PGW 2200 DPNSS Configuration Example

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Introduction

This document provides an introduction on the Digital Private Network Signaling System (DPNSS) configuration with the Cisco PGW 2200.

Prerequisites

Requirements

Before attempting this configuration, ensure that you meet these requirements:

- PGW 2200 DPNSS Feature
- PGW 2200 support for User Adaptation Layer (IUA)
- Cisco IOS® Support for Digital Private Network Signaling System Backhaul
- RFC 2960: Stream Control Transmission Protocol
- RFC 3057: ISDN Q.921−IUA
- ITU−T Recommendation Q.920, Digital Subscriber Signaling System No. 1 (DSS1) − ISDN User−Network Interface Data Link Layer − General Aspects

Components Used

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

- Cisco PGW 2200 release 9.5.2 and later
- Cisco IOS Software Release 12.(15)ZJ5 and later
- Cisco hardware platform that support DPNSS backhaul

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, refer to the Cisco Technical Tips Conventions.

Background Information

Look at the protocol stacks in IOS Support for DPNSS Backhaul Details which discusses the transport protocol stacks that are available in the documents listed in the Prerequisite section above.

Configure

In these configuration procedures, the minimal configuration is described with notes on the key parameters.

Configure the Voice Gateway

Complete these steps to configure the Voice gateway.

1. Define the application server (AS) and one or more application server processes linked to it. This defines the transport of the DPNSS signaling from the Voice gateway to the Cisco PGW 2200.

   In this specific example, the Voice gateway uses 10.48.84.75 as the IP address while the Cisco PGW 2200 uses 10.48.84.62 as the IP address. Port 9000 is used on both sides.

   ```
   iua
   AS AS-BRU1 10.48.84.75 9000
   ASP ASP-BRU1 AS AS-BRU1 10.48.84.62 9000
   ```
2. Configure the physical E1.

   In this example, only six voice channels are used, so that the configuration is small. With **mgcp**, the control of the voice channel is placed under the Media Gateway Control Protocol (MGCP).

   With **pri-group** a common channel for signaling is used and a virtual interface representing it is created (interface serial 1/0:15).

   ```
   controller E1 1/0
   pri-group timeslots 12-18 service mgcp
   ```
3. Bind the control channel for signaling to the IUA AS that is transporting it.

   ```
   interface Serial1/0:15
   isdn switch-type primary-dpnss
   isdn incoming-voice voice
   isdn bind-l3 iua-backhaul AS-BRU1

   isdn dpnss pbxA
   ```

   It is important to check if the Voice gateway needs to be defined as 'pabxA' or 'pabxB' for the DPNSS Layer 2. The configuration needs to be the opposite of the PABX connected to it. A wrong configuration here may stop the DPNSS Layer 2 from coming up.
4. Define MGCP on the Voice gateways with the MGCP version and the Call Agent IP address or name.

   ```
   mgcp
   mgcp call-agent 10.48.84.62 service-type mgcp version 1.0
   ```

Configure the Cisco PGW 2200

Complete these steps to configure the Cisco PGW 2200.

1. Add the Voice gateway as External Node and note the `ISDNSIGTYPE="IUA"`.

   ```
   prov-add:EXTNODE:NAME="gw1",DESC="DPNSS GW1",
   TYPE="C2600",ISDNSIGTYPE="IUA",GROUP=0
   ```

2. Add the MGCP path to control the Voice gateway with MGCP.

   ```
   prov-add:MGCPPATH:NAME="mgcp-gw1",DESC="mgcp path to
   gw1",EXTNODE="gw1"
   ```

3. Add the association that defines the Stream Control Transmission Protocol (SCTP)/IUA link between the PGW 2200 and the Voice gateway and make sure the IP addresses and the port matches with the Voice gateway.

