



## **Avaya Solution & Interoperability Test Lab**

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# **Application Notes for RAD Data Communications Vmux Gateway with Avaya Communication Manager using an E1 interface - Issue 1.0**

## **Abstract**

These Application Notes describe a solution for integrating RAD Data Communications Vmux Gateways with Avaya Communication Manager on two different media gateways, Avaya G650 and Avaya G350. RAD Vmux Gateways are connected to Avaya gateways through an E1 interface. RAD Vmux is a TDM over IP gateway that enables the TDM T1/E1 circuits to be extended over an IP/Ethernet network.

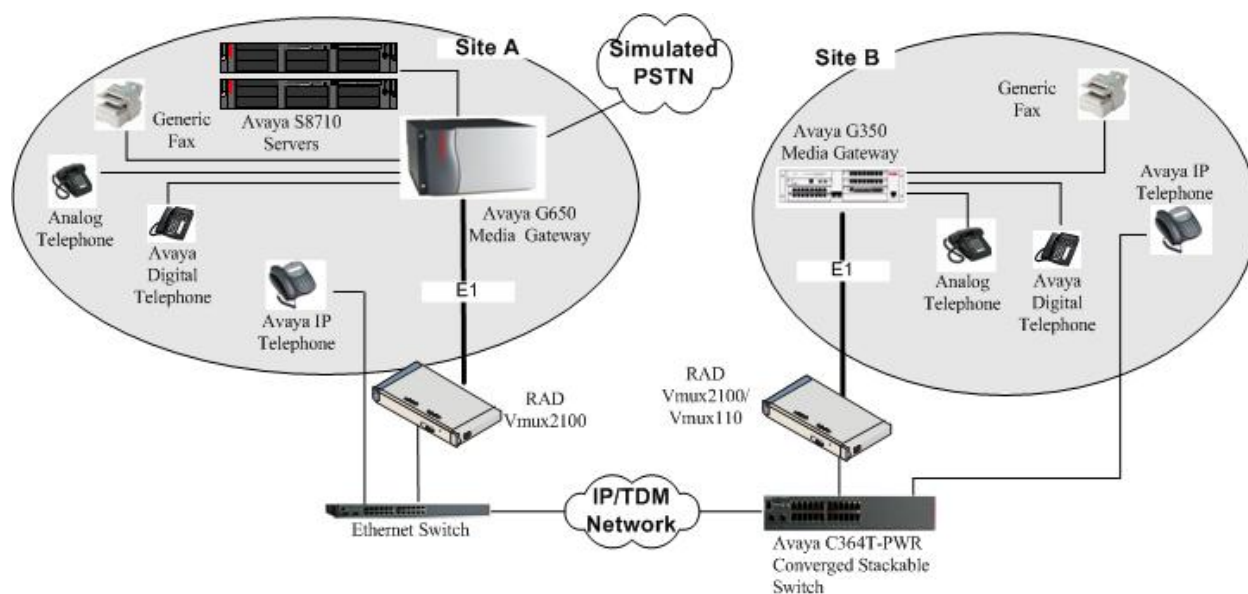
Information in these Application Notes has been obtained through DevConnect compliance testing and additional technical discussions. Testing was conducted via the DevConnect Program at the Avaya Solution and Interoperability Test Lab.

# 1. Introduction

These Application Notes describe a solution for integrating RAD Data Vmux Gateways (Vmux) with Avaya Communication Manager on two different media gateways, Avaya G650 (G650) and Avaya G350 (G350). RAD Vmux gateways are connected to Avaya gateways through an E1 interface. RAD Vmux is a TDM over IP (TDMoIP) gateway that enables the TDM T1/E1 circuits to be extended over an IP/Ethernet network. RAD Vmux deploys TDMoIP technology to extend voice and signaling protocols transparently over packet networks. An Avaya C364T-PWR Converged Stackable Switch and MM314 Power over Ethernet (PoE) HDDDM Media Module on Avaya G350 were interconnected to each end of the RAD Vmux gateway to provide the IP packet network.

For additional information on RAD Vmux, refer to [3].

**Figure 1** illustrates the network configuration used to verify the RAD Data Communications solution. An E1 interface was used between RAD Vmux and Avaya gateways. During the test, two RAD Vmux products (Vmux 2100 and Vmux 110) were used.



