

# Cisco Aironet Windows Clients FAQ

Document ID: 8102

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## Introduction

This document provides information on the most frequently asked questions (FAQ) asked about Cisco Aironet Client Adapters used with Microsoft Windows operating systems.

Refer to Cisco Technical Tips Conventions for more information on document conventions.

## Basics

### **Q. Where can I find the latest utilities, drivers, and firmware for my Windows client?**

**A.** Cisco Aironet equipment operates best when all components are loaded with the most current version of the software. You can download the latest software and drivers at Wireless Downloads ( registered customers only) .

### **Q. At what frequency does a client card communicate?**

**A.** The 802.11b and 802.11g standards define a total of 14 frequency channels in the 2.4 GHz band. The 802.11a standard defines 12 channels in the 5 GHz band for UNII-1 communications.

In 802.11b/g installations, channels 1 through 11 can be used within the United States. These are public frequencies and are unlicensed by the Federal Communications Commission (FCC). Most of Europe can use channels 1 through 13. Channels 1 through 14 are allowed in Japan.

In 802.11a access point/client installations, channels 36, 40, 44, 48, 52, 56, 60 and 64 can be

used in the United States. These are public UNII–1 frequencies and are unlicensed by the FCC. Most of Europe can use these same channels. Channels 34, 38, 42 and 46 are allowed in Japan.

## Q. What is the typical range for a client card?

A. The typical range for a client card depends on many factors. Among them are data rate (bandwidth) desired, antenna type and cable length (where applicable), and the device that sends and receives the transmission. In an optimal installation, the range can be up to 300 feet.

Due to the reduced maximum allowable transmit power on the 802.11a band, the range for 802.11a installations is less.

The best estimates of performance and range for a given install site come from a presales site survey. Contact your Cisco Systems Engineer (SE), Cisco account team or Cisco authorized wireless reseller for assistance in the coordination of a site survey by a qualified survey partner.

## Q. Are the 340 and 350 Series products interoperable?

A. Yes. The major difference between the two product lines is the power of the radio. The 350 Series has the stronger radio at 100 milliwatts. In a mixed installation, the shorter range of the 340 Series prevails. Both series operate only in the 802.11b frequency band.

The CB20A Card operates in the 802.11a band, and the CB21AG or PI21AG Cards can operate in any of the three bands (802.11a, b or g), but only in one band at a time.

## Q. What is Wireless Zero Configuration (WZC)?

A. The WZC service is built into the Windows XP operating system. The Microsoft WZC service is designed to dynamically select the wireless network to which it will attempt a connection, based either on your preferences or on default settings. This includes the automatic selection and connection to a more preferable wireless network when it becomes available.

The WZC service is not installed by default during a Windows XP installation.

Complete these steps in order to install the WZC service on your system:

1. Click **Start**, then click **Control Panel**.
2. In the Control Panel window under Pick a Category, double-click the **Network and Internet Connections** icon.
3. In the Network and Internet Connections window under or pick a Control Panel icon, double-click the **Network Connections** icon.
4. In the Network Connections window under LAN or High Speed Internet, click to select the **Local Area Connection** icon.
5. On the menu bar, click **File**.
6. On the File menu, click **Properties**.
7. In the Local Area Connections Properties window, on the General tab, click **Install**.
8. In the Select Network Component Type window, in the type of network... box, click to select the **Service** icon.
9. Click **Add...**

10. In the Select Network Service window, click **Have Disk...**
11. Click **OK**.
12. In the Install From Disk window, click **Browse...**
13. In the Locate File window, browse to the C:WindowsInf folder (this is a hidden folder).
14. Click to select **NETWZC.INF**.
15. Click **Open**.
16. In the Install From Disk window, click **OK**.
17. In the Select Network Service window, in the Network Service box, click to select **Wireless Zero Configuration**.
18. Click **OK**. At this point, you need to reboot your PC. With that completed, you should find that the WZC service has been successfully installed on your system, and you should now have access to the Windows Network tab.

**Note:** If you do not see the Wireless Network tab when you go back into the Network Properties page, then the problem might be that the service did not start.

