

QSIG Protocol Support on Cisco MC3810, 7200, 2600, and 3600 Series Routers

This document describes how to configure QSIG protocol support for Cisco 7200, 2600, and 3600 series routers and enhancements to QSIG protocol support on the Cisco MC3810 multiservice access concentrator.

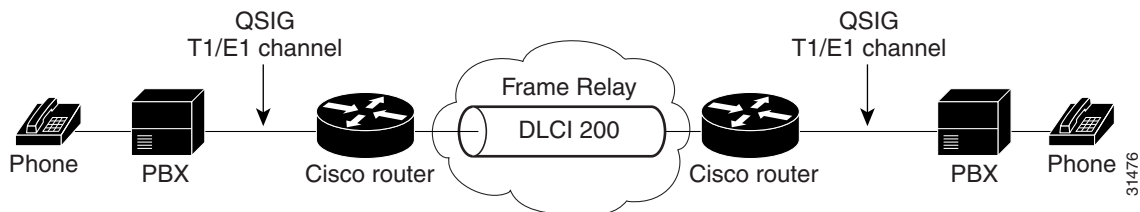
This feature description includes the following sections:

- Feature Overview, page 1
- Supported Platforms, page 6
- Supported Standards, MIBs, and RFCs, page 7
- Prerequisites, page 7
- Configuration Tasks, page 9
- Configuration Examples, page 18
- Command Reference, page 30
- Glossary, page 37

Feature Overview

QSIG protocol support allows Cisco voice switching services to connect private branch exchanges (PBXs), key systems (KTs), and central office switches (COs) that communicate by using the QSIG protocol, which is becoming the standard for PBX interoperability in Europe and North America. QSIG is a variant of ISDN D-channel signaling. With QSIG, Cisco networks emulate the functionality of the public-switched telephone network (PSTN), and QSIG signaling messages allow the dynamic establishment of voice connections across a Cisco wide-area network (WAN) to a peer router, which can then transport the signaling and voice packets to a second private integrated services network exchange (PINX), as shown in Figure 1.

Figure 1 **QSIG Signaling**



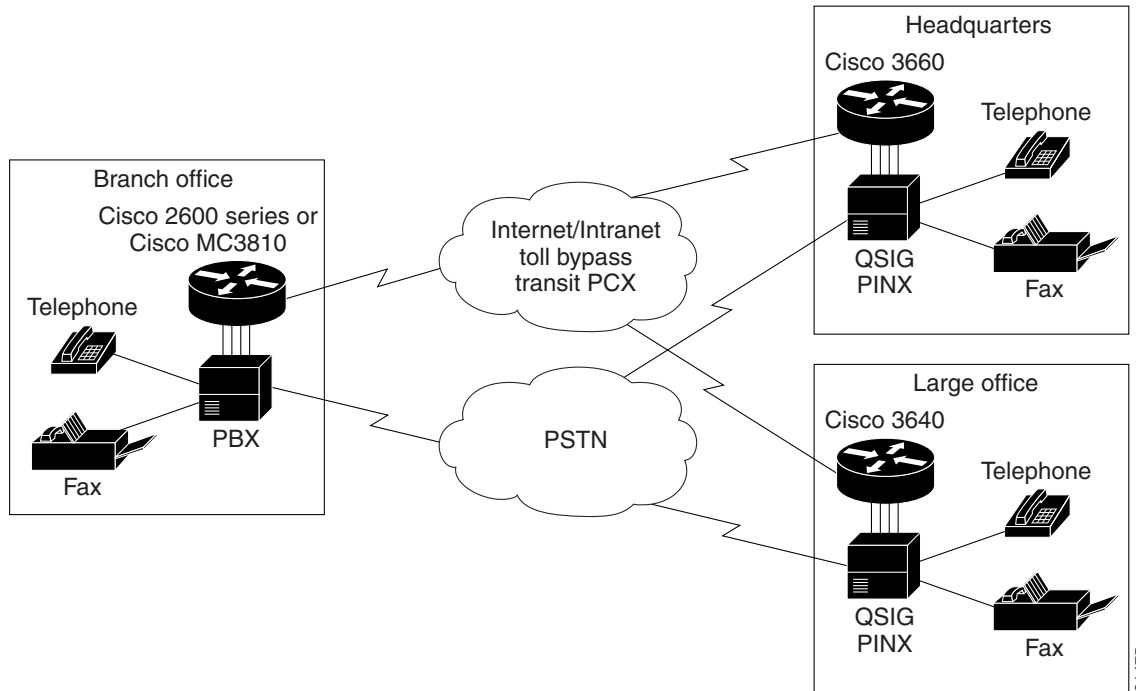
The Cisco voice packet network appears to the traditional QSIG PBXs as a distributed transit PBX that can establish calls to any PBX, non-QSIG PBX, or other telephony endpoint served by a Cisco gateway, including non-QSIG endpoints. When originating and terminating on QSIG endpoints, the QSIG messages are passed transparently across the network; the PBXs are responsible for processing and provisioning the supplementary services. When linking QSIG and non-QSIG endpoints served by a Cisco packet voice gateway, only basic calls are supported. In addition, all switched voice connections must be established and torn down in response to QSIG control messages.

QSIG support includes the following capabilities:

- Enables digit forwarding on POTS dial peers.
- On Cisco 3600 series routers, enables QSIG-switched calls over Voice over Frame Relay (VoFR), Voice over IP (VoIP), and Voice over ATM (VoATM) for T1/E1 and BRI voice interface cards.
- On Cisco 2600 series routers, enables QSIG-switched calls over Voice over Frame Relay (VoFR) and Voice over IP (VoIP) for T1/E1 and BRI voice interface cards.
- On Cisco 3600 series routers, enables T1 or E1 PRI and Basic Rate Interface (BRI) QSIG-switched calls over VoFR, VoATM, and VoIP for Cisco 2600 and 3600 digital packet voice trunk network modules.
- On Cisco 2600 series routers, enables T1 or E1 PRI and Basic Rate Interface (BRI) QSIG-switched calls over VoFR and VoIP for digital packet voice trunk network modules.
- On Cisco 7200 series routers, enables QSIG-switched calls over Voice over Frame Relay (VoFR) and Voice over IP (VoIP) on T1/E1 voice interface cards.
- On Cisco MC 3810, enables T1 or E1 PRI and Basic Rate Interface (BRI) QSIG-switched calls over VoFR, VoIP, and VoATM for Cisco MC3810 digital voice modules (DVMs) and BRI voice module (BVM). QSIG support on the Cisco MC3810 was introduced in Cisco IOS Release 12.0(2)T.

Figure 2 shows an example of how QSIG support can enable a toll-bypass application.

Figure 2 QSIG Toll-Bypass Application



QSIG Protocol Stack

QSIG is a variant of ISDN D-channel signaling. The protocol was originally specified by ECMA, then was adopted by European Telecommunications Standards Institute (ETSI) and the ISO. The following table identifies that ECMA standards and to which OSI layer they define of the QSIG protocol stack.

Table 1 QSIG Protocol Stack

Layer	Standards	Description
Layers 4 to 7	Application mechanisms	End-to-end protocols Network transparent
	Multiple ECMA standards	Standards for Supplementary Services and Advance Network Features
Layer 3	ECMA-165	QSIG Generic Functional Procedures
	ECMA-142/143	QSIG Basic Call
Layer 2	ECMA-141	Interface-dependent protocols
Layer 1	I.430 / I.431	PRI and BRI

Switch-Type Configuration Options

Step-by-step configuration procedures are included in “Configuration Tasks” on page 9. This section includes some tips for configuring the ISDN switch type.

You can enter the **isdn switch-type** command to support QSIG at either the global configuration level or at the interface configuration level. For example, if you have a QSIG connection on one line as well as on the BRI or PRI port, you can configure the ISDN switch type in one of the following combinations:

- Set the global **isdn switch-type** command to support QSIG by entering either the **isdn-switch-type basic-qsig** command (BRI) or **isdn-switch-type primary-qsig** command (BRI); and set the interface **isdn-switch-type** command for the interfaces to a regular central office switch type, such as those shown in Table 2.
- Set the global **isdn switch-type** command to support the CO switch type (see Table 2), and set the interface **isdn switch-type** command for the interface to support QSIG.
- Configure the global **isdn switch-type** command to another setting (see Table 2); then, set the interface **isdn switch-type** command for **interface bri** to a BRI setting; set the interface **isdn switch-type** command for the serial interface to support QSIG.