**Figure 1 Test configuration of RAD Vmux with Avaya G650 and Avaya G350 Media Gateways (E1 Interface)**

## 2. Equipment and Software Validated

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

Equipment		Software/Firmware
Avaya S8710 Servers		Avaya Communication Manager 5.0 (R015x.00.0.825.4)
Avaya G650 Media Gateway with S8710 Servers		Avaya Communication Manager 5.0 (R015x.00.0.825.4)
	TN464GP DS1 Card	HW02 FW 022
	TN2312BP IP Server Interface	HW12 FW 40
	TN799DP C-LAN Interface	HW01 FW 26
Avaya C364T-PWR Converged Stackable Switch		4.5.14
Avaya 4600 Series SIP Telephones		2.2.2 (4610SW SIP) 2.3 (4602SW H.323) 2.6 (4610SW H.323) 2.5 (4625SW H.323)
Avaya one-X Desktop Edition		2.1 SP2
Avaya 6400 and 8400 Series Digital Telephones		-
Avaya G350 Media Gateway with S8300B Server		Avaya Communication Manager 4.0 (R014x.00.1.731.2)
	MM710AP DS1 Card	HW02 FW 018
	MM314 PoE HDDM Media Module	HW00 FW 00
RAD Devices		
	Vmux2100	HW 02.00 SW 04.06
	Vmux110	HW 01.00 SW 04.06

## 3. Configure Avaya Communication Manager

This section describes the necessary configuration on Avaya Communication Manager for E1 operations with Vmux. Configuration steps for configuring Avaya G650 and Avaya G350 are almost identical. Differences in configuration will be pointed out. The configuration of Avaya Communication Manager was performed using the System Access Terminal (SAT). Configuration in the following sections is only for the fields where a value needs to be entered or modified. Default values are used for all other fields. After completion of the configuration in this section, perform a **save translations** command to make the changes permanent. Refer to [1] for additional details.

### 3.1. Verifying System Parameters

These steps are common for Avaya G650 and Avaya G350 and are to verify that the proper options are set.

Step	Description
1.	<p>Enter the <b>display system-parameters customer-options</b> command and proceed to <b>Page 3</b> to verify that <b>DS1 MSP</b> field is set to <b>y</b>.</p> <pre> display system-parameters customer-options                                     Page   3 of  10      Abbreviated Dialing Enhanced List? n          Audible Message Waiting? n       Access Security Gateway (ASG)? n          Authorization Codes? n     Analog Trunk Incoming Call ID? n Backup Cluster Automatic Takeover? n A/D Grp/Sys List Dialing Start at 01? n          CAS Branch? n Answer Supervision by Call Classifier? n          CAS Main? n       ARS? y          Change COR by FAC? n       ARS/AAR Partitioning? y Computer Telephony Adjunct Links? n     ARS/AAR Dialing without FAC? y    Cvg Of Calls Redirected Off-net? n     ASAI Link Core Capabilities? n          DCS (Basic)? n     ASAI Link Plus Capabilities? n          DCS Call Coverage? n     Async. Transfer Mode (ATM) PNC? n          DCS with Rerouting? n     Async. Transfer Mode (ATM) Trunking? n       ATM WAN Spare Processor? n    Digital Loss Plan Modification? n       ATMS? n          DS1 MSP? y       Attendant Vectoring? n          DS1 Echo Cancellation? y           </pre>
2.	<p>Proceed to <b>Page 5</b> and verify that <b>Station and Trunk MSP</b> field is set to <b>y</b>.</p> <pre> display system-parameters customer-options                                     Page   5 of  10                                 OPTIONAL FEATURES      Multinational Locations? n          Station and Trunk MSP? y Multiple Level Precedence &amp; Preemption? n    Station as Virtual Extension? n       Multiple Locations? n          System Management Data Transfer? n     Personal Station Access (PSA)? n          Tenant Partitioning? n       Posted Messages? n          Terminal Trans. Init. (TTI)? n       PNC Duplication? n          Time of Day Routing? n       Port Network Support? y          Uniform Dialing Plan? y           Usage Allocation Enhancements? y     Processor and System MSP? n          TN2501 VAL Maximum Capacity? y       Private Networking? y          Wideband Switching? n       Processor Ethernet? n          Wireless? y      Remote Office? n Restrict Call Forward Off Net? y       Secondary Data Module? y           </pre>

## 3.2. Configuring DS1 for ISDN-PRI Trunks

The DS1 board can be configured to 24 channels T1 or 32 channels E1 mode. Following steps are for configuring a DS1 card for the ISDN-PRI trunks in E1 mode. **Step 1** is for configuring DS1 card on Avaya G650 and **Step 2** is for configuring DS1 card on Avaya G350.

