



Setting Up the Network

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This chapter describes how to configure your Cisco Unified Survivable Remote Site Telephony (SRST) router to run DHCP and to communicate with the IP phones during Cisco Unified Communications Manager fallback.

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Information About Setting Up the Network

When the WAN link fails, the Cisco Unified IP Phones detect that they are no longer receiving keepalive packets from Cisco Unified Communications Manager. The Cisco Unified IP Phones then register with the router. The Cisco Unified SRST software is automatically activated and builds a local database of all Cisco Unified IP Phones attached to it (up to its configured maximum). The IP phones are configured to query the router as a backup call-processing source when the central Cisco Unified Communications Manager does not acknowledge keepalive packets. The Cisco Unified SRST router now performs call setup and processing, call maintenance, and call termination.

Cisco Unified Communications Manager uses DHCP to provide Cisco Unified IP Phones with the IP address of Cisco Unified Communications Manager. In a remote branch office, DHCP service is typically provided either by the SRST router itself or through the Cisco Unified SRST router using DHCP relay. Configuring DHCP is one of two main tasks in setting up network communication. The other task is configuring the Cisco Unified SRST router to receive messages from the Cisco IP phones through the specified IP addresses. Keepalive intervals are also set at this time.

How to Set Up the Network

This section contains the following tasks:

- [Enabling IP Routing, page 50](#) (Required)
- [Enabling Cisco Unified SRST on an MGCP Gateway](#) (Required)
- [Configuring DHCP for Cisco Unified SRST Phones, page 56](#) (Required)
- [Specifying Keepalive Intervals, page 59](#) (Optional)
- [Configuring Cisco Unified SRST to Support Phone Functions, page 60](#) (Required)
- [Verifying That Cisco Unified SRST Is Enabled, page 62](#) (Optional)

Enabling IP Routing

For information about enabling IP routing, see [Configuring IP Addressing](#).

Enabling Cisco Unified SRST on an MGCP Gateway

To use SRST as your fallback mode with an MGCP gateway, SRST and MGCP fallback must both be configured on the same gateway. The configuration below allows SRST to assume control over the voice port and over call processing on the MGCP gateway. Due to command changes that were made in Cisco IOS Release 12.3(14)T, use the configuration task that corresponds with the Cisco IOS Release you have installed.

**Note**

The commands described in the configuration below are ineffective unless both commands are configured. For instance, your configuration will not work if you only configure the **ccm-manager fallback-mgcp** command.

**Note**

When an MGCP-controlled PRI goes into SRST mode, do not make or save configuration changes to the NVRAM on the router. If configuration changes are made and saved in SRST mode, the MGCP-controlled PRI fails when normal MGCP operation is restored.

Configuring Cisco Unified SRST on an MGCP Gateway Prior to Cisco IOS Release 12.3(14)T

Perform this task to enable SRST on a MGCP Gateway if you are using a software release prior to Cisco IOS Release 12.3(14)T.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ccm-manager fallback-mgcp**
4. **call application alternate** *[application-name]*
or
service *[alternate | default] service-name location*
5. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password when prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	ccm-manager fallback-mgcp Example: Router(config)# ccm-manager fallback-mgcp	Enables the gateway fallback feature and allows an MGCP voice gateway to provide call processing services through SRST or other configured applications when Cisco Unified Communications Manager is unavailable.

Command or Action	Purpose
<p>Step 4</p> <pre>call application alternate [application-name] or service [alternate default] service-name location</pre> <p>Example:</p> <pre>Router(config)# call application alternate or Router(config)# service default</pre>	<p>The call application alternate command specifies that the default voice application takes over if the MGCP application is not available. The <i>application-name</i> argument is optional and indicates the name of the specific voice application to use if the application in the dial peer fails. If a specific application name is not entered, the gateway uses the DEFAULT application.</p> <p>Or</p> <p>The service command loads and configures a specific, standalone application on a dial peer. The keywords and arguments are as follows:</p> <ul style="list-style-type: none"> • alternate (Optional). Alternate service to use if the service that is configured on the dial peer fails. • default (Optional). Specifies that the default service (“DEFAULT”) on the dial peer is used if the alternate service fails. • <i>service-name</i>: Name that identifies the voice application. • <i>location</i>: Directory and filename of the Tcl script or VoiceXML document in URL format. For example, flash memory (flash:filename), a TFTP (tftp://./filename) or an HTTP server (http://./filename) are valid locations
<p>Step 5</p> <pre>exit</pre> <p>Example:</p> <pre>Router(config)# exit</pre>	<p>Exits global configuration mode and returns to privileged EXEC mode.</p>

Configuring SRST on an MGCP Gateway Using Cisco IOS Release 12.3(14)T or Later Releases

Perform this task to enable SRST on a MGCP Gateway if you are using Cisco IOS Release 12.3(14)T or later version.