   ```
   prov-add:ASSOCIATION:NAME="ass-gw1",DESC="",EXTNODE="gw1",
   SGP="",TYPE="IUA",IPADDR1="IP_Addr1",PORT=9000,PEERADDR1="10.48.84.75",PEERPORT=9000
   ```

4. Add the Signaling path for DPNSS and ensure that the correct MDO file for DPNSS is selected, and that the slot/port corresponds to the E1 slot/port on the Voice gateway.

   ```
   prov-add:DPNSSPATH:NAME="dpnss-path-1",DESC="",EXTNODE="gw1",
   MDO="DPNSS_BTNR188", SIGSLOT=1,SIGPORT=0
   ```

5. Define the Trunk Groups.

   Ensure that the type is `TDM_DPNSS`, that `svc` corresponds to the previously defined DPNSS path, and that `selseq` is compatible with the PABX side to avoid contention on the channel at call setup (PabxA / PabxB definitions have a mechanism to resolve this contention).

   ```
   prov-add:trnkgrp:name="61",type="TDM_DPNSS",svc="dpnss-path-1",
   selseq="DESC"
   ```

6. Bind a dial plan to the Trunk Group to:

   ```
   prov-ed:trnkgrpprop:name="61",custgrpid="0001"
   ```

7. Define the voice trunks that should match to the trunks defined on the Voice gateway, and to the voice trunks defined on the PABX.

   The easiest way is to import a file containing the trunk definitions. Here is the command to import the trunk definition file (the trunk definition file should be located at /opt/CiscoMGC/etc/cust_specific/directory1) :

   ```
   prov-add:files:name="bcfile",file="directory1/export_trunk.dat",
   action="IMPORT"
   ```

   This is an example of the trunk definition file:

   ```
   mgcusr@mgc-bru-1% cat /opt/CiscoMGC/etc/cust_specific/directory1/export_trunk.dat

   !--- This is the Trunk Group number that should match what
   !--- was defined in prov-add:trnkgrp.

   #format3 - 0.0

   !--- This is the raw trunk number.

   61 12 ffff 12 gw1 s1/ds1-0/12@v2650-4.cisco.com

   !--- This is the SPAN number. Always insert ffff.
   ```

```
61 13 ffff 13 gw1 s1/ds1-0/13@v2650-4.cisco.com

!--- This is the DS0/CIC number. This needs to match
!--- what is defined on the PABX side.
!--- If not, calls  fail or have mute audio.

61 14 ffff 14 gw1 s1/ds1-0/14@v2650-4.cisco.com

!--- This is the external note and it should match
!--- what is configured in prov-add:EXTNODE.

61 15 ffff 15 gw1 s1/ds1-0/15@v2650-4.cisco.com

!--- This is the endpoint name. It should match exactly
!--- with the endpoint names in the Voice gateway.

61 17 ffff 17 gw1 s1/ds1-0/17@v2650-4.cisco.com
61 18 ffff 18 gw1 s1/ds1-0/18@v2650-4.cisco.com
```

Use the **show mgcp endpoint** command to know the endpoint name syntax on the Voice gateway and possibly add the domain if **ip domain name** is configured.

Verify

There is currently no verification procedure available for this configuration.

Troubleshoot

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

Troubleshooting Commands

Certain **show** commands are supported by the Output Interpreter Tool (registered customers only) , which allows you to view an analysis of **show** command output.

Note: Before issuing **debug** commands, refer to Important Information on Debug Commands.

Use these commands to troubleshoot the SCTP/IUA link on the Voice gateway.

- **debug ip sctp init** Displays datagrams and other information related to the initializing of new SCTP associations.
- **debug iua asp sctp−sig all** Display debugging messages for the IDSN IUA application server process (ASP), displays information about the signals being sent by the SCTP layer, and enables debugging output for all configured ASPs.
- **debug iua asp peer−msg all** Display debugging messages for the IDSN IUA ASP, displays information about IUA peer−to−peer messages, and enables debugging output for all configured ASPs.
- **debug iua asp state all** Display debugging messages for the IDSN IUA ASP, displays information about ASP state transition, and enables debugging output for all configured ASPs.
- **debug iua AS user all** Displays debugging messages for the IDSN IUA AS, and enables debugging output for all configured ASes.
- **show iua asp all** − Displays information about the current condition of all ASPs.
- **show isdn status** − Displays the status of all ISDN interfaces or, optionally, a specific DSL or a specific ISDN PRI interface (created and configured as a serial interface).
- **show isdn service** − Displays the service status of all ISDN interfaces or, optionally, a specific DSL or a specific ISDN PRI interface (created and configured as a serial interface).

