

# Cisco CallManager Express/Cisco Unity Express Configuration Example

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## Contents

### Introduction

#### Prerequisites

- Requirements
- Components Used
- Conventions

#### Configure

- Network Diagram
- Define a Local DHCP Server
- Configure the Router Interfaces
- Set Network Time Protocol
- Configure VLANs on a Catalyst Switch 3550
- Configure an Interface on a Catalyst Switch 3550
- Configure the Port to Connect to a Cisco 7960 IP Phone
- Configure the Cisco Unified CallManager Express Parameters
- Provision IP Phones
- Set Dial Plan on Cisco CallManager Express
- Connect to PSTN
- Activate IP Connectivity to Cisco Unity Express Software
- Configure Dial Peers for Cisco CallManager Express Phones to Call Cisco Unity Express Voicemail
- Configure Voicemail Access
- Configure MWIs
- Configure the Voicemail Application
- Configure Auto-Attendant Application
- Configure SIP Triggers for Applications
- Configure Users
- Configure Mailboxes

#### Verify

#### Troubleshoot

- Problem: User Cannot Log In Through the Cisco Unity Express Graphical User Interface (GUI)
  - Problem: IP Phone Cannot Hear Ringback or Busy Tone while Called IP Phone is Ringing or Busy
  - Problem: Calls from PSTN Fail to CUE AA via SIP Tunnel
  - Problem: CUE Clock Not Synchronizing with CME Router Configured as a NTP Server
  - Problem: When External Calls are Transferred to the CUE Auto Attendant, the North American Ring Back Tone is Heard Instead of the British Ring Back Tone
  - Problem: CCME Hunt Group Not Ringing the Final Number in Hunt Group

#### Related Information

## Introduction

This document provides a sample configuration for Cisco CallManager Express (CME) 4.0 and Cisco Unity Express (CUE) 2.2.2, and how to integrate these two systems on your telephony network.

# Prerequisites

## Requirements

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

- Install the appropriate hardware.
- Download and install appropriate Cisco IOS® software.
- Download Cisco Unified CallManager Express software.
- Download Cisco Unity Express software.

## Components Used

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

- Cisco 3725 Router on Cisco IOS Software Release 12.4(9)T
- Cisco Catalyst 3550 Switch on Cisco IOS Software Release 12.1
- Cisco IP 7960 Phone
- Cisco Unified CallManager Express 4.0
- Cisco Unity Express 2.2.2

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

## Conventions

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

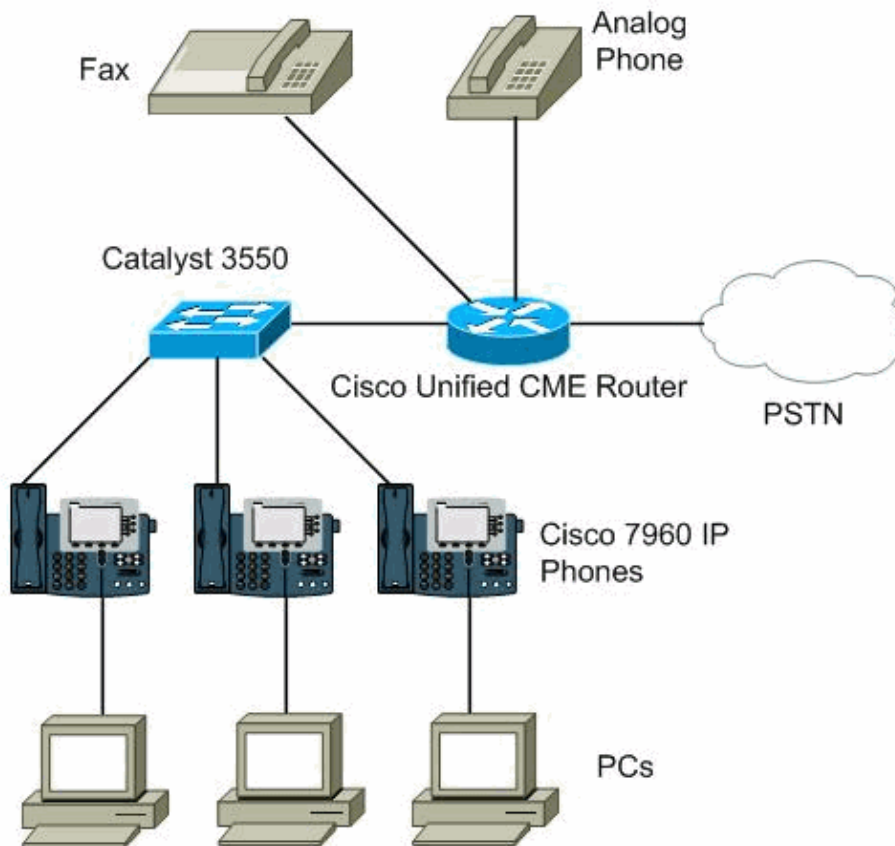
## Configure

In this section, you are presented with the information in order to configure the features described in this document.

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

## Network Diagram

This document uses this network setup:

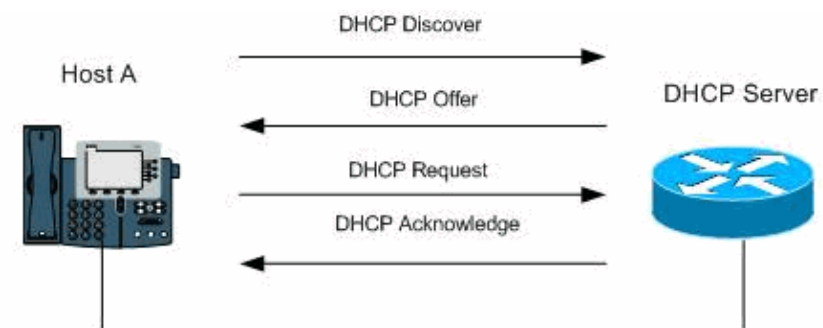


## Define a Local DHCP Server

In an optimized IP Telephony network, IP addresses for telephones and PCs must be set up in different network segments. Dynamic Host Control Protocol (DHCP) enables you to automatically assign reusable IP addresses to DHCP clients. The Cisco IOS DHCP Server feature is a full DHCP server implementation that assigns and manages IP addresses from specified address pools within the router to DHCP clients. If the Cisco IOS DHCP Server cannot satisfy a DHCP request from the database, it can forward the request to one or more secondary DHCP servers that the network administrator defines.

Figure 1 shows the basic steps that occur when a DHCP client requests an IP address from a DHCP server. The client, Host A, sends a DHCPDISCOVER broadcast message in order to locate a Cisco IOS DHCP Server. A DHCP server offers configuration parameters such as an IP address, a MAC address, a domain name, and a lease for the IP address to the client in a DHCPOFFER unicast message.

**Figure 1 DHCP Request for an IP Address from a DHCP Server**



The client returns a formal request for the offered IP address to the DHCP server in a DHCPREQUEST broadcast message. The DHCP server confirms that the IP address is allocated to the client with the return of a

DHCPACK unicast message to the client.

For this configuration you create two local DHCP servers, one for voice and one for data. When you create the two DHCP servers, you have two different subnetworks that facilitate the process of the assignment of the correct addresses without any conflict.

