Avaya Solution & Interoperability Test Lab

Application Notes for Lucent Technologies VitalQIP DHCP/DNS Management with Avaya IP Telephones and Avaya Communication Manager – Issue 1.0

Abstract

These Application Notes describe the procedures for configuring the Lucent Technologies VitalQIP DNS/DHCP IP Management software, Lucent Technologies DHCP Server, and Lucent Technologies DNS Server to manage DHCP and DNS services in an enterprise network containing Avaya Communication Manager and Avaya 4600 Series IP Telephones. VitalQIP centralizes the administration of IP names and addresses across Lucent and third-party DHCP/DNS servers in the enterprise network. During compliance testing, a VitalQIP-managed Lucent DHCP server successfully assigned IP and Avaya-specific parameters to Avaya 4600 Series IP Telephones in both VLAN and non-VLAN network configurations. In addition, a VitalQIP-managed Lucent DNS server successfully resolved DNS queries for hostnames and IP addresses of Avaya Media Servers. 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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1. Introduction

These Application Notes describe a compliance-tested configuration comprised of Avaya 4600 Series IP Telephones, Lucent Technologies VitalQIP DNS/DHCP IP Management software, a Lucent Technologies DHCP Server, and a Lucent Technologies DNS Server. VitalQIP centralizes the administration of IP names and addresses across Lucent and third-party DHCP and DNS servers in the enterprise network. Specifically, the definition of DHCP address scopes, DHCP options, lease times, and other DHCP parameters, as well as DNS administration, is performed centrally in VitalQIP and pushed down to the managed DHCP and DNS servers. DHCP clients, such as PCs and Avaya IP telephones, acquire IP address information from the VitalQIP-managed Lucent DHCP Server. Similarly, DNS queries are sent to and resolved by the VitalQIP-managed Lucent DNS Server.

Figure 1 illustrates a sample configuration consisting of a pair of redundant Avaya S8710 Media Servers, an Avaya G650 Media Gateway, Avaya 4600 Series IP Telephones, PCs, a Lucent VitalQIP Enterprise server, and a Lucent VitalQIP Remote server. The Lucent DHCP Server and Lucent DNS Server run on the VitalQIP Remote server.

In **Figure 1**, the PCs and Avaya IP telephones reside on separate VLANs. VLANs 51 and 61 are the native (untagged) VLANs while VLANs 53 and 63 are tagged VLANs. Under normal circumstances, the PCs transmit and receive untagged frames on the untagged VLANs, and the Avaya IP telephones transmit and receive tagged frames on the tagged VLANs. However, when an Avaya IP telephone requests new DHCP parameters, the telephone first uses the untagged VLAN to exchange DHCP messages with the VitalQIP Remote server. From this initial exchange, the Avaya IP telephones leases an IP address on the untagged VLAN and more importantly, learns of the tagged VLAN that it is supposed to use via DHCP Option 176. The Avaya IP telephone then releases the leased IP addresses and issues a new DHCP request on the tagged VLAN. From this second exchange, the Avaya IP telephone receives an IP address valid for the tagged VLAN, as well as H.323 registration and file server information.

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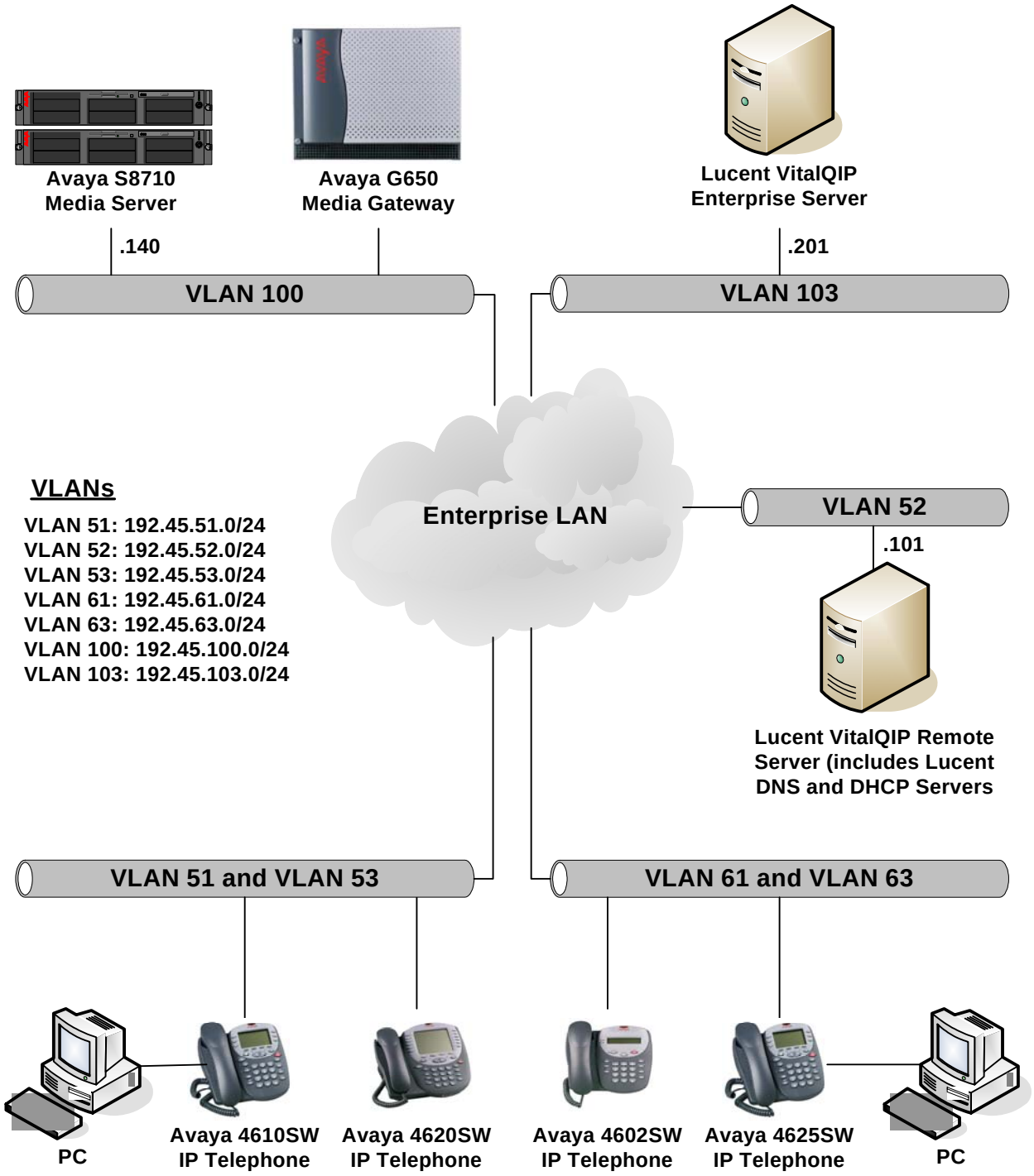

Figure 1: Sample Configuration.

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2. Equipment and Software Validated

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

Equipment	Software/Firmware
Avaya 4600 Series IP Telephones	2.3 (4602SW) 2.3 (4610SW) 2.3 (4620SW) 2.5 (4625SW)
Avaya S8710 Media Server	Avaya Communication Manager 3.1 (R013x.01.0.628.6)
Avaya G650 Media Gateway	-
TN2312BP IP Server Interface	HW12 FW30
TN799DP C-LAN Interface	HW1 FW17
TN2302AP IP Media Processor	HW20 110
Lucent Technologies VitalQIP running on Windows 2003 Server Service Pack 1	6.2 Build 36
Lucent Technologies DNS Server running on Windows 2000 Server Service Pack 4	4.0 Build 15
Lucent Technologies DHCP Server running on Windows 2000 Server Service Pack 4	5.4 Build 21

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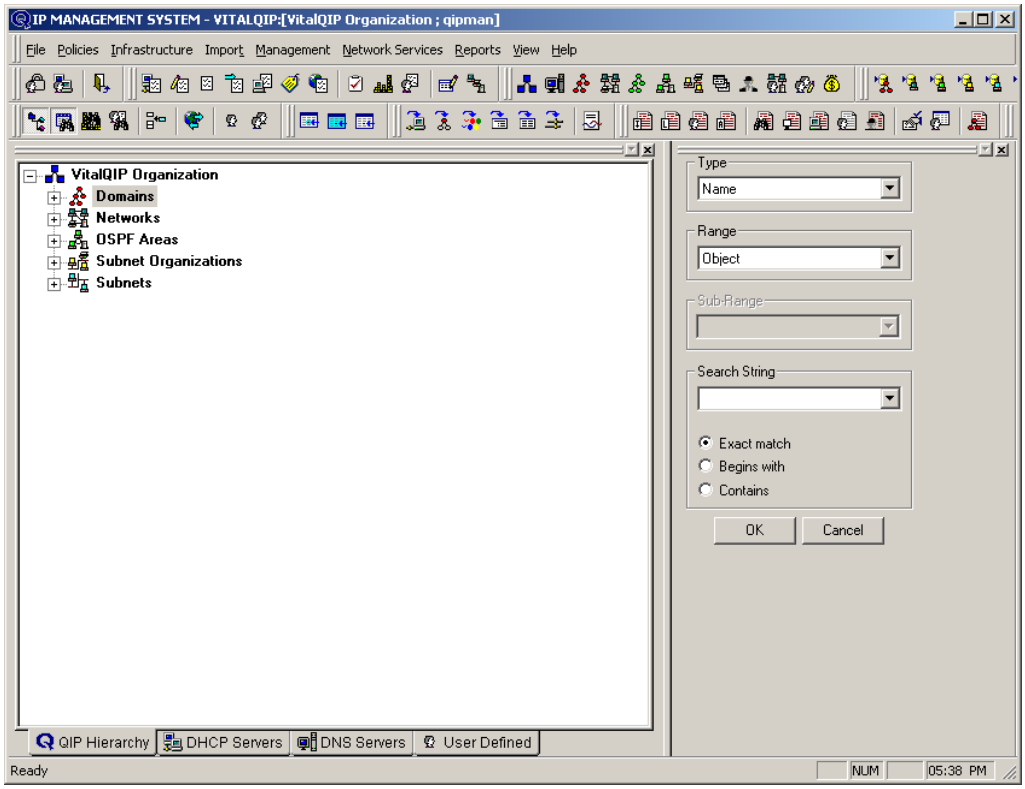
3. Configure Lucent Technologies VitalQIP

3.1. Global Parameters

The steps in this section define domain names, networks, and DHCP and DNS servers in the managed network.

