“Deployment Guide: Cisco Guest Access Using the Cisco Wireless LAN Controller”

August 2006

Contents

Overview

Today, leading companies are faced with providing network access for their customers, partners, vendors, contractors and other visitors. This expanded network access enables higher productivity, improved collaboration, and better service; however, it necessitates that a guest access policy be established to address increased network usage and security issues.

By implementing a broad-based solution to guest access, companies can control network access, eliminate ad hoc IT support requirements, track guest network usage and securely separate guest traffic from internal resources.

The need for guest access has evolved as the needs of guests have evolved. Today, with laptops, networked applications, and digital phone lines, a visiting guest is disempowered without continued access to these technologies.

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Guest networks are network connections provided by an enterprise to enable their guests to gain access to the Internet, and the guests' own enterprise without compromising the security of the host enterprise. The main technical requirements for a complete guest access solution are outlined below:

- Complete integration into the enterprise network and its resources
- Logical separation (segmentation) of guest traffic from internal enterprise traffic
- Secure VPN connections to guests' own corporate networks
- Authentication and login capabilities

In this document, we have included various scenarios where the Cisco Wireless LAN Controller can be used to deploy a guest access solution over the corporate network.

Terms and Acronyms

Table 1 Key Terms Used in this Deployment Guide

Term or Acronym	Definition
AP	Wireless access point
BBSM	Cisco Building Broadband Service Manager
Cisco WiSM	Cisco Wireless Services Module
Lightweight AP	An access point running LWAPP that makes the AP work with the WLCs
LWAPP	Lightweight Access Point Protocol—IETF draft protocol used in the Cisco Centralized WLAN Architecture implementations. LWAPP defines both control and data encapsulation formats used in the Cisco Centralized WLAN Architecture
WCS	Cisco Wireless Control System—Management software that manages WLC devices and adds advanced management like location-based services
WLC	Cisco Wireless LAN controller—Cisco devices that centrally manage lightweight access points and WLAN data traffic

Configuring Guest Access on the Cisco Wireless LAN Controller

An existing enterprise wired and wireless network infrastructure can be used to implement a wireless guest network. No separate, overlay network is required to support guest access.

Therefore, the overall implementation and maintenance costs of a guest network are greatly reduced.

To successfully implement a guest network on an existing wired or wireless network, the following critical elements are required:

- A dedicated guest SSID/WLAN – Required implementation within all wireless networks in which guest access is needed.

- Guest traffic segregation or path isolation – To restrict guest user traffic to distinct, independent logical traffic paths within a shared physical network infrastructure.
- Access Control – To identify any user or device that logs onto the network for assignment to appropriate groups by employing an authentication process.
- Guest User Credential Management - To support creation of temporary credentials for a guest by an authorized user. This function may reside within an access control platform or a component of AAA or other management system.

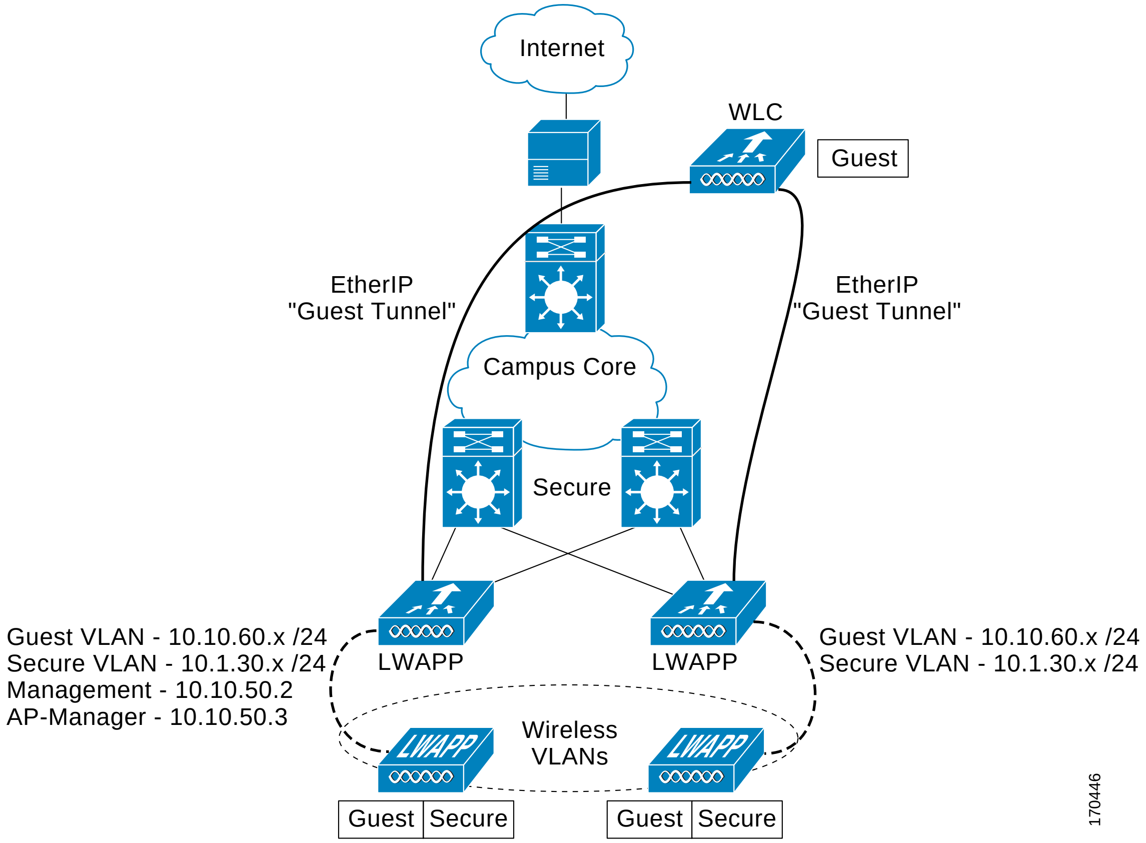
Initial Configuration

Figure 1 shows an example of basic guest access using the Cisco wireless LAN controller. The configuration shown is applicable for Cisco controller models 2006, 410x, and 440x.

The wireless LAN controller in the remote office is connected to a WAN infrastructure.

- All the interfaces on the wireless LAN controller are mapped to physical port 1 and two WLANs are configured:
  - one for a guest user (SSID – *guest*) and
  - one for EAP authentication (SSID – *secure*).
- Dynamic VLAN interfaces are created for the guest SSID (VLAN 60) and the secure EAP SSID (VLAN 30).
- The management and access point (AP) manager interfaces are configured to use VLAN 50.
- All network services (AAA, DHCP, and DNS) are configured on VLAN 1.
- All access points will be connected to VLAN 50.

Figure 1 Configuration Example - Remote Office



Connecting to the Neighbor Switch

The WLC is connected to the neighboring Catalyst 3750 switch using only 1 port. The neighbor switch port is configured as an 802.1Q trunk, and only the appropriate VLANs in this case, specifically VLANs 30, 50 and 60 are allowed. The AP-Manager and Management interfaces are members of VLAN 50 which in this example is configured as the native VLAN in the trunk interface.

The 802.1Q switchport command-line interface (CLI) configuration is as follows:

```
interface GigabitEthernet1/1
 description Trunk Port to Cisco WLC
 switchport trunk encapsulation dot1q
 switchport trunk native vlan 50
 switchport trunk allowed vlan 30,50,60
 switchport mode trunk
 no ip address
```

Configuring the Cisco Wireless LAN Controller

The initial configuration of the Cisco wireless LAN controller is done through a console cable connected to the controller. The administrator can configure the system using the Configuration Wizard available on the console port.

Note After the initial configuration, the administrator can configure the Cisco wireless LAN controller using the controller command-line interface (CLI) or the controller GUI.

The Configuration Wizard is used to configure a number of items as seen in the script example below. Some of the items configured during this process include: the system name, Cisco wireless LAN controller (WLC) administrative user credentials, the Management interface, AP Manager, virtual interfaces, the mobility group name, one SSID, and a RADIUS server.

```
Welcome to the Cisco Wizard Configuration Tool
Use the '-' character to backup
System Name [Cisco_33:1c:c0]:
Enter Administrative User Name (24 characters max): admin
Enter Administrative Password (24 characters max): *****
Management Interface IP Address: 10.10.50.2
Management Interface Netmask: 255.255.255.0
Management Interface Default Router: 10.10.50.1
Management Interface VLAN Identifier (0 = untagged):
Management Interface Port Num [1 to 4]: 1
Management Interface DHCP Server IP Address: 10.1.1.11
AP Manager Interface IP Address: 10.10.50.3
AP-Manager is on Management subnet, using same values
AP Manager Interface DHCP Server (10.1.1.11):
Virtual Gateway IP Address: 1.1.1.1
Mobility/RF Group Name: mobile-1
Network Name (SSID): guest
Allow Static IP Addresses [YES][no]: no
Configure a RADIUS Server now? [YES][no]: YES
Enter the RADIUS Server's Address: 10.1.1.11
Enter the RADIUS Server's Port [1812]:
Enter the RADIUS Server's Secret: cisco
Enter Country Code (enter 'help' for a list of countries) [US]: US
Enable 802.11b Network [YES][no]: YES
Enable 802.11a Network [YES][no]: YES
Enable 802.11g Network [YES][no]: YES
Enable Auto-RF [YES][no]: YES
Configuration saved!
Resetting system with new configuration....
```

Note During initial setup, the VLAN for the Management interface is untagged because it corresponds to the native VLAN on the switch trunk port. By default, an untagged VLAN is assigned the value of zero (0) but this value may not correspond to the VLAN number on the switch port. In the example in this document, the switch port’s Native VLAN is VLAN 50, but on the Cisco wireless LAN controller, the Management interface is assigned to VLAN 0. The default values for all other options are accepted as assigned and noted above in the Configuration Wizard script.

Modifying the VLAN Interfaces for the Guest and Secure (Employee) VLAN

The guest VLAN and the employee (secure) VLAN must be modified from the configuration initially assigned during the configuration wizard process.

Note All configuration of the controller from this point forward is done using a web management interface.

To modify the guest and employee (secure) VLAN interfaces, follow these steps:

Step 1 Open an Internet Explorer browser window (only Internet Explorer is supported) and point it at the Management interface IP address. Only HTTPS is on by default, so the URL should be ***https://<management_IP>***.

The window seen in Figure 2 appears.

Step 2 In the web interface of the wireless LAN controller (WLC), choose **Controller > Interfaces.**

Step 3 Click **New...** to create a dynamic VLAN interface for the guest SSID.

In the window that appears (Figure 3), enter a name in the Interface Name field and assign a value to the VLAN ID field. For this example, we entered *guest-vlan* and *60*, respectively.

Step 4 Click **Apply**.

Step 5 In the window that appears (Figure 4), enter the IP address, net mask, and gateway addresses for the VLAN interface.

Step 6 Enter the port number of the physical port.

Step 7 Enter the IP address for the DHCP server.

Step 8 Select the Access Control List, if applicable.

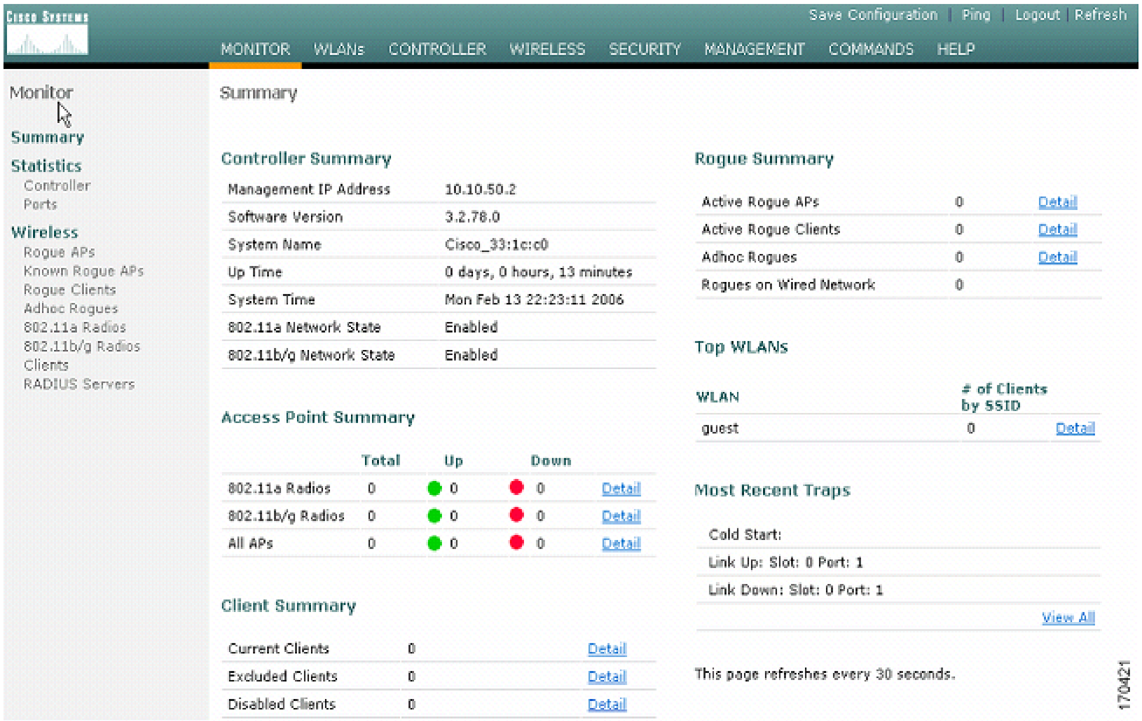
Step 9 Click **Apply**. The window seen in Figure 5 appears.

Step 10 Repeat steps 2 to 9 to create another dynamic interface for the EAP SSID (employee secure VLAN).

For this example, we named the VLAN *secure-vlan* with a VLAN ID of *30*.

Note To view the newly created *guest-VLAN* and *secure-VLAN*, choose **WLANs** from the navigation bar **(**Figure 5**)**.

Figure 2 Initial Configuration of the WLC as Created by the Configuration Wizard



Summary

Controller Summary

Management IP Address	10.10.50.2
Software Version	3.2.78.0
System Name	Cisco_33:1c:c0
Up Time	0 days, 0 hours, 13 minutes
System Time	Mon Feb 13 22:23:11 2006
802.11a Network State	Enabled
802.11b/g Network State	Enabled

Access Point Summary

	Total	Up	Down	
802.11a Radios	0	● 0	● 0	Detail
802.11b/g Radios	0	● 0	● 0	Detail
All APs	0	● 0	● 0	Detail

Client Summary

Current Clients	0	Detail
Excluded Clients	0	Detail
Disabled Clients	0	Detail

Rogue Summary

Active Rogue APs	0	Detail
Active Rogue Clients	0	Detail
Adhoc Rogues	0	Detail
Rogues on Wired Network	0	

Top WLANs

WLAN	# of Clients by SSID	
guest	0	Detail

Most Recent Traps

Cold Start:

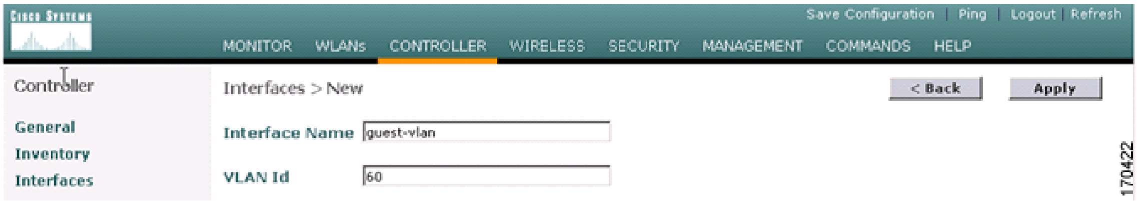
Link Up: Slot: 0 Port: 1

Link Down: Slot: 0 Port: 1

View All

This page refreshes every 30 seconds.

Figure 3 Configuring VLAN Interface for Guest and Secure (Employee) Wireless LAN Access

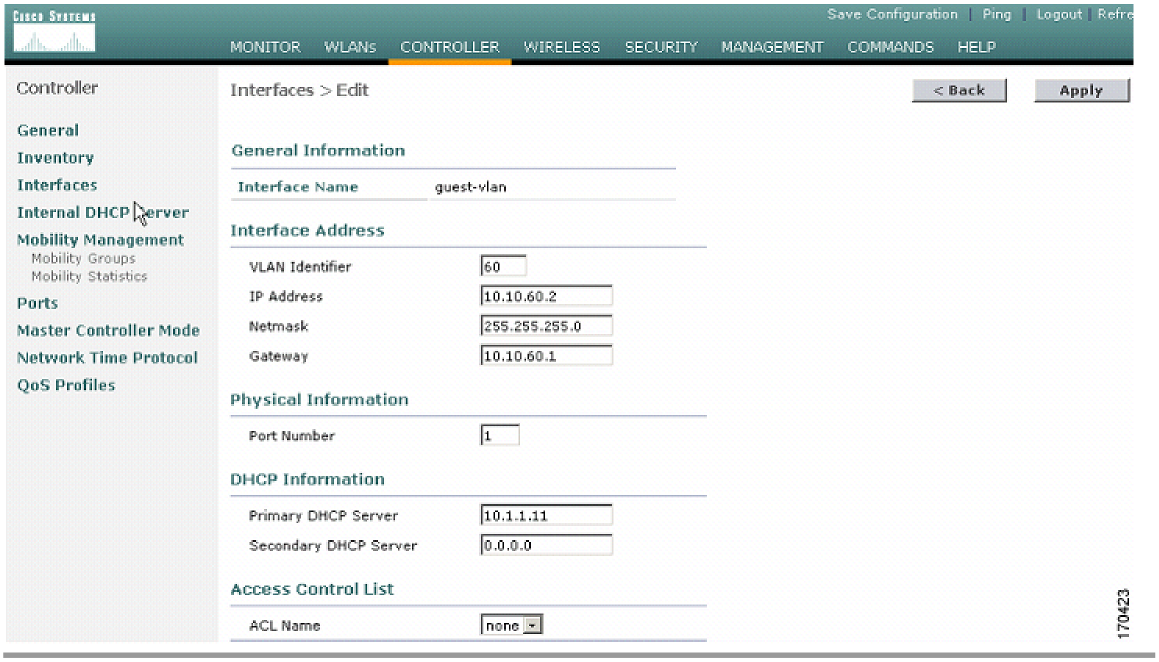

Cisco Systems
Save Configuration | Ping | Logout | Refresh
MONITOR WLANs CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP
Controller
General
Inventory
Interfaces
< Back
Apply
170422

Interfaces > New

Interface Name: guest-vlan

VLAN Id: 60

Figure 4 Entering Configuration Details for the Guest VLAN Interface



Interfaces > Edit

General Information

Interface Name	guest-vlan

Interface Address

VLAN Identifier	60
IP Address	10.10.60.2
Netmask	255.255.255.0
Gateway	10.10.60.1

Physical Information

Port Number	1

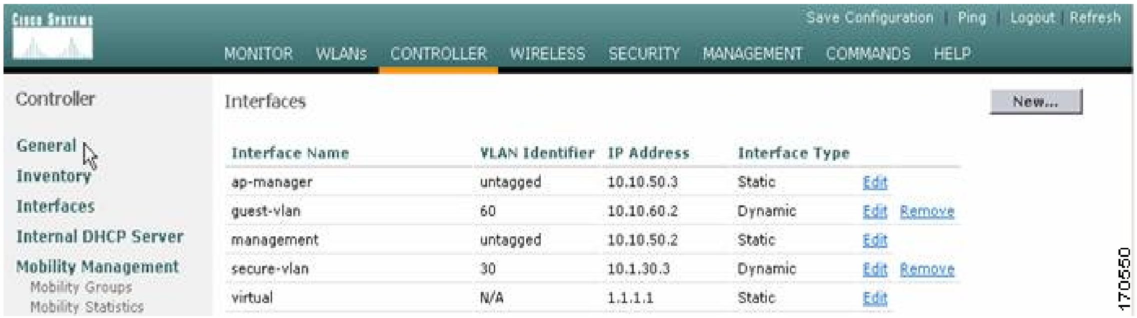
DHCP Information

Primary DHCP Server	10.1.1.11
Secondary DHCP Server	0.0.0.0

Access Control List

ACL Name	none

Figure 5 Summary Page Showing Guest and Secure VLAN



Interfaces

Interface Name	VLAN Identifier	IP Address	Interface Type		
ap-manager	untagged	10.10.50.3	Static	Edit	
guest-vlan	60	10.10.60.2	Dynamic	Edit	Remove
management	untagged	10.10.50.2	Static	Edit	
secure-vlan	30	10.1.30.3	Dynamic	Edit	Remove
virtual	N/A	1.1.1.1	Static	Edit	

Modifying the WLAN Instance to Define Security Policies

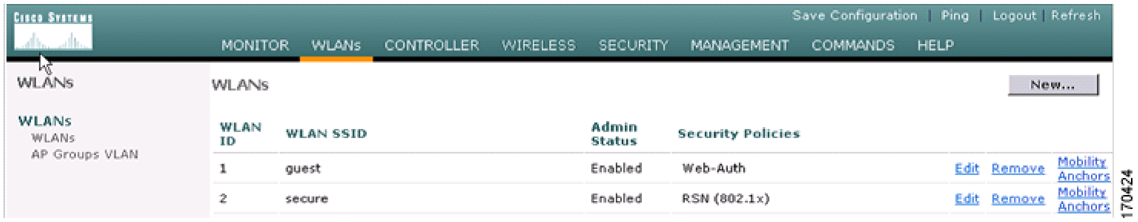
After configuring the IP address for the guest and secure VLAN interfaces for the wireless LAN, you can define security polices such as web authentication (a Layer 3 security policy) for the guest and secure (employee) wireless LAN access interfaces.