This procedure creates a shared pool of IP addresses, in which all DHCP clients receive the same information that include the option 150 TFTP server IP address. The benefit of the selection of this method to set up DHCP service is that you set up only one DHCP pool.

1. Enter the command **enable** in order to enter the privileged EXEC mode.

```
Router>enable
```

2. Enter the command **configure terminal** in order to enter the global configuration mode.

```
Router#configure terminal
```

3. Enter the command **ip dhcp pool pool-name** in order to create a name for the DHCP server address pool and enter DHCP pool configuration mode.

```
Router(config)#ip dhcp pool Voice
```

4. Enter the command **network ip-address mask** in order to specify the IP address of the DHCP address pool and the optional mask.

```
Router(dhcp-config)#network 172.22.100.0 255.255.255.0
```

5. Enter the command **option 150 ip ip-address** in order to specify the TFTP server address from which the Cisco Unified IP phone download the image configuration file.

```
Router(dhcp-config)#option 150 ip 172.22.1.107
```

6. Enter the command **default-router ip-address** in order to specify the router that the IP phones uses to send or receive IP traffic that is external to their local subnet.

```
Router(dhcp-config)#default-router 172.22.100.1
```

7. Enter the command **end** in order to finish the configuration.

```
Router(dhcp-config)#end
```

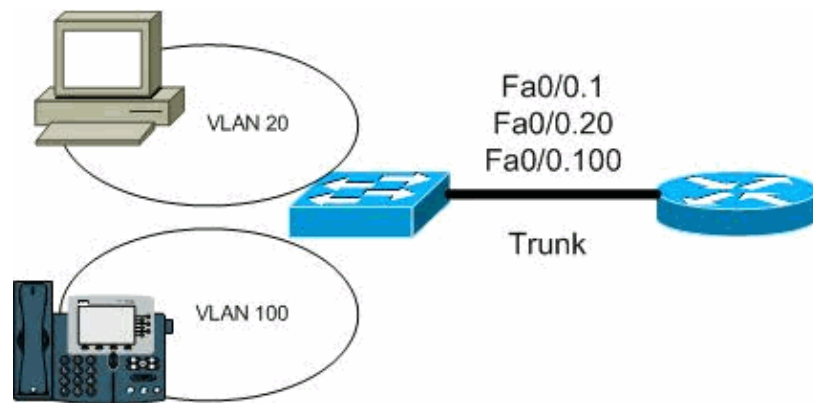
**Note:** Repeat the same procedure in order to create the local DHCP server for the range of data addresses.

## Configure the Router Interfaces

In this case, the platform 3725 contains two FastEthernet interfaces that can be used in order to connect to the core switch. However, you want to be able to use only one interface in order to transmit the data traffic, the voice traffic, and have access to the Internet through the default gateway. A good method that permits this is called InterVLAN communication, in which the router has the capability to divide one of its interfaces into several subinterfaces in order to create different logical segments or VLANs. With this feature, the router can receive packets on one VLAN and forward them to another VLAN. You need to enable Inter Switch Link (ISL) or 802.1Q trunking on a single physical connection between the switch and the router in order to accomplish this. After the IP addresses are configured on subinterfaces, the router is aware of the network associated with every VLAN as a directly connected network.

Figure 2 shows a router connected to a switch with the FastEthernet 0/0 interface connected to a trunk port on a switch. The FastEthernet interface is divided into logical interfacers, subinterfaces, for each VLAN and assigned an IP address to act as a gateway for each broadcast domain.

**Figure 2 Configure InterVLAN Routing**



This shows the configuration required for the router 3725 that uses 802.1Q frame tagging:

1. Enter the command **enable** in order to enter the privileged EXEC mode.

```
Router>enable
```

2. Enter the command **configure terminal** in order to enter the global configuration mode.

```
Router#configuration terminal
```

3. Enter the command **interface fastethernet port** in order to enter the interface configuration mode.

```
Router(config)#interface fastethernet 0/0.1
```

4. Enter the command **encapsulation [dot1q/ISL] id-num native** in order to create the Native VLAN.

```
Router(config-if)#encapsulation dot1q 1 native
```

5. Enter the command **ip address ip-address mask** in order to assign the interface a valid address.

```
Router(config-if)#ip address 172.22.1.154 255.255.255.0
```

6. Enter the command **exit** in order to get out of the configuration of that interface.

```
Router(config-if)#exit
```

7. Enter the command **interface fastethernet port.id-num** in order to create and enter the configuration of the Voice subinterface.

```
Router(config)#interface fastethernet 0/0.100
```

8. Enter the command **encapsulation [dot1q/ISL] id-num** in order to enable the trunk.

```
Router(config-if)#encapsulation dot1q 100
```

9. Enter the command **ip address ip-address mask** in order to assign a valid address to the Voice subinterface.

```
Router(config-if)#ip address 172.22.100.1 255.255.255.0
```

10. Enter the command **interface fastethernet port.id-num** in order to create and enter the configuration of your Data subinterface.

```
Router(config)#interface fastethernet 0/0.20
```

11. Enter the command **encapsulation [dot1q/ISL] id-num** in order to enable the trunk.

```
Router(config-if)#encapsulation dot1q 20
```

12. Enter the command **ip address ip-address mask** in order to assign a valid address to the Data subinterface.

```
Router(config-if)#ip address 172.22.101.1 255.255.255.0
```

13. Enter the command **end** in order to finish the configuration.

```
Router(config-if)#end
```

## Set Network Time Protocol

The Network Time Protocol (NTP) allows you to synchronize your Cisco Unified CallManager Express router to a single clock on the network, which is known as the clock master. NTP is disabled on all interfaces by default, but it is essential for Cisco Unified CallManager Express. Therefore, you must ensure that it is enabled. This procedure shows the steps in order to enable NTP on the Cisco 3725:

1. Enter the command **enable** in order to enter the privileged EXEC mode.

```
Router>enable
```

2. Enter the command **configure terminal** in order to enter the global configuration mode.

```
Router#configure terminal
```

3. Enter the command **clock timezone zone hours–offset** in order to set the local time zone.

```
Router(config)#clock timezone central -8
```

4. Enter the command **clock summer–time zone recurring** in order to specify daylight savings time. The default is that summer time is disabled.

```
Router(config)#clock summer-time central recurring
```

5. Enter the command **ntp server ip–address** in order to allow the clock on this router to be synchronized with the specified NTP Server. In this case, this is the same address from the TFTP Server.

```
Router(config)#ntp server 172.22.1.107
```

