Avaya Solution & Interoperability Test Lab

Application Notes for Configuring Westell Interchange Convergence Switch3 with Avaya Communication Manager – Issue 1.0

Abstract

These Application Notes describe the configuration steps required for the Westell Interchange Convergence Switch3 (ICS3) to interoperate with Avaya Communication Manager. The ICS3 serves as a gateway between a traditional PBX with a Digital Private Network Signalling System (DPNSS) interface and a IP-based PBX with a Q.931/QSIG interface. All calls to and from a legacy DPNSS PBX are routed via the ICS3 gateway to Avaya Communication Manager.

Information in these Application Notes has been obtained through DevConnect compliance testing and additional technical discussions. Testing was conducted via the DevConnect Program at the Avaya Solution and Interoperability Test Lab.

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1. Introduction

These Application Notes describe a compliance-tested configuration consisting of a ICS3 gateway networked with Avaya Communication Manager via a QSIG trunk.

The ICS3 is a DPNSS/QSIG gateway. ICS3 connects via DPNSS trunk to traditional PBX and connects via a QSIG trunk to Avaya Communication Manager. All calls to and from a traditional DPNSS PBX are routed via the ICS3 gateway to Avaya Communication Manager. The following DPNSS and QSIG supplementary services were tested.

- Basic Call
- Call Hold /Retrieve
- Call Forward Busy/No answer/All
- Calling Name Display
- Call Transfer Attended
- Call Transfer Unattended
- Conference
- Call Waiting

In **Figure 1**, Avaya Communication Manager runs on the Avaya S8500 Server. The solution described herein is also extensible to other Avaya Servers and Media Gateways. The Avaya G650 Media Gateway is connected to the ICS3 via a QSIG trunk. The ICS3 in turn connects to the traditional PBX via a DPNSS trunk. During compliance testing an Avaya INDex was used to provide the DPNSS connection to the ICS3. Configuration of the Avaya INDex is not included in these Application Notes and the PBX providing the DPNSS connection will be referred to as the DPNSS PBX .

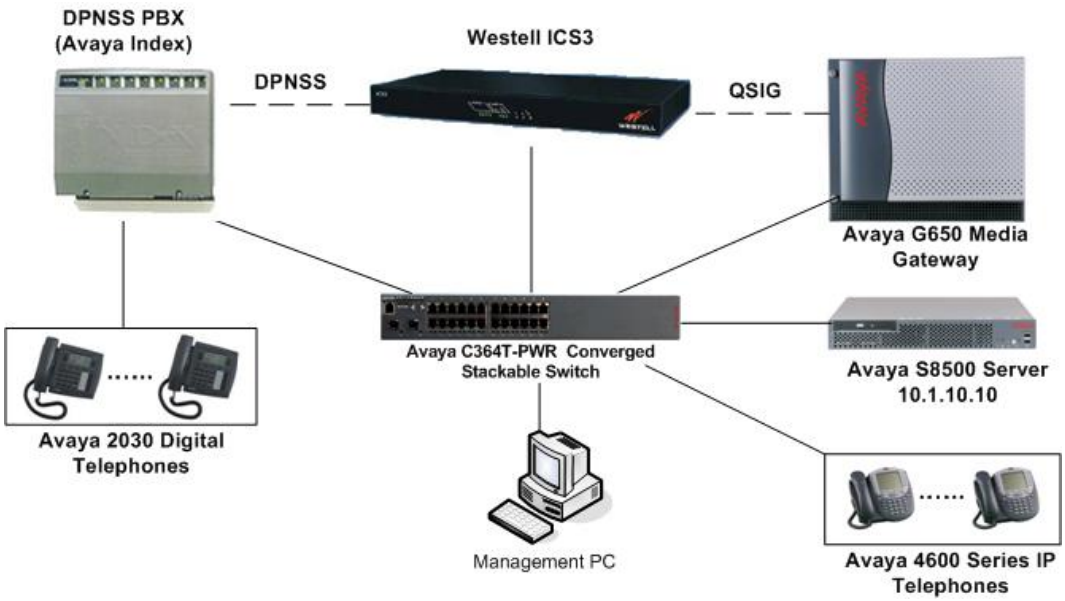

Figure 1: Network Diagram of the Compliance Tested Configuration

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2. Equipment and Software Validated

Equipment	Software
Avaya S8500B Server	Avaya Communication Manager 5.0 (R015x.00.0.825.4), patch 15175
Avaya G650 Media Gateway C-LAN TN799DP Medpro TN2302AP	 HW 1, FW24 HW 20, FW116
Avaya C364T-PWR Converged Stackable Switch	4.3.12
Avaya 4600 Series IP Telephones (H.323)	2.8
Avaya INDex	11.0
Westell Interchange Convergence Switch3 (ICS3)	IPH-DP-QS 1-0-0

3. Configure Avaya Communication Manager

Initial configuration of Avaya Communication Manager is beyond the scope of these Application Notes. See Section 9 for Avaya documentation references. This section illustrates the configuration of the DS1 board, QSIG trunk and signalling group, AAR analysis, and route patterns used in the compliance-tested configuration. The steps are performed from the System Access Terminal (SAT) interface.

