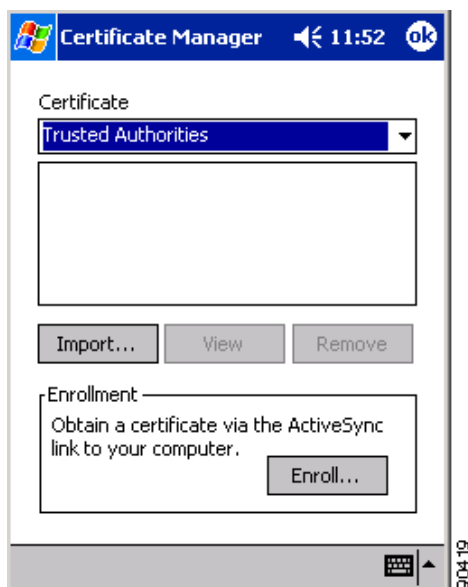
- Step 1 Obtain the certificate file(s) (*.cer or *.crt) from your system administrator.
- Step 2 Establish an ActiveSync connection between your laptop or PC and your Windows CE device.
- Step 3 Open **Windows Explorer** on your laptop or PC.
- Step 4 Copy the certificate file(s) and paste them into a folder under **My Computer > Mobile Device**.
- Step 5 Follow the steps in the “[Obtaining a CA Certificate](#)” section below and the “[Obtaining a User Certificate](#)” section on page 5-19 to import the certificate file(s) for your Windows CE device.

Obtaining a CA Certificate

If you are planning to use EAP-TLS or PEAP authentication on a PPC 2002 device, follow the steps below to import the CA certificate.

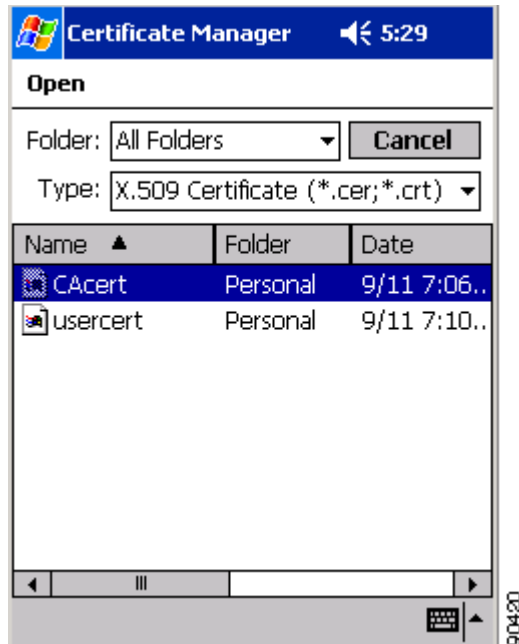
- Step 1 Select **Start > Programs > Cisco > CertMgr**. The Certificate Manager screen appears (see [Figure 5-4](#)).

Figure 5-4 Certificate Manager Screen



- Step 2 Make sure **Trusted Authorities** appears in the Certificate drop-down menu.
- Step 3 Tap the **Import** button.
- Step 4 The Certificate Manager Open screen appears (see [Figure 5-5](#)).

Figure 5-5 Certificate Manager Open Screen



- Step 5 Tap the CA certificate file.
- Step 6 The Certificate Manager screen reappears with the name of the CA certificate server listed in the middle of the screen.
- Step 7 Tap **OK** to close the Certificate Manager.

Obtaining a User Certificate

If you are planning to use EAP-TLS authentication on a PPC 2002 device, follow the steps below to import the user certificate.



Note

As an alternative to the procedure below, you can use the Certificate Manager to import a user certificate. To do so, follow the steps in the “[Obtaining a CA Certificate](#)” section above, but make sure My Certificates (not Trusted Authorities) appears in the Certificate drop-down menu in [Step 2](#) and tap the user certificate file (not the CA certificate file) in [Step 5](#).

- Step 1 Make sure that your Windows CE device has an ActiveSync link to a laptop or PC that is on the same network as the certificate server you want to use.
- Step 2 Select **Start > Programs > Cisco > Enroll**. The Certificate Enrollment screen appears (see [Figure 5-6](#)).

Figure 5-6 Certificate Enrollment Screen



- Step 3** Enter your username, password, and server name for your certificate server, which can be obtained from your system administrator, in the appropriate fields.
- Step 4** Tap the **Enroll** button. The box at the bottom of the screen indicates the status of the certificate enrollment by changing from *Ready* to *Processing*.
- If the operation is successful, the following message appears: “A certificate has been added to your device.”
- Step 5** Tap **OK** to close the Certificate Enrollment screen.

Enabling Host-Based EAP

Follow the steps below to enable host-based EAP authentication (EAP-TLS or PEAP) for this profile on a PPC 2002 device.



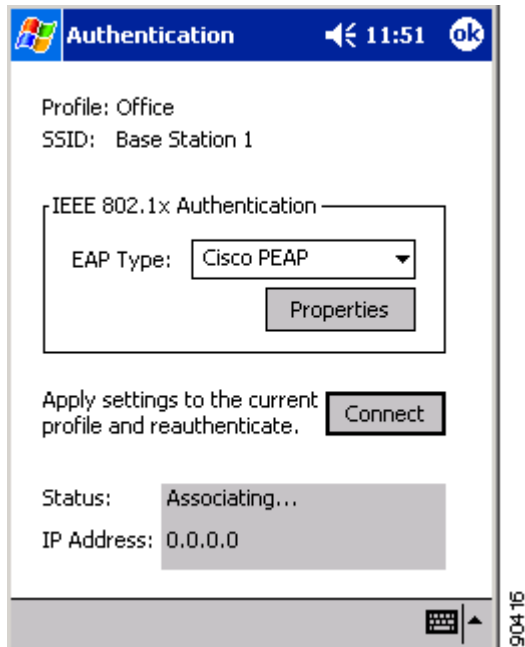
Note

Because EAP-TLS and PEAP authentication are not enabled 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 the Authentication Manager. In addition, only one authentication type can be set 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 the authentication type in the Authentication Manager after switching profiles in ACU.

- Step 1** From the Properties screen, select **Network Security Type** under Property and **Host Based EAP** from the list of options in the Value box.
- Step 2** Select **WEP** under Property and **Dynamic WEP Keys** from the list of options in the Value box.

- Step 3** Tap **OK** to save your changes.
- Step 4** Select **Start > Programs > Cisco > AuthMgr**. The Authentication screen appears (see [Figure 5-7](#)).

Figure 5-7 Authentication Screen



- Step 5** 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 5-22.

Enabling EAP-TLS

Follow the steps below to enable EAP-TLS for this profile.

- Step 1** For EAP Type, select **TLS**.
- Step 2** If your Windows CE device has more than one user certificate, tap the **Properties** button. On the Select Certificate screen, select the user certificate that you want to use and tap **OK**.
- Step 3** The configuration is complete. Tap the **Connect** button on the Authentication screen to start the EAP authentication process.



Note Any time you make a change to the active profile in ACU or the Authentication Manager, you must tap the **Connect** button on the Authentication screen to start the authentication process.

- Step 4** Refer to the [“Using EAP-TLS”](#) section on page 6-4 for instructions on authenticating using EAP-TLS.

Enabling PEAP

Follow the steps below to enable PEAP for this profile.

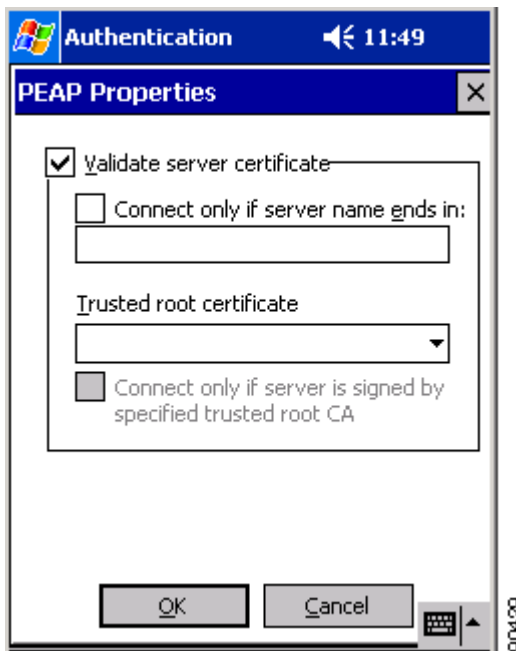
- Step 1** For EAP Type, select **Cisco PEAP** or **PEAP**. If you select Cisco PEAP, go to [Step 2](#). If you select PEAP, go to [Step 8](#).



Note **PEAP** appears as an EAP Type option on a PPC 2002 device if the Microsoft PEAP supplicant (rather than the Cisco PEAP supplicant) was installed.

- Step 2** Tap the **Properties** button. The PEAP Properties screen appears (see [Figure 5-8](#)).

Figure 5-8 PEAP Properties Screen



- Step 3** Make sure that the **Validate server certificate** check box is checked 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 in** 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 field. If necessary, tap 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** Tap **OK** to save your settings. The configuration is complete.

- Step 8** Tap the **Connect** button on the Authentication screen to start the EAP authentication process.



Note Any time you make a change to the active profile in ACU or the Authentication Manager, you must tap the **Connect** button on the Authentication screen to start the authentication process.

- Step 9** Refer to the [“Using PEAP” section on page 6-6](#) for instructions on authenticating using PEAP.
-

Disabling Host-Based EAP

Follow the steps below if you ever need to disable host-based EAP (EAP-TLS or PEAP) for a particular profile on a PPC 2002 device.

-
- Step 1** Double-tap the **ACU** icon or select **Start > Programs > Cisco > ACU**. The Profiles screen appears.
- Step 2** Select the profile that you want to change from the Manage Profiles box and tap the **Edit** button.
- Step 3** Select **Network Security Type** under Property and **None** from the list of options in the Value box.
- Step 4** Tap **OK** to save your changes.
-



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, page 6-2](#)
- [Using LEAP, page 6-2](#)
- [Using EAP-TLS, page 6-4](#)
- [Using PEAP, page 6-6](#)

Overview

This chapter explains the sequence of events that occurs as soon as you select a profile that uses EAP authentication as well as after you eject and reinsert the client adapter, reset the Windows CE device, or are informed that your username and password have expired. The chapter contains three sections based on the profile's authentication type:

- Using LEAP, see below
- Using EAP-TLS, [page 6-4](#)
- Using PEAP, [page 6-6](#)

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

**Note**

If any error messages appear during authentication, refer to [Chapter 9](#) for explanations and recommended actions.

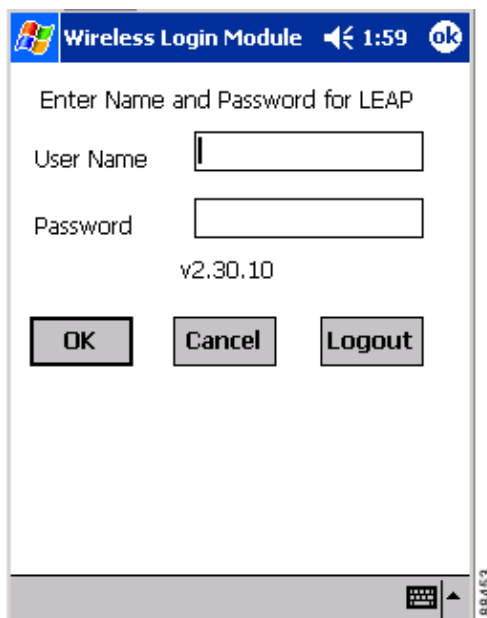
Using LEAP

With a Temporary Username and Password

After you select a profile that uses LEAP authentication (with a temporary username and password) or you eject and reinsert the client adapter or reset your Windows CE device while this profile is selected, follow the steps below to LEAP authenticate.

- Step 1 The Wireless Login Module screen appears (see [Figure 6-1](#)).

Figure 6-1 Wireless Login Module Screen





Note You can also start WLM by selecting **Start > Programs > Cisco > Wireless Login Module**. You may want to do this if you inadvertently exited WLM after it started or if you roam to a different part of the network where a different login is required.

Step 2 Obtain your LEAP username and password from your system administrator.



Note The password is optional because not all host accounts on the RADIUS server are set up with a password.

Step 3 Enter your LEAP username in the User Name field.



Note Usernames and passwords are case sensitive and can contain up to 32 alphanumeric characters.



Note If you are using a PPC 2002 device and your RADIUS server account specifies a domain, enter the domain name before the username and separate the two with a forward slash (for example, *domain/username*).

Step 4 Enter your LEAP password in the Password field if your RADIUS server account was set up with a password.



Note For security reasons, the characters entered for the password are displayed as asterisks.

Step 5 Tap **OK**. If the username and password were entered correctly, they are written to volatile memory on the client adapter. The username and password remain on the client adapter until a different profile is selected, the client adapter is ejected and reinserted, or the Windows CE device is reset.