6. Enter the command **end** in order to finish the configuration.

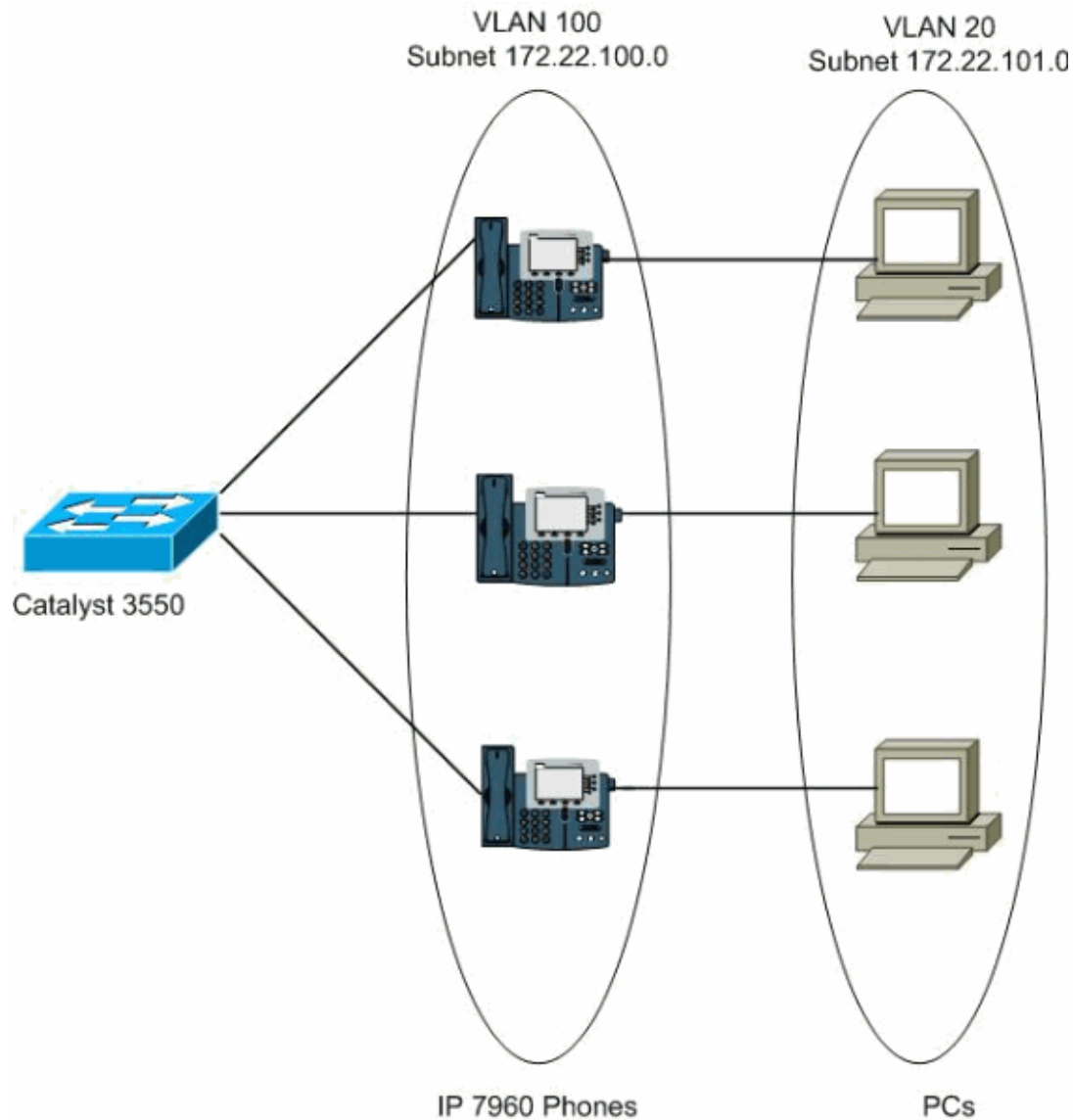
```
Router(config)#end
```

## Configure VLANs on a Catalyst Switch 3550

You can create different Virtual Local Area Networks (VLANs) in order to separate the traffic of one from the other in order to separate the voice and data traffic. Create two VLANs, one for voice and one for data on a Catalyst switch, in order to accomplish this. With this, you create two logical subnetworks that create multiple broadcast domains and prevent the possibility of loops in the network. Indeed the phones and PCs are connected together physically, but are separated logically in different subnetworks. These are the steps to create a VLAN for Voice on a Catalyst 3550.

Figure 3 shows how VLANs enable the switch to have multiple broadcast domains within a switched environment. A VLAN for Voice and a VLAN for Data are created. Two completely separate subnets permit the phones and PCs in order to talk on the VLANs that correspond.

### Figure 3 VLAN Overview



1. Enter the command **enable** in order to enter the privileged EXEC mode.

```
Switch>enable
```

2. Enter the command **configure terminal** in order to enter the global configuration mode.

```
Switch#configure terminal
```

3. Enter the command **vlan vlan-id** in order to create a VLAN on the switch.

```
Switch(config)#vlan 100
```

4. Enter the command **name vlan-name** in order to give a name to the VLAN.

```
Switch(config)#name Voice
```

5. Enter the command **end** in order to finish the configuration.

```
Switch(config)#end
```

**Note:** Repeat the same procedure in order to create the VLAN for Data.

## Configure an Interface on a Catalyst Switch 3550

You need to configure the interface that connects to the router in order to complete the trunking process between the Cisco 3725 router and the Catalyst 3550 switch. The configuration on the interface of the switch needs to be the same as the configuration on the interface of the router, so that the trunk can carry traffic from different VLANs across a single link. A VLAN interface, for example, int vlan 1, can be created for each VLAN that is configured on the switch. In this case, use the default interface VLAN (int vlan 1) for management VLAN. Once the interface VLAN is created and configured properly, you need to enable trunking on the interface. This is the configuration for the Catalyst 3550 switch interface:

1. Enter the command **enable** in order to enter the privileged EXEC mode.

```
Switch>enable
```

2. Enter the command **configure terminal** in order to enter the global configuration mode.

```
Switch#configure terminal
```

3. Enter the command **interface vlan vlan-id** in order to enter the interface that you want to configure.

```
Switch(config)#interface vlan 1
```

4. Enter the command **ip address ip-address mask** in order to give the interface a valid address

```
Switch(config-if)#ip address 172.22.1.201 255.255.255.0
```

5. Enter the command **exit** in order to finish the configuration of that interface.

```
Switch(config-if)#exit
```

6. Enter the command **ip default-gateway ip-address** in order to give access to the outside network.

```
Switch(config)#ip default-gateway 172.22.1.1
```

7. Enter the command **interface fastethernet port** in order to enter the interface that needs to be enabled for trunking

```
Switch(config)#interface fastethernet 0/19
```

8. Enter the command **switchport trunk encapsulation [dot1q/ISL]** in order to choose the method in which frames are tagged.

```
Switch(config-if)#switchport trunk encapsulation dot1q
```

9. Enter the command **switchport mode trunk** in order to enable the trunk.

```
Switch(config-if)#switchport mode trunk
```

10. Enter the command **switchport trunk allowed vlan all** in order to allow all VLANs on the trunk.

```
Switch(config-if)#switchport trunk allowed vlan all
```

11. Enter the command **duplex [full/half]** in order to enable the duplex mode, same as the duplex of that router.

```
Switch(config-if)#duplex full
```

