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Application Notes for Configuring a H.323 IP Trunk between Avaya IP Office Release 4.0 and Avaya Communication Manager Release 4.0 – Issue 1.0

Abstract

These Application Notes describe how to configure a H.323 IP trunk between Avaya IP Office Release 4.0 and Avaya Communication Manager Release 4.0. The H.323 IP trunk was established between an Avaya IP Office 406V2 and an Avaya S8710 Media Server with Avaya G650 Media Gateway but is also applicable to other Avaya media servers and media gateways.

1. Introduction

These Application Notes describe how to configure a H.323 IP trunk between Avaya IP Office Release 4.0 and Avaya Communication Manager Release 4.0. The H.323 IP trunk was established between an Avaya IP Office 406V2 and an Avaya S8710 Media Server with Avaya G650 Media Gateway but is also applicable to other Avaya media servers and media gateways.

The network configuration diagram shown in **Figure 1** was used for these Application Notes. The Headquarters consists of an Avaya S8710Media Server with Avaya G650 Media Gateway. The Avaya IP Office 406V2 is located in Retail Store 1.

In general, the phrase "shuffling to direct media" refers to a process that can result in final media paths that flow directly between IP devices such as IP Telephones, thus allowing resources to be conserved on the Media Processor for Avaya Communication Manager or Voice Compression Modules for the Avaya IP Office. The configuration described in this document shows how to configure the systems to allow shuffling to occur.

In addition to verifying successful inter-site bi-directional calls, the following Avaya IP Office features were tested using the H.323 IP trunk:

- DTMF (Dual Tone Multi-Frequency)
- Hold/Unhold
- Transfer
- Conference
- Call Park
- Forwarding

The administration of the network infrastructure shown in **Figure 1** is not the focus of these Application Notes and will not be covered.
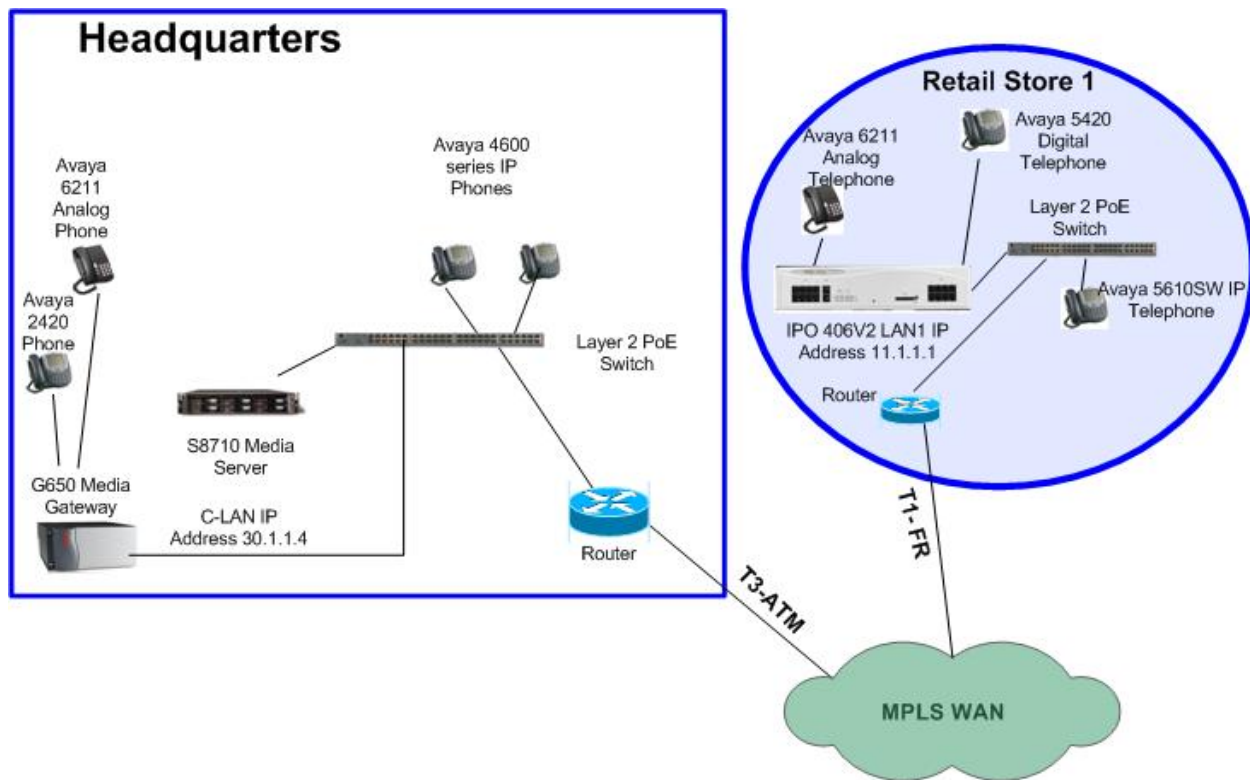
Figure 1: Avaya Communication Manager networked to Avaya IP Office

