**Avaya Solution & Interoperability Test Lab**

# Configuring an IPSec Tunnel between a Cisco 3825 Router and the Cisco VPN Client to Support Avaya IP Softphone – Issue 1.0

## Abstract

These Application Notes describe the steps to configure an IPSec tunnel between a Cisco 3825 Router and Cisco VPN Client to support Avaya IP Softphone. Cisco Security Device Manager (SDM) is used to configure the Cisco 3825 router as an EasyVPN Server.

# 1. Introduction

These Application Notes describe the steps to configure the Cisco 3825 Router and Cisco VPN client to support Avaya IP Softphones using IPSec tunnel. In these Application Notes, the Cisco router is configured as a VPN Server to establish a VPN tunnel with Cisco VPN client for remote access. Avaya IP Softphone that resides on the same PC with Cisco VPN client will utilize this VPN tunnel to connect to Avaya Communication Manager. Signaling and audio packets from the IP Softphone will be encrypted through this tunnel. Note: Network Address Translation (NAT) is not addressed in these Application Notes.

# 2. Network Topology

The sample network implemented for these Application Notes is shown in **Figure 1.** The Corporate IP Network location contains the Cisco 3825 Router functioning as a VPN Server. The Avaya S8710 Server and Avaya G650 Media Gateway are also located at the Corporate IP Network location. The Corporate IP Network is mapped to **IP Network Region 1** in Avaya Communication Manager.

The Cisco VPN clients are located in the public network and configured to establish an IPSec tunnel to the Public IP address of the Cisco 3825 Router. The Cisco 3825 Router will assign IP addresses to the VPN clients. The assigned IP addresses, also known as the inner addresses, will be used by the Avaya IP Softphones when communicating inside the IPSec tunnel and in the corporate IP network to Avaya Communication Manager.

Avaya Communication Manager maps the Avaya IP Softphones to the appropriate IP Network Region using this inner IP address and applies the IP Network Region specific parameters to the IP Softphones. In these Application Notes, the G.729 codec with two voice samples per packet is assigned to the IP Softphones.

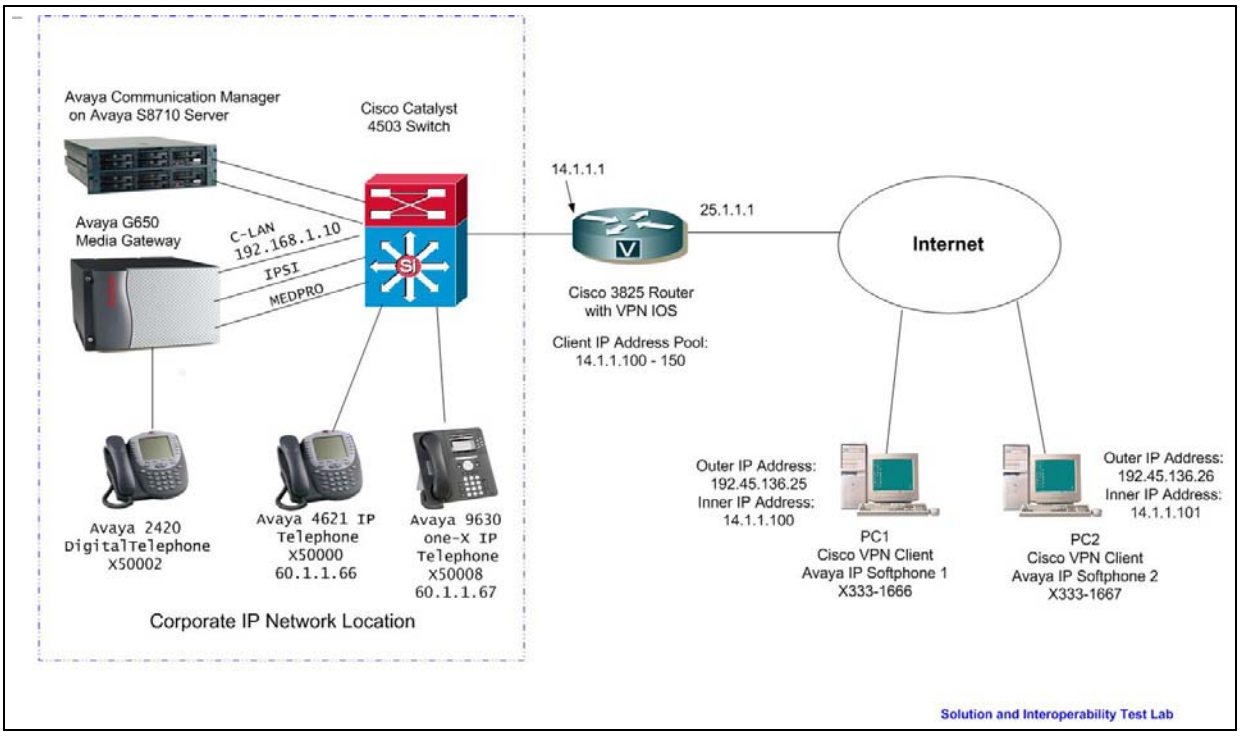



**Figure 1: Network Diagram**

# 3. Equipment and Software Validated

**Table 1** lists the equipment and software/firmware versions used in the sample configuration provided.

| Equipment | Software Version |
|---|---|
| Avaya S8710 Server with<br>G650 Media Gateway | Avaya Communication Manager 4.0.1<br>(R014x.00.1.731.2) |
| Avaya IP Softphone | R6.0 with SP2 |
| Avaya 9600 one-X IP Telephone | R1.5 |
| Avaya 4621 IP Telephone | R2.8 |
| Cisco 3825 Router | IOS 12.4-15 T1<br>SDM V2.2 |
| Cisco VPN Client | V 5.0.02.0090 |

**Table 1 – Equipment Version Information**

# 4. Cisco 3825 VPN Router Configuration

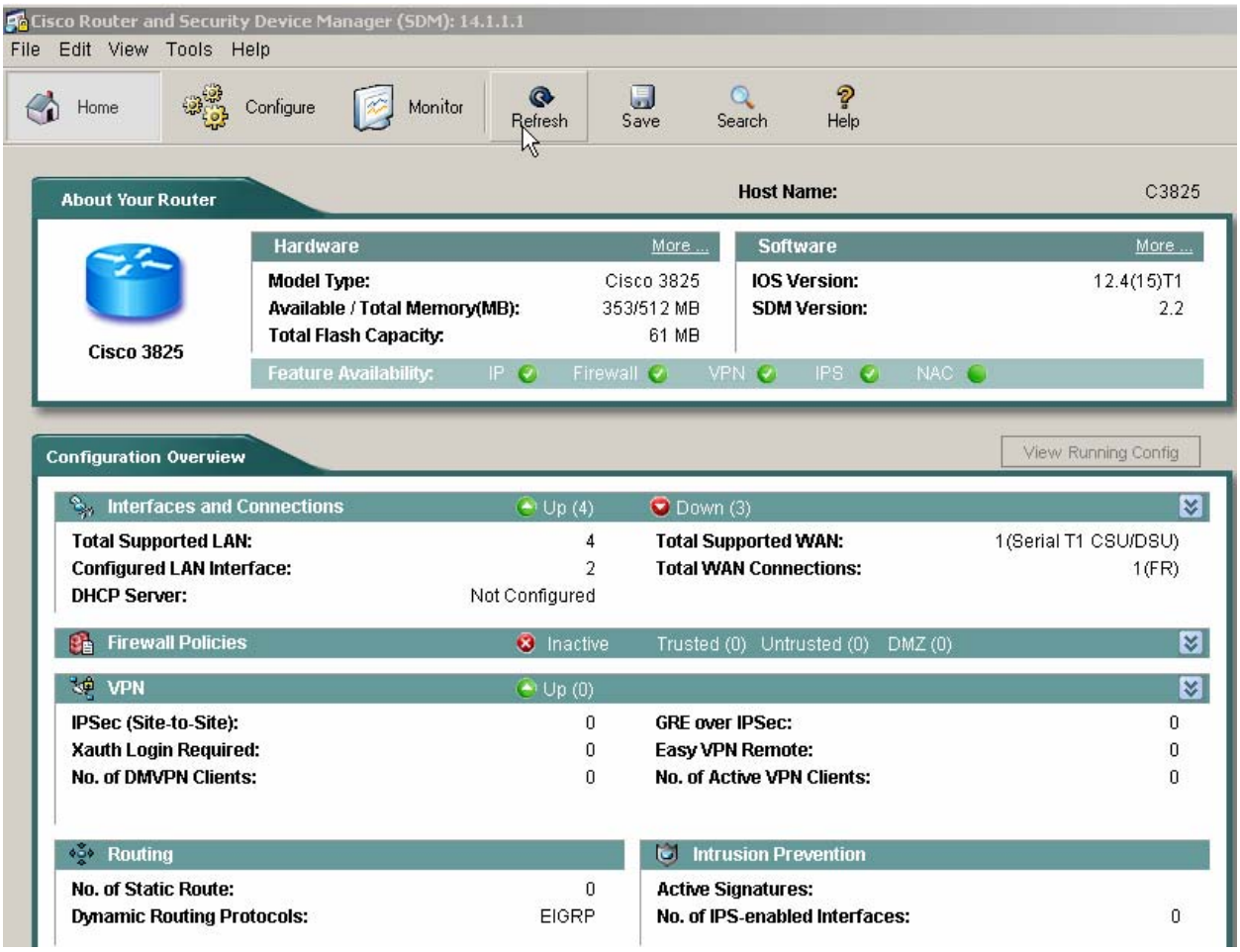
These Application Notes assume that the Cisco 3825 Router has been configured with basic IP connectivity, is connected to the network, is running the VPN capable IOS and the Cisco Security Device Manager (SDM) software has been installed. For steps to install the SDM, refer to reference **[1].** The Cisco 3825 VPN Router depicted in **Figure 1** has been configured with a corporate IP address 14.1.1.1 and a public IP address 25.1.1.1.