Step	Description
1.	From the Windows Start menu on the VitalQIP Enterprise server, click on **All Programs → Vital QIP → VitalQIP** and log in with the appropriate credentials.
2.	From the **QIP MANAGEMENT SYSTEM** main window menu bar, select **Infrastructure → Domain**. 

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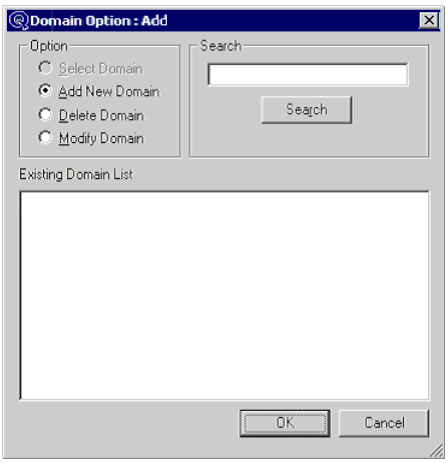
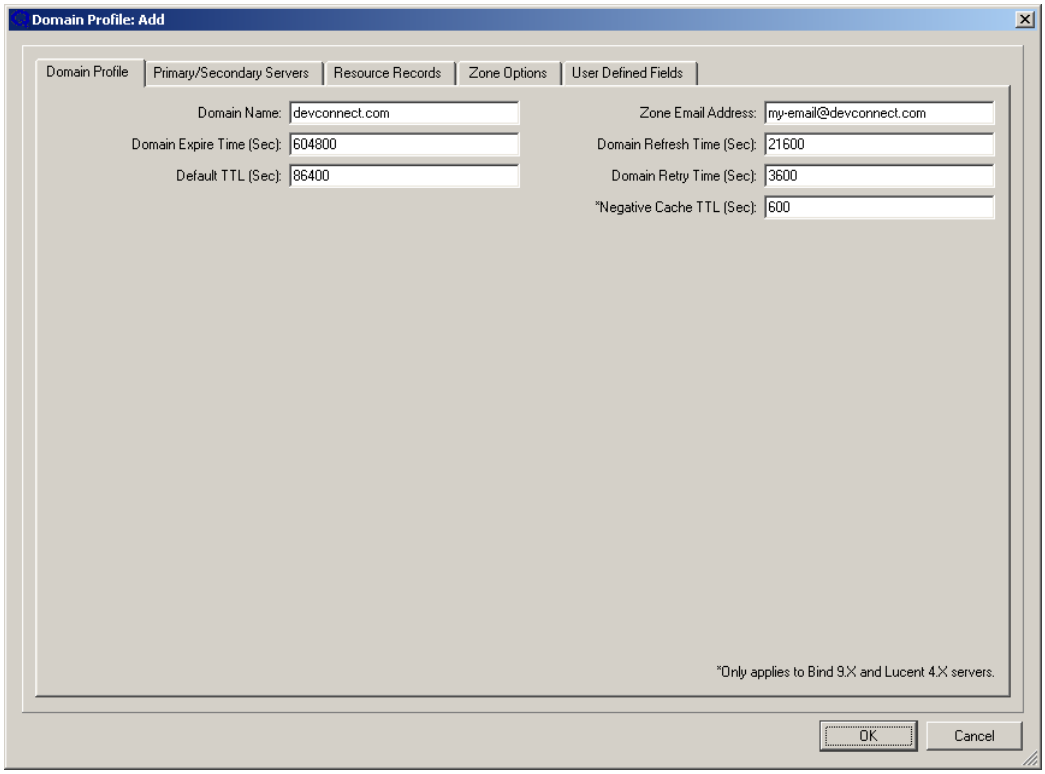
Step	Description
3.	Select "**Add New Domain**" and click on "**OK**". 
4.	In the **Domain Profile** tab, enter the **Domain Name** and click on "**OK**". 

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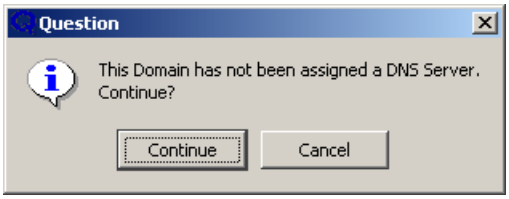
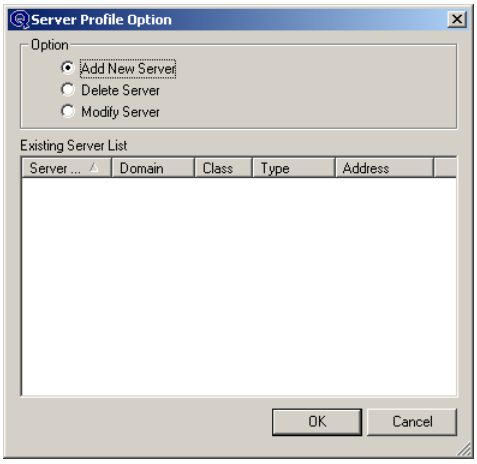
Step	Description
5.	Click on "**Continue**" in the warning pop-up window. A DNS server will be assigned to this domain in Steps 11 – 13. 
6.	The next task is to enter the DHCP and DNS servers to be managed by VitalQIP. From the **QIP MANAGEMENT SYSTEM** main window menu bar, select **Infrastructure → Server**.
7.	Select "**Add New Server**" and click on "**OK**". 

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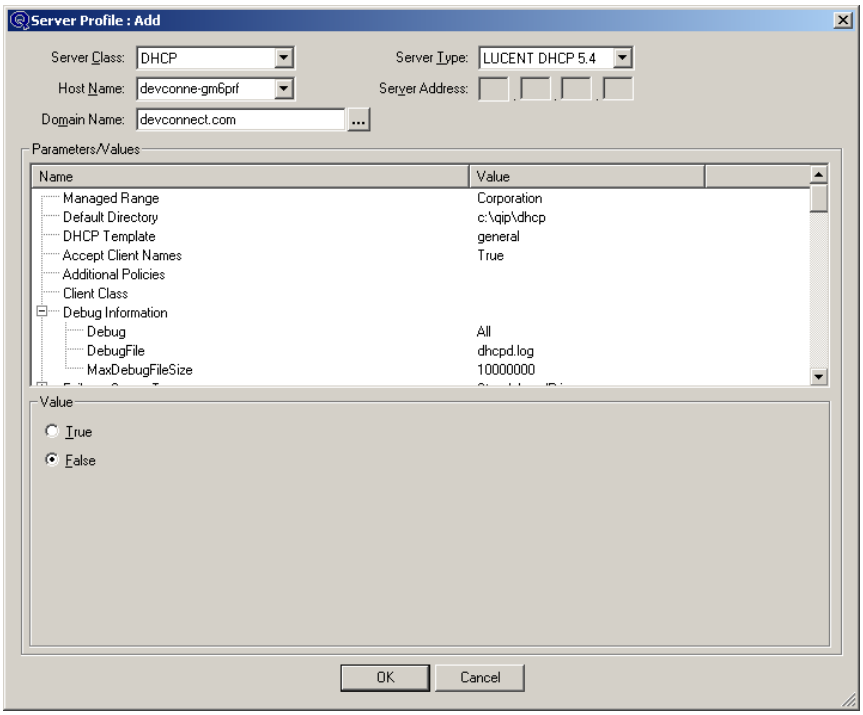
Step	Description
8.	The **Server Profile : Add** window appears. Configure the following: • **Server Class –** set to "**DHCP**" • **Host Name** – set to the hostname of the VitalQIP Remote DHCP server. • **Domain Name** – set to the domain name configured earlier in Steps 2 – 5. • **Server Type –** set to "**LUCENT DHCP 5.4**". The **Parameters/Values** section must be customized according to customer requirements. At a minimum, the **Default Directory**, **DHCP Template**, and **Ping Delay** (not shown) must be configured. Consult the VitalQIP documentation for further details. Click on "**OK**". 
9.	Repeat Steps 6 – 7 to enter the DNS server.

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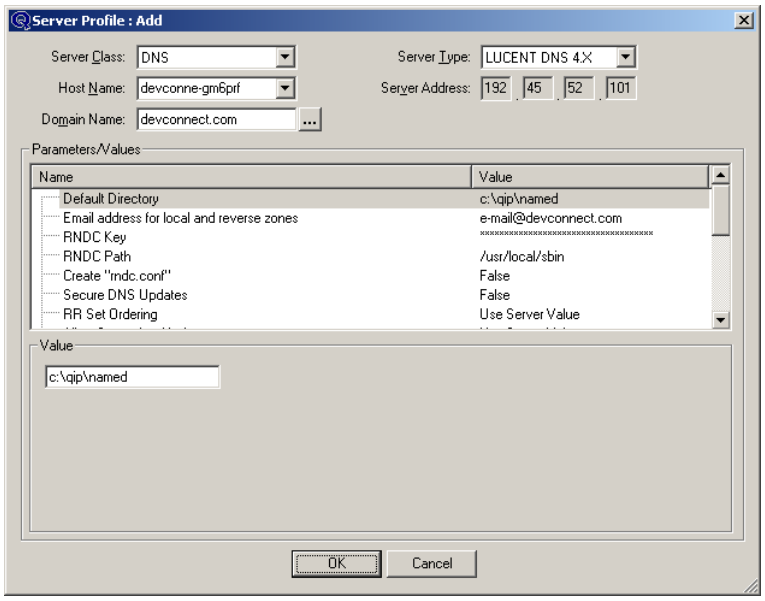
Step	Description
10.	The **Server Profile : Add** window appears. Configure the following: • **Server Class –** set to "**DNS**" • **Host Name** – set to the hostname of the VitalQIP Remote DNS server. • **Domain Name** – set to the domain name configured earlier in Steps 2 – 5. • **Server Type –** set to "**LUCENT DNS 4.X**". The **Parameters/Values** section must be customized according to customer requirements. At a minimum, the **Default Directory**, **Email address for local and reverse zones**, and **RNDC Key** must be configured. Consult the VitalQIP documentation for further details. Click on "**OK**". 
11.	The next task is to assign the DNS server entered in the previous two steps to the domain defined earlier in Steps 2 – 5. From the **QIP MANAGEMENT SYSTEM** main window menu bar, select **Infrastructure → Domain**.

