Abstract

These Application Notes present a sample configuration for a network comprised of an Avaya S8300 Server, Avaya G450 Media Gateway, and a Nortel Communication Server 1000. The focus is on the Avaya Aura™ Communication Manager configuration for the H.323 signaling groups, IP trunk groups, and IP codec sets, and the corresponding Nortel CS1000 configuration of IP Peer Networking and Virtual Trunks. Using this configuration, Nortel digital telephones, Nortel IP Telephones, and Nortel IP Software Phones can call (and be called by) Avaya digital telephones, Avaya IP Telephones, and Avaya IP Softphones. Screens that describe the detailed status and communication paths of active calls are presented to reinforce the understanding of the configuration. These results should be applicable to other Avaya servers and gateways.
1 Introduction

These Application Notes present a sample configuration for a network comprised of an Avaya S8300 Server, Avaya G450 Media Gateway, and a Nortel Communication Server 1000. The focus is on the Avaya Aura™ Communication Manager configuration for the H.323 signaling groups, IP trunk groups, and IP codec sets, and the corresponding Nortel CS1000 configuration of IP Peer Networking and Virtual Trunks. Using this configuration, Nortel digital telephones, Nortel IP Telephones, and Nortel IP Software Phones can call (and be called by) Avaya digital telephones, Avaya IP Telephones, and Avaya IP Softphones. Screens that describe the detailed status and communication paths of active calls are presented to reinforce the understanding of the configuration. These results should be applicable to other Avaya servers and gateways.

Figure 1 depicts the network used to verify these Application Notes.

![Figure 1: Network Overview](image)

A five digit Uniform Dial Plan (UDP) is used to facilitate inter-system dialing. Unique ranges of extensions are associated with the Nortel CS1000 (53xxx) and the Avaya S8300 Server (24xxx). The Avaya S8300 Server will route 53xxx extensions to the Nortel CS1000 over an H.323 signaling group and IP trunk group, whose configuration is fully described. The Nortel CS1000
will in turn route 24xxx numbers to the Avaya S8300 Server. The Nortel CS1000 configuration is presented, inclusive of the Coordinated Dial Plan (CDP) feature that is similar to the Avaya UDP feature. The Avaya UDP configuration steps are not described, since there is no new routing consideration introduced by the presence of the Nortel CS1000 in the network. All servers are configured to pass 5 digit extensions over the IP Trunks (i.e., five digits are included in the Called Party Number Information Element in the Q.931 SETUP message).

2 Equipment and Software Validated

The following equipment and software were used for this sample configuration.

<table>
<thead>
<tr>
<th>Network Component</th>
<th>Version Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avaya S8300 Server running Communication Manager</td>
<td>5.2, Load 947.3 + update 17250, with SA8507 turned on</td>
</tr>
<tr>
<td>Avaya G450 Media Gateway</td>
<td>Firmware 29.22.3 Hardware Vintage 1</td>
</tr>
<tr>
<td>Avaya 9630 One-X Deskphone Edition</td>
<td>3.0</td>
</tr>
<tr>
<td>Avaya IP Softphone</td>
<td>R6.0 SP6</td>
</tr>
<tr>
<td>Nortel CS1000 Signaling Server</td>
<td>SSE 4.50.88</td>
</tr>
<tr>
<td>Nortel CS1000 Call Server (NTDK20HA)</td>
<td>Release 450w, Version 2121</td>
</tr>
<tr>
<td>Nortel CS1000 Voice Gateway Media Card (Single Slot 24 port NTV001BA card)</td>
<td>Firmware Release 6.7</td>
</tr>
<tr>
<td>Nortel i2004 IP Telephone (Registered to CS1000)</td>
<td>0602B76</td>
</tr>
<tr>
<td>Nortel i2050 Software Phone (Registered to CS1000)</td>
<td>1.4.0 Build 346</td>
</tr>
</tbody>
</table>

Table 1 – Equipment Version Information

3 Conventions

Native Communication Manager interfaces have been used to describe the configuration. Graphical and wizard interfaces are also available as an alternative. For example, additional information on the Avaya Installation Wizard and other wizards can be found at http://support.avaya.com/avayaiw/.

In these Application Notes, Communication Manager administration screens are shown with a gray shaded background. These administration screens are also referred to as “SAT” (System Access Terminal) screens in this document. In many instances, the original screens have been edited for brevity in presentation. Commands and fields requiring user input or special attention are highlighted in bold. Nortel CS1000 command line interface (CLI) screen captures are presented without background shading.

It is assumed that the appropriate license files have been installed on all products, and that login and password credentials for all products are available to the reader.
4 Configuring Communication Manager on the Avaya S8300 Server

This section presents configuration steps for the Avaya S8300 Server. Before proceeding, use the command “display system-parameters special-applications” and page forward to Page 4 to verify that Special Application SA8507 is enabled. If SA8507 is not enabled, contact an authorized Avaya sales representative.

| display system-parameters special-applications |
|------------------|------------------|------------------|------------------|------------------|
| SPECIAL APPLICATIONS                      | Page 4 of 9     |
| (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 |               |
| (SA8517) - Authorization Code By COR? n |               |
| (SA8520) - Hoteling Application for IP Terminals? n |               |
| (SA8558) - Increase Automatic MNI & VuStats (S8700 only)? n |               |
| (SA8567) - PHS X-Station Mobility over IP? n |               |
| (SA8569) - No Service Observing Tone Heard by Agent? n |               |
| (SA8573) - Call xfer via ASAI on CAS Main? n |               |
| (SA8582) - PSA Location and Display Enhancements? n |               |
| (SA8587) - Networked PSA via QSIG Diversion? n |               |
| (SA8589) - Background BSR Polling? n |               |
| (SA8608) - Increase Crisis Alert Buttons (S8700 only)? n |               |
| (SA8621) - SCH Feature Enhancements? n |               |

Section 4.1 shows aspects of the configuration that are not unique to configurations involving Nortel CS1000. The standard configuration of the G450 Media Gateway and S8300 Server are omitted; product documentation and other available Application Notes cover these procedures. There are no special G450 Media Gateway considerations due to the presence of the Nortel CS1000 in this configuration. A reader experienced with the Avaya S8300 Server may wish to skip forward to Section 4.2, which illustrates the parameters used in the administration of the H.323 signaling group, IP trunk group, and IP codec sets used to connect with Nortel CS1000.

4.1 Common Communication Manager VoIP Concepts

The list ip-interface all command illustrates the IP configuration of the S8300 Server. The IP address and gateway address of the “PROCR” interface are configured using the S8300 Server Web utilities. The “PROCR” interface will be used as the near-end of the H.323 signaling group to the Nortel CS1000. Avaya IP Telephones also register for service with this interface.
The **display media-gateway 1** screen shown below illustrates aspects of the G450 Media Gateway configuration in Figure 1. The **Controller IP Address** field and **MGP IP Address** field are display only fields that are not assigned via the SAT. The **Controller IP Address** field will contain the address of the Avaya S8300 Server. The **MGP IP Address** field will contain the address of the G450 Media Gateway processor, after it has registered with the Avaya S8300 Server as its controller. Note the use of Network Region 1 for the Avaya devices.

<table>
<thead>
<tr>
<th>display media-gateway 1</th>
<th>MEDIA GATEWAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number: 1</td>
<td>Registered: y</td>
</tr>
<tr>
<td>Type: g450</td>
<td>FW Version/HW Vintage: 29.22.3 /1</td>
</tr>
<tr>
<td>Name: G450-NT-test</td>
<td>MGP IP Address: 192.45.100.47</td>
</tr>
<tr>
<td>Serial No: 08IS35197397</td>
<td>Controller IP Address: 192.45.100.48</td>
</tr>
<tr>
<td>Encrypt Link: y</td>
<td>MAC Address: 00:1b:4f:03:3c:58</td>
</tr>
<tr>
<td>Network Region: 1</td>
<td>Location: 1</td>
</tr>
<tr>
<td></td>
<td>Enable CF?: n</td>
</tr>
<tr>
<td>Recovery Rule: none</td>
<td>Site Data:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Slot</th>
<th>Module Type</th>
<th>Name</th>
<th>DSP Type</th>
<th>FW/HW version</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1:</td>
<td>S8300</td>
<td>ICC MM</td>
<td>MP80</td>
<td>16 3</td>
</tr>
<tr>
<td>V2:</td>
<td>MM712</td>
<td>DCP MM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V3:</td>
<td>MM711</td>
<td>ANA MM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V4:</td>
<td>MM710</td>
<td>DS1 MM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V5:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V6:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V7:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V8:</td>
<td>MM710</td>
<td>DS1 MM</td>
<td></td>
<td>Max Survivable IP Ext: 8</td>
</tr>
<tr>
<td>V9:</td>
<td>gateway-announcements</td>
<td>ANN VMM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 4.2 Configuration Related to Nortel CS1000 Interoperability

This section focuses on the parameter settings for the H.323 signaling group, IP trunk group, and IP codec sets used to connect with Nortel CS1000.