Step	Description
1.	<p>Configure as follows for Avaya G650:</p> <ul style="list-style-type: none"><li>On DS1 board, move the channel selection switch to 32.</li><li>Enter the <b>add ds1 1a07</b> command and configure as follows:<ul style="list-style-type: none"><li><b>Name</b> – Any descriptive string.</li><li><b>Bit Rate</b> – Set to <b>2.048</b>.</li><li><b>Line Coding</b> – Set to <b>hdb3</b>.</li><li><b>Signaling Mode</b> – Set to <b>isdn-pri</b>.</li><li><b>Connect</b> – Set to <b>pbx</b>.</li><li><b>Interface</b> – Set to <b>network</b>.</li><li><b>Interface Companding</b> – Set to <b>alaw</b>.</li></ul></li></ul>
	<pre>add ds1 1a07                                     Page 1 of 2 DS1 CIRCUIT PACK Location: 01A07                                Name: E1 VMUX Bit Rate: 2.048                                Line Coding: hdb3 Signaling Mode: isdn-pri Connect: pbx                                   Interface: network TN-C7 Long Timers? n                           Country Protocol: 1 Interworking Message: PROGress                 Protocol Version: a Interface Companding: alaw                     CRC? n Idle Code: 11111111 DCP/Analog Bearer Capability: 3.1kHz T303 Timer(sec): 4 Slip Detection? n                             Near-end CSU Type: other</pre>

Step	Description
2.	<p>Enter the <b>add ds1 1v5</b> command and configure as follows for Avaya G350:</p> <ul style="list-style-type: none"> <li>• <b>Name</b> – Set to any descriptive string.</li> <li>• <b>Bit Rate</b> - Set to <b>2.048</b> for E1.</li> <li>• <b>Line Coding</b> – Set to <b>hdb3</b>.</li> <li>• <b>Signaling Mode</b> – Set to <b>isdn-pri</b>.</li> <li>• <b>Connect</b> – Set to <b>pbx</b></li> <li>• <b>Interface</b> – Set to <b>user</b>.</li> <li>• <b>Interface Companding</b> – Set to <b>alaw</b>.</li> </ul> <p>Note: DS1 board has a soft setting for changing it from T1 to E1 and vice versa.</p> <pre> add ds1 1v5                                     Page 1 of 2  DS1 CIRCUIT PACK        Location: 001V5                               Name: E1 VMUX       Bit Rate: 2.048                               Line Coding: hdb3        Signaling Mode: isdn-pri       Connect: pbx                                   Interface: user TN-C7 Long Timers? n                               Country Protocol: 1 Interworking Message: PROGress                       Protocol Version: a Interface Companding: alaw                           CRC? n       Idle Code: 11111111  DCP/Analog Bearer Capability: 3.1kHz   T303 Timer(sec): 4  Slip Detection? n                               Near-end CSU Type: other </pre>

### 3.3. Configuring ISDN-PRI Trunks

To configure the trunks, a trunk group is added and then a signaling group for that trunk group is added. The trunk group is then modified to add the members of the trunk group.

Step	Description
1.	<p>Enter the <b>add trunk-group &lt;t&gt;</b>, where <b>t</b> is an available trunk group and configure as follows:</p> <ul style="list-style-type: none"> <li>• <b>Group Type</b> – Set to <b>isdn</b>.</li> <li>• <b>Group Name</b> – Set to any descriptive string.</li> <li>• <b>TAC</b> – Enter any value per the dial plan. Set to <b>141</b> for this compliance testing.</li> <li>• <b>Service Type</b> – Set to <b>tie</b>.</li> </ul> <pre> add trunk-group 41                                     Page 1 of 21                                      TRUNK GROUP  Group Number: 41                                     Group Type: isdn          CDR Reports: y Group Name: E1 PRI                                     COR: 1                  TN: 1          TAC: 141 Direction: two-way                                     Outgoing Display? n     Carrier Medium: PRI/BRI Dial Access? y   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 </pre>
2.	<p>Enter the <b>add signaling-group &lt;s&gt;</b> command, where <b>s</b> is an available signaling group and configure as follows:</p> <ul style="list-style-type: none"> <li>• <b>Group Type</b> – Set to <b>isdn-pri</b>.</li> <li>• <b>Primary D-Channel</b> – Set to <b>01A0716</b> for E1.</li> <li>• <b>Trunk Group for Channel Selection</b> – Set to <b>41</b>, the trunk group created in Step 1.</li> </ul> <pre> add signaling-group 41                               Page 1 of 5                                      SIGNALING GROUP  Group Number: 41                                     Group Type: isdn-pri Associated Signaling? y                               Max number of NCA TSC: 0 Primary D-Channel: 01A0716                           Max number of CA TSC: 0 Trunk Group for Channel Selection:41                  Trunk Group for NCA TSC: Supplementary Service Protocol: a </pre>