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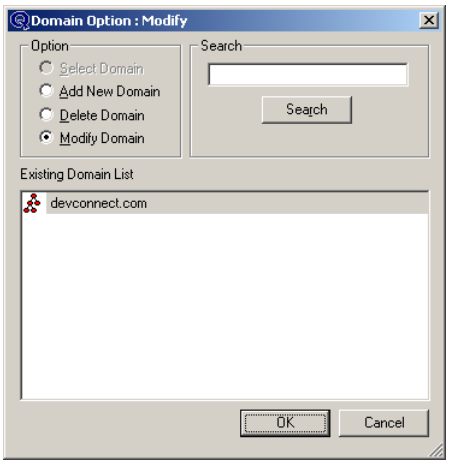
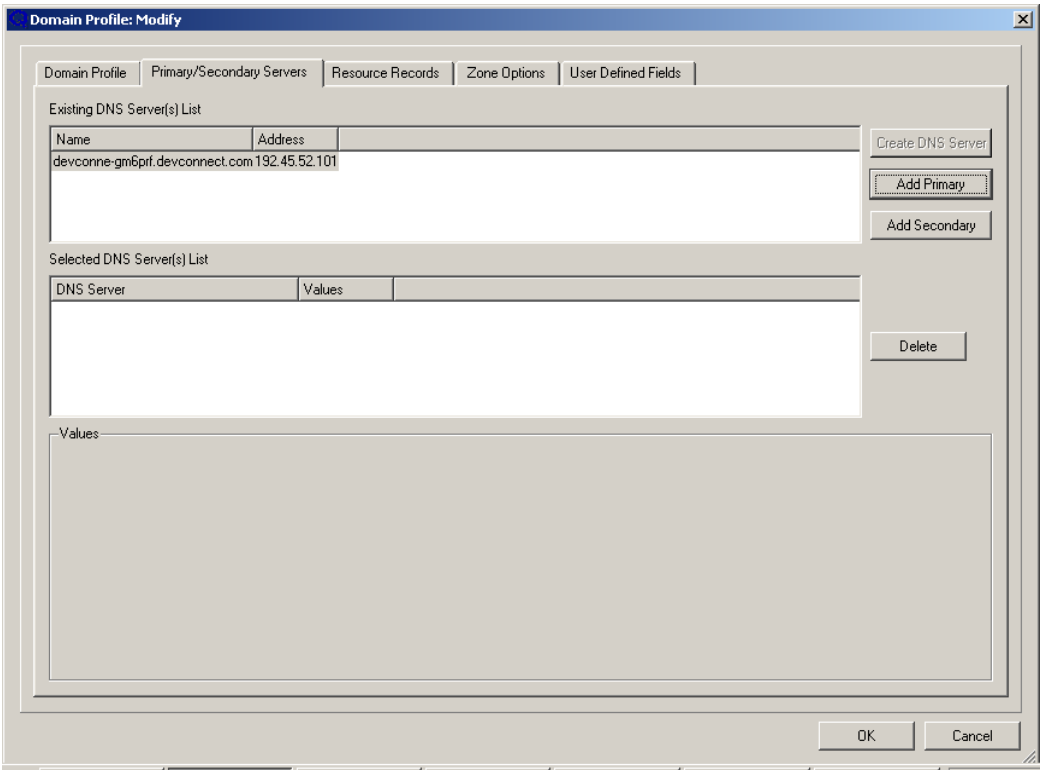
Step	Description
12.	Select the domain defined earlier in Steps 2 - 5 and click on "**OK**". 
13.	Select the **Primary/Secondary Servers** tab. In the **Existing DNS Server(s) List**, select the DNS server specified earlier in Steps 9 - 10 and click on "**Add Primary**" and then "**OK**". 
14.	The next task is to specify the networks on which DHCP and DNS servers and DHCP clients reside. From the **QIP MANAGEMENT SYSTEM** main window menu bar, select **Infrastructure → Network/Reverse Zone**.

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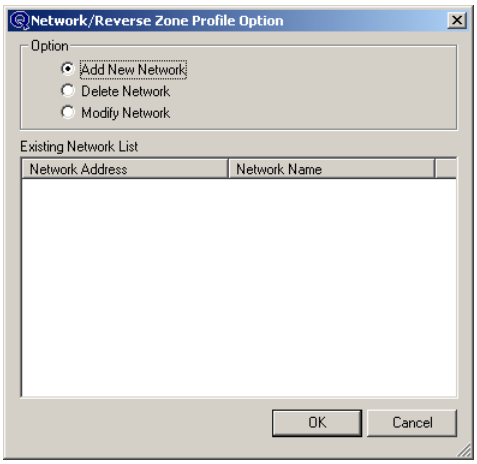
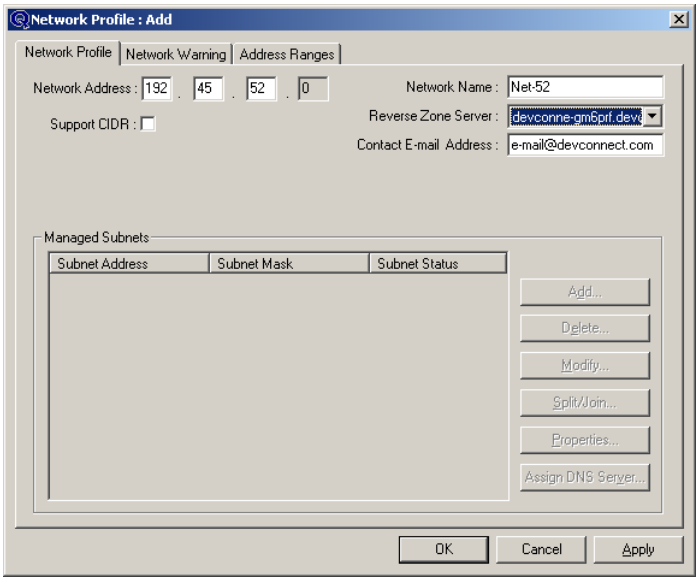
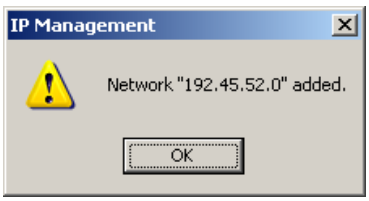
Step	Description
15.	Select "**Add New Network**" and click on "**OK**". 
16.	The **Network Profile** window appears. Specify the **Network Address**, enter a descriptive **Network Name**, and set **Reverse Zone Server** to the hostname of the VitalQIP Remote server. Click on "**Apply**". 
17.	Click on "**OK**" in the informational pop-up window. 

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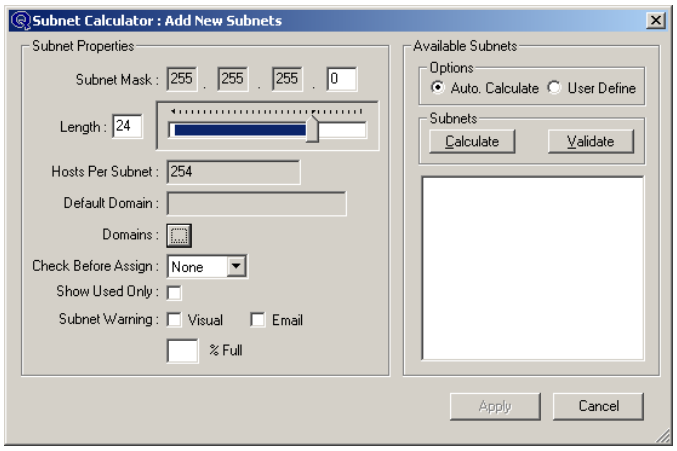
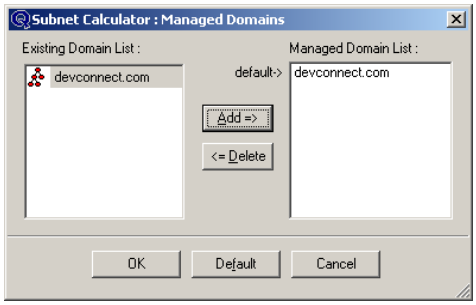
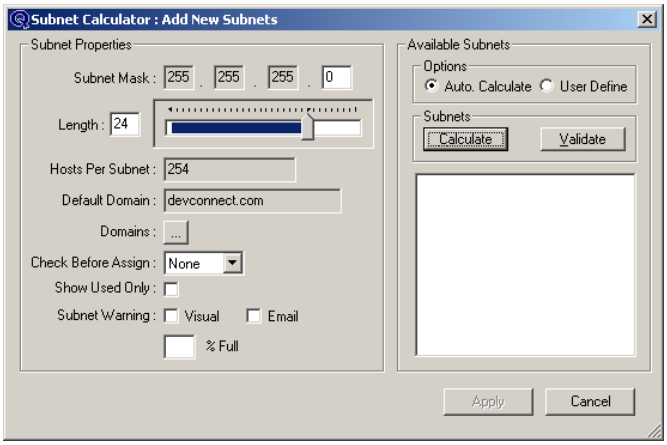
Step	Description
18.	In the **Network Profile** window, click on "**Add**" to invoke the **Subnet Calculator : Add New Subnets** window. Click on the button next to **Domains** to invoke the **Subnet Calculator : Managed Domains** window. 
19.	Add the domain configured in Steps 2 - 5 to the **Managed Domain List** and click on "**OK**". 
20.	Back in the **Subnet Calculator : Add New Subnets** window, set **Length** to "**24**" and click on "**Calculate**" to list the possible subnets for the network given the subnet mask length. For a subnet mask of 24, there is only one subnet. Select the subnet and click on "**Apply**". 