The following illustrates a subset of the **change node-names ip** screen that maps logical names to IP addresses. These node names are presented because they will appear in other screens, such as the screen defining the H.323 signaling group.

<table>
<thead>
<tr>
<th>change node-names ip</th>
<th>IP NODE NAMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>IP Address</td>
</tr>
<tr>
<td>default</td>
<td>0.0.0.0</td>
</tr>
<tr>
<td>ia770</td>
<td>192.45.100.49</td>
</tr>
<tr>
<td>nortel-cs1000</td>
<td>192.168.1.33</td>
</tr>
<tr>
<td>procr</td>
<td>192.45.100.48</td>
</tr>
</tbody>
</table>
Signaling Group 7 will be created using the command “add signaling-group 7” to establish an H.323 signaling link between the Avaya S8300 Server and the Nortel CS1000. The signaling group number is not relevant; use any available number.

```
add signaling-group 7

Group Number: 7
Group Type: h.323
Remote Office? n
Max number of NCA TSC: 0
SBS? n
Max number of CA TSC: 0
IP Video? n
Trunk Group for Channel Selection:
TSC Supplementary Service Protocol: a
Trunk Group for NCA TSC:
T303 Timer(sec): 10
H.245 DTMF Signal Tone Duration(msec):
Near-end Node Name: procr
Far-end Node Name: nortel-cs1000
Near-end Listen Port: 1720
Far-end Listen Port: 1720
Far-end Network Region: 4
LRQ Required? n
Calls Share IP Signaling Connection? n
RRQ Required? n
H245 Control Addr On FACility? n
Media Encryption? n
Bypass If IP Threshold Exceeded? n
DTMF over IP: out-of-band
Direct IP-IP Audio Connections? n
Link Loss Delay Timer(sec): 90
H.235 Annex H Required? n
Enable Layer 3 Test? n
IP Audio Hairpinning? n
DCP/Analog Bearer Capability: 3.1kHz
Interworking Message: PROGress
```

The S8300 “procr” is the near-end of the signaling group. The far-end must be set to the CS1000 Node IP address (192.168.1.33), and not the IP address configured for the CS1000 Signaling Server (192.168.1.30). Retain the default near-end listen port (1720) and enter 1720 as the far-end listen port. The Calls Share IP Signaling Connection and the Direct IP-IP Audio Connections fields must remain set to the default n setting, or interoperability problems will be experienced.

In general, the Far-end Network Region field can be left blank, or it can be populated with a network region number. In these Application Notes, the Far-end Network Region field is populated to illustrate how different audio codecs can be used for intra-region calls among the Avaya devices, and inter-region calls over the IP Trunk to the Nortel CS1000. Since “Direct IP-IP Audio Connections”, also referred to as “shuffling”, must remain disabled for the signaling group, calls between Avaya IP Telephones and Nortel devices will require the resources of the G450 media processors. The approach described below allows connections among Avaya IP devices in Network Region 1 to use G.722-64K or G.711MU while media connections across the IP Trunk to Nortel IP devices will use G729A. This may be an appropriate configuration in environments where the two servers are separated by a WAN, and it is desirable to conserve bandwidth over the WAN. (An alternative showing G.711MU over the IP Trunk is shown in Section 7). For Signaling Group 7, the Far-end Network Region field has been set to 4. Communication Manager will treat calls using this signaling group as calls between Network Region 1 and Network Region 4.

The signaling group created with the preceding screen will be associated with Trunk Group 7 in a subsequent step.
The **ip-network-region** and **ip-codec-set** screens are shown below to complete the example of using different codecs for intra-region (Avaya-Avaya) and inter-region (Avaya-Nortel) calls. For connections within region 1, the Codec Set field shown in bold on the first page of the form determines the codec set used.

<table>
<thead>
<tr>
<th>Source Region: 1</th>
<th>Inter Network Region Connection Management</th>
<th>T</th>
<th>M</th>
<th>G</th>
<th>A</th>
<th>e</th>
</tr>
</thead>
<tbody>
<tr>
<td>dst codec direct</td>
<td>WAN-BW-limits</td>
<td>Video</td>
<td>Intervening</td>
<td>Dyn</td>
<td>A</td>
<td>G</td>
</tr>
<tr>
<td>rgn set</td>
<td>WAN Units</td>
<td>Total Norm</td>
<td>Prio Shr</td>
<td>Regions</td>
<td>CAC</td>
<td>R</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>all</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>y</td>
<td>NoLimit</td>
<td></td>
<td>n</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>y</td>
<td>NoLimit</td>
<td></td>
<td>n</td>
<td></td>
</tr>
<tr>
<td><strong>4</strong></td>
<td><strong>4</strong></td>
<td>y</td>
<td><strong>NoLimit</strong></td>
<td></td>
<td>n</td>
<td>all</td>
</tr>
</tbody>
</table>

Navigate to Page 3. The codec set configured for calls between Region 1 and Region 4 will be Codec Set 4, as shown by the bolded row in the following screen. In this example, no Call Admission Control bandwidth limits are configured for inter-region connections.
Calls among the Avaya IP devices within Region 1 will use G.722-64K or G.711MU with 2 Frames Per Packet.

<table>
<thead>
<tr>
<th>IP Codec Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>Codec Set: 1</td>
</tr>
<tr>
<td>Audio Codec</td>
</tr>
<tr>
<td>1: G.722-64K</td>
</tr>
<tr>
<td>2: G.711MU</td>
</tr>
</tbody>
</table>

Media Encryption
1: none

Calls to and from the Nortel CS1000 use Codec Set 4 because Signaling Group 7 to the Nortel CS1000 specifies the **Far-end Network Region** field to be Region 4, and calls between Region 1 and Region 4 are configured to use Codec Set 4. For interoperability for calls requiring the Nortel CS1000 Media Card, such as calls over the IP Trunk to Nortel digital telephones, the audio codec must be set to match what Nortel CS1000 supports (in this case G.729A).

<table>
<thead>
<tr>
<th>IP Codec Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>Codec Set: 4</td>
</tr>
<tr>
<td>Audio Codec</td>
</tr>
<tr>
<td>1: G.729A</td>
</tr>
</tbody>
</table>

Media Encryption
1: none
Although the configuration presented here shows how to achieve G.729A across the IP Trunk, note that G.711MU was also verified successfully, as shown in Section 7.8.

Next, a trunk group is established using the command “add trunk-group” for calls to and from the Nortel CS1000. Most fields can be left at their defaults. Data has been entered in the fields shown in bold. The **Number of Members** field will determine the number of simultaneous calls allowed on the IP trunk group linking the Avaya S8300 Server with the Nortel CS1000. After this form is submitted, Communication Manager will assign a trunk number as a port identifier (e.g., T00032 and T00033 in this case, as seen in the verification screens in Section 7.)

<table>
<thead>
<tr>
<th>change trunk-group 7</th>
<th>Page 1 of 21</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TRUNK GROUP</strong></td>
<td></td>
</tr>
<tr>
<td>Group Number: 7</td>
<td>Group Type: isdn</td>
</tr>
<tr>
<td><strong>Group Name</strong>: Nortel CS1000</td>
<td>CDR Reports: y</td>
</tr>
<tr>
<td>Direction: two-way</td>
<td>CDR: 1</td>
</tr>
<tr>
<td>Dial Access? n</td>
<td>TN: 1</td>
</tr>
<tr>
<td>Queue Length: 0</td>
<td>TAC: 107</td>
</tr>
<tr>
<td><strong>Number of Members</strong></td>
<td>Carrier Medium: H.323</td>
</tr>
<tr>
<td>Service Type: tie</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Auth Code? n</td>
</tr>
<tr>
<td></td>
<td><strong>Member Assignment Method</strong>: auto</td>
</tr>
<tr>
<td></td>
<td>Signal Group: 7</td>
</tr>
<tr>
<td></td>
<td>Number of Members: 7</td>
</tr>
</tbody>
</table>

Navigate to Page 2. Set the **Disconnect Supervision – In? Out?** field to “y” and “y” to allow an Avaya phone to transfer an incoming call from the Nortel PBX to an endpoint on the Nortel PBX.

