Cisco 2651 Gateway-PBX Interoperability: Lucent Definity G3r with T1 ISDN PRI Network Facility Associated Signaling

This document describes the interoperability and configuration of a Cisco 2651 voice gateway with a Lucent Definity G3r PBX using T1 ISDN PRI Network Facility Associated Signaling (NFAS). It includes the following sections:

- System Components
- Configuration Tasks
- Caveats

System Components

PBX Model	Lucent Definity G3r
PBX Release	V6.0
Telephony Signaling	T1 ISDN PRI
Voice Gateway	Cisco 2651
Gateway Release	Cisco IOS Release 12.2
VoX Protocol	H.323

Configuration Tasks

See the following sections for configuration tasks for this feature:

- Set Up
- Lucent PBX Configuration
- Call Manager Configuration

Set Up

This section includes the following information:

- Connectivity Diagrams
- Set Up Notes

Connectivity Diagrams

Figure 1: Test Configuration

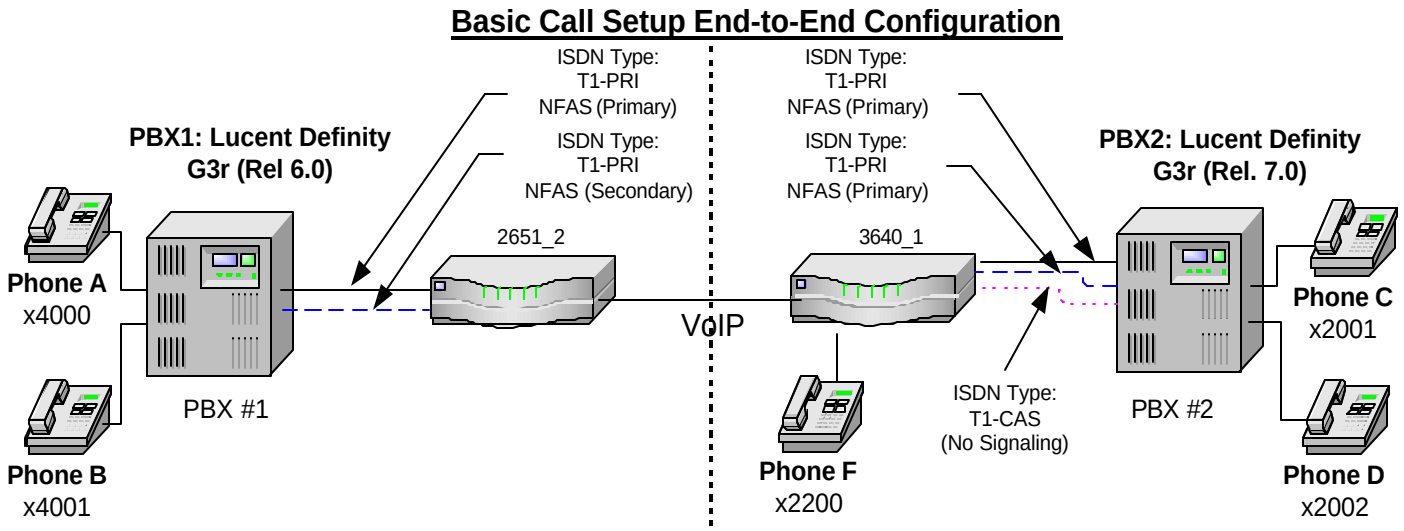

Figure 1 represents the configuration used for testing: a Lucent Definity G3r PBX connected to a Cisco 2651 voice gateway via a T1 ISDN PRI connection.

Set Up Notes

The Cisco 2651 router when doing ISDN NFAS only supports switch type settings of **primary-ntt, primary-ni, primary-4ess and primary-5ess.** It does not support network side emulation when doing ISDN NFAS.

