



Avaya Solution & Interoperability Test Lab

Configuring Avaya Communication Manager With Cisco Gatekeepers and Cisco VoIP Gateways - Issue 1.0

Abstract

These Application Notes describe a configuration verified in a customer proof of concept request, and show how to configure Avaya Communication Manager, Cisco Directory gatekeeper, Cisco Gatekeeper and Gateway so that Avaya Communication Manager can communicate with these products. Configurations for T1 PRI, DTMF Relay and Caller ID are also provided in these Application Notes.

1. Introduction

An H.323 gatekeeper can provide address translation and network access control services for H.323 terminals and gateways.

In Office A of **Figure 1**, the Avaya S8500 Media Server and Avaya G650 Media Gateway provide both H.323 Gateway (GW) and Gatekeeper (GK) functionality. In Office B, the Cisco 3660 access router is configured to be an H.323 Gatekeeper, and the Cisco 3725 access router is an H.323 GW. The Cisco 3725 GW is registered with the Cisco 3660 GK, which provides E.164 to IP address resolution. The Cisco 3725 GW is connected to the Avaya S8300 Media Server with Avaya G700 Media Gateway via T1/PRI.

The Cisco 3725 Access Router in Office A is configured to be a Directory Gatekeeper (DGK). The main function of the Cisco DGK is to forward location request (LRQ) messages for the other GKs. The following shows the basic flow for a call from Office A to Office B:

- The C-LAN of the Avaya G650 Media Gateway sends LRQ to the Cisco 3725 DGK
- The 3725 DGK forwards the LRQ to the Cisco 3660 GK based on its dial plan.
- The Cisco 3660 GK responds with location confirm (LCF) to the C-LAN of the Avaya G650 Media Gateway.
- The C-LAN of the Avaya G650 Media Gateway will set up the call to the Cisco 3725 GW through H.225 (Q.931) signaling

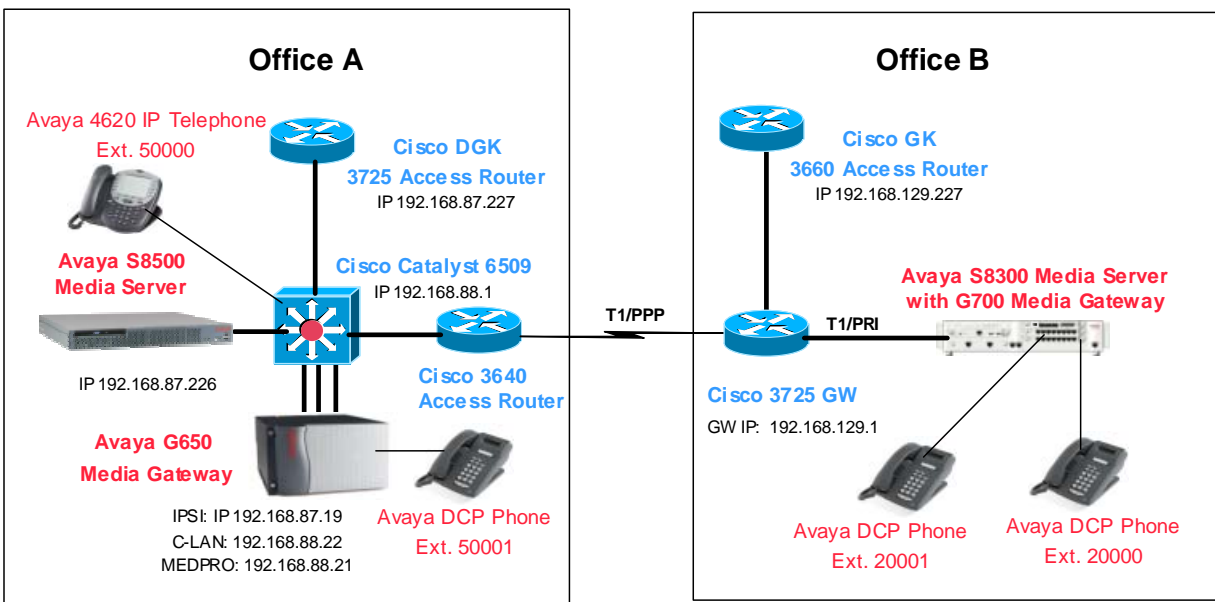


Figure 1: Network Diagram For Avaya Communication Manager With Cisco DGK, GK and GW

2. Equipment and Software Validated

The following equipment and software were used for the sample configuration provided:

Network Component	Software Version
Avaya Communication Manager S8500 Media Server S8300 Media Server	2.0.1 (221.1) 2.0.1 (221.1)
Avaya G650 Media Gateway IPSI C-LAN MEDPRO	FW009 FW011 FW072
Avaya G700 Media Gateway	21.22.0
Avaya 4620 IP Telephone	2.0.1
Cisco Directory Gatekeeper (Cisco 3725 MultiService Access Router)	12.3(8)T (IP/H323)
Cisco Gatekeeper (Cisco MultiService 3660 Access Router)	12.3(8)T (IP/H323)
Cisco Gateway (Cisco 3725 MultiService Access Router)	12.3(8)T (IP Voice)
Cisco Catalyst 6509	8.2.1
Cisco 3640 MultiService Access Router	12.2(24)

Table 1 - Network Component Software Versions

Note that the special Application SA8507 must be ordered for the Avaya S8500 Media Server to support out of band DTMF via H.245 with the Cisco GW.