<table>
<thead>
<tr>
<th>add trunk-group 7</th>
<th>Page 2 of 21</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TRUNK PARAMETERS</strong></td>
<td></td>
</tr>
<tr>
<td>Codeset to Send Display: 6</td>
<td>Codeset to Send National IEs: 6</td>
</tr>
<tr>
<td>Charge Advice: none</td>
<td>Digit Handling (in/out): en bloc/en bloc</td>
</tr>
<tr>
<td>Digital Loss Group: 18</td>
<td></td>
</tr>
<tr>
<td><strong>Disconnect Supervision – In? y Out? y</strong></td>
<td></td>
</tr>
<tr>
<td>Answer Supervision Timeout: 0</td>
<td>CONNECT Reliable When Call Leaves ISDN? n</td>
</tr>
<tr>
<td>Insert:</td>
<td>Format:</td>
</tr>
</tbody>
</table>
Navigate to Page 3. The **Send Calling Number** field can be set to “y” to allow the calling party number to be included in calls from Avaya to Nortel, subject to the usual rules governing the inclusion and content of this information (i.e., not unique to Nortel, and not presented here). Although the **Send Connected Number** field is shown set to “y”, the Nortel CS1000 software tested does not display the connected number on a display-equipped telephone.

Next, the signaling group is associated with the IP trunk group. Using the command “**change signaling-group 7**”, enter the number 7 in the **Trunk Group for Channel Selection** field.

Traditional Avaya UDP call routing is established such that dialed number 53xxx is routed to a route pattern containing Trunk Group 7, passing the dialed 53xxx digits to the Nortel CS1000.

The command “**save translation**” must be entered to save the configuration.
5 Nortel CS1000 Configuration

This section illustrates the relevant Nortel configuration used to verify these Application Notes. Please consult the Nortel Networks product documentation referenced in Section 9 for additional information. The documents “IP Peer Networking” [1] and “Signaling Server: Installation and Configuration” [2] are especially relevant to these Application Notes.

IP Peer Networking can use an H.323 Gatekeeper to manage a numbering plan for the network. For the simple network depicted in Figure 1, the numbering plan associated with the Avaya devices has the form 24xxx. Routing calls over a H.323 link requires configuration steps on the CS1000 Call Server and the CS1000 Gatekeeper. The CS1000 Call Server needs to be configured to steer calls of the form 24xxx to a Virtual Trunk using the Coordinated Dial Plan (CDP) feature. In addition, the CS1000 Gatekeeper, co-resident on the CS1000 Signaling Server as part of the Network Routing Service (NRS), needs to be configured to direct dialed digits of the form 24xxx to the Avaya S8300 Server. In these Application Notes, the interface to the Avaya S8300 Server is configured as a “non-RAS endpoint” in the NRS. An alternative would be to configure Communication Manager as a Collaborative Server, and the configuration differences for this alternative are briefly summarized in Section 5.13.

The CS1000 Signaling Server provides the H.323 Gateway function for “Virtual Trunks” that correspond logically to the Avaya H.323 IP trunk configuration described in Section 4.2. The CS1000 Signaling Server also provides the “Terminal Proxy Server” (TPS) function for the Nortel IP Telephones associated with the CS1000. Finally, the Signaling Server includes two web interfaces called “Element Manager” and “Network Routing Service Manager” for managing the configuration of the Signaling Server and Gatekeeper.
5.1 Launch Element Manager and Log in

In the configuration depicted in Figure 1, the Signaling Server address is 192.168.1.30 and the Nortel Node IP address is 192.168.1.33. A web browser can connect to http://192.168.1.30 or http://192.168.1.33 to access the Element Manager as shown below. The “Call Server IP Address” (in this case, 192.168.0.1) is the private ELAN IP Address of the CS1000 Call Server, and should be automatically populated from prior basic system configuration. Click the Login button.
The **Home – System Overview** page is displayed as shown below. The left side of this screen will be referred to as the Navigation Tree. Click on **Signaling Server** in the middle of the main screen to display attributes related to the Signaling Server.
Select IP Telephony > Nodes: Servers, Media Cards > Configuration in the left pane. The Node Configuration screen is displayed. Click Node: 271 Node IP: 192.168.1.33 to expand it. Note that the node number and IP address may vary.

The Node Configuration screen is updated with additional details as shown below. Make a note of the Node ID “271”, Node IP “192.168.1.33”, and Signaling Server TLAN IP address of “192.168.1.30”. These values are used to configure other sections.
5.2 Configure the Customer Data Block

Select **Customers** from the Navigation Tree.
Click the **Edit** button associated with the customer. The screen below is displayed.
Click **Feature Packages**. Scroll down the resulting screen and select **Integrated Services Digital Network Package: 145**. Check the **Integrated Services Digital Network (ISDN)** checkbox, as shown below.

<table>
<thead>
<tr>
<th>Feature Packages</th>
<th>Package: 145</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dial Access Prefix on CLID table entry option (DAPC)</td>
<td></td>
</tr>
<tr>
<td>• Virtual Private Network Identifier (VPNI)</td>
<td>Range: 1 - 65535</td>
</tr>
<tr>
<td>• Private Network Identifier (PNI)</td>
<td>Range: 1 - 65535</td>
</tr>
<tr>
<td>• Node DN (PBX_DN)</td>
<td></td>
</tr>
<tr>
<td>• Multi-location Business Group (MBG)</td>
<td>Range: 0 - 65535</td>
</tr>
<tr>
<td>• Business Sub Group Consist only (DSGC)</td>
<td>Range: 0 - 65535</td>
</tr>
<tr>
<td>• Prefix 1 (PX1)</td>
<td></td>
</tr>
<tr>
<td>• Prefix 2 (PX2)</td>
<td></td>
</tr>
<tr>
<td>• Home Number Plan Area code (HNPNA)</td>
<td>Range: 200 - 999</td>
</tr>
<tr>
<td>• Prefix for Central Office (HBOC)</td>
<td>Range: 100 - 9999</td>
</tr>
<tr>
<td>• Local steering code (LSC)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Calling Number Type (CITN)</th>
<th>CLID feature displays the set's Prime DN (PON)</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direction Control for ISDN calls (DCC)</td>
<td>No manipulation is done (NO)</td>
<td></td>
</tr>
<tr>
<td>CLID Information for incoming/outgoing calls (CLIU)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flexible Services</th>
<th>Package: 152</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network Attendant Service</td>
<td>Package: 159</td>
</tr>
<tr>
<td>Flexible Numbering Plan</td>
<td>Package: 160</td>
</tr>
<tr>
<td>Traffic Monitoring</td>
<td>Package: 168 - Unequipped</td>
</tr>
<tr>
<td>Trunk Failure Monitor</td>
<td>Package: 162 - Unequipped</td>
</tr>
<tr>
<td>Radio Paging</td>
<td>Package: 187 - Unequipped</td>
</tr>
</tbody>
</table>

Scroll to the bottom of the page and click the **Submit** button (not shown).
5.3 Configure the D-Channel

Select Routes and Trunks → D-Channels from the Navigation Tree. The resulting screen will display any D-Channels that have been previously configured. D-Channel 5 is associated with the IP trunk to the Avaya system. The text below is written as if the D-Channel had not been previously configured.
In the **Choose a D-Channel Number** drop-down, select an unused D-Channel number and click the **Add** button. From the **D-channel Card Type (CTYP)** drop-down field, select **D-Channel is over IP (DCIP)**. In the **Designator (DES)** field, enter a descriptive name for the D-Channel. From the **User (USR)** drop-down, select **Integrated Services Signaling Link Dedicated (ISLD)**. From the **Interface type for D-channel (IFC)** drop-down, select **Meridian Meridian1 (SL1)**.
Optionally, to set the “Remote Capabilities”, click on **Basic options (BSCOPT)** followed by the **Edit** button next to **Remote Capabilities (RCAP)**.
A screen with parameters such as **Network name display method 1** is displayed. Scroll down and check the box for **Network name Display method 2 (ND2)**. Click the Return – Remote Capabilities button at the bottom of the page, followed by the Submit button to save the changes.
5.4 Configure Zones

Zones can be used for bandwidth management. In this respect, the zone concept is similar to the Communication Manager “network region” (see Section 4.2). A zone must be configured prior to the virtual route.

Select IP Telephony $\rightarrow$ Zones from the Navigation Tree. The resulting screen will display a list of zones that have been previously configured. Zone 5 is associated with the IP route to the Avaya S8300 system. The text below is written as if the zone had not been previously configured.

