Newer Cisco SBA Guides Available

This guide is part of an older series of Cisco Smart Business Architecture designs. To access the latest Cisco SBA Guides, go to http://www.cisco.com/go/sba

Cisco strives to update and enhance SBA guides on a regular basis. As we develop a new series of SBA guides, we test them together, as a complete system. To ensure the mutual compatibility of designs in Cisco SBA guides, you should use guides that belong to the same series.

Teleworking—Cisco OfficeExtend Deployment Guide

SMART BUSINESS ARCHITECTURE

August 2012 Series

Preface

Who Should Read This Guide

This Cisco® Smart Business Architecture (SBA) guide is for people who fill a variety of roles:

- Systems engineers who need standard procedures for implementing solutions
- Project managers who create statements of work for Cisco SBA implementations
- Sales partners who sell new technology or who create implementation documentation
- Trainers who need material for classroom instruction or on-the-job training

In general, you can also use Cisco SBA guides to improve consistency among engineers and deployments, as well as to improve scoping and costing of deployment jobs.

Release Series

Cisco strives to update and enhance SBA guides on a regular basis. As we develop a series of SBA guides, we test them together, as a complete system. To ensure the mutual compatibility of designs in Cisco SBA guides, you should use guides that belong to the same series.

The Release Notes for a series provides a summary of additions and changes made in the series.

All Cisco SBA guides include the series name on the cover and at the bottom left of each page. We name the series for the month and year that we release them, as follows:

month year Series

For example, the series of guides that we released in August 2012 are the "August 2012 Series".

You can find the most recent series of SBA guides at the following sites:

Customer access: http://www.cisco.com/go/sba

Partner access: http://www.cisco.com/go/sbachannel

How to Read Commands

Many Cisco SBA guides provide specific details about how to configure Cisco network devices that run Cisco IOS, Cisco NX-OS, or other operating systems that you configure at a command-line interface (CLI). This section describes the conventions used to specify commands that you must enter.

Commands to enter at a CLI appear as follows:

```
configure terminal
```

Commands that specify a value for a variable appear as follows:

```
ntp server 10.10.48.17
```

Commands with variables that you must define appear as follows:

```
class-map [highest class name]
```

Commands shown in an interactive example, such as a script or when the command prompt is included, appear as follows:

```
Router# enable
```

Long commands that line wrap are underlined. Enter them as one command:

```
wrr-queue random-detect max-threshold 1 100 100 100 100 100
100 100 100
```

Noteworthy parts of system output or device configuration files appear highlighted, as follows:

```
interface Vlan64
  ip address 10.5.204.5 255.255.255.0
```

Comments and Questions

If you would like to comment on a guide or ask questions, please use the SBA feedback form.

If you would like to be notified when new comments are posted, an RSS feed is available from the SBA customer and partner pages.

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What's In This SBA Guide

Cisco SBA Solutions

Cisco SBA helps you design and quickly deploy a full-service business network. A Cisco SBA deployment is prescriptive, out-of-the-box, scalable, and flexible.

Cisco SBA incorporates LAN, WAN, wireless, security, data center, application optimization, and unified communication technologies—tested together as a complete system. This component-level approach simplifies system integration of multiple technologies, allowing you to select solutions that solve your organization's problems—without worrying about the technical complexity.

Cisco SBA Solutions are designs for specific problems found within the most common technology trends. Often, Cisco SBA addresses more than one use case per solution because customers adopt new trends differently and deploy new technology based upon their needs.

Route to Success

To ensure your success when implementing the designs in this guide, you should first read any guides that this guide depends upon—shown to the left of this guide on the route below. As you read this guide, specific prerequisites are cited where they are applicable.

About This Guide

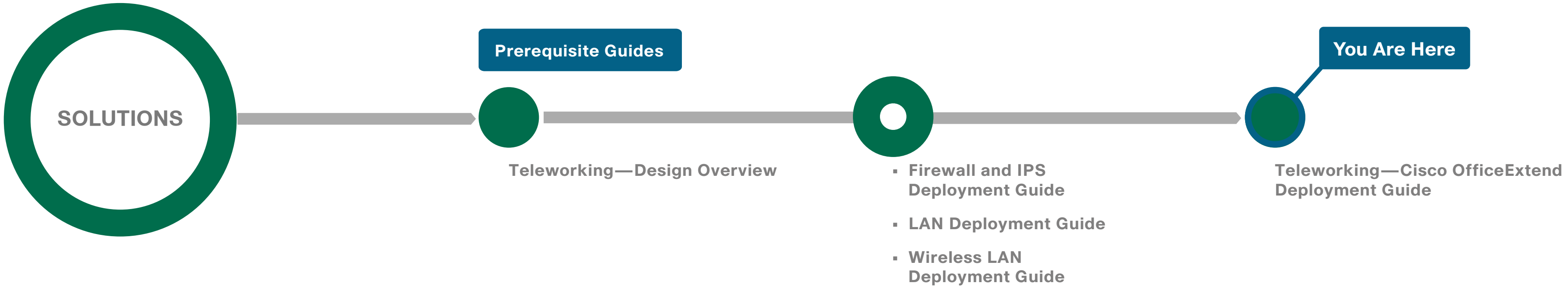
This *deployment guide* contains one or more deployment chapters, which each include the following sections:

- Business Overview—Describes the business use case for the design. Business decision makers may find this section especially useful.
- Technology Overview—Describes the technical design for the business use case, including an introduction to the Cisco products that make up the design. Technical decision makers can use this section to understand how the design works.
- Deployment Details—Provides step-by-step instructions for deploying and configuring the design. Systems engineers can use this section to get the design up and running quickly and reliably.

You can find the most recent series of Cisco SBA guides at the following sites:

Customer access: http://www.cisco.com/go/sba

Partner access: http://www.cisco.com/go/sbachannel


SOLUTIONS
Prerequisite Guides
Teleworking—Design Overview
Firewall and IPS Deployment Guide
LAN Deployment Guide
Wireless LAN Deployment Guide
You Are Here
Teleworking—Cisco OfficeExtend Deployment Guide

Introduction

Business Overview

Providing employees access to networked business services from a residential environment poses challenges for both the end user and IT operations. For the home-based teleworker, it is critical that access to business services be reliable and consistent, providing an experience that is as similar as sitting in a cubicle or office in the organization's facility. However, residential and urban environments tend to have many potential sources of congestion found on the commonly used 2.4-GHz wireless band. Potential sources of interference include cordless handsets, personal home laptops, iPhones or iPods, baby monitors, and many more. Additionally, solutions must support a wide range of teleworking employees who have varying skill sets, making it critical to have a streamlined and simplified way to implement devices that allow for access to the corporate environment.

IT operations have a different set of challenges when it comes to implementing a teleworking solution, including properly securing, maintaining, and managing the teleworker environment from a centralized location. Because operational expenses are a constant consideration, IT must implement a cost-effective solution that protects an organization's investment without sacrificing quality or functionality.

Technology Overview

The Cisco OfficeExtend solution is specifically designed for the teleworker who primarily uses wireless devices. The solution consists of the following components:

- Cisco Aironet 600 Series OfficeExtend Access Point
- Cisco 2500 Series or Cisco 5500 Series Wireless LAN Controller

Deployment Components

The Cisco Smart Business Architecture (SBA) OfficeExtend deployment is built around two main components: Cisco wireless LAN controllers and Cisco OfficeExtend Access Points.

Cisco Wireless LAN Controllers

Cisco wireless LAN controllers are responsible for system-wide WLAN functions, such as security policies, intrusion prevention, RF management, quality of service (QoS), and mobility. They work in conjunction with Cisco OfficeExtend Access Points to support business-critical wireless applications for teleworkers. Cisco wireless LAN controllers provide the control, scalability, security, and reliability that network managers need to build a secure, scalable teleworker environment.

Although a standalone controller can support up to 500 Cisco OfficeExtend sites, Cisco recommends deploying controllers in pairs for resiliency. There are many different ways to configure controller resiliency; the simplest is to use a primary/secondary model where all the access points at the site prefer to join the primary controller and only join the secondary controller during a failure event. However, even when configured as a pair, wireless LAN controllers do not share configuration information. Each wireless LAN controller must be configured separately.

The following controllers are included in this release of Cisco SBA.

- Cisco 2500 Series Wireless LAN Controller—The 2504 controller supports up to 50 Cisco OfficeExtend Access Points and 500 clients. Cisco 2500 Series Wireless LAN Controllers are ideal for small OfficeExtend deployments.
- Cisco 5500 Series Wireless LAN Controller—The 5508 controller supports up to 500 Cisco OfficeExtend Access Points and 7000 clients, making it ideal for large OfficeExtend deployments.

Because software license flexibility allows you to add additional access points as business requirements change, you can choose the controller that will support your needs long-term, but only pay for what you need, when you need it.

To allow users to connect their endpoint devices to either the organization's on-site wireless network or their at-home teleworking wireless networks without reconfiguration, the Cisco OfficeExtend teleworking solution offers the same wireless Secure Set Identifiers (SSIDs) at teleworkers' homes as those that support data and voice inside the organization.

Cisco OfficeExtend Access Points

Cisco Aironet 600 Series OfficeExtend Access Points are lightweight. This means they cannot act independently of a wireless LAN controller (WLC). As the access point communicates with the WLC resources, it will download its configuration and synchronize its software/firmware image, if required. Cisco Aironet 600 Series establishes a secure Datagram Transport Layer Security (DTLS) connection between the access point and the controller to offer remote WLAN connectivity using the same profile as at the corporate office. Secure tunneling allows all traffic to be validated against centralized security policies and minimizes the management overhead associated with home-based firewalls.

Cisco OfficeExtend delivers full 802.11n wireless performance and avoids congestion caused by residential devices because it operates simultaneously in the 2.4-GHz and the 5-GHz radio frequency bands. The access point also provides wired Ethernet connectivity in addition to wireless. The Cisco OfficeExtend Access Point provides wired and wireless segmentation of home and corporate traffic, which allows for home device connectivity without introducing security risks to corporate policy.

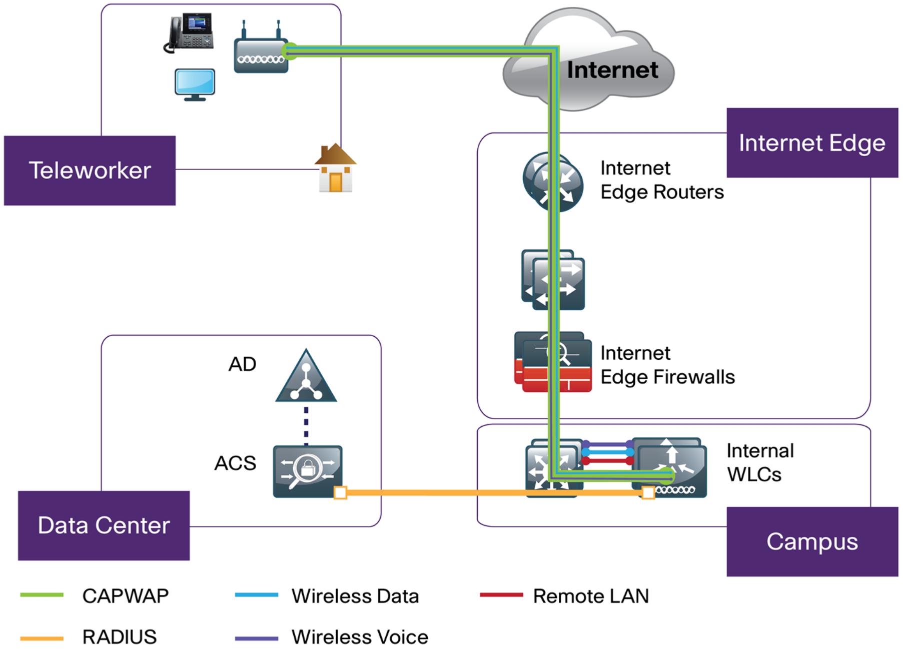
Deployment Models

You can deploy Cisco OfficeExtend using either a shared controller pair inside the organization or a dedicated controller pair in the Internet edge DMZ.

If you have one controller pair for the entire organization, and that controller pair is connected to the same distribution switch as the Internet edge firewall, you can use a *shared deployment*. In a shared deployment, the traffic from the Cisco OfficeExtend Access Point is tunneled through the internet edge firewall and terminated on the internal WLC. The Cisco OfficeExtend wireless clients are in the same network as the internal wireless clients, but you must deploy a new network for the wired Cisco OfficeExtend users.

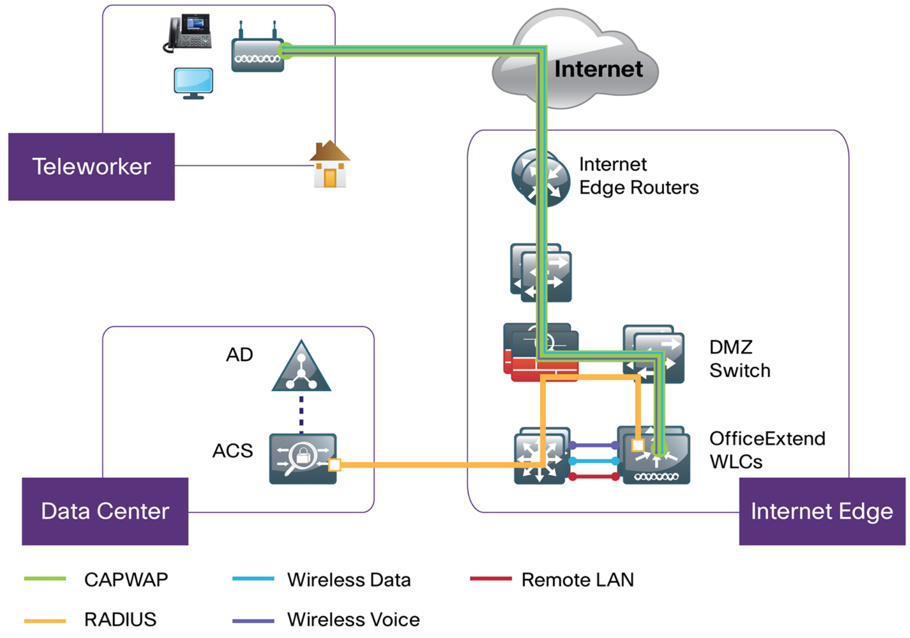
A shared deployment is typically used for small deployments or proof-of-concepts where the existing wireless controller has enough existing license to support the additional access points.

Figure 1 - Cisco OfficeExtend shared design model



If you don't meet the requirements for a shared deployment, or if you want a more secure Cisco OfficeExtend environment, you can deploy a dedicated controller pair using the Cisco 5500 or 2500 Series Wireless LAN Controllers. In a dedicated deployment such as this, the controller is directly connected to the Internet edge DMZ and traffic from the Internet is terminated in the DMZ versus on the internal network, while client traffic is still directly connected to the internal network.

Figure 2 - Cisco OfficeExtend dedicated design model



Notes

Deployment Details

This deployment guide uses certain standard design parameters and references various network infrastructure services that are not located within the solution. These parameters are listed in the following table.

Table 1 - Universal design parameters

Network service	Cisco SBA values	Site specific values
Domain name	cisco.local	
Active Directory, Domain Name System (DNS) server, Dynamic Host Configuration Protocol (DHCP) server	10.4.48.10	
Network Time Protocol (NTP) server	10.4.48.17	
Simple Network Management Protocol (SNMP) read-only community	cisco	
SNMP read/write community	cisco123	

Dedicated Deployment

Process

Configuring Cisco ACS—Dedicated Deployment

1. Create the wireless device group
2. Create the TACACS+ shell profile
3. Modify the device admin policy
4. Create the network access policy
5. Modify the network access policy
6. Create the network device

This guide assumes that you have already configured Cisco Secure Access Control System (ACS). This process includes only the procedures required to support the integration of wireless into the deployment. Full details on Cisco ACS configuration are included in the *Cisco SBA—Borderless Networks Device Management Using ACS Deployment Guide*.

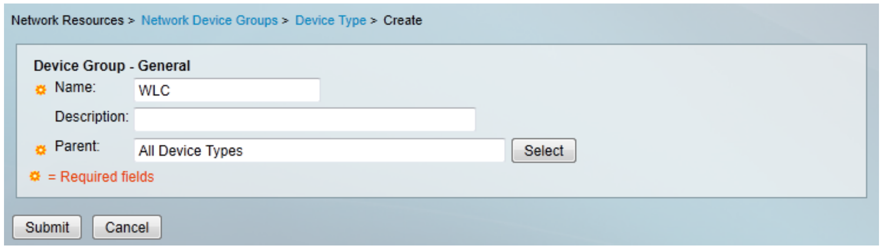
Procedure 1 Create the wireless device group

Step 1: Navigate to the Cisco ACS Administration Page. (Example: https://acs.cisco.local)

Step 2: In **Network Resources > Network Device Groups > Device Type**, click **Create**.

Step 3: In the **Name** box, enter a name for the group. (Example: WLC)

Step 4: In the **Parent** box, select **All Device Types**, and then click **Submit**.



Network Resources > Network Device Groups > Device Type > Create

Device Group - General

Name: WLC

Description:

Parent: All Device Types

Procedure 2 Create the TACACS+ shell profile

You must create a shell profile for the WLCs that contains a custom attribute that assigns the user full administrative rights when the user logs in to the WLC.

Step 1: In **Policy Elements > Authorization and Permissions > Device Administration > Shell Profiles**, click **Create**.

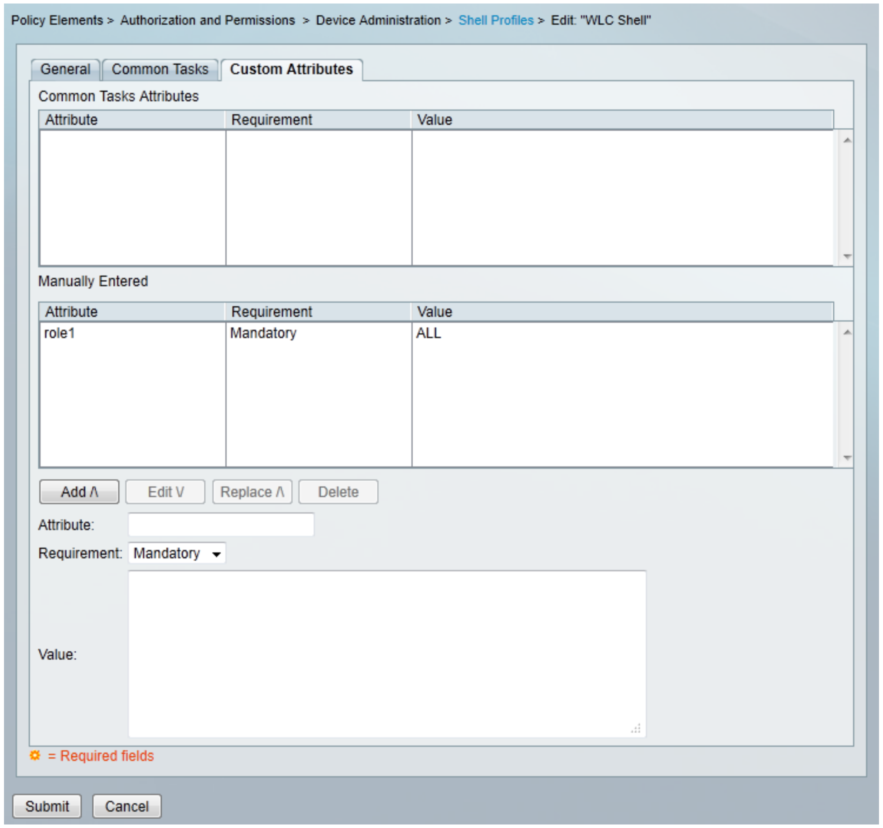
Step 2: Under the General tab, in the **Name** box, enter a name for the wireless shell profile. (Example: WLC Shell)

Step 3: On the Custom Attributes tab, in the **Attribute** box, enter **role1**.

Step 4: In the **Requirement** list, choose **Mandatory**.

Step 5: In the **Value** box, enter **ALL**, and then click **Add**.

Step 6: Click **Submit**.



Policy Elements > Authorization and Permissions > Device Administration > Shell Profiles > Edit: "WLC Shell"

Common Tasks Attributes

Attribute	Requirement	Value

Manually Entered

Attribute	Requirement	Value
role1	Mandatory	ALL

Attribute:

Requirement: Mandatory

Value:

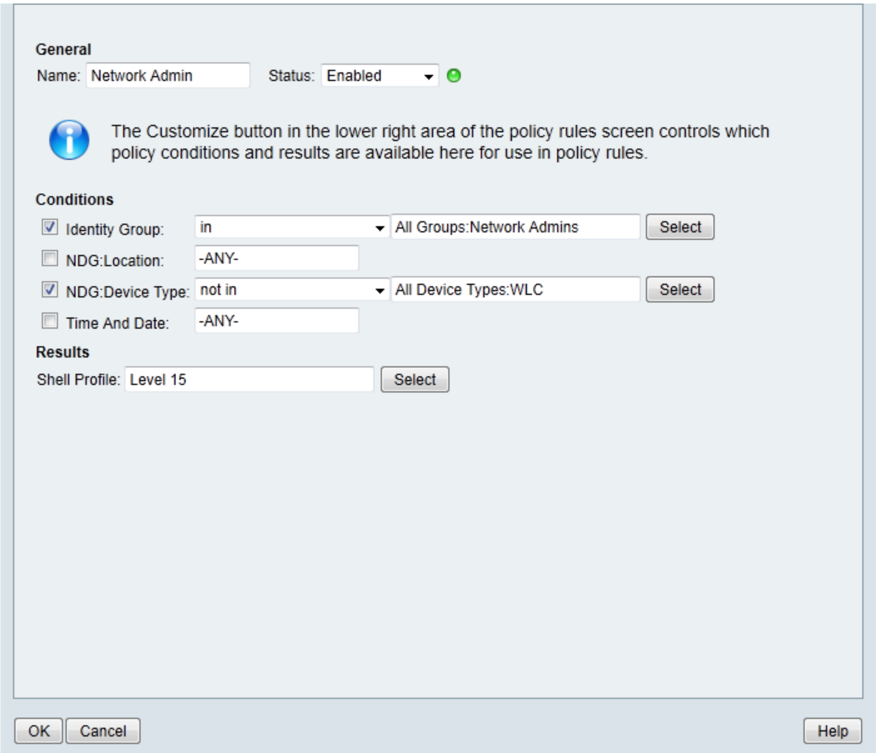
Procedure 3 Modify the device admin policy

First, you must exclude WLCs from the existing authorization rule.

Step 1: In **Access Policies > Default Device Admin >Authorization,** click the **Network Admin** rule.

Step 2: Under Conditions, select **NDG:Device Type**, and from the **filter** list, choose **not in**.

Step 3: In the box to the right of the **filter** list, select **All Device Types:WLC**, and then click **OK**.



General

Name: Network Admin   Status: Enabled

The Customize button in the lower right area of the policy rules screen controls which policy conditions and results are available here for use in policy rules.

Conditions

☑ Identity Group: in — All Groups:Network Admins

☐ NDG:Location: -ANY-

☑ NDG:Device Type: not in — All Device Types:WLC

☐ Time And Date: -ANY-

Results

Shell Profile: Level 15

Next, create a WLC authorization rule.

Step 4: In **Access Policies > Default Device Admin >Authorization**, click **Create**.

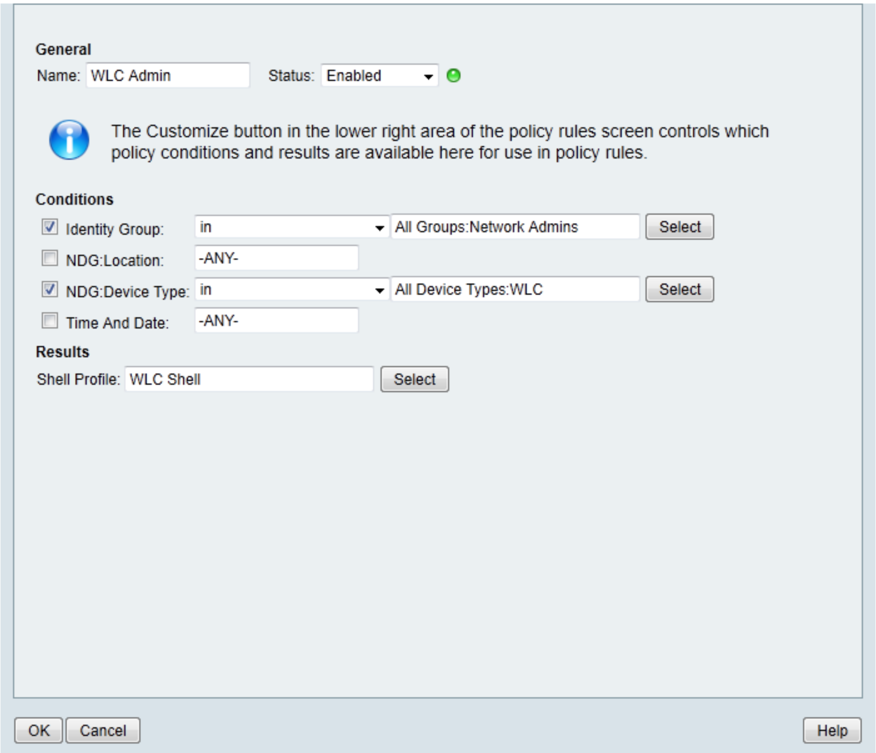
Step 5: In the **Name** box, enter a name for the WLC authorization rule. (Example: WLC Admin)

Step 6: Under Conditions, select **Identity Group** condition, and in the box, select **Network Admins**.