Note If you want to terminate the LEAP session, tap the **Logout** button. If you want to exit WLM, tap the **Cancel** button.

Step 6 One of three scenarios occurs:

1. The client adapter authenticates to the RADIUS server using your username and password and receives a dynamic, session-based WEP key. The ACU Profiles screen indicates if your client adapter is authenticated to an access point.
 2. If you enter the username or password incorrectly or enter ones that are not valid for the RADIUS server on the network, the Wireless Login Module screen reappears with a message indicating that your login was incorrect. You are able to retry immediately by re-entering the username and password.
 3. The client adapter times out while trying to authenticate, possibly because it is out of range of an access point. After 30 seconds, a message appears indicating that the authentication attempt timed out and that you need to rerun WLM.
-

With a Saved Username and Password

After you select a profile that uses LEAP authentication (with a saved username and password) or you eject and reinsert the client adapter or reset your Windows CE device while this profile is selected, the client adapter should LEAP authenticate automatically. The ACU Profiles screen indicates if your client adapter is authenticated to an access point.



Note If you entered your username or password incorrectly in the ACU Properties screen or entered ones that are not valid for the RADIUS server on the network, the Wireless Login Module screen appears with a message indicating that your login was incorrect. Tap **Cancel**; then change your username or password on the ACU Properties screen and tap **OK**.



Note If you want to log out of a LEAP session, select **Start > Programs > Cisco > Wireless Login Module** and tap the **Logout** button on the Wireless Login Module screen.

Using EAP-TLS

After you select a profile that uses host-based EAP authentication and configure the card for EAP-TLS, follow the steps below to EAP authenticate.



Note These instructions are applicable after profile selection, card ejection and reinsertion, or reset.

Step 1 If a message appears informing you that you need to accept a certificate to begin the EAP authentication process, tap the message and follow the instructions provided to accept the certificate.



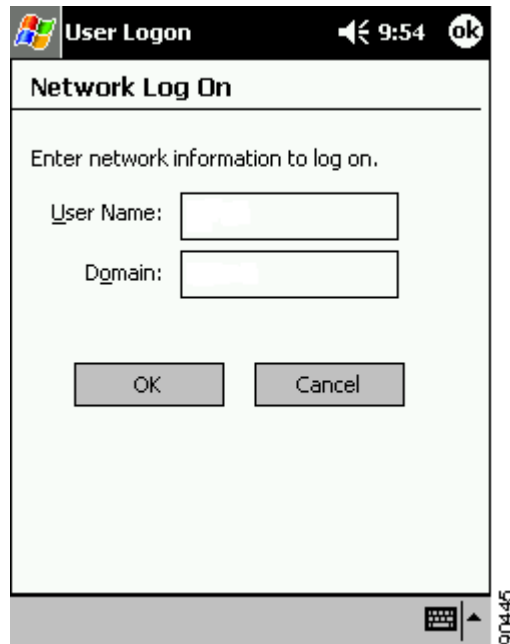
Note You should not have to accept a certificate for future authentication attempts. After you accept one, the same certificate is used subsequently.

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

Step 4 The User Logon screen appears (see [Figure 6-2](#)).

Figure 6-2 User Logon Screen



- Step 5** Enter your EAP-TLS username and optional domain name (which are registered with the RADIUS server) in the appropriate fields. For example, if your EAP-TLS username is *jsmith* and the domain name is *corporate*, you would enter **jsmith** in the User Name field and **corporate** in the Domain field.



Note If your network uses a Cisco Secure ACS server, you must leave the Domain field blank and enter the fully qualified domain name in the User Name field as follows: *username@fully.qualified.domain*. For example, if your EAP-TLS username is *jsmith* and the domain name is *corporate on Cisco.com*, you would enter **jsmith@corporate.cisco.com** in the User Name field and leave the Domain field blank.

- Step 6** Tap **OK**. The client adapter should now EAP authenticate. To verify authentication, select **Start > Programs > Cisco > AuthMgr**. The Status field at the bottom of the screen shows the authentication status. If the authentication is successful, the Status field displays *Authenticated*, and the IP Address field displays the IP address of the client adapter.

Using PEAP

After Profile Selection, Card Insertion, or Reset

After you select a profile that uses host-based EAP authentication and configure the card for PEAP, follow the steps below to EAP authenticate.


Note

These instructions are applicable for use with Windows NT or 2000 domain, LDAP, or OTP user databases after profile selection, card ejection and reinsertion, or reset.

- Step 1** If a message appears informing you that you need to select a certificate or other credentials to access the network, tap 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, tap **OK** to accept the connection. Otherwise, tap **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, tap **OK** to accept the connection. Otherwise, tap **Cancel**.
- Step 4** The Static Password screen appears (see [Figure 6-3](#)).


Note

If a message appears prompting you to process your logon information for your wireless network, tap this message. Then the Static Password screen appears.

Figure 6-3 Static Password Screen

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

Step 6 If applicable, enter your domain name in the Domain field.



Note A domain name is not required for OTP databases.

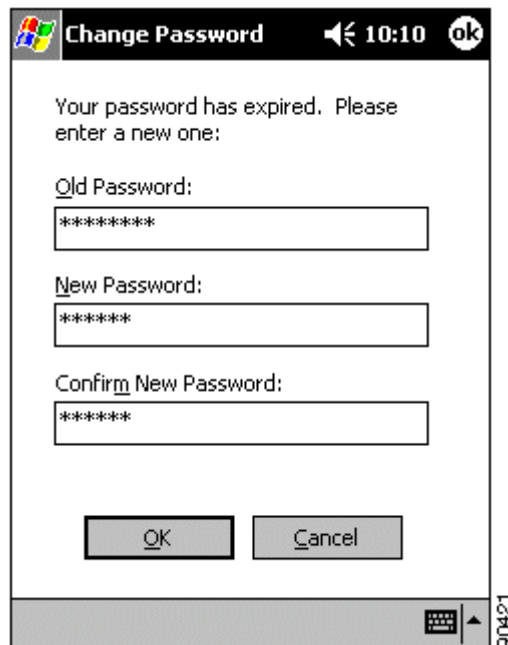
Step 7 Tap **OK**. The client adapter should now EAP authenticate. To verify authentication, select **Start > Programs > Cisco > AuthMgr**. The Status field at the bottom of the screen shows the authentication status. If the authentication is successful, the Status field displays *Authenticated*, and the IP Address field displays the IP address of the client adapter.

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 username expires, follow the steps below to change your password.

Step 1 When the Change Password screen appears (see [Figure 6-4](#)) to indicate that your password has expired, enter your old password in the Old Password field.

Figure 6-4 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 Tap **OK**. The client adapter should authenticate using your new password.



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, page 7-2](#)
- [Setting Signal Strength Display Units, page 7-2](#)
- [Viewing the Status of Your Client Adapter, page 7-3](#)
- [Viewing Statistics for Your Client Adapter, page 7-5](#)

Overview of ACU Diagnostic Tools

The ACU diagnostic tools enable you to assess the performance of your client adapter within the wireless network. These tools perform the following functions:

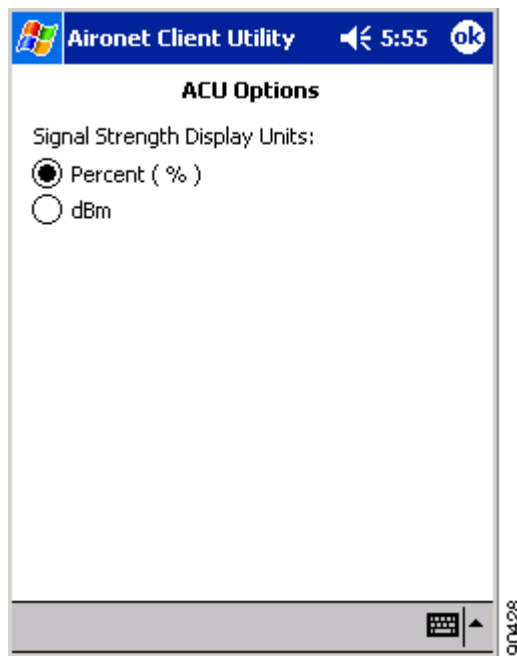
- Display your client adapter's current status
- Display statistics pertaining to your client adapter's transmission and reception of data

Setting Signal Strength Display Units

Follow the steps below to specify the units used to display signal strength on the ACU Status screen.

-
- Step 1** Double-tap the **ACU** icon or select **Start > Programs > Cisco > ACU**. The Profiles screen appears.
- Step 2** Tap the **Options** button. The ACU Options screen appears (see [Figure 7-1](#)).

Figure 7-1 ACU Options Screen



- Step 3** Select one of the following options for Signal Strength Display Units:
- **Percent (%)**—Displays the signal strength as a percentage. This is the default setting.
 - **dBm**—Displays the signal strength in decibels with respect to milliwatts.
- Step 4** Tap **OK** to save your changes.
-

Viewing the Status of Your Client Adapter

Follow the steps below to view the current status of your client adapter.

- Step 1** From the Profiles screen, tap the **Status** tab. 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 same screen with the signal strength values displayed in decibels with respect to milliwatts (dBm).

Figure 7-2 Status Screen (with Signal Strength as a Percentage)

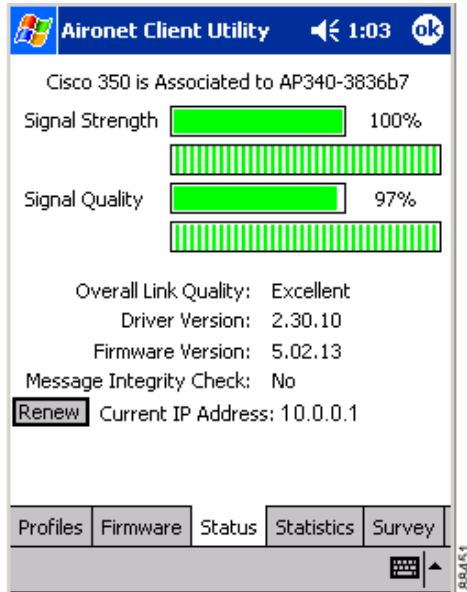


Figure 7-3 Status Screen (with Signal Strength in dBm)

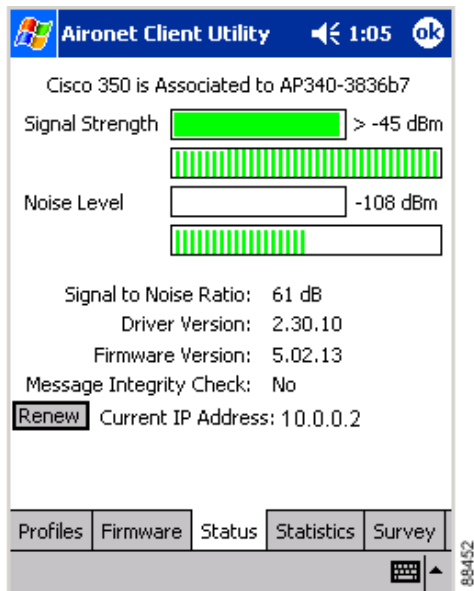


Table 7-1 interprets each element of the Status screen.

Table 7-1 Client Adapter Status

Status	Description
The first line of the Status screen	<p>Indicates the operational mode of your client adapter and the name or MAC address of any associated access point.</p> <p>Value: Not Associated, Associated, Authenticated, or Ad Hoc Mode</p> <p>Note The access point name or MAC address is shown only if the client adapter is in infrastructure mode and Aironet Extensions are enabled (on access points running Cisco IOS release 12.2(4)JA or greater).</p>
Signal Strength	<p>The signal strength for all received packets. The higher the value and the more green the bar graph is, the stronger the signal.</p> <p>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).</p> <p>Range: 0 to 100% or -95 to -45 dBm</p>
Signal Quality	<p>The signal quality for all received packets. The higher the value and the more green the bar graph is, the clearer the signal.</p> <p>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).</p> <p>Range: 0 to 100%</p> <p>Note This setting appears only if you selected signal strength to be displayed as a percentage. See the “Setting Signal Strength Display Units” section on page 7-2 for information.</p>
Noise Level	<p>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.</p> <p>Range: -100 to -45 dBm</p> <p>Note This setting appears only if you selected signal strength to be displayed in dBm. See the “Setting Signal Strength Display Units” section on page 7-2 for information.</p>
Overall Link Quality	<p>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.</p> <p>Value: Not Associated, Poor, Fair, Good, Excellent</p> <p>Note This setting appears only if you selected signal strength to be displayed as a percentage. See the “Setting Signal Strength Display Units” section on page 7-2 for information.</p>

Table 7-1 Client Adapter Status (continued)

Status	Description
Signal to Noise Ratio	<p>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.</p> <p>Range: 0 to 90 dB</p> <p>Note This setting appears only if you selected signal strength to be displayed in dBm. See the "Setting Signal Strength Display Units" section on page 7-2 for information.</p>
Driver Version	The version of the client adapter driver that is installed on your Windows CE device.
Firmware Version	The version of the firmware that is currently running on your client adapter.
Message Integrity Check	<p>Indicates whether your client adapter is using message integrity check (MIC) to protect packets sent to and received from the access point.</p> <p>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.</p> <p>Note MIC is supported automatically by the client adapter's driver, but it must be enabled on the access point.</p> <p>Value: Yes or No</p>
Current IP Address	<p>The IP address of the client adapter. If your Windows CE device is set up to obtain an IP address from a DHCP server, you can press the Renew button to initiate a release and renew of the IP address.</p> <p>Note This parameter and the Renew button appear only on PPC 2002, HPC 2000, and CE .NET devices.</p>

Step 2 Tap **OK** to exit the Status screen.