Choose an unused zone number from the drop-down, and click to Add. A window with the text

To maintain consistent zone properties within the network, it is recommended to use the “Zone Basic Property and Bandwidth Management Spreadsheet”. Do you wish to Proceed? will pop up. Click OK.
The Zone Basic Property and Bandwidth Management page will appear. The Intrazone Strategy (INTRA_STGY) should be left at the default value of Best Quality (BQ). From the Interzone Strategy (INTER_STGY) drop-down, select the value Best Bandwidth (BB). This approach is similar to the Avaya configuration in Section 4.2. From the Zone Intent (ZBRN) drop-down, select the value VTRK (VTRK). All other parameters are left with their default values. Enter text in the Description (ZDES) field if desired, and click the Submit button.
5.5 Configure Virtual Route

Select Routes and Trunks → Routes and Trunks from the Navigation Tree. Click the Add route button associated with the customer.
A Customer 0, New Route Configuration screen appears. Under Basic Configuration section, select a Route Number from the Route Number (ROUT) drop-down. In these Application Notes, Route Number 15 is associated with the IP virtual route to the Avaya S8300 Server. In the Designator field for trunk (DES) enter a descriptor. From the Trunk Type (TKTP) drop-down, select TIE trunk data block (TIE). From the Incoming and Outgoing trunk (ICOG) drop-down, select Incoming and Outgoing (IAO). Once TIE is selected for the Trunk Type, additional fields appear. Check the box The route is for a virtual trunk route (VTRK). Enter the zone number configured in section 5.4 in the Zone for codec selection and bandwidth management (ZONE) field. Enter the node id (e.g., 271) in the Node ID of signaling server for this route (NODE) field. Confirm the auto-filled Protocol ID for the route (PCID) is set to H323 (H323). Check the box for Integrated Services Digital Network (ISDN). This will result in a few new fields to be displayed. In the Mode of operation (MODE) drop-down, select Route uses ISDN Signaling Link (ISLD). Enter the D-channel number configured previously (e.g., 5). Check the boxes for Network Calling Name Allowed (NCNA), and Network Call Redirection (NCRD). Scroll to the top of the page and enter a value to the Access code for the trunk route (ACOD) field. Other options can be set according to customer considerations, or left at their default settings. When finished, click the Submit button (not shown).
5.6 Configure Virtual Trunks

Select Routes and Trunks → Routes and Trunks from the Navigation Tree. Select the customer to expand the list of routes. Click the Add Trunk button beside the desired route (e.g., Route 15).
In the **Trunk data block (TYPE)** drop-down, select **IP Trunk (IPT1)**. In the **Terminal Number (TN)** field, enter an unused TN (e.g., 062 02). In the **Extended Trunk (XTRK)** drop-down, select **Virtual trunk (VTRK)**. In the **Route Number, Member number (RTMB)** field, enter the configured route from Section 5.5 followed by a space and the configured trunk member (e.g., 15 1). In the **Start arrangement Incoming (STRI)** drop-down, select **Immediate (IMM)**. In the **Start arrangement Outgoing (STRO)** drop-down, select **Immediate (IMM)**. In the **Channel ID for this trunk** field, enter a Channel ID that has not been used in the system (e.g. 5). Fill the remaining fields according to customer preference. Repeat this procedure for each trunk member. Alternatively, to add multiple trunk members in a single operation, use the **Multiple trunk input number (MTINPUT)** drop-down. When finished, click the **Submit** button.
The following Routes and Trunks screen shows the results after two virtual trunk members have been added to Route 15. Configure the same number of virtual trunk members in CS1000 as have been configured as trunk members in the corresponding Communication Manager trunk group (i.e., Trunk Group 7 in Section 4.2).
5.7 Enable Desired Networking Options for the Call Server

These Application Notes use the Coordinated Dial Plan (CDP) feature to steer calls from the Nortel CS1000 to the IP Trunk to Communication Manager. The Nortel CDP feature together with the Communication Manager Uniform Dial Plan (UDP) feature enable Nortel and Avaya telephone users to dial 5-digit extensions to reach one another. Of course, other numbering plan options are also possible.

To ensure that CDP is enabled, select **Dialing and Numbering Plans → Electronic Switched Network** from the Navigation Tree. Select **ESN Access Codes and Parameters (ESN)**.
Scroll down to the bottom of the resulting screen and check **Coordinated Dial Plan feature for this customer (CDP)**. Scroll to the bottom of the page and click **Submit**.
The default parameters for Network Control must be turned on. From the Navigation Tree, select **Dialing and Numbering Plans → Electronic Switched Network**. Select **Network Control Parameters (NCTL)**.

Select the **Edit** button next to **Network Control Basic Parameters**.

On the resulting page, click the **Submit** button to accept the default parameters.
5.8 Configure Route List Block

Configure the Route List Block that will be used to route calls over the virtual trunk route. From the Navigation Tree, select Dialing and Numbering Plans → Electronic Switched Network. Next, select Route List Block.

In the resulting Route List Blocks page, enter an unused route list index in the text box and click the Add button. Route List Block Index 15 will be associated with the IP trunk to the Avaya S8300 Server.
In the **Route Number (ROUT)** drop-down, select the appropriate route (e.g., 15). Other parameters can be set according to customer preference or left at their default values. Scroll to the bottom and click the **Submit** button (not shown).
5.9 Configure Steering Codes

From the Navigation Tree, select **Dialing and Numbering Plans ➔ Electronic Switched Network**. Under the **Coordinated Dialing Plan (CDP)** heading, select **Distant Steering Code (DSC)**.

Enter the leading digits of a CDP number (e.g., 24) in the Please enter a distant steering code text box, and click the **to Add** button.
In the **Flexible Length number of digits (FLEN)** text box, enter the number of digits used in the CDP. In these Application Notes, a 5-digit dialing plan is illustrated. In the **Route List to be accessed for trunk steering code (RLI)** drop-down, select the appropriate route list (e.g., 15). Click the **Submit** button.

---

### 5.10 Configure Codecs

From the Navigation Tree, select **IP Telephony → Nodes: Servers, Media Cards → Configuration**. The following screen is displayed.
Click the **Edit** button. The **Edit** page displays, illustrating the basic configuration of the node.
Click **VGW and IP phone codec profile**. Select the check boxes for the desired codecs. In these Application Notes, G729A is illustrated for calls between Avaya and Nortel users.
Click on each codec if additional special configuration of the codec is desired. The following screen shows the expanded view for G729A, although all values are left at their defaults.
5.11 Configure H.323 Gateway and Signaling Server

Continue from the **Edit** page in Section 5.10. Click on **H323 GW Settings** to expand the options. Set the **Primary gatekeeper IP address** to 192.168.1.30, which is the TLAN IP address of the CS1000 Signaling Server running the Gatekeeper application. Note that the IP address entered into this field is not the Node IP address.
Click on **Signaling Servers**, and then click on the appropriate signaling server properties. Check the **Enable Line TPS** checkbox and **Enable Gatekeeper** checkbox. Set the **Enable IP Peer Gateway (Virtual Trunk TPS)** field to **H.323 only**, and the **H323 ID** field to the text string **H323Gateway**. Click the **Save and Transfer** button at the bottom of the screen.
As part of the **Save and Transfer**, the following screen will be displayed. Click **OK**. A series of pages may display, indicating the progress and result of the operation.

![Microsoft Internet Explorer]

Please reboot the following Signaling Server/Succession Media Card after the save and transfer is done.

192.168.0.3
192.168.0.4

Are you sure you want to Save this Node configuration and Transfer to all elements?

[OK]  [Cancel]

### 5.12 Reboot Signaling Server and Media Card

Some of the parameter changes require a reboot of the Signaling Server and the Media Card (e.g. Primary gatekeeper IP address, Enable Line TPS, Enable Gatekeeper, and Enable IP Peer Gateway (Virtual Trunk TPS)).

To reboot the Signaling Server and Media Card, select **IP Telephony → Nodes: Servers, Media Cards → Maintenance and Reports** from the Navigation Tree. Click **Node ID: 271**. The following screen will appear.

![Element Manager - Microsoft Internet Explorer]

Click **Reset** in the second line to reboot the Media Card. Click **Reset** in the first line to reboot the Signaling Server.
5.13 Gatekeeper Database Configuration

In the configuration depicted in Figure 1, the H.323 Gatekeeper function is provided by the Network Routing Service, which resides on the Signaling Server. A simple Gatekeeper database is configured to cause dialed digits of the form 24xxx to be routed to the Avaya S8300 Server. The approach can be generalized for any numbering plan. A “non-RAS” H.323 Gateway interface will be defined for the Nortel CS1000 to communicate with the Avaya S8300 Server.

