



Configuring Voice-Related Support Features

This chapter describes various voice-related support features that work in conjunction with Voice over Frame Relay (VoFR), Voice over ATM (VoATM), or Voice over HDLC (VoHDLC).

This chapter includes the following sections:

- Configuring Call Detail Records on the Cisco MC3810
- Configuring Local Voice Busyout on the Cisco MC3810
- Configuring Trunk Conditioning on the Cisco MC3810
- Voice-Related Support Configuration Examples


For a complete description of the commands used in this chapter, refer to the *Cisco IOS Multiservice Applications Command Reference*. To locate documentation of other commands that appear in this chapter, use the command reference master index or search online.

Configuring Call Detail Records on the Cisco MC3810

Using the Call Detail Records (CDR) functionality, you configure the Cisco MC3810 to compile records of successful calls and failed call events for billing and administrative purposes. You can use a Cisco network management system (NMS) to poll the Cisco MC3810 for CDR events, or display the call records directly on the Cisco MC3810.

This functionality requires that VoFR, VoATM, or VoHDLC already be configured.

To configure the Cisco MC3810 to compile CDR events, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	<code>Router(config)# dial-control-mib {max-size number retain-timer number}</code>	<p>Configures the Cisco MC3810 to compile CDR events.</p> <p>The max-size value specifies the maximum size of the CDR event table. The valid range is from 0–1200, and the default is 50. The value 0 disables the CDR feature, meaning no call history is compiled.</p> <p>The retain-timer value specifies the length of time in minutes that entries will remain in the call history table. The valid range is from 0–2147483647 minutes, and the default is 15. Setting the value to 0 prevents any call history from being retained.</p> <p> Note We recommend that both values be set high enough for the NMS to successfully poll the CDR events, and to access the events in the call history table.</p>
Step 2	<code>Router(config)# exit</code>	Exits configuration mode.
Step 3	<code>Router# show call history voice record</code>	<p>As an alternative to displaying CDR events via the NMS, displays portions of the call history table showing the CDR events. The display only shows a snapshot of the events currently stored in the call history table buffer.</p> <p>Some call history records may show an empty string for the calling number. An empty string for the calling number may be caused by certain configurations, but does not necessarily indicate a problem with the call.</p>



Note The CDR event output is not meaningful until after dial peers for VoFR, VoATM, or VoHDLC are configured.

Configuring Local Voice Busyout on the Cisco MC3810

The local voice busyout feature for the Cisco MC3810 is designed to busy out the trunks assigned to a permanent virtual circuit (PVC) whose pipe is broken so that the PBX will not attempt to seize the circuit. This allows the PBX to route or reroute a given call based on the actual availability of trunks.

This feature is not supported on the BRI voice module (BVM).

**Note**

This feature is different from busy-back. Busy-back refers to the signal sent from within the network to the calling party that indicates a busy (or congested) state anywhere along the route, up to and including the condition of the called party. When the number of available Digital Signal Processors (DSPs) is less than the number of incoming trunks from a PBX, a call from the PBX will connect to “dead air.” The capability to provide a busy-back signal because no DSPs are available is not supported on the Cisco MC3810 as part of this feature.

Local voice busyout provides the following benefits:

- A group of voice ports can be marked busy if the link is broken.
- Specific voice ports in a PVC application can be marked busy under specified conditions.

By marking ports busy, the call is forced back to the originating equipment (typically a PBX), which then reroutes the call over an alternate facility. This ensures that if a link is broken, a caller will not experience a “dead air” state that accompanies a connection that never terminates.

The following restrictions and limitations apply to the Cisco MC3810 local voice busyout implementation:

- For switched calls, a call can still pass through an alternate interface, if specified. A voice port needs to be busied out only if all interfaces are down. To configure this case, the **voice-port busyout** command must be specified for each interface. The voice port is then placed in busyout state if all the specified interfaces are down.
- This feature does not monitor end-to-end connectivity, meaning only the immediate interface connection is monitored. As a result, the interface might be up, but the call still might not go through if the PVC is down. Busyout for specific PVCs or subinterfaces is not available.
- The busyout feature will not be activated under the following conditions:
 - No DSP resources are available
 - No bandwidth is available

These two conditions can be addressed by configuring alternate routing.