Complete these steps in order to start the service:

- a. Open **Administrative Tools** in the Control Panel and select **Services**.
- b. Scroll down to **Wireless Zero Configuration**, right-click on it and select **Start**. The service is now enabled. If the USB adapter had been successfully configured, then the Wireless Network tab will be visible under Network Properties. New notebooks that are equipped with wireless network adapters from the manufacturer usually have WZC pre-installed. In order to make use of the WZC service, you must use a compatible wireless network adapter, such as a Cisco adapter. The wireless network adapter scans for available wireless networks and passes the network names (also known as Service Set Identifiers or SSIDs) to the WZC service. The **Wireless Zero – Auto configuration** from Microsoft explains how to configure the WZC service.

**Note:** However, make sure that you do not run a third party wireless client utility, such as Cisco's Aironet Desktop Utility (ADU), as well as WZC service simultaneously on your computer. This can lead to an inconsistent client connectivity issue. In such cases, you can disable the WZC service on your computer.

Complete these steps in order to disable WZC on your computer:

- a. Click **Start**, then click **Control Panel**.
- b. Click **Performance and Maintenance**, click **Administrative Tools**, and then click **Services**.
- c. Double-click the **Wireless Zero Configuration** service.
- d. On the General tab, click **Stop**.
- e. In the Startup type list, click **Disabled**, then click **OK**. The WZC is now disabled and does not reload when you restart your computer.

## Capabilities

### Q. Can I run two computers together without an access point?

**A.** From the Aironet Client Utility (ACU) or Aironet Desktop Utility (ADU), configure the clients to run in **ad-hoc** mode. This is only a peer-to-peer connection. One PC becomes the parent, while the other becomes the child.

The CB20A does not support ad-hoc mode. However, the CB21AG or PI21AG does, but only in the 802.11b mode.

**Q. How do I make a client card work with a non-Cisco access point?**

A. The access point, not the client, controls interoperability. Make sure that the access point does not use any proprietary extensions or require firmware specific to the products of the manufacturer. Also, ensure that the access point is 802.11-compliant for the frequency band desired.

**Q. I am working a new install of WLC4402 and have found that the wireless handheld devices work fine. However, if they go into hibernation, authentication is lost and they have to reauthenticate all over again. Is this an expected behavior?**

A. It is normal behavior for any client (laptop/scanner/pda) to reauthenticate after power-save mode if it had been asleep for more than the WLAN session timeout and User Idle timeout periods.

**Q. Can a Windows Zero Configuration (WZC) supplicant support fast roaming with an access point (AP)?**

A. No, in order for a wireless client or a supplicant to support fast roaming, it must support Cisco Centralized Key Management (CCKM). A WZC does not support CCKM.

When you use CCKM, authenticated client devices can roam from one AP to another without any perceptible delay during reassociation. An AP on your network provides wireless domain services (WDS) and creates a cache of security credentials for CCKM-enabled client devices on the subnet. The WDS AP cache of credentials dramatically reduces the time required for reassociation when a CCKM-enabled client device roams to a new AP.

**Q. Can I remove the PC Memory Card International Association (PCMCIA) card radio module from an Aironet PCI client adapter and use it as a PCMCIA client adapter?**

A. No, this is not supported in any version of the hardware. Because the radio card is set to a different I/O mode, the operating system does not recognize the card. There is no known method to bypass this problem.

**Q. What is the Cisco Compatible Extensions (CCX) program?**

A. The CCX program ensures the widespread availability of client devices that are interoperable with a Cisco Wireless LAN (WLAN) infrastructure and take advantage of Cisco innovations for enhanced security, mobility, quality of service, and network management. Cisco does not sell or support Cisco Compatible client devices, but the device manufacturers do. Refer to Cisco Compatible Client Devices and Cisco Compatible Extensions – Versions and Features for information on Cisco Compatible products.

**Q. How do I know if a client device is interoperable with a Cisco Wireless LAN (WLAN) infrastructure and supports the latest WLAN standards and Cisco innovations?**

A. Look for the Cisco Compatible logo, which is earned through the Cisco Compatible Extensions (CCX) program for WLAN client devices. In the program, Cisco licenses a specification with the latest WLAN standards and Cisco innovations. A program participant, such as the maker of a WLAN client adapter or client device, implements support for all features and then submits the product to an independent lab for rigorous testing. The device can earn the right to be called Cisco Compatible only if the device passes all the tests. Refer to Cisco Compatible Extensions Program Brochure for more information on the CCX program.