The non-RAS H.323 Gateway interface will not send H.323 “Location Request” (LRQ) before initiating call setup. An alternative approach would be to define the Avaya system as a Collaborative Server. Although not specifically illustrated in these Application Notes, this summary paragraph is provided to summarize the alternative approach, which has also been verified. If the IP address of the S8300 Server were defined in the Nortel NRS as a Collaborative Server, the Avaya system would not need to be added as a non-RAS endpoint nor would it be necessary to define the numbering plan (e.g., 24xxx) that the Avaya system can terminate. However, an additional signaling group would be required in Communication Manager. This additional signaling group would have its far-end set to the TLAN IP of the Nortel CS1000 Signaling Server that would appear as the source IP of the LRQ. The near-end and far-end listen ports for this additional signaling group would be set to 1719 (for RAS). The LRQ Required field of this additional signaling group would be set to y. The additional signaling group could be associated with the same trunk group (e.g., trunk group 7) used for the outbound calls from Avaya to Nortel. That is, inbound and outbound calls could effectively use the same Avaya IP trunk group, even though outbound calls (to Nortel) would use Signaling Group 7 as defined in Section 4.2, while inbound calls (from Nortel) would use the additional RAS LRQ signaling group summarized in this paragraph.
5.14 Log in to the Network Routing Service using Element Manager

The Gatekeeper configuration is configured through the Network Routing Service Manager. The Network Routing Service Manager can be accessed via the Element Manager. Select **Dialing and Number Plans > Network Routing Service** from the left pane to launch the Network Routing Service Manager. The **Network Routing Service (NRS)** screen is displayed. Retain the automatically populated IP address, and click **Next** to proceed.
A separate Internet browser window is opened with the **NETWORK ROUTING SERVICE MANAGER** login screen. Enter the appropriate credentials and click **Login**.
The **NETWORK ROUTING SERVICE MANAGER** home screen is displayed. Click **NRS Server Settings** in the left pane. The **NRS Server Settings** screen will display. In the **Host name** field, enter the Host name of Signaling Server from the **Home – System Overview** page of the Element Manager in Section 5.1. In the **Primary IP (TLAN)** field, enter the Signaling Server TLAN IP address from Section 5.1. Retain the default values for the remaining fields. Scroll down to the bottom of the screen, click **Save**.

```
<table>
<thead>
<tr>
<th>NRS Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host name:  SS_Node</td>
</tr>
<tr>
<td>Primary IP (TLAN):  192.168.1.30</td>
</tr>
<tr>
<td>Alternate IP (TLAN):  0.0.0.0</td>
</tr>
<tr>
<td>Control priority:  40</td>
</tr>
</tbody>
</table>

H.323 Gatekeeper Settings

Location request (LIO) response timeout (Seconds):  3   |
```
5.15 Configure NRS Database

The NRS hosts an active and a standby database. The active database is used for runtime queries, and the standby database is used for administrative modifications. When configuration is completed on the standby database, the standby database can be cut over to become the active database.

To configure the NRS database, click the Configuration tab in the top of the screen. The message pop up dialog box below is displayed. Click OK.

Click (set Standby DB view) to switch to the standby database, in order to make administrative changes.

5.16 Administer Service Domain

The view changes to Standby DB view, as shown below. The Service Domains option in the left pane is automatically selected, with the Service Domains screen displayed in the right pane. Click Add.
The Add Service Domain screen is displayed. Enter the domain name into the Domain name field, and a descriptive text for the Domain description field. Click Save.

Select L1 Domains (UDP) in the left pane to display the L1 Domains (UDP) screen. Click Add to add a new L1 domain. The L1 and L0 domains are building blocks of the phone context for private addresses. For more information on L1 and L0 domains, refer to the Nortel documentation in Section 9.
The Add L1 Domain (avaya.com) screen is displayed next, as shown below. Enter a descriptive **Domain name** and **Domain description**, and applicable **E.164 country code** and **E.164 area code** for the network configuration. Retain the default value in the remaining fields, and scroll down to the bottom of the screen to click **Save** (not shown).

Select **L0 Domains (CDP)** in the left pane to display the **L0 Domains (CDP)** screen. Click **Add** to add a new L0 domain.
The Add L0 Domain (avaya.com / udp1) screen is displayed next, as shown below. Enter a descriptive Domain name and Domain description. Retain the default values in the remaining fields, and scroll down to the bottom of the screen to click Save (not shown).

5.17 Administer Gateway Endpoints

One of the functions that the Nortel CS1000 Signaling Server supports is H.323 Gateway. The H.323 Gateway translates TDM signaling to H.323 and vice versa. It is used by the Nortel Call Server to establish an H.323 signaling channel with the Gatekeeper and other systems (in these Application Notes, the Avaya S8300 Server). The interfaces to the NRS and the Avaya S8300 Server are defined as Gateway Endpoints. To configure the Gateway Endpoint for the interface to the Avaya S8300, select Gateway Endpoints in the left pane to display the Gateway Endpoints screen. Click Add to add a new gateway endpoint for the Avaya S8300 Server.
Enter a descriptive **Endpoint name** and **Endpoint description**, as shown below.

![Gateway Endpoint Configuration](image)

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endpoint name</td>
<td>To-CM-mon-LRQ</td>
</tr>
<tr>
<td>Endpoint description</td>
<td>H.323 to CM</td>
</tr>
<tr>
<td>Tandem gateway endpoint name</td>
<td></td>
</tr>
<tr>
<td>Endpoint authentication enabled</td>
<td>Not configured</td>
</tr>
</tbody>
</table>
Scroll down the screen. Enter the IP address of the Avaya S8300 Server from **Section 4.1** in the **Static endpoint address** field. Select **Not RAS H.323 endpoint** from the **H.323 Support** dropdown. Retain the default values for the remaining fields. Click **Save**.
Repeat the procedures to add a gateway endpoint for the interface from the Nortel H.323 Gateway to the NRS as shown below. In the **Endpoint name** and **Endpoint description** field, enter the **H323 ID** configured in section 5.11 (i.e. H323Gateway) and a descriptive text. Select **Authentication off** from the drop-down list for the **Endpoint authentication enabled** field.
Scroll down the screen. For the **H.323 Support** field, select **RAS H.323 endpoint** from the drop-down list. Leave the **Static endpoint address** field blank. Maintain the default values in the remaining fields, and click **Save**.
5.18 Administer Routing Entry

Configure a routing entry for endpoints at the Avaya S8300 Server. Select **Routing Entries** in the left pane to display the **Routing Entries** screen. Enter the gateway endpoint name for the Avaya S8300 Server (To-CM-non-LRQ), and click **Show**. Click **Add** to add a routing entry.
The **Add Routing Entry** screen is displayed next. Select **Private level 0 regional (CDP steering code)** for the **DN Type** field from the drop-down list. In the **DN prefix** field, enter the leading digits of the dialed number to be directed to the Avaya S8300 Server. In these Application Notes, all numbers of the form 24XXX are directed to the non-RAS gateway endpoint named “To-CM-non-LRQ”. In the **Route cost (1-255)** field, enter an appropriate cost value. Click **Save**.
5.19 Test the Standby Database

Before making the standby database the active database, it may be desirable to test the numbering plan. From the top menu, select Tools → H.323 Routing Test. In the **Origination gateway endpoint name** textbox, select the gateway endpoint representing the interface to the Avaya S8300 Server (e.g., To-CM-non-LRQ). In the **DN to query** text box, enter the extension of an Avaya telephone, such as 24000. In the DN Type drop-down, select **Private level 0 regional (CDP steering code)**. Click the **Submit** button.
A screen similar to the following should display, indicating that the call will be directed to the Avaya S8300 Server.

5.20 Cut Over and Commit Changes

When satisfied that the standby database is proper, the standby database can be made the active database. Select the Tools tab at the top of the screen. Select Database Actions from the left pane to display the Database Actions | Database State: Changed | screen. To swap the active and standby databases, retaining the uniqueness of each, select Cut over in the Select database action drop-down. To make the standby database active and also synchronize the databases so that the primary and standby databases are identical, select Cut over & Commit in the Select database action drop-down. In the example below, the Cut over & Commit option was used. Click Submit to request the action.
5.21 Test the Active Database

Before making calls, it may be desirable to check the active database. Similar procedures to those described in Section 5.19 may be used to test the active database after cutover. Select the Tools tab at the top of the screen. Select Database Actions from the left pane to display the Database Actions [ Database State: Changed ] screen, and follow the procedures shown in Section 5.19.

6 Verification

Verification of the configuration described in these Application Notes included (with G.729A being the inter-PBX codec):

