Avaya Solution & Interoperability Test Lab

Application Notes for Solution Redundancy of NEC IP DECT Handsets with Avaya Aura® Communication Manager R7.0.1 and Avaya Aura® Session Manager R7.0.1 using TLS/SRTP – Issue 1.0

Abstract

These Application Notes describe the configuration steps for provisioning NEC's IP DECT Access Points and Handsets to interoperate with Avaya Aura® Communication Manager and Avaya Aura® Session Manager focusing on the redundancy of the NEC DECT handsets having them registered simultaneously to multiple Avaya Aura® Session Manager instances.

Readers should pay particular attention to the scope of testing as outlined in Section 2.1, as well as observations noted in Section 2.2 to ensure that their own use cases are adequately covered by this scope and results.

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 the configuration steps for provisioning NEC's IP DECT Access Point (AP400) and NEC´s DECT handsets to interoperate with Avaya Aura® Communication Manager R7.0.1 and Avaya Aura® Session Manager R7.0.1 specifically to show redundancy using multiple simultaneous registrations with different Avaya Aura® Session Managers in a main/branch environment and seamless failover during active calls when an outage occurs.

Application Notes have already been written outlining the setup of the NEC IP DECT Access Points AP400 and NEC DECT Handsets with Avaya Aura® Communication Manager and Avaya Aura® Session Manager using TLS/SRTP, therefore these Application Notes will focus instead on the setup required for redundancy and how the NEC DECT handsets respond to various failover scenarios outlined in **Section 2.1**. For more information on the configuration of the NECT DECT handsets with Avaya Aura® Communication Manager and Avaya Aura® Session Manager using TLS/SRTP please refer to the Application Notes titled, *Application Notes for configuring NEC IP DECT Access Points AP400 and NEC DECT Handsets with Avaya Aura® Communication Manager R7.0 and Avaya Aura® Session Manager R7.0 using TLS/SRTP*.

An NEC IP DECT solution typically consists of a windows based instance called DAP Controller that runs the IP DECT system software (DAP Configurator and DAP Manager), one or more DECT access points (DAP) AP400, DECT handsets (e.g. G566, I766, G966) and if needed a software based DMLS open interface for messaging and alarming. The DAP´s are connected to the IP network and get the needed power by using POE following 802.3af standard. Multiple NEC DECT access points (DAP) are tied together to build a single DECT system. The handsets are enrolled into that System using Digital Enhanced Cordless Technology (DECT). Each DAP is hosting (responsible for) a particular number of handsets although roaming/handover is possible across all DAPs. The DAPs are configured to register with Session Manager using Session Initiation Protocol (SIP). A single DAP will register multiple times against Session Manager on behalf of the handsets it is responsible for.

Each handset is configured as a SIP user on Avaya Aura® System Manager, using an Avaya 9608 SIP endpoint type on Avaya Aura® Communication Manager. The NEC DECT handsets behave as third-party SIP extensions (non AST device) integrated into the Avaya Aura® Core. They are able to register to different Avaya Aura® Session Managers simultaneously in a similar way to the Avaya SIP phones allowing for no manual intervention upon any service interruption due to LAN or service failures on Avaya Aura® Session Manager.

2. General Test Approach and Test Results

The interoperability compliance testing evaluates the ability of NEC DECT handsets to register with up to two core Session Manager instances and one Branch Session Manager as outlined in **Figure 1**. The NEC DECT handset supports multiple, simultaneous registrations allowing the DECT handsets to failover seamlessly during active calls between the core and branch sites. A number of failover and fall back (fail back) scenarios were carried out testing basic call functionality after every step as outlined in **Section 2.1**. In addition there was also tested the ability of the NEC DECT handsets to deal properly with a "301 Moved Permanently" message received from a Session Manager instance. This happens when a User (e.g. NEC DECT handset) tries to register against a Session Manager instance which is not responsible for that SIP User. This scenario is outlined in **Section 2.1.5**.

2.1. Interoperability Compliance Testing

The following scenarios were tested in order to prove that the NEC DECT phones were registered correctly to each Session Manager allowing for a seamless failover depending on the outage that occurred.
"Normal Mode" is, when all Core Components (SMGR, SM, CM etc.) are healthy and reachable and the NEC DECT handsets are registered simultaneously against two Core Session Manager instances and the Branch Session Manager.
"Failover feature tests" are a series of basic telephony features e.g. make call, answer call, hold, transfer, MWI to prove telephony functionality before and after an outage occurred. These tests were made by using Avaya SIP and H.323 phones along with NEC DECT handsets.

Note: For a complete list of tested/supported telephony features of the NEC DECT handsets in an Avaya Aura® environment, please refer to the Application Notes titled, *Application Notes for configuring NEC IP DECT Access Points AP400 and NEC DECT Handsets with Avaya Aura® Communication Manager R7.0 and Avaya Aura® Session Manager R7.0 using TLS/SRTP*.

2.1.1. LAN failure and failover Site 1 (CM, SM1) to Site 2 (SC, SM2)

Failover from Site 1 to Site 2, starting in "Normal Mode", several LAN failures are then experienced in the following order with some basic feature tests carried out after each failure.

1. Fail network connectivity to Active CM (CMA), redundant CM (CMB) at the same location becomes active.
2. Carry out "failover feature tests".
3. Fail network connectivity to redundant CM (CMB) at main location (both down), Session Manager 1 (SM1) at main site (Site1) now talks to Survivable Core (SC) at backup location (Site 2).
4. Carry out "failover feature tests".
5. Fall-back to CMA at main location (Site 1).
6. Carry out "failover feature tests".
7. Fail network connectivity to SM1 (Site 1). NEC Endpoints which are already registered with Session Manager 2 (SM2) will now SUBSCRIBE to events from SM2 at backup location (Site 2) and use SM2 as the active Controller.

8. Carry out “failover feature tests”.
9. Restore network connectivity to SM1 (Site 1). NEC Endpoints will automatically REGISTER and SUBSCRIBE again with SM1 at main location (Site 1) and use SM1 as the active controller.
10. Carry out “failover feature tests”.
11. Force a complete failover from Site 1 to Site 2 (failure the Media Server, Communication Manager and Session Manager at the main site). Survivable Core (SC) at Site 2 becomes active. SM2 talks to SC. NEC Endpoints which are already registered with SM2 will now SUBSCRIBE to events from SM2 at backup location (Site2) and use SM2 as the active Controller.
12. Carry out “failover feature tests”.
13. Restore network connectivity to CMA and CMB at main location (Site1). CMA or CMB becomes active and SC goes to backup. SM2 at backup location (Site2) now talks to active CM (either CMA or CMB) at main location (Site1).
14. Carry out “failover feature tests”.
15. Restore network connectivity to SM1 at main location (Site 1).NEC endpoints will automatically REGISTER and SUBSCRIBE again with SM1 at main location (Site 1) and use SM1 as the active controller. Now the system should be back to original state “normal mode” once again.
16. Carry out “failover feature tests”.

2.1.2. Session Manager ‘Deny New Service’ Failover Site 1 to Site 2

Session Manager Failovers are carried out by sending a “Deny New Service" to the Session Managers through the System Manager Web interface.

1. Starting from “Normal Mode”, send a “Deny New Service" to the SM1. NEC Endpoints which are already registered with Session Manager 2 (SM2) will now SUBSCRIBE to events from SM2 at backup location (Site 2) and use SM2 as the active Controller.
2. Carry out “failover feature tests”.
3. Fail network connectivity to CM duplex at main location (both CM instances not reachable), Survivable Core (SC) at Site 2 becomes active and SM2 now talks to SC at Site 2.
4. Carry out “failover feature tests”.
5. Fall-back to Session Manager at main location, by “Allow new service” on the SM1. NEC endpoints will automatically REGISTER and SUBSCRIBE again with SM1 and use this as the active controller. SM1 now talks to SC at Site 2.
6. Carry out “failover feature tests”.
7. Restore network connectivity to CM duplex at main location, SC goes to backup and CM becomes active again. SM1 now talks to CM at main location. System should be back to original state “normal mode” once again.
8. Carry out “failover feature tests”.

2.1.3. Failover to Site 3 (Branch Site) in case of a WAN outage

The BSM and LSP at the Branch site will come into use when a WAN failure is detected from the Branch Site. The NEC DECT handsets at the Branch location will now SUBSCRIBE and start using the Branch Session Manager (BSM) and LSP at the Branch site. They will remain REGISTERED at the BSM once the WAN connection to the Main Site has recovered.

1. Starting from “Normal Mode”, create a WAN failure by disconnecting the WAN cable on the Branch Site. LSP and BSM at Site 3 (Branch) become active. NEC endpoints which are already registered with Branch Session Manager (BSM) will now SUBSCRIBE to events from BSM and use BSM as the active controller.
2. Carry out “failover feature tests”.
3. Reconnect the WAN cable to ensure connectivity to the Main Site is restored. CM and SM1 at main location (Site1) as well as SM2 at backup location (Site2) become reachable again. LSP and BSM go backup. NEC endpoints at the branch (Site3) will automatically REGISTER and SUBSCRIBE again with SM1 and use this as the active controller. They will also REGISTER with SM2. Now the system should be back to original state “normal mode” once again.
4. Carry out “failover feature tests”.

2.1.4. Failover to Site 3 (Branch Site) when Site 1 and Site 2 go down

The BSM and LSP at the Branch site will come into use when all core components at main location (Site1) and backup location (Site2) will fail. The NEC DECT handsets at the Branch location will now SUBSCRIBE and start using the Branch Session Manager (BSM) and LSP at the Branch site. They will remain REGISTERED at the BSM once the WAN connection has recovered.

1. Starting from “Normal Mode" ensure that full failover from Site 1 to Site 2 occurs. SC and SM2 at backup location (Site 2) are now ‘Active’. NEC Endpoints which are already registered with Session Manager 2 (SM2) will now SUBSCRIBE to events from SM2 at backup location (Site 2) and use SM2 as the active Controller.
2. Carry out “failover feature tests”.
3. Create a simulated Site 2 failure by failing all components on Site 2, resulting in LSP and BSM at Site 3 (Branch) become active. NEC endpoints which are already registered with Branch Session Manager (BSM) will now SUBSCRIBE to events from BSM and use BSM as the active controller.
4. Carry out “failover feature tests”.
5. Reconnect the LAN cables on Site 2 components to ensure that connectivity to Site 2 is restored. SC and SM2 at backup location (Site2) become reachable again. LSP and BSM go backup. NEC endpoints at the branch (Site3) will automatically REGISTER and SUBSCRIBE again with SM2 and use this as the active controller. They remain registered to BSM.
6. Carry out “failover feature tests”.
7. Reconnect the LAN cables on Site 1 components to ensure that connectivity to Site 1 is restored. CM and SM1 at main location (Site1) become reachable again. SC goes backup. NEC endpoints at the branch (Site3) will automatically REGISTER and SUBSCRIBE

again with SM1 and use this as the active controller. They will remain registered to SM2 and BSM. Now the system should be back to original state “normal mode” once again.

8. Carry out “failover feature tests”.

2.1.5. Session Manager Registration using ‘301 Moved Permanently’

The Avaya Aura® Core provides the ability that a Session Manager will send out a “301 Moved Permanently” upon a REGISTER in case this Session Manager instance is not responsible for that SIP user. The message includes the information which SM instances need to be used (Core SM and BSM) for that particular SIP user. The NEC endpoints (DAP) can deal with that message and use the provided information to register with the correct SM instances depending on the configuration within SMGR for each particular User and DECT handset.

1. The NEC DAP is configured to send initially all registrations to SM3. The SIP users on SMGR are configured to use SM1, SM2 and BSM.
2. The DAP send out a REGISTER to SM3 and receives a “301 Moved Permanently” message including the information to use SM1, SM2 and BSM instead of SM3.
3. The DAP now send out a REGISTER against SM1, SM2 and BSM as well as a SUBSCRIBE against SM1 for the NEC handset.
4. The NEC handset is registered against SM1, SM2 and BSM and subscribed against SM1 which is used as the active controller.

2.2. Test Results

All test cases passed successfully.
Active stable calls (NEC handset <-> Avaya SIP, NEC handset <-> Avaya H323, NEC handset <-> NEC handset, NEC handset <-> SIP-Trunk) which were established before an outage survived the outage and talk path remained.

2.3. Support

Support from Avaya is available by visiting the website http://support.avaya.com and a list of product documentation can be found in **Section 10** of these Application Notes. Technical support for the NEC IP DECT product can be obtained through NEC global technical support by accessing the website http://www.nec-ipdect.com/Contact-7 or http://businessnet.nec-enterprise.com (which is available only for partners with authorized access).

3. Reference Configuration

Figure 1 shows the network topology during compliance testing. The NEC DECT handsets subscribe to the NEC DECT Access Points (DAP) which is placed on the LAN. The DECT handsets register with all Session Managers in order to be able to make/receive calls to and from the Avaya H.323 and SIP deskphones as well as from simulated PSTN SIP Trunks.

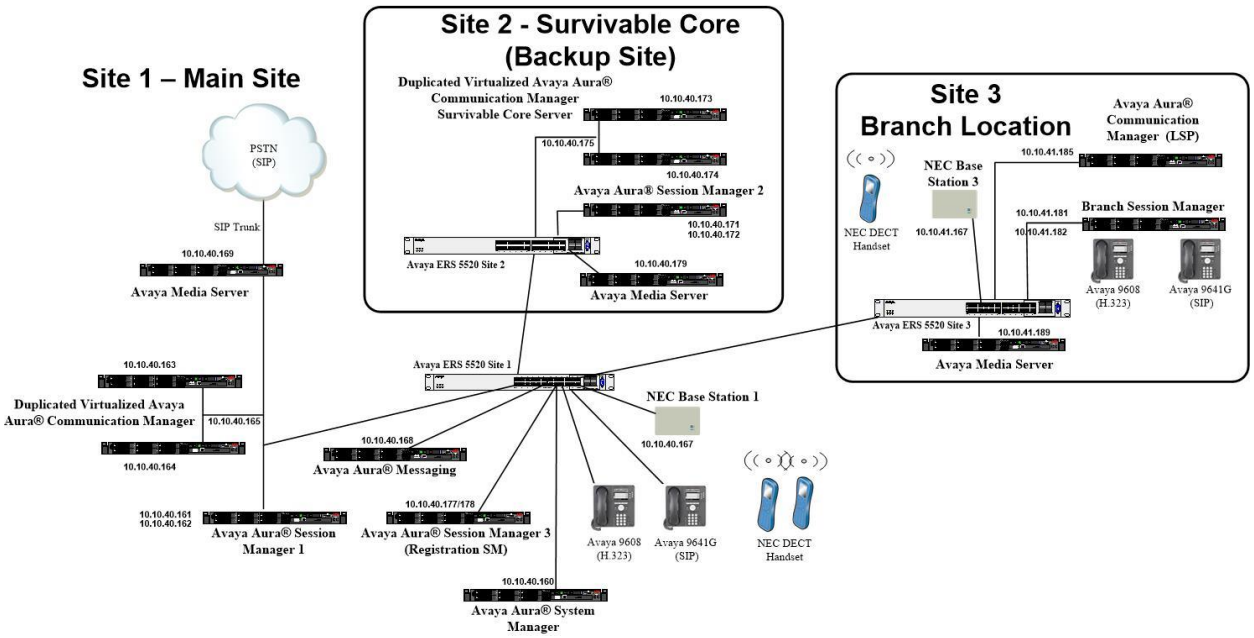


Figure 1: Network Solution of NEC DECT Handsets with Avaya Aura® Communication Manager R7.0.1 and Avaya Aura® Session Manager R7.0.1

4. Equipment and Software Validated

The following equipment and software was used for the compliance test.

Equipment/Software	Release/Version
Avaya Aura® System Manager running on a virtual server	System Manager 7.0.1.2 Build No. - 7.0.0.0.16266 Software Update Revision No: 7.0.1.2.086007 Service Pack 2
Avaya Aura® Session Manager running on a virtual server	Session Manager R7.0 SP2 Build No. – 7.0.1.2.701230
Avaya Aura® Communication Manager running on a virtual server	R7.0.1 R017x.00.0.441.0 00.0.441.0-23523
Avaya Media Server running on a virtual server	Media Server SYSTEM R7.7.0.21 Media Server R7.7.0.350
Avaya Aura® Messaging running on a virtual server	R7.0.0.0.441
Avaya 9608 H323 Deskphone	96x1 H323 Release 6.6.028
Avaya 9608 SIP Deskphone	96x1 SIP Release 7.0.0.39
DAP Controller software running on Windows 2012 virtual server	6.41.0554
NEC DECT Access Point	6.41 : 4920b653.dwl
NEC DECT Handset NEC G566 NEC DECT Handset NEC I766	1.10.00.01 1.10.00.02

5. Configure Avaya Aura® Communication Manager

It is assumed that a fully functioning Communication Manager is in place with the necessary licensing and with a SIP Trunk in place to Session Manager. For further information on the configuration of Communication Manager please see **Section 10** of these Application Notes. The following sections go through the following.

- Configure Dial Plan Analysis.
- Configure Node Names.
- Configure Signalling Group.
- Configure Trunk Group.
- Configure Route Pattern.
- Configure AAR Analysis.
- Network Region.
- IP Codec.

5.1. Configure Dial Plan Analysis

Use the **change dialplan analysis** command to configure the dial plan using the parameters shown below. Extension numbers (**ext**) are those beginning with **6**. Feature Access Codes (**fac**) use digits **8** and **9** or * and #.

```
change dialplan analysis                                        Page   1 of  12
                              DIAL PLAN ANALYSIS TABLE
                                    Location: all            Percent Full: 2

    Dialed   Total  Call     Dialed   Total  Call     Dialed   Total  Call
    String   Length Type     String   Length Type     String   Length Type
   1           4   udp
   2           4   udp
   3           4   udp
   4           4   udp
   5           4   ext
   6           4   ext
   7           4   udp
   8           1   fac
   9           1   fac
   *           3   fac
   *8          4   dac
   #           3   fac
```

5.2. Configure Node Names

Each component that talks to Communication Manager will need to be added under **node-names ip**. Type **change node-names ip** and add each Session Manager, Branch Session Manager and Media Server along with other equipment such as Local Survivability Servers and Survivable Cores. These were some of the components that were added for compliance testing, making note of **SMA70vmpg** and **SMB70vmpg** in particular as these will be required in creating the Signaling and Trunk Groups in **Section 5.3** and **Section 5.4**.

```
change node-names ip                                            Page   1 of   2
                                  IP NODE NAMES
    Name              IP Address
AMSBackup           10.10.40.179
AMSBranch           10.10.41.189
AMSMain             10.10.40.169
BSM                 10.10.41.182
CMAvmpg             10.10.40.163
CMBvmpg             10.10.40.164
LSP2                10.10.40.170
LSP3                10.10.41.170
LSP70               10.10.41.185
SC70Redundancy      10.10.40.175
SCAvmpg             10.10.40.173
SCBvmpg             10.10.40.174
SMA70vmpg           10.10.40.162
SMB70vmpg           10.10.40.172
default             0.0.0.0
procr               10.10.40.165
( 16 of 17   administered node-names were displayed )
Use 'list node-names' command to see all the administered node-names
Use 'change node-names ip xxx' to change a node-name 'xxx' or add a node-name
```

5.3. Configure Signaling Group

A Signaling Group will need to be created for the connection between Communication Manager and Session Manager to route calls. There are two Session Managers in this configuration for redundancy so two signaling groups will need to be created. The following shows one of the SIP Signaling Groups that was used during compliance testing. Type **change signaling-group** x, where x is the signaling group number

- Set the **Group Type** field to **sip**.
- For compliance testing **Transport Method** was set to **tls**.
- The **Peer Detection Enabled** field should be set to **y** allowing the Communication Manager to automatically detect if the peer server is a Session Manager.
- Set the **Near-end Node Name** to **procr**. Set the **Far-end Node Name** to the node name defined for the Session Manager (node name **SMA70vmpg**), as per **Section 5.2**.
- Ensure that the recommended TLS port value of **5061** is configured in the **Near-end Listen Port** and the **Far-end Listen Port** fields.
- In the **Far-end Network Region** field, enter the IP Network Region configured in **Section 5.7**. This field logically establishes the **far-end** for calls using this signaling group as network region 1.
- **Far-end Domain** was set to the domain used during compliance testing.
- The **DTMF over IP** field should remain set to the default value of **rtp-payload**. This value enables Communication Manager to send DTMF transmissions using RFC 2833.
- The **Direct IP-IP Audio Connections** field is set to **y**.
- **Initial IP-IP Direct Media** was set to **n** for compliance testing.
- The default values for the other fields may be used.

```
change signaling-group 1                                          Page   1 of   2
                                SIGNALING GROUP

 Group Number: 1              Group Type: sip
  IMS Enabled? n        Transport Method: tls
        Q-SIP? n
     IP Video? n                                    Enforce SIPS URI for SRTP? n
  Peer Detection Enabled? y  Peer Server: SM
 Prepend '+' to Outgoing Calling/Alerting/Diverting/Connected Public Numbers? y
Remove '+' from Incoming Called/Calling/Alerting/Diverting/Connected Numbers? n
Alert Incoming SIP Crisis Calls? n
   Near-end Node Name: procr                 Far-end Node Name: SMA70vmpg
 Near-end Listen Port: 5061                Far-end Listen Port: 5061
                                        Far-end Network Region: 1

Far-end Domain: devconnect.local
                                            Bypass If IP Threshold Exceeded? n
Incoming Dialog Loopbacks: eliminate                 RFC 3389 Comfort Noise? n
         DTMF over IP: rtp-payload           Direct IP-IP Audio Connections? y
Session Establishment Timer(min): 3                    IP Audio Hairpinning? n
         Enable Layer 3 Test? n                   Initial IP-IP Direct Media? n
H.323 Station Outgoing Direct Media? n            Alternate Route Timer(sec): 6
```