You can configure a busyout trigger event at both the serial interface level and the voice-port level. If there is a conflict between the interface-level trigger event and the voice-port level trigger event, meaning the trigger events for each are different, the voice-port-level trigger event will overwrite the interface level trigger event.

If more than one interface is configured for a busyout trigger event, voice ports will not be busied out until all of the interfaces are down.


Configuring the Busyout Trigger Event for Serial Network Interfaces

To configure the voice-port busyout trigger event for a serial network interface, use the following commands in global configuration mode:

	Command	Purpose
Step 1	Router(config)# interface serial 0:x	Enters serial interface configuration mode.
Step 2	Router(config-if)# voice-port busyout	<p>Busies out all voice-ports associated with this serial interface.</p> <p>This command busies out all voice ports associated with the interface, except any voice ports configured to busy out under specific conditions, as described in the “Configuring the Voice Port to Busy Out Under Specified Conditions” section on page 403.</p>
Step 3	Router# show voice busyout	Verifies the busyout status.

When you configure voice-port busyout from a serial network interface, all voice ports are placed into a busyout state when the serial interface goes down.

To configure the voice-port busyout trigger event for the ATM interface, use the following commands in global configuration mode:

	Command	Purpose
Step 1	Router(config)# interface atm 0	Enters interface configuration mode for the ATM interface.
Step 2	Router(config-if)# voice-port busyout	<p>Busies out the voice port associated with the ATM interface.</p> <p> Note This command busies out all voice ports associated with the interface, except any voice ports configured to busy out under specific conditions, as described in the “Configuring the Voice Port to Busy Out Under Specified Conditions” section later in this chapter.</p>
Step 3	Router# show voice busyout	Verifies the busyout status.

Configuring the Busyout Trigger Event for Voice Ports

On voice ports, you can either configure the voice port to busyout under specified conditions, or you can manually force the voice port into a busyout state using the following procedures:

- Configuring the Voice Port to Busy Out Under Specified Conditions
- Forcing the Voice Port into Busyout State

Configuring the Voice Port to Busy Out Under Specified Conditions

You can specify that for a given voice port, certain conditions will trigger a voice port to enter busyout state. To configure this setting, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	For Cisco MC3810 series analog voice ports: <code>router(config)# voice-port slot/port</code> For Cisco MC3810 series digital voice ports: <code>router(config)# voice-port slot:ds0-group</code>	Enters voice-port configuration mode.
Step 2	<code>Router(config-voiceport)# busyout monitor serial {0 1} 0:0</code>	Places the voice port into monitor state. You can monitor either serial 0, serial 1, or serial 0:0, but only one of these interfaces at once. When in monitor mode, if the interface goes down, it triggers a busyout on the voice port.

You can configure how the voice port will handle the seize conditions (for FXO and FXS voice ports only). To configure the seize conditions, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	For Cisco MC3810 series analog voice ports: <code>router(config)# voice-port slot/port</code> For Cisco MC3810 series digital voice ports: <code>router(config)# voice-port slot:ds0-group</code>	Enters voice-port configuration mode.
Step 2	<code>Router(config-voiceport)# busyout seize {ignore repeat}</code>	Configures the busyout seize state for the voice port. After you enter this command, you will receive no response or output; however, when you enter the show voice port summary command, the busyout state for the voice port will be shown.

The busyout seize action depends on the voice port signalling type. For information on the different busyout actions that take place, see Table 30. For E&M voice ports, the busyout action is always seize.



Note

The Cisco MC3810 returns the voice ports to an idle state when the event that triggered the busyout disappears.