3. Avaya Communication Manager Configuration

3.1. Configuring Avaya S8500 Media Server to control Avaya G650 Media Gateway

This section presents configuration steps for the Avaya S8500 Media Server and the Avaya G650 Media Gateway. It is assumed that appropriate license and authentication files have been installed on the S8500 Media Server. It is also assumed that the control network IP address on the S8500 Media Server has been configured to 192.168.87.226/24 and the IPSI IP address on the G650 GW has been configured to 192.168.87.19/24 by following standard procedures.

The Avaya Communication Manager SAT screens can be accessed using “telnet 192.11.13.6 5023” from a computer connected to the services port, or “telnet 192.168.87.226 5023” through the control network.

Use the command **change system-parameters ipserver-interface** to globally enable IPSI control. Set the Field **IPSI Control of Port Networks** to **enabled**.

```

change system-parameters ipserver-interface                               Page 1 of 1
                               IP SERVER INTERFACE (IPSI) SYSTEM PARAMETERS

SERVER INFORMATION

                               IPSI Host Name Prefix:
                               Primary Control Subnet Address: 192.168. 87. 0
                               Secondary Control Subnet Address: . . .

OPTIONS

                               Switch Identifier: A
                               IPSI Control of Port Networks: enabled

```

The following illustrates the mapping of node names to IP addresses. The node name CLAN is mapped to the C-LAN IP 192.168.88.22 and the node name MEDPRO to the MEDPRO IP 192.168.88.21. The node name GK-3725 is mapped to the Cisco 3725 DGK IP 192.168.87.227.

```

change node-names ip                                                  Page 1 of 1

                               IP NODE NAMES
Name                           IP Address                          Name                          IP Address
CLAN                          192.168.88 .22                               . . .
GK-3725                       192.168.87 .227                             . . .
MEDPRO                        192.168.88 .21                               . . .

```

Use the command **add cabinet X** (X is the cabinet number) to add a cabinet. **Cabinet Layout** must be configured to **G650-rack-mount-stack** for the Avaya G650 Media Gateway. Use the command **display cabinet X** to verify the configuration.

```

display cabinet 1

                               CABINET
CABINET DESCRIPTION
    Cabinet: 1
    Cabinet Layout: G650-rack-mount-stack
    Cabinet Type: expansion-portnetwork

    Location: 1

Rack:                          Room:                          Floor:                          Building:

CARRIER DESCRIPTION
Carrier      Carrier Type          Number
    E         not-used              PN 01
    D         not-used              PN 01
    C         not-used              PN 01
    B         not-used              PN 01
    A         G650-port          PN 01

```

Use the command **add ipserver-interface X** (X is the cabinet number) to add an IPSI. Type the IPSI IP address (192.168.87.19 in the example) in the **Host** field. The following displays the ipserver-interface configuration.

```
display ipserver-interface 1
      IP SERVER INTERFACE (IPSI) ADMINISTRATION - PORT NETWORK 1

IP Control? y                               Socket Encryption? y
                                           Enable QoS? n

Primary IPSI
-----
Location: 1A01
Host: 192.168.87.19
DHCP ID: ipsi-A01a
```

Use the command **add data-module** to enable the C-LAN. Set the **Type** field to **ethernet** and the **Port** field to the C-LAN circuit pack (from **list configuration all** in Section 7) with port 17. The following snapshot displays the C-LAN configuration.

```
display data-module 2000
                        DATA MODULE

Data Extension: 2000      Name: CLAN
      Type: ethernet
      Port: 01A0217
Link: 1

Network uses 1's for Broadcast Addresses? Y
```

Use the command **add ip-interface** to add and configure the C-LAN and the MEDPRO of the Avaya G650 Media Gateway. The following two screens display the configurations of the C-LAN (01A02) and the MEDPRO (01A03). The C-LAN and MEDPRO are assigned to Network Region 1.

```
display ip-interface 01A02
```

```
IP INTERFACES
```

```

Type: C-LAN                                ETHERNET OPTIONS
Slot: 01A02                                Auto? y
Code/Suffix: TN799 D
Node Name: CLAN
IP Address: 192.168.88 .22
Subnet Mask: 255.255.255.0
Gateway Address: 192.168.88 .1
Enable Ethernet Port? y
Network Region: 1
VLAN: n
```

```
Number of CLAN Sockets Before Warning: 400
```

```
display ip-interface 01A03
```

```
IP INTERFACES
```

```

Type: MEDPRO                                ETHERNET OPTIONS
Slot: 01A03                                Auto? y
Code/Suffix: TN2302
Node Name: MEDPRO
IP Address: 192.168.88 .21
Subnet Mask: 255.255.255.0
Gateway Address: 192.168.88 .1
Enable Ethernet Port? y
Network Region: 1
VLAN: n
```

The command **save translation** must be entered to save the administration performed.

3.2. Controlling Intra-office and Inter-Office VoIP Behavior on the Avaya S8500 Media Server

In this sample configuration, IP network region 1 is configured for Office A and IP network region 2 is used for Office B (see Section 4). By default, an Avaya IP Telephone registered to the C-LAN of the Avaya G650 Gateway will be assigned to the same network region as the C-LAN.