12. Enter the command **speed number** in order to set the speed of the data.

```
Switch(config-if)#speed 100
```

13. Enter the command **end** in order to finish the configuration.

```
Switch(config-if)#end
```

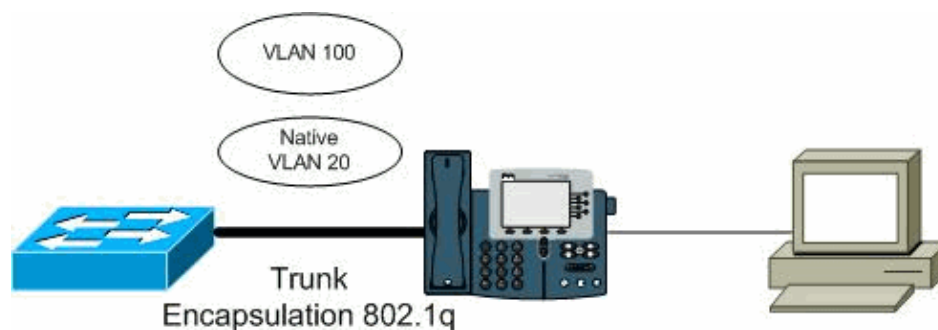


## Configure the Port to Connect to a Cisco 7960 IP Phone

A Cisco 7960 IP Phone supports connection to a PC or other device. For this reason, an interface that connects a Catalyst 3550 family switch to a Cisco 7960 IP Phone can carry a mix of voice and data traffic. You need to set the interface as a trunk in order to be able to carry the traffic from the Voice and the Data VLANs on a single link and allow them to extend across the entire network. Once the trunk mode is enabled, the two switchports for the different VLANs must be configured in order to specify how the traffic is divided. Configure a Voice VLAN in order to carry Voice traffic and a native VLAN in order to allow the rest of the traffic to travel untagged through this VLAN. Perform this procedure in order to configure a port to carry voice and data traffic on different VLANs.

Figure 4 shows a trunk created between the switch and the phone. The trunk reflects an 802.1q type of encapsulation and the different VLANs allowed to be extended across the network.

**Figure 4 Trunking**



1. Enter the command **enable** in order to enter the privileged EXEC mode.

```
Switch>enable
```

2. Enter the command **configure terminal** in order to enter the global configuration mode.

```
Switch#configure terminal
```

3. Enter the command **interface fastethernet port** in order to enter the port used to connect the phone.

```
Switch(config)#interface fastethernet0/21
```

4. Enter the command **switchport mode trunk** in order to configure the port as a VLAN trunk.

```
Switch(config-if)#switchport mode trunk
```

5. Enter the command **switchport trunk encapsulation dot1q** in order to configure the port to support 802.1q encapsulation.

```
Switch(config-if)#switchport trunk encapsulation dot1q
```

6. Enter the command **switchport voice vlan vlan-id** in order to instruct the Cisco IP phone to forward all voice traffic through the specified VLAN.

```
Switch(config-if)#switchport voice vlan 100
```

7. Enter the command **switchport trunk native vlan vlan-id** in order to instruct the Cisco IP phone to forward all data traffic through the specified VLAN.

```
Switch(config-if)#switchport trunk native vlan 20
```

8. Enter the command **end** in order to finish the configuration.

```
Switch(config-if)#end
```

## Configure the Cisco Unified CallManager Express Parameters

The next step in the configuration process modifies the extensible Markup Language (XML) phone configuration files so that IP phones can automatically find the defaults in order to configure them when they come online or are rebooted. For security purposes, turn off the auto-registration option to no-auto registration in order to prevent a connection from any phone without permission. This procedure sets values for the telephony parameters that the Cisco Unified CallManager Express system requires. With this procedure, you build the configuration files. Therefore, phones can download the parameter values to reset themselves.

1. Enter the command **enable** in order to enter the privileged EXEC mode.

```
Router>enable
```

2. Enter the command **configure terminal** in order to enter the configuration mode.

```
Router#configure terminal
```

3. Enter the command **tftp-server flash:filename** in order to permit the Cisco CallManager Express router to provide TFTP access to the specified file by the IP phone served by the router.

```
Router(config)#tftp-server flash:P00307020300.bin
```

4. Enter the command **telephony-service** in order to enter telephone configuration mode.

```
Router(config)#telephony-service
```

5. Enter the command **max-ephones max-num-phones** in order to set the maximum number of IP phones to be supported by this platform.

```
Router(config-telephony)#max-ephones 144
```

6. Enter the command **max-dn max-directory-numbers** in order to set the maximum number of extensions that can exist in this platform.

```
Router(config-telephony)#max-dn 500
```

7. Enter the command **no auto-reg-ephone** in order to prevent the connection of any phone to the system.

```
Router(config-telephony)#no auto-reg-ephone
```

8. Enter the command **load phone-type firmware-file** in order to identify the firmware file that the IP phone uses to register in the system.

```
Router(config-telephony)#load 7960 P0030700300
```

9. Enter the command **ip source-address ip-address** in order to identify the IP address and port number that the Cisco CallManager Express router uses for IP phone registration. The default port is 2000.

```
Router(config-telephony)#ip source-address 172.22.1.107
```

10. Enter the command **create cnf-files** in order to build the XML configuration files.

```
Router(config-telephony)#create cnf-files
```

11. Enter the command **transfer-system full-consultant** in order to specify the call transfer method. This is the default method.

```
Router(config-telephony)#transfer-system full-consultant
```

12. Enter the command **secondary-dialtone 9** in order to create another tone when you dial 9 to place an outside call.

```
Router(config-telephony)#secondary-dialtone 9
```

13. Enter the command **end** in order to finish the configuration.

```
Router(config-telephony)#end
```

## Provision IP Phones

The Cisco Unified CallManager Express parameters are set so the IP phones can register and start to function. However, before you start to make and receive calls, you need to register the specific IP phones that you want on the Cisco CallManager Express system. In this process you set up individual ephone-dn and then associate each with a button or buttons on one or more ephones. Each ephone-dn is a virtual line, or extension, on which call connections can be made. Each physical phone must be configured as an ephone in the Cisco CallManager Express router in order to receive support in the LAN environment. With the use of the **ephone-dn** command and dual-line keyword you create an ephone-dn in dual-line mode. The reason is to have one voice port and two channels in order to handle two independent calls. This mode enables call transfer, call waiting, and conference options. This procedure registers ephones and ephones-dns with dual-line mode:

1. Enter the command **enable** in order to enter EXEC mode.

```
Router>enable
```

2. Enter the command **configure terminal** in order to enter the configuration mode.

```
Router#configure terminal
```

3. Enter the command **ephone-dn dn-tag dual-line** in order to create the extension with two channels.

```
Router(config)#ephone-dn 11 dual-line
```

4. Enter the command **number number** in order to configure a valid extension number.

```
Router(config-ephone-dn)#number 1001
```

5. Enter the command **name name** in order to associate a name to this ephone-dn.

```
Router(config-ephone-dn)#name John Smith
```

6. Enter the command **exit** in order to leave the ephone-dn configuration.

```
Router(config-ephone-dn)#exit
```

7. Enter the command **ephone phone-tag** in order to enter the physical phone configuration.

```
Router(config)#ephone 1
```

8. Enter the command **mac-address [mac-address]** in order to specify which phone is configured.

```
Router(config-ephone)#mac-address 0030.94C2.D6E7
```

9. Enter the command **type phone-type** in order to specify the type of phone.

```
Router(config-ephone)#type 7960
```

10. Enter the command **button button-number (separator) dn-tag** in order to associate the button number and line characteristics with an extension. In this case, use a :(colon) separator which implies a normal ring.

```
Router(config-ephone)#button 1:11
```