Lucent PBX Configuration

Lucent PBX Version Information

- Software: Version G3V6i.01.0.018.2
- Hardware: G3siV6

Lucent PBX Sample Configuration

```
display trunk-group 14 print                          07/08/00  7:23 Page   1 of  10
                                 TRUNK GROUP

Group Number: 14                     Group Type: isdn-pri      CDR Reports: y
  Group Name: Slot 12                       COR: 1        TN: 1        TAC: 669
```

```
   Direction: two-way        Outgoing Display? n
 Dial Access? y                Busy Threshold: 99          Night Service:
Queue Length: 0
Service Type: tie                    Auth Code? n            TestCall ITC: rest
                         Far End Test Line No:
TestCall BCC: 4
TRUNK PARAMETERS
         Codeset to Send Display: 0     Codeset to Send TCM,Lookahead: 7
        Max Message Size to Send: 260   Charge Advice: none
  Supplementary Service Protocol: a     Digit Handling (in/out): enbloc/enbloc

            Trunk Hunt: ascend
     Connected to Toll? n      STT Loss: normal       DTT to DCO Loss: normal
Calling Number - Delete:     Insert:                 Numbering Format:
              Bit Rate: 1200         Synchronization: async    Duplex: full
 Disconnect Supervision - In? y  Out? y
 Answer Supervision Timeout: 0


display trunk-group 14 print                      07/08/00  7:23 Page   2 of  10
TRUNK FEATURES
          ACA Assignment? n            Measured: none      Wideband Support? n
                                     Internal Alert? n        Maintenance Tests? y
                                   Data Restriction? n  NCA-TSC Signaling Group: 3
                                          Send Name: y      Send Calling Number: y
            Used for DCS? n                              Send Connected Number: y
   Suppress # Outpulsing? n    Numbering Format: public


display trunk-group 14 print                      07/08/00  7:23 Page   3 of  10
                         INCOMING CALL HANDLING TREATMENT
 Service/       Called    Called        Del  Insert            Per Call  Night
 Feature         Len      Number                               CPN/BN    Serv
```

```
display trunk-group 14 print                          07/08/00  7:23 Page   4 of  10
                                                 TRUNK GROUP
                                                      Administered Members (min/max):   1/22
GROUP MEMBER ASSIGNMENTS                                  Total Administered Members:  22

       Port    Code Sfx Name        Night           Sig Grp
   1: 01A1101 TN464  F                                3
   2: 01A1102 TN464  F                                3
   3: 01A1103 TN464  F                                3
   4: 01A1104 TN464  F                                3
   5: 01A1105 TN464  F                                3
   6: 01A1106 TN464  F                                3
   7: 01A1107 TN464  F                                3
   8: 01A1108 TN464  F                                3
   9: 01A1109 TN464  F                                3
  10: 01A1110 TN464  F                                3
  11: 01A1201 TN464  F                                3
  12: 01A1202 TN464  F                                3
  13: 01A1203 TN464  F                                3
  14: 01A1204 TN464  F                                3
  15: 01A1205 TN464  F                                3
```

```
display trunk-group 14 print                          07/08/00  7:23 Page   5 of  10
                                                 TRUNK GROUP
                                                      Administered Members (min/max):   1/22
GROUP MEMBER ASSIGNMENTS                                  Total Administered Members:  22

       Port    Code Sfx Name        Night           Sig Grp
  16: 01A1206 TN464  F                                3
  17: 01A1207 TN464  F                                3
  18: 01A1208 TN464  F                                3
  19: 01A1209 TN464  F                                3
  20: 01A1210 TN464  F                                3
  21: 01A1401 TN464  F                                3
  22: 01A1402 TN464  F                                3
  23:
  24:
  25:
  26:
  27:
  28:
  29:
  30:
```

```
display dialplan print                              07/08/00  7:23 Page   1 of   1
                                DIAL PLAN RECORD

    North American Area Code:                          Local Node Number: 2
                                                         ETA Node Number:
        Uniform Dialing Plan: 4-digit                ETA Routing Pattern:
  UDP Extension Search Order: udp-table-first
FIRST DIGIT TABLE
First                                    Length
Digit  - 1 -       - 2 -       - 3 -       - 4 -       - 5 -       - 6 -
  1:
  2:                                        extension
  3:                                        extension
  4:                                        extension
  5:
  6:                           dac
  7:
  8: fac
  9: fac
  0: attd
  *: fac
  #: fac


display signaling-group 3 print                     07/08/00  7:23 Page   1 of   5
                                SIGNALING GROUP

 Group Number: 3    Associated Signaling? n          Max number of NCA TSC: 0
                       Primary D-Channel: 01A1124     Max number of CA TSC: 0