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. It also shows message integrity check (MIC) statistics if your client adapter's driver supports MIC and MIC is enabled on the access point.



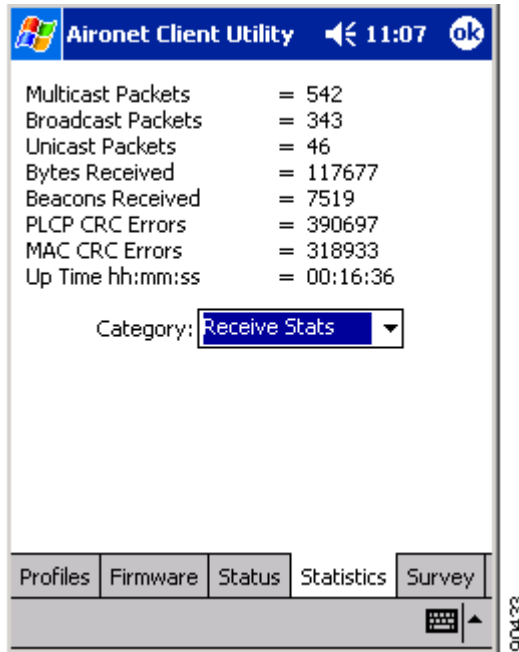
Note

The receive and transmit statistics are host statistics. That is, they show packets and errors received or sent by the Windows CE device. Link status tests from the access point or ACU site survey tool are performed at the firmware level; therefore, they have no effect on the statistics shown by the Statistics screen.

Follow the steps below to view your client adapter's statistics.

- Step 1** From the Profiles screen, tap the **Statistics** tab. The Receive Statistics screen appears (see [Figure 7-4](#)).

Figure 7-4 Receive Statistics Screen



The statistics are calculated as soon as your client adapter is started.

[Table 7-2](#) describes each receive statistic that is displayed for your client adapter.

Table 7-2 Receive Statistics

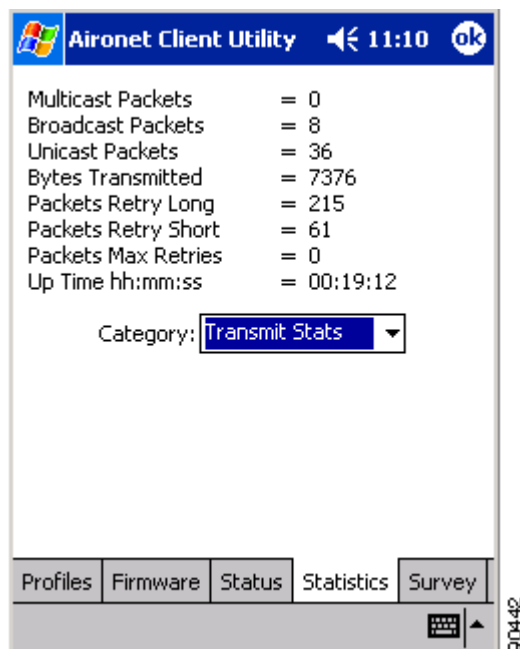
Statistic	Description
Multicast Packets	The number of multicast packets that were received successfully.
Broadcast Packets	The number of broadcast packets that were received successfully.
Unicast Packets	The number of unicast packets that were received successfully.
Bytes Received	The number of bytes of data that were received successfully.
Beacons Received	The number of beacon packets that were received successfully.
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.

Table 7-2 Receive Statistics (continued)

Statistic	Description
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.
Up Time (hh:mm:ss)	The amount of time (in hours:minutes:seconds) since your client adapter was started. If the client adapter has been running for more than 24 hours, the time is displayed in days, hours:minutes:seconds.

- Step 2** To view the transmit statistics for your client adapter, tap the arrow in the Category drop-down menu and select **Transmit Stats**. The Transmit Statistics screen appears (see [Figure 7-5](#)).

Figure 7-5 Transmit Statistics Screen



[Table 7-3](#) describes each transmit statistic that is displayed for your client adapter.

Table 7-3 Transmit Statistics

Statistic	Description
Multicast Packets	The number of multicast packets that were transmitted successfully.
Broadcast Packets	The number of broadcast packets that were transmitted successfully.
Unicast Packets	The number of unicast packets that were transmitted successfully.
Bytes Transmitted	The number of bytes of data that were transmitted successfully.
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.
Up Time (hh:mm:ss)	The amount of time (in hours:minutes:seconds) since your client adapter was started. If the client adapter has been running for more than 24 hours, the time is displayed in days, hours:minutes:seconds.

Step 3 To view the MIC statistics for your client adapter, tap the arrow in the Category drop-down menu and select **MIC Stats**. The MIC Statistics screen appears (see [Figure 7-6](#)).



Note The MIC Stats option is available only if your client adapter's driver supports MIC and only if MIC is enabled on the access point.

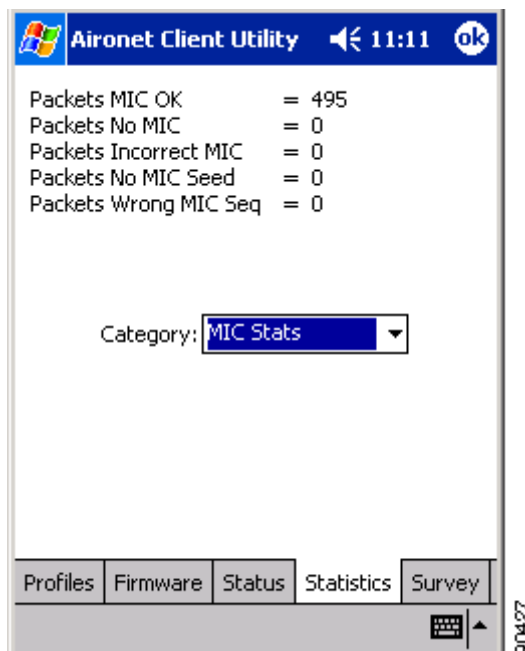
Figure 7-6 MIC Statistics Screen

Table 7-4 describes each MIC statistic that is displayed for your client adapter.

Table 7-4 MIC Statistics

Statistic	Description
Packets MIC OK	The number of packets that were received successfully with a valid MIC.
Packets No MIC	The number of packets that were discarded due to no MIC being found.
Packets Incorrect MIC	The number of packets that were discarded due to an incorrect MIC value.
Packets No MIC Seed	The number of packets that were discarded due to no MIC seed being received.
Packets Wrong MIC Seq	The number of packets that were discarded due to the MIC sequence number being wrong.

Step 4 Tap **OK** to exit the Statistics screen.



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 PC Card, page 8-2](#)
- [Upgrading the Client Adapter Software, page 8-3](#)
- [Client Utility Procedures, page 8-8](#)
- [CA and User Certificate Procedures \(Host-Based EAP Only\), page 8-11](#)
- [Restarting the Client Adapter, page 8-12](#)

Inserting and Removing a PC Card

This section provides instructions for inserting a PC card into or removing a PC card from a Windows CE device.

Inserting a PC Card into a Windows CE Device

Follow the steps below to insert a PC card into a Windows CE device.



Caution

This procedure and the physical connections it describes apply generally to conventional PC card slots. In cases of custom or nonconventional equipment, be alert to possible differences in PC card slot configurations.

Step 1

Before you begin, examine the PC card. One end has a dual-row, 68-pin PC card connector. The card is keyed so it can be inserted only one way into the PC card slot.



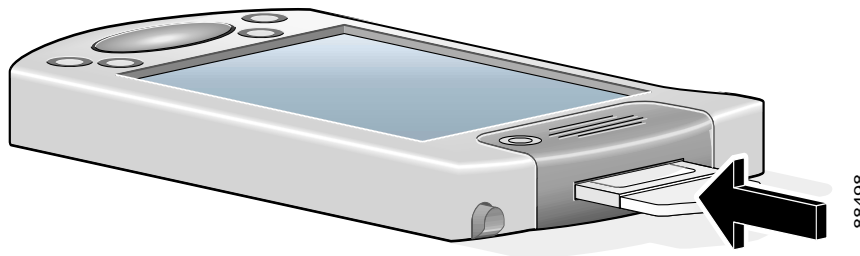
Caution

Do not force the PC card into your computer's PC card slot. Forcing it will damage both the card and the slot. If the PC card does not insert easily, remove the card and reinsert it.

Step 2

Insert the PC card into the PC card slot, applying just enough pressure to make sure it is fully seated (see [Figure 8-1](#)).

Figure 8-1 Inserting a PC Card into a Computing Device



Removing a PC Card from a Windows CE Device

Follow the instructions below whenever you need to remove the PC card from your Windows CE device.

To remove a PC card after it is successfully installed and configured, press the Eject button and pull the card out of the PC card slot. When the PC card is reinserted, your connection to the network should be re-established.

Upgrading the Client Adapter Software

This section provides instructions for the following procedures:

- Upgrading the firmware, see below
- Upgrading the driver and client utilities, [page 8-6](#)

Upgrading the Firmware

The client adapter is shipped with the firmware installed in its Flash memory; however, a more recent version of the firmware may be available from Cisco.com. Cisco recommends using the most current version of radio firmware. Follow the instructions in this section to find the version of your client adapter's firmware and to upgrade it if a more recent version is available from Cisco.com.



Note

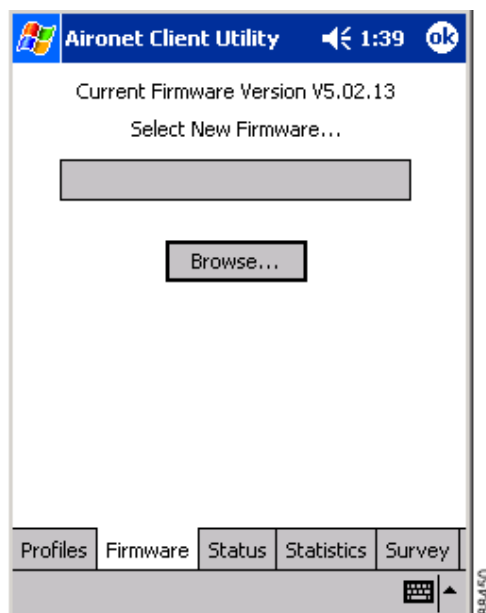
Firmware version 5.02.19 or greater is recommended for use with client adapter driver and utility version 2.30.

Finding the Firmware Version

Follow the steps below to determine if you need to upgrade the client adapter's firmware.

- Step 1** To find the version of firmware that your client adapter is currently using, follow the steps below:
- Double-tap the **ACU** icon or select **Start > Programs > Cisco > ACU**.
 - Tap the **Firmware** tab. The Firmware screen appears (see [Figure 8-2](#)).

Figure 8-2 Firmware Screen



The current version of your client adapter's firmware is shown at the top of the screen, provided a client adapter is inserted in your Windows CE device.

- Step 2** To find the latest firmware version available on Cisco.com, follow the steps below:
- Use your computer's web browser to access the following URL:
<http://www.cisco.com/public/sw-center/sw-wireless.shtml>
 - Select **Option #2: Aironet Wireless Software Display Tables**.
 - Select **Cisco Aironet Wireless LAN Client Adapters**.
 - Find the section for client adapter firmware.
 - Select the link for your client adapter's series (for example, 350 Series).
 - Look at the available filenames for radio firmware. The numbers that follow the "v" indicate the version number. For example, v50219 indicates a firmware version of 5.02.19.
- Step 3** If the firmware available from Cisco.com has a higher number than the firmware currently installed in your client adapter, follow the instructions in the "[Loading New Firmware](#)" section below to upgrade the firmware.
-

Loading New 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 Windows CE device 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.

Follow the instructions below to load new firmware into your client adapter.