Step	Description
3.	<p>Enter <b>change trunk-group &lt;t&gt;</b> command, where <b>t</b> is the trunk group created in <b>Step 1</b> and go to <b>Page 5</b> of the <b>trunk-group</b> form. Add 15 ports along with signaling group created in <b>Step 2</b>.</p> <pre> change trunk-group 41 Page 5 of 21 TRUNK GROUP Administered Members (min/max): 0/0 GROUP MEMBER ASSIGNMENTS Total Administered Members: 0 Port Code Sfx Name Night Sig Grp 1: 01a0701 TN464 G 41 2: 01a0702 TN464 G 41 3: 01a0703 TN464 G 41 4: 01a0704 TN464 G 41 5: 01a0705 TN464 G 41 6: 01a0706 TN464 G 41 7: 01a0707 TN464 G 41 8: 01a0708 TN464 G 41 9: 01a0709 TN464 G 41 10: 01a0710 TN464 G 41 11: 01a0711 TN464 G 41 12: 01a0712 TN464 G 41 13: 01a0713 TN464 G 41 14: 01a0714 TN464 G 41 15: 01a0715 TN464 G 41 </pre>
4.	<p>Go to <b>Page 6</b> of the <b>trunk-group</b> form and enter remaining 15 ports. Port <b>16</b> is used for signaling.</p> <pre> change trunk-group 41 Page 6 of 21 TRUNK GROUP Administered Members (min/max): 0/0 GROUP MEMBER ASSIGNMENTS Total Administered Members: 0 Port Code Sfx Name Night Sig Grp 16: 1a0717 TN464 G 41 17: 1a0718 TN464 G 41 18: 1a0719 TN464 G 41 19: 1a0720 TN464 G 41 20: 1a0721 TN464 G 41 21: 1a0722 TN464 G 41 22: 1a0723 TN464 G 41 23: 1a0724 TN464 G 41 24: 1a0725 TN464 G 41 25: 1a0726 TN464 G 41 26: 1a0727 TN464 G 41 27: 1a0728 TN464 G 41 28: 1a0729 TN464 G 41 29: 1a0730 TN464 G 41 30: 1a0731 TN464 G 41 </pre>
5.	Repeat <b>Steps 1-4</b> to configure trunks in Avaya G350.



### 3.4. Configuring Dial Plan/Routing

To route the calls properly between the two PBXs, a uniform dial plan is created. A route pattern is defined to handle the calls which match a certain criteria for the Called Party Number.

Step	Description
1.	<p>Enter the <b>change uniform-dialplan</b> &lt;u&gt;, where <b>u</b> is the matching pattern and configure as follows:</p> <ul style="list-style-type: none"> <li>• <b>Matching Pattern</b> – Pattern to match for the Called Party Number. Set to <b>5</b> for this compliance test.</li> <li>• <b>Len</b> – Length of the Called Party Number.</li> <li>• <b>Net</b> – Set to <b>aar</b>.</li> </ul> <pre> change uniform-dialplan 5                                     Page 1 of 2                                 UNIFORM DIAL PLAN TABLE                                 Percent Full: 0  Matching          Insert          Node Pattern          Len Del Digits Net Conv Num 5                5  0              aar n </pre>
2.	<p>Enter the <b>change route-pattern</b> &lt;r&gt; command, where <b>r</b> is route pattern and configure as follows:</p> <ul style="list-style-type: none"> <li>• <b>Grp No</b> – Set to <b>41</b>, trunk group created in <b>Section 3.3, Step 1</b>.</li> <li>• <b>FRL</b> – Set to <b>0</b>.</li> </ul> <pre> change route-pattern 41                                     Page 1 of 3                                 Pattern Number: 41  Pattern Name:  Grp FRL NPA Pfx Hop Toll No.  Inserted          DCS/ IXC No          Mrk Lmt List Del  Digits          QSIG                                 Dgts          Intw 1: 41  0 2: 3: 4: 5: 6:                                 n  user                                 n  user                                 n  user                                 n  user                                 n  user                                 n  user  BCC VALUE  TSC CA-TSC      ITC BCIE Service/Feature BAND  No. Numbering LAR 0 1 2 3 4 W      Request      Subaddress 1: y y y y y n  n          rest          none 2: y y y y y n  n          rest          none 3: y y y y y n  n          rest          none 4: y y y y y n  n          rest          none 5: y y y y y n  n          rest          none 6: y y y y y n  n          rest          none </pre>

Step	Description
3.	<p>Enter <b>change aar analysis &lt;a&gt;</b> command, where <b>a</b> is dialed string of the Called Party Number and configure as follows:</p> <ul style="list-style-type: none"> <li>• <b>Dialed String</b> – Partial or completely dialed number string.</li> <li>• <b>Total Min</b> – Minimum number of digits in the dialed string. Set to <b>5</b> for this compliance testing.</li> <li>• <b>Total Max</b> – Maximum number of digits in the dialed string. Set to <b>5</b> for this compliance testing.</li> <li>• <b>Route Pattern</b> – Set to <b>41</b>, the route pattern created in <b>Step 2</b>.</li> <li>• <b>Call Type</b> – Set to <b>aar</b>.</li> </ul>
	<pre>change aar analysis 5</pre> <div> <div>AAR DIGIT ANALYSIS TABLE</div> <div> <div> <div>Dialed String</div> <div>5</div> </div> <div> <div>Total Min</div> <div>5</div> </div> <div> <div>Max</div> <div>5</div> </div> <div> <div>Route Pattern</div> <div>41</div> </div> <div> <div>Call Type</div> <div>aar</div> </div> <div> <div>Node Num</div> <div></div> </div> <div> <div>ANI Req'd</div> <div>n</div> </div> </div> </div> <div> <div>Page 1 of 2</div> <div>Percent Full: 6</div> </div>
4.	Repeat <b>Steps 1-3</b> to configure dial plan and routing in Avaya G350.