To define security policies for the VLANs, follow these steps:

Step 1 Click **WLANs**. The WLANs summary window appears (Figure 6).

Step 2 At the WLANs window (Figure 6), click the **Edit** link next to the **guest WLAN** to access the **WLANs > Edit** page (Figure 7).

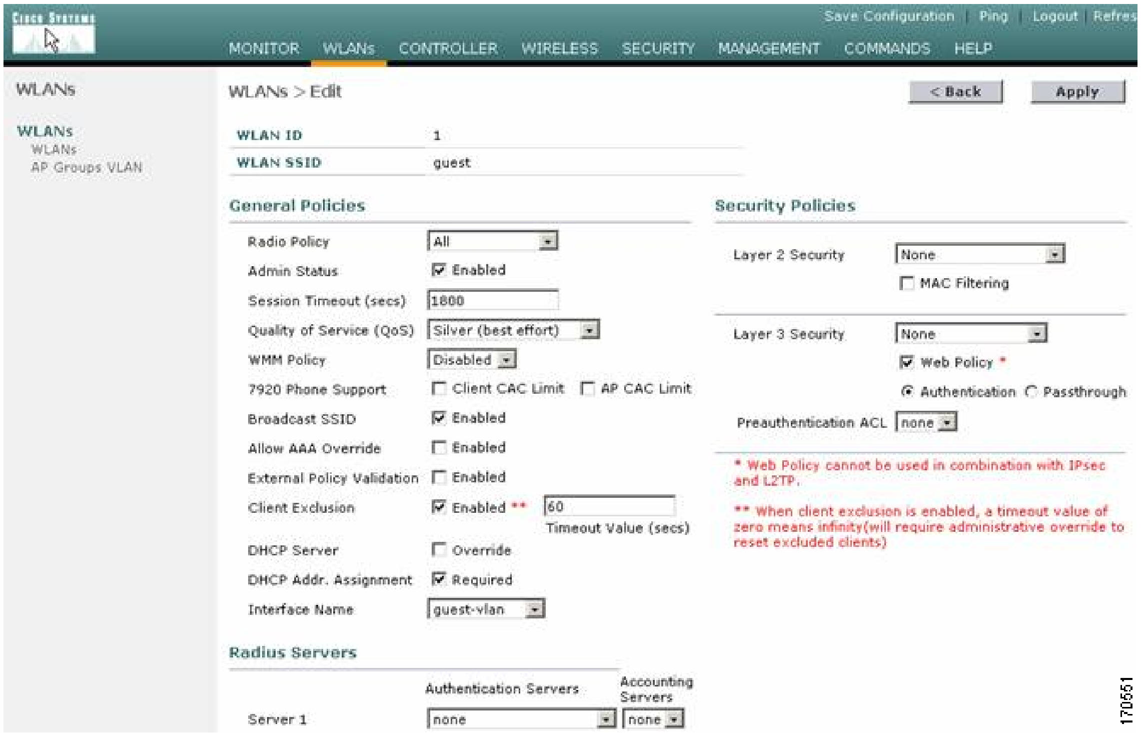
Figure 6 WLANs Summary Page Showing Existing Defined Wireless LANs



WLANs

WLAN ID	WLAN SSID	Admin Status	Security Policies			
1	guest	Enabled	Web-Auth	Edit	Remove	Mobility Anchors
2	secure	Enabled	RSN (802.1x)	Edit	Remove	Mobility Anchors

Figure 7 WLANs > Edit Page for the Guest WLAN



WLANs > Edit

WLAN ID	1
WLAN SSID	guest

General Policies

Radio Policy	All
Admin Status	☑ Enabled
Session Timeout (secs)	1800
Quality of Service (QoS)	Silver (best effort)
WMM Policy	Disabled
7920 Phone Support	☐ Client CAC Limit ☐ AP CAC Limit
Broadcast SSID	☑ Enabled
Allow AAA Override	☐ Enabled
External Policy Validation	☐ Enabled
Client Exclusion	☑ Enabled ** 60 Timeout Value (secs)
DHCP Server	☐ Override
DHCP Addr. Assignment	☑ Required
Interface Name	guest-vlan

Security Policies

Layer 2 Security	None ☐ MAC Filtering
Layer 3 Security	None ☑ Web Policy * ● Authentication ○ Passthrough
Preauthentication ACL	none

* Web Policy cannot be used in combination with IPsec and L2TP.

** When client exclusion is enabled, a timeout value of zero means infinity(will require administrative override to reset excluded clients)

Radius Servers

	Authentication Servers	Accounting Servers
Server 1	none	none

Step 3 At the **WLANs > Edit** page (Figure 7), check the **DHCP Addr. Assignment** box.

This enables dynamic IP address assignment.

Step 4 Select the appropriate **Interface Name** from the drop-down menu.

For this example, the interface for the guest WLAN is *guest-vlan (*assigned in the "Modifying the VLAN Interfaces for the Guest and Secure (Employee) VLAN" section on page 5).

Step 5 At the Layer 3 Security section, check the **Web Policy** box and select the circle next to **Authentication**.

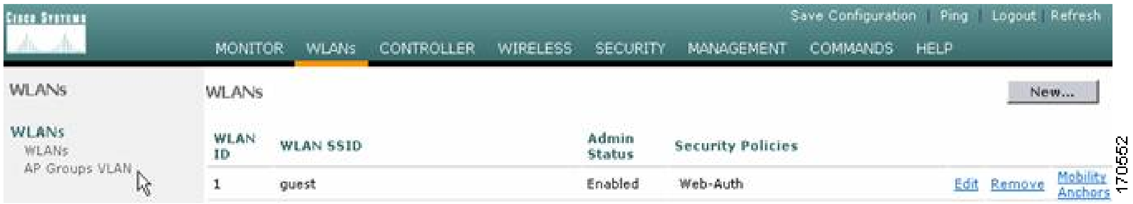
Note Menu options for Layer 2 and Layer 3 Security remain as "None."

Step 6 Click **Apply** to save edits for the interface on the running configuration of the WLAN switch.

Step 7 Choose **WLANs** to verify that the edits are saved (Figure 8).

For this example, we want to verify that web authentication (Web-Auth), the assigned security policy, is enabled for the guest WLAN.

Figure 8 WLANs Page Verifying Security Policy Assigned to Guest WLAN



WLAN ID	WLAN SSID	Admin Status	Security Policies			
1	guest	Enabled	Web-Auth	Edit	Remove	Mobility Anchors

Step 8 Choose **WLANs** > **New** to create a secure (employee) WLAN.

Step 9 At the WLANs page, select the **Edit** link next to the newly created secure WLAN.

Step 10 At the **WLANs** > **Edit** page, check the **DHCP Addr. Assignment** box.

Step 11 Select *secure-vlan* from the **Interface Name** drop-down menu.

Step 12 From the **Layer 2 Security** section, select one of the higher security options.

For this example, we chose WPA2 with 802.1x authentication from a RADIUS server.

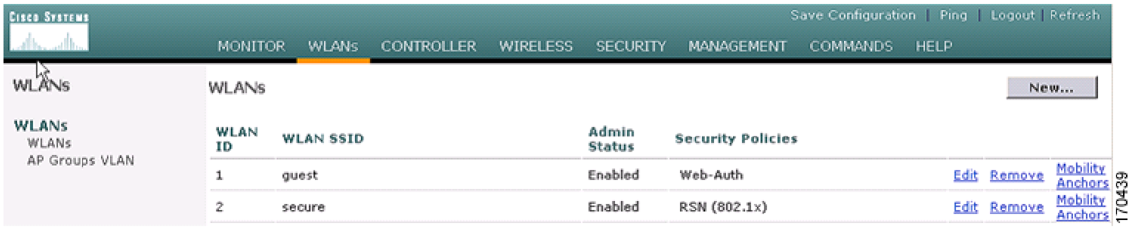
Note If you select WPA2 from the Layer 2 Security menu, you must select the **TKIP and AES** option from the **WPA1/WPA2 Policy** drop-down menu (scroll to bottom of screen) for the feature to work.

Note If using a RADIUS server to authenticate, select the appropriate IP address from the **Authentication Server** drop-down menu found under the Radius Servers section. For this example, we need to define this value given our Layer 2 security selection in Step 12.

Step 13 Click **Apply** to save edits for the interface on the running configuration of the WLAN switch.

Step 14 Choose **WLANs** to verify that the edits are saved (Figure 9).

Figure 9 WLANs Page Verifying Security Policy Assigned to Secure (Employee) WLAN



WLAN ID	WLAN SSID	Admin Status	Security Policies			
1	guest	Enabled	Web-Auth	Edit	Remove	Mobility Anchors
2	secure	Enabled	RSN (802.1x)	Edit	Remove	Mobility Anchors

Creating Guest Access Accounts

If you are using controllers running controller software release 3.2, see the "Creating a Guest Access Account Using the Local Network User Option" section on page 11.

The Local Network User option allows you to directly add users to the local database of the controller. The local user database is limited to a maximum of 2048 entries and is set to a default value of 512 entries at the **Security** > **General** page. This database is shared by local management users (including lobby ambassadors), net users (including guest users), MAC filter entries, and disabled clients. Together, all of these types of users cannot exceed the configured database size.

If you are using controllers running software release 4.0 or greater, see the"Creating a Guest Access Account Using the Lobby Ambassador Option" section on page 12.

The Lobby Ambassador option is a two-step process. The first step is to create a lobby administrator account, also known as a *lobby ambassador account*. The second step is to create guest accounts when the lobby ambassador is active. The lobby ambassador has limited configuration privileges and only has access to the web pages used to manage the guest accounts. The lobby ambassador can specify the amount of time that the guest user accounts remain active. After the specified time elapses, the guest user accounts expire automatically.

Creating a Guest Access Account Using the Local Network User Option

You must create a local net user username and password to use when logging in as a Web Authentication client to the wireless LAN.

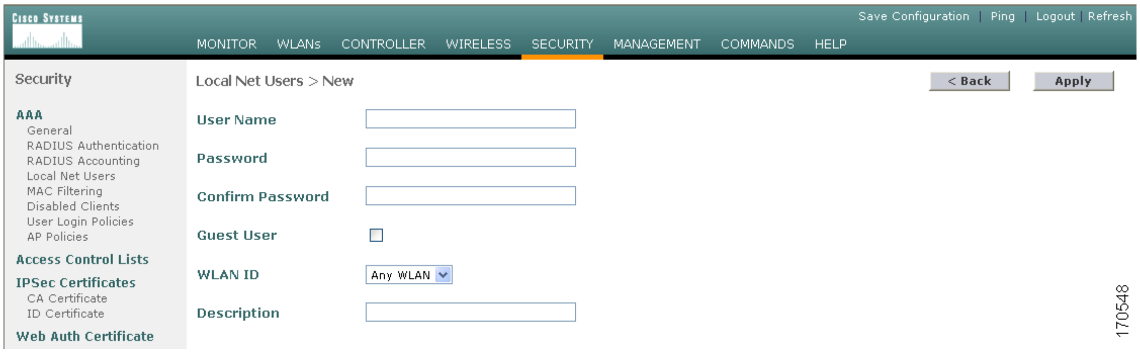
To create a username and a password, follow these steps:

Step 1 Choose **Security** > **Local Net Users** found under the AAA summary heading.

Step 2 On the Local Net Users page, click **New**.

The **Local Net Users** > **New** page appears (Figure 10).

Figure 10 Local Net Users > New Page



WLAN ID: Any WLAN

Step 3 Enter a username.

Step 4 Enter a password.

Step 5 Re-enter the password for confirmation.

Step 6 Check the **Guest User** box to enable the local net user account.

Step 7 In the Lifetime field, enter the period of time (in seconds) that the user account should remain active.

Step 8 Select the WLAN ID to which the user is allowed access.

Note Select the WLAN which has layer 3 web authentication configured (under WLAN Security Policies).

Step 9 In the Description field, enter a term for the user such as *guest user*.

Step 10 Click **Apply** to see your entries and changes.

Step 11 Click **Save Configuration** to save the information entered.

Creating a Guest Access Account Using the Lobby Ambassador Option

You can create a lobby ambassador account on the controller through either its web interface or the CLI. Examples of both are provided below.

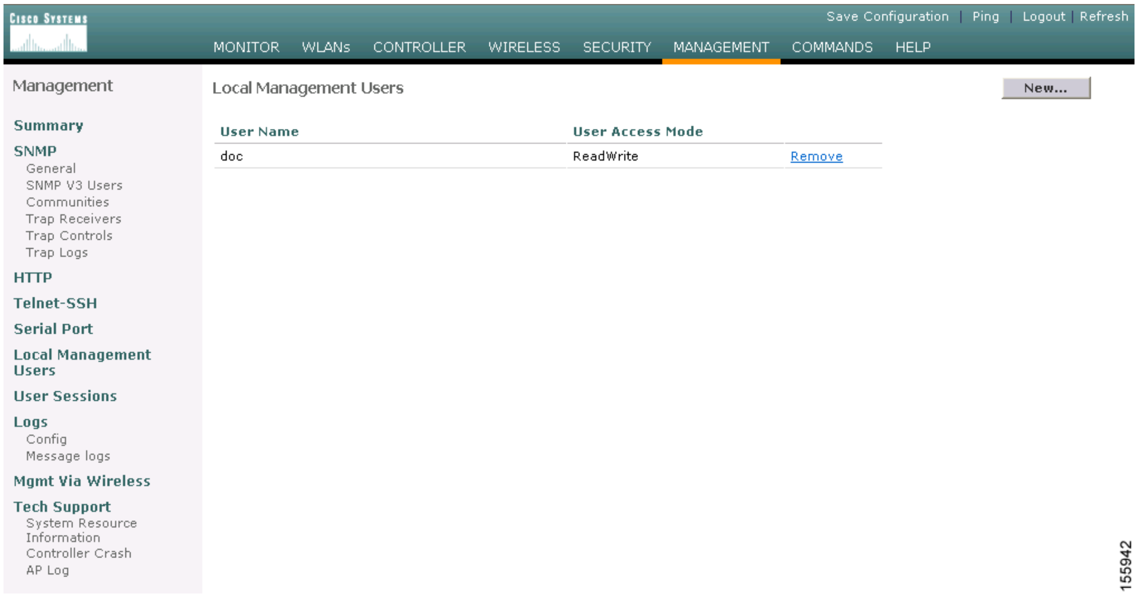
Creating a Lobby Ambassador Account Using the Controller Web Interface

To create a lobby ambassador account on the controller using the web interface, follow these steps:

Step 1 Click **Management** > **Local Management Users** to access the Local Management Users page (Figure 11).

Note This page lists the names and access privileges of the local management users.You can click **Remove** to delete any of the user accounts from the controller. However, deleting the default administrative user prohibits both GUI and CLI access to the controller. Therefore, you must create a user with administrative privileges (ReadWrite) before you remove the default user.

Figure 11 Local Management Users Page



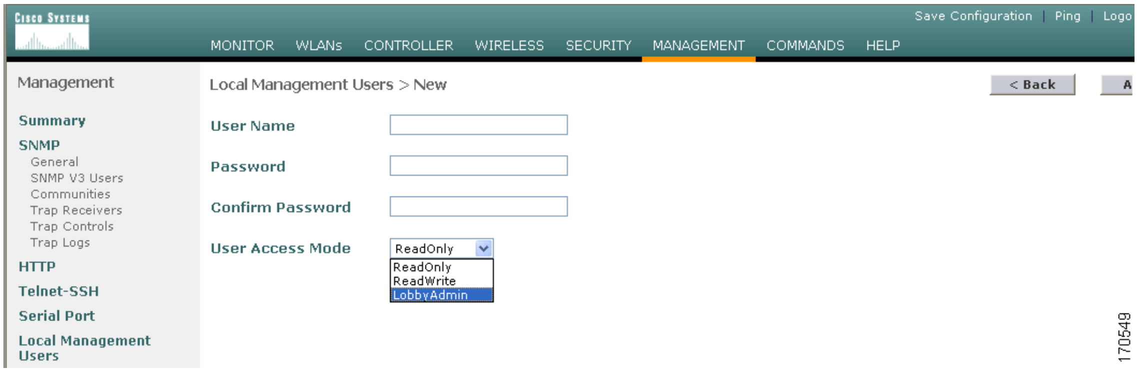
Local Management Users

User Name	User Access Mode	
doc	ReadWrite	Remove

Step 2 Click **New**.

The **Local Management Users** > **New** page appears (Figure 12).

Figure 12 Local Management Users > New Page



Local Management Users > New

User Name

Password

Confirm Password

User Access Mode: ReadOnly

Step 3 In the User Name field, enter a username.

Step 4 In the Password and Confirm Password fields, enter a password.

Note Passwords are case sensitive.

Step 5 Choose **LobbyAdmin** from the User Access Mode drop-down menu. This option enables the lobby ambassador to create guest user accounts.

Note The **ReadOnly** option creates an account with read-only privileges, and the **ReadWrite** option creates an administrative account with both read and write privileges.

Step 6 Click **Apply** to see your changes. The new lobby ambassador account appears in the list of local management users.

Step 7 Click **Save Configuration** to save your changes.

Creating a Lobby Ambassador Account Using the Command-Line Interface

Enter this command to create a lobby ambassador account using the controller CLI:

config mgmtuser add *lobbyadmin_username lobbyadmin_pwd* **lobby-admin**

Note Replacing **lobby-admin** with **read-only** creates an account with read-only privileges. Replacing **lobby-admin** with **read-write** creates an administrative account with both read and write privileges.

Creating Guest User Accounts as a Lobby Ambassador

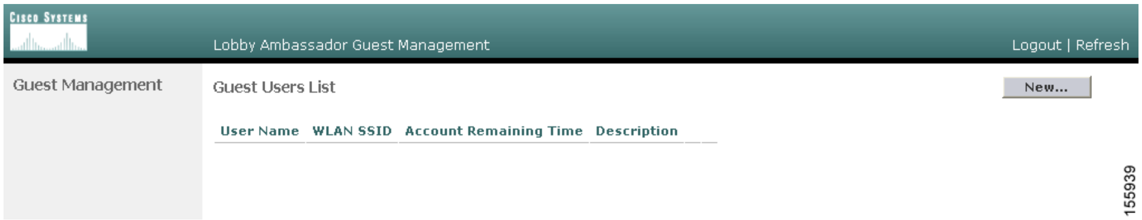
Follow these steps to create guest user accounts:

Note A lobby ambassador cannot access the controller CLI and therefore can only create guest user accounts from the controller GUI.