- Calls between Nortel IP telephones and Software Phones controlled by the Nortel CS1000 and Avaya IP Telephones and Softphones registered to the Avaya S8300 Server. Successful calls can be made in both directions across the IP Trunk using G.729A. As mentioned previously, “shuffling” of the media to “ip-direct” must be disabled.
- Calls between Nortel IP telephones and Software Phones controlled by the Nortel CS1000 and Avaya digital telephones connected to the Avaya G450 Media Gateway. Successful calls can be made in both directions using G.729A. This result may be extrapolated to other non-IP devices connected to the G450 Media Gateway (e.g., analog telephones, PSTN trunks, etc.).
- Calls from Nortel IP telephones and Nortel digital telephones into an Avaya Meet-Me conference configured on the Avaya S8300 Server. After the welcome announcement prompts the caller for the conference password, digits pressed on any of the Nortel telephone keypads (to enter the conference password) are processed properly, and the Nortel telephones can participate in the conference. This verification is included to show that Avaya applications requiring DTMF collection can collect the digits using out-of-band signaling from the IP Trunk interface to the Nortel server. The IP Trunk interface serving the Nortel telephones can be muted using the Communication Manager “fe-mute” feature button, and the Nortel telephone can use the “#” key to un-mute the trunk. Far-end mute is a feature that can be used to allow unwanted music on hold or noisy audio sources to be muted at the Avaya trunk interface by a display-equipped telephone or softphone.
- Calls from Avaya IP Telephones, Avaya IP Softphones, and Avaya digital telephones interacting with a Modular Messaging system via the Nortel CS1000. The Modular Messaging system and the Nortel CS1000 are connected via T1 QSIG as a part of a centralized messaging configuration. Digits pressed on the Avaya telephone keypads are processed properly by the Nortel CS1000 before passing through a T1 to the Modular Messaging. This verification is included to show that applications requiring DTMF can collect the digits using out-of-band signaling from the IP Trunk interface to the Avaya S8300 server.
- Ringback tone to the originator of calls is heard when appropriate in all cases.
• Calling party number can be displayed for calls in either direction:
  o For calls from an Avaya telephone to a Nortel telephone, the Nortel telephone can display the number of the Avaya caller, provided the Avaya server is provisioned to send this information. The screen capture from the Nortel i2050 Software Phone in Section 7.5 illustrates the calling number of the Avaya caller.
  o For calls from a Nortel telephone to an Avaya telephone, the Avaya telephone can display the calling party number, when sent by the Nortel CS1000. The screen capture from the Avaya IP Softphone in Section 7.5 illustrates the calling number of the Nortel caller.
• A call between Nortel phones controlled by the Nortel CS1000 and Avaya phones controlled by the Avaya S8300 Server can be successfully held and subsequently unheld by either the originating party or the termination party of the call.
• A call between Nortel phones controlled by the Nortel CS1000 and Avaya phones controlled by the Avaya S8300 Server can be successfully transferred to another Nortel phone or Avaya phone by either the originating party or the termination party of the initial call.
• A call between Nortel phones controlled by the Nortel CS1000 and Avaya phones controlled by the Avaya S8300 Server can successfully conference in another Nortel phone or Avaya phone. The conference action can be initiated by either the originating party or the termination party of the initial call.
• Call forwarding works except the following case: If an Avaya phone calls a Nortel phone which has Call Forward All Calls feature activated to forward calls to another Avaya phone, the forwarded party will ring. However, when the forwarded party answers, the call drops immediately.

When G.711MU is used on the H.323 trunk, it is required that 10ms packet size be configured for G.711MU using Avaya ip-codec-set 4 (see Section 7.8). Otherwise calls from Nortel IP telephones to Avaya IP telephones and digital telephones will not pass audio properly (including both ringback tone and talk path) to the Nortel IP telephones.

7 Detailed Information for Active Calls
To reinforce the understanding of the configuration, the following subsections show detailed status for representative calls.

7.1 Avaya IP Telephone Calls Nortel IP Telephone

This section presents details for a call involving the Avaya 9630 IP Telephone with IP address 192.45.100.44 (x24030) and the Nortel IP Telephone with IP address 192.45.100.73 (x53505). Avaya IP telephones are registered with the S8300 Server, whose address is 192.45.100.48. Nortel IP telephones are registered with the Nortel CS1000 Node IP, whose address is 192.168.1.33.

Observe the final audio path for the call, shown in the Avaya status station screen below. The first media path shown, between the Avaya IP Telephone and the Avaya G450 Media Gateway VoIP at 192.45.100.47, is within Network Region 1. Recall that Codec Set 1 has been
configured for intra-region calls, and Codec Set 1 contains G.711MU at 2 Frames Per Packet (20 msec audio). The second media path shown is from the G450 VoIP at 192.45.100.47 to the Nortel IP Telephone. This connection was configured as an inter-region call between Network Region 1 and Network Region 4, due to the Far-end Network Region field being set to 4 for the signaling group to the Nortel CS1000 Node IP. Codec Set 4, which contained G.729A, is configured for calls between Regions 1 and 4. Recall that the G450 Media Gateway VoIP remains in the communication path because “Direct IP-IP Audio Connections” or “shuffling” has been turned off on the signaling group to the Nortel CS1000.

<table>
<thead>
<tr>
<th>status station 24030</th>
<th>SRC PORT TO DEST PORT TALKPATH</th>
</tr>
</thead>
<tbody>
<tr>
<td>src port: S00002</td>
<td>S00002:TX:192.45.100.44:2630/g711u/20ms</td>
</tr>
<tr>
<td>001V024:RX:192.45.100.47:2050/g711u/20ms:TX:ctxID:464</td>
<td></td>
</tr>
<tr>
<td>001V024:RX:ctxID:464:TX:192.45.100.47:2052/g729/20ms</td>
<td></td>
</tr>
<tr>
<td>T00032:RX:192.45.100.73:5200/g729a/20ms</td>
<td></td>
</tr>
<tr>
<td>dst port: T00032</td>
<td></td>
</tr>
</tbody>
</table>

The following screen shows the results of the Nortel H323GwShow command issued from a telnet session into the Nortel CS1000 Node IP.

```
oam> H323GwShow num 53505
Npm status: Active
Active GateKeeper: 192.168.1.30 (primary)
GateKeeper registration status: registered, TTL: 25 secs, re-register: 21 secs
Channels Busy / Idle / Total: 1 / 1 / 2
Stack version: RadVision 4.1.0.19
Channel tracing: -1
Signaling Server H323 ID : H323Gateway

 Calling/Called Party Number: 53505
 Type Of Number: Undefined
 Chan Direction CallState RxState TxState Codec AirTime FS MS Fax DestNum RemoteIP
```

The following illustrates the first page of the Avaya status trunk screen for this same call. This is included to illustrate the H.245 and Q.931 signaling from the S8300 Server (192.45.100.48) to the Nortel CS1000 Node IP Address (192.168.1.33).
### 7.2 Nortel IP Telephone Calls Avaya IP Telephone

The following Avaya screens show status for a call from Nortel IP telephone x53505 to Avaya IP Telephone x24030.

<table>
<thead>
<tr>
<th>Near-end Signaling Loc: 01A0017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signaling IP Address</td>
</tr>
<tr>
<td>Near-end: 192.45.100.48</td>
</tr>
<tr>
<td>Far-end: 192.168.1.33</td>
</tr>
<tr>
<td>H.245 Near: 192.45.100.48</td>
</tr>
<tr>
<td>H.245 Far: 192.168.1.33</td>
</tr>
</tbody>
</table>

Audio Connection Type: ip-tdm Authentication Type: None

<table>
<thead>
<tr>
<th>Audio Near-end IP Address</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>Near-end: 192.45.100.47</td>
<td>2050</td>
</tr>
<tr>
<td>Far-end: 192.45.100.73</td>
<td>5200</td>
</tr>
</tbody>
</table>

Video Near:

Video Port:

Video Near-end Codec: Video Far-end Codec:
The next screen shows Page 3. Observe that the packet size negotiates to 10ms for calls from Nortel to Avaya.

<table>
<thead>
<tr>
<th>SRC PORT TO DEST PORT TALKPATH</th>
<th>status trunk 7/1</th>
</tr>
</thead>
<tbody>
<tr>
<td>src port: T00032</td>
<td></td>
</tr>
<tr>
<td>T00032:TX:192.45.100.73:5200/g729a/10ms</td>
<td></td>
</tr>
<tr>
<td>001V024:RX:192.45.100.47:2050/g729/10ms:TX:ctxID:466</td>
<td></td>
</tr>
<tr>
<td>001V024:RX:ctxID:466:TX:192.45.100.47:2052/g711u/20ms</td>
<td></td>
</tr>
<tr>
<td>S00002:RX:192.45.100.44:2630/g711u/20ms</td>
<td></td>
</tr>
</tbody>
</table>

The next screen shows the information for this call available from the **H323GwShow** command from the Nortel CS1000 Signaling Server CLI.

```
-oam> H323GwShow num 53505
Npm status: Active
Active GateKeeper: 192.168.1.30 (primary)
GateKeeper registration status: registered, TTL: 25 secs, re-register: 1 secs
Channels Busy / Idle / Total: 1 / 1 / 2
Stack version: RadVision 4.1.0.19
Channel tracing: -1
Signaling Server H323 ID: H323Gateway
Calling/Called Party Number: 53505
Numbering Plan Indicator: Undefined
Type Of Number: Undefined
Chan Direction CallState RxState TxState Codec AirTime FS MS Fax DestNum RemoteIP
--- -------- --- ------- ------- ------- ---------------------- ------- ---
-- --- -------- --------
   6 Originate Connected Connected G_729A_20MS 341 yes s no 24030 192.45.100.48
```
7.3 Nortel Digital Telephone calls Avaya Digital Telephone

This section illustrates details for a call between an Avaya digital telephone (i.e., example of a non-IP Telephone) connected to port 1v202 on the G450 Media Gateway and the Nortel M3904 Digital Phone with extension 53500. The Nortel digital telephone dialed the Avaya digital telephone (x24001). Observe the Q.931 and H.245 signaling path is between the Avaya S8300, whose IP address is 192.45.100.48 (near-end of Signaling Group 7), and the Nortel CS1000 Node IP, whose IP address is 192.168.1.33 (far-end of Signaling Group 7). The audio path is from the G450 VoIP media processor, whose IP address is 192.45.100.47, to the Nortel CS1000 Media Card with IP Address 192.168.1.31.