**Q. My 350 adapter uses Cisco Centralized Key Management (CCKM) to associate. Why does the adapter not use fast roaming?**

A. The 350 cards use fast roaming if they use Lightweight Extensible Authentication Protocol (LEAP) or Extensible Authentication Protocol (EAP)-FAST with CCKM. Although the 350 associates with other EAP types through CCKM, the fast roaming feature is not supported with those EAP types.

**Q. How do I configure the Aironet Client Utility (ACU) or Aironet Desktop Utility (ADU) so that the radio icon appears in the system tray ?**

A. When you install the client driver and utilities for a Cisco Aironet 340, 350, and CB20A Wireless LAN Client Adapters, a utility called Aironet Client Monitor (ACM) also is installed. ACM is an optional application that provides a small subset of the features available through ACU. Specifically, ACM enables you to access status information about your client adapter and perform basic tasks. ACM is accessible from an icon in the Windows system tray, which makes ACM easily accessible and convenient to use. Refer to Using the Aironet Client Monitor (ACM) for information on ACM and the supported features.

For Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG), a utility called Aironet System Tray utility (ASTU) is installed with the other client utilities. ASTU is an optional application that provides a small subset of the features available through ADU. Specifically, ASTU enables you to access status information about your client adapter and perform basic tasks. ASTU is accessible from an icon in the Windows system tray, which makes ASTU easily accessible and convenient to use. The ASTU icon appears only if a client adapter is installed into your computer and you have not disabled ASTU. Refer to Using the Aironet System Tray Utility (ASTU) for more information on ASTU and the features supported

**Note:** Sometimes, you need to select the utilities that you want to install during the client software installation.

**Q. How many profiles can I create with the help of the Aironet Desktop Utility (ADU)?**

A. The ADU profile manager feature enables you to create and manage up to 16 profiles or saved configurations for your client adapter. When you try to add more than 16 profiles, this message appears:



These profiles enable you to use your client adapter in different locations, each of which requires different configuration settings. For example, you can set up profiles to use your client adapter at the office, at home, and in public areas such as airports. After you create the profiles, you can easily switch between the profiles without a need to reconfigure your client adapter each time you enter a new location.

Profiles reside in the registry. You lose any saved profiles if you uninstall the software on the client adapter. In order to prevent the loss of your profiles, Cisco recommends that you back up your profiles through the import/export feature in Profile Manager.

**Q. Rather than attempt to reauthenticate when an Extensible Authentication Protocol (EAP)–FAST authentication fails with one profile, can I configure Aironet Desktop Utility (ADU) in such a way that it automatically moves to the next profile?**

A. No, this cannot be accomplished with ADU profiles. You can configure multiple Service Set Identifiers (SSIDs) on the access point so that the clients with different SSIDs can connect to the access point.

**Q. Is there a way to configure the Request To Send (RTS) and Clear To Send (CTS) values with Aironet Desktop Utility (ADU) and CB21AG? This was possible with Aironet Client Utility (ACU) and 350 cards. If there is not a way, then what are the default values used by the client adapter?**

A. The default value of the RTS threshold is 2346 in CB21AG. This is the max. There is no such threshold for CTS because it is sent as a response to incoming CTS. You can add a key in the driver hive registry in order to adjust RTS.

The RTS threshold equals your desired value.

This registry key that manipulates the RTS threshold value is provided for Wi-Fi and other tests. Cisco recommends that you do not change this value for general deployment because it can interfere with the rate adaptation algorithms.

**Q. Can I configure Wi-Fi Protected Access–Pre-Shared Key (WPA–PSK) with the help of the Aironet Client Utility (ACU)?**

A. WPA provides a PSK version that is intended for use in small office, home office (SOHO) or home wireless networks. Cisco ACU does not support WPA–PSK. The Wireless Zero Configuration utility from Microsoft Windows supports WPA–PSK for most wireless cards.

**Q. In WLC v4.1 (and later), do the client roaming parameters available from the Wireless > 802.11x > Client Roaming page apply only to CCXv4 clients (i.e., "directed roaming")? Do these parameters have any impact on non-CCXv4 clients?**

A. Directed roaming is supported in CCXv4 and later. Cisco does not really do directed roaming (the controller does not tell client to roam to a specific access point) but does send these parameters to clients for clients to make roaming decisions. These are only for CCXv4 and later clients. This will not affect clients which have a CCX version earlier than 4.