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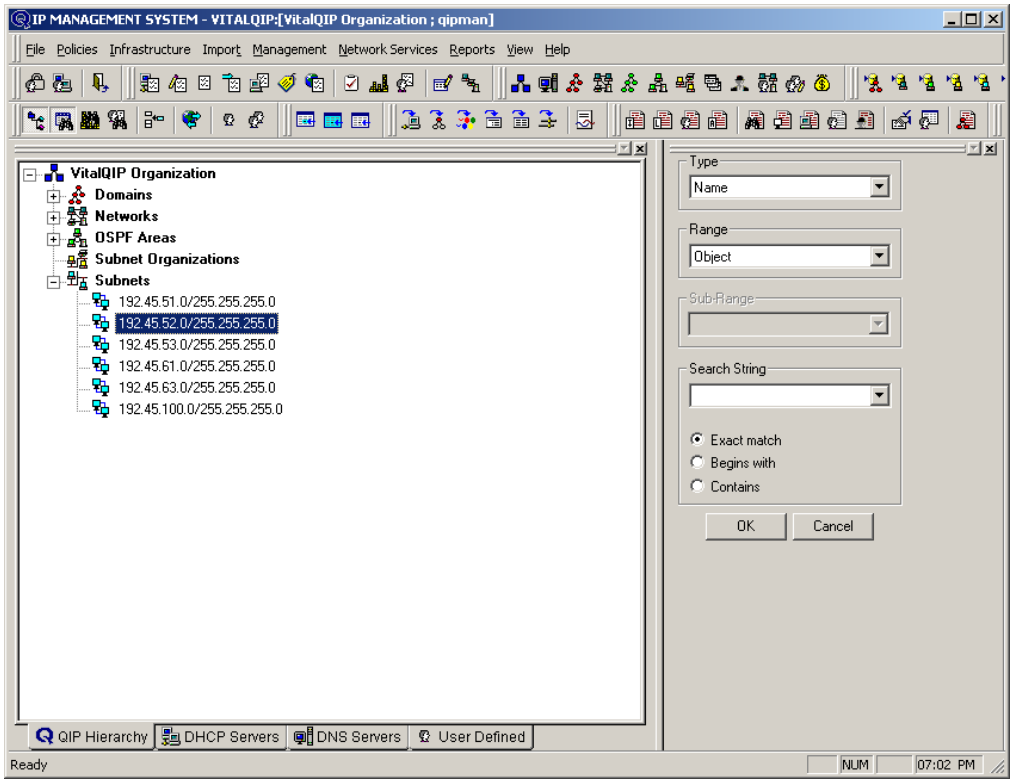
Step	Description
21.	In the **Network Profile** window, click on "**OK**".
22.	Repeat above Steps 14 – 21 to specify other networks.
23.	In the **QIP MANAGEMENT SYSTEM** main window, expand **Subnets** and double-click on the subnet on which the VitalQIP Remote server resides. 

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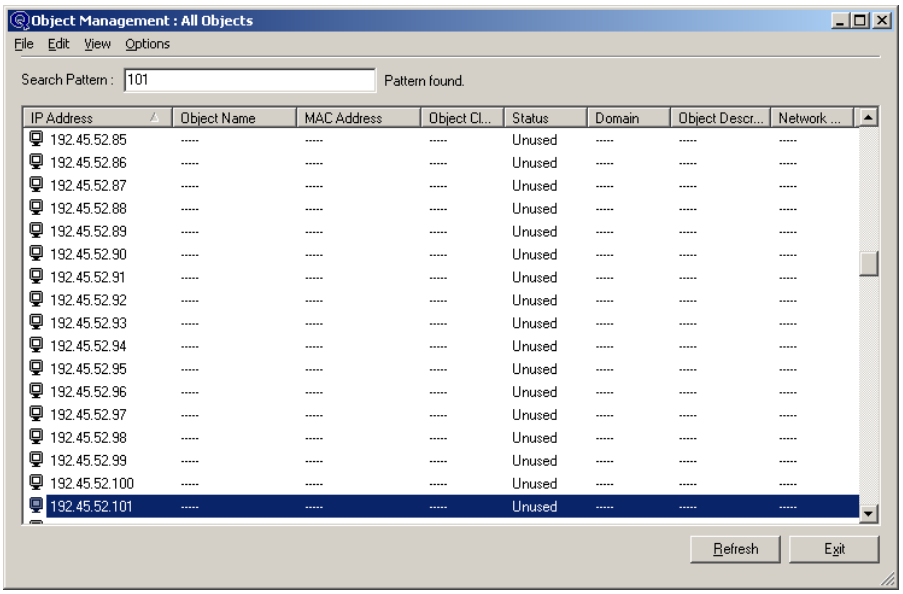
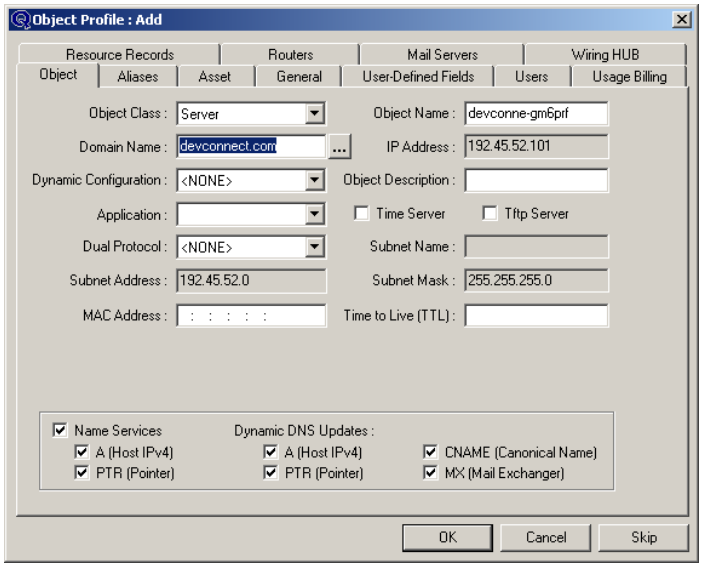
Step	Description
24.	Find the IP address of the VitalQIP Remote server and double-click. 
25.	Select the **Object** tab, and configure the following: • **Object Class –** set to "**Server**". • **Object Name –** set to the hostname of the VitalQIP Remote server. Click on "**OK**". 

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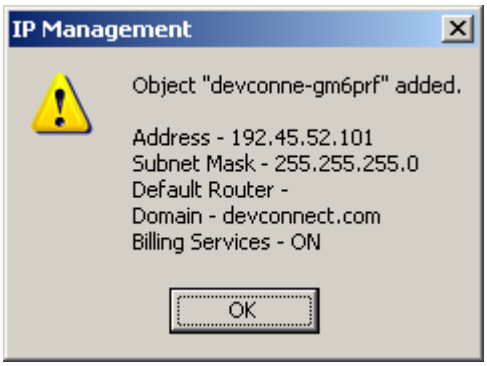
Step	Description
26.	Click on "**OK**" in the informational pop-up window. 

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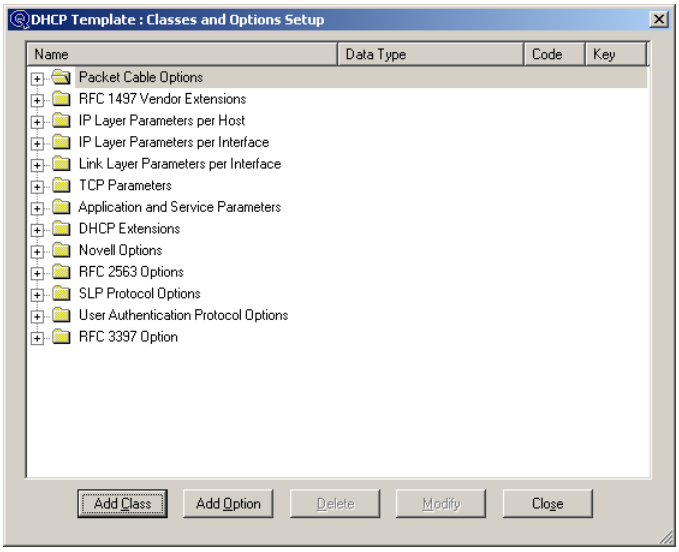
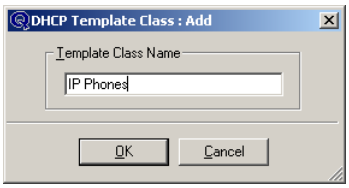
3.2. DHCP Option Configuration and Address Scopes

An address scope needs to be defined for each subnet/VLAN on which DHCP clients reside. Each address scope includes the subnet IP information (network address, subnet mask, and router addresses), as well as any DHCP options to be applied to the subnet. Specifically, DHCP Option 176 must be specified in the address scopes for both the untagged VLANs ("data" VLANs) and the tagged VLANs ("voice" VLANs). For the "data" VLANs (e.g., VLANs 51 and 61 in the sample configuration), DHCP Option 176 is used to instruct Avaya IP telephones to turn tagging on and inform the telephones of the "voice" VLAN ID. PCs and other DHCP clients ignore DHCP Option 176. For the "voice" VLANs (e.g., VLANs 53 and 63 in the sample configuration), DHCP Option 176 is used to pass gatekeeper information (i.e., C-LAN or Processor Ethernet IP address and RAS port), and the file server IP address to the Avaya IP telephones.