Table 2 ISDN CO Switch Types

Country	ISDN Switch Type	Description
Australia	basic-ts013	Australian TS013 switches
Europe	basic-1tr6	German ITR6 ISDN switches
	basic-nwnet3	Norwegian NET3 ISDN switches (phase 1)
	basic-net3	NET3 ISDN switches (UK and others)
	vn2	French VN2 ISDN switches
	vn3	French VN3 ISDN switches
Japan	ntt	Japanese NTT ISDN switches
New Zealand	basic-nznet3	New Zealand NET3 switches
North America	basic-5ess	Lucent Technologies basic rate switches
	basic-dms100	NT DMS-100 basic rate switches
	basic-ni1	National ISDN-1 switches

Benefits

QSIG voice signaling provides the following benefits:

- Provides efficient and cost-effective services on permanent (virtual) circuits or leased lines.
- Allows enterprise networks that include PBX networks to replace leased voice lines with the voice switching capability.
- Eliminates the need to route connections through multiple tandem PBX hops to reach the desired destination, saving bandwidth and PBX hardware and switching power.
- Improves voice quality through the single-hop routing provided by voice switching while allowing voice to be compressed more aggressively, resulting in additional savings.
- Supports PBX “feature transparency” across a WAN, permitting PBX networks to provide advanced features such as calling name and number display, camp-on/callback, network call forwarding, centralized attendant, and centralized message waiting. Usually, these capabilities are available on only a single site where users are attached to the same PBX.

Restrictions

The following restrictions apply to the Cisco MC3810:

- QSIG data calls are not supported. All calls with bearer capability indicating a non-voice type (such as for video telephony) are rejected.
- A Cisco MC3810 supports only one T1/E1 interface with direct connectivity to a PINX.
- The Cisco MC3810 supports a maximum of 24 B channels.
- When QSIG is configured, serial port 1 cannot support speeds higher than 192 kbps. This restriction assumes that the MFT is installed in slot 3 on the Cisco MC3810. If the MFT is not installed, then serial port 1 does not operate.

The Cisco 2600 series does not support VoATM.

The following restrictions apply to the Cisco 7200 series:

- VoATM is not supported.
- BRI is not supported.

Related Documents

The following online documents can help you understand QSIG support:

- *Voice over IP Q.SIG Network Transparency for the Cisco AS5300:*
http://www.cisco.com/univercd/cc/td/doc/product/access/acs_serv/5300/cfios/cfselfea/0125qsig.htm
- *QSIG Digit Forwarding on the Cisco MC3810:*
<http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/120newft/120limit/120xg/120xg3/qsigdmxg.htm>
- *ISDN BRI Voice on the Cisco MC3810:*
<http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/120newft/120t/120t4/brivocf2.htm>
- *ISDN PRI QSIG Voice Signaling on the Cisco MC3810:*
<http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/120newft/120t/120t2/qsigfm.htm>

The following Cisco IOS Release 12.0 documents are also helpful:

- *Dial Solutions Configuration Guide:*
http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/12cgcr/dial_c/index.htm
- *Dial Solutions Command Reference:*
http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/12cgcr/dial_r/index.htm
- *Voice, Video, and Home Applications Configuration Guide:*
http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/12cgcr/voice_c/index.htm
- *Voice, Video, and Home Applications Command Reference:*
http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/12cgcr/voice_r/index.htm

The following documents can help you troubleshoot ISDN, PRI, and BRI connections:

- *Internetwork Troubleshooting Guide*
http://www.cisco.com/univercd/cc/td/doc/cisintwk/itg_v1/tr1917.htm
- *Debug Command Reference*
http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/12supdoc/debug_r/index.htm

The following documents can help with hardware installation and configuration:

- *Cisco 7206 Installation and Configuration Guide:*
<http://www.cisco.com/univercd/cc/td/doc/product/core/7206/index.htm>
- *Cisco 7204 Installation and Configuration Guide*
<http://www.cisco.com/univercd/cc/td/doc/product/core/7204/index.htm>
- *Cisco 7202 Installation and Configuration Guide*
<http://www.cisco.com/univercd/cc/td/doc/product/core/7202/index.htm>
- *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines*
<http://www.cisco.com/univercd/cc/td/doc/product/core/7206/7206cfg/3471pac6.htm>
- *Cisco 7200 Series Configuration Notes*
<http://www.cisco.com/univercd/cc/td/doc/product/core/7206/7206cfg/index.htm>
- *Cisco MC3810 Multiservice Concentrator Hardware Installation:*
<http://www.cisco.com/univercd/cc/td/doc/product/access/multicon/3810hwig/index.htm>
- For more information about supported hardware on a Cisco 2600 or 3600 series router, go to:
 - http://www.cisco.com/univercd/cc/td/doc/product/access/acs_mod/cis2600/index.htm
 - http://www.cisco.com/univercd/cc/td/doc/product/access/acs_mod/cis3600/index.htm

Supported Platforms

This feature is supported on the following platforms:

- Cisco 7202 VXR
- Cisco 7204 VXR
- Cisco 7206 VXR
- Cisco 2610
- Cisco 2611
- Cisco 2612
- Cisco 2613
- Cisco 2620
- Cisco 2621
- Cisco 3620
- Cisco 3640
- Cisco 3662
- Cisco 3661

- Cisco MC3810

Supported Standards, MIBs, and RFCs

RFCs

- RFC 1890
- RFC 1889

MIBs

- CISCO-ENTITY-VENDORTYPE-OID-MIB
- OLD-CISCO-CHASSIS-MIB
- CAS_INTF_MIB

Other Supported Standards

QSIG is based on the widely used ISDN Q.931 standards. Cisco's QSIG implementation follows the following International standards:

- ECMA 143: Private Telecommunication Network (PTN) Inter-Exchange Signaling Protocol Circuit Mode Basic Services. This specification covers QSIG basic call services.
- ECMA 142: Specification, Functional Model and Information Flows for Control Aspects of Circuit Mode Basic Services in Private Telecommunication Networks.
- ECMA 141: Private Telecommunication Networks Inter-Exchange Signaling Data Link layer Protocol.
- ECMA 165. Generic Functional Protocol for the Support of Supplementary Services.
- H.323: Visual Telephone System and Equipment for Local Area Networks which Provide a Non-Guaranteed Quality of Service.
- H.245: Control Protocol for Multimedia Communication.
- H.225: Media Stream Packetization and Synchronization on Non-Guaranteed Quality of Service LANs.

Prerequisites

- Install Cisco IOS Release 12.0(7)XK.
- Obtain PRI or BRI (not available for Cisco 7200 series) and T1 or E1 service from your service provider.
- Establish a working network.
 - For more information about configuring IP, see the Cisco IOS Release 12.0 *Network Protocols Configuration Guide, Part 1*.

- For more information about configuring Frame Relay, see “Configuring Frame Relay” in the Cisco IOS Release 12.0 *Wide-Area Networking Configuration Guide*.
- For more information about configuring ATM, see “Configuring ATM” in the Cisco IOS Release 12.0 *Wide-Area Networking Configuration Guide*.
- Complete your company’s dial plan.
- Establish a working telephony network based on your company’s dial plan:
 - *Voice, Video, and Home Applications Configuration Guide* and *Voice, Video, and Home Applications Command Reference* for Cisco IOS Release 12.0 provide information about setting up voice networks.
 - For more information about configuring VoATM on Cisco 3600 series routers, see the Cisco IOS Release 12.0(7)XK online document:
Voice over ATM on Cisco 3600 Series Routers
http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/120newft/120limit/120xk/1207xk/voatm_6x.htm
 - For more information about configuring VoFR on Cisco 2600 and 3600 series routers, see the Cisco IOS Release 12.0(7)XK online document:
Voice over Frame Relay Using FRF.11 and FRF.12 Configuration Updates
http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/120newft/120limit/120xk/1207xk/vofr_6x.htm
 - For more information about configuring VoIP on the Cisco MC3810, see the Cisco IOS Release 12.0(7)XK online document:
Configuring Voice over IP for Cisco MC3810 Series Concentrators
<http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/120newft/120limit/120xk/1207xk/voip3810.htm>
- For a Cisco MC3810, install the required digital voice modules (DVMs), BRI voice module (BVM), and multiflex trunk modules. For more information about supported hardware, see *Cisco MC3810 Multiservice Concentrator Hardware Installation*:
<http://www.cisco.com/univercd/cc/td/doc/product/access/multicon/3810hwig/index.htm>
- For a Cisco 2600 or 3600 series router, install digital T1 or E1 packet voice trunk network modules, BRI voice interface cards, and other voice interface cards as required on your network. For more information about supported hardware, go to:
 - http://www.cisco.com/univercd/cc/td/doc/product/access/acs_mod/cis2600/index.htm
 - http://www.cisco.com/univercd/cc/td/doc/product/access/acs_mod/cis3600/index.htm
- For a Cisco 7200 series router, install a single-port 30-channel T1/E1 high-density voice port adapter. For more information about supported hardware, go to:
<http://www.cisco.com/univercd/cc/td/doc/product/core/7200vx/index.htm>
- Configure voice card and controller settings.
- Configure serial and LAN interfaces.
- Configure voice ports.
- Configure voice dial peers.

