Configuring ISDN BRI Voice over IP for Cisco 2600 and 3600 Series Voice Interface Cards

Feature Overview

The Voice over IP feature enables the Cisco 2600 and Cisco 3600 series of modular routers to carry voice traffic simultaneously with data traffic over an IP network. Voice over IP (VoIP) is primarily a software feature, supporting both voice and fax calls. Support for the ISDN BRI signaling type allows a Cisco 2600 or Cisco 3600 series router to provide voice access connectivity to either an ISDN telephone network or a digital interface on a PBX/key communications system. The voice or data also crosses an IP network to which the router connects. This allows branch offices and enterprises to route incoming public switched telephone network (PSTN) ISDN BRI calls over an IP network or send outgoing digital fax and voice calls via an IP network.

Figure 1 shows a home-office user dialing directly into a local router via the PSTN, and reaching headquarters through an IP network, saving the cost of a long-distance call. In another example, Figure 1 shows how an extension at headquarters makes a fax or voice call to a branch office in a different area code using a corporate IP network only.
To use this feature on a Cisco 2600 or Cisco 3600 series router, you must install a voice network module (VNM). A VNM can hold either one or two voice interface cards (VICs), each of which is specific to a particular signaling type. In the case of BRI VICs (VIC-2BRI-S/T-TE), which have two ports, a two-slot VNM holds a single BRI VIC to provide a total of four digital B channels for voice calls. This document describes how to configure ISDN Basic Rate Interface (BRI) VICs for VoIP.

For complete VoIP configuration instructions, see Cisco IOS Release 12.0 *Voice, Video, and Home Applications Configuration Guide*. For a description of the commands used to configure VoIP, see the “Voice-Related Commands” chapter in the *Voice, Video, and Home Applications Command Reference*.

**Benefits**

ISDN BRI VoIP offers direct ISDN network connectivity as well as connectivity to the digital interfaces of PBX and Key communications systems. Prior to the introduction of this feature, VoIP was available only for foreign exchange station (FXS) connection to a POTS telephone or other TE, FXO for connection to a POTS PBX or Key system, or ear and mouth (E&M) for two-wire and four-wire telephone and trunk interfaces—typically used to connect remote calls from an IP network to a PBX.

ISDN BRI VoIP provides the following toll-saving benefits for enterprises and branch offices:

- ISDN BRI network connectivity, particularly critical in areas where this is the standard provider offering
- Use of digital terminal equipment such as digital telephones and fax machines
- Off-premise ISDN BRI dialing into an IP network

**Related Documents**

- Cisco IOS Release 12.0 *Voice, Video, and Home Applications Configuration Guide*
- Cisco IOS Release 12.0 *Voice, Video, and Home Applications Command Reference*
- *Voice Network Module and Voice Interface Card Configuration Note*
- *Voice over IP for the Cisco 3600 and Cisco 2600 Series Software Configuration Guide*

**Supported Platforms**

This feature is supported on the following platforms:

- Cisco 2600 series routers
- Cisco 3600 series routers
Prerequisites

This feature requires Cisco IOS Release 12.0(2)XD, 12.0(2)XD1, or 12.0(3)T.

Before you can configure your Cisco 2600 or Cisco 3600 series router for VoIP on a BRI interface, you must:

- Obtain BRI service from your telecommunications provider. The BRI line must be provisioned at the switch to support voice calls.

- Establish a working IP network. At least one network module or WAN interface card must be installed in the router to provide the connection to the IP LAN or WAN. For more information about configuring IP, refer to the “IP Overview,” “Configuring IP Addressing,” and “Configuring IP Services” chapters in the Cisco IOS Release 12.0 Network Protocols Configuration Guide, Part 1.

- Install a 2-slot voice network module (NM-2V) into the appropriate slot of your Cisco router. A 1-slot voice network module (NM-1V) does not provide use of all four BRI VIC slots. At least one other network module or WAN interface card must be installed in the router to provide the connection to the IP LAN or WAN.

- Refer to the installation documentation, Voice Network Module and Voice Interface Card Configuration Note, that came with your voice network module. It provides more information about the physical characteristics of the voice network module and how to install it.

- Install a 2-port BRI VIC (VIC-2BRI-S/T-TE) into Slot 0, the first slot of the voice network module. Slot 1 of the voice network module should remain empty. Each of the two ports of a BRI VIC can carry two voice calls, one over each ISDN B channel, for a total of four calls per BRI VIC.