Step 7: Select **NDG:Device Type** , and then in the box, select **All Device Types:WLC.**

Step 8: In the **Shell Profile** box, select **WLC Shell**, and then click **OK**.

Step 9: Click **Save Changes**.



General

Name: WLC Admin   Status: Enabled

The Customize button in the lower right area of the policy rules screen controls which policy conditions and results are available here for use in policy rules.

Conditions

☑ Identity Group: in — All Groups:Network Admins

☐ NDG:Location: -ANY-

☑ NDG:Device Type: in — All Device Types:WLC

☐ Time And Date: -ANY-

Results

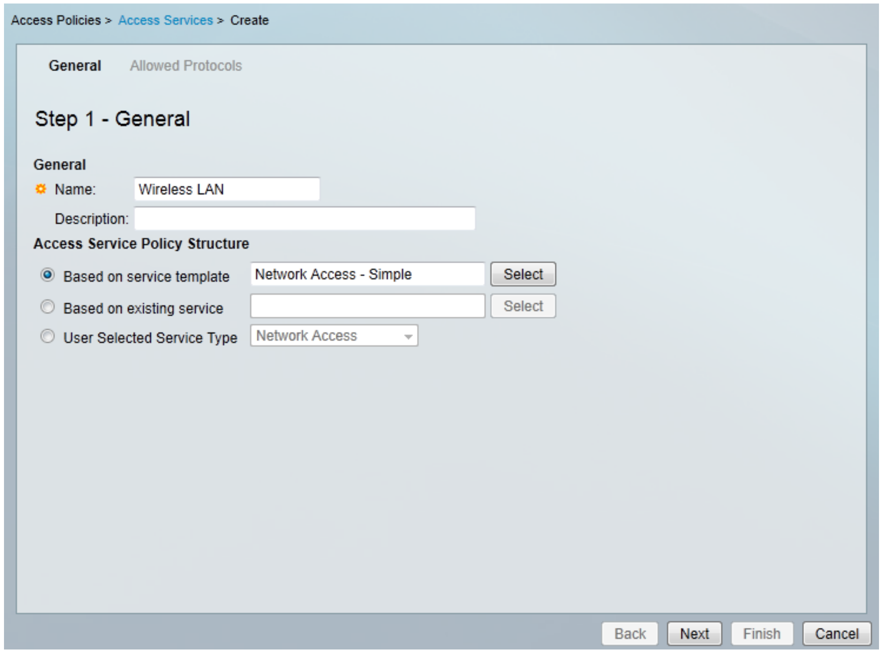
Shell Profile: WLC Shell

Procedure 4 Create the network access policy

Step 1: In **Access Policies > Access Services**, click **Create**.

Step 2: In the **Name** box, enter a name for the policy. (Example: Wireless LAN)

Step 3: To the right of Based on Service Template, select **Network Access - Simple**, and then click **Next**.



Access Policies > Access Services > Create

General | Allowed Protocols

Step 1 - General

General

Name: Wireless LAN

Description:

Access Service Policy Structure

● Based on service template: Network Access - Simple [Select]

○ Based on existing service: [Select]

○ User Selected Service Type: Network Access

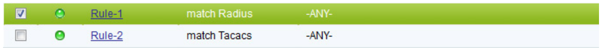
Step 4: On the Allowed Protocols pane, click **Finish**.

Step 5: On the message "Access Service created successfully. Would you like to modify the Service Selection policy to activate this service?", click **Yes**.

Step 6: On the Service Selection Policy pane, click **Customize.**

Step 7: Using the arrow buttons, move **Compound Condition** from the **Available** list to the **Selected** list, and then click **OK**.

Step 8: On the Service Selection Rules pane, select the default RADIUS rule.



☑	●	Rule-1	match Radius	-ANY-
☐	●	Rule-2	match Tacacs	-ANY-

Next, you create a new rule for wireless client authentication.

Step 9: Click **Create > Create Above**.

Step 10: In the **Name** box, enter a name for the rule. (Example: Rule-3)

Step 11: Under Conditions, select **Compound Condition**.

Step 12: In the **Dictionary** list, choose **RADIUS-IETF**.

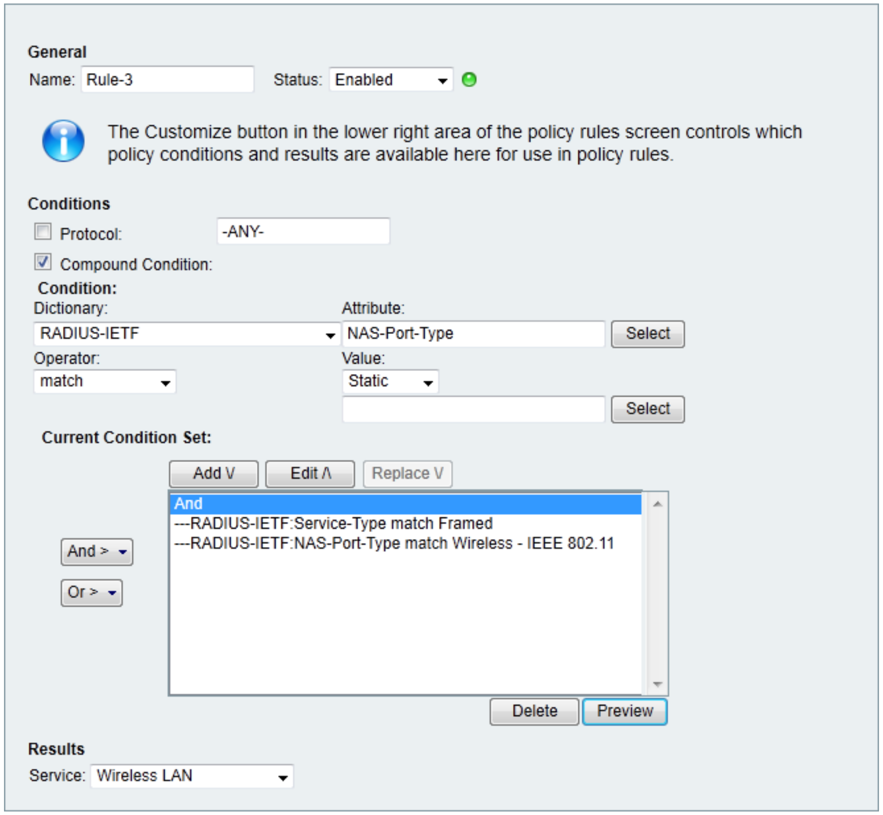
Step 13: In the **Attribute** box, select **Service-Type**.

Step 14: In the **Value** box, select **Framed**, and then click **Add V**.

Step 15: In the **Attribute** box, select **NAS-Port-Type**.

Step 16: In the **Value** box, select **Wireless - IEEE 802.11**, and then click **Add to selected with And**.

Step 17: Under Results, in the **Service** list, choose **Wireless LAN**, and then click **OK**.



General

Name: Rule-3 Status: Enabled

The Customize button in the lower right area of the policy rules screen controls which policy conditions and results are available here for use in policy rules.

Conditions

☐ Protocol: -ANY-

☑ Compound Condition:

Condition:

Dictionary: RADIUS-IETF

Attribute: NAS-Port-Type [Select]

Operator: match

Value: Static [Select]

Current Condition Set:

And
---RADIUS-IETF:Service-Type match Framed
---RADIUS-IETF:NAS-Port-Type match Wireless - IEEE 802.11

Results

Service: Wireless LAN

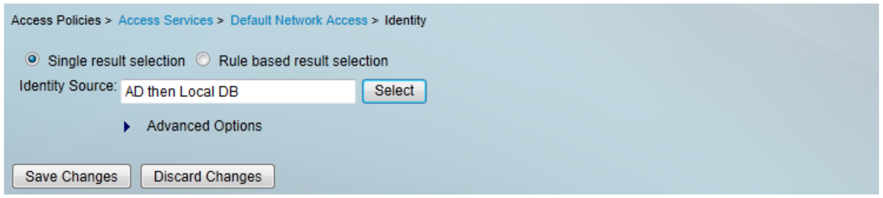
Step 18: On the Service Selection Rules pane, click **Save Changes**.

Procedure 5 Modify the network access policy

First you must, create an authorization rule to allow the WLCs to authenticate clients using RADIUS.

Step 1: Navigate to **Access Policies > Wireless LAN > Identity**.

Step 2: In the **Identity Source** box, select **AD then Local DB**, and then click **Save Changes**.



Access Policies > Access Services > Default Network Access > Identity

● Single result selection ○ Rule based result selection

Identity Source: AD then Local DB

Step 3: Navigate to **Access Policies > Wireless LAN > Authorization.**

Step 4: On the Network Access Authorization Policy pane, click **Customize.**

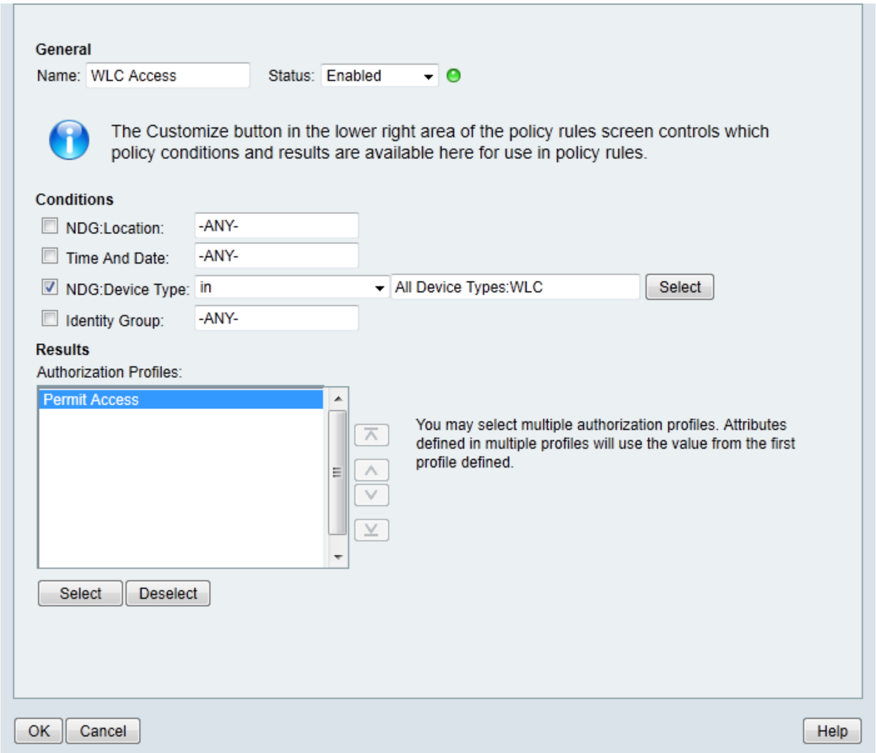
Step 5: Using the arrow buttons, move **NDG:Device Type** from the **Available** list to the **Selected** list, and then click **OK**.

Step 6: In **Access Policies > Wireless LAN > Authorization**, click **Create**.

Step 7: In the **Name** box, enter a name for the rule. (Example: WLC Access)

Step 8: Under Conditions, select **NDG:Device Type**, and in the box, select **All DeviceTypes:WLC**.

Step 9: In the **Authorization Profiles** box, select **Permit Access**, and then click **OK**.



General

Name: WLC Access Status: Enabled

The Customize button in the lower right area of the policy rules screen controls which policy conditions and results are available here for use in policy rules.

Conditions

□ NDG:Location: -ANY-

□ Time And Date: -ANY-

☑ NDG:Device Type: in All Device Types:WLC

□ Identity Group: -ANY-

Results

Authorization Profiles: Permit Access

You may select multiple authorization profiles. Attributes defined in multiple profiles will use the value from the first profile defined.

Step 10: Click **Save Changes**.

Procedure 6 Create the network device

The TACACS+ shell profile that is required when managing the controllers with AAA must be applied to the controllers. This requires that for each controller in the organization; you create a network device entry in Cisco ACS.

Step 1: In **Network Resources > Network Devices and AAA Clients**, click **Create**.

Step 2: In the **Name** box, enter the device host name. (Example: WLC-OEAP-1)

Step 3: In the **Device Type** box, select **All Device Types:WLC**.

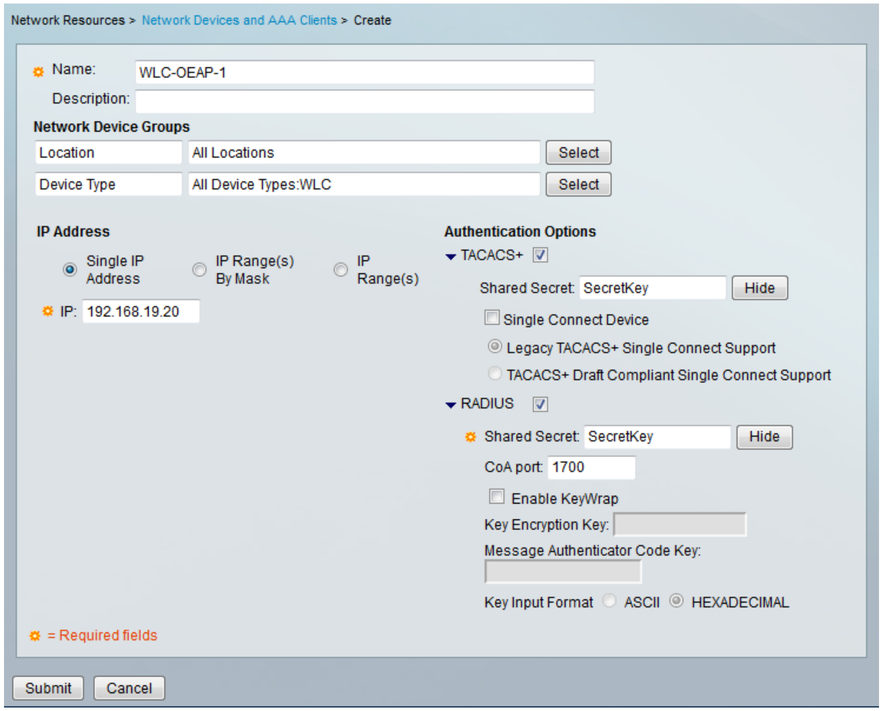
Step 4: In the **IP** box, enter the WLC's management interface IP address. (Example: 192.168.19.20)

Step 5: Select **TACACS+**.

Step 6: Enter the TACACS+ shared secret key. (Example: SecretKey)

Step 7: Select **RADIUS**.

Step 8: Enter the RADIUS shared secret key, and then click **Submit**. (Example: SecretKey)



Network Resources > Network Devices and AAA Clients > Create

Name: WLC-OEAP-1

Description:

Network Device Groups

Location	All Locations	Select
Device Type	All Device Types:WLC	Select

IP Address

● Single IP Address ○ IP Range(s) By Mask ○ IP Range(s)

IP: 192.168.19.20

Authentication Options

TACACS+ ☑

Shared Secret: SecretKey Hide

□ Single Connect Device

● Legacy TACACS+ Single Connect Support

○ TACACS+ Draft Compliant Single Connect Support

RADIUS ☑

Shared Secret: SecretKey Hide

CoA port: 1700

□ Enable KeyWrap

Key Encryption Key:

Message Authenticator Code Key:

Key Input Format ○ ASCII ● HEXADECIMAL

= Required fields

Submit Cancel

Process

Configuring Internet Edge—Dedicated Deployment

1. Configure the DMZ switch
2. Configure the DMZ interface
3. Configure Address Translation
4. Configure security policy

Procedure 1 Configure the DMZ switch

Step 1: On the DMZ switch, create the wireless VLANs.

```
vlan 1119
 name WLAN_Mgmt
```

Step 2: Configure the interfaces that connect to the Internet firewalls as trunk ports, and add the wireless VLANs.

```
interface GigabitEthernet1/0/24
 description IE-ASA5545a Gig0/1
!
interface GigabitEthernet2/0/24
 description IE-ASA5545b Gig0/1
!
interface range GigabitEthernet1/0/24, GigabitEthernet2/0/24
 switchport trunk encapsulation dot1q
 switchport trunk allowed vlan add 1119
 switchport mode trunk
 macro apply EgressQoS
 logging event link-status
 logging event trunk-status
 no shutdown
```

Step 3: Configure the interfaces that are connected to the primary and resilient WLCs' management port.

```
interface GigabitEthernet1/0/5
 description OEAP WLC-1 Management Port
!
interface GigabitEthernet2/0/5
 description OEAP WLC-2 Management Port
!
interface range GigabitEthernet 1/0/5, GigabitEthernet 2/0/5
 switchport access vlan 1119
 switchport host
 macro apply EgressQoS
 logging event link-status
 no shutdown
```

Procedure 2 Configure the DMZ interface

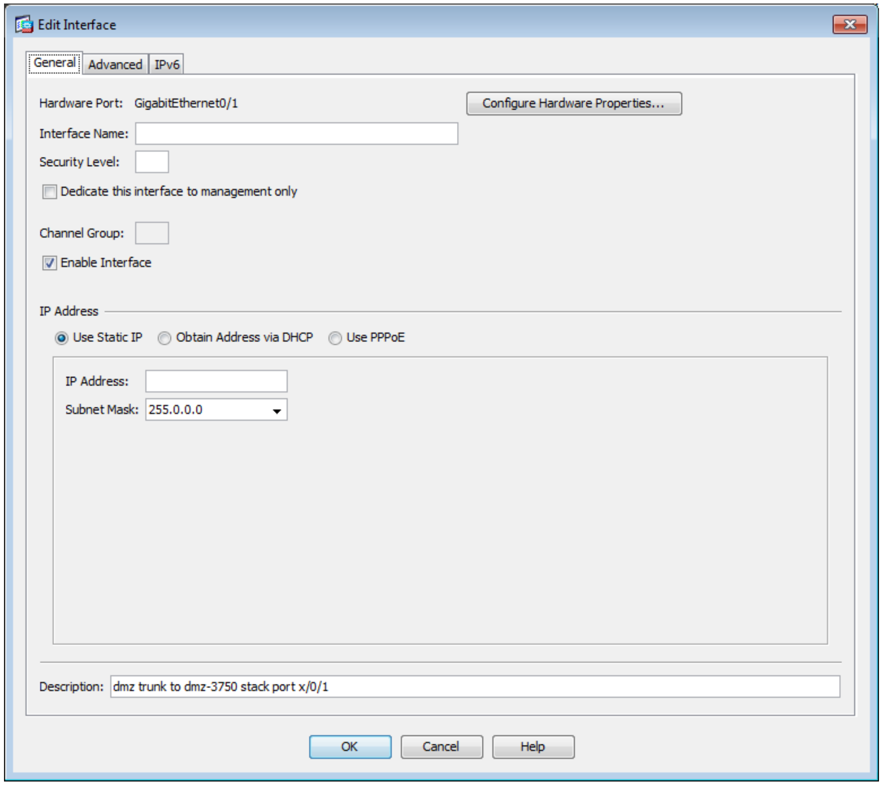
Typically, the firewall DMZ is a portion of the network where traffic to and from other parts of the network is tightly restricted. Organizations place network services in a DMZ for exposure to the Internet; these services are typically not allowed to initiate connections to the inside network, except for specific circumstances.

The various DMZ networks are connected to Cisco ASA on the appliance's GigabitEthernet interface via a VLAN trunk. The IP address assigned to the VLAN interface on the appliance is the default gateway for that DMZ subnet. The DMZ switch's VLAN interface does not have an IP address assigned for the DMZ VLAN.

Step 1: Log in to the Internet edge firewall using Cisco Adaptive Security Device Manager (ASDM).

Step 2: In **Configuration > Device Setup > Interfaces**, click the interface that is connected to the DMZ switch, and then click **Edit**. (Example: GigabitEthernet0/1)

Step 3: Select **Enable Interface**, and then click **OK**.



Hardware Port: GigabitEthernet0/1
Interface Name:
Security Level:
☐ Dedicate this interface to management only
Channel Group:
☑ Enable Interface
IP Address
● Use Static IP ○ Obtain Address via DHCP ○ Use PPPoE
IP Address:
Subnet Mask: 255.0.0.0
Description: dmz trunk to dmz-3750 stack port x/0/1

Step 4: On the Interface pane, click **Add > Interface**.

Step 5: In the **Hardware Port** list, choose the interface that you configured in Step 2. (Example: GigabitEthernet0/1)

Step 6: In the **VLAN ID** box, enter the VLAN number for the DMZ VLAN. (Example: 1119)

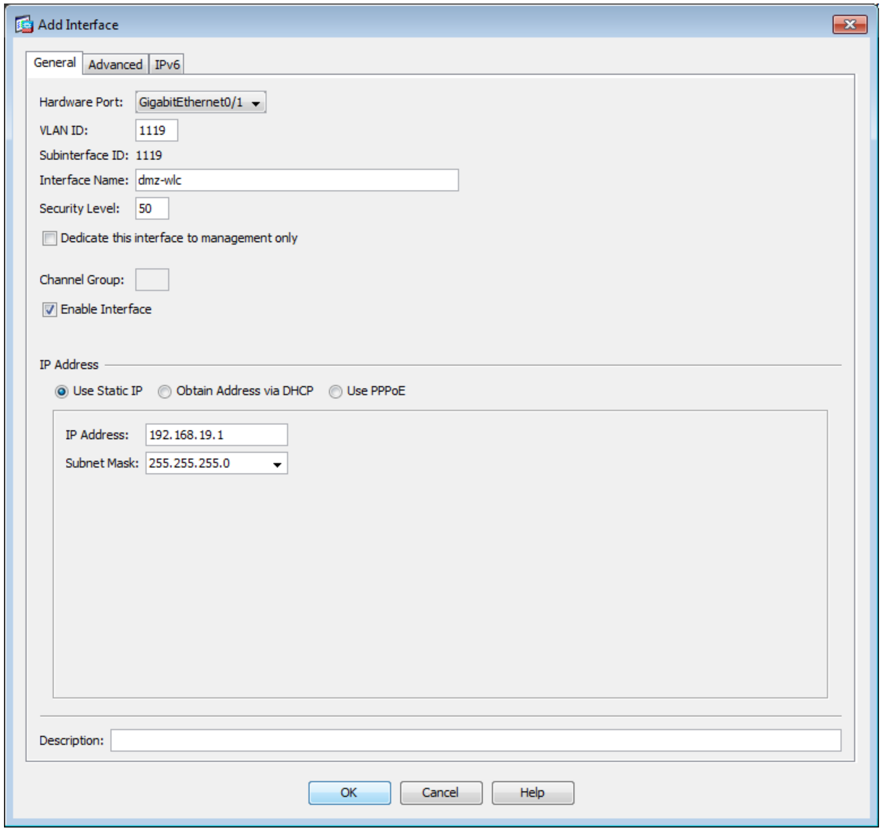
Step 7: In the **Subinterface ID** box, enter the VLAN number for the DMZ VLAN. (Example: 1119)

Step 8: Enter an **Interface Name**. (Example: dmz-wlc)

Step 9: In the **Security Level** box, enter a value of **50**.

Step 10: Enter the interface **IP Address**. (Example: 192.168.19.1)

Step 11: Enter the interface **Subnet Mask**, and then click **OK**. (Example: 255.255.255.0)



Hardware Port: GigabitEthernet0/1
VLAN ID: 1119
Subinterface ID: 1119
Interface Name: dmz-wlc
Security Level: 50
□ Dedicate this interface to management only
Channel Group:
☑ Enable Interface

IP Address
● Use Static IP ○ Obtain Address via DHCP ○ Use PPPoE
IP Address: 192.168.19.1
Subnet Mask: 255.255.255.0
Description:

Procedure 3 Configure Address Translation

The DMZ network uses private network (RFC 1918) addressing that is not Internet routable, so the firewall must translate the DMZ address of the WLC to an outside public address. For resiliency, the primary and resilient WLCs are translated to separate ISPs. The example DMZ address–to–public IP address mapping is shown in the following table.

WLC DMZ address	WLC public address (externally routable after NAT)
192.168.19.20	172.16.130.20 (ISP-A)
192.168.19.21	172.17.130.20 (ISP-B)

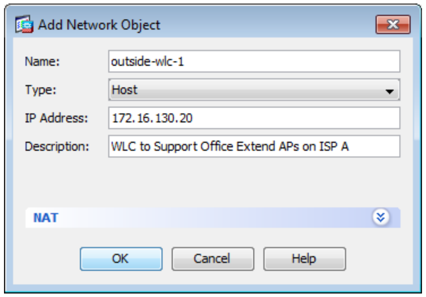
Step 1: Navigate to **Configuration > Firewall > Objects > Network Objects/Groups**.

First, add a network object for the public address of the WLC.

Step 2: Click **Add > Network Object**.

Step 3: In the Add Network Object dialog box, in the **Name** box, enter a description for the primary WLC's public IP address. (Example: outside-wlc-1)

Step 4: In the **IP Address** box, enter the primary WLC's public IP address, and then click **OK**. (Example: 172.16.130.20)



Name: outside-wlc-1
Type: Host
IP Address: 172.16.130.20
Description: WLC to Support Office Extend APs on ISP A

Next, you add a network object for the private DMZ address of the WLC.

