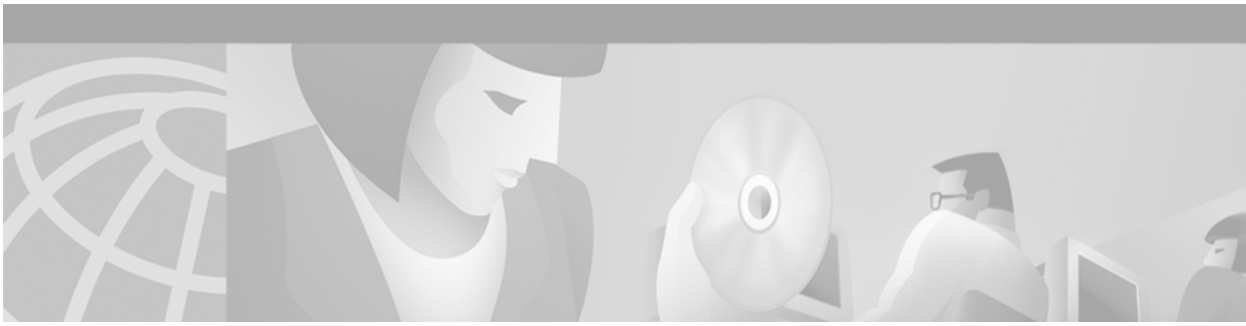


PRI and BRI QSIG Protocol Support on Cisco 2600, 3600, and MC3810 Series Routers and PRI QSIG on the Cisco 7200

Document Update Alert

This document was originally produced for Cisco IOS Release 12.1(2)T. This feature has been updated in subsequent releases, and more recent documentation is available.

If you are using Cisco IOS Release 12.3 or higher, refer to the following documentation in the *Cisco IOS ISDN Voice Configuration Guide*, Cisco IOS Voice Configuration Library, Release 12.3:

- Configuring ISDN Interfaces for Voice

If you are using Cisco IOS Release 12.2 or higher, refer to the following documentation in the *Cisco IOS Voice, Video, and Fax Configuration Guide*, Release 12.2:

- Configuring ISDN Interfaces for Voice

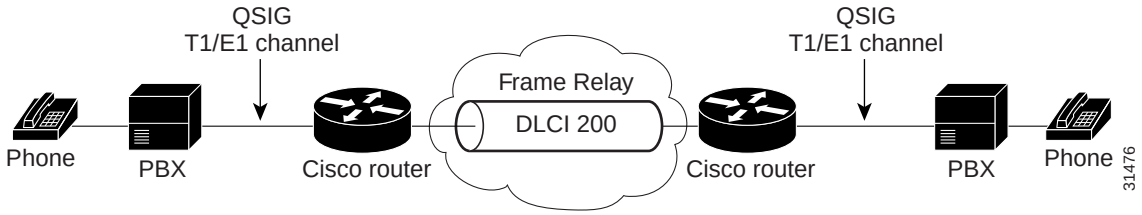
This document describes how to configure QSIG protocol support for Cisco 7200, 2600, and 3600 series routers and enhancements to QSIG protocol support on the Cisco MC3810 multiservice access concentrator.

This feature description includes the following sections:

