



Configuring Voice over HDLC

This chapter describes how to configure voice traffic over High-Level Data Link Control (HDLC), a protocol that provides Cisco serial encapsulation. For a description of the commands used to configure Voice over HDLC (VoHDLC), refer to the *Cisco IOS Multiservice Applications Command Reference* publication.

VoHDLC enables a Cisco MC3810 concentrator to carry live voice traffic (for example, telephone calls and faxes) back-to-back to a second Cisco MC3810. VoHDLC on the Cisco MC3810 is supported on serial ports 0 or 1, or on 0:*x* (the T1/E1 trunk, where *x* represents the channel group number).

Configuring VoHDLC is simpler than configuring Voice over Frame Relay or ATM. Because the target voice-network peer is another Cisco MC3810 configured back-to-back with the first Cisco MC3810, you need not configure the network backbone to support Voice over HDLC.

Before you can configure your Cisco MC3810 to use VoHDLC, you must first configure the clock source for the Cisco MC3810 interfaces. For more information, refer to the “Configuring Synchronous Clocking” appendix.

VoHDLC Configuration Task List

To configure VoHDLC, perform the following tasks:

- Configuring Voice Ports on the Cisco MC3810 for VoHDLC
- Configuring HDLC Voice Encapsulation
- Configuring Dial Peers

Configuring Voice Ports on the Cisco MC3810 for VoHDLC

For procedures on how to configure voice ports on the Cisco MC3810, see the “Configuring Voice Ports on the Cisco MC3810” section of the “Configuring Voice over ATM” chapter.

Configuring HDLC Voice Encapsulation

Before you can configure HDLC dial peers, you need to configure the HDLC voice encapsulation.

To configure HDLC voice encapsulation, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# controller {t1 e1} 0	<p>If configuring VoHDLC over the T1/E1 trunk (T1/E1 0), enters controller configuration mode.</p> <p>If configuring VoHDLC over serial port 0 or 1, proceed to Step 5.</p> <p>If the digital voice module (DVM) is installed, the controller number can be either 0 or 1. If the Multiflex Trunk (MFT) is installed, the controller number must be 0.</p>
Step 2	Router(config-controller)# channel-group <i>channel-no</i> timeslots <i>timeslot-list</i> speed {56 64}	<p>Configures the channel group number and the time slot list for the controller. The channel group is a number from 0–23. The <i>timeslot-list</i> argument is a number from 1–24.</p> <p>The channel group number must be unique, and cannot be the same as a configured channel-associated signalling (CAS) group or voice group.</p>
Step 3	Router(config-controller)# exit	Exits controller configuration mode.
Step 4	Router(config)# interface serial 0:x { multipoint point-to-point }	<p>If configuring VoHDLC over the T1/E1 trunk, enters interface configuration mode by specifying serial 0:x, where <i>x</i> is the channel group number you configured in the previous step.</p> <p>If the VoHDLC connection will be over a point-to-point network, specify the point-to-point option. The default option, multipoint, assumes you have a fully meshed network. Proceed to Step 6.</p>
Step 5	Router(config-if)# interface serial <i>number</i> { multipoint point-to-point }	<p>If configuring VoHDLC over serial port 0 or 1, enters interface configuration mode and configure the serial interface.</p> <p>If the VoHDLC connection will be over a point-to-point network, specify the point-to-point option. The default option, multipoint, assumes you have a fully meshed network.</p> <p>You can specify serial port 0 or 1 for traffic over the Universal I/O (UIO) serial ports.</p>
Step 6	Router(config-if)# voice-encap <i>size</i>	Configures the voice segmentation size. The valid range for the <i>size</i> value is from 80 to 1600. There is no default.
Step 7	Router(config-if)# exit	Exits interface configuration mode.

Configuring Dial Peers

Dial peers describe the entities to and from which a call is established. Dial-peer configuration tasks define the address or set of addresses serviced by that dial peer and the call parameters required to establish a call to and from that dial peer.

The following two different kinds of dial peers pertain to VoHDLC:

- POTS—Dial peer connected via a traditional telephony network. POTS dial peers point to a particular voice port on a voice network device.
- HDLC—Dial peer connected back-to-back with the Cisco MC3810. HDLC peers point to specific voice-network devices, normally a second Cisco MC3810.



Note

The configuration for HDLC dial peers is very similar to the dial-peer configuration for Frame Relay or ATM. The term HDLC dial peer is used here because in most cases, the peer is back-to-back and normally on the same network.