Table 30 Busyout Procedure Actions

Voice-Port Signalling Type	Procedure Setting (busyout-option Command)	Busyout Actions
FXS Loop Start	Default	Remove the power from the loop. For analog voice ports, this is equivalent to removing the ground from the tip lead. For digital voice ports, the port will generate the bit pattern equivalent to removing the ground from the tip lead, or will busy out if the bit pattern exists.
FXS Loop Start	Ignore	Ignore the ground on the ring lead.
FXS Ground Start	Default	Ground the tip lead and stay at this state.
FXS Ground Start	Ignore	<ol style="list-style-type: none"> 1. Leave the tip lead open. 2. Ignore the ground on the ring lead.
FXS Ground Start	Repeat	<ol style="list-style-type: none"> 1. Ground the tip lead. 2. Wait for the far end to close the loop. 3. The far end closes the loop. 4. If the far end then opens the loop, FXS removes the ground from the tip lead. 5. FXS waits for several seconds before returning to Step 1.
FXO Loop Start	Default	Close the loop and stay at this state.
FXO Loop Start	Ignore	<ol style="list-style-type: none"> 1. Leave the loop open. 2. Ignore the ringing current on the ring level.
FXO Loop Start	Repeat	<ol style="list-style-type: none"> 1. Close the loop. 2. After the detected far end starts the power denial procedure, FXO opens the loop. 3. After the detected far end has completed the power denial procedure, FXO waits for several seconds before returning to Step 1.
FXO Ground Start	Default	Ground the tip lead.
FXO Ground Start	Ignore	<ol style="list-style-type: none"> 1. Leave the loop open. 2. Ignore the running current on the ring lead, or ground on the tip lead.

Table 30 Busyout Procedure Actions (continued)

Voice-Port Signalling Type	Procedure Setting (busyout-option Command)	Busyout Actions
FXO Ground Start	Repeat	<ol style="list-style-type: none"> 1. Ground the ring lead. 2. Remove the ground from the ring lead, and close the loop after the detected far end grounds the tip lead. 3. When the detected far end removes the ground from tip lead, FXO opens the loop. 4. FXO waits for several seconds before returning to Step 1.
E&M Immediate Start	Default (only option available)	Seize the far end by setting lead busy.
E&M Delay Start	Default (only option available)	Seize the far end by setting lead busy.
E&M Wink Start	Default (only option available)	Seize the far end by setting lead busy.

Forcing the Voice Port into Busyout State

To force the voice port into a busyout state, use the following commands in global configuration mode:

	Command	Purpose
Step 1	For Cisco MC3810 series analog voice ports: <code>router(config)# voice-port slot/port</code> For Cisco MC3810 series digital voice ports: <code>router(config)# voice-port slot:ds0-group</code>	Enters voice-port configuration mode.
Step 2	<code>Router(config-voiceport)# busyout forced</code>	Places the voice port into busyout state.
Step 3	<code>Router# show voice busyout</code>	Verifies the busyout status.

When you perform the previous procedure, the specified voice port is forced into a busyout state when the interface is down. When the **busyout forced** command is entered, the voice port is forced unconditionally into a busyout state.

When you enter the **busyout forced** command to a voice port under an interface (such as serial 0:0), when the interface goes down it becomes a condition for the voice port to go down. If more than one interface has the **voice-port busyout** interface command configured, all interfaces must be down for the busyout to take effect.

When you force the voice port into the busyout state, you must manually force the voice port out of the busyout state by entering the **no busyout forced** voice-port configuration command.

Configuring Trunk Conditioning on the Cisco MC3810

Trunk conditioning on the Cisco MC3810 enables you to create a voice class, configure specific signalling attributes to the voice class, and then map the attributes in the voice class to either a VoFR, VoATM, or a VoHDLC dial peer. Using the voice class, you can define the keepalive signalling packet interval and the signal pattern (ABCD) bit pattern for Cisco-trunk (private-line) calls.

Trunk conditioning on the Cisco MC3810 provides the following benefits:

- Enables greater control over the signalling attributes for Cisco trunk (private line) calls sent over Frame Relay, ATM, or HDLC networks.
- Enables permanent connections to provide fault indication (busy out) to the PBX so that if the permanent connection fails, the PBX can select an alternate path to route calls. This functionality applies to analog telephony connections or digital T1/E1 using channel-associated signalling (CAS)/robbed-bit ABCD signalling. It does not cover common channel signalling (CCS) type signalling.
- Enables detection of out-of-service (OOS) conditioning applied by the PBX.