Step	Description
1.	On Page 4 of the **System-Parameters Customer-Options** form, verify that the **ISDN-PRI** is set to "y".

```
display system-parameters customer-options                    Page   4 of  10
                                OPTIONAL FEATURES

   Emergency Access to Attendant? y                              IP Stations? y
            Enable 'dadmin' Login? y
            Enhanced Conferencing? n                        ISDN Feature Plus? n
                     Enhanced EC500? y        ISDN/SIP Network Call Redirection? n
    Enterprise Survivable Server? n                           ISDN-BRI Trunks? n
       Enterprise Wide Licensing? n                                 ISDN-PRI? y
              ESS Administration? n                Local Survivable Processor? n
          Extended Cvg/Fwd Admin? n                      Malicious Call Trace? n
     External Device Alarm Admin? n                   Media Encryption Over IP? n
  Five Port Networks Max Per MCC? n     Mode Code for Centralized Voice Mail? n
                  Flexible Billing? n
   Forced Entry of Account Codes? n                   Multifrequency Signaling? y
      Global Call Classification? n          Multimedia Call Handling (Basic)? n
             Hospitality (Basic)? y       Multimedia Call Handling (Enhanced)? n
 Hospitality (G3V3 Enhancements)? n                Multimedia IP SIP Trunking? n
                       IP Trunks? Y
```


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Step	Description
2.	On Page 8 of the **System-Parameters Customer-Options** form, verify that the **Basic Call Setup** and **Basic Supplementary Services** is set to "y". display system-parameters customer-options Page 8 of 10 QSIG OPTIONAL FEATURES **Basic Call Setup? y** **Basic Supplementary Services? y** Centralized Attendant? n Interworking with DCS? n Supplementary Services with Rerouting? n Transfer into QSIG Voice Mail? n Value-Added (VALU)? n
3.	Enter **add ds1** <board location> command, where the board location is an available DS1 circuit pack. The DS1 circuit pack was configured with the following parameters highlighted in bold, as shown below. add ds1 01a11 Page 1 of 1 DS1 CIRCUIT PACK Location: 01A11 **Name: Westell** **Bit Rate: 2.048** **Line Coding: hdb3** **Signaling Mode: isdn-pri** **Connect: pbx** **Interface: peer-master** TN-C7 Long Timers? n **Peer Protocol: Q-SIG** Interworking Message: PROGress Side: a **Interface Companding: alaw** **CRC? y** **Idle Code: 01010100** **Channel Numbering: timeslot** DCP/Analog Bearer Capability: 3.1kHz T303 Timer(sec): 4 Disable Restarts? n Slip Detection? n Near-end CSU Type: other

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Step	Description

4.	Enter the **add trunk-group n** command, where "n" is an available trunk group number. On Page 1 of the **trunk-group** form, configure the following:
	• **Group Type** – set to "isdn".
	• **Group Name** – enter a meaningful name/description.
	• **TAC** – enter a Trunk Access Code that is valid under the provisioned dial plan.
	• **Carrier Medium** – set to "PRI/BRI".
	• **Service Type** – set to "tie".
	
	`add trunk-group 40 Page 1 of 21`
	`TRUNK GROUP`
	
	`Group Number: 40 **Group Type: isdn** CDR Reports: y`
	`**Group Name: Westell** COR: 1 TN: 1 **TAC: 740**`
	`Direction: two-way Outgoing Display? n **Carrier Medium: PRI/BRI**`
	`Dial Access? n Busy Threshold: 255 Night Service:`
	`Queue Length: 0`
	`**Service Type: tie** Auth Code? n TestCall ITC: rest`
	`Far End Test Line No:`
	`TestCall BCC: 4`

5.	On Page 2, set the **Supplementary Service Protocol** to "b" for the QSIG protocol. Set the **Digit Handling (in/out)** to "overlap/enbloc".
	
	`add trunk-group 40 Page 2 of 21`
	`Group Type: isdn`
	
	`TRUNK PARAMETERS`
	`Codeset to Send Display: 6 Codeset to Send National IEs: 6`
	`Max Message Size to Send: 260 Charge Advice: none`
	`**Supplementary Service Protocol: b** **Digit Handling (in/out): overlap/enbloc**`
	
	`Trunk Hunt: cyclical`
	`Digital Loss Group: 13`
	`Incoming Calling Number - Delete: Insert: Format:`
	`Bit Rate: 1200 Synchronization: async Duplex: full`
	`Disconnect Supervision - In? y Out? n`
	`Answer Supervision Timeout: 0`
	`Administer Timers? n`

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Step	Description
6.	On Page 3 of the trunk-group form, set the **Send Name**, **Send Calling Number** and **Send Connected Number** to "y" and set the **Format** is set to "private" as shown below. add trunk-group 40 Page 3 of 21 TRUNK FEATURES ACA Assignment? n Measured: none Wideband Support? n Internal Alert? n Maintenance Tests? y Data Restriction? n NCA-TSC Trunk Member: **Send Name: y** **Send Calling Number: y** Used for DCS? n Hop Dgt? n Send EMU Visitor CPN? n Suppress # Outpulsing? n **Format: private** Outgoing Channel ID Encoding: preferred UUI IE Treatment: service-provider Replace Restricted Numbers? n Replace Unavailable Numbers? n **Send Connected Number: y** Hold/Unhold Notifications? y Send UUI IE? y Modify Tandem Calling Number? n Send UCID? n Send Codeset 6/7 LAI IE? y Ds1 Echo Cancellation? N
7.	Enter the **add signaling-group n** command, where "n" is an unused signalling group number. On Page 1 of the form, configure the following: • **Group Type** – set to "isdn-pri". • **Primary D-Channel** – enter the channel for the DS1 board configured in Step 3. • **Trunk Group for Channel Selection** – enter the number of the trunk group configured in Step 4. • **TSC Supplementary Service Protocol –** set to "b" to match the service protocol set in Step 5. • **Max number of CA TSC –** Enter the number of Channel Associated Temporary Signalling Connections to be used. add signaling-group 40 Page 1 of 1 SIGNALING GROUP Group Number: 40 **Group Type: isdn-pri** Associated Signaling? y Max number of NCA TSC: **Primary D-Channel: 01A1116** **Max number of CA TSC: 5** Trunk Group for NCA TSC: **Trunk Group for Channel Selection: 40** **TSC Supplementary Service Protocol: b**

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Step	Description

8.	Enter the **change trunk-group n** command, where "n" is the trunk group number configured in Step 4. On Page 5 of the **trunk-group** form, configure the **Port** numbers (the port field value is the DS1 board location followed by the trunk group number) and the associated **Sig Grp** (signalling group) configured in the previous step. The number of trunk members required would vary; for compliance testing only 5 trunk members were configured.
	
