AVAYA

Avaya Solution & Interoperability Test Lab

Application Notes for Product Support Solutions' FlexxGate™ Media Gateway with Avaya Communication Manager using T1/E1 ISDN/QSIG and CAS Interfaces – Issue 1.0

Abstract

These Application Notes describe the configuration steps required for Product Support Solutions' FlexxGate™ media gateway connectivity solution to successfully interoperate with Avaya Communication Manager using T1/E1 ISDN/QSIG and CAS (Channel Associated Signaling) interfaces. Information in these Application Notes has been obtained through compliance testing and additional technical discussions. Testing was conducted via the Developer*Connection* Program at the Avaya Solution and Interoperability Test Lab.

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Solution & Interoperability Test Lab Application Notes
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FlexxGate

1. Introduction

Product Support Solutions' FlexxGate™ media gateway is a TDM/VoIP connectivity solution. For this integration, the FlexxGate™ media gateway received inbound calls on T1 and E1 interfaces and converted the calls for delivery to an Interactive Voice Response (IVR) unit using SIP protocol. Subsequently, the SIP IVR transmitted SIP REFER messages and the FlexxGate™ used ISDN/QSIG Path Replacement, on spans configured for ISDN/QSIG, or flash-hook requests, on spans configured for CAS, to complete the transfers. Using these transfer methods results in the release of the bearer channels as soon as the transfers are complete.

In the scenarios that were tested, the FlexxGate™ media gateway interfaced with Avaya Communication Manager via a TN464 DS1 circuit pack. Four spans were used during the testing and were configured in the following manner: span 1 was configured for T1/CAS, span 2 was configured for E1/CAS, span 3 was configured for T1/ISDN/QSIG, and span 4 was configured for E1/ISDN/QSIG. The compliance testing focused on the ability of the FlexxGate™ to properly initiate transfers using either ISDN/QSIG Path Replacement or flash-hook signaling.

The FlexxGate™ media gateway utilizes a Digium TE412P telephony interface card that is physically inserted in the FlexxGate™ media gateway server. The Digium TE412P terminates up to 4 spans and, in the tested scenario, simultaneously terminated each of the four spans that were used. The other end of each span was terminated on a TN464 DS1 Interface circuit pack in an Avaya Communication Manager media gateway. In the tested scenarios, an Avaya MCC1 media gateway was used. Refer to **Figure 1**.
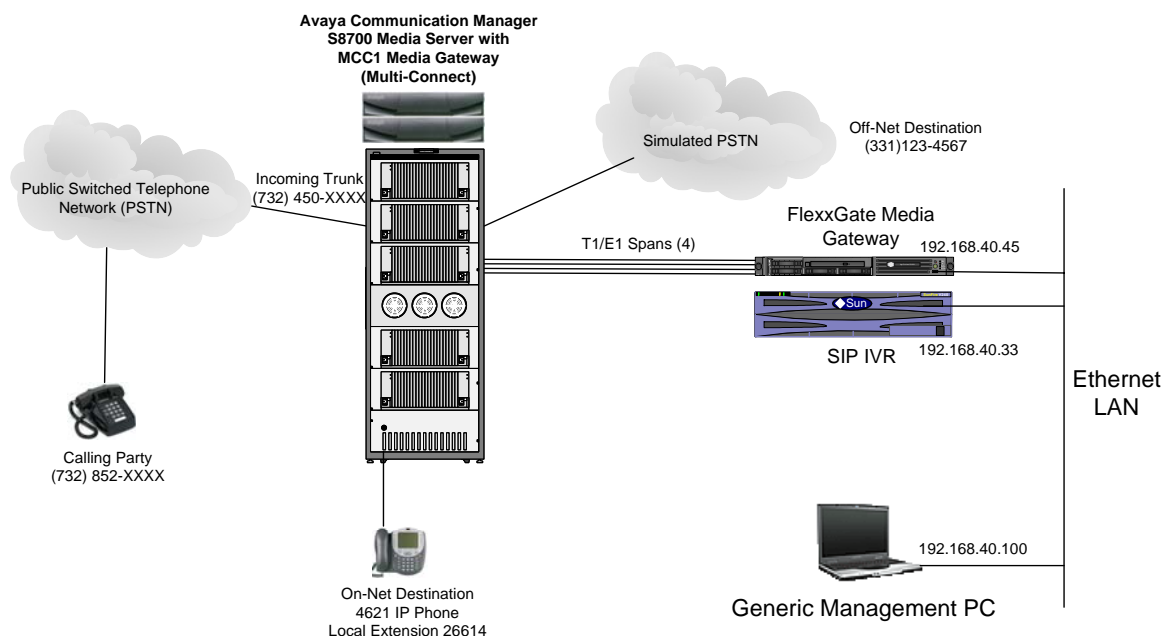
Figure 1: Avaya Developer*Connection* Compliance Test Configuration

2. Equipment and Software Validated

The following equipment and software were used in the tested configuration:

Equipment	Version Information
Avaya S8700 Media Servers	Avaya Communication Manager 4.0, load 730.5 w/update 13566
Avaya MCC1 Media Gateway	N/A
Avaya TN464F DS1 Interface	Vintage 6 (used for CAS spans)
Avaya TN464GP DS1 Interface	HW02 FW019 (used for ISDN/QSIG spans)
FlexxGate™ Media Gateway	V2.1.2
FlexxGate™ Server – HP DL360/G4 w/Digium TE412P	Red Hat Enterprise Linux ES Release 4 (Nahant Update 4)
Holly Voice Portal (HVP)	V4.2
Server for HVP Sun V240	Solaris 9

3. Configure Avaya Communication Manager[1]

3.1. Channel Associated Signaling (T1/CAS)

The procedures for configuring T1/CAS on Avaya Communication Manager include the following areas:

- Administer a DS1 Circuit Pack
- Administer Stations
- Administer a Hunt Group

3.1.1. Administer a DS1 Circuit Pack (T1/CAS)

Note that the values described in this section are appropriate when adding a TN464 circuit pack with switches set to 24 channel and 120 ohms. Note that these switches must be set properly prior to inserting the circuit pack into the system. Refer to [2] for instructions on how to set the switches on TN464 circuit packs.

Administer a DS1 circuit pack to be used for connectivity to the FlexxGate™ media gateway. Use the "add ds1 1c12" command. The actual slot number may vary. In this case "1c12" is the slot number. Enter the following values for the specified fields, and retain the default values for all remaining fields. Enter a descriptive name, such as "FlexxGateSpan1", in the **Name** field. Enter "ami-basic" in the **Line Coding** field, "d4" in the **Framing Mode** field, "robbed-bit" in the **Signaling Mode** field, and "mulaw" in the **Interface Companding** field. The appropriate entry for the **Line Compensation** field varies with the type of cable used. A value of 1 is

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[1] Note that while four spans were configured during integration testing, the number of spans and the method in which the spans will be configured on Avaya Communication Manager and FlexxGate™ will depend upon customer requirements.

appropriate for 22-gauge ABAM cable terminated on a DSX-1 cross-connect and a wire length between 0 and 133 feet[2]. Submit these changes.

```
add ds1 1c12
                             DS1 CIRCUIT PACK

          Location: 01C12                       Name: FlexxGateSpan1
          Bit Rate: 1.544               Line Coding: ami-basic
  Line Compensation: 1                  Framing Mode: d4
     Signaling Mode: robbed-bit



Interface Companding: mulaw
         Idle Code: 11111111




     Slip Detection? n                  Near-end CSU Type: other
```

3.1.2. Administer Stations

Add a station for each of the 24 channels using the "add station n" command, where "n" is an available extension number. In the following example, extension "22201" was used for channel 1. Enter a descriptive name in the **Name** field. Set the **Type** field to "DS1FD". For the **Port** field, note that "01C1201" refers to the first channel of the DS1 circuit pack as administered in **Section 3.1.1.**

Repeat this procedure for the rest of the channels. The "duplicate station" command can be used to expedite the process. Submit these changes.

```
add station 22201                                         Page   1 of   4
                               STATION

Extension: 22201                    Lock Messages? n            BCC: 0
    Type: DS1FD                       Security Code:             TN: 1
    Port: 01C1201                   Coverage Path 1:            COR: 1
    Name: FlexxGate                 Coverage Path 2:            COS: 1
                                    Hunt-to Station:          Tests? y
STATION OPTIONS
                                      Time of Day Lock Table:

           Loss Group: 4
   Off Premises Station? y
      R Balance Network? n


        Survivable COR: internal
   Survivable Trunk Dest? y
```

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[2] See [1].