## **Association and IP Addressing**

**Q. The access point has an entry in the association table for my PC Memory Card International Association (PCMCIA) card, but I cannot get a dynamic IP address. What is the problem?**

A. The most common cause of this behavior is the inability of the PC to communicate with the card through the PCMCIA socket. Check the driver for your PC card socket. If the driver is a CardBus driver, check whether it is 32-bit only. The Cisco Aironet card requires 16-bit access. If the driver for the socket only works in 32-bit mode, you must contact the manufacturer of the computer for a 16-bit version. If the manufacturer cannot provide you with one, there are third-party PCMCIA card and socket service manufacturers who sell products that support 16-bit access.

The CB20A and CB21AG Cards are CardBus compliant, and only work with hardware sockets and drivers that supply 32-bit access. The PI21AG is a PCI card, so other problems can contribute.

**Q. What devices can associate with a client card?**

- ◆ Client to access point
- ◆ Client to bridge (in access point mode)
- ◆ Client to base station
- ◆ Client to client (in ad-hoc mode)

Refer to the Cisco Aironet Hardware Association Matrix for more details.

**Q. How many clients can associate to an access point?**

A. An access point has the physical capacity to handle 2,048 MAC addresses. However, the access point is a shared medium and acts as a wireless hub. Therefore, a large number of users on an individual access point degrades performance.

The best estimates of potential client population for a given install site come from a presales site survey. Contact your Cisco Systems Engineer (SE), Cisco account team or Cisco authorized wireless reseller for assistance in the coordination of a site survey by a qualified survey partner.

**Q. Why does my client card not associate to the closest access point?**

A. If you have multiple access points in your wireless topology, your client maintains an association with the access point with which the client originally associated. The association

remains until the client loses keepalive beacons from that access point. The client then seeks out another access point and attempts to associate to that access point, if the client has sufficient rights and authorization on the new access point.

Make sure that available configured data rates match between a given client and the access point desired. An auto setting on the client card does not automatically match everything, but allows the client card to rate shift among available rates that the access point advertises.

## Software Installation

### Q. Where can I find help to install my client card?

A. Refer to Cisco Aironet Wireless LAN Client Adapters Installation and Configuration Guide for Windows or Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters Installation and Configuration Guide. Refer to the Wireless Devices Technical Support page for additional information, which includes installation–related documents.

### Q. How do I update the software for my Windows client?

A. There are three pieces of client software:

- ◆ The radio firmware on the card
- ◆ The client driver for the operating system
- ◆ The Aironet Client Utility (ACU)

The radio firmware resides on the client device, and in the case of the PC card, is removed when the card is removed.

The client driver is the software that manages interactions between Windows (or another operating system) and the hardware.

The ACU is a utility to manage the card and the radio.

These three pieces of software have different functions, but work together to provide wireless connectivity to your client. You must always use the most recent versions of the software available. These three pieces of software have been combined into the Cisco Aironet Client Adapter Installation Wizard for Windows available at Wireless Downloads (registered customers only).

### Q. How do I install the PC card drivers on my Windows NT 4.0–based PC?

A. Windows NT 4.0 does not support Plug–and–Play. Therefore, check the available Interrupt Request (IRQ) and I/O ports. In order to do this, choose **Programs > Administrative Tools > Windows NT Diagnostics**.

Try IRQ port 10 and I/O port 100 first. Then choose **Control Panel > Network > Adapter > Add**.

Pick the right driver from the installation diskette. In NT, look at the interrupt settings I/O base 64 k contiguous I/O block. Do not select obvious I/O blocks.

In order to find out which interrupts are in use, choose **Programs > Administrative Tools >**

**NT Diagnostics**, then click the **Resource** tab.

This information is what NT reports, and is not set in the registry. Do not select obvious I/O bases, such as I/O bases, that sound cards use. NT then copies and binds the files.

## **Q. How do I remove the PC card drivers on my Windows–based PC?**

**A.** In Windows 95 and Windows ME, remove these files:

- ◆ C:\windows\system\PCX500.SYS
- ◆ C:\windows\system\VXDX500.VXD

In Windows 98, remove the files listed for Windows 95 and Windows ME and this additional file:

- ◆ C:\windows\inf\other\AIRONETNETX500.INF

In Windows 2000, make sure the card is inserted, then remove these files:

- ◆ C:\WINNT\system32\drivers\PCX500.SYS
- ◆ C:\WINNT\system32\VXDX500.VXD

The Aironet card copies protocols from other network cards.