5.4. Configure Trunk Group

Like the Signaling Groups, a trunk group will need to be setup for each Session Manager connection. These trunk groups are used for calls to and from NEC SIP phones. Type **change trunk-group** x, where x is the trunk group number. Enter a descriptive name in the **Group Name** field. Set the **Group Type** field to **sip**. Enter a **TAC** code compatible with the Communication Manager dial plan. Set the **Service Type** field to **tie**. Specify the signaling group associated with this trunk group in the **Signaling Group** field, and specify the **Number of Members** supported by this SIP trunk group. Accept the default values for the remaining fields.

```
change trunk-group 1                                          Page   1 of  21
                                TRUNK GROUP

Group Number: 1                    Group Type: sip           CDR Reports: y
  Group Name: SIPTRK1                     COR: 1        TN: 1        TAC: *801
   Direction: two-way        Outgoing Display? n
 Dial Access? n                                    Night Service:
Queue Length: 0
Service Type: tie                   Auth Code? n
                                          Member Assignment Method: auto
                                                   Signaling Group: 1
                                                 Number of Members: 10
```

On **Page 2** of the trunk-group form the **Preferred Minimum Session Refresh Interval (sec)** field should be set to a value mutually agreed with NEC to prevent unnecessary SIP messages during call setup. Session refresh is used throughout the duration of the call, to check the other side has not gone away, for the compliance test a value of **600** was used.

```
change trunk-group 1                                          Page   2 of  21
      Group Type: sip

TRUNK PARAMETERS

     Unicode Name: auto

                                          Redirect On OPTIM Failure: 5000

            SCCAN? n                               Digital Loss Group: 18
                      Preferred Minimum Session Refresh Interval(sec): 600

 Disconnect Supervision - In? y  Out? y


             XOIP Treatment: auto    Delay Call Setup When Accessed Via IGAR? n




 Caller ID for Service Link Call to H.323 1xC: station-extension
```

Settings on **Page 3** can be left as default. However the **Numbering Format** in the example below is set to **private**.

```
change trunk-group 1                                          Page   3 of  21
TRUNK FEATURES
          ACA Assignment? n            Measured: none
                                                       Maintenance Tests? y



   Suppress # Outpulsing? n  Numbering Format: private
                                                UUI Treatment: service-provider

                                                 Replace Restricted Numbers? n
                                                Replace Unavailable Numbers? n

                                                  Hold/Unhold Notifications? y
                                 Modify Tandem Calling Number: no




 Show ANSWERED BY on Display? y
```

Settings on **Page 4** are as follows.

```
change trunk-group 1                                          Page   4 of  21
                              PROTOCOL VARIATIONS

                                       Mark Users as Phone? y
Prepend '+' to Calling/Alerting/Diverting/Connected Number? n
                       Send Transferring Party Information? y
                                  Network Call Redirection? y
          Build Refer-To URI of REFER From Contact For NCR? n
                                     Send Diversion Header? n
                                  Support Request History? y
                              Telephone Event Payload Type: 120


                        Convert 180 to 183 for Early Media? n
                  Always Use re-INVITE for Display Updates? n
                        Identity for Calling Party Display: P-Asserted-Identity
            Block Sending Calling Party Location in INVITE? n
                 Accept Redirect to Blank User Destination? n
                                           Enable Q-SIP? n

          Interworking of ISDN Clearing with In-Band Tones: keep-channel-active
                                 Request URI Contents: may-have-extra-digits
```

5.5. Route Pattern

A route pattern is implemented to route calls to SIP phones. This route pattern should include the trunk groups to both core Session Managers. Note that two signaling groups and two trunk groups were set up connecting Communication Manager to both Session Manager A and Session Manager B. For compliance testing these were labelled 1 and 2 and so these two trunk groups were added to route pattern 61 as shown below. In order to amend this route pattern type in **change route-pattern** x, where x is the route pattern to be changed. Enter a suitable **Pattern Name** and add the two trunk groups to the **Grp No** as shown below.

```
change route-pattern 61                                          Page   1 of   3
                    Pattern Number: 61     Pattern Name: SIP_PHONES
    SCCAN? n    Secure SIP? n     Used for SIP stations? y
    Primary SM: SMA70vmpg       Secondary SM: SMB70vmpg
    Grp FRL NPA Pfx Hop Toll No.  Inserted                              DCS/ IXC
    No          Mrk Lmt List Del  Digits                                QSIG
                             Dgts                                       Intw
 1: 1    0                                                               n   user
 2: 2    0                                                               n   user
 3:                                                                      n   user
 4:                                                                      n   user
 5:                                                                      n   user
 6:                                                                      n   user

     BCC VALUE  TSC CA-TSC    ITC BCIE Service/Feature PARM Sub  Numbering LAR
    0 1 2 M 4 W     Request                                Dgts Format
 1: y y y y y n  n            unre                                         next
 2: y y y y y n  n            unre                                         next
 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
```

5.6. AAR Analayis

Routing to the SIP phones is done using aar, where aar stands for Automatic Alternate Routing and is the digit analysis algorithm commonly used for private network calls .Making changes to the aar analysis table as shown below for numbers beginning with 6 allows the user to decide what route pattern will be used for dialling numbers beginning with 6.

```
change aar analysis 6                                            Page   1 of   2
                             AAR DIGIT ANALYSIS TABLE
                                   Location: all            Percent Full: 1

          Dialed           Total     Route    Call   Node  ANI
          String          Min  Max  Pattern   Type   Num   Reqd
    6                     4    4     61       unku         n
    6666                  4    4     1        aar          n
    7                     4    4     1        pubu         n
    8                     7    7     999      aar          n
    9                     7    7     999      aar          n
                                                            n
                                                            n
                                                            n
```

5.7. Configure Network Region

Use the **change ip-network-region x** (where x is the network region to be configured) command to assign an appropriate domain name to be used by Communication Manager. In the example below **devconnect.local** is used. Note this domain is also configured in **Section 6.1** of these Application Notes.

```
change ip-network-region 1                                      Page   1 of  20
                              IP NETWORK REGION
  Region: 1
Location: 1       Authoritative Domain: devconnect.local
    Name: Redundancy Lab        Stub Network Region: n
MEDIA PARAMETERS                Intra-region IP-IP Direct Audio: yes
      Codec Set: 1              Inter-region IP-IP Direct Audio: yes
   UDP Port Min: 2048                     IP Audio Hairpinning? n
   UDP Port Max: 3329
DIFFSERV/TOS PARAMETERS
 Call Control PHB Value: 46
        Audio PHB Value: 46
        Video PHB Value: 26
802.1P/Q PARAMETERS
 Call Control 802.1p Priority: 6
        Audio 802.1p Priority: 6
        Video 802.1p Priority: 5      AUDIO RESOURCE RESERVATION PARAMETERS
H.323 IP ENDPOINTS                                   RSVP Enabled? n
  H.323 Link Bounce Recovery? y
 Idle Traffic Interval (sec): 20
   Keep-Alive Interval (sec): 5
            Keep-Alive Count: 5
```

```
change ip-network-region 1                                      Page   2 of  20
                              IP NETWORK REGION

 RTCP Reporting to Monitor Server Enabled? y

 RTCP MONITOR SERVER PARAMETERS
   Use Default Server Parameters? y
```

```
change ip-network-region 1                                      Page   3 of  20
                              IP NETWORK REGION

INTER-GATEWAY ALTERNATE ROUTING / DIAL PLAN TRANSPARENCY
 Incoming LDN Extension:
 Conversion To Full Public Number - Delete:    Insert:
 Maximum Number of Trunks to Use for IGAR:
 Dial Plan Transparency in Survivable Mode? n

BACKUP SERVERS(IN PRIORITY ORDER)    H.323 SECURITY PROFILES
 1   LSP70                           1   challenge
 2                                   2
 3                                   3
 4                                   4
 5
 6                                   Allow SIP URI Conversion? y

TCP SIGNALING LINK ESTABLISHMENT FOR AVAYA H.323 ENDPOINTS
   Near End Establishes TCP Signaling Socket? y
                       Near End TCP Port Min: 61440
                       Near End TCP Port Max: 61444
```

```
change ip-network-region 1                                      Page   4 of  20

 Source Region: 1     Inter Network Region Connection Management     I       M
                                                                     G  A    t
 dst codec direct   WAN-BW-limits   Video      Intervening      Dyn  A  G    c
 rgn  set   WAN  Units    Total Norm  Prio Shr Regions          CAC  R  L    e
 1    1                                                               all
 2
 3
 4
 5
 6
 7
 8
 9
 10
 11
 12
 13
 14
 15
```

5.8. Configure IP-Codec

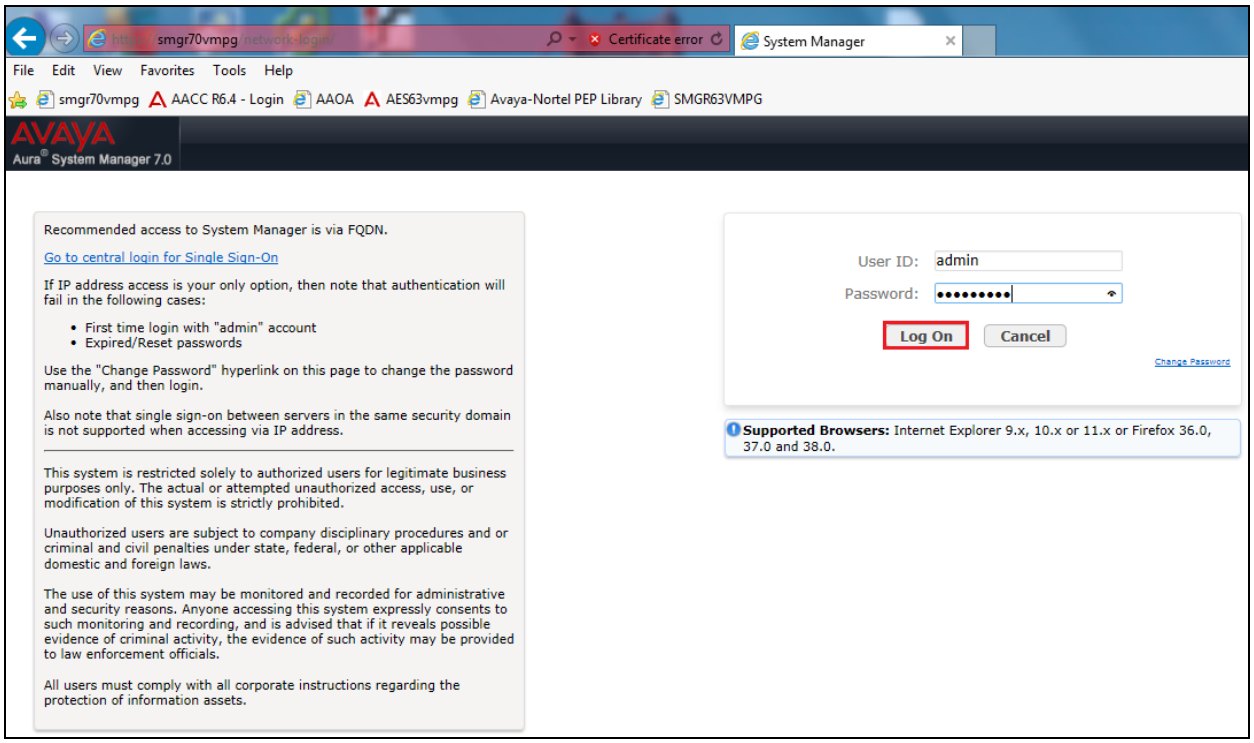
Use the **change ip-codec-set x** (where x is the ip-codec set used) command to designate a codec set compatible with the NEC Handsets, which support both **G.711** and **G.729**. Multiple codecs may be specified in the **IP Codec Set** form in order of preference; the example below includes **G.711A** (a-law), which is supported by NEC.
Note the **Media Encryption** has been set to **1-srtp-aescm128-hmac80**. This is the encryption that is support by NEC and must be set correctly on each side to allow secure RTP (SRTP). In order for SRTP to work properly, **Encrypted SRTCP** needed to be set to **enforce-unenc-srtcp** as shown below.

```
change ip-codec-set 1                                           Page   1 of   2

                          IP CODEC SET
    Codec Set: 1

    Audio        Silence      Frames   Packet
    Codec        Suppression  Per Pkt  Size(ms)
 1: G.711A            n         2        20
 2: G.729             n         2        20
 3: G.711MU           n         2        20
 4:
 5:
 6:
 7:

     Media Encryption                  Encrypted SRTCP: enforce-unenc-srtcp
 1: 1-srtp-aescm128-hmac80
 2:
 3:
 4:
 5:
```

```
change ip-codec-set 1                                           Page   2 of   2

                          IP CODEC SET

                              Allow Direct-IP Multimedia? y
              Maximum Call Rate for Direct-IP Multimedia:   384:Kbits
     Maximum Call Rate for Priority Direct-IP Multimedia:   384:Kbits

                                                                        Packet
                          Mode                    Redundancy            Size(ms)
    FAX                   pass-through             0
    Modem                 pass-through             0
    TDD/TTY               US                       3
    H.323 Clear-channel   y                        0
    SIP 64K Data          n                        0                    20
```

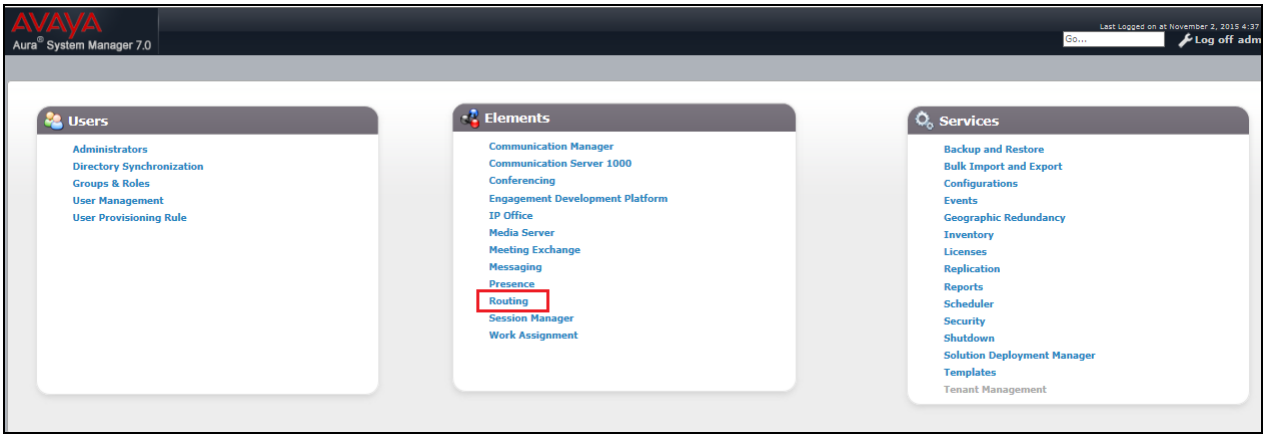
6. Configure Avaya Aura® Session Manager

The NEC DECT handsets are added to Session Manager as SIP Users. In order to make changes in Session Manager, a web session to System Manager is opened. Navigate to http://<System Manager IP Address>/SMGR, enter the appropriate credentials and click on **Log On** as shown below.

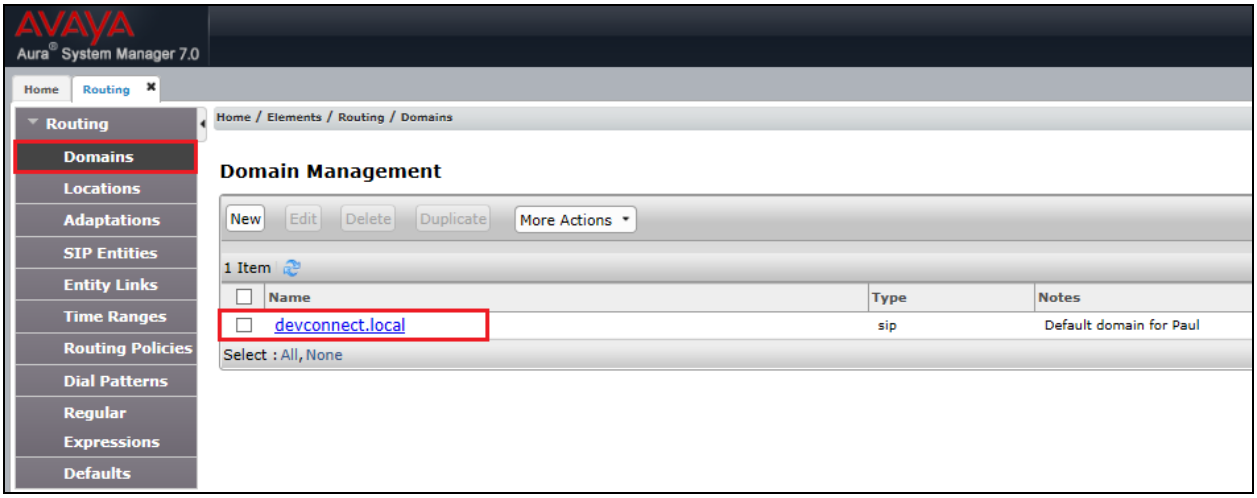


6.1. Configuration of a Domain

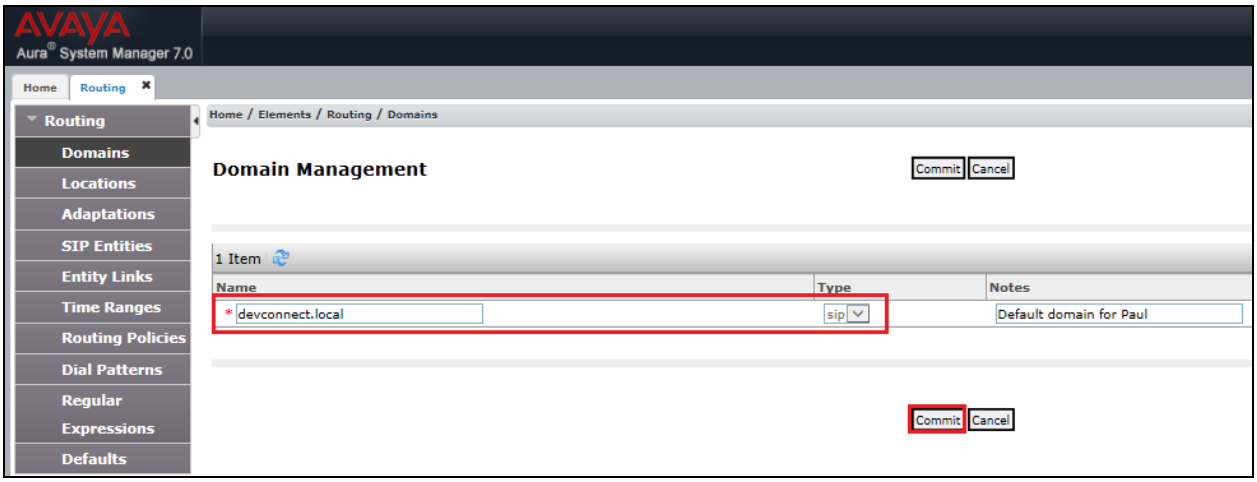
Click on **Routing** highlighted below.



Click on **Domains** in the left window. If there is not a domain already configured click on **New**. In the example below there exists a domain called devconnect.local which has been already configured.