Restrictions

Effective with Cisco IOS Release 12.3(14)T, the **call application alternate** command is replaced by the **service** command. The **service** command can be used in all releases after Cisco IOS Release 12.3(14)T.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ccm-manager fallback-mgcp**
4. **application** [*application-name*]
5. **global**
6. **service** [**alternate** | **default**] *service-name location*
7. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password when prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	ccm-manager fallback-mgcp Example: Router(config)# ccm-manager fallback-mgcp	Enables the gateway fallback feature and allows an MGCP voice gateway to provide call processing services through SRST or other configured applications when Cisco Unified Communications Manager is unavailable.
Step 4	application [<i>application-name</i>] Example: Router(config) application app-xfer	The <i>application-name</i> argument is optional and indicates the name of the specific voice application to use if the application in the dial peer fails. If a specific application name is not entered, the gateway uses the DEFAULT application.
Step 5	global Example: Router(config)# global	Enters global configuration mode.

	Command or Action	Purpose
Step 6	<p>service [<i>alternate</i> <i>default</i>] <i>service-name</i> <i>location</i></p> <p>Example: Router(config) service myapp https://myserver/myfile.vxml</p>	<p>Loads and configures a specific, standalone application on a dial peer.</p> <ul style="list-style-type: none"> • alternate (Optional). Alternate service to use if the service that is configured on the dial peer fails. • default (Optional). Specifies that the default service (“DEFAULT”) on the dial peer is used if the alternate service fails. • <i>service-name</i>: Name that identifies the voice application. • <i>location</i>: Directory and filename of the Tcl script or VoiceXML document in URL format. For example, flash memory (flash:filename), a TFTP (tftp://../filename), or an HTTP server (http://../filename) are valid locations.
Step 7	<p>exit</p> <p>Example: Router(config)# exit</p>	<p>Exits global configuration mode and returns to privileged EXEC mode.</p>

Configuration Example of Enabling SRST on a MGCP Gateway using Cisco IOS Release 12.3(14)T

The following is an example of configuring SRST on a MGCP Gateway if you are using Cisco IOS Release 12.3(14)T or later release.

```

isdn switch-type primary-net5
!
!
ccm-manager fallback-mgcp
ccm-manager mgcp
ccm-manager config
mta receive maximum-recipients 0
!
controller E1 1/0
pri-group timeslots 1-12,16 service mgcp
!
controller E1 1/1
!
!
!
interface Ethernet0/0
ip address 10.48.80.9 255.255.255.0
half-duplex
!
interface Serial1/0:15
no ip address
no logging event link-status
isdn switch-type primary-net5
isdn incoming-voice voice
isdn bind-l3 ccm-manager
no cdp enable
!
!
!

```

```
!
call rsvp-sync
!
call application alternate DEFAULT

!--- For Cisco IOS® Software Release 12.3(14)T or later,
this command was replaced by the service command
in global application configuration mode.
application
global
service alternate Default

!
voice-port 1/0:15
!
mgcp
mgcp dtmf-relay voip codec all mode cisco
mgcp package-capability rtp-package
mgcp sdp simple
!
mgcp profile default
!
!
!
dial-peer cor custom
!
!
!
dial-peer voice 10 pots
application mgcpapp
incoming called-number
destination-pattern 9T
direct-inward-dial
port 1/0:15

!
!
call-manager-fallback
limit-dn 7960 2
ip source-address 10.48.80.9 port 2000
max-ephones 10
max-dn 32
dialplan-pattern 1 704.... extension-length 4
keepalive 20
default-destination 5002
alias 1 5003 to 5002
call-forward busy 5002
call-forward noan 5002 timeout 12
time-format 24
!
!
line con 0
exec-timeout 0 0
line aux
```

Configuring DHCP for Cisco Unified SRST Phones

To perform this task, you must have your network configured with DHCP. For further details about DHCP configuration, see the [Cisco IOS DHCP Server](#) document and see your Cisco Unified Communications Manager documentation.

When a Cisco IP phone is connected to the Cisco Unified SRST system, it automatically queries for a DHCP server. The DHCP server responds by assigning an IP address to the Cisco IP phone and providing the IP address of the TFTP server through DHCP option 150. Then the phone registers with the Cisco Unified Communications Manager system server and attempts to get configuration and phone firmware files from the Cisco Unified Communications Manager TFTP server address provided by the DHCP server.