Step	Description
1.	From the **QIP MANAGEMENT SYSTEM** main window menu bar, select **Policies → DHCP/Bootp Template → Class/Option Setup**.
2.	In the **DHCP Template** window, click on "**Add Class**". 
3.	Enter a descriptive **Template Class Name** and click on "**OK**". 

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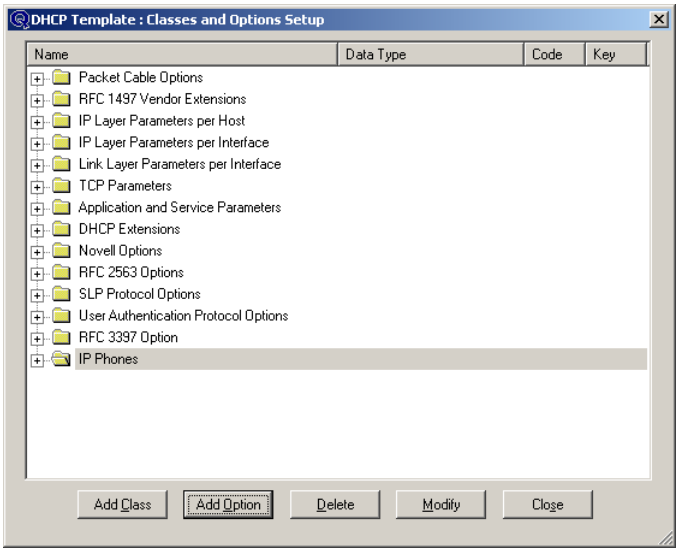
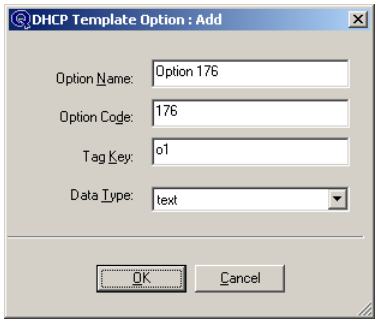
Step	Description
4.	In the **DHCP Template** window, select the Class created in the previous step and click on "Add Option". 
5.	Enter a descriptive **Option Name**, set **Option Code** to "**176**" and **Data Type** to "**text**", and click on "**OK**". 
6.	In the **DHCP Template** window, click on "**Close**" in the DHCP Template screen.
7.	The next task is to define several DHCP Option Templates. One DHCP Option Template will be defined for each untagged ("data") subnet/VLAN, in order to convey the appropriate VLAN tagging information to the Avaya IP telephones. A single DHCP Option Template will be defined for all "voice" VLANs, in order to convey the gatekeeper and TFTP server information to the Avaya IP telephones. From the **QIP MANAGEMENT SYSTEM** main window menu bar, select **Policies → DHCP/Bootp Template → Option Template**.

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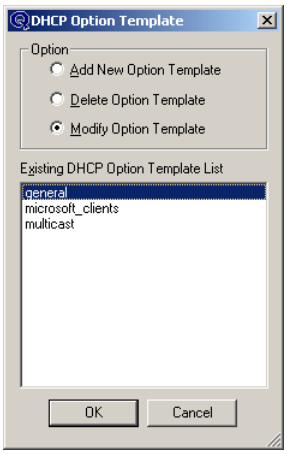
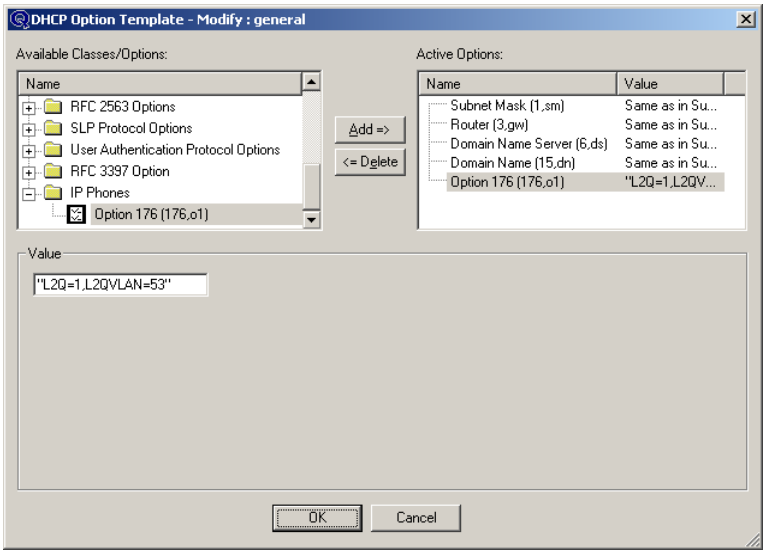
Step	Description
8.	A new DHCP Option Template may be created, or an existing DHCP Option Template may be modified and saved as a new template. For the latter, select the "**general**" template from the **Existing DHCP Option Template List**, and click on "**OK**". 
9.	Add the Option 176 configured earlier in Steps 4 - 5 to the **Active Options** list. Configure **Value** as follows: • If this DHCP Option Template is to be defined for an untagged VLAN, specify the Layer 2 tagging setting and the VLAN ID of the "voice" VLAN. For example, for untagged VLAN 51 in the sample configuration, enter "L2Q=1,L2QVLAN=53". Similarly, for untagged VLAN 61 in the sample configuration, enter "L2Q=1,L2QVLAN=63". • If this DHCP Option Template is to be defined for voice VLANs, specify the C-LAN or Processor Ethernet IP address and RAS port and the TFTP server IP address. For example, for the sample configuration, enter "MCIPADD=192.45.100.144,MCPORT=1719,TFTPSRVR=192.45.51.112".  Note that the enclosing double quotes above are required for **Value**. Click on "**OK**".

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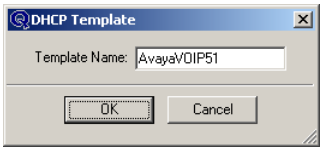
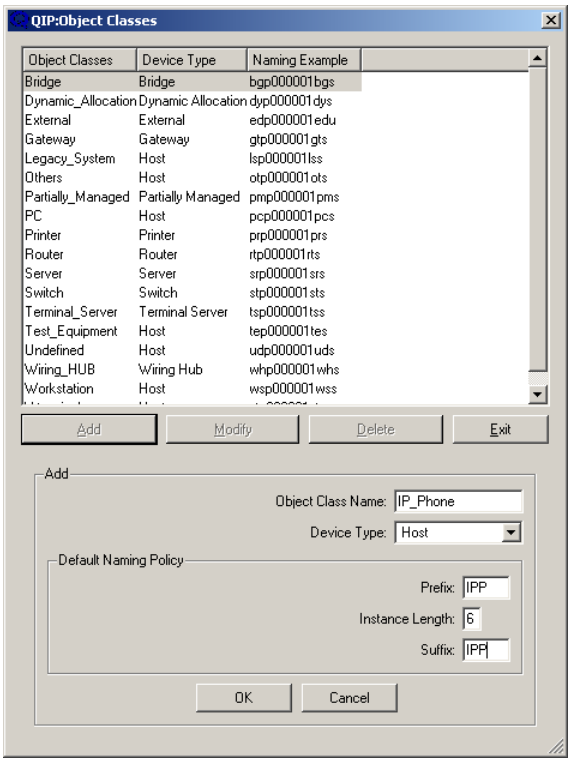
Step	Description
10.	A window appears prompting the user to use the existing template name or enter a new template name. Enter a new **Template Name** and click on "**OK**". 
11.	Repeat Steps 7 – 10 as necessary to create the other DHCP Option Templates.
12.	From the **QIP MANAGEMENT SYSTEM** main window menu bar, select **Policies → Object Classes**.
13.	In the **QIP:Object Classes** window, click on "**Add**". Enter a descriptive **Object Class Name** and set **Device Type** to "**Host**". The Default Naming Policy provides default name assignments for objects of this class that do not have hostname, for example IP telephones. Consult the VitalQIP documentation for guidance. Click on "**OK**". 