	`change trunk-group 40 Page 5 of 21`
	`TRUNK GROUP`
	`Administered Members (min/max): 1/30`
	`GROUP MEMBER ASSIGNMENTS Total Administered Members: 5`
	
	`Port Code Sfx Name Night Sig Grp`
	`1: 01A1101 TN2464 40`
	`2: 01A1102 TN2464 40`
	`3: 01A1103 TN2464 40`
	`4: 01A1104 TN2464 40`
	`5: 01A1105 TN2464 40`

9.	Enter the **change route-pattern n** command, where "n" is the route pattern that processes dialed numbers configured in the aar analysis table in the next step. Configure the following on the route-pattern form.
	• **Grp No** – enter the trunk group number configured in Step 4 to route calls to ICS3.
	• **FRL** - assign a Facility Restriction Level to this routing preference.
	• **TSC** – set to "y".
	• **CA-TSC** – set to "as-needed".
	
	`change route-pattern 40 Page 1 of 3`
	`Pattern Number: 40 Pattern Name: `**`Westell`**
	`SCCAN? n Secure SIP? N`
	`Grp FRL NPA Pfx Hop Toll No. Inserted DCS/ IXC`
	`No Mrk Lmt List Del Digits QSIG`
	`Dgts Intw`
	`1: `**`40 0`**` n user`
	`2: 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 `**`y as-needed`**` rest none`
	`2: y y y y y n n rest none`

10.	Enter the **change aar analysis** 0 command. During compliance testing extension range 2xxx was used for the DPNSS PBX telephones. Enter "2" for the **Dialed String** field and "4" for the **Min** and **Max** fields. Set the **Route Pattern** to the number configured in the previous step.
	
	`change aar analysis 0 Page 1 of 2`
	`AAR DIGIT ANALYSIS TABLE`
	`Location: all Percent Full: 0`
	
	`Dialed Total Route Call Node ANI`
	`String Min Max Pattern Type Num Reqd`
	`2 4 4 40 aar`` n`
	`3 5 5 3 aar n`

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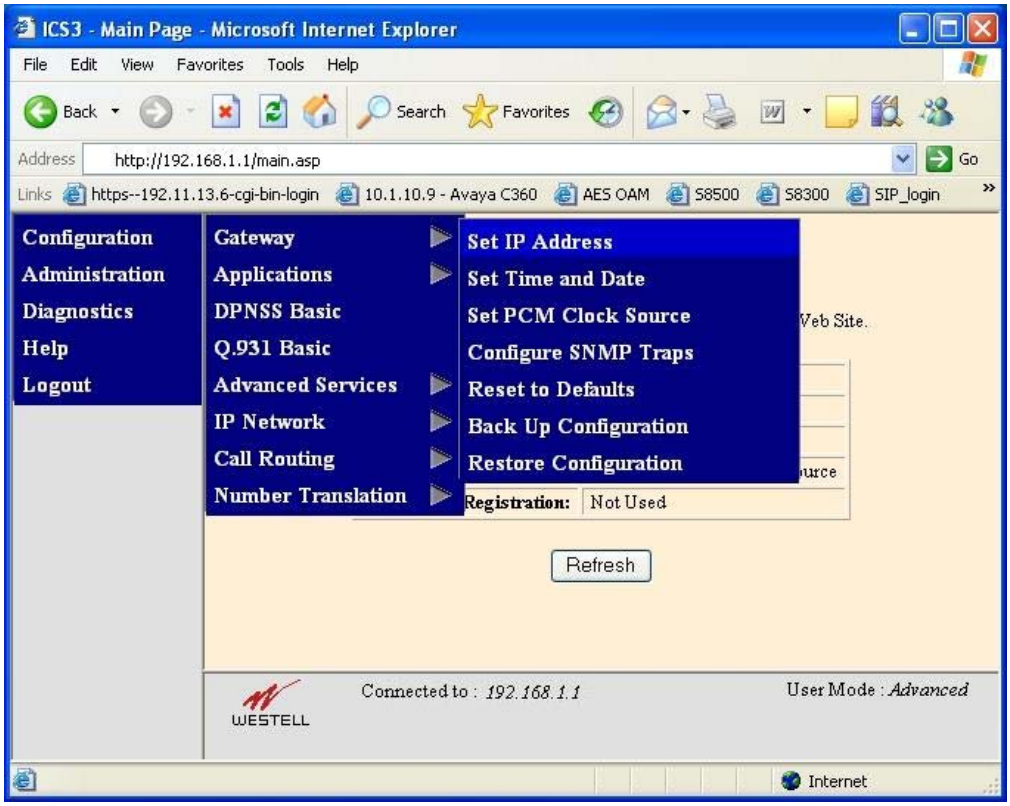
4. Configure the ICS3

This section includes the necessary configuration steps to allow the ICS3 to network with the traditional DPNSS PBX and Avaya Communication Manager and to route calls between them.

Step	Description
1.	Connect the management PC directly to the ICS3 and open a web browser and enter the following ICS3 default URL "http://192.168.1.1". Log in using the appropriate user name and password. Although not necessary for compliance testing it is possible to set the IP address of the ICS3 by selecting **Configuration → Gateway → Set IP Address**. 