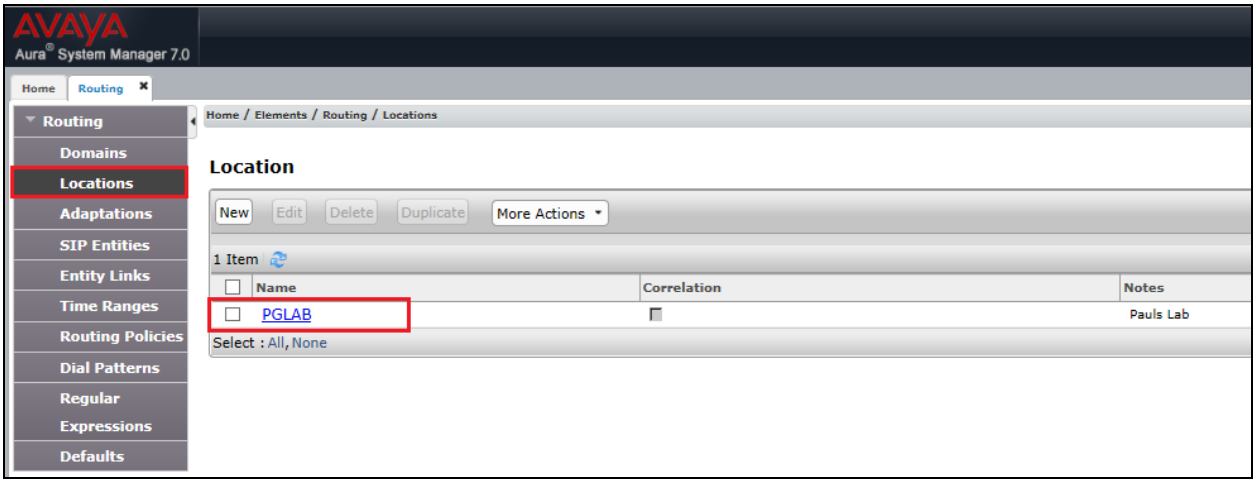


Clicking on the domain name above will open the following window; this is simply to show an example of such a domain. When entering a new domain the following should be entered. Once the domain name is entered click on **Commit** to save this.

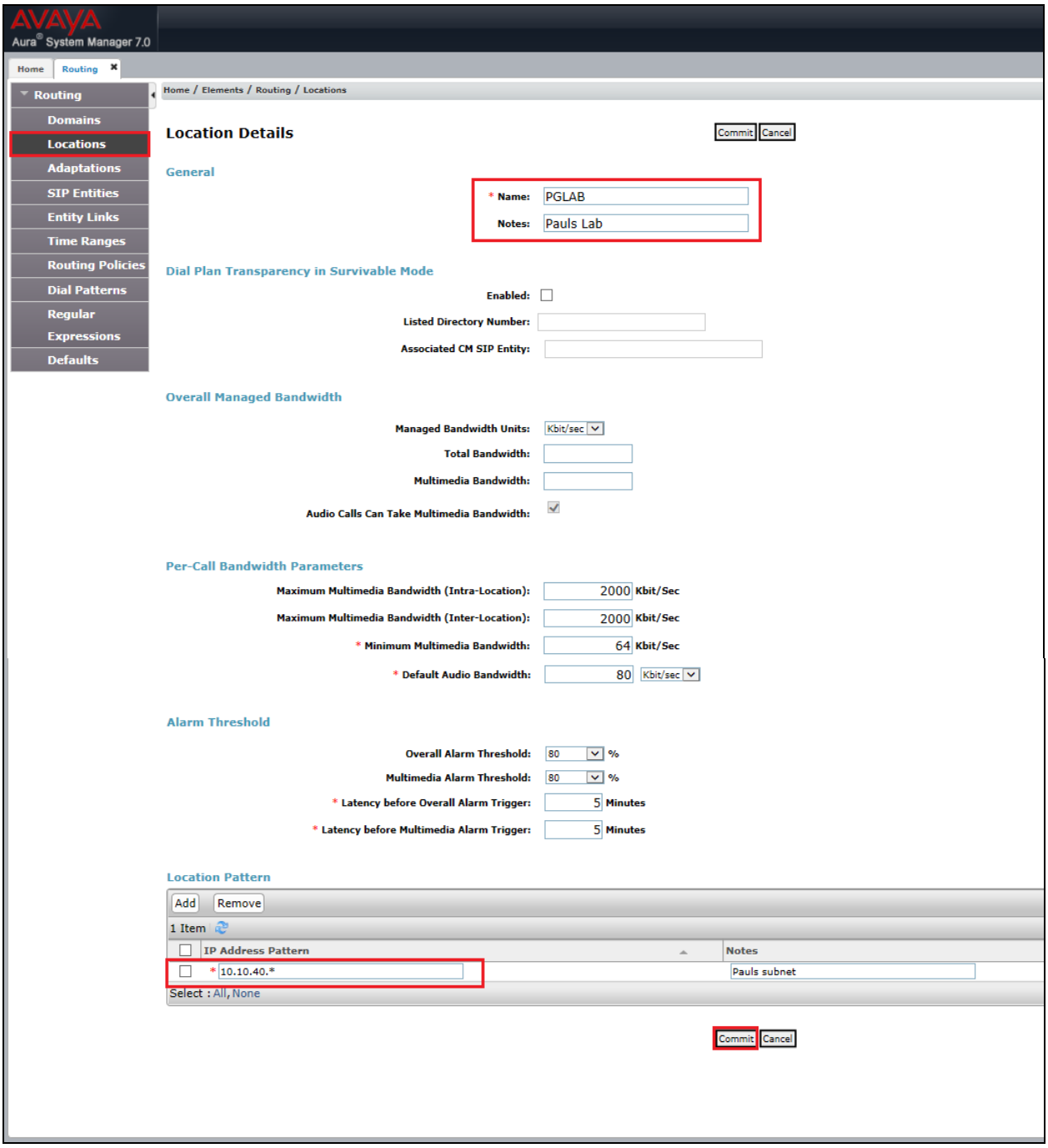


6.2. Configuration of a Location

Click on **Locations** in the left window and if there is no Location already configured then click on **New**, however in the screen below a location called **PGLAB** is already setup and configured and clicking into this will show its contents.



The Location below shows a suitable **Name** with a **Location Pattern** of **10.10.40.***. Once this is configured, click on **Commit**.

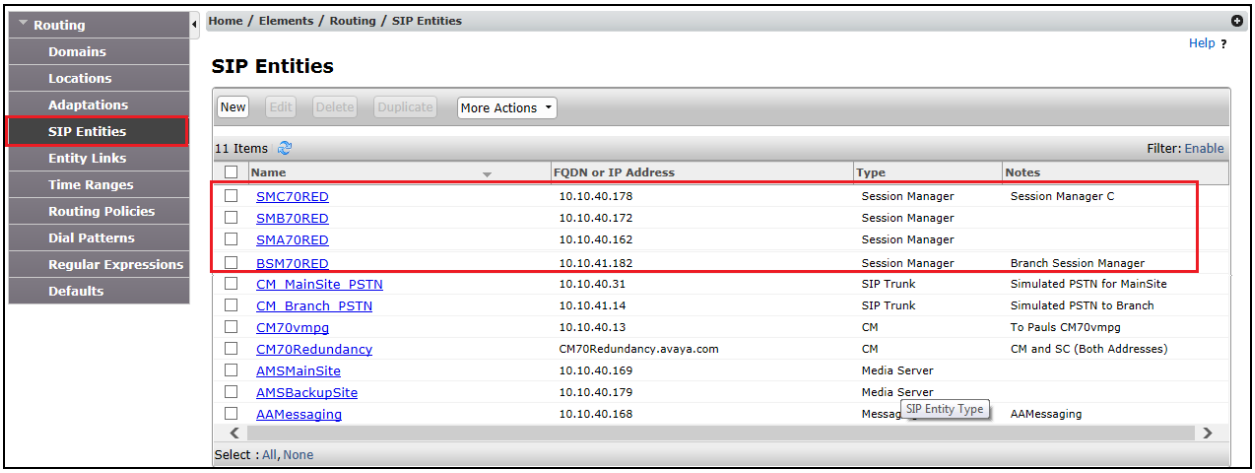


6.3. Configuration of SIP Entities

If needed, a SIP Entity can be created for each DAP controller, these will be added as type "Endpoint Concentrator". This Endpoint Concentrator type, allows up to 1000 connections from a single IP address. The single IP address can be shared by multiple Windows instances running on a Virtualized server or multiple DECT handsets sharing the same Access Point IP address.

Note: During compliance testing no SIP Entity was created for the NEC DAP. For more information on creating SIP Entities for NEC please refer to the Application Notes titled, *Application Notes for configuring NEC IP DECT Access Points AP400 and NEC DECT Handsets with Avaya Aura® Communication Manager R7.0 and Avaya Aura® Session Manager R7.0 using TLS/SRTP*.

SIP Entities must be created for each SIP server instance including each Session Manager. The screenshot below shows the four Session Manage SIP Entities that were created for compliance testing.

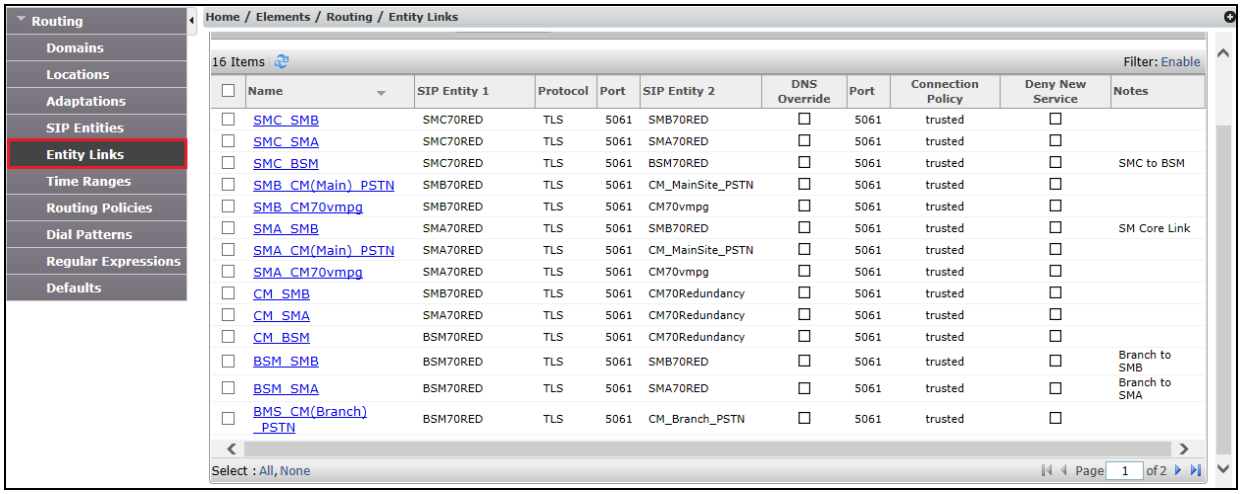


6.4. Configuration on SIP Entity Links

Entity Links must be added between all Core Session Managers. Entity Links between Core Session Managers (SM) and Branch Session Managers (BSM) are optional. For Compliance testing the following Entity Links were added.

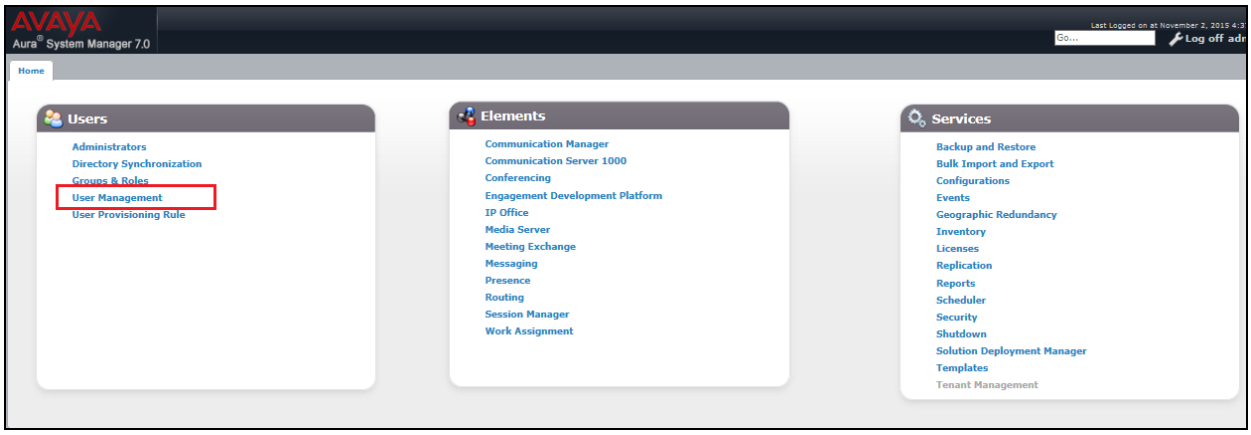
- SM1 ←→ SM2 Entity Link between the core Session Managers.
- SM1 ←→ SM3 Entity Link between the core Session Managers.
- SM2 ←→ SM3 Entity Link between the core Session Managers.
- SM1 ←→ BSM Entity Link between Session Manager 1 and the Branch Session Manager.
- SM2 ←→ BSM Entity Link between Session Manager 2 and the Branch Session Manager.
- SM3 ←→ BSM Entity Link between Session Manager 3 and the Branch Session Manager.

The screen shot below shows the Entity Links used during compliance testing.

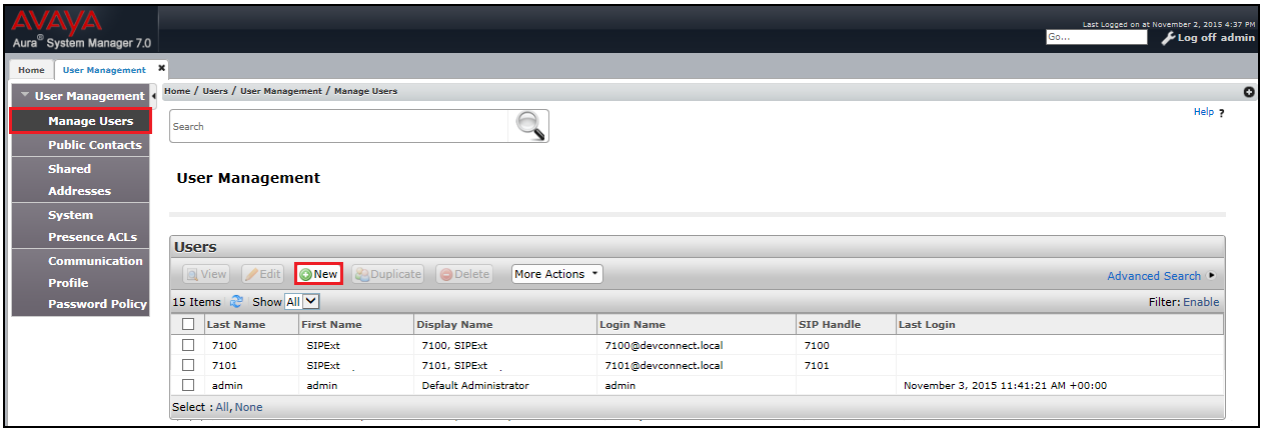


6.5. Adding NEC SIP Users

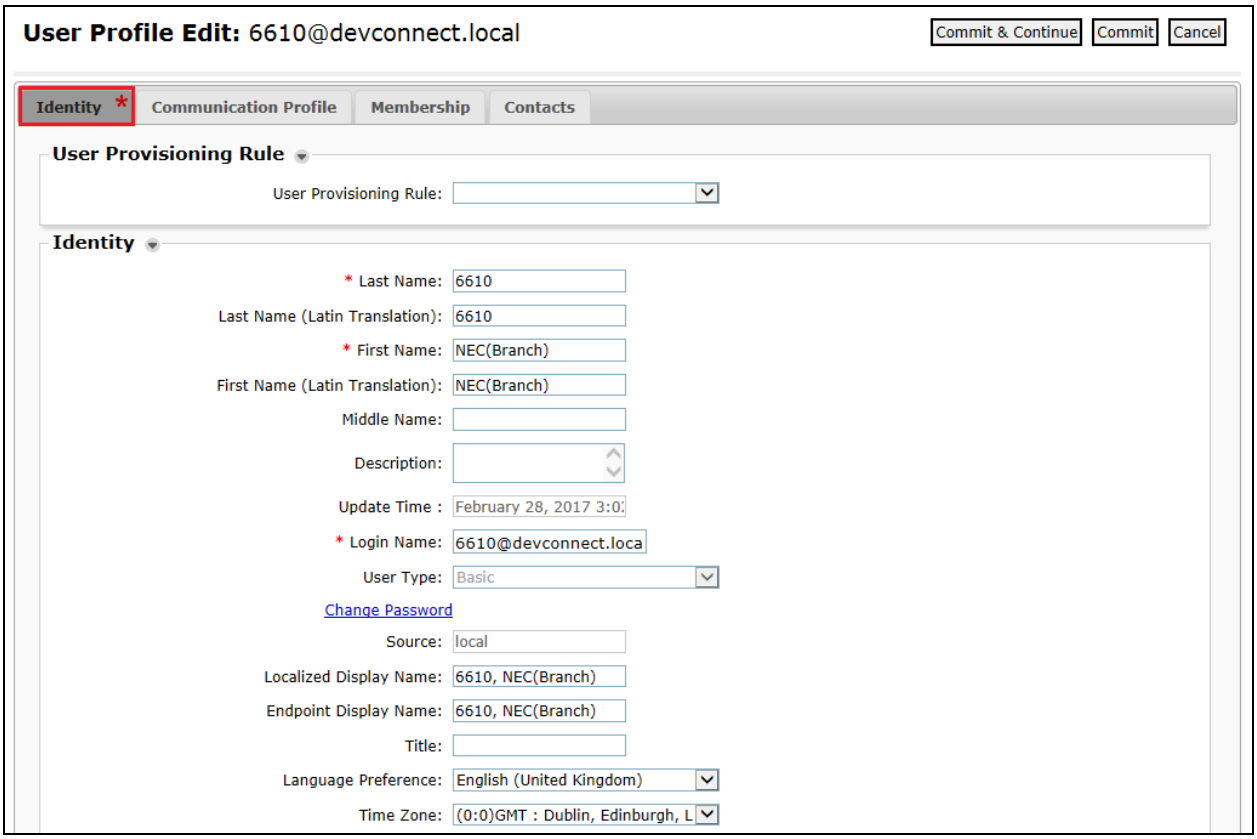
From the home page click on **User Management** highlighted below.



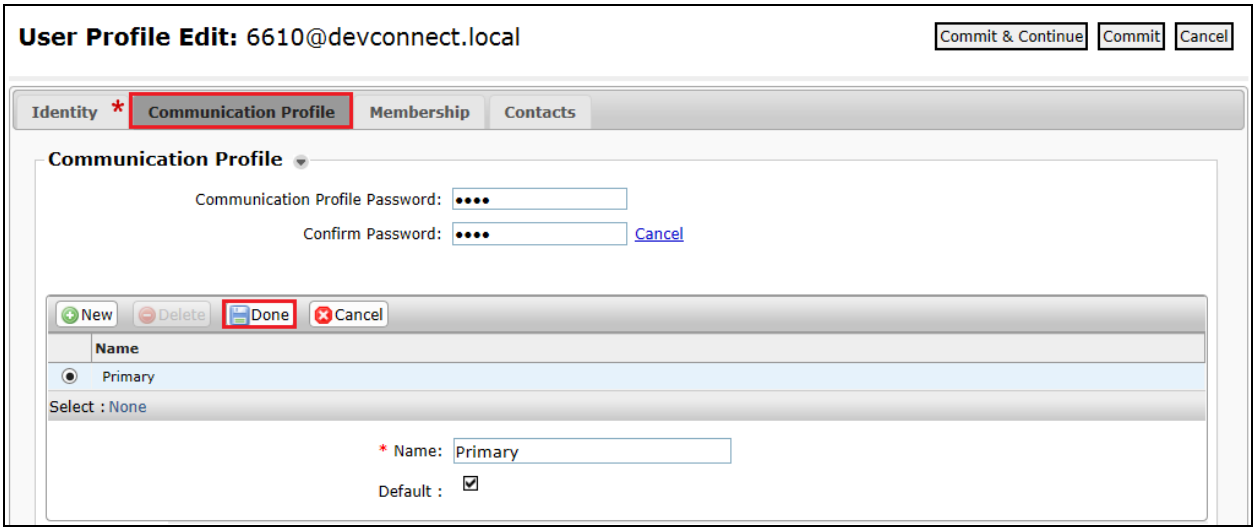
Click on **New** (highlighted) to add a new SIP user.