Configuration Tasks

Perform the following tasks to configure your Cisco 2600, 3600, or 7200 VXR series routers or your Cisco MC3810 multiservice concentrator:

- Configuring Global QSIG Support for BRI or PRI
- Configuring Controllers for QSIG PRI
- Configuring BRI or PRI Interfaces for QSIG

These sections do not include all possible configuration steps. For more information, see the resources listed in “Related Documents” on page 5.

Configuring Global QSIG Support for BRI or PRI

To complete global configuration of QSIG signaling on the router, follow the steps in this section.

If you need additional guidance regarding switch-type configuration, see “Switch-Type Configuration Options” on page 4.

Step	Command	Purpose
1	<code>router# configure terminal</code>	Enter global configuration mode.
2	<code>router(config)# isdn switch-type basic-qsig</code> or <code>isdn switch-type primary-qsig</code>	(Optional, BRI only on Cisco MC3810, 2600, and 3600 series routers) Configure the global ISDN switch type. (Optional, PRI only) Configure the ISDN switch-type to support QSIG signaling. Note You can configure the ISDN switch type by using either this global command or the same command in interface configuration mode, depending on your configuration. If you configure the global isdn-switch-type command for QSIG support, you do not need to configure the interface isdn-switch-type command for QSIG. For more information, see “Switch-Type Configuration Options” on page 4. For a list of CO switch types, see Table 2 on page 4.
3	<code>router(config)# dspinterface dspfarm slot/port</code>	(Cisco 7200 series only) Configure the digital signal processor (DSP) farm interface.
4	<code>router(config)# card type {t1/e1} slot</code>	(Cisco 7200 series only) Enter T1 or E1 card type and specify the slot location by using a value from 0 to 5, depending upon your router.

Configuring Controllers for QSIG PRI

Beginning in global configuration mode, complete the following steps to configure QSIG signaling over PRI:

1	<code>router(config)# controller {T1 E1}controller number</code>	<p>Enter interface configuration mode and specify the E1 or T1 controller, specifying <i>I</i> for a Cisco MC3810 and a <i>slot/port</i> location on a Cisco 7200, 2600, or 3600 series router.</p> <p>Note On the Cisco MC3810, QSIG is only supported on controller 1.</p>
2	<code>router(config-controller)# pri-group {timeslots range}</code>	<p>Configure the PRI group for either T1 or E1 to carry voice traffic. For T1, available timeslots are from 1 to 23, and for E1, available timeslots are from 1 to 31.</p> <p>You can configure the PRI group to include all available timeslots, or you can configure a select group of timeslots for the PRI group. For example, if only timeslots 1 to 10 are in the PRI group, enter pri-group timeslot 1-10.</p> <p>If the PRI group includes all channels available for T1 (channels 1 to 24), enter pri-group timeslot 1-24.</p> <p>If the PRI group includes all channels available for E1 (channels 1 to 31), enter pri-group timeslot 1-31.</p>
3	<code>router(config-controller)# exit</code>	Exit controller configuration mode.

Configuring BRI or PRI Interfaces for QSIG

To configure BRI or PRI interfaces for QSIG support, complete the following steps, beginning in global configuration mode:

1	<code>router(config)# interface bri slot</code> or <code>router(config)# interface bri slot/port</code>	<p>(BRI only on Cisco MC3810, 2600, and 3600 series routers) Enter interface configuration mode to configure parameters for the specified BRI voice interface.</p> <p>(Cisco MC3810) Enter a <i>slot</i> number from 1 to 4.</p> <p>(Cisco 2600 or 3600 series router) Enter a <i>slot</i> number from 1 to 6 and a <i>port</i> value of 1 or 2.</p>
2	<code>router(config)# isdn static tei 0</code>	<p>(BRI only on Cisco MC3810, 2600, and 3600 series routers) This command is required. In previous releases, it was set automatically when the isdn switch-type basic-qsig command was issued.</p>
3	<code>router(config-if)# isdn layer1-emulate {user network}</code>	<p>(BRI only, Cisco MC3810 only) Configure the Layer 1 port mode emulation and the clock settings:</p> <ul style="list-style-type: none"> Enter user to configure the port as TE and to function as a clock slave. This is the default. The term user is equivalent to the QSIG term <i>slave</i>. Enter network to configure the port as NT and to function as a clock master. The term network is equivalent to the QSIG term <i>master</i>.

4	<code>router(config-if)# network-clock-priority {low high}</code>	<p>(BRI only, Cisco MC3810 only) If this BRI voice port is configured as TE and you want it to be the first-priority BRI voice port for recovering clock from the network NT device, enter high.</p> <p>If this BRI voice port is configured as TE and you want it to be a low-priority BRI voice port for recovering clock from the network NT device, enter low.</p> <p>Do not use this command if this port is configured as NT in Step 3 with the command isdn layer1-emulate network.</p>
5	<code>router(config-if)# isdn incoming-voice voice</code>	<p>Route incoming voice calls. This is set for voice-capable BRI interfaces by default, except for Cisco 2600 and 3600 BRI S/T TE voice interface cards, where, unless this command is used, the isdn incoming-voice modem configuration setting is converted to isdn incoming-voice voice when it receives an incoming call.</p>
6	<code>router(config-if)# isdn sending-complete</code>	<p>(Optional) Configure the voice port to include the Sending Complete information element in the outgoing call setup message. This command is used in some geographic locations, such as Hong Kong and Taiwan, where the sending complete information element is required in the outgoing call setup message.</p>
7	<code>router(config-if)# isdn switch-type basic-qsig</code>	<p>(Optional, BRI only on Cisco MC3810, 2600, and 3600 series routers, see “Switch-Type Configuration Options” on page 4) If the service provider switch type for this BRI port is different from the global ISDN switch type, configure the interface ISDN switch type to match the service provider switch type. The interface ISDN switch type overrides the global ISDN switch type on this interface.</p> <p>Continue BRI interface configuration at Step 4 of the following procedure.</p>
8	<code>router(config-if)# exit</code>	<p>(PRI only) Exit interface configuration mode.</p>

If you are configuring a BRI interface, begin at Step 4. If you are configuring a PRI interface, begin at Step 1.

1	<code>router(config)# interface serial slot/port:channelnumber</code> or <code>interface serial 1:channelnumber</code>	<p>(PRI only) Enter interface configuration mode for the ISDN PRI interface and the interface slot and port location.</p> <p>On a Cisco MC3810, enter the slot location as 1.</p> <p>On any supported router, for T1, enter the channel number as 23. For E1, enter 15.</p>
2	<code>router(config-if)# isdn switch-type primary-qsig</code>	<p>(PRI only, see “Switch-Type Configuration Options” on page 4) If you did not configure the global PRI ISDN switch type for Q.SIG support in global configuration mode, configure the interface ISDN switch type to support Q.SIG signaling.</p> <p>The conditions that apply to this command in global configuration mode also apply to this command in interface configuration mode.</p> <p>Note This interface command overrides the global isdn switch-type command setting for this interface.</p>

Configuration Tasks

3	<code>router(config-if)# isdn contiguous-bchan</code>	(PRI only, E1 only) Specify contiguous bearer channel handling so that B channels 1 through 30 map to time slots 1 to 31, skipping 16.
4	<code>router(config-if)# isdn protocol-emulate {user network}</code>	<p>Configure the Layer 2 and Layer 3 port protocol emulation:</p> <ul style="list-style-type: none"> Enter user (equivalent to the QSIG term <i>slave</i>) to configure the port as TE; the PINX is the master. This is the default. Enter network (equivalent to the QSIG term <i>master</i>) to configure the port as NT; the PINX is the slave. <p>Note On the Cisco MC3810, this command replaces the command <code>isdn switch-type [primary-qsig-slave primary-qsig-master]</code>.</p>
5	<code>router(config-if)# isdn overlap-receiving value</code>	<p>(Optional) Activate overlap signaling to send to the destination PBX. In this mode, the interface waits for possible additional call-control information from the preceding PINX.</p> <p>Note You can leave the default mode of <i>enbloc</i>, where all call establishment information is sent in the setup message without need for additional messages from the preceding PINX.</p>
6	<code>router(config-if)# isdn network-failure-cause [value]</code>	<p>(Optional) Specify the cause code to pass to the PBX when a call cannot be placed or completed because of internal network failures. Possible values are from 1 to 127. See Table 3 for a list.</p> <p>Note All cause codes except for Normal Call Clearing (16), User Busy (17), No User Responding (18) and No Answer from User (19) will be changed to the specified cause code.</p>
7	<code>router(config-if)# exit</code>	Exit interface configuration mode.