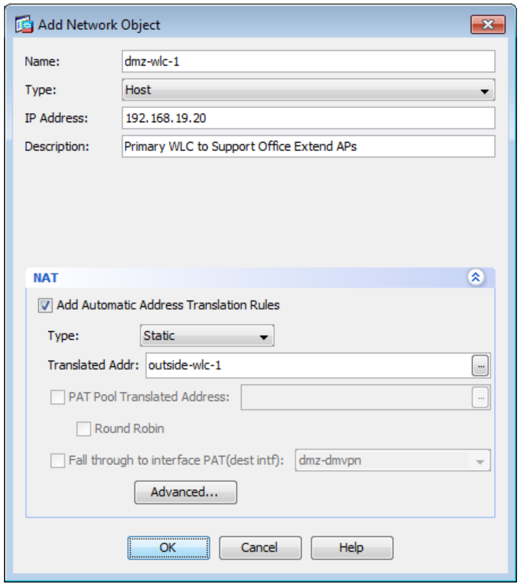
Step 5: In the Add Network Object dialog box, in the **Name box**, enter a description for the primary WLC's private DMZ IP address. (Example: dmz-wlc-1)

Step 6: In the **IP Address** box, enter the primary WLC's private DMZ IP address. (Example: 192.168.19.20)

Step 7: Click the two down arrows. The NAT pane expands.

Step 8: Select **Add Automatic Address Translation Rules**.

Step 9: In the **Translated Addr** list, choose the network object created in Step 2.



Add Network Object

Name: dmz-wlc-1

Type: Host

IP Address: 192.168.19.20

Description: Primary WLC to Support Office Extend APs

NAT

☑ Add Automatic Address Translation Rules

Type: Static

Translated Addr: outside-wlc-1

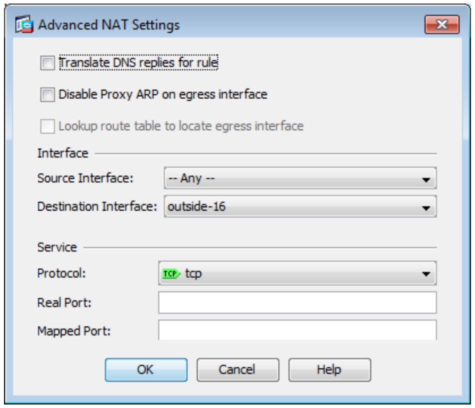
□ PAT Pool Translated Address:

□ Round Robin

□ Fall through to interface PAT(dest intf): dmz-dmvpn

Step 10: Click **Advanced**.

Step 11: In the **Destination Interface** list, choose the interface name for the primary Internet connection, and then click **OK**. (Example: outside-16)



Advanced NAT Settings

□ Translate DNS replies for rule

□ Disable Proxy ARP on egress interface

□ Lookup route table to locate egress interface

Interface

Source Interface: -- Any --

Destination Interface: outside-16

Service

Protocol: tcp

Real Port:

Mapped Port:

Step 12: Repeat Step 1 through Step 11 for the resilient WLC.

Next, you create a network object group that contains the private DMZ address of every WLC in the DMZ. This makes it easier to configure security policy.

Step 13: Click **Add > Network Object Group**.

Step 14: In the Add Network Object Group dialog box, in the **Group Name** box, enter a name for the group. (Example: dmz-wlcs)

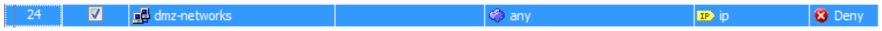
Step 15: On the Existing Network Objects/Groups pane, select the primary WLC, and then click **Add >>**.

Step 16: On the Existing Network Objects/Groups pane, select the resilient WLC, click **Add >>**, and then click **OK**.

Procedure 4 Configure security policy

Step 1: Navigate to **Configuration > Firewall > Access Rules**.

Step 2: Click the rule that denies traffic from the DMZ toward other networks.



24	☑	dmz-networks		any	ip	Deny

Next, you insert a new rule above the rule you selected that enables the WLCs in the DMZ to communicate with the AAA server in the data center for management and user authentication.

Step 3: Click **Add > Insert**.

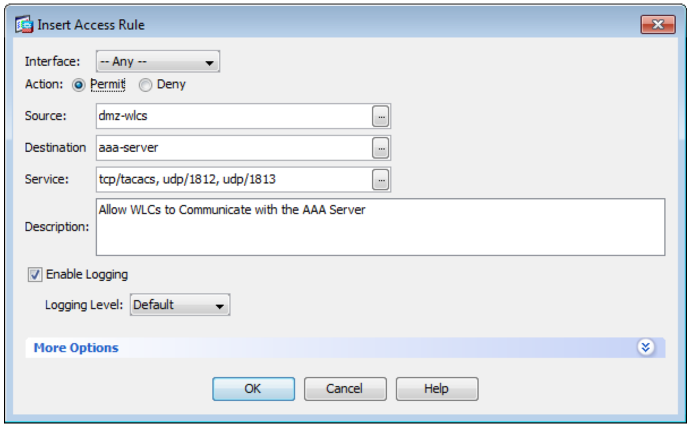
Step 4: In the Internet Access Rule dialog box, in the **Interface** list, select **—Any—**.

Step 5: To the right of Action, select **Permit**.

Step 6: In the **Source** list, choose the network object group created in Procedure 3, Step 14. (Example: dmz-wlcs)

Step 7: In the **Destination** list, choose the network object for the AAA server. (Example: aaa-server)

Step 8: In the **Service** list, enter **tcp/tacacs, udp/1812, udp/1813**, and then click **OK**.


Insert Access Rule

Interface: -- Any --

Action: ● Permit ○ Deny

Source: dmz-wlcs

Destination aaa-server

Service: tcp/tacacs, udp/1812, udp/1813

Description: Allow WLCs to Communicate with the AAA Server

☑ Enable Logging

Logging Level: Default

Next, you must enable the WLCs in the DMZ to synchronize their time with the NTP server in the data center.

Step 9: Click **Add > Insert**.

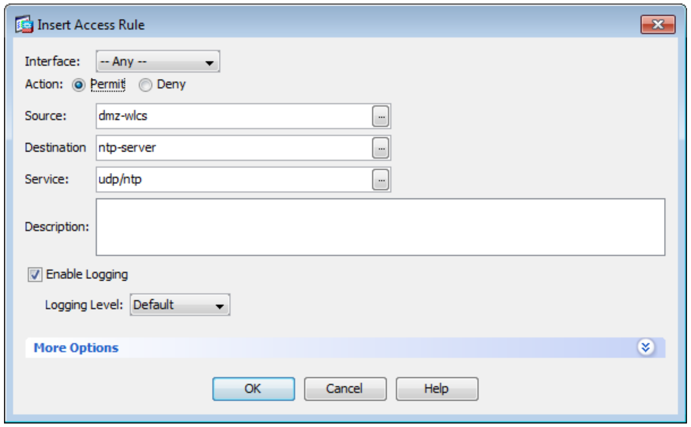
Step 10: In the Internet Access Rule dialog box, in the **Interface** list, select **—Any—**.

Step 11: To the right of Action, select **Permit**.

Step 12: In the **Source** list, choose the network object group created in Procedure 3, Step 14. (Example: dmz-wlcs)

Step 13: In the **Destination** list, choose the network object for the NTP server. (Example: ntp-server)

Step 14: In the **Service** list, enter **udp/ntp**, and then click **OK**.


Insert Access Rule

Interface: -- Any --

Action: ● Permit ○ Deny

Source: dmz-wlcs

Destination ntp-server

Service: udp/ntp

Description:

☑ Enable Logging

Logging Level: Default

Next, you enable the WLCs in the DMZ to be able to download new software via FTP.

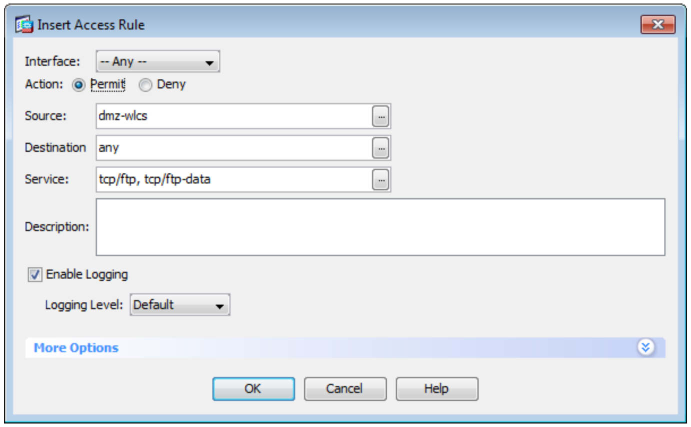
Step 15: Click **Add > Insert**.

Step 16: In the Internet Access Rule dialog box, in the **Interface** list, select **—Any—**.

Step 17: To the right of Action, select **Permit**.

Step 18: In the **Source** list, choose the network object group created in Procedure 3, Step 14. (Example: dmz-wlcs)

Step 19: In the **Service** list, enter **tcp/ftp, tcp/ftp-data**, and then click **OK**.



Insert Access Rule

Interface: -- Any --
Action: ● Permit ○ Deny
Source: dmz-wlcs
Destination: any
Service: tcp/ftp, tcp/ftp-data
Description:
☑ Enable Logging
Logging Level: Default

Now you enable the Cisco OfficeExtend Access Points to communicate with the WLCs in the DMZ using Control and Provisioning of Wireless Access Points (CAPWAP).

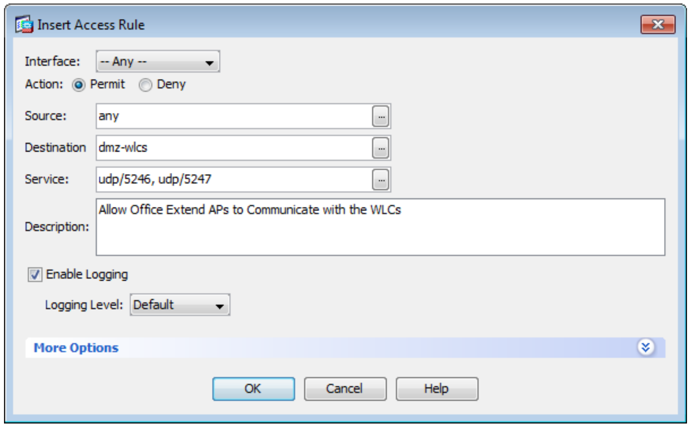
Step 20: Click **Add > Insert**.

Step 21: In the Internet Access Rule dialog box, in the **Interface** list, select **—Any—**.

Step 22: To the right of Action, select **Permit**.

Step 23: In the **Destination** list, choose the network object group created in Procedure 3, Step 14. (Example: dmz-wlcs)

Step 24: In the **Service** list, enter **udp/5246, udp/5247**, and then click **OK**.



Insert Access Rule

Interface: -- Any --
Action: ● Permit ○ Deny
Source: any
Destination: dmz-wlcs
Service: udp/5246, udp/5247
Description: Allow Office Extend APs to Communicate with the WLCs
☑ Enable Logging
Logging Level: Default

Step 25: Click **Apply**.

Process

Configuring LAN Distribution Switch—Dedicated Deployment

1. Configure the distribution switch

Procedure 1 Configure the distribution switch

The VLANs used in the following configuration examples are:

- Wireless data—VLAN 244, IP: 10.4.144.0/22
- Wireless voice—VLAN 248, IP 10.4.148.0/22
- Remote LAN—VLAN 252, IP 10.4.152.0/24

Step 1: On the LAN distribution switch, create the wireless VLANs that you are connecting to the distribution switch.

```
vlan 244
 name OEAP_Data
vlan 248
 name OEAP_Voice
vlan 252
 name OEAP_RemoteLAN
```

Step 2: Configure a VLAN interface (SVI) for each VLAN so devices in the VLAN can communicate with the rest of the network.

```
interface Vlan244
 description OEAP Wireless Data Network
 ip address 10.4.144.1 255.255.252.0
 no shutdown
!
interface Vlan248
 description OEAP Wireless Voice Network
 ip address 10.4.148.1 255.255.252.0
 no shutdown
!
interface Vlan252
 description OEAP Remote LAN Data Network
 ip address 10.4.152.1 255.255.252.0
 no shutdown
```

Step 3: For interface configuration, an 802.1Q trunk is used for the connection to the WLCs. This allows the distribution switch to provide the Layer 3 services to all the networks defined on the WLC. The VLANs allowed on the trunk are pruned to only the VLANs that are active on the WLC.

If you are deploying the Catalyst 6500 or 4500 LAN distribution switch, you do not need to use the **switchport trunk encapsulation dot1q** command in the following configurations.

```
interface GigabitEthernet [port 1]
 description OEAP WLC-1
interface GigabitEthernet [port 2]
 description OEAP WLC-2
!
interface range GigabitEthernet [port 1], GigabitEthernet 
[port 2]
 switchport trunk encapsulation dot1q
 switchport trunk allowed vlan 244,248,252
 switchport mode trunk
 macro apply EgressQoS
 logging event link-status
 logging event trunk-status
 no shutdown
```

Process

Configuring WLC—Dedicated Deployment

1. Configure the WLC platform
2. Configure the WLC for NAT
3. Configure the time zone
4. Configure SNMP
5. Limit what networks can manage the WLC
6. Configure wireless user authentication
7. Centralize management authentication

Procedure 1 Configure the WLC platform

After the WLC is physically installed and powered up, you will see the following on the console:

```
Welcome to the Cisco Wizard Configuration Tool
Use the '-' character to backup
Would you like to terminate autoinstall? [yes]: YES
```

Step 1: Enter a system name. (Example: WLC-OEAP-1)

```
System Name [Cisco_7e:8e:43] (31 characters max): WLC-OEAP-1
```

Step 2: Enter an administrator username and password.

Tech Tip

Use at least three of the following four classes in the password: lowercase letters, uppercase letters, digits, or special characters .

```
Enter Administrative User Name (24 characters max): admin
Enter Administrative Password (24 characters max): *****
Re-enter Administrative Password : *****
```

Step 3: Use DHCP for the service port interface address.

```
Service Interface IP address Configuration [none] [DHCP]: DHCP
```

Step 4: If you are deploying a Cisco 5500 Series Wireless LAN Controller, disable link aggregation so clients can attach directly to the LAN distribution switch and not have to traverse the firewall.

```
Enable Link Aggregation (LAG) [yes][NO]: NO
```

Step 5: Enter the IP address and subnet mask for the management interface.

```
Management Interface IP Address: 192.168.19.20
Management Interface Netmask: 255.255.255.0
Management interface Default Router: 192.168.19.1
Management Interface VLAN Identifier (0 = untagged): 0
Management Interface Port Num [1 to 8]: 1
```

Step 6: Enter the default DHCP server for clients. (Example: 10.4.48.10)

```
Management Interface DHCP Server IP Address: 10.4.48.10
```

Step 7: Configure the virtual interface the WLC uses for Mobility DHCP relay and inter-controller communication. (Example: 192.0.2.1)

```
Virtual Gateway IP Address: 192.0.2.1
```

Step 8: Enter a name that will be used as the default mobility and RF group. (Example: OEAP-1)

```
Mobility/RF Group Name: OEAP-1
```

Step 9: Enter an SSID for the WLAN SSID that supports data traffic. You will be able to leverage this later in the deployment process.

```
Network Name (SSID): WLAN-Data
Configure DHCP Bridging Mode [yes][NO]: NO
```

Step 10: Disable DHCP snooping. This increases resiliency during a WLC failure.

```
Allow Static IP Addresses {YES][no]: YES
```

Step 11: Specify that the RADIUS Server will be configured later using the GUI.

```
Configure a RADIUS Server now? [YES][no]: NO
```

Step 12: Enter the correct country code for the country where you are deploying the WLC.

```
Enter Country Code list (enter 'help' for a list of countries)
[US]: US
```

Step 13: Enable all wireless networks.

```
Enable 802.11b network [YES][no]: YES
Enable 802.11a network [YES][no]: YES
Enable 802.11g network [YES][no]: YES
```

Step 14: Enable the radio resource management (RRM) auto-RF feature. This helps you keep your network up and operational.

```
Enable Auto-RF [YES][no]: YES
```

Step 15: Synchronize the WLC clock to your organization's NTP server.

```
Configure a NTP server now? [YES][no]:YES
Enter the NTP server's IP address: 10.4.48.17
Enter a polling interval between 3600 and 604800 secs: 86400
```

Step 16: Save the configuration. If you respond with **no**, the system will restart without saving the configuration and you will have to complete this procedure again.

```
Configuration correct? If yes, system will save it and reset.
[yes][NO]: YES
Configuration saved!
Resetting system with new configuration
```

Step 17: After the WLC has reset, log in to the Cisco Wireless LAN Controller Administration page using the credentials defined in Step 2. (Example: https://wlc-oeap-1.cisco.local/)

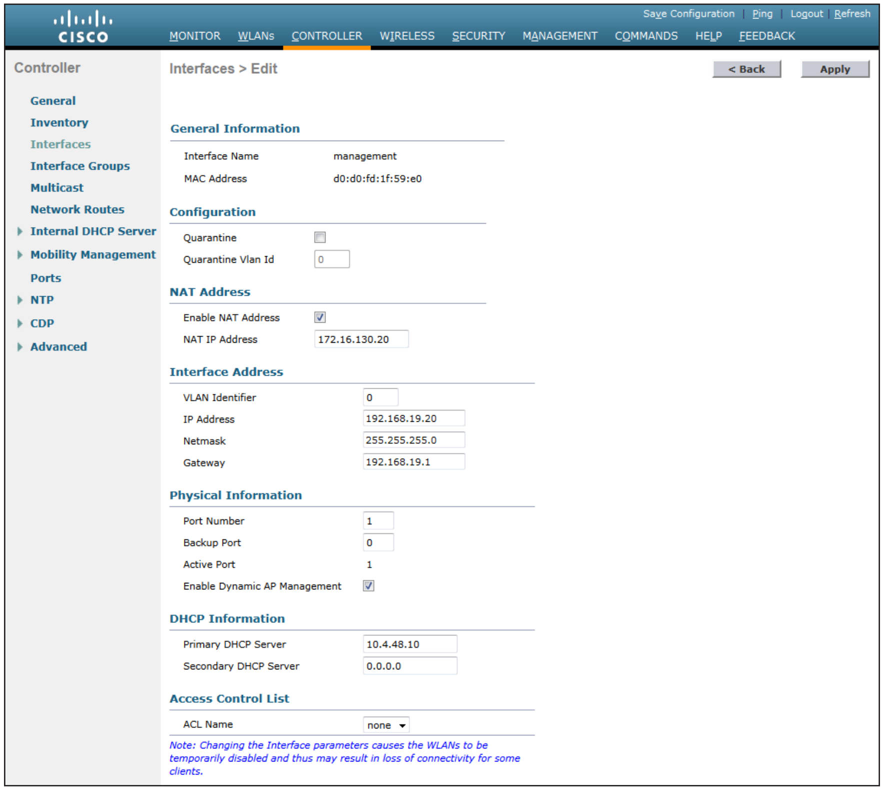
Procedure 2 Configure the WLC for NAT

The Internet edge firewall translates the IP address of the WLC management interface in the DMZ to a publicly reachable IP address so Cisco OfficeExtend Access Points at teleworker locations can reach the WLC. However, in order for the Cisco OfficeExtend Access Points to be able to communicate with the WLC, the publicly reachable address must also be configured on the WLC management interface.

Step 1: In **Controller > Interfaces**, click the **management** interface.

Step 2: Select **Enable NAT Address**.

Step 3: In the **NAT IP Address** box, enter the publicly reachable IP address, and then click **Apply**. (Example: 172.16.130.20)



Interfaces > Edit

General Information

Interface Name: management
MAC Address: d0:d0:fd:1f:59:e0

Configuration

Quarantine: □
Quarantine Vlan Id: 0

NAT Address

Enable NAT Address: ☑
NAT IP Address: 172.16.130.20

Interface Address

VLAN Identifier: 0
IP Address: 192.168.19.20
Netmask: 255.255.255.0
Gateway: 192.168.19.1

Physical Information

Port Number: 1
Backup Port: 0
Active Port: 1
Enable Dynamic AP Management: ☑

DHCP Information

Primary DHCP Server: 10.4.48.10
Secondary DHCP Server: 0.0.0.0

Access Control List

ACL Name: none

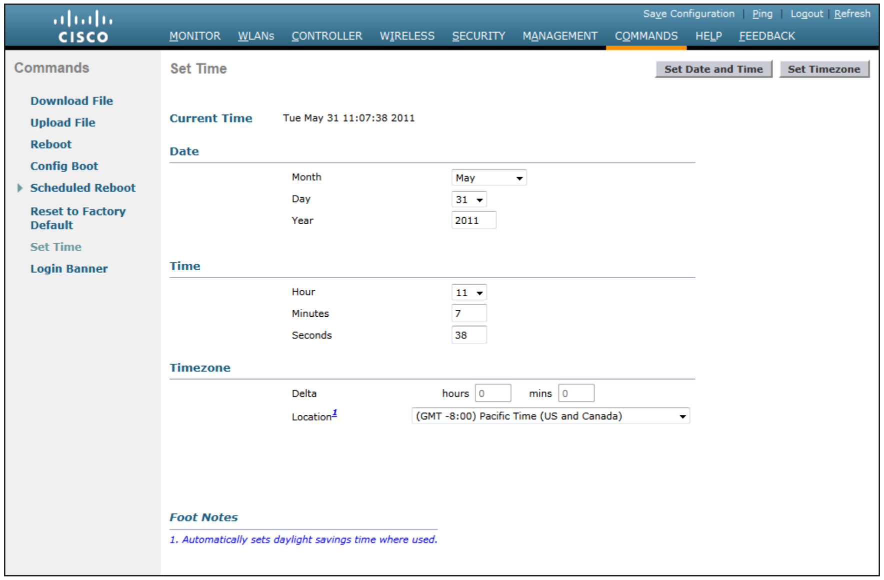
Note: Changing the Interface parameters causes the WLANs to be temporarily disabled and thus may result in loss of connectivity for some clients.

Procedure 3 Configure the time zone

Step 1: Navigate to **Commands > Set Time.**

Step 2: In the **Location** list, choose the time zone that corresponds to the location of the WLC.

Step 3: Click **Set Timezone**.



Set Time

Current Time: Tue May 31 11:07:38 2011

Date

Month: May
Day: 31
Year: 2011

Time

Hour: 11
Minutes: 7
Seconds: 38

Timezone

Delta: hours 0 mins 0
Location[1]: (GMT -8:00) Pacific Time (US and Canada)

Foot Notes

1. Automatically sets daylight savings time where used.

Procedure 4 Configure SNMP

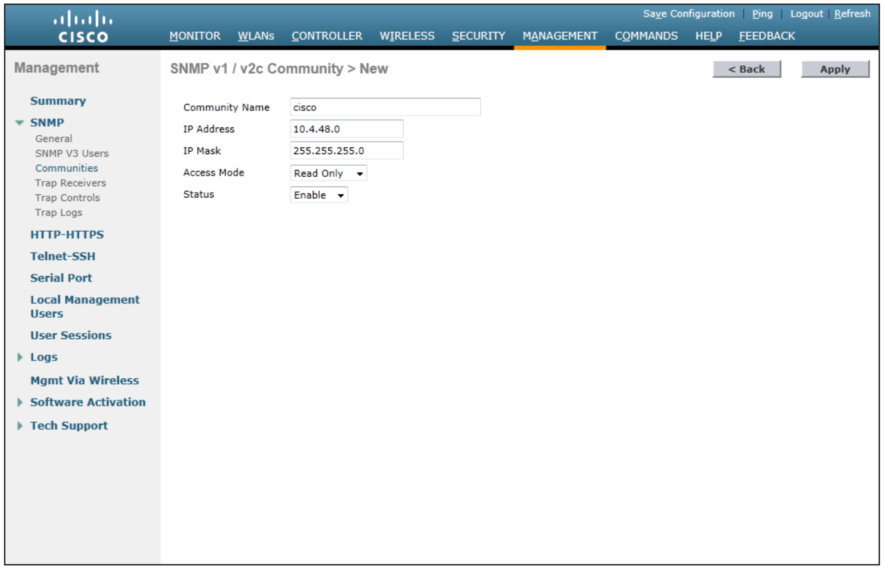
Step 1: In **Management > SNMP > Communities**, click **New**.

Step 2: Enter the **Community Name**. (Example: cisco)

Step 3: Enter the **IP Address.** (Example: 10.4.48.0)

Step 4: Enter the **IP Mask**. (Example: 255.255.255.0)

Step 5: In the **Status** list, choose **Enable**, and then click **Apply**.



SNMP v1 / v2c Community > New

Community Name: cisco
IP Address: 10.4.48.0
IP Mask: 255.255.255.0
Access Mode: Read Only
Status: Enable

Step 6: In **Management > SNMP > Communities**, click **New**.