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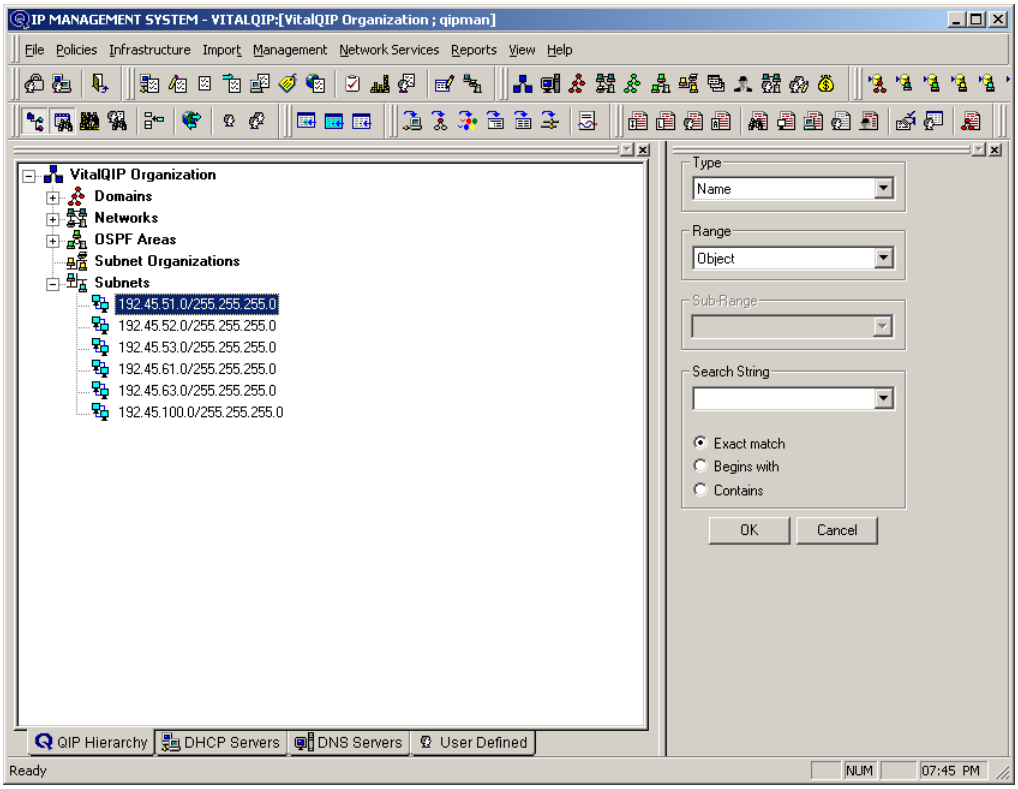
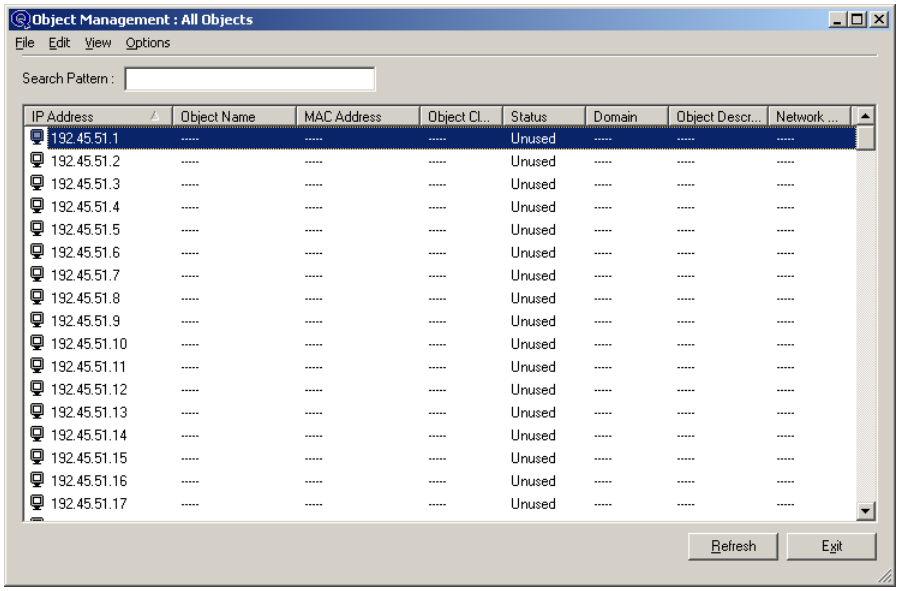
Step	Description
14.	In the **QIP MANAGEMENT SYSTEM** main window, expand **Subnets** and double-click on a subnet on which DHCP clients reside. 
15.	Find the IP address of the default gateway on the subnet and double-click. 

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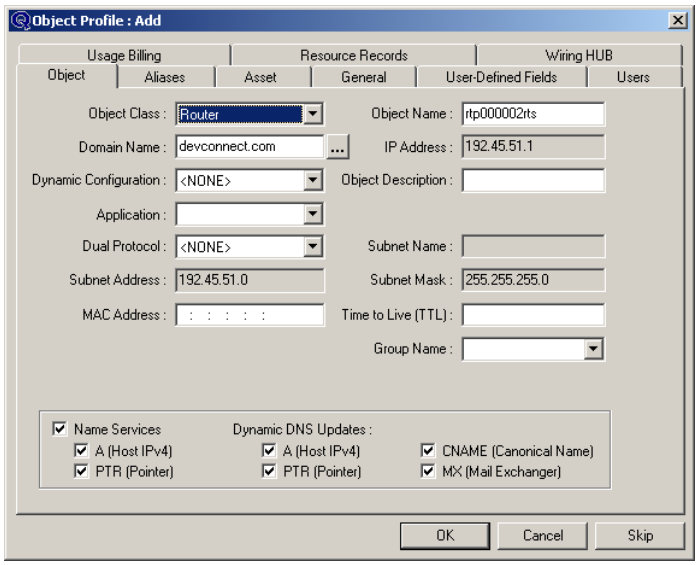
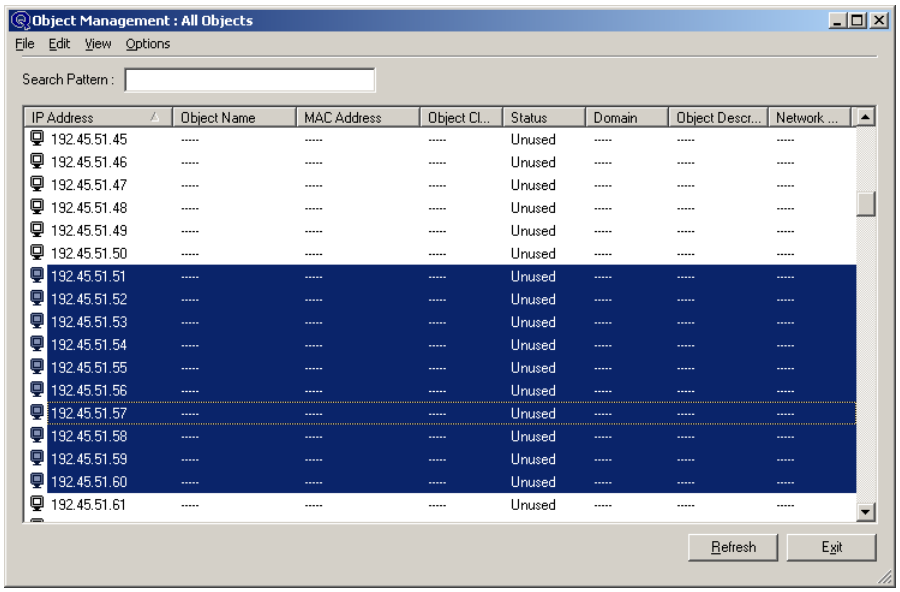
Step	Description
16.	Select the **Object** tab, and set **Object Class** to "**Router**". Click on "**OK**". 
17.	To define an address scope on the subnet, select the first IP address in the scope, hold down the Shift key, and then select the last IP address in the scope. Right-click on the highlighted range and select **Add → Dynamic**. 

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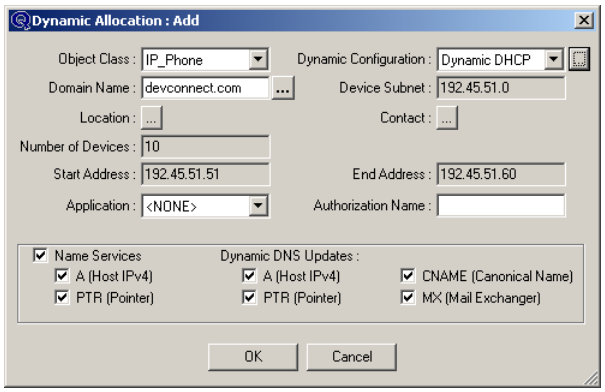
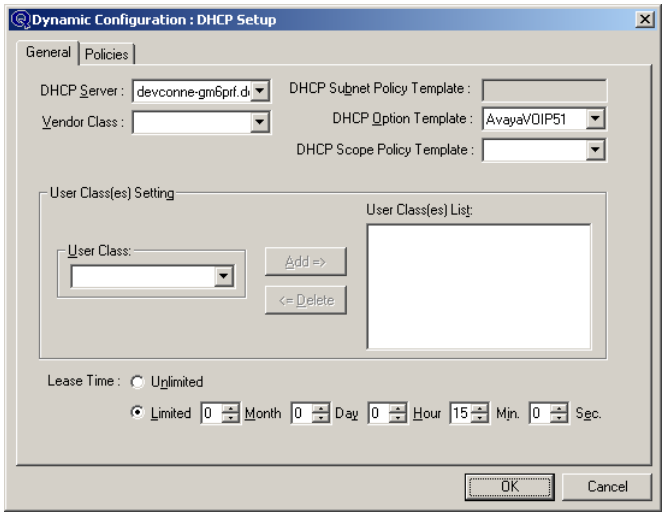
Step	Description
18.	In the **Dynamic Allocation : Add** window that appears, set **Object Class** to the object class created earlier in Steps 12 - 13 and set **Dynamic Configuration** to "**Dynamic DHCP**". Click on the button next to **Dynamic Configuration**. 
19.	In the **Dynamic Configuration** window that appears, select the **General** tab and set **DHCP Option Template** to the appropriate DHCP option template created earlier in Steps 7 -11. For example, for VLAN 51 in the sample configuration, use the DHCP Option Template with Value "L2Q=1,L2QVLAN=53". Similarly, for VLAN 61, use the DHCP Option Template with Value "L2Q=1,L2QVLAN=63". For VLANs 53 and 63, use the DHCP Option Template with Value "MCIPADD=192.45.100.144,MCPORT=1719,TFTPSRVR=192.45.51.112". Define the **Lease Time** according to customer requirements; the 15 minute lease time below was used for testing convenience only. Click on "**OK**". 