- Step 1** Connect your Windows CE device to a laptop or PC running Microsoft ActiveSync. This is typically done using a serial or USB cable.
- A message appears on the Windows CE device indicating that it is connecting to the host. After the Windows CE device is connected, the New Partnership window appears on the laptop or PC. This window asks if you want to set up a partnership.
- Step 2** Perform one of the following:
- If you want to establish a partnership that allows you to synchronize files between the laptop or PC and the Windows CE device, select **Yes**, click **Next**, and follow the instructions on the screen to specify the files to be synchronized and to finish setting up the partnership.
 - If you do not want to synchronize files and want to connect as a "guest," select **No** and click **Next**. The screen indicates that you are connected as a guest.
- Step 3** Use the laptop or PC's web browser to access the following URL:
<http://www.cisco.com/public/sw-center/sw-wireless.shtml>

Step 4 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 9](#).

Step 5 Select **Cisco Aironet Wireless LAN Client Adapters**.

Step 6 Find the section for client adapter firmware.

Step 7 Select the link for your client adapter's series (for example, 350 Series).

Step 8 Select the firmware file for your client adapter.

Step 9 Read and accept the terms and conditions of the Software License Agreement.

Step 10 Select the firmware file to download it.

Step 11 Save the file to a floppy disk or to the hard drive of your laptop or PC.

Step 12 Locate the file using Windows Explorer, double-click it, and extract the image file (*.img) to a folder.

Step 13 In the ActiveSync window on the laptop or PC, click the **Explore** button to view the files on the Windows CE device.

Step 14 Drag and drop the firmware image from Windows Explorer to a location in the ActiveSync window.



Note If your Windows CE device is a PPC running Windows CE 3.0, you must copy the firmware image to the My Documents folder or a folder under My Documents.

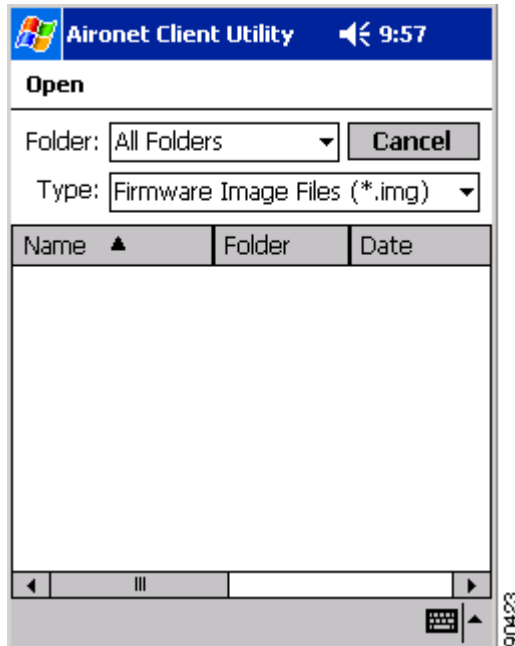
Step 15 After the file is copied, disconnect the Windows CE device.

Step 16 Make sure the client adapter is installed in your Windows CE device and is operational.

Step 17 On your Windows CE device, open ACU and tap the **Firmware** tab. The Firmware screen appears (see [Figure 8-2](#)).

Step 18 Tap the **Browse** button. The Open window appears (see [Figure 8-3](#)).

Figure 8-3 Open Window



Step 19 Perform one of the following:

- If you are using a PPC device, select the folder from the Folder drop-down menu where the new firmware image is located. Then tap the new firmware image file (*.img) in the Name field in the center of the window.
- If you are using an HPC or Windows CE .NET device, locate the new firmware image file (*.img) and select it so that it appears in the Name field at the bottom of the screen.

Step 20 Tap **OK**.



Note If the OK button is unavailable, tap the **Enter** key on the Windows CE device's keyboard.

A progress bar displays as the new firmware is loaded. If the selected image is loaded successfully into the client adapter's Flash memory, a "Firmware Upgrade Complete!" message appears.

Step 21 Tap **OK** to exit the Firmware screen.

Upgrading the Driver and Client Utilities

Follow the instructions in this section to find the versions of your client adapter's driver and client utilities and to upgrade them if more recent versions are available from Cisco.com.



Note The driver, client utilities, and online help files are installed together.

Finding the Driver and Client Utility Versions

Follow the instructions in this section to determine if you need to upgrade the client adapter's driver or client utilities.

-
- Step 1** To find the version of the driver that your client adapter is currently using, follow the steps below:
- Double-tap the **ACU** icon or select **Start > Programs > Cisco > ACU** to open ACU.
 - Tap the **Status** tab. The current version of your client adapter's driver is shown on the Status screen, provided the adapter is installed in the Windows CE device and is operational.
- Step 2** To find the version of ACU or WLM that your client adapter is using, follow the steps below:
- To find the version of ACU, tap the **About** button on the Profiles screen. The About screen displays the current version of ACU.
 - To find the version of WLM, double-tap the **Wireless Login Module** icon or select **Start > Programs > Cisco > Wireless Login Module**. The current version of the utility is shown below the Password field on the Wireless Login Module screen.
- Step 3** To find the latest driver and client utility versions available on Cisco.com, follow the steps below:
- Use your computer's web browser to access the following URL:
<http://www.cisco.com/public/sw-center/sw-wireless.shtml>
 - Select **Option #2: Aironet Wireless Software Display Tables**.
 - Select **Cisco Aironet Wireless LAN Client Adapters**.
 - Find the section for Windows CE client adapter drivers and utilities.
 - Select the link for Windows CE 3.0 or Windows CE .NET, depending on your device's operating system.



Note If you are not sure which version of Windows CE your device is running, refer to the [“Finding the Windows CE Version”](#) section on page 3-2 for instructions.

- Look at the release numbers of the driver and client utilities in the description below the filename. These are the latest available versions on Cisco.com.
- Step 4** If the driver or client utility version available from Cisco.com is greater than the version currently being used by your client adapter, follow the instructions in the [“Uninstalling the Current Driver and Client Utilities”](#) section below to remove the current driver and client utilities and then follow the instructions in the [“Installing the Driver and Client Utilities”](#) section on page 3-2 to install the new driver and client utilities.
-

Uninstalling the Current Driver and Client Utilities

Cisco recommends that you uninstall the existing driver and client utilities for your client adapter before upgrading to more recent versions. Follow the steps below to uninstall your client adapter's current driver and client utilities.

-
- Step 1 Eject the client adapter and remove it from the Windows CE device.
 - Step 2 Select **Start > Settings > System** tab > **Remove Programs** (on a PPC device) or **Start > Settings > Control Panel > Remove Programs** (on an HPC or Windows CE .NET device).
 - Step 3 Select **Cisco Wireless LAN Adapter**.
 - Step 4 Tap the **Remove** button.
 - Step 5 When asked to verify your decision to remove the adapter, tap **Yes**.
 - Step 6 Tap **OK**. The driver, client utilities, registry entries, and Cisco directory are removed.
 - Step 7 Go to the [“Installing the Driver and Client Utilities”](#) section on page 3-2 for instructions on loading a new driver and client utilities.
-

Client Utility Procedures

This section provides instructions for the following procedures:

- Opening a client utility, [page 8-8](#)
- Exiting a client utility, [page 8-8](#)
- Finding the version of a client utility, [page 8-9](#)
- Deleting client utility icons on HPC and Windows CE .NET devices, [page 8-10](#)

Opening a Client Utility

To open ACU on your Windows CE device, double-tap the **ACU** icon or select **Start > Programs > Cisco > ACU**. The Profiles screen appears.

To open WLM on your Windows CE device, double-tap the **Wireless Login Module** icon or select **Start > Programs > Cisco > Wireless Login Module**. The Wireless Login Module screen appears.

Exiting a Client Utility

To exit ACU or WLM, tap **OK**.

Finding the Version of a Client Utility

To find the version of ACU or WLM that your client adapter is currently using, follow the steps below.

- To find the version of ACU, tap the **About** button on the Profiles screen. The About screen appears (see [Figure 8-4](#)).

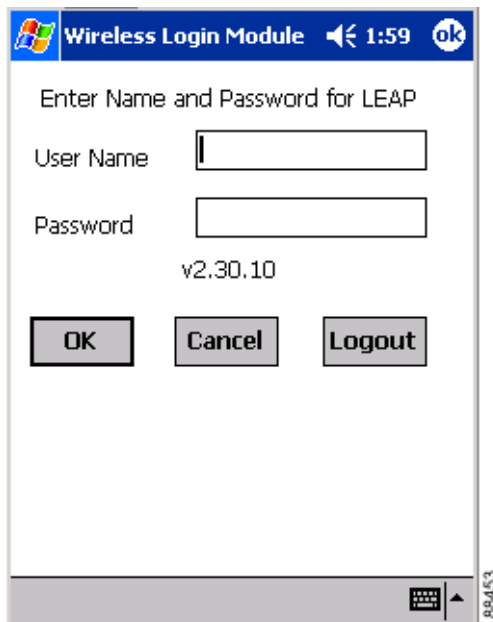
Figure 8-4 About Screen



The About screen displays the current version of ACU.

- To find the version of WLM, double-tap the **Wireless Login Module** icon or select **Start > Programs > Cisco > Wireless Login Module**. The Wireless Login Module screen appears (see Figure 8-5).

Figure 8-5 Wireless Login Module Screen



The Wireless Login Module screen displays the current version of WLM below the Password field.

Deleting Client Utility Icons on HPC and Windows CE .NET Devices

Icons for ACU and WLM are automatically added to the desktop of HPC and Windows CE .NET devices when you install the client utilities. If you wish to remove these icons from your desktop, hold down the **Alt** key and tap the icon. Then tap **Delete** and **Yes** to confirm your decision.



Note

You can also use File Explorer or Windows Explorer to browse to the desktop, select the icon, and delete it.

CA and User Certificate Procedures (Host-Based EAP Only)

Follow the instructions in this section to view or remove CA and user certificates for use with EAP-TLS or PEAP authentication.



Note

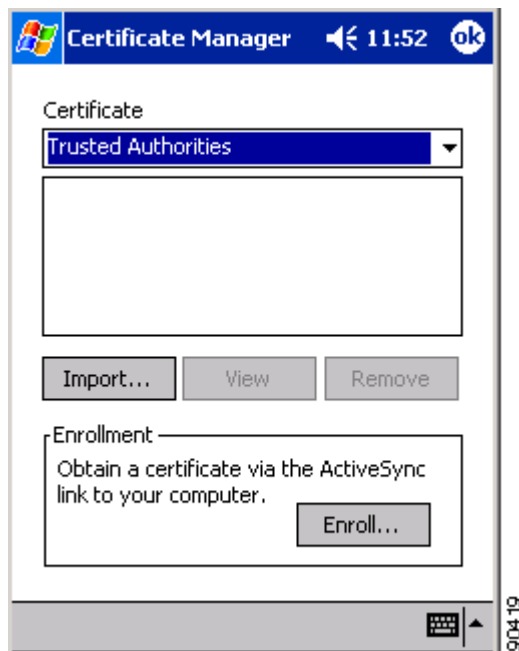
Refer to [Chapter 5](#) for instructions on obtaining CA and user certificates.

Viewing CA and User Certificates

Follow the steps below to view details about the CA and user certificates for your Windows CE device.

- Step 1** Select **Start > Programs > Cisco > CertMgr**. The Certificate Manager screen appears (see [Figure 8-6](#)).

Figure 8-6 Certificate Manager Screen



- Step 2** Select **Trusted Authorities** (if you want to view a CA certificate) or **My Certificates** (if you want to view a user certificate) in the Certificate drop-down menu.
- Step 3** Select the certificate that you want to view.
- Step 4** Tap the **View** button. A screen appears that enables you to access information about the certificate, including its issuer, expiration date, and serial number.

Removing CA and User Certificates

-
- Step 1 Select **Start > Programs > Cisco > CertMgr**. The Certificate Manager screen appears (see [Figure 8-6](#)).
 - Step 2 Select **Trusted Authorities** (if you want to remove a CA certificate) or **My Certificates** (if you want to remove a user certificate) in the Certificate drop-down menu.
 - Step 3 Select the certificate that you want to remove.
 - Step 4 Tap the **Remove** button. The certificate is removed.
-

Restarting the Client Adapter

ACU enables you to restart the client adapter when necessary. For example, you might want to restart the adapter for the following reasons:

- 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 will reassociate to an access point with a stronger signal.
- If you use LEAP and then disable it in ACU, you might want to restart the client adapter to ensure that the adapter stops using the dynamic WEP key assigned during LEAP authentication.

Follow the steps below to restart the client adapter.

-
- Step 1 Go to the ACU Profiles screen.
 - Step 2 Perform one of the following:
 - Change the active profile and then select it again.
 - Select the active profile in the Manage Profiles box, tap the **Edit** button, and tap **OK**.

The driver stops the client adapter's radio, writes the configuration (although no parameter settings have been changed), and restarts the radio.