The command **change ip-network-map** can be used to change the default behavior and set the network region of the Avaya IP telephones based on their IP addresses. In order for an IP telephone to receive 802.1p/Q including priority and VLAN ID based on its mapped network region, the VLAN must be configured (not shown here). The following screen shows that the IP endpoints with IP 192.168.88.0/24 are configured to the network region 1.

```

change ip-network-map                                     Page 1 of 32
                IP ADDRESS MAPPING

From IP Address  (To IP Address  Subnet  Region  VLAN  Emergency
                  (To IP Address  or Mask)  Location
192.168.88 .0    192.168.88 .255    24     1      n      Extension

```

Use the command **change ip-network-region 1** to specify the IP Codec Set to be used for network region 1 and the IP Codec Set used between network region 1 and 2. Page 1 of 19 shows that Codec Set 1 is used for network region 1. **DIFFSERV/TOS PARAMETERS** and **802.1P/Q PARAMETERS** are used for QoS. The Avaya IP telephone will receive these QoS parameters upon registration.

```

change ip-network-region 1                               Page 1 of 19
                IP NETWORK REGION

Region: 1
Location:                Home Domain:
Name:

AUDIO PARAMETERS
Codec Set: 1
UDP Port Min: 16384
UDP Port Max: 32767
                Intra-region IP-IP Direct Audio: no
                Inter-region IP-IP Direct Audio: no
                IP Audio Hairpinning? n
                RTCP Reporting Enabled? y
                RTCP MONITOR SERVER PARAMETERS
                Use Default Server Parameters? y

DIFFSERV/TOS PARAMETERS
Call Control PHB Value: 34
Audio PHB Value: 46

802.1P/Q PARAMETERS
Call Control 802.1p Priority: 7
Audio 802.1p Priority: 6
                AUDIO RESOURCE RESERVATION PARAMETERS
                RSVP Enabled? n

H.323 IP ENDPOINTS
H.323 Link Bounce Recovery? y
Idle Traffic Interval (sec): 20
Keep-Alive Interval (sec): 5
Keep-Alive Count: 5

```

Page 3 of 19 shows that calls between network region 1 and 2 are allowed, up to the **WAN-BW-limit** 54 kbps, which can support 2 G729B calls with a 20ms packet size. Calls above the specified limit will not be permitted (i.e., may be re-routed to a different path). The bandwidth usage is based on the packet size and Codec selection. Avaya supports IP Call Admission Control via Bandwidth Limits (CAC-BL).

```

change ip-network-region 1 Page 3 of 19

Inter Network Region Connection Management

src dst
rgn rgn      codec-set  direct-WAN  WAN-BW-limits  Intervening-regions
1 1          1
1 2          2          y          54:Kbits
1 3

```

In order to get high voice quality in the LAN, Codec G.711MU is configured for network region 1 (Intra-office call). Codec G729B is configured for calls between network region 1 and 2 (Inter-office call) to save WAN bandwidth.

Use the command **change ip-codec-set** to configure IP Codec(s). The following screens show the Codec configuration. Several Codecs can be configured in one Codec set for Codec negotiation.

```

change ip-codec-set 1 Page 1 of 1

IP Codec Set

Codec Set: 1

Audio      Silence      Frames      Packet
Codec      Suppression  Per Pkt     Size(ms)
1: G.711MU      n           2           20
2:
...

```

```

change ip-codec-set 2 Page 1 of 1

IP Codec Set

Codec Set: 2

Audio      Silence      Frames      Packet
Codec      Suppression  Per Pkt     Size(ms)
1: G.729B      n           2           20
2:
...

```

3.3. Configuring Avaya S8500 Media Server to Communicate With the Cisco Gatekeeper and Cisco Gateway

In order to configure the Avaya S8500 Media Server as an H.323 Gatekeeper to send LRQ to the Cisco 3725 DGK, a signaling group for outbound traffic with **LRQ required** must be configured. Note that the C-LAN IP address of the Avaya G650 Media Gateway functions as an IP address for both H.323 GW and GK.

Use the command **add signaling-group X** (X is the signaling group number). The **Near-End Node Name** and **Far-end Node Name** are configured to the C-LAN and Cisco 3725 DGK, respectively. To configure the Avaya S8500 as a H.323 GK, **LRQ required** must be set to **y**. **Near-end Listen Port** and **Far-end Listen Port** must be configured to **1719** (UDP port 1719 for H.225 RAS). **Direct IP-IP Audio Connections** and **IP Audio Hairpinning** must be set to **n** for successful media paths. By disabling Direct IP-IP and IP Audio hairpinning, the RTP stream for a call between Office A (either digital phone or IP telephone) and Office B is between the MEDPRO on the Avaya G650 Media Gateway and the Cisco 3725 GW. To support out-of-band DTMF, **DTMF over IP** must be configured to **out-of-band**. To control Codec Set selection, **Far-end Network Region** is configured to 2. Note that this signaling group is configured to be associated with trunk group 1.

```
display signaling-group 1                                     Page 1 of 5
SIGNALING GROUP
Group Number: 1      Group Type: h.323
Remote Office? n    Max number of NCA TSC: 0
SBS? n              Max number of CA TSC: 0
Trunk Group for Channel Selection: 1
Supplementary Service Protocol: a
Near-end Node Name: CLAN      Far-end Node Name: GK-3725
Near-end Listen Port: 1719    Far-end Listen Port: 1719
LRQ Required? y      Far-end Network Region: 2
RRQ Required? n      Calls Share IP Signaling Connection? n
H245 Control Addr On FACility? n
Bypass If IP Threshold Exceeded? n
DTMF over IP: out-of-band    Direct IP-IP Audio Connections? n
IP Audio Hairpinning? n
Interworking Message: PROGRESS
```

Use the command **add trunk-group <group number>** to add an IP trunk group. Use the command **display trunk-group** to verify the configuration. The following screen shows the IP trunk group 1 configuration. As a standard IP trunk configuration, **Group Type** is configured to **isdn**, **Carrier Medium** to **IP** and **Service Type** to **tie**.