Step 1 Log into the controller as the lobby ambassador, using the username and password specified in the "Creating a Guest Access Account Using the Lobby Ambassador Option" section above.

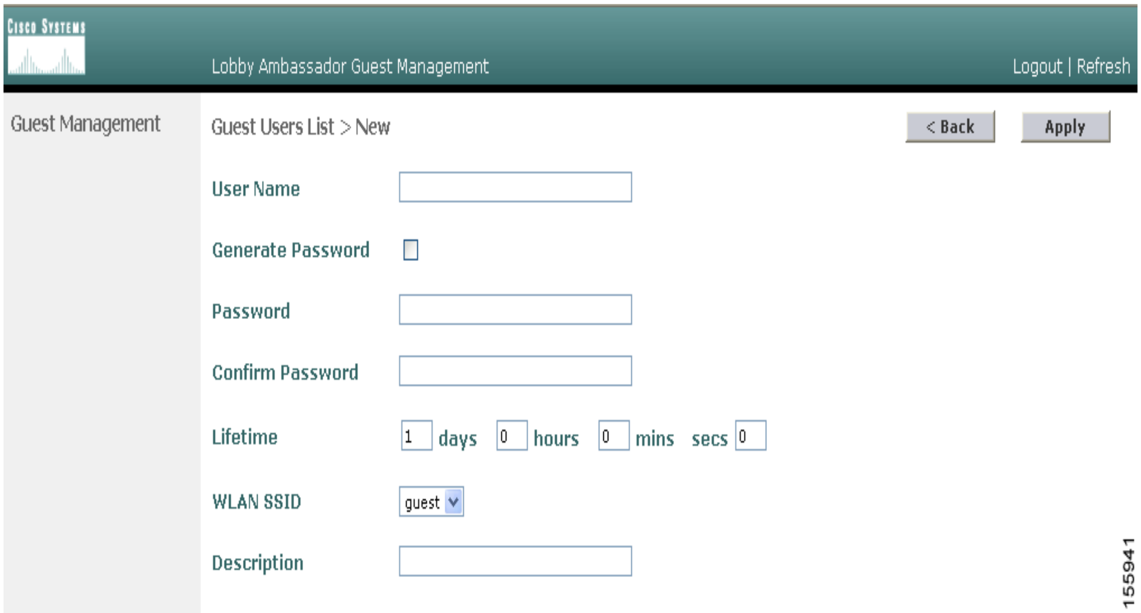
The **Lobby Ambassador Guest Management > Guest Users List** page appears (Figure 13).

Figure 13 Lobby Ambassador Guest Management > Guest Users List Page



Step 2 Click **New** to create a guest user account. The **Guest Users List > New** page appears (Figure 14).

Figure 14 Guest Users List > New Page



User Name

Generate Password □

Password

Confirm Password

Lifetime 1 days 0 hours 0 mins secs 0

WLAN SSID guest

Description

Step 3 In the User Name field, enter a name for the guest user. You can enter up to 24 characters.

Step 4 Perform one of the following:

- If you want to generate an automatic password for this guest user, check the **Generate Password** check box. The generated password is entered automatically in the Password and Confirm Password fields.
- If you want to create a password for this guest user, leave the **Generate Password** check box unchecked and enter a password in both the Password and Confirm Password fields.

Note Passwords can contain up to 24 characters and are case sensitive.

Step 5 From the Lifetime drop-down boxes, choose the amount of time (in days, hours, minutes, and seconds) that this guest user account is to remain active. A value of zero (0) for all four fields creates a permanent account.

Default: 1 day

Range: 5 minutes to 30 days

Note The smaller of this value or the session timeout for the guest WLAN, which is the WLAN on which the guest account is created, takes precedence. For example, if a WLAN session timeout is due to expire in 30 minutes but the guest account lifetime has 10 minutes remaining, the account is deleted in 10 minutes upon guest account expiry. Similarly, if the WLAN session timeout expires before the guest account lifetime, the client experiences a recurring session timeout that requires re-authentication.

Note You can change a guest user account with a non-zero lifetime to another lifetime value at any time while the account is active. However, to make a guest user account permanent or to change a permanent account to a guest account, you must delete the account and create it again.

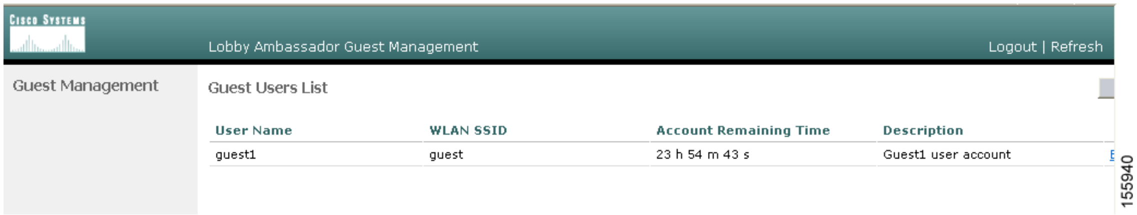
Step 6 From the WLAN SSID drop-down box, choose the SSID that will be used by the guest user. The only WLANs that are listed are those for which Layer 3 web authentication has been configured (under WLAN Security Policies).

Note Cisco recommends that the system administrator create a specific guest WLAN to prevent any potential conflicts. If a guest account expires and it has a name conflict with an account on the RADIUS server and both are on the same WLAN, the users associated with both accounts are disassociated before the guest account is deleted.

Step 7 In the Description field, enter a description of the guest user account. You can enter up to 32 characters.

Step 8 Click **Apply** to commit your changes. The new guest user account appears in the list of guest users on the Guest Users List page (Figure 15).

Figure 15 Lobby Ambassador Guest Management > Guest Users List Page



User Name	WLAN SSID	Account Remaining Time	Description
guest1	guest	23 h 54 m 43 s	Guest1 user account

From this page, you can see all of the guest user accounts, their WLAN SSIDs, and their lifetimes. You can also edit or remove a guest user account. When you remove a guest user account, all of the clients that are using the guest WLAN and are logged in using that account's username are deleted.

Step 9 Repeat this procedure to create any additional guest user accounts.

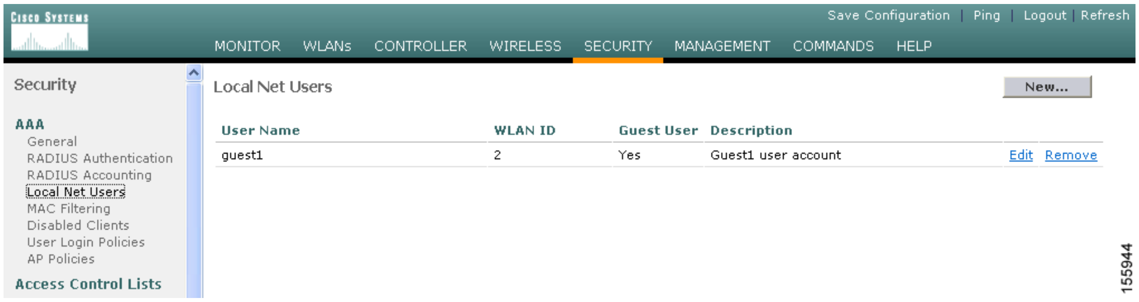
Viewing Guest User Accounts

After a lobby ambassador creates the guest user accounts, the system administrator can view them from the controller GUI or CLI.

Using the GUI to View Guest Accounts

To view guest user accounts using the controller GUI, click **Security** and then **Local Net Users** under AAA. The Local Net Users page appears (Figure 16).

Figure 16 Local Net Users Page



User Name	WLAN ID	Guest User	Description		
guest1	2	Yes	Guest1 user account	Edit	Remove

From the Local Net Users page, the system administrator can see all of the local net user accounts (including guest user accounts) and can edit or remove them as desired. When you remove a guest user account, all of the clients that are using that guest WLAN and are logged in using that account's username are deleted.

Using the CLI to View Guest Accounts

To view all of the local net user accounts (including guest user accounts) using the controller CLI, enter this command: **show netuser summary**

Web Authentication Process

Web authentication is a Layer 3 security feature that causes the controller to block IP traffic (except DHCP-related packets) until the client has correctly supplied a valid username and password. When you use web authentication to authenticate clients, you must define a username and password for each client. Then when the clients attempt to join the wireless LAN, their users must enter the username and password when prompted by a login window.

Using the Web Authentication feature on a Cisco wireless LAN controller, we can authenticate a guest user on the wireless LAN controller, an external web server, an external database on a RADIUS server or via the Cisco Building Broadband Service Manager (BBSM).

These four methods are described in the following sections:

"Web Authentication Using Mobility Anchor Feature on Controller" section on page 17

"Web Authentication Using an External RADIUS Server" section on page 26

"Web Authentication Using an External Web Server" section on page 28

"Web Authentication Using Cisco Building Broadband Service Manager" section on page 30

Web Authentication Using Mobility Anchor Feature on Controller

Guest tunneling provides additional security for guest-user access to the corporate wireless network, ensuring that guest users are unable to access the corporate network without first passing through the corporate firewall. Instead of extending the DMZ virtual LAN (VLAN) to each wireless LAN controller on the network, a Cisco 4100 or 4400 series wireless LAN controller or Cisco WiSM can be used in the DMZ as an anchor controller to terminate traffic from remote controllers.

Internal employee user traffic is segregated from guest user traffic using Ethernet over IP (EoIP) tunnels and VLANs between the remote controllers and the DMZ controller.

Guest Tunneling Support on Cisco Products

Guest Tunneling provides additional security for guest-user access to the corporate wireless network across most wireless LAN controller platforms (Table 2).

Table 2 Guest Tunneling Support on Wireless LAN Controller Platforms

Software Release/Platform	3.0	3.2	4.0
Cisco 4100 series wireless LAN controllers	Y	Y	N
Cisco 4400 series wireless LAN controllers	Y	Y	Y
Cisco 2000 series wireless LAN controllers[1]	N	Y	Y
Cisco 6500 series (WiSM)	---	Y	Y
Cisco 3750 series with integrated wireless LAN controller	---	N	Y
Cisco wireless LAN controller module for Integrated Service Routers[1]	---	Y	Y

[1] Cannot be used for anchor functions (tunnel termination, web authentication and access control); however, origination of guest controller tunnels is supported. When a user associates with a service set identifier (SSID) that is designated as the guest SSID, the user's traffic is tunneled to the DMZ Anchor controller which can route the traffic to the DMZ network outside of the corporate firewall.

In guest tunneling scenarios:

- The user's IP address is administered from the DMZ anchor controller, which has dedicated VLAN for guest users.
- All user traffic is transported over an Ethernet-over-IP (EoIP) tunnel between the remote wireless LAN controller and the DMZ anchor wireless LAN controller.

Mobility is supported as a client device roams between wireless LAN controllers.

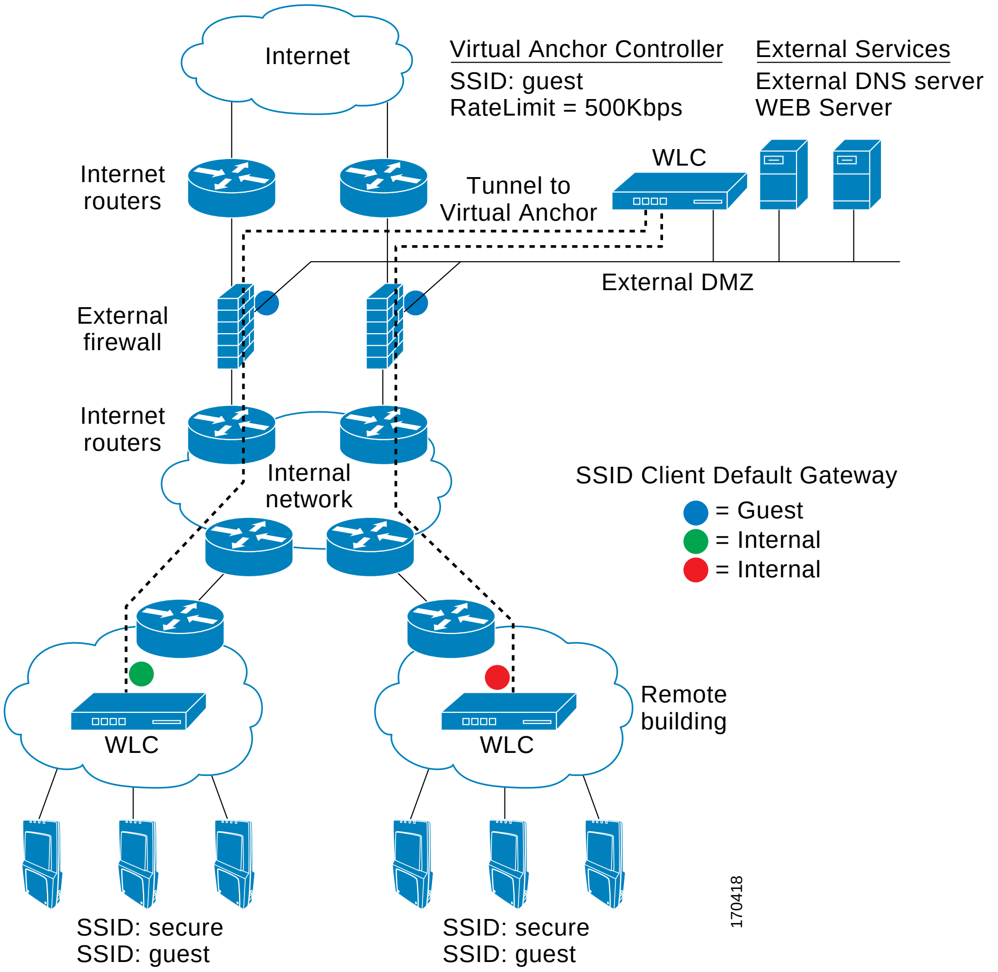
Each DMZ anchor controller can support 40 tunnels from various inside controllers. These tunnels are established from each controller for each SSID using the mobility anchor feature, meaning that many wireless clients can ride the tunnel.

For a customer with many remote sites, it is now possible to forward different types of guest traffic from different sites to different DMZ Anchor controllers, or to the same DMZ Anchor controller with different wireless LANs. Any user getting placed on the DMZ can use the AAA-override feature to apply RADIUS Vendor Specific Attributes (VSAs) on a per-session basis.

Guest tunneling provides additional security for guest-user access to the corporate wireless network.

Note For the example in this deployment guide, the remote and the DMZ anchor controllers are assigned to the same mobility group. Generally, implementing the guest tunneling feature does not require that the remote and DMZ anchor controllers be in the same mobility group.

Figure 17 Web Authentication Using the Mobility Anchor Controller Feature



Anchor Controller Selection

The anchor function on a controller includes tunnel termination, web authentication, and access control.

A Cisco 4400 series controller is the most cost effective controller that can be used as an Anchor controller in the DMZ.

- If the controller is used for guest access and tunnel termination functions only, a Cisco 4402 with 12 access point support is sufficient as it is not used to manage LWAPP access points in the network. Additionally, the Cisco 4400 supports up to 2,500 simultaneous users and has a forwarding capacity of 2 Gbps.
- If your guest access network deployment requires more than 2 Gbps throughput, you can use a Cisco 4404 or Cisco WiSM as an Anchor controller.
  - A single Cisco 4400 series controller or Cisco Catalyst 3750G Integrated wireless LAN controller can support EoIP tunnels from up to 40 other controllers.
  - A Cisco WiSM, which consists of two independent controllers, can support up to 80 EoIP tunnels.

Creating and Adding Controllers to the Same Mobility Group

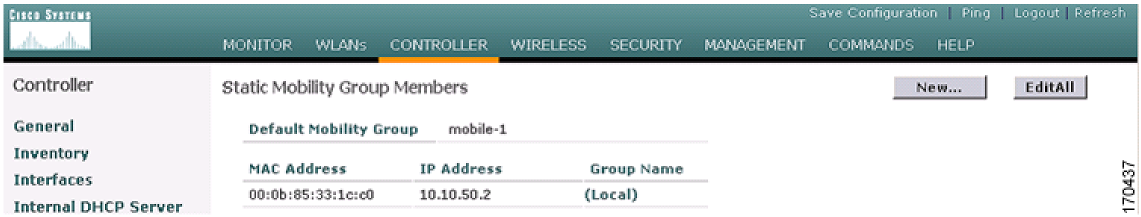
To configure a mobility group, follow these steps:

Step 1 Create a mobility group in the remote and DMZ anchor controller. For this example, we named the mobility group, *mobile-1*.

Note The mobility group name is generally set at deployment time through the Startup Wizard. However, you can change it if necessary through the Default Mobility Domain Name field on the **Controller** > **General** page. The mobility group name is case sensitive.

Step 2 From the remote controller, choose **Controller** > **Mobility Groups** to access the Static Mobility Group Members page (Figure 18).

Figure 18 Controller > Static Mobility Group Members Page



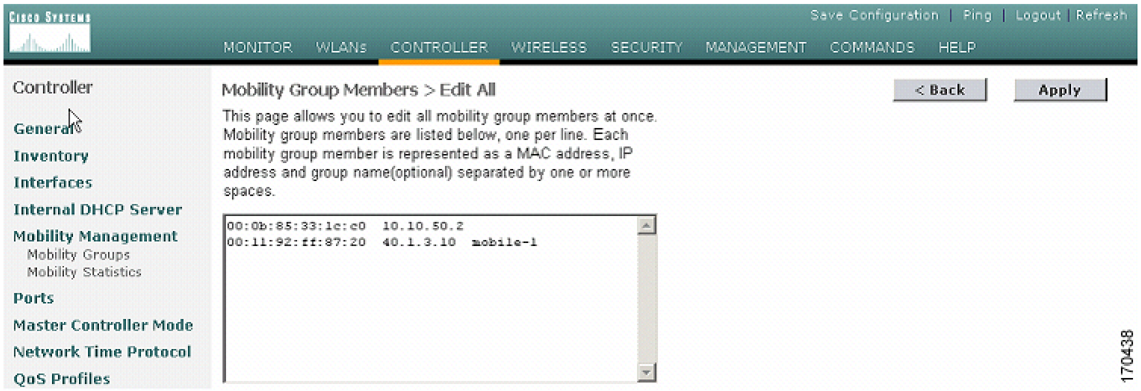
Static Mobility Group Members

Default Mobility Group mobile-1

MAC Address	IP Address	Group Name
00:0b:85:33:1c:c0	10.10.50.2	(Local)

Step 3 Click **Edit All**. The window seen in Figure 19 appears.

Figure 19 Mobility Group Members > Edit All



Mobility Group Members > Edit All

This page allows you to edit all mobility group members at once. Mobility group members are listed below, one per line. Each mobility group member is represented as a MAC address, IP address and group name(optional) separated by one or more spaces.

```
00:0b:85:33:1c:c0  10.10.50.2
00:11:92:ff:87:20  40.1.3.10  mobile-1
```

Step 4 Enter the MAC address and IP address of the DMZ anchor controller in the window of the Edit All page.

Note In this example, we use a MAC address of 00:11:92:ff:87:20 and an IP address of 40.1.3.10 for the DMZ anchor controller.

Step 5 From the DMZ anchor controller, choose **Controller > Mobility Groups** to access the Static Mobility Group Members page.

Step 6 Click **Edit All**.

Step 7 Enter the MAC address and IP address of the remote controller in the window of the Edit All page.

Note In this example, we use a MAC address of 00:0b:85:33:1c:c0 and an IP address of 10.10.50.2 for the remote controller.