When setting up your network, configure your DHCP server local to your site. You may use your SRST router to provide DHCP service (recommended). If your DHCP server is across the WAN and there is an extended WAN outage, the DHCP lease times on your Cisco Unified IP Phones may expire. This may cause your phones to lose their IP addresses, resulting in a loss of service. Rebooting your phones when there is no DHCP server available after the DHCP lease has expired will not reactivate the phones, because they will be unable to obtain an IP address or other configuration information. Having your DHCP server local to your remote site ensures that the phones can continue to renew their IP address leases in the event of an extended WAN failure.

Choose one of the following tasks to set up DHCP service for your Cisco Unified IP Phones:

- [Defining a Single DHCP IP Address Pool, page 56](#): Use this method if the Cisco Unified SRST router is a DHCP server and if you can use a single shared address pool for all your DHCP clients.
- [Defining a Separate DHCP IP Address Pool for Each Cisco Unified IP Phone, page 57](#): Use this method if the Cisco Unified SRST router is a DHCP server and you need separate pools for non-IP-phone DHCP clients.
- [Defining the DHCP Relay Server, page 58](#): Use this method if the Cisco Unified SRST router is not a DHCP server and you want to relay DHCP requests from IP phones to a DHCP server on a different router.

Defining a Single DHCP IP Address Pool

This task creates a large shared pool of IP addresses in which all DHCP clients receive the same information, including the option 150 TFTP server IP address. The benefit of selecting this method is that you set up only one DHCP pool. However, defining a single DHCP IP address pool can be a problem if non-IP phone clients need to use a different TFTP server address.

SUMMARY STEPS

1. **ip dhcp pool** *pool-name*
2. **network** *ip-address* [*mask* | *prefix-length*]
3. **option 150 ip** *ip-address*
4. **default-router** *ip-address*
5. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 8	ip dhcp pool <i>pool-name</i> Example: Router(config)# ip dhcp pool mypool	Creates a name for the DHCP server address pool and enters DHCP pool configuration mode.
Step 9	network <i>ip-address</i> [<i>mask</i> <i>prefix-length</i>] Example: Router(config-dhcp)# network 10.0.0.0 255.255.0.0	Specifies the IP address of the DHCP address pool and the optional mask or number of bits in the address prefix, preceded by a forward slash.
Step 10	option 150 ip <i>ip-address</i> Example: Router(config-dhcp)# option 150 ip 10.0.22.1	Specifies the TFTP server address from which the Cisco IP phone downloads the image configuration file. This needs to be the IP address of Cisco Unified Communications Manager.
Step 11	default-router <i>ip-address</i> Example: Router(config-dhcp)# default-router 10.0.0.1	Specifies the router to which the Cisco Unified IP phones are connected directly. <ul style="list-style-type: none"> This router should be the Cisco Unified SRST router because this is the default address that is used to obtain SRST service in the event of a WAN outage. As long as the Cisco IP phones have a connection to the Cisco Unified SRST router, the phones are able to get the required network details.
Step 12	exit Example: Router(config-dhcp)# exit	Exits DHCP pool configuration mode.

Defining a Separate DHCP IP Address Pool for Each Cisco Unified IP Phone

This task creates a name for the DHCP server address pool and specifies IP addresses. This method requires you to make an entry for every Cisco Unified IP phone.

SUMMARY STEPS

- ip dhcp pool** *pool-name*
- host** *ip-address subnet-mask*
- option 150 ip** *ip-address*
- default-router** *ip-address*
- exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>ip dhcp pool pool-name</code> Example: Router(config)# ip dhcp pool pool2	Creates a name for the DHCP server address pool and enters DHCP pool configuration mode.
Step 2	<code>host ip-address subnet-mask</code> Example: Router(config-dhcp)# host 10.0.0.0 255.255.0.0	Specifies the IP address that you want the phone to use.
Step 3	<code>option 150 ip ip-address</code> Example: Router(config-dhcp)# option 150 ip 10.0.22.1	Specifies the TFTP server address from which the Cisco IP phone downloads the image configuration file. This needs to be the IP address of Cisco Unified Communications Manager.
Step 4	<code>default-router ip-address</code> Example: Router(config-dhcp)# default-router 10.0.0.1	Specifies the router to which the Cisco Unified IP phones are connected directly. <ul style="list-style-type: none"> This router should be the Cisco Unified SRST router because this is the default address that is used to obtain SRST service in the event of a WAN outage. As long as the Cisco IP phones have a connection to the Cisco Unified SRST router, the phones are able to get the required network details.
Step 5	<code>exit</code> Example: Router(config-dhcp)# exit	Exits DHCP pool configuration mode.