Note that **Codeset to Send Display** must be configured to **0** in order for the Cisco GW to accept the Q.931 Setup message from the Avaya Media Gateway.

```

display trunk-group 1                                     Page 1 of 22
                                     TRUNK GROUP
Group Number: 1                                         Group Type: isdn           CDR Reports: y
  Group Name: Cisco 3725 DGK                            COR: 1                     TN: 1          TAC: 101
  Direction: two-way                                    Outgoing Display? n       Carrier Medium: IP
  Dial Access? n                                        Busy Threshold: 255       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 National IEs: 6
  Max Message Size to Send: 260                       Charge Advice: none
  Supplementary Service Protocol: a                    Digit Handling (in/out):
enbloc/enbloc
                                     Trunk Hunt: cyclical
...

```

In order to support caller ID on the IP trunk (isdn type), configure **Send Name** and **Send Calling Number** to **y**. In the sample configuration, **Numbering Format** is configured to **unk-pvt**.

```

display trunk-group 1                                     Page 2 of 22
TRUNK FEATURES
  ACA Assignment? n                                     Measured: none           Wideband Support? n
                                     Internal Alert? n         Maintenance Tests? y
  Data Restriction? n                                  NCA-TSC Trunk Member:
  Send Name: y                                         Send Calling Number: y
  Used for DCS? n
  Suppress # Outpulsing? n                             Numbering Format: unk-pvt
Outgoing Channel ID Encoding: preferred                UUI IE Treatment: service-provider
                                     Replace Restricted Numbers? n
                                     Replace Unavailable Numbers? n
                                     Send Connected Number: y

```

IP trunk member port values are initially configured to “ip” in the **Port** field. The system will then assign a **Txxxxx** value to the port as shown below. Note the IP trunk members are virtual ports. In the following screen, four members associated with signaling group 1 are configured. This means that the IP trunk group only supports four VoIP calls. The fifth call will be blocked if there is no backup trunk available. If a PSTN trunk is configured as a backup trunk, the additional calls can be overflowed to the PSTN, or all calls can use the PSTN if the VoIP trunk is out of service.

```

display trunk-group 1                                     Page 6 of 22
TRUNK GROUP
Administered Members (min/max): 1/4
GROUP MEMBER ASSIGNMENTS                               Total Administered Members: 4

Port      Code Sfx Name      Night      Sig Grp
1: T00001
2: T00002
3: T00003
4: T00004
...

```

When a call is made from Avaya Communication Manager, the called number is routed (by appropriate routing, UDP, AAR/ARS, etc.) to the configured IP trunk group 1. The remote GK will decide to which GW IP address the Avaya Gateway should send the Setup message. Therefore, the outbound trunk members apply to all the remote Gateways using the Cisco 3725 DGK.

When Avaya Communication Manager receives a call setup from a Cisco GW, Avaya Communication Manager will try to match it to a signaling group based on the remote GW's IP address. The call will be denied if there is no match. To reduce the configuration required, the **Far-end-node** can be left unspecified, or an inbound signaling group can be configured for each GW from which Avaya Communication Manager should accept calls. The following screen shows the inbound signaling group configuration. Note that **Near-end Listen Port** must be 1720 to accept incoming calls (TCP port 1720 for H.225 call setup). Like the configuration for signaling group 1, **Direct IP-IP Audio Connections** and **IP Audio Hairpinning** are set to **n**, **DTMF over IP** is configured to **out-of-band**, and **Far-end Network Region** is set to 2.

```

change signaling-group 2                                 Page 1 of 5
SIGNALING GROUP

Group Number: 2          Group Type: h.323
Remote Office? n        Max number of NCA TSC: 0
SBS? n                 Max number of CA TSC: 0
Trunk Group for NCA TSC:

Trunk Group for Channel Selection: 2
Supplementary Service Protocol: a

Near-end Node Name: CLAN          Far-end Node Name:
Near-end Listen Port: 1720       Far-end Listen Port:
Far-end Network Region: 2
LRQ Required? n                Calls Share IP Signaling Connection? n
RRQ Required? n                H245 Control Addr On FACility? n
Bypass If IP Threshold Exceeded? n

DTMF over IP: out-of-band       Direct IP-IP Audio Connections? n
IP Audio Hairpinning? n
Interworking Message: PROGRESS

```

The following shows the configuration of an IP trunk group 2 for the incoming calls with 4 members.

```

display trunk-group 2                                     Page 1 of 22
                                     TRUNK GROUP

Group Number: 2                               Group Type: isdn           CDR Reports: y
  Group Name: cisco GW                         COR: 1                   TN: 1           TAC: 102
  Direction: two-way                          Outgoing Display? n      Carrier Medium: IP
  Dial Access? n                              Busy Threshold: 255      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 National IEs: 6
  Max Message Size to Send: 260             Charge Advice: none
  Supplementary Service Protocol: a         Digit Handling (in/out):
enbloc/enbloc
...

```

```

display trunk-group 2                                     Page 2 of 22
TRUNK FEATURES
  ACA Assignment? n                            Measured: none          Wideband Support? n
                                           Internal Alert? n       Maintenance Tests? y
                                           Data Restriction? n    NCA-TSC Trunk Member:
                                           Send Name: y           Send Calling Number: y

  Used for DCS? n
  Suppress # Outpulsing? n
  Outgoing Channel ID Encoding: preferred    UUI IE Treatment: service-provider

                                           Replace Restricted Numbers? n
                                           Replace Unavailable Numbers? n
                                           Send Connected Number: y
...

```

```

display trunk-group 2                                     Page 6 of 22
                                     TRUNK GROUP
Administered Members (min/max): 1/4
GROUP MEMBER ASSIGNMENTS                    Total Administered Members: 4

  Port      Code Sfx Name      Night      Sig Grp
  1: T00005
  2: T00006
  3: T00007
  4: T00008
...