status trunk 7/1

CALL CONTROL SIGNALING

Near-end Signaling Loc: 01A0017

<table>
<thead>
<tr>
<th>Signaling IP Address</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>Near-end: 192.45.100.48</td>
<td>1720</td>
</tr>
<tr>
<td>Far-end: 192.168.1.33</td>
<td>1183</td>
</tr>
</tbody>
</table>

H.245 Near: 192.45.100.48 : 1720
H.245 Far: 192.168.1.33 : 1183

H.245 Signaling Loc: 01A0017 H.245 Tunneled in Q.931? yes

Audio Connection Type: ip-tdm Authentication Type: None

Near-end Audio Loc: MG1 Codec Type: G.729A

Audio IP Address Port
Near-end: 192.45.100.47 : 2052
Far-end: 192.168.1.31 : 5216

The following screen shows Page 3.

status trunk 7/1

SRC PORT TO DEST PORT TALKPATH

src port: T00032
T00032:TX:192.168.1.31:5216/g729a/10ms
001V024:RX:192.45.100.47:2052/g729/10ms:TX:ctxID:469
001V202:RX:ctxID:469

dst port: 001V202
The next screen shows the information available from the H323GwShow command from Nortel CS1000 for this call. The screen has been edited to remove common information.

```
oam> H323GwShow num 53500
Calling/Called Party Number: 53500
Chan Direction CallState RxState TxState Codec AirTime FS
MS Fax DestNum RemoteIP
-- --- -------- -------------- --- ----------- --- --------- ---
6 Originate Connected Connected Connected G_729A_20MS 173 yes
s no 24001 192.45.100.48
```

7.4 Avaya Digital Telephone calls Nortel Digital Telephone

The following screen shows a status screen for a call from Avaya digital telephone extension 24001 to Nortel digital telephone 53500.

```
status trunk 7/2
CALL CONTROL SIGNALING

Near-end Signaling Loc: 01A0017
Signaling IP Address Port
Near-end: 192.45.100.48 : 10827
Far-end: 192.168.1.33 : 1720
H.245 Near: 192.45.100.48 : 10827
H.245 Far: 192.168.1.33 : 1720
H.245 Signaling Loc: 01A0017 H.245 Tunneled in Q.9317 yes

Audio Connection Type: ip-tdm Authentication Type: None
Near-end Audio Loc: MG1 Codec Type: G.729A
Audio IP Address Port
Near-end: 192.45.100.47 : 2050
Far-end: 192.168.1.31 : 5222
```

The following screen shows Page 3.

```
status trunk 7/2
SRC PORT TO DEST PORT TALKPATH

src port: T00033
T00033:TX:192.168.1.31:5222/g729a/20ms
001V024:RX:192.45.100.47:2050/g729/20ms:TX:ctxID:472
001V202:RX:ctxID:472
dst port: 001V202
```

The next screen shows the information available from the H323GwShow command from Nortel CS1000 for this call. Again, the screen has been edited to remove common information.

```
oam> H323GwShow num 53500
Calling/Called Party Number: 53500
Chan Direction CallState RxState TxState Codec AirTime FS
MS Fax DestNum RemoteIP
-- --- -------- -------------- --- ----------- --- --------- ---
5 Terminate Connected Connected Connected G_729A_20MS 135 yes
s no 53500 192.45.100.48
```
7.5 Calls Involving Nortel IP Software Phone or Avaya IP Softphone

7.5.1 Example of Call Using Nortel i2050 Software Phone

The following screens illustrate details for a call between an Avaya digital telephone connected to port 1v202 in the G450 Media Gateway and the Nortel i2050 Software Phone, loaded on a computer whose IP address is 192.45.100.202. The Avaya digital telephone is extension 24001, and the Nortel i2050 Software Phone is extension 53509. In this example, the Avaya digital set dialed 53509. This call does not illustrate any new concept; it is presented to include status of a call involving the Nortel i2050 Software Phone.

```
status trunk 7/1

CALL CONTROL SIGNALING
Near-end Signaling Loc: 01A0017
Signaling IP Address Port
Near-end: 192.45.100.48 : 10551
Far-end: 192.168.1.33 : 1720
H.245 Near: 192.45.100.48 : 10551
H.245 Far: 192.168.1.33 : 1720
H.245 Signaling Loc: 01A0017 H.245 Tunneled in Q.931? yes
Audio Connection Type: ip-tdm Authentication Type: None
Near-end Audio Loc: MG1 Codec Type: G.729A
Audio IP Address Port
Near-end: 192.45.100.47 : 2056
Far-end: 192.45.100.202 : 5200
```

Page 3 shows further details of the IP audio path, using G.729A between the Nortel IP Software Phone (192.45.100.202) and the G450 Media Gateway VoIP (192.45.100.47).

```
status trunk 7/1

SRC PORT TO DEST PORT TALKPATH
src port: T00032
t00032:TX:192.45.100.202:5200/g729a/20ms
001V023:RX:192.45.100.47:2056/g729/20ms:TX:ctxID:155
001V202:RX:ctxID:155
dst port: 001V202
```
The following is a screen capture of the Nortel i2050 Software Phone while this call was in progress. Note that the caller identification (24001) of the Avaya originator is displayed.

The next (edited) screen shows the information available from the **H323GwShow** command from the Nortel CS1000 Signaling Server CLI, while this call was in progress.

<table>
<thead>
<tr>
<th>Chan</th>
<th>Direction</th>
<th>CallState</th>
<th>RxState</th>
<th>TxState</th>
<th>Codec</th>
<th>AirTime</th>
<th>FS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ms</td>
<td>----------</td>
<td>-----------</td>
<td>---------</td>
<td>---------</td>
<td>-------</td>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>5</td>
<td>Terminate</td>
<td>Connected</td>
<td>Connected</td>
<td>Connected</td>
<td>G_729A_20MS</td>
<td>603</td>
<td>yes</td>
</tr>
</tbody>
</table>

s no 53509 192.45.100.48
7.5.2 Example of Using Avaya IP Softphone

The following screen illustrates details for a call from a Nortel IP Telephone to an Avaya IP Softphone, loaded on a computer whose IP address is 192.45.100.201. The Avaya IP Softphone is logged in as extension 24050, and the Nortel IP Telephone is extension 53505. In this example, the Nortel IP Telephone called extension 24050. This call does not illustrate any new concept; it is presented to include status of a call involving the Avaya IP Softphone.

<table>
<thead>
<tr>
<th>status station 24050</th>
<th>SRC PORT TO DEST PORT TALKPATH</th>
</tr>
</thead>
<tbody>
<tr>
<td>src port: S00017</td>
<td>S00017:TX:192.45.100.201:2048/g711u/20ms</td>
</tr>
<tr>
<td></td>
<td>001V024:RX:192.45.100.47:2050/g711u/20ms:TX:ctxID:96</td>
</tr>
<tr>
<td></td>
<td>001V023:RX:ctxID:96:TX:192.45.100.47:2054/g729/10ms</td>
</tr>
<tr>
<td>dst port: T00032</td>
<td>T00032:RX:192.45.100.73:5200/g729a/10ms</td>
</tr>
</tbody>
</table>

The following is a screen capture of the Avaya IP Softphone while this call was in progress. Note that the caller identification (53505) of the Nortel originator is displayed.
7.6 Status for Nortel IP Devices

The following commands can be executed from the CLI of the CS1000 Signaling Server. The following screen shows the registration of the Nortel IP Telephones shown in Figure 1, using the `isetShow` command from the CLI. Observe the registered status of the i2004 (192.45.100.73) and i2050 Software Phone (192.45.100.202) depicted in Figure 1.

```
oam> isetShow
Set Information
-------------
          IP Address  NAT  Model Name                    Type  RegType  Sta
          Te             Up  Time   Set-TN   Regd-TN    HWID          FWVsn  U
        NISTimVsn SrcPort DstPort
---------------------------------------------------------------
192.45.100.73  IP Phone 2004 Phase 0/1   i2004       Regular online
                3  19:27:37   061-00    061-00  18-000ae4082a2-66  B76
                2.9  5100    5000
192.45.100.202 Not reported     i2050       Regular online
                3  19:24:10   061-02    061-02  18-0060a100000-66  346
                2.6  5100    5000
192.168.35.98   IP Phone 2004 Phase 2   i2004 Ph2    Regular online
                2  08:47:27   061-04    061-04  18-00159be3b383-66  D9F
                2.9  5100    5000
Total sets = 3
```