Feature Overview

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



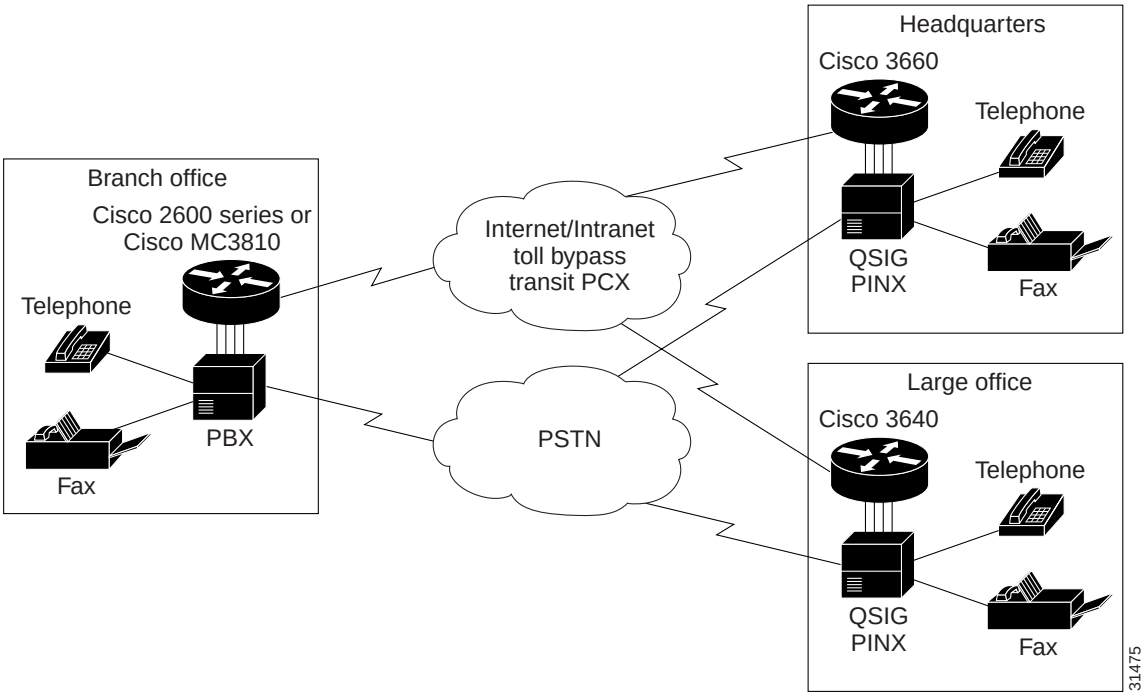
The Cisco voice packet network appears to the traditional QSIG PBXs as a distributed transit PBX that can establish calls to any PBX, non-QSIG PBX, or other telephony endpoint served by a Cisco gateway, including non-QSIG endpoints. When originating and terminating on QSIG endpoints, the QSIG messages 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 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. Table 1 identifies the ECMA standards and the OSI layer of the QSIG protocol stack to which they relate.

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
	ECMA-165	QSIG Generic Functional Procedures
Layer 3	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 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

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 Cisco IOS Release 12.1 documents can help you understand QSIG support:

- *Cisco IOS Multiservice Applications Configuration Guide*
  http://www.cisco.com/univercd/cc/td/doc/product/software/ios121/121cgcr/multi_c/index.htm
- *Cisco IOS Multiservice Applications Command Reference*
  http://www.cisco.com/univercd/cc/td/doc/product/software/ios121/121cgcr/multi_r/index.htm

The following Cisco IOS Release 12.1 documents are also helpful:

- *Cisco IOS Dial Services Configuration Guide: Network Services*
  http://www.cisco.com/univercd/cc/td/doc/product/software/ios121/121cgcr/dialns_c/index.htm
- *Cisco IOS Dial Services Configuration Guide: Terminal Services*
  http://www.cisco.com/univercd/cc/td/doc/product/software/ios121/121cgcr/dialts_c/index.htm

- *Cisco IOS Dial Services Quick Configuration Guide*
  http://www.cisco.com/univercd/cc/td/doc/product/software/ios121/121sup/121dsqcg/index.htm
- *Cisco IOS Dial Services Command Reference*
  http://www.cisco.com/univercd/cc/td/doc/product/software/ios121/121cgcr/dial_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/index.htm
- *Cisco IOS Debug Command Reference*
  http://www.cisco.com/univercd/cc/td/doc/product/software/ios121/121sup/121debug/index.htm

The following sites contain hardware installation and configuration guides, as well as regulatory and safety information for the products covered by this feature:

- Cisco 7206
  http://www.cisco.com/univercd/cc/td/doc/product/core/7206/index.htm
- Cisco 7204
  http://www.cisco.com/univercd/cc/td/doc/product/core/7204/index.htm
- Cisco 7202
  http://www.cisco.com/univercd/cc/td/doc/product/core/7202/index.htm
- Cisco 2600 series
  http://www.cisco.com/univercd/cc/td/doc/product/access/acs_mod/cis2600/index.htm
- Cisco 3600 series
  http://www.cisco.com/univercd/cc/td/doc/product/access/acs_mod/cis3600/index.htm
- Cisco MC3810
  http://www.cisco.com/univercd/cc/td/doc/product/access/multicon/index.htm