1. AAA must be enabled on the router before the Easy VPN Server configuration starts. To enable AAA, log into the router at configuration mode and execute command **AAA new-model.**

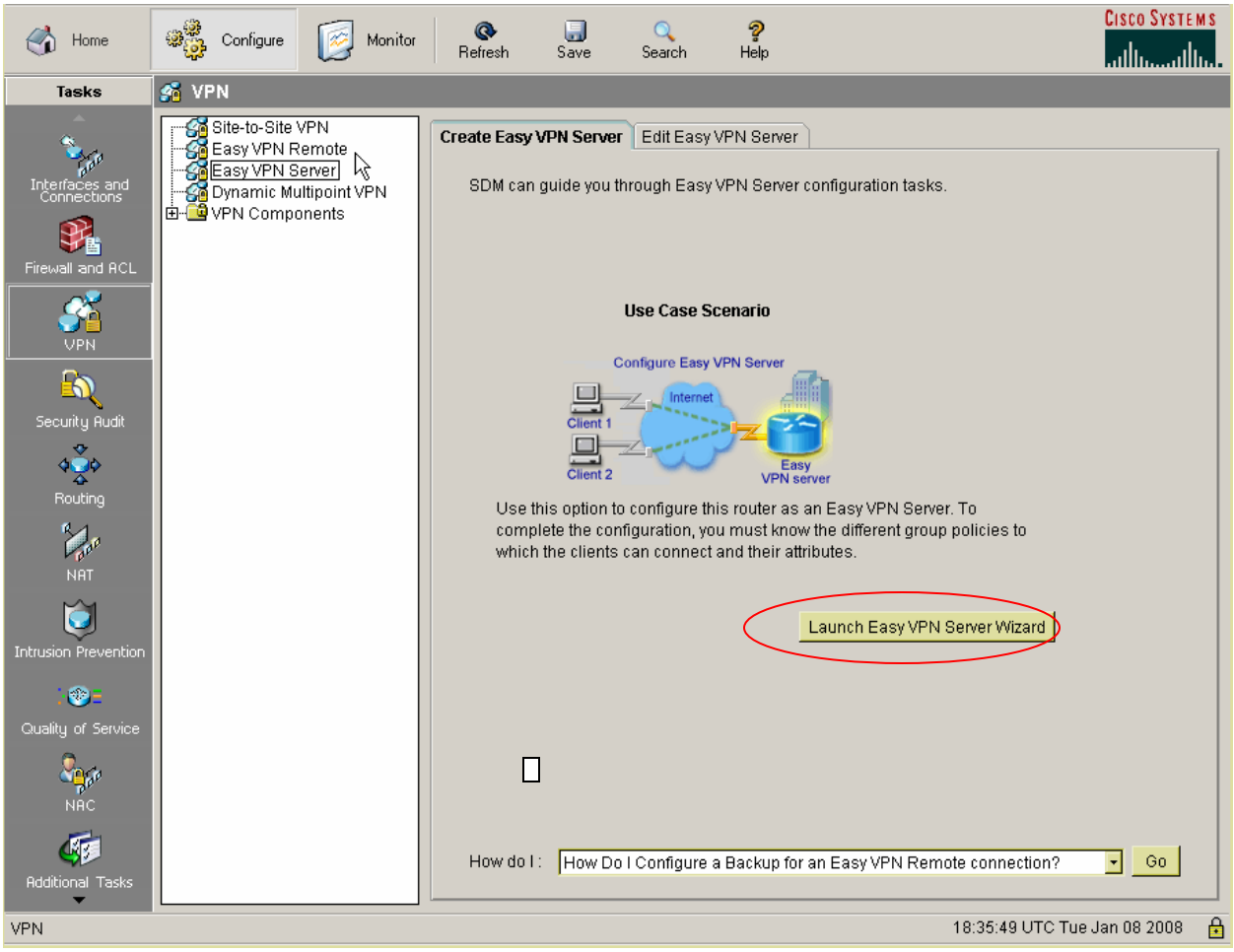
```
Cisco3825(config)# aaa new-model
```

2. From a web browser, enter the URL of the Cisco 3825 Router interface's corporate IP address **http://14.1.1.1** and log in using a user name with administrative privileges in the pop-up window ( not shown here).The SDM will provide a second login window for user authentication as shown below. Enter user name and password and click **OK**

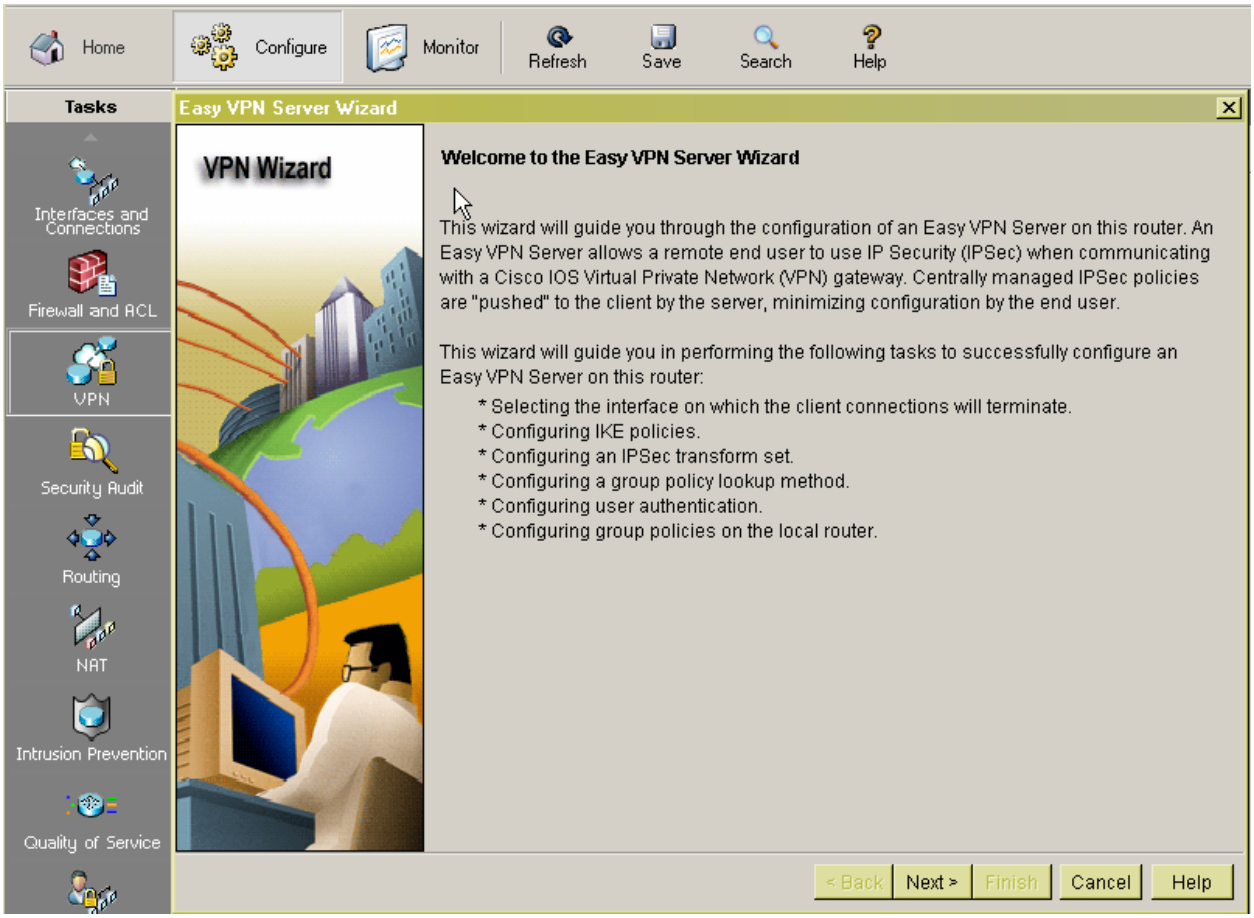
After successful login, the main menu is displayed as shown below.