- Configure your network for real-time voice traffic. This document describes only a portion of the process. For more information about configuring VoIP, refer to the Voice over IP for the Cisco 2600 and Cisco 3600 Series Software Configuration Guide.

Supported MIBs and RFCs

None.

List of Terms

**BRI**—Basic Rate Interface. ISDN interface composed of two B channels and one D channel for circuit-switched communication of voice, video, and data.

**dial peer**—An addressable call endpoint. In Voice over IP (VoIP), there are two types of dial peers: POTS and VoIP.

**DNS**—Domain name system used in address translation to convert H.323 IDs, URLs, or e-mail IDs to IP addresses. DNS is also used to assist in the location of remote gatekeepers and to reverse-map raw IP addresses to host names of administrative domains.

**DNIS**—Dialed number identification service (the called number). Feature of trunk lines where the called number is identified; this called number information is used to route the call to the appropriate service.
E.164—International Telecommunication Union (ITU-T) recommendation for international telecommunication numbering. This recommendation provides the number structure and functionality for the 3 categories of numbers used for international public telecommunication: geographic areas, global services, and networks.

E&M—E&M (recEive and transMit or Ear and Mouth). E&M is a trunking arrangement generally used for two-way switch-to-switch or switch-to-network connections. Cisco’s E&M interface is an RJ-48 connector that allows connections to PBX trunk lines (tie lines).

FXO—Foreign Exchange Office. An FXO interface connects to the PSTN’s central office and is the interface offered on a standard telephone. Cisco’s FXO interface is an RJ-11 connector that allows an analog connection to be directed at the PSTN’s central office. This interface is of value for off-premise extension applications.

FXS—Foreign Exchange Station. An FXS interface connects directly to a standard telephone and supplies ring, voltage, and dial tone. Cisco’s FXS interface is an RJ-11 connector that allows connections to basic telephone service equipment, keysets, and PBXs.

gateway—An H.323 endpoint on the LAN that provides real-time, two-way communications between H.323 terminals on the LAN and other ITU-T terminals in the WAN, or to another H.323 gateway. A gateway allows H.323 terminals to communicate with non-H.323 terminals by converting protocols. A gateway is the point at which a circuit-switched call is encoded and repackaged into IP packets.

H.323—An ITU-T standard that describes packet-based video, audio, and data conferencing. H.323 is an umbrella standard that describes the architecture of the conferencing system, and refers to a set of other standards (H.245, H.225.0, and Q.931) to describe its actual protocol.

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

NM—Network module.

POTS—Plain Old Telephone Service. Basic telephone service supplying standard single-line telephones, telephone lines, and access to the public switched telephone network.

PSTN—Public switched telephone network, also refers to the local telephone company.

QoS—Quality of service, which refers to the measure of service quality provided to the user.

Technology prefix—Discriminators used to distinguish between gateways having specific capabilities within a given zone. In the exchange between the gateway and the gatekeeper, the technology prefix is used to select a gateway after the zone has been selected. Technology prefixes can be used to tell the gatekeeper that a certain technology is associated with a particular call (for example, 15# could mean a fax transmission), or it can be used like an area code for more generic routing. No standard defines what the numbers in a technology prefix mean; by convention, technology prefixes are designated by a pound (#) symbol as the last character.

SPID—Service profile identifier. Number that some service providers use to define the services to which an ISDN device subscribes. The ISDN device uses the SPID when accessing the switch that initializes the connection to a service provider.

VIC—Voice interface card.

VNM—Voice network module.

VoIP—Voice over IP. The ability to carry normal telephone-style voice over an IP-based internet with POTS-like functionality, reliability, and voice quality. VoIP is a blanket term that generally refers to Cisco’s standards based (for example, H.323) approach to IP voice traffic.

WIC—Wide-area network (WAN) interface card.
**Configuration Tasks**

To set up the BRI interface characteristics, set the global parameters and then configure each interface separately. Next, configure dial peers for VoIP.