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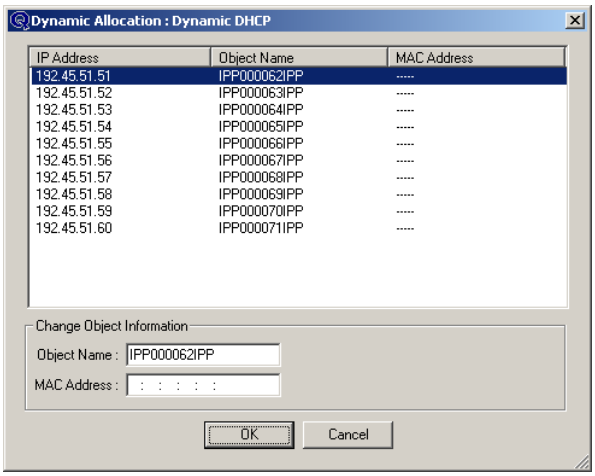
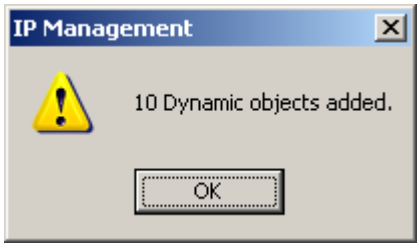
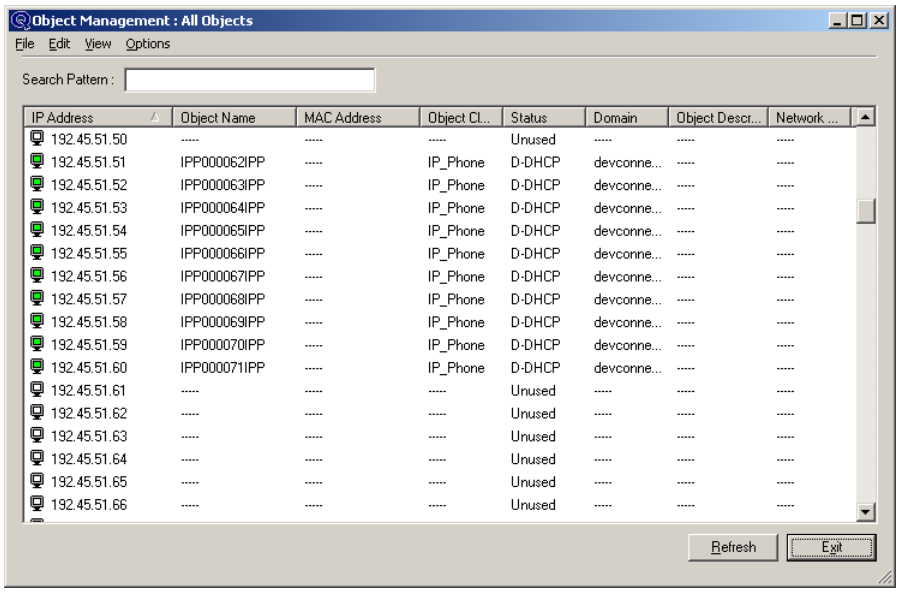
Step	Description
20.	In the **Dynamic Allocation : Dynamic DHCP** window that appears, click on "**OK**". 
21.	Click on "**OK**" in the informational pop-up window. 
22.	In the **Object Management** window, select "**Exit**". 

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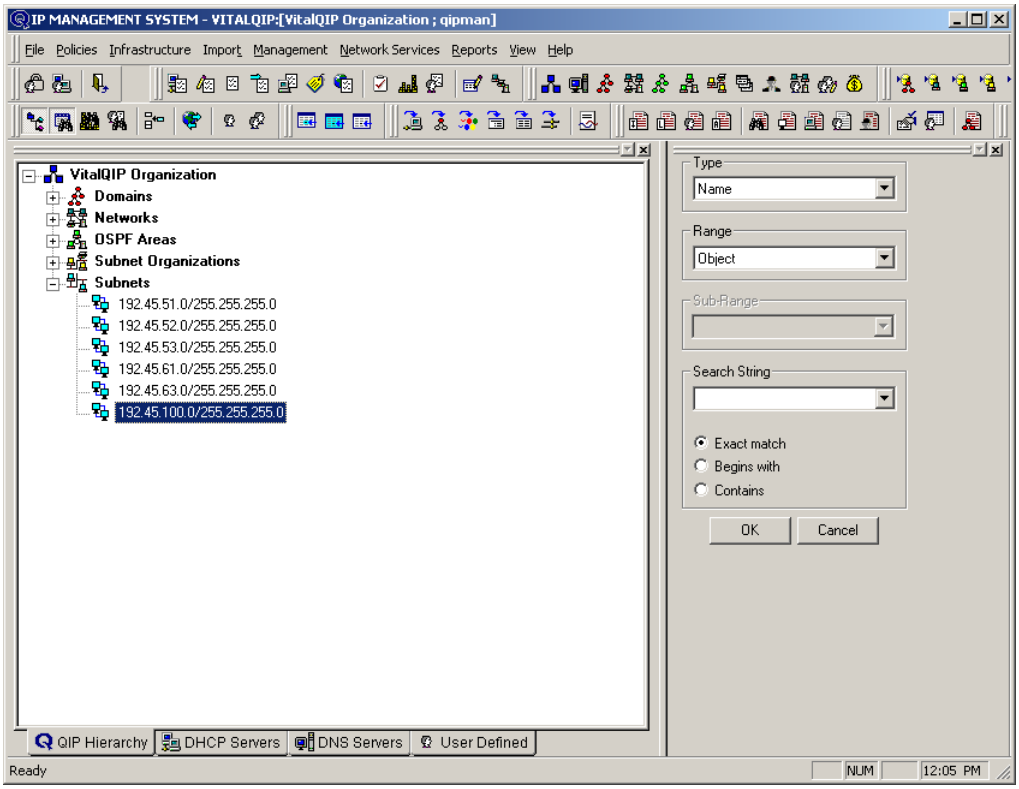
Step	Description
23.	Repeat Steps 14 – 22 for the other subnets on which DHCP clients reside.

3.3. DNS Configuration

The steps in this section enter the hostnames and IP addresses of the Avaya Media Servers into VitalQIP.

Step	Description
1.	In the **QIP MANAGEMENT SYSTEM** main window, expand **Subnets** and double-click on the subnet on which the Avaya Media Servers reside. 

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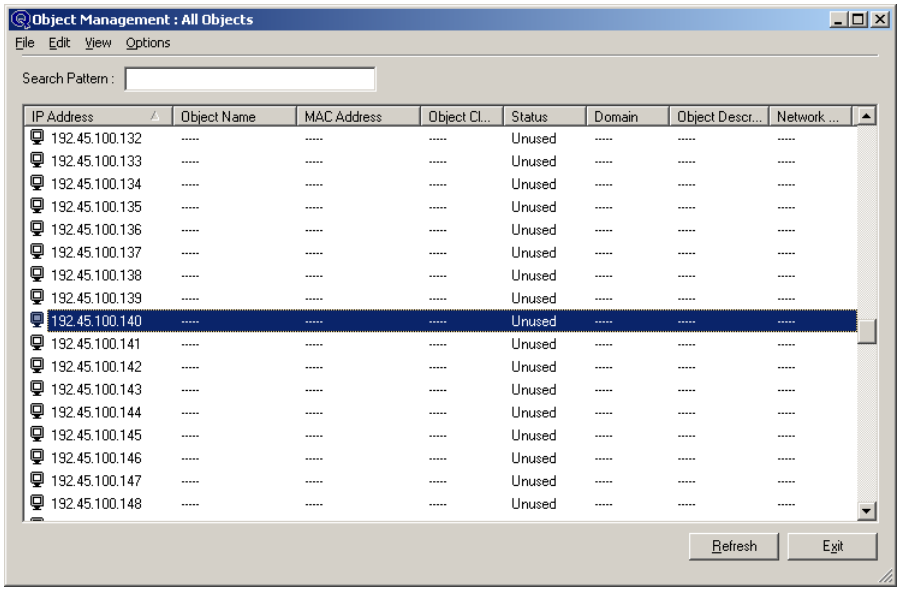
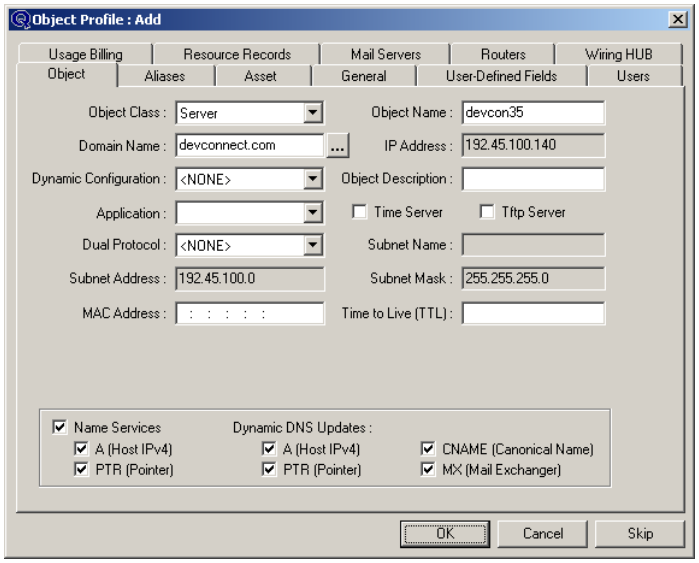
Step	Description
2.	Find the IP address of the Avaya Media Server on the subnet and double-click. The entry selected below is the logical IP address of the Avaya S8710 Media Server. 
3.	Select the **Object** tab, and set **Object Class** to "**Server**" and enter the hostname for **Object Name**. Click on "**OK**". 