This is a successful link activation debug:

```
00115: May 7 09:42:21.854: SCTP: Process Init
000116: May 7 09:42:21.854: SCTP: INIT_CHUNK, len 30
000117: May 7 09:42:21.854: SCTP: Initiate Tag: 34493454, Initial TSN: 34493454, rwnd 1800
000118: May 7 09:42:21.854: SCTP: Streams Inbound: 128, Outbound: 128
000119: May 7 09:42:21.854: SCTP: Unknown param type 49152 (0xC000) of len 4
000120: May 7 09:42:21.854: SCTP: Supported addr types: 5
000121: May 7 09:42:21.854: SCTP: Assoc (new): Send InitAck
000122: May 7 09:42:21.858: SCTP: INIT_ACK_CHUNK, len 108
000123: May 7 09:42:21.858: SCTP: Initiate Tag: 9CBB4B2D, Initial TSN: 9CBB4B2D, rwnd 1800
000124: May 7 09:42:21.858: SCTP: Streams Inbound: 5, Outbound: 5
000125: May 7 09:42:21.858: SCTP: Responder cookie len 80
000126: May 7 09:42:21.858: SCTP: IP Addr: 10.48.84.75
000127: May 7 09:42:21.858: SCTP: Assoc (new): Process Cookie
000128: May 7 09:42:21.858: SCTP: COOKIE_ECHO_CHUNK, len 80
000129: May 7 09:42:21.898: SCTP: Assoc 0: Send CookieAck
000130: May 7 09:42:21.902: SCTP: COOKIE_ACK_CHUNK
000131: May 7 09:42:21.902: IUA: rcv SCTP IUA_ASSOC_UP for AS AS-BRU1
000132: May 7 09:42:21.902: IUA:Dest addresses match for
ASP ASP-BRU1 IUA: rcv sctp signal Association Up for ASP ASP-BRU1

000133: May 7 09:42:21.906: IUA :rcv DATA_PDU sig with invalid context 0 ,
trying assoc idIUA : recvd ASP_UP message on ASP ASP-BRU
IUA: ASP ASP-BRU1 rcv peer msg ASP-DOWN ,cur_state ASP-Down ,
New state ASP-Inactive

000134: May 7 09:42:25.864: IUA: sending ACK of type 0x4 to asp ASP-BRU1
000135: May 7 09:42:25.864: IUA: ASP ASP-BRU1 state change
ASP-Down --> ASP-InactiveIUA: recvd HEARTBEAT message for ASP ASP-BRU1

000136: May 7 09:42:25.864: IUA: sending ACK of type 0x6 to asp
ASP-BRU1 IUA: recvd ASP_ACTIVE message for ASP ASP-BRU1
IUA: ASP ASP-BRU1 rcv peer msg ASP-Active ,cur_state ASP-Inactive ,
New state ASP-Active

000137: May 7 09:42:25.884: IUA: sending ACK of type 0x3 to asp ASP-BRU1
000138: May 7 09:42:25.884: IUA: ASP ASP-BRU1 state change
ASP-Inactive --> ASP-ActiveIUA: recvd HEARTBEAT message for ASP ASP-BRU1

000139: May 7 09:42:29.875: IUA: sending ACK of type 0x6 to asp
ASP-BRU1 IUA: recvd HEARTBEAT message for ASP ASP-BRU1

000140: May 7 09:42:33.885: IUA: sending ACK of type 0x6 to asp
ASP-BRU1 IUA: recvd HEARTBEAT message for ASP ASP-BRU1

000141: May 7 09:42:37.892: IUA: sending ACK of type 0x6 to asp
ASP-BRU1 IUA: recvd HEARTBEAT message for ASP ASP-BRU1

000142: May 7 09:42:41.902: IUA: sending ACK of type 0x6 to asp ASP-BRU1
```