                     Secondary D-Channel: 01A1224  Trunk Group for NCA TSC:
       Trunk Group for Channel Selection: 14


         Trunk Brd      Interface ID          Trunk Brd      Interface ID
          1: 01A11            0              11:
          2: 01A12            1              12:
          3: 01A14            2              13:
          4:                                 14:
          5:                                 15:
          6:                                 16:
          7:                                 17:
          8:                                 18:
          9:                                 19:
         10:                                 20:

display isdn public-unknown-numbering print      07/08/00  7:24 Page   1 of   8
                    ISDN NUMBERING - PUBLIC/UNKNOWN FORMAT

Ext   Ext         CPN        Total CPN    Ext   Ext         CPN        Total CPN
Len   Code       Prefix       Length     Len   Code       Prefix       Length

 4    2      408522             10
 4    4      408522             10
```

```
display ds1 a11 print                                07/08/00  7:24 Page   1 of   2
                                  DS1 CIRCUIT PACK

            Location: 01A11                              Name: pri-a11
            Bit Rate: 1.544                     Line Coding: b8zs
   Line Compensation: 1                        Framing Mode: esf
      Signaling Mode: isdn-pri
             Connect: line-side
                                                Country Protocol: 1
                                                Protocol Version: a
Interface Companding: mulaw                                CRC? n
           Idle Code: 11111111
                                  DCP/Analog Bearer Capability: 3.1kHz

 MAINTENANCE PARAMETERS

      Slip Detection? n                  Near-end CSU Type: other

                             Alarm When PRI Endpoint Detached? y



display ds1 a11 print                                07/08/00  7:24 Page   2 of   2
                                  DS1 CIRCUIT PACK

 ESF DATA LINK OPTIONS

                       Network Management Protocol: tabs
 Send ANSI-T1.403 One-Second Performance Reports? n
                                Far-end CSU Address: b
```

```
display ds1 a12 print                                07/08/00  7:24 Page   1 of   2
                                  DS1 CIRCUIT PACK

           Location: 01A12                              Name: pri-a12
           Bit Rate: 1.544                      Line Coding: b8zs
   Line Compensation: 1                        Framing Mode: esf
      Signaling Mode: isdn-pri
             Connect: line-side
                                            Country Protocol: 1
                                            Protocol Version: a
Interface Companding: mulaw                            CRC? n
           Idle Code: 11111111
                                DCP/Analog Bearer Capability: 3.1kHz

 MAINTENANCE PARAMETERS

      Slip Detection? n                  Near-end CSU Type: other

                            Alarm When PRI Endpoint Detached? y


display ds1 a12 print                                07/08/00  7:24 Page   2 of   2
                                  DS1 CIRCUIT PACK

 ESF DATA LINK OPTIONS

                       Network Management Protocol: tabs
 Send ANSI-T1.403 One-Second Performance Reports? n
                              Far-end CSU Address: b
```

```
display ds1 a14 print                                07/08/00  7:24 Page   1 of   2
                                  DS1 CIRCUIT PACK

            Location: 01A14                              Name: pri-a14
            Bit Rate: 1.544                     Line Coding: b8zs
   Line Compensation: 1                        Framing Mode: esf
      Signaling Mode: isdn-ext



Interface Companding: mulaw
           Idle Code: 11111111


 MAINTENANCE PARAMETERS

      Slip Detection? n                  Near-end CSU Type: other


display ds1 a14 print                                07/08/00  7:24 Page   2 of   2
                                DS1 CIRCUIT PACK

 ESF DATA LINK OPTIONS

                      Network Management Protocol: tabs
 Send ANSI-T1.403 One-Second Performance Reports? n
                             Far-end CSU Address: b
```

```
display system-parameters customer-options prin  07/08/00  7:25 Page   1 of   4
                                OPTIONAL FEATURES

                  G3 Version: V6                Maximum Ports: 100

    Abbreviated Dialing Enhanced List? y                     DCS (Basic)? n
 A/D Grp/Sys List Dialing Start at 01? y               DCS Call Coverage? n
Answer Supervision by Call Classifier? y              DCS with Rerouting? n
                                ARS? y                           DS1 MSP? n
                 ARS/AAR Partitioning? y    Emergency Access to Attendant? y
                       ASAI Interface? n           Extended Cvg/Fwd Admin? n
       ASAI Proprietary Adjunct Links? n      External Device Alarm Admin? y
                               ATMS? y                 Flexible Billing? n
              Audible Message Waiting? y    Forced Entry of Account Codes? y
                  Authorization Codes? y       Global Call Classification? y
                             CAS Branch? n              Hospitality (Basic)? y
                               CAS Main? n  Hospitality (G3V3 Enhancements)? y
