

Workgroup Bridges in a Cisco Unified Wireless Network Configuration Example

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Introduction

This document provides an example for the configuration of Cisco Autonomous IOS[®] access points to operate in Workgroup Bridge (WGB) mode and connect to a Cisco Unified wireless network.

Prerequisites

Requirements

Ensure that you meet these requirements before you attempt this configuration:

- Knowledge of Cisco Autonomous solution and Cisco IOS–based Access Points
- Knowledge of Lightweight Access Point Protocol (LWAPP)

Components Used

The information in this document is based on these software and hardware versions:

- Cisco 1231G AP that runs Cisco IOS Software Release 12.3 (8)JEC
- Cisco 4400 WLC that runs version 4.2
- Cisco 1130 series Light Weight AP

The WGB can be any Cisco Autonomous Access Point that supports the Workgroup Bridge mode and runs Cisco IOS Software Release 12.4(3g)JA or later (on 32–MB access points) or Cisco IOS Software Release 12.3(8)JEB or later (on 16–MB access points). These access points include the AP1120, AP1121, AP1130, AP1231, AP1240, and AP1310. Cisco IOS software releases prior to Cisco IOS Software Releases 12.4(3g)JA

and 12.3(8)JEB are not supported.

On the wireless LAN controller, you should have software version 4.1.185.0 or later. The Workgroup Bridge mode is not supported on the controller on any of the earlier versions.

Guidelines and Limitations for Using Workgroup Bridges in a Lightweight Environment

There are various guidelines that must be completed and limitations that need to be understood before you use workgroup bridges in a lightweight environment. Refer to Guidelines for Using Workgroup Bridges in a Lightweight Environment for more information.

Conventions

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

Workgroup Bridge in a Cisco Unified Wireless Network

You can configure an access point to operate as a workgroup bridge so that it can provide wireless connectivity to a lightweight access point on behalf of clients that are connected by Ethernet to the workgroup bridge access point. When you configure the access point to operate as a workgroup bridge and connect to a Cisco Unified network, it can provide wireless connectivity to wired clients that are connected by Ethernet to the workgroup bridge access point. For example, if you need to provide wireless connectivity for a group of wired devices, you can connect the devices to a hub or to a switch, connect the hub or switch to the access point Ethernet port, and configure the access point as a workgroup bridge.

A workgroup bridge connects to a wired network over a single wireless segment by learning the MAC address of its wired clients on the Ethernet interface and reporting them to the lightweight access point using Internet Access Point Protocol (IAPP) messaging. The workgroup bridge provides wireless access connectivity to wired clients by establishing a single connection to the lightweight access point. The lightweight access point treats the workgroup bridge as a wireless client.

If your access point has two radios, either the 2.4-GHz radio or the 5-GHz radio can function in workgroup bridge mode. When you configure one radio interface as a workgroup bridge, the other radio interface remains up.

Passive Clients Behind a WGB

The controller might not be able to see passive clients behind a WGB. Clients (such as cameras and programmable logic devices) do not initiate a traffic stream unless they are connected. Complete these steps in order avoid this issue:

1. Add a static MAC filter entry for the passive WGB device and MAC filter entry for the devices that are behind it.
2. Use this command in order to enable MAC filtering on the WLAN along with aaa override:

```
config macfilter ipaddress MAC_address IP_address
```

3. Add a static entry on the WGB IOS-based device: **bridge 1 addressxxxx.xxxx.xxxx forward FastEthernet0**

Note: In addition, increase the dot11 activity timer.

4. Add a static ARP entry on the L3 router:

```
hostname(config)#arp <ip addr> <mac addr>
arpa
```

This feature allows the controller to learn the IP address of a passive WGB wired client when the WGB sends an IAPP message to the controller that contains only the MAC address of the WGB wired client. When this message is received from the WGB, the controller checks the local MAC filter list or, if the WGB has roamed, the MAC filter list of the anchor controller for the MAC address of the client. If an entry is found and it contains an IP address for the client, the controller adds the client to the client table of the controller.

Unlike the existing MAC filtering feature for wireless clients, you are not required to enable MAC filtering on the WLAN for WGB wired clients. WGB wired clients that use MAC filtering do not need to obtain an IP address through DHCP to be added to the client table of the controller.