2. Equipment and Software Validated

Equipment	Software
Avaya S8300 Media Server	Avaya Communication Manager R4.0 (R014x.00.0.730.5)
Avaya G650 Media Gateway IPSI (TN2312BP) C-LAN(TN799DP) MEDPRO(TN2602AP)	HW12 FW 036 HW01 FW022 HW20 FW030
Avaya IP 406V2	4.0.5
Avaya 5610SW IP Telephone (H.323 firmware)	2.3
Avaya 4621SW IP Telephone (H.323 firmware)	2.7
Avaya 4622SW IP Telephone (H.323 firmware)	2.7
Avaya 5420 Digital Telephone	N/A
Avaya 6211 Analog Telephone	N/A
Avaya 2420 Digital Telephone	N/A

3. Configure Avaya Communication Manager

The screens in this section are accessed using Avaya Communication Manager System Access Terminal (SAT). Log in with the appropriate credentials.

1. *Verify H.323 license.* Use the **display system-parameters customer-options** command to verify that sufficient H.323 trunk capacity exists. On Page 2, verify that the number of H.323 trunks supported by the system is sufficient.

   The license file installed on the system controls the maximum permitted. If a required feature is not enabled or there is insufficient capacity, contact an authorized Avaya sales representative to make the appropriate changes.

```
display system-parameters customer-options            Page   2 of  11
                           OPTIONAL FEATURES
IP PORT CAPACITIES                                             USED
                    Maximum Administered H.323 Trunks: 200    83
           Maximum Concurrently Registered IP Stations: 50    36
              Maximum Administered Remote Office Trunks: 0     0
Maximum Concurrently Registered Remote Office Stations: 0     0
                Maximum Concurrently Registered IP eCons: 0     0
  Max Concur Registered Unauthenticated H.323 Stations: 0     0
                 Maximum Video Capable H.323 Stations: 0     0
                  Maximum Video Capable IP Softphones: 0     0
                     Maximum Administered SIP Trunks: 256    96
   Maximum Number of DS1 Boards with Echo Cancellation: 0     0
                         Maximum TN2501 VAL Boards: 10    1
                 Maximum Media Gateway VAL Sources: 10    0
         Maximum TN2602 Boards with 80 VoIP Channels: 128    1
        Maximum TN2602 Boards with 320 VoIP Channels: 128    0
 Maximum Number of Expanded Meet-me Conference Ports: 50    0
     (NOTE: You must logoff & login to effect the permission changes.)
```

2. *Add the IP Address information for Avaya IP Office.* Use the **change node-names ip** command to assign the node name and IP address for the Avaya IP Office at the Retail Site 1. Enter a unique name in the **Name** field and enter the Avaya IP Office LAN1 IP Address in the **IP Address** field.

```
change node-names ip                                    Page   1 of   2
                              IP NODE NAMES
    Name                IP Address
C-LAN                30.1.1.4
G700-HQ1             40.1.1.1
HQ-VAL               30.1.1.31
MediaResource        30.1.1.32
Medpro               30.1.1.5
RS1-IPO              11.1.1.1
RS2-G350             22.1.1.22
RS3-S8500            30.1.1.30
RS4-IPSO             44.1.1.1
abacus               30.1.1.182
default              0.0.0.0
exchange-mas         30.1.1.19
hq-ses               30.1.1.25
procr                30.1.1.1
( 14 of 14   administered node-names were displayed )
Use 'list node-names' command to see all the administered node-names
Use 'change node-names ip xxx' to change a node-name 'xxx' or add a
node-name
```