3.1.3. Administer a DDC Hunt Group

Add a hunt group using the "add hunt-group n" command, where "n" is an available hunt group number. Enter a descriptive name in the **Group Name** field. Set the **Group Type** field to "ddc". A Direct Department Calling (DDC) type hunt group selects the first available extension (in the administered sequence) when answering a new call. Enter an available extension number in the **Group Extension** field. In the example below, the extension number assigned in the **Group Extension** field was 22200 and was used to allow calls to be answered by any one of the channels in the group. Note that multiple hunt-groups can be defined and channels assigned to each hunt group to allow for different IVR applications to be run on different groups of channels as required by the implementation. In addition, channels can be dialed individually using their individual extension numbers as assigned in **Section 3.1.2.**

```
add hunt-group 22                                          Page   1 of  60
                            HUNT GROUP

           Group Number: 22                              ACD? n
             Group Name: FlexxGateSpan1                 Queue? n
        Group Extension: 22200                          Vector? n
             Group Type: ddc                      Coverage Path:
                     TN: 1          Night Service Destination:
                    COR: 1                  MM Early Answer? n
          Security Code:             Local Agent Preference? n
 ISDN/SIP Caller Display:
```

Page Down to the **Group Member Assignments** page and enter the extensions of each of the channels that were added in **Section 3.1.2.** Submit these changes.

```
add hunt-group 22                                          Page   3 of  60
                            HUNT GROUP
         Group Number: 22   Group Extension: 22200      Group Type: ddc
  Member Range Allowed: 1 - 1500      Administered Members (min/max): 1   /24
                                    Total Administered Members: 24
GROUP MEMBER ASSIGNMENTS
      Ext          Name(19 characters)      Ext          Name(19 characters)
  1: 22201         FlexxGate          14: 22214         FlexxGate
  2: 22202         FlexxGate          15: 22215         FlexxGate
  3: 22203         FlexxGate          16: 22216         FlexxGate
  4: 22204         FlexxGate          17: 22217         FlexxGate
  5: 22205         FlexxGate          18: 22218         FlexxGate
  6: 22206         FlexxGate          19: 22219         FlexxGate
  7: 22207         FlexxGate          20: 22220         FlexxGate
  8: 22208         FlexxGate          21: 22221         FlexxGate
  9: 22209         FlexxGate          22: 22222         FlexxGate
 10: 22210         FlexxGate          23: 22223         FlexxGate
 11: 22211         FlexxGate          24: 22224         FlexxGate
 12: 22212         FlexxGate          25:
 13: 22213         FlexxGate          26:

  At End of Member List
```

3.2. Channel Associated Signaling (E1/CAS)

The procedures for configuring E1/CAS on Avaya Communication Manager include the following areas:

- Administer a DS1 Circuit Pack
- Administer Stations
- Administer a Hunt Group

3.2.1. Administer a DS1 Circuit Pack (E1/CAS)

Note that the values described in this section are appropriate when adding a TN464 circuit pack with switches set to 32 channels and 120 ohms. Note that these switches must be set properly prior to inserting the circuit pack into the system. Refer to [2] for instructions on how to set the switches on TN464 circuit packs.

Administer a DS1 circuit pack to be used for connectivity to the FlexxGate™ media gateway. Use the "add ds1 1c13" command. The actual slot number may vary. In this case "1c13" is the slot number. Enter the following values for the specified fields, and retain the default values for all remaining fields. Enter a descriptive name, such as "FlexxGateSpan2", in the **Name** field. Enter "ami-basic" in the **Line Coding** field, "CAS" in the **Signaling Mode** field, and "alaw" in the **Interface Companding** field. Submit these changes.

```
add ds1 1c13
                             DS1 CIRCUIT PACK

          Location: 01C13                         Name: FlexxGateSpan2
          Bit Rate: 2.048                   Line Coding: ami-basic

      Signaling Mode: CAS

        Interconnect: pbx               Country Protocol: 1

Interface Companding: alaw                              CRC? n
          Idle Code: 11111111




      Slip Detection? n                 Near-end CSU Type: other
```

3.2.2. Administer Stations

Add a station for each of the 30 channels using the "add station n" command, where "n" is an available extension number. In the following example, extension "22226" was used for channel 1. Enter a descriptive name in the **Name** field. Set the **Type** field to "DS1FD". For the **Port** field, note that "01C1301" refers to the first channel of the DS1 circuit pack as administered in **Section 3.2.1.**

Repeat this procedure for the rest of the channels. The "duplicate station" command can be used to expedite the process. Submit these changes.

```
add station 22226                                           Page   1 of   4
                                 STATION

Extension: 22226                      Lock Messages? n              BCC: 0
      Type: DS1FD                     Security Code:                 TN: 1
      Port: 01C1301              Coverage Path 1:                   COR: 1
      Name: FlexxGate            Coverage Path 2:                   COS: 1
                                 Hunt-to Station:              Tests? y
STATION OPTIONS
                                      Time of Day Lock Table:
          Loss Group: 4
   Off Premises Station? y
      R Balance Network? n


        Survivable COR: internal
  Survivable Trunk Dest? y
```

3.2.3. Administer a DDC Hunt Group

Add a hunt group using the "add hunt-group n" command, where "n" is an available hunt group number. Enter a descriptive name in the **Group Name** field. Set the **Group Type** field to "ddc". A Direct Department Calling (DDC) type hunt group selects the first available extension (in the administered sequence) when answering a new call. Enter an available extension number in the **Group Extension** field. In the example below, the extension number assigned in the **Group Extension** field was 22225 and was used to allow calls to be answered by any one of the channels in the group. Note that multiple hunt-groups can be defined and channels assigned to each hunt group to allow for different IVR applications to be run on different groups of channels as required by the implementation. In addition, channels can be dialed individually using the individual extension numbers as assigned in **Section 3.2.2.**

```
add hunt-group 23                                          Page   1 of  60
                            HUNT GROUP

          Group Number: 23                            ACD? n
            Group Name: FlexxGateSpan2              Queue? n
       Group Extension: 22225                      Vector? n
            Group Type: ddc               Coverage Path:
                    TN: 1        Night Service Destination:
                   COR: 1               MM Early Answer? n
         Security Code:              Local Agent Preference? n
 ISDN/SIP Caller Display:
```

Page Down to the **Group Member Assignments** page and enter the extensions of each of the channels that were added in **Section 3.2.2.**

```
display hunt-group 23                                        Page   3 of  60
                               HUNT GROUP
         Group Number: 23   Group Extension: 22225        Group Type: ddc
  Member Range Allowed: 1 - 1500      Administered Members (min/max): 1   /30
                                         Total Administered Members: 30
GROUP MEMBER ASSIGNMENTS
      Ext          Name(19 characters)        Ext          Name(19 characters)
   1: 22226        FlexxGate            14: 22239        FlexxGate
   2: 22227        FlexxGate            15: 22240        FlexxGate
   3: 22228        FlexxGate            16: 22241        FlexxGate
   4: 22229        FlexxGate            17: 22242        FlexxGate
   5: 22230        FlexxGate            18: 22243        FlexxGate
   6: 22231        FlexxGate            19: 22244        FlexxGate
   7: 22232        FlexxGate            20: 22245        FlexxGate
   8: 22233        FlexxGate            21: 22246        FlexxGate
   9: 22234        FlexxGate            22: 22247        FlexxGate
  10: 22235        FlexxGate            23: 22248        FlexxGate
  11: 22236        FlexxGate            24: 22249        FlexxGate
  12: 22237        FlexxGate            25: 22250        FlexxGate
  13: 22238        FlexxGate            26: 22251        FlexxGate

  More Members Exist
```

Page Down to the next page and enter the remaining extensions of each of the channels that were added in **Section 3.2.2.** Submit these changes.

```
add hunt-group 23                                           Page   4 of  60
                               HUNT GROUP
         Group Number: 23   Group Extension: 22225        Group Type: ddc
  Member Range Allowed: 1 - 1500      Administered Members (min/max): 1   /30
                                         Total Administered Members: 30
GROUP MEMBER ASSIGNMENTS
      Ext          Name(19 characters)        Ext          Name(19 characters)
  27: 22252        FlexxGate            40:
  28: 22253        FlexxGate            41:
  29: 22254        FlexxGate            42:
  30: 22255        FlexxGate            43:
  31:                                   44:
  32:                                   45:
  33:                                   46:
  34:                                   47:
  35:                                   48:
  36:                                   49:
  37:                                   50:
  38:                                   51:
  39:                                   52:

  At End of Member List
```

3.3. T1/ISDN/QSIG

The procedures for configuring the T1/ISDN/QSIG trunk on Avaya Communication Manager include the following areas:

- Verify Avaya Communication Manager License
- Administer DS1 Circuit Pack
- Administer ISDN Trunk Group
- Administer ISDN Signaling Group
- Administer ISDN Trunk Group Members
- Administer System Features Form
- Administer Private Numbering Selection Numbers
- Administer Private Network Routing

3.3.1. Verify Avaya Communication Manager License

Log into the System Access Terminal (SAT) to verify that the Avaya Communication Manager license has proper permissions for features illustrated in these Application Notes. Use the "display system-parameters customer-options" command to verify that the **ISDN-PRI** option is set to "y" on **Page 4**, as shown below. A system license file controls the settings on the customer-options form.

```
display system-parameters customer-options                      Page  4 of  11
                              OPTIONAL FEATURES

   Emergency Access to Attendant? y                              IP Stations? y
          Enable 'dadmin' Login? y
          Enhanced Conferencing? y                         ISDN Feature Plus? y
               Enhanced EC500? y         ISDN 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? y                    Malicious Call Trace? y
       External Device Alarm Admin? n          Media Encryption Over IP? y
 Five Port Networks Max Per MCC? n   Mode Code for Centralized Voice Mail? n
               Flexible Billing? n
   Forced Entry of Account Codes? y              Multifrequency Signaling? y
        Global Call Classification? n    Multimedia Call Handling (Basic)? y
             Hospitality (Basic)? y    Multimedia Call Handling (Enhanced)? y
 Hospitality (G3V3 Enhancements)? y
                      IP Trunks? y


          IP Attendant Consoles? n
        (NOTE: You must logoff & login to effect the permission changes.)
```