Step 8 After adding the two controllers to the mobility group, click **Apply** and **Save Configuration**.

You are now ready to create the mobility anchor between the remote and DMZ controllers.

Configuring Auto-Anchor Mobility

You can use auto-anchor mobility (or guest WLAN mobility*)* to improve load balancing and security for roaming clients on your wireless LANs. Under normal roaming conditions, client devices join a wireless LAN and are anchored to the first controller that they contact. If a client roams to a different subnet, the controller to which the client roamed sets up a foreign session for the client with the anchor controller.

However, using the auto-anchor mobility feature, you can specify a controller or set of controllers as the anchor points for clients on a wireless LAN. In auto-anchor mobility mode, a subset of a mobility group is specified as the anchor controllers for a wireless LAN. You can use this feature to restrict a wireless LAN to a single subnet, regardless of a client's entry point into the network. Clients can then access a guest wireless LAN throughout an enterprise but still be restricted to a specific subnet.

Auto-anchor mobility can also provide geographic load balancing because the wireless LANs can represent a particular section of a building (such as a lobby, a restaurant, and so on), effectively creating a set of home controllers for a wireless LAN. Instead of being anchored to the first controller that they happen to contact, mobile clients can be anchored to controllers that control access points in a particular vicinity.

Configuration Guidelines

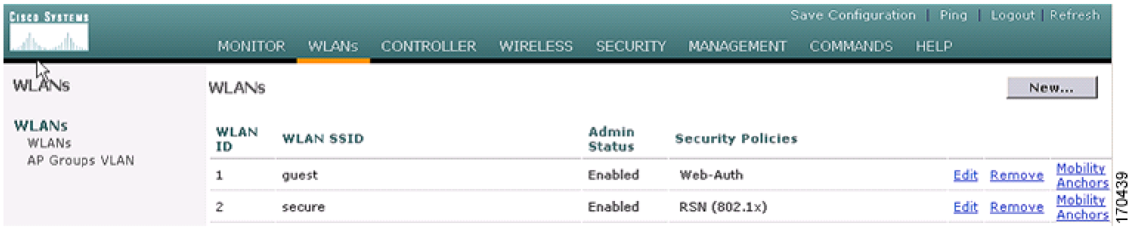
Keep these guidelines in mind when configuring auto-anchor mobility:

- Add Controllers to the mobility group member list before you designate them as mobility anchors for a wireless LAN.
- You can configure multiple controllers as mobility anchors for a wireless LAN.
- The wireless LANs on both the foreign controller and the anchor controller must be configured with mobility anchors. On the anchor controller, configure the anchor controller itself as a mobility anchor. On the foreign controller, configure the anchor as a mobility anchor.

To configure auto-anchor mobility, follow these steps:

Step 1 Click **Controller** > **WLANs** to access the WLANs page (Figure 20).

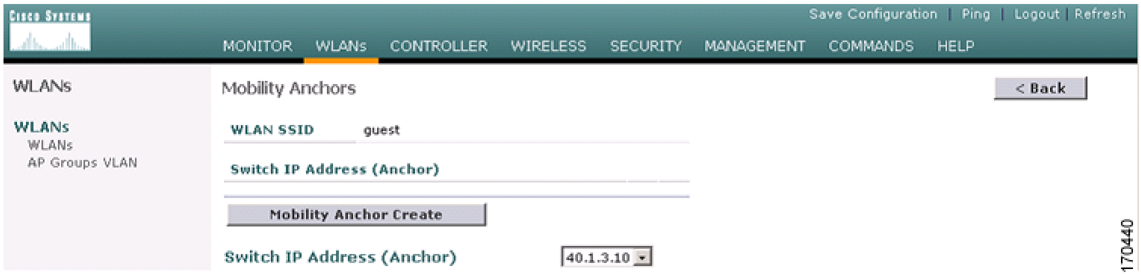
Figure 20 Controller > WLANs Page



WLAN ID	WLAN SSID	Admin Status	Security Policies			
1	guest	Enabled	Web-Auth	Edit	Remove	Mobility Anchors
2	secure	Enabled	RSN (802.1x)	Edit	Remove	Mobility Anchors

Step 2 On the WLANs page, click the **Mobility Anchors** link for the desired wireless LAN. The Mobility Anchors page for that wireless LAN appears (Figure 21).

Figure 21 Mobility Anchors Page



WLAN SSID guest

Switch IP Address (Anchor)

Switch IP Address (Anchor) 40.1.3.10

Step 3 At the Mobility Anchors page, select the IP address of the controller to be designated a mobility anchor in the Switch IP Address (Anchor) drop-down box.

Step 4 Click **Mobility Anchor Create**. The selected controller becomes an anchor for this WLAN.

Note To delete a mobility anchor for a WLAN, click **Remove** to the right of the controller's IP address.

Step 5 Click **Save Configuration** to save your changes.

Step 6 Repeat steps 3 to 5 to set any other controllers as mobility anchors for this WLAN.

Step 7 Configure the same set of anchor controllers on every controller in the mobility group.

Verifying Mobility Anchor Configuration

You can use the CLI to verify the configuration of the mobility anchor configuration for the remote and DMZ anchor controller.

To verify the configuration on the remote controller, follow these steps:

```
(Cisco Controller) >show wlan summary

Number of WLANs.................................. 2

WLAN ID  WLAN Name               Status     Interface Name
-------  ---------------------   ---------  ---------------------------
1         guest                              Enabled    guest-vlan
2        secure                          Enabled    secure-vlan

(Cisco Controller) >show mobility summary

Mobility Protocol Port........................... 16666
Default Mobility Domain.......................... mobile-1
Mobility Group members configured................ 2

Switches configured in the Mobility Group
 MAC Address          IP Address         Group Name
00:0b:85:33:1c:c0    10.10.50.2         <local>
00:11:92:ff:87:20    40.1.3.10    mobile-1

(Cisco Controller) >show mobility anchor
Mobility Anchor Export List
 WLAN ID     IP Address
     1        40.1.3.10
     2        40.1.3.10
```

To verify the configuration on the DMZ controller, follow these steps:

```
(Cisco Controller) >show wlan summary

Number of WLANs.................................. 2

WLAN ID  WLAN Name               Status     Interface Name
-------  ---------------------   ---------  --------------------------------
1        secure-1             Enabled    management
2        guest                Enabled    guest-vlan

(Cisco Controller) >show mobility summary
Mobility Protocol Port........................... 16666
Mobility Security Mode........................... Disabled
Default Mobility Domain.......................... mobile-1
Mobility Group members configured................ 2

Switches configured in the Mobility Group
 MAC Address          IP Address         Group Name
 00:0b:85:33:1c:c0    10.10.50.2         mobile-1
 00:11:92:ff:87:20    40.1.3.10          <local>

(Cisco Controller) >show mobility anchor
Mobility Anchor Export List
 WLAN ID     IP Address
     1        40.1.3.10
```

Note On any firewalls between the two controllers, the following ports need to be open: (1) UDP 16666 (or 16667, if encryption is enabled) for tunnel control traffic, (2) IP protocol 97 for user data traffic, (3) TCP 161 and 162 for SNMP, (4) UDP 69 for TFTP and (5) TCP port 80/443 for management.

Note For details on debugging the Mobility Anchor feature, please see the "Troubleshooting" section at the end of this deployment guide.

Running Mobility Ping Tests (Release 4.0 and later)

Controllers belonging to the same mobility group communicate with each other by controlling information over a well-known UDP port and exchanging data traffic through an Ethernet-over-IP (EoIP) tunnel. Because UDP and EoIP are not reliable transport mechanisms, there is no guarantee that a mobility control packet or data packet will be delivered to a mobility peer. Mobility packets may be lost in transit due to a firewall filtering the UDP port or EoIP packets or due to routing issues.

Controller software release 4.0 enables you to test the mobility communication environment by performing mobility ping tests. These tests may be used to validate connectivity between members of a mobility group (including guest controllers).

Note You must have release 4.0 installed in the anchor and remote controller for this feature to work.

Two ping tests are available:

- **Mobility ping over UDP—**This test runs over mobility UDP port 16666. It tests whether the mobility control packet can be reached over the management interface.
- **Mobility ping over EoIP—**This test runs over EoIP. It tests the mobility data traffic over the management interface.

Only one mobility ping test per controller can be run at a time.

Note These ping tests are not Internet Control Message Protocol (ICMP) based. The term "ping" is used to indicate an echo request and an echo reply message.

Use these commands to run mobility ping tests from the controller CLI.

1. To test the mobility UDP control packet communication between two controllers, enter this command:

   mping *mobility_peer_IP_address*

   The *mobility_peer_IP_address* parameter must be the IP address of a controller that belongs to a mobility group.

2. To test the mobility EoIP data packet communication between two controllers, enter this command:

   eping *mobility_peer_IP_address*

   The *mobility_peer_IP_address* parameter must be the IP address of a controller that belongs to a mobility group.

3. To troubleshoot your controller for mobility ping, enter these commands:

   config msglog level verbose

   show msglog

   To troubleshoot your controller for mobility ping over UDP, enter this command to display the mobility control packet:

   debug mobility handoff enable

Note Cisco recommends using an ethereal trace capture when troubleshooting.

Enabling the Web Login Page on the Controller

After defining the security policies for the guest and secure VLAN interfaces, you need to enable the web login on the controller.

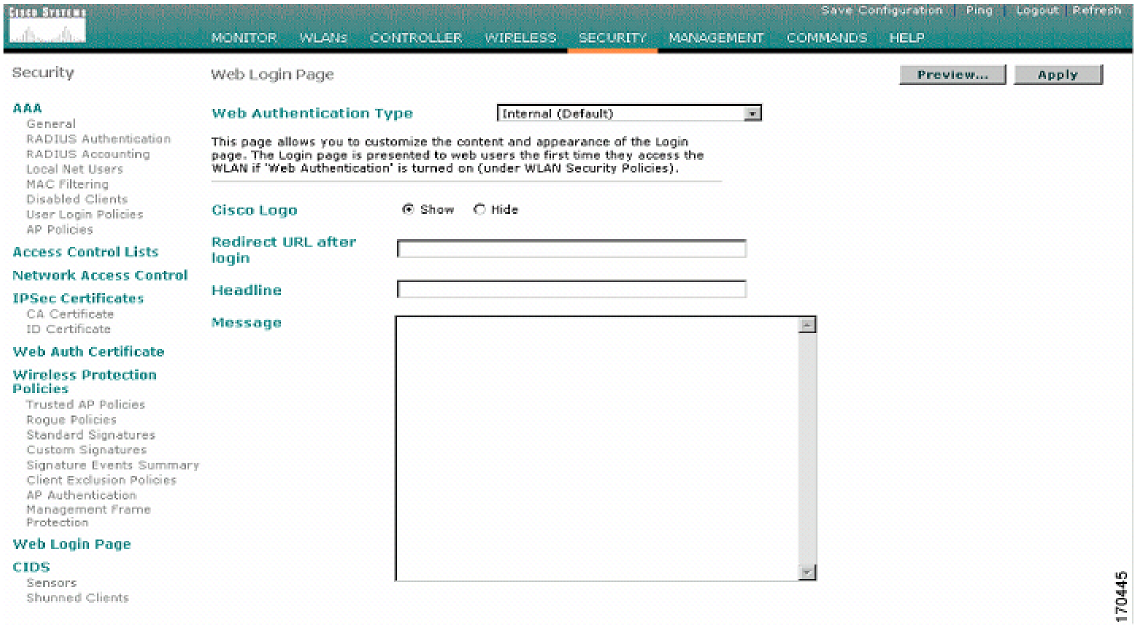
To enable the web login, follow these steps:

Step 1 Choose **Controllers** from the navigation bar at the top of the page.

Step 2 Click **Web Login Page** from the option summary on the left.

The Web Login Page appears (Figure 22).

Figure 22 Configuring Web Login Page on Controller



Web Login Page

Web Authentication Type: Internal (Default)

This page allows you to customize the content and appearance of the Login page. The Login page is presented to web users the first time they access the WLAN if 'Web Authentication' is turned on (under WLAN Security Policies).

Cisco Logo: ● Show ○ Hide

Redirect URL after login:

Headline:

Message:

Step 3 Choose **Internal (Default)** from the Web Authentication Type drop-down menu.

Note If you want to customize the Web Login Page display, continue with Step 4. If you want to keep the Cisco defaults, go to Step 8.

Step 4 Click **Hide** if you do not want the Cisco logo to appear on the log on page.

Step 5 To direct the user to a specific URL (such as your company) after log in, enter the appropriate URL in the Redirect URL after login field. Format of entry is: www.companyname.com. Up to 254 characters can be entered.

Step 6 To display summary or headline information on the web login page, enter that information in the Headline field. Up to 127 characters can be entered. The default headline is “Welcome to the Cisco wireless network.”

Step 7 To display a message on the Web login page, enter the desired text in the Message field. Up to 2047 characters can be entered. The default message is “Cisco is pleased to provide the wireless LAN infrastructure for your network. Please login and put your air space to work.”

Step 8 Click **Apply** to save changes.

Note You must reboot the controller to commit the changes. See “Rebooting the Wireless LAN Controller” section on page 26 for detailed steps.

Rebooting the Wireless LAN Controller

To commit the web authentication changes entered in the previous steps, you must reboot the controller.

To reboot the controller, follow these steps:

Step 1 Choose **Commands** from the navigation bar at the top of the page.

Step 2 Choose Reboot and then click **Reboot**.

Step 3 If there are any unsaved changes in your configuration, click **Save and Reboot**.

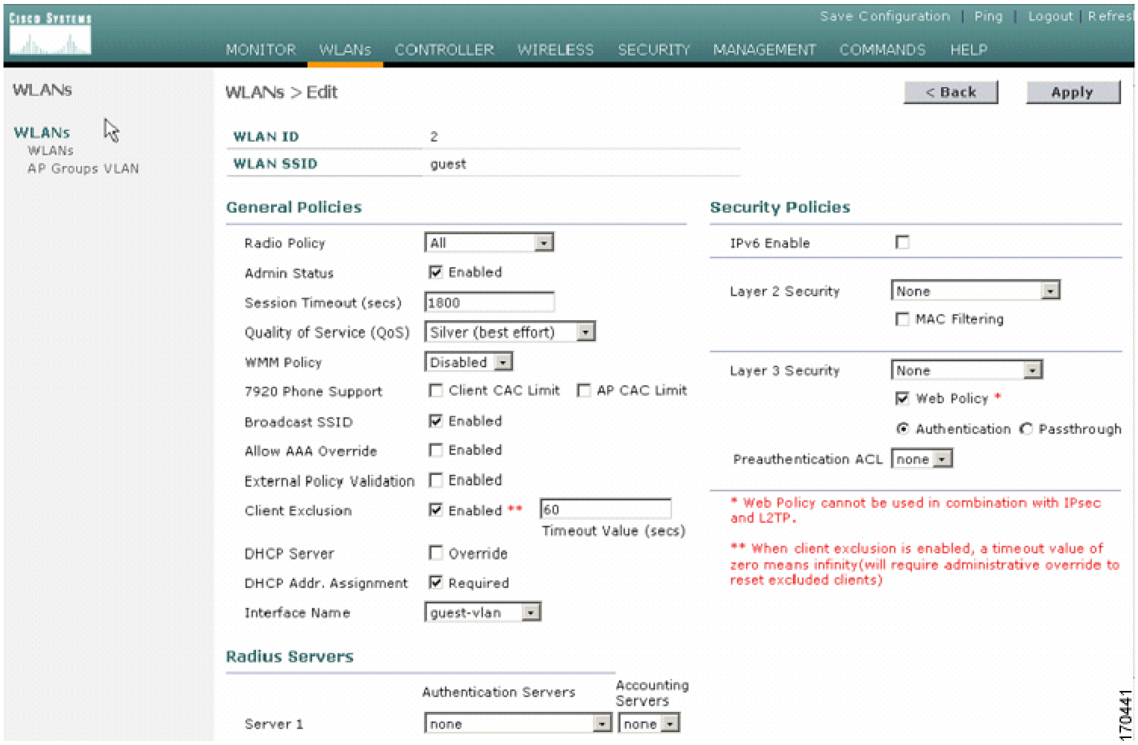
Web Authentication Using an External RADIUS Server

We can configure the wireless LAN used for guest traffic to authenticate the user from an external RADIUS server; in this example it is 10.1.1.11.

To enable an external RADIUS server to authenticate traffic using the GUI, follow these steps:

Step 1 Choose **WLANs** > **Edit** (Figure 23).

Figure 23 WLANs > Edit Page



WLANs > Edit

WLAN ID	2
WLAN SSID	guest

General Policies

Radio Policy	All
Admin Status	☑ Enabled
Session Timeout (secs)	1800
Quality of Service (QoS)	Silver (best effort)
WMM Policy	Disabled
7920 Phone Support	□ Client CAC Limit □ AP CAC Limit
Broadcast SSID	☑ Enabled
Allow AAA Override	□ Enabled
External Policy Validation	□ Enabled
Client Exclusion	☑ Enabled ** 60 Timeout Value (secs)
DHCP Server	□ Override
DHCP Addr. Assignment	☑ Required
Interface Name	guest-vlan

Security Policies

IPv6 Enable	□
Layer 2 Security	None □ MAC Filtering
Layer 3 Security	None ☑ Web Policy * ● Authentication ○ Passthrough
Preauthentication ACL	none

* Web Policy cannot be used in combination with IPsec and L2TP.

** When client exclusion is enabled, a timeout value of zero means infinity(will require administrative override to reset excluded clients)

Radius Servers

	Authentication Servers	Accounting Servers
Server 1	none	none

Step 2 Select the appropriate IP address from the Radius Servers drop-down menu.

Note The IP address for the RADIUS server is entered during initial setup of the controller using the configuration wizard.

Step 3 Click **Save Configuration**.

To enable an external RADIUS server to authenticate traffic using CLI, follow these steps:

Step 1 Enter **config radius auth** *ip-address* to configure a RADIUS server for authentication.

Step 2 Enter **config radius auth** *port* to specify the UDP port for authentication.

Step 3 Enter **config radius auth** *secret* to configure the shared secret.

Step 4 Enter **config radius auth** *enable* to enable authentication.

Note Authentication is disabled by default.

Step 5 Enter **config radius acct** *disable* to disable authentication.

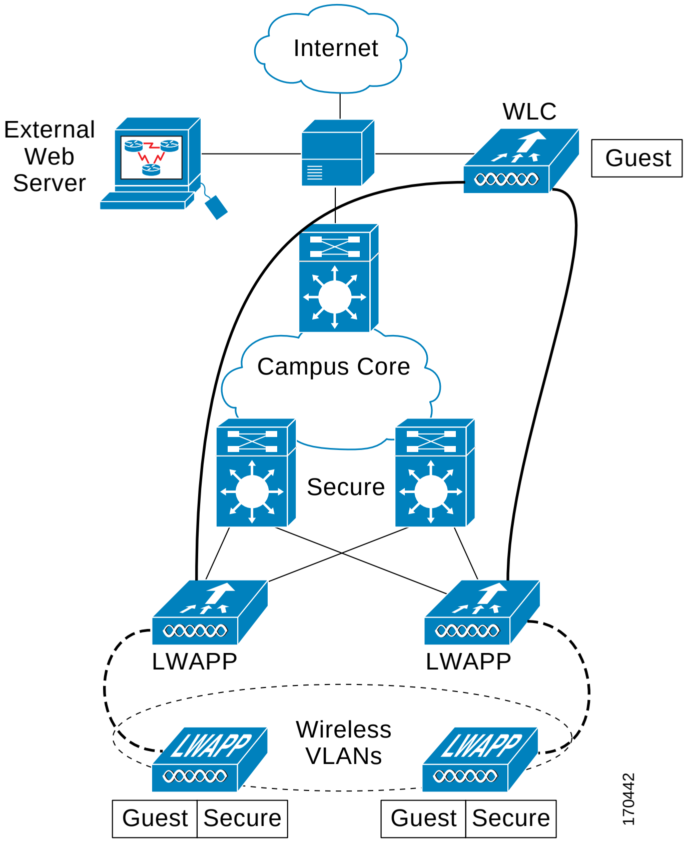
Note You can enter the **show radius acct statistics**, **show radius auth statistics**, and **show radius summary** commands to verify that the RADIUS settings are correctly configured.