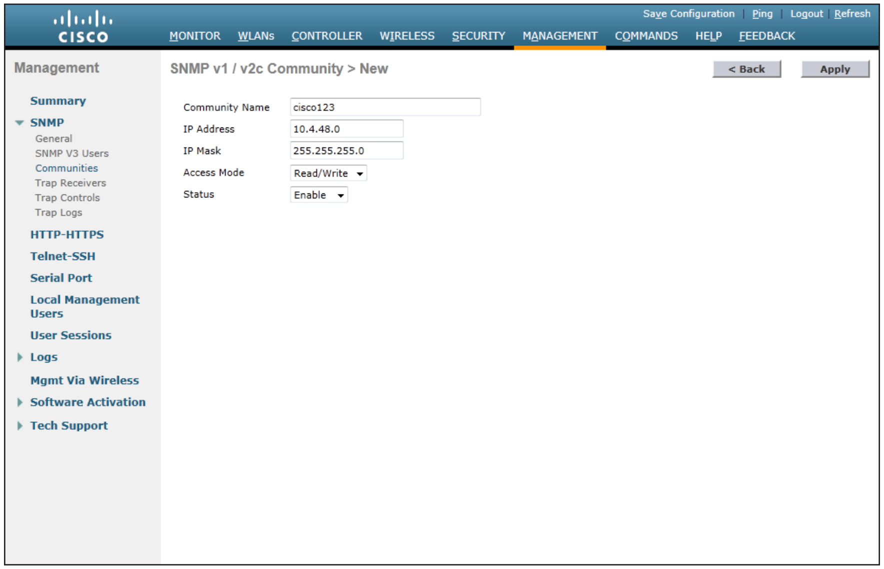
Step 7: Enter the **Community Name**. (Example: cisco123)

Step 8: Enter the **IP Address.** (Example: 10.4.48.0)

Step 9: Enter the **IP Mask**. (Example: 255.255.255.0)

Step 10: In the **Access Mode** list, choose **Read/Write**.

Step 11: In the **Status** list, choose **Enable**, and then click **Apply**.



SNMP v1 / v2c Community > New

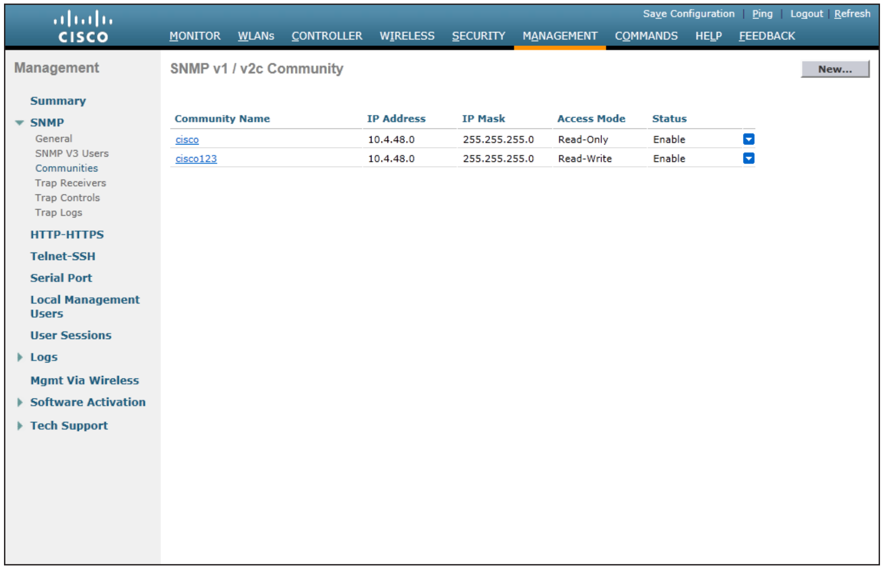
Community Name: cisco123
IP Address: 10.4.48.0
IP Mask: 255.255.255.0
Access Mode: Read/Write
Status: Enable

Step 12: Navigate to **Management > SNMP > Communities**.

Step 13: Point to the blue box for the **public** community, and then click **Remove**.

Step 14: On the message "Are you sure you want to delete?", click **OK**.

Step 15: Repeat Step 13 and Step 14 for the **private** community.



SNMP v1 / v2c Community

Community Name	IP Address	IP Mask	Access Mode	Status
cisco	10.4.48.0	255.255.255.0	Read-Only	Enable
cisco123	10.4.48.0	255.255.255.0	Read-Write	Enable

Procedure 5 Limit what networks can manage the WLC

(Optional)

In networks where network operational support is centralized, you can increase network security by using an access list to limit the networks that can access your controller. In this example, only devices on the 10.4.48.0/24 network will be able to access the controller via Secure Shell (SSH) Protocol or SNMP.

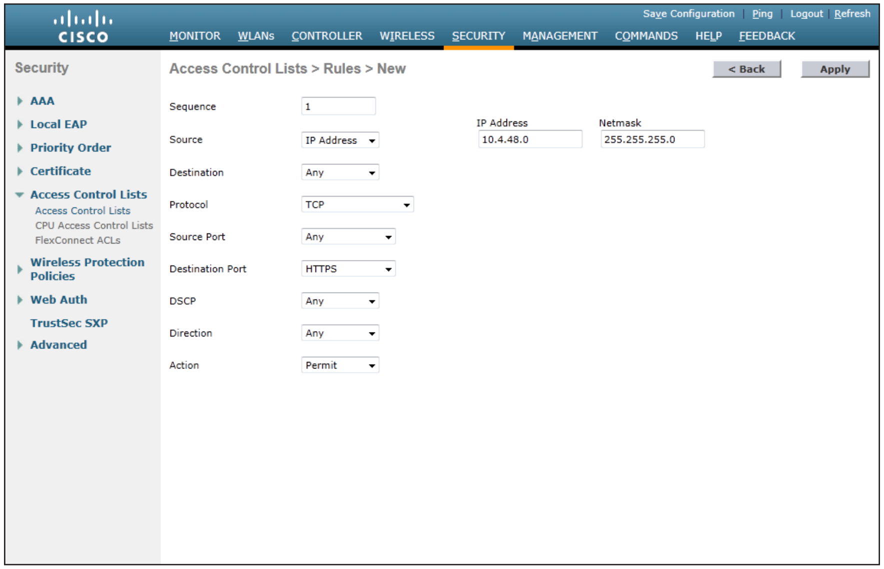
Step 1: In **Security > Access Control Lists > Access Control Lists**, click **New**.

Step 2: Enter an access list name, and then click **Apply**.

Step 3: In the list, choose the name of the access list you just created, and then click **Add New Rule**.

Step 4: In the window, enter the following configuration details, and then click **Apply**.

- Sequence—**1**
- Source—**10.4.48.0 / 255.255.255.0**
- Destination—**Any**
- Protocol—**TCP**
- Destination Port—**HTTPS**
- Action—**Permit**



Access Control Lists > Rules > New

Sequence: 1
Source: IP Address — IP Address: 10.4.48.0 — Netmask: 255.255.255.0
Destination: Any
Protocol: TCP
Source Port: Any
Destination Port: HTTPS
DSCP: Any
Direction: Any
Action: Permit

Step 5: Repeat Step 3 through Step 4 four more times, using the configuration details in the following table.

Sequence	Source	Destination	Protocol	Destination port	Action
2	10.4.48.0/255.255.255.0	Any	TCP	Other/22	Permit
3	Any	Any	TCP	HTTPS	Deny
4	Any	Any	TCP	Other/22	Deny
5	Any	Any	Any	Any	Permit

Step 6: In **Security > Access Control Lists > CPU Access Control Lists**, select **Enable CPU ACL**.

Step 7: In the **ACL Name** list, choose the ACL you created in Step 2, and then click **Apply.**

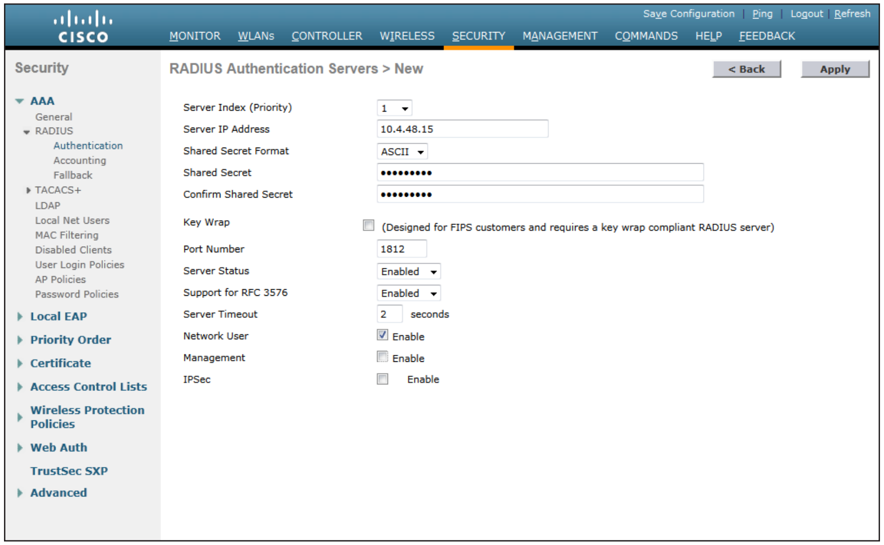
Procedure 6 Configure wireless user authentication

Step 1: In **Security > AAA > Radius > Authentication**, click **New**.

Step 2: Enter the **Server IP Address**. (Example: 10.4.48.15)

Step 3: Enter and confirm the **Shared Secret**. (Example: SecretKey)

Step 4: To the right of Management, clear **Enable**, and then click **Apply**.



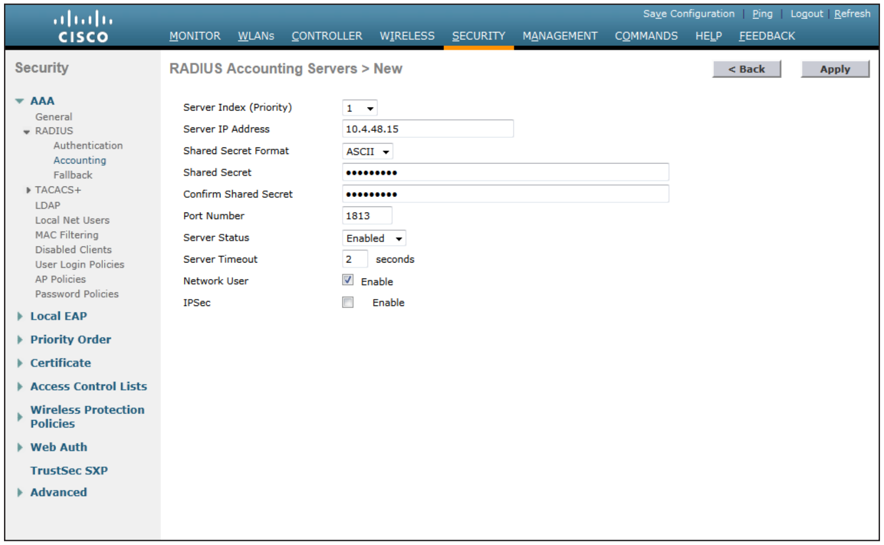
RADIUS Authentication Servers > New

Server Index (Priority)	1
Server IP Address	10.4.48.15
Shared Secret Format	ASCII
Shared Secret	•••••••••
Confirm Shared Secret	•••••••••
Key Wrap	□ (Designed for FIPS customers and requires a key wrap compliant RADIUS server)
Port Number	1812
Server Status	Enabled
Support for RFC 3576	Enabled
Server Timeout	2 seconds
Network User	☑ Enable
Management	□ Enable
IPSec	□ Enable

Step 5: In **Security > AAA > Radius > Accounting**, click **New**.

Step 6: Enter the **Server IP Address**. (Example: 10.4.48.15)

Step 7: Enter and confirm the **Shared Secret**, and then click **Apply**. (Example: SecretKey)



RADIUS Accounting Servers > New

Server Index (Priority)	1
Server IP Address	10.4.48.15
Shared Secret Format	ASCII
Shared Secret	•••••••••
Confirm Shared Secret	•••••••••
Port Number	1813
Server Status	Enabled
Server Timeout	2 seconds
Network User	☑ Enable
IPSec	□ Enable

Procedure 7 Centralize management authentication

(Optional)

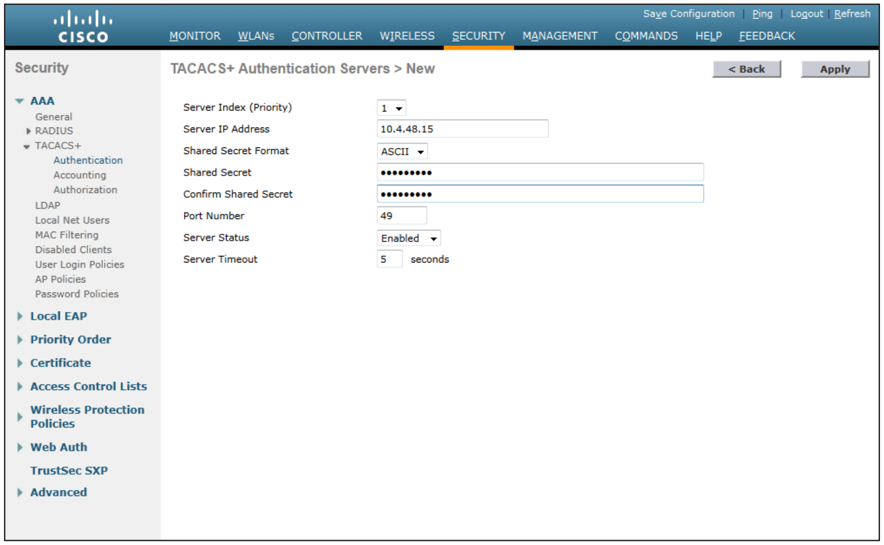
You can use this procedure to deploy centralized management authentication by configuring the authentication, authorization, and accounting (AAA) service. If you prefer to use local management authentication, skip this procedure.

As networks scale in the number of devices to maintain, the operational burden to maintain local management accounts on every device also scales. A centralized AAA service reduces operational tasks per device and provides an audit log of user access for security compliance and root-cause analysis. When AAA is enabled for access control, all management access to the network infrastructure devices (SSH and HTTPS) is controlled by AAA.

Step 1: In **Security > AAA > TACACS+ > Authentication**, click **New**.

Step 2: Enter the **Server IP Address**. (Example: 10.4.48.15)

Step 3: Enter and confirm the **Shared Secret**, and then click **Apply** (Example: SecretKey)



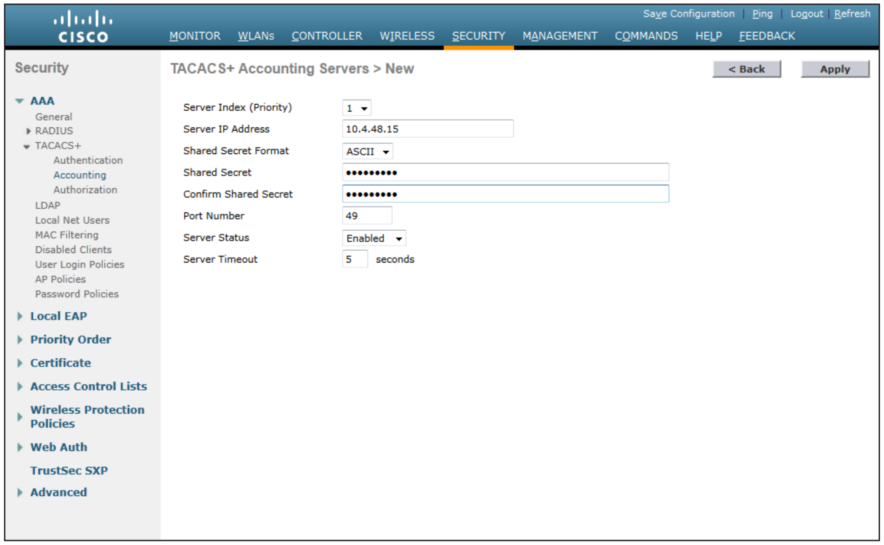
TACACS+ Authentication Servers > New

Server Index (Priority)	1
Server IP Address	10.4.48.15
Shared Secret Format	ASCII
Shared Secret	•••••••••
Confirm Shared Secret	•••••••••
Port Number	49
Server Status	Enabled
Server Timeout	5 seconds

Step 4: In **Security > AAA > TACACS+ > Accounting**, click **New**.

Step 5: Enter the **Server IP Address**. (Example: 10.4.48.15)

Step 6: Enter and confirm the **Shared Secret**, and then click **Apply**. (Example: SecretKey)



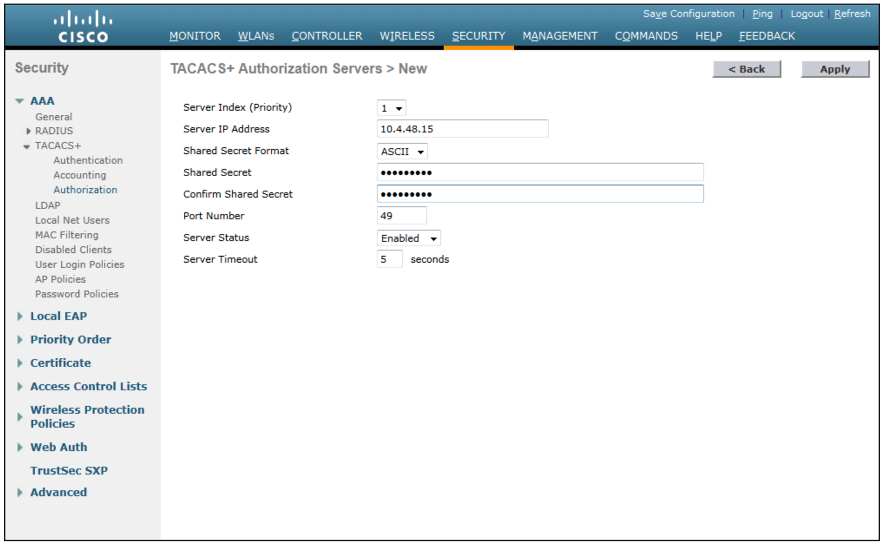
TACACS+ Accounting Servers > New

Server Index (Priority)	1
Server IP Address	10.4.48.15
Shared Secret Format	ASCII
Shared Secret	•••••••••
Confirm Shared Secret	•••••••••
Port Number	49
Server Status	Enabled
Server Timeout	5 seconds

Step 7: In **Security > AAA > TACACS+ > Authorization**, click **New**.

Step 8: Enter the **Server IP Address**. (Example: 10.4.48.15)

Step 9: Enter and confirm the **Shared Secret**, and then click **Apply**. (Example: SecretKey)



TACACS+ Authorization Servers > New

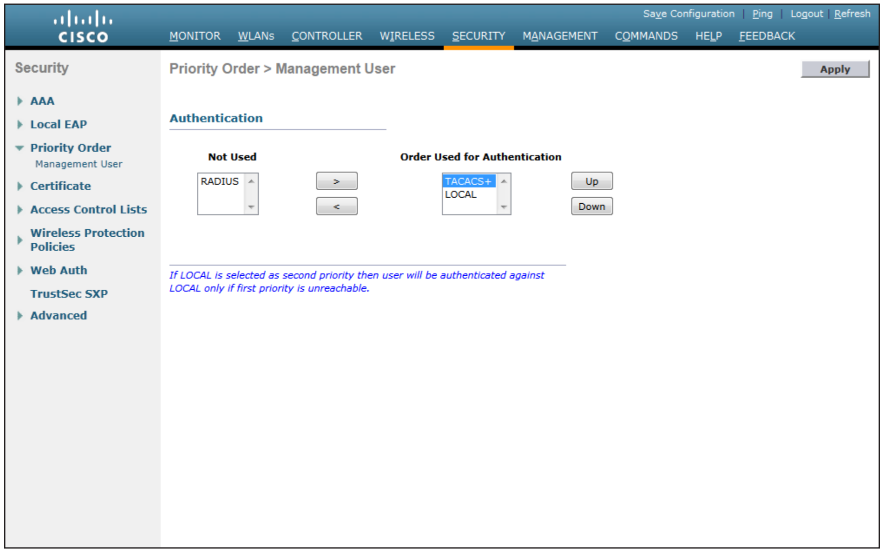
Server Index (Priority)	1
Server IP Address	10.4.48.15
Shared Secret Format	ASCII
Shared Secret	•••••••••
Confirm Shared Secret	•••••••••
Port Number	49
Server Status	Enabled
Server Timeout	5 seconds

Step 10: Navigate to **Security > Priority Order > Management User.**

Step 11: Using the arrow buttons, move **TACACS+** from the **Not Used** list to the **Used for Authentication** list.

Step 12: Using the **Up** and **Down** buttons, move **TACACS+** to be the first in the **Order Used for Authentication** list.

Step 13: Using the arrow buttons, move **RADIUS** to the **Not Used** list, and then click **Apply**.



Priority Order > Management User

Authentication

Not Used	Order Used for Authentication
RADIUS	TACACS+ LOCAL

If LOCAL is selected as second priority then user will be authenticated against LOCAL only if first priority is unreachable.

Process

Configuring Voice/Data Connectivity—Dedicated Deployment

1. Create the wireless LAN data interface
2. Create the wireless LAN voice interface
3. Create the remote LAN interface
4. Configure the data wireless LAN
5. Configure voice wireless LAN
6. Configure the remote LAN

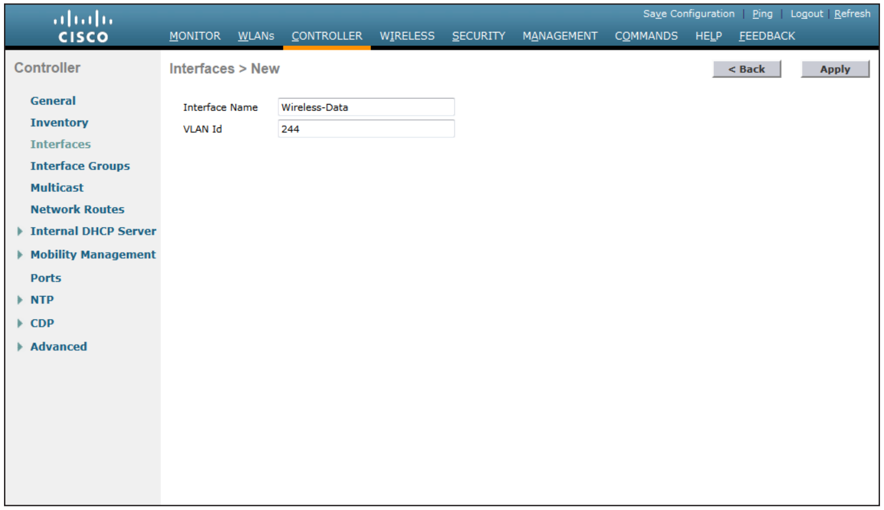
The Cisco OfficeExtend Access Point supports a maximum of two wireless LANs and one remote LAN. Configure the SSIDs to separate voice and data traffic, which is essential in any good network design in order to ensure proper treatment of the respective IP traffic, regardless of the medium it is traversing. In this procedure, you add an interface that allows devices on the wireless data network to communicate with the rest of your organization.

Procedure 1 Create the wireless LAN data interface

Step 1: In **Controller>Interfaces,** click **New**.

Step 2: Enter the **Interface Name**. (Example: Wireless-Data)

Step 3: Enter the **VLAN Id**, and then click **Apply**. (Example: 244)



Interface Name	Wireless-Data
VLAN Id	244

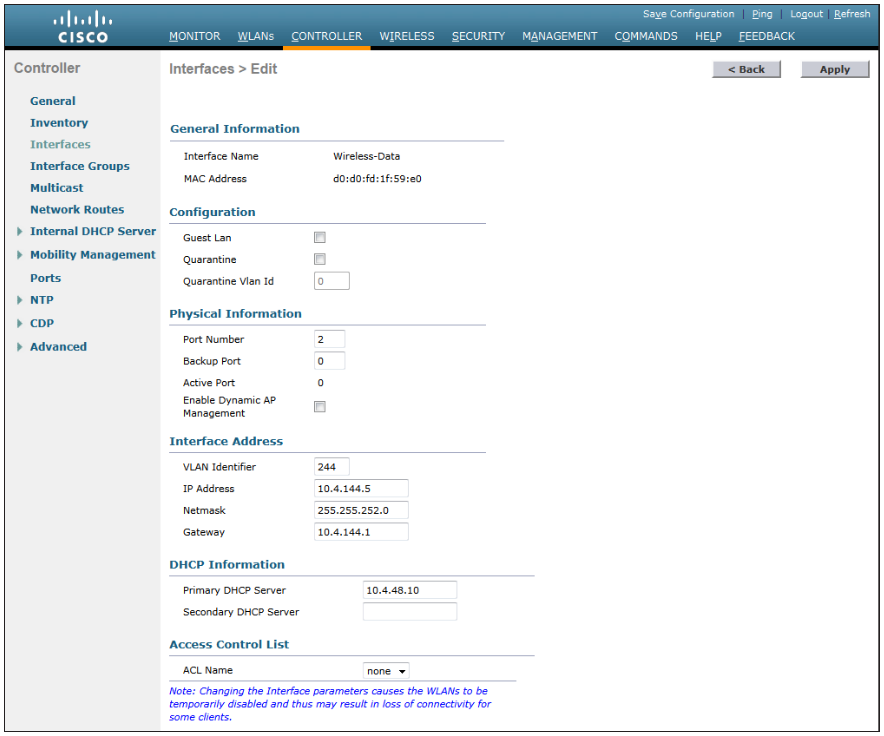
Step 4: In the **Port Number** box, enter the WLC interface that connects to the LAN distribution switch. (Example: 2)

Step 5: In the **IP Address** box, enter the IP address to assign to the WLC interface. (Example: 10.4.144.5)

Step 6: Enter the **Netmask**. (Example: 255.255.252.0)

Step 7: In the **Gateway** box, enter the IP address of the VLAN interface defined in Configuring LAN Distribution Switch—Dedicated Deployment, Procedure 1, Step 2. (Example: 10.4.144.1)

Step 8: In the **Primary DHCP Server** box, enter the IP address of your organization's DHCP server, and then click **Apply**. (Example: 10.4.48.10)



General Information

Interface Name	Wireless-Data
MAC Address	d0:d0:fd:1f:59:e0

Configuration

Guest Lan	☐
Quarantine	☐
Quarantine Vlan Id	0

Physical Information

Port Number	2
Backup Port	0
Active Port	0
Enable Dynamic AP Management	☐

Interface Address

VLAN Identifier	244
IP Address	10.4.144.5
Netmask	255.255.252.0
Gateway	10.4.144.1

DHCP Information

Primary DHCP Server	10.4.48.10
Secondary DHCP Server	

Access Control List

ACL Name	none

Note: Changing the Interface parameters causes the WLANs to be temporarily disabled and thus may result in loss of connectivity for some clients.