Page Down to Page 5 and verify that the **Private Networking** and **Uniform Dialing Plan** features are set to "y" as shown below.

```
display system-parameters customer-options                    Page   5 of  11
                              OPTIONAL FEATURES

                Multinational Locations? n          Station and Trunk MSP? y
Multiple Level Precedence & Preemption? n        Station as Virtual Extension? n
                    Multiple Locations? n
                                            System Management Data Transfer? n
          Personal Station Access (PSA)? y           Tenant Partitioning? n
                    Posted Messages? n         Terminal Trans. Init. (TTI)? y
                     PNC Duplication? n             Time of Day Routing? y
                Port Network Support? y           Uniform Dialing Plan? y
                                            Usage Allocation Enhancements? y
            Processor and System MSP? y       TN2501 VAL Maximum Capacity? y
                 Private Networking? y
                Processor Ethernet? y                Wideband Switching? y
                                                            Wireless? n
                      Remote Office? n
          Restrict Call Forward Off Net? y
                Secondary Data Module? y


          (NOTE: You must logoff & login to effect the permission changes.)
```

Page Down to Page 8 and verify that the **Basic Call Setup**, **Basic Supplementary Services**, and **Supplementary Services with Rerouting** features are set to "y" as shown below.

```
display system-parameters customer-options                    Page   8 of  11
                          QSIG OPTIONAL FEATURES

                             Basic Call Setup? y
                   Basic Supplementary Services? y
                          Centralized Attendant? n
                          Interworking with DCS? n
          Supplementary Services with Rerouting? y
                   Transfer into QSIG Voice Mail? n
                             Value-Added (VALU)? n









          (NOTE: You must logoff & login to effect the permission changes.)
```

3.3.2. Administer DS1 Circuit Pack (T1/QSIG)

Note that the values described in this section are appropriate when adding a TN464 circuit pack with switches set to 24 channels and 120 ohms. Refer to [2] for instructions on how to set the switches on TN464 circuit packs.

Administer a DS1 circuit pack to be used for connectivity to the FlexxGate™ media gateway. Use the "add ds1 1b17" command. The actual slot number may vary. In this case "1b17" is the slot number. Enter the following values for the specified fields, and retain the default values for all remaining fields. Enter a descriptive name, such as "FlexxGateSpan3" in the **Name** field, "b8zs" in the **Line Coding** field, "esf" in the **Framing Mode** field, "isdn-pri" in the **Signaling Mode** field, "pbx" in the **Connect** field, "peer-master"[3] in the **Interface** field, "Q-SIG" in the **Peer Protocol** field, and "a" in the **Side** field. Submit these changes.

```
add ds1 1b17                                                   Page   1 of   2
                              DS1 CIRCUIT PACK


            Location: 01B17                          Name: FlexxGateSpan3
            Bit Rate: 1.544                   Line Coding: b8zs
  Line Compensation: 1                       Framing Mode: esf
      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: mulaw                           CRC? n
            Idle Code: 11111111
                            DCP/Analog Bearer Capability: 3.1kHz


                                            T303 Timer(sec): 4




    Slip Detection? n                   Near-end CSU Type: other





                                            T303 Timer(sec): 4


    Slip Detection? n                   Near-end CSU Type: other

                            Block Progress Indicator? n
```

3.3.3. Administer ISDN Trunk Group

Administer an ISDN trunk group. Use the "add trunk-group n" command, where "n" is an available trunk group number. In the test configuration, trunk group 200 was used. Enter the following values for the specified fields, and retain the default values for all remaining fields. Enter "isdn" in the **Group Type** field, a descriptive name, such as "FlexxGateSpan3" in the

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[3] A setting of "peer-master" was used in the tested configuration. When the **Interface** field is set to "peer-master", the FlexxGate media gateway must be set to slave. This setting on the FlexxGate will be provisioned by Product Support Solutions, Inc. Avaya Communication Manager can also work in the reverse configuration.

Group Name field, an available trunk access code in the **TAC** field, "two-way" in the **Direction** field, and "tie" in the **Service Type** field.

```
add trunk-group 200                                          Page   1 of  21
                              TRUNK GROUP

Group Number: 200                    Group Type: isdn        CDR Reports: y
  Group Name: FlexxGateSpan3               COR: 1      TN: 1      TAC: 1200
    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
```

Page Down to Page 2 and enter the following values for the specified fields, and retain the default values for all remaining fields. Enter "b" in the **Supplementary Service Protocol** field and "ascend"[4] in the **Trunk Hunt** field.

```
add trunk-group 200                                          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): enbloc/enbloc


           Trunk Hunt: ascend
                                            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
```

---

[4] In the tested configuration, the **Trunk Hunt** field was set to "ascend". This setting controls how Avaya Communication Manager performs a trunk hunt when searching for available channels within a facility in an ISDN trunk group. A value of "ascend" enables a linear trunk hunt search from the lowest to highest numbered channels. The FlexxGate media gateway was set to choose channels from highest to lowest to help avoid the possibility of glare conditions. Avaya Communication Manager can also work in the reverse configuration.

Page Down to Page 3 and enter the following values for the specified fields, and retain the default values for all remaining fields. Enter "y" in the **Send Name** field, "y" in the **Send Calling Number** field, "unk-pvt" in the **Format** field and "y" in the **Send Connected Number** field.

```
add trunk-group 200                                          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: unk-pvt
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

    Apply Local Ringback? n
 Show ANSWERED BY on Display? y
                            Network (Japan) Needs Connect Before Disconnect? n
```

Page Down to Page 4 and ensure the **Path Replacement** field is set to "y". Submit these changes.

```
add trunk-group 200                                          Page   4 of  21
                      QSIG TRUNK GROUP OPTIONS




   TSC Method for Auto Callback: drop-if-possible
         Diversion by Reroute? y
             Path Replacement? y
Path Replacement with Retention? n
       Path Replacement Method: better-route
                         SBS? n
 Display Forwarding Party Name? y
   Character Set for QSIG Name: eurofont
```

3.3.4. Administer ISDN Signaling Group

Administer an ISDN signaling group for the DS1 circuit pack. Use the "add signaling-group n" command, where "n" is an available signaling group number. For the **Primary D-Channel** field, enter the slot number for the DS1 circuit pack as administered in **Section 3.3.2** and port "24". Note that TSCs were not used during this integration testing and, therefore, the TSC related fields are not relevant for this integration.

Maintain the default values for the remaining fields, and submit these changes.

```
add signaling-group 200
                                SIGNALING GROUP

 Group Number: 200              Group Type: isdn-pri
                    Associated Signaling? y        Max number of NCA TSC: 0
                      Primary D-Channel: 01B1724    Max number of CA TSC: 0
                                                 Trunk Group for NCA TSC:
        Trunk Group for Channel Selection:
      TSC Supplementary Service Protocol: a
```

3.3.5. Administer ISDN Trunk Group Members

Use the "change trunk-group n" command, where "n" is the trunk group number that was
administered in **Section 3.3.3**. Navigate to the **GROUP MEMBER ASSIGNMENTS** page of
the **TRUNK GROUP** screen, and enter the ports of the DS1 circuit pack into the corresponding
Port fields. The corresponding **Code** and **Sfx** fields will be populated automatically.

Repeat this procedure for the desired number of trunk group members. The number of members
assigned should match the total number of active channels between Avaya Communication
Manager and the FlexxGate™ media gateway on this span. This includes the channels that will
be used by FlexxGate™ to transfer calls away from the FlexxGate™ back to the Avaya system.

```
change trunk-group 200                                        Page   5 of  21
                                  TRUNK GROUP
                                   Administered Members (min/max):   1/23
GROUP MEMBER ASSIGNMENTS                   Total Administered Members:  23


        Port    Code Sfx Name        Night          Sig Grp
  1: 01B1701  TN464  G                                200
  2: 01B1702  TN464  G                                200
  3: 01B1703  TN464  G                                200
  4: 01B1704  TN464  G                                200
  5: 01B1705  TN464  G                                200
  6: 01B1706  TN464  G                                200
  7: 01B1707  TN464  G                                200
  8: 01B1708  TN464  G                                200
  9: 01B1709  TN464  G                                200
 10: 01B1710  TN464  G                                200
 11: 01B1711  TN464  G                                200
 12: 01B1712  TN464  G                                200
 13: 01B1713  TN464  G                                200
 14: 01B1714  TN464  G                                200
 15: 01B1715  TN464  G                                200
```

Page Down to the next page and enter the remaining ports. Note that port 24 is reserved for the signaling channel and is not added as a group member. Submit these changes.

```
change trunk-group 200                                      Page   6 of  21
                              TRUNK GROUP
                                Administered Members (min/max):   1/23
GROUP MEMBER ASSIGNMENTS                Total Administered Members:  23

     Port    Code Sfx Name         Night           Sig Grp
 16: 01B1716 TN464  G                                200
 17: 01B1717 TN464  G                                200
 18: 01B1718 TN464  G                                200
 19: 01B1719 TN464  G                                200
 20: 01B1720 TN464  G                                200
 21: 01B1721 TN464  G                                200
 22: 01B1722 TN464  G                                200
 23: 01B1723 TN464  G                                200
 24:
 25:
 26:
 27:
 28:
 29:
 30:
```