POTS dial peers associate a telephone number with a particular voice port so that incoming calls for that telephone number can be received and outgoing calls can be placed. HDLC peers point to specific voice-network devices so that incoming calls can be received and outgoing calls can be placed. Both POTS and HDLC dial peers are needed to establish VoHDLC connections if you want to both send and receive calls. Establishing two-way communication using VoHDLC requires establishing a specific voice connection between two defined endpoints.

The following sections describe how to configure POTS and HDLC dial peers.

Configuring POTS Dial Peers

To configure a POTS dial peer, you need to uniquely identify the peer (by assigning it a unique tag number), define its telephone number, and associate it with a voice port through which calls will be established. Under most circumstances, the default values for the remaining dial-peer configuration commands will be sufficient to establish connections.

To configure POTS dial peers, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# dial-peer voice <i>number</i> pots	Defines a POTS 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 Cisco MC3810. Do not duplicate a specific <i>number</i> tag.

	Command	Purpose
Step 2	Router(config-dial-peer)# destination-pattern <i>string</i>	Configures the dial peer destination pattern. The <i>string</i> argument is a series of digits that specify the E.164 or private dialing plan telephone number. Valid entries are the digits 0–9 and the letters A–D. The following special characters can be entered in the string: <ul style="list-style-type: none"> • The star character (*) and the pound sign (#) that appear on standard touch-tone dial pads can be used in any dial string. However, these characters cannot be used as leading characters in a string (for example, *650). • The period (.) can be entered any time, and is used as a wildcard character. • The comma (,) can be used only in prefixes, and is used to insert a 1-second pause or a delay.
Step 3	Router(config-dial-peer)# port <i>slot/port</i>	Associates this POTS dial peer with a specific logical dial interface. Enter the slot/port number of the voice port connected to the POTS dial peer.
Step 4	Router(config-dial-peer)# forward-digits { <i>num-digit</i> all }	(Optional) If you will use the digit-forwarding feature, configures the digit-forwarding method that will be used on the dial peer.
Step 5	Router(config-dial-peer)# prefix <i>string</i>	(Optional) If the forward-digits feature was not configured in the last step, assigns the dialed digits prefix for the dial peer.

To configure additional POTS dial peers, exit dial-peer configuration mode by entering the **exit** command, and repeat the previous steps.

Configuring VoHDLC Dial Peers

To configure a VoHDLC dial peer, you need to uniquely identify the peer (by assigning it a unique tag number), define the outgoing serial port number, and define the virtual circuit number.

To configure VoHDLC dial peers, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# dial-peer voice <i>tag</i> vohdlc	Defines a dial peer for VoHDLC 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 Cisco MC3810. Do not duplicate a specific <i>number</i> tag.
Step 2	Router(config-dial-peer)# destination-pattern <i>string</i>	Configures the dial peer destination pattern. The same restrictions for the string listed in the POTS dial-peer configuration also apply to the VoHDLC destination pattern.
Step 3	Router(config-dial-peer)# session target <i>interface</i> <i>serial-port-number</i>	Configures the HDLC session target for the dial peer. For the <i>serial-port-number</i> value, enter either 0 and 1.
Step 4	Router(config-dial-peer)# preference <i>value</i>	(Optional) Configures a preference for the VoHDLC dial peer. The value is a number from 0–10 where the lower the number, the higher the preference.
Step 5	Router(config-dial-peer)# alt-dial <i>string</i>	(Optional) Configures the alternate dial-out string when configuring on-net-to-off-net alternative dialing.

To configure additional HDLC dial peers, exit dial-peer configuration mode by entering the **exit** command, and repeat the previous steps.

Configuring VoHDLC Dial Peers for Cisco-Trunk (Private Line) Calls

If you will be sending Cisco-trunk (private line) calls over HDLC, you must configure the VoHDLC dial peers to specifically support Cisco-trunk (private line) calls. Cisco-trunk (private line) calls are permanent calls.




Note

You can also create a voice class to configure trunk conditioning values for the idle and out-of-service (OOS) states, and then assign the voice class to the VoHDLC dial peer. For more information, see the “Configuring Voice-Related Support Features” chapter.

To configure a VoHDLC dial peer to support Cisco-trunk permanent (private line) calls, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# dial-peer voice <i>number</i> vohdlc	Defines a VoHDLC dial peer and enters dial-peer configuration mode.
Step 2	Router(config-dial-peer)# destination-pattern <i>string</i>	Configures the dial peer’s destination pattern.
Step 3	Router(config-dial-peer)# session target <i>interface</i>	Configures the HDLC session target for the dial peer.