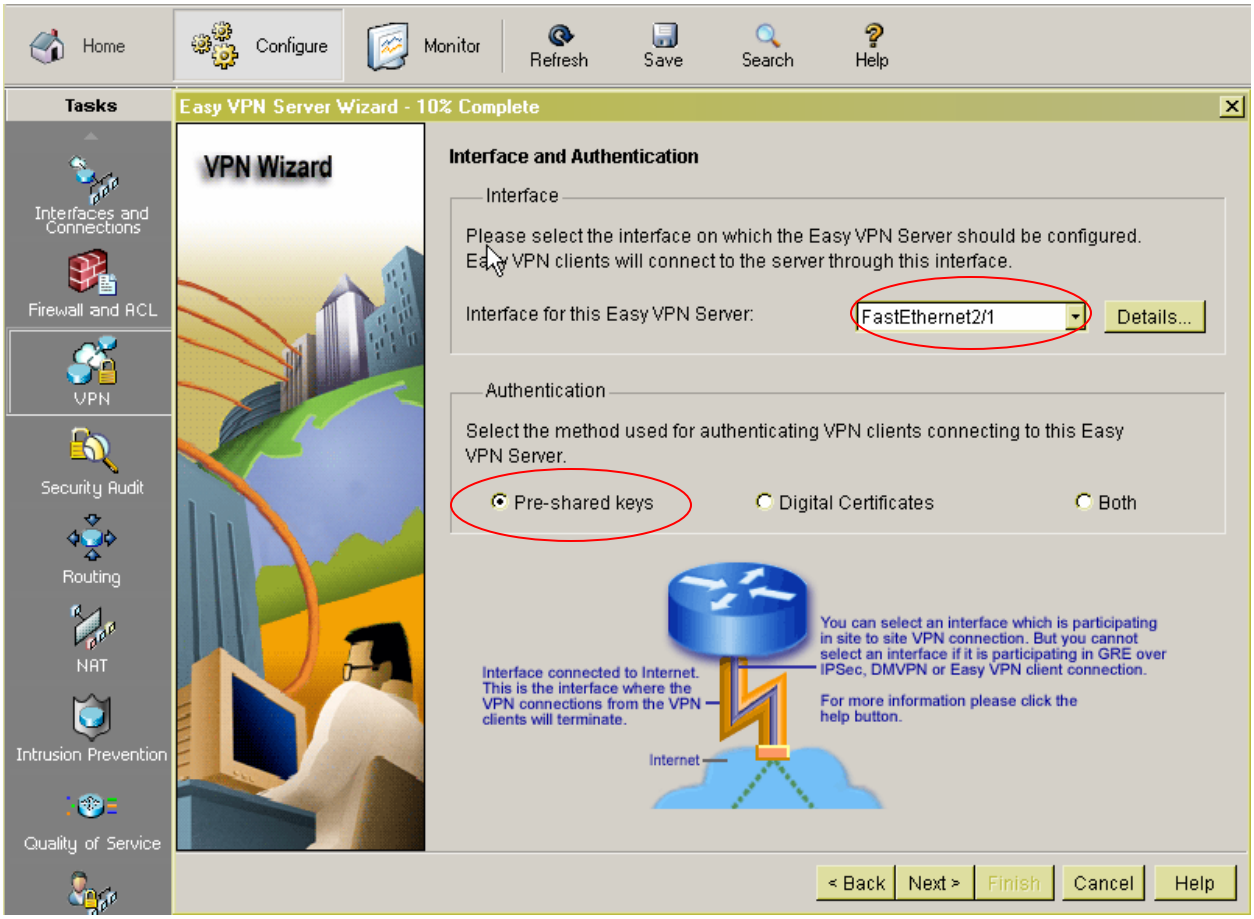
3. Select **Configure → VPN → Easy VPN Server** from the Home window and the following Cisco Router screen appears. Click **Launch Easy VPN Server Wizard** as shown below.



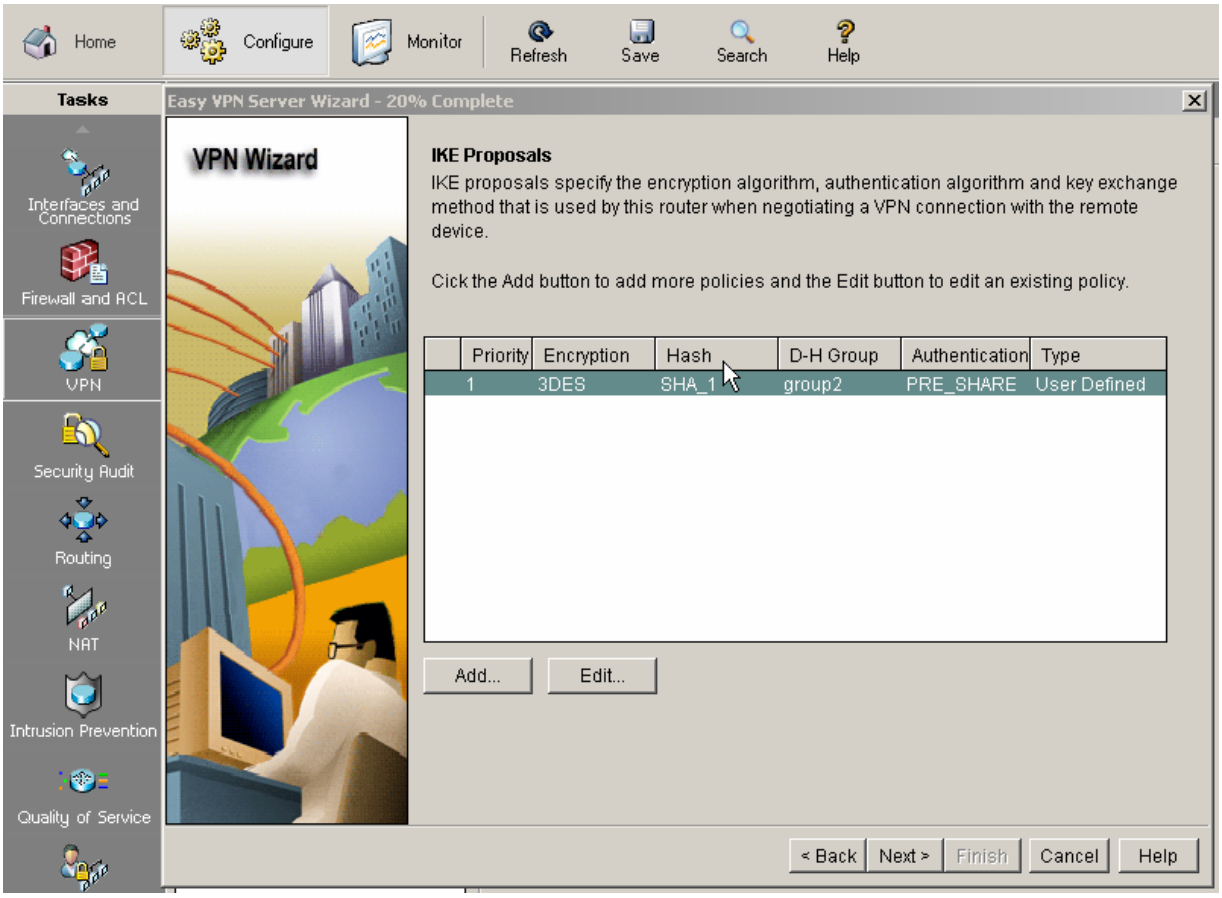
- Click **Next** to start the Easy VPN Server Wizard.