```

3.4. Configuring Avaya Communication Manager For Out-Of-Band DTMF Relay via H245

Cisco GWs only support out-of-band DTMF via an H.245 message. Avaya Communication Manager supports DTMF relay via H245-signal and H245-alphanumeric from Cisco. The Avaya S8500 Media Server must be configured to send out-of-band DTMF via H.245. Use the command **display system-parameters special-applications** to verify that **H245 Support With Other Vendors** is set to **y**. In addition, **DTMF over IP** must be configured to **out-of-band** on the signaling groups (as illustrated in Section 3.3).

```
display system-parameters special-applications                               Page 4 of 4
                                SPECIAL APPLICATIONS

(SA8481) - Replace Calling Party Number with ASAI ANI? n
(SA8500) - Expanded UUI Display Information? n
(SA8506) - Altura Interoperability (FIPN)? n
(SA8507) - H245 Support With Other Vendors? y
(SA8508) - Multiple Emergency Access Codes? n
(SA8510) - NTT Mapping of ISDN Called-Party Subaddress IE? n
```

3.5. Configuring Dial Plan and Caller ID on the Avaya S8500 Media Server

In the sample configuration, Uniform Dialing Plan (UDP) and Automated Alternate Routing (AAR) are used for the call routing. The configuration in this section is for demonstration only.

Use the command **display system-parameters customer-options** to verify that **Uniform Dialing Plan** is set to **y**.

```
change system-parameters customer-options                               Page 5 of 10
                                OPTIONAL FEATURES

Posted Messages? n                               Tenant Partitioning? n
PNC Duplication? n                               Terminal Trans. Init. (TTI)? n
Port Network Support? y                         Time of Day Routing? n
                                                Uniform Dialing Plan? y
Processor and System MSP? n                     Usage Allocation Enhancements? y
Private Networking? y                           TN2501 VAL Maximum Capacity?
...

```

Use the command **change dialplan analysis** to configure dial plan. The dialed digits 2xxxx (“x” is any digit) is configured as **ext**. The digits 2xxxx match extensions on the Avaya S8300 Media Server.

```

change dialplan analysis                               Page 1 of 12
                                                    DIAL PLAN ANALYSIS TABLE
                                                    Percent Full: 1

Dialed Total Call      Dialed Total Call      Dialed Total Call
String Length Type     String Length Type     String Length Type
  1         3     dac      1         3     dac
  2         4     ext      2         4     ext
  2         5     ext      2         5     ext

```

Use the command **change aar analysis 2** (“2” is the first dialed digit) to configure the dialed digits 2xxxx to use **aar** and route pattern 5.

```

change aar analysis 2                               Page 1 of 2
                                                    AAR DIGIT ANALYSIS TABLE
                                                    Percent Full: 1

Dialed Total Route Call Node ANI
String Min Max Pattern Type Num Reqd
  2         5     5     aar      n
...

```

Use the command **change route-pattern 5** to use the trunk group 1 as a primary trunk group for the dialed digits 2xxxx. Since there are no digits deleted or inserted, all 5 digits will be used as the called number. **Numbering Format** is configured to **lev0-pvt** to support Caller ID in the sample configuration.

```

change route-pattern 5                               Page 1 of 3
Pattern Number: 5   Pattern Name:
                  Secure SIP? n

Grp FRL NPA Pfx Hop Toll No.  Inserted      DCS/ IXC
No   Mrk Lmt List Del Digits  Dgts      QSIG
                  Intw
1: 1   0
2:
3:
4:
5:
6:

BCC VALUE TSC CA-TSC ITC BCIE Service/Feature BAND No. Numbering LAR
0 1 2 3 4 W Request Dgts Format Subaddress
1: y y y y y n n rest lev0-pvt none
2: y y y y y n n rest none

```

In order to support caller ID for the private network, use the command **display system-parameters customer-options** to verify that **Private Networking** is set to **y**.

```

display system-parameters customer-options                               Page 5 of 10
                                OPTIONAL FEATURES

                                Posted Messages? n
                                PNC Duplication? n
                                Port Network Support? y
                                Processor and System MSP? n
                                Private Networking? y

                                Tenant Partitioning? n
                                Terminal Trans. Init. (TTI)? y
                                Time of Day Routing? n
                                Uniform Dialing Plan? y
                                Usage Allocation Enhancements? y
                                TN2501 VAL Maximum Capacity? n
...

```

Use the command **change private-numbering** to change private format for the calling number. The configuration below will use the phone extension as the calling number.

```

change private-numbering                                             Page 1 of 1

                                NUMBERING - PRIVATE FORMAT

                                Network Level: 0
                                Level 2 Code:
                                Level 1 Code:

                                PBX Identifier:
                                Deleted Digits: 0

```

4. Configuring Avaya S8300 Media Server for T1/PRI with the Cisco 3725 GW

As illustrated in **Figure 1**, T1/PRI is configured between the Cisco 3725 GW and Avaya S8300 Media Server with G700 Media Gateway. This section provides the T1/PRI configuration on the Avaya S8300 Media Server. It is assumed that the Avaya S8300 and G700 Media Gateway have been configured properly.

Use the command **list configuration all** on the Avaya S8300 Media Server to verify that the system has recognized the G700 Media Gateway and is displaying all of the boards currently in the Gateway including the MM710AP T1/E1 circuit pack.

```

list configuration all

                                SYSTEM CONFIGURATION

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

001V1          ICC MM               S8300    HW02 FW006
001V2          DS1 MM              MM710AP  HW04 FW008  01 02 u u u u u u
                                u u u u u u u u
                                u u u u u u u u 24
                                u u u u u u u u
001V3          DCP MM              MM712AP  HW03 FW005  01 02 03 u u u u u
...