11. Enter the command **end** in order to finish the configuration.

```
Router(config-ephone)#end
```

## Set Dial Plan on Cisco CallManager Express

A dial-plan pattern creates a sequence of digits that specifies a global prefix for the expansion of abbreviated extension numbers into fully qualified E.164 numbers. With this configuration, the Cisco CallManager Express system is able to map a digit pattern for an abbreviated extension-number prefix to the full E.164

telephone number pattern. This procedure shows the configuration for the dial-plan pattern:

1. Enter the command **enable** in order to enter EXEC mode.

```
Router>enable
```

2. Enter the command **configure terminal** in order to enter the configuration mode.

```
Router#configure terminal
```

3. Enter the command **telephony-service** in order to enter the telephony-service configuration mode.

```
Router(config)#telephony-service
```

4. Enter the command **dialplan-pattern tag pattern extension length length** in order to match the extension number to the phone.

```
Router(config-telephony)#dialplan-pattern 1 5123781291 extension length 4
```

5. Enter the command **end** in order to finish the configuration.

```
Router(config-telephony)#end
```

## Connect to PSTN

During this task, configure the FXO voice ports in order to support connections to Public Service Telephone Network (PSTN). Configure the hardware (voice ports) and dial peers required to place and receive incoming and outgoing calls in order to make connection to a telephone outside of the network.

This configuration is divided into three parts. First, you need to configure your FXO port in order to forward incoming calls to extensions that accept dial-in, for instance to a receptionist that can transfer the incoming call. This procedure helps you configure your FXO ports:

1. Enter the command **enable** in order to enter the EXEC mode.

```
Router>enable
```

2. Enter the command **configure terminal** in order to enter the configuration mode.

```
Router#configure terminal
```

3. Enter the command **voice-port slot/port** in order to enter voice-port configuration mode and specify what port to configure. This port is the one where the telephone cable is connected to, in this case voice port 1/0.

```
Router(config)#voice-port 2/1/0
```

4. Enter the command **connection plar digits** in order to specify a private-line, automatic ring down (PLAR) connection and automatically forward the incoming call to the extension specified by the digits argument.

```
Router(config-voiceport)#connection plar 1001
```

5. Enter the command **caller-id enable** in order to allow the caller ID information to be received at the FXO port that is configured.

```
Router(config-voiceport)#caller-id enable
```

6. Enter the command **exit** in order to leave the voice-port configuration.

```
Router(config-voiceport)#exit
```

Second, you need to create some dial peers in order for the Cisco CallManager Express system to associate a telephone number with a particular FXO port so that outgoing calls can be placed. You need to create as many dial peers as you need (local calls, long distance calls, international calls and so forth) as you consider the

different order in which they are handled and certain restrictions. Refer to Understanding Dial Peers and Call Legs on Cisco IOS Platforms for more information on dial-peers. You assign a voice port number to the dial peer and a destination pattern. This procedure configures a dial peer for local calls:

1. Enter the command **dial-peer voice tag pots** in order to configure an outbound POTS dial peer.

```
Router(config)#dial-peer voice 1 pots
```

2. Enter the command **destination-pattern string** in order to specify the pattern of the numbers that the user must dial to place a call that includes prefix and destination numbers.

You can use different characters to represent the numbers. However, this procedure configures a local call dial peer with a prefix 9 (number dial to place an outside call), [] (brackets) to indicate a range, and six "." (dots) to match any entered digit. Refer to the Digit Stripping and Prefixes section of Configuring Dial Plans, Dial Peers, and Digit Manipulation for more information.

```
Router(config-dial-peer)#destination-pattern 9[2-9].....
```

**Note:** The special characters ^ and \$ are counted as explicitly matched digits and any pattern inside ( ) is **not** counted as explicitly matched digits.

3. Enter the command **port slot/port** in order to specify the port through which calls to this peer are placed.

```
Router(config-dial-peer)#port 2/1/0
```

4. Enter the command **prefix number character-comma** in order to specify that the number gives you a dial tone to place an outside call.

```
Router(config-dial-peer)#prefix 9,
```

5. Enter the command **end** in order to finish the configuration.

```
Router(config-dial-peer)#end
```

Third, you need to create a dial peer in order for an analog phone to be able to connect to a Foreign Exchange Station (FXS) port. The FXS interface is an RJ-11 connector that allows connection for basic telephone equipment, keysets, PBX, and supplies ring, voltage, and dial tone. You need to assign the FXS port to this dial peer and give it a destination or an extension in order to be able to configure the FXS ports on the router. This is the procedure to configure the FXS ports:

1. Enter the command **configure terminal** in order to enter the configuration mode.

```
Router#configure terminal
```

2. Enter the command **dial-peer voice tag pots** in order to configure an outbound POTS dial peer.

```
Router(config)#dial-peer voice 5 pots
```

3. Enter the command **destination-pattern string** in order to specify the pattern of the numbers that the user must dial to place a call. In this case, assign a destination-pattern with the same extension length as your IP phones so that you can avoid confusion with the rest of the dial peers.

With the dial peer, you are able to make local calls, long distance, and international calls from the analog phone.

```
Router(config-dial-peer)#destination-pattern 1005
```

4. Enter the command **port slot/port** in order to specify the port that corresponds to your FXS interface through which calls to this peer are placed.

```
Router(config-dial-peer)#port 2/0/0
```

5. Enter the command **end** in order to finish the configuration.

```
Router(config-dial-peer)#end
```

## Activate IP Connectivity to Cisco Unity Express Software

Now you need to integrate Cisco Unity Express 2.2.2 to Cisco CallManager Express 4.0. In order to do this, you need to create two interfaces so communication between Cisco Unity Express and Cisco Call Manager Express can take place. The first is an interface to the router that hosts Cisco CallManager Express which is previously set up in Configuring the Router Interfaces. The second is an interface that links together Cisco Unity Express and Cisco CallManager Express ports and IP addresses. Complete these steps in order to achieve this task:

1. Enter the command **enable** in order to enter the EXEC mode.

```
Router>enable
```

2. Enter the command **configure terminal** in order to enter the configuration mode.

```
Router#configure terminal
```

3. Enter the command **interface service-engine slot/unit** in order to enter the Cisco Unity Express interface configuration mode.

```
Router(config)#interface service-engine 1/0
```

4. Enter the command **ip unnumbered type number** in order to specify the interface type and number for the Cisco IOS router.

```
Router(config-if)#ip unnumbered fastethernet 0/0.1
```

5. Enter the command **service-module ip address cue-ip address subnet-mask** in order to specify the IP address of the Cisco Unity Express module interface. The IP must be on the same subnet as the Cisco IOS router that hosts Cisco Unity Express.

```
Router(config-if)#service-module ip address 172.22.1.155 255.255.255.0
```

6. Enter the command **service-module ip default-gateway ip address** in order to specify the IP address of the Cisco IOS router that hosts Cisco Unity Express.

```
Router(config-if)#service-module ip default-gateway 172.22.1.154
```

**Note:** These steps only work if **proxy-arp** is currently enabled on the interface (FastEthernet0/0.1) referenced as unnumbered in the Service-Engine configuration. Proxy-arp is enabled by default on Ethernet interfaces, and the operational status of proxy-arp on the interface can be verified if you issue **Show ip interface FastEthernet0/0.1**. If proxy-arp is disabled, it can be re-enabled if you issue **ip proxy-arp** under the interface configuration

7. Enter the command **exit** in order to finish the interface configuration.

```
Router(config-if)#exit
```

8. Enter the command **ip route ip-address mask service-engine slot/number** in order to establish a static route to the Cisco Unity Express module.

```
Router(config)#ip route 172.22.1.155 255.255.255.255 service-engine 1/0
```

9. Enter the command **exit** in order to finish the configuration.

```
Router(config)#end
```

**Note:** Although there is an enable mode in the Cisco Unity Express module CLI, Cisco Unity Express has no password capability. Any network administrator with access to enable mode on the router can access the Cisco Unity Express CLI. There is no user ID or password control on the Cisco Unity Express CLI. Access is controlled via the router. If logging is required, you need to set up the router with AAA/RADIUS monitoring of login access.