### 3.5. Configuring E1 QSIG Trunks

The configuration for setting up an E1 QSIG trunk is similar to the E1 ISDN PRI trunk. The only changes are to the DS1 form.

Step	Description
1.	<p>Enter the <b>change ds1 1a07</b> and configure as follows on Avaya G650:</p> <ul style="list-style-type: none"><li>• <b>Name</b> – Set to any descriptive string.</li><li>• <b>Line Coding</b> – Set to <b>hdb3</b>.</li><li>• <b>Signaling Mode</b> – Set to <b>isdn-pri</b>.</li><li>• <b>Connect</b> – Set to <b>pbx</b>.</li><li>• <b>Interface</b> – Set to <b>peer-master</b>.</li></ul> <pre>change ds1 1a07                                     Page 1 of 2 DS1 CIRCUIT PACK  Location: 01A07                                     Name: E1 VMUX 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: b Interface Companding: alaw                          CRC? n Idle Code: 11111111                                DCP/Analog Bearer Capability: 3.1kHz T303 Timer(sec): 4  Slip Detection? n                                  Near-end CSU Type: other</pre>

Step	Description
2.	<p>Enter the <b>change ds1 1v5</b> command and configure as follows for Avaya G350:</p> <ul style="list-style-type: none"> <li>• <b>Name</b> – Set to any descriptive string.</li> <li>• <b>Line Coding</b> – Set to <b>hdb3</b>.</li> <li>• <b>Signaling Mode</b> – Set to <b>isdn-pri</b>.</li> <li>• <b>Connect</b> – Set to <b>pbx</b></li> <li>• <b>Interface</b> – Set to <b>peer-slave</b>.</li> </ul>
	<div> <div>change ds1 1v5</div> <div>Page 1 of 2</div> <div>DS1 CIRCUIT PACK</div> <div> <div>Location: 001V5</div> <div>Bit Rate: 2.048</div> <div>Signalng Mode: isdn-pri</div> <div>Connect: pbx</div> <div>TN-C7 Long Timers? n</div> <div>Interworking Message: PROGress</div> <div>Interface Companding: alaw</div> <div>Idle Code: 11111111</div> </div> <div> <div>Name: E1 VMUX</div> <div>Line Coding: hdb3</div> <div>Interface: peer-slave</div> <div>Country Protocol: 1</div> <div>Protocol Version: a</div> <div>CRC? n</div> <div>DCP/Analog Bearer Capability: 3.1kHz</div> <div>T303 Timer(sec): 4</div> </div> <div> <div>Slip Detection? n</div> <div>Near-end CSU Type: other</div> </div> </div>

### 3.6. Configuring E1 CAS Trunks

The following screens show how to configure a DS1 card for E1 CAS signaling mode. No signaling group needs to be specified. In cases where a previously configured DS1 card is used, then the DS1 card and its associated trunk and signaling groups should be removed prior to configuring the DS1 card for E1 CAS.

Step	Description
1.	<p>Enter the <b>add ds1 1a07</b> command and configure as follows for Avaya G650:</p> <ul style="list-style-type: none"> <li>• <b>Name</b> – Set to any descriptive string.</li> <li>• <b>Line Coding</b> – Set to <b>hdb3</b>.</li> <li>• <b>Signaling Mode</b> – Set to <b>CAS</b>.</li> </ul> <pre> add ds1 1a07                                     Page 1 of 2                                      DS1 CIRCUIT PACK  Location: 01A09                                Name: E1 VMUX Bit Rate: 2.048                                Line Coding: hdb3 Signalng Mode: CAS  Interconnect: pbx                               Country Protocol: 1  Interface Companding: alaw Idle Code: 11111111  Slip Detection? n                               Near-end CSU Type: other </pre>
2.	<p>Enter the <b>add trunk-group &lt;t&gt;</b>, where <b>t</b> is an available trunk group and configure as follows:</p> <ul style="list-style-type: none"> <li>• <b>Group Type</b> – Set to <b>tie</b>.</li> <li>• <b>Group Name</b> – Set to any descriptive string.</li> <li>• <b>TAC</b> – Enter any value per the dial plan. Set to <b>141</b> for this compliance testing.</li> <li>• <b>Trunk Type</b> – Set to <b>wink/wink</b>.</li> </ul> <pre> add trunk-group 41                               Page 1 of 20                                      TRUNK GROUP  Group Number: 41                                Group Type: tie          CDR Reports: y Group Name: E1 CAS                               COR: 1                  TN: 1                TAC: 141 Direction: two-way                               Outgoing Display? n     Trunk Signaling Type: Dial Access? n                                   Busy Threshold: 255     Night Service: Queue Length: 0                                  Incoming Destination: Comm Type: voice                                Auth Code? n Trunk Flash? N Trunk Type (in/out): wink/wink </pre>