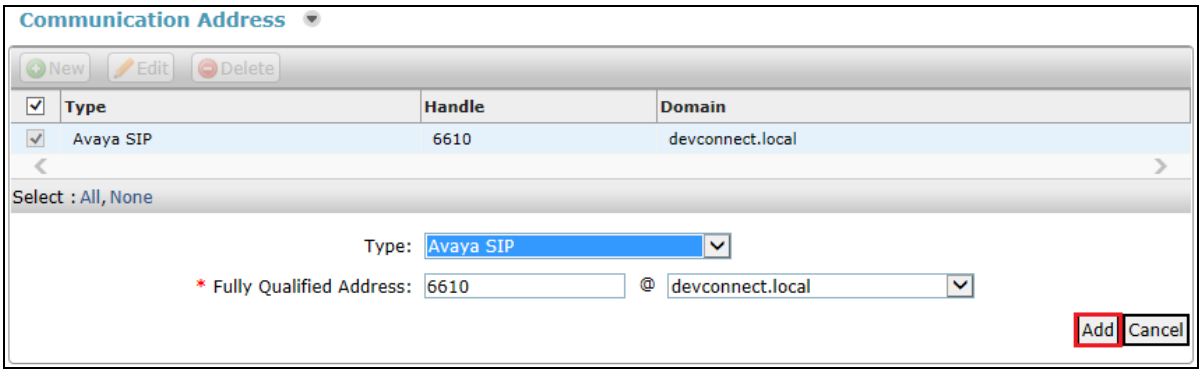
Under the **Identity** tab fill in the user's **Last Name** and **First Name** as shown below. Enter a **Login Name**. The remaining fields can be left as default.



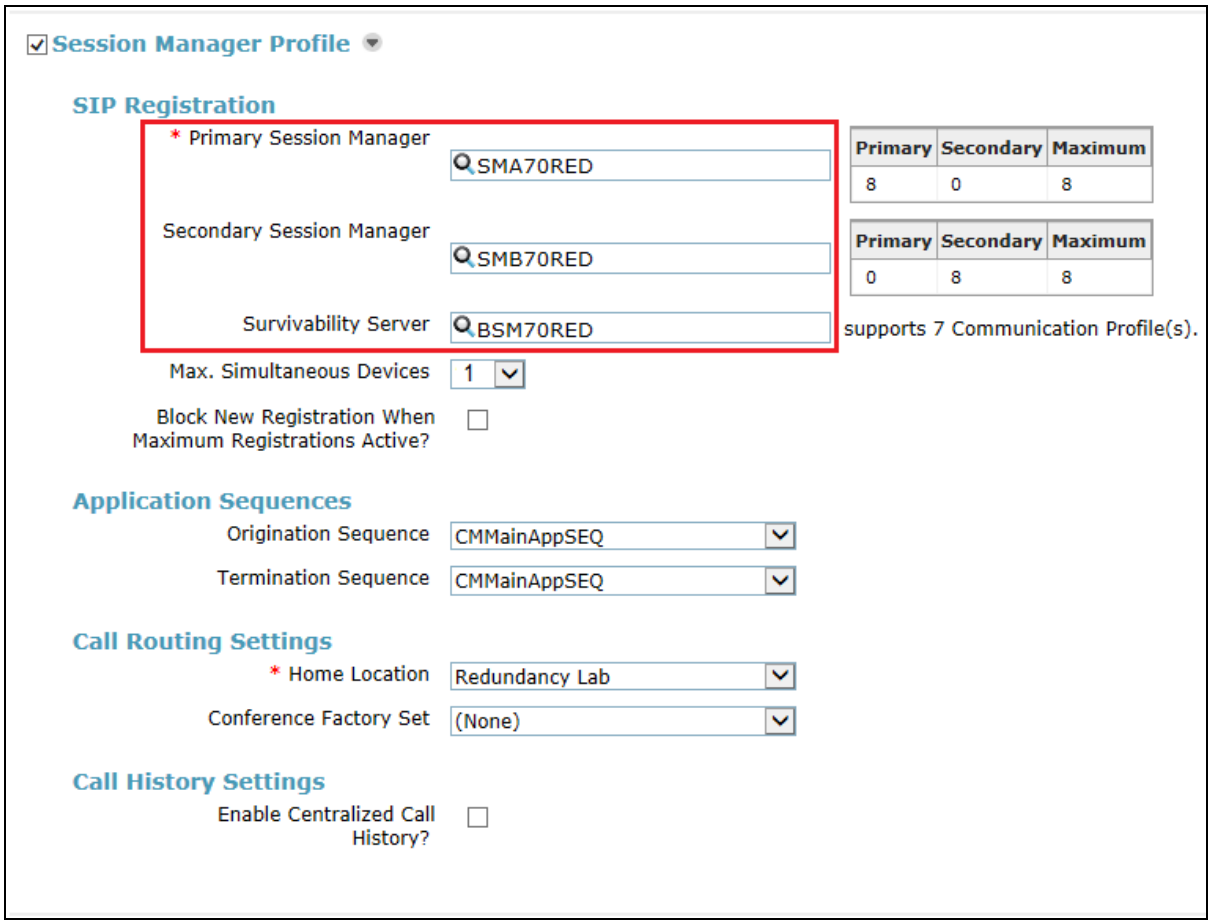
Under the **Communication Profile** tab enter a suitable **Communication Profile Password** (which is the login password for the SIP communication) and click on **Done** when added. Note that this password is required when configuring the NEC handset in **Section 7.4**.



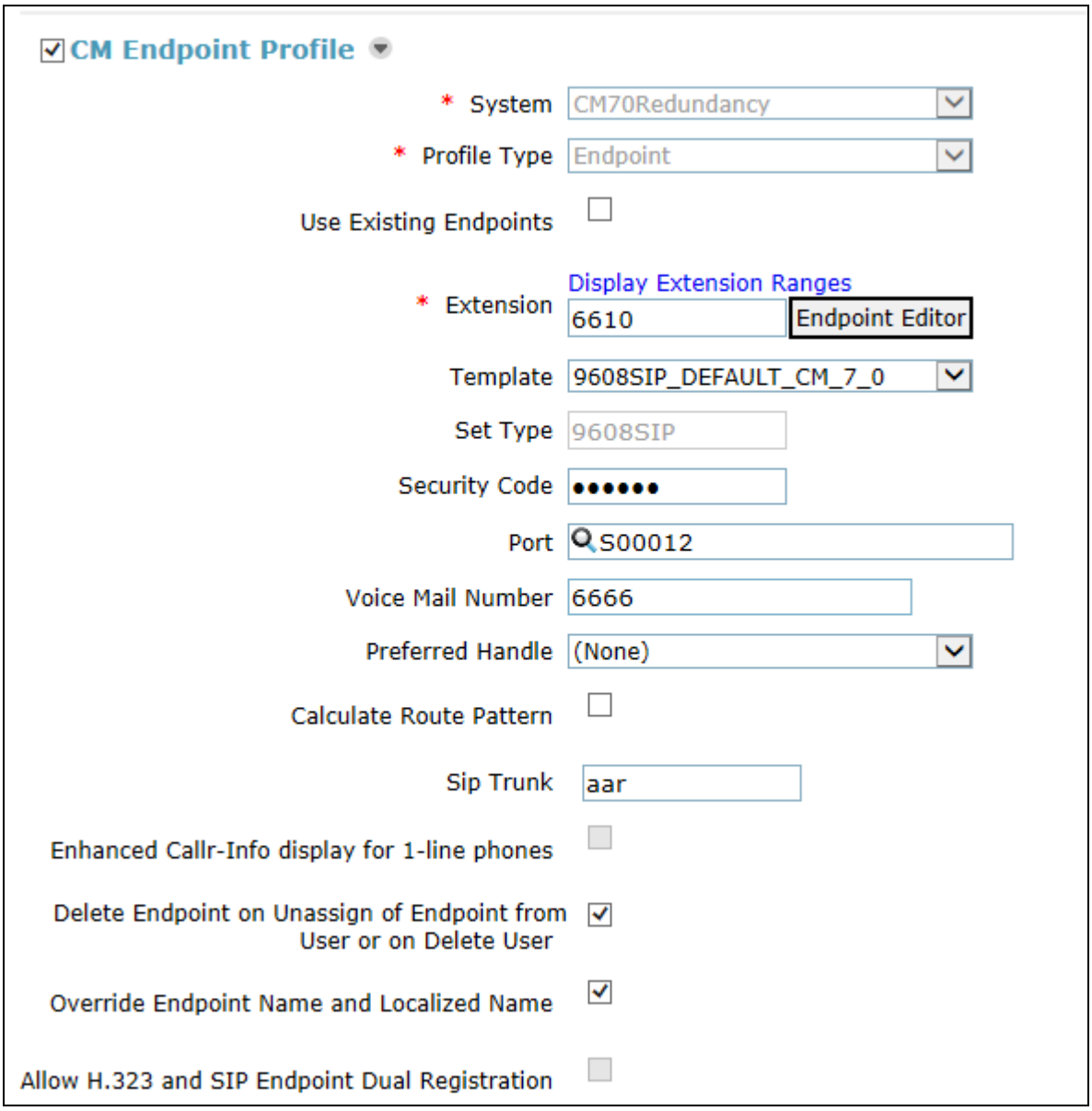
Click on **New** to add a new **Communication Address**. Enter the extension number and the domain for the **Fully Qualified Address** and click on **Add** once finished.



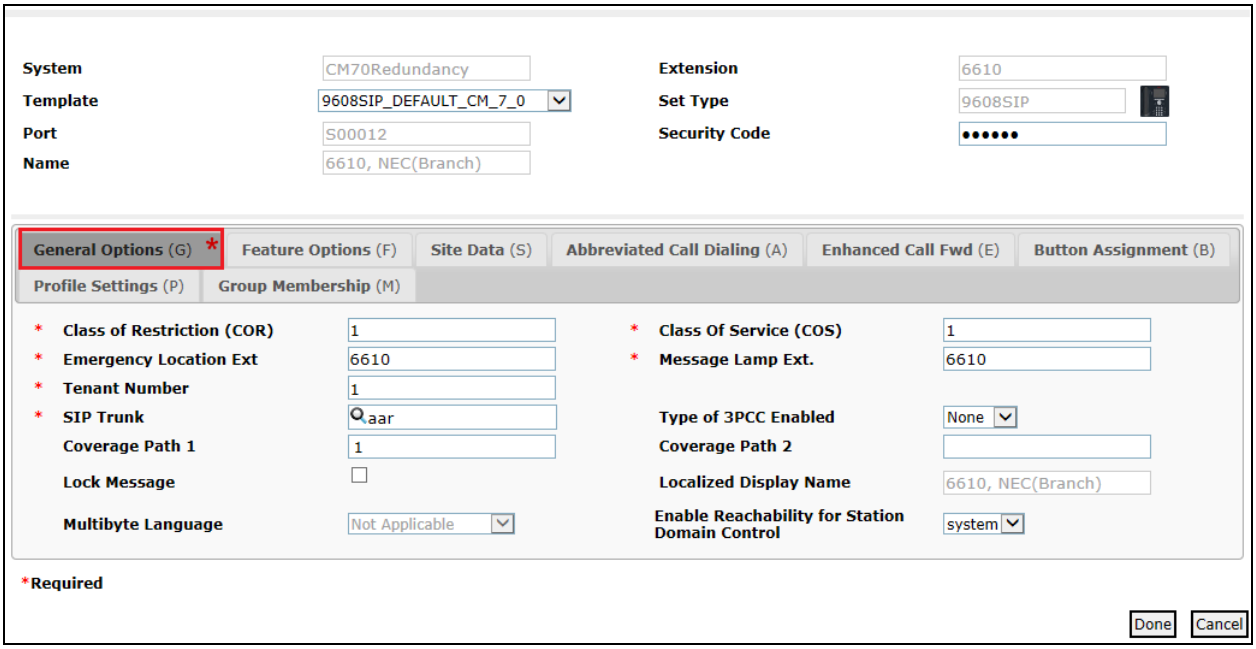
Ensure **Session Manager Profile** is checked and enter all the Session Managers where the NEC phone will be registering to, this includes the **Primary Session Manager** details, the **Secondary Session Manager** details and the **Survivability Server** which in this case is the Branch Session Manager. Note: In case of a Session Manager returns a "301 Moved Permanently", these entries will be included in that message. Enter the **Origination Application Sequence** and the **Termination Application Sequence** and the **Home Location** as shown below.



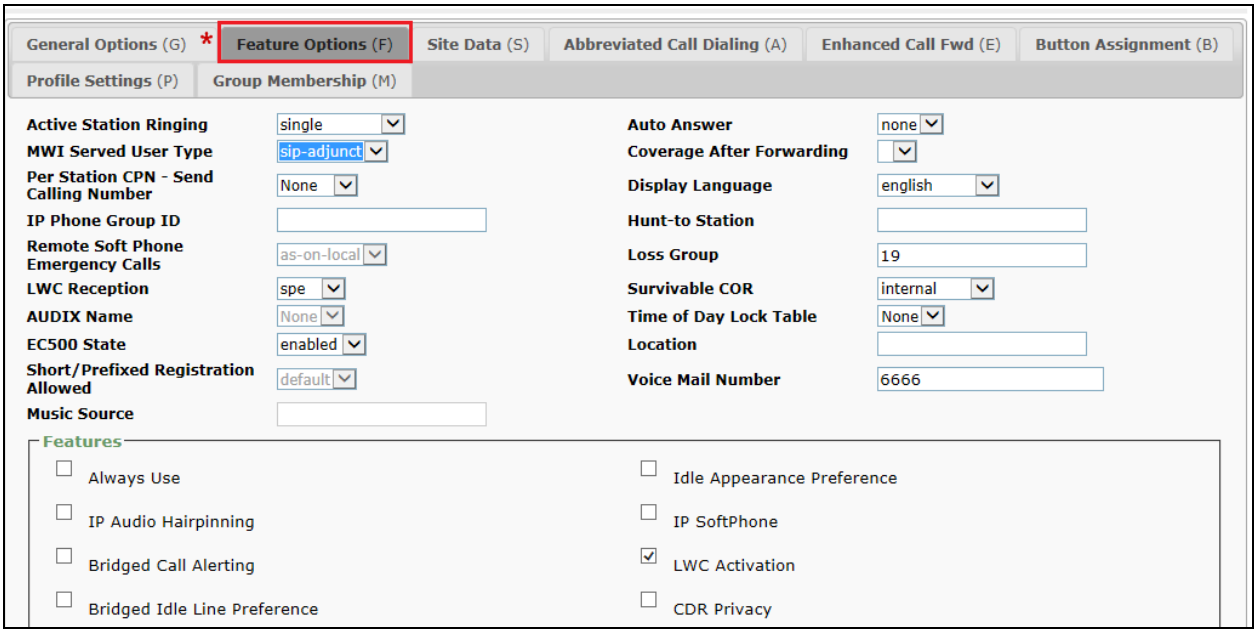
Ensure that **CM Endpoint Profile** is selected and choose the **9608SIP_DEFAULT_CM_7_0** as the **Template**. Enter the correct voicemail number, the rest of the fields can be left as default or set as shown below. Click on **Endpoint Editor** to configure the buttons and features for that handset on Communication Manager.



Click on the **General Options** tab, if voicemail is being used ensure that **Coverage Path 1** (the Coverage Path is configured on Communication Manager to go to Messaging). Also ensure that **Message Lamp Ext.** is showing the correct extension number.



Under the tab **Feature Options** ensure that **MWI Served User Type** is set to **sip-adjunct**. Ensure the **Voice Mail Number** is set correctly.



Once the **CM Endpoint Profile** is completed correctly, click on **Commit** to save the new user, (not shown).

7. Configure NEC DECT Access Points and Handsets

The following section shows the setup used during compliance testing for the NEC DECT solution. Both the configuration of the DECT Access Points and the addition and subscription of the NEC DECT handsets are clearly outlined. The installation of the NEC DECT solution is outside the scope of these Application Notes for more information on this please refer to **Section 10**.

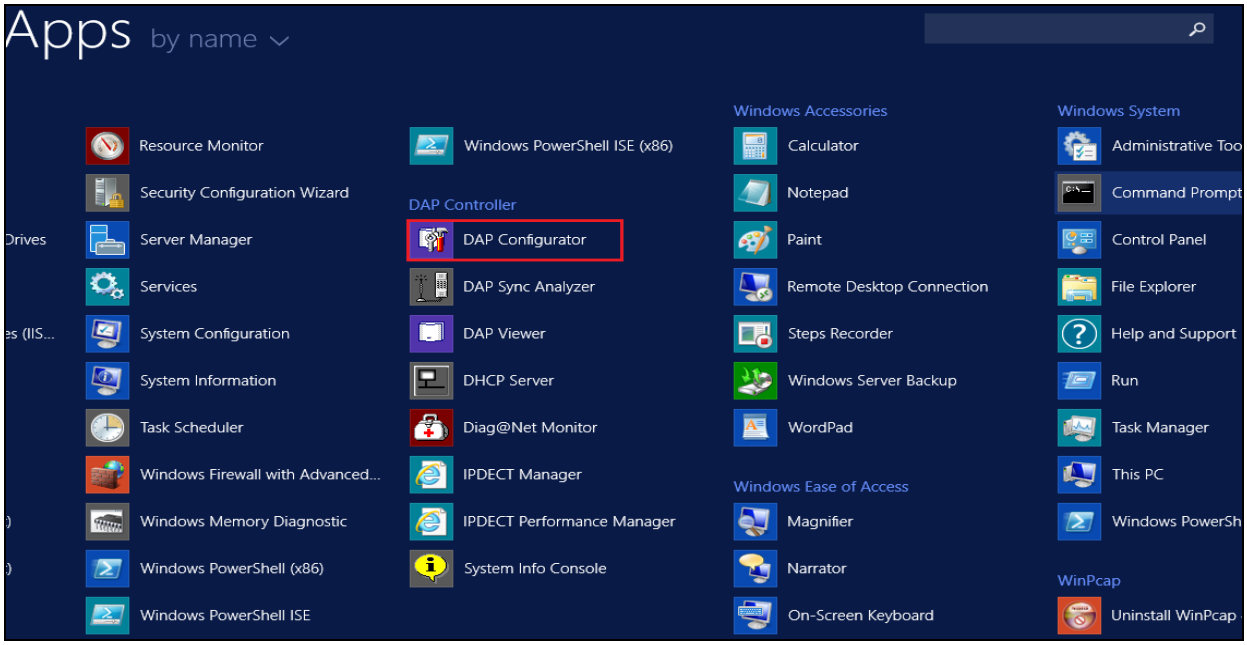
Note: The NEC IP DECT solution relies on DHCP (Option 66, 67), NTP and TFTP as network-services. DHCP and TFTP services can be provided from the DAP controller instance. In addition a Multi-Cast IP address is also required for the DAPs to synch.

7.1. DAP Configurator - Configure DECT Access Point (DAP)

The configuration of the DECT Access Point uses the DAP Configurator which creates a configuration file that is this pushed to each DAP on the network. Click on **DAP Configurator** as shown below.

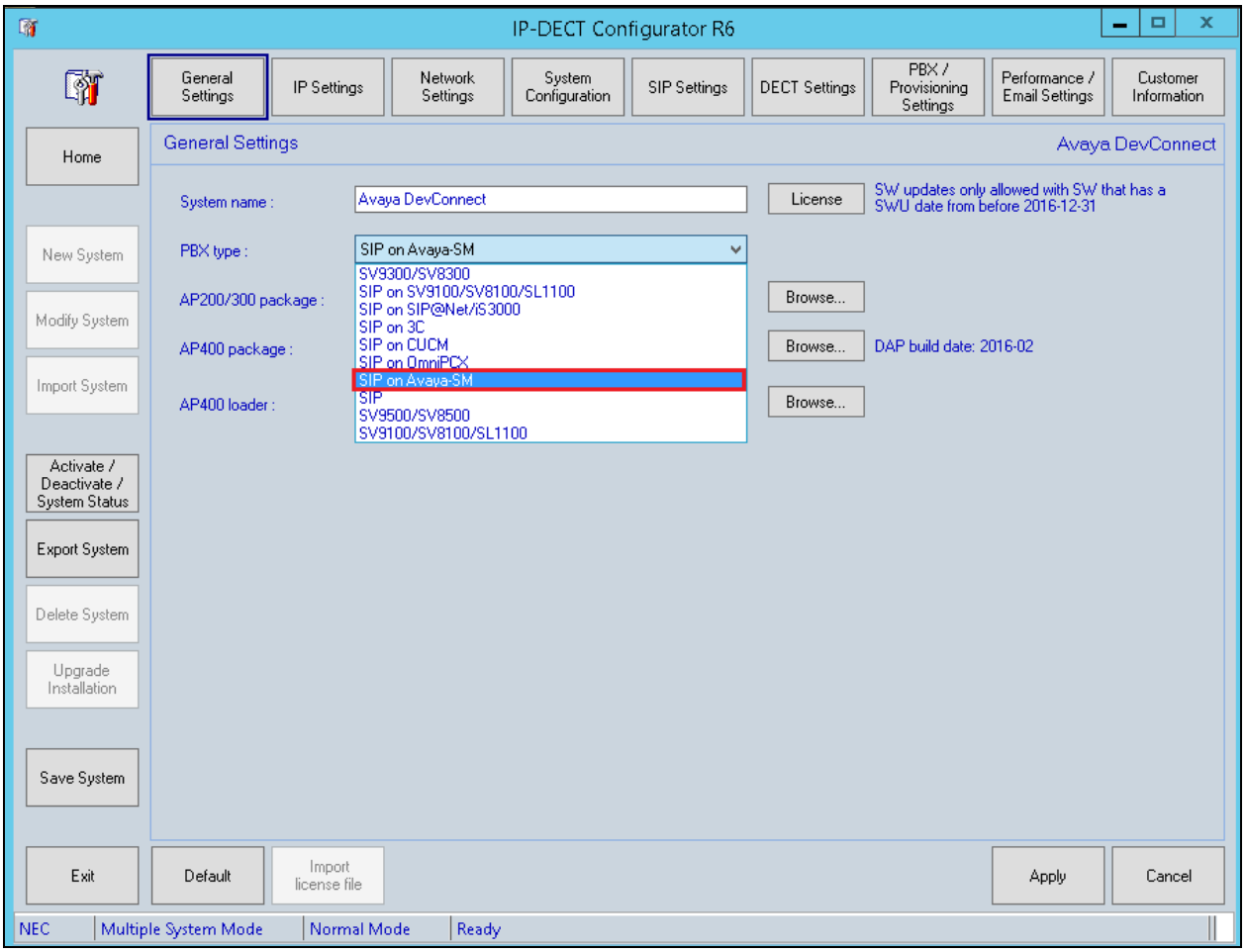
Note: An NEC IP DECT solution typically consists of a windows based instance called DAP Controller which includes "DAP Configurator" and "DAP Manager".

