Configuring Network Side ISDN BRI Voice Interface Cards

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Contents

Introduction

This document details the configuration and cabling required to connect VIC−2BRI−NT/TE and VIC−2BRI−S/T cards as ISDN network devices.

Note: There is a new generation Voice Interface Card (VIC), called the VIC2−2BRI−NT/TE, which is a hardware refresh of an older card with similar functionality. You can find comparisons between the VIC−2BRI−NT/TE and VIC2−2BRI−NT/TE in Understanding ISDN BRI Voice Interface Cards.

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

The information in this document is based on these software and hardware versions:

- Cisco 2610 router with an NM−2V voice carrier card.
- The VIC−2BRI−NT/TE, supported on these hardware platforms:

  - 1751
  - 1760
  - ICS 7750
  - 2600
  - 3600
  - 3700

- Cisco IOS® Software Release 12.2.5
- The VIC−2BRI−NT/TE card should be installed in slot 0 of the NM−2V voice carrier card. The second VIC slot of the NM−2V must not have any other VICs installed when an ISDN voice card is installed. This is necessary to ensure that the NM−2V voice carrier card allocates the four Digital Signal Processor (DSP) resources correctly to the four available B channels on the two BRI ports. Only one BRI port would be active, and ISDN voice calls may not work if the card is installed in slot 1 of the NM−2V card.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Conventions

For more information on document conventions, see the Cisco Technical Tips Conventions.

Background Information

The advantage ISDN BRI voice ports offer over other analog voice port types is that ISDN signaling provides end−to−end call information, with details of the called and calling numbers, numbering types, call progress status, and call clearing cause codes. Also, the audio is sent as a digital pulse code modulation (PCM) stream so problems due to audio levels and attenuation are reduced.

Previous IOS routers/gateways have supported ISDN BRI voice ports for quite some time with the VIC−2BRI−S/T card. This allowed a router to interface to existing ISDN voice networks as an ISDN terminal device. Beginning with release 12.1.(3)X1, Cisco offers emulation of the ISDN network and with the newer VIC−2BRI−NT/TE card, support for phantom power generation.

The VIC−2BRI−NT/TE card interfaced to normal ISDN basic rate services as a terminal (or user) side device in the same way as the VIC−2BRI−S/T, and like the VIC−2BRI−S/T, also allows software−configurable options of running as a layer 1, 2, and 3 network side device. This feature allows the integration of existing ISDN terminal equipment such as Key Telephone Systems and small PBXs into Voice over IP (VoIP) networks.

The VIC−2BRI−NT/TE card can be configured to provide phantom line power (power source 1) to bring up the physical layer connection between itself and the ISDN terminal device. Once the link is established, ISDN voice calls can be originated or terminated on the router and sent as VoIP calls to remote locations.

The physical pinouts of the VIC−2BRI−NT/TE and VIC−2BRI−S/T cards are designed such that they will interface to an ISDN network directly through the external NT1 device. In this case, the cabling between the BRI port RJ45 socket and the ISDN NT1 would be a straight through (1 to 1) Category 5 cable.

When the BRI port is run in the network mode, and connected to an ISDN terminal device, a BRI crossover cable is needed to connect the transmit and receive signal pairs between the two devices. The pinouts for a suitable RJ45 ISDN BRI crossover cable are shown here:

ISDN Terminal Device

3
4
5
6

VIC-2BRI-NT/ TE card

3
4
5
6
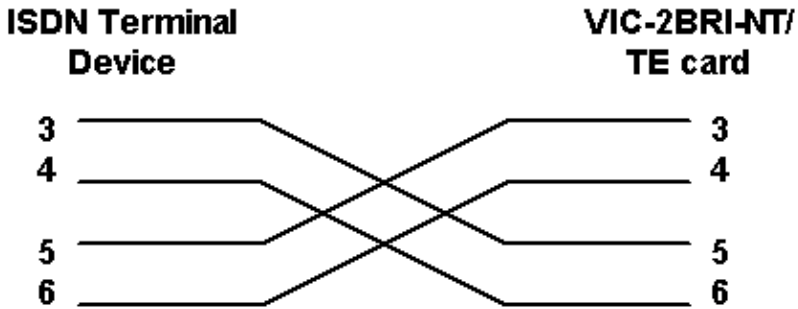
Configure

In this section, you are presented with the information to configure the features described in this document.