## Configuring BRI Interfaces

To configure BRI interfaces, perform the following configuration tasks:

<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Router#configure terminal</td>
<td>Enter global configuration mode.</td>
</tr>
<tr>
<td>2</td>
<td>Router(config)#isdn switch-type switch-type</td>
<td>Configure the global ISDN switch type to match the service provider switch type. For a list of keywords, see Table 1.</td>
</tr>
<tr>
<td>3</td>
<td>Router(config)#interface bri slot/port</td>
<td>Enter interface configuration mode to configure parameters for the specified interface. <em>slot</em> is the location of the voice network module in the router. <em>port</em> is the location of the BRI VIC in the voice network module. Valid values are 0 or 1.</td>
</tr>
<tr>
<td>4</td>
<td>Router(config-if)#no ip address</td>
<td>Specify that there is no IP address for this interface. For information about IP addressing, see the IOS software document, <em>Network Protocols Configuration Guide, Part 1</em>.</td>
</tr>
<tr>
<td>5</td>
<td>Router(config-if)#no ip-directed broadcast</td>
<td>Disable the translation of directed broadcast to physical broadcasts.</td>
</tr>
<tr>
<td>6</td>
<td>Router(config-if)#isdn switch-type switch-type</td>
<td>(Optional) 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 the interface. For a list of keywords, refer to Table 1.</td>
</tr>
<tr>
<td>7</td>
<td>Router(config-if)#isdn spid1 spid-number [ldn]</td>
<td>Specify a SPID and local directory number for the B1 channel. Currently, only the DMS-100 and NI-1 switch types require SPIDs. Although the Lucent 5ESS switch type might support a SPID, we recommend that you set up that ISDN service without SPIDs.</td>
</tr>
<tr>
<td>8</td>
<td>Router(config-if)#isdn spid2 spid-number [ldn]</td>
<td>Specify a SPID and local directory number for the B2 channel.</td>
</tr>
<tr>
<td>9</td>
<td>Router(config-if)#isdn twait-disable</td>
<td>(Optional) Use this command when the ISDN switch type is basic-ni1. Delay a National ISDN BRI switch a random time before activating the Layer 2 interface when the switch starts up.</td>
</tr>
<tr>
<td>10</td>
<td>Router(config-if)#isdn incoming-voice modem</td>
<td>Configure the port for incoming voice calls.</td>
</tr>
</tbody>
</table>

When you have finished configuring one interface, you can repeat Steps 3 through 10 above.
Verifying BRI Interface Configuration

To verify the ISDN BRI interface configuration, follow the steps below.

**Step 1**  The `show running-config` command in EXEC mode shows the current configuration running on the terminal. The example below shows some of the command output that is relevant to BRI configuration tasks.

---

**Table 1**  ISDN Switch Types

<table>
<thead>
<tr>
<th>Country</th>
<th>ISDN Switch Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>basic-ts013</td>
<td>Australian TS013 switches</td>
</tr>
<tr>
<td>Europe</td>
<td>basic-1tr6</td>
<td>German 1TR6 ISDN switches</td>
</tr>
<tr>
<td></td>
<td>basic-nwnt3</td>
<td>Norwegian NET3 ISDN switches (phase 1)</td>
</tr>
<tr>
<td></td>
<td>basic-net3</td>
<td>NET3 ISDN switches (UK and others)</td>
</tr>
<tr>
<td></td>
<td>vn2</td>
<td>French VN2 ISDN switches</td>
</tr>
<tr>
<td></td>
<td>vn3</td>
<td>French VN3 ISDN switches</td>
</tr>
<tr>
<td>Japan</td>
<td>ntt</td>
<td>Japanese NTT ISDN switches</td>
</tr>
<tr>
<td>New Zealand</td>
<td>basic-nznet3</td>
<td>New Zealand NET3 switches</td>
</tr>
<tr>
<td>North America</td>
<td>basic-5ess</td>
<td>Lucent Technologies basic rate switches</td>
</tr>
<tr>
<td></td>
<td>basic-dms100</td>
<td>NT DMS-100 basic rate switches</td>
</tr>
<tr>
<td></td>
<td>basic-ni1</td>
<td>National ISDN-1 switches</td>
</tr>
</tbody>
</table>

---

**Note**  The `show startup-config` shows the configuration stored in NVRAM or in a location specified by the CONFIG_FILE environment variable.

Router#show running-config
Building configuration...