3.3.6. Administer System Features Form

Use the "change system-parameters features" command and enter "all" in the **Trunk-to-Trunk Transfer** field.

```
display system-parameters features                          Page   1 of  17
                        FEATURE-RELATED SYSTEM PARAMETERS
                          Self Station Display Enabled? n
                           Trunk-to-Trunk Transfer: all
    Automatic Callback - No Answer Timeout Interval (rings): 9
                   Call Park Timeout Interval (minutes): 1
       Off-Premises Tone Detect Timeout Interval (seconds): 10
                          AAR/ARS Dial Tone Required? y
                       Music/Tone on Hold: music Type: port  02A0715
          Music (or Silence) on Transferred Trunk Calls? all
                   DID/Tie/ISDN/SIP Intercept Treatment: attd
    Internal Auto-Answer of Attd-Extended/Transferred Calls: transferred
                Automatic Circuit Assurance (ACA) Enabled? n




            Abbreviated Dial Programming by Assigned Lists? n
      Auto Abbreviated/Delayed Transition Interval (rings): 2
                Protocol for Caller ID Analog Terminals: Bellcore
   Display Calling Number for Room to Room Caller ID Calls? n
```

Page Down to page 8 and enter an available extension number in the **QSIG PATH REPLACEMENT EXTENSION** field. In this case, extension "22770" was used. Enter "0" in the **PARAMETERS FOR CREATING QSIG SELECTION NUMBERS NETWORK LEVEL** field. Submit these changes.

```
display system-parameters features                          Page   8 of  17
                       FEATURE-RELATED SYSTEM PARAMETERS


ISDN PARAMETERS
                                                  PARAMETERS FOR CREATING
 Send Non-ISDN Trunk Group Name as Connected Name? n   QSIG SELECTION NUMBERS
 Display Connected Name/Number for ISDN DCS Calls? n     Network Level: 0
      Send ISDN Trunk Group Name on Tandem Calls? n       Level 2 Code:
                                                          Level 1 Code:


                          QSIG/ETSI TSC Extension: 22699
 MWI - Number of Digits Per Voice Mail Subscriber: 5
                               Feature Plus Ext:
                            National CPN Prefix:
                       International CPN Prefix:
                       Pass Prefixed CPN to ASAI? n
   Unknown Numbers Considered Internal for AUDIX? n
            USNI Calling Name for Outgoing Calls? n
              Path Replacement with Measurements? y
                 QSIG Path Replacement Extension: 22700
           Path Replace While in Queue/Vectoring? n
```

3.3.7. Administer Private Numbering

Use the "change private-numbering 0" command to access the **NUMBERING – PRIVATE FORMAT** table. In the tested configuration, FlexxGate™ transferred calls to on-pbx extensions that were 5 digits in length and started with digit 2. Therefore, a new entry was created as follows: "5" was inserted in the **EXT LEN** column, "2" in the **EXT CODE** column and "5" in the **TOTAL LEN** column. This explicitly specifies to Avaya Communication Manager that the extensions in the range of 20000 through 29999 are local endpoints that pertain to the local system. This configuration is necessary for Avaya Communication Manager to initiate QSIG Path Replacement Proposals. Note that the extension number assigned in the **QSIG Path Replacement Extension** field in **Section 3.3.6** must also be included in this range. The entry in the **QSIG Path Replacement Extension** field in **Section 3.3.6** is used so that QSIG Path Replacement can still function when the transfer destination is not a local endpoint. Submit these changes.

```
change private-numbering 0                                  Page   1 of   2
                       NUMBERING - PRIVATE FORMAT


Ext Ext          Trk        Private        Total
Len Code         Grp(s)     Prefix         Len
 0  attd                                    0     Total Administered: 2
 5  2                                       5        Maximum Entries: 540
```

3.3.8. Administer Private Routing to the T1/ISDN/QSIG Span

3.3.8.1 Administer the AAR Feature Access Code[5]

Use the "change feature-access-code" command to access the **FEATURE ACCESS CODE** form. Enter "8" in the **Auto Alternate Routing (AAR) Access Code** field. Submit this change.

```
change feature-access-codes                                  Page   1 of   8
                           FEATURE ACCESS CODE (FAC)
         Abbreviated Dialing List1 Access Code: *70
         Abbreviated Dialing List2 Access Code:
         Abbreviated Dialing List3 Access Code:
Abbreviated Dial - Prgm Group List Access Code:
                    Announcement Access Code: *45
                    Answer Back Access Code: *31

      Auto Alternate Routing (AAR) Access Code: 8
   Auto Route Selection (ARS) - Access Code 1: 9      Access Code 2:
               Automatic Callback Activation:          Deactivation:
Call Forwarding Activation Busy/DA:        All: #444   Deactivation: #445
  Call Forwarding Enhanced Status:         Act:        Deactivation:
                         Call Park Access Code: *10
                       Call Pickup Access Code: *22
CAS Remote Hold/Answer Hold-Unhold Access Code: *04
               CDR Account Code Access Code: *55
                     Change COR Access Code:
                Change Coverage Access Code: *83
                    Contact Closure   Open Code:        Close Code:
```

3.3.8.2 Administer the Uniform Dialing Plan

Use the "change uniform-dialplan 2" command to access the **UNIFORM DIAL PLAN TABLE**. In the tested configuration, an entry was created to convert extension 22291 into a private network number of 2262291 in the following manner: enter "22291" in the **Matching Pattern** column, "5" in the **Len** column, "1" in the **Del** column, "226" in the **Insert Digits** column, "aar" in the **Net** column, and "n" in the **Conv** column. Submit these changes.

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


 Matching                    Insert              Node
 Pattern        Len Del      Digits      Net Conv Num
 22291           5   1       226         aar  n
```

---

[5] Note that in the following sections, AAR Feature Access Code "8", extension "22291", AAR dialed string "2262291", route pattern "201", trunk group "200", vector directory number "2201", and vector "201", were used in the tested configuration. However, these values will differ from site to site.

3.3.8.3 Administer the AAR Digit Analysis Table

Use the "change aar analysis 2262291" command to access the **AAR DIGIT ANALYSIS TABLE**. In the tested configuration, an entry was created to route private network calls to 2262291 using route pattern 201 in the following manner: enter "2262291" in the **Dialed String** column, "7" in the **Total Min** column, "7" in the **Total Max** column, "201" in the **Route Pattern** column, "aar" in the **Call Type**. Other values were left at the defaults. Submit these changes.

```
change aar analysis 2262291                                     Page   1 of   2
                          AAR DIGIT ANALYSIS TABLE
                                                        Percent Full:    7


        Dialed           Total      Route     Call   Node  ANI
        String           Min  Max   Pattern   Type   Num   Reqd
    2262291              7    7     201       aar          n
```

3.3.8.4 Administer the Route Pattern

Use the "change route-pattern 201" command to access route pattern 201. In the tested configuration, an entry was created to route calls to trunk 200 in the following manner: enter "200" in the **Grp No** column, "0" in the **FRL** column, "7" in the **No. Del Dgts** column, and "2201" in the **Inserted Digits.** The inserted digits "2201" represent the Dialed Number Identification Service (DNIS) digits to be passed to the FlexxGate™ during the initial call setup. Other values were left at the defaults. Submit these changes.

```
change route-pattern 201                                        Page   1 of   3
                    Pattern Number: 201 Pattern Name: FlexGate2201
                          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: 200  0                    7    2201                             n   user
 2:                                                                 n   user
 3:                                                                 n   user
 4:                                                                 n   user
 5:                                                                 n   user
 6:                                                                 n   user


     BCC VALUE  TSC CA-TSC    ITC BCIE Service/Feature PARM  No. Numbering LAR
     0 1 2 M 4 W    Request                                  Dgts Format
                                                          Subaddress
 1: y y y y y n  n          rest                                       none
 2: y y y y y n  n          rest                                       none
 3: y y y y y n  n          rest                                       none
 4: y y y y y n  n          rest                                       none
 5: y y y y y n  n          rest                                       none
 6: y y y y y n  n          rest                                       none
```

3.3.8.5 Administer a Vector Directory Number

Use the "add vdn n" command, where "n" is an available extension number. In the tested configuration, a vector directory number was used as the initial pilot number to route calls to the FlexxGate™. Enter a description name such as "FlexxGateVDN2201" in the **Name** field. Enter

"201" in the **Vector Number** field. Other values were left at the defaults. Submit these changes.

```
add vdn 2201                                              Page   1 of   3
                          VECTOR DIRECTORY NUMBER

                             Extension: 2201
                                 Name*: FlexxGateVDN2201
                         Vector Number: 201

                   Meet-me Conferencing? n
                     Allow VDN Override? n
                                   COR: 1
                                   TN*: 1
                              Measured: none


         VDN of Origin Annc. Extension*:
                             1st Skill*:
                             2nd Skill*:
                             3rd Skill*:



* Follows VDN Override Rules
```

3.3.8.6 Administer a Vector

Use the "change vector 201" command. In the tested configuration, a vector was used to route calls to the FlexxGate™. Enter a description name such as "FlexxGateVec201" in the **Name** field. For vector Step 1, enter "wait-time" and populate the rest of the values as shown below. For vector Step 2, enter "route-to" "number" and enter "82262291" as shown below. The number "82262291" corresponds to the AAR Feature Access Code configured in **Section 3.3.8.1** and the AAR Routing Table Entry configured in **Section 3.3.8.3.** For vector Step 3, enter "busy".[6] Submit these changes.