Current versions of the Aironet Client Adapter software put an entry in the Add/Remove Programs panel of Windows.

## **Q. After I insert my PCI card and boot my PC, the Cisco Aironet installation software indicates that the card is not installed. What is the problem?**

**A.** Sometimes when a new PCI card is installed in a PC, the BIOS/CMOS does not reread the PCI bus and recognize that a new card has been inserted. Reboot the computer and enter your CMOS setup program. Some computers require you to press **Delete**, **F2**, **F10**, or other keys. Some computers require you to boot with a special boot utility disk. Have the CMOS reset configuration data or refresh hardware configuration. This wording can be different and depends on the manufacturer of the BIOS. If there is no option of this nature, change the date/time, or some other minor BIOS setting. Then, save the changes and exit.

The fact is that something in CMOS changed must trigger a re–read of the PCI bus and make sure the hardware recognizes the PCI card so that Windows also recognizes the card. If you are unable to get the BIOS to see the card at this level, contact technical support for assistance on your PC.

## **Q. Do I require Windows 98 driver for my AIR–PI21AG–A–K9 802.11 a/b/g PCI adapter? I cannot find the driver in the Wireless Downloads page.**

**A.** The Windows 98 platform does not support the AIR–CB21AG cards and AIR–PI21AG cards. These cards are developed only for Windows XP and Windows 2000 platforms. You can use the 350 Series Client Cards with 802.11b radio or the Cisco Aironet 5 GHz Wireless LAN Client Adapter (CB20A). The Windows 98 platform supports these client cards. Drivers for these cards are available at Wireless Downloads (registered customers only) .

## **Q. What are the Cisco Client Adapters and Utilities supported on Windows Vista?**

A. Currently, Cisco Aironet 802.11a/b/g Cardbus Wireless LAN Client Adapter (CB21AG) and Cisco Aironet 802.11 a/b/g PCI Wireless LAN Client adapter (PI21AG) are supported on Windows Vista. Refer to Release Notes for Cisco Aironet 802.11a/b/g Client Adapters (CB21AG and PI21AG) for Windows Vista 1.0 for more information about Vista support on Wireless Client Adapters.

Cisco Aironet Desktop Utility (ADU) and Cisco Aironet Client Utility are not supported on Windows Vista.

## **Configuration**

### **Q. How do I set the client card back to the factory default settings?**

A. Launch the Aironet Client Utility (ACU) or Aironet Desktop Utility (ADU) and click **Commands**, then click **Edit Properties**. On each tab, click **Defaults**.

## **Security**

### **Q. Do I need special hardware to support encryption?**

A. The specific hardware model determines the level of encryption for the unit:

- ◆ The 342 and 352 models support both 40– and 128–bit encryption.
- ◆ The 341 and 351 models support only 40–bit encryption.
- ◆ The CB20A and CB21AG models support both 40– and 128–bit encryption.
- ◆ The CB21AG model supports AES encryption, as well.
- ◆ PI21AG supports for static and dynamic IEEE 802.11 WEP keys of 40 and 128 bits

### **Q. How do I secure the data across the radio link of a client card?**

A. Enable Wired Equivalent Privacy (WEP) to encrypt packets sent across a radio link. Refer to Wired Equivalent Privacy (WEP) on Aironet Access Points and Bridges Configuration Example for more information.

## **Miscellaneous Problems and Errors**

### **Q. When my PC card passes traffic, the speakers in my laptop buzz. What is the problem?**

A. This problem comes from inadequate shielding around the PCMCIA socket. The radio energy of the card that passes traffic leaks over into the speakers (because the energy is not sufficiently contained in the card socket) and manifests as a buzz in the speakers. Therefore, this buzz is not a problem with the card, but with the socket. Resolution must come from the laptop manufacturer that chose not to shield the socket.

**Q. What are possible sources of interference for the radio frequency (RF) link of my client card?**

A. Interference can come from a number of sources, including 2.4 GHz cordless phones, improperly shielded microwave ovens, and wireless equipment manufactured by other companies. Police radar, electrical motors, and moving metal parts of machinery can also cause interference. Refer to Troubleshooting Problems Affecting Radio Frequency Communication for more information.

**Q. Do autonomous access points (APs) support load balancing with all Wireless client adapters?**

A. Autonomous APs support load balancing only with Cisco 350 Wireless Cards with Aironet extensions enabled. Because this is not included in the Cisco Compatible Extensions (CCX) program, it does not work with any other wireless cards.