Configure

In this example, the 1231 Autonomous Access Point is configured as a workgroup bridge and connects to the LWAPP network. Use the SSID **WGB_LWAPP** for the connection to the WLAN and use the Open authentication with WEP for the authentication of the WGB to the LWAPP network.

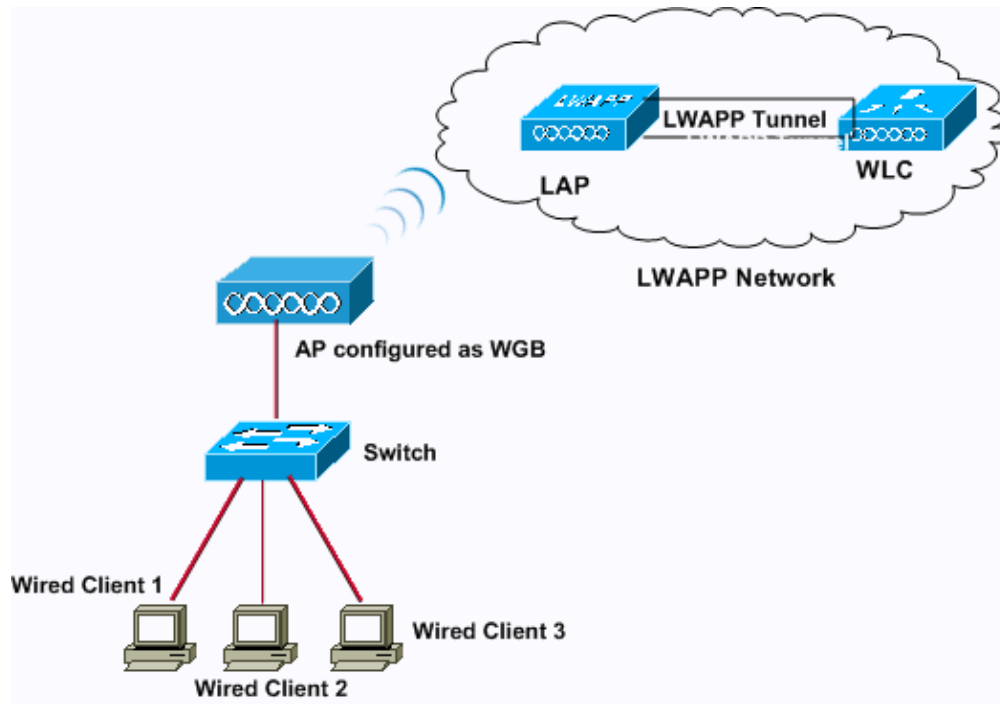
Note: Open authentication with WEP is NOT a secure method for authenticating devices. Cisco recommends that you use advanced authentication methods, such as WPA+TKIP, WPA2+AES, EAP-FAST, and EAP-TLS authentication, in order to secure the WLAN. WGB supports Open, WEP, CKIP, WPA+TKIP, WPA2+AES, LEAP, EAP-FAST, Local EAP and EAP-TLS authentication modes. This document uses Open with WEP only for simplicity.

Note: Use the Command Lookup Tool (registered customers only) in order to obtain more information on the commands used in this section.

Network Diagram

This document uses this network setup:

Note: This document assumes that the WLC is configured for basic operation and that the LAPs are registered to the WLC. Refer to Lightweight AP (LAP) Registration to a Wireless LAN Controller (WLC) for more information on how a new user can set up the WLC for basic operation with LAPs.



How to Configure the Workgroup Bridge

The workgroup bridge can be configured using either the CLI or the GUI.

Complete these steps in order to configure the workgroup bridge with the GUI:

1. Complete these steps in order to configure an SSID that the WGB can use to connect to the LWAPP network:
 - a. Choose **Security > SSID Manager** from the left navigation pane.

The Global SSID Manager page appears.