```
change vector 201                                        Page   1 of   6
                             CALL VECTOR

    Number: 201               Name: FlexxGateVec201
Multimedia? n                              Meet-me Conf? n          Lock? n
    Basic? y   EAS? y   G3V4 Enhanced? y   ANI/II-Digits? y   ASAI Routing? y
 Prompting? y   LAI? y  G3V4 Adv Route? y   CINFO? y   BSR? y   Holidays? y
 Variables? y   3.0 Enhanced? y
01 wait-time     2    secs hearing ringback
02 route-to      number 82262291          with cov n if unconditionally
03 busy
04
05
```

3.4. E1/ISDN/QSIG

Since the procedures for configuring the E1/ISDN/QSIG trunk are very similar to the procedures for configuring the T1/ISDN/QSIG trunk in **Section 3.3**, the reader will be referred to the

---

[6] Additional call vectoring steps can be added to take advantage of conditional routing per customer requirements.

appropriate sub-sections under T1/ISDN/QSIG configuration. Only those sections that differ will be highlighted in this section. The procedures include the following areas:

- Verify Avaya Communication Manager License
- Administer DS1 Circuit Pack
- Administer ISDN Trunk Group
- Administer ISDN Signaling Group
- Administer ISDN Trunk Group Members
- Administer System Features Form
- Administer Private Numbering Selection Numbers
- Administer Private Network Routing

3.4.1. Verify Avaya Communication Manager License

See **Section 3.3.1.**

3.4.2. Administer DS1 Circuit Pack (E1/ISDN/QSIG)

Note that the values described in this section are appropriate when adding a TN464 circuit pack with switches set to 32 channels and 120 ohms. Refer to [2] for instructions on how to set the switches on TN464 circuit packs.

Administer a DS1 circuit pack to be used for connectivity to the FlexxGate™ media gateway. Use the "add ds1 1b16" command. The actual slot number may vary. In this case "1b16" is the slot number. Enter the following values for the specified fields, and retain the default values for all remaining fields. Enter a descriptive name, such as "FlexxGateSpan4", in the **Name** field. Enter "hdb3" in the **Line Coding** field, "isdn-pri" in the **Signaling Mode** field, "pbx" in the **Connect** field, "peer-master" in the **Interface** field, "Q-SIG" in the **Peer Protocol** field, "alaw" in the **Interface Companding** field, and "a" in the **Side** field. Submit these changes.

```
add ds1 1b16
                             DS1 CIRCUIT PACK

          Location: 01B16                            Name: FlexxGateSpan4
          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: 11111111          Channel Numbering: timeslot
                           DCP/Analog Bearer Capability: 3.1kHz


                                     T303 Timer(sec): 4


      Slip Detection? n                  Near-end CSU Type: other
```

3.4.3. Administer ISDN Trunk Group

Administer an ISDN trunk group. Use the "add trunk-group n" command, where "n" is an available trunk group number. In the test configuration, trunk group 210 was used. Enter the following values for the specified fields, and retain the default values for all remaining fields. Enter "isdn" in the **Group Type** field, a descriptive name, such as "FlexxGateSpan4", in the **Group Name** field, an available trunk access code in the **TAC** field, "two-way" in the **Direction** field, and "tie" in the **Service Type** field.

```
add trunk-group 210                                         Page   1 of  21
                              TRUNK GROUP

Group Number: 210                    Group Type: isdn        CDR Reports: y
  Group Name: FlexxGateSpan4              COR: 1     TN: 1       TAC: 1210
    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
```

Page Down to Page 2 and enter the following values for the specified fields, and retain the default values for all remaining fields. Enter "b" in the **Supplementary Service Protocol** field and "ascend"[7] in the **Trunk Hunt** field.

```
add trunk-group 210                                         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): enbloc/enbloc

           Trunk Hunt: ascend
                                          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
```

---

[7] In the tested configuration, the **Trunk Hunt** field was set to "ascend". This setting controls how Avaya Communication Manager performs a trunk hunt when searching for available channels within a facility in an ISDN trunk group. A value of "ascend" enables a linear trunk hunt search from the lowest to highest numbered channels. The FlexxGate media gateway was set to choose channels from highest to lowest to help avoid the possibility of glare conditions. Avaya Communication Manager can also work in the reverse configuration.

Page Down to Page 3 and enter the following values for the specified fields, and retain the default values for all remaining fields. Enter "y" in the **Send Name** field, "y" in the **Send Calling Number** field, "unk-pvt" in the **Format** field, and "y" in the **Send Connected Number** field.

```
add trunk-group 210                                             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: unk-pvt
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

   Apply Local Ringback? n
 Show ANSWERED BY on Display? y
                          Network (Japan) Needs Connect Before Disconnect? n
```

Page Down to Page 4 and ensure the **Path Replacement** field is set to "y". Submit these changes.

```
add trunk-group 210                                             Page   4 of  21
                         QSIG TRUNK GROUP OPTIONS




   TSC Method for Auto Callback: drop-if-possible
          Diversion by Reroute? y
              Path Replacement? y
Path Replacement with Retention? n
       Path Replacement Method: better-route
                          SBS? n
 Display Forwarding Party Name? y
   Character Set for QSIG Name: eurofont
```

3.4.4. Administer ISDN Signaling Group

Administer an ISDN signaling group for the DS1 circuit pack. Use the "add signaling-group n" command, where "n" is an available signaling group number. For the **Primary D-Channel** field, enter the slot number for the DS1 circuit pack as administered in **Section 3.4.2** and port "16". Note that TSCs were not used during this integration testing and, therefore, the TSC related fields are not relevant for this integration.

Maintain the default values for the remaining fields, and submit these changes.

```
add signaling-group 210
                              SIGNALING GROUP

 Group Number: 210              Group Type: isdn-pri
                  Associated Signaling? y        Max number of NCA TSC: 0
                  Primary D-Channel: 01B1616      Max number of CA TSC: 0
                                              Trunk Group for NCA TSC:
       Trunk Group for Channel Selection:
     TSC Supplementary Service Protocol: a
```

3.4.5. Administer ISDN Trunk Group Members

Use the "change trunk-group n" command, where "n" is the trunk group number that was administered in **Section 3.4.3**. Navigate to the **GROUP MEMBER ASSIGNMENTS** page of the **TRUNK GROUP** screen, and enter the ports of the DS1 circuit pack into the corresponding **Port** fields. The corresponding **Code** and **Sfx** fields will be populated automatically.

Repeat this procedure for the desired number of trunk group members. The number of members assigned should match the total number of active channels between Avaya Communication Manager and the FlexxGate™ media gateway on this span. This includes the channels that will be used by FlexxGate™ to transfer calls away from the FlexxGate™ back to the Avaya system.

```
change trunk-group 210                                      Page   5 of  21
                                TRUNK GROUP
                                    Administered Members (min/max):   1/30
GROUP MEMBER ASSIGNMENTS                     Total Administered Members:  30


      Port    Code Sfx Name         Night           Sig Grp
  1: 01B1601  TN464  G                                210
  2: 01B1602  TN464  G                                210
  3: 01B1603  TN464  G                                210
  4: 01B1604  TN464  G                                210
  5: 01B1605  TN464  G                                210
  6: 01B1606  TN464  G                                210
  7: 01B1607  TN464  G                                210
  8: 01B1608  TN464  G                                210
  9: 01B1609  TN464  G                                210
 10: 01B1610  TN464  G                                210
 11: 01B1611  TN464  G                                210
 12: 01B1612  TN464  G                                210
 13: 01B1613  TN464  G                                210
 14: 01B1614  TN464  G                                210
 15: 01B1615  TN464  G                                210
```

Page Down to the next page and enter the remaining ports. Note that port 16 is reserved for the signaling channel and is not added as a group member. Submit these changes.

```
change trunk-group 210                                          Page   6 of  21
                                 TRUNK GROUP
                                   Administered Members (min/max):   1/30
GROUP MEMBER ASSIGNMENTS                     Total Administered Members:  30

        Port    Code Sfx Name         Night              Sig Grp
 16: 01B1617   TN464  G                                    210
 17: 01B1618   TN464  G                                    210
 18: 01B1619   TN464  G                                    210
 19: 01B1620   TN464  G                                    210
 20: 01B1621   TN464  G                                    210
 21: 01B1622   TN464  G                                    210
 22: 01B1623   TN464  G                                    210
 23: 01B1624   TN464  G                                    210
 24: 01B1625   TN464  G                                    210
 25: 01B1626   TN464  G                                    210
 26: 01B1627   TN464  G                                    210
 27: 01B1628   TN464  G                                    210
 28: 01B1629   TN464  G                                    210
 29: 01B1630   TN464  G                                    210
 30: 01B1631   TN464  G                                    210
```

3.4.6. Administer System Features Form

See **Section 3.3.6.**

3.4.7. Administer Private Numbering

See **Section 3.3.7.**

3.4.8. Administer Private Routing to the E1/ISDN/QSIG Span

3.4.8.1   Administer the AAR Feature Access Code[8]

See **Section 3.3.8.1.**

3.4.8.2   Administer the Uniform Dialing Plan

See **Section 3.3.8.2.**

3.4.8.3   Administer the AAR Digit Analysis Table

See **Section 3.3.8.3.**

3.4.8.4   Administer the Route Pattern

Use the "change route-pattern 201" command to access route pattern 201. In the tested configuration, an entry was created to route calls to trunk 210 in the following manner: enter "210" in the **Grp No** column, "0" in the **FRL** column, "7" in the **No. Del Dgts** column, and "2201" in the **Inserted Digits.** The inserted digits "2201" represent the Dialed Number

---

[8] Note that in the following sections, AAR Feature Access Code "8", extension "22291", AAR dialed string 2262291", route pattern "201", trunk group "210", vector directory number "2201", and vector "201", were used in the tested configuration. However, these values will differ from site to site.

Identification Service (DNIS) digits to be passed to the FlexxGate™ during the initial call setup. Other values were left at the defaults. Submit these changes.