# Configure Dial Peers for Cisco CallManager Express Phones to Call Cisco Unity Express Voicemail

A dedicated dial peer is required to facilitate communication between Cisco CallManager Express and Cisco Unity Express. The destination-pattern under the dial peer assigns a set of phone numbers dedicated to applications such as Cisco Unity Express. One thing that you need to consider is that the voicemail number must be within the destination-pattern range of the dial peer, and the ephone-dns must be configured for call forwarding to the voicemail number which triggers the use of the dial peer. The Cisco Unity Express dial peer must use Session Initiation Protocol (SIP) for call sessions and for the translation of dual tone multifrequency (DTMF) tones into SIP notify messages. A voice activity detection (VAD) must be switched off and a codec must be designated.

1. Enter the command **enable** in order to enter the EXEC mode.

```
Router>enable
```

2. Enter the command **configure terminal** in order to enter the configuration mode.

```
Router#configure terminal
```

3. Enter the command **dial-peer voice tag voip** in order to define a dial peer with a method of voice encapsulation.

```
Router(config)#dial-peer voice 2 voip
```

4. Enter the command **destination-pattern string** in order to specify the prefix or the full E.164 number to be used for the dial peer.

```
Router(config-dial-peer)#destination-pattern 2...
```

5. Enter the command **session protocol sipv2** in order to specify SIP as the session protocol for calls between host Cisco CallManager Express router and Cisco Unity Express module.

```
Router(config-dial-peer)#session protocol sipv2
```

6. Enter the command **session target ipv4:destination-ip address** in order to designate a network-specific address to receive calls from a voice over IP dial peer.

```
Router(config-dial-peer)#session target ipv4:172.22.1.155
```

7. Enter the command **dtmf-relay sip-notify** in order to forward DTMF tones using SIP notify messages.

```
Router(config-dial-peer)#dtmf-relay sip-notify
```

8. Enter the command **codec codec** in order to specify the voice codec rate of speech for a dial peer.

```
Router(config-dial-peer)#codec g711ulaw
```

**Note:** Always ensure that there is no codec mismatch as any mismatch might result in inbound and outbound call failure.

9. Enter the command **no vad** in order to disable VAD for the calls that use a particular dial peer.

```
Router(config-dial-peer)#no vad
```

10. Enter the command **exit** in order to finish the configuration.

```
Router(config-dial-peer)#end
```

## Configure Voicemail Access

The Cisco CallManager Express configuration must include the creation of a voicemail number that is within the range of the destination pattern for the dial peer that you previously created. The voicemail number is the

telephone number that is dialed when the Messages button on a Cisco IP phone is pressed, or a busy or unanswered call is forwarded to voicemail. Complete these steps in order to configure your voicemail phone number. In addition, ephone-dns must be configured to forward unanswered or busy calls to the voicemail number.

1. Enter the command **enable** in order to enter the EXEC mode.

```
Router>enable
```

2. Enter the command **configure terminal** in order to enter the configuration mode.

```
Router#configure terminal
```

3. Enter the command **telephony-service** in order to enter the telephony-service configuration mode.

```
Router(config)#telephony-service
```

4. Enter the command voicemail **phone-number** in order to define the number that is dialed when the Messages button is pressed.

```
Router(config-telephony-service)#voicemail 2000
```

5. Enter the command **exit** in order to finish the configuration.

```
Router(config-telephony-service)#exit
```

6. Enter the command **ephone-dn dn-tag** in order to enter the ephone-dn configuration mode to modify the extensions previously created.

```
Router(config)#ephone-dn 11
```

7. Enter the command **call-forward busy directory-number** in order to configure the call forwarding so that incoming calls to a busy extension are forwarded to voicemail.

```
Router(config-ephone-dn)#call-forward busy 2000
```

8. Enter the command **call-forward noan directory number timeout seconds** in order to configure the call forwarding so that incoming calls to a no-answer extension are forwarded to voicemail.

```
Router(config-ephone-dn)#call-forward noan 2000 time 10
```

9. Enter the command **end** in order to finish the configuration.

```
Router(config-ephone-dn)#end
```

**Note:** Repeat steps 6–9 on all the Cisco IP Phones connected to the system.

## Configure MWIs

The MWI mechanism turns on the light indicator on Cisco IP phones in order to inform the user that there is a voicemail message waiting. The MWI is initiated after someone leaves a voicemail message and is turned off after the user listens to voicemail. Create two ephone-dns, one with the MWI feature on (for example, ephone-dn 8000) and the other with the MWI feature off (for example, ephone-dn 8001) in order to have the MWI mechanism work.

When an extension receives a call (ext. 1001) and is not answered, the IP phone forwards the call to voicemail where the person leaves a message. Once the message is recorded, Cisco Unity Express places an MWI notification call to the MWI processing ephone-dn (ext. 8000) and appends the extension (ext. 1001) as the calling party ID for the notification call. The number dialed is 80001001. The light turns on the extension (ext. 1001).

When the user of the extension (ext. 1001) listens to all the voicemail, Cisco Unity Express places an MWI notification call to the MWI processing ephone-dn (ext. 8001) and appends the extension (ext. 1001) as the



calling party ID for the notification call. The number 80011001 is dialed. After the user listens to voicemail, the light turns off. This is the procedure to configure the MWI ephone-dns:

1. Enter the command **enable** in order to enter the EXEC mode.

```
Router>enable
```

2. Enter the command **configure terminal** in order to enter the configuration mode.

```
Router#configure terminal
```

3. Enter the command **ephone-dn** in order to create the extensions for the Cisco IP phone lines.

```
Router(config)#ephone-dn 14
```

4. Enter the command **number number** in order to associate a telephone or extension with the ephone-dn.

```
Router(config-ephone-dn)#number 8000....
```

5. Enter the command **mw [on|off]** in order to configure specific ephone-dns to receive MWI notification from an external voicemail system.

```
Router(config-ephone-dn)#mw on
```

6. Enter the command **end** in order to finish the configuration.

```
Router(config-ephone-dn)#end
```

**Note:** Repeat the same procedure in order to create an extension 8001 with the MWI off.

## Configure the Voicemail Application

From now on, most of the configurations need to be made on the actual NM-Cisco Unity Express module, which means that a connection needs to establish from the router to module. The Cisco Unity Express has EXEC and configuration modes that operate similarly to the EXEC and configuration modes for Cisco IOS CLI commands. Issue the **service-module service-engine 1/0 session** command in order to enter Cisco Unity Express. This is the procedure to configure voicemail:

1. Enter the command **service-module service-engine 1/0 session** in order to connect to the module.

```
Router#service-module service-engine 1/0 session
```