Defining the DHCP Relay Server

This task sets up DHCP relay on the LAN interface where the Cisco Unified IP phones are connected and enables the Cisco IOS DHCP server feature to relay requests from DHCP clients (phones) to a DHCP server. For further details about DHCP configuration, see the [Cisco IOS DHCP Server](#) document.

The Cisco IOS DHCP server feature is enabled on routers by default. If the DHCP server is not enabled on your Cisco Unified SRST router, use the following steps to enable it.

SUMMARY STEPS

1. `service dhcp`
2. `interface type number`
3. `ip helper-address ip-address`
4. `exit`

DETAILED STEPS

	Command or Action	Purpose
Step 1	service dhcp Example: Router(config)# service dhcp	Enables the Cisco IOS DHCP Server feature on the router.
Step 2	interface type number Example: Router(config)# interface serial 0	Enters interface configuration mode for the specified interface. See the Cisco IOS Interface and Hardware Component Command Reference, Release 12.3T for more information.
Step 3	ip helper-address ip-address Example: Router(config-if)# ip helper-address 10.0.22.1	Specifies the helper address for any unrecognized broadcast for TFTP server and Domain Name System (DNS) requests. For each server, a separate ip helper-address command is required if the servers are on different hosts. You can also configure multiple TFTP server targets by using the ip helper-address commands for multiple servers.
Step 4	exit Example: Router(config-if)# exit	Exits interface configuration mode.

Specifying Keepalive Intervals

The keepalive interval is the period of time between keepalive messages sent by a network device. A keepalive message is a message sent by one network device to inform another network device that the virtual circuit between the two is still active.

**Note**

If you plan to use the default time interval between messages, which is 30 seconds, you do not have to perform this task.

SUMMARY STEPS

1. **call-manager-fallback**
2. **keepalive seconds**
3. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	call-manager-fallback Example: Router(config)# call-manager-fallback	Enters call-manager-fallback configuration mode.
Step 2	keepalive <i>seconds</i> Example: Router(config-cm-fallback)# keepalive 60	Sets the time interval, in seconds, between keepalive messages that are sent to the router by Cisco Unified IP Phones. • <i>seconds</i> :Range is 10 to 65535. Default is 30.
Step 3	exit Example: Router(config-cm-fallback)# exit	Exits call-manager-fallback configuration mode.

Examples

The following example sets a keepalive interval of 45 seconds:

```
call-manager-fallback
keepalive 45
```

Configuring Cisco Unified SRST to Support Phone Functions



Tip

When the Cisco Unified SRST is enabled, Cisco Unified IP Phones do not have to be reconfigured while in Cisco Unified Communications Manager fallback mode because phones retain the same configuration that was used with Cisco Unified Communications Manager.

To configure Cisco Unified SRST on the router to support the Cisco Unified IP Phone functions, use the following commands beginning in global configuration mode.

SUMMARY STEPS

1. **call-manager-fallback**
2. **ip source-address** *ip-address* [**port** *port*] [**any-match** | **strict-match**]
3. **max-dn** *max-directory-numbers* [**dual-line**] [**preference** *preference-order*]
4. **max-ephones** *max-phones*
5. **limit-dn** {**7910** | **7935** | **7940** | **7960**} *max-lines*
6. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	call-manager-fallback Example: Router(config)# call-manager-fallback	Enters call-manager-fallback configuration mode.
Step 2	ip source-address <i>ip-address</i> [port <i>port</i>] [any-match strict-match] Example: Router(config-cm-fallback)# ip source-address 10.6.21.4 port 2002 strict-match	Enables the router to receive messages from the Cisco IP phones through the specified IP addresses and provides for strict IP address verification. The default port number is 2000.
Step 3	max-dn <i>max-directory-numbers</i> [dual-line] [preference <i>preference-order</i>] Example: Router(config-cm-fallback)# max-dn 15 dual-line preference 1	Sets the maximum number of directory numbers (DNs) or virtual voice ports that can be supported by the router and activates the dual-line mode. <ul style="list-style-type: none"> • <i>max-directory-numbers</i>: Maximum number of directory numbers or virtual voice ports supported by the router. The maximum number is platform-dependent. The default is 0. See the “Platform and Memory Support” section on page 37 for further details. • dual-line (Optional). Allows IP phones in Cisco Unified Communications Manager fallback mode to have a virtual voice port with two channels. • preference <i>preference-order</i> (Optional). Sets the global preference for creating the VoIP dial peers for all directory numbers that are associated with the primary number. Range is from 0 to 10. Default is 0, which is the highest preference. The alias command also has a preference keyword that sets alias command preference values. Setting the alias command preference keyword allows the default preference set with the max-dn command to be overridden. See Configuring Call Rerouting , page 79 for more information on using the max-dn command with the alias command.
		Note You must reboot the router in order to reduce the limit of the directory numbers or virtual voice ports after the maximum allowable number is configured.