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, page 9-2](#)
- [Interpreting the Indicator LEDs, page 9-2](#)
- [Troubleshooting the Client Adapter, page 9-3](#)
- [Error Messages, page 9-5](#)
- [Getting Help, page 9-11](#)

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:

<http://www.cisco.com/en/US/support/index.html>

Select **Wireless Troubleshooting Center** under Tools & Utilities.

Interpreting the Indicator 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 9-1](#) interprets the LED messages during normal operation. [Table 9-2](#) interprets the LED error condition messages.

Table 9-1 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 9-2 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 9-2 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.

Problems Obtaining an IP Address

If your network is set up to use DHCP to acquire an IP address, the DHCP lease renewal may fail, especially in suspend/resume situations. To force DHCP to try to reacquire an IP address, tap the **Renew** button on the ACU Status screen, power your Windows CE device off and on, or eject and reinsert your client adapter.

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 Windows CE device a few feet closer to an access point and try again.
- Make sure the client adapter is securely inserted in your device’s PC card slot.
- Make sure that the access point is turned on and operating.
- Ensure that all parameters are set properly for both the client adapter and the access point. These include the SSID, WEP activation, EAP activation, infrastructure mode, etc.
- 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 to 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 driver and client utilities, contact your IS department if you have a problem connecting to the network. Proxy server, DNS or WINS, and further authentication information might be needed to connect to the network.

Prioritizing Network Connections (Windows CE .NET Only)

If you have a Windows CE .NET device and more than one network adapter is enabled, you can select which one is used by assigning a priority to your network connections. Follow the steps below to prioritize your network connections.

-
- Step 1** Select **Start > Settings > Network and Dial-up Connections**.
 - Step 2** Select the **Advanced** menu option at the top of the screen.
 - Step 3** Select **Advanced Settings**. Your network connections are listed in the Connections box on the Advanced Adapter Settings screen.
 - Step 4** Use the arrows beside the Connections box to move the network connection that you want to use to the top.
 - Step 5** Tap **OK**.
-

Reauthenticating After LEAP Times Out

If your client adapter times out while trying to LEAP authenticate, open WLM, enter your LEAP credentials, and try again to authenticate.

**Note**

If you use the same password for your laptop or PC as for your Windows CE device, your session may expire on your Windows CE device if you change the password on your laptop or PC. In this event, simply open WLM, enter your new password, and try again to authenticate.

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 listed in alphabetical order, and an explanation as well as a recommended user action are provided for each message.

Error Message Authentication attempt timed out. Rerun WLM and try again.

Explanation The client adapter was unable to LEAP authenticate within a specified amount of time.

Recommended Action Tap **OK**. Then open WLM, enter your LEAP credentials, and try to authenticate again.

Error Message Can't delete active profile

Explanation An attempt was made to delete the active profile, which cannot be removed.

Recommended Action Tap **OK**. Then select a different active profile and delete the profile that you want to remove.

Error Message Certificate enrollment failed.

Explanation Your attempt to import a user certificate on a PPC 2002 device failed.

Recommended Action Re-enter your username, password, and server name for your certificate server on the Certificate Enrollment screen and tap the **Enroll** button. If the second attempt also fails, try to import a new certificate.

Error Message The certificate server was not found.

Explanation A certificate server could not be found during certificate enrollment on a PPC 2002 device.

Recommended Action Re-enter your username, password, and server name for your certificate server on the Certificate Enrollment screen and tap the **Enroll** button. If the second attempt also fails, enter your credentials for a different certificate server on your network.

Error Message Cisco Aironet Wireless LAN Adapter does not support the connected device type. Application Manager will make the application available for installation when a supported device type is connected.

Explanation The client adapter software does not support the Windows CE device on which the adapter is being installed. Refer to the [“System Requirements” section on page 2-4](#) for the list of Windows CE devices that are supported by the client adapter.

Recommended Action Tap **OK** to acknowledge the message and terminate the installation process. To install the client adapter's driver and client utilities on a supported Windows CE device, follow the instructions in the [“Installing the Driver and Client Utilities” section on page 3-2](#).

Error Message Cisco Wireless LAN Adapter Not Found!

Explanation ACU or WLM was activated without a client adapter being inserted in the Windows CE device, or the client adapter was ejected while ACU was running. WLM cannot execute if a client adapter is not running because it needs to be able to read from and write to the adapter.

Recommended Action Tap **OK** to acknowledge the message on WLM. Insert a client adapter into the Windows CE device.

Error Message Client adapter not found.

Explanation A client adapter is not inserted in the Windows CE device.

Recommended Action Insert a client adapter if you want to start wireless communications. If necessary, reset the Windows CE device.

Error Message The combination of the domain name and user name is too long. It exceeds the maximum of 255 characters allowed. Please use shorter ones.

Explanation The combination of characters entered for the username and domain name in the Static Password screen exceeds the maximum number supported by PEAP, which is 255.

Recommended Action Enter a set of credentials (username, password, and domain name) with fewer characters.

Error Message Could NOT find all of the appropriate files for this installation. Make sure that all of the files are installed to the same directory.

Explanation Some of the client adapter installation files could not be found.

Recommended Action Download the **WinCE-PCMCIA-LMC-v230.exe** file again and extract its files to a folder, making sure that you keep all of the extracted files together in the one folder.

Error Message File not valid for this radio! Firmware Upgrade Failed!

Explanation Your attempt to upgrade the client adapter firmware failed because an invalid file was selected. The firmware file should have a .img extension.

Recommended Action Tap the **Browse** button and select a new firmware image file.

Error Message First Authentication Attempt Timed Out. Radio Will Continue Trying.

Explanation The client adapter timed out while trying to LEAP authenticate, possibly because it is out of range of an access point. The client adapter continues trying to authenticate.

Recommended Action Tap **OK** to acknowledge the message and terminate WLM. Then perform one of the following: 1) move the Windows CE device closer to an access point so that WLM will continue trying to authenticate or 2) enter a different saved or temporary LEAP username and password.

Error Message Incorrect Login -- Please Re-Enter

Explanation The LEAP username or password was entered incorrectly in the Wireless Login Module screen or was not valid for the RADIUS server on the network.

Recommended Action Re-enter the LEAP username and password and tap **OK**.

Error Message An internal error has occurred.

Explanation An error has occurred.

Recommended Action Reset the Windows CE device and try the operation again.

Error Message LEAP Not Enabled on the Cisco Wireless LAN Adapter! Start ACU and Enable LEAP First.

Explanation An attempt was made to start WLM before LEAP was enabled on the client adapter.

Recommended Action Tap **OK** to acknowledge the message and terminate the utility. Then enable LEAP in ACU. WLM restarts automatically, provided you are using a temporary LEAP username and password.

Error Message Must set a User Name

Explanation A password was entered in the Wireless Login Module screen, but a username was not entered. The password is an optional entry, but if a password is entered, a username must also be entered.

Recommended Action Tap **OK** to acknowledge the message. Then enter your LEAP username in the User Name field on the Wireless Login Module screen and tap **OK**.

Error Message This name already exists. Please use a different name.

Explanation An attempt was made to create or rename a profile using the name of an existing profile.

Recommended Action Tap **OK**. Then create or rename the profile using a unique name.

Error Message New Password and Confirm New Password entered do not match. Please try it again.

Explanation Different values were entered 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 No CE services are currently running on this computer. Please run ActiveSync and make sure you are connected to a supported device. NOTE: This Install is for 3.0 CE devices and greater.

Explanation An attempt was made to install the client adapter installation file without an ActiveSync connection established between your laptop or PC and your Windows CE device.

Recommended Action Follow the instructions in the [“Installing the Driver and Client Utilities” section on page 3-2](#) to establish an ActiveSync connection.

Error Message No profiles found. (Use ACU to create a profile.)

Explanation Profiles have not been created for your client adapter.

Recommended Action Create a profile in ACU for the client adapter to use. If necessary, reset the Windows CE device.

Error Message The object or property already exists.

Explanation An attempt was made to import a certificate file that was already installed.

Recommended Action Tap **OK** and select a different certificate to import.

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 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 Please select one of the profiles.

Explanation The Edit, Rename, or Delete button on the ACU Profiles screen was tapped before a profile was selected.

Recommended Action Tap **OK** to acknowledge the message. Then select a profile and tap the button for the action you want to take.

Error Message The selected profile does not support EAP. (Use ACU to modify the security settings.)

Explanation The Authentication Manager (AuthMgr) was activated on a PPC 2002 device although the current profile does not have host-based EAP enabled.

Recommended Action Tap **OK** twice. Then select a profile in ACU that uses host-based EAP and reactivate the Authentication Manager. If necessary, reset the Windows CE device.

Error Message Unable to configure connection settings.

Explanation An error occurred after you tapped the Connect button on the Authentication screen.

Recommended Action Reset the Windows CE device and try the operation again.

Error Message Unable to load the Wireless Zero Configuration interface.

Explanation An error occurred during installation, or the system is not working properly.

Recommended Action Reset the Windows CE device; then reinstall the client adapter software.

Error Message WEP Key x must be 10 Hex digits!

Explanation An invalid number of characters or an incorrect character was entered for the WEP key indicated. 40-bit keys must have 10 characters.

Recommended Action Tap **OK** to acknowledge the message; then re-enter the characters for the invalid key.

Error Message WEP Key x must be 26 Hex digits!

Explanation An invalid number of characters or an incorrect character was entered for the WEP key indicated. 128-bit keys must have 26 characters.

Recommended Action Tap **OK** to acknowledge the message; then re-enter the characters for the invalid key.

Error Message Windows CE Services not found on this computer. Setup cannot continue and will now exit.

Explanation The driver installation utility cannot locate the ActiveSync directory on the laptop or PC. This directory and the files it contains are needed to copy the client adapter's driver and client utility files from the laptop or PC to a Windows CE device.

Recommended Action Tap **OK** to acknowledge the message and terminate the installation utility. Then install Windows CE Services on the laptop or PC and start the driver installation procedure again.



Note Windows CE Services can be obtained from the CD that shipped with your Windows CE device or from the device manufacturer.

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 although it may present a security risk, tap **Yes**. Otherwise, tap **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 although it may present a security risk, tap **Yes**. Otherwise, tap **No**.

Error Message You must enter a server name.

Explanation The server name for your certificate server was not entered on the Certificate Enrollment screen.

Recommended Action Enter the server name for your certificate server. Then tap the **Enroll** button.

Error Message You must enter a user name.

Explanation Your username for your certificate server was not entered on the Certificate Enrollment screen.

Recommended Action Enter your username for your certificate server. Then tap the **Enroll** button.

Error Message You must enter a WEP Key!

Explanation A WEP key was not entered on the WEP Keys screen.

Recommended Action Tap **OK** to acknowledge the message. Then enter a WEP key on the WEP Keys screen and tap **OK** to save the WEP key settings or tap **Cancel** to exit the WEP Keys screen without entering a WEP key.

Error Message Your password has expired. Please enter a new one.

Explanation The password that you have been using to PEAP authenticate has expired.

Recommended Action Follow the instructions in the [“After Your Password Expires \(Windows NT or 2000 Domain Databases Only\)”](#) section on page 6-7 to change your password.

Getting Help

To access online help for ACU, follow the instructions below for your specific Windows CE device.

PPC Devices

To access help related to ACU on a PPC device, open ACU and select **Start > Help**. Select the topic for which you want information.

HPC and Windows CE .NET Devices

To access help related to ACU on an HPC or Windows CE .NET device, open ACU and tap the ? button on the top of the screen. Select the topic for which you want information.



Technical Specifications

This appendix provides technical specifications for the Cisco Aironet 340 and 350 Series Wireless LAN Client Adapters.

The following topics are covered in this appendix:

- Physical Specifications, [page A-2](#)
- Radio Specifications, [page A-3](#)
- Power Specifications, [page A-4](#)
- Safety and Regulatory Compliance Specifications, [page A-5](#)

[Table A-1](#) lists the technical specifications for the Cisco Aironet 340 and 350 Series Wireless LAN Client Adapters.

**Note**

If a distinction is not made between series or client adapter type, the specification applies to both 340 and 350 series PC and LM cards.