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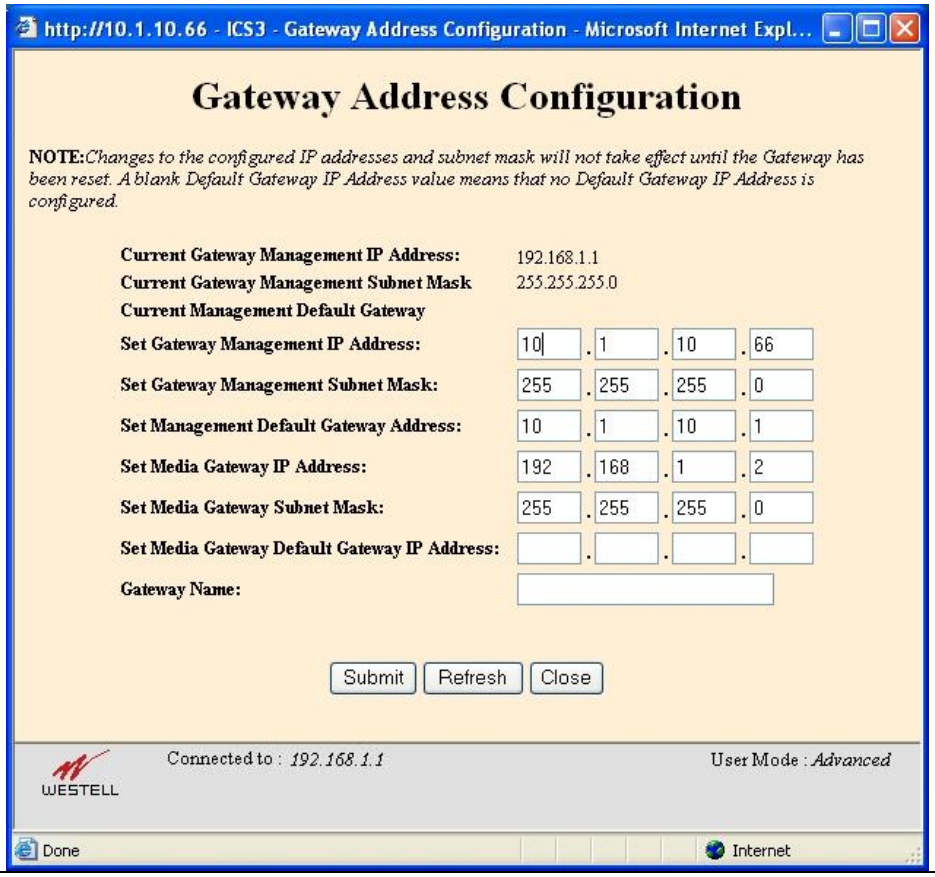
Step	Description
2.	The following parameters were configured so the ICS3 could be accessible on the test network • Set Gateway Management IP Address • Set Gateway Management Subnet Mask • Set Management Default Gateway Address The remaining fields may be left at their default values. Click on **Submit**. To reset ICS3, from the main screen select **Administration → Reboot**.



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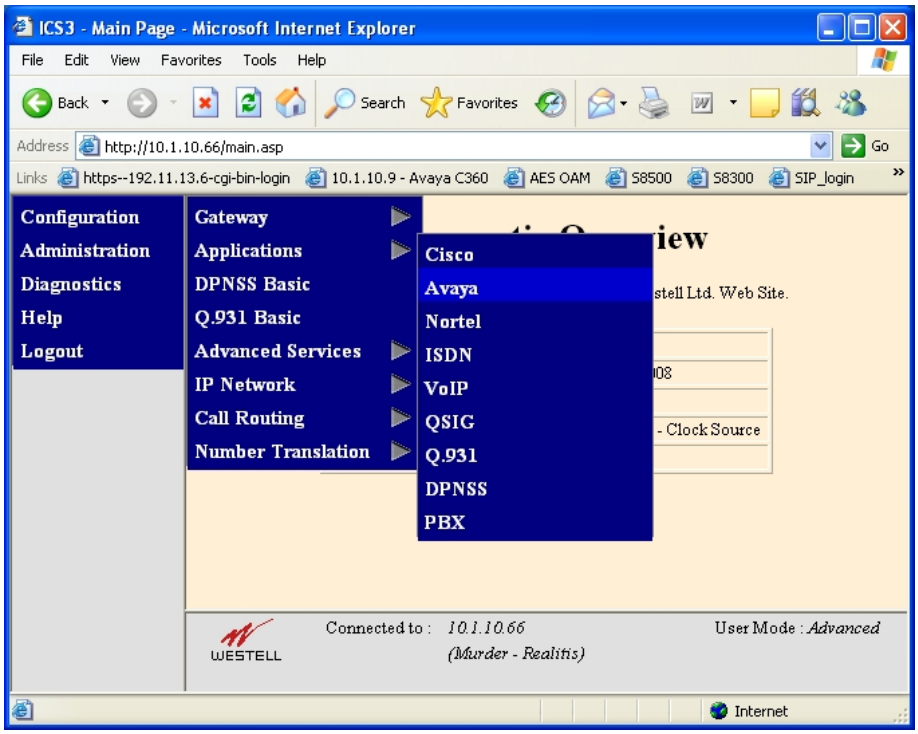
Step	Description
3.	Open a web browser from the management PC connected to the test network and enter the IP address configured in the previous step as the URL. Select **Configuration → Applications → Avaya**. 