Table 3 ISDN Failure Cause Codes

No.	Meaning	No.	Meaning	No.	Meaning	No.	Meaning
1	Unallocated or unassigned number	29	Facility rejected	54	Incoming calls barred	86	Call with requested call ID is cleared
2	No route to specified transit network	30	Response to status enquiry	57	Bearer capability not authorized	88	Incompatible destination
3	No route to destination	31	Normal, unspecified	58	Bearer capability not now available	91	Invalid transit network selection
6	Channel unacceptable	34	No circuit/channel available	63	Service or option not available, unspecified	95	Invalid message, unspecified
7	Call awarded and being delivered in an established channel	38	Network out of order	65	Bearer capability not implemented	96	Mandatory information element missing

Table 3 ISDN Failure Cause Codes (continued)

No.	Meaning	No.	Meaning	No.	Meaning	No.	Meaning
16	Normal call clearing	41	Temporary failure	66	Channel type not implemented	97	Message type nonexistent or not implemented
17	User busy	42	Switch congestion	69	Requested facility not implemented	98	Message not compatible with call state or message type nonexistent or not implemented
18	No user responding	43	Access information discarded	70	Only restricted digital information bearer capability is available	99	Information element nonexistent or not implemented
19	No answer from user (user alerted)	44	Requested channel not available	79	Service or option not implemented, unspecified	100	Invalid information element contents
21	Call rejected	45	Preempted	81	Invalid call reference value	101	Message not compatible with call state
22	Number changed	47	Resources unavailable, unspecified	82	Identified channel does not exist	102	Recovery on timer expiry
26	Non selected user clearing	49	Quality of service unavailable	83	Suspended call exists, but this call ID does not	111	Protocol error, unspecified
27	Destination out of order	50	Requested facility not subscribed	84	Call ID in use	127	Interworking, unspecified
28	Invalid number format	52	Outgoing calls barred	85	No call suspended		

Verifying the QSIG Configuration

Perform the following steps to confirm the QSIG configuration. The **show running-config** command displays PRI time slot group configuration and other details, as shown in “Configuration Examples” on page 18.

- Step 1** To see information about switch type, memory, status, and Layer 2 and Layer 3 timers, enter the **show isdn {memory | status | timers}** command.

For more information about this command, see *Cisco IOS 12.0 Dial Solutions Command Reference* at:

http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/12cgcr/dial_r/index.htm

The following sample output shows the results of the **show isdn status** command for a BRI voice port and a PRI voice port on the Cisco MC3810:

```
router# show isdn status
Global ISDN Switchtype = basic-qsig
ISDN BRI1 interface
dsl 1, interface ISDN Switchtype = basic-qsig
**** Slave side configuration ****
Layer 1 Status:
```

```

DEACTIVATED
  Layer 2 Status:
TEI = 0, Ces = 1, SAPI = 0, State = TEI_ASSIGNED
  Layer 3 Status:
NLCB:callid=0x0, callref=0x0, state=31, ces=0 event=0x0
0 Active Layer 3 Call(s)
  Activated dsl 1 CCBs = 0
ISDN BRI2 interface
.
.

```

router# **show isdn status**

```

Global ISDN Switchtype = primary-qsig
ISDN Serial1:23 interface
  dsl 0, interface ISDN Switchtype = primary-qsig
  **** Slave side configuration ****
  Layer 1 Status:
    DEACTIVATED
  Layer 2 Status:
    TEI = 0, Ces = 1, SAPI = 0, State = TEI_ASSIGNED
  Layer 3 Status:
    0 Active Layer 3 Call(s)
  Activated dsl 0 CCBs = 0
  The Free Channel Mask: 0x7FFFFFF

```

The following sample output shows the results of the **show isdn status** command for a BRI voice port on a Cisco 3600 series router:

router# **show isdn status**

```

Global ISDN Switchtype = primary-qsig
ISDN Serial3/1:15 interface
  dsl 0, interface ISDN Switchtype = primary-qsig
  **** Master side configuration ****
  Layer 1 Status:
    ACTIVE
  Layer 2 Status:
    TEI = 0, Ces = 1, SAPI = 0, State = MULTIPLE_FRAME_ESTABLISHED
  Layer 3 Status:
    29 Active Layer 3 Call(s)
  Activated dsl 0 CCBs = 29
    CCB:callid=89BF, sapi=0, ces=0, B-chan=5, calltype=VOICE
.
.
.
.
    CCB:callid=89C8, sapi=0, ces=0, B-chan=14, calltype=VOICE
.
.
.
.
    CCB:callid=89D9, sapi=0, ces=0, B-chan=1, calltype=VOICE
    CCB:callid=89DA, sapi=0, ces=0, B-chan=2, calltype=VOICE
    CCB:callid=89DB, sapi=0, ces=0, B-chan=3, calltype=VOICE
  The Free Channel Mask: 0x80000018
ISDN Serial3/0:15 interface
  dsl 1, interface ISDN Switchtype = primary-qsig
  **** Master side configuration ****
  Layer 1 Status:
    ACTIVE
  Layer 2 Status:
    TEI = 0, Ces = 1, SAPI = 0, State = MULTIPLE_FRAME_ESTABLISHED
    TEI = 0, Ces = 9, SAPI = 16, State = TEI_ASSIGNED
  Layer 3 Status:
    28 Active Layer 3 Call(s)

```

```

Activated dsl 1 CCBS = 28
  CCB:callid=BDF, sapi=0, ces=0, B-chan=2, calltype=VOICE
  CCB:callid=BE0, sapi=0, ces=0, B-chan=1, calltype=VOICE
  CCB:callid=BE1, sapi=0, ces=0, B-chan=3, calltype=VOICE
.
.
.
  CCB:callid=BFA, sapi=0, ces=0, B-chan=31, calltype=VOICE
The Free Channel Mask: 0xB0000000
Total Allocated ISDN CCBS = 54

Total Allocated ISDN CCBS = 0
.
.
.
  CCB:callid=89C8, sapi=0, ces=0, B-chan=14, calltype=VOICE
.
.
.
  CCB:callid=89D9, sapi=0, ces=0, B-chan=1, calltype=VOICE
  CCB:callid=89DA, sapi=0, ces=0, B-chan=2, calltype=VOICE
  CCB:callid=89DB, sapi=0, ces=0, B-chan=3, calltype=VOICE
The Free Channel Mask: 0x80000018
ISDN Serial3/0:15 interface
  dsl 1, interface ISDN Switchtype = primary-qsig
  **** Master side configuration ****
Layer 1 Status:
  ACTIVE
Layer 2 Status:
  TEI = 0, Ces = 1, SAPI = 0, State = MULTIPLE_FRAME_ESTABLISHED
  TEI = 0, Ces = 9, SAPI = 16, State = TEI_ASSIGNED
Layer 3 Status:
  28 Active Layer 3 Call(s)
Activated dsl 1 CCBS = 28
  CCB:callid=BDF, sapi=0, ces=0, B-chan=2, calltype=VOICE
  CCB:callid=BE0, sapi=0, ces=0, B-chan=1, calltype=VOICE
  CCB:callid=BE1, sapi=0, ces=0, B-chan=3, calltype=VOICE
.
.
.
  CCB:callid=BFA, sapi=0, ces=0, B-chan=31, calltype=VOICE
The Free Channel Mask: 0xB0000000
Total Allocated ISDN CCBS = 54

```

The following sample output shows the results of the **show isdn status** command for a PRI voice port on a Cisco 7200 VXR series router:

```

Global ISDN Switchtype = primary-qsig
ISDN Serial1/0:15 interface
  dsl 0, interface ISDN Switchtype = primary-qsig
  **** Slave side configuration ****
Layer 1 Status:
  DEACTIVATED
Layer 2 Status:
  TEI = 0, Ces = 1, SAPI = 0, State = TEI_ASSIGNED
Layer 3 Status:
  0 Active Layer 3 Call(s)
Activated dsl 0 CCBS = 0
The Free Channel Mask: 0x7FFF7FFF
ISDN Serial1/1:15 interface
  dsl 1, interface ISDN Switchtype = primary-qsig

```

```

**** Slave side configuration ****
Layer 1 Status:
  DEACTIVATED
Layer 2 Status:
  TEI = 0, Ces = 1, SAPI = 0, State = TEI_ASSIGNED
Layer 3 Status:
  0 Active Layer 3 Call(s)
Activated dsl 1 CCBS = 0
The Free Channel Mask: 0x7FFF7FFF
Total Allocated ISDN CCBS = 0

```

Step 2 To display the state and the service status of each ISDN channel, enter the **show isdn service** privileged EXEC command.