Cisco Aironet 1200 Series Access Point

Hostname: WGB-1231 WGB-1231 uptime is 3 days, 23 hours, 57 minutes

Security: Global SSID Manager

SSID Properties

Current SSID List

- < NEW >
- admin

SSID: WGB_LWAPP

VLAN: 2 [Define VLANs](#)

Backup 1:

Backup 2:

Backup 3:

Interface: Radio0-602.11G

Network ID: (0-4096)

Delete

Client Authentication Settings

Methods Accepted:

- Open Authentication: < NO ADDITION >
- Shared Authentication: < NO ADDITION >
- Network EAP: < NO ADDITION >

- Enter the SSID name, VLAN ID, and the RADIO interface. This example uses *WGB_LWAPP* as the SSID.
- In the Client Authentication Settings area, check the **Open Authentication** check box.
- Leave all other parameters with their default values.
- Click **Apply**.
- In order to configure the WEP keys, choose **Security > Encryption Manager** from the left navigation pane.

The Encryption Manager page appears.

Cisco Aironet 1200 Series Access Point

Hostname: WGB-1231 WGB-1231 uptime is 4 days, 5 minutes

Security: Encryption Manager

Set Encryption Mode and Keys for VLAN: 2 [Define VLANs](#)

Encryption Modes

- None
- WEP Encryption: Mandatory
- Cipher: WEP 128 bit

Cisco-Compliant TKIP Features: Enable Message Integrity Check (MIC) Enable Per Packet Keying (PPK)

Encryption Keys

Transmit Key	Encryption-Key (Hexadecimal)	Key Size
Encryption Key 1: <input checked="" type="radio"/>	<input type="text"/>	128 bit
Encryption Key 2: <input type="radio"/>	<input type="text"/>	128 bit
Encryption Key 3: <input type="radio"/>	<input type="text"/>	128 bit
Encryption Key 4: <input type="radio"/>	<input type="text"/>	128 bit

Apply Cancel

- g. In the Encryption Modes area, click the **WEP Encryption** radio button, and choose **Mandatory** from the drop-down list.
- h. In the Encryption Keys area, enter the encryption key for WEP.

Note: The WEP encryption keys can be 40 bits or 128 bits in length. This example uses the 128-bit WEP encryption key 123456789123456789abc.

- i. Click **Apply** in order to save the settings.
2. Complete these steps in order to configure the AP as a WGB:
- a. Click **Network Interfaces** in the left navigation pane in order to browse to the Network Interfaces Summary page.
 - b. Choose the radio interface that you want to configure as a WGB. This example uses interface **Radio0-802.11G**. The action allows you to browse to the Network Interfaces: Radio Status page.
 - c. Click the **Settings** tab in order to open the Settings page for the radio interface.
 - d. Click the **Enable** radio button in order to enable the radio.
 - e. For Role in Radio Network, click the **Workgroup Bridge** radio button. This option enables the radio to operate in Workgroup Bridge mode.
 - f. Leave all the other settings on the page with the default values.

The screenshot shows the configuration page for the Cisco Aironet 1200 Series Access Point, specifically for the Radio0-802.11G interface. The page is titled "Cisco Aironet 1200 Series Access Point" and "Network Interfaces: Radio0-802.11G Settings". The hostname is "WGB-1231" and the uptime is "4 days, 6 minutes".

Key settings shown:

- Enable Radio:** Enable, Disable
- Current Status (Software/Hardware):** Disabled, Down
- Role in Radio Network:**
 - Access Point
 - Access Point (Fallback to Radio Shutdown)
 - Access Point (Fallback to Repeater)
 - Repeater
 - Root Bridge
 - Non-Root Bridge
 - Root Bridge with Wireless Clients
 - Non-Root Bridge with Wireless Clients
 - Workgroup Bridge
 - Scanner
- Data Rates:**

	Best Range	Best Throughput	Default
1.0Mb/sec	<input checked="" type="radio"/> Require	<input type="radio"/> Enable	<input type="radio"/> Disable
2.0Mb/sec	<input checked="" type="radio"/> Require	<input type="radio"/> Enable	<input type="radio"/> Disable
5.5Mb/sec	<input checked="" type="radio"/> Require	<input type="radio"/> Enable	<input type="radio"/> Disable
* 6.0Mb/sec	<input type="radio"/> Require	<input checked="" type="radio"/> Enable	<input type="radio"/> Disable
* 9.0Mb/sec	<input type="radio"/> Require	<input checked="" type="radio"/> Enable	<input type="radio"/> Disable
11.0Mb/sec	<input checked="" type="radio"/> Require	<input type="radio"/> Enable	<input type="radio"/> Disable

- g. Click **Apply** in order to save the settings

Use these commands in order to configure the AP through the CLI:

```
AP_WGB#configure terminal
```