Web Authentication Using an External Web Server

To use a custom web authentication login window configured on an external web server rather than the default web login window of Cisco's wireless LAN controller or the Cisco Building Broadband Service Manager (BBSM), follow the instructions in the GUI or CLI procedure below.

When you enable this feature, the user is automatically directed to your custom login window on the external web server.

Figure 24 Using an External Web Server to Authenticate a Guest User



Note You must configure a pre-authentication access control list (ACL) on the wireless LAN for the external web server and then choose this ACL as the wireless LAN pre-authentication ACL under **Security Policies** > **Web Policy** on the **WLANs** > **Edit** page. Once this information is entered, the Cisco wireless LAN controller web server will automatically redirect the guest to the web address entered as part of the ACL configuration.

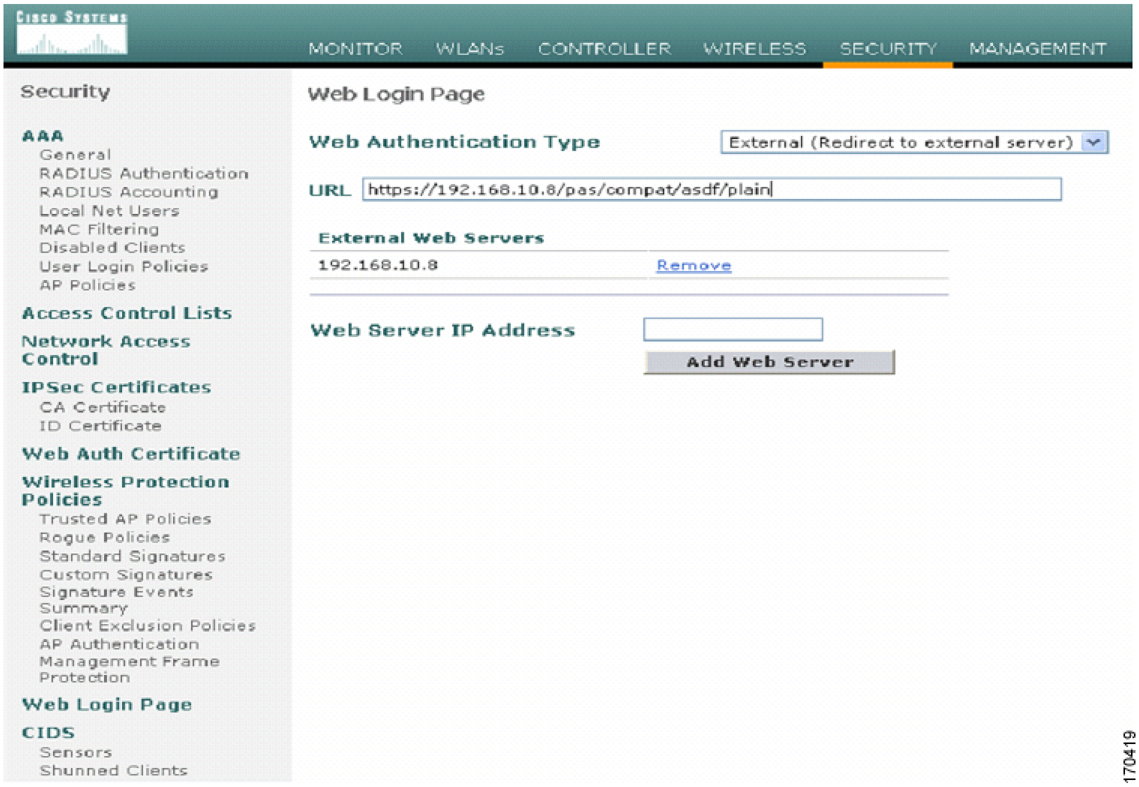
Note Web authentication through external servers is supported on controllers that are integrated into Cisco switches and routers, including those in the Catalyst 3750G Integrated Wireless LAN Controller Switch, the Cisco WiSM, and the Cisco 28/37/38xx Series Integrated Services Router.

Using the GUI to Choose a Customized Web Authentication Login Window from an External Web Server

To use an external web server for authentication, follow these steps:

Step 1 Click **Security** > **Web Login Page** to access the Web Login page (Figure 25).

Figure 25 Security > Web Login Page



Web Login Page

Web Authentication Type: External (Redirect to external server)

URL: https://192.168.10.8/pas/compat/asdf/plain

External Web Servers

192.168.10.8

Web Server IP Address

Step 2 From the Web Authentication Type drop-down box, choose **External (Redirect to external server)**.

Step 3 In the URL field, enter the URL of the customized web authentication login window on your web server. You can enter up to 252 characters.

Step 4 In the Web Server IP Address field, enter the IP address of your web server. Your web server should be on a different network from the controller service port network. Click **Add Web Server**.

This server now appears in the list of external web servers.

Step 5 Click **Apply** to see your changes.

Step 6 If you are satisfied with the content and appearance of the login window, click **Save Configuration**.

Once authenticated at the external login page of the external web server, a request is sent back to the controller. The controller then submits the username and password for authentication to an external RADIUS server for verification.

If verification at the RADIUS server is successful, the controller web server either forwards the user to the configured redirect URL or to the user's original opening web page.

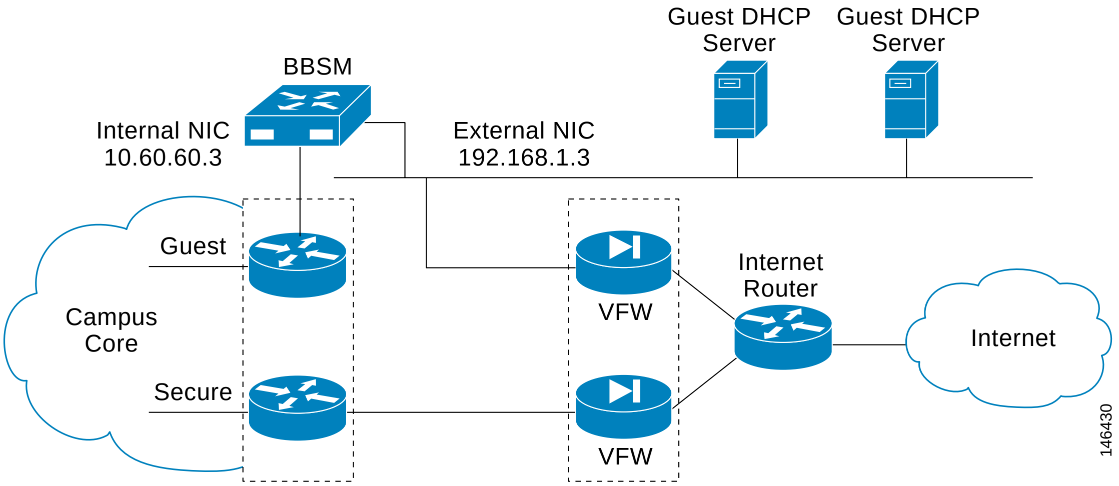
If verification at the RADIUS server fails, then the controller web server redirects the user back to the customer login URL.

Web Authentication Using Cisco Building Broadband Service Manager

Cisco Building Broadband Service Manager (BBSM) works with Cisco access-layer LAN and wireless LAN products (Figure 26) to provide a complete solution that enables businesses, venues and service providers to create, market and operate broadband access services in markets such as public hotspots, enterprise, health care and retail. The Enterprise can securely offer their guest's access to the Internet over existing networks.

For more details on configuring BBSM for Web Authentication, please refer to the *Cisco BBSM 5.3 Configuration Guide*.

Figure 26 Guest Access Deployment Using BBSM.



Configuring the BBSM Server to Authenticate Guest Traffic

Using the address change wizard, follow these steps to configure the BBSM server to authenticate guest traffic:

Step 1 Choose **IP Addresses**. Figure 27 appears.

Step 2 Enter the range of DHCP Start and End addresses to which guest access is allowed.

These IP addresses should be served by the BBSM or external DHCP server.

Step 3 Enter the Management Start and End addresses.

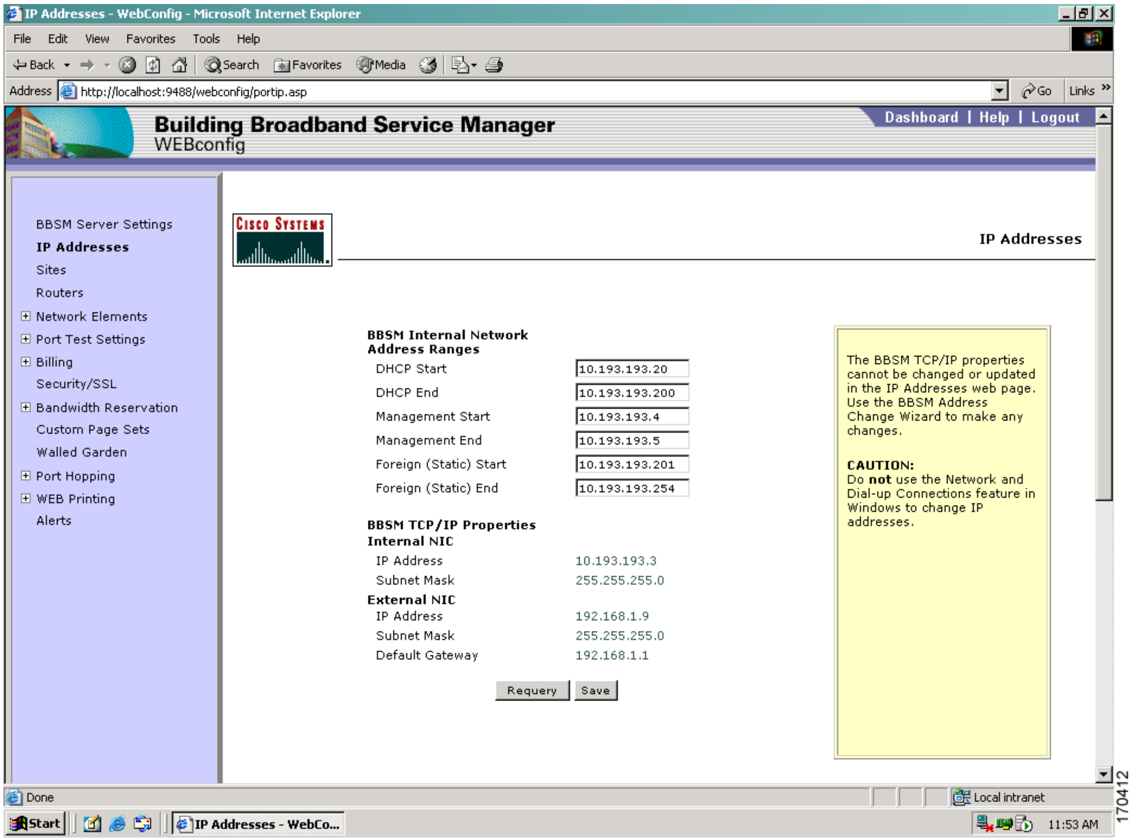
The management addresses define the range of IP addresses that will pass through BBSM and will not require redirection for external web authentication. Examples of these devices are routers, switches, and access points.

Step 4 Enter a starting and ending range of static IP addresses in the Foreign Static fields.

Users assigned these addresses will not be able to request dynamic (DHCP) IP address assignment.

Step 5 Click **Save**.

Figure 27 Entering Internal Network Addresses for BBSM Server to Support Authentication



BBSM Internal Network Address Ranges

DHCP Start	10.193.193.20
DHCP End	10.193.193.200
Management Start	10.193.193.4
Management End	10.193.193.5
Foreign (Static) Start	10.193.193.201
Foreign (Static) End	10.193.193.254

BBSM TCP/IP Properties

Internal NIC

IP Address	10.193.193.3
Subnet Mask	255.255.255.0

External NIC

IP Address	192.168.1.9
Subnet Mask	255.255.255.0
Default Gateway	192.168.1.1

The BBSM TCP/IP properties cannot be changed or updated in the IP Addresses web page. Use the BBSM Address Change Wizard to make any changes.

CAUTION:
Do **not** use the Network and Dial-up Connections feature in Windows to change IP addresses.

Enabling DNS Forwarding

After entering the appropriate internal IP addresses for the BBSM server, enable DNS forwarding on the server.

Domain Name System (DNS) forwarding allows DNS requests to be relayed to a remote DNS server.

BBSM is not configured as a DNS server; instead it acts as a DNS forwarder for its clients and its own DNS requests. These DNS requests, such as a request for www.cisco.com, are mapped with their IP addresses so that the Internet routers can locate the web server with the content.

Note If BBSM cannot locate an IP address, it responds with its own internal IP address when the server is pinged. If the IP address that the browser requests cannot be located, BBSM displays a Network Error page or the browser displays a DNS fail page.

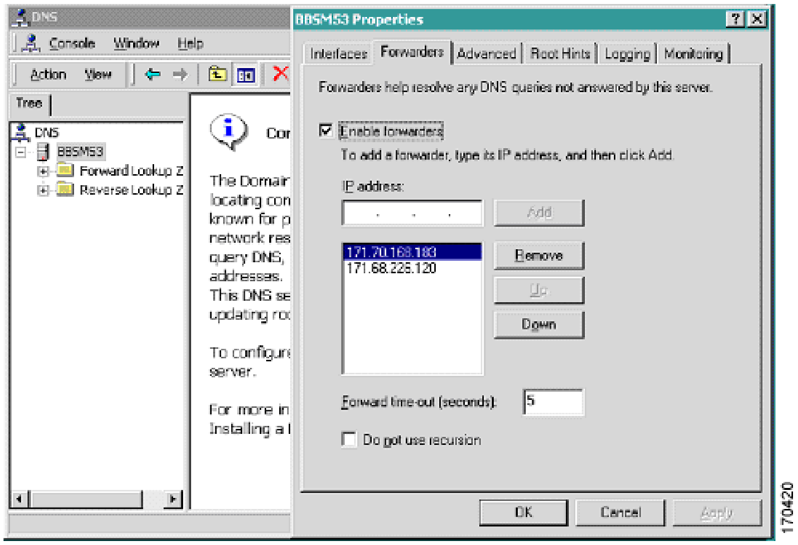
Note You must obtain an IP addresses for your DNS server from your ISP before you can perform this procedure.

To enable DNS forwarding on your server, follow these steps:

Step 1 Choose **Start** > **Programs** > **Administrative Tools** > **DNS**. The DNS window appears.

Step 2 From the left pane, right-click your BBSM server name and choose **Properties**. The BBSM Properties dialog box for that server appears (Figure 28).

Figure 28 Configuring DNS Forwarding in the Server Properties Window



Forwarders help resolve any DNS queries not answered by this server.

☑ Enable forwarders

To add a forwarder, type its IP address, and then click Add.

IP address:

171.70.168.183
171.68.226.120

Forward time-out (seconds): 5

☐ Do not use recursion

Step 3 Click the **Forwarders** tab.

Step 4 Check the **Enable forwarders** box.

Step 5 In the IP address field, enter the DNS server IP address provided by your ISP and click **Add**.

If you have more than one DNS server IP address, continue to enter them and click **Add** until they are all in the list. Enter the primary DNS server first. It will appear first in the list. Enter the secondary DNS server second.

Step 6 Click **OK.** Close the DNS window.

Defining an Access Interface

After enabling DNS forwarding, an access interface is defined on a Layer 3 switch or router interface.

Note A router is configured if all users are on the same network. In this example, the router address is used as a loopback address. If the end users are on a different subnet, define the router that is closest to the end users. The router should be configured in advance.

Note If in Layer 3 mode, SNMP communication to the router is used to track MAC addresses of end users and to define the SNMP string that is used for communication between the BBSM and the router.

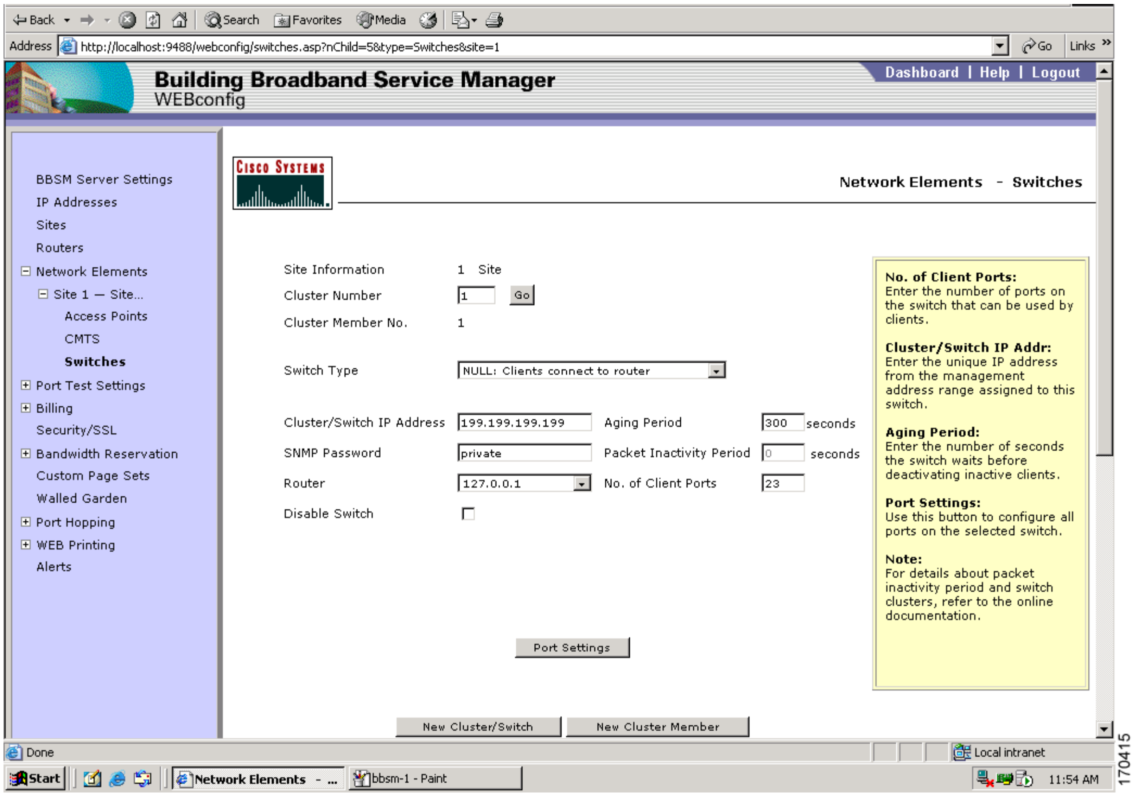
To define an access interface on either a switch or router, follow these steps:

Step 1 From the Dashboard, choose **WebConfig** > **Network Elements** > **Site** > **Switch.**

Step 2 Select the **Null:Clients connect to router switch** option from the Switch Type drop-down menu (Figure 29).

By selecting this option, BBSM will not try to discover the hosts behind this switch to track their MAC addresses.

Figure 29 Network Elements Page



Site Information	1 Site		
Cluster Number	1		
Cluster Member No.	1		
Switch Type	NULL: Clients connect to router		
Cluster/Switch IP Address	199.199.199.199	Aging Period	300 seconds
SNMP Password	private	Packet Inactivity Period	0 seconds
Router	127.0.0.1	No. of Client Ports	23
Disable Switch	□		

No. of Client Ports: Enter the number of ports on the switch that can be used by clients.

Cluster/Switch IP Addr: Enter the unique IP address from the management address range assigned to this switch.

Aging Period: Enter the number of seconds the switch waits before deactivating inactive clients.

Port Settings: Use this button to configure all ports on the selected switch.