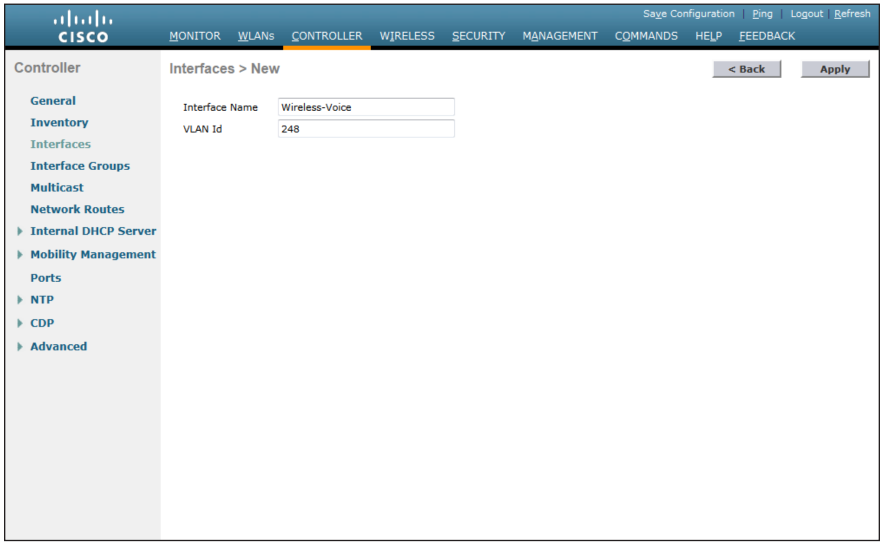
Procedure 2 Create the wireless LAN voice interface

You must add an interface that allows devices on the wireless voice network to communicate with the rest of the organization.

Step 1: In **Controller>Interfaces,** click **New**.

Step 2: Enter the **Interface Name**. (Example: Wireless-Voice)

Step 3: Enter the **VLAN Id**, and then click **Apply**. (Example: 248)



Interfaces > New

Interface Name	Wireless-Voice
VLAN Id	248

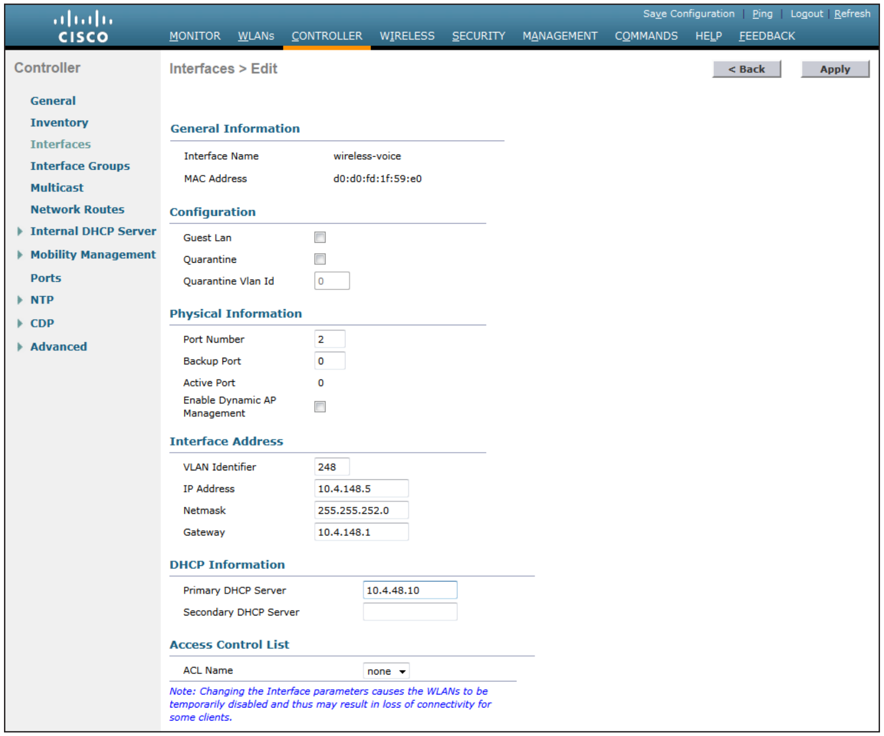
Step 4: In the **Port Number** box, enter the WLC interface that connects to the LAN distribution switch. (Example: 2)

Step 5: In the **IP Address** box, enter the IP address to assign to the WLC interface. (Example: 10.4.148.5)

Step 6: Enter the **Netmask**. (Example: 255.255.252.0)

Step 7: In the **Gateway** box, enter the IP address of the VLAN interface defined in Configuring LAN Distribution Switch—Dedicated Deployment, Procedure 1, Step 2. (Example: 10.4.148.1)

Step 8: In the **Primary DHCP Server** box, enter the IP address of your organization's DHCP server, and then click **Apply**. (Example: 10.4.48.10)



Interfaces > Edit

General Information

Interface Name	wireless-voice
MAC Address	d0:d0:fd:1f:59:e0

Configuration

Guest Lan	□
Quarantine	□
Quarantine Vlan Id	0

Physical Information

Port Number	2
Backup Port	0
Active Port	0
Enable Dynamic AP Management	□

Interface Address

VLAN Identifier	248
IP Address	10.4.148.5
Netmask	255.255.252.0
Gateway	10.4.148.1

DHCP Information

Primary DHCP Server	10.4.48.10
Secondary DHCP Server	

Access Control List

ACL Name	none

Note: Changing the Interface parameters causes the WLANs to be temporarily disabled and thus may result in loss of connectivity for some clients.

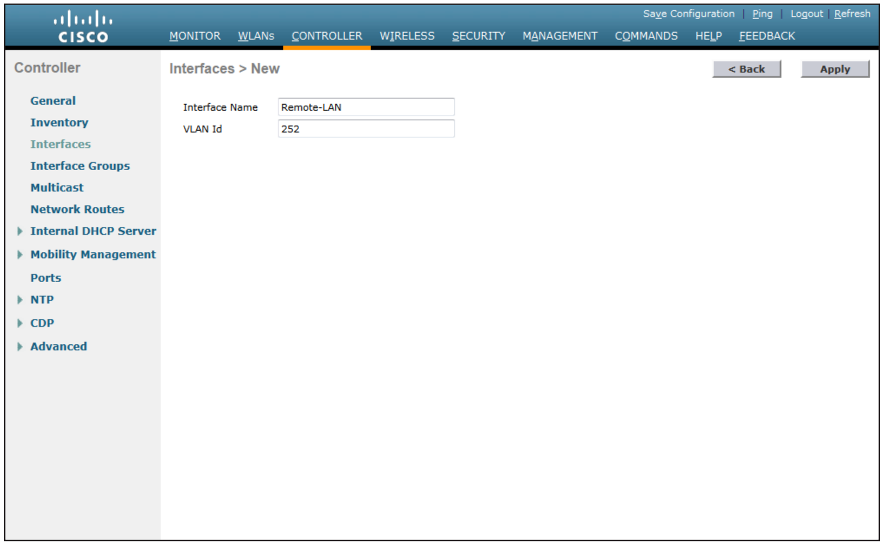
Procedure 3 Create the remote LAN interface

Next, you add an interface that allows devices on the remote LAN network to communicate with the rest of the organization.

Step 1: In **Controller>Interfaces,** click **New**.

Step 2: Enter the **Interface Name**. (Example: Remote-LAN)

Step 3: Enter the **VLAN Id**, and then click **Apply**. (Example: 252)



Interfaces > New

Interface Name: Remote-LAN

VLAN Id: 252

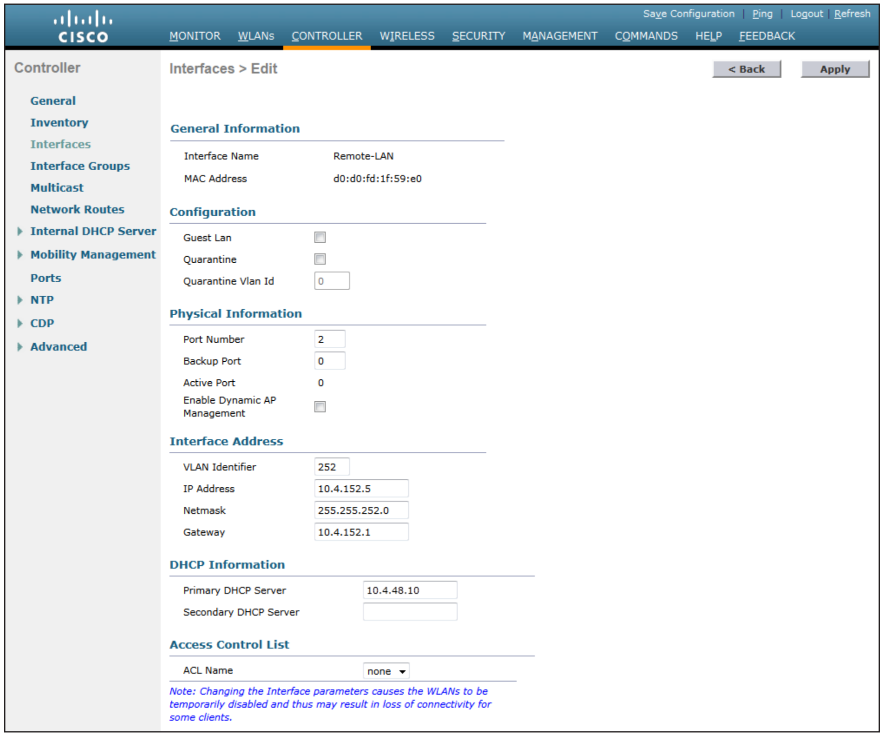
Step 4: In the **Port Number** box, enter the WLC interface that connects to the LAN distribution switch. (Example: 2)

Step 5: In the **IP Address** box, enter the IP address to assign to the WLC interface. (Example: 10.4.152.5)

Step 6: Enter the **Netmask**. (Example: 255.255.252.0)

Step 7: In the **Gateway** box, enter the IP address of the VLAN interface defined in Configuring LAN Distribution Switch—Dedicated Deployment, Procedure 1, Step 2. (Example: 10.4.152.1)

Step 8: In the **Primary DHCP Server** box, enter the IP address of your organization's DHCP server, and then click **Apply**. (Example: 10.4.48.10)



Interfaces > Edit

General Information

Interface Name: Remote-LAN

MAC Address: d0:d0:fd:1f:59:e0

Configuration

Guest Lan: □

Quarantine: □

Quarantine Vlan Id: 0

Physical Information

Port Number: 2

Backup Port: 0

Active Port: 0

Enable Dynamic AP Management: □

Interface Address

VLAN Identifier: 252

IP Address: 10.4.152.5

Netmask: 255.255.252.0

Gateway: 10.4.152.1

DHCP Information

Primary DHCP Server: 10.4.48.10

Secondary DHCP Server:

Access Control List

ACL Name: none

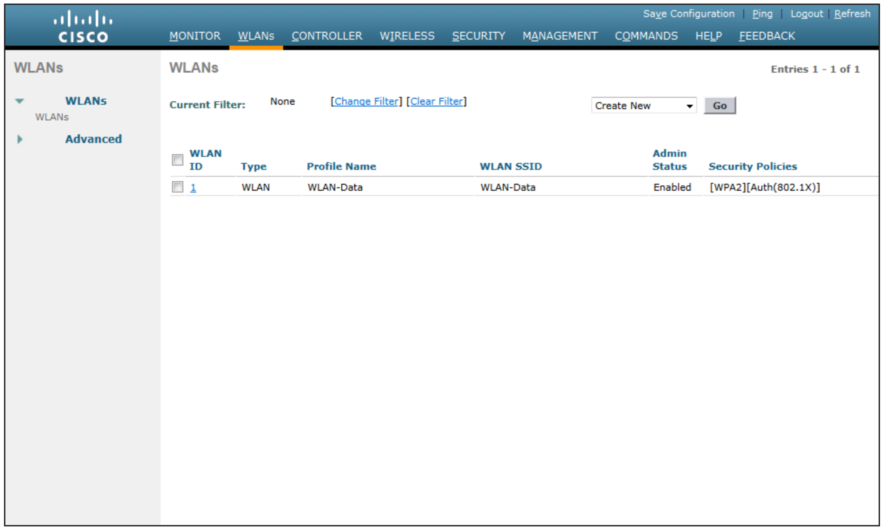
Note: Changing the Interface parameters causes the WLANs to be temporarily disabled and thus may result in loss of connectivity for some clients.

Procedure 4 Configure the data wireless LAN

Wireless data traffic is different from voice traffic in that it can more efficiently handle delay and jitter as well as greater packet loss. For the data wireless LAN, keep the default QoS settings and segment the data traffic onto the data wired VLAN.

Step 1: Navigate to **WLANs**.

Step 2: Click the **WLAN ID** of the SSID created during platform setup.


Save Configuration | Ping | Logout | Refresh
MONITOR WLANs CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP FEEDBACK
WLANs
WLANs
WLANs
Advanced
Create New
Go

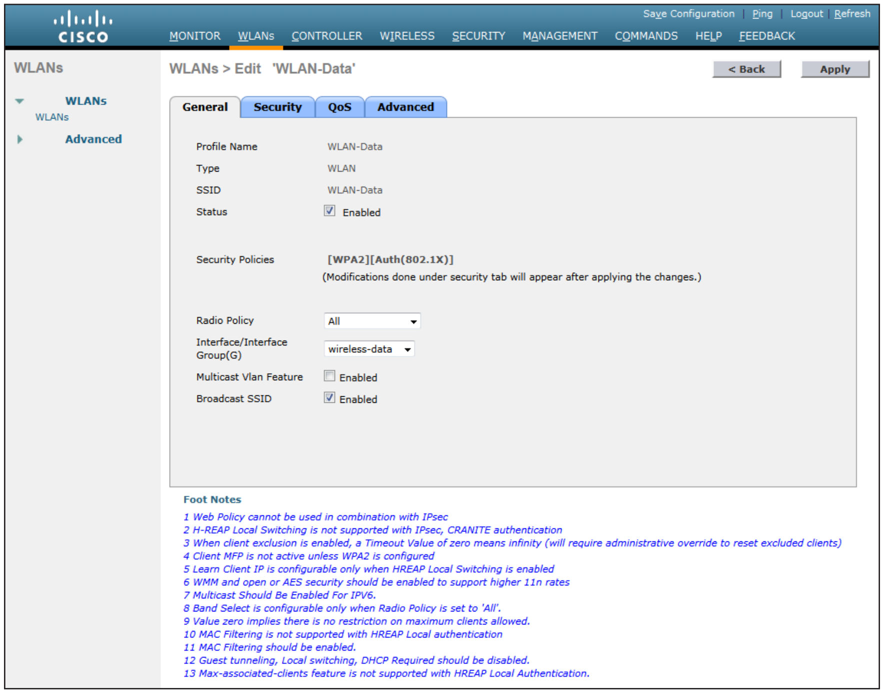
WLANs

Entries 1 - 1 of 1

Current Filter: None [Change Filter] [Clear Filter]

	WLAN ID	Type	Profile Name	WLAN SSID	Admin Status	Security Policies
□	1	WLAN	WLAN-Data	WLAN-Data	Enabled	[WPA2][Auth(802.1X)]

Step 3: On the General tab, in the **Interface** list, choose the interface created in Procedure 1. (Example: Wireless-Data)


Save Configuration | Ping | Logout | Refresh
MONITOR WLANs CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP FEEDBACK
WLANs
WLANs
WLANs
Advanced
< Back
Apply
General
Security
QoS
Advanced

WLANs > Edit 'WLAN-Data'

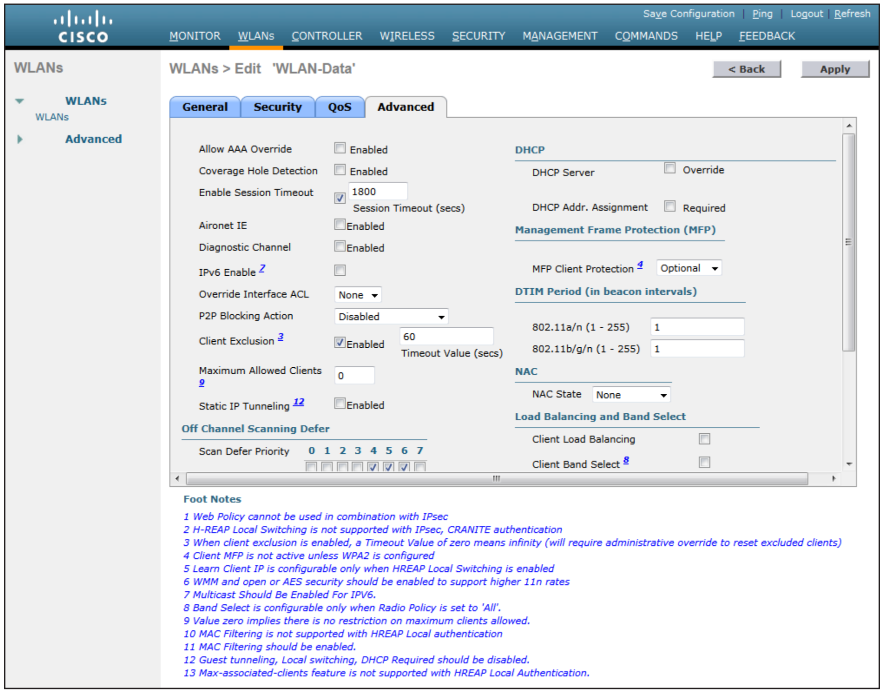
Profile Name	WLAN-Data
Type	WLAN
SSID	WLAN-Data
Status	☑ Enabled
Security Policies	[WPA2][Auth(802.1X)] (Modifications done under security tab will appear after applying the changes.)
Radio Policy	All
Interface/Interface Group(G)	wireless-data
Multicast Vlan Feature	□ Enabled
Broadcast SSID	☑ Enabled

Foot Notes

1 Web Policy cannot be used in combination with IPsec
2 H-REAP Local Switching is not supported with IPsec, CRANITE authentication
3 When client exclusion is enabled, a Timeout Value of zero means infinity (will require administrative override to reset excluded clients)
4 Client MFP is not active unless WPA2 is configured
5 Learn Client IP is configurable only when HREAP Local Switching is enabled
6 WMM and open or AES security should be enabled to support higher 11n rates
7 Multicast Should Be Enabled For IPV6.
8 Band Select is configurable only when Radio Policy is set to 'All'.
9 Value zero implies there is no restriction on maximum clients allowed.
10 MAC Filtering is not supported with HREAP Local authentication
11 MAC Filtering should be enabled.
12 Guest tunneling, Local switching, DHCP Required should be disabled.
13 Max-associated-clients feature is not supported with HREAP Local Authentication.

Step 4: On the Advanced tab, clear **Coverage Hole Detection**.

Step 5: Clear **Aironet IE**, and then click **Apply**.


Save Configuration | Ping | Logout | Refresh
MONITOR WLANs CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP FEEDBACK
WLANs
WLANs
WLANs
Advanced
< Back
Apply
General
Security
QoS
Advanced

WLANs > Edit 'WLAN-Data'

Allow AAA Override	□ Enabled
Coverage Hole Detection	□ Enabled
Enable Session Timeout	☑ 1800 Session Timeout (secs)
Aironet IE	□ Enabled
Diagnostic Channel	□ Enabled
IPv6 Enable [7]	□
Override Interface ACL	None
P2P Blocking Action	Disabled
Client Exclusion [3]	☑ Enabled 60 Timeout Value (secs)
Maximum Allowed Clients [9]	0
Static IP Tunneling [12]	□ Enabled

Off Channel Scanning Defer

Scan Defer Priority	0	1	2	3	4	5	6	7
	□	□	□	□	☑	☑	☑	□

DHCP

DHCP Server	□ Override
DHCP Addr. Assignment	□ Required

Management Frame Protection (MFP)

MFP Client Protection [4]	Optional

DTIM Period (in beacon intervals)

802.11a/n (1 - 255)	1
802.11b/g/n (1 - 255)	1

NAC

NAC State	None

Load Balancing and Band Select

Client Load Balancing	□
Client Band Select [8]	□

Foot Notes

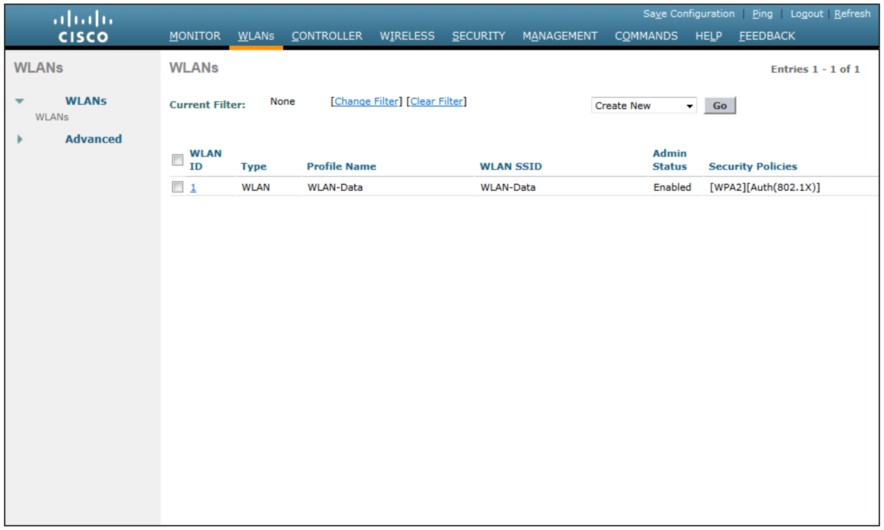
1 Web Policy cannot be used in combination with IPsec
2 H-REAP Local Switching is not supported with IPsec, CRANITE authentication
3 When client exclusion is enabled, a Timeout Value of zero means infinity (will require administrative override to reset excluded clients)
4 Client MFP is not active unless WPA2 is configured
5 Learn Client IP is configurable only when HREAP Local Switching is enabled
6 WMM and open or AES security should be enabled to support higher 11n rates
7 Multicast Should Be Enabled For IPV6.
8 Band Select is configurable only when Radio Policy is set to 'All'.
9 Value zero implies there is no restriction on maximum clients allowed.
10 MAC Filtering is not supported with HREAP Local authentication
11 MAC Filtering should be enabled.
12 Guest tunneling, Local switching, DHCP Required should be disabled.
13 Max-associated-clients feature is not supported with HREAP Local Authentication.

Procedure 5 Configure voice wireless LAN

Wireless voice traffic is different from data traffic in that it cannot effectively handle delay and jitter as well as packet loss. To configure the voice wireless LAN, change the default QoS settings to Platinum and segment the voice traffic onto the voice wired VLAN.

Step 1: Navigate to **WLANs**.

Step 2: In the drop-down list, choose **Create New**, and then click **Go**.