Current configuration:
!
version 12.0
no service udp-small-servers
service tcp-small-servers
!
hostname Router
!
enable secret 5 $1$c8xi$tObplXsIS.jDeo43y2gq50
enable password xxx
!
username xxxx password x 1lx5xx07
no ip domain-lookup
ip host Labhost 172.17.12.1
ip host Labhost2 172.17.12.2
ip name-server 171.70.169.21
!
Verifying BRI Interface Configuration

Configuring ISDN BRI Voice over IP for Cisco 2600 and 3600 Series Voice Interface Cards

... interface BRI1/0
    no ip address
    no ip directed-broadcast
    isdn switch-type basic-nil
    isdn twait-disable
    isdn spid1 140855542790101 5554279
    isdn spid2 140855542800101 5554280
    isdn incoming-voice modem
!
interface BRI1/1
    no ip address
    no ip directed-broadcast
    isdn switch-type basic-nil
    isdn twait-disable
    isdn spid1 140855542290101 5554229
    isdn spid2 140855542330101 5554233
    isdn incoming-voice modem
!
interface BRI2/0
    no ip address
    no ip directed-broadcast
    isdn switch-type basic-nil
    isdn twait-disable
    isdn spid1 140855542110101 5554211
    isdn spid2 140855542120101 5554212
    isdn incoming-voice modem
!
interface BRI2/1
    no ip address
    no ip directed-broadcast
    isdn switch-type basic-nil
    isdn twait-disable
    isdn spid1 140855546880101 5554688
    isdn spid2 140855546890101 5554689
    isdn incoming-voice modem
...

Step 2

The `show interfaces bri` command displays information about the physical attributes of the ISDN BRI B and D channels. The term “spoofing” means that the interface is presenting itself to the IOS software as operational.

Router#show interfaces bri
BRI1/0 is up, line protocol is up (spoofing)
    Hardware is Voice TE BRI
    MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
    Encapsulation VOICE, loopback not set
    Last input 00:00:08, output never, output hang never
    Last clearing of "show interface" counters never
    Input queue: 0/75/0 (size/max/drops); Total output drops: 0
    Queueing strategy: weighted fair
    Output queue: 0/1000/64/0 (size/max total/threshold/drops)
    Conversations 0/0/256 (active/max active/max total)
    Reserved Conversations 0/0 (allocated/max allocated)
    5 minute input rate 0 bits/sec, 0 packets/sec
    5 minute output rate 0 bits/sec, 0 packets/sec
    109063 packets input, 508010 bytes, 0 no buffer
    Received 425 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    11115 packets output, 1503160 bytes, 0 underruns
    0 output errors, 0 collisions, 1 interface resets
    0 output buffer failures, 0 output buffers swapped out
    1 carrier transitions

Configuring ISDN BRI Voice over IP for Cisco 2600 and 3600 Series Voice Interface Cards 7
BRI1/0:1 is down, line protocol is down
Hardware is Voice TE BRI
MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec,
reliability 255/255, txload 1/255, rxload 1/255
Encapsulation VOICE, loopback not set, keepalive set (10 sec)
Last input never, output never, output hang never
Last clearing of "show interface" counters never
Input queue: 0/75/0 (size/max/drops); Total output drops: 0
Queueing strategy: weighted fair
Output queue: 0/1000/64/0 (size/max total/threshold/drops)
Conversations 0/0/256 (active/max active/max total)
Reserved Conversations 0/0 (allocated/max allocated)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  0 packets input, 0 bytes, 0 no buffer
  Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  11115 packets output, 1503160 bytes, 0 underruns
  0 output errors, 0 collisions, 0 interface resets
  0 output buffer failures, 0 output buffers swapped out
  0 carrier transitions
BRI1/0:2 is down, line protocol is down
Hardware is Voice TE BRI
MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec,
reliability 255/255, txload 1/255, rxload 1/255
Encapsulation VOICE, loopback not set, keepalive set (10 sec)
Last input never, output never, output hang never
Last clearing of "show interface" counters never
Input queue: 0/75/0 (size/max/drops); Total output drops: 0
Queueing strategy: weighted fair
Output queue: 0/1000/64/0 (size/max total/threshold/drops)
Conversations 0/0/256 (active/max active/max total)
Reserved Conversations 0/0 (allocated/max allocated)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  0 packets input, 0 bytes, 0 no buffer
  Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  11115 packets output, 1503160 bytes, 0 underruns
  0 output errors, 0 collisions, 0 interface resets
  0 output buffer failures, 0 output buffers swapped out
  0 carrier transitions

Configuring VoIP Peers
To configure VoIP dial peers, repeat the following steps for each dial peer:

<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| 1 | Router(config-if)#dial-peer voice tag-number {voip | pots} | Enter dial-peer configuration mode to configure parameters for the specified dial peer. The dial peer is identified by the tag number. Valid entries for tag-number are from 1 to 10000.  
voip indicates that this is a VoIP peer using voice encapsulation on the PSTN and pointing to a specific IP address.  
pots indicates that this is a POTS peer using Voice over IP encapsulation on the IP backbone and pointing to a specific voice port on a voice network device. |
**Step** | **Command** | **Purpose**
--- | --- | ---
2 | `Router(config-if)#direct-inward-dial` | (Optional) POTs peers only. Configures the router to identify the destination dial peer by deriving a Direct Inward Dial (DID) called-number from the ISDN setup message. When a call arrives for this peer, the router forwards the call directly to the configured destination, instead of presenting dial tone and collecting dialed digits. **Note** Most configurations associate only one POTS dial peer for each port. However, if DID configuration is used and more than one dial peer points to the same port, DID should be specified for all of the associated dial peers.
3 | `Router(config-if)#destination-pattern [tech-prefix#]string[t]` | Specify the telephone number (E.164 or otherwise) associated with this dial peer. Use the `tech-prefix` argument to define a technology prefix. **Note** Technology prefixes are required for some Registration, Admission, and Status (RAS) gateways. For more information, see the Cisco IOS Release 12.0(2)XD configuration note, *Using Cisco 3600 and Cisco 2600 Series Routers as H.323 VoIP Gateways*. 
4 | `Router(config-if)#port slot-number/subunit-number/port` | POTS peers only. Specify the voice port through which incoming VoIP calls will be received. The three-part number indicates the chassis slot, voice network module slot, and the VIC port, in that order.
VoIP peers only. Indicate a network-specific address for a dial peer. 

ipv4:destination-address specifies the IP address of the dial peer.

dns:host-name indicates that the domain name server (DNS) will be used to resolve the name of the IP address. Valid entries are characters representing the name of the host device. One of the following optional wildcards can further define the session target:

- $s$.—Indicates that the source destination pattern will be used as part of the domain name.
- $d$.—Indicates that the destination number will be used as part of the domain name.
- $e$.—Indicates that the digits in the called number will be reversed, periods will be added between each digit of the called number, and that this string will be used as part of the domain name.
- $u$.—Indicates that the unmatched portion of the destination pattern (such as a defined extension number) will be used as part of the domain name.

The following three loopback parameters are used only for loopback testing:

- **loopback:rtp** indicates that all voice data will be looped back to the originating source (applicable to VoIP peers).
- **loopback:compressed** indicates that all voice data will be looped back in compressed mode to the originating source (applicable to POTS peers).
- **loopback:uncompressed** indicates that all voice data will be looped back in uncompressed mode to the originating source (applicable to POTS peers).
- **ras** indicates that the Registration, Admission and Status (RAS) signaling function protocol is in use and a gatekeeper will be consulted to translate the E.164 address to an IP address.
Verifying VoIP Dial-Peer Configuration

The `show dial-peer voice` command displays information about the dial-peer configuration.

The following example shows output from the `show dial-peer voice` command for a VoIP dial peer using a BRI VIC:

```
Router#show dial-peer voice
VoiceOverIpPeer13
   tag = 13, destination-pattern = '9.......',
   answer-address = '', preference=0,
   group = 13, Admin state is up, Operation state is up,
   incoming called-number = '', connections/maximum = 0/unlimited,
   application associated:
      type = voip, session-target = 'ipv4:12.0.0.2',
      technology prefix:
         ip precedence = 0, UDP checksum = disabled,
         session-protocol = cisco, req-qos = best-effort,
         acc-qos = best-effort,
         fax-rate = voice, codec = g729r8,
         Expect factor = 10, Icpif = 30,
         VAD = enabled, Poor QOV Trap = disabled,
         Connect Time = 0, Charged Units = 0,
         Successful Calls = 0, Failed Calls = 0,
         Accepted Calls = 0, Refused Calls = 0,
         Last Disconnect Cause is '',
         Last Disconnect Text is '',
         Last Setup Time = 0.
VoiceOverIpPeer12
   tag = 12, destination-pattern = '7....',
   answer-address = '', preference=0,
   group = 12, Admin state is up, Operation state is up,
   incoming called-number = '', connections/maximum = 0/unlimited,
   application associated:
      type = voip, session-target = 'ipv4:12.0.0.2',
      technology prefix:
         ip precedence = 0, UDP checksum = disabled,
         session-protocol = cisco, req-qos = best-effort,
         acc-qos = best-effort,
         fax-rate = voice, codec = g729r8,
         Expect factor = 10, Icpif = 30,
         VAD = enabled, Poor QOV Trap = disabled,
         Connect Time = 4123, Charged Units = 0,
         Successful Calls = 2, Failed Calls = 0,
         Accepted Calls = 2, Refused Calls = 0,
         Last Disconnect Cause is "10 ",
         Last Disconnect Text is "normal call clearing.",
         Last Setup Time = 989287.
```
Configuration Examples