**Q. How do you turn on logging in Windows Zero Config (WZC) in Windows wireless clients?**

A. On the client, turn on the EAPOL and RASTLS logs with these commands:

- ◆ **netsh ras set tracing eapol enable**
- ◆ **netsh ras set tracing rastls enable**

In order to disable the logs, run the same commands, but replace **enable** with **disable**. For XP, all logs are located in `%systemroot%\windows\tracing`.

**Q. I configured a Windows Zero Config (WZC) supplicant with a SSID name. I have SSID broadcast disabled in the access point (AP). It is configured for static Wired Equivalent Privacy (WEP). Association with the AP is fine when this SSID is used. However, once I disconnect the wireless connection from the wireless network list (windows), it is removed from the network list. Why is this?**

A. The WZC supplicant configuration needs to have the broadcast SSID enabled for this to work as expected. If broadcast SSID is not enabled, the utility runs into issues of the network disappearing from the list.

**Q. I configured two networks with SSID broadcast enabled in the access point (AP). However, I can only see one network in the wireless network list (windows). Is this normal and is there any workaround to see both?**

A. If you use Multiple Basic Service Set Identifier (MBSSID) on the AP, then the AP uses an offset MAC address to broadcast both SSIDs. Because any broadcast SSID requires the MAC address of the AP, without MBSSID enabled, you will only see one.

**Q. When a client comes back from sleep mode, the client does not get reauthenticated automatically to the access point (AP). It requires the entire authenticating process to be restarted. Is this normal?**

A. It is normal that a client adapter has problems re-authenticating to the AP once it comes back from sleep mode. The AP has an inactivity timeout. Therefore, when an adapter goes in to sleep mode the AP de-authenticates the client. When the client resumes the session, it keeps the status of authenticated. Because of this, it does not re-send the probe request in order to start the whole process over again. This is why if they boot or restart the authentication process, the client is able to authenticate.

**Q. What does error message mean: "Packet to client xxxx reached max retries, removing the client"?**

A. The Packet to client xxxx reached max retries, removing the client error message means that the AP disassociates the client because the client did not respond to max keep-alive messages sent by the AP. This can be an indication of a bad RF. Configure this command on the AP in order to eliminate this issue and to enable the client to not lose the connection:

```
packet retries 128 drop-packet
```

The increase of packet re-tries to 128 with the drop-packet option is a workaround for the bad RF problem. Refer to Configuring the Maximum Data Retries for more information on this command.

**Q. Is it possible to dynamically manage client bandwidth via the RADIUS server and BBSM?**

A. Yes. This can be achieved by using the Cisco Building Broadband Service Manager (BBSM) with RADIUS server.

Cisco BBSM provides public and guest Internet access management features and functionality to wired and wireless networks. It works with Cisco access-layer LAN products like access layer switches. Refer to Cisco BBSM documentation for more information.

BBSM performs RADIUS authentication and authorization of end users (of a specific VLAN). Each time the end user attempts to connect to the Internet, BBSM prompts for a username and password. The values entered are used in the Access-Request packet to the RADIUS authentication server. Upon successful authentication, the RADIUS server sends a vendor-specific attribute that contains a bandwidth kbps value in the Access-Accept packet.

When the RADIUS server sends this vendor-specific attribute that contains a bandwidth kbps value, BBSM throttles the bandwidth of the end user session to the kbps value specified. In order to use this feature, administrators need to configure their RADIUS server to send the vendor-specific attribute to transmit a Vendor ID of 5263, a Vendor type of 1, and the integer value of the bandwidth kbps desired for the user account.

Refer to Cisco BBSM – Using RADIUS Authentication, Authorization, and Accounting for more information on how BBSM works with a RADIUS server for user authentication and bandwidth management.

Refer to Cisco BBSM Bandwidth Management on how to control a users bandwidth in BBSM.

Also, refer to Configuring Cisco 2900XL/3500XL Switches with VLANs to Use Cisco BBSM 5.0 for detailed information on how to configure the upstream switches of a client

with VLANs in order to work with BBSM.

## Related Information

- **Cisco Aironet Client Adapters Installation & Configuration Guides**
  - **Cisco Wireless LAN Products**
  - **Technical Support & Documentation – Cisco Systems**
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Updated: Jun 29, 2007

Document ID: 8102

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