!--- Enter configuration commands, one on each line. End with CNTL/Z.

```
AP_WGB(config)#dot11 ssid WGB_LWAPP
```

```
AP_WGB(config-ssid)#authentication open
```

```
AP_WGB(config-ssid)#guest-mode

AP_WGB(config-ssid)#exit

AP_WGB(config)#interface dot11Radio 0

AP_WGB(config)#station-role workgroup-bridge

AP_WGB(config-if)#encryption vlan 2 mode wep mandatory

AP_WGB(config-if)#encryption vlan 2 key 1 size 128bit 12345678912345678912345

AP_WGB(config-if)#WGB_LWAPP

AP_WGB(config-if)#end
```

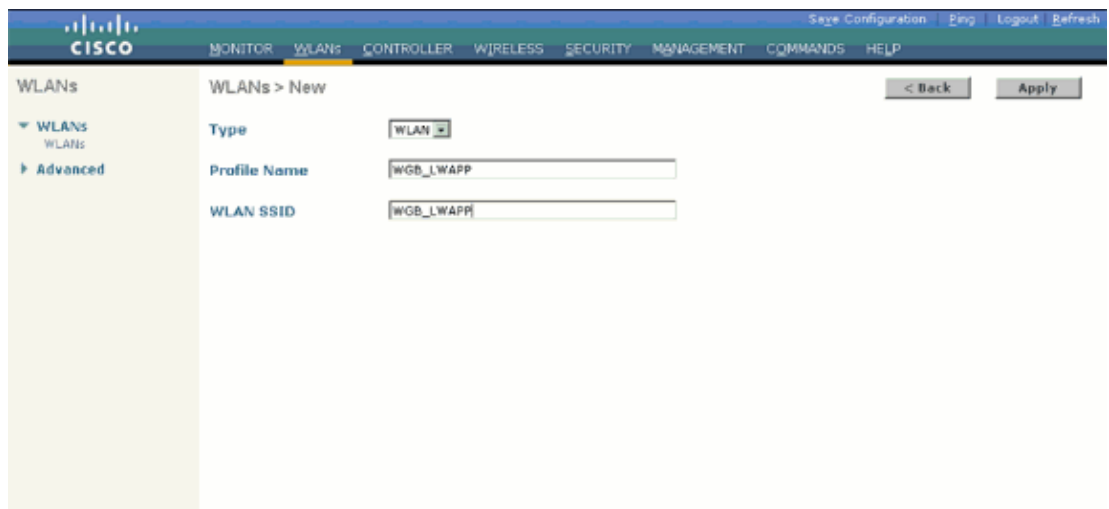
How to Configure the Wireless LAN Controller (WLC)

On the wireless LAN controller, create a WLAN that matches the SSID and security method that was configured on the workgroup bridge. This is the only configuration required on the controller for the WGB to associate with it.

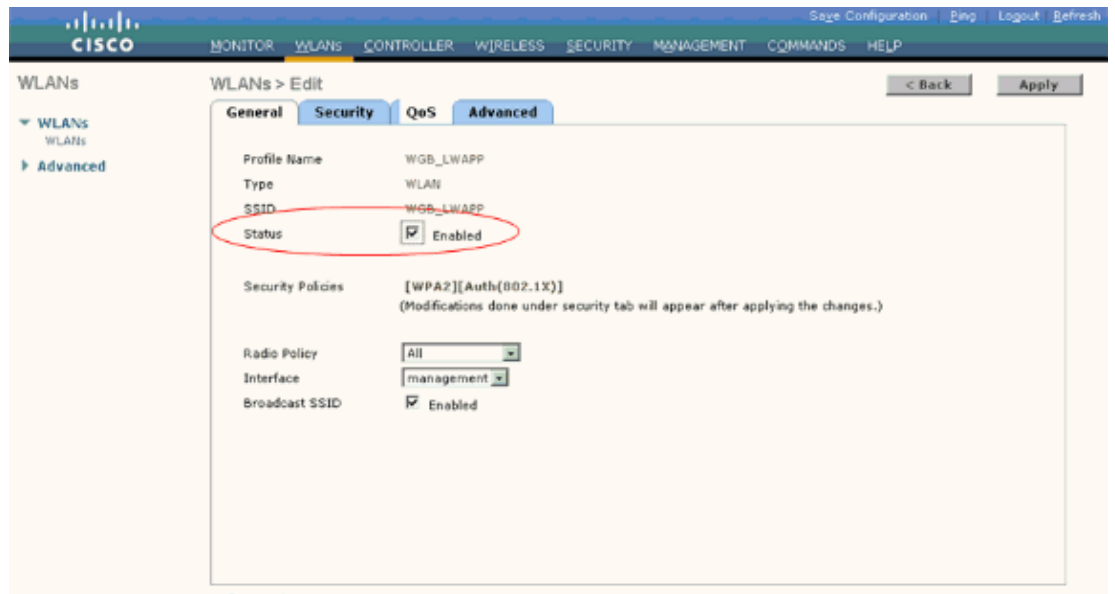
Note: Aironet IE also needs to be enabled. It is enabled by default with a new WLAN.