```

Use the command **add ds1 <board>** (001v2 in the example) to configure the ds1 board. Use the command **display ds1 <board>** to verify the configuration. **Signaling Mode** must be configured to **isdn-pri** and **Connect** can be configured to **line-side** or **PBX**. **Bit Rate**, **Line Coding**, **Framing Mode** and ISDN switch type must match the configuration on the Cisco 3725 GW (Section 5.3.2). **Protocol Version "a"** refers to the primary 5ess switch type.

```

display ds1 01v2                                     Page 1 of 2
                                         DS1 CIRCUIT PACK

      Location: 001V2                               Name: PRI
      Bit Rate: 1.544                               Line Coding: b8zs
Line Compensation: 1                               Framing Mode: esf
      Signaling Mode: isdn-pri
      Connect: line-side
      TN-C7 Long Timers? n                          Country Protocol: 1
Interworking Message: PROGRESS                     Protocol Version: a
Interface Companding: mulaw                        CRC? n
      Idle Code: 11111111
                                         DCP/Analog Bearer Capability: 3.1kHz

      Slip Detection? n                             Near-end CSU Type: other
                                         Alarm When PRI Endpoint Detached? Y

```

Use the command **add signal-group X** (X is the group number) to add a signaling group for the T1/PRI. Use the command **display signaling-group** to verify the configuration. Note that **Group Type** must be configured to **isdn-pri** and **Primary D-Channel** must be configured to channel 24. This signaling group is associated with trunk group 30.

```

display signaling-group 30                           Page 1 of 5
                                         SIGNALING GROUP

Group Number: 30                                   Group Type: isdn-pri
      Associated Signaling? y                       Max number of NCA TSC: 0
      Primary D-Channel: 001V224                   Max number of CA TSC: 0
                                         Trunk Group for NCA TSC:
      Trunk Group for Channel Selection: 30
      Supplementary Service Protocol: a             Network Call Transfer? N

```

Use the command **add trunk-group** to add a trunk group associated with the T1/PRI signaling group. Use the command **display trunk-group** to verify the configuration. **Group Type** must be configured to **isdn**, **Service Type** to **tie**, and **Carrier Medium** to **PRI/BRI**.

```

display trunk-group 30                                     Page 1 of 22
                                     TRUNK GROUP

Group Number: 30                                         Group Type: isdn           CDR Reports: y
  Group Name: To Cisco G3725                             COR: 1                   TN: 1           TAC: 130
  Direction: two-way                                     Outgoing Display? n      Carrier Medium: PRI/BRI
  Dial Access? n                                         Busy Threshold: 255      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: 6                             Codeset to Send National IEs: 6
  Max Message Size to Send: 260                         Charge Advice: none
  Supplementary Service Protocol: a                     Digit Handling (in/out):
...

```

In order to support caller ID on the PRI trunk, configure **Send Name** and **Send Calling Number** to **y**. In the sample configuration, **Numbering Format** is configured to **unk-pvt**.

```

display trunk-group 30                                     Page 2 of 22
TRUNK FEATURES
  ACA Assignment? n                                     Measured: none           Wideband Support? n
                                     Internal Alert? n         Maintenance Tests? y
  Data Restriction? n                                   NCA-TSC Trunk Member:
  Send Name: y                                         Send Calling Number: y
  Used for DCS? n
  Suppress # Outpulsing? n                             Numbering Format: unk-pvt
Outgoing Channel ID Encoding: preferred                 UUI IE Treatment: service-provider
                                     Replace Restricted Numbers? n
                                     Replace Unavailable Numbers? n
                                     Send Connected Number: y
...

```

Two channels associated with signaling group 30 are configured on trunk group 30.

```

display trunk-group 30                                     Page 6 of 22
                                     TRUNK GROUP
                                     Administered Members (min/max): 1/2
GROUP MEMBER ASSIGNMENTS                               Total Administered Members: 2

  Port      Code Sfx Name      Night      Sig Grp
1: 001V201 MM710                30
2: 001V202 MM710                30
3:
...

```

Follow the same procedures in Section 3.5 to configure dial plan and Caller ID on the Avaya S8300 Media Server.

5. Cisco Configuration

5.1. Configuring Cisco 3725 Directory Gatekeeper

The following are the annotated Cisco 3725 DGK configuration. A GK becomes a DGK when LRQ forwarding is enabled on the GK. To enable a gatekeeper to forward location request (LRQ) messages, use the **lrq forward-queries** command in gatekeeper configuration mode. Note that **lrq forward-queries add-hop-count** must be configured on the Cisco 3725 DGK, to allow the Cisco 3725 DGK to forward the LRQ from the Avaya S8500 Media Server.

There are two remote zones configured on the Cisco 3725 DGK. Prefix “5*” (*: match to any numbers) is associated with the C-LAN of the Avaya G650 Media Gateway. Prefix “2*” is associated with the Cisco 3660 GK.

<pre>! interface FastEthernet0/0 ip address 192.168.87.227 255.255.255.0 speed auto full-duplex gatekeeper ! zone remote GK-3660 cisco.com 192.168.129.227 1719 ! ! zone remote G650 cisco.com 192.168.88.22 ! ! zone prefix GK-3660 2* ! ! zone prefix G650 5* ! ! lrq forward-queries add-hop-count no shutdown !</pre>	<p>Interface FastEthernet 0/0 configuration.</p> <p>Configure remote zone GK-3660 with IP address 192.168.129.227</p> <p>Configure remote zone ACM with C-LAN IP address 192.168.88.22</p> <p>Configure zone prefix 2* for remote zone GK-3660.</p> <p>Configure zone prefix 5* for remote zone G650.</p> <p>Enable lrq forward-queries with add-hop-count</p>
--	---

5.2. Configuring Cisco 3660 Gatekeeper

The following is the annotated Cisco 3660 GK configuration. There are two zones configured. Prefix “5*” is associated with the Cisco 3725 DGK. Prefix “2*” is associated with the Cisco 3725 GW.