The following example shows sample output from the **show isdn service** command when PRI is configured on a T1 controller:

```

router# show isdn service

PRI Channel Statistics:
ISDN Se0:15, Channel (1-31)
  Activated dsl 8
  State (0=Idle 1=Propose 2=Busy 3=Reserved 4=Restart 5=Maint)
  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
  Channel (1-31) Service (0=Inservice 1=Maint 2=Outofservice)
  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

```

Step 3 To display the Call Distributor Application Programming Interface (CDAPI) information, use the **show cdapi** command.

The following sample output shows the results of the **show cdapi** command PRI on a the Cisco 3660 series router:

```

Registered CDAPI Applications/Stacks
=====

Application: TSP CDAPI Application Voice
  Application Type(s) : Voice Facility Signaling
  Application Level   : Tunnel
  Application Mode    : Enbloc

Signaling Stack: ISDN
  Interface: Se5/0:15

Signaling Stack: ISDN
  Interface: Se5/1:15

Signaling Stack: ISDN
  Interface: Se6/0:15

Signaling Stack: ISDN
  Interface: Se6/1:15

CDAPI Message Buffers
=====

Used Msg Buffers: 0, Free Msg Buffers: 9600
Used Raw Buffers: 0, Free Raw Buffers: 4800
Used Large-Raw Buffers: 0, Free Large-Raw Buffers: 480

```

The following sample output shows the results of the **show cdapi** command for a PRI voice port on the Cisco MC3810:

```
Registered CDAPI Applications/Stacks
=====

Application: TSP CDAPI Application Voice
  Application Type(s) : Voice Facility Signaling
  Application Level   : Tunnel
  Application Mode    : Enbloc

Signaling Stack: ISDN
  Interface: Se1:15

CDAPI Message Buffers
=====

Used Msg Buffers: 2, Free Msg Buffers: 1198
Used Raw Buffers: 2, Free Raw Buffers: 598
Used Large-Raw Buffers: 0, Free Large-Raw Buffers: 60
```

Troubleshooting Tips

The table below lists **debug** and **show** commands that can help you analyze problems with your configuration. “Related Documents” on page 5 lists documentation that includes information about these commands.

Command	Purpose
router# show isdn status	Shows the status of all ISDN interfaces, including active layers, timer information, and switch type settings.
router# show controller t1/e1	Shows information about T1 and E1 controllers.
router# show voice port summary	Shows summary information about voice-port configuration.
router# show dial-peer voice	Shows how voice dial peers are configured.
router# show cdapi	Shows the Call Distributor Application Programming Interface (CDAPI) information.
router# show call history voice record	Shows information about calls made to and from the router.
router# show rawmsg	Shows information about any memory leaks.
router# debug isdn event	Shows events occurring on the user side (on the router) of the ISDN interface. The ISDN events that can be displayed are Q.931 events (call setup and teardown of ISDN network connections).
router# debug tsp	Shows information about the telephony service provider (TSP).
router# debug cdapi { events detail }	Shows information about CDAPI application events, registration, messages, and so on.

Configuration Examples

The following configuration examples shows QSIG configuration on several supported routers:

- QSIG Support on Cisco 7200 VXR Series Routers
- QSIG Support on Cisco 3600 Series Routers
- QSIG Support on the Cisco MC3810

Note Please disregard the fictional IP addresses.

QSIG Support on Cisco 7200 VXR Series Routers

The following example configurations show how QSIG protocol support is configured with VoFR on Router A, where calls are originated, and Router B, where calls terminate.

Router A: Originating Configuration

Router B: Terminating Configuration

```

.
.
.
hostname 7200_RouterA
!
card type e1 3
card type e1 4
!
!
dspint DSPfarm3/0
!
dspint DSPfarm4/0
!
ip subnet-zero
no ip domain-lookup
ip host routerC 223.255.254.254
ip host routerD 10.1.1.2
!
multilink virtual-template 1
frame-relay switching
isdn switch-type primary-qsig
isdn voice-call-failure 0
!
voice class codec 1
  codec preference 1 g711ulaw
  codec preference 3 g729br8
!
controller E1 3/0
  pri-group timeslots 1-31
  description qsig connected to PCG 1
!
controller E1 3/1
  pri-group timeslots 1-31
  description cas connected to PCG 2
!
controller E1 4/0
  pri-group timeslots 1-31
  description qsig group connected PCG slot3
!
controller E1 4/1
  pri-group timeslots 1-31
  description qsig group connected PCG slot4
!
interface FastEthernet0/0
  no ip address
  no ip directed-broadcast
  shutdown
  half-duplex
!

```

```

.
.
.
hostname 7200_RouterB
!
card type e1 3
card type e1 4
!
!
dspint DSPfarm3/0
!
dspint DSPfarm4/0
!
ip subnet-zero
ip cef
no ip domain-lookup
ip host routerC 223.255.254.254
!
multilink virtual-template 1
isdn switch-type primary-qsig
isdn voice-call-failure 0
!
controller E1 3/0
  pri-group timeslots 1-31
  description qsig connected to PCG 5
!
controller E1 3/1
  pri-group timeslots 1-31
  description cas connected to PCG 6
!
controller E1 4/0
  pri-group timeslots 1-31
  description cas connected to PCG slot7
!
controller E1 4/1
  pri-group timeslots 1-31
  description cas connected to PCG slot8
!
interface Loopback0
  no ip address
  no ip directed-broadcast
!
interface FastEthernet0/0
  description VOIP_10.0.0.1_maxstress to
7200_RouterAgate
  ip address 10.0.0.1 255.0.0.0
  no ip directed-broadcast
  no ip mroute-cache
  shutdown
  media-type MII
  full-duplex
!

```

Router A: Originating Configuration

```

interface Serial1/0
bandwidth 512
ip address 10.1.1.104 255.255.255.0
no ip directed-broadcast
encapsulation ppp
no ip route-cache
no ip mroute-cache
load-interval 30
no keepalive
shutdown
no fair-queue
clockrate 2015232
ppp multilink
!
interface Serial1/1
description vofr connection to
7200_RouterB_s1/1
ip address 10.0.0.2 255.0.0.0
ip broadcast-address 10.0.0.0
no ip directed-broadcast
encapsulation frame-relay
no ip route-cache
no ip mroute-cache
no keepalive
frame-relay traffic-shaping
frame-relay map ip 10.0.0.1 100 broadcast
frame-relay interface-dlci 100
class vofr_class
vofr data 4 call-control 5
!
interface Serial1/2
no ip address
no ip directed-broadcast
no ip route-cache
no ip mroute-cache
shutdown
!
interface Serial1/3
no ip address
no ip directed-broadcast
no ip route-cache
no ip mroute-cache
shutdown
clockrate 2015232
!
interface Ethernet2/0
ip address 10.1.50.77 255.255.0.0
ip broadcast-address 10.1.0.0
no ip directed-broadcast
no ip route-cache
no ip mroute-cache
!
interface Ethernet2/1
ip address 10.0.0.2 255.255.0.0
ip broadcast-address 10.0.0.0
no ip directed-broadcast
no ip route-cache
no ip mroute-cache
shutdown
!

```

Router B: Terminating Configuration

```

interface Serial1/0
no ip address
no ip directed-broadcast
no ip mroute-cache
shutdown
!
interface Serial1/1
description vofr connection to 7200_RouterA
ip address 10.0.0.1 255.0.0.0
ip broadcast-address 10.0.0.0
no ip directed-broadcast
encapsulation frame-relay
no keepalive
clockrate 8060928
frame-relay traffic-shaping
frame-relay map ip 10.0.0.2 100 broadcast
frame-relay interface-dlci 100
class vofr_class
vofr data 4 call-control 5
!
interface Serial1/2
no ip address
no ip directed-broadcast
shutdown
clockrate 2015232
!
interface Serial1/3
no ip address
no ip directed-broadcast
shutdown
!
interface Ethernet2/0
ip address 10.5.192.123 255.255.0.0
ip helper-address 223.255.254.254
no ip directed-broadcast
no ip mroute-cache
!
interface Ethernet2/1
ip address 10.0.0.1 255.255.0.0
no ip directed-broadcast
no ip mroute-cache
shutdown
!