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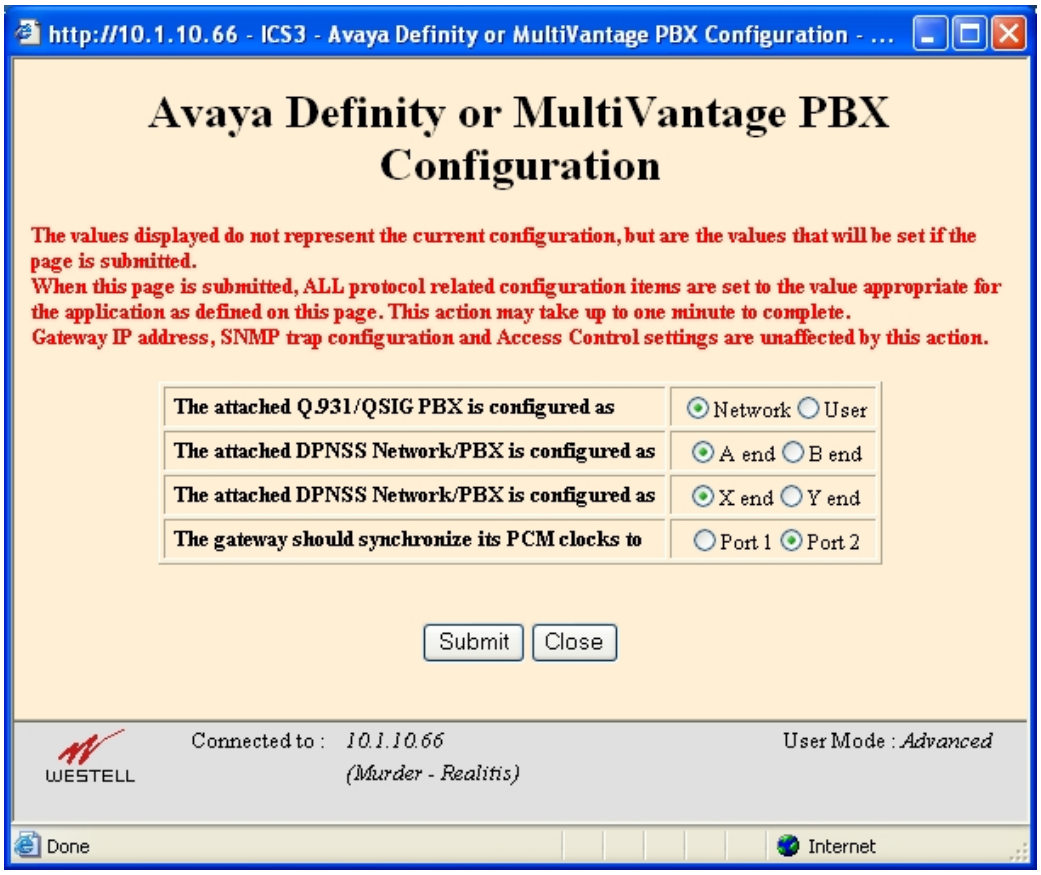
Step	Description
4.	The following preset application is provided for quick configuration. Configure the following parameters to reflect the configuration of Avaya Communication Manager in Section 3 and the pre-configured DPNSS PBX as shown below. Port 2 was connected to the DPNSS PBX. Click on **Submit**.



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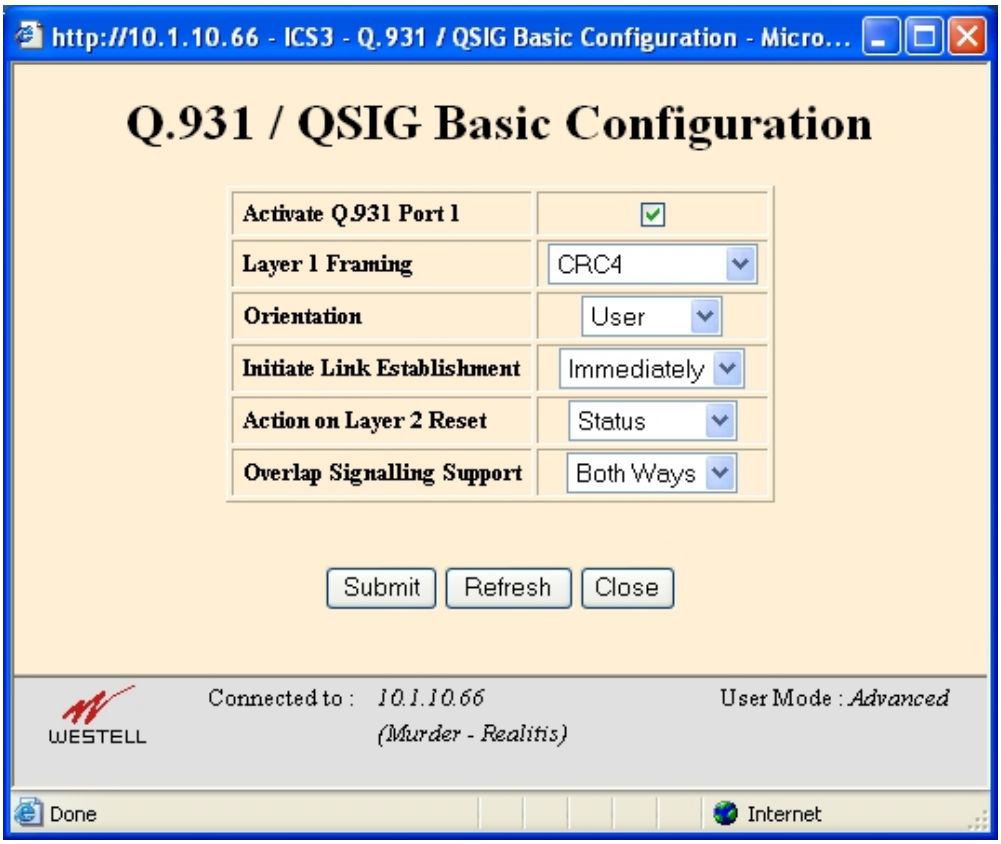
Step	Description
5.	Select **Configuration → Q.931 Basic**. Verify the default ICS3 **Layer 1 Framing** and **Orientation** settings with the **CRC** and **Interface** settings configured for Avaya Communication Manager DS1 circuit pack in Section 3, Step 3. Verify the **Digit Handling(In/Out)** setting configured on the trunk group in Section 3, Step 5 with the **Overlap Signalling Support**. Click on **Close**.