The following screen shows the status of the Terminal Proxy Server, using the `tpsShow` command available from the CLI.

```
oam> tpsShow
Node ID     : 271
Is master   : 1
Up time     : 3 days, 19 hours, 34 mins, 37 secs (329677 secs)
Platform    : ISP 1100
TPS Service : Yes
IP TLAN     : 192.168.1.30
IP ELAN     : 192.168.0.3
ELAN Link   : Up
Sets Connected: 3
Sets Reserved : 0
```
The following screen shows the status of the virtual trunks, using the `vtrkShow h323` command. In this case, the command was executed with a call actively using one of the virtual trunks.

```
oam> vtrkShow h323

---------------------------
VTRK Summary
---------------------------
VTRK status   : Active
Protocol      : H323
D-Channel     : 5
Customer      : 0
Channels Idle : 1
Channels Busy : 1
Channels Mbsy : 0
Channels Pend : 0
Channels Dsbl : 0
Channels Ukw : 0
Channels Total: 2
Chid ranges   : 5 to 6
---------------------------
IND    TN         DCH  PROTOCOL  CHID  CUST  ROUTE  MEMB  ICOC  VoIP  ESN5 PRFX
SAT NCOS STATUS
---------------------------
 0  062-02       005  MCDN->EST  005   00    015    001   IO   H323   NO  ----
    NO   00  CS BUSY
 1  062-03       005  MCDN->EST  006   00    015    002   IO   H323   NO  ----
    NO   00  CS IDLE
---------------------------
VTRK State = Active
---------------------------
VTRK Status = Enabled
---------------------------
```
The following screen shows summary information on the status of the CS1000 Media Card, using the **itgCardShow** command available from the CLI of the Media Card (i.e., telnet to 192.168.1.31). In this case, the command was executed with a call actively using one of the virtual trunks.

```
IPL> itgCardShow

    Index : 0
    Type  : EXUT
    Role  : Follower
    Node  : 271
    Leader IP  : 192.168.1.33
    Card IP   : 192.168.1.31
    Card TN   : Slot 14
    Card State: ENBL
    Uptime   : 0 days, 5 hours, 59 mins, 6 secs (21546 secs)
    Codecs   : G711Ulaw(default), G711Alaw, G729A, G711CC, T38FAX

ELAN (ixpMac1) stat: 10 Mbps, Half duplex (Carrier OK)
TLAN (ixpMac0) stat: 100 Mbps, Full duplex (Carrier OK)

value = 1 = 0x1
```

The following screen shows summary information on the voice gateway status of the CS1000 Media Card, using the **vgwShow** command available from the CLI of the Media Card (i.e., telnet to 192.168.1.31). In this case, the command was executed with a call actively using a G.729A resource on the Nortel Media Card.

```
IPL> vgwShow

VGW Service is: Enabled

Chan   ChanState  CsAudioState  DspMode  Codec  Tn     Reg  AirTime  r
       xTsap       txTsap       -------  ------  ------  ----  ---------- ------
       -------------  -------------  ----------  -------  ------  ----------  
       17 Busy       RxTxOpen     Voice     G.729A-20 0x0d09 yes 12  192.1
68.1.31:5234 192.45.100.47:2052

value = 114 = 0x72 = 'r'
```

As previously mentioned, calls among the Avaya endpoints in “ip-network-region 1” will use G.711MU while calls across the IP Trunk will use G.729A. The following screens illustrate the similar concept for calls among the Nortel endpoints.

The following screen shows summary information on the voice gateway status of the CS1000 Media Card, using the **vgwShow** command available from the CLI of the Media Card (i.e., telnet to 192.168.1.31). In this case, the command was executed with an active call between a Nortel IP Telephone (192.45.100.73) and a Nortel digital telephone. A G.711 resource is being used for the call.
7.7 Multiple Calls Active over the Avaya-Nortel IP Trunk

The following screens were captured while two calls were active over the Avaya – Nortel IP Trunk. In this example, two Nortel telephones and two Avaya telephones were dialed into an Avaya Meet-Me Conference. (If one call at a time can be placed over the IP Trunk, but problems arise when a second concurrent call is attempted, verify the **Calls Share Signaling Connection** parameter is set to **no** on the Avaya signaling group.) The following screen shows that both members of Trunk Group 7 are active.

```
IPL> vgwShow
VGW Service is: Enabled
Chan ChanState  CsaAudioState  DspMode  Codec  Tn  Reg AirTime  r
xTsap  txTsap
-------- --------------- --------- --------- ------ --- ------- --------
---------- ------------------- ---------------
20 Busy  RxTxOpen       Voice  G.711-30  0x0d48 yes  47    192.1
68.1.31:5240 192.45.100.73:5200
value = 114 = 0x72 = 'r'
```

All participants in the conference were required to enter a passcode, and therefore success of this call requires that Communication Manager can properly interpret the out-of-band DTMF signals from the Nortel CS1000.

```
status trunk 7

TRUNK GROUP STATUS
Member  Port    Service State  Mtce Connected Ports
Busy
0007/001 T00032  in-service/active  no     S00002  001V202  T00033
0007/002 T00033  in-service/active  no     S00002  001V202  T00032
```

The following **status station** screens illustrate the media paths. Observe the two separate G.729A sessions over the two IP Trunks, and the use of G.711MU from the Avaya IP Telephone to the Avaya G450 VoIP resource. Note the trunk port (T000032) on the first screen.

```
status meet-me-vdn 24081

GENERAL STATUS
Extension: 24081
Conferee Ports
S00002  001V202  T00032  T00033
```
The following screen is another page for this same call. Note the second trunk port (T000033).

The next (edited) screen shows the signaling information available from the H323GwShow command from Nortel CS1000 for this same call.

### 7.8 Example of Call Using G.711MU over the IP Trunk

As stated previously, the configuration screens presented in these Application Notes show how to achieve G.729A over the IP Trunk. A compressed codec like G.729A might be chosen to conserve bandwidth for VoIP calls over the IP Trunk. Other codecs are also supported.
For example, the following screen shows a call from an Avaya IP Telephone to a Nortel IP Telephone across the IP Trunk using G.711MU. G.711MU might be configured to optimize voice quality when ample bandwidth is available.

The next (edited) screen shows the information available from the H323GwShow command from the Nortel CS1000 Signaling Server CLI for this same call.

To vary codec selection, the configured Communication Manager “ip-codec-set” can be changed (see the screen below), along with Nortel CS1000 parameters associated with inter-zone behavior (see Section 5.4). When G.711MU is selected, it is required that 10ms packet size be configured. Otherwise calls from Nortel IP telephones to Avaya IP telephones and digital telephones will not pass audio properly (including both ringback tone and talk path) to the Nortel IP telephones.
7.9 Example of Call Using Encryption Among the Avaya IP Devices

If it is desired to use media encryption among the Avaya IP devices, encryption can be enabled for the codec set used for the intra-region connections (e.g., codec set 1 in Section 4.2). The following status screen illustrates a call from an Avaya 9630 IP Telephone to a Nortel IP Telephone where the bolded Avaya intra-region connections use G.711MU and AES encryption, while the connection over the IP Trunk to Nortel continues to use G.729A and no encryption.

<table>
<thead>
<tr>
<th>status station 24030</th>
<th>SRC PORT TO DEST PORT TALKPATH</th>
</tr>
</thead>
<tbody>
<tr>
<td>src port: S00002</td>
<td>S00002:TX:192.45.100.44:2630/g711u/20ms/aes</td>
</tr>
<tr>
<td></td>
<td>001V023:RX:192.45.100.47:2054/g711u/20ms/aes:TX:ctxID:145</td>
</tr>
<tr>
<td></td>
<td>001V024:RX:ctxID:145:TX:192.45.100.47:2052/g729/20ms</td>
</tr>
<tr>
<td></td>
<td>T00033:RX:192.45.100.73:5200/g729a/20ms</td>
</tr>
<tr>
<td>dst port: T00033</td>
<td></td>
</tr>
</tbody>
</table>

For detailed configuration procedures for media encryption, the interested reader may wish to consult the Application Notes listed as reference [3] in Section 9.

8 Conclusion

As illustrated in these Application Notes, Communication Manager can interoperate with Nortel CS1000 using H.323 Trunks, inclusive of basic calling and out-of-band DTMF collection. Compared with other interoperable H.323 Trunk configurations, the main Communication Manager configuration differences for interoperability with the Nortel CS1000 are as follows. First, Direct IP-IP audio connections, often referred to as “shuffling”, must be disabled on the Avaya H.323 signaling group. Second, if compression using a G.729 variant is desired for calls involving the Nortel CS1000 Media Card, the Avaya “ip-codec-set” must be configured for “G.729A”.

9 References

The following documents from the Nortel Communication Server Electronic Reference Library CD contain information relevant to these Application Notes:


Avaya product documentation can be found at [http://support.avaya.com](http://support.avaya.com)
The following reference is among the many Application Notes available at [http://www.avaya.com](http://www.avaya.com)