Additional platform-specific documents can be helpful:

- *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines*
  http://www.cisco.com/univercd/cc/td/doc/product/core/7206/7206cfig/3471pac6.htm
- *Cisco 7200 Series Configuration Notes*
  http://www.cisco.com/univercd/cc/td/doc/product/core/7206/7206cfig/index.htm
- *Cisco MC3810 Multiservice Concentrator Hardware Installation*
  http://www.cisco.com/univercd/cc/td/doc/product/access/multicon/3810hwig/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

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.

MIBs

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

RFCs

- RFC 1890
- RFC 1889

Prerequisites

- Install Cisco IOS Release 12.1(2)T.
- 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 12.1 *IP and IP Routing Configuration Guide*.
  - For more information about configuring Frame Relay, see "Configuring Frame Relay" in the Cisco IOS Release 12.1 *Wide-Area Networking Configuration Guide*.
  - For more information about configuring ATM, see "Configuring ATM" in the Cisco IOS Release 12.1 *Wide-Area Networking Configuration Guide*.
- Complete your company's dial plan.
- Establish a working telephony network based on your company's dial plan. To set up voice networks, see the Cisco IOS Release 12. 1 *Multiservice Applications Configuration Guide*.
- 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.

	Command	Purpose
Step 1	`router# configure terminal`	Enter global configuration mode.

Step 2	`router(config)# isdn switch-type basic-qsig`
	or
	`isdn switch-type primary-qsig`
		Optional.
		(BRI only on Cisco MC3810, 2600, and 3600 series routers) Configure the global ISDN switch type.
		(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.

Step 3	`router(config)# dspinterface dspfarm` *slot/port*	(Cisco 7200 series only) Configure the digital signal processor (DSP) farm interface.
Step 4	`router(config)# card type` {`t1`/`e1`} *slot*	(Cisco 7200 series only) Enter T1 or E1 card type and specify the slot location by using a value from 0 to 5, depending on your router.

Configuring Controllers for QSIG PRI

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

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

	Command	Purpose
Step 1	`router(config)# interface bri` *slot* or `router(config)# interface bri` *slot/port*	(BRI only on Cisco MC3810, 2600, and 3600 series routers) Enter interface configuration mode to configure parameters for the specified BRI voice interface. (Cisco MC3810) Enter a *slot* number from 1 to 4. (Cisco 2600 or 3600 series router) Enter a *slot* number from 1 to 6 and a *port* value of 1 or 2.
Step 2	`router(config)# isdn static tei 0`	(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.
Step 3	`router(config-if)# isdn layer1-emulate {user | network}`	(BRI only, Cisco MC3810 only) Configure the Layer 1 port mode emulation and the clock settings: • 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 *slave*. • Enter **network** to configure the port as NT and to function as a clock master. The term **network** is equivalent to the QSIG term *master.*
Step 4	`router(config-if)# network-clock-priority {low | high}`	(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**. 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**. Do not use this command if this port is configured as NT in Step 3 with the command **isdn layer1-emulate network**.
Step 5	`router(config-if)# isdn incoming-voice voice`	Route incoming voice calls. This is set for voice-capable BRI interfaces by default, except for Cisco 2600 and 3600 series 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.

	Command	Purpose
Step 6	`router(config-if)# isdn sending-complete`	(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.
Step 7	`router(config-if)# isdn switch-type basic-qsig`	(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. Continue BRI interface configuration at Step 4 of the following procedure.
Step 8	`router(config-if)# exit`	(PRI only) Exit interface configuration mode.