```
change route-pattern 201                                          Page   1 of   3
                        Pattern Number: 201 Pattern Name: FlexGate2201
                                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: 210  0                  7    2201                                 n    user
 2:                                                                   n    user
 3:                                                                   n    user
 4:                                                                   n    user
 5:                                                                   n    user
 6:                                                                   n    user

     BCC VALUE  TSC CA-TSC    ITC BCIE Service/Feature PARM  No. Numbering LAR
     0 1 2 M 4 W    Request                                  Dgts Format
                                                         Subaddress
 1: y y y y y n  n         rest                                              none
 2: y y y y y n  n         rest                                              none
 3: y y y y y n  n         rest                                              none
 4: y y y y y n  n         rest                                              none
 5: y y y y y n  n         rest                                              none
 6: y y y y y n  n         rest                                              none
```

3.4.8.5 Administer a Vector Directory Number
See **Section 3.3.8.5.**

3.4.8.6 Administer a Vector
See **Section 3.3.8.6.**

4.   Configure FlexxGate™ T1/E1 Board and Protocol
The procedures for configuring the FlexxGate™ media gateway include the following areas:

- Span Configuration – Physical Layer
- Signaling and Channel Configuration
- Dial Plan Configuration

4.1. Span Configuration – Physical Layer
The /etc/zaptel.conf file controls the physical layer configuration of the individual spans connected to the Digium TE412P telephony interface card. Four spans were used during the testing and were configured in the following manner: span 1 was configured for T1/CAS, span 2 was configured for E1/CAS, span 3 was configured for T1/ISDN/QSIG, and span 4 was configured for E1/ISDN/QSIG.

Log into the FlexxGate™ media gateway using root level permissions and edit the /etc/zaptel.conf file. The programming of this file is beyond the scope of these Application Notes. Product Support Solutions, Inc. will provision this file as necessary to meet customer

requirements. The values that were used during integration testing are listed below and are described in [4], available from Product Support Solutions, Inc.

```
# Span 1 = T1 - D4/AMI
# Channels 1-24 set to e&m
span=1,1,0,d4,ami
fxsks=1-24

# Span 2 = E1 - CAS/AMI
# Channels 25-55 set to e&m
span=2,2,0,cas,ami
fxsks=25-55

# Span 3 = T1 - ISDN (ESF/B8ZS)
# B Channels 56-78 / D Channel 79
span=3,3,0,esf,b8zs
bchan=56-78
dchan=79

# Span 4 = E1 - ISDN
# B Channels 80-94 & 96-110 / D Channel 95
span=4,4,0,ccs,hdb3,crc4
bchan=80-94,96-110
dchan=95
```

4.2. Signaling and Channel Configuration

The /etc/asterisk/zapata.conf file controls the signaling layer configuration for all calls arriving at the FlexxGate™ media gateway. Four spans were used during the testing and were configured in the following manner: span 1 was configured for T1/CAS, span 2 was configured for E1/CAS, span 3 was configured for T1/ISDN/QSIG, and span 4 was configured for E1/ISDN/QSIG.

Log into the FlexxGate™ media gateway using root level permissions and edit the /etc/zapata.conf file. For spans 1 and 2, the **switchtype** variables were set to "5ess" and the "signalling" variables were set to "fxs_ks". For spans 3 and 4, the **switchtype** variables were set to "qsig" and the "signalling" variables were set to "pri_cpe". The programming of this file is beyond the scope of these Application Notes. Product Support Solutions, Inc. will provision this file as necessary to meet customer requirements. The values that were used during integration testing are listed below and are described in [4], available from Product Support Solutions, Inc.

```
; ****************
; **** Span 1 ****
; ****************
language=en
switchtype=5ess
signalling=fxs_ks
usecallerid=yes
rxgain=0.0
txgain=0.0
echocancel=no
echocancelwhenbridged=no
echotraining=no
transfer=yes
transfertobusy=yes
threewaycalling=yes
cancallforward=yes
immediate=no
busydetect=no
callprogress=no
```

```
relaxdtmf=no
;facilityenable=yes
;overlapdial=yes
group=0
channel=1-24
; ******************
; **** End Span 1 ****
; ******************

; ***************
; **** Span 2 ****
; ***************
language=en
switchtype=5ess
signalling=fxs_ks
usecallerid=yes
rxgain=0.0
txgain=0.0
echocancel=no
echocancelwhenbridged=no
echotraining=no
transfer=yes
transfertobusy=yes
threewaycalling=yes
cancallforward=yes
immediate=no
busydetect=no
callprogress=no
relaxdtmf=no
;facilityenable=yes
;overlapdial=yes
group=1
channel=25-55
; ******************
; **** End Span 2 ****
; ******************

; ***************
; **** Span 3 ****
; ***************
language=en

; ISDN - no Path Replacement!
;switchtype=national

; ISDN - Q.Sig with Path Replacement!
switchtype=qsig

signalling=pri_cpe
usecallerid=yes
rxgain=0.0
txgain=0.0
echocancel=no
echocancelwhenbridged=no
echotraining=no
transfer=yes
transfertobusy=yes
threewaycalling=yes
cancallforward=yes
immediate=no
busydetect=no
callprogress=no
relaxdtmf=no
;facilityenable=yes
;overlapdial=yes
group=2
channel=56-78
; ******************
; **** End Span 3 ****
; ******************
```

```
; ****************
; **** Span 4 ****
; ****************
language=en

; E1-ISDN - no Path Replacement!
;switchtype=euroisdn

; ISDN - Q.Sig with Path Replacement!
switchtype=qsig

signalling=pri_cpe
usecallerid=yes
rxgain=0.0
txgain=0.0
echocancel=no
echocancelwhenbridged=no
echotraining=no
transfer=yes
transfertobusy=yes
threewaycalling=yes
cancallforward=yes
immediate=no
busydetect=no
callprogress=no
relaxdtmf=no
;facilityenable=yes
;overlapdial=yes
group=3
channel=80-94,96-110
; *******************
; **** End Span 4 ****
; *******************
```

4.3. Dial Plan Configuration

The /etc/asterisk/extensions.conf file controls the dial plan configuration of the individual spans connected to the Digium TE412P telephony interface card. This file provides the flexibility to map incoming channels to the appropriate IVR script and can manipulate or forward any DNIS digits that are received from Avaya Communication Manager, as programmed in **Section 3.3.8.4** and **Section 3.4.8.4**, for processing by the appropriate IVR script.

Log into the FlexxGate™ media gateway using root level permissions and edit the /etc/asterisk/extensions.conf file. The programming of this file is beyond the scope of these Application Notes. Product Support Solutions, Inc. will provision this file as necessary to meet customer requirements.

```
; ******************************************************************************
; *                          INBOUND FROM AVAYA                                *
; ******************************************************************************

; example ...
; send ANY inbound call to 2202@hollylab
;exten => s,1,Dial(SIP/2203@hollylab)
; ... end of example

; for standard T1 and E1 inbound (without DNIS)
; check inbound channel and send call to appropriate app for that channel - for a specific span
exten => s,1,NoOp(${CHANNEL})                ; show current channel designation
exten => s,2,Set(CHNO=${CUT(CHANNEL,/,2)})   ; Get JUST channel number from Channel designation
exten => s,3,Set(CHNO=${CUT(CHNO,-,-1)})      ;
exten => s,4,NoOp(${CHNO})                    ; show JUST channel number
```

```
; Span 1
exten => s,5,GotoIf($[${CHNO} < 9]?:7)        ;if channel is less than 9(1-8) send DNIS 2201 to
holly
exten => s,6,Dial(SIP/2201@hollylab)
exten => s,7,GotoIf($[${CHNO} < 17]?:9)       ;if channel is less than 17(9-16) send 2202 to holly
exten => s,8,Dial(SIP/2201@hollylab)
exten => s,9,GotoIf($[${CHNO} < 25]?:11)      ;if channel is less than 25(17-24) send 2203 to
holly
exten => s,10,Dial(SIP/2201@hollylab)
; Span 2
exten => s,11,GotoIf($[${CHNO} < 36]?:13)     ;if channel is less than 36(S2,1-11) send 2201 to
holly
exten => s,12,Dial(SIP/2201@hollylab)
exten => s,13,GotoIf($[${CHNO} < 46]?:15)     ;if channel is less than 46(S2,12-21) send 2202 to
holly
exten => s,14,Dial(SIP/2201@hollylab)
exten => s,15,GotoIf($[${CHNO} < 56]?:17)     ;if channel is less than 56(S2,22-30) send 2202 to
holly
exten => s,16,Dial(SIP/2201@hollylab)
exten => s,17,NoOp(Fell through - Channel ${CHNO} did not match dialplan)

; For ISDN lines with Inbound DNIS - change 1001-1003 to any inbound DNIS as received from the
Avaya
; Get appropriate DNIS and send onto associated Holly app
; App 1
exten => 2201,1,Dial(SIP/2201@hollylab)
; App 2
exten => 2202,1,Dial(SIP/2202@hollylab)
; App 3
exten => 2203,1,Dial(SIP/2203@hollylab)


; ******************************************************************************
; *                         TRANSFERS OUT FROM HOLLY                          *
; ******************************************************************************
;
; All the dialplans below are to be used with the Holly 2201 Transfer App
; The number dialed when asked by Holly "Please enter your transfer number" is the exten =>
number at
; the start of each dialplan below.