Note: The DAP Controller Package must be installed in the DAP Controller server. This package is only available from NEC.

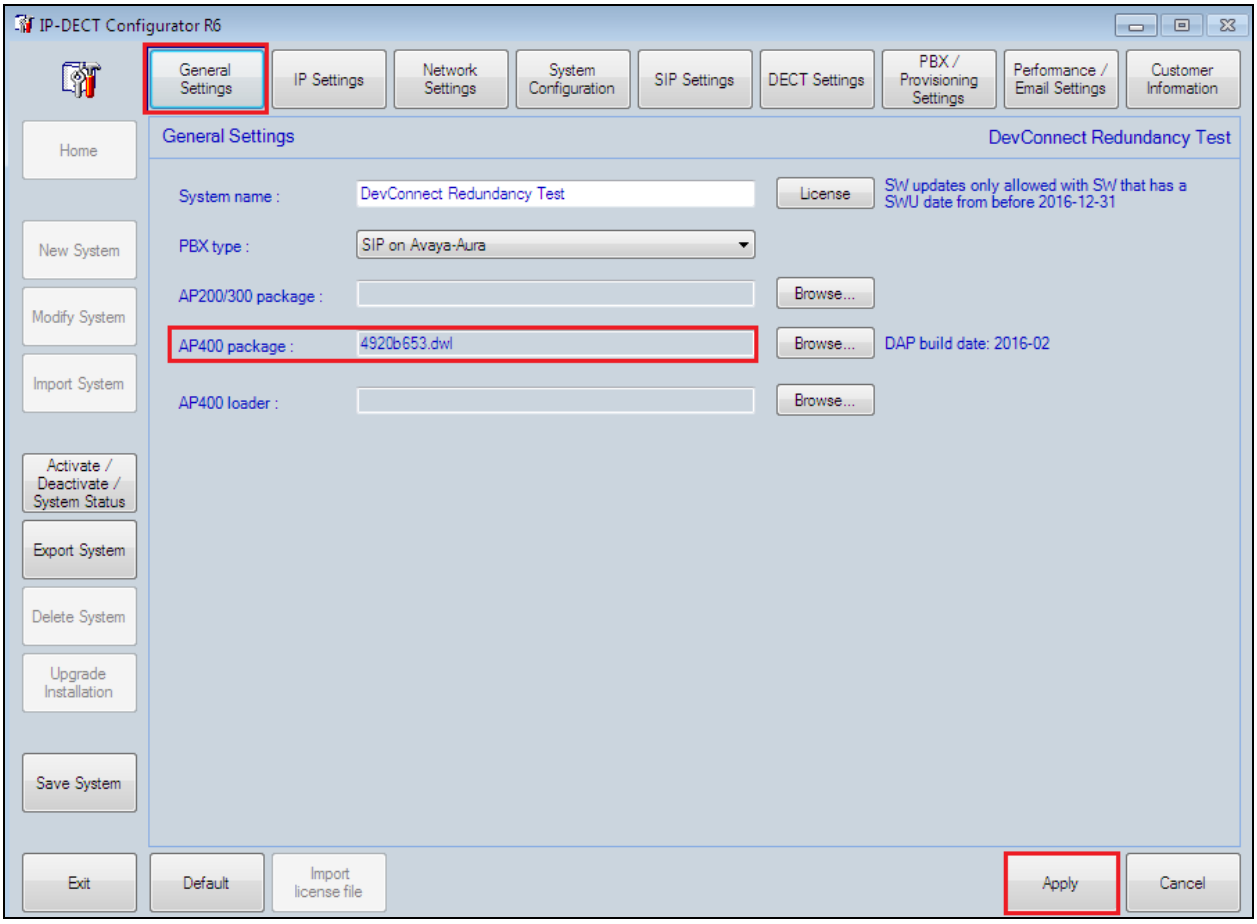


Click on the **General Settings** tab and enter the information on the main window. Enter a suitable **System Name** and ensure the **PBX type** is set to **SIP on Avaya-SM**.

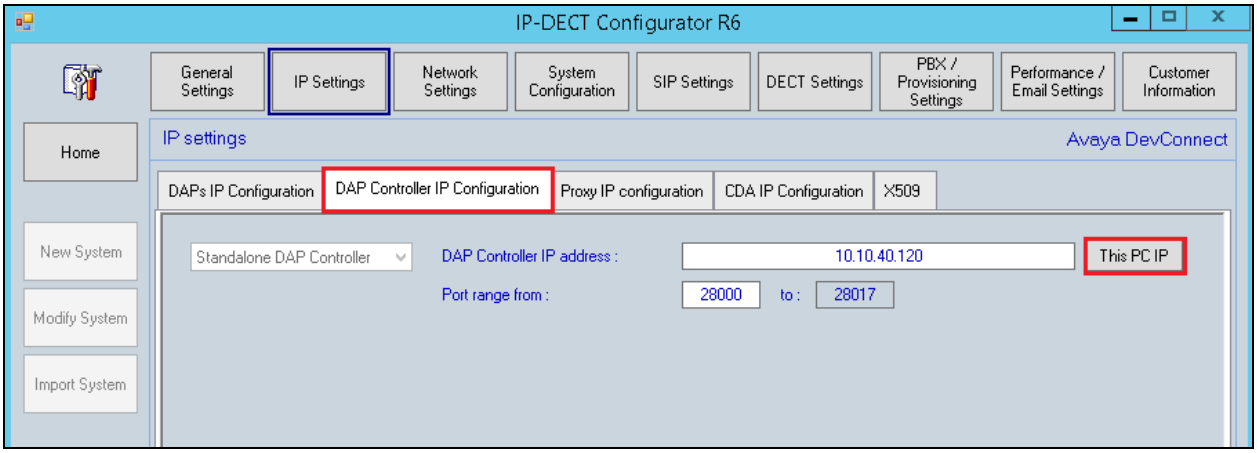
Note: Typically a license file is ordered and contains the licenses (number of access points (DAPs) and other features) for the new IP DECT Release 6.41 system. This license file also contains the PARI, which must be unique for each DECT System. When the license file is loaded here the PARI will be filled in automatically.



Ensure the correct AP400 package file from NEC is available on the machine with the DAP configurator. Click on **Browse** for the **AP400 package** and select the proper file (<filename>.dwl). Click on **Apply** at the bottom of the screen.

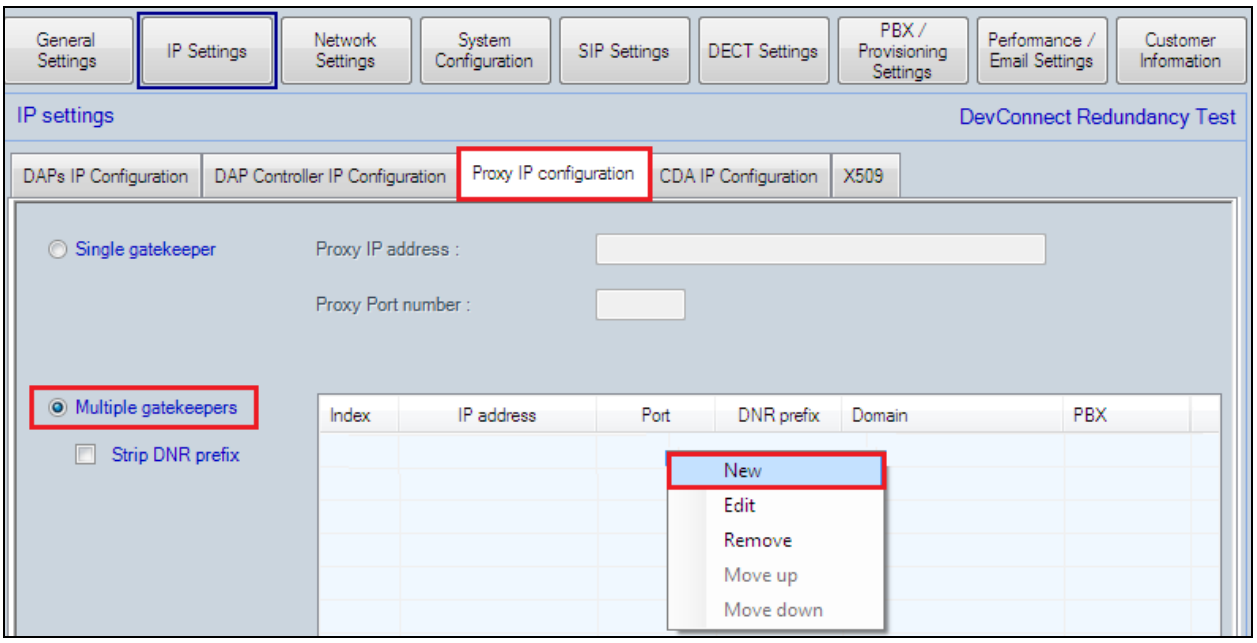


Click on the **IP Settings** tab at the top of the screen and on the **DAP Controller IP Configuration** tab in the main window. Enter the IP address of the DAP Controller server. In this case just pressing **This PC IP** will fill in the required information.

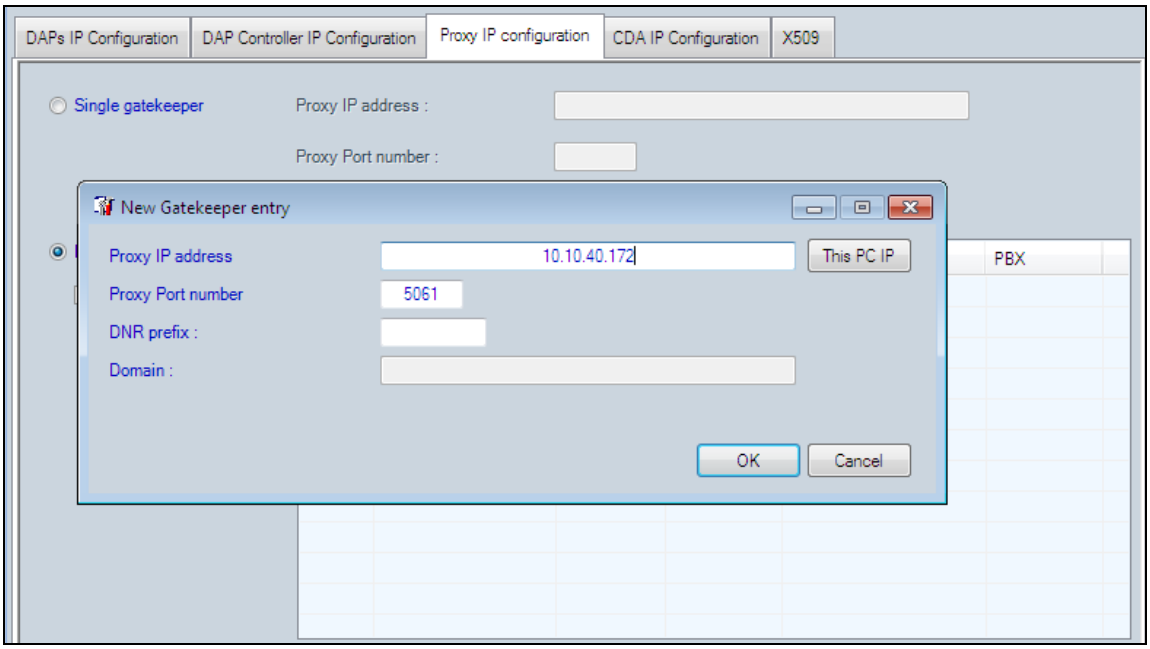


For redundant systems multiple gatekeepers can be selected, click on the **Proxy IP configuration** tab and click on **Multiple gatekeepers** in the main window. Right-click in the main window and click on new.

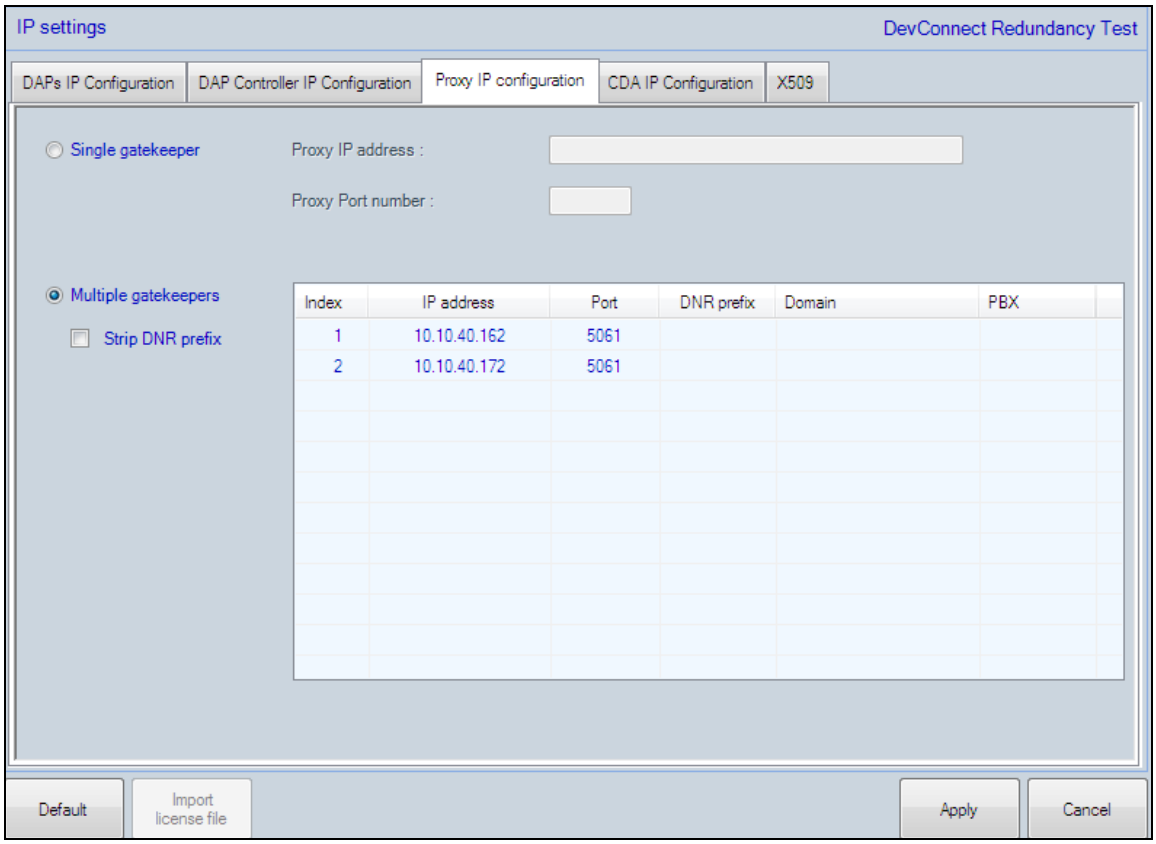
Note: In the Event the NEC DAP controller will send registration messages to a single Session Manager, click on the Single gatekeeper button below and enter the Session Manager details and the port number. This option may be used if a single Session Manager is being used or a Session Manager for registrations only.



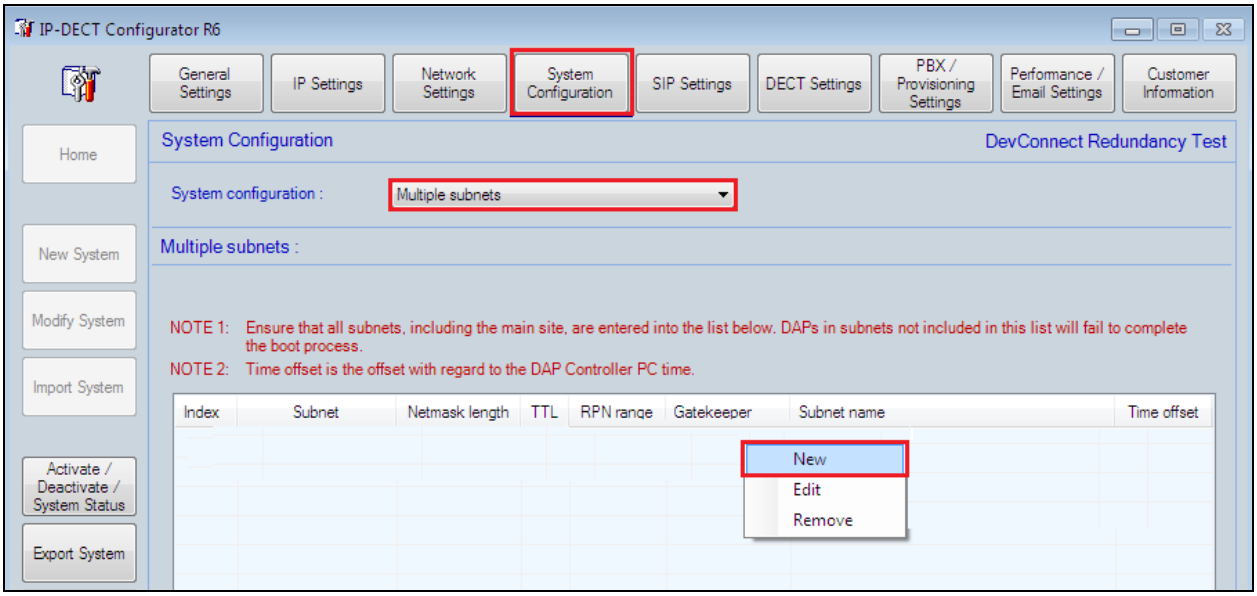
Enter the **Proxy IP address** for each Session Manager (SIP entity address) and the **Proxy port number** as shown below.



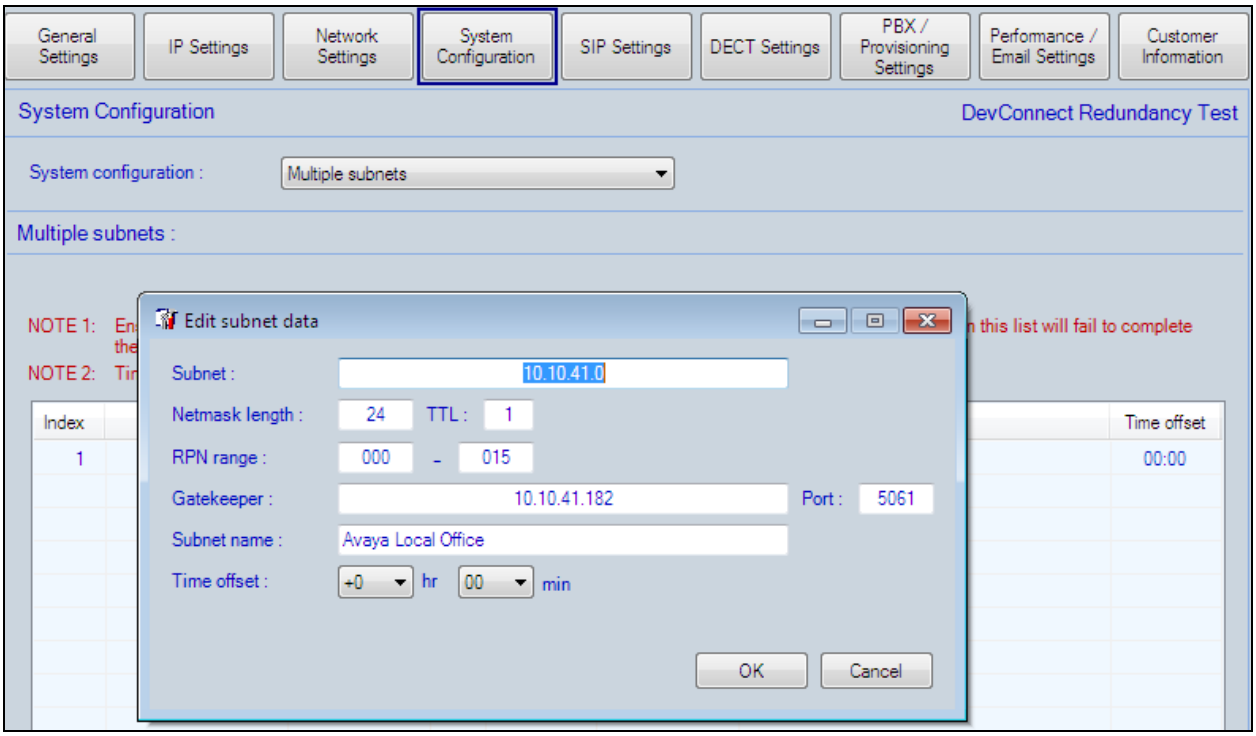
Once the two core Session Managers have been added, click on **Apply**.