	Command or Action	Purpose
Step 4	<p>max-ephones <i>max-phones</i></p> <p>Example: Router(config-cm-fallback)# max-ephones 24</p>	<p>Configures the maximum number of Cisco IP phones that can be supported by the router. The default is 0. The maximum number is platform dependent. See the “Platform and Memory Support” section on page 37 for further details.</p> <p>Note You must reboot the router in order to reduce the limit of Cisco IP phones after the maximum allowable number is configured.</p>
Step 5	<p>limit-dn {7910 7935 7940 7960} <i>max-lines</i></p> <p>Example: Router(config-cm-fallback)# limit-dn 7910 2</p>	<p>Limits the directory number lines on Cisco IP phones during Cisco Unified Communications Manager fallback.</p> <p>Note You must configure this command during initial Cisco Unified SRST router configuration, before any phone actually registers with the Cisco Unified SRST router. However, you can modify the number of lines at a later time.</p> <p>The setting for maximum lines is from 1 to 6. The default number of maximum directory lines is set to 6. If there is any active phone with the last line number greater than this limit, warning information is displayed for phone reset.</p>
Step 6	<p>exit</p> <p>Example: Router(config-cm-fallback)# exit</p>	<p>Exits call-manager-fallback configuration mode.</p>

Verifying That Cisco Unified SRST Is Enabled

To verify that the Cisco Unified SRST feature is enabled, perform the following steps:

- Step 1** Enter the **show running-config** command to verify the configuration.
- Step 2** Enter the **show call-manager-fallback all** command to verify that the Cisco Unified SRST feature is enabled.
- Step 3** Use the Settings display on the Cisco IP phones in your network to verify that the default router IP address on the phones matches the IP address of the Cisco Unified SRST router.
- Step 4** To temporarily block the TCP port 2000 Skinny Client Control Protocol (SCCP) connection for one of the Cisco IP phones in order to force the Cisco IP phone to lose its connection to the Cisco Unified Communications Manager and register with the Cisco Unified SRST router, perform the following steps:
 - a.** Use the appropriate IP **access-list** command to temporarily disconnect a Cisco Unified IP Phone from the Cisco Unified Communications Manager.

During a WAN connection failure, when Cisco Unified SRST is enabled, Cisco Unified IP Phones display a message informing you that they are operating in Cisco Unified Communications Manager fallback mode. The Cisco IP Phone 7960 and Cisco IP Phone 7940 display a “CM Fallback Service Operating” message, and the Cisco IP Phone 7910 displays a “CM Fallback Service” message when

operating in Cisco Unified Communications Manager fallback mode. When the Cisco Unified Communications Manager is restored, the message goes away and full Cisco IP phone functionality is restored.

- b. Enter the **no** form of the appropriate **access-list** command to restore normal service for the phone.
 - c. Use the **debug ephone register** command to observe the registration process of the Cisco IP phone on the Cisco Unified SRST router.
 - d. Use the **show ephone** command to display the Cisco IP phones that have registered to the Cisco Unified SRST router.
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Troubleshooting

To troubleshoot your Cisco Unified SRST configuration, use the following commands:

- To set keepalive debugging for Cisco IP phones, use the **debug ephone keepalive** command.
- To set registration debugging for Cisco IP phones, use the **debug ephone register** command.
- To set state debugging for Cisco IP phones, use the **debug ephone state** command.
- To set detail debugging for Cisco IP phones, use the **debug ephone detail** command.
- To set error debugging for Cisco IP phones, use the **debug ephone error** command.
- To set call statistics debugging for Cisco IP phones, use the **debug ephone statistics** command.
- To provide voice-packet-level debugging and to display the contents of one voice packet in every 1024 voice packets, use the **debug ephone pak** command.
- To provide raw low-level protocol debugging display for all SCCP messages, use the **debug ephone raw** command.

For further debugging, see the [Cisco IOS Debug Command Reference](#).

Where to Go Next

The next step is setting up the phone and getting a dial tone. For instructions, see the [“Setting Up Cisco Unified IP Phones”](#) chapter.

For additional information, see the [“Additional References”](#) section on page 44 in the [Overview of Cisco Unified SRST](#) chapter.