; T1 and E1 hookflash CAS transfers (Spans 1&2) - use 8101 to transfer from the Holly back to the
Avaya (at extension 1234)
; 1234 can be changed to any valid - any length - extension the Avaya is set to receive for xfer
testing
exten => 8101,1,flash()
exten => 8101,2,SendDTMF(1234)
exten => 8101,3,Wait(2)
exten => 8101,4,Hangup()

; T1 bridged/trombone CAS transfers (Spans 1&2) - use 8101 to transfer from the Holly back to the
Avaya (at extension 1234)
; 1234 can be changed to any valid - any length - extension the Avaya is set to receive for xfer
testing
exten => 8301,1,Dial(Zap/g0/ww1234)

; E1 bridged/trombone CAS transfers (Spans 1&2) - use 8101 to transfer from the Holly back to the
Avaya (at extension 1234)
; 1234 can be changed to any valid - any length - extension the Avaya is set to receive for xfer
testing
exten => 8302,1,Dial(Zap/g1/ww1234)


; T1 ISDN xfer (Span 3) - Use 8202 to transfer from the Holly back to the Avaya (at extension
1234)
; for trombone (dual-line) or Path Replacment xfers based on setting of switchtype in
/etc/zaptel.conf
```

```
; 1234 can be changed to any valid - any length - extension the Avaya is set to receive for xfer
testing
exten => 8202,1,Dial(Zap/G2/26614)
;exten => _2XXXX,1,Dial(Zap/G2/${EXTEN})
;exten => _91331XXXXXXX,1,Dial(Zap/G2/${EXTEN})

; E1 ISDN xfer (Span 4) - Use 8202 to transfer from the Holly back to the Avaya (at extension
1234)
; for trombone (dual-line) or Path Replacment xfers based on setting of switchtype in
/etc/zaptel.conf
; 1234 can be changed to any valid - any length - extension the Avaya is set to receive for xfer
testing
exten => 8203,1,Dial(Zap/g3/26614)

; For 5 digit extensions starting with 2, refer back on same span:
exten => _2XXXX!,1,NoOp(${CHANNEL})      ; dial the number given from the SIP-REFER message
exten => _2XXXX!,n,Set(CHNO=${CUT(CHANNEL,/,2)})
exten => _2XXXX!,n,Set(CHNO=${CUT(CHNO,-,-1)})
exten => _2XXXX!,n,NoOp(${CHNO})
exten => _2XXXX!,n,GotoIf($[${CHNO} < 25]?:10)      ;if Span 1 (1-24), do hook-flash
exten => _2XXXX!,n,flash()
exten => _2XXXX!,n,SendDTMF(${EXTEN})
exten => _2XXXX!,n,Wait(0)
exten => _2XXXX!,n,Hangup()
exten => _2XXXX!,n,GotoIf($[${CHNO} < 56]?:15)      ;if Span 2 (25-55), do hook-flash
exten => _2XXXX!,n,flash()
exten => _2XXXX!,n,SendDTMF(${EXTEN})
exten => _2XXXX!,n,Wait(0)
exten => _2XXXX!,n,Hangup()
exten => _2XXXX!,15,GotoIf($[${CHNO} < 79]?:17)     ;if Span 3 (56-78), dial out on Span 3 (G2)
exten => _2XXXX!,n,Dial(Zap/G2/${EXTEN})
exten => _2XXXX!,17,Dial(Zap/G3/${EXTEN})           ;else must be Span 4, dial out on Span 4
(G3)

; Refer external Long Distance calls for area code 331 back on same span:
exten => _91331XXXXXXX,1,NoOp(${CHANNEL})      ; dial the number given from the SIP-REFER message
exten => _91331XXXXXXX,n,Set(CHNO=${CUT(CHANNEL,/,2)})
exten => _91331XXXXXXX,n,Set(CHNO=${CUT(CHNO,-,-1)})
exten => _91331XXXXXXX,n,NoOp(${CHNO})
exten => _91331XXXXXXX,n,GotoIf($[${CHNO} < 25]?:10)      ;if Span 1 (1-24), do hook-flash
exten => _91331XXXXXXX,n,flash()
exten => _91331XXXXXXX,n,SendDTMF(${EXTEN})
exten => _91331XXXXXXX,n,Wait(0)
exten => _91331XXXXXXX,n,Hangup()
exten => _91331XXXXXXX,n,GotoIf($[${CHNO} < 56]?:15)      ;if Span 2 (25-55), do hook-flash
exten => _91331XXXXXXX,n,flash()
exten => _91331XXXXXXX,n,SendDTMF(${EXTEN})
exten => _91331XXXXXXX,n,Wait(0)
exten => _91331XXXXXXX,n,Hangup()
exten => _91331XXXXXXX,15,GotoIf($[${CHNO} < 79]?:17)    ;if Span 3 (56-78), dial out on Span 3
(G2)
exten => _91331XXXXXXX,n,Dial(Zap/G2/${EXTEN})
exten => _91331XXXXXXX,17,Dial(Zap/G3/${EXTEN})      ;else must be Span 4, dial out on Span 4
(G3)
```

5. Interoperability Compliance Testing

The interoperability compliance testing focused on the following areas:

- The ability of FlexxGate™ to receive inbound calls from Avaya Communication Manager via T1/E1 ISDN/QSIG and CAS interfaces.
- The ability of FlexxGate™ to properly transfer calls using QSIG Path Replacement or flash-hook signaling.

5.1. General Test Approach

The feature test cases were conducted by dialing Public Switched Telephone Network (PSTN) calls that arrived on trunk facilities to Avaya Communication Manager. For T1/CAS and E1/CAS spans, calls were dialed to hunt group extensions and for T1/ISDN/QSIG and E1/ISDN/QSIG spans, calls were dialed to vector directory numbers that routed calls over the appropriate span to the FlexxGate™ media gateway. The FlexxGate™ converted these calls for processing by the IVR using SIP based protocols. The caller was prompted to enter either a five digit extension or a long distance telephone number. In either case, calls were transferred to the intended destination and the bearer channels between Avaya Communication Manager and the FlexxGate™ media gateway were properly dropped.

Subjective verification of the talk path was performed from the caller to the intended transfer destination. Various call detail record reports available using the FlexxGate™ media gateway browser interface were verified.

5.2. Test Results

All of the executed test cases passed.

6. Verification Steps

This section provides various checks that can be performed to verify basic connectivity between Avaya Communication Manager and the FlexxGate™ media gateway.

6.1. Verify Avaya Communication Manager T1/CAS and E1/CAS

Verify the status of the T1/CAS and E1/CAS channels by using the "status station n" command, where "n" is the extension number administered in **Section 3.1.2,** for T1/CAS channels, and **Section 3.2.2,** for E1/CAS channels. While the channels are idle, verify the **Service State** for each of the stations is "in-service/on-hook" as shown below.

```
status station 22201                                         Page   1 of   3
                            GENERAL STATUS
     Administered Type: DS1FD              Service State: in-service/on-hook
        Connected Type: N/A
             Extension: 22201
                  Port: 01C1201      Parameter Download: not-applicable
          Call Parked? no                   SAC Activated? no
     Ring Cut Off Act? no
Active Coverage Option: 1


          EC500 Status: N/A       Off-PBX Service State: N/A
  Message Waiting:
  Connected Ports:



  Limit Incoming Calls? no

 User Cntrl Restr: none                       HOSPITALITY STATUS
Group Cntrl Restr: none                    Awaken at:
                                            User DND: not activated
                                           Group DND: not activated
                                         Room Status: non-guest room
```

6.2. Verify Avaya Communication Manager T1/ISDN/QSIG and E1/ISDN/QSIG

Verify the status of the trunk group by using the "status trunk n" command, where "n" is the trunk group number administered in **Section 3.3.3** for T1/ISDN/QSIG or in **Section 3.4.3** for E1/ISDN/QSIG. While the trunks are connected and idle, verify the **Service State** for each connected trunk is "in-service/idle" as shown below.

```
status trunk 200                                                  Page   1

                            TRUNK GROUP STATUS

Member    Port    Service State        Mtce Connected Ports
                                       Busy

0200/001 01B1701  in-service/idle       no
0200/002 01B1702  in-service/idle       no
0200/003 01B1703  in-service/idle       no
0200/004 01B1704  in-service/idle       no
0200/005 01B1705  in-service/idle       no
0200/006 01B1706  in-service/idle       no
0200/007 01B1707  in-service/idle       no
0200/008 01B1708  in-service/idle       no
0200/009 01B1709  in-service/idle       no
0200/010 01B1710  in-service/idle       no
0200/011 01B1711  in-service/idle       no
0200/012 01B1712  in-service/idle       no
0200/013 01B1713  in-service/idle       no
0200/014 01B1714  in-service/idle       no


              press CANCEL to quit --  press NEXT PAGE to continue
```

Page Down to Page 2 and verify the remaining trunk group members are "in-service/idle" as shown below.