Note: For details about packet inactivity period and switch clusters, refer to the online documentation.

Step 3 Leave the default values for the remaining fields and click **Save**.

Note Details for each switch field is provided in Table 3 below.

The **Network Elements Port Settings** page appears. This page is used to define the web page that will be displayed to visiting guests.

Note If port configuration records already exist, the **Network Element Port Settings** window does not pop up automatically. Click **Port Settings**.

Step 4 Enter the applicable information in the **Network Element Port Settings** window based on the information in Table 4 and click **Submit**. A dialog box appears, asking you to verify your changes. Click **OK.**

You are returned to the Switches web page.

Table 3 Switch Fields and Descriptions

Field	Description
Site Information	Displays the site number and name associated with the switch to be configured.
Cluster Number Cluster Member No. Go	Displays the cluster number and cluster member number associated with the switch to be configured. Click **Go** to advance to another previously configured switch.
Switch Type	Choose a switch type. For this example, we select *Null:Clients connect to router switch.*
Cluster/Switch IP Address	Enter a unique IP address in the management range assigned to the cluster or switch. Check with the person installing your clusters and switches if you are unsure of this IP address.
SNMP Password	Enter the SNMP read-write community string (password) that is used when communicating with switches. (Non–Cisco stackable switches, which share the same stack, are installed with the same password.) The default is *public*. **Note** Cisco strongly recommends that the default password on the switches and on BBSM be changed because the default password is well known and could compromise network security.
Router	From the drop-down menu, choose the IP address of the router to which this site and cluster are connected. If the site and cluster are directly connected to the BBSM server, use the default IP address for the BBSM server, which is *127.0.0.1*.
Disable Switch	Check this check box if you do not want BBSM to look for clients on the cluster ports. Use when troubleshooting. Even if you disable a switch, its IP address remains reserved. If you need to reuse the IP address for a different switch, change the IP address of the disabled switch temporarily. If you do not change the IP address, you will not be able to update WEBconfig.
Aging Period (in seconds)	Enter a time period, in seconds, that the network device will wait before eliminating inactive clients from its internal tables. This period also indicates at what interval BBSM automatically signs off the client. The default time period is 300 (5 minutes).
Packet Inactivity Period (in seconds)	**Note** This field is disabled unless your switch type supports packet inactivity. Enter a time, in seconds, that a user can be idle before being automatically signed off by BBSM. If needed, refer to the *Cisco BBSM Products Network Device Compatibility Guide* to verify the switches that monitor for packet inactivity.
No. of Client Ports	Enter the number of ports that can be used as clients on switch 1 of the cluster. The default is 23.
VLANs (Apply to dual VLANs only)	Clients VLAN ID: Displays the client VLAN ID. Mgmt VLAN ID: Displays the management VLAN ID.

Table 4 Port Setting Fields and Descriptions

Field	Description
Type	Displays the network device type.
Location Prefix	Enter a location prefix (optional). You can enter up to 40 characters.
Page Set	Choose a Page Set from the drop-down menu. For more details on the initial system defaults for this option, refer to Chapter 18 of the *Cisco BBSM 5.3 Configuration Guide.* **Caution** You cannot use an SSL page set if your SSL certificate is not installed. Choose the *Clear* version of the page set until you install the certificate, and then change your page set to the SSL page set. For example, select **RADIUSClear** until the certificate is installed, then after installing the certificate, change the page set to **RADIUS**. If you install the SSL page set before installing the certificate, the Start page will not display. **Note** For CMTSs, the page set that you choose is the default page set that will be applied to the CMTS dynamic port-room configuration. For more details refer to Chapter 13 of the *Cisco BBSM 5.3 Configuration Guide.*
Start Page	BBSM automatically enters the starting page for the network device based on the page set; however, you can enter a different starting page.
Bandwidth	Enter a bandwidth throttling value in kbps for clients connected to this network device. Bandwidth management must be turned on for this option to be effective. For more details, please refer to Chapter 9 of the *Cisco BBSM 5.3 Configuration Guide*. If the end user selects a bandwidth from the Connect page, that selection overrides this default bandwidth.
Enable Port Hopping	Check this option box to enable port hopping.
Client IP Address Range (DHCP)	*This field appears only if you are using multinet.* If you are using multiple networks, click the default multinet number for clients connected to this network device: Multinet 1 or Multinet 2. **Note** The Connect page overrides this setting if the end user selects a public or private IP address.

Defining Access Codes (Temporary Credentials)

After defining the access interface, you are ready to define the Internet access code for the guests. With BBSM, Internet access is defined (purchased) in one of two ways:

- **Specified date range (start and end date and time)—**A specified time period is purchased when the reservation is made for the access code or at the time the access code is used.
- **Specified duration (in minutes, hours, days, or weeks)—**Access codes are based on the duration of usage instead of a specific time period. Bandwidth throttling (instead of bandwidth reservation) is used because BBSM has no way of preventing oversubscription. When the user logs onto the Internet using access codes by duration, a disconnect window displays the time remaining.

Note Before creating and configuring access codes, you must choose a bandwidth management option on the BBSM Server Settings web page and, if you are using bandwidth reservation, configure reservation on the Bandwidth Reservation web pages. For more details, please refer to the "Configuring Bandwidth Reservation" section in Chapter 17 of the *Cisco BBSM 5.3 Configuration Guide*.

To define guest access authentication parameters, follow these steps:

Step 1 From the Dashboard, click **WEBconfig**. The BBSM Server Settings web page appears.

Step 2 In the Bandwidth Management area, verify that you chose *Throttling* or *Reservation* in the Access Code Bandwidth field. This option enables bandwidth throttling or reservation for access codes.

Step 3 Click **Dashboard** in the upper right-hand corner and then click **Access Code Management**. The Codes by Date web page appears. This web page is used to create access codes based on date range. The page differs depending on the access codes bandwidth options that you configured on BBSM Server Settings web page in WEBconfig:

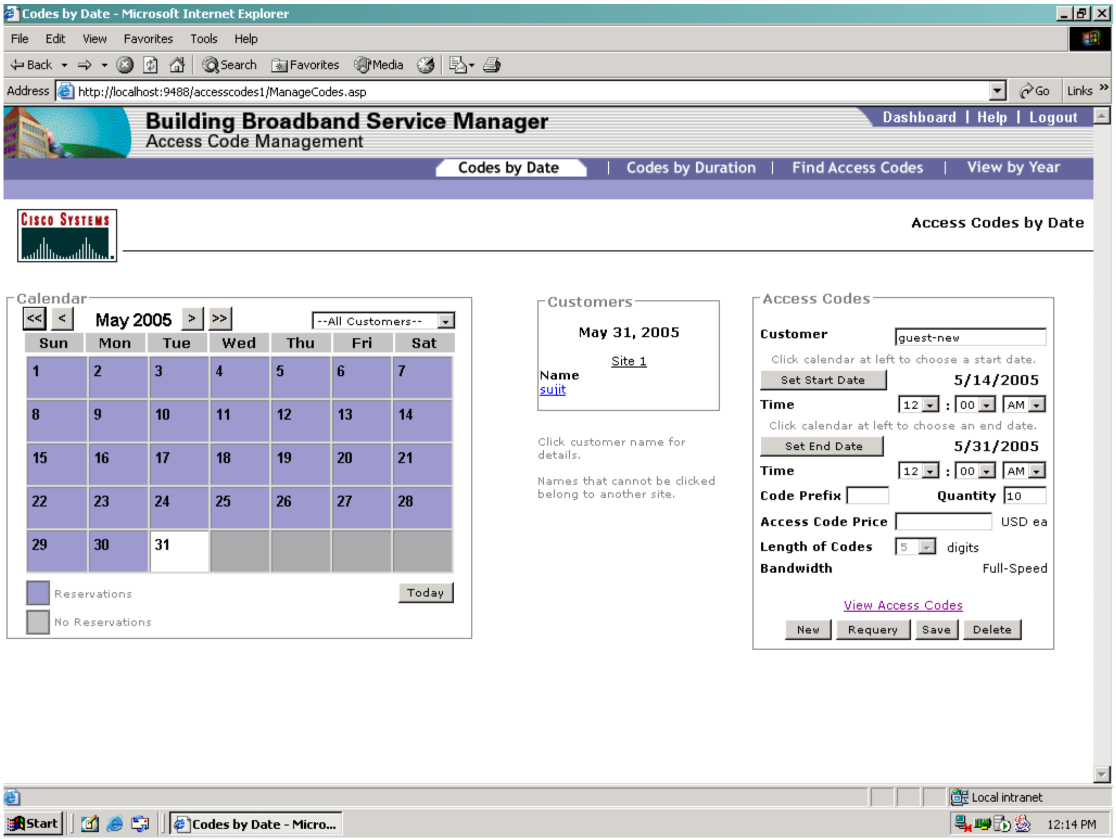
- **None—**If you chose *None* from the Access Codes Bandwidth drop-down menu, the bandwidth defaults to Full Speed and that displays in the Manage Codes web page.
- **Throttle—**If you chose *Throttle* from the Access Codes Bandwidth drop-down menu, the Manage Codes web page appears without the Bandwidth Class of Service options.
- **Reservation—**If you chose *Reservation* from the Access Codes Bandwidth drop-down menu, the Manage Codes web page appears with Bandwidth Class of Service options.

Step 4 Option 1: To create Access Codes by date, select the Codes by Date tab (Figure 30).

Option 2: To create Access Codes by duration, select the Codes by Duration tab.

Enter the appropriate values to define access for the guest given the assignment option chosen.

Figure 30 Access Code Management > Codes by Date Page


Codes by Date - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address
Go Links
Dashboard | Help | Logout
Codes by Date | Codes by Duration | Find Access Codes | View by Year
Cisco Systems
<< < > >>
Today
Set Start Date
Set End Date
View Access Codes
New Requery Save Delete
Local intranet
Start
Codes by Date - Micro...
12:14 PM
170416

Address http://localhost:9488/accesscodes1/ManageCodes.asp

Building Broadband Service Manager
Access Code Management

Access Codes by Date

Calendar

May 2005 --All Customers--

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

▨ Reservations
□ No Reservations

Customers

May 31, 2005

Site 1

Name
suit

Click customer name for details.

Names that cannot be clicked belong to another site.

Access Codes

Customer guest-new

Click calendar at left to choose a start date.

Set Start Date 5/14/2005

Time 12 : 00 AM

Click calendar at left to choose an end date.

Set End Date 5/31/2005

Time 12 : 00 AM

Code Prefix Quantity 10

Access Code Price USD ea

Length of Codes 5 digits

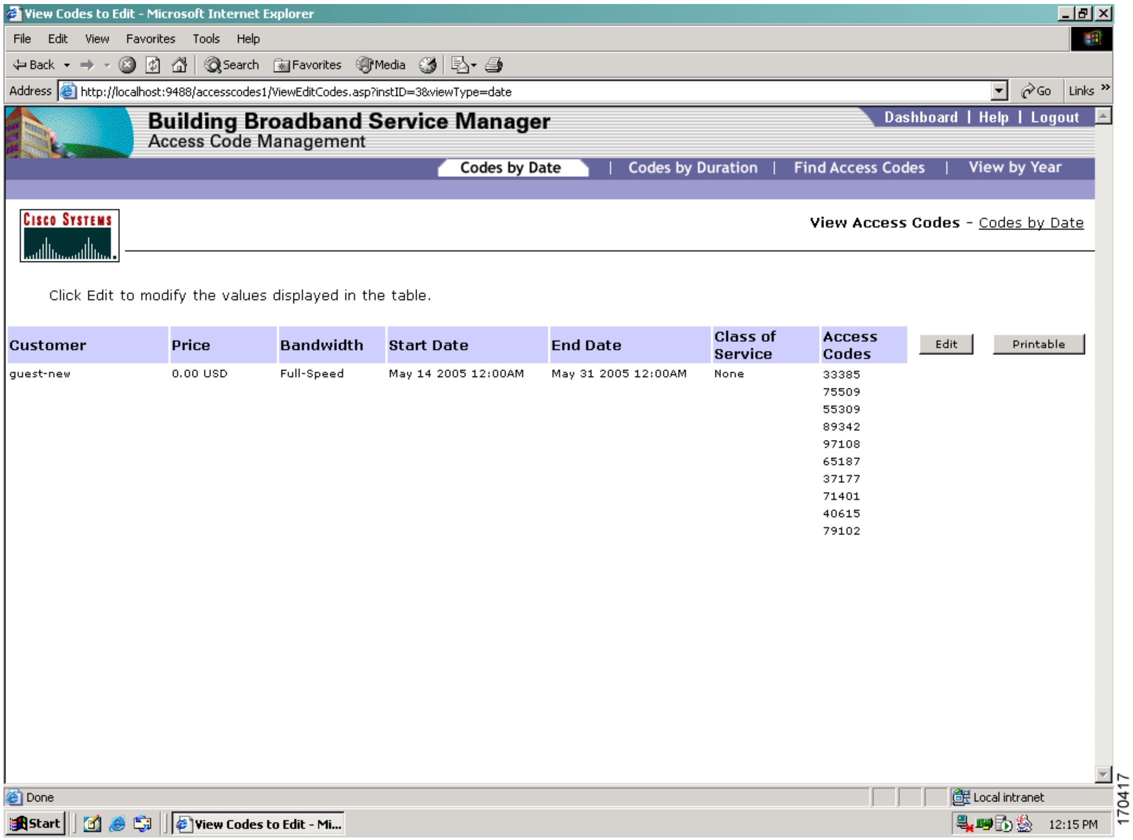
Bandwidth Full-Speed

Step 5 Click **Save**.

Note If you modify a reservation while guests defined for that reservation are connected, bandwidth changes are not applied.

Step 6 Click **View Access Codes** button to verify configuration. The window seen in Figure 31 appears.

Figure 31 View Access Codes Page


View Codes to Edit - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://localhost:9488/accesscodes1/ViewEditCodes.asp?instID=3&viewType=date
Go Links
Building Broadband Service Manager
Access Code Management
Dashboard | Help | Logout
Codes by Date | Codes by Duration | Find Access Codes | View by Year
Cisco Systems
Edit
Printable
Done
Local intranet
Start
View Codes to Edit - Mi...
12:15 PM
170417

View Access Codes - Codes by Date

Click Edit to modify the values displayed in the table.

Customer	Price	Bandwidth	Start Date	End Date	Class of Service	Access Codes
guest-new	0.00 USD	Full-Speed	May 14 2005 12:00AM	May 31 2005 12:00AM	None	33385 75509 55309 89342 97108 65187 37177 71401 40615 79102

Note You can find access codes and reservations by customer name by selecting the Find Access Codes tab.

Note To find reservations by date, choose **Access Code Management** > **View by Year**.

Modifying PC to Support Wireless Guest Access

After you have defined the access codes using BBSM, you need to make changes to the client on the guest user's PC to support guest access.

The Microsoft Wireless Client on your PC requires minimal changes to support guest access.

To support guest access on your PC, follow these steps:

Step 1 From your Windows Start button, launch the **Settings** > **Control Panel**.

Step 2 Click the **Network and Internet Connections** icon.

Step 3 Click the **Network Connections** icon.

Step 4 Right click the **LAN Connection** icon and select **Disable**.

Step 5 Right click the **Wireless Connection** icon and select **Enable.**

Step 6 Right click the **Wireless Connection** icon again and select **Properties**.

Step 7 From the Wireless Network Connection Properties window, select the **Wireless Networks** tab.

Step 8 Change the Network Name in the **Preferred Network** area. Remove the old SSID and then click on the **Add…** button.

Step 9 In the Association tab, type in the Network Name (SSID) value you will be using for Web Authentication.

Note Notice that WEP is enabled. You must disable WEP for Web authentication to work.

Step 10 Select **OK** to save the configuration.

When you are actively communicating with the wireless LAN you will see a beacon icon in the preferred network box.

Client Login

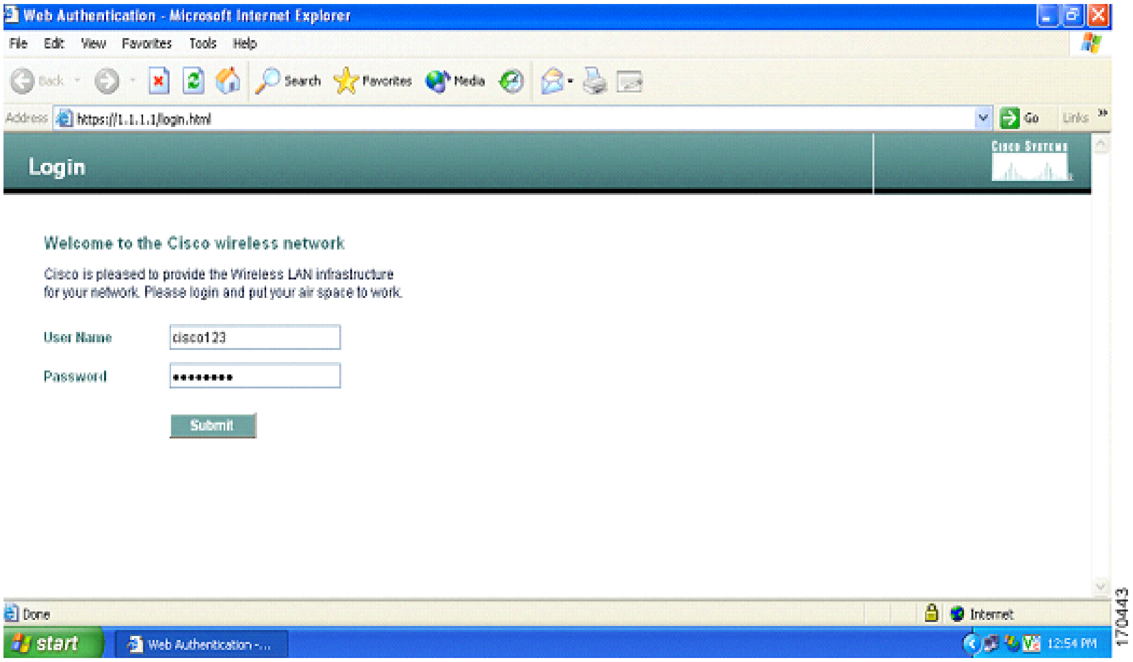
Once the web authentication method is defined and the client changes are made to the guest user's PC, the user can log on.

To log on as a guest user, follow these steps:

Step 1 Open a browser window and enter the IP address of the authenticating server (Figure 32).

Note Be sure you use secure https:// when authenticating the user with the controller's web server.

Figure 32 Client Login Page



Web Authentication - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address Go Links
Cisco Systems
Done Internet
start Web Authentication -...
12:54 PM
170443

https://1.1.1.1/login.html

Login

Welcome to the Cisco wireless network

Cisco is pleased to provide the Wireless LAN infrastructure for your network. Please login and put your air space to work.