Command	Purpose
Step 4 Router(config-dial-peer)# session protocol cisco-switched	Configures the session protocol to support Cisco-trunk calls. The cisco-switched option is the default setting, and entering this command is not required.
Step 5 Router(config-dial-peer)# codec type [bytes bytes]	Specifies the voice coder rate of speech and payload size for the dial peer. The default dial peer codec is g729r8. Note that the Cisco MC3810 is limited to a maximum of 12 calls when using g729r8; to support up to 24 calls on the Cisco MC3810, use g729ar8. Specifying the payload size by entering the bytes value is optional. Each codec type defaults to a different payload size if you do not specify a value. To obtain a list of the default payload sizes, enter the codec command and the bytes option followed by a question mark (?).  <p>Note On the Cisco MC3810, you can also assign codec values to the voice port. When you configure the codec type for regular switched voice calls, you must set the codec type on the Cisco MC3810 voice port. When you configure the codec for permanent calls (the cisco-trunk keyword), you must configure the codec type on the dial peer. You cannot specify the payload size on the voice port.</p>
Step 6 Router(config-dial-peer)# dtmf-relay	(Optional) If the codec type is a low bit-rate codec such as g729 or g723, specifies support for DTMF relay to improve end-to-end transport of DTMF tones. DTMF tones do not always propagate reliably with low bit-rate codecs. DTMF relay is disabled by default.

	Command	Purpose
Step 7	Router(config-dial-peer)# signal-type { cas cept ext-signal transparent }	<p>Defines the flavor of the ABCD signalling packets that are generated by the voice port and sent to the data network. The signal type must be configured to the same setting at both ends of the permanent voice call.</p> <p>Enter cas to support CAS. Enter cept to support the European CEPT standard (related to MELCAS).</p> <p>Enter ext-signal to indicate that ABCD signalling packets should not be sent, for configurations where the line signalling information is carried externally to the voice port.</p> <p>Enter transparent (for digital T1/E1 interfaces on the Cisco MC3810 only) to read the ABCD signalling bits directly from the T1/E1 interface without interpretation, and to pass them transparently to the data network (this is also known as transparent FRF.11 signalling).</p>
Step 8	Router(config-dial-peer)# no vad	(Optional) Disables voice activity detection (VAD) on the dial peer. This command is enabled by default.
Step 9	Router(config-dial-peer)# sequence-numbers	(Optional) Enables the voice sequence number if required for your configuration. This command is disabled by default.
Step 10	Router(config-dial-peer)# preference <i>value</i>	(Optional) Configures a preference for the VoHDLC dial peer. The value is a number from 0–10 where the lower the number, the higher the preference in hunt groups.
Step 11	Router(config-dial-peer)# fax rate { 2400 4800 7200 9600 14400 disable voice }	<p>(Optional) Configures the transmission speed (in bits per second) at which a fax will be sent to the dial peer.</p> <p>The default is voice, which specifies the highest possible transmission speed allowed by the voice rate.</p>

To configure another VoHDLC dial peer for Cisco-trunk (private line) calls, exit dial-peer configuration mode and repeat Steps 1 through 11.

To configure Cisco-trunk permanent calls on a Cisco MC3810, see the next section, “Configuring Cisco-Trunk Permanent Calls on a Cisco MC3810.”

Configuring Cisco-Trunk Permanent Calls on a Cisco MC3810

A Cisco-trunk (private line) call is basically a normal dynamic switched call of indefinite duration that uses a fixed destination telephone number and includes optional transparent end-to-end signalling. The telephone number of the destination endpoint is permanently configured into the router so that it always selects a fixed destination. After the call is established, either at boot-up or when configured, the call stays up until one of the voice ports or network ports is shut down, or until a network disruption occurs.

The **connection trunk** voice-port configuration command is used to establish a Cisco-trunk call; the dial peer is configured using the **session protocol cisco-switched** command, which invokes the Cisco proprietary session protocol.

Cisco-trunk (private line) trunk calls can be configured for VoFR and VoATM in addition to VoHDLC.

The Cisco-trunk (private line) trunk call functionality provides the following benefits:

- Provides true permanent (private line) connections.
- Provides comprehensive busyout support for trunk connections (for more information, see the “Configuring Voice-Related Support Features” chapter).
- Provides transparent CAS protocol transport to allow the trunk to carry arbitrary ABCD signalling protocols.
- Provides conversion from North American signalling protocols to the CEPT signalling protocols used for European voice networks.
- Provides remote analog to digital channel-bank operation for converting from DVM to AVM configurations on the Cisco MC3810.