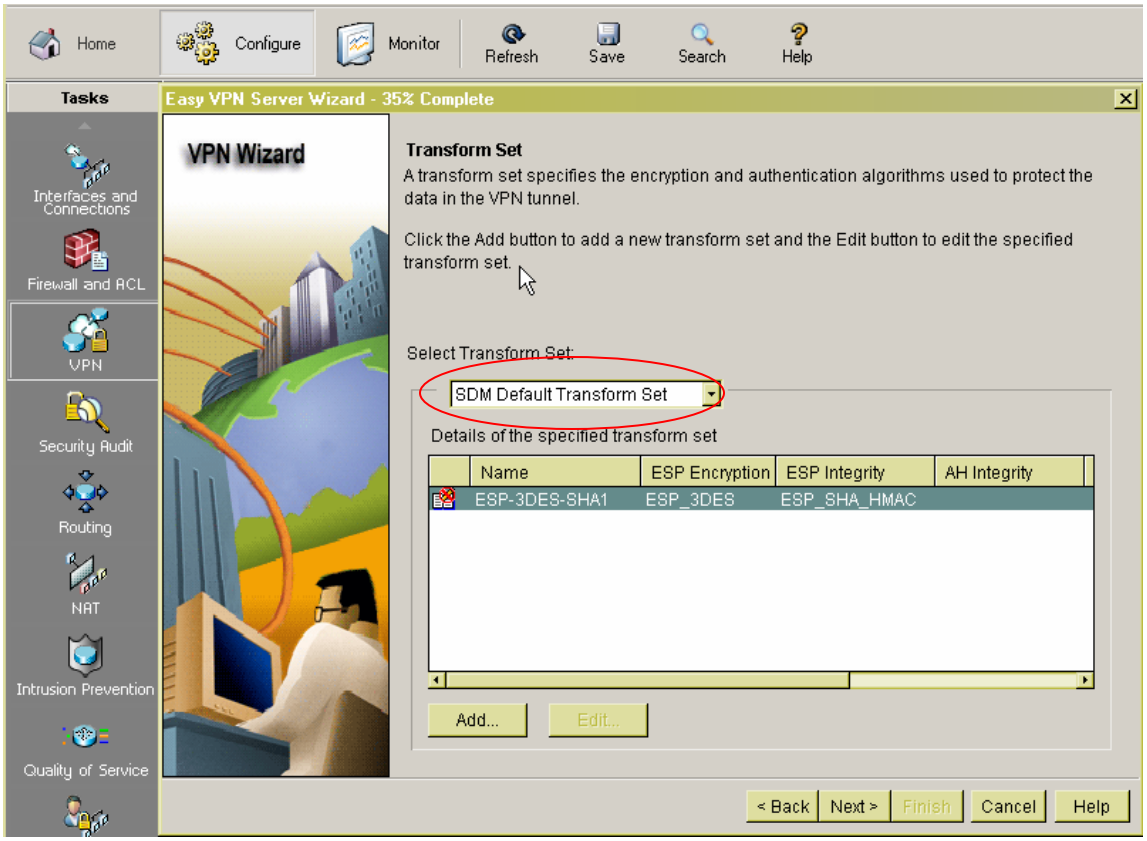
4. Select the interface on which the client connections terminate and the authentication type. In these Application Notes, interface FastEtherenet2/1 is used for the router's public interface and Pre-shared keys is choose as Authentication type. Click **Next** when done.



5. At the next screen, configure the IKE Proposals. Note that there is a default IKE policy that exists in the router as shown below. These Application Notes use this default policy. Highlight the IKE policy and click **Next** to select the default Internet Key Exchange (IKE) policy.

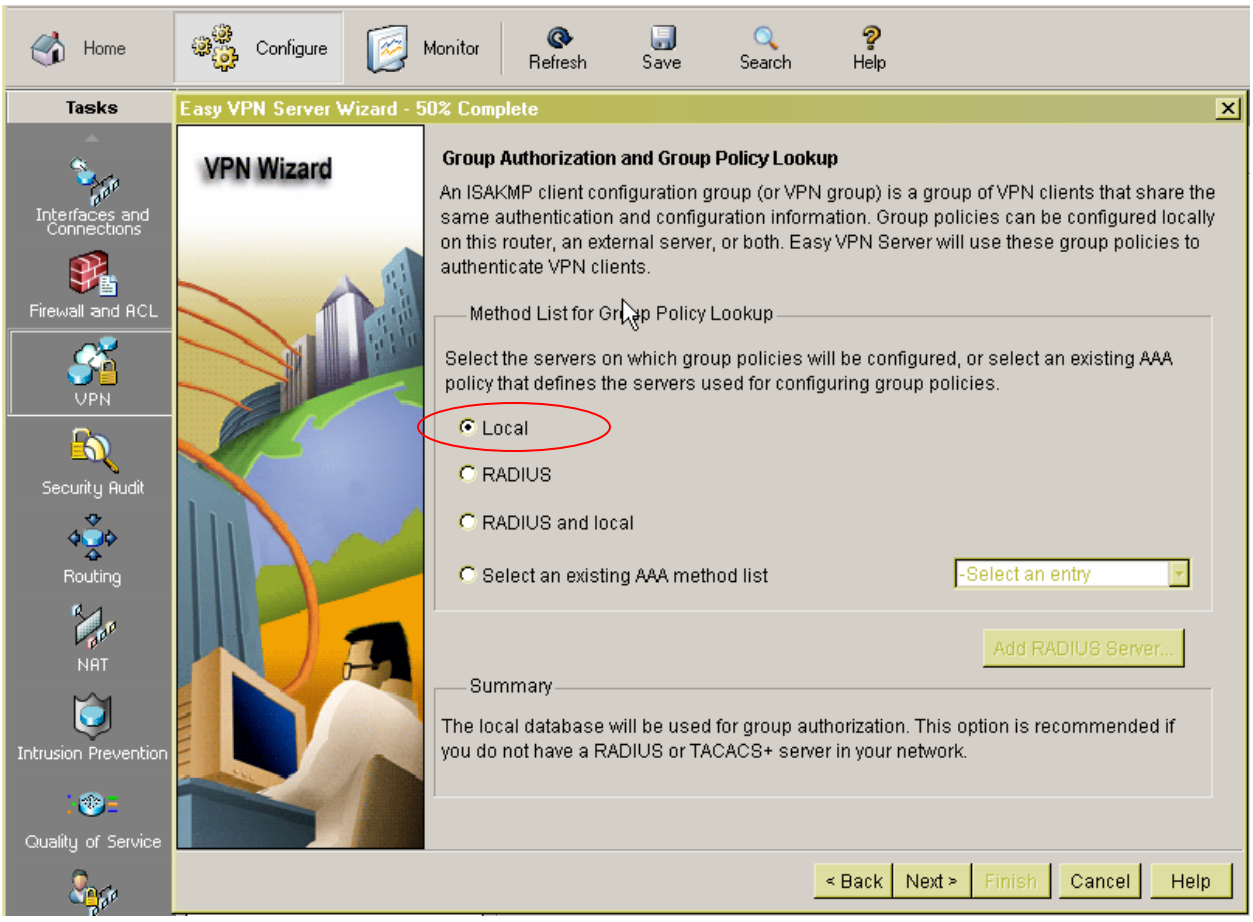


6. The next screen shows the Transform Set configuration. There is a default Transform Set pre-defined on the router.
   - Click **Next** to choose this default transform set or add a new one to specify the encryption and authentication algorithm. In this example, the default transform set is used.