      Cvg Of Calls Redirected Off-net? n  Hospitality Parameter Reduction? n


        (NOTE: You must logoff & login to effect the permission changes.)

display system-parameters customer-options prin  07/08/00  7:25 Page   2 of   4
                                OPTIONAL FEATURES

                         ISDN-BRI Trunks? y  Restrict Call Forward Off Net? y
                                ISDN-PRI? y          Secondary Data Module? y
                     ISDN-PRI over PACCON? y          Station and Trunk MSP? n
                     Malicious Call Trace? y            Tenant Partitioning? n
                      Mode Code Interface? y    Terminal Trans. Init. (TTI)? y
                  Multifrequency Signaling? y            Time of Day Routing? y
Multimedia Appl. Server Interface (MASI)? n          Uniform Dialing Plan? y
          Multimedia Call Handling (MMCH)? n  Usage Allocation Enhancements? y
            Personal Station Access (PSA)? n
                                                      Wideband Switching? n
                                                                Wireless? n
                 Processor and System MSP? n
                       Private Networking? y




        (NOTE: You must logoff & login to effect the permission changes.)
```

```
display system-parameters customer-options prin  07/08/00  7:25 Page   3 of   4
                        CALL CENTER OPTIONAL FEATURES

                           Logged-In ACD Agents: 500

                                ACD? n          Service Observing (Basic)? y
                        BCMS (Basic)? n   Service Observing (Remote/By FAC)? n
                BCMS/VuStats LoginIDs? n           Service Observing (VDNs)? n
            BCMS/VuStats Service Level? n                        Timed ACW? n
                     Call Work Codes? n                 Vectoring (Basic)? n
        DTMF Feedback Signals For VRU? n              Vectoring (Prompting)? n
         Expert Agent Selection (EAS)? n          Vectoring (G3V4 Enhanced)? n
                               EAS-PHD? n   Vectoring (ANI/II-Digits Routing)? n
                    Forced ACD Calls? n   Vectoring (G3V4 Advanced Routing)? n
             Lookahead Interflow (LAI)? n                 Vectoring (CINFO)? n
Multiple Call Handling (On Request)? n         VDN of Origin Announcement? n
    Multiple Call Handling (Forced)? n             VDN Return Destination? n
  PASTE (Display PBX Data on Phone)? n                              VuStats? n
                        Reason Codes? n             VuStats (G3V4 Enhanced)? n


        (NOTE: You must logoff & login to effect the permission changes.)
```

```
display system-parameters customer-options prin  07/08/00  7:26 Page   4 of   4
                              QSIG OPTIONAL FEATURES

                                        Basic Call Setup? y
                                Basic Supplementary Services? y
                            Supplementary Services with Rerouting? y




        (NOTE: You must logoff & login to effect the permission changes.)
```

```
list configuration all print                    07/08/00  7:26        Page   1

                              SYSTEM CONFIGURATION

Board                                                          Assigned Ports
Number   Board Type              Code     Vintage    u=unassigned t=tti p=psa

01A03    TIE TRUNK                        no board   u  u  u  u
01A04    TIE TRUNK                        no board   01 u  u  u
01A06    DIGITAL LINE             TN754B  000002     01 02 03 04 05 06 u  u
01A07    ANALOG LINE              TN746B  000010     01 02 u  u  u  u  u  u
                                                     u  u  u  u  u  u  u  u
01A10    BRI TRUNK BOARD                  no board   u  u  u  u  u  u  u  u
                                                     u  u  u  u  u  u  u  u
01A11    DS1 INTERFACE            TN464F  000018     01 02 03 04 05 06 07 08
                                                     09 10 u  u  u  u  u  u
                                                     u  u  u  u  u  u  u  24
                                                     u  u  u  u  u  u  u  u


list configuration all print                    07/08/00  7:26        Page   2

                              SYSTEM CONFIGURATION

Board                                                          Assigned Ports
Number   Board Type              Code     Vintage    u=unassigned t=tti p=psa

01A12    DS1 INTERFACE            TN464F  000010     01 02 03 04 05 06 07 08
                                                     09 10 u  u  u  u  u  u
                                                     u  u  u  u  u  u  u  24
                                                     u  u  u  u  u  u  u  u
01A14    DS1 INTERFACE            TN464F  000010     01 02 u  u  u  u  u  u
                                                     u  u  u  u  u  u  u  u
                                                     u  u  u  u  u  u  u  u
                                                     u  u  u  u  u  u  u  u
01A      PROCESSOR                TN790   000012     u  u
01A      NETWORK CONTROL          TN777B  000021     u  u  u  u
01A      PACKET CONTROL           TN778   000007
01A      TONE/CLOCK               TN2182  000006     01 02 03 04 05 06 07 08
```