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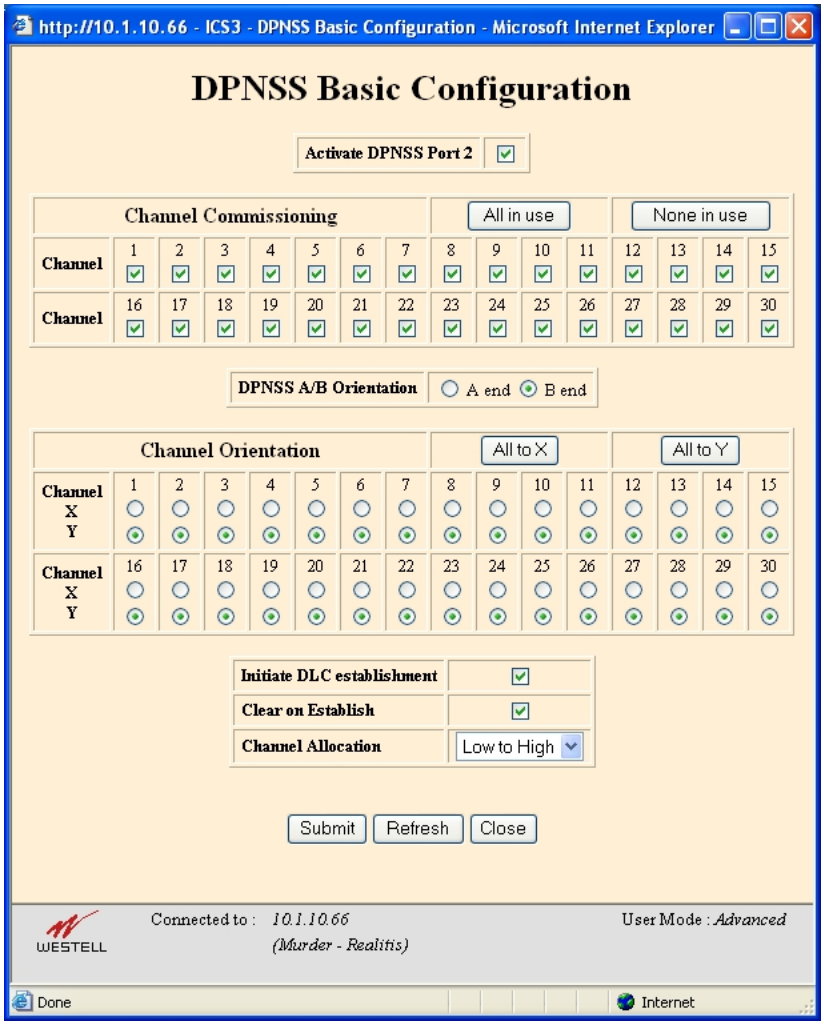
Step	Description
6.	Select **Configuration → DPNSS Basic**. The screen below shows the ICS3 DPNSS basic settings no changes were made to the DPNSS basic configuration settings. Note: The DPNSS PBX was pre-configured with signalling channel set as "A" and the frame format set as Double Frame (DF). Click on **Close**.



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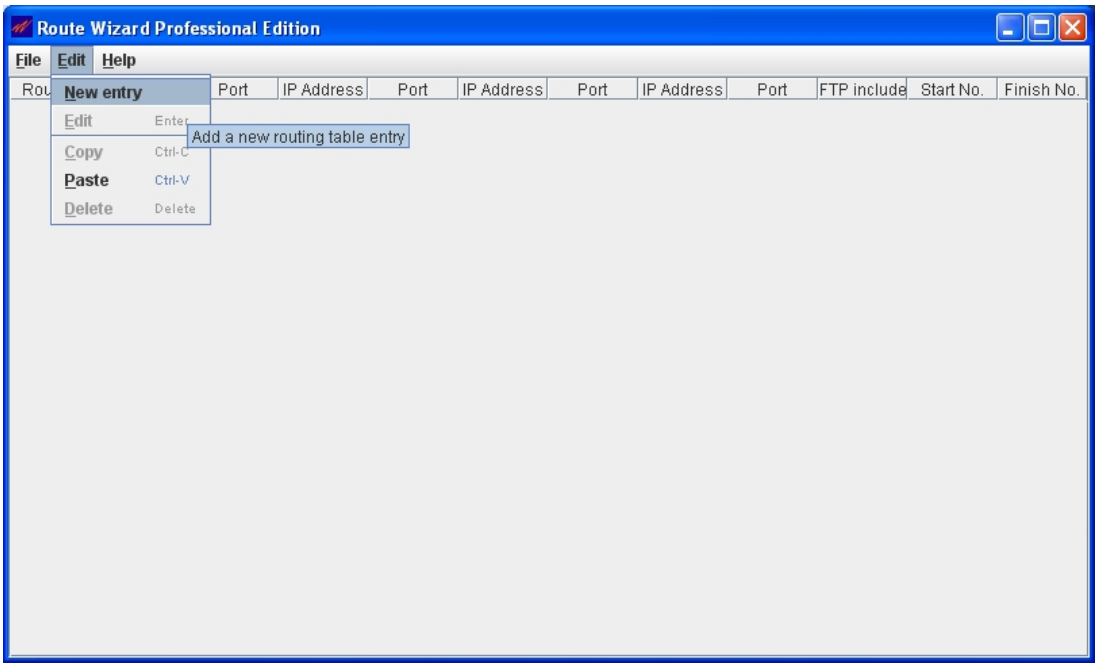
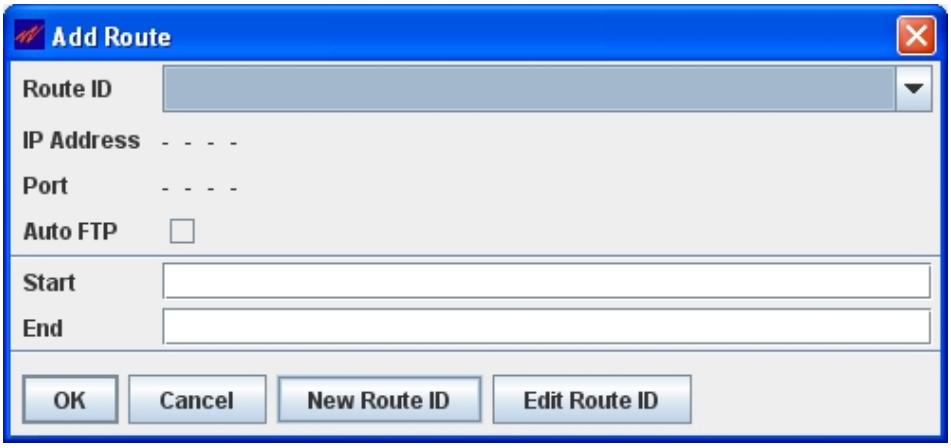
Step	Description
7.	The routing of calls between the DPNSS PBX and Avaya Communication Manager is done via the Route Wizard application. On the management PC, click on the Route Wizard application icon located on the desktop. From the tool bar select **Edit → New Entry**. 
8.	In the **Add Route** dialog box click on **New Route ID**. 