Complete these steps in order to configure a WLAN on the controller:

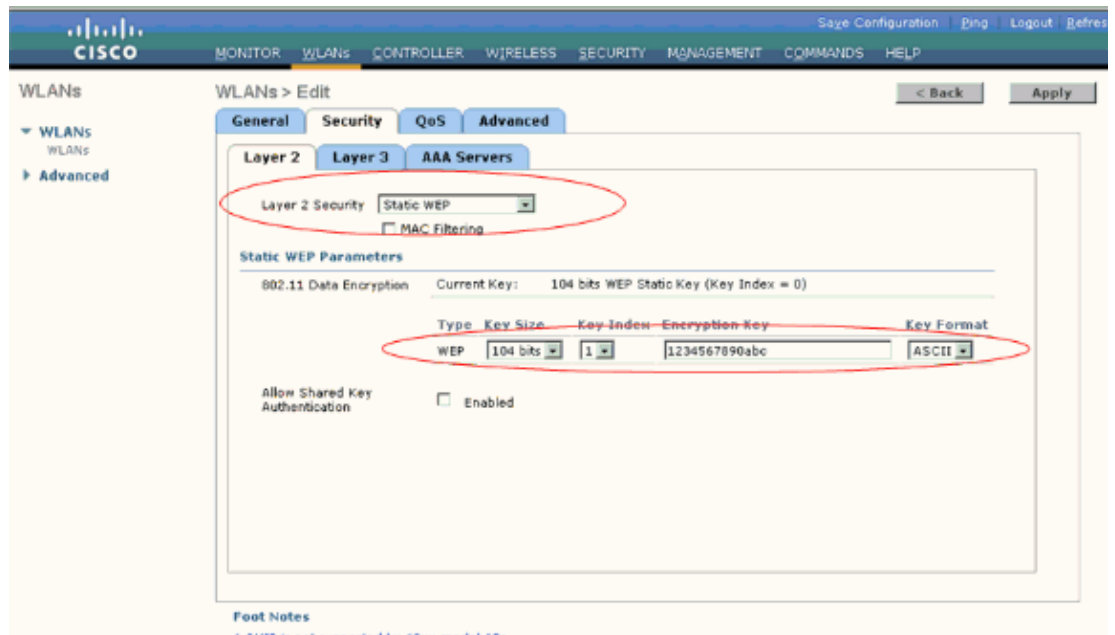
1. Click **WLANs** from the controller GUI in order to create a WLAN. The WLANs window appears. This window lists the WLANs configured on the controller.
2. Click **New** in order to configure a new WLAN. In this example, the WLAN is named *WGB_LWAPP*.