Cisco 2651 Gateway Configuration

The following is the configuration of the Cisco 2651 voice gateway connected to the Lucent Definity G3r PBX via a T1 ISDN PRI interface.

Cisco 2651 Voice Gateway Version Information

```
2651-2#show version
sh ver
Cisco Internetwork Operating System Software
IOS (tm) C2600 Software (C2600-JS-M), Version 12.2(moonlight_dev.0.8.0),
CISCO DEVELOPMENT TEST VERSION
Copyright (c) 1986-2001 by cisco Systems, Inc.
Compiled Mon 23-Jul-01 15:00 by liha
Image text-base: 0x80008088, data-base: 0x814E574C

ROM: System Bootstrap, Version 12.1(3r)T1, RELEASE SOFTWARE (fc1)

2651-2 uptime is 2 minutes
System returned to ROM by power-on
System image file is "flash:auto/tftpboot-users/melai/c2600-js-mz-
moonlight_"

cisco 2651 (MPC860P) processor (revision 0x00) with 56320K/9216K bytes
of memory.
Processor board ID JAB04230BEE (2852613764)
M860P processor: part number 5, mask 1
Bridging software.
X.25 software, Version 3.0.0.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
TN3270 Emulation software.
Primary Rate ISDN software, Version 1.1.
2 FastEthernet/IEEE 802.3 interface(s)
2 Serial network interface(s)
2 Serial(sync/async) network interface(s)
2 Channelized T1/PRI port(s)
32K bytes of non-volatile configuration memory.
16384K bytes of processor board System flash (Read/Write)

Configuration register is 0x0
```

Cisco 2651 Voice Gateway Sample Configuration

```
2651-2#show running-config

Building configuration...

Current configuration : 1896 bytes
!
version 12.2
no service single-slot-reload-enable
service timestamps debug uptime
service timestamps log uptime
```

```
no service password-encryption
!
hostname 2651-2
!
no logging buffered
logging rate-limit console 10 except errors
!
!
!
memory-size iomem 15
voice-card 1
!
ip subnet-zero
!
!
!
no ip dhcp-client network-discovery
isdn switch-type primary-ni
call rsvp-sync
!
!
!
controller T1 1/0
 framing esf
 linecode b8zs
 cablelength short 133
 pri-group timeslots 1-10,24 nfas_d primary nfas_int 0 nfas_group 0
!
controller T1 1/1
 framing esf
 linecode b8zs
 cablelength short 133
 pri-group timeslots 1-10,24 nfas_d backup nfas_int 1 nfas_group 0
!
!
 interface FastEthernet0/0
 ip address 100.100.100.6 255.255.255.0
 no ip mroute-cache
 no keepalive
 speed auto
 half-duplex
 no cdp enable
!
interface Serial0/0
 mtu 200
 ip address 140.1.0.2 255.255.0.0
 encapsulation frame-relay
 no ip mroute-cache
 no keepalive
 shutdown
 no arp frame-relay
 frame-relay map ip 140.1.0.1 113 broadcast
 frame-relay interface-dlci 113
!
```

```
interface FastEthernet0/1
 ip address 11.0.0.5 255.255.0.0
 no ip mroute-cache
 duplex auto
 speed auto
!
interface Serial0/1
 no ip address
 no ip mroute-cache
 shutdown
!
interface Serial1/0:23
 no ip address
 no logging event link-status
 isdn switch-type primary-4ess
 isdn incoming-voice voice
 isdn T306 60000
 no cdp enable
!
ip classless
ip http server
!
!
snmp-server packetsize 4096
snmp-server manager
tftp-server nvram
!
voice-port 1/0:23
!
voice-port 1/1:23
!
dial-peer cor custom
!
!
dial-peer voice 29 pots
 destination-pattern 2...
 direct-inward-dial
 port 1/0:23
 prefix 2
!
dial-peer voice 2 voip
 destination-pattern 4...
 session target ipv4:100.100.100.5
!
!
line con 0
 exec-timeout 0 0
line aux 0
exec-timeout 0 0
line vty 0 4
 exec-timeout 0 0
 login
line vty 5 15
 exec-timeout 0 0
```

```
 login
!
scheduler allocate 3996 1000
!
end
```

Caveats

- When the Primary D channel is operational, and the Backup D channel is taken out of service (either by a **shut** command or by physically removing the ISDN T1 connection), any calls on the D channel (whether they are initiated before the connection is removed or after) are dropped when the Backup D channel is brought back in service.
- Changing the switch type on the Cisco 2651 requires rebooting the router by cycling power. If you do not power cycle, you get “Disconnect, no circuit/channel available” when you try to place a call.