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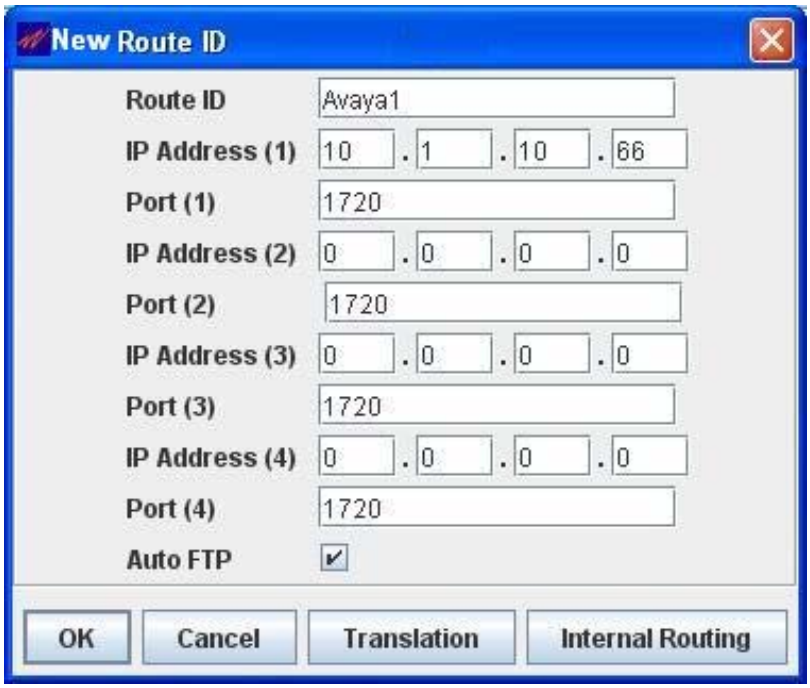
Step	Description
9.	Enter a descriptive name in the Route ID field. Enter the ICS3 IP address configured in Step 2 in the IP Address (1) field. The remaining fields may be left at their default values. Click on **Internal Routing**. 

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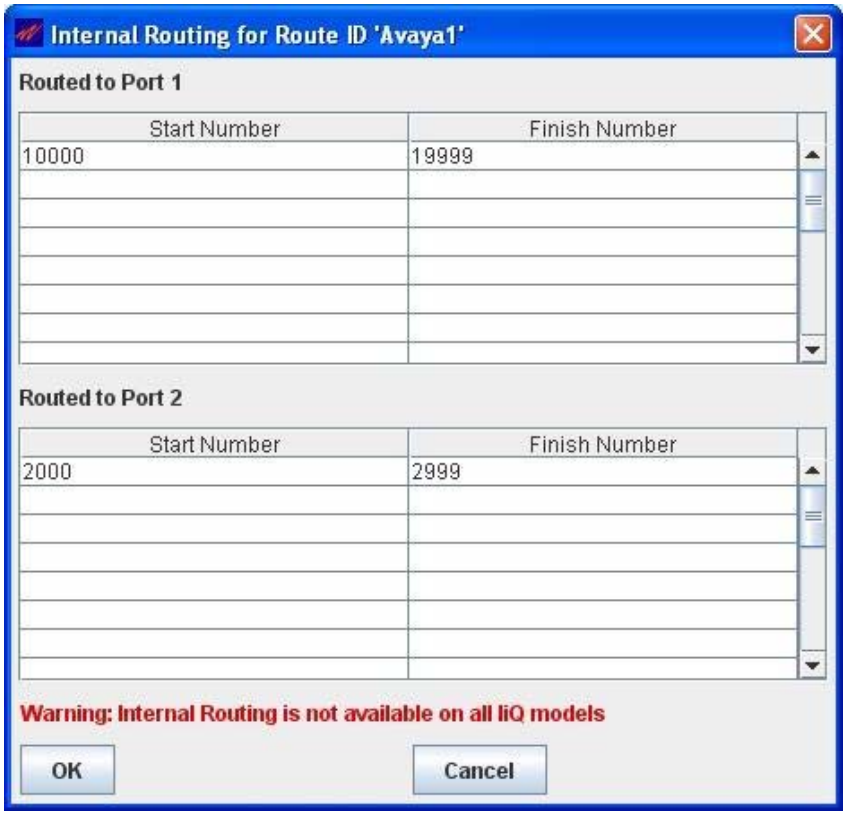
Step	Description
10.	For calls to be **Routed to Port 1** (Avaya Communication Manager), enter the telephone extension range for Avaya Communication Manager telephones in the **Start Number** and **Finish Number** fields. For calls to be **Routed to Port 2** (DPNSS PBX). Enter the telephone extension range for the DPNSS PBX telephones in the **Start Number** and **Finish Number** fields. Click **OK**. 
11.	Click **OK** on the New Route ID and the Add Route dialog box. From the tool bar select **File → Save routing tables as**. Select an appropriate name and location for the routing tables to be saved. A batch file is created along with the following 3 configuration files. • IP Route ID table Configuration File • Internal Route ID Table Configuration File • IP Address Table Configuration File Double click to execute the batch file. The batch file upon execution will upload the 3 configuration files to ICS3.