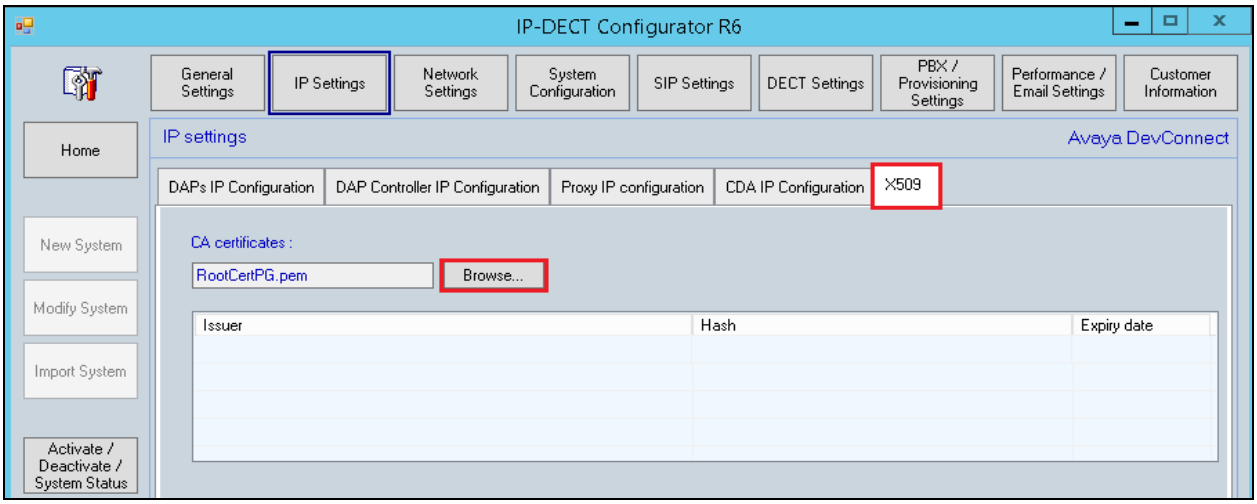
To enter the Branch Session Managers details from a different subnet, click on **System Configuration** from the top menu and select **Multiple subnets** from the drop-down box. In the main window right-click and select **New**.



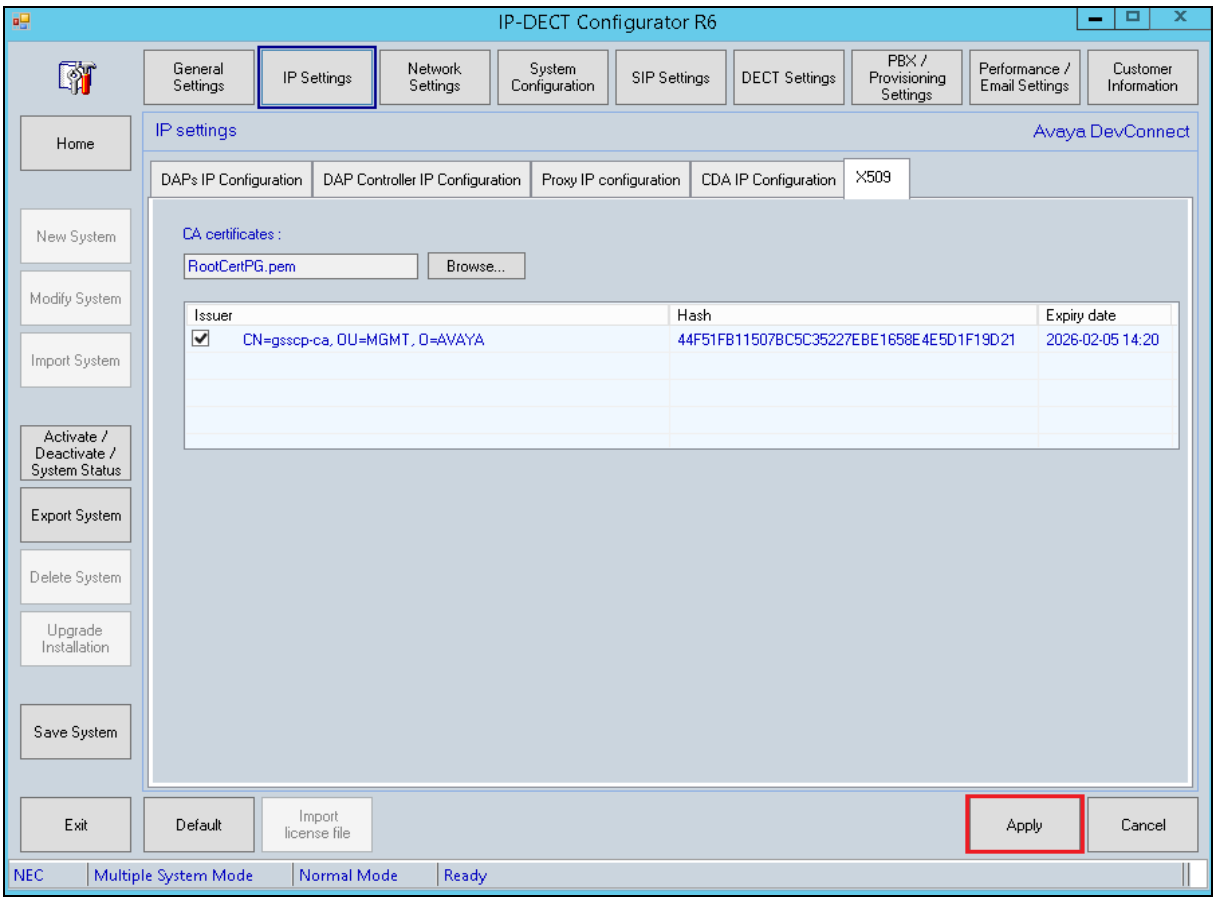
Enter the subnet information and the Branch Session Managers IP address (SIP Entity address) for the **Gatekeeper**. Enter the correct port number and click on **OK**.



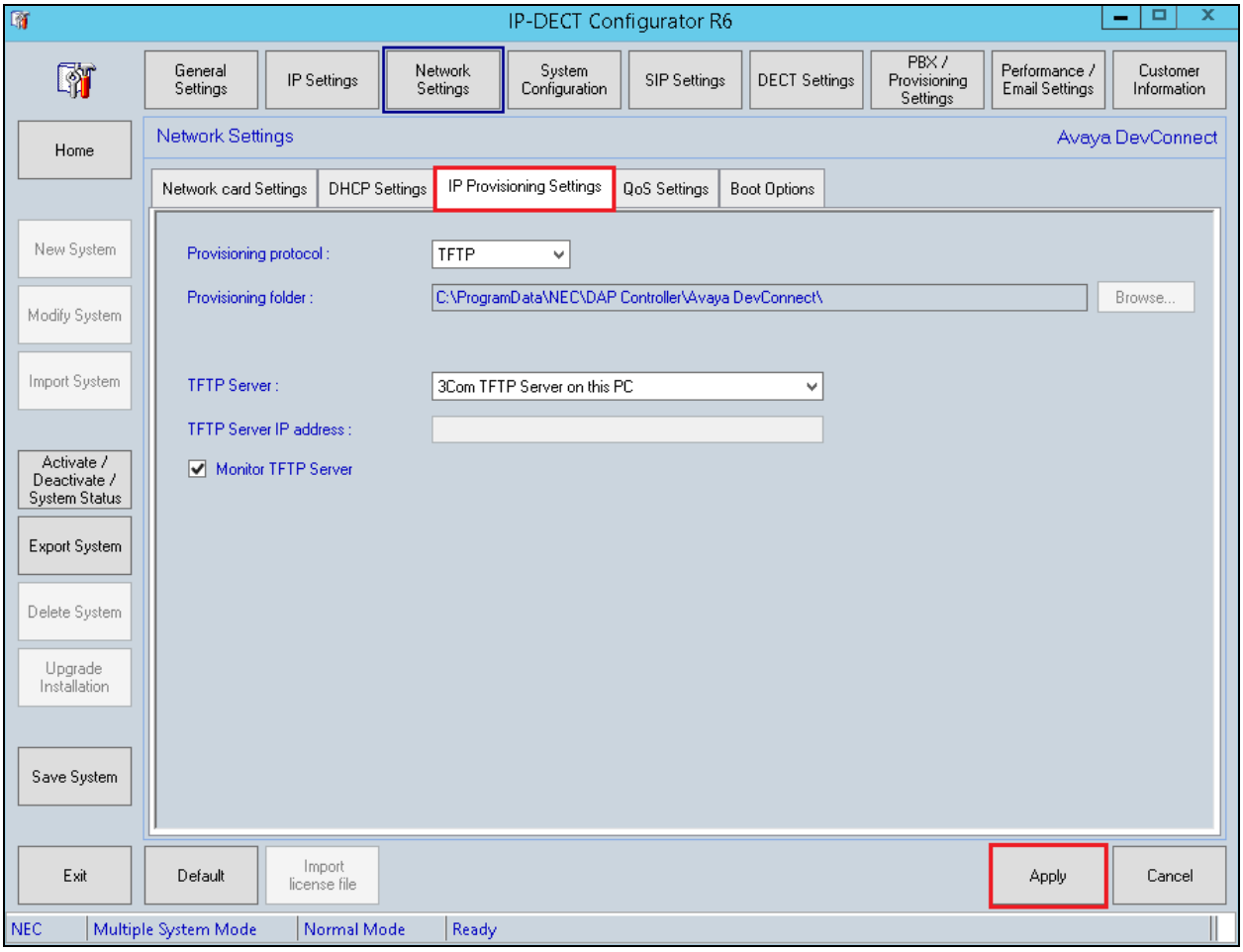
To add the Root Cert in order to use TLS and SRTP click on the **IP Settings** button at the top of the screen and click on the **X509** tab and import the Root Cert into the DAP Controller. This will be the same root cert that is being used on Session Manager. The root certificate is being used by the DAP to verify the certificate sent by the Session Manager.



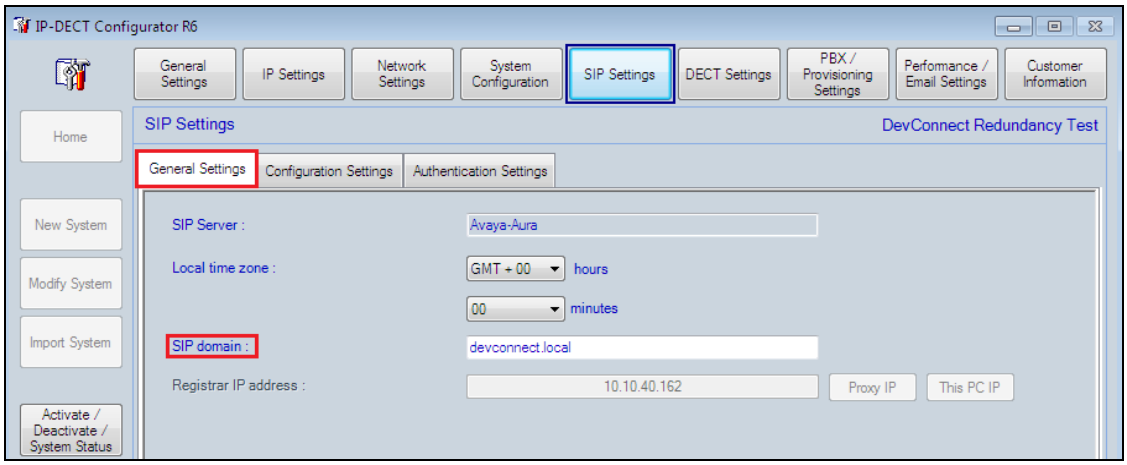
The following shows the imported cert information, click on **Apply** once done.



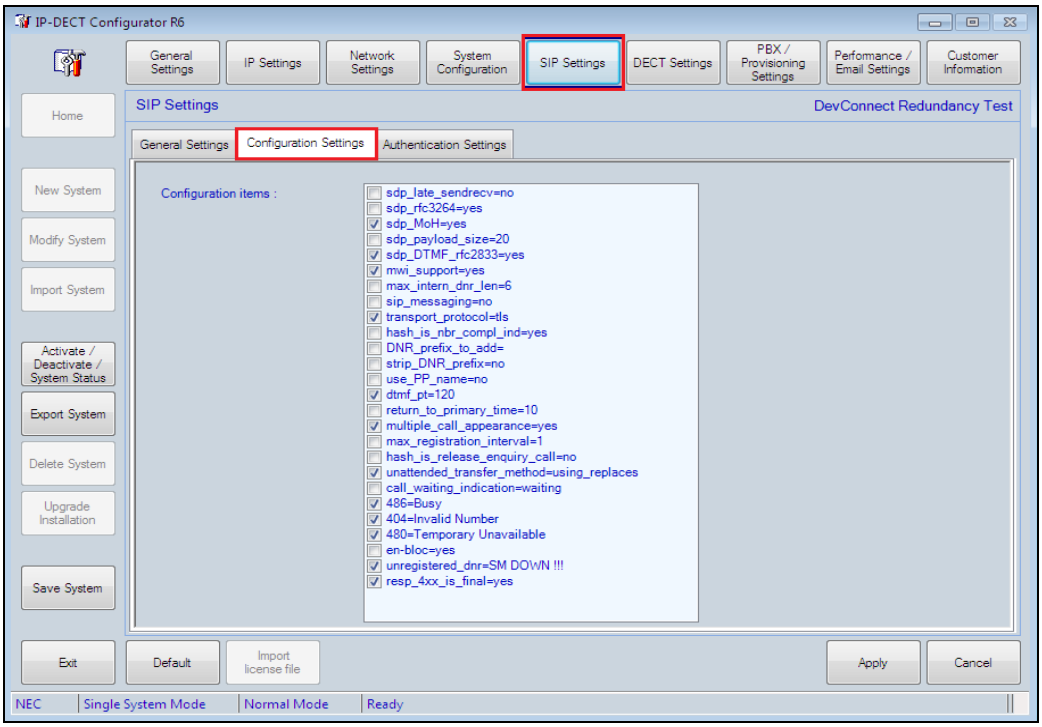
Click on **Network Settings** at the top of the page and within this tab select the **IP Provisioning Settings** tab to check the **TFTP** details. The NEC DAP Controller sever can be setup as a TFTP server which will send any and all details to each DAP using TFTP. This information should be filled in automatically but the screen shot below shows the setup implemented for compliance testing. Once the information here is correctly filled in, click on **Apply** at the bottom of the page to continue.



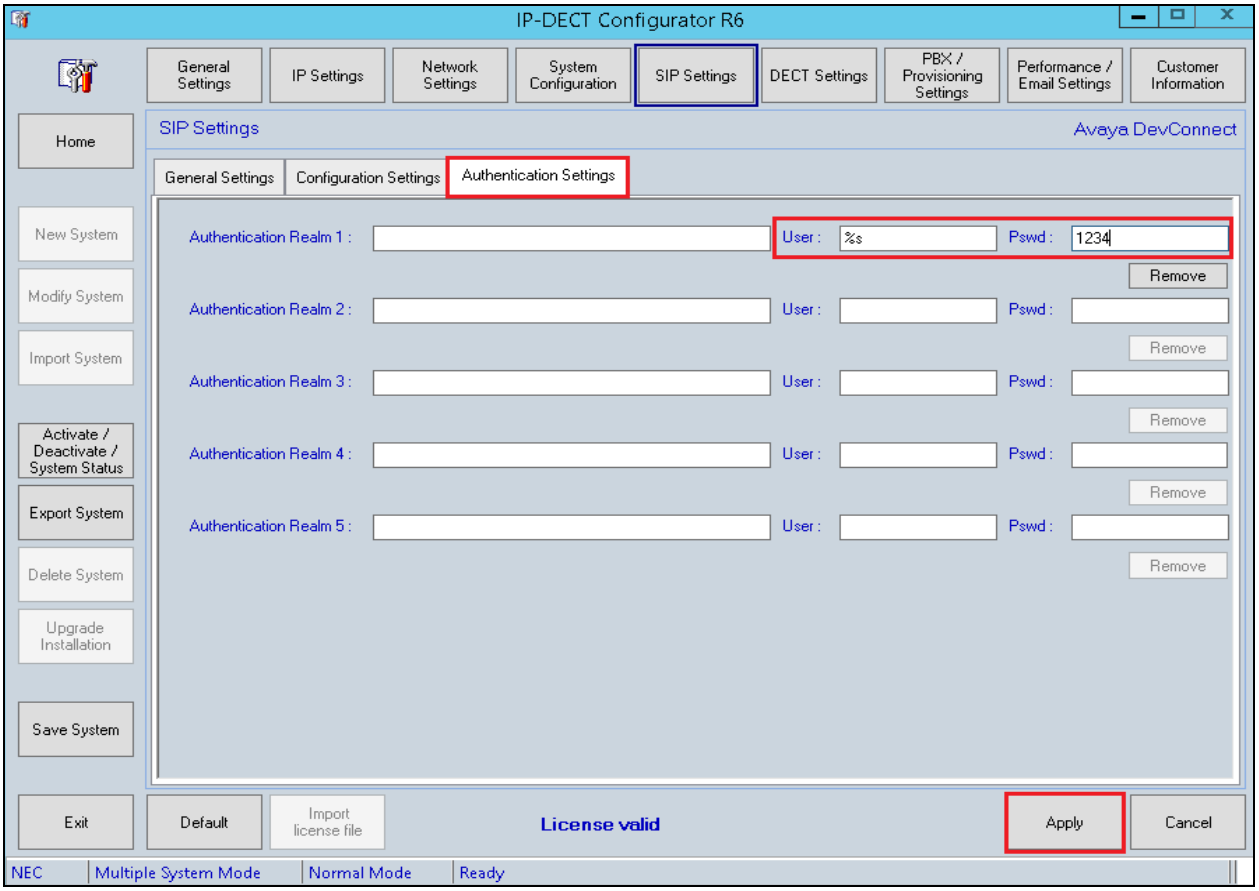
Click on **SIP Settings** at the top of the page and the **General Settings** tab in the main window. The SIP Server details will be automatically filled in. Set the time zone and the **SIP domain**, note this is the same SIP domain featured in **Section 6.1**. Note the **Registrar IP address**; is greyed out as this was completed earlier in this section.