```

Router A: Originating Configuration

```

interface Ethernet2/2
 no ip address
 no ip directed-broadcast
 no ip route-cache
 no ip mroute-cache
 shutdown
!
interface Ethernet2/3
 no ip address
 no ip directed-broadcast
 no ip route-cache
 no ip mroute-cache
 shutdown
interface Serial3/0:15
 no ip address
 no ip directed-broadcast
 no logging event link-status
 isdn switch-type primary-qsig
 isdn overlap-receiving
 isdn incoming-voice voice
 isdn bchan-number-order ascending
 no cdp enable
!
interface Serial3/1:15
 no ip address
 no ip directed-broadcast
 no logging event link-status
 isdn switch-type primary-qsig
 isdn overlap-receiving
 isdn incoming-voice voice
 isdn bchan-number-order ascending
 no cdp enable
!
interface Serial4/0:15
 no ip address
 no ip directed-broadcast
 no logging event link-status
 isdn switch-type primary-qsig
 isdn overlap-receiving
 isdn incoming-voice voice
 isdn bchan-number-order ascending
 no cdp enable
!
interface Serial4/1:15
 no ip address
 no ip directed-broadcast
 no logging event link-status
 isdn switch-type primary-qsig
 isdn overlap-receiving
 isdn incoming-voice voice
 isdn bchan-number-order ascending
 no cdp enable
!
interface ATM5/0
 no ip address
 no ip directed-broadcast
 no ip route-cache
 no ip mroute-cache
 shutdown
 no atm ilmi-keepalive

```

Router B: Terminating Configuration

```

interface Ethernet2/2
 no ip address
 no ip directed-broadcast
 shutdown
!
interface Ethernet2/3
 no ip address
 no ip directed-broadcast
 shutdown
interface Serial3/0:15
 no ip address
 no ip directed-broadcast
 no ip route-cache cef
 ip mroute-cache
 no logging event link-status
 isdn switch-type primary-qsig
 isdn overlap-receiving
 isdn incoming-voice voice
 isdn bchan-number-order ascending
 no cdp enable
!
interface Serial3/1:15
 no ip address
 no ip directed-broadcast
 no ip route-cache cef
 ip mroute-cache
 no logging event link-status
 isdn switch-type primary-qsig
 isdn overlap-receiving
 isdn incoming-voice voice
 isdn bchan-number-order ascending
 no cdp enable
!
interface Serial4/0:15
 no ip address
 no ip directed-broadcast
 no ip route-cache cef
 ip mroute-cache
 no logging event link-status
 isdn switch-type primary-qsig
 isdn overlap-receiving
 isdn incoming-voice voice
 isdn bchan-number-order ascending
 no cdp enable
!
interface Serial4/1:15
 no ip address
 no ip directed-broadcast
 no ip route-cache cef
 ip mroute-cache
 no logging event link-status
 isdn switch-type primary-qsig
 isdn overlap-receiving
 isdn incoming-voice voice
 isdn bchan-number-order ascending
 no cdp enable
!
interface ATM5/0
 no ip address
 no ip directed-broadcast
 shutdown
 no atm ilmi-keepalive

```

Router A: Originating Configuration

```
!  
interface Virtual-Template1  
 ip address 10.0.0.2 255.255.255.0  
 no ip directed-broadcast  
 load-interval 30  
 fair-queue 64 256 1  
 ppp multilink  
 ppp multilink fragment-delay 20  
 ppp multilink interleave  
 ip rtp priority 16384 16383 92  
!  
router igrp 144  
 network 10.0.0.0  
!  
ip default-gateway 10.21.75.10  
ip classless  
no ip http server  
!  
!  
map-class frame-relay vofr_class  
 no frame-relay adaptive-shaping  
 frame-relay cir 4400000  
 frame-relay bc 1000  
 frame-relay fair-queue  
 frame-relay voice bandwidth 4000000  
 frame-relay fragment 256  
!
```

Router B: Terminating Configuration

```
!  
interface FastEthernet6/0  
 no ip address  
 no ip directed-broadcast  
 shutdown  
 half-duplex  
interface Virtual-Template1  
 ip unnumbered Loopback0  
 no ip directed-broadcast  
 no ip route-cache cef  
 ip mroute-cache  
 ppp multilink  
 ppp multilink fragment-delay 20  
 ppp multilink interleave  
!  
router igrp 144  
 network 10.0.0.0  
!  
ip classless  
no ip http server  
!  
!  
map-class frame-relay vofr_class  
 no frame-relay adaptive-shaping  
 frame-relay cir 4400000  
 frame-relay bc 1000  
 frame-relay fair-queue  
 frame-relay voice bandwidth 4000000  
 frame-relay fragment 256  
!
```

Router A: Originating Configuration

```

voice-port 3/0:15
  compand-type a-law
  cptone DE
!
voice-port 3/1:15
  compand-type a-law
  cptone DE
!
voice-port 4/0:15
  compand-type a-law
  cptone DE
!
voice-port 4/1:15
  compand-type a-law
  cptone DE
!
dial-peer voice 5552222 pots
  destination-pattern +5552...
  direct-inward-dial
  port 3/1:15
  prefix 5552
!
dial-peer voice 5551111 vofr
  destination-pattern +5.....
  sequence-numbers
  session target Serial1/1 100
  codec g729br8
!
dial-peer voice 5554 pots
  destination-pattern 5554...
  direct-inward-dial
  port 4/1:15
  prefix 5554
!
dial-peer voice 5553 pots
  destination-pattern 5553...
  direct-inward-dial
  port 4/0:15
  prefix 5553
!
dial-peer voice 5551 pots
  destination-pattern +5551...
  direct-inward-dial
  port 3/0:15
  prefix 5551
.
.
.

```

Router B: Terminating Configuration

```

voice-port 3/0:15
  compand-type a-law
!
voice-port 3/1:15
  compand-type a-law
!
voice-port 4/0:15
  compand-type a-law
!
voice-port 4/1:15
  compand-type a-law
!
dial-peer voice 5552222 pots
  destination-pattern +5552...
  direct-inward-dial
  port 3/1:15
  prefix 6662
!
dial-peer voice 5551111 vofr
  destination-pattern +5.....
  sequence-numbers
  session target Serial1/1 100
  codec g729br8
!
dial-peer voice 6661 pots
  destination-pattern +6661...
  direct-inward-dial
  port 3/0:15
  prefix 6661
!
dial-peer voice 6663 pots
  destination-pattern +6663...
  direct-inward-dial
  port 4/0:15
  prefix 6663
!
dial-peer voice 6664 pots
  destination-pattern +6664...
  direct-inward-dial
  port 4/1:15
  prefix 6664
.
.
.

```

QSIG Support on Cisco 3600 Series Routers

The example below shows how a Cisco 3660 series router can be configured for E1 and PRI with QSIG signaling support using VoIP and VoATM.

```

.
.
.
hostname router3660
!
!
!
!
!
!
memory-size iomem 20
voice-card 5
!
voice-card 6
!
ip subnet-zero
!
isdn switch-type primary-qsig
isdn voice-call-failure 0
!
!
!
!
controller E1 5/0
    pri-group timeslots 1-5,16
!
controller E1 5/1
    pri-group timeslots 1-31
!
controller E1 6/0
    pri-group timeslots 1-31
!
controller E1 6/1
    pri-group timeslots 1-31
!
!
!
interface FastEthernet0/0
    ip address 10.7.72.9 255.255.255.0
    speed auto
    half-duplex
!
interface FastEthernet0/1
    ip address 10.100.100.7 255.255.255.0
    no keepalive
    duplex auto
    speed auto
    hold-queue 1000 in
!
interface Serial2/0
    no ip address
    shutdown
!
interface Serial2/1
    no ip address
    shutdown
!
interface Serial2/2
    no ip address
    shutdown

```

```

!
interface Serial2/3
  no ip address
  shutdown
!
interface ATM3/0
  no ip address
  atm clock INTERNAL
  no atm ilmi-keepalive
  pvc 10/40
    vbr-rt 155000 50000 64000
    encapsulation aal5mux voice
  !
interface Serial5/0:15
  no ip address
  ip mroute-cache
  no logging event link-status
  isdn switch-type primary-qsig
  isdn overlap-receiving
  isdn incoming-voice voice
  no cdp enable
!
interface Serial5/1:15
  no ip address
  ip mroute-cache
  no logging event link-status
  isdn switch-type primary-qsig
  isdn incoming-voice voice
  fair-queue 64 256 0
  no cdp enable
!
interface Serial6/0:15
  no ip address
  ip mroute-cache
  no logging event link-status
  isdn switch-type primary-qsig
  isdn incoming-voice voice
  fair-queue 64 256 0
  no cdp enable
!
interface Serial6/1:15
  no ip address
  ip mroute-cache
  no logging event link-status
  isdn switch-type primary-qsig
  isdn incoming-voice voice
  fair-queue 64 256 0
  no cdp enable
!
ip classless
ip route 223.255.254.254 255.255.255.255 FastEthernet0/0
no ip http server
!
!
map-class frame-relay frs0
  frame-relay voice bandwidth 1260000
  frame-relay fragment 200
  no frame-relay adaptive-shaping
  frame-relay cir 1260000
  frame-relay fair-queue
!
voice-port 1/0/0
  modem passthrough system
  timing hookflash-in 0
!