2. Enter the command **enable** in order to enter the EXEC mode.

```
se-172-22-1-155>enable
```

3. Enter the command **configure terminal** in order to enter the configuration mode.

```
se-172-22-1-155#configure terminal
```

4. Enter the command **ccn application voicemail** in order to enter the application configuration for voicemail.

```
se-172-22-1-155(config)#ccn application voicemail
```

5. Enter the command **description "text"** in order to enter a description of the application.

```
se-172-22-1-155(config-application)#description "Cisco Voicemail"
```

6. Enter the command **maxsessions number** in order to specify the number of subscribers who can access this application simultaneously. Refer to Sharing Ports Among Applications and Triggers for more information on the value.

```
se-172-22-1-155(config-application)#maxsessions 4
```

7. Enter the command **exit** in order to finish the application configuration.

```
se-172-22-1-155(config-application)#exit
```

8. Enter the command **exit** in order to finish the configuration mode.

```
se-172-22-1-155(config)#exit
```

## Configure Auto-Attendant Application

The Auto-Attendant application permits the system to have an auto operator answer the calls and gives the caller different options to choose from a menu. For example, if the Cisco Unity Express systems has an auto attendant, the caller listens to a welcome greeting and then they are able to choose the option in order to be transferred to a specific department (for example, sales, HR and so forth) or a specific person (for example, John Smith, Alex Lewis and so forth). This procedure provides a configuration for Auto-Attendant:

1. Enter the command **service-module service-engine slot/number session** in order to connect to the module.

```
Router#service-module service-engine 1/0 session
```

2. Enter the command **enable** in order to enter the EXEC mode.

```
se-172-22-1-155#enable
```

3. Enter the command **configure terminal** in order to enter the configuration mode.

```
se-172-22-1-155#configure terminal
```

4. Enter the command **ccn application autoattendant** in order to specify the application to configure.

```
se-172-22-1-155(config)#ccn applicatio autoattendant
```

5. Enter the command **description "text"** in order to enter a description of the application.

```
se-172-22-1-155(config-application)#description "Cisco Auto-Attendant"
```

6. Enter the command **maxsessions number** in order to specify the number of callers who can access this application simultaneously. Refer to Sharing Ports Among Applications and Triggers for more information on the value.

```
se-172-22-1-155(config-application)#maxsessions 4
```

7. Enter the command **parameter "name" "value"** in order to specify the parameter for the application.

```
se-172-22-1-155(config-application)#parameter "operExtn" "1001"
```

8. Enter the command **exit** in order to finish the application configuration.

```
se-172-22-1-155(config-application)#exit
```

9. Enter the command **exit** in order to finish the configuration.

```
se-172-22-1-155(config)#exit
```

## Configure SIP Triggers for Applications

After the voicemail and Auto-Attendant are configured, the system must be configured to start the voicemail, and Auto-Attendant applications when a specific signal or trigger is invoked. The trigger is a telephone number. When a caller dials a specified telephone number, the SIP subsystem starts the voicemail or Auto-Attendant. This procedure configures SIP triggers for voicemail:

1. Enter the command **service-module service-engine slot/number session** in order to connect to the module.

```
Router#service-module service-engine 1/0 session
```

2. Enter the command **enable** in order to enter the EXEC mode.

```
se-172-22-1-155>enable
```

3. Enter the command **configure terminal** in order to enter the configuration mode.

```
se-172-22-1-155#configure terminal
```

4. Enter the command **ccn trigger sip phonenumber number** in order to specify the telephone number that acts as the trigger configuration mode. The number value can match one of the patterns configured in the destination-pattern field of the SIP dial peer that points to Cisco Unity Express.

```
se-172-22-1-155(config)#ccn trigger sip phonenumber 2000
```

5. Enter the command **application string** in order to specify the name of the application to start when the trigger is entered.

```
se-172-22-1-155(config-trigger)#application voicemail
```

6. Enter the command **enabled** in order to enable the trigger.

```
se-172-22-1-155(config-trigger)#enabled
```

7. Enter the command **maxsessions number** in order to specify the maximum number of callers that the application can handle simultaneously. Refer to Sharing Ports Among Applications and Triggers for more information on the value.

```
se-172-22-1-155(config-trigger)#maxsessions 4
```

8. Enter the command **exit** in order to finish the trigger configuration.

```
se-172-22-1-155(config-trigger)#exit
```

9. Enter the command **exit** in order to finish the configuration.

```
se-172-22-1-155(config)#exit
```

**Note:** Repeat this process for the Auto-Attendant and promptmgmt application.

## Configure Users

Users and groups can be created to use the system. All the people who have extensions and access voicemail must be users. An administrator user is created by default when you first access Cisco Unity Express. This administrator cannot be assigned a voice mailbox. However, the administrator is able to configure the system, which includes the voicemail and Auto-Attendant application. This procedure creates a user and assigns a telephone number:

1. Enter the command **service-module service-engine slot/number session** in order to connect to the module.

```
Router#service-module service-engine 1/0 session
```

2. Enter the command **enable** in order to enter the EXEC mode.

```
se-172-22-1-155>enable
```

3. Enter the command **username userid create** in order to create a subscriber with the specified user ID.

```
se-172-22-1-155#username John create
```

4. Enter the command **configure terminal** in order to enter the configuration mode.

```
se-172-22-1-155#configure terminal
```

5. Enter the command **username userid phone number** in order to specify the extension for this subscriber.

```
se-172-22-1-155(config)#username John phonenumber 1002
```

6. Enter the command **exit** in order to finish the configuration.

```
se-172-22-1-155(config)#exit
```

**Note:** Repeat this process in order to register as many users as you need, which does not exceed the limit supported by the Cisco Unity Express system. Make sure you assign a password and a pin to the administrator user in order to be able to configure Cisco Unity Express and make changes to it. Refer to Adding and Modifying a User for more information on passwords and pins.

## Configure Mailboxes

Assign a voice mailbox to a subscriber in order to configure a Cisco Unity Express database. A mailbox subscriber is a user created in the previous section. Not all the subscribers or extensions require a voice mailbox such as an administrator user. Consider the function or purpose of the subscriber or extension before you assign the mailbox in order to use mailboxes efficiently.