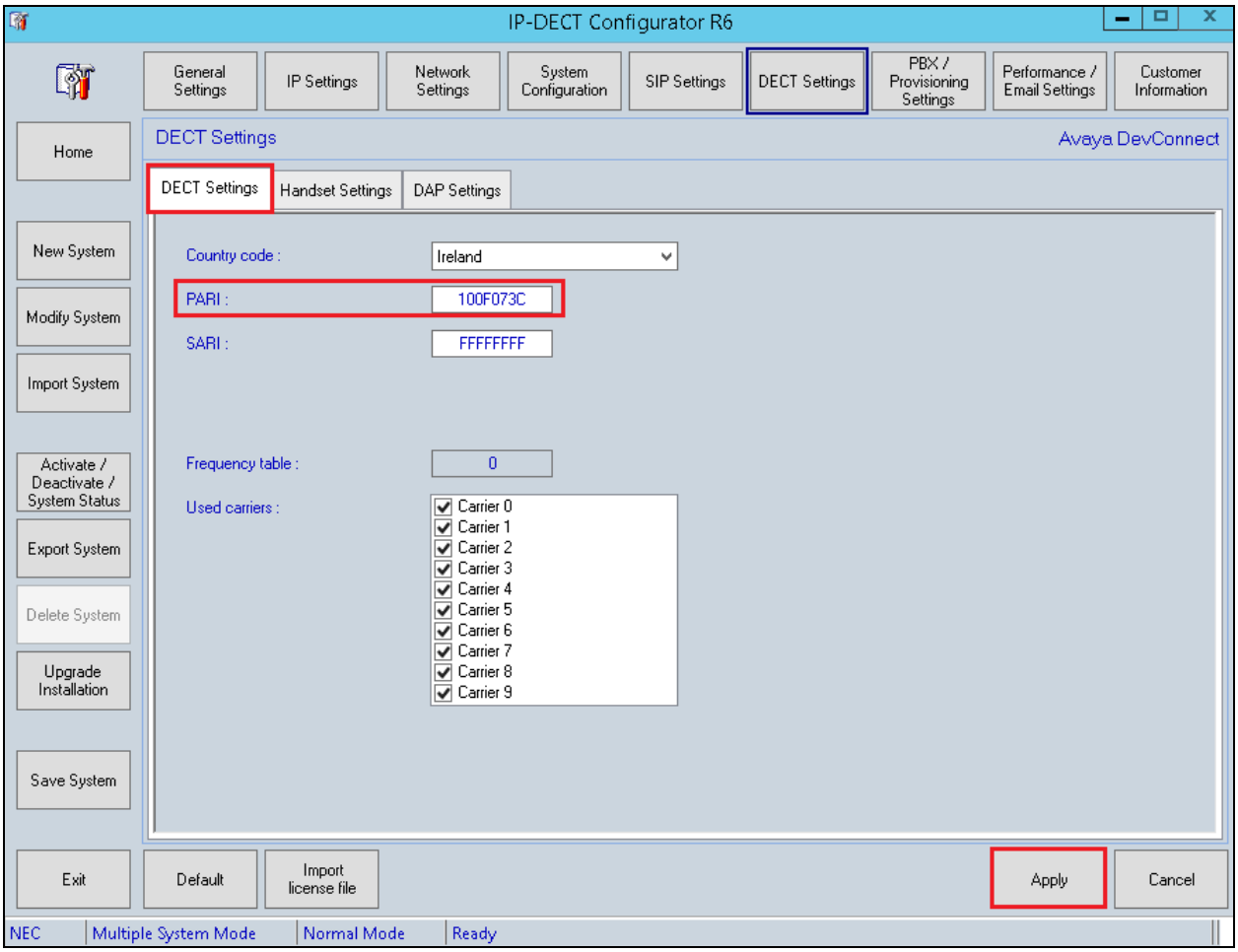
Click on **Configuration Settings** tab, due to the choice of the PBX type (SIP on Avaya SM) the corresponding SIP settings are automatically set for that PBX type the screen shot below shows the settings used during compliance testing. The **transport_protocol** shows that **TLS** is being used and the **mwi_support=yes**, with the **DTMF_pt** set to **120** (needs to match the setting "Telephony Event Payload type" on CM trunk group form on page 4). All other values shown were set for standard compliance testing.



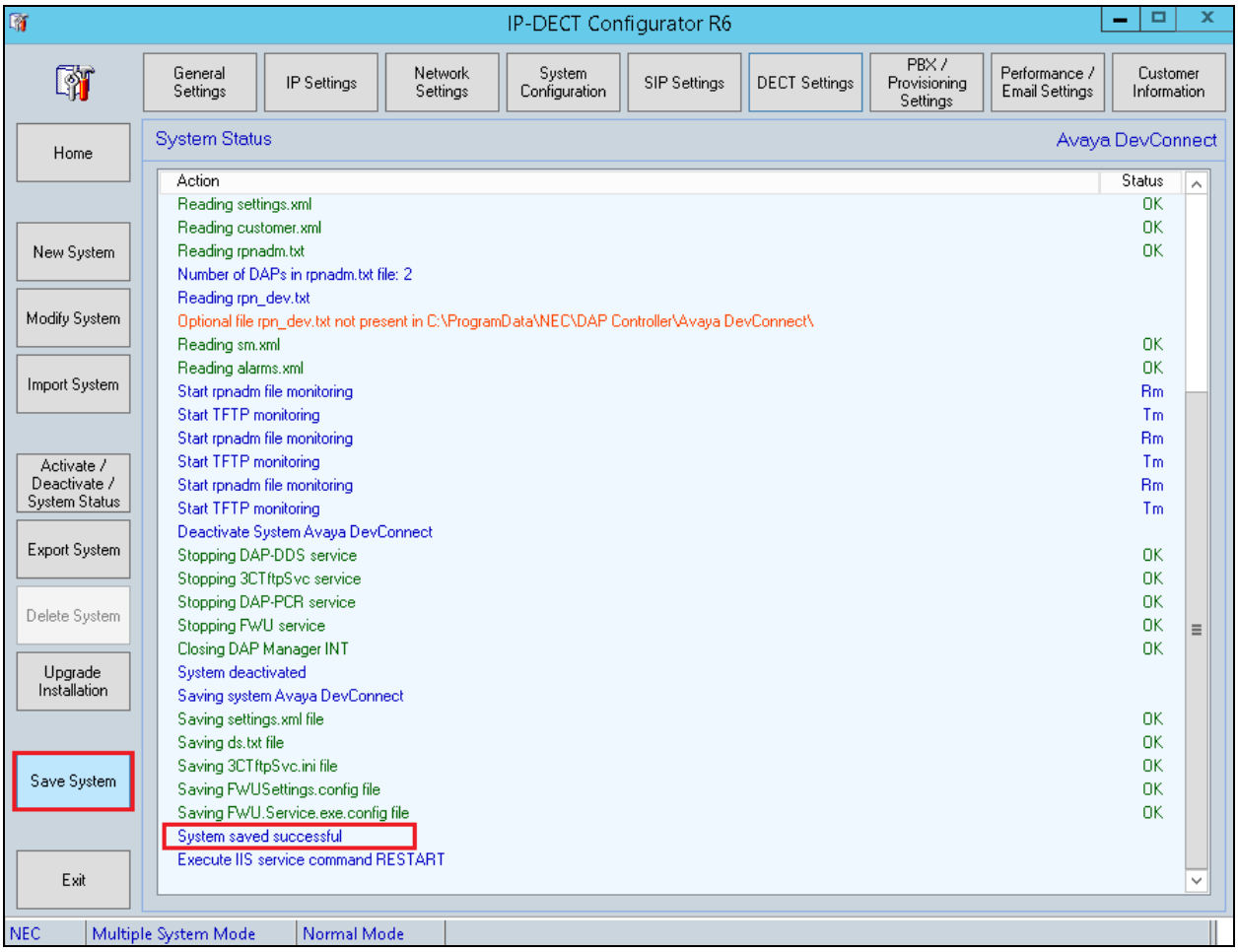
Click on **Authentication Settings** tab and enter **%s** as the user (means the DNR will be used as the SIP extension) and **1234** as the password, note that this is the same password set in **Section 6.5**.



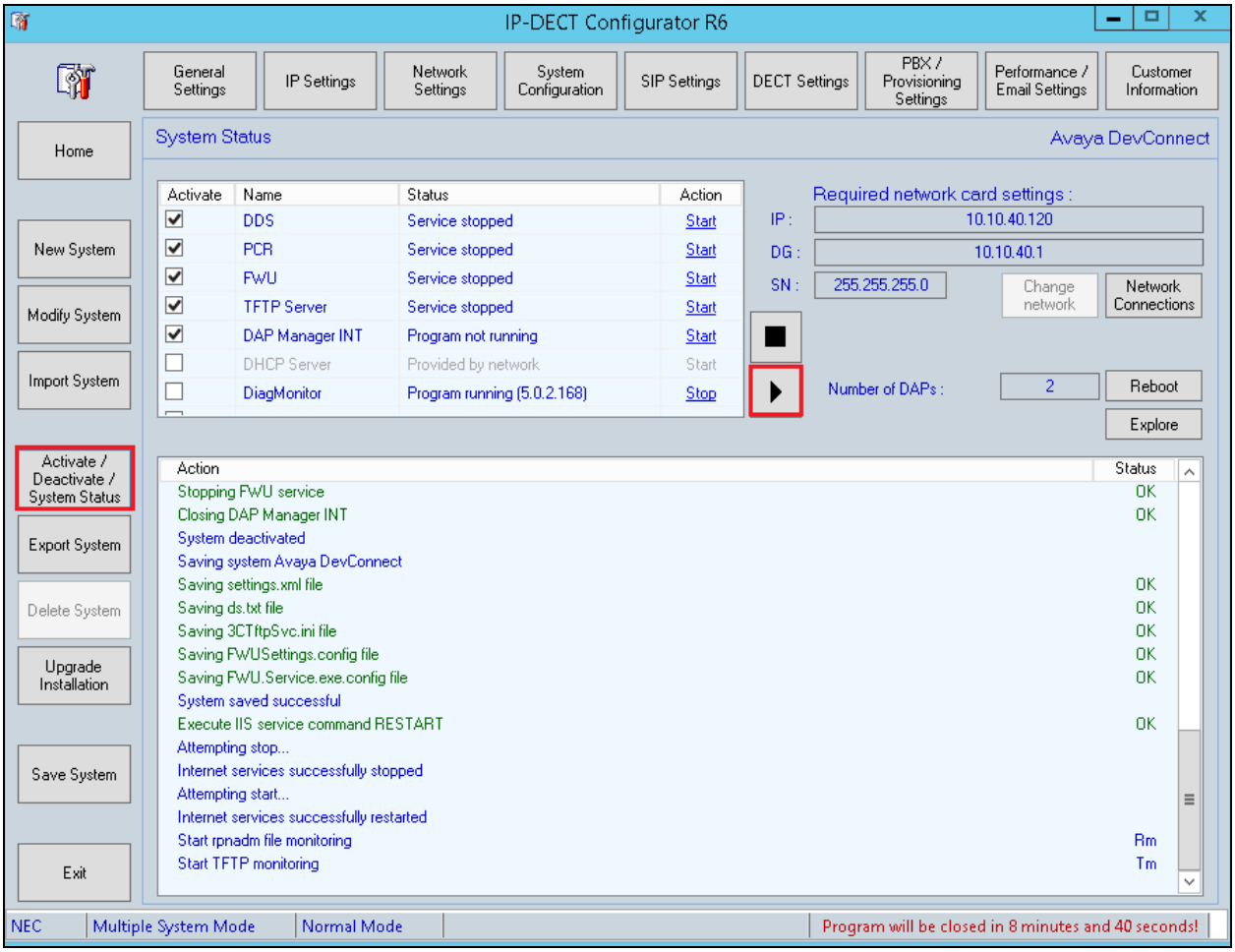
Click on **DECT Settings** at the top of the page and the **DECT Settings** tab in the main window. The **PARI** should be already filled in from the information provided by the license file. The **Country code** can be changed to suite and click on **Apply** once this information has been entered as the other tabs do not need to be changed.



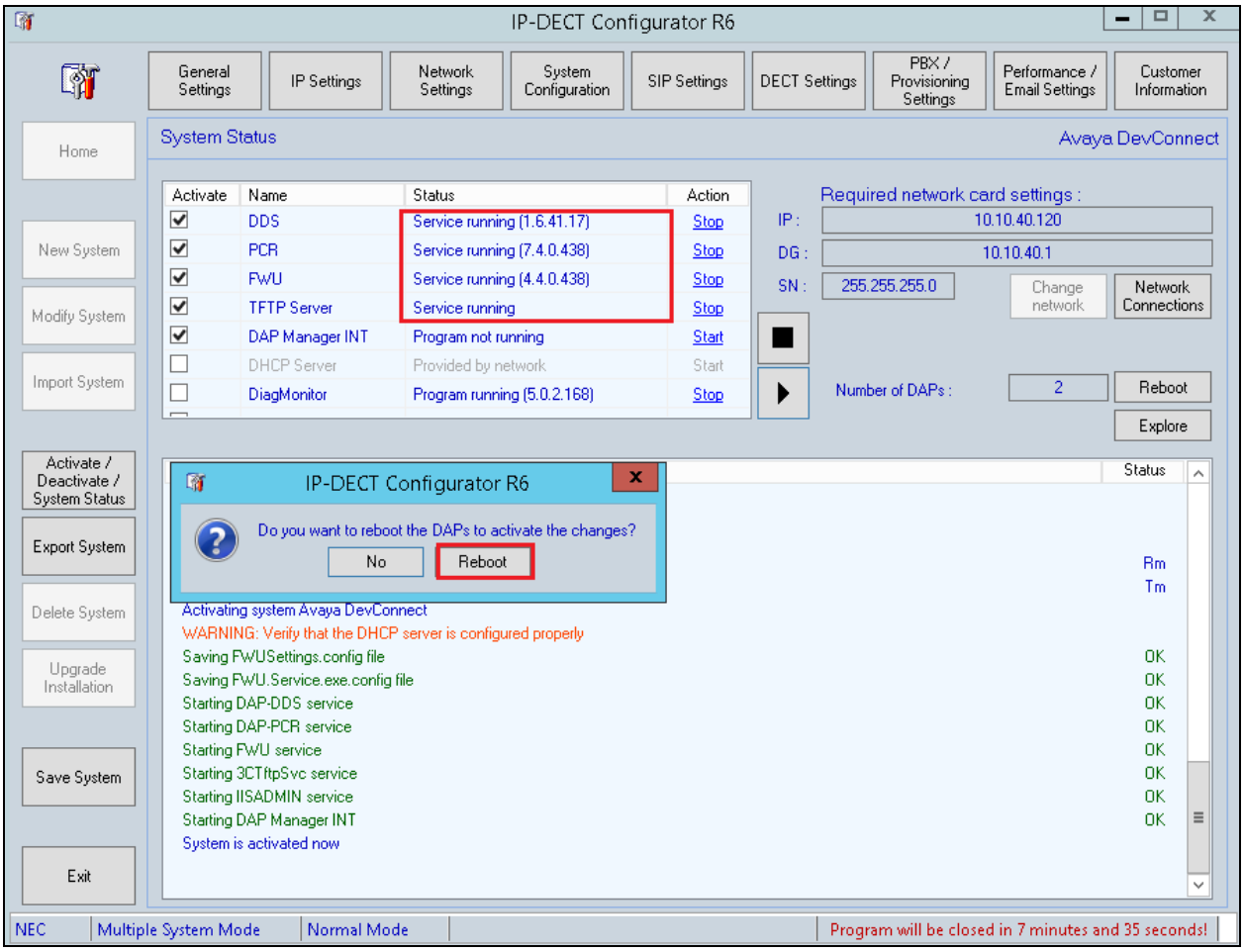
Once **Save System** has been pressed at the bottom right of the screen the following will be displayed showing that the system has **saved successfully**.



Clicking on **Activate/Deactivate System Status** on the left side of the screen will bring a page on which a restart can be done by clicking the start icon (> button). The DAPs remain fully operational and making and receiving calls is still possible. The DAP controller is only necessary for Management actions regarding the handsets. Clicking on the start icon highlighted in the main screen will restart the system again after Activate/Deactivate System Status has been pressed.



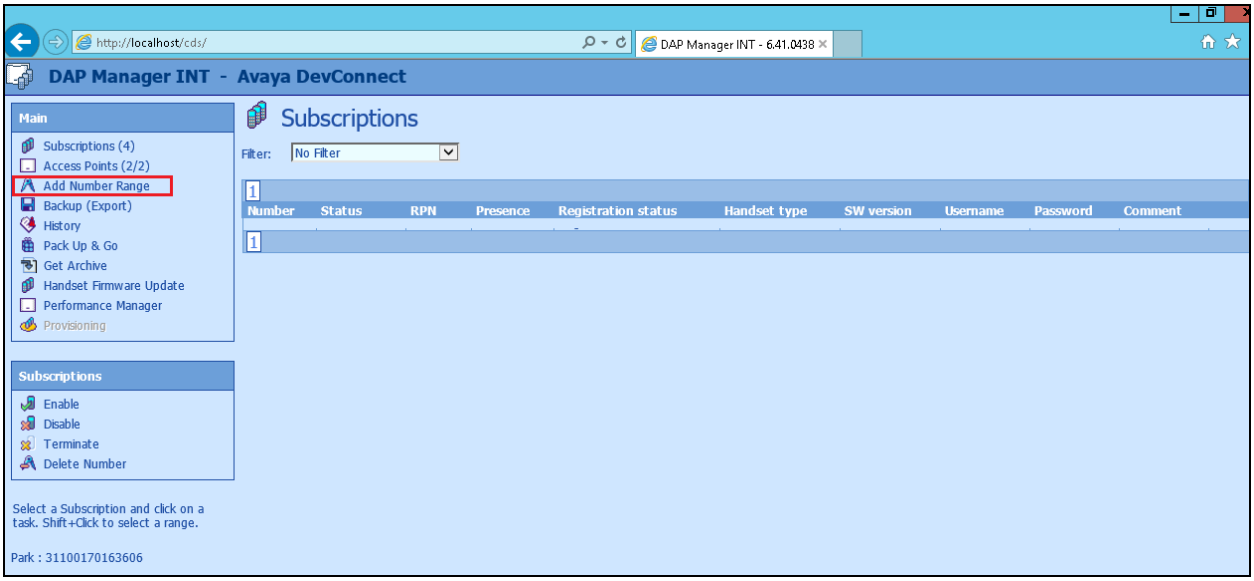
With the system up and running again a window should automatically appear asking to reboot the DAP's. Click on **Reboot** to complete the setup.



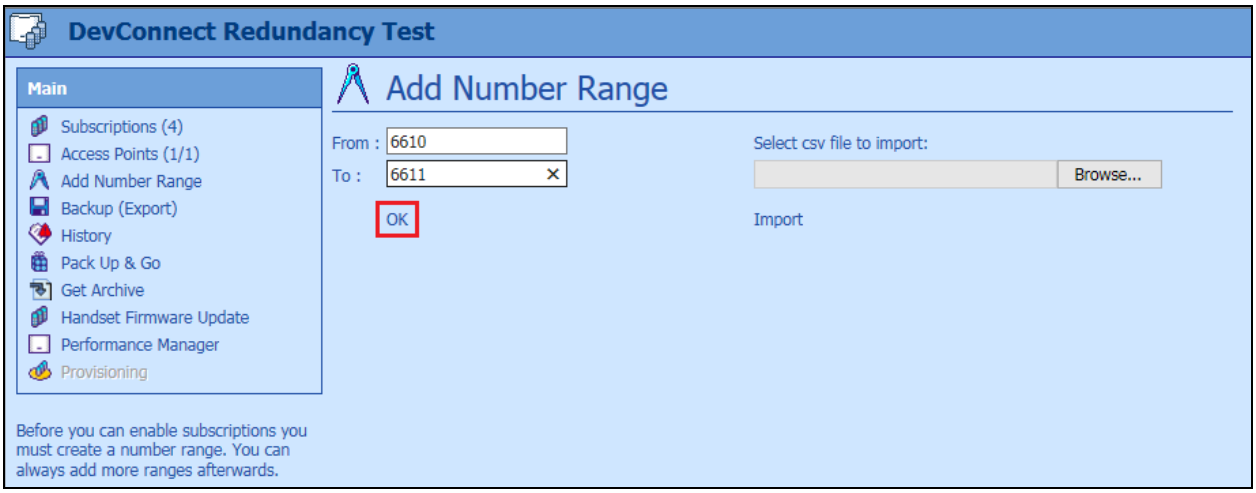
7.2. DAP Manager – Managing DECT users and handsets

Once the DAP configurator has been fully configured, the following window of the DAP manager is automatically popped. The DAP manager can also be reached by typing the following URL http://<IP-of-DAP-manager>/cds/. The DAP manager is used to manage the extensions (DNR) on the DECT system and also to subscribe the DECT handsets.

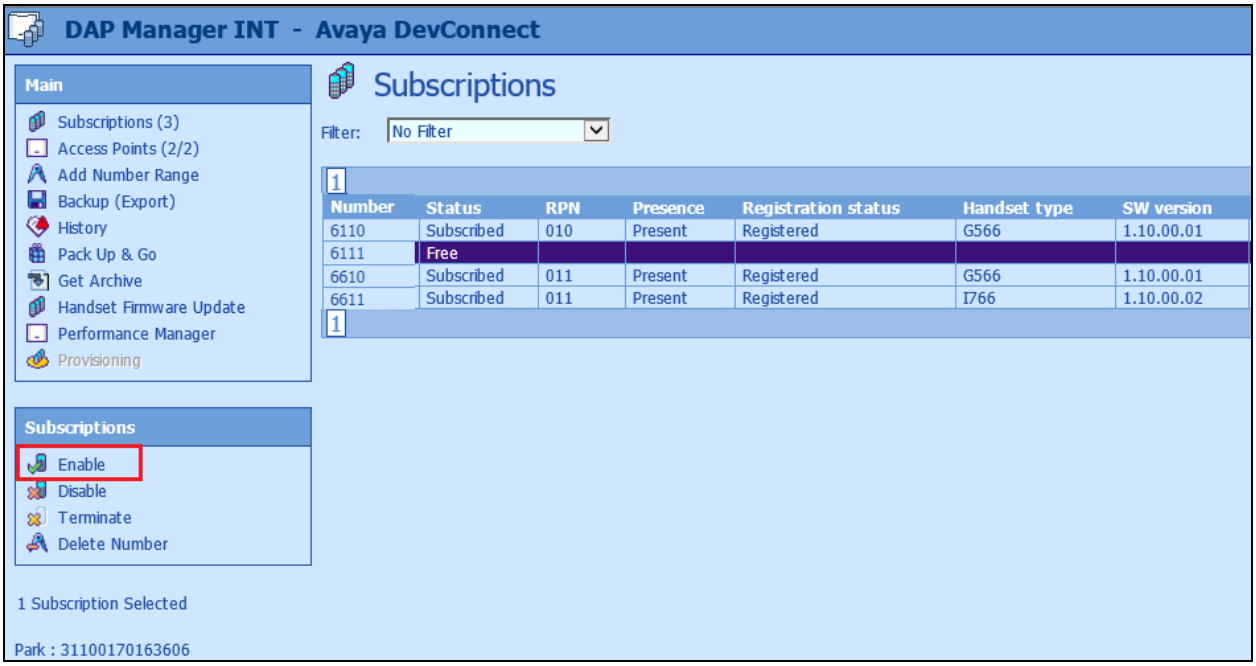
Click on **Add Number Range** in the left window.