<pre>interface FastEthernet0/0 ip address 192.168.129.227 255.255.255.0 duplex auto speed auto ! gatekeeper zone local GK-3660 cisco.com 192.168.129.227 ! ! ! zone remote DK-3725 cisco.com 192.168.87.227 ! ! zone prefix DK-3725 5* ! ! gw-type-prefix 2* gw ipaddr 192.168.129.1 no shutdown !</pre>	<p>Interface FastEthernet 0/0 configuration.</p> <p>Configure local zone GK-3660 with IP address 192.168.129.227.</p> <p>Configure remote zone DK-3725 with IP address 192.168.87.227</p> <p>Configure zone prefix for remote GK GK-3725</p> <p>Configure Cisco 3725 GW prefix to 2*.</p>
--	---

5.3. Configuring Cisco 3725 Gateway

5.3.1. Configuring Cisco 3725 GW to register to the Cisco 3660 GK

The following is the annotated Cisco 3725 GW configuration related to the H.225 RAS registration with the Cisco 3660 Gatekeeper. Note that the highlighted configuration including **h323-gateway voip interface** and **h323-gateway voip id** with the associated **ip address** must match the configuration on the Cisco 3660 GK.

<pre>interface FastEthernet0/1 ip address 192.168.129.1 255.255.255.0 duplex auto speed auto h323-gateway voip interface ! h323-gateway voip id GK-3660 ipaddr 192.168.129.227 1719 h323-gateway voip h323-id 3725-GW h323-gateway voip bind srcaddr 192.168.129.1 dial-peer cor custom ! gateway ...</pre>	<p>Source IP interface for the registration.</p> <p>Zone name "GK-3660" and GK IP address 192.168.129.227</p> <p>VoIP GW ID for the registration</p> <p>Source IP address for the call setup</p> <p>Enable gateway for the registration.</p>
--	--

5.3.2. Configuring T1/PRI and Dial Peers on the Cisco 3725 GW

The following are the annotated Cisco 3725 GW T1/PRI and dial peer configuration. The highlighted T1/PRI configuration on the Cisco 3725 GW must match the configuration on the Avaya S8300 Media Server in Section 4.

<pre> voice class codec 1 codec preference 1 g729br8 codec preference 2 g711ulaw ! voice class codec 2 codec preference 1 g711ulaw codec preference 2 g729br8 isdn switch-type primary-5ess ! controller T1 1/1 framing esf clock source line primary linecode b8zs pri-group timeslots 1-2,24 ! interface Serial1/1:23 no ip address isdn switch-type primary-5ess isdn incoming-voice voice isdn outgoing display-ie no cdp enable ! dial-peer voice 3 pots destination-pattern 2.... ! ! direct-inward-dial ! ! ! ! ! port 1/1:23 ! ! ! forward-digits all dial-peer voice 10 voip destination-pattern 5.... ! voice-class codec 2 ! ! session target ras ! dtmf-relay h245-alphanumeric ! ! </pre>	<p>Codec class configuration</p> <p>Global configuration for the ISDN Switch type</p> <p>T1/PRI Configuration. Use the line clock from the S8300 T1/PRI</p> <p>Configure incoming-voice to voice. Display ie for outgoing ISDN to the Avaya S8300 Media Server.</p> <p>Pots dial Peer For the call to the S8300 Media Server.</p> <p>The Cisco 3725 GW will use the digits in the Q.931 setup message from the S8300 Media Server to set up VoIP call instead of providing the second dial tone</p> <p>Use the T1/PRI D-channel for the matched destination pattern</p> <p>For the call to the S8300 Media Server, forward all the digits to the S8300</p> <p>When the GW receives the called digits 5xxxx, use the dial peer 10.</p> <p>Codec class 2 is used for Codec negotiation</p> <p>Use RAS for call routing.</p> <p>Send out of band DTMF via H245-alphanumeric</p>
---	--

6. Voice Call Flow Between Avaya Communication Manager and Cisco 3725 GW

Call flows from ext. 50000 (Avaya) to ext. 20000 (through Cisco 3725 GW to Avaya S8300/G700):

- User dials 20000, the Avaya S8500 Media Server will route the call with the signaling group 1 and trunk group 1 based on its dial plan.
- Based on the signaling group 1 configuration, the C-LAN of the Avaya G650 Media Gateway will send a LRQ message with the called number 20000 to the Cisco 3725 DGK.
- The DGK will forward the LRQ message to the Cisco 3660 GK based on its dial plan.
- The Cisco 3660 GK will respond with the LCF message to the C-LAN. The LCF message includes the 3725 GW IP address for call setup.
- The C-LAN of the Avaya G650 Media Gateway will set up a call with the Cisco 3725 GW. During the call setup, the Cisco 3725 GW will exchange the RAS messages with the Cisco 3660 GK, and call setup message with the Avaya S8300 Media Server/G700 Media Gateway on the T1/PRI trunk.