3. *Create the codec set that will be used for calls between Avaya Communication Manager and Avaya IP Office.* Use the **change ip-codec-set n** command, where **n** is an available number, to enter the supported audio codecs for calls routed to and from Avaya IP Office. Multiple codec can be entered in order of priority.

```
change ip-codec-set 1                                   Page   1 of   2
                         IP Codec Set
    Codec Set: 1
    Audio        Silence       Frames    Packet
    Codec        Suppression   Per Pkt   Size(ms)
 1: G.711MU          n            2         20
 2: G.729a           n            2         20
 3:
 4:
 5:
 6:
 7:

     Media Encryption
 1: none
 2:
 3:
```

4. *Configure the VoIP parameters for calls between Avaya Communication Manager and Avaya IP Office.* Use the **change ip-network-region n** command, where **n** is the number of the region to be changed, to define the connectivity settings for all VoIP resources and IP endpoints within the region.

   Set the **Inter-region IP-IP Direct Audio** field to **yes** and the **IP Audio Hairpinning** field to **y** to enable IP shuffling. Set the **Codec Set** field to the one created in **Step 3**. Set the **Call Control PHB Value** to the **SIG DSCP** value on IP Office and set the **Audio PHB Value** to the **DSCP** value on IP Office (see **Step 1** in **Section 4**). The default values for the other fields may be used.

```
change ip-network-region 1                              Page   1 of  19
                            IP NETWORK REGION
  Region: 1
Location: 1       Authoritative Domain: retail.com
    Name: Retail HQ
MEDIA PARAMETERS                    Intra-region IP-IP Direct Audio: no
      Codec Set: 1                  Inter-region IP-IP Direct Audio: yes
   UDP Port Min: 5000                           IP Audio Hairpinning? y
   UDP Port Max: 5999
DIFFSERV/TOS PARAMETERS                        RTCP Reporting Enabled? y
 Call Control PHB Value: 34      RTCP MONITOR SERVER PARAMETERS
       Audio PHB Value: 46        Use Default Server Parameters? y
       Video PHB Value: 26
802.1P/Q PARAMETERS
 Call Control 802.1p Priority: 6
       Audio 802.1p Priority: 6
       Video 802.1p Priority: 5     AUDIO RESOURCE RESERVATION
PARAMETERS
H.323 IP ENDPOINTS                                 RSVP Enabled? n
  H.323 Link Bounce Recovery? y
 Idle Traffic Interval (sec): 20
   Keep-Alive Interval (sec): 5
           Keep-Alive Count: 5
```

5. *Set up a signaling group for calls between Avaya Communication Manager and Avaya IP Office.* Use the **add signaling group n** command, where **n** is the number of an unused signaling group. Set the **Group Type** field to **h.323**. Specify the C-LAN (node name **C-LAN**) and the Avaya IP Office (node name **RS1-IPO**) as the two ends of the signaling group in the **Near-end Node Name** and the **Far-end Node Name** fields, respectively. These field values are from the **IP Node Names** form shown in **Step 2**. In the **Far-end Network Region** field, enter the IP network region value assigned in the **IP Network Region** form in **Step 3**. Set the **Direct IP-IP Audio Connections** and **IP Audio Hairpinning** field to **y**. Set the **Trunk Group for Channel Section** to the Trunk Group number created in **Step 6**. The default values for the other fields may be used.

```
add signaling-group 11                              Page   1 of   1
                              SIGNALING GROUP
Group Number: 11               Group Type: h.323
                 Remote Office? n        Max number of NCA TSC:
                             SBS? n         Max number of CA TSC:
        IP Video? n                     Trunk Group for NCA TSC:
Trunk Group for Channel Selection: 11
TSC Supplementary Service Protocol: b         Network Call Transfer? n
                     T303 Timer(sec): 10
 Near-end Node Name: C-LAN                    Far-end Node Name: RS1-IPO
 Near-end Listen Port: 1720                   Far-end Listen Port: 1720
                                          Far-end Network Region: 1
LRQ Required? n                 Calls Share IP Signaling Connection? n
RRQ Required? n  Media Encryption? n
                                   Bypass If IP Threshold Exceeded? n
                                   H.235 Annex H Required? n
 DTMF over IP: out-of-band       Direct IP-IP Audio Connections? y
 Link Loss Delay Timer(sec): 90            IP Audio Hairpinning? y
 Enable Layer 3 Test? y          Interworking Message: PROGress
                                 DCP/Analog Bearer Capability: 3.1kHz
```