Configure the VIC–2BRI–NT/TE and VIC–2BRI–S/T Cards

Here is a basic configuration for the VIC–2BRI–NT/TE card running as network side ISDN with line power enabled.

```
!
interface BRI 1/0
 no ip address
 isdn switch-type basic-net3

!--- Local ISDN switch type

 isdn protocol-emulate network

!--- Layer 2/3 network operation

 isdn layer1-emulate network

!--- Act as ISDN NT1 device

 isdn incoming-voice voice

 !--- Accept ISDN voice calls

 line-power

 !--- Generate line power, only possible on VIC-2VRI-NT/TE

 !
```

Notes

- The ISDN switch type needs to match the configured switch type of the terminal device.
- The BRI interface must be shut down, and the **isdn layer1–emulate network** command, entered before the **line–power** command will be accepted.
- Power source 1 is only supported in network configuration. There is no support for power source/sink 2 or 3.
- Cisco IOS currently only supports layer 2/3 network side operation with QSIG, NET3 and NI ISDN switch types.
- Cisco IOS will default the PCM companding on BRI voice ports to u–law. If the VIC–2BRI–NT/TE is used in locations outside of North America, a–law PCM coding may need to be selected. If an incorrect PCM coding type is selected, the audio may be distorted, and may have a *metallic* or *tinny* sound.

```
      !
      Voice-port 1/0
       description - network side BRI port to key system
       cptone AU
```

      !--- Select appropriate call progress tones

```
       compand-type a-law
```
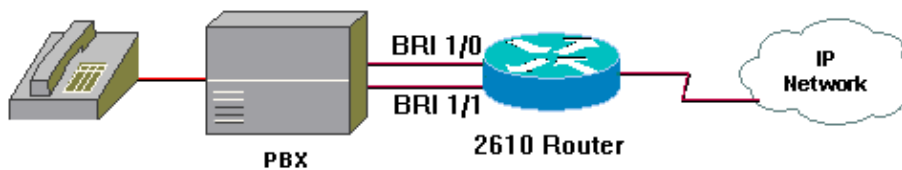
      !--- Use a-law companding for voice calls

```
      !
```

Network Diagram

This document uses this network setup:

Configurations

This document uses this configuration:

- 2610 Router

2610 Router
2610#**show run** Building configuration... Current configuration : 1232 bytes ! version 12.2 service timestamps debug datetime msec localtime service timestamps log uptime no service password-encryption ! hostname 2610 ! ip subnet-zero ! **isdn switch-type basic-net3** call rsvp-sync voice rtp send-recv ! interface FastEthernet0/0 ip address 192.168.1.1 255.255.255.0 duplex auto speed auto ! **interface BRI1/0** no ip address isdn switch-type basic-net3 **isdn protocol-emulate network** **isdn layer1-emulate network**

```
 isdn incoming-voice voice
 isdn skipsend-idverify
 line-power
!
interface BRI1/1
 no ip address
 isdn switch-type basic-net3
 isdn protocol-emulate network
 isdn layer1-emulate network
 isdn skipsend-idverify
 line-power
!
ip classless
ip http server
ip pim bidir-enable
!
voice-port 1/0/0
 compand-type a-law
 cptone AU
!
voice-port 1/0/1
 compand-type a-law
 cptone AU
!
dial-peer cor custom
!
dial-peer voice 1 pots
 incoming called-number .
 direct-inward-dial
 port 1/0/0
!
dial-peer voice 2 pots
 incoming called-number .
 direct-inward-dial
 port 1/0/1
!
dial-peer voice 100 voip
 destination-pattern 8.......
 session target ipv4:192.168.1.10
 dtmf-relay h245-alphanumeric
 codec g723r63
 ip precedence 5
!
dial-peer voice 1000 pots
 destination-pattern 0
 port 1/0/0
!
dial-peer voice 1001 pots
 destination-pattern 0
 port 1/0/1
!
line con 0
line aux 0
line vty 0 4
!
no scheduler allocate
end
```

Verify

This section provides information you can use to confirm your configuration is working properly.

Certain **show** commands are supported by the Output Interpreter Tool (registered customers only) , which

allows you to view an analysis of the **show** command output.

- **show isdn status** provides information on the BRI port and ISDN connection.

Here is the output of the **show isdn status** command:

```
2610#show isdn status
Global ISDN Switchtype = basic-net3
ISDN BRI1/0 interface
        ******* Network side configuration *******

!--- Network side

        dsl 0, interface ISDN Switchtype = basic-net3
    Layer 1 Status:
        ACTIVE
    Layer 2 Status:
        TEI = 64, Ces = 1, SAPI = 0, State = MULTIPLE_FRAME_ESTABLISHED
    Layer 3 Status:
        0 Active Layer 3 Call(s)
    Active dsl 0 CCBs = 0
    The Free Channel Mask:  0x80000003
    Number of L2 Discards = 0, L2 Session ID = 5
ISDN BRI1/1 interface
        ******* Network side configuration *******

!--- Network side

        dsl 1, interface ISDN Switchtype = basic-net3
    Layer 1 Status:
        DEACTIVATED
    Layer 2 Status:
        Layer 2 NOT Activated
    Layer 3 Status:
        0 Active Layer 3 Call(s)
    Active dsl 1 CCBs = 0
    The Free Channel Mask:  0x80000003
    Number of L2 Discards = 0, L2 Session ID = 0
    Total Allocated ISDN CCBs = 0
```

Note: When the cable from the NT is removed, NT Layer 1 remains in active state. This is as per I.430 standard section 5.18. Where power and clock is provided by the NT, it can be up all the time.