```

```
voice-port 1/0/1
  modem passthrough system
  timing hookflash-in 0
!
voice-port 5/0:15
  compand-type a-law
!
voice-port 5/1:15
  compand-type a-law
  cptone DE
!
voice-port 6/0:15
  compand-type a-law
  cptone DE
!
voice-port 6/1:15
  no echo-cancel enable
  compand-type a-law
  cptone DE
!
dial-peer voice 1 pots
  shutdown
  destination-pattern 21...
  modem passthrough system
  direct-inward-dial
!
dial-peer voice 51 voip
  shutdown
  destination-pattern 6504007
  modem passthrough system
  session target ipv4:100.100.100.3
!
dial-peer voice 2 pots
  shutdown
  destination-pattern 21...
  modem passthrough system
  direct-inward-dial
  port 5/1:15
!
dial-peer voice 3 voip
  shutdown
  destination-pattern 22...
  modem passthrough system
  session target ipv4:100.100.100.6
!
dial-peer voice 5 pots
  shutdown
  destination-pattern 22...
  modem passthrough system
  direct-inward-dial
  prefix 4006
!
dial-peer voice 13 pots
  shutdown
  destination-pattern 21...
  modem passthrough system
  direct-inward-dial
  port 6/0:15
!
dial-peer voice 6 pots
  destination-pattern 21...
  modem passthrough system
  direct-inward-dial
  port 6/1:15
!
```

```

dial-peer voice 44 voatm
 destination-pattern 22...
 modem passthrough system
 session target ATM3/0 pvc 10/40
!
dial-peer voice 20 pots
 incoming called-number 4...
 destination-pattern 4007
 modem passthrough system
 direct-inward-dial
 port 5/0:15
 prefix 4007
!
dial-peer voice 21 pots
 destination-pattern 4006
 modem passthrough system
 direct-inward-dial
 port 5/0:15
 prefix 4006
!
!
line con 0
 transport input none
line aux 0
line vty 0 4
 login
!
end

```

QSIG Support on the Cisco MC3810

The example below shows how a Cisco MC3810 can be configured for E1 and PRI with QSIG signaling support and VoIP and VoFR.

```

.
.
.
hostname Router3810
!
!
!
!
!
!
network-clock base-rate 56k
ip subnet-zero
!
isdn switch-type primary-qsig
isdn voice-call-failure 0
!
!
!
controller T1 0
mode atm
framing esf
clock source internal
linecode b8zs
!
controller E1 1
pri-group timeslots 1-7,16
!
!
!
interface Ethernet0
ip address 100.100.100.6 255.255.255.0
no ip directed-broadcast
!
interface Serial0
bandwidth 2000
ip address 10.168.14.1 255.255.255.0
no ip directed-broadcast
encapsulation frame-relay
no ip mroute-cache
no keepalive
clockrate 2000000
cdp enable
frame-relay traffic-shaping
frame-relay interface-dlci 100
class frs0
vofr cisco
!
interface Serial1
no ip address
no ip directed-broadcast
shutdown
!
interface Serial1:15
no ip address
no ip directed-broadcast
ip mroute-cache
no logging event link-status
isdn switch-type primary-qsig
isdn overlap-receiving

```

```

isdn incoming-voice voice
fair-queue 64 256 0
no cdp enable
!
interface ATM0
no ip address
no ip directed-broadcast
ip mroute-cache
no atm ilmi-keepalive
pvc 10/42
    encapsulation aal5mux voice
!
!
interface FR-ATM20
no ip address
no ip directed-broadcast
shutdown
!
no ip http server
ip classless
ip route 223.255.254.0 255.255.255.0 Ethernet0
!
!
map-class frame-relay frs0
frame-relay voice bandwidth 1260000
frame-relay fragment 200
no frame-relay adaptive-shaping
frame-relay cir 1260000
frame-relay fair-queue
!
map-class frame-relay frsisco
!
voice-port 1:15
    compand-type a-law
!
dial-peer voice 100 voatm
shutdown
destination-pattern 4...
session target ATM0 pvc 10/42
codec g729ar8
no vad
!
dial-peer voice 1 pots
shutdown
destination-pattern 3001
!
dial-peer voice 42 vofr
destination-pattern 4006
session target Serial0 100
signal-type ext-signal
!
dial-peer voice 21 pots
destination-pattern 4007
direct-inward-dial
port 1:15
prefix 4007
!
dial-peer voice 12 voip
shutdown
destination-pattern 4006
session target ipv4:100.100.100.7
.
.
.

```

Command Reference

This section describes new and modified commands for use with QSIG protocol support. All other commands used with this feature are documented in the Cisco IOS Release 12.0 command reference publications and online feature documentation. See “Related Documents” on page 5.

- **isdn contiguous-bchan**
- **isdn incoming-voice**
- **isdn protocol-emulate**
- **isdn switch type**

isdn contiguous-bchan

To configure contiguous bearer channel handling on an E1 Primary Rate Interface (PRI) interface, use the **isdn contiguous-bchan** interface configuration command. To disable the contiguous B channel handling, use the **no** form of this command.

isdn contiguous-bchan

no isdn contiguous-bchan

Syntax Description

This command has no arguments or keywords.

Defaults

By default, contiguous B channel handling is off.

Command Mode

Interface configuration

Command History

Release	Modification
12.0(7)XK	This command was introduced.

Usage Guidelines

Use the **isdn contiguous-bchan** command to specify contiguous bearer channel handling so that B channels 1 through 30, skipping 16, map to timeslots 1 through 31). This is available for E1 PRI interfaces only, when the **primary-qsig** switch type option is configured by using the **isdn switch-type** command.

Example

The following example shows the command configuration on a Cisco 3660 series router E1 interface:

```
interface Serial5/0:15
  no ip address
  ip mroute-cache
  no logging event link-status
  isdn switch-type primary-qsig
  isdn overlap-receiving
  isdn incoming-voice voice
  isdn contiguous-bchan
```

Related Commands

Command	Description
isdn switch-type primary-qsig	In global or interface configuration mode, configures the primary-qsig switch type for PRI support.

isdn incoming-voice

To route all incoming voice calls as voice calls, to route them the modem and treat them as analog data, or to ensure that calls bypass the modems and are treated as digital data, use the **isdn incoming-voice** interface configuration command. Use the **no** form of this command to disable the setting.

```
isdn incoming-voice {data [56 | 64] | modem [56 | 64] | voice}
no isdn incoming-voice {data [56 | 64] | modem [56 | 64] | voice}
```

Syntax Description

data	Specifies that incoming voice calls bypass the modems and are handled as digital data.
modem	Specifies that incoming voice calls are passed over to the digital modems, where they negotiate the appropriate modem connection with the far-end modem.
voice	Specifies that incoming voice calls are treated as voice calls rather than being routed to the modem or handled as digital data.
56	Specifies that the bandwidth for this connection is 56 kbps.
64	Specifies that the bandwidth for this connection is 64 kbps. If no argument is entered for either the data or modem keywords, the default value is 64.

Default

When a PRI or BRI interface is created, **isdn incoming-voice voice** is the default, except on a Cisco 2600 or 3600 BRI S/T TE interface. In this case, if the command is not specified, the default **isdn incoming-voice modem** configuration setting is converted to **isdn incoming-voice voice** when the interface receives an incoming call.

Command Mode

Interface configuration

Command History

Release	Modification
11.1	This command was introduced.
12.0(2)XC and 12.0(3)T	This command was made available for BRI interfaces.
12.0(7)XK	This command was modified to include the voice keyword.

Usage Guidelines

Unless you specify otherwise, all calls received by the router and characterized as voice calls are treated as such and not handled as digital data or not passed over to the modem.

On a Cisco 2600 or 3600 series router BRI S/T TE interface where the **isdn incoming-voice** command is not specified, the default **isdn incoming-voice modem** configuration setting is converted to **isdn incoming-voice voice** when the interface receives an incoming call.

To establish speedier connections for analog calls to the router, use the **isdn incoming-voice** command with the **modem** keyword to have voice calls routed through digital modems (as pulse-code modulated analog data) instead of being treated as digital data.

Example

The following example shows the command configuration on a Cisco 3660 series router T1 PRI interface:

```
interface Serial5/0:23
  no ip address
  ip mroute-cache
  no logging event link-status
  isdn switch-type primary-qsig
  isdn overlap-receiving
  isdn incoming-voice voice
```

isdn protocol-emulate

To configure a Primary Rate Interface (PRI) interface to serve as either the primary QSIG slave or the primary QSIG master, use the **isdn protocol-emulate** interface command. To disable QSIG signaling, use the **no** form of this command.

```
isdn protocol-emulate { user | network }
no isdn protocol-emulate { user | network }
```

Syntax Description

user Enter **user** (equivalent to the QSIG term *slave*) to configure the port as the terminating end. This is the default.

network Enter **network** (equivalent to the QSIG term *master*) to configure the port as NT; the PINX is the slave.