To configure Cisco-trunk permanent calls on a Cisco MC3810 for VoHDLC, 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)# connection trunk destination-string [answer-mode]</code>	Configures the trunk connection, specifying the telephone number in the <i>destination-string</i> argument. When you configure Cisco-trunk permanent calls, one side must be the call initiator (master) and the other side is normally the call answerer (slave). By default, the voice port operates in master mode. Enter the answer-mode keyword to specify that the voice port should operate in slave mode.
Step 3	<code>Router(config-voiceport)# shutdown</code>	Shuts down the voice port.
Step 4	<code>Router(config-voiceport)# no shutdown</code>	Reactivates the voice port to enable the trunk connection to take effect.

**Note**

Every time you enter the **connection trunk** or **no connection trunk** command, you must toggle the voice port (by entering **shutdown**, then **no shutdown**) for the changes to take effect.

Disabling Dial-Peer Hunting on a Dial Peer

To disable dial-peer hunting on a dial peer, enter the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# dial-peer voice tag {pots vohdlc}	Enters dial-peer configuration mode for the specified dial peer.
Step 2	Router(config-dial-peer)# huntstop	Disables dial-peer hunting on the dial peer. Once you enter this command, no further hunting will be allowed if a call fails on the specified dial peer.

To reenables dial-peer hunting on a dial peer, enter the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# dial-peer voice tag {pots vohdlc}	Enters dial-peer configuration mode for the specified dial peer.
Step 2	Router(config-dial-peer)# no huntstop	Reenables dial-peer hunting on the dial peer. Once you enter this command, no further hunting will be allowed if a call fails on the specified dial peer.

Verifying the VoHDLIC Configuration

If you have relatively few dial peers configured, you can use the **show dial-peer voice** command to verify the validity of your dial-peer configuration.

Troubleshooting Tips

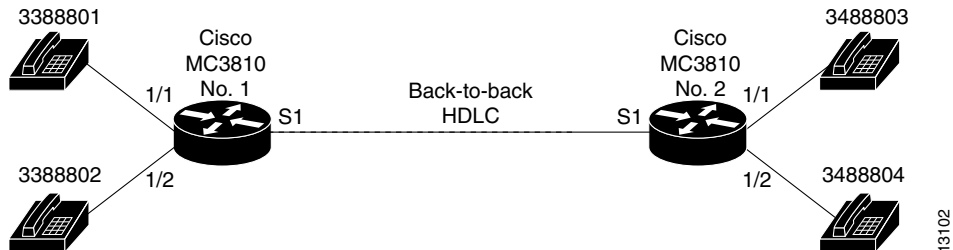
If you are having trouble connecting a call, you can try to resolve the problem by performing the following tasks:

- If you suspect the problem is associated with the dial-peer configuration, use the **show dial-peer voice** command on the local and remote concentrators to verify that the data is configured correctly on both.
- Toggle the voice port or serial port by entering the **shutdown** command, and then the **no shutdown** command.

VoHDLC Configuration Example

Figure 94 shows an example of a simple back-to-back VoHDLC configuration.

Figure 94 VoHDLC Configuration Example



The following is the configuration for both Cisco MC3810 concentrators to configure back-to-back VoHDLC:

Cisco MC3810 No. 1 Configuration

```
interface Serial1 point-to-point
 ip address 5.5.5.1 255.0.0.0
 no keepalive
 ipx network 2222
 ipx accounting
 voice-encap 512
 clockrate 64000

ip classless

line con 0
 exec-timeout 0 0
line aux 0
line vty 0 4
 login

voice-port 1/1

 dial-peer voice 1 pots
 destination-pattern 3388801
 port 1/1

 dial-peer voice 2 pots
 destination-pattern 3388802
 port 1/2

 dial-peer voice 44 vohdlc
 destination-pattern 348....
 session target Serial1

end
```

Cisco MC3810 No. 2 Configuration

```
interface Serial1 point-to-point
 ip address 5.5.5.2 255.0.0.0
 no keepalive
 ipx network 2222
 ipx accounting
 voice-encap 512
 clockrate 64000

 ip classless

 line con 0
   exec-timeout 0 0
 line aux 0
 line vty 0 4
   login

 voice-port 1/1

 dial-peer voice 1 pots
 destination-pattern 3488803
 port 1/1

 dial-peer voice 2 pots
 destination-pattern 3488804
 port 1/2

 dial-peer voice 40 vohdld
 destination-pattern 338....
 session target Serial1

end
```