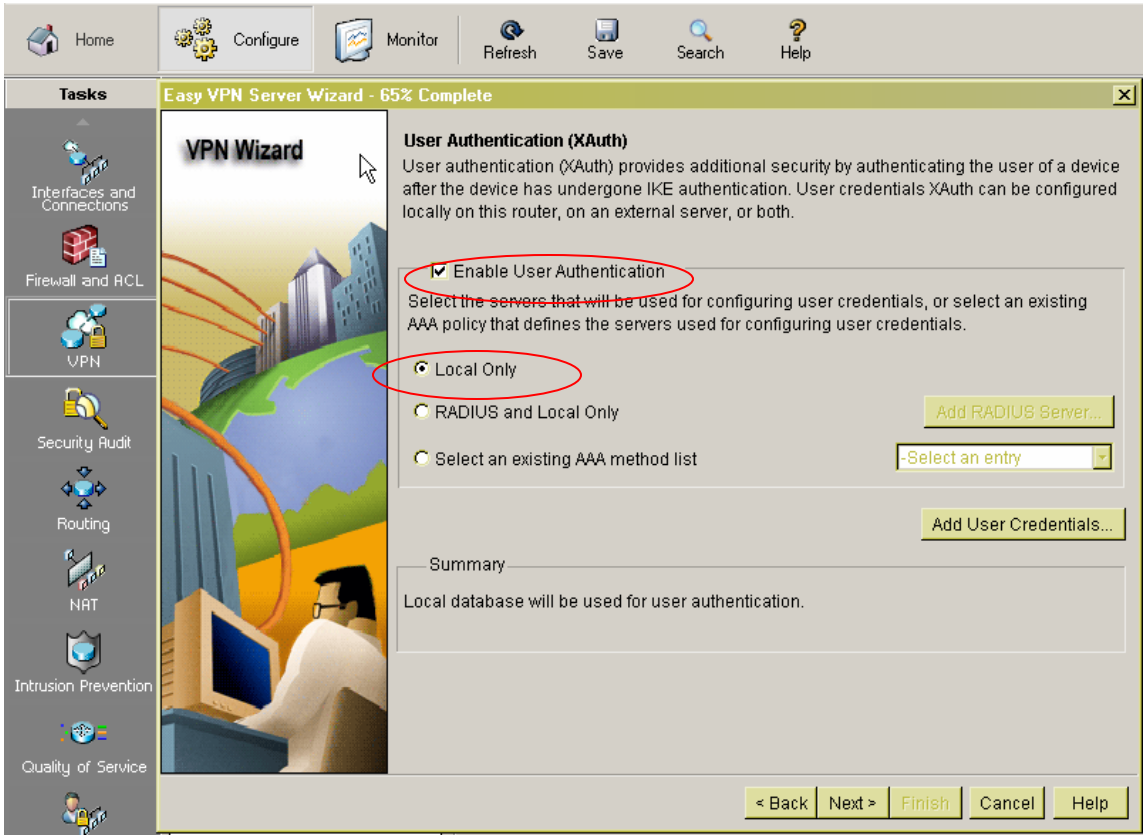
**7.** Use this step to configure the Group Authorization and Group Policy.

- In this configuration, select **Local** under **Method List for Group Policy Lookup**.
- Click **Next**.

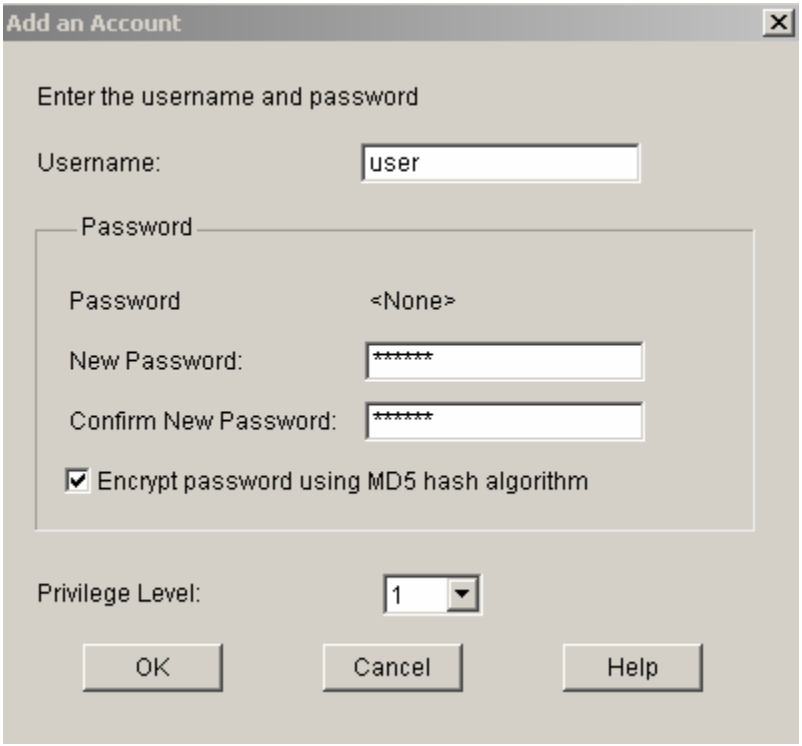


**8.** Configure user authentication on the Easy VPN server. User authentication details can be stored on an external server such as a RADIUS server or a local database or on both. An AAA login authentication method list is used to decide the order in which user authentication details should be searched. In this configuration,

- Check the box **Enable User Authentication** and select **Local Only** to authenticate users using the local database on the router.
- Click tab **Add User Credentials** to add a user

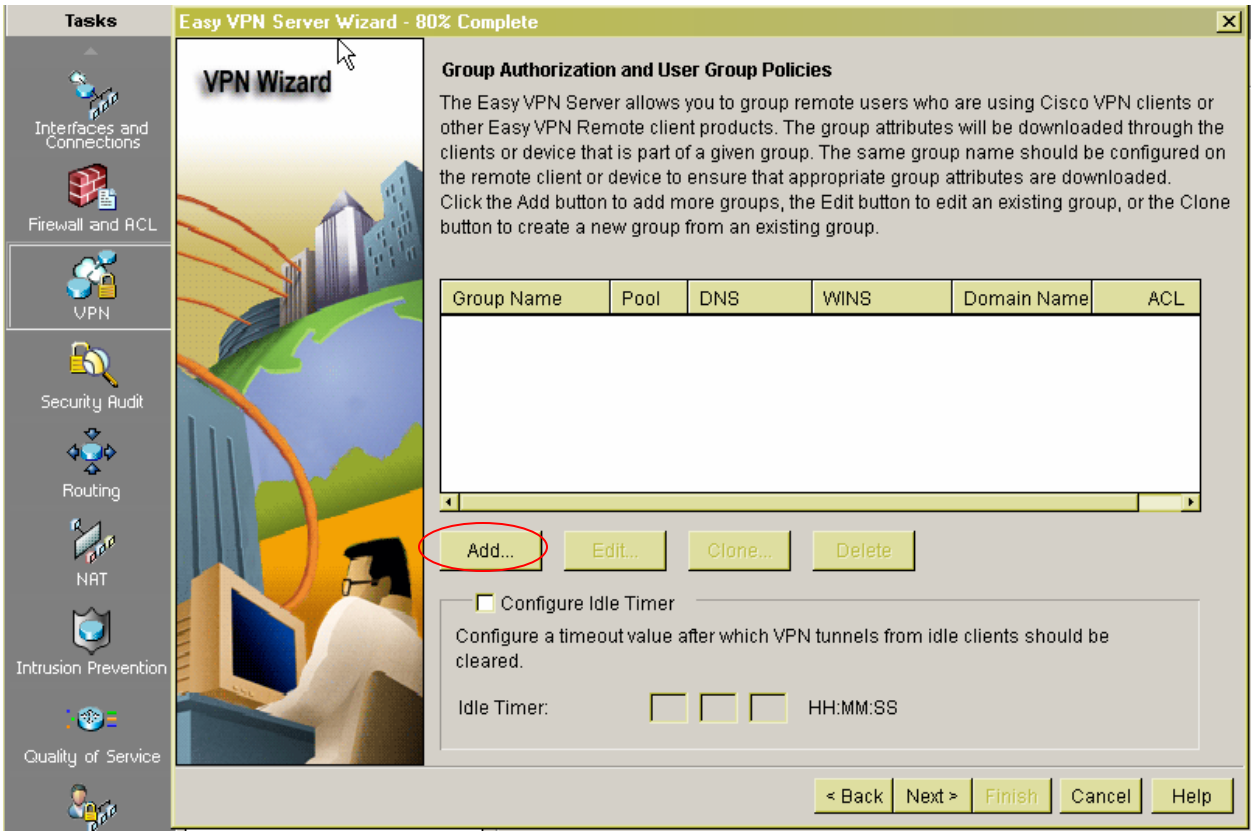


- Enter **user** and **password** for Username and password as shown
- Check box **Encrypt password using MD5 hash algorithm**
- Select **Privilege Level 1**. Note this privilege level only allow users to access VPN server, not to make any changes on the server.
- Click **OK** and bring the screen back to the previous **User Authentication** configuration
- Click **OK** to proceed to group configuration