After the activation, the ASP and the AS are marked **active** on the Voice gateway.

```
v2650-4#show iua asp all

Name of ASP : ASP-BRU1
Current State of ASP: ASP-Active
Current state of underlying SCTP Association IUA_ASSOC_ESTAB, association id 0
SCTP Association information :
Local receive window : 18000
Remote receive window : 18000
Primary Dest address requested by IUA 10.48.84.62
Effective Primary Dest address 10.48.84.62
Remote address list : 10.48.84.62
Remote Port : 9000
```

```
Statistics :
Invalid SCTP signals Total : 0 Since last 0
SCTP Associate failures : 0
SCTP Send failures : 0

v2650-4#show iua as all

Name of AS : AS-BRU1
Total num of ASPs configured : 1
ASP-BRU1
Current state : ACTIVE
Active ASP : ASP-BRU1
Number of ASPs up : 1
Fail-Over time : 4000 milliseconds
Local address list : 10.48.84.75
Local port: 9000
Interface IDs registered with this AS
Interface ID
256 (Serial1/0:15)
```

Note: The interfaceID registered with the AS is the result of the **bind** command on the common channel interface. This is transported in the IUA part of the protocol stack.

Note: The number 265 is the transposition in decimal of the binary representation of the slot/port number on the Voice gateway. With a simplified rule, the interface identifier is equal to 265 x slot_number + port_number (this is equal to 265 in our case where slot=1 and port = 0).

The next step is the activation of Layer 2. DPNSS Layer 2 is very similar to Q.921. It can be monitored with **debug isdn q921**, although it is not exactly Q.921.

At activation time, an SABMR is sent on all the possible 63 channels (DLCI distinguishes between them).

```
ISDN Se1/0:15 Q921: PBXb RX <- SABMR dlci=13 cntl=SABMR nbit=0
```

The side that receives this message answers with UI if the channel status is ok.

```
ISDN Se1/0:15 Q921: PBXb RX <- UI(C) dlci=13 cntl=UI nbit=0
```