Table A-1 *Technical Specifications for the 340 and 350 Series Client Adapters*

Physical Specifications

Size	
PC 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)
Weight	1.3 oz (0.037 kg)
Enclosure	
PC card	Extended Type II PC card
LM card	Standard Type II PC card with RF connectors
Connector	68-pin PCMCIA
Status indicators	Green and amber LEDs; see Chapter 9
Operating temperature	
350 series	–22°F to 158°F (–30°C to 70°C)
340 series	32°F to 158°F (0°C to 70°C)
Storage temperature	–40°F to 185°F (–40°C to 85°C)
Humidity (non-operational)	95% relative humidity
Altitude	Operational 9843 ft (3000 m) @ room temperature for 2 hours Non-operational 15,000 ft (4572 m) @ room temperature for 20 hours
ESD	15 kV (human body model)

Table A-1 Technical Specifications for the 340 and 350 Series Client Adapters (continued)

Radio Specifications	
Type	Direct-sequence spread spectrum (DSSS) IEEE 802.11b 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.
350 series	100 mW (20 dBm) 50 mW (17 dBm) 30 mW (15 dBm) 20 mW (13 dBm) 5 mW (7 dBm) 1 mW (0 dBm)
340 series PC card	30 mW (15 dBm) 1 mW (0 dBm)
340 series LM card	30 mW (15 dBm) 15 mW (12 dBm) 5 mW (7 dBm) 1 mW (0 dBm)
Operating frequency	2.400 to 2.497 GHz (depending on the regulatory domain in which the client adapter is used)
Usable channels	2412 to 2484 MHz in 5-MHz increments
Interference rejection	-35 dB adjacent channel rejection
Data rates	1, 2, 5.5, and 11 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
Receiver sensitivity	
350 series	-94 dBm @ 1 Mbps -91 dBm @ 2 Mbps -89 dBm @ 5.5 Mbps -85 dBm @ 11 Mbps
340 series	-90 dBm @ 1 Mbps -88 dBm @ 2 Mbps -87 dBm @ 5.5 Mbps -83 dBm @ 11 Mbps
Receiver delay spread (multipath)	500 ns @ 1 Mbps 400 ns @ 2 Mbps 300 ns @ 5.5 Mbps 140 ns @ 11 Mbps (350 series) 70 ns @ 11 Mbps (340 series)

Table A-1 Technical Specifications for the 340 and 350 Series Client Adapters (continued)

Range	
350 series	<p>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</p> <p>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</p> <p>Note The above range numbers assume the use of a snap-on antenna with the LM card.</p>
340 series	<p>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</p> <p>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</p> <p>Note The above range numbers assume the use of a snap-on antenna with the LM card.</p>
Antenna	
PC card	Integrated diversity antenna
LM card	Two MMCX antenna connectors
Power Specifications	
Operational voltage	5.0 V (\pm 0.25 V)
Receive current steady state	Typically 250 mA
Transmit current steady state	
350 series	Typically 450 mA @ 20 dBm
340 series	Typically 350 mA @ 15 dBm
Sleep mode steady state	
350 series	Typically 15 mA
340 series	Typically 15 mA

Table A-1 *Technical Specifications for the 340 and 350 Series Client Adapters (continued)*

Safety and Regulatory Compliance Specifications	
Safety	Designed to meet: <ul style="list-style-type: none"> • 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
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
Radio approvals	FCC Part 15.247 Canada RSS-139-1, RSS-210 Japan Telec 33B EN 300.328
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, page B-2](#)
- [Dipole Antenna Installation Warning, page B-3](#)
- [Warning for Laptop Users, page B-4](#)

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.

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 tändhättar 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 sijoitettava 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 frequência 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 dipolantenner 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 pitkäaikaisten lähetys- 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-adaptorns 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 340 and 350 Series Wireless LAN Client Adapters.

The following topics are covered in this appendix:

- [Manufacturer's Federal Communication Commission Declaration of Conformity Statement, page C-2](#)
- [Department of Communications – Canada, page C-3](#)
- [European Community, Switzerland, Norway, Iceland, and Liechtenstein, page C-4](#)
- [Declaration of Conformity for RF Exposure, page C-5](#)
- [Guidelines for Operating Cisco Aironet Wireless LAN Client Adapters in Japan, page C-6](#)

Manufacturer's Federal Communication Commission Declaration of Conformity Statement



Models: AIR-PCM341, AIR-PCM342, AIR-LMC341, AIR-LMC342, AIR-PCM351, AIR-PCM352, AIR-LMC351, AIR-LMC352, AIR-PCM350-A-K9, AIR-PCM350-40-A-K9, AIR-LMC350-A-K9, AIR-LMC350-40-A-K9

FCC Certification Number: LDK102038 (AIR-PCM34x),
LDK102035 (AIR-LMC34x),
LDK102040 (AIR-xxx35x)

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.

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-ANT5959	Omni-directional	2.0
AIR-ANT4941	Dipole	2.2

**Note**

AIR-ANT3338 is approved for use with only the LM card.

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 numérique de la classe B respecte les exigences du Règlement sur le matériel brouilleur 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.

The device is certified to the requirements of RSS-139-1 and RSS-210 for 2.4-GHz spread spectrum devices. The use of this device 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 entsprechenden Vorgaben der Richtlinie 1999/5/EU.
Dansk:	Dette udstyr er i overensstemmelse med de væsentlige krav og andre relevante bestemmelser i Direktiv 1999/5/EF.
Español:	Este equipo cumple con los requisitos esenciales así como con otras disposiciones de la Directiva 1999/5/EC.
Έλληνας:	Αυτός ο εξοπλισμός συμμορφώνεται με τις ουσιαστικές απαιτήσεις και τις λοιπές διατάξεις της Οδηγίας 1999/5/EK.
Français:	Cet appareil est conforme aux exigences essentielles et aux autres dispositions pertinentes 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-direktiv 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>.

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:



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:



The above CE mark is required as of April 8, 2000 but might change in the future.

**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-3.

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

43768

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: 03-5219-6000



Channels, Power Levels, and Antenna Gains

This appendix lists the 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-3](#)

Channels

The channel identifiers, channel center frequencies, and regulatory domains of each 22-MHz-wide channel are shown in [Table D-1](#).

Table D-1 Channels

Channel Identifier	Frequency (in MHz)	Regulatory Domains				
		Americas (-A)	ETSI (-E)	Israel (-I)	China (-C)	Japan (-J)
1	2412	X	X	-	X	X
2	2417	X	X	-	X	X
3	2422	X	X	X	X	X
4	2427	X	X	X	X	X
5	2432	X	X	X	X	X
6	2437	X	X	X	X	X
7	2442	X	X	X	X	X
8	2447	X	X	X	X	X
9	2452	X	X	X	X	X
10	2457	X	X	-	X	X
11	2462	X	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

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-2](#) indicates the maximum power levels and antenna gains allowed for each regulatory domain.

Table D-2 Maximum Power Levels Per Antenna Gain

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
ETSI (-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

Table D-2 Maximum Power Levels Per Antenna Gain (continued)

Regulatory Domain	Antenna Gain (dBi)	Maximum Power Level (mW)
China (-C) (10 mW EIRP maximum)	0	5
	2.2	5
	5.2	n/a
	6	n/a
	8.5	n/a
	12	n/a
	13.5	n/a
	21	n/a
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



Configuring the Client Adapter through Windows CE .NET

This appendix explains how to configure and use the client adapter with Windows CE .NET.

The following topics are covered in this appendix:

- [Overview, page E-2](#)
- [Configuring the Client Adapter, page E-2](#)
- [Associating to an Access Point Using Windows CE .NET, page E-5](#)
- [Viewing the Status of Your Client Adapter, page E-6](#)

Overview

This chapter provides instructions for configuring the client adapter through Windows CE .NET (instead of through ACU). It also provides basic information on using Windows CE .NET to specify the networks to which the client adapter associates and to view the status of your client adapter.



Note

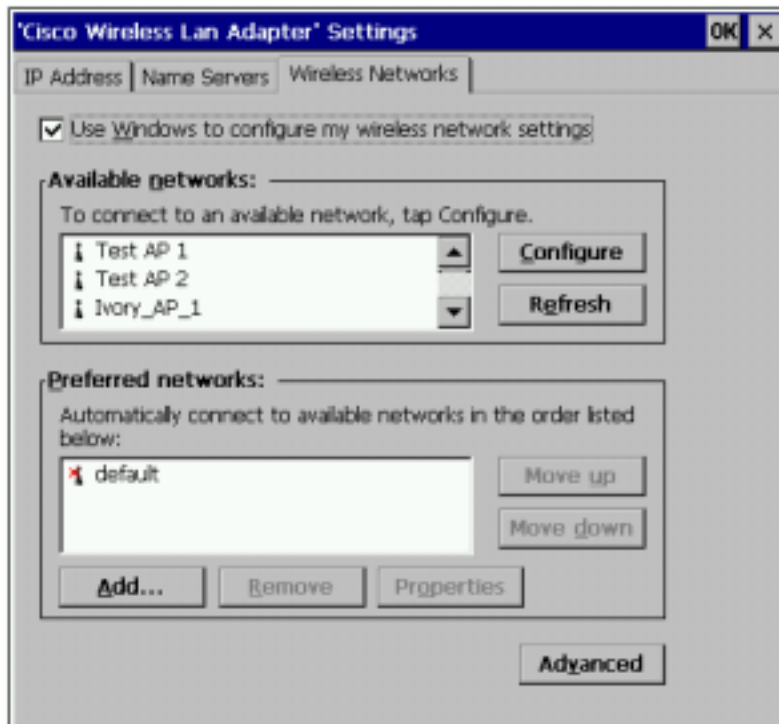
If you require more information about configuring or using your client adapter with Windows CE .NET, refer to Microsoft's documentation for Windows CE .NET.

Configuring the Client Adapter

Follow the steps below to configure your client adapter using Windows CE .NET.

- Step 1 Make sure the client adapter is inserted in the Windows CE .NET device.
- Step 2 Double-tap the **ACU** icon on your desktop or select **Start > Programs > Cisco > ACU**.
- Step 3 On the Profiles screen, select **<External Settings>** from the Select Active Profile drop-down menu.
- Step 4 Tap **OK** to save your settings.
- Step 5 When prompted, reset your Windows CE device or eject and reinsert the client adapter.
- Step 6 Select **Start > Settings > Network and Dial-up Connections > the Cisco Wireless LAN Client Adapter icon > the Wireless Networks tab**. The Cisco Wireless LAN Adapter Settings (Wireless Networks tab) screen appears (see [Figure E-1](#)).

Figure E-1 Cisco Wireless LAN Adapter Settings Screen (Wireless Networks Tab)



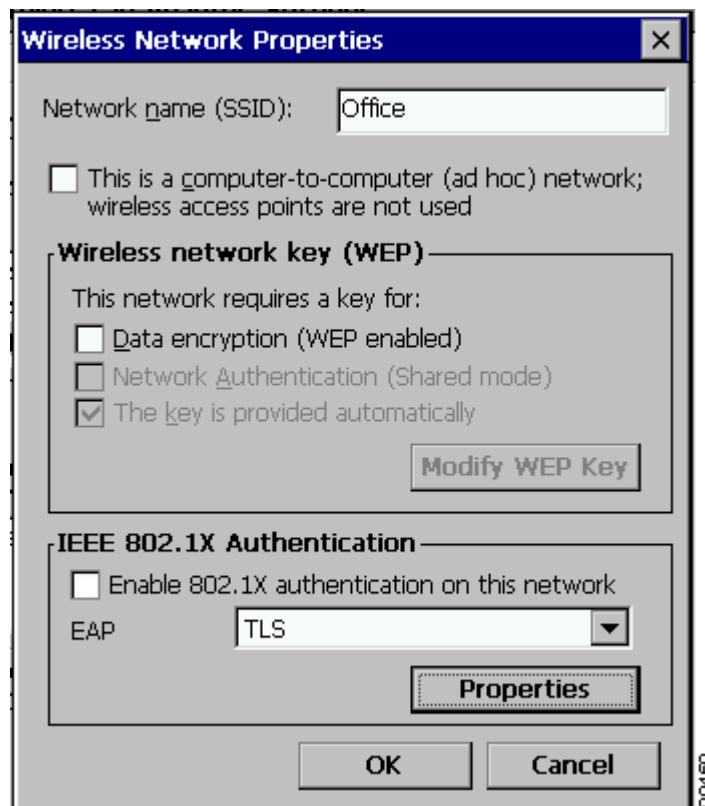
- Step 7** Make sure that the **Use Windows to configure my wireless network settings** check box is checked.
- Step 8** Select the SSID of the access point to which you want the client adapter to associate from the list of available networks and tap the **Configure** button. If the SSID of the access 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), tap the **Add** button at the bottom of the screen.



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



Note The IEEE 802.1X Authentication portion of the screen is currently not operational. Support for EAP-TLS and PEAP authentication will be available for Windows CE .NET devices in a future release.

- Step 9** 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 tapped the Add button, enter the case-sensitive SSID of the access point to which you want the client adapter to associate or the name of the ad hoc network in the Network name (SSID) field.

Step 10 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 11 Check the **Data encryption (WEP enabled)** check box if you are planning to use static WEP.



Note Refer to the “[Static WEP Keys](#)” section on page 5-10 for information on static WEP keys.

Step 12 Check the **Network Authentication (Shared mode)** check box if you want to use shared key (rather than open) authentication with the access point.