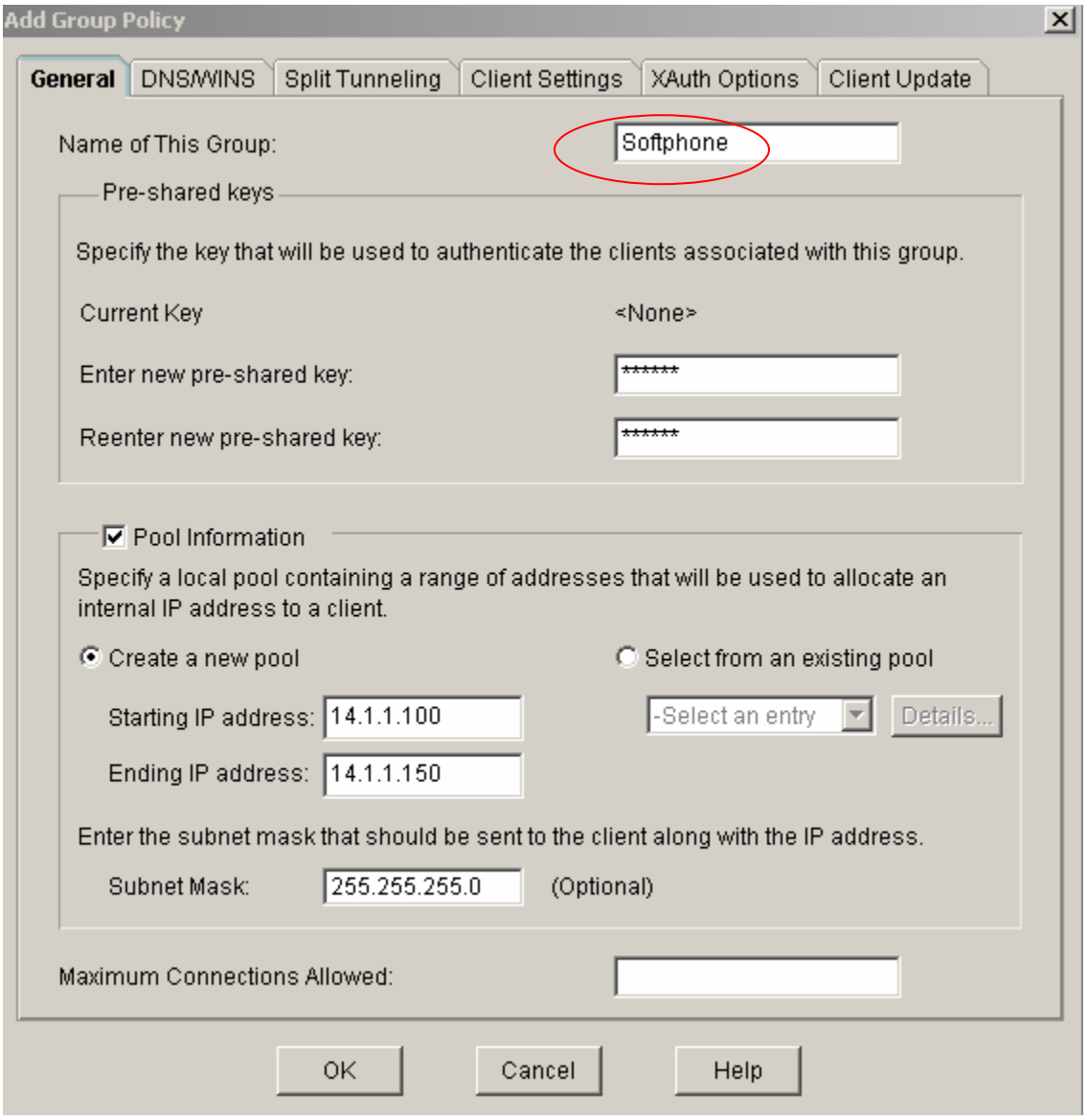
**9.** Use the window below to add user group policies on the local database.

- Click **Add** to add a group policy for this VPN.
- Click **Next**.