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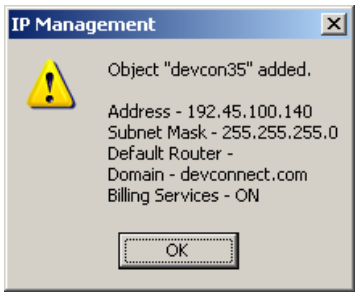
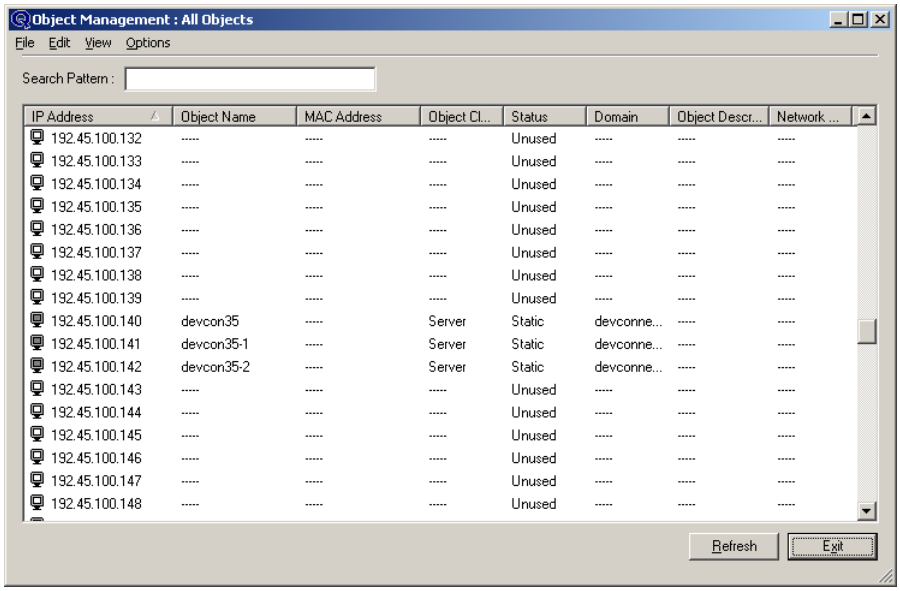
Step	Description
4.	Click on "**OK**" in the informational pop-up window. 
5.	Repeat Steps 2 – 4 as necessary to enter the hostnames and IP addresses of the active and standby Avaya S8710 Media Servers into VitalQIP.
6.	In the **Object Management** window, select "**Exit**". 

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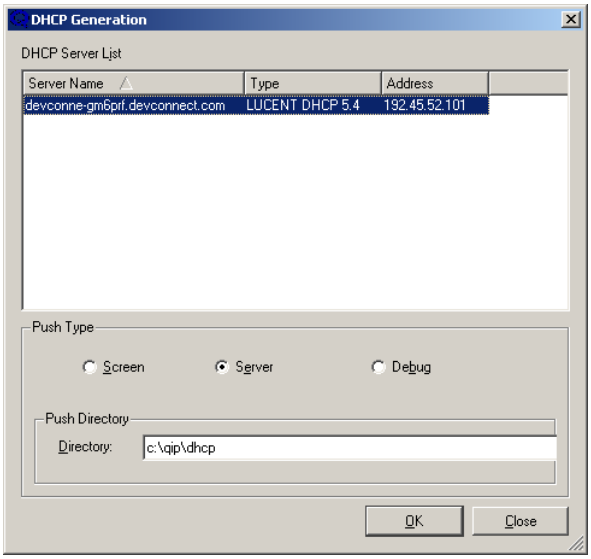
3.4. Push Configuration to DHCP and DNS Servers

After the DHCP and DNS configuration is complete on the VitalQIP Enterprise server, the DHCP address scopes and DNS settings must be pushed down to the VitalQIP Remote servers.

Step	Description
1.	From the **QIP MANAGEMENT SYSTEM** main window menu bar, select **Network Services → DHCP Generation**.
2.	Select the VitalQIP Remote server from the **DHCP Server List** and set **Push Type** to "**Server**". Verify that the Push Directory matches the Default Directory configured in Section 3.1 Step 8. Click on "**OK**". 
3.	Click on "**OK**" in the informational pop-up window.
4.	From the **QIP MANAGEMENT SYSTEM** main window menu bar, select **Network Services → DNS Generation**.

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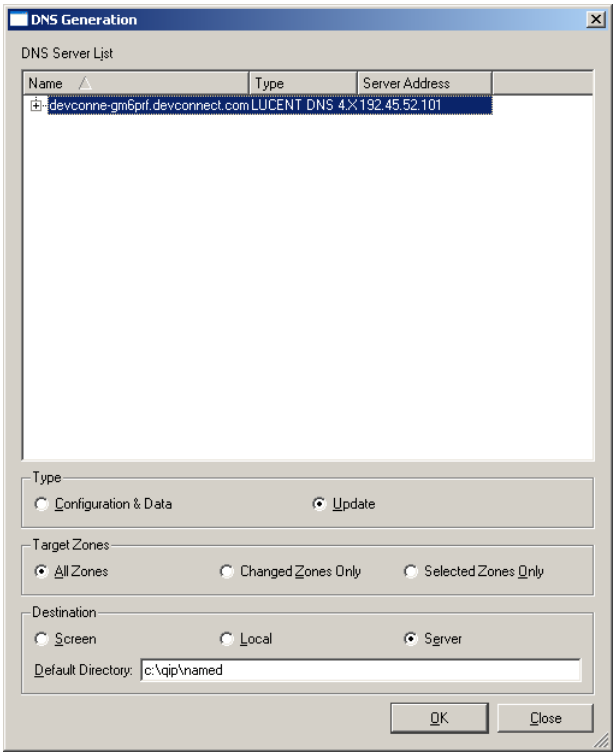
Step	Description
5.	Select the VitalQIP Remote server from the **DNS Server List** and configure the following: • **Type –** set to "**Update**". • **Target Zones –** set to "**All Zones**". • **Destination –** set to "**Server**". Verify that the **Destination Default Directory** matches the Default Directory configured in Section 3.1 Step 10. Click on "**OK**". 
6.	Click on "**OK**" in the informational pop-up window.

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4. Configure Lucent Technologies DHCP and DNS Servers

The Lucent DHCP Server and Lucent DNS Server configuration is performed during installation and is beyond the scope of these Application Notes. Please see reference [3] for further details. The only information required from these Application Notes for the installation is the IP address of the VitalQIP Enterprise server.

5. Configure Avaya 4600 Series IP Telephones

Step	Description
1.	With the telephone powered and on-hook idle, press the **MUTE** button and then press the following keys in sequence on the dialpad: **73738#** (**RESET#**).
2.	When prompted to "**Reset Values?**", press the # key. This will reset any previously assigned values. When prompted to "**Restart Phone?**", press the # key. The telephone will automatically obtain configuration information from the DHCP and file servers.

6. Interoperability Compliance Testing

The interoperability compliance testing included feature and serviceability testing. The feature testing evaluated the ability of Lucent VitalQIP, Lucent DHCP Server, and Lucent DNS Server to provide DHCP and DNS services in an enterprise network containing Avaya IP telephones and Avaya Media Servers. The serviceability testing introduced failure scenarios to see if VitalQIP, Lucent DHCP Server, and Lucent DNS Server continue to provide DHCP and DNS services after failure recovery.

6.1. General Test Approach

The main objectives were to verify that:

- VitalQIP and the Lucent DHCP Server provide correct IP and Avaya-specific information to Avaya IP telephones configured as DHCP clients on different subnets and VLANs.
- Avaya IP telephones successfully renew their leases from the Lucent DHCP Server after lease expiration.
- Avaya IP telephones successfully obtain new DHCP information from the Lucent DHCP Server after moving to a different subnet or VLAN.
- VitalQIP and the Lucent DNS Server correctly resolve DNS queries for Avaya Media Server IP addresses and hostnames.
- VitalQIP, the Lucent DHCP Server, and the Lucent DNS Server continue to provide DHCP and DNS services after recovery from failures such as cable pulls and device resets.

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6.2. Test Results

The test objectives of Section 6.1 were verified.

7. Verification Steps

The following steps may be used to verify the configuration:

- From the VitalQIP Enterprise server, ping the VitalQIP Remote server and verify connectivity.
- From each subnet/VLAN, ping the VitalQIP Remote server and verify connectivity.
- On the VitalQIP Enterprise server and the Lucent DHCP Server, verify that the address scopes and associated address ranges and options are specified correctly.
- On each subnet/VLAN, power on an Avaya IP telephone and verify that the telephone acquires the correct configuration information.
- On the VitalQIP Enterprise server, verify the leased IP addresses.
- Verify that calls may be placed between the Avaya IP telephones.
- Verify that nslookups on the IP addresses and hostnames of the Avaya Media Servers are resolved correctly.

8. Support

For technical support on Lucent Technologies VitalQIP products, consult the support pages at http://www.lucent.com/support or contact Lucent Technologies customer support at (866) 582-3688.

9. Conclusion

These Application Notes described the procedures for configuring the Lucent Technologies VitalQIP DNS/DHCP IP Management software, Lucent Technologies DHCP Server, and Lucent Technologies DNS Server to manage DHCP and DNS services in an enterprise network containing Avaya Media Servers and Avaya 4600 Series IP Telephones. VitalQIP centralizes the administration of hostnames and IP addresses across Lucent DHCP/DNS servers in the enterprise network. During compliance testing, a VitalQIP-managed Lucent DHCP server successfully assigned IP and Avaya-specific parameters to Avaya 4600 Series IP Telephones in both VLAN and non-VLAN network configurations. In addition, a VitalQIP-managed Lucent DNS server successfully resolved DNS queries for hostnames and IP addresses of Avaya Media Servers.

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10. Additional References

Product documentation for Avaya products may be found at http://support.avaya.com.

[1] *Administrator Guide for Avaya Communication Manager*, Issue 2, February 2006, Document Number 03-300509
[2] *Avaya 4600 Series IP Telephones R2.3 LAN Administrator Guide*, Issue 2.3, November 2005, Document Number 555-233-507

Product information for Lucent Technologies VitalQIP products may be found at https://support.lucent.com.

[3] *VitalQIP Installation Guide Release 6.2*, Issue Number 1, June 30, 2005
[4] *VitalQIP User's Guide Version 6.2*, Issue Number 1, June 30, 2005
[5] *VitalQIP Administrator Reference Manual Release 6.2*, Issue 1, June 30, 2005

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