In this example, the two BRI ports are configured for network–side operation. Port 1/0 is active, has a TEI of 64, and there are no calls on the link. Port 1/1 is not activated.

Troubleshoot

This section provides information you can use to troubleshoot your configuration.

Troubleshoot the VIC–2BRI–NT/TE and VIC–2BRI–S/T Cards

Standard ISDN troubleshooting techniques are used with ISDN BRI voice interface cards. ISDN debugs for Q921 (layer 2) and Q931 (layer 3) are extremely helpful in determining link or network problems. The following debug shows an ISDN call coming into the router, connecting and then clearing down normally. It gives useful information such as:

```
Calling number  : 55551000
Called number   : 84487633
```

The call came in to the gateway router BRI port 1/0 at 1:50:33.397 (time stamps are formatted as hours/minutes/seconds/milliseconds). Calling number was 55551000, Called number was 84487633. Call connected at 1:51:01.561, was then disconnected at 1:51:13.345 – a duration of around 12 seconds. Shown below is an output sample from a **debug isdn q931** command

```
2610#
*Mar  2 01:50:53.397: ISDN BR1/0: RX <- SETUP pd = 8  callref = 0x09
*Mar  2 01:50:53.397:         Bearer Capability i = 0x8090A3
*Mar  2 01:50:53.401:         Channel ID i = 0x83
*Mar  2 01:50:53.401:         Progress Ind i = 0x8183 - Origination address
      is non-ISDN
*Mar  2 01:50:53.405:         Calling Party Number i = 0x00, 0x80, '55510000',
      Plan:Unknown, Type:Unknown
*Mar  2 01:50:53.409:         Called Party Number i = 0x81, '84487633',
      Plan:ISDN, Type:Unknown
*Mar  2 01:50:53.417: ISDN BR1/0: Event: Received a VOICE call from 55510000
      on B1 at 64 Kb/s
*Mar  2 01:50:53.417: ISDN BR1/0: Event: Accepting the call id 0xC
*Mar  2 01:50:53.437: ISDN BR1/0: TX -> CALL_PROC pd = 8  callref = 0x89
*Mar  2 01:50:53.437:         Channel ID i = 0x89
*Mar  2 01:50:54.085: ISDN BR1/0: TX -> ALERTING pd = 8  callref = 0x89
*Mar  2 01:51:01.561: ISDN BR1/0: TX -> CONNECT pd = 8  callref = 0x89
*Mar  2 01:51:01.561:         Channel ID i = 0x89
*Mar  2 01:51:01.589: ISDN BR1/0: RX <- CONNECT_ACK pd = 8  callref = 0x09
*Mar  2 01:51:13.345: ISDN BR1/0: RX <- DISCONNECT pd = 8  callref = 0x09
*Mar  2 01:51:13.349:         Cause i = 0x8090 - Normal call clearing
*Mar  2 01:51:13.357: ISDN BR1/0: TX -> RELEASE pd = 8  callref = 0x89
*Mar  2 01:51:13.361:         Cause i = 0x8090 - Normal call clearing
*Mar  2 01:51:13.393: ISDN BR1/0: RX <- RELEASE_COMP pd = 8  callref = 0x09
```

Helpful Links

These URLs provide more information on ISDN troubleshooting:

- Using the **show isdn status** Command for BRI Troubleshooting
- Troubleshooting ISDN BRI Layer 1
- Troubleshooting BRI Layer 2
- Troubleshooting ISDN BRI Layer 3 Using the **debug isdn q931** Command
- Troubleshooting ISDN Connections

Note: Before issuing **debug** commands, please see Important Information on Debug Commands.

Related Information

- **Q.931 User–Side and Network–Side Switch Support**
- **Configuring an ISDN BRI NT/TE Interface on Voice Interface Cards and ISDN BRI Voice Modules**
- **Understanding debug isdn q931 Disconnect Cause Codes**
- **Understanding ISDN BRI Voice Interface Cards**
- **Voice Technology Support**
- **Voice and Unified Communications Product Support**
- **Troubleshooting Cisco IP Telephony**
- **Technical Support – Cisco Systems**