Default

User

Command Mode

Interface configuration mode.

Command History

Release	Modification
12.0(7)T	This command was introduced for the Cisco AS5300.
12.0(7)XK	This command was introduced for the Cisco MC3810, and for the Cisco 7200 VXR, Cisco 2600, and Cisco 3600 series routers.

Usage Guidelines

On the Cisco MC3810, this command replaces the command **isdn switch-type [primary-qsig-slave | primary-qsig-master]** command.

Examples

The following example shows the command configuration on a Cisco 3660 series router T1 PRI interface:

```
interface Serial5/0:23
  no ip address
  ip mroute-cache
  no logging event link-status
  isdn switch-type primary-qsig
  isdn overlap-receiving
  isdn protocol-emulate user
```

isdn switch type

To specify a central office switch type or configure a Primary Rate Interface (PRI) interface to support Q.SIG signaling, use the **isdn switch-type** global or interface command. To disable the central office switch type or QSIG signaling, use the **no** form of this command.

isdn switch-type {*switch-type* | **primary-qsig** | **basic-qsig**}

no isdn switch-type {*switch-type* | **primary-qsig** | **basic-qsig**}

Syntax Description

<i>switch-type</i>	Service provider switch type. See Table 4 for a list.
primary-qsig	PRI
basic-qsig	BRI

Defaults

The switch type defaults to none, which disables the switch type.

Command Modes

Global configuration mode or interface configuration mode.

Command History

Release	Modification
9.21	Introduced as a global command.
11.3 T	Introduced as an interface command.
12.0(2)T	primary-qsig-slave and primary-qsig-master keywords introduced for the Cisco MC3810.
12.0(7)K	primary-qsig-slave and primary-qsig-master keywords for the Cisco MC3810 are no longer supported. primary-qsig and basic-qsig keywords supported on the Cisco MC3810, Cisco 7200 VXR, 2600 and 3600 series routers.

Usage Guidelines

You can enter the **isdn switch-type** command to support QSIG at either the global configuration level or at the interface configuration level. For example, if you have a QSIG connection on one line as well as on the BRI or PRI port, you can configure the ISDN switch type in one of the following combinations:

- Set the global **isdn switch-type** command to support QSIG by entering either the **isdn-switch-type basic-qsig** command (BRI) or **isdn-switch-type primary-qsig** command (PRI); and set the interface **isdn-switch-type** command for the interfaces to a regular central office switch type, such as those shown in Table 2.
- Set the global **isdn switch-type** command to support the CO switch type (see Table 2), and set the interface **isdn switch-type** command for the interface to support QSIG.

- Configure the global **isdn switch-type** command to another setting (see Table 4); then, set the interface **isdn switch-type** command for **interface bri** to a BRI setting; set the interface **isdn switch-type** command for the serial interface to support QSIG.

Table 4 ISDN CO Switch Types

Country	ISDN Switch Type	Description
Australia	basic-ts013	Australian TS013 switches
Europe	basic-1tr6	German 1TR6 ISDN switches
	basic-nwnet3	Norwegian NET3 ISDN switches (phase 1)
	basic-net3	NET3 ISDN switches (UK and others)
	vn2	French VN2 ISDN switches
	vn3	French VN3 ISDN switches
Japan	ntt	Japanese NTT ISDN switches
New Zealand	basic-nznet3	New Zealand NET3 switches
North America	basic-5ess	Lucent Technologies basic rate switches
	basic-dms100	NT DMS-100 basic rate switches
	basic-ni1	National ISDN-1 switches

Examples

The following example shows the command configuration on a Cisco 3660 series router T1 PRI interface:

```
interface Serial5/0:23
  no ip address
  ip mroute-cache
  no logging event link-status
  isdn switch-type primary-qsig
  isdn overlap-receiving
  isdn protocol-emulate user
```

Related Commands

Command	Description
isdn protocol-emulate	Configures the interface to serve as either the QSIG slave or the QSIG master.

Glossary

Note For a list of other internetworking terms, see *Internetworking Terms and Acronyms* document that accompanied your access server and is available on the Documentation CD-ROM and Cisco Connection Online (CCO) at the following URL:
<http://www.cisco.com/univercd/cc/td/doc/cisintwk/ita/index.htm>.

AAL—ATM Adaptation Layer. Service-dependent sublayer of the data link layer. The AAL accepts data from different applications and presents it to the ATM layer in the form of 48-byte ATM payload segments. AALs consist of two sublayers: convergence sublayer (CS) and segmentation and reassembly (SAR). AALs differ on the basis of the source-destination timing used, whether they use constant bit rate (CBR) or variable bit rate (VBR), and whether they are used for connection-oriented or connectionless mode data transfer. At present, the four types of AAL recommended by the ITU-T are AAL1, AAL2, AAL3/4, and AAL5.

ATM—Asynchronous Transfer Mode. International standard for cell relay in which multiple service types (such as voice, video, or data) are conveyed in fixed-length (53-byte) cells. Fixed-length cells allow cell processing to occur in hardware, thereby reducing transit delays. ATM is designed to take advantage of high-speed transmission media, such as E3, SONET, and T3.

CAS—channel-associated signaling. Trunk signaling (for example, in a T1 line) in which control signals, such as those for synchronizing and bounding frames, are carried in the same channel along with voice and data signals.

CCAPI—Call Control application programming interface (API).

CDAPI—Call Distribution application programming interface (API).

CCS—common channel signaling. Trunk signaling (for example, using Primary Rate Interface) in which a control channel carries signaling for separate voice and data channels.

CO—central office. Local telephone company office to which all local loops in a given area connect and in which circuit switching of subscriber lines occurs.

codec—coder-decoder. Device that typically uses pulse code modulation to transform analog signals into a digital bit stream and digital signals back into analog.

DTMF—dual-tone multifrequency. Use of two simultaneous voice-band tones for dialing, such as touch tone.

DSP—digital signal processor.

DVM—Digital Voice Module

E1—European digital carrier facility used for transmitting data through the telephone hierarchy. The transmission rate for E1 is 2.048 megabits per second (Mbps).

E&M—receive and transmit, or Ear and Mouth. Type of signaling originally developed for analog two-state voltage telephony using the ear and mouth leads; in digital telephony, uses two bits.

Enbloc—Mode where all call establishment information is sent in the setup message (opposite of overlap mode, where additional messages are needed to establish the call).

GFP—General Functional Procedures. Standard defined by ECMA-165.

H.323—Extension of ITU-T standard H.320 that enables videoconferencing over LANs and other packet-switched networks, as well as video over the Internet.

ISDN—Integrated Services Digital Network. Communication protocol offered by telephone companies that permits telephone networks to carry data, voice, and other source traffic.

Overlap—Mode where call control is waiting for possible additional call information from the preceding PINX, since it received acknowledgment that the subsequent PINX may receive additional call information.

FXO—Foreign Exchange Office. A voice interface emulating a PBX trunk line to a switch or telephone equipment to a PBX extension interface.

FXS—Foreign Exchange Station. A voice interface for connecting telephone equipment, emulates the extension interface of a PBX or the subscriber interface for a switch.

IETF—Internet Engineering Task Force.

ISDN—Integrated Services Digital Network. Communication protocol, offered by telephone companies, that permits telephone networks to carry data, voice, and other source traffic.

packet—Logical grouping of information that includes a header containing control information and (usually) user data. Packets are most often used to refer to network layer units of data.

POTS—plain old telephone service.

PDVM—packet data voice module.

PINX—private integrated services network exchange.

PSTN—Public Switched Telephone Network. General term referring to the variety of telephone networks and services in place worldwide.

QoS—quality of service. Measure of performance for a transmission system that reflects its transmission quality and service availability.

QSIG—Q (point of the ISDN model) Signaling. Signaling standard. Common channel signaling protocol based on ISDN Q.931 standards and used by many digital PBXs.

T1—Digital WAN carrier facility. T1 transmits DS 1-formatted data at 1.544 Mbps through the telephone switching network, by using alternate mark inversion or B8ZS coding.

T1 trunk—Digital WAN carrier facility. See T1.

TCCS—Transparent Common Channel Signaling

TDM—time-division multiplexing

Trunk—Physical and logical connection between two switches across which network traffic travels. A backbone is composed of a number of trunks.

UNI—User-Network Interface. ATM Forum specification that defines an interoperability standard for the interface between ATM-based products (a router or an ATM switch) located in a private network and the ATM switches located within the public carrier networks. Also used to describe similar connections in Frame Relay networks.

VAD—voice activity detection

VoFR—voice over frame relay.

VoATM—voice over ATM