The configuration examples included in this section correspond to the topology shown in Figure 2. The routers each include a BRI VIC and a two-slot voice network module, along with other voice interface cards and modules that are included for the sake of completeness. Router A is connected to a PBX through the BRI VIC and connected to Router B by a serial Ethernet interface. Router B includes a BRI VIC for connection to the PSTN, in order to process voice calls from off-premises terminal equipment.

For more information about IP configuration, see the Cisco IOS Release 12.0 Network Protocols Configuration Guide, Part 1. For more information about VoIP configuration, see Cisco IOS Release 12.0 Voice, Video, and Home Applications Configuration Guide.

Figure 2  Configuration Topology

Router A: Connection to a PBX

The following example illustrates the configuration of a Cisco 3640 router for connection to a BRI VIC accessing a PBX:

```
vicbri_3640_s1#sh run
Building configuration...

Current configuration:
!
version 12.0
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname vicbri_3640_s1
!
logging buffered 200000 debugging
!
ip subnet-zero
ip host keyer 223.255.254.254
!
isdn switch-type basic-ni
!
```

Router B: Cisco 2600 series with BRI VIC

PBX

BRI VIC

IP network

BRI VIC

PSTN

Router A: Cisco 3640 with BRI VIC

Router B: Cisco 2600 series with BRI VIC
The following commands configure the ports on VICs. The last four specified ports are for FXO and E&M VICs:

```
voice-port 1/0/0
!
voice-port 1/0/1
!
voice-port 2/0/0
!
voice-port 2/0/1
!
voice-port 3/0/0
  operation 4-wire
  type 2
!
voice-port 3/0/1
  operation 4-wire
  type 2
!
voice-port 3/1/0
  input gain 10
  connection plar 39019
!
voice-port 3/1/1
  input gain 10
  connection plar 39020
```

The following commands configure dial peers to specify where incoming VoIP calls should be directed. In the first example, call received with a starting digit of 5 are sent to the PBX via the BRI VIC:

```
dial-peer voice 10 pots
  destination-pattern 5.....
  port 1/1/0
!
```

This command sets up a local BRI connection:

```
dial-peer voice 11 pots
  destination-pattern 66002
  port 1/0/0
!
```

In this example, calls with a starting digit of 9 are PSTN calls that are routed over IP:

```
dial-peer voice 13 voip
  destination-pattern 9.....
  session target ipv4:12.0.0.2
!
```

This command sets up an FXS connection over IP to the other router:

```
dial-peer voice 12 voip (calls to other router with FXS - go over IP)
  destination-pattern 7.....
  session target ipv4:12.0.0.2
!
```
The following global configuration commands define how to expand an extension number into a particular destination pattern.

num-exp 8 9529399
num-exp 1 550950
num-exp 2 76002

The following commands configure the Ethernet and serial interfaces:

interface Ethernet0/0
  ip address 1.14.122.10 255.255.0.0
  ip helper-address 223.255.254.254
  no ip directed-broadcast

interface Serial0/0
  ip address 3.0.0.2 255.0.0.0
  no ip directed-broadcast
  no ip mroute-cache
  no keepalive
  no fair-queue

interface Ethernet0/1
  ip address 11.0.0.1 255.0.0.0
  no ip directed-broadcast

interface Serial0/1
  ip address 14.0.0.1 255.0.0.0
  no ip directed-broadcast
  no keepalive
  shutdown
  no fair-queue
  clockrate 2000000