Save Configuration | Ping | Logout | Refresh
MONITOR WLANs CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP FEEDBACK
WLANs
WLANs
WLANs
Advanced
Create New
Go

WLANs

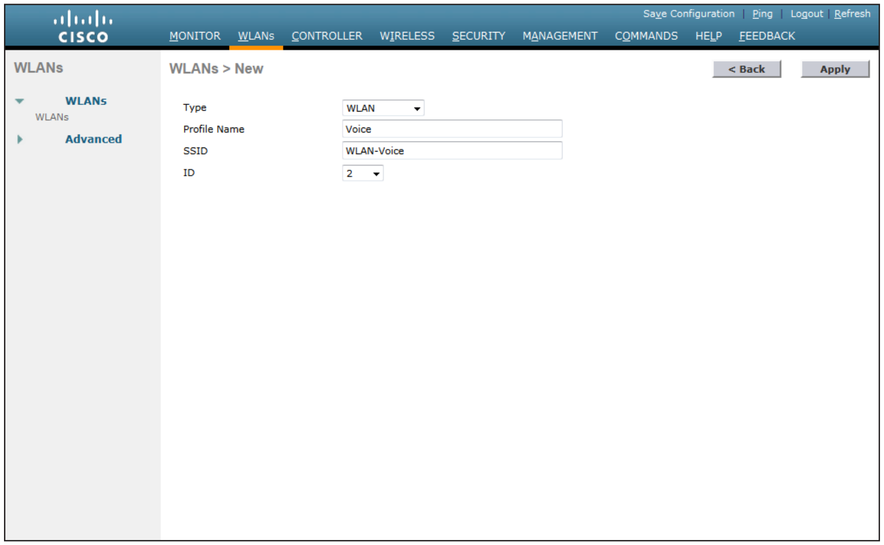
Entries 1 - 1 of 1

Current Filter: None [Change Filter] [Clear Filter]

□	WLAN ID	Type	Profile Name	WLAN SSID	Admin Status	Security Policies
□	1	WLAN	WLAN-Data	WLAN-Data	Enabled	[WPA2][Auth(802.1X)]

Step 3: Enter the **Profile Name**. (Example: Voice)

Step 4: In the **SSID** box, enter the voice WLAN name, and then click **Apply**. (Example: WLAN-Voice)

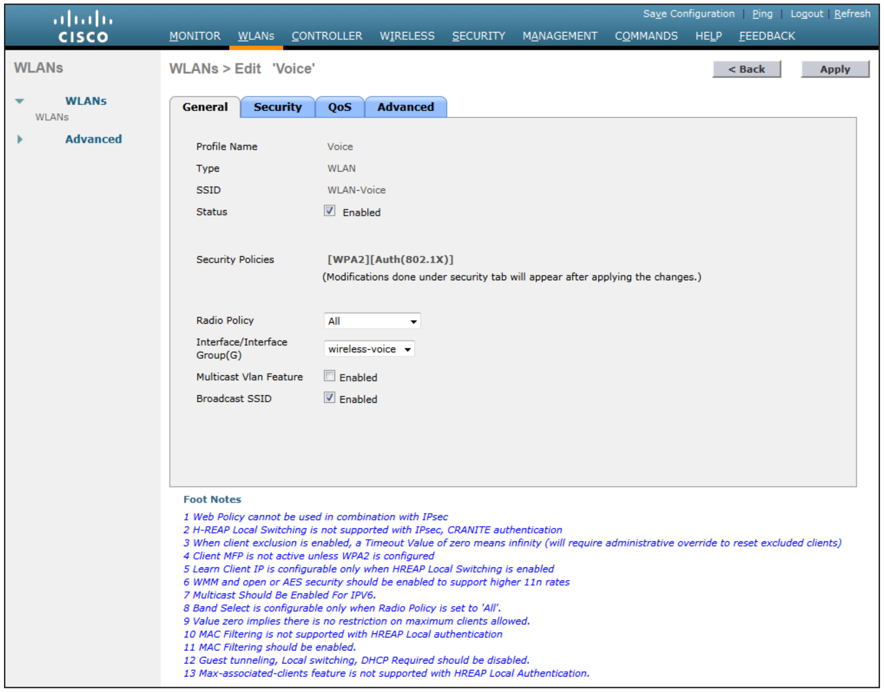

Save Configuration | Ping | Logout | Refresh
MONITOR WLANs CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP FEEDBACK
WLANs
WLANs
WLANs
Advanced
< Back
Apply

WLANs > New

Type	WLAN
Profile Name	Voice
SSID	WLAN-Voice
ID	2

Step 5: On the General tab, to the right of **Status**, select **Enabled**.

Step 6: In the **Interface** list, choose the interface created in Procedure 2. (Example: Wireless-Voice)


Save Configuration | Ping | Logout | Refresh
MONITOR WLANs CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP FEEDBACK
WLANs
WLANs
WLANs
Advanced
< Back
Apply
General
Security
QoS
Advanced

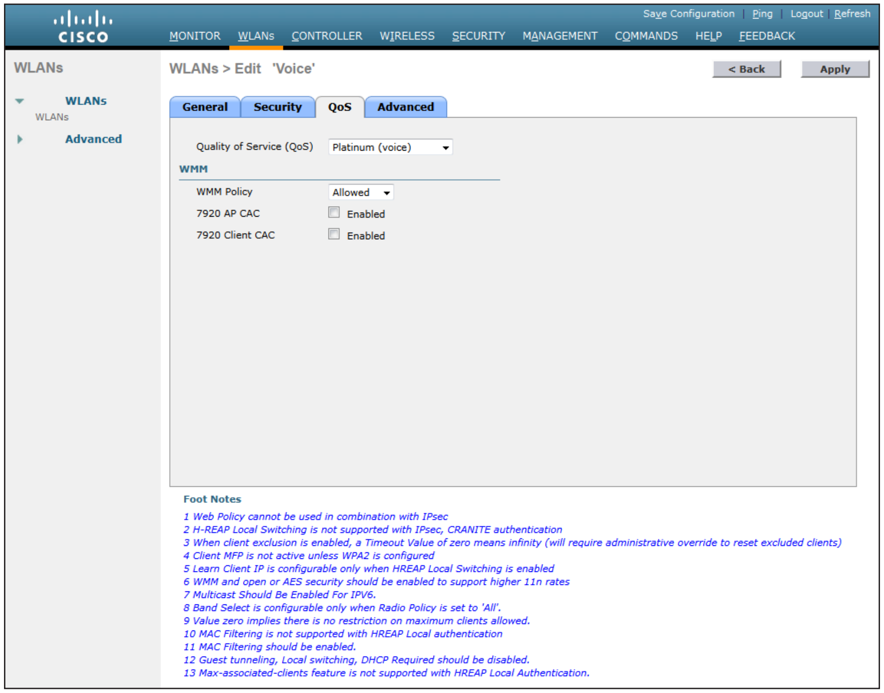
WLANs > Edit 'Voice'

Profile Name	Voice
Type	WLAN
SSID	WLAN-Voice
Status	☑ Enabled
Security Policies	[WPA2][Auth(802.1X)] (Modifications done under security tab will appear after applying the changes.)
Radio Policy	All
Interface/Interface Group(G)	wireless-voice
Multicast Vlan Feature	□ Enabled
Broadcast SSID	☑ Enabled

Foot Notes

1 Web Policy cannot be used in combination with IPsec
2 H-REAP Local Switching is not supported with IPsec, CRANITE authentication
3 When client exclusion is enabled, a Timeout Value of zero means infinity (will require administrative override to reset excluded clients)
4 Client MFP is not active unless WPA2 is configured
5 Learn Client IP is configurable only when HREAP Local Switching is enabled
6 WMM and open or AES security should be enabled to support higher 11n rates
7 Multicast Should Be Enabled For IPV6.
8 Band Select is configurable only when Radio Policy is set to 'All'.
9 Value zero implies there is no restriction on maximum clients allowed.
10 MAC Filtering is not supported with HREAP Local authentication
11 MAC Filtering should be enabled.
12 Guest tunneling, Local switching, DHCP Required should be disabled.
13 Max-associated-clients feature is not supported with HREAP Local Authentication.

Step 7: Click the **QoS** tab, and in the **Quality of Service (QoS)** list, choose **Platinum**.


Save Configuration | Ping | Logout | Refresh
MONITOR WLANs CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP FEEDBACK
WLANs
WLANs
WLANs
Advanced
< Back
Apply
General
Security
QoS
Advanced

WLANs > Edit 'Voice'

Quality of Service (QoS): Platinum (voice)

WMM

WMM Policy: Allowed

7920 AP CAC: □ Enabled

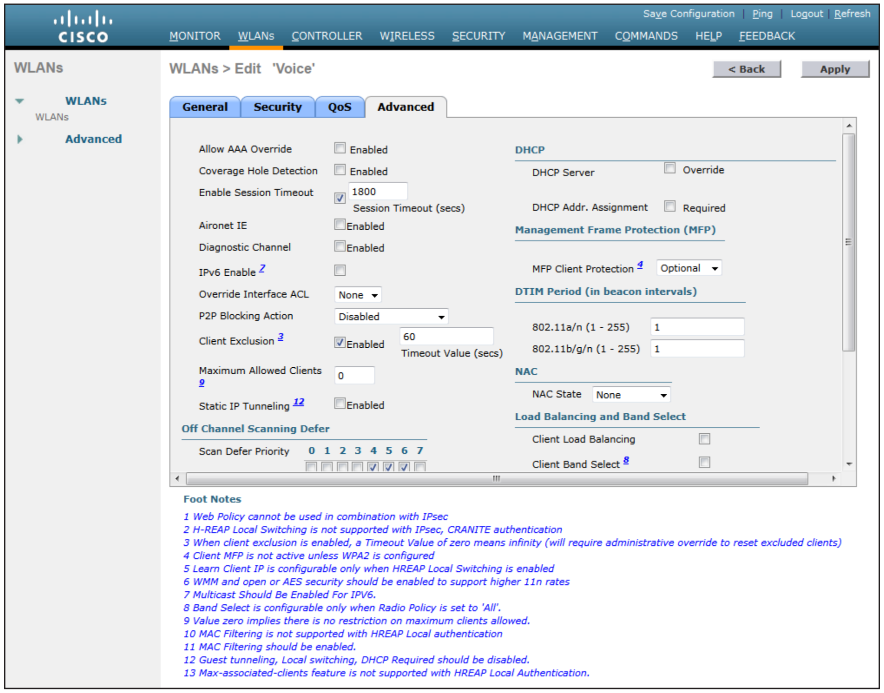
7920 Client CAC: □ Enabled

Foot Notes

1 Web Policy cannot be used in combination with IPsec
2 H-REAP Local Switching is not supported with IPsec, CRANITE authentication
3 When client exclusion is enabled, a Timeout Value of zero means infinity (will require administrative override to reset excluded clients)
4 Client MFP is not active unless WPA2 is configured
5 Learn Client IP is configurable only when HREAP Local Switching is enabled
6 WMM and open or AES security should be enabled to support higher 11n rates
7 Multicast Should Be Enabled For IPV6.
8 Band Select is configurable only when Radio Policy is set to 'All'.
9 Value zero implies there is no restriction on maximum clients allowed.
10 MAC Filtering is not supported with HREAP Local authentication
11 MAC Filtering should be enabled.
12 Guest tunneling, Local switching, DHCP Required should be disabled.
13 Max-associated-clients feature is not supported with HREAP Local Authentication.

Step 8: Click the **Advanced** tab, and then clear **Coverage Hole Detection**.

Step 9: Clear **Aironet IE**, and then click **Apply**.


Save Configuration | Ping | Logout | Refresh
MONITOR WLANs CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP FEEDBACK
WLANs
WLANs
WLANs
Advanced
< Back
Apply
General
Security
QoS
Advanced

WLANs > Edit 'Voice'

Allow AAA Override: □ Enabled

Coverage Hole Detection: □ Enabled

Enable Session Timeout: ☑ 1800 Session Timeout (secs)

Aironet IE: □ Enabled

Diagnostic Channel: □ Enabled

IPv6 Enable [7]: □

Override Interface ACL: None

P2P Blocking Action: Disabled

Client Exclusion [3]: ☑ Enabled 60 Timeout Value (secs)

Maximum Allowed Clients [9]: 0

Static IP Tunneling [12]: □ Enabled

Off Channel Scanning Defer

Scan Defer Priority: 0 □ 1 □ 2 □ 3 □ 4 ☑ 5 ☑ 6 ☑ 7 □

DHCP

DHCP Server: □ Override

DHCP Addr. Assignment: □ Required

Management Frame Protection (MFP)

MFP Client Protection [4]: Optional

DTIM Period (in beacon intervals)

802.11a/n (1 - 255): 1

802.11b/g/n (1 - 255): 1

NAC

NAC State: None

Load Balancing and Band Select

Client Load Balancing: □

Client Band Select [8]: □

Foot Notes

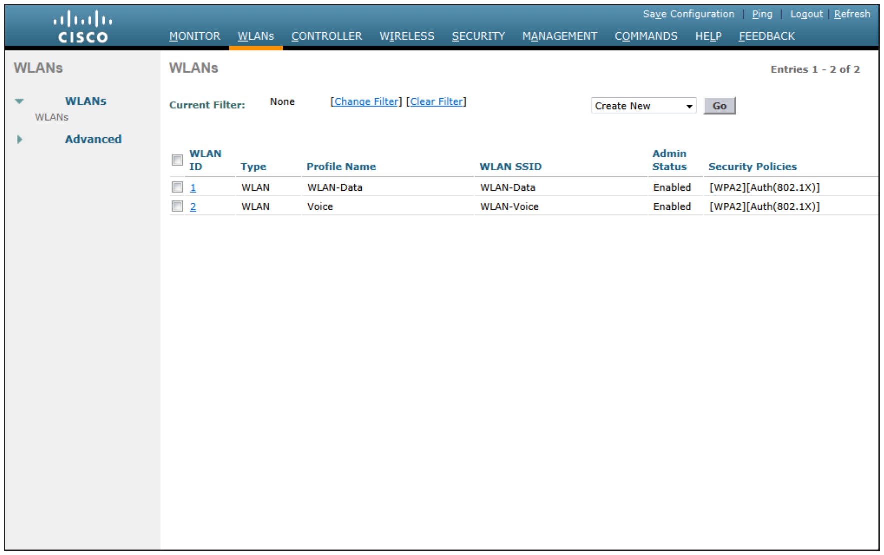
1 Web Policy cannot be used in combination with IPsec
2 H-REAP Local Switching is not supported with IPsec, CRANITE authentication
3 When client exclusion is enabled, a Timeout Value of zero means infinity (will require administrative override to reset excluded clients)
4 Client MFP is not active unless WPA2 is configured
5 Learn Client IP is configurable only when HREAP Local Switching is enabled
6 WMM and open or AES security should be enabled to support higher 11n rates
7 Multicast Should Be Enabled For IPV6.
8 Band Select is configurable only when Radio Policy is set to 'All'.
9 Value zero implies there is no restriction on maximum clients allowed.
10 MAC Filtering is not supported with HREAP Local authentication
11 MAC Filtering should be enabled.
12 Guest tunneling, Local switching, DHCP Required should be disabled.
13 Max-associated-clients feature is not supported with HREAP Local Authentication.

Procedure 6 Configure the remote LAN

A remote LAN is similar to a WLAN except it is mapped to one of the Ethernet ports on the back of the Cisco OfficeExtend Access Point.

Step 1: Navigate to **WLANs**.

Step 2: In the drop-down list, choose **Create New**, and then click **Go**.


Save Configuration | Ping | Logout | Refresh
cisco
MONITOR WLANs CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP FEEDBACK
WLANs
WLANs
WLANs
Advanced
Go

WLANs

Entries 1 - 2 of 2

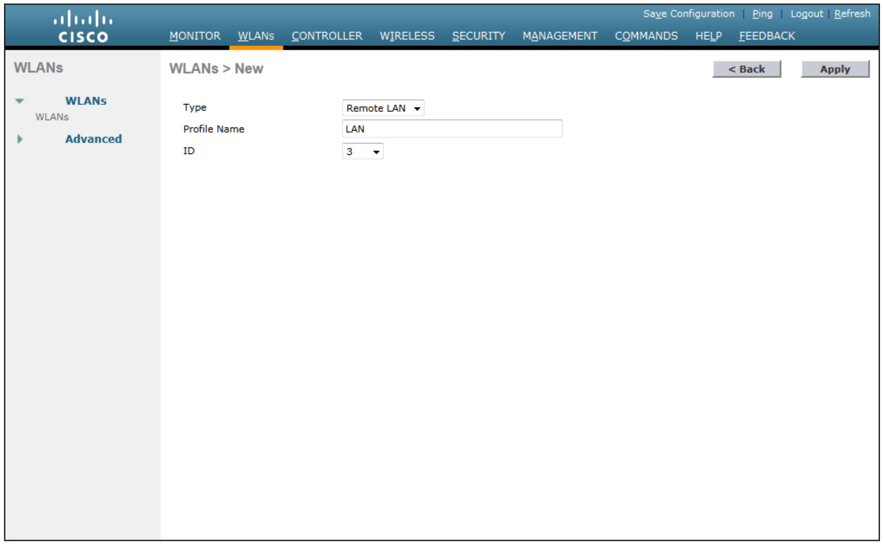
Current Filter: None [Change Filter] [Clear Filter]

Create New

	WLAN ID	Type	Profile Name	WLAN SSID	Admin Status	Security Policies
□	1	WLAN	WLAN-Data	WLAN-Data	Enabled	[WPA2][Auth(802.1X)]
□	2	WLAN	Voice	WLAN-Voice	Enabled	[WPA2][Auth(802.1X)]

Step 3: In the **Type** list, choose **Remote LAN**.

Step 4: Enter the **Profile Name**, and then click **Apply**. (Example: LAN)

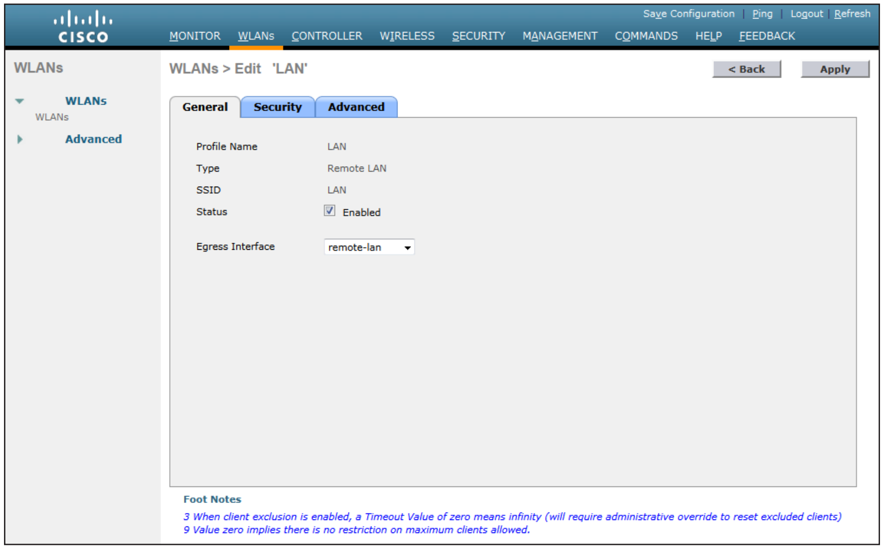

Save Configuration | Ping | Logout | Refresh
cisco
MONITOR WLANs CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP FEEDBACK
WLANs
WLANs
WLANs
Advanced
< Back
Apply

WLANs > New

Type	Remote LAN
Profile Name	LAN
ID	3

Step 5: On the General tab, to the right of **Status**, select **Enabled**.

Step 6: In the **Interface** list, choose the interface created in Procedure 3. (Example: Remote-LAN)


Save Configuration | Ping | Logout | Refresh
cisco
MONITOR WLANs CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP FEEDBACK
WLANs
WLANs
WLANs
Advanced
< Back
Apply
General
Security
Advanced

WLANs > Edit 'LAN'

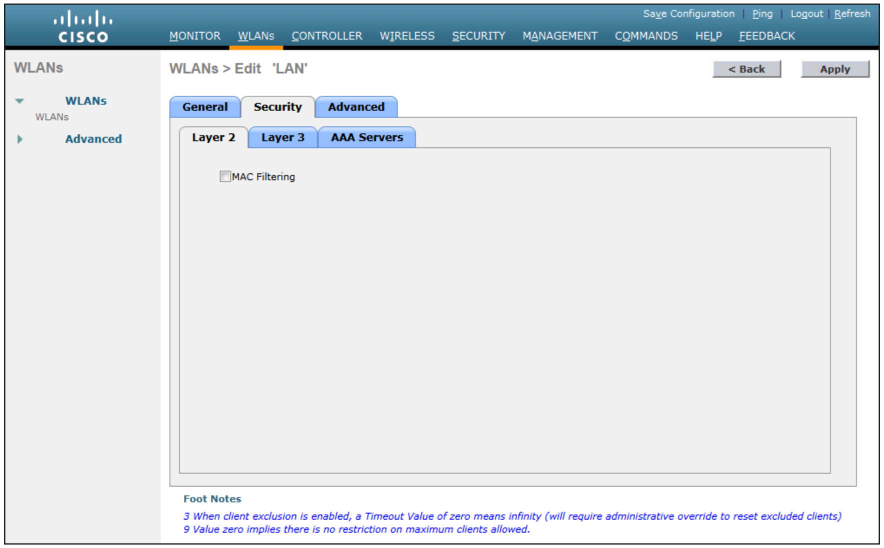
Profile Name	LAN
Type	Remote LAN
SSID	LAN
Status	☑ Enabled
Egress Interface	remote-lan

Foot Notes

3 When client exclusion is enabled, a Timeout Value of zero means infinity (will require administrative override to reset excluded clients)
9 Value zero implies there is no restriction on maximum clients allowed.

Step 7: Click the **Security** tab.

Step 8: On the Layer 2 tab, clear **MAC Filtering**, and then click **Apply**.


Save Configuration | Ping | Logout | Refresh
cisco
MONITOR WLANs CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP FEEDBACK
WLANs
WLANs
WLANs
Advanced
< Back
Apply
General
Security
Advanced
Layer 2
Layer 3
AAA Servers

WLANs > Edit 'LAN'

□ MAC Filtering

Foot Notes

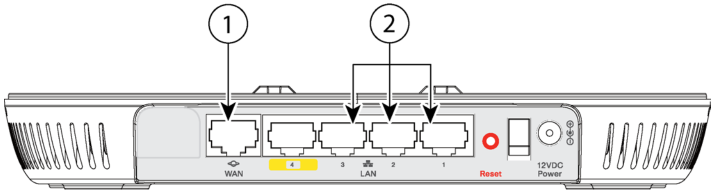
3 When client exclusion is enabled, a Timeout Value of zero means infinity (will require administrative override to reset excluded clients)
9 Value zero implies there is no restriction on maximum clients allowed.

Process

Configuring Cisco OfficeExtend AP—Dedicated Deployment

1. Configure the Cisco OfficeExtend AP

Procedure 1 Configure the Cisco OfficeExtend AP



Step 1: Connect the WAN port on the back of the Cisco OfficeExtend Access Point to your home router/gateway. The Cisco OfficeExtend Access Point gets an IP address from the home router/gateway.

Tech Tip

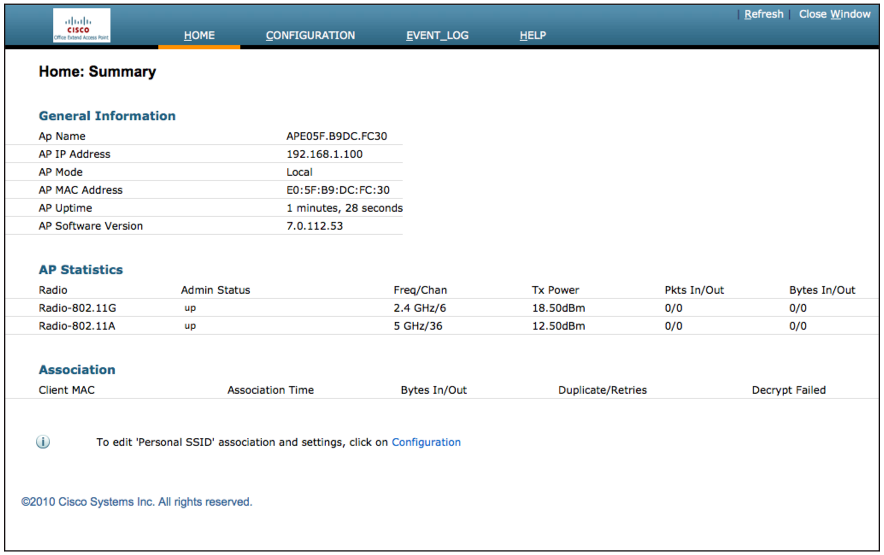
The Cisco OfficeExtend Access Point is not designed to replace the functionality of a home router, and it should not be connected directly to the service provider gateway.

Step 2: After the Cisco OfficeExtend Access Point has started, connect a computer to Ethernet port 1, 2, or 3. The computer gets an IP address from the default DHCP address pool of 10.0.0.0/24.

Step 3: Navigate to the Cisco OfficeExtend Access Point by using its default IP address: http://10.0.0.1/

Step 4: Log in to the Administration page by using the default credentials admin/admin.

Step 5: On the Cisco OfficeExtend Access Point Welcome page, click **Enter**. The Summary page appears.



Home: Summary

General Information

Ap Name	APE05F.B9DC.FC30
AP IP Address	192.168.1.100
AP Mode	Local
AP MAC Address	E0:5F:B9:DC:FC:30
AP Uptime	1 minutes, 28 seconds
AP Software Version	7.0.112.53

AP Statistics

Radio	Admin Status	Freq/Chan	Tx Power	Pkts In/Out	Bytes In/Out
Radio-802.11G	up	2.4 GHz/6	18.50dBm	0/0	0/0
Radio-802.11A	up	5 GHz/36	12.50dBm	0/0	0/0

Association

Client MAC	Association Time	Bytes In/Out	Duplicate/Retries	Decrypt Failed

To edit 'Personal SSID' association and settings, click on Configuration

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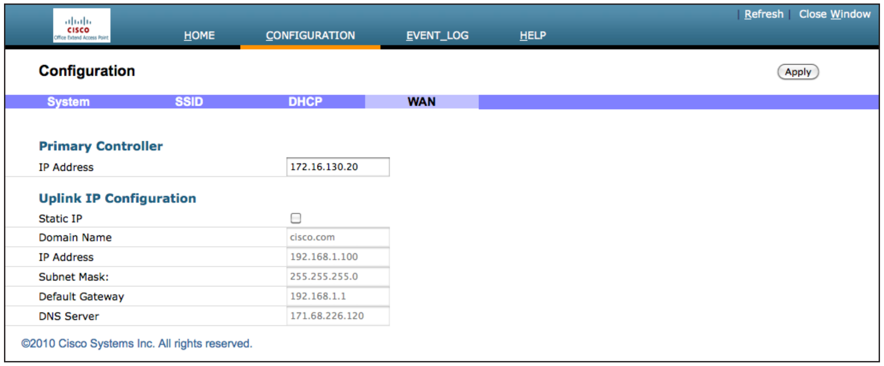
Step 6: Navigate to **Configuration > WAN**.