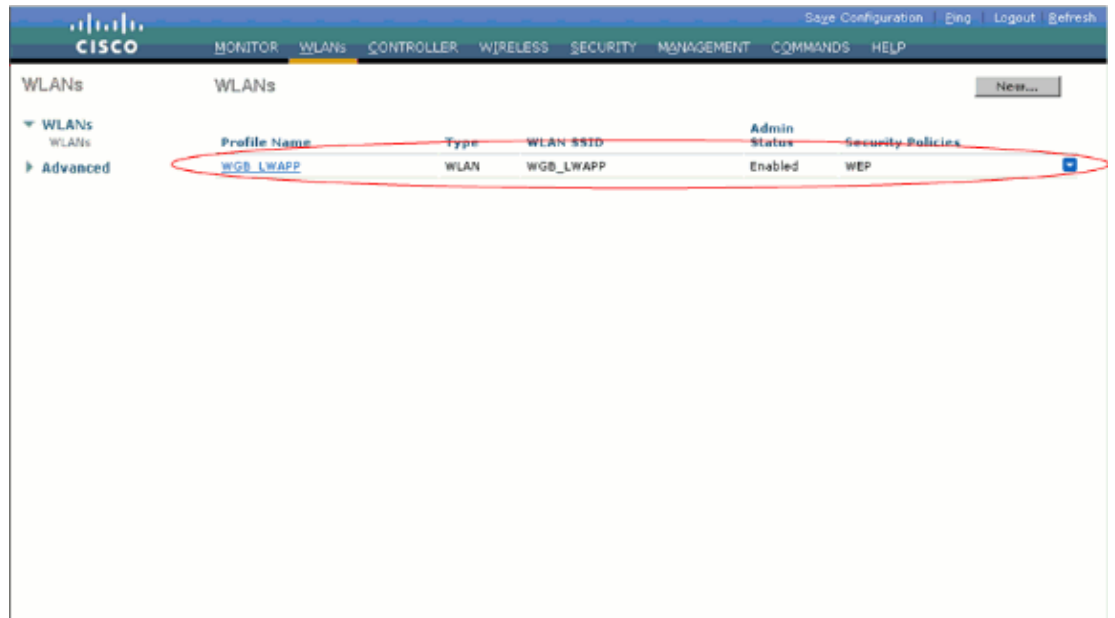
3. Click **Apply**.
4. In the WLANs > Edit window, define the parameters specific to the WLAN.
 - a. Under General Policies, check the **Status** check box in order to enable the WLAN.



- b. Under Security Policies, choose **Static WEP** from the Layer 2 Security drop-down list, and specify the WEP parameters within the Static WEP Parameters area.



- c. Change other parameters depending on the design of the network, and click **Apply**.