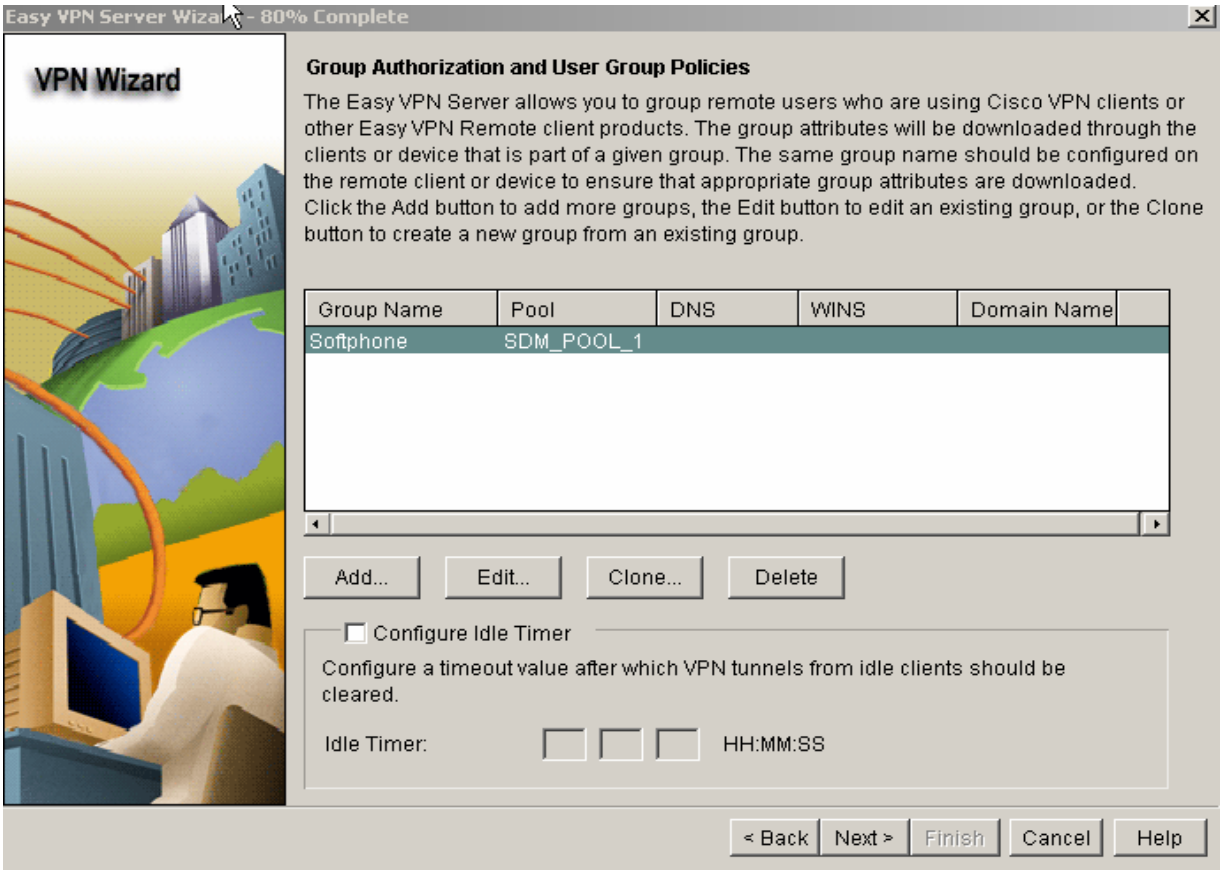


**10.** Configure Group Policy as follows:

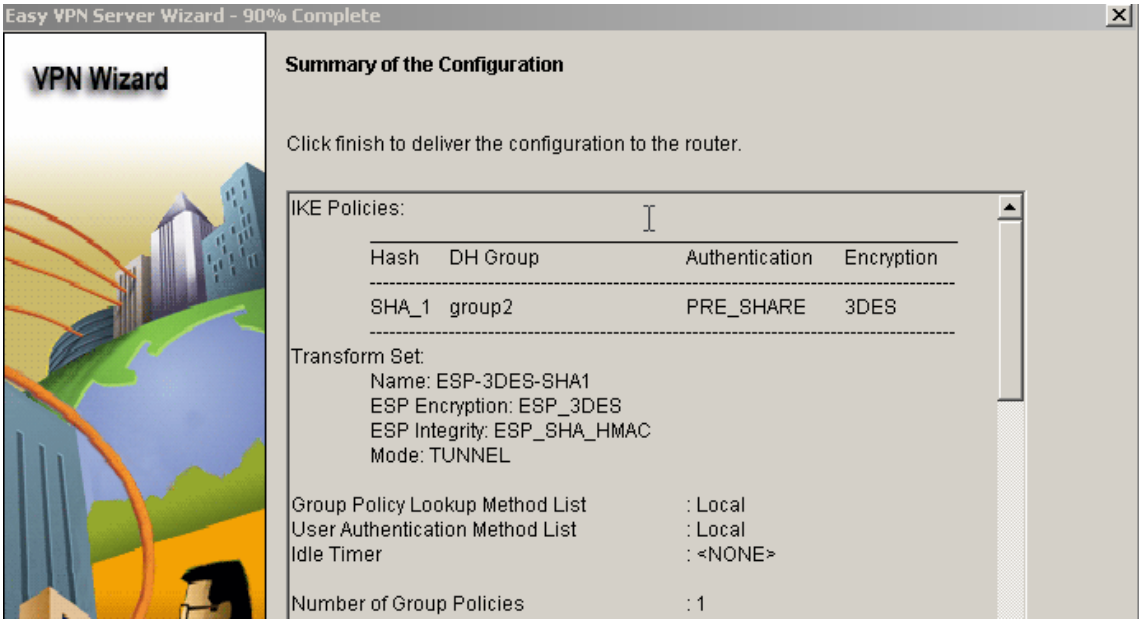
- Enter **Softphone** for the Name of This Group and enter the **pre-shared key** used for authentication information.
- Check **Pool Information** and **Create a new pool** to allocate the IP addresses to be assigned to VPN Clients. In this configuration, IP addresses range **14.1.1.100 – 14.1.1.150** is used.
- Click **OK**.

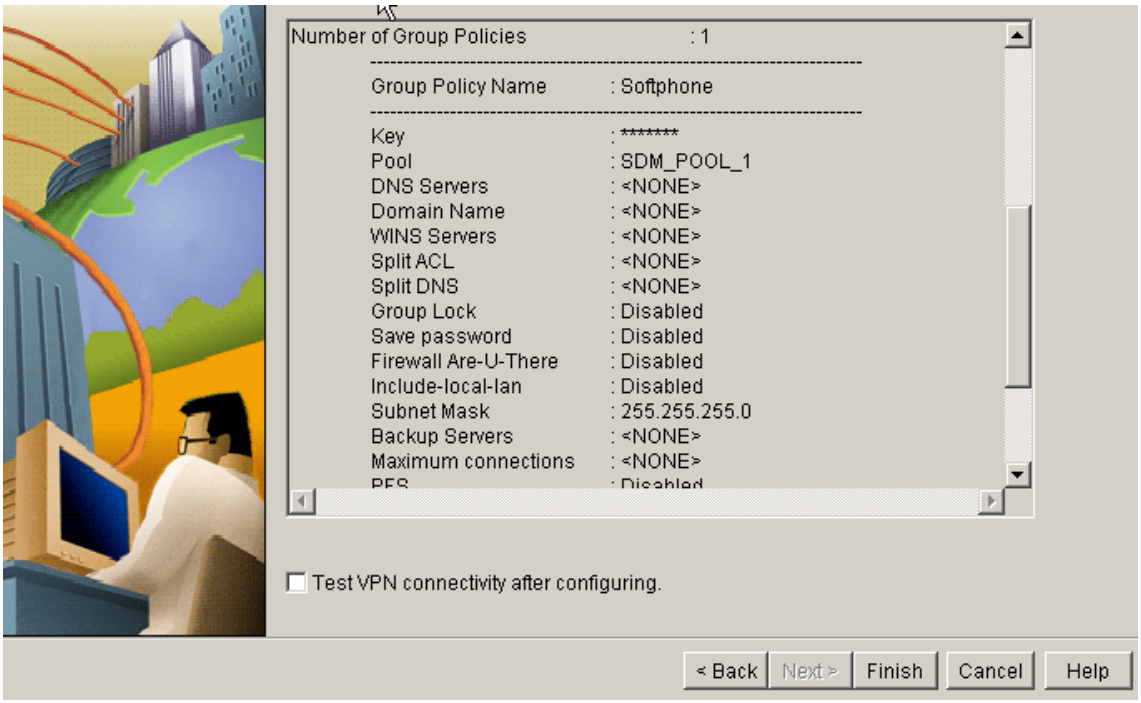


- Click **Next**

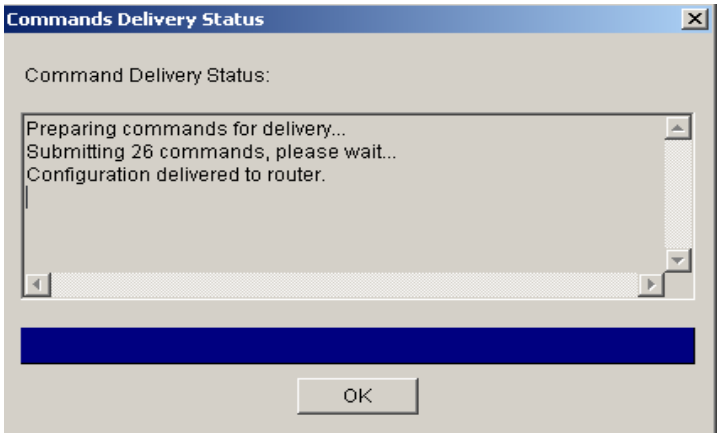


**11.** The next window shows a summary of the completed configuration. Click **Finish** after reviewing the configuration.



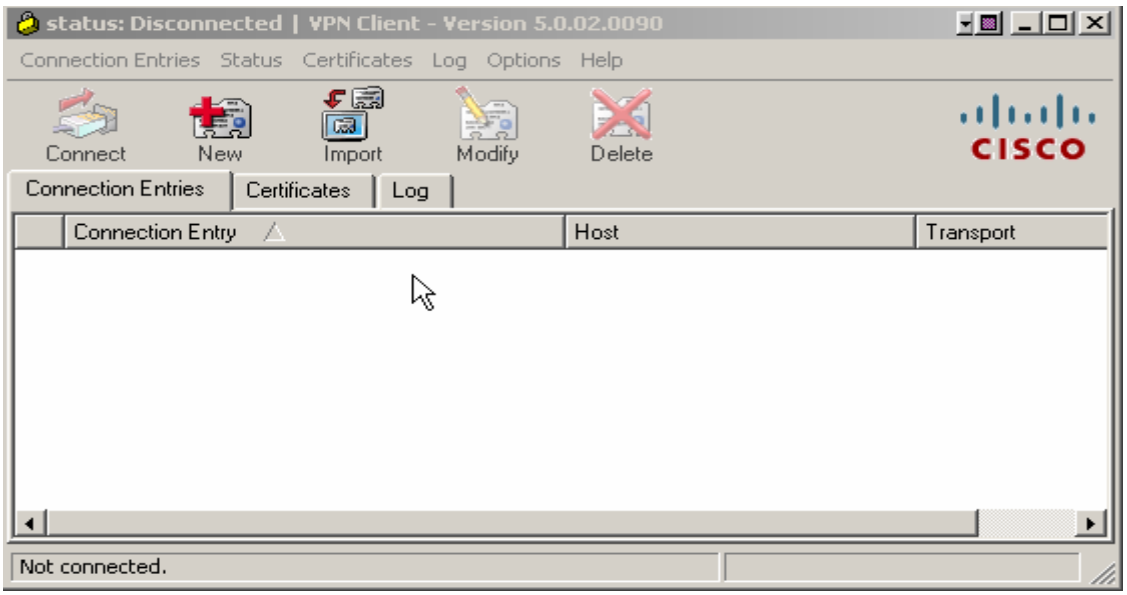
**12.** After the Finish button is clicked, the SDM sends the configuration to the router to update the running configuration. Click **OK**.