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

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

	Command	Purpose
Step 3	`router(config-if)#` **`isdn contiguous-bchan`**	(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.
Step 4	`router(config-if)#` **`isdn protocol-emulate`** {**`user`** | **`network`**}	Configure the Layer 2 and Layer 3 port protocol emulation: • Enter **user** (equivalent to the QSIG term *slave*) to configure the port as TE; the PINX is the master. This is the default. • Enter **network** (equivalent to the QSIG term *master*) to configure the port as NT; the PINX is the slave. **Note** On the Cisco MC3810, this command replaces the command **isdn switch-type** [**primary-qsig-slave** | **primary-qsig-master**].
Step 5	`router(config-if)#` **`isdn overlap-receiving`** *`value`*	(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. **Note** You can leave the default mode of *enbloc*, where all call establishment information is sent in the setup message without need for additional messages from the preceding PINX.
Step 6	`router(config-if)#` **`isdn network-failure-cause`** *`value`*	(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 range from 1 to 127. See Table 3 in the Command Reference section for a list of cause codes.
Step 7	`router(config-if)#` **`exit`**	Exit interface configuration mode.

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 20.

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 the Cisco IOS Release 12.1 *Dial Services Command Reference*, http://www.cisco.com/univercd/cc/td/doc/product/software/ios121/121cgcr/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: 0x7FFFFF
```

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 3 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 2 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 IP addresses in these examples are fictitious.

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

```
.
.
.
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 192.168.17.125
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
!
```

Router B: Terminating Configuration

```
.
.
.
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 192.168.17.125
!
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	Router B: Terminating 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
!
	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 192.168.17.125
	 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	Router B: Terminating 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	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	Router B: Terminating Configuration
!	!
interface Virtual-Template1	interface FastEthernet6/0
ip address 10.0.0.2 255.255.255.0	no ip address
no ip directed-broadcast	no ip directed-broadcast
load-interval 30	shutdown
fair-queue 64 256 1	half-duplex
ppp multilink	interface Virtual-Template1
ppp multilink fragment-delay 20	ip unnumbered Loopback0
ppp multilink interleave	no ip directed-broadcast
ip rtp priority 16384 16383 92	no ip route-cache cef
!	ip mroute-cache
router igrp 144	ppp multilink
network 10.0.0.0	ppp multilink fragment-delay 20
!	ppp multilink interleave
ip default-gateway 10.21.75.10	!
ip classless	router igrp 144
no ip http server	network 10.0.0.0
!	!
!	ip classless
map-class frame-relay vofr_class	no ip http server
no frame-relay adaptive-shaping	!
frame-relay cir 4400000	!
frame-relay bc 1000	map-class frame-relay vofr_class
frame-relay fair-queue	no frame-relay adaptive-shaping
frame-relay voice bandwidth 4000000	frame-relay cir 4400000
frame-relay fragment 256	frame-relay bc 1000
!	frame-relay fair-queue
	frame-relay voice bandwidth 4000000
	frame-relay fragment 256
	!

Router A: Originating Configuration	Router B: Terminating 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 . . .	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 192.168.17.125 255.255.255.255 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 12.1 command reference publications and online feature documentation. See “Related Documents” on page 5.

- **isdn contiguous-bchan**
- **isdn global-disconnect**
- **isdn incoming-voice**
- **isdn network-failure-cause**
- **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 Modes

Interface configuration

Command History

Release	Modification
12.0(7)XK	This command was introduced.
12.1(2)T	This command was implemented in the 12.1(2)T release.

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 time slots 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.

Examples

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 continguous-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 global-disconnect

To allow passage of "release" and "release complete" messages over the voice network, use the **isdn global-disconnect** command. To disable the passage of these messages, use the **no** form of this command.

isdn global-disconnect

no isdn global-disconnect

Syntax Description

This command has no arguments or keywords.

Defaults

Passage of messages is disabled by default; "release" and "release complete" will terminate locally by default.

Command Modes

Interface configuration

Command History

Release	Modification
12.1(2)T	This command was introduced.

Usage Guidelines

Enter this command under the isdn interface with switch type bri-qsig or pri-qsig. Use **isdn global-disconnect** to allow passage of "release" and "release complete" messages end-to-end across the network. This is required for certain types of QSIG PBXs whose software or features require either Facility or User Info IEs in those messages to be passed end-to-end between the PBXs. All QSIG interfaces connecting the PBXs to the routers must have this command enabled. This command is available when using BRI QSIG or PRI QSIG switch type in either master or slave mode.