After the Layer 2 activation, status can be checked with the **show isdn status** and the **show isdn sevice** commands as seen here.

```
v2650-4#show isdn status serial 1/0:15
Global ISDN Switchtype = primary-5ess
ISDN Serial1/0:15 interface
dsl 0, interface ISDN Switchtype = primary-dpnss
L2 Protocol = Q.921 L3 Protocol(s) = IUA BACKHAUL
Layer 1 Status:
ACTIVE
Layer 2 Status:
Channel 1 : RESET COMPLETE,
Channel 2 : RESET COMPLETE,
Channel 3 : RESET COMPLETE,
Channel 4 : RESET COMPLETE,
Channel 5 : RESET COMPLETE,
Channel 6 : RESET COMPLETE,
Channel 7 : RESET COMPLETE,
Channel 8 : RESET COMPLETE,
Channel 9 : RESET COMPLETE,
Channel 10: RESET COMPLETE,
Channel 11: RESET COMPLETE,
Channel 12: INFORMATION TRANSFER,
Channel 13: INFORMATION TRANSFER,
```

```
Channel 14: INFORMATION TRANSFER,
Channel 15: INFORMATION TRANSFER,
Channel 17: INFORMATION TRANSFER,
Channel 18: INFORMATION TRANSFER,
Channel 19: RESET COMPLETE,
Channel 20: RESET COMPLETE,
Channel 21: RESET COMPLETE,
Channel 22: RESET COMPLETE,
Channel 23: RESET COMPLETE,
Channel 24: RESET COMPLETE,
Channel 25: RESET COMPLETE,
Channel 26: RESET COMPLETE,
Channel 27: RESET COMPLETE,
Channel 28: RESET COMPLETE,
Channel 29: RESET COMPLETE,
Channel 30: RESET COMPLETE,
Channel 31: RESET COMPLETE,
Channel 33: RESET COMPLETE,
Channel 34: RESET COMPLETE,
Channel 35: RESET COMPLETE,
Channel 36: RESET COMPLETE,
Channel 37: RESET COMPLETE,
Channel 38: RESET COMPLETE,
Channel 39: RESET COMPLETE,
Channel 40: RESET COMPLETE,
Channel 41: RESET COMPLETE,
Channel 42: RESET COMPLETE,
Channel 43: RESET COMPLETE,
Channel 44: RESET COMPLETE,
Channel 45: RESET COMPLETE,
Channel 46: RESET COMPLETE,
Channel 47: RESET COMPLETE,
Channel 49: RESET COMPLETE,
Channel 50: RESET COMPLETE,
Channel 51: RESET COMPLETE,
Channel 52: RESET COMPLETE,
Channel 53: RESET COMPLETE,
Channel 54: RESET COMPLETE,
Channel 55: RESET COMPLETE,
Channel 56: RESET COMPLETE,
Channel 57: RESET COMPLETE,
Channel 58: RESET COMPLETE,
Channel 59: RESET COMPLETE,
Channel 60: RESET COMPLETE,
Channel 61: RESET COMPLETE,
Channel 62: RESET COMPLETE,
Channel 63: RESET COMPLETE,
Total Allocated ISDN CCBs = 0
v2650-4#


v2650-4#show isdn service serial 1/0:15
PRI Channel Statistics:
ISDN Se1/0:15, Channel [1-31]
Configured Isdn Interface (dsl) 0
Channel State (0=Idle 1=Proposed 2=Busy 3=Reserved 4=Restart 5=Maint_Pend)
Channel : 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
State : 3 3 3 3 3 3 3 3 3 3 3 0 0 0 0 3 0 0 3 3 3 3 3 3 3 3 3 3 3 3 3
Service State (0=Inservice 1=Maint 2=Outofservice)
Channel : 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
State : 2 2 2 2 2 2 2 2 2 2 2 0 0 0 0 2 0 0 2 2 2 2 2 2 2 2 2 2 2 2 2
v2650-4#
```

Additional Troubleshooting Notes

- IUA and DPNSS are not currently supported in the Cisco snooper and ptc−mt.
- Ethereal supports IUA. However, in version 0.10.0, it is unable to interpret the DPNSS transported in the IUA frames.
- Given that the DPNSS has most of the service in ASCII, a plain packed dump can still show valuable information (although it can give rather long output).

  For example, with the UNIX **snoop** command:

```
#snoop −x 42 10.48.84.75

!−−− Where 10.48.84.75 is the IP address of the Voice gateway.


<snip>


mgc−bru−1 −> v2650−4.cisco.com IP D=10.48.84.75 S=10.48.84.62 LEN=92, ID=2226

0: f3ca 9ef7 0003 003c 3449 3732 0002 001b .......<4I72....
16: 0000 0001 0100 0b01 0000 002c 0001 0008 ...........,....
32: 0000 0101 0005 0008 0025 0000 000e 0011 .........%......
48: 092a 3123 2a35 302a 3438 3331 2300 0101 .*1#*50*4831#...
<snip>
```

  In the output, is is possible to identify a DPNSS ISRM message (hex 00) that is used to set up a voice call, followed by *50 (supplementay information for called/calling number) that introduces the called number, in this case 4831.

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Related Information

- **Configuration Examples for the PGW 2200**
- **Voice Technology Support**
- **Voice and Unified Communications Product Support**
- **Recommended Reading: Troubleshooting Cisco IP Telephony**
- **Technical Support − Cisco Systems**

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