Voicemails are not compressed and use the G.711 codec. Each second of G.711 audio equals 64 Kbits/second, so 8 K bytes/second converts into 480 K bytes/minute. This list shows a storage capacity summary for each Cisco Unity Express module type:

- Cisco Unity Express Advanced Integration Module (AIM-CUE); 4 hours
- Cisco Unity Express network module (NM-CUE); 00 hours
- Cisco Unity Express Enhanced Capacity (NM-CUE-EC); 00 hours

In this configuration, you create a personal mailbox. A personal mailbox is assigned to a specific subscriber and is accessible only by this subscriber. When a caller leaves a message in this mailbox, the message waiting indicator (MWI) light turns on. Complete these steps in order to configure voice mailboxes:

1. Enter the command **service-module service-engine slot/number session** in order to connect to the module.

```
Router#service-module service-engine 1/0 session
```

2. Enter the command **enable** in order to enter the EXEC mode.

```
se-172-22-1-155>enable
```

3. Enter the command **configure terminal** in order to enter the configuration mode.

```
se-172-22-1-155#configure terminal
```

4. Enter the command **voice mailbox owner name** in order to create a mailbox for the name value.

```
se-172-22-1-155(config)#voice mailbox owner John
```

5. Enter the command **description "text"** in order to give a description of the mailbox.

```
se-172-22-1-155(config-mailbox)#description "John's Mailbox"
```

6. Enter the command **enable** in order to activate the new mailbox or reactivate the disabled mailbox.

```
se-172-22-1-155(config-mailbox)#enable
```

7. Enter the command **expiration time days** in order to set the number of days for which messages are stored in the mailbox. The default is 30 days.

```
se-172-22-1-155(config-mailbox)#expiration time 10
```

8. Enter the command **mailboxsize seconds** in order to specify the storage size of the mailbox in seconds.

```
se-172-22-1-155(config-mailbox)#mailboxsize 300
```

9. Enter the command **messagesize seconds** in order to specify the maximum size of an incoming message, in seconds.

```
se-172-22-1-155(config-mailbox)#messagesize 120
```

10. Enter the command **end** in order to finish the mailbox configuration.

```
se-172-22-1-155(config-mailbox)#end
```

11. Enter the command **exit** in order to finish the configuration.

```
se-172-22-1-155(config)#exit
```

**Note:** Repeat this procedure for every user that needs a voice mailbox.

## Verify

There is currently no verification procedure available for this configuration.

## Troubleshoot

### Problem: User Cannot Log In Through the Cisco Unity Express Graphical User Interface (GUI)

The Cisco Unity Express user cannot log in through the Cisco Unity Express GUI and receives the Cisco Unity Express has lost contact with the Host router. Enter the new CCME Web Administrator username and password error message.

Complete these steps in order to resolve this problem:

1. Check in order to see if the Cisco CallManager Express configuration misses any of the configuration commands mentioned in this document.
2. If the configuration is correct, the Cisco CallManager Express router might miss the **default-gateway** configuration. This might happen if the administrator reloads the router without saving the configuration. Check the Cisco CallManager Express configuration for IP connectivity to Cisco Cisco Unity Express.
3. This error message is also seen when the administrator decides to change the Cisco CallManager Express **web administrator username** and **password**, and the new name and password is not updated in the Cisco Unity Express system. Use the procedure mentioned in Unity Express GUI Password Recovery in order to update the system with new Cisco CallManager Express username and password.
4. Use the **service-module service-engine slot/port reload** command in order to reload the Cisco Unity Express module.

**Note:** A reboot of the Cisco Unity Express module does not require a reboot of the router. The Cisco Unity Express module and the router can be rebooted independently of each other. However, if you reboot the router, no calls reach the module until IP connectivity is reestablished between the router and the module. Always perform a shutdown of the module before you power-cycle the router in order to avoid data loss or file corruption.

Refer to Troubleshooting Cisco Unity Express System Features for more information on how to troubleshoot CallManager Express/Cisco Unity Express configuration issues.

## Problem: IP Phone Cannot Hear Ringback or Busy Tone while Called IP Phone is Ringing or Busy

This is the network topology:



There are two Skinny Call Control Protocol (SCCP) Phones, IP Phone 1 and IP Phone 2, that are registered with Cisco CallManager Express. IP Phone 2 is configured to have *call-forward busy* and *call-forward noan* forwarded to the Cisco Unity Express voice mail.

Consider a situation where the Cisco Unity Express is down or registering, and the call is made from IP Phone 1 to IP Phone 2. IP Phone 1 does not get a ringback/ busy tone when IP Phone 2 rings or is busy upon attempted transfer to voice mail. When the Cisco Unity Express is up, everything works as expected. The reason for this issue is that the default retry for SIP INVITE to Cisco Unity Express is too long.

In order to resolve this issue, configure SIP retry invite to a lower value other than the default value of six. You can configure the SIP retry invite timer under the SIP-*UA* configuration as this example output shows:

```
configure terminal
sip-ua
retry invite 2

!--- For example, SIP retry invite two.
```

## Problem: Calls from PSTN Fail to CUE AA via SIP Tunnel

Inbound PSTN calls (SIP) to CUE Auto Attendant (AA) Pilot number do not work via SIP Tunnel. Internal calls from the IP phone (SCCP) to CUE AA work fine.

CUE AA uses SIP protocol to communicate with CallManager Express. In this case, the call that originates from PSTN is also an SIP call. In order to fix this issue, you need to issue these commands:

```
CME(config)#voice service voip
CME(conf-voi-serv)#allow-connections sip to sip
```

**Note:** This feature is only supported in Cisco CallManager Express 4.0 and later.

## Problem: CUE Clock Not Synchronizing with CME Router Configured as a NTP Server

NTP on the CUE is unable to synchronize with the CallManager Express. The CallManager Express router is configured as a NTP server. The CUE clock is not displaying accurate time. However, CallManager Express

displays the correct time.

Issue these commands in order to overcome this problem:

On the CallManager Express router:

```
ntp master
```

On the CUE:

```
ntp server x.x.x.x
```

*!--- Where x.x.x.x is the ip address of the CME router which is configured as a NTP server*

Once the mentioned configuration changes are made on the CUE and CallManager Express, issue the **show ntp status** command on the CallManager Express router. You should see that the clock is synchronized.

## Problem: When External Calls are Transferred to the CUE Auto Attendant, the North American Ring Back Tone is Heard Instead of the British Ring Back Tone

CUE has British English Local installed. Cisco CallManager has US English and British English Local installed.

In order to overcome this problem, configure the **cptone GB** command under the appropriate voice port in the voice gateway. This is an example output:

aus-3725-03
<pre>voice-port 2/0/0 trunk-group PSTN_ANALOG_IN_OUT_TG echo-cancel coverage 32 no vad no comfort-noise <b>cptone GB</b> connection plar 42700 description cptone EXAMPLE caller-id enable</pre>

**Note:** The ringback tone is generated by the voice gateway.

## Problem: CCME Hunt Group Not Ringing the Final Number in Hunt Group

With the **ephone-hunt** command configured, the call does not get transferred to the CUE VM system after the final dn, and the caller receives a busy tone.

In order to fix the problem, increase the **max-redirect** to the desired value.

This issue can occur if the **ephone-hunt** command is configured with hops that are more than what is specified in the **max-redirect** command.


This is an example configuration of **ephone-hunt** and **max-redirect**:

**Note:** Sample output omitted.

## Device Name 1

```
!  
!  
ephone-hunt 12 sequential  
  
!--- Your ephone hunt group configuration would exist here.  
  
!  
!  
!  
telephony-service  
no auto-reg-ephone  
load 7960-7940 P00307020300  
max-ephones 144  
max-dn 500  
ip source-address 172.22.1.107 port 2000  
max-redirect 15  
service phone videoCapability 1  
dialplan-pattern 1 5123781291 extension-length 4  
voicemail 2000  
max-conferences 8 gain -6  
transfer-system full-consult  
secondary-dialtone 9  
create cnf-files version-stamp Jan 01 2002 00:00:00
```

## Related Information

- [Troubleshoot Voice View Express](#)
- [Cisco Unified CME GUI Support](#)
- [Voice Technology Support](#)
- [Voice and Unified Communications Product Support](#)
- [Troubleshooting Cisco IP Telephony](#) 
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