The following restrictions and limitations apply to trunk conditioning on the Cisco MC3810:

- This feature applies only to Cisco-trunk (private line) or FRF.11 trunk calls.
- This feature does not apply to digital T1/E1 connections using CCS-type signalling.

When voice-over-packet calls are used to provide fixed point-to-point permanent connections (private line or tie-line) between two PBXs, fault indications are sent to the PBX so that if the permanent connection fails, the PBX is able to select an alternate path to route calls. This feature addresses analog telephony connections or digital T1/E1 using CAS/robbed-bit ABCD signalling. It does not cover CCS-type signalling.

When T1/E1 CAS/robbed-bit ABCD signalling is carried in transparent pass-through mode for arbitrary, unknown, or unsupported CAS/robbed-bit protocols, it is necessary to define explicit on-hook/idle patterns so that the DSP/signalling code can sense the idle call state and shut off the flow of voice packets when no active call is in progress. This provides an additional idle bandwidth saving mechanism for cases in which bandwidth-saving using voice activity detection (VAD) is not desired.

Configuring Trunk Conditioning on the Cisco MC3810

This section describes how to configure a voice class to define trunk conditioning attributes for both VoFR and VoATM. Major tasks are described in the following sections:

- Configuring a Voice Class to Define Trunk Conditioning Attributes
- Applying Voice-Class Signalling Attributes to the Voice Network Dial Peer

Configuring a Voice Class to Define Trunk Conditioning Attributes

In conjunction with the configuration for permanent connections (Cisco trunks and FRF.11 trunks), you can define a voice class and configure specific signalling attributes to the voice class, and then map the voice class to a dial peer.

To configure a voice class to define trunk conditioning attributes, including signalling attributes, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	<code>Router(config)# voice class permanent tag</code>	Creates a voice class for Cisco trunk (private line) or FRF.11 trunk calls. The valid range for the <i>tag</i> number is 1 to 10000. The <i>tag</i> number must be unique on the router.
Step 2	<code>Router(config-voice-class)# signal keepalive number</code>	Configures the keepalive signalling packet interval in seconds for Cisco trunk (private line) calls. The valid range for the <i>number</i> argument is 1 to 65535.
Step 3	<code>Router(config-voice-class)# signal pattern {idle receive idle transmit oos receive oos transmit} word</code>	Configures the signal pattern (ABCD bit pattern) for Cisco trunk (private line) calls. Configure both the idle receive and the idle transmit keywords for the idle state of the call. Configure both the oos receive and the oos transmit keywords for the out-of-service state of the call. The receive signal pattern is from the data network side to the PBX. The transmit signal pattern is from the PBX to the data network side. The valid range for all options is 0000 to 1111.
Step 4	<code>Router(config-voice-class)# signal timing idle suppress-voice seconds</code>	Configures the signal timing parameter for the idle state of the call. The suppress-voice parameter shuts down the voice traffic when the existence of the idle state exceeds the configured time in seconds. The valid range is 0 to 65535.
Step 5	<code>Router(config-voice-class)# signal timing oos {restart slave-standby suppress-all suppress-voice timeout} seconds</code>	Configures signal timing parameters for the out-of-service state of the call. The valid range for all options is 0 to 65535 seconds. Select the restart keyword to set the signalling packet timeout period to trigger reinitializing a permanent call connection. Select the slave-standby keyword to set the timeout period for slave ports to return to the standby state for permanent calls. Select the suppress-all keyword to shut down both signal and voice traffic when existence of the transmit OOS state from the PBX exceeds the configured time. Select the suppress-voice keyword to shut down voice traffic when existence of the OOS state exceeds the configured time. Select the timeout keyword to set the timeout period to assert receive OOS pattern to the PBX when signalling packets are lost (this option can be used to cause a busyout when the network goes down).

After you have created the voice class, assign it to a VoFR or VoATM dial peer using the **voice-class permanent** dial-peer configuration command.


**Note**

The **voice-class** command in dial-peer configuration mode is entered with a hyphen. The **voice class** command in global configuration mode is entered without the hyphen.