The following commands configure the BRI interfaces:

interface BRI1/0
  no ip address
  no ip directed-broadcast
  isdn switch-type basic-nil
  isdn twait-disable
  isdn spid1 14085552121010 5552121
  isdn spid2 14085552122010 5552122
  isdn incoming-voice modem

interface BRI1/1
  no ip address
  no ip directed-broadcast
  isdn switch-type basic-nil
  isdn twait-disable
  isdn spid1 14085556362010 5556362
  isdn spid2 14085556364010 5556364
  isdn incoming-voice modem

interface BRI2/0
  no ip address
  no ip directed-broadcast
  isdn switch-type basic-nil
  isdn twait-disable
  isdn spid1 140855557111010 5555711
  isdn spid2 14085555712010 5555712
  isdn incoming-voice modem
Router B: Connection to PSTN

The following example illustrates the configuration of a Cisco 2600 series router for connection to a BRI VIC accessing an ISDN telephone network:

```
vicbri_2600_s2#sh run
Building configuration...

Current configuration:
!
version 12.0
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname vicbri_2600_s2
!
logging buffered 200000 debugging
!
ip subnet-zero
!
isdn switch-type basic-ni
!
!
The following commands configure the ports on VICs:
!
voice-port 1/0/0
!
voice-port 1/0/1
!
```

Router B: Connection to PSTN

The following example illustrates the configuration of a Cisco 2600 series router for connection to a BRI VIC accessing an ISDN telephone network:

```
interface BRI2/1
no ip address
no ip directed-broadcast
isdn switch-type basic-nil
isdn twait-disable
isdn spid1 14085555162010 5555162
isdn spid2 14085555163010 5555163
isdn incoming-voice modem
!
ip default-gateway 1.14.0.1
ip classless
ip route 2.0.0.0 255.0.0.0 Ethernet0/1
ip route 2.0.0.0 255.0.0.0 Serial0/1
ip route 223.255.254.254 255.255.255.255 Ethernet0/0
!
!
line con 0
exec-timeout 0 0
transport input none
line aux 0
line vty 0 4
login
!
end
```

vicienri_3640_s1#
Configuration Examples

The following commands configure dial peers to specify where incoming VoIP calls should be directed. In the first example, a local FXS connection is made to Router A:

```
dial-peer voice 22 voip
  destination-pattern 6....
  session target ipv4:12.0.0.1

!  
```

This command sets up a connection to the PSTN via a BRI VIC:

```
dial-peer voice 23 pots
  destination-pattern 9....
  port 1/1/0

!  
```

This command sets up a local BRI connection:

```
dial-peer voice 24 pots
  destination-pattern 76003
  port 1/0/0

!  
```

This command sets up a connection to a PBX via Router A:

```
!  
dial-peer voice 26 voip
  destination-pattern 5....
  session target ipv4:12.0.0.1

!  
```

The following commands configure the Ethernet and serial interfaces:

```
interface Ethernet0/0
  ip address 1.14.122.11 255.255.0.0
  no ip directed-broadcast

!  
interface Serial0/0
  ip address 2.0.0.1 255.0.0.0
  no ip directed-broadcast
  no keepalive

!  
interface Ethernet0/1
  ip address 11.0.0.2 255.0.0.0
  no ip directed-broadcast

!  
interface Serial0/1
  ip address 14.0.0.2 255.0.0.0
  no ip directed-broadcast
  no keepalive
  no fair-queue
```
The following commands configure the BRI interfaces. Note that only one BRI VIC is installed in a voice network module:

```
interface BRI1/0
  no ip address
  no ip directed-broadcast
  isdn switch-type basic-nil
  isdn twait-disable
  isdn spid1 14085551111 5551111
  isdn spid2 14085551112 5551112
  isdn incoming-voice modem

interface BRI1/1
  no ip address
  no ip directed-broadcast
  isdn switch-type basic-nil
  isdn twait-disable
  isdn spid1 14085552111 5552111
  isdn spid2 14085552112 5552112
  isdn incoming-voice modem

ip classless
ip route 3.0.0.0 255.0.0.0 Ethernet0/1
ip route 3.0.0.0 255.0.0.0 Serial0/1
ip route 223.255.254.0 255.255.255.0 Ethernet0/0
!
!
!
line con 0
  exec-timeout 0 0
  transport input none
line aux 0
line vty 0 4
  login
!
end
```

**Command Reference**

All commands used with this feature are documented in the Cisco IOS Release 12.0 command references. The “Configuration Tasks” section on page 5 illustrates how the commands are used when configuring a BRI VIC for VoIP.