6. *Set up a trunk group for calls between Avaya Communication Manager and Avaya IP Office.* Use the **add trunk-group n** command, where **n** is the number of an unused trunk group. Enter a descriptive name in the **Group Name** field. Specify an available trunk access code (**TAC**) that is consistent with the existing dial plan. Set the **Carrier Medium** field to H.323. Set the **Group Type** field to **isdn**. The default values for the other fields may be used.

```
add trunk-group 11                                  Page   1 of   21
                              TRUNK GROUP
Group Number: 11               Group Type: isdn         CDR Reports: y
Group Name: To Retail-S1         COR: 1       TN: 1          TAC: 101
Direction: two-way       Outgoing Display? n   Carrier Medium: H.323
 Dial Access? y              Busy Threshold: 255  Night Service:
Queue Length: 0
Service Type: tie                    Auth Code? n
                                     Member Assignment Method: manual
```

7. Proceed to **Page 3** of the TRUNK GROUP Form. Set the **Send Name** and **Send Calling Number** fields to **y**. The default values for the other fields may be used.

```
add trunk-group 11                                    Page   3 of  21
TRUNK FEATURES
         ACA Assignment? n              Measured: none
                           Internal Alert? n       Maintenance Tests? y
                           Data Restriction? n   NCA-TSC Trunk Member: 1
                              Send Name: y      Send Calling Number: y
 Used for DCS? n                Hop Dgt? n     Send EMU Visitor CPN? y
  Suppress # Outpulsing? n    Format: unknown
                              UUI IE Treatment: service-provider
                              Replace Restricted Numbers? n
                              Replace Unavailable Numbers? n
                              Send Called/Busy/Connected Number: n
                              Hold/Unhold Notifications? y
         Send UUI IE? y          Modify Tandem Calling Number? n
         Send UCID? n
         Send Codeset 6/7 LAI IE? y
```

8. Proceed to **Page 5** of the TRUNK GROUP Form. Enter **IP** in the Port field for each member. This assigns each group member to Signaling Group 11. Avaya Communication Manager will replace the initial value of "**IP**" for the *Port* field with a unique port (e.g., **T00001**). Enter a descriptive name in the **Name** field.

*Note: The number of trunk group members should match the number of channels defined on the Avaya IP Office in **Step 2** of **Section 4**.*

```
add trunk-group 11                                    Page   5 of  21
                         TRUNK GROUP
              Administered Members (min/max):   1/10
GROUP MEMBER ASSIGNMENTS          Total Administered Members:  10
     Port              Name          Night           Sig Grp
 1: IP              trkttoip1                        11
 2: IP              trkttoip2                        11
 3:
 4:
 5:
 6:
 7:
 8:
 9:
10:
11:
12:
13:
14:
15:
```