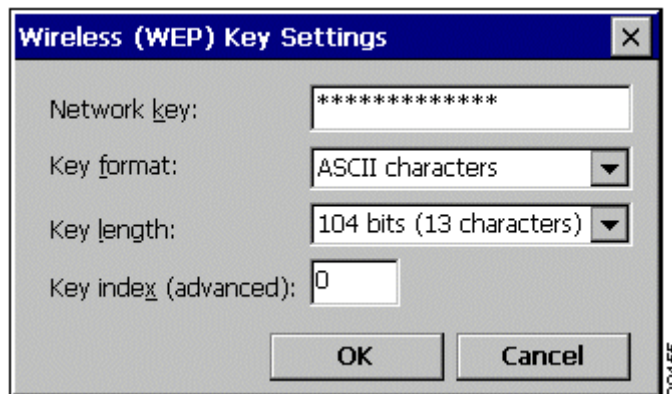
Open authentication enables your client adapter, regardless of its WEP settings, to authenticate and attempt to communicate with an access point.

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.

Step 13 Follow the steps below to enter up to four WEP keys, if you are planning to use static WEP.

- 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.
- b. Tap the **Modify WEP Key** button. The Wireless (WEP) Key Settings screen appears (see [Figure E-3](#)).

Figure E-3 Wireless (WEP) Key Settings Screen



- c. Enter the WEP key 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.
- d. 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 the 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.

- e. Select one of the following WEP key lengths:
 - **104 bits (13 characters)**—You can select this option (or the 40 bits option) if your client adapter supports 128-bit WEP.
 - **40 bits (5 characters)**—You must select this option if your client adapter supports only 40-bit WEP.
- f. In the Key index (advanced) field, enter 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).

- g. Tap **OK** to save your settings.
 - h. Repeat the previous steps if you want to enter another WEP key.
- Step 14** Tap **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.
- To verify association, double-tap the icon of the two connected computers in the Windows CE .NET system tray and tap the **Wireless Information** tab. The status appears at the bottom of the screen. If the client adapter is associated, the status reads *Associated*.
-

Associating to an Access Point Using Windows CE .NET

Windows CE .NET 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 tap **Configure** and **OK**).

You can also attempt to force the client adapter to switch associations from the Wireless Information screen. To do so, follow the steps below:

-
- Step 1** Double-tap the icon of the two connected computers in the Windows CE .NET system tray.
 - Step 2** Tap the **Wireless Information** tab. The Wireless Information screen appears, showing a list of all available networks (or access points in the vicinity that are broadcasting their SSIDs).
 - Step 3** Select the network to which you want your client adapter to associate and tap the **Connect** button.
 - Step 4** If the Wireless Network Properties screen appears, tap **OK**.

The client adapter scans for the SSID of the specified network, and the status of the connection appears in the Status field at the bottom of the Wireless Information screen.

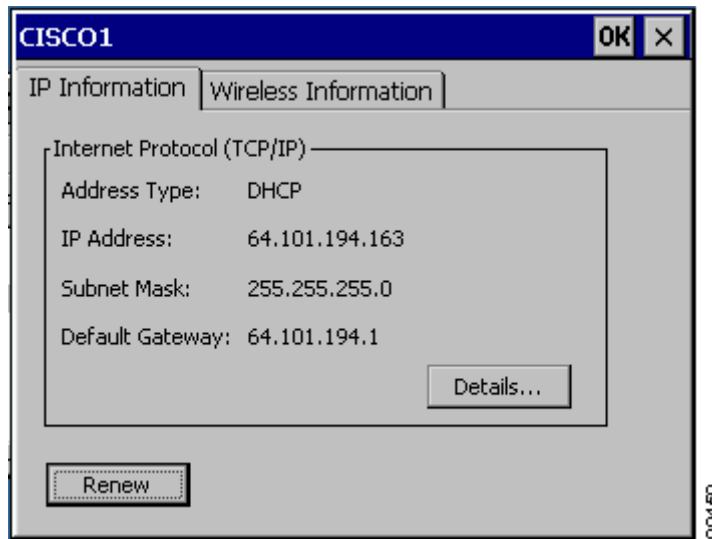
Viewing the Status of Your Client Adapter

This section enables you to view IP and wireless information for your client adapter.

Viewing IP Information

To view IP information for your client adapter, double-tap the icon of the two connected computers in the Windows CE .NET system tray. The IP Information screen appears (see [Figure E-4](#)).

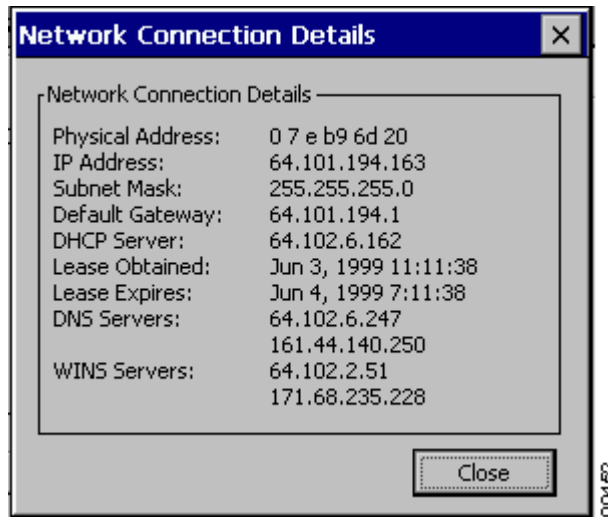
Figure E-4 IP Information Screen



This screen shows the client adapter's address type (DHCP or static), IP address, subnet mask, and default gateway address. To renew the adapter's IP address and refresh the displayed information, tap the **Renew** button.

If you want to view more information about the adapter's network connections, tap the **Details** button. The Network Connection Details screen appears (see [Figure E-5](#)).

Figure E-5 Network Connection Details Screen



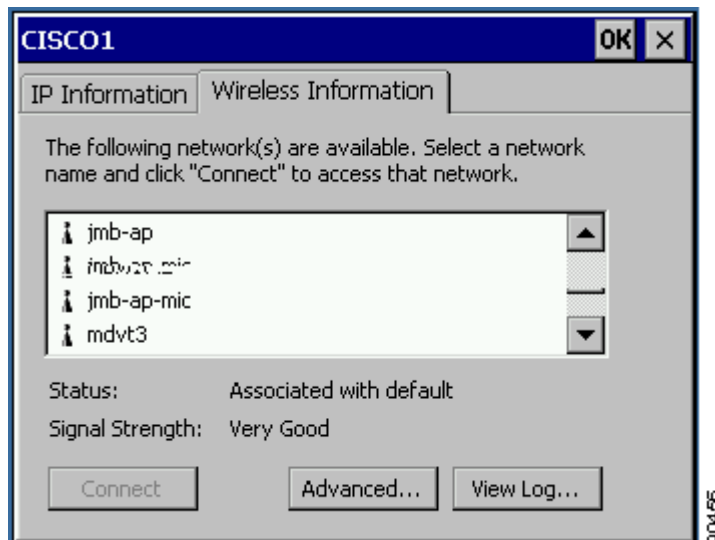
In addition to the information shown on the IP Information screen, this screen also shows the physical (MAC) address, the DHCP server, the date the lease was obtained and the date it expires, the DNS servers, and the WINS servers.

Viewing Wireless Information

To view wireless information for your client adapter, follow the steps below.

- Step 1 Tap the **Wireless Information** tab. The Wireless Information screen appears (see [Figure E-6](#)).

Figure E-6 Wireless Information Screen

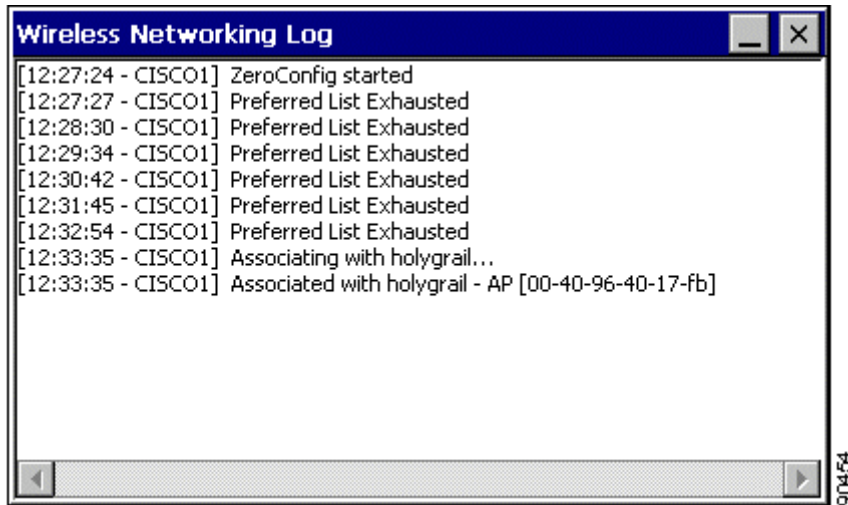


The Status field at the bottom of the screen shows the status of your client adapter's connection to an access point. In [Figure E-6](#), the status "Associated with default" indicates that the client adapter is associated to an access point whose SSID is *default*.

The Signal Strength field shows the strength of that connection.

- Step 2** If you want to view a log of Windows CE .NET messages that pertain to the client adapter's connections, tap the **View Log** button. The Wireless Networking Log screen appears (see [Figure E-7](#)).

Figure E-7 Wireless Networking Log Screen





Performing a Site Survey

This appendix explains how ACU can be used when conducting a site survey.

The following topics are covered in this appendix:

- [Overview, page F-2](#)
- [Setting Signal Strength Display Units, page F-3](#)
- [Using Passive Mode, page F-4](#)
- [Using Active Mode, page F-6](#)
- [Forcing the Client Adapter to Reassociate, page F-12](#)

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-4](#) 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-6](#) 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

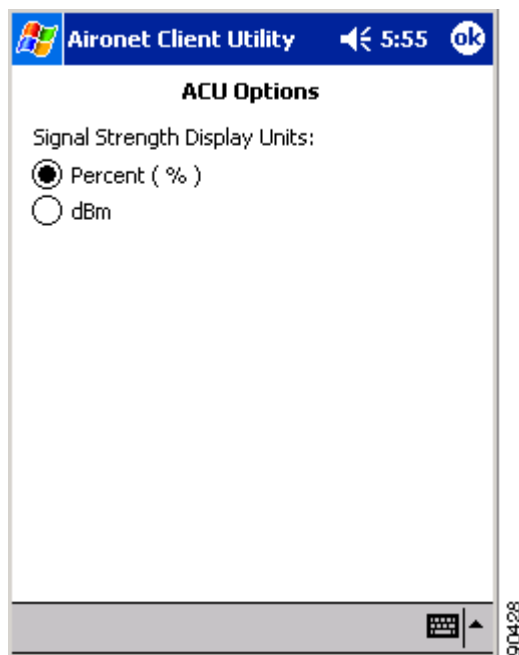
Refer to the hardware installation guide for your infrastructure device for additional information on factors affecting placement.

Setting Signal Strength Display Units

Follow the steps below to specify the units used to display signal strength on the Survey screen.

- Step 1** Double-tap the **ACU** icon or select **Start > Programs > Cisco > ACU**. The Profiles screen appears.
- Step 2** Tap the **Options** button. The ACU Options screen appears (see [Figure F-1](#)).

Figure F-1 ACU Options screen



- Step 3** Select one of the following options for Signal Strength Display Units:
 - **Percent (%)**—Displays the signal strength as a percentage. This is the default setting.
 - **dBm**—Displays the signal strength in decibels with respect to milliwatts.
- Step 4** Tap **OK** to save your changes.

Using Passive Mode

Follow the steps below to activate the site survey passive mode and obtain current information about RF network traffic.

- Step 1** From the Profiles screen, tap the **Survey** tab. The Site Survey - Passive screen appears (see [Figure F-2](#)), provided a client adapter is installed in the Windows CE device and is running.

[Figure F-2](#) shows the Site Survey - Passive Mode screen with the signal strength values displayed as percentages, and [Figure F-3](#) shows the same screen with the signal strength values displayed in dBm.