Step 7: In the **Primary Controller IP Address** box, enter the outside IP address of the primary WLC, and then click **Apply**. (Example: 172.16.130.20)



Configuration

Primary Controller

IP Address	172.16.130.20

Uplink IP Configuration

Static IP	□
Domain Name	cisco.com
IP Address	192.168.1.100
Subnet Mask:	255.255.255.0
Default Gateway	192.168.1.1
DNS Server	171.68.226.120

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Step 8: On the verification screen that appears, click **Continue**.

The Cisco OfficeExtend Access Point connects to the controller and downloads the current software image. Allow 5 minutes for the device to download and reboot with the new code and configuration.

Tech Tip

After the access point makes a connection to the WLC, the Status LED on the top of the access point flashes. The Status LED continues flashing until the download is complete. When the download is complete, your access point restarts. After the access point connects to the controller again, the Status LED is displayed as solid blue or purple.

Process

Configuring WLC Resiliency—Dedicated Deployment

1. Configure the resilient WLC
2. Configure APs for resiliency

This design uses two WLCs. The first is the primary controller, and in this process, you configure all of the Cisco OfficeExtend Access Points to register to it.

The secondary controller, also called the *resilient controller*, provides resiliency in case the primary controller or Internet connection fails. Under normal operation, there will not be any Cisco OfficeExtend Access Points registered to the resilient controller.

Procedure 1 Configure the resilient WLC

On the resilient WLC, repeat the procedures in the “Configuring the WLC (Dedicated Deployment)” process.

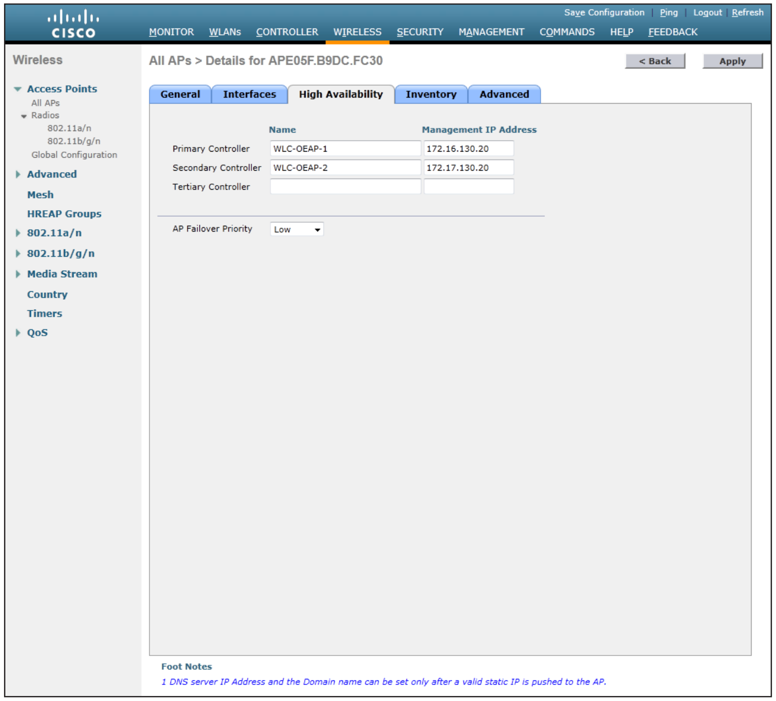
Procedure 2 Configure APs for resiliency

Step 1: On the primary WLC, navigate to **Wireless**, and then select the desired Cisco OfficeExtend Access Point.

Step 2: Click the **High Availability** tab.

Step 3: In the **Primary Controller** box, enter the name and management IP address of the primary WLC. (Example: WLC-OEAP-1 / 172.16.130.20)

Step 4: In the **Secondary Controller** box, enter the name and management IP address of the resilient WLC, and then click **Apply**. (Example: WLC-OEAP-2 / 172.17.130.20)



All APs > Details for APE05F.B9DC.FC30

	Name	Management IP Address
Primary Controller	WLC-OEAP-1	172.16.130.20
Secondary Controller	WLC-OEAP-2	172.17.130.20
Tertiary Controller		

AP Failover Priority: Low

Foot Notes

1 DNS server IP Address and the Domain name can be set only after a valid static IP is pushed to the AP.

Shared Deployment

Process

Configuring Internet Edge—Shared Deployment

1. Configure Network Address Translation
2. Configure security policy

Procedure 1 Configure Network Address Translation

The LAN network uses private network (RFC 1918) addressing that is not Internet-routable, so the firewall must translate the internal address of the WLC to an outside public address. The example private address–to–public IP address mapping is shown in the following table.

WLC DMZ address	WLC public address (externally routable after NAT)
10.4.46.64	172.16.130.20
10.4.46.65	172.16.130.21

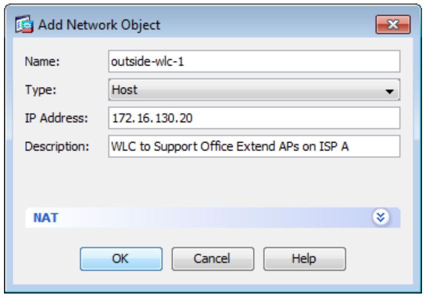
Step 1: Navigate to **Configuration > Firewall > Objects > Network Objects/Groups**.

First, add a network object for the public address of the WLC.

Step 2: Click **Add > Network Object**.

Step 3: On the Add Network Object dialog box, in the **Name** box, enter a description for the primary WLC's public IP address. (Example: outside-wlc-1)

Step 4: In the **IP Address** box, enter the primary WLC's public IP address, and then click **OK**. (Example: 172.16.130.20)



Add Network Object

Name: outside-wlc-1

Type: Host

IP Address: 172. 16. 130. 20

Description: WLC to Support Office Extend APs on ISP A

Next, you add a network object for the private address of the WLC.

Step 5: Click **Add > Network Object**.

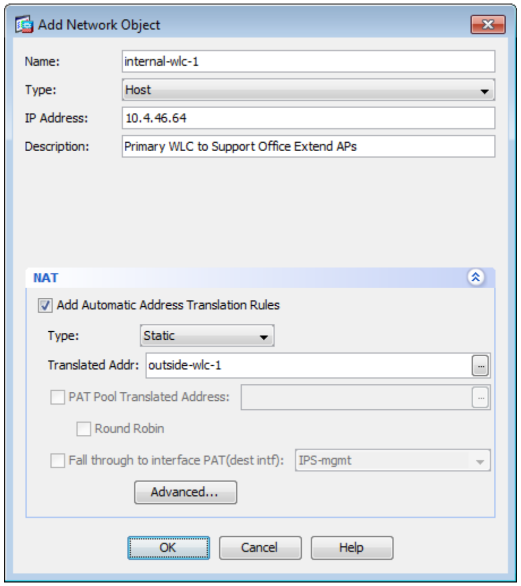
Step 6: In the Add Network Object dialog box, in the **Name** box, enter a description for the primary WLC's private IP address. (Example: internal-wlc-1)

Step 7: In the **IP Address** box, enter the primary WLC's private IP address. (Example: 10.4.46.64)

Step 8: Click the two down arrows. The NAT pane expands.

Step 9: Select **Add Automatic Address Translation Rules**.

Step 10: In the **Translated Addr** list, choose the network object created in Step 2.



Add Network Object

Name: internal-wlc-1

Type: Host

IP Address: 10.4.46.64

Description: Primary WLC to Support Office Extend APs

NAT

☑ Add Automatic Address Translation Rules

Type: Static

Translated Addr: outside-wlc-1

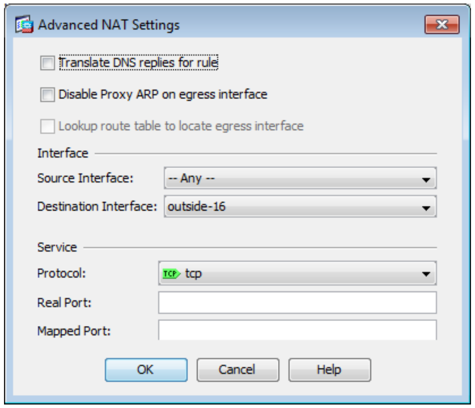
□ PAT Pool Translated Address:

□ Round Robin

□ Fall through to interface PAT(dest intf): IPS-mgmt

Step 11: Click **Advanced**.

Step 12: In the **Destination Interface** list, choose the interface name for the primary Internet connection, and then click **OK**. (Example: outside-16)



Advanced NAT Settings

□ Translate DNS replies for rule

□ Disable Proxy ARP on egress interface

□ Lookup route table to locate egress interface

Interface

Source Interface: -- Any --

Destination Interface: outside-16

Service

Protocol: tcp

Real Port:

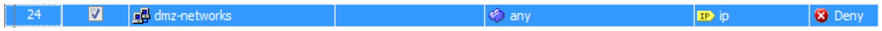
Mapped Port:

Step 13: Repeat Step 1 through Step 12 for the resilient WLC.

Procedure 2 Configure security policy

Step 1: Navigate to **Configuration > Firewall > Access Rules**.

Step 2: Click the rule that denies traffic from the DMZ toward other networks.



24	☑	dmz-networks	any	ip	Deny

Now you enable the Cisco OfficeExtend Access Points to communicate with the WLCs in the DMZ using CAPWAP.

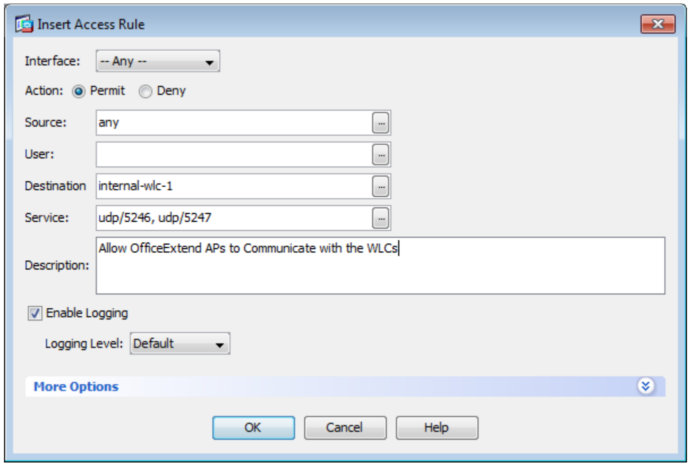
Step 3: Click **Add > Insert**.

Step 4: In the Internet Access Rule dialog box, in the **Interface** list, choose **Any**.

Step 5: To the right of Action, select **Permit**.

Step 6: In the **Destination** list, choose the network object group created in Procedure 1, Step 5. (Example: internal-wlc-1)

Step 7: In the **Service** list, enter **udp/5246, udp/5247**, click **OK**, and then click **Apply**.



Insert Access Rule

Interface: -- Any --

Action: ● Permit ○ Deny

Source: any

User:

Destination internal-wlc-1

Service: udp/5246, udp/5247

Description: Allow OfficeExtend APs to Communicate with the WLCs

☑ Enable Logging

Logging Level: Default

Process

Configuring LAN Distribution Switch—Shared Deployment

1. Configure the LAN distribution switch

Procedure 1 Configure the LAN distribution switch

The VLANs used in the following configuration examples are:

- Wireless data—VLAN 116, IP: 10.4.144.0/22
- Wireless voice—VLAN 120, IP 10.4.148.0/22
- Remote LAN—VLAN 252, IP 10.4.152.0/22

VLANs 116 and 120 were configured in the *Cisco SBA—Borderless Networks Wireless LAN Deployment Guide* and will be re-used to extend the wireless LAN to teleworkers' homes. VLAN 252 is a separate VLAN that you will add to the LAN distribution switch to provide connectivity for hosts that are connected to the Home Office LAN port on the Cisco OfficeExtend Access Point.

Step 1: On the LAN distribution switch, create the wireless VLANs that you are connecting to the distribution switch.

```
vlan 252
 name OEAP_RemoteLAN
```

Step 2: Configure a VLAN interface (SVI) for each VLAN so devices in the VLAN can communicate with the rest of the network.

```
interface Vlan252
 description OEAP Remote LAN Data Network
 ip address 10.4.152.1 255.255.252.0
 no shutdown
```

Step 3: Add the remote LAN's VLAN to the interfaces that connect to the primary and resilient controllers.

If you have deployed a Cisco 5500 Series Wireless LAN Controller, configure the EtherChannel trunk.

```
interface range Port-channel11
 description Trunk to WLC-1
 switchport trunk allowed vlan add 252
```

If you have deployed a Cisco 2500 Series Wireless LAN Controller, configure the Ethernet interface trunk.

```
interface GigabitEthernet [port]
 switchport trunk allowed vlan add 252
```

Process

Configuring WLC—Shared Deployment

1. Configure the WLC for NAT
2. Create the remote LAN interface
3. Configure the remote LAN
4. Configure the Cisco OfficeExtend AP Group

This WLC configuration is built upon the wireless LAN controller configuration from the *Cisco SBA—Borderless Networks Wireless LAN Deployment Guide*.

Procedure 1 Configure the WLC for NAT

The Internet edge firewall translates the IP address of the WLC's management interface to a publicly reachable IP address so Cisco OfficeExtend Access Points at teleworker locations can reach the WLC. However, in order for the Cisco OfficeExtend Access Points to be able to communicate with the WLC, the publicly reachable address must also be configured on the WLC management interface.

Step 1: Using the CLI, configure the controller to respond with the NAT and internal IP address during AP discovery.

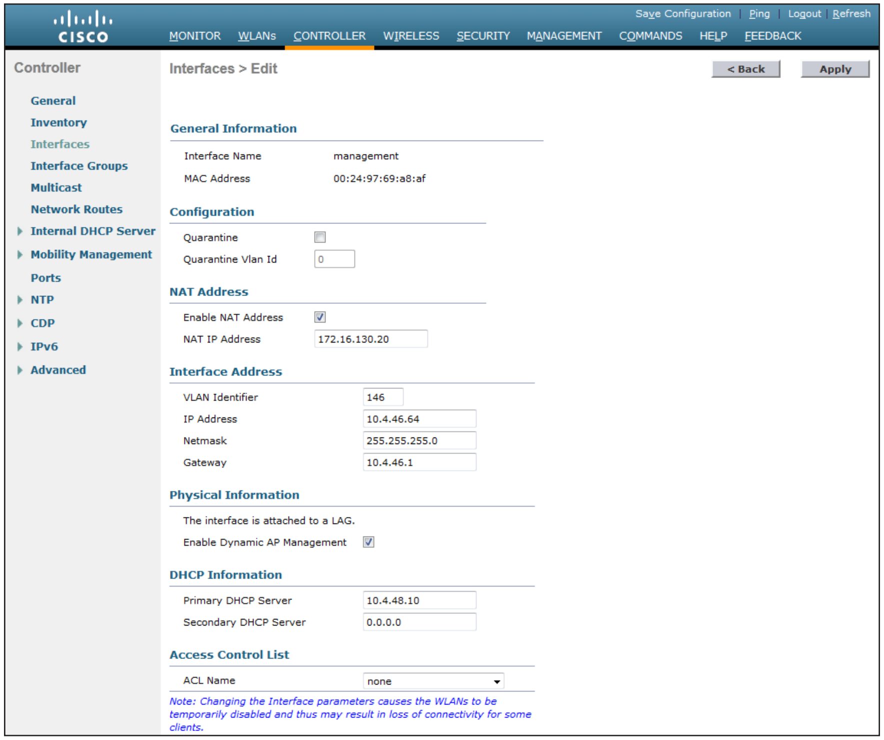
```
config network ap-discovery nat-ip-only disable
```

Step 2: Log in to the Cisco Wireless LAN Controller Administration page.

Step 3: In **Controller > Interfaces**, click the **management** interface.

Step 4: Select **Enable NAT Address**.

Step 5: In the **NAT IP Address** box, enter the publicly reachable IP address, and then click **Apply**. (Example: 172.16.130.20)



Interfaces > Edit

General Information

Interface Name management
MAC Address 00:24:97:69:a8:af

Configuration

Quarantine □
Quarantine Vlan Id 0

NAT Address

Enable NAT Address ☑
NAT IP Address 172.16.130.20

Interface Address

VLAN Identifier 146
IP Address 10.4.46.64
Netmask 255.255.255.0
Gateway 10.4.46.1

Physical Information

The interface is attached to a LAG.
Enable Dynamic AP Management ☑

DHCP Information

Primary DHCP Server 10.4.48.10
Secondary DHCP Server 0.0.0.0

Access Control List

ACL Name none

Note: Changing the Interface parameters causes the WLANs to be temporarily disabled and thus may result in loss of connectivity for some clients.

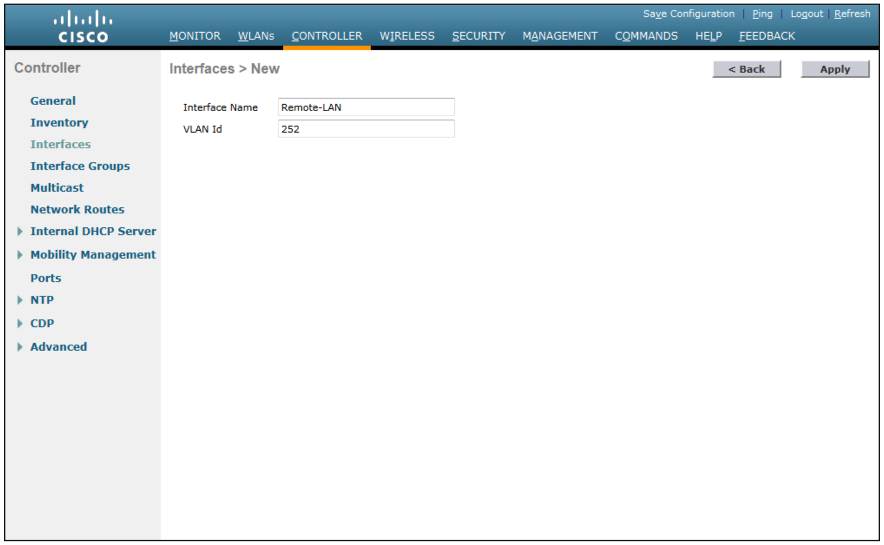
Procedure 2 Create the remote LAN interface

Next, you add an interface that allows devices on the remote LAN network to communicate with the rest of the organization.

Step 1: In **Controller>Interfaces**, click **New**.

Step 2: Enter the **Interface Name**. (Example: Remote-LAN)

Step 3: Enter the **VLAN Id**, and then click **Apply**. (Example: 252)



Interfaces > New

Interface Name Remote-LAN
VLAN Id 252

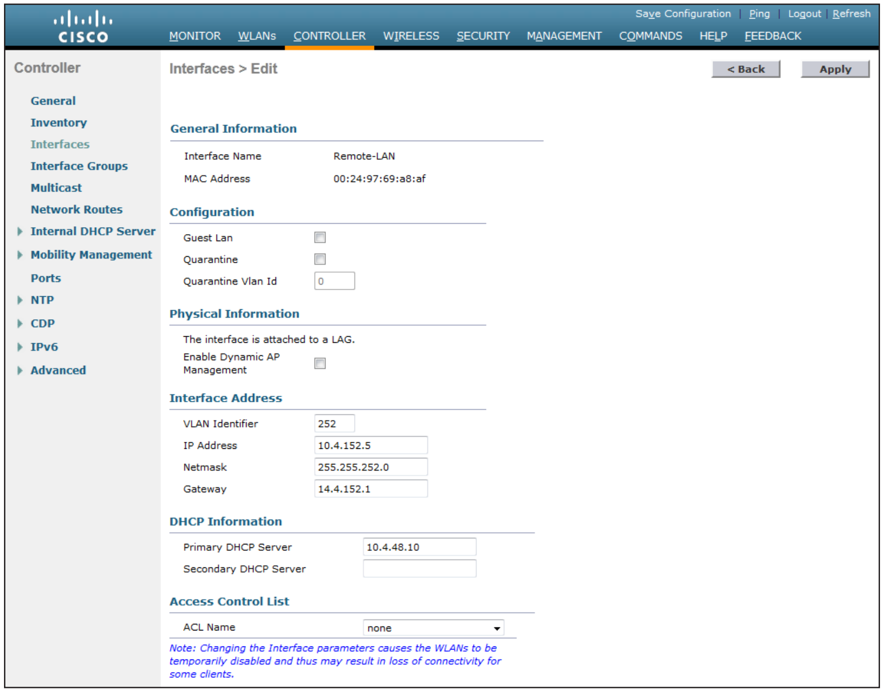
Step 4: If you have deployed a Cisco 2500 Series Wireless LAN Controller, in the **Port Number** box, enter the port that is connected to the LAN distribution switch. (Example: 1)

Step 5: In the **IP Address** box, enter the IP address to assign to the WLC interface. (Example: 10.4.152.5)

Step 6: Enter the **Netmask**. (Example: 255.255.252.0)

Step 7: In the **Gateway** box, enter the IP address of the VLAN interface defined in Step 2 of Procedure 1 in the previous process, “Configuring the LAN Distribution Switch (Shared Deployment).” (Example: 10.4.152.1)

Step 8: In the **Primary DHCP Server** box, enter the IP address of your organization's DHCP server, and then click **Apply**. (Example: 10.4.48.10)



Interfaces > Edit

General Information

Interface Name	Remote-LAN
MAC Address	00:24:97:69:a8:af

Configuration

Guest Lan	□
Quarantine	□
Quarantine Vlan Id	0

Physical Information

The interface is attached to a LAG.

Enable Dynamic AP Management	□

Interface Address

VLAN Identifier	252
IP Address	10.4.152.5
Netmask	255.255.252.0
Gateway	14.4.152.1

DHCP Information

Primary DHCP Server	10.4.48.10
Secondary DHCP Server	

Access Control List

ACL Name	none

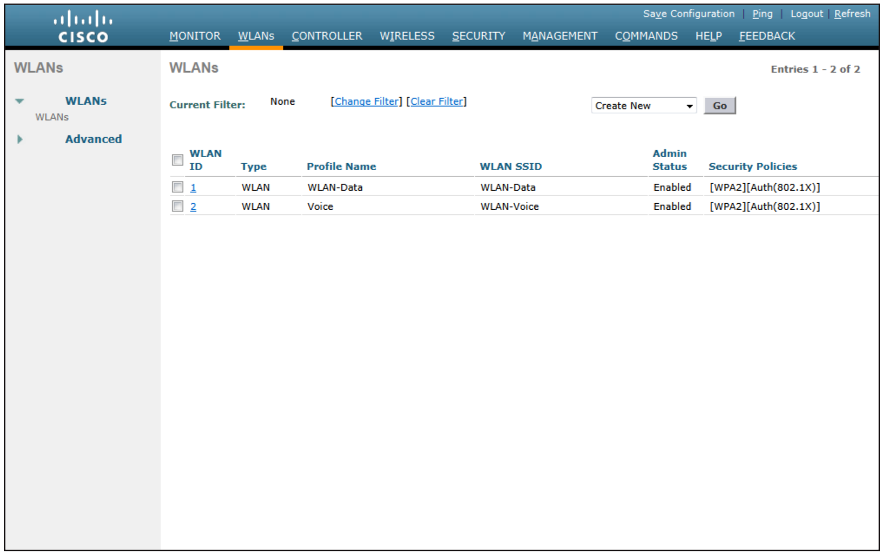
Note: Changing the Interface parameters causes the WLANs to be temporarily disabled and thus may result in loss of connectivity for some clients.

Procedure 3 Configure the remote LAN

A remote LAN is similar to a WLAN except it is mapped to one of the Ethernet ports on the back of the Cisco OfficeExtend Access Point.

Step 1: Navigate to **WLANs**.

Step 2: In the drop-down list, choose **Create New**, and then click **Go**.


Save Configuration | Ping | Logout | Refresh
MONITOR WLANs CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP FEEDBACK
WLANs
WLANs
WLANs
Advanced
[Change Filter] [Clear Filter]
Create New
Go

WLANs

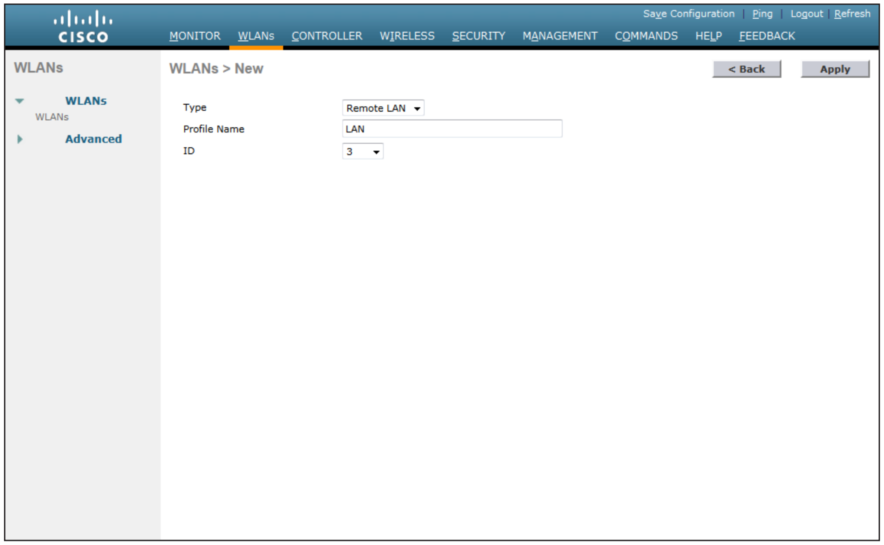
Entries 1 - 2 of 2

Current Filter: None

WLAN ID	Type	Profile Name	WLAN SSID	Admin Status	Security Policies
1	WLAN	WLAN-Data	WLAN-Data	Enabled	[WPA2][Auth(802.1X)]
2	WLAN	Voice	WLAN-Voice	Enabled	[WPA2][Auth(802.1X)]

Step 3: In the **Type** list, choose **Remote LAN**.