9. *Create a dialplan entry for Avaya IP Office extension numbers*. Use the **change dialplan analysis** command, to add a dialplan entry for the Avaya IP Office extension numbers (in this example, the extension numbers are five digits beginning with "5"). In the **Dialed String** field, add a unique set of digits that can be used for the Avaya IP Office extension numbers. In the **Total Length** field, put in the total number of dialed digits. Use **aar** in the **Call Type** field.

```
change dialplan analysis                                       Page   1 of  12
                          DIAL PLAN ANALYSIS TABLE
                                         Percent Full:    2
  Dialed    Total  Call      Dialed    Total  Call     Dialed    Total  Call
  String   Length Type      String   Length Type      String   Length Type
    45         4   ext        5         5   aar
```

10. *Create a uniform dialplan entry for Avaya IP Office extension numbers*. Use the **change uniform-dialplan n** command, where **n** is the **Dialed String** added in **Step 9**, for the Avaya IP Office extension numbers. In the **Matching Pattern** field, use the **Dialed String** value from **Step 9**. In the **Len** field, put in the total number of dialed digits. Enter **0** for **Del** and use **aar** in the **Net** field. Use default values for all other fields.

```
change uniform-dialplan 5                                      Page   1 of   2
                       UNIFORM DIAL PLAN TABLE
                             Percent Full: 0


  Matching                     Insert                Node
  Pattern          Len Del     Digits      Net Conv Num
  5                  5   0                  aar  n
```

11. *Create an Automatic Alternate Route entry for Avaya IP Office extension numbers*. Use the **change aar analysis** command, to add an entry for the Avaya IP Office extension numbers. In the **Dialed String** field enter the same value that was entered in the **Dialed String** field in **Step 9**. In the **Total Length** field, put in the total number of dialed digits for both **Min** and **Max**, make sure to include any prefixes. Use **aar** in the **Call Type** field. The default values for the other fields may be used. In the **Route Pattern** field, enter the route pattern number added in **Step 12**.

```
change aar analysis 50                                         Page   1 of   2
                          AAR DIGIT ANALYSIS TABLE
                                                 Percent
Full:     2
  Dialed     Total       Route      Call   Node  ANI
  String     Min  Max   Pattern     Type   Num   Reqd
    50        5    5      11         aar          n
```

12. *Create a route pattern that will use the trunk from Avaya Communication Manager to Avaya IP Office*. Use the **change route-pattern *n*** command, where **n** is the number of the route pattern specified in **Step 11**. Enter a descriptive name for the **Pattern Name** field. Set the **Grp No** field to the trunk group number created in **Step 6**. Set the Facility Restriction Level (**FRL**) field to a level that allows access to this trunk for all users that require it. The value of **0** is the least restrictive level.   Use default values for all other fields.

```
add route-pattern 11                                   Page   1 of   3
                     Pattern Number: 12  Pattern Name: RS1-IPO
                           SCCAN? n      Secure SIP? n
    Grp FRL NPA Pfx Hop Toll No.  Inserted             DCS/ IXC
    No           Mrk Lmt List Del                      QSIG
                             Dgts                       Intw
 1: 11   0                                              n    user
 2:                                                     n    user
 3:                                                     n    user
 4:                                                     n    user
 5:                                                     n    user
 6:                                                     n    user
BCC VALUE  TSC CA-TSC   ITC BCIE Service/Feature PARM  No. Numbering LAR
    0 1 2 M 4 W    Request                        Dgts Format
                                                 Subaddress
 1: y y y y y n  n            rest                       none
 2: y y y y y n  n            rest                       none
 3: y y y y y n  n            rest                       none
 4: y y y y y n  n            rest                       none
 5: y y y y y n  n            rest                       none
 6: y y y y y n  n            rest                       none
```

4. Configure the Avaya IP Office

IP Office is configured via the IP Office Manager program. Log into the IP Office Manager PC and select **Start → Programs → IP Office → Manager** to launch the Manager application. Log into the Manager application using the appropriate credentials.

1. *Note the Diffserv settings.* Select **System** in the left panel. Double-click on the entry in the right panel.

   Select the **LAN1** tab. Within that tab, select the **Gatekeeper** tab and note the **DSCP** and **SIG DSCP** values. These are used in **Step 4** of **Section 3**.

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2. *Create the IP line for Avaya Communication Manager.* Select **Line** in the left panel. Right-click and select **New → IP Line**.