Step	Description																																																																																																																																																
3.	Go to <b>Page 5</b> of the <b>trunk-group</b> form and add 15 ports.																																																																																																																																																
	add trunk-group 41 <div>Page 5 of 21</div> <div>TRUNK GROUP</div> <div>Administered Members (min/max): 0/0</div> <div>GROUP MEMBER ASSIGNMENTS</div> <div>Total Administered Members: 0</div> <table><thead><tr><th>Port</th><th>Code</th><th>Sfx</th><th>Name</th><th>Night</th><th>Mode</th><th>Type</th><th>Ans</th><th>Delay</th></tr></thead><tbody><tr><td>1: 01A0701</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2: 01A0702</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>3: 01A0703</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>4: 01A0704</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>5: 01A0705</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>6: 01A0706</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>7: 01A0707</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>8: 01A0708</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>9: 01A0709</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>10: 01A0710</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>11: 01A0711</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>12: 01A0712</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>13: 01A0713</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>14: 01A0714</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>15: 01A0715</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr></tbody></table>	Port	Code	Sfx	Name	Night	Mode	Type	Ans	Delay	1: 01A0701	TN464	G							2: 01A0702	TN464	G							3: 01A0703	TN464	G							4: 01A0704	TN464	G							5: 01A0705	TN464	G							6: 01A0706	TN464	G							7: 01A0707	TN464	G							8: 01A0708	TN464	G							9: 01A0709	TN464	G							10: 01A0710	TN464	G							11: 01A0711	TN464	G							12: 01A0712	TN464	G							13: 01A0713	TN464	G							14: 01A0714	TN464	G							15: 01A0715	TN464	G						
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4.	Go to <b>Page 6</b> of the <b>trunk-group</b> form and enter remaining 15 ports.																																																																																																																																																
	add trunk-group 41 <div>Page 6 of 21</div> <div>TRUNK GROUP</div> <div>Administered Members (min/max): 0/0</div> <div>GROUP MEMBER ASSIGNMENTS</div> <div>Total Administered Members: 0</div> <table><thead><tr><th>Port</th><th>Code</th><th>Sfx</th><th>Name</th><th>Night</th><th>Mode</th><th>Type</th><th>Ans</th><th>Delay</th></tr></thead><tbody><tr><td>16: 01A0716</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>17: 01A0717</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>18: 01A0718</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>19: 01A0719</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>20: 01A0720</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>21: 01A0721</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>22: 01A0722</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>23: 01A0723</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>24: 01A0724</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>25: 01A0725</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>26: 01A0726</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>27: 01A0727</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>28: 01A0728</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>29: 01A0729</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>30: 01A0730</td><td>TN464</td><td>G</td><td></td><td></td><td></td><td></td><td></td><td></td></tr></tbody></table>	Port	Code	Sfx	Name	Night	Mode	Type	Ans	Delay	16: 01A0716	TN464	G							17: 01A0717	TN464	G							18: 01A0718	TN464	G							19: 01A0719	TN464	G							20: 01A0720	TN464	G							21: 01A0721	TN464	G							22: 01A0722	TN464	G							23: 01A0723	TN464	G							24: 01A0724	TN464	G							25: 01A0725	TN464	G							26: 01A0726	TN464	G							27: 01A0727	TN464	G							28: 01A0728	TN464	G							29: 01A0729	TN464	G							30: 01A0730	TN464	G						
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5.	Repeat <b>Steps 1-4</b> to configure Avaya G350.																																																																																																																																																

## 4. Configuring RAD Data Vmux Gateway

RAD Data Communications System can be configured using either a Hyper Terminal or a telnet session. The following screens show the E1 configuration. Vmux configuration should match the local PBX configuration. Each Vmux comes with 4 slots. Each slot can be configured for either T1 or E1. Therefore, Vmux 2100 can be configured for 4 T1 slots, 4 E1 slots or combination. Each T1 / E1 slot consists of 4 T1 / 4 E1 ports. The first two T1 / E1 ports are called **group 1** and the next two are called **group 2**. The first port of each group is assigned as **External 1** and the second port as **External 2**. To configure any Vmux telnet to the device, using a proper user name and password. At any given time, and especially after a configuration change, it is recommended to save the DB changes by pressing the '@' (shift+'2') key.