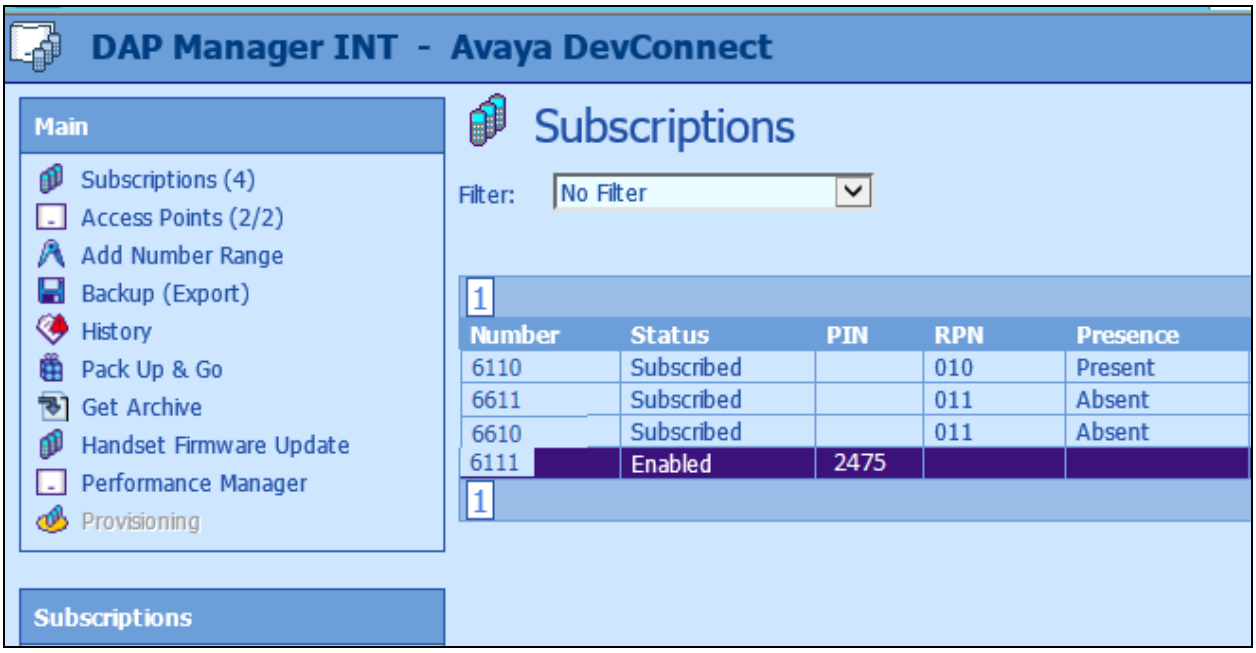
Enter the number range or the number of the extension(s) to be added and click on **OK**.



Highlight the new extension added in the main window and click on **Enable** in the left window.



Note the **PIN** number which will be used to subscribe the handset in the next section.

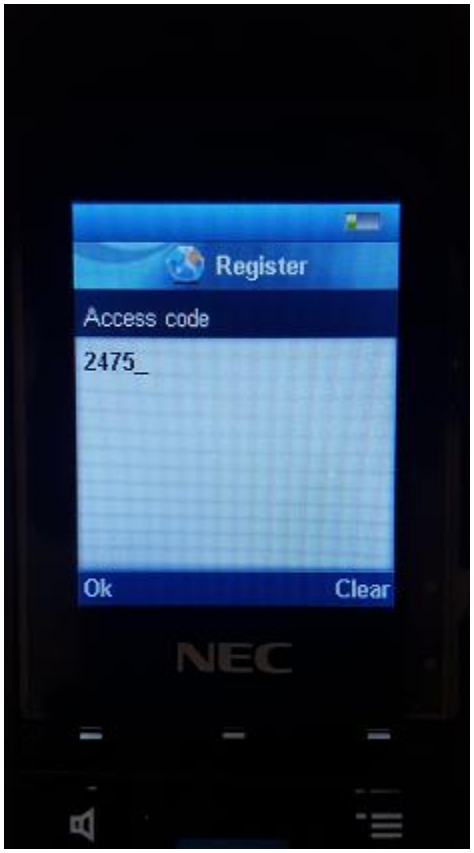


7.3. How to Subscribe the DECT Handset

From the DECT handset click on the menu button (on top of the power button) and select **Settings** as highlighted below.

Scroll right to **Connectivity** and select **Register** as shown below.

There will be a number of slots labelled **Empty** (not shown) choose one and continue pressing Ok until the Access Code is asked for. Enter the **Access code** as per **Section 7.2**.



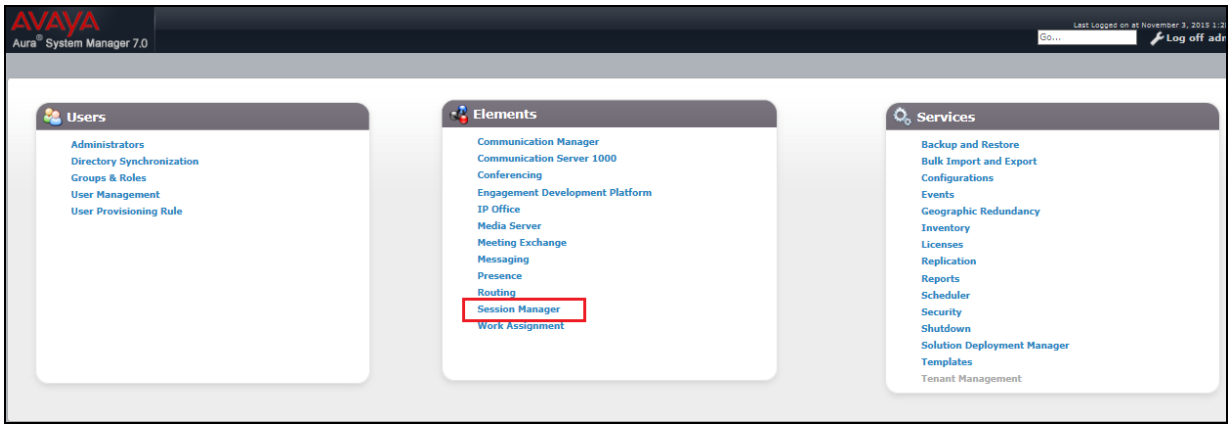
Once this is all entered the phoneset display should show **Registering**, as shown below.

8. Verification Steps

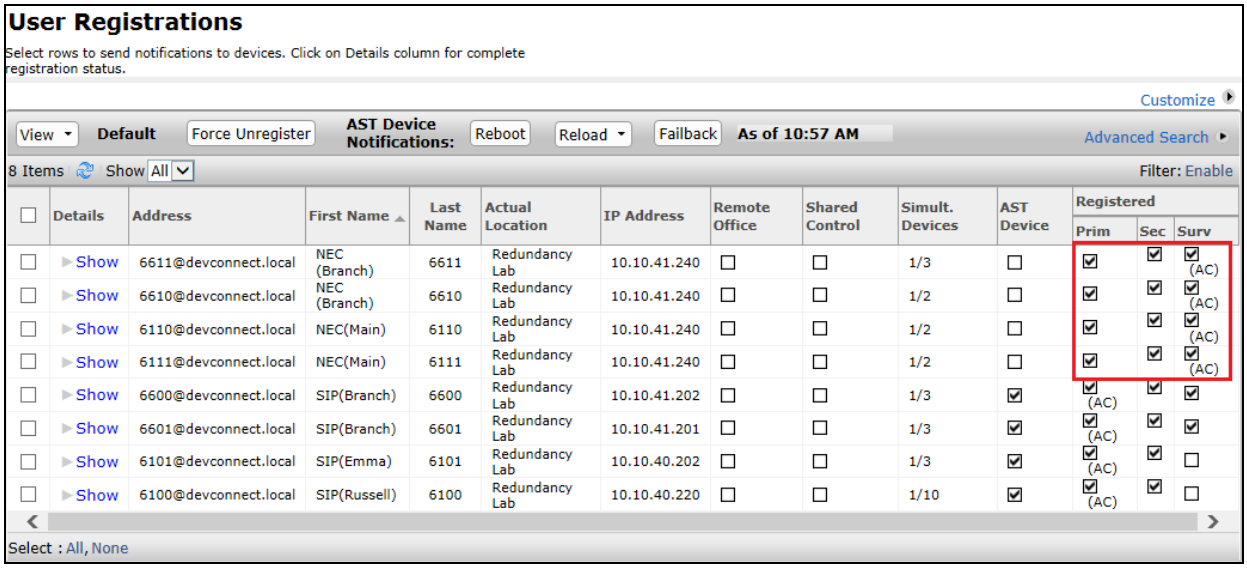
In order to validate that each NEC phone has been registered correctly to each Session Manager, this can be checked on System Manager under **Session Manager → User Registrations** and this is shown in **Section 8.1**. Making calls to and from the NEC phones while observing a Wireshark trace will provide enough information to verify that the NEC phones are registered correctly and are working as expected.

8.1. Session Manager Registration

Log into System Manager as done previously in **Section 6.1**, select **Session Manager** as highlighted below.



Under **System Status** in the left window, select **User Registrations** (not shown) to display all the SIP users that are currently registered with Session Manager. The NEC DECT users should show as being registered as highlighted. Note that each NEC user is registered with all three Session Managers, this is with the two core Session Managers and the Branch Session Manager.



User Registrations

Select rows to send notifications to devices. Click on Details column for complete registration status.

Customize

View | Default | Force Unregister | AST Device Notifications: | Reboot | Reload | Failback | As of 10:57 AM | Advanced Search

8 Items | Show All | Filter: Enable

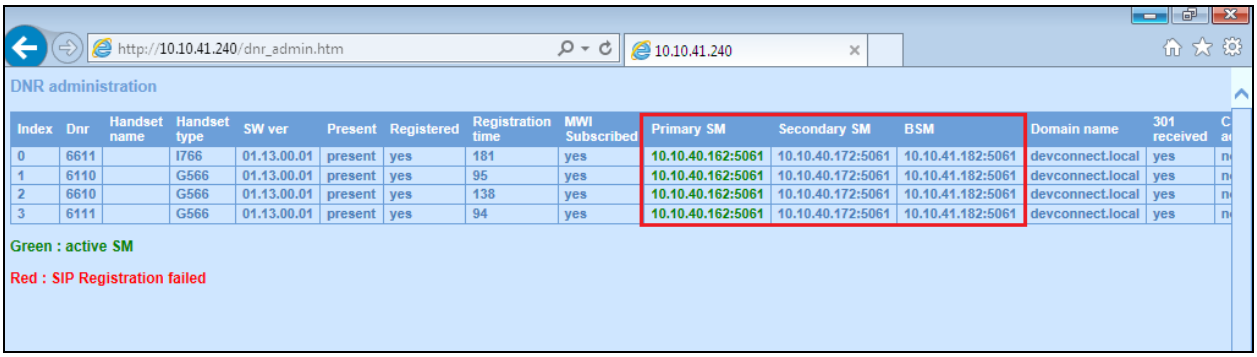
Details	Address	First Name	Last Name	Actual Location	IP Address	Remote Office	Shared Control	Simult. Devices	AST Device	Registered Prim	Registered Sec	Registered Surv
Show	6611@devconnect.local	NEC (Branch)	6611	Redundancy Lab	10.10.41.240	☐	☐	1/3	☐	☑	☑	☑ (AC)
Show	6610@devconnect.local	NEC (Branch)	6610	Redundancy Lab	10.10.41.240	☐	☐	1/2	☐	☑	☑	☑ (AC)
Show	6110@devconnect.local	NEC(Main)	6110	Redundancy Lab	10.10.41.240	☐	☐	1/2	☐	☑	☑	☑ (AC)
Show	6111@devconnect.local	NEC(Main)	6111	Redundancy Lab	10.10.41.240	☐	☐	1/2	☐	☑	☑	☑ (AC)
Show	6600@devconnect.local	SIP(Branch)	6600	Redundancy Lab	10.10.41.202	☐	☐	1/3	☑	☑ (AC)	☑	☑
Show	6601@devconnect.local	SIP(Branch)	6601	Redundancy Lab	10.10.41.201	☐	☐	1/3	☑	☑ (AC)	☑	☑
Show	6101@devconnect.local	SIP(Emma)	6101	Redundancy Lab	10.10.40.202	☐	☐	1/3	☑	☑ (AC)	☑	☐
Show	6100@devconnect.local	SIP(Russell)	6100	Redundancy Lab	10.10.40.220	☐	☐	1/10	☑	☑ (AC)	☑	☐

Select : All, None

Note: As the NEC endpoints are not AST devices (AST device unchecked), the (AC) flag regarding registration (Registered columns) works different than for Avaya phones (AST devices). The (AC) flag for non AST devices just points to the Session Manager instance to which that endpoint has registered latest. It does NOT point to the current "active" controller. Aura® Core and NEC endpoints will use in hierarchical order (Prim to Surv) as the "active" controller – depending on which registrations are established.

8.2. NEC Registrations on DAP Manager DNR administration

The registrations for the NEC handset to each Session Manager can also be verified from the DAP Manager itself by opening a http session to the DAP controller. This is shown below and the resulting page shows the NEC handsets all registered to three Session Managers, the two core Session Managers and the Branch Session Manager.



Index	Dnr	Handset name	Handset type	SW ver	Present	Registered	Registration time	MWI Subscribed	Primary SM	Secondary SM	BSM	Domain name	301 received
0	6611		I766	01.13.00.01	present	yes	181	yes	10.10.40.162:5061	10.10.40.172:5061	10.10.41.182:5061	devconnect.local	yes
1	6110		G566	01.13.00.01	present	yes	95	yes	10.10.40.162:5061	10.10.40.172:5061	10.10.41.182:5061	devconnect.local	yes
2	6610		G566	01.13.00.01	present	yes	138	yes	10.10.40.162:5061	10.10.40.172:5061	10.10.41.182:5061	devconnect.local	yes
3	6111		G566	01.13.00.01	present	yes	94	yes	10.10.40.162:5061	10.10.40.172:5061	10.10.41.182:5061	devconnect.local	yes

9. Conclusion

These Application Notes describe the configuration steps for provisioning NEC's IP DECT Access Point (AP400) and NEC´s DECT handsets to interoperate with Avaya Aura® Communication Manager R7.0.1 and Avaya Aura® Session Manager R7.0.1 specifically to show redundancy failover using multiple simultaneous registrations with different Avaya Aura® Session Managers in a main/branch environment. Please refer to **Section 2.1** and **2.2** for test results and observations.

10. Additional References

This section references documentation relevant to these Application Notes. The Avaya product documentation is available at http://support.avaya.com where the following documents can be obtained.

[1] *Administering Avaya Aura® Communication Manager*, Document ID 03-300509

[2] *Avaya Aura® Communication Manager Feature Description and Implementation*, Document ID 555-245-205

[3] *Implementing Avaya Aura® Session Manager* Document ID 03-603473

[4] *Administering Avaya Aura® Session Manager*, Doc ID 03-603324

NEC's technical documentation is available from NEC or from http://businessnet.nec-enterprise.com.

[5] *NEC, 2016, Business Mobility IP DECT CE Manual for SIP Connectivity, R6.41*, available at http://businessnet.nec-enterprise.com

[6] *NEC, 2016, IP DECT Administrator Guide, R6.41*, available at http://businessnet.nec-enterprise.com

11. Appendix

Configuration for the Survivable Core and Local Survivable Processor on Communication Manager

The following is the setup for both the Survivable Core and the Local Survivable Processor that was used during compliance testing.

The setup requires that each component is added under **node-names ip**. Take note of the LSP and the SC as shown below.

```
change node-names ip                                            Page   1 of   2
                                   IP NODE NAMES
    Name               IP Address
AMSBackup            10.10.40.179
AMSBranch            10.10.41.189
AMSMain              10.10.40.169
BSM                  10.10.41.182
CMAvmpg              10.10.40.163
CMBvmpg              10.10.40.164
LSP70                10.10.41.185
SC70Redundancy       10.10.40.175
SCAvmpg              10.10.40.173
SCBvmpg              10.10.40.174
SMA70vmpg            10.10.40.162
SMB70vmpg            10.10.40.172
default              0.0.0.0
procr                10.10.40.165
( 16 of 17   administered node-names were displayed )
Use 'list node-names' command to see all the administered node-names
Use 'change node-names ip xxx' to change a node-name 'xxx' or add a node-name
```

11.1. Survivable Core

In the setup for this compliance testing a duplex Survivable Core was used so each Server must be added separately as shown below.

```
add survivable-processor SC70Redundancy                          Page   1 of   7
                              SURVIVABLE PROCESSOR

Type: duplex-ess   Cluster ID/MID: 2     Processor Ethernet Network Region: 1
                       Community: 1         Enable PE for H.323 Endpoints? y
ACTIVE SERVER                                Enable PE for H.248 Gateways? y
 V4 Node Name: SC70Redundancy  Address: 10.10.40.175
 V6 Node Name:                 Address:
SERVER A
    Server ID: 3
 V4 Node Name: SCAvmpg         Address: 10.10.40.173
 V6 Node Name:                 Address:
SERVER B
    Server ID: 4
 V4 Node Name: SCBvmpg         Address: 10.10.40.174
 V6 Node Name:                 Address:

PORT NETWORK PARAMETERS
                  Community Size: all      System Preferred: y
                  Priority Score: 1         Local Preferred: n
                                                 Local Only: n
```

Page 2 shows the priority of the Survivable Core with respect to the Media Servers.

```
add survivable-processor SC70Redundancy                          Page   2 of   7
                              SURVIVABLE PROCESSOR

 MEDIA SERVER PARAMETERS
  Priority with respect to Media Servers: 2
```

Page 3 shows the different Media-Servers that were used for compliance testing and the order in which they are prioritized.

```
add survivable-processor SC70Redundancy                          Page   3 of   7
                 MEDIA SERVER REPORTING LIST FOR SC70Redundancy

   Num NR  Node Name         Num NR  Node Name         Num NR  Node Name
   1   1   AMSMain
   2   1   AMSBackup
   3   1   AMSBranch
```

11.2. Local Survivable Processor

The LSP is added using the name as per the **node-names ip** at the beginning of **Section 11**.

```
add survivable-processor LSP70                                  Page   1 of   7
                              SURVIVABLE PROCESSOR

Type: lsp          Cluster ID/MID: 3     Processor Ethernet Network Region: 1


 V4 Node Name: LSP70           Address: 10.10.41.185
 V6 Node Name:                 Address:
```

Page 2 shows the Priority of the LSP with respect to the Media Servers.

```
add survivable-processor LSP70                                  Page   2 of   7
                              SURVIVABLE PROCESSOR

 MEDIA SERVER PARAMETERS
  Priority with respect to Media Servers: 3
```

Page 3 shows the Media Servers associated with the LSP and logically this will only be the Branch Media Server as this is the only server it will ever need to speak with.

```
add survivable-processor LSP70                                  Page   3 of   7
                 MEDIA SERVER REPORTING LIST FOR LSP70

   Num NR  Node Name         Num NR  Node Name         Num NR  Node Name
   3   1   AMSBranch
```

11.3. Configure Recovery Rules

In order for Communication Manager to recover from an outage a recovery rule must be setup as shown below. In this case the Communication Manager will try to recover automatically after 2 minutes.

```
change system-parameters ms-recovery-rule                      Page   1 of   1


                         MEDIA SERVER RECOVERY RULES


 FAILOVER PARAMETERS                     FALLBACK PARAMETERS

    Report Interval (sec): 60             Auto Return: yes
  Report Expiration (sec): 180

                                     Time Delay (min): 2
```

Please e-mail any questions or comments pertaining to these Application Notes along with the full title name and filename, located in the lower right corner, directly to the Avaya DevConnect Program at devconnect@avaya.com.