Examples

The following example shows 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 global-disconnect
 isdn overlap-receiving
 isdn incoming-voice voice
```

Related Commands

Command	Description
isdn protocol-emulate	Configures the interface to serve as either the QSIG slave or the QSIG master.
isdn switch-type	In global or interface configuration mode, configures the switch type for BRI or 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.

Defaults

When a PRI or BRI interface is created, **isdn incoming-voice voice** is the default, except on a Cisco 2600 or 3600 series 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 Modes

Interface configuration

Command History

Release	Modification
11.1	This command was introduced.
12.0(2)XC	This command was made available for BRI interfaces.
12.0(3)T	This command was implemented in the 12.0(3)T release.
12.0(7)XK	This command was modified to include the **voice** keyword.
12.1(2)T	The modified command was implemented in the 12.1(2)T release.

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.

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 incoming-voice voice
```

isdn network-failure-cause

To specify the cause code to pass to the PBX when a call cannot be placed or completed because of internal network failures, use the **isdn network-failure-cause** interface command. To unconfigure use of this cause code, use the **no** form of this command.

isdn network-failure-cause *value*

no isdn network-failure-cause *value*

Syntax Description

value	Number from 1 to 127. See Table 3 for a list of failure cause code values.

Defaults

No default.

Command Modes

Interface configuration

Command History

Release	Modification
12.1(2)T	This command was implemented in the 12.1(2)T release.

Usage Guidelines

The PBX can re-route calls based on cause code returned by the router.

This command allows the original cause to be changed to the value specified if the original cause code is not one of the following: NORMAL_CLEARING (16), USER_BUSY (17), NO_USER_RESPONDING (18), NO_USER_ANSWER (19), NUMBER_CHANGED (22), INVALID_NUMBER_FORMAT (28), UNSPECIFIED_CAUSE (31), UNASSIGNED_NUMBER (1).

Table 3 ISDN Failure Cause Codes

Failure Cause Code	Meaning
1	Unallocated or unassigned number
2	No route to specified transit network
3	No route to destination
6	Channel unacceptable
7	Call awarded and being delivered in an established channel
16	Normal call clearing
17	User busy
18	No user responding
19	No answer from user (user alerted)
21	Call rejected
22	Number changed

Table 3 ISDN Failure Cause Codes (continued)

Failure Cause Code	Meaning
26	Non-selected user clearing
27	Destination out of order
28	Invalid number format
29	Facility rejected
30	Response to status enquiry
31	Normal, unspecified
34	No circuit/channel available
38	Network out of order
41	Temporary failure
42	Switch congestion
43	Access information discarded
44	Requested channel not available
45	Preempted
47	Resources unavailable, unspecified
49	Quality of service unavailable
50	Requested facility not subscribed
52	Outgoing calls barred
54	Incoming calls barred
57	Bearer capability not authorized
58	Bearer capability not now available
63	Service or option not available, unspecified
65	Bearer capability not implemented
66	Channel type not implemented
69	Requested facility not implemented
70	Only restricted digital information bearer capability is available
79	Service or option not implemented, unspecified
81	Invalid call reference value
82	Identified channel does not exist
83	Suspended call exists, but this call ID does not
84	Call ID in use
85	No call suspended
86	Call with requested call ID is cleared
88	Incompatible destination
91	Invalid transit network selection
95	Invalid message, unspecified
96	Mandatory information element missing

Table 3 ISDN Failure Cause Codes (continued)

Failure Cause Code	Meaning
97	Message type nonexistent or not implemented
98	Message not compatible with call state or message type nonexistent or not implemented
99	Information element nonexistent or not implemented
100	Invalid information element contents
101	Message not compatible with call state
102	Recovery on timer expiry
111	Protocol error, unspecified
127	Interworking, unspecified

Examples

```
isdn network-failure-cause  28
```

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.

Defaults

User

Command Modes

Interface configuration

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.
12.1(2)T	This command was implemented in the 12.1(2)T release.

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 QSIG 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

switch-type	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 or interface configuration

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)XK	**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.
12.1(2)T	The modified command was implemented in the 12.1(2)T release.

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 (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 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* on the Documentation CD-ROM that accompanied your access server, 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.