Vmux-110 with the E1 port will be configured in a similar way

### 4.1. Configuring E1 ISDN PRI or QSIG

Step	Description
1.	<p>At the <b>Main Menu</b> screen (Not shown), navigate to the <b>Configuration → Systems → Management</b> page and configure the IP address of the device.</p> <pre>1. Set Host IP address      &gt; (192.45.50.230) 2. Set Subnet Mask         &gt; (255.255.255.0) 3. Set Default Gateway     &gt; (192.45.50.1) 4. Read                   &gt; (public) 5. Write                  &gt; (private) 6. Trap                   &gt; (public)</pre>
2.	<p>Navigate to the <b>Configuration → Slot 1 → Group 2 → Bundles Parameters -&gt; Bundle Configuration</b> page. Add / enable the bundle (bundle 1). The following screen shows the bundle configuration. The important parameters are highlighted.</p> <pre>1. Enter Bundle Number          [1 - 30]&gt; (1) 2. Connect&gt; (Yes) 3. Function&gt; (TDMoIP+) 4. Routing Parameters 5. Max Bytes In Multiplexed Frame [100 - 1461]&gt; (1400) 6. Packetizing Interval (msec)   [10 - 90]&gt; (30) 7. Packet Redundancy [1 -4]&gt; (1) 8. Connectivity Parameters 9. Voice Parameters 10. Transparent Jitter Size (N x 10mSec)[2 - 10]&gt; (2) 11. CAS Redundancy (Disable) 12. Bundle Name&gt; ()</pre>

Step	Description
3.	<p>Configure the routing parameters of each Vmux gateway. This enables one Vmux gateway to know about the other Vmux gateway. Navigate to the <b>Configuration → Slot 1 → Group 2 → Bundle Parameters → Bundle Configuration -&gt; Routing Parameters</b> page.</p> <p>1. Destination IP &gt; (192.45.83.3)  2. Next hop &gt; (0.0.0.0)  3. Destination Bundle[1 - 30]&gt; (1)  4. TOS Parameters  5. VLAN Parameters</p>
4.	<p>Configure the Voice Parameters. Navigate to the <b>Configuration → Slot 1 → Group 2 → Bundle Parameters → Bundle Configuration -&gt; Voice Parameters</b> page. The <b>Coder/Rate</b> indicates the codec used between the two Vmux gateways. The compression codec on Vmux should match the one on the PBX. The coding should match the Interface Companding field on the Avaya PBX DS1 form.</p> <p>1. Coder/Rate (kbps) &gt; (G.729A/8)  2. Caller ID  3. Tx Gain &gt; (0 dB )  4. Rx Gain &gt; (0 dB)  5. Fax/Modem  6. MF Parameters  7. Custom Tone Detection  8. Super Tandem &gt; (Disable)  9. VAD 10. CNG mode &gt; (On )  11. Coding &gt; (A-Law)</p>
5.	<p>Configure the E1 Parameter. Navigate to the <b>Configuration → Card → Slot 1 → Group 2 → External 1</b> page.</p> <p>1. Connect &gt; (Yes)  2. Frame &gt; (G.732N)  3. Interface Type &gt; (Dsu)  4. Restoration Time &gt; (1 Second (Fast))  5. Clock Source &gt; (Lbt (Local))  6. Idle Code [0 - ff] &gt; (ff)</p>



Step	Description																																																																						
6.	Navigate to the <b>Configuration → Card → Slot 1 → Group 2 → External 1 → Distribution Of Framer Time Slots → Time Slots Configuration</b> page to configure the E1 time slots allocation.																																																																						
	1. Update from Time Slot [1 - 31]... (1) 2. To Time Slot [1 - 31]... (31) 3. Type > (Voice) 4. Bundle [1 - 30]... (1) 5. Destination Port ID [1 - 4]... (1) 6. Destination Time Slot ID [1 - 31]... (1) 7. Update Time Slot																																																																						
	1. Update from Time Slot [1 - 31]... (16) 2. To Time Slot [1 - 31]... (16) 3. Type > (HDLC-1) 4. Bundle [1 - 30]... (1) 5. Destination Port ID [1 - 4]... (1) 6. Destination Time Slot ID [1 - 31]... (16) 7. Destination HDLC Ch ID > (HDLC-1) 8. Update Time Slot																																																																						
7.	Check the resulting timeslot configuration by selecting the <b>Configuration → Card → Slot 1 → Group 2 → External 1 → Distribution Of Framer Time Slots → Display Time Slots Configuration</b> page.																																																																						
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## 4.2. Configuring E1 CAS