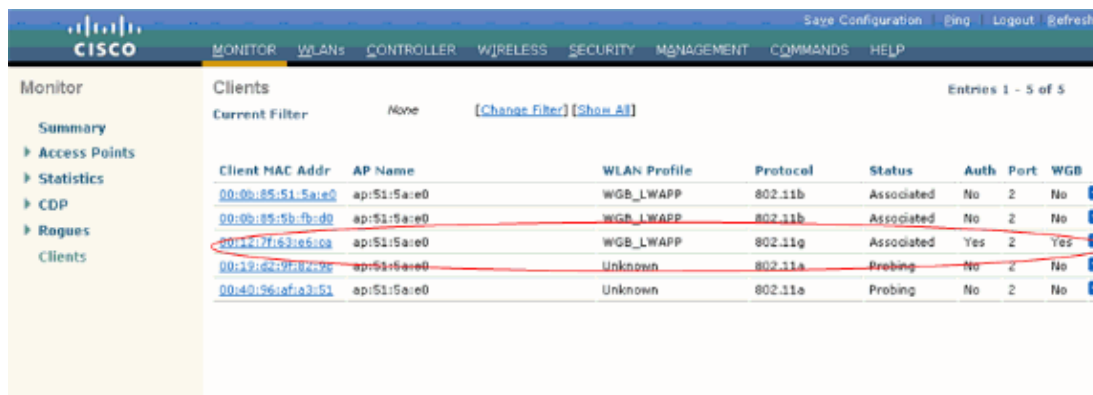


Verify and Troubleshoot

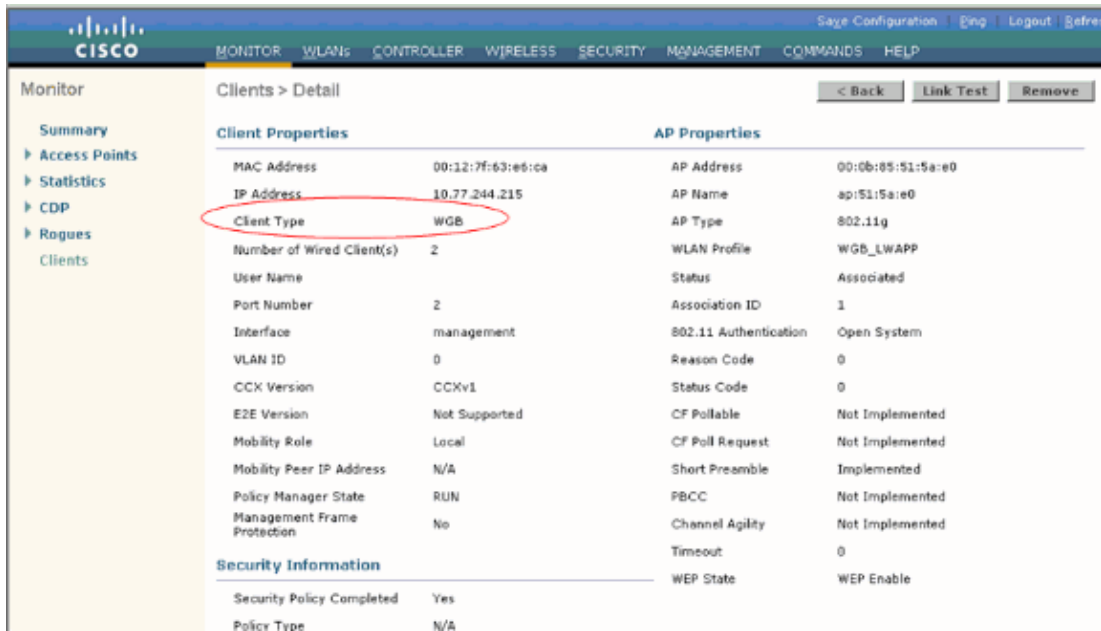
Verify

Once the WLC and the WGB AP are configured, the WGB associates to the LAP as a client. You can view the status of WGBs on your network with the controller GUI.

From the controller GUI, choose **Monitor > Clients** in order to open the Clients page. The WGB field on the right side of the page indicates whether any of the clients on your network are workgroup bridges.



Click the MAC address of the desired client in order to view the details of the WGB. The Clients > Detail page appears.



In order to see the details of any wired clients that are connected to a particular WGB, go to the Clients page, hover your cursor over the blue drop-down arrow for the desired WGB, and choose **Show Wired Clients**. The WGB Wired Clients page appears.



From the controller CLI, you can use this command in order to view the list of WGBs connected to the network:

```
show wgb summary
```

Here is an example:

```
(Cisco Controller) >show wgb summary
```

```
Number of WGBs..... 1
```

```
MAC Address          IP Address          AP Name             Status    WLAN  Auth  Protocol  Client
-----
00:12:7f:63:e6:ca   10.77.244.215     ap:51:5a:e0        Assoc    2     Yes   802.11g   2
```

Enter this command in order to see the details of any wired clients that are connected to a particular WGB:

```
show wgb detail wgb_mac_address
```

Here is an example:

```
(Cisco Controller) >show wgb detail 00:12:7f:63:e6:ca
```

```
Number of wired client(s): 2
```

MAC Address	IP Address	AP Name	Mobility	WLAN	Auth
00:0b:85:5b:fb:d0	Unknown	ap:51:5a:e0	Local	2	No
00:0b:85:51:5a:e0	Unknown	ap:51:5a:e0	Local	2	No

Troubleshoot

A common problem has been observed mainly with the Cisco IOS–Based workgroup bridge. When a wired client does not send traffic for an extended period of time, the WGB removes the client from its bridge table, even if the traffic is continuously being sent to the wired client. As a result, the traffic flow to the wired client fails. In order to avoid the traffic loss and removal of the wired client from the bridge table, use this command in order to configure the aging–out timer on the WGB to a large value:

bridge <bridge–group–number> **aging–time** <seconds>, where *bridge–group–number* is a value between 1 and 255 and *seconds* is a value between 10 and 1,000,000 seconds. Cisco recommends that you configure the seconds parameter to a value greater than the idle period of the wired client.

Note: This can be particularly helpful if you have devices such as a printer that sits idle for a long period of time.

Related Information

- [Wireless LAN Controller and Lightweight Access Point Basic Configuration Example](#)
- [Wireless LAN Controller \(WLC\) Configuration Best Practices](#)
- [Cisco Aironet Workgroup Bridge FAQ](#)
- [Access Point as a Workgroup Bridge Configuration Example](#)
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