Applying Voice-Class Signalling Attributes to the Voice Network Dial Peer

After you have created the voice class, you must apply the voice class to the dial-peer configuration. You can assign voice-class signalling attributes to VoFR, VoATM, or VoHDLC dial peers. You cannot assign voice-class signalling attributes to POTS dial peers.

To apply voice-class signalling attributes to the voice network dial peer, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# dial-peer voice <i>number</i> { vofr voatm vohdlc }	Defines a VoFR, VoATM, or VoHDLC dial peer and enters dial-peer configuration mode. All subsequent commands that you enter in dial-peer configuration mode before you exit will apply to this dial peer. The <i>number</i> tag value identifies the dial peer and must be unique on the router. Do not duplicate a specific tag number.
Step 2	Router(config-dialpeer)# voice-class permanent <i>tag</i>	Assigns to the dial peer the voice class that you created in the “Configuring a Voice Class to Define Trunk Conditioning Attributes” section earlier in this chapter.  Note The voice-class command in dial-peer configuration mode is entered with a hyphen. The voice class command in global configuration mode is entered without the hyphen.

Voice-Related Support Configuration Examples

Voice-related support configuration examples are provided in the following sections:

- Call Detail Records on the Cisco MC3810 Configuration Examples
- Local Voice Busyout Configuration Examples
- Trunk Conditioning on the Cisco MC3810 Configuration Examples

Call Detail Records on the Cisco MC3810 Configuration Examples

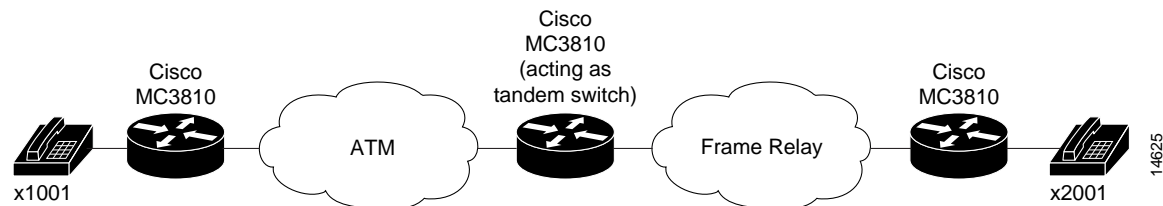
The following is a sample of the output obtained using the **show call history voice record** command showing a local call between two telephones attached to the same Cisco MC3810:

```
router# show call history voice record
ConnectionId=[0x2C7AEFDC 0x59830001 0x0 0xB0AAA3]
Media=TELE, TxDuration= 1418 ms
CallingNumber=2001
SetupTime=1157801 x 10ms
ConnectTime=1158046 x 10ms
DisconnectTime=1158188 x 10ms
DisconnectText=local onhook
```

```
ConnectionId=[0x2C7AEFDC 0x59830001 0x0 0xB0AAA3]
Media=TELE, TxDuration= 1422 ms
CalledNumber=2002
SetupTime=1157802 x 10ms
ConnectTime=1158046 x 10ms
DisconnectTime=1158188 x 10ms
DisconnectText=remote onhook
```

Figure 95 shows an example of a tandem call with three Cisco MC3810 concentrators handling the call.

Figure 95 Tandem Call Configuration Example for CDR Display



On the first Cisco MC3810 (on the left), where the call originates, the **show call history voice record** output is the following:

```
ConnectionId=[0x5BB38AB2 0x3C2D0004 0x0 0x1BD45D]
Media=TELE, TxDuration= 1222 ms
CallingNumber=1001
SetupTime=182383 x 10ms
ConnectTime=182634 x 10ms
DisconnectTime=182756 x 10ms
DisconnectText=local onhook
```

```
ConnectionId=[0x5BB38AB2 0x3C2D0004 0x0 0x1BD45D]
Media=ATM, LowerIfName=ATM0, VPI=0, VCI=1
CalledNumber=2001
SetupTime=182383 x 10ms
ConnectTime=182634 x 10ms
DisconnectTime=182756 x 10ms
DisconnectText=local onhook
```