Call flows from ext. 20000 (from Avaya S8300/G700 to Cisco 3725 GW) to ext. 50000(Avaya):

- User dials 50000, the Avaya S8300 Media Server will route the call to the T1/PRI and send call setup message to the Cisco 3725 GW.
- The Cisco 3725 GW will map the called number 50000 to dial peer 10 and send RAS message to the Cisco 3660 GK.
- The Cisco 3660 GK will send an LRQ message to the Cisco 3725 DGK based on its dial plan.
- The Cisco 3725 DGK will forward the LRQ message to the C-LAN of the Avaya G650 Media Gateway based on its dial plan.
- The C-LAN of the Avaya G650 Media Gateway will respond with the LCF message to the Cisco 3660 GK.
- The Cisco 3725 GW will set up a call with the C-LAN of the Avaya G650 Media Gateway. During the call setup, the Cisco 3725 GW will exchange the RAS messages with the Cisco 3660 GK, and call connect message with the Avaya S8300 Media Server/G700 Media Gateway on the T1/PRI trunk

7. Verification Steps

The following are the verification steps:

- Use the commands **status port-network** to check the port network (or the G650 GW) status.

```
status port-network

                                PORT NETWORK STATUS

Major   Minor   Warning   Carrier   PN Control   FIBER-
PN Alarms Alarms Alarms   Locs      Active      Standby   LINK      Endpoints  Mode
1       0       0       3       01A      up
...
```

- If the port network is active, use the command **list configuration all** to verify that the system has recognized the IPSI board and is displaying all of the boards currently in the Gateway.

```
list configuration all

                                SYSTEM CONFIGURATION

Board   Board Type           Code      Vintage   Assigned Ports
Number                                     u=unassigned t=tti p=psa
01A00   POWER SUPPLY         655A
01A01   IP SERVER INTFC      TN2312BP HW03 FW009 01 02 03 04 05 06 07 08
01A02   CONTROL-LAN         TN799DP  HW01 FW011  u u u u u u u u
                                     u u u u u u u u
                                     17
01A03   IP MEDIA PROCESSOR   TN2302AP HW15 FW072 01 02 03 04 05 06 07 08
...
```

- Use the command **status station <extension>** to verify IP network region assignment and the selected Codec for an Avaya IP Telephone on an active call. The following screens show that the IP Telephone with Ext. 50000 is assigned to network region 1 and Codec G729B is used for the call across the WAN to the Ext. 20000 through the Cisco 3725 GW (IP 192.168.129.1).

```

status station 50000                                     Page 3 of 6

                                CALL CONTROL SIGNALING

Switch                               IP                               IP
Port                               Switch-end IP Addr:Port       Set-end IP Addr:Port
IP Signaling: 01A0217 192.168. 88. 22      :1720      192.168. 88.108:4066
H.245:
Node Name: CLAN
Network Region: 1                                     1

                                AUDIO CHANNEL

Switch                               IP                               IP
Port                               Other-end IP Addr :Port       Set-end IP Addr:Port
G.711MU Audio: 01A0303 192.168. 88. 21      :22432     192.168. 88.108:2592
Node Name: MEDPRO
Network Region: 1                                     1
Audio Connection Type: ip-tdm
Product ID and Release: IP_Phone 2. 0
H.245 Tunneler in Q.931? does not apply
Registration Status: registered-authenticated
MAC Address: 00:04:0d:4b:d8:5b Native NAT Address: not applicable

```

```

status station 50000                                     Page 5 of 6

                                CONNECTED PORTS

src port: S00000

MP      HP
ip-start: 192.168. 88.108:2592
ip-end: 192.168. 88. 21:22432      01A0303
audio: G.711MU encryption:none ss:off pkt:20ms

ip-start: 192.168. 88. 21:22436      01A0302
ip-end: 192.168.129. 1:17348
audio: G.729B encryption:none ss:off pkt:20ms

```

- Use the command **status ip-network-region** to check the status of CAC-BL. As seen, 27kbps is used for a call.

```

status ip-network-region 1

                                Inter Network Region Bandwidth Status

Times                                     #
Src Dst Conn Conn BW-limits BW-Used(Kbits) #-of-Connections BW-
Limit
Rgn Rgn Type Stat Tx Rx Tx Rx Hit
Today

1 2 direct pass 54 Kbits 27 27 1 1 0

```

- Use the command **show gatekeeper endpoints** on the Cisco 3660 GK to display the registered endpoints. The following screen shows that the Cisco 3725 GW is registered with the Cisco 3660 GK.

```
C3660-GK#show gatekeeper endpoints
                        GATEKEEPER ENDPOINT REGISTRATION
                        =====
CallSignalAddr  Port  RASSignalAddr  Port  Zone Name           Type      Flags
-----
192.168.129.1   1720  192.168.129.1  49541  GK-3660             VOIP-GW
      H323-ID: 3725-GW
      Voice Capacity Max.= Avail.= Current.= 0
Total number of active registrations = 1
```

- Use the command **show gateway** on the Cisco 3725 GW to verify the registration status.

```
C3725-GW#show gateway
H.323 ITU-T Version: 4.0   H323 Stack Version: 0.1

H.323 service is up
Gateway 3725-GW is registered to Gatekeeper GK-3660

Alias list (CLI configured)
H323-ID 3725-GW
Alias list (last RCF)
H323-ID 3725-GW

H323 resource thresholding is Disabled
```

- Verify that out of band DTMF can be passed between Office A and B.
- Verify that caller ID (calling name and number) can be displayed correctly.

8. Conclusion

As illustrated in these Application Notes, calls can be made between Avaya Communication Manager and Cisco GWs using Cisco GK and DGK. DTMF Relay and Caller ID also work well between Avaya Communication Manager and Cisco GWs.

9. Glossary

Technical Term	Definition as it pertains to this document
LAN	Local Area Network
WAN	Wide Area Network
IPSI	IP Server Interface
C-LAN	Control-LAN
MEDPRO	Media Processor
SAT	System Access Terminal
Codec	Coder/Decoder
RAS	Registration, Administration and Status
GK	Gatekeeper
DGK	Directory Gatekeeper
GW	Gateway
LRQ	Local Request
LCF	Location Confirm

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