User Name cisco123

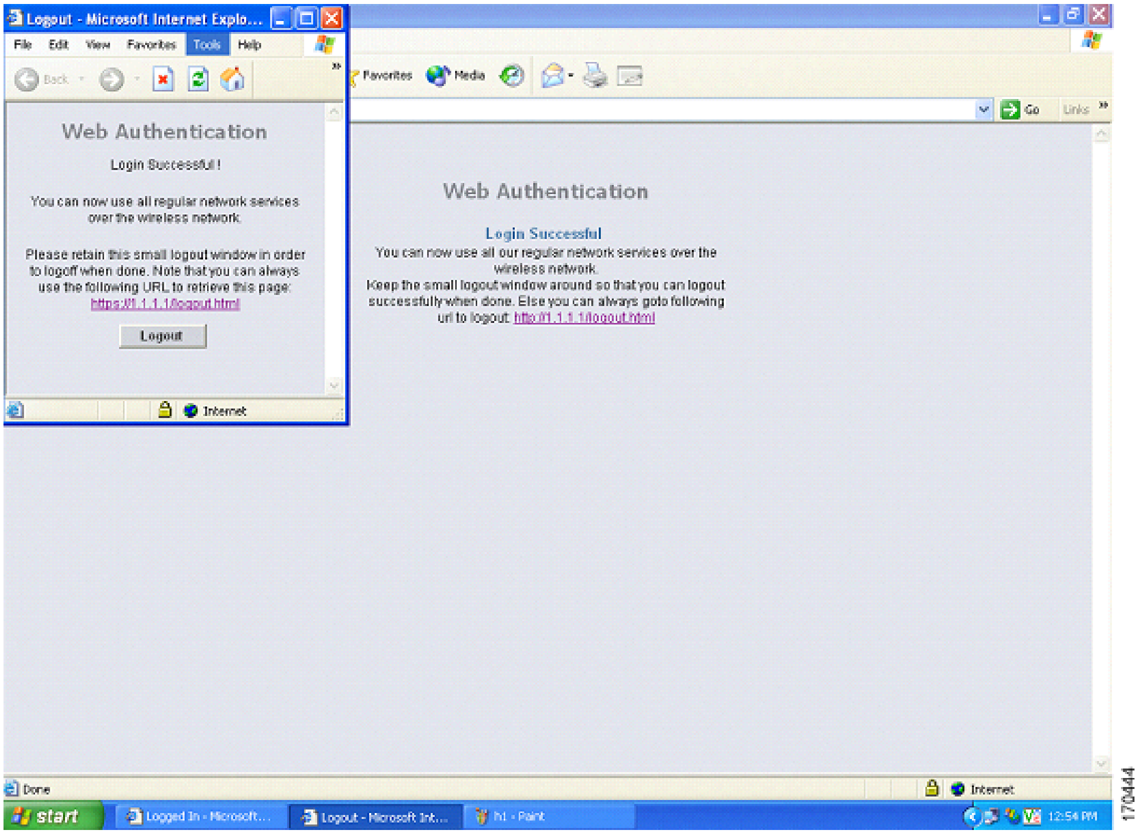
Password ••••••••

Submit

Step 2 Enter the username and password provided.

Step 3 If your login is successful, a browser window noting a successful login appears (Figure 33).

Figure 33 Successful Login Page



Web Authentication

Login Successful !

You can now use all regular network services over the wireless network.

Please retain this small logout window in order to logoff when done. Note that you can always use the following URL to retrieve this page: https://1.1.1.1/logout.html

Web Authentication

Login Successful

You can now use all our regular network services over the wireless network.

Keep the small logout window around so that you can logout successfully when done. Else you can always goto following url to logout: http://1.1.1.1/logout.html

Troubleshooting

This section provides debugging tips for specific features.

Note CLI commands and key sections of the debugging script are highlighted in bold.

Debugging Mobility Anchor

Mobility hand off and mobility directory debug commands display the guest-tunnel or AnchorExport debugging information in addition to the traditional mobility debugging information.

You will see mobility exchanges [MobileAnchorExport messages (on Foreign) & MobileAnchorExportAck (on Anchor)] when enabling mobility hand off and mobility directory debugs.

Debugging guest tunneling and the Ethernet over IP are both included in the regular mobility debugs:

```
debug mac addr <client mac address>
debug mobility handoff enable
debug mobility directory enable
debug dhcp packet enable
debug pem state enable
debug pem events enable
debug dot11 mobile enable
debug dot11 state enable
```

While the data source port is being diagnosed, look for UDP packets with Source/Destination Port=16666. Any EoIP packets can be filtered by using the display filter *etherip* in the capture taken.

Debug Scripts from the Foreign Controller

```
(Cisco Controller) > show debug
MAC address ................................ 00:40:96:a9:fa:a0

Debug Flags Enabled:
arp error enabled.
bcast error enabled.
dhcp packet enabled.
dot11 mobile enabled.
dot11 state enabled
mobility directory enabled.
mobility handoff enabled.
pem events enabled.
pem state enabled.


 (Cisco Controller) > show time
Time............................................ Tue Feb 14 13:47:31 2006
Timezone delta.................................. 0:0
Daylight savings................................ disabled
NTP Servers
    NTP Polling Interval.........................     86400
     Index             NTP Server
      ------- --------------------------------
```

```
(Cisco Controller) >
Tue Feb 14 13:47:40 2006: Scheduling deletion of Mobile Station: 00:40:96:a9:fa:
a0 (callerId: 24) in 5 seconds
Tue Feb 14 13:47:40 2006: Updated location for station 00:40:96:a9:fa:a0 - old AP
00:00:00:00:00:00-0, new AP 00:0b:85:23:cc:50-0
Tue Feb 14 13:47:40 2006: Association received from mobile 00:40:96:a9:fa:a0 on AP
00:0b:85:23:cc:50
Tue Feb 14 13:47:40 2006: Initializing policy for mobile 00:40:96:a9:fa:a0
Tue Feb 14 13:47:40 2006: pem_api.c:1785 - State Update 00:40:96:a9:fa:a0 from START (0)
to AUTHCHECK (2)
Tue Feb 14 13:47:40 2006: pem_api.c:1873 - State Update 00:40:96:a9:fa:a0 from AUTHCHECK
(2) to L2AUTHCOMPLETE (4)
Tue Feb 14 13:47:40 2006: Plumbed mobile LWAPP rule on AP 00:0b:85:23:cc:50 for mobile
00:40:96:a9:fa:a0
Tue Feb 14 13:47:40 2006: pem_api.c:2006 - State Update 00:40:96:a9:fa:a0 from L
2AUTHCOMPLETE (4) to DHCP_REQD (7)
Tue Feb 14 13:47:40 2006: Changing state for mobile 00:40:96:a9:fa:a0 on AP
00:0b:85:23:cc:50 from Probe to Associated
Tue Feb 14 13:47:40 2006: Session Timeout is 1800 - starting session timer for STA
00:40:96:a9:fa:a0
Tue Feb 14 13:47:40 2006: Scheduling deletion of Mobile Station: 00:40:96:a9:fa:a0
(callerId: 49) in 1800 seconds
Tue Feb 14 13:47:40 2006: Sending Assoc Response to station 00:40:96:a9:fa:a0 on BSSID
00:0b:85:23:cc:50 (status 0)
Tue Feb 14 13:47:40 2006: Changing state for mobile 00:40:96:a9:fa:a0 on AP
00:0b:85:23:cc:50 from Associated to Associated
Tue Feb 14 13:47:40 2006: Mobility query, Mobile: 00:40:96:a9:fa:a0 PEM State: DHCP_REQD
Tue Feb 14 13:47:40 2006: Mobility packet sent to:
Tue Feb 14 13:47:40 2006:   40.1.3.10, port 16666, Switch IP: 10.10.50.2
Tue Feb 14 13:47:40 2006:   type: 3(MobileAnnounce) subtype: 0 version: 1 xid: 20 seq: 21
len 120
Tue Feb 14 13:47:40 2006:   group id: 8980c166 1ac12d02 a250ca56 49c7b762
Tue Feb 14 13:47:40 2006:   mobile MAC: 00:40:96:a9:fa:a0, IP: 0.0.0.0, instance: 0
Tue Feb 14 13:47:40 2006:   VLAN IP: 10.10.60.2, netmask: 255.255.255.0
Tue Feb 14 13:47:41 2006: Mobility packet sent to:
Tue Feb 14 13:47:41 2006:   40.1.3.10, port 16666, Switch IP: 10.10.50.2
Tue Feb 14 13:47:41 2006:   type: 3(MobileAnnounce) subtype: 0 version: 1 xid: 20 seq: 21
len 120
Tue Feb 14 13:47:41 2006:   group id: 8980c166 1ac12d02 a250ca56 49c7b762
Tue Feb 14 13:47:41 2006:   mobile MAC: 00:40:96:a9:fa:a0, IP: 0.0.0.0, instance: 0
Tue Feb 14 13:47:41 2006:   VLAN IP: 10.10.60.2, netmask: 255.255.255.0
Tue Feb 14 13:47:41 2006: Mobility packet retry:, Client: 00:40:96:a9:fa:a0 Peer IP:
Groupcast, Anchor IP: 0.0.0.0
Tue Feb 14 13:47:43 2006: DHCP proxy received packet, src: 0.0.0.0, len = 300
Tue Feb 14 13:47:43 2006: dhcpProxy(): dhcp request, client: 00:40:96:a9:fa:a0:    dhcp
op: 1, port: 1, encap 0xec03, old mscb port number: 1
Tue Feb 14 13:47:43 2006: Dropping DHCP during mobility, chaddr: 00:40:96:a9:fa:a0 siaddr:
0.0.0.0
Tue Feb 14 13:47:43 2006: Attempting anchor export for mobile 00:40:96:a9:fa:a0
Tue Feb 14 13:47:43 2006: Anchor Export: Client: 00:40:96:a9:fa:a0    Client IP: 0.0.0.0,
Anchor IP: 40.1.3.10
Tue Feb 14 13:47:43 2006: Mobility packet sent to:
Tue Feb 14 13:47:43 2006:   40.1.3.10, port 16666, Switch IP: 10.10.50.2
Tue Feb 14 13:47:43 2006:   type: 16(MobileAnchorExport) subtype: 0 version: 1 xid: 21
seq: 22 len 244
Tue Feb 14 13:47:43 2006:   group id: 8980c166 1ac12d02 a250ca56 49c7b762
Tue Feb 14 13:47:43 2006:   mobile MAC: 00:40:96:a9:fa:a0, IP: 0.0.0.0, instance: 0
Tue Feb 14 13:47:43 2006:   VLAN IP: 10.10.60.2, netmask: 255.255.255.0
Tue Feb 14 13:47:43 2006: Mobility Response: mobile 00:40:96:a9:fa:a0IP 0.0.0.0
    code 1, reason 6, PEM State DHCP_REQD, Role Unassociated(0)
Tue Feb 14 13:47:43 2006: Mobility packet received from:
Tue Feb 14 13:47:43 2006:   40.1.3.10, port 16666, Switch IP: 40.1.3.10
Tue Feb 14 13:47:43 2006:   type: 17(MobileAnchorExportAck) subtype: 0 version: 1 xid: 21
seq: 15 len 272
```

```
Tue Feb 14 13:47:43 2006:   group id: 8980c166 1ac12d02 a250ca56 49c7b762
Tue Feb 14 13:47:43 2006:   mobile MAC: 00:40:96:a9:fa:a0, IP: 0.0.0.0, instance: 1
Tue Feb 14 13:47:43 2006:   VLAN IP: 10.10.60.3, netmask: 255.255.255.0
Tue Feb 14 13:47:43 2006: Received Anchor Export Ack: 00:40:96:a9:fa:a0 from Switch IP:
40.1.3.10
Tue Feb 14 13:47:43 2006: Anchor IP: 40.1.3.10 Old Foreign IP: 10.10.50.2 New Foreign IP:
10.10.50.2
Tue Feb 14 13:47:43 2006: mobility role update request from Unassociated to Export Foreign
for mobile 00:40:96:a9:fa:a0 Peer = 40.1.3.10, Old Anchor = 40.1.3.10, New Anchor =
40.1.3.10
Tue Feb 14 13:47:43 2006: pemAdvanceState: State Update 00:40:96:a9:fa:a0, mscb state:
DHCP_REQD from Mobility-Incomplete to Mobility-Complete
Tue Feb 14 13:47:43 2006: pem_api.c:3541 - State Update 00:40:96:a9:fa:a0 from DHCP_REQD
(7) to RUN 20)
Tue Feb 14 13:47:43 2006: Plumbing duplex mobility tunnel to 40.1.3.10, as Export Foreign,
(VLAN 60) for mobile 00:40:96:a9:fa:a0
Tue Feb 14 13:47:43 2006: Adding Fast Path rule for mobile Mac: 00:40:96:a9:fa:a0, IP:
0.0.0.0   type = Airespace AP Client on AP 00:0B:85:23:CC:50, slot 0 InHandle = 0,
OutHandle = 0   ACL Id = 255, Jumbo Frames = NO, interface = 1 802.1P = 0, DSCP = 0,
TokenID =
Tue Feb 14 13:47:43 2006: Successfully plumbed mobile rule for mobile00:40:96:a9:fa:a0
(ACL ID 255)
Tue Feb 14 13:47:43 2006: Mobility Response: mobile 00:40:96:a9:fa:a0IP 0.0.0.0 code 4,
reason 4, PEM State RUN, Role Export Foreign(5)
Tue Feb 14 13:47:43 2006: pemAddScb: not sending gratuitous ARP MAC 0:40:96:a9:fa:a0, IP
0.0.0.0, VLAN Id 60
```

The details about the client can be seen with the command **show client detail** <*mac-address*> and look for the following entries in the script **Mobility State = Export Foreign, Security Policy Completed = Yes** and **Policy Manager State = RUN**.

```
(Cisco Controller) >show client detail 00:40:96:a9:fa:a0
Client MAC Address............................... 00:40:96:a9:fa:a0
Client Username................................. N/A
AP MAC Address................................... 00:0b:85:23:cc:50
Client State..................................... Associated
Wireless LAN Id.................................. 1
BSSID............................................ 00:0b:85:23:cc:50
Channel.......................................... 36
IP Address....................................... Unknown
Association Id................................... 1
Authentication Algorithm......................... Open System
Reason Code...................................... 0
Status Code...................................... 0
Session Timeout.................................. 1800
Re-Authentication Timeout........................ 1800
Remaining Re-Authentication Time................. 1790
QoS Level........................................ Silver
Diff Serv Code Point (DSCP)...................... disabled
802.1P Priority Tag.............................. disabled
Mobility State................................... Export Foreign
Mobility Anchor IP Address....................... 40.1.3.10
Mobility Move Count.............................. 0
Security Policy Completed........................ Yes
Policy Manager State............................. RUN
Policy Manager Rule Created...................... No
Policy Type...................................... N/A
Encryption Cipher................................ None
EAP Type......................................... Unknown
Interface........................................ guest-vlan
VLAN............................................. 60
```

```
Client Capabilities:
      CF Pollable................................ Not implemented
      CF Poll Request............................ Not implemented
      Short Preamble............................. Not implemented
      PBCC....................................... Not implemented
      Channel Agility............................ Not implemented
      Listen Interval............................ 0
Client Statistics:
      Number of Bytes Received................... 0
      Number of Bytes Sent....................... 0
      Number of Packets Received................. 0
      Number of Packets Sent..................... 0
      Number of Policy Errors.................... 0
      Radio Signal Strength Indicator............ Unavailable
      Signal to Noise Ratio...................... Unavailable
Nearby AP Statistics:
                     --More-- or (q)uit
        TxExcessiveRetries: 0
                                TxRetries: 0
                                                RtsSuccessCnt: 0
                                                                        RtsFailC
nt: 0
        TxFiltered: 0
                        TxRateProfile: [0,0,0,0,0,0,0,0,0,0,0,0]
      AP1-cc:50(slot 0) 11 seconds ago........... -29 dBm
      AP1-cc:50(slot 1) 11 seconds ago........... -33 dBm
```