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5. Interoperability Compliance Testing

The interoperability compliance testing focused on verifying the ICS3, DPNSS connection to the DPNSS PBX and the QSIG connection to Avaya Communication Manager, and testing the DPNSS PBX and Avaya Communication Manager end to end basic calls and supplementary services via the ICS3.

5.1. General Test Approach

The general approach was to place inbound and outbound calls and test supplementary services to and from the DPNSS PBX through the ICS3 and verify successful call completion. The following DPNSS and QSIG supplementary services were tested.

- Basic Call
- Call Hold /Retrieve
- Call Forward Busy/No answer/All
- Calling Name Display
- Call Transfer Attended
- Call Transfer Unattended
- Conference
- Call Waiting

Serviceability tests were carried out by disconnecting the DPNSS link and then QSIG link.

5.2. Test Results

All tests passed successfully.

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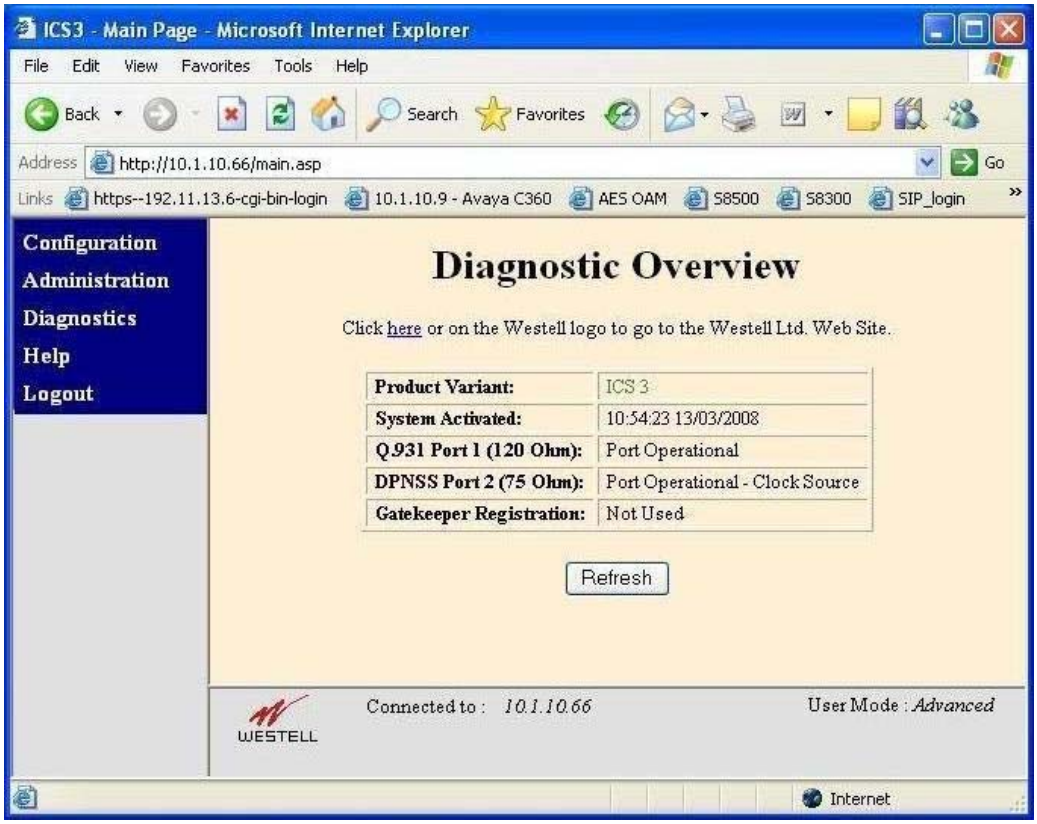
6. Verification Steps

This section provides the tests that can be performed to verify proper configuration of Avaya Communication Manager and ICS3.

Step	Description
1.	From the SAT, enter the command **status signaling-group s**, where s is the number of a signaling group configured in Section 3, Step 7, and verify that the Group State is "in service". From the SAT, enter the command **status trunk-group t**, where t is the number of a trunk group configured in Section 3, Step 4, and verify that the Service States of all trunks are "in-service/idle" or "in-service/active".
2.	Verify that ICS3 is operational by selecting Diagnostic. On Diagnostic Over view page verify both Q.931 Port1(120 Ohm) and DPNSS Port 2 (75 Ohm) are operational. 

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7. Support

If technical support is required for Westell ICS3 , contact Technical Support.

Email: support@westell.co.uk

Phone: 0906 5500 722

8. Conclusion

These Application Notes describe the configuration steps required for ICS3 version IPH-DP-QS 1-0-0 to successfully interoperate with Avaya Communication Manager 5.0. All feature functionality and serviceability test cases were completed successfully.

9. Additional References

This section references the Avaya and ICS3 product documentation that are relevant to these Application Notes.

The following Avaya Documents are available at http://support.avaya.com

- *Administrator Guide for Avaya Communication Manager (5.0),* Document ID 03-300509, Issue 4, January 2008.

The following documents can be requested from Westell by sending an e-mail to helpdesk@westell.co.uk.

- Interchange Convergence Switch3 (ICS3): ics3user3.pdf
- ICS3 Technical Specification: ICS3Brochurefin.pdf

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