On the second Cisco MC3810 (in the center) acting as the tandem switch, the **show call history voice record** output is the following:

```
ConnectionId=[0x5BB38AB2 0x3C2D0004 0x0 0x1BD45D]
Media=ATM, LowerIfName=ATM0, VPI=0, VCI=1
CallingNumber=1001
SetupTime=8004 x 10ms
ConnectTime=8253 x 10ms
DisconnectTime=8376 x 10ms
DisconnectText=remote onhook
```

```
ConnectionId=[0x5BB38AB2 0x3C2D0004 0x0 0x1BD45D]
Media=FR, LowerIfName=Serial1, DLCI=131
CalledNumber=2001
SetupTime=8004 x 10ms
ConnectTime=8251 x 10ms
DisconnectTime=8376 x 10ms
DisconnectText=remote onhook
```

On the third Cisco MC3810 (on the right) where the call is terminated, the **show call history voice record** output is the following:

```
ConnectionId=[0x5BB38AB2 0x3C2D0004 0x0 0x1BD45D]
Media=FR, LowerIfName=Serial1, DLCI=131
CallingNumber=1001
SetupTime=1663593 (10ms)
ConnectTime=1663839 (10ms)
DisconnectTime=1663964 (10ms)
DisconnectText=remote onhook
```

```
ConnectionId=[0x5BB38AB2 0x3C2D0004 0x0 0x1BD45D]
Media=TELE, TxDuration= 1258 (ms)
CalledNumber=2001
SetupTime=1663594 (10ms)
ConnectTime=1663838 (10ms)
DisconnectTime=1663964 (10ms)
DisconnectText=remote onhook
```

Local Voice Busyout Configuration Examples

The following configuration examples configure interface serial local voice busyout. The examples also show other commands necessary for the configuration.

Example 1

The following example configures voice port 1/1 into forced busyout state:

```
Router(config)# voice-port 1/1
    Type of VoicePort is FXS
Router(config-voiceport)# busyout forced
Router(config-voiceport)#
00:09:46: port 0 is forced into busyout state
Router(config-voiceport)# end
Router# show voice busyout
If following network interfaces are down, voice port will be put into busyout state
The following voice ports are in busyout state

1/1      is forced into busyout state
```

Example 2

The following example configures voice port 1/2 to busyout monitor mode, monitoring serial 0:

```
Router(config)# voice-port 1/2
  Type of VoicePort is FXS
Router(config-voiceport)# busyout-monitor serial 0
1/2 is in busyout state
Router(config-voiceport)# end
Router# show voice busyout
If following network interfaces are down, voice port will be put into busyout state
The following voice ports are in busyout state

1/1      is forced into busyout state
1/2      is in busyout state caused by Serial0
```

Example 3

The following example configures voice port 1/3 to the busyout seize repeat state:

```
Router(config)# voice-port 1/3
  Type of VoicePort is FXO
Router(config-voiceport)# busyout-seize repeat
Router(config-voiceport)#
Router(config-voiceport)# end
Router# show voice busyout
If following network interfaces are down, voice port will be put into busyout state
The following voice ports are in busyout state

1/1      is forced into busyout state
1/2      is in busyout state caused by Serial0
```

Trunk Conditioning on the Cisco MC3810 Configuration Examples

The following example configures a voice class and then applies it to both a VoFR dial peer and a VoATM dial peer:

```
router(config)# voice class permanent 10
router(config-class)# signal keepalive 10
router(config-class)# signal pattern idle receive 0101
router(config-class)# signal pattern idle transmit 0101
router(config-class)# signal timing idle suppress-voice 5
router(config-class)# signal pattern oos receive 0001
router(config-class)# signal pattern oos transmit 0001
router(config-class)# signal timing oos timeout 60
router(config-class)# signal timing oos restart 120
router(config-class)# signal timing oos suppress-voice 30

router(config)# dial peer voice vofr 10
router(config-dial-peer)# voice-class permanent 10

router(config)# dial peer voice voatm 20
router(config-dial-peer)# voice-class permanent 10
```