Figure F-2 Site Survey - Passive Screen (with Signal Strength as a Percentage)

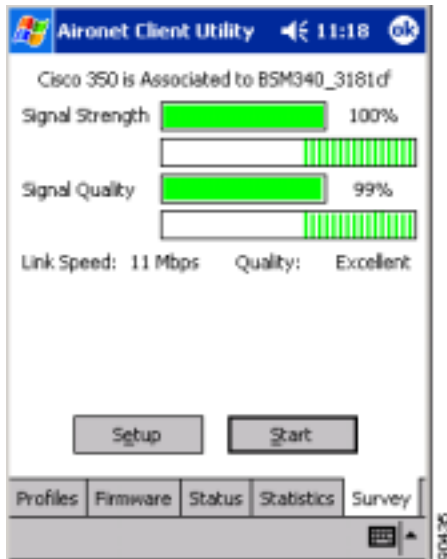


Figure F-3 Site Survey - Passive Screen (with Signal Strength in dBm)

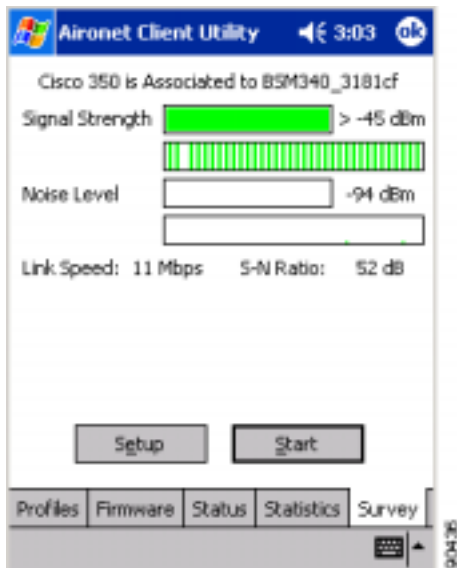


Table F-1 interprets the information that is displayed on the Site Survey - Passive screen.

Table F-1 Site Survey Passive Mode Statistics

Statistic	Description
The first line of the Site Survey - Passive screen	<p>Indicates the operational mode of your client adapter and the name or MAC address of any associated access point.</p> <p>Value: Not Associated, Associated, Authenticated, or Ad Hoc Mode</p> <p>Note The access point name or MAC address is shown only if the client adapter is in infrastructure mode and Aironet Extensions are enabled (on access points running Cisco IOS release 12.2(4)JA or greater).</p>
Signal Strength	<p>The signal strength for all received packets. The higher the value and the more green the bar graph is, the stronger the signal.</p> <p>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).</p> <p>Range: 0 to 100% or -95 to -45 dBm</p>
Signal Quality	<p>The signal quality for all received packets. The higher the value and the more green the bar graph is, the clearer the signal.</p> <p>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).</p> <p>Range: 0 to 100%</p> <p>Note This setting appears only if you selected signal strength to be displayed as a percentage. See the “Setting Signal Strength Display Units” section on page F-3 for information.</p>
Noise Level	<p>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.</p> <p>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).</p> <p>Range: -100 to -45 dBm</p> <p>Note This setting appears only if you selected signal strength to be displayed in dBm. See the “Setting Signal Strength Display Units” section on page F-3 for information.</p>

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. Value: 1, 2, 5.5, or 11 Mbps
Quality	The client adapter's ability to communicate with the access point. Value: Not Associated, Poor, Fair, Good, Excellent Note This setting appears only if you selected signal strength to be displayed as a percentage. See the " Setting Signal Strength Display Units " section on page F-3 for information.
Signal to Noise (S-N) Ratio	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 if you selected signal strength to be displayed in dBm. See the " Setting Signal Strength Display Units " section on page F-3 for information.

- Step 2** If you want to activate the site survey active mode, go to the "[Using Active Mode](#)" section below. Otherwise, tap **OK** to exit the site survey tool.

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 screen (see [Figure F-2](#)), tap the **Setup** button. The Active Mode Setup screen appears (see [Figure F-4](#)).

Figure F-4 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	<p>The MAC address of the access point (in infrastructure mode) or other clients (in ad hoc mode) that will be used in the test.</p> <p>Default: The MAC address of the access point (in infrastructure mode) to which your client adapter is associated</p> <p>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.</p>
Destination Is Another Cisco Aironet Device	<p>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.</p> <p>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.</p> <p>Default: Checked</p>

Table F-2 Site Survey Active Mode Parameters (continued)

Parameter	Description						
Number of Packets	The number of packets that will be sent during the test. Range: 1 to 999 Default: 100						
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 Default: 11 Mbps						
Continuous Link Test	Checking this check box causes the test to run until you tap OK or Stop . The test loops repeatedly for the number of packets specified in the Number of Packets field. Default: Unchecked						
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						
Delay Between Packets	The delay (in milliseconds) between successive transmissions. Range: 1 to 2048 ms Default: 1 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						
Data Retries	The number of times a transmission is retried if an acknowledgment (Ack) is not returned by the destination device. Default: None						
	<table border="1"> <thead> <tr> <th>Retry Value</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>No retries will occur.</td> </tr> <tr> <td>Default Retries</td> <td>The firmware's default value for retries (16) will be used.</td> </tr> </tbody> </table>	Retry Value	Description	None	No retries will occur.	Default Retries	The firmware's default value for retries (16) will be used.
Retry Value	Description						
None	No retries will occur.						
Default Retries	The firmware's default value for retries (16) will be used.						

Table F-2 Site Survey Active Mode Parameters (continued)

Parameter	Description	
Tx Type	The packet type that is transmitted during the test. Default: Unicast	
	Packet Type	Description
	Unicast	When unicast packets are used, the system expects to receive an acknowledgment from the destination, and retries can occur.
	Multicast	When multicast packets are used, no packet retries occur during the test.

Step 2 After setting any parameters, tap **OK** to save your settings. The Site Survey - Passive screen appears (see [Figure F-2](#)).

Step 3 Tap the **Start** button to run the site survey test. The Site Survey - Active screen appears.

[Figure F-5](#) shows the Site Survey - Active screen with the signal strength values displayed as percentages, and [Figure F-6](#) shows the same screen with the signal strength values displayed in dBm.

Figure F-5 Site Survey - Active Screen (with Signal Strength as a Percentage)

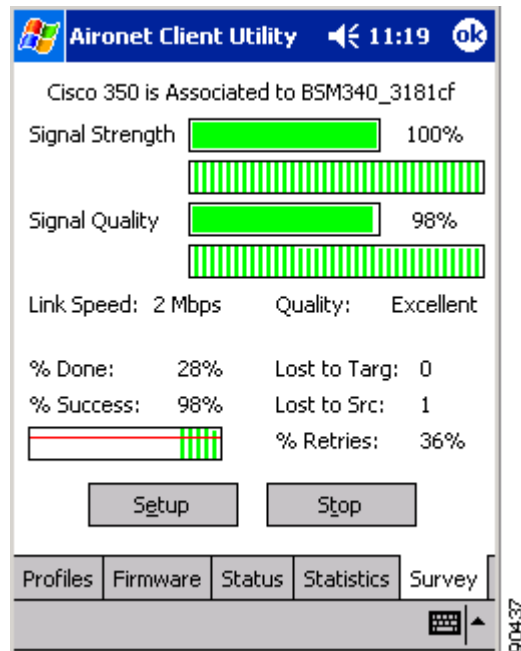


Figure F-6 Site Survey - Active Screen (with Signal Strength in dBm)

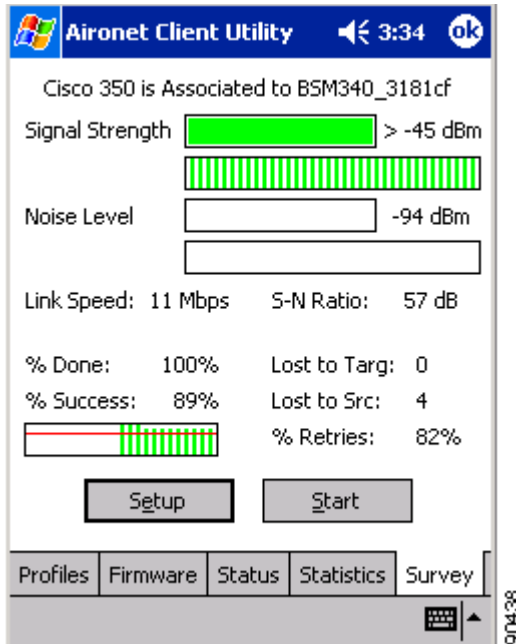


Table F-3 interprets the information that is displayed on the Site Survey - Active screen while the site survey test is running.

Table F-3 Site Survey Active Mode Statistics

Statistic	Description
The first line of the Site Survey - Active screen	<p>Indicates the operational mode of your client adapter and the name or MAC address of any associated access point.</p> <p>Value: Not Associated, Associated, Authenticated, or Ad Hoc Mode</p> <p>Note The access point name or MAC address is shown only if the client adapter is in infrastructure mode and Aironet Extensions are enabled (on access points running Cisco IOS release 12.2(4)JA or greater).</p>
Signal Strength	<p>The signal strength for all received packets. The higher the value and the more green the bar graph is, the stronger the signal.</p> <p>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).</p> <p>Range: 0 to 100% or -95 to -45 dBm</p>

Table F-3 Site Survey Active Mode Statistics (continued)

Statistic	Description
Signal Quality	<p>The signal quality for all received packets. The higher the value and the more green the bar graph is, the clearer the signal.</p> <p>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).</p> <p>Range: 0 to 100%</p> <p>Note This setting appears only if you selected signal strength to be displayed as a percentage. See the “Setting Signal Strength Display Units” section on page F-3 for information.</p>
Noise Level	<p>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.</p> <p>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).</p> <p>Range: –100 to –45 dBm</p> <p>Note This setting appears only if you selected signal strength to be displayed in dBm. See the “Setting Signal Strength Display Units” section on page F-3 for information.</p>
Link Speed	<p>The rate at which your client adapter is transmitting packets to or from its associated access point.</p> <p>Value: 1, 2, 5.5, or 11 Mbps</p>
Quality	<p>The client adapter’s ability to communicate with the access point.</p> <p>Value: Not Associated, Poor, Fair, Good, Excellent</p> <p>Note This setting appears only if you selected signal strength to be displayed as a percentage. See the “Setting Signal Strength Display Units” section on page F-3 for information.</p>
Signal to Noise (S-N) Ratio	<p>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.</p> <p>Range: 0 to 90 dB</p> <p>Note This setting appears only if you selected signal strength to be displayed in dBm. See the “Setting Signal Strength Display Units” section on page F-3 for information.</p>

Table F-3 Site Survey Active Mode Statistics (continued)

Statistic	Description
Percent Done	The percentage of packets that have been transmitted based on the number specified in the Number of Packets field.
Percent Successful	<p>The percentage of packets that were transmitted successfully.</p> <p>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.</p> <p>Note Refer to the Percent Success Threshold parameter in Table F-2 for more information.</p>
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.
Percent Retries	<p>The percentage of packets that were retried for transmission.</p> <p>Note This value is calculated as follows: $(\text{number of retries} \times 100) / \text{number of packets sent}$</p> <p>If a lot of packets get lost, the number of retries could be greater than the number of packets sent. Then this field would show a value greater than 100%.</p>

- Step 4** When you tap the **Stop** button or when the Percent Complete reaches 100%, the active mode changes back to the passive mode.
- Step 5** Tap **OK** to exit the site survey tool.

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.

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** Tap the **Profiles** tab.
- Step 2** Perform one of the following:
- Change the active profile and then select it again.
 - Select the active profile in the Manage Profiles box, tap the **Edit** button, and tap **OK**.
- Step 3** Tap the **Survey** tab to return to the Site Survey screen. The first line of the Site Survey screen displays *Not Associated* while the client adapter disassociates from its current access point and then displays *Associated* once the adapter is reassociated to an access point.
-

■ 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.
- 802.11b** The IEEE standard that specifies carrier sense media access control and physical layer specifications for 5.5- and 11-Mbps wireless LANs.

A

- Access Point** A wireless LAN data transceiver that uses radio waves to connect a wired network with wireless stations.
- ActiveSync** A Microsoft program that enables a desktop-to-Windows CE device connection in order to transfer files.
- 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, or PEAP 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.
CeAppMgr	Windows CE Application Manager. The desktop Windows CE Services component that provides a desktop-to-device application management tool. It is responsible for adding and removing applications on the Windows CE device and for deleting the application files from the desktop computer. CeAppMgr is included with every installation of Windows CE Services.
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.
Domain Name Server	A network server that translates text names to IP addresses.
Domain Name System (DNS)	Provides names for computers using alphanumeric characters instead of numbers like IP addresses use. Maintains a database of the host alphanumeric names and their corresponding IP addresses.
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.
<hr/>	
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.
<hr/>	
G	
Gateway	A device that connects two otherwise incompatible networks together.
GHz	Gigahertz. One billion cycles per second. A unit of measure for frequency.
<hr/>	
H	
Hexadecimal	A set of characters consisting of ten numbers and six letters (0-9, A-F, and a-f).
HPC	Handheld Personal Computer. One of the three defined types of Windows CE devices.
<hr/>	
I	
IEEE	Institute of Electrical and Electronic 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.

Isotropic An antenna that radiates its signal 360 degrees both vertically and horizontally in a perfect sphere.

L

LEAP LEAP, or *EAP-Cisco Wireless*, is an 802.1X authentication type that is available on Windows CE devices. 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

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.

PPC Pocket-sized Personal Computer. One of the three defined types of Windows CE devices.

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.
RTS Threshold	The packet size at which an access point will issue 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 <i>WEP key hashing</i> . 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.

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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