Step 4: Enter the **Profile Name**, and then click **Apply**. (Example: LAN)

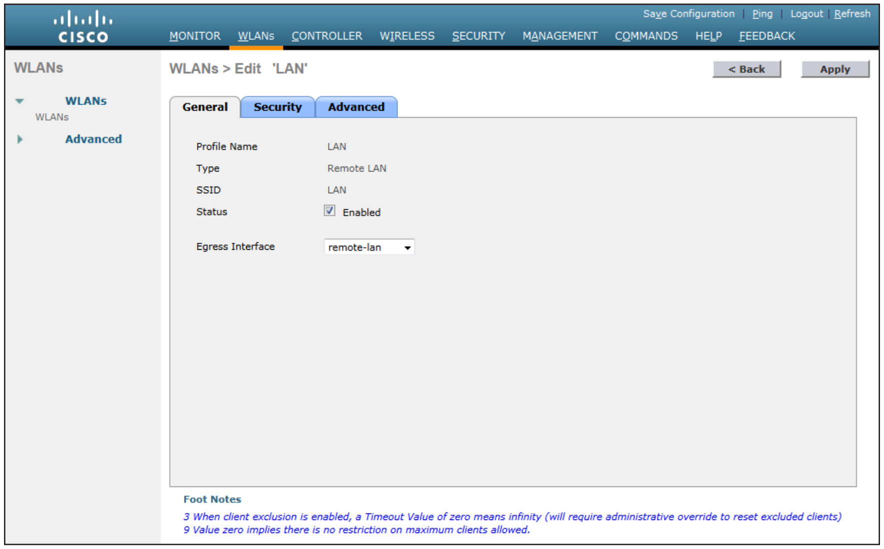

Save Configuration | Ping | Logout | Refresh
MONITOR WLANs CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP FEEDBACK
WLANs
WLANs
WLANs
Advanced
< Back
Apply

WLANs > New

Type	Remote LAN
Profile Name	LAN
ID	3

Step 5: On the General tab, next to **Status**, select **Enabled**.

Step 6: In the **Interface** list, choose the interface created in Procedure 2. (Example: Remote-LAN)


CISCO
Save Configuration | Ping | Logout | Refresh
MONITOR WLANs CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP FEEDBACK
WLANs
WLANs
WLANs
Advanced
< Back
Apply
General
Security
Advanced

WLANs > Edit 'LAN'

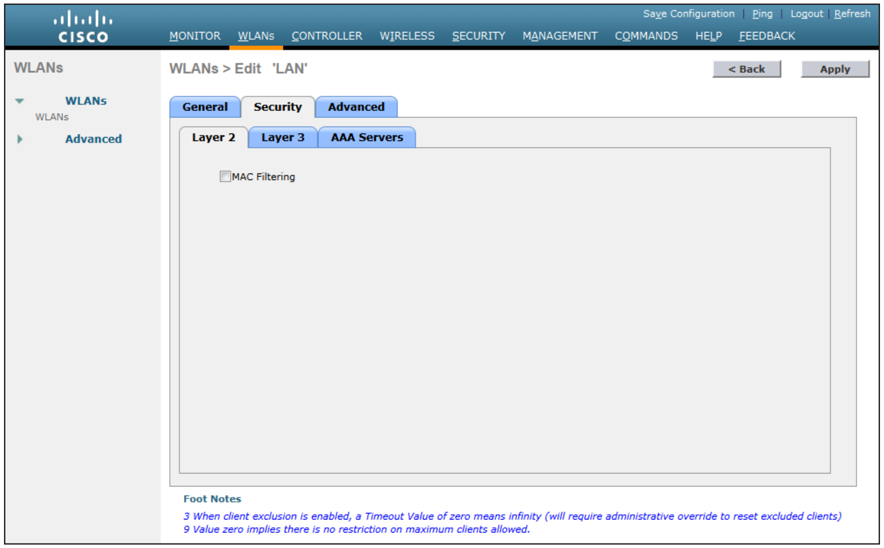
Profile Name	LAN
Type	Remote LAN
SSID	LAN
Status	☑ Enabled
Egress Interface	remote-lan

Foot Notes

3 When client exclusion is enabled, a Timeout Value of zero means infinity (will require administrative override to reset excluded clients)
9 Value zero implies there is no restriction on maximum clients allowed.

Step 7: Click the **Security** tab.

Step 8: On the Layer 2 tab, clear **MAC Filtering**, and then click **Apply**.


CISCO
Save Configuration | Ping | Logout | Refresh
MONITOR WLANs CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP FEEDBACK
WLANs
WLANs
WLANs
Advanced
< Back
Apply
General
Security
Advanced
Layer 2
Layer 3
AAA Servers

WLANs > Edit 'LAN'

☐ MAC Filtering

Foot Notes

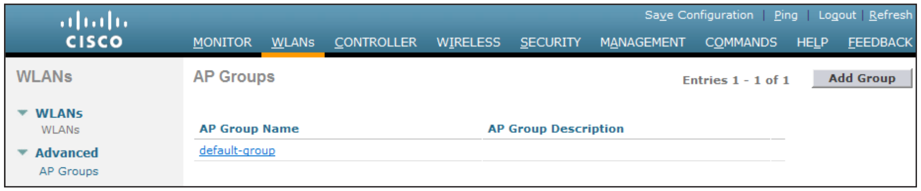
3 When client exclusion is enabled, a Timeout Value of zero means infinity (will require administrative override to reset excluded clients)
9 Value zero implies there is no restriction on maximum clients allowed.

Procedure 4 Configure the Cisco OfficeExtend AP Group

The Cisco OfficeExtend Access Point supports a maximum of two wireless LANs and one remote LAN. Teleworker sites offer the same SSIDs as the headquarters LAN in order to separate voice and data traffic. However, Cisco OfficeExtend Access Points should not offer the guest WLAN. OfficeExtend Access Points are assigned to a different access-point group that provides a different set of WLAN SSIDs. To offer the correct WLANs and the remote LAN for OfficeExtend Access Point–connected users, OfficeExtend Access Points must connect to a separate access point connection group than those that are connected to the headquarters or remote-site LANs. Access points are assigned to the OfficeExtend Access Point group by their MAC addresses, which you will need when you must revoke a teleworker's connectivity. You should maintain a list of access points' MAC address assignments to teleworkers.

Access points that are connected to the headquarters and remote-site LANs connect to the default group, which does not offer the Cisco OfficeExtend Access Point's remote LAN.

Step 1: Navigate to **WLANs > Advanced > AP Groups**, and then click **Add Group.**

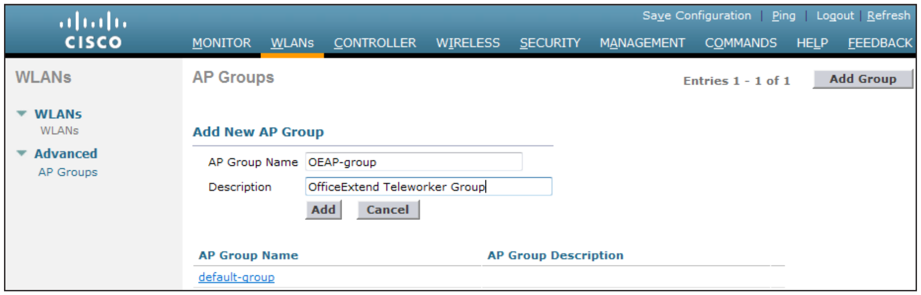

CISCO
Save Configuration | Ping | Logout | Refresh
MONITOR WLANs CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP FEEDBACK
WLANs
WLANs
WLANs
Advanced
AP Groups
Add Group

AP Groups

Entries 1 - 1 of 1

AP Group Name	AP Group Description
default-group	

Step 2: In the **AP Group Name** box, enter the name of the Cisco OfficeExtend teleworker access point group. (Example: OEAP-group)


CISCO
Save Configuration | Ping | Logout | Refresh
MONITOR WLANs CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP FEEDBACK
WLANs
WLANs
WLANs
Advanced
AP Groups
Add Group
Add
Cancel

AP Groups

Entries 1 - 1 of 1

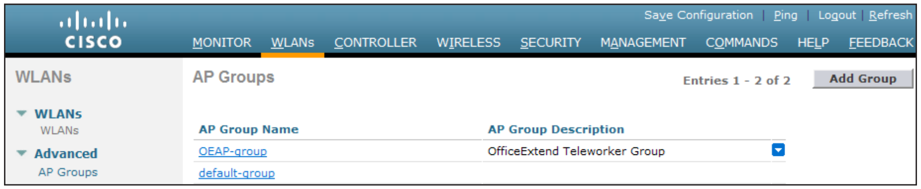
Add New AP Group

AP Group Name	OEAP-group
Description	OfficeExtend Teleworker Group

AP Group Name	AP Group Description
default-group	

Step 3: Click **Add.**

Step 4: On the WLANs > Advanced > AP Groups page, click the name of the access point group that you just created:



Save Configuration | Ping | Logout | Refresh
CISCO
MONITOR WLANs CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP FEEDBACK
WLANs
WLANs
WLANs
Advanced
AP Groups
Add Group

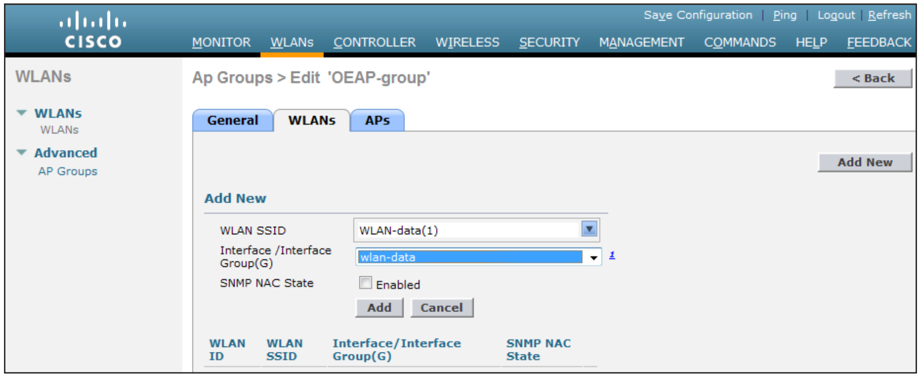
AP Groups

Entries 1 - 2 of 2

AP Group Name	AP Group Description
OEAP-group	OfficeExtend Teleworker Group
default-group	

Step 5: On the WLANs tab, click **Add New**, and from the WLAN SSID list, choose **WLAN-data**.

Step 6: In the **Interface/Interface Group** list, be sure that **wlan-data** is selected, and then click **Add**.



Save Configuration | Ping | Logout | Refresh
CISCO
MONITOR WLANs CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP FEEDBACK
WLANs
WLANs
WLANs
Advanced
AP Groups
< Back
General
WLANs
APs
Add New
Add
Cancel

Ap Groups > Edit 'OEAP-group'

Add New

WLAN SSID: WLAN-data(1)

Interface /Interface Group(G): wlan-data

SNMP NAC State: □ Enabled

WLAN ID	WLAN SSID	Interface/Interface Group(G)	SNMP NAC State

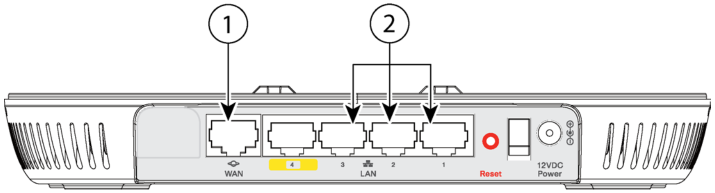
Step 7: Repeat Step 5 to add the **wlan-voice** and **remote-lan** SSIDs to the OEAP-group access point group.

Process

Configuring Cisco OfficeExtend AP—Shared Deployment

1. Configure the Cisco OfficeExtend AP

Procedure 1 Configure the Cisco OfficeExtend AP



Step 1: Connect the WAN port on the back of the Cisco OfficeExtend Access Point to your home router/gateway. The Cisco OfficeExtend Access Point gets an IP address from the home router/gateway.

Tech Tip

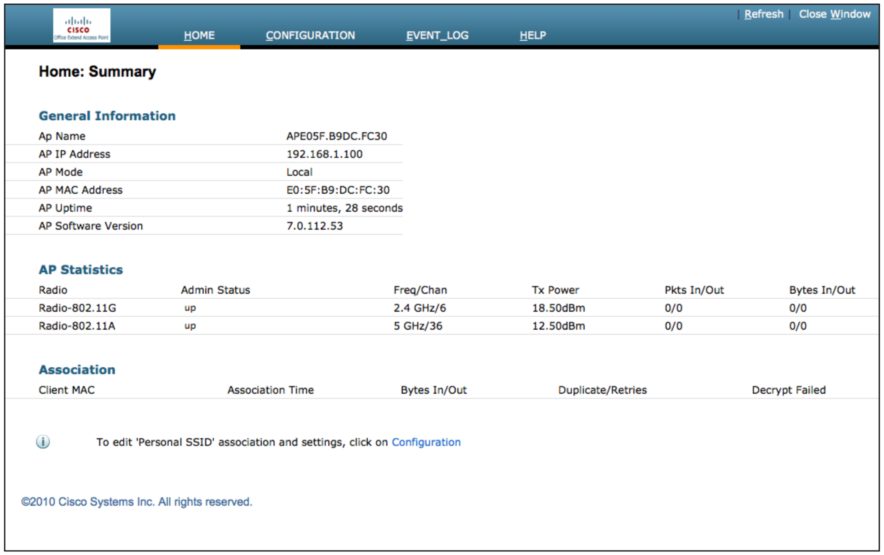
The Cisco OfficeExtend Access Point is not designed to replace the functionality of a home router, and it should not be connected directly to the service provider gateway.

Step 2: After the Cisco OfficeExtend Access Point has started, connect a computer to Ethernet port 1, 2, or 3. The computer gets an IP address from the default DHCP address pool of 10.0.0.0/24.

Step 3: Navigate to the Cisco OfficeExtend Access Point by using its default IP address: https://10.0.0.1/

Step 4: Log in to the Administration page by using the default credentials admin/admin.

Step 5: On the Cisco OfficeExtend Access Point Welcome page, click **Enter**. The Summary page appears.



Home: Summary

General Information

Ap Name	APE05F.B9DC.FC30
AP IP Address	192.168.1.100
AP Mode	Local
AP MAC Address	E0:5F:B9:DC:FC:30
AP Uptime	1 minutes, 28 seconds
AP Software Version	7.0.112.53

AP Statistics

Radio	Admin Status	Freq/Chan	Tx Power	Pkts In/Out	Bytes In/Out
Radio-802.11G	up	2.4 GHz/6	18.50dBm	0/0	0/0
Radio-802.11A	up	5 GHz/36	12.50dBm	0/0	0/0

Association

Client MAC	Association Time	Bytes In/Out	Duplicate/Retries	Decrypt Failed

To edit 'Personal SSID' association and settings, click on Configuration

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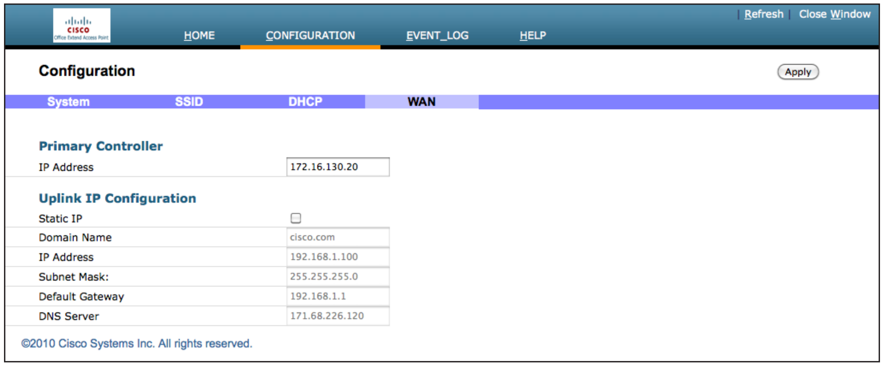
Step 6: Navigate to **Configuration > WAN**.

Step 7: In the **Primary Controller IP Address** box, enter the outside IP address of the primary WLC, and then click **Apply**. (Example: 172.16.130.20)



Configuration

Primary Controller

IP Address	172.16.130.20

Uplink IP Configuration

Static IP	□
Domain Name	cisco.com
IP Address	192.168.1.100
Subnet Mask:	255.255.255.0
Default Gateway	192.168.1.1
DNS Server	171.68.226.120

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Step 8: On the verification screen that appears, click **Continue**.

The Cisco OfficeExtend Access Point connects to the controller and downloads the current software image. Allow 5 minutes for the device to download and reboot with the new code and configuration.

Tech Tip

After the access point makes a connection to the WLC, the Status LED on the top of the access point flashes. The Status LED continues flashing until the download is complete. When the download is complete, your access point restarts. After the access point connects to the controller again, the Status LED is displayed as solid blue or purple.

Process

Configuring WLC Resiliency—Shared Deployment

1. Configure the resilient WLC
2. Configure access points for resiliency

This design uses two WLCs. The first is the primary controller, and in this process, you configure all of the Cisco OfficeExtend Access Points to register to it.

The secondary controller, also called the *resilient controller*, provides resiliency in case the primary controller or Internet connection fails. Under normal operation, there will not be any Cisco OfficeExtend Access Points registered to the resilient controller.

Procedure 1 Configure the resilient WLC

On the resilient WLC, repeat the procedures in the “Configuring the WLC (Shared Deployment)” process.

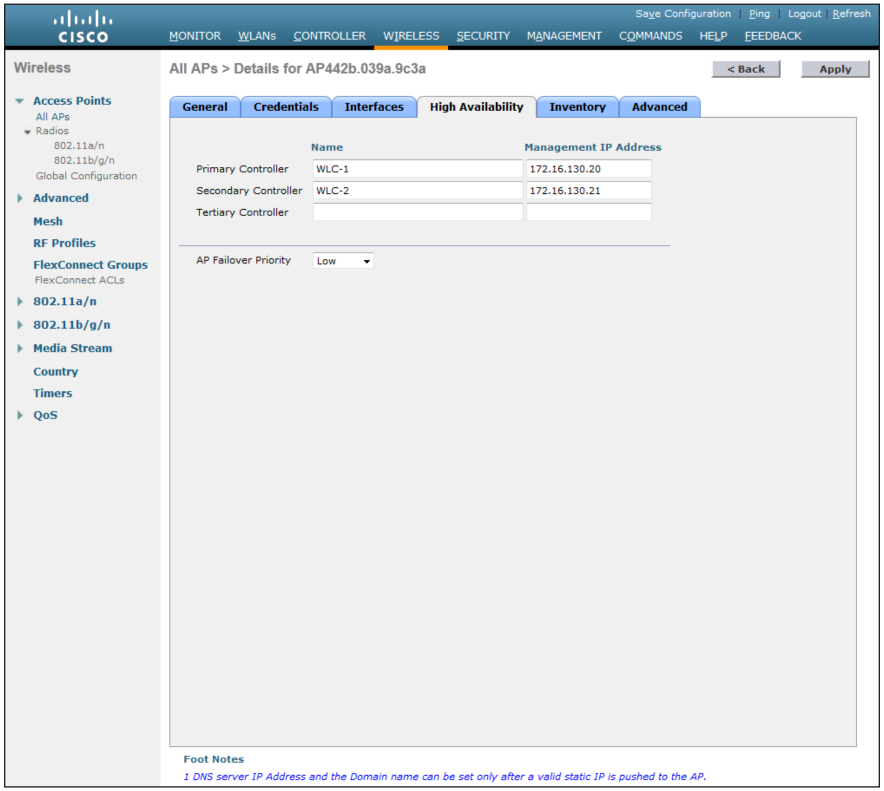
Procedure 2 Configure access points for resiliency

Step 1: On the primary WLC, navigate to **Wireless**, and select the desired Cisco OfficeExtend Access Point.

Step 2: Click the **High Availability** tab.

Step 3: In the **Primary Controller** box, enter the name and management IP address of the primary WLC. (Example: WLC-1 / 172.16.130.20)

Step 4: In the **Secondary Controller** box, enter the name and management IP address of the resilient WLC, and then click **Apply**. (Example: WLC-2 / 172.16.130.21)



All APs > Details for AP442b.039a.9c3a

	Name	Management IP Address
Primary Controller	WLC-1	172.16.130.20
Secondary Controller	WLC-2	172.16.130.21
Tertiary Controller		

AP Failover Priority: Low

Foot Notes

1 DNS server IP Address and the Domain name can be set only after a valid static IP is pushed to the AP.

Appendix A: Product List

Wireless LAN OfficeExtend Access Points

Functional Area	Product Description	Part Numbers	Software
Teleworker AP	Cisco Aironet 600 OfficeExtend Series Access Point: Dual-band Controller-based 802.11a/g/n	AIR-OEAP602I-x-K9	7.2.110.0

Wireless LAN Controllers

Functional Area	Product Description	Part Numbers	Software
OfficeExtend Controller	Cisco 5500 Series Wireless Controller for up to 500 Cisco access points	AIR-CT5508-500-K9	7.2.110.0
	Cisco 5500 Series Wireless Controller for up to 250 Cisco access points	AIR-CT5508-250-K9	
	Cisco 5500 Series Wireless Controller for up to 100 Cisco access points	AIR-CT5508-100-K9	
	Cisco 5500 Series Wireless Controller for up to 50 Cisco access points	AIR-CT5508-50-K9	
	Cisco 5500 Series Wireless Controller for up to 25 Cisco access points	AIR-CT5508-25-K9	
	Cisco 5500 Series Wireless Controller for up to 12 Cisco access points	AIR-CT5508-12-K9	
OfficeExtend Controller	Cisco 2500 Series Wireless Controller for up to 50 Cisco access points	AIR-CT2504-50-K9	7.2.110.0
	Cisco 2500 Series Wireless Controller for up to 25 Cisco access points	AIR-CT2504-25-K9	
	Cisco 2500 Series Wireless Controller for up to 15 Cisco access points	AIR-CT2504-15-K9	
	Cisco 2500 Series Wireless Controller for up to 5 Cisco access points	AIR-CT2504-5-K9	

Access Control

Functional Area	Product Description	Part Numbers	Software
Authentication Services	ACS 5.3 VMware Software and Base License	CSACS-5.3-VM-K9	5.3

Internet Edge

Functional Area	Product Description	Part Numbers	Software
Firewall	Cisco ASA 5545-X IPS Edition - security appliance	ASA5545-IPS-K9	ASA 8.6(1)1 IPS 7.1(4) E4
	Cisco ASA 5525-X IPS Edition - security appliance	ASA5525-IPS-K9	
	Cisco ASA 5515-X IPS Edition - security appliance	ASA5515-IPS-K9	
	Cisco ASA 5512-X IPS Edition - security appliance	ASA5512-IPS-K9	
	Cisco ASA5512-X Security Plus license	ASA5512-SEC-PL	
	Firewall Management	ASDM	6.6.114

Internet Edge LAN

Functional Area	Product Description	Part Numbers	Software
DMZ Switch	Cisco Catalyst 3750-X Series Stackable 24 10/100/1000 Ethernet ports	WS-C3750X-24T-S	15.0(1)SE2 IP Base

LAN Distribution Layer

Functional Area	Product Description	Part Numbers	Software
Modular Distribution Layer Virtual Switch Pair	Cisco Catalyst 6500 E-Series 6-Slot Chassis	WS-C6506-E	15.0(1)SY1 IP services
	Cisco Catalyst 6500 VSS Supervisor 2T with 2 ports 10GbE and PFC4	VS-S2T-10G	
	Cisco Catalyst 6500 16-port 10GbE Fiber Module w/DFC4	WS-X6816-10G-2T	
	Cisco Catalyst 6500 24-port GbE SFP Fiber Module w/DFC4	WS-X6824-SFP	
	Cisco Catalyst 6500 4-port 40GbE/16-port 10GbE Fiber Module w/DFC4	WS-X6904-40G-2T	
	Cisco Catalyst 6500 4-port 10GbE SFP+ adapter for WX-X6904-40G module	CVR-CFP-4SFP10G	
Modular Distribution Layer Switch	Cisco Catalyst 4507R+E 7-slot Chassis with 48Gbps per slot	WS-C4507R+E	3.3.0.SG(15.1-1SG) Enterprise Services
	Cisco Catalyst 4500 E-Series Supervisor Engine 7-E, 848Gbps	WS-X45-SUP7-E	
	Cisco Catalyst 4500 E-Series 24-port GbE SFP Fiber Module	WS-X4624-SFP-E	
	Cisco Catalyst 4500 E-Series 12-port 10GbE SFP+ Fiber Module	WS-X4712-SFP+E	
Stackable Distribution Layer Switch	Cisco Catalyst 3750-X Series Stackable 12 GbE SFP ports	WS-C3750X-12S-E	15.0(1)SE2 IP Services
	Cisco Catalyst 3750-X Series Two 10GbE SFP+ and Two GbE SFP ports network module	C3KX-NM-10G	
	Cisco Catalyst 3750-X Series Four GbE SFP ports network module	C3KX-NM-1G	

Appendix B: Changes

This appendix summarizes the changes to this guide since the previous Cisco SBA series.

- We incorporated a shared OfficeExtend and internal wireless design model into the guide.
- We made minor changes to improve the readability of this guide.

Notes

Feedback

Click here to provide feedback to Cisco SBA.

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