Debugging Script from the Anchor Controller.

```
(Cisco Controller) > show debug
MAC address................................ 00:40:96:a9:fa:a0

Debug Flags Enabled:
  arp error enabled.
  bcast error enabled.
  dhcp packet enabled.
  dot11 mobile enabled.
  dot11 state enabled
  mobility directory enabled.
  mobility handoff enabled.
  pem events enabled.
  pem state enabled.


(Cisco Controller) > show time

Time............................................. Tue Feb 14 14:48:03 2006

Timezone delta................................... 0:0
Daylight savings................................. disabled

NTP Servers
    NTP Polling Interval.........................     86400

     Index              NTP Server
    ------- --------------------------------


Tue Feb 14 14:48:18 2006: Mobility packet received from:
Tue Feb 14 14:48:18 2006:   10.10.50.2, port 16666, Switch IP: 10.10.50.2
Tue Feb 14 14:48:18 2006:   type: 3(MobileAnnounce) subtype: 0 version: 1 xid: 20 seq: 21
len 120
```

```
Tue Feb 14 14:48:18 2006:   group id: 66c18089 22dc11a 56ca50a2 62b7c749
Tue Feb 14 14:48:18 2006:   mobile MAC: 00:40:96:a9:fa:a0, IP: 0.0.0.0, instance: 0
Tue Feb 14 14:48:18 2006:   VLAN IP: 10.10.60.2, netmask: 255.255.255.0
Tue Feb 14 14:48:19 2006: Mobility packet received from:
Tue Feb 14 14:48:19 2006:   10.10.50.2, port 16666, Switch IP: 10.10.50.2
Tue Feb 14 14:48:19 2006:   type: 3(MobileAnnounce) subtype: 0 version: 1 xid: 20 seq: 21
len 120
Tue Feb 14 14:48:19 2006:   group id: 66c18089 22dc11a 56ca50a2 62b7c749
Tue Feb 14 14:48:19 2006:   mobile MAC: 00:40:96:a9:fa:a0, IP: 0.0.0.0, instance: 0
Tue Feb 14 14:48:19 2006:   VLAN IP: 10.10.60.2, netmask: 255.255.255.0
Tue Feb 14 14:48:21 2006: Mobility packet received from:
Tue Feb 14 14:48:21 2006:   10.10.50.2, port 16666, Switch IP: 10.10.50.2
Tue Feb 14 14:48:21 2006:   type: 16(MobileAnchorExport) subtype: 0 version: 1 xid: 21
seq: 22 len 244
Tue Feb 14 14:48:21 2006:   group id: 66c18089 22dc11a 56ca50a2 62b7c749
Tue Feb 14 14:48:21 2006:   mobile MAC: 00:40:96:a9:fa:a0, IP: 0.0.0.0, instance: 0
Tue Feb 14 14:48:21 2006:   VLAN IP: 10.10.60.2, netmask: 255.255.255.0
Tue Feb 14 14:48:21 2006: Received Anchor Export request: 00:40:96:a9:fa:a0 from Switch
IP: 10.10.50.2
Tue Feb 14 14:48:21 2006: Adding mobile 00:40:96:a9:fa:a0 on Remote AP
00:00:00:00:00:00(0)
Tue Feb 14 14:48:21 2006: mobility role update request from Unassociated to Export Anchor
for mobile 00:40:96:a9:fa:a0 Peer = 0.0.0.0, Old Anchor = 0.0.0.0, New Anchor = 40.1.3.10
Tue Feb 14 14:48:21 2006: Initializing policy for mobile 00:40:96:a9:fa:a0
Tue Feb 14 14:48:21 2006: pem_api.c:1785 - State Update 00:40:96:a9:fa:a0 from START (0)
to AUTHCHECK (2)
Tue Feb 14 14:48:21 2006: pem_api.c:1873 - State Update 00:40:96:a9:fa:a0 from AUTHCHECK
(2) to L2AUTHCOMPLETE (4)
Tue Feb 14 14:48:21 2006: pem_api.c:2006 - State Update 00:40:96:a9:fa:a0 from
L2AUTHCOMPLETE (4) to DHCP_REQD (7)
Tue Feb 14 14:48:21 2006: Received Anchor Export policy update, valid mask 0x0: Qos Level:
0, DSCP: 0, dot1p: 0 Interface Name:, ACL Name:
Tue Feb 14 14:48:21 2006: Stopping deletion of Mobile Station: 00:40:96:a9:fa:a0
(callerId: 53)
Tue Feb 14 14:48:21 2006: Mobility packet sent to:
Tue Feb 14 14:48:21 2006:   10.10.50.2, port 16666, Switch IP: 40.1.3.10
Tue Feb 14 14:48:21 2006:   type: 17(MobileAnchorExportAck) subtype: 0 version: 1 xid: 21
seq: 15 len 272
Tue Feb 14 14:48:21 2006:   group id: 66c18089 22dc11a 56ca50a2 62b7c749
Tue Feb 14 14:48:21 2006:   mobile MAC: 00:40:96:a9:fa:a0, IP: 0.0.0.0, instance: 1
Tue Feb 14 14:48:21 2006:   VLAN IP: 10.10.60.3, netmask: 255.255.255.0
Tue Feb 14 14:48:21 2006: pemAdvanceState: State Update 00:40:96:a9:fa:a0, ms
cab state: DHCP_REQD from Mobility-Incomplete to Mobility-Complete
Tue Feb 14 14:48:21 2006: pem_api.c:3549 - State Update 00:40:96:a9:fa:a0 from DHCP_REQD
(7) to DHCP_REQD (7)
Tue Feb 14 14:48:21 2006: pemAdvanceState:3559 - Adding TMP rule for STA 00:40:96:a9:fa:a0
Tue Feb 14 14:48:21 2006: Plumbing duplex mobility tunnel to 10.10.50.2, as Export Anchor
(VLAN 60) for mobile 00:40:96:a9:fa:a0
Tue Feb 14 14:48:21 2006: Adding Fast Path rule for mobile Mac: 00:40:96:a9:fa:a0, IP:
0.0.0.0 type = Airespace AP - Learn IP address on AP 00:00:00:00:00:00, slot 0 InHandle =
0, OutHandle = 0 ACL Id = 255, Jumbo Frames = NO, interface = 29 802.1P = 0, DSCP =
Tue Feb 14 14:48:21 2006: Successfully plumbed mobile rule for mobile00:40:96:a9:fa:a0
(ACL ID 255)
Tue Feb 14 14:48:21 2006: pemAddScb: Added NPU entry of type 9 for STA 00:40:96:a9:fa:a0
Tue Feb 14 14:48:21 2006: pemAddScb: not sending gratuitous ARP MAC 0:40:96:a9:fa:a0, IP
0.0.0.0, VLAN Id 60
Tue Feb 14 14:48:24 2006: DHCP proxy received packet, src: 0.0.0.0, len = 300
Tue Feb 14 14:48:24 2006: dhcpProxy(): dhcp request, client: 00:40:96:a9:fa:a0: dhcp op:
1, port: 29, encap 0xec05, old mscb port number: 29
Tue Feb 14 14:48:24 2006: mscb->dhcp Server: 0.0.0.0, mscb->dhcpNetmask: 0.0.0.0,
mscb->dhcpGateway: 0.0.0.0, mscb->dhcpRelay: 10.10.60.3  VLAN: 60
Tue Feb 14 14:48:24 2006: Local Address: 10.10.60.3, DHCP Server: 10.1.1.11, Gateway Addr:
10.10.60.1, VLAN: 60, port: 29
Tue Feb 14 14:48:24 2006: DHCP Message Type received: DHCP DISCOVER msg
Tue Feb 14 14:48:24 2006:   op: BOOTREQUEST, htype: Ethernet, hlen: 6, hops: 1
Tue Feb 14 14:48:24 2006:   xid: 729520998, secs: 32774, flags: 0
Tue Feb 14 14:48:24 2006:   chaddr: 00:40:96:a9:fa:a0
Tue Feb 14 14:48:24 2006:   ciaddr: 0.0.0.0,  yiaddr: 0.0.0.0
Tue Feb 14 14:48:24 2006:   siaddr: 0.0.0.0, giaddr: 10.10.60.3
Tue Feb 14 14:48:24 2006: DHCP request to 10.10.60.1, len 350, switchport 29, vlan 60
Tue Feb 14 14:48:24 2006: mscb->dhcpServer: 0.0.0.0, mscb->dhcpNetmask: 0.0.0.0,
mscb->dhcpGateway: 0.0.0.0, mscb->dhcpRelay: 10.10.60.3 VLAN: 60
Tue Feb 14 14:48:24 2006: DHCP proxy received packet, src: 10.1.1.11, len = 300
Tue Feb 14 14:48:24 2006: DhcpProxy(): Setting dhcp server from OFFER server: 10.1.1.11
    client mac: 00:40:96:a9:fa:a0 offer ip: 0.0.0.0
Tue Feb 14 14:48:24 2006: DHCP EoIP tunnel to foreign 10.10.50.2 client 00:40:96:a9:fa:a0,
len 346
Tue Feb 14 14:48:24 2006: DHCP Message Type received: DHCP OFFER msg
Tue Feb 14 14:48:24 2006:   op: BOOTREPLY, htype: Ethernet, hlen: 6, hops: 0
Tue Feb 14 14:48:24 2006:   xid: 729520998, secs: 0, flags: 0
Tue Feb 14 14:48:24 2006:   chaddr: 00:40:96:a9:fa:a0
Tue Feb 14 14:48:24 2006:   ciaddr: 0.0.0.0, yiaddr: 10.10.60.23
Tue Feb 14 14:48:24 2006:   siaddr: 0.0.0.0, giaddr: 0.0.0.0
Tue Feb 14 14:48:24 2006:   server id: 1.1.1.1 rcvd server id: 10.1.1.11
Tue Feb 14 14:48:24 2006: DHCP proxy received packet, src: 0.0.0.0, len = 326
Tue Feb 14 14:48:24 2006: dhcpProxy(): dhcp request, client: 00:40:96:a9:fa:a0:
    dhcp op: 1, port: 29, encap 0xec05, old mscb port number: 29
Tue Feb 14 14:48:24 2006: mscb->dhcpServer: 10.1.1.11, mscb->dhcpNetmask: 0.0.0.0,
mscb->dhcpGateway: 0.0.0.0, mscb->dhcpRelay: 10.10.60.3 VLAN: 60
Tue Feb 14 14:48:24 2006: Local Address: 10.10.60.3, DHCP Server: 10.1.1.11, Gateway Addr:
10.10.60.1, VLAN: 60, port: 29
Tue Feb 14 14:48:24 2006: DHCP Message Type received: DHCP REQUEST msg
Tue Feb 14 14:48:24 2006:   op: BOOTREQUEST, htype: Ethernet, hlen: 6, hops: 1
Tue Feb 14 14:48:24 2006:   xid: 729520998, secs: 32774, flags: 0
Tue Feb 14 14:48:24 2006:   chaddr: 00:40:96:a9:fa:a0
Tue Feb 14 14:48:24 2006:   ciaddr: 0.0.0.0, yiaddr: 0.0.0.0
Tue Feb 14 14:48:24 2006:   siaddr: 0.0.0.0, giaddr: 10.10.60.3
Tue Feb 14 14:48:24 2006:   server id: 10.1.1.11 rcvd server id: 1.1.1.1
Tue Feb 14 14:48:24 2006: DHCP request to 10.10.60.1, len 374, switchport 29, vlan 60
Tue Feb 14 14:48:24 2006: DHCP proxy received packet, src: 10.1.1.11, len = 300
Tue Feb 14 14:48:24 2006: pem_api.c:4284 - State Update 00:40:96:a9:fa:a0 from DHCP_REQD
(7) to WEBAUTH_REQD (8)
Tue Feb 14 14:48:24 2006: pemAdvanceState:4287 - Adding TMP rule for STA 00:40:96:a9:fa:a0
Tue Feb 14 14:48:24 2006: Plumbing duplex mobility tunnel to 10.10.50.2, as Export Anchor
(VLAN 60) for mobile 00:40:96:a9:fa:a0
Tue Feb 14 14:48:24 2006: Replacing Fast Path rule for mobile Mac: 00:40:96:a9:fa:a0, IP:
10.10.60.23 type = Airespace AP Client - ACL passthru on AP 00:00:00:00:00:00, slot 0
InHandle = 0, OutHandle = 0 ACL Id = 255, Jumbo Frames = NO, interface = 29 802.1P =
Tue Feb 14 14:48:24 2006: Successfully plumbed mobile rule for mobile00:40:96:a9:fa:a0
(ACL ID 255)
Tue Feb 14 14:48:24 2006: Plumbing web-auth redirect rule due to user logout for
00:40:96:a9:fa:a0
Tue Feb 14 14:48:24 2006: Adding Web RuleID 14 for mobile 00:40:96:a9:fa:a0
Tue Feb 14 14:48:24 2006: Assigning Address 10.10.60.23 to mobile 00:40:96:a9:fa:a0
Tue Feb 14 14:48:24 2006: DHCP EoIP tunnel to foreign 10.10.50.2    client
00:40:96:a9:fa:a0, len 346
Tue Feb 14 14:48:24 2006: DHCP Message Type received: DHCP ACK msg
Tue Feb 14 14:48:24 2006:   op: BOOTREPLY, htype: Ethernet, hlen: 6, hops: 0
Tue Feb 14 14:48:24 2006:   xid: 729520998, secs: 0, flags: 0
Tue Feb 14 14:48:24 2006:   chaddr: 00:40:96:a9:fa:a0
Tue Feb 14 14:48:24 2006:   ciaddr: 0.0.0.0, yiaddr: 10.10.60.23
Tue Feb 14 14:48:24 2006:   siaddr: 0.0.0.0, giaddr: 0.0.0.0
Tue Feb 14 14:48:24 2006:   server id: 1.1.1.1 rcvd server id: 10.1.1.11
Tue Feb 14 14:48:24 2006: pemAddScb: Added NPU entry of type 2 for STA 00:40:96:a9:fa:a0
Tue Feb 14 14:48:24 2006: Sent an XID frame for mobile 00:40:96:a9:fa:a0
```

At this stage the client is connected and has received a DHCP address from the server. The user now opens the web browser and enters the username *cisco1* and password and completes the web authentication.

```
Tue Feb 14 14:48:58 2006: Username entry (cisco1) created for mobile 00:40:96:a9:fa:a0
Tue Feb 14 14:48:58 2006: pem_api.c:4178 - State Update 00:40:96:a9:fa:a0 from
WEBAUTH_REQD (8) to WEBAUTH_NOL3SEC (14)
Tue Feb 14 14:48:58 2006: pem_api.c:4215 - State Update 00:40:96:a9:fa:a0 from
WEBAUTH_NOL3SEC (14) to RUN (20)
Tue Feb 14 14:48:58 2006: Plumbing duplex mobility tunnel to 10.10.50.2, as Export Anchor
(VLAN 60) for mobile 00:40:96:a9:fa:a0
Tue Feb 14 14:48:58 2006: Replacing Fast Path rule for mobile Mac: 00:40:96:a9:fa:a0, IP:
10.10.60.23   type = Airespace AP Client on AP 00:00:00:00:00:00, slot 0 InHandle = 0,
OutHandle = 0 ACL Id = 255, Jumbo Frames = NO, interface = 29 802.1P = 0, DSCP = 0, To
Tue Feb 14 14:48:58 2006: Successfully plumbed mobile rule for mobile00:40:96:a9:fa:a0
(ACL ID 255)
Tue Feb 14 14:48:58 2006: pemAddScb: Added NPU entry of type 1 for STA 00:40:96:a9:fa:a0
Tue Feb 14 14:48:58 2006: Sending a gratuitous ARP for mobile 00:40:96:a9:fa:a0, IP
Address 10.10.60.23, 1Q TAG=0x003c
```

Client logs out of the web authentication session and closes the browser.

```
Tue Feb 14 14:49:24 2006: Deleting policy rule for mobile 00:40:96:a9:fa:a0
Tue Feb 14 14:49:24 2006: pem_api.c:3423 - State Update 00:40:96:a9:fa:a0 from RUN (20) to
L2AUTHCOMPLETE (4)
Tue Feb 14 14:49:24 2006: pem_api.c:4401 - State Update 00:40:96:a9:fa:a0 from
L2AUTHCOMPLETE (4) to DHCP_REQD (7)
Tue Feb 14 14:49:24 2006: pemAdvanceState:4405 - Adding TMP rule for STA 00:40:96:a9:fa:a0
Tue Feb 14 14:49:24 2006: Plumbing duplex mobility tunnel to 10.10.50.2, as Export Anchor
(VLAN 60) for mobile 00:40:96:a9:fa:a0
Tue Feb 14 14:49:24 2006: Adding Fast Path rule for mobile Mac: 00:40:96:a9:fa:a0, IP:
10.10.60.23   type = Airespace AP - Learn IP address on AP 00:00:00:00:00:00, slot 0
InHandle = 0, OutHandle = 0 ACL Id = 255, Jumbo Frames = NO, interface = 29 802.1P = 0,
DSC
Tue Feb 14 14:49:24 2006: Successfully plumbed mobile rule for mobile00:40:96:a9:fa:a0
(ACL ID 255)
Tue Feb 14 14:49:24 2006: pem_api.c:4420 - State Update 00:40:96:a9:fa:a0 from DHCP_REQD
(7) to WEBAUTH_REQD (8)
Tue Feb 14 14:49:24 2006: pemAdvanceState:4423 - Adding TMP rule for STA 00:40:96:a9:fa:a0
Tue Feb 14 14:49:24 2006: Plumbing duplex mobility tunnel to 10.10.50.2, as Export Anchor
(VLAN 60) for mobile 00:40:96:a9:fa:a0
Tue Feb 14 14:49:24 2006: Replacing Fast Path rule for mobile Mac: 00:40:96:a9:fa:a0, IP:
10.10.60.23   type = Airespace AP Client - ACL passthru on AP 00:00:00:00:00:00, slot 0
InHandle = 0, OutHandle = 0 ACL Id = 255, Jumbo Frames = NO, interface = 29 802.1P =
Tue Feb 14 14:49:24 2006: Successfully plumbed mobile rule for mobile00:40:96:a9:fa:a0
(ACL ID 255)
Tue Feb 14 14:49:24 2006: Plumbing web-auth redirect rule due to user logout for
00:40:96:a9:fa:a0
Tue Feb 14 14:49:24 2006: Deleting mobile policy rule -570425345 for 00:40:96:a9:fa:a0
Tue Feb 14 14:49:24 2006: Adding Web RuleID 15 for mobile 00:40:96:a9:fa:a0
Tue Feb 14 14:49:24 2006: Username entry delete for mobile 00:40:96:a9:fa:a0
Tue Feb 14 14:49:24 2006: pemDelScb: removed NPU entry for STA 00:40:96:a9:fa:a0
Tue Feb 14 14:49:24 2006: pemAddScb: Added NPU entry of type 9 for STA 00:40:96:a9:fa:a0
Tue Feb 14 14:49:24 2006: pemAddScb: Added NPU entry of type 2 for STA 00:40:96:a9:fa:a0
Tue Feb 14 14:49:24 2006: Sent an XID frame for mobile 00:40:96:a9:fa:a0
```

For details on the client on the anchor controller, enter **show client detail** <*mac-address*> and look for the following information: **Mobility State = Export Anchor, Security Policy Completed = Yes** and **Policy Manager State = WEBAUTH_REQD** as the user has not completed the web authentication.

```
(Cisco Controller) > show client summary
Number of Clients................................ 1
MAC Address        AP Name            Status         WLAN Auth Protocol Port
-          ----------------- -------------          ----      ---- -------- ----
00:40:96:a9:fa:a0 10.10.50.2         Associated     2           No   Mobile    29

(Cisco Controller) >show client detail 00:40:96:a9:fa:a0
Client MAC Address............................... 00:40:96:a9:fa:a0
Client Username................................. N/A
AP MAC Address................................... 00:00:00:00:00:00
Client State..................................... Associated
Wireless LAN Id.................................. 2
BSSID............................................ 00:00:00:00:00:01
Channel.......................................... N/A
IP Address....................................... 10.10.60.23
Association Id................................... 0
Authentication Algorithm......................... Open System
Reason Code...................................... 0
Status Code...................................... 0
Session Timeout.................................. 1800
Re-Authentication Timeout........................ 1800
Remaining Re-Authentication Time................. Timer is not running
Mirroring........................................ Disabled
QoS Level........................................ Silver
Diff Serv Code Point (DSCP)...................... disabled
802.1P Priority Tag.............................. disabled
Mobility State................................... Export Anchor
Mobility Foreign IP Address...................... 10.10.50.2
Mobility Move Count.............................. 1
Security Policy Completed........................ No
Policy Manager State............................. WEBAUTH_REQD
Policy Manager Rule Created...................... Yes
NPU Fast Fast Notified........................... Yes
Policy Type...................................... N/A
Encryption Cipher................................ None
EAP Type......................................... Unknown
Interface........................................ guest-vlan
VLAN............................................. 60
Client Capabilities:
      CF Pollable................................ Not implemented
      CF Poll Request............................ Not implemented
      Short Preamble............................. Not implemented
      PBCC....................................... Not implemented
      Channel Agility............................ Not implemented
      Listen Interval............................ 0
Client Statistics:
      Number of Bytes Received................... 0
      Number of Bytes Sent....................... 0
      Number of Packets Received................. 0
      Number of Packets Sent..................... 0
      Number of Policy Errors.................... 0
      Radio Signal Strength Indicator............ Unavailable
      Signal to Noise Ratio...................... Unavailable
Nearby AP Statistics:
                        TxExcessiveRetries: 0
                                                TxRetries: 0
                                                                RtsSuccessCnt: 0
        RtsFailCnt: 0
                        TxFiltered: 0
                                        TxRateProfile: [0,0,0,0,0,0,0,0,0,0,0,0]
```

Note Client details for the anchor controller details have changed and web authentication is complete (see bold text in script below). New values display when the **show client detail** <*mac-address*> is entered for the following values: **Mobility State = Export Anchor, Security Policy Completed = Yes** and **Policy Manager State = RUN.**

```
(Cisco Controller) > show client summary
Number of Clients................................ 1
MAC Address        AP Name            Status WLAN Auth  Protocol  Port
----------------- -----------------  ------------  ----      ----  --------  ----
00:40:96:a9:fa:a0  10.10.50.2         Associated     2 Yes   Mobile    29


(Cisco Controller) > show client detail 00:40:96:a9:fa:a0
Client MAC Address............................... 00:40:96:a9:fa:a0
Client Username ................................. cisco1
AP MAC Address................................... 00:00:00:00:00:00
Client State..................................... Associated
Wireless LAN Id.................................. 2
BSSID............................................ 00:00:00:00:00:01
Channel.......................................... N/A
IP Address....................................... 10.10.60.23
Association Id................................... 0
Authentication Algorithm......................... Open System
Reason Code...................................... 0
Status Code...................................... 0
Session Timeout.................................. 1800
Re-Authentication Timeout........................ 1800
Remaining Re-Authentication Time................. Timer is not running
Mirroring........................................ Disabled
QoS Level........................................ Silver
Diff Serv Code Point (DSCP)...................... disabled
802.1P Priority Tag.............................. disabled
Mobility State................................... Export Anchor
Mobility Foreign IP Address...................... 10.10.50.2
Mobility Move Count.............................. 1
Security Policy Completed........................ Yes
Policy Manager State............................. RUN
Policy Manager Rule Created...................... Yes
NPU Fast Fast Notified........................... Yes
Policy Type...................................... N/A
Encryption Cipher................................ None
EAP Type......................................... Unknown
Interface........................................ guest-vlan
VLAN............................................. 60
Client Capabilities:
      CF Pollable................................ Not implemented
      CF Poll Request............................ Not implemented
      Short Preamble............................. Not implemented
      PBCC....................................... Not implemented
      Channel Agility............................ Not implemented
      Listen Interval............................ 0
Client Statistics:
      Number of Bytes Received................... 0
      Number of Bytes Sent....................... 0
      Number of Packets Received................. 0
      Number of Packets Sent..................... 0
      Number of Policy Errors.................... 0
      Radio Signal Strength Indicator............ Unavailable
      Signal to Noise Ratio...................... Unavailable
```

```
Nearby AP Statistics:
                    TxExcessiveRetries: 0
                    TxRetries: 0
                    RtsSuccessCnt: 0
                    RtsFailCnt: 0
                    TxFiltered: 0
                    TxRateProfile: [0,0,0,0,0,0,0,0,0,0,0,0]
```

Related Documentation

The following Cisco documents can provide additional information on the wireless LAN controller:

- *Cisco Wireless LAN Controller Configuration Guide*, Software Release 4.0, June 2006, Part Number OL-9141-01
- *Cisco BBSM 5.3 Configuration Guide*, June 2006, Part Number 78-15807-01

This document is to be used in conjunction with the documents listed in the Related Documentation section.