Step	Description
1.	<p>Configuring E1 CAS is similar to ISDN PRI or QSIG. The only page that is different is the following:  Configure the E1 Parameter. Navigate to the <b>Configuration → Slot 1 → Group 2 → External 1</b> page. The important parameters that are different from the default values are highlighted.</p> <pre> 1. Connect &gt; (Yes)  2. Frame &gt; (G.732S) 3. Interface Type &gt; (Dsu )  4. Restoration Time &gt; (1 Second (Fast)) 5. Clock Source &gt; (Lbt (Local)) 6. Idle Code [0 - ff] &gt; (ff) 7. Q.50 Protocol &gt; (Disable) </pre>
2.	<p>Navigate to the <b>Configuration → Card → Slot 1 → Group 2 → External 1 → Distribution Of Framer Time Slots → Time Slots Configuration</b> page to configure the E1 time slots allocation.</p> <pre> Time Slot Configuration &gt; Slot 1 &gt; Group 2 &gt; External 1 1. Update from Time Slot [1 - 31]... (1) 2. To Time Slot [1 - 31]... (31) 3. Type &gt; (Voice) 4. Bundle [1 - 30]... (1) 5. Destination Port ID [1 - 4]... (1) 6. Destination Time Slot ID [1 - 31]... (1) 7. Update Time Slot </pre> <pre> Time Slot Configuration &gt; Slot 1 &gt; Group 2 &gt; External 1 1. Update from Time Slot [1 - 31]... (16) 2. To Time Slot [1 - 31]... (16) 3. Type &gt; (N.C.) 4. Bundle [1 - 30]... (1) 5. Destination Port ID [1 - 4]... (1) 6. Destination Time Slot ID [1 - 31]... (16) 7. Update Time Slot </pre>

Step	Description																																																											
3.	Check the resulting timeslot configuration by selecting the <b>Configuration → Card → Slot 1 → Group 2 → External 1 → Distribution Of Framer Time Slots → Display Time Slots Configuration</b> page.																																																											
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## 5. Interoperability Compliance Testing

Interoperability compliance testing covered connectivity, error recovery, and feature functionality. Feature functionality testing verified the ability of Vmux TDM over IP solution to provide PBX to PBX communication to make, receive, transfer, and conference calls. Connectivity functionality testing verified that Vmux gateways were able to connect Avaya G650 and Avaya G350 gateways over E1 using ISDN PRI, QSIG, and CAS.

### 5.1. General Test Approach

All test cases were performed manually. For each E1 configuration the direct connection between the Avaya G650 and Avaya G350 were tested first. Once, calls could be made between two sites, then, Vmux gateways were introduced to verify the operation. The following features and functionality were verified:

- E1 connectivity with ISDN-PRI
- E1 connectivity with QSIG
- E1 connectivity with CAS
- Transfers and Conference calls
- Modem Calls
- Codec Sets G.711MU, G729A and G723.1
- FAX with various bandwidths
- DTMF
- Vmux 110 in place of Vmux 2100

### 5.2. Test Results

All test cases passed. Vmux provided connectivity between Avaya G650 and Avaya G350 gateways over E1. During the test, no problems were encountered.

## 6. Verification Steps

To verify that the solution is properly configured in the field, the following steps can be taken.

After Vmux gateways are connected, make sure that the physical connection (Layer 2) is good by executing “**test board 1AXX**”, where **1** is the cabinet ID, **A** is the carrier ID and **XX** is the slot number of the DS1 board.

If the connection is OK, check the trunk status by running “**status trunk YY**” where YY is the trunk-group number.

Place calls between Site A and Site B to verify proper connectivity. Fax machines were utilized at Site A and Site B to verify proper operation (Tested with 4.8Kbps, 9.6Kbps and 14.4Kbps).

## 7. Support

For technical support on Vmux gateways, call RAD Data Communications Support at (800) 444-7234 or send email to [techsup@radusa.com](mailto:techsup@radusa.com).

## 8. Conclusion

These Application Notes describe a solution for integrating RAD Data Communications Vmux Gateways with Avaya Communication Manager on two different gateways, Avaya G650 and Avaya G350. RAD Vmux Gateways are connected to Avaya gateways through an E1 interface. RAD Vmux Gateway is a TDM over IP gateway that enables the TDM T1/E1 circuits to be extended over an IP/Ethernet network. The systems interoperated successfully, providing a suitable solution for TDMoIP in the PBX-to-PBX environment.

## 9. References

This section references the Avaya and RAD Data Communications documentation that are relevant to these Application Notes.

The following Avaya product documentation can be found at <http://support.avaya.com>.

- [1] *Administration for Network Connectivity for Avaya Communication Manager*, Issue 13, January 2008, Document Number 555-233-504.
- [2] *Administrator's Guide for Avaya Communication Manager*, Issue 4, January 2008, Document Number 03-300509.

The following product documentation is provided by RAD Data Communications. For additional product and company information, visit <http://www.radusa.com>.

- [3] *RAD Vmux-2100 Installation and Operation Manual*: Version 4.
- [4] *RAD Vmux-110 Installation and Operation Manual*: Version 4.

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