```
status trunk 200

                        TRUNK GROUP STATUS

Member   Port        Service State       Mtce Connected Ports
                                         Busy

0200/015 01B1715  in-service/idle        no
0200/016 01B1716  in-service/idle        no
0200/017 01B1717  in-service/idle        no
0200/018 01B1718  in-service/idle        no
0200/019 01B1719  in-service/idle        no
0200/020 01B1720  in-service/idle        no
0200/021 01B1721  in-service/idle        no
0200/022 01B1722  in-service/idle        no
0200/023 01B1723  in-service/idle        no




Command successfully completed
```

6.3. Verify FlexxGate™ Spans

Open a browser interface and enter the URL for the FlexxGate™ media gateway as shown below to access the FlexxGate™ OA&M screen. In the tested configuration, the URL for the FlexxGate™ media gateway was http://192.168.40.45.
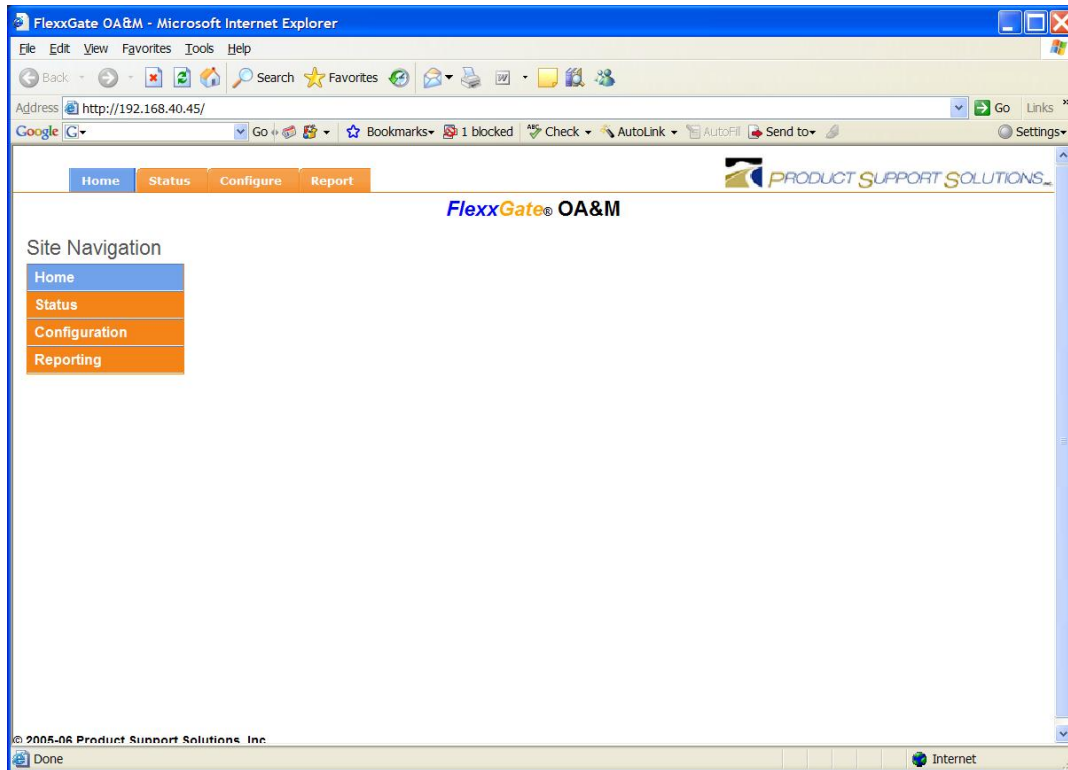
Click on **Status** on the toolbar at the top of the browser window.

The **Status Monitor** screen will be displayed. Verify that the **Status** column shows "OK" for each of the spans as shown below.

6.4. Verify FlexxGate™ Call Detail Records

Make a test call to the DDC hunt group extension added in **Section 3.1.3** for T1/CAS **or Section 3.2.3** for E1/CAS. Or, make a test call to the vector directory number added in **Section 3.3.8.5** for T1/ISDN/QSIG or **Section 3.4.8.5** for E1/ISDN/QSIG. Verify that a prompt is played back to the caller. The prompt that will be heard will depend upon customer requirements. In the test configuration, the IVR prompted the caller to enter transfer destination digits. Enter the transfer destination and verify that the call is transferred to the intended destination. Allow a few minutes for call detail records to be populated into the call detail records database on the FlexxGate™. Open a browser interface and enter the URL for the FlexxGate™ media gateway as shown below to access the FlexxGate™ OA&M screen. In the tested configuration, the URL for the FlexxGate™ media gateway was http://192.168.40.45.
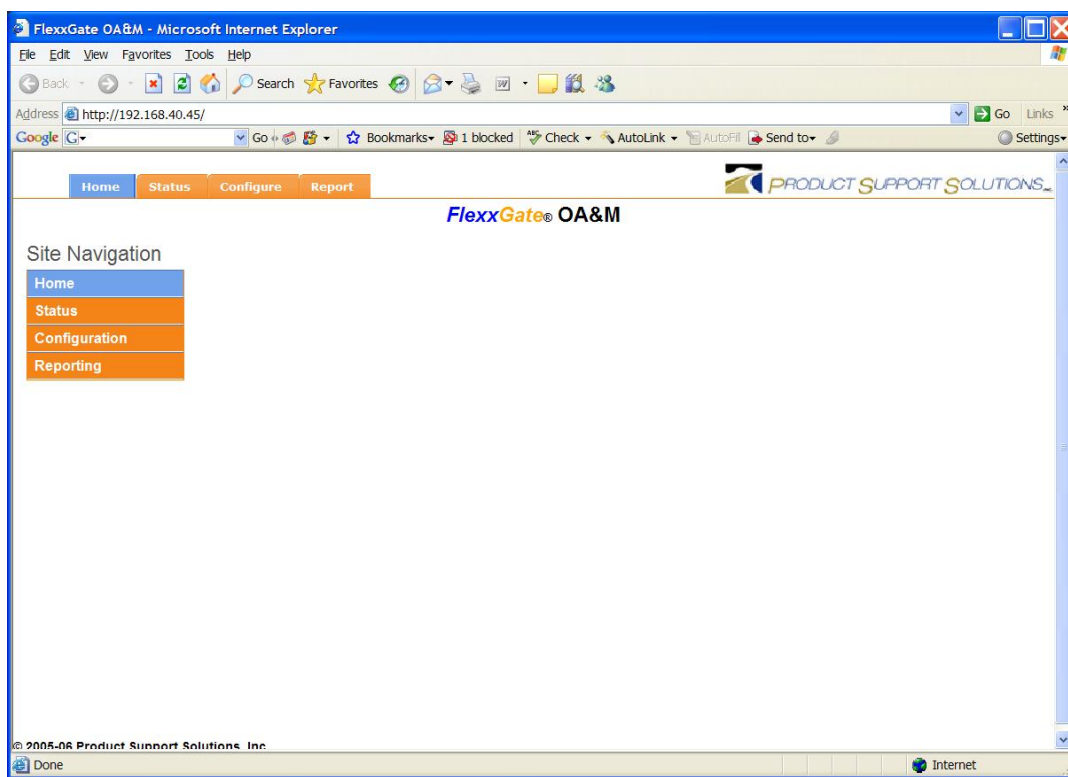
Click on **Report** on the toolbar at the top of the browser window.

The **FlexxGate™ Reporting** screen will be displayed. Verify the default selection of "Selection of the month". Click on the **Search** button.

Under the **Call Logs** section, verify that call detail records are found and listed. A call detail record should exist for each new call that has arrived at the FlexxGate™ system. As shown below, the search results will contain the channel number, the caller identification, if available, and the call disposition.

7. Support

Technical support on FlexxGate™ can be obtained through the following:
- Email the PSS support center via support@psshelp.com
- Web at http://www.psshelp.com
- Call the PSS support center:
  - In the US (24x7) at 1.888.455.2285
  - In the UK (24x7) at 0.808.234.6787

8. Conclusion

These Application Notes describe the configuration steps required for Product Support Solutions' FlexxGate media gateway connectivity solution to successfully interoperate with Avaya Communication Manager 4.0 using T1/E1 ISDN/QSIG and CAS interfaces.

VV; Reviewed:
SPOC 5/29/2007
Solution & Interoperability Test Lab Application Notes
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9. Additional References

This section references the product documentation relevant to these Application Notes.

[1] *Administrator Guide for Avaya Communication Manager*, Document 03-300509, Issue 3, February 2007, available at http://support.avaya.com

[2] *Job Aid: Option Switch Settings*, Document 555-245-774, Issue 3, January 2005, available at http://support.avaya.com

[3] *Avaya Call Center Release 4.0 Call Vectoring and Expert Agent Selection (EAS) Guide,* Document 07-600780, Release 4.0, February 2007, available at http://support.avaya.com

[4] *Product Support Solutions, Inc., FlexxGate™ Media Gateway Operations Guide, Revision 0.04,* available from Product Support Solutions, Inc.

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