   Enter a unique number in the **Incoming Group ID** and **Outgoing Group ID** fields. Use default values for all other fields.

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3. *Configure VoIP parameters for the line.* Select the **VoIP Settings** tab.

   Enter the Avaya Communication Manager C-LAN IP Address in the **Gateway IP Address** field. Check the **Enable Faststart** and **Allow Direct Media Path** boxes. Use default values for all other fields. Click the **OK** button.

4. *Create a short code to route calls to Avaya Communication Manager.* Select **Short Code** in the left panel. Right-click and select **New**.

   Enter a unique code for the **Code** field. Select **Dial** for the **Feature** field. Enter the Outgoing Group ID created in **Step 2** for the **Line Group Id** field. Use default values for all other fields. Click the **OK** button.

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5. Verification and Troubleshooting

- Place a call from an extension on the Avaya IP Office to an extension on Avaya Communication Manger. Answer the call and verify talkpath.
- Repeat previous case in the opposite direction.
- Verify that shuffling is happening on an IP-IP call. This can be done through H.323 trace.
- Verify that calls can be transferred from an extension on Avaya IP Office to an extension on Avaya Communication Manager.
- Verify that extensions on Avaya IP Office can conference in extensions on Avaya Communication Manager.
- Verify that a call can be forwarded from Avaya IP Office to an extension on Avaya Communication Manager.
- Verify that a call from Avaya Communication Manager to Avaya IP Office can be answered, parked and retrieved at Avaya IP Office.
- Verify out-of-band DTMF

5.1. Avaya Communication Manager Troubleshooting

Using the SAT, enter the **list trace tac n**, where n is the TAC used for the Trunk Group created in **Step 6** of **Section 3**. This will show call information. Below is an example of a call from Avaya Communication Manager to Avaya IP Office.

```
list trace tac 105                                                Page   1
                            LIST TRACE
time          data
16:42:26      dial 50016 route:UDP|AAR
16:42:26      term trunk-group 5     cid 0x39
16:42:26      dial 50016 route:UDP|AAR
16:42:26      route-pattern  55 preference 1  cid 0x39
16:42:26      seize trunk-group 5 member 4  cid 0x39
16:42:26      Calling Number & Name 28000 EXT 28000
16:42:26      Proceed trunk-group 5 member 4  cid 0x39
16:42:26      Alert trunk-group 5 member 4  cid 0x39
16:42:27      active trunk-group 5 member 4  cid 0x39
16:42:27      G711MU ss:off ps:20 rn:1/1 11.1.1.1:49154 30.1.1.5:5448
16:42:27      xoip: fax:Relay modem:off tty:US 30.1.1.5:5448 uid:0x5007a
              VOIP data from: 30.1.1.5:5448
16:42:38      Jitter:0 0 0 0 0 0 0 0 0 0: Buff:8 WC:5 Avg:0
16:42:38      Pkloss:0 0 0 0 0 0 0 0 0 0: Oofo:0 WC:0 Avg:0
```

5.2. Avaya IP Office Troubleshooting

IP Office can be debugged with the System Status Application. Log into the IP Office Administration PC and select **Start → Programs → IP Office → System Status** to launch the application. Log into the application using the appropriate credentials.

In the left panel, double-click on the **Trunks** entry and select the H.323 trunk created in **Step 2** of **Section 4**. Click the **Trace All** button (Not Shown). The messages on the line are displayed.

6. Conclusion

These Application Notes describe how to configure an H.323 IP trunk for calls between Avaya IP Office and Avaya Communication Manager. Interoperability testing included verification of successful bi-directional calls among several types of endpoints with various features including transfer, conference and out-of-band DTMF verification. Calls using the IP Trunk can utilize "shuffling" of the media paths to direct media.

7. Additional References

1. Feature Description and Implementation for Avaya Communication Manager, Issue 4.0, Feb 2007, Document Number 555-245-205 can be found at:
   http://support.avaya.com

2. IP Office documentation can be found at:
   http://marketingtools.avaya.com/knowledgebase/