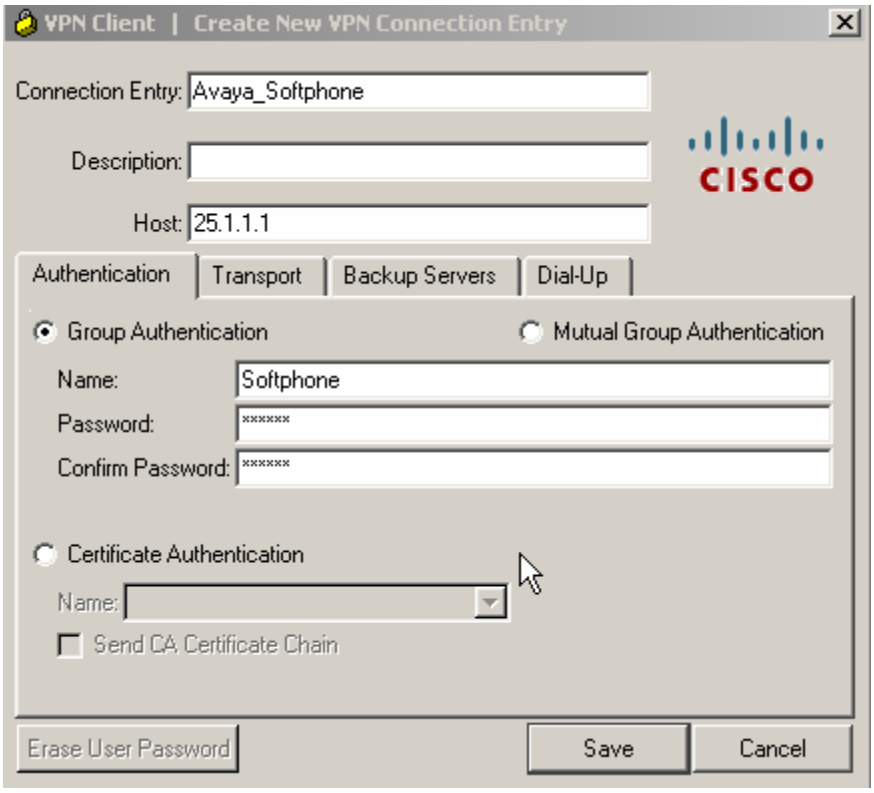

# 5. Cisco VPN Client Configuration

These Application Notes assume that the Cisco VPN client software has been installed on a computer and the computer has connectivity to the Cisco 3825 router via its Internet connection. For Cisco VPN software installation, refer to the reference **[2].**

1. Launch the VPN client application:
   - Select **Start → Programs → Cisco Systems VPN Client → VPN Client Programs**. The Cisco VPN Client application window appears as shown below.
   - Click **Connection Entries → New**



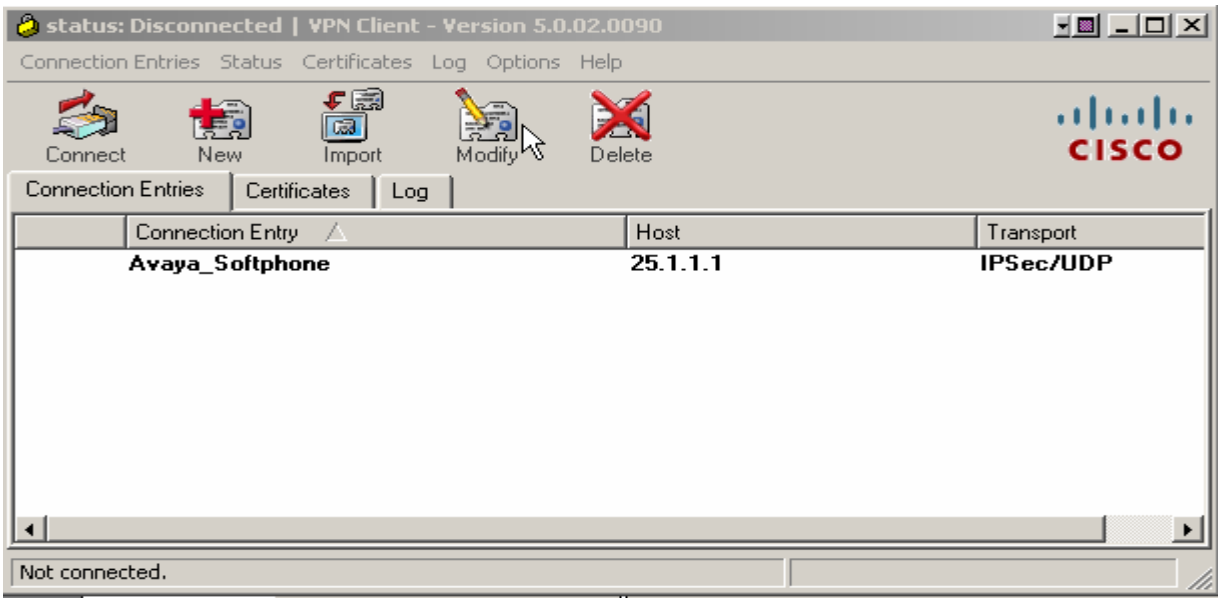
2. Enter connection information
   - For **Connection Entry**, enter the name **Avaya_Softphone** in this example
   - Enter the router's public interface IP address **25.1.1.1** in the **Host** field.
   - Click **Group Authentication**
   - Enter **Softphone** for group name and password created in Step 10, Section 4.
   - Click **Save**.



The following screen shows the **Avaya_Softphone** connection entry and the default Transport is **IPSec/UDP**. Click **Modify** to change the connection property if needed.

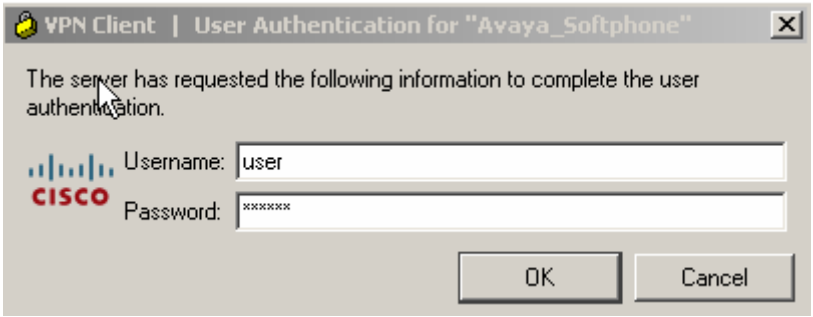
**3.** Connect to VPN server

- Click the **Connect** button to connect to the VPN Server (3825 Router).




At the login screen,

- Enter the user **name** and **password** as defined in Step 8, Section 4.
- Click **OK**.




These Application Notes do not cover the Avaya IP Softphone configuration and usage. Refer to reference **[4]** for detail.

# 6. Avaya Communication Manager Configuration

All the commands discussed in this section are executed on Avaya Communication Manager using the System Access Terminal (SAT). This section assumes that basic configuration on Avaya Communication Manager has already been completed.

The Avaya IP Softphones are assigned to IP Network Region 2 using the IP address range of the VPN Client IP Address Pool. G729 codec is assigned to IP Network Region 2 for calls within this region and between the IP Network Region 1.

## 6.1. IP Softphone Administration

An Avaya IP Softphone is administered similar to other IP telephones within Avaya Communication Manager. The following screens show IP Softphone extension 333-1666 being added to Avaya Communication Manager. For additional information regarding the administration of Avaya Communication Manager, refer to reference **[3]**.

- Enter **4620** for phone Type
- Enter **y** for IP Softphone

```
add station 3331666                                          Page   1 of   5
                                     STATION

Extension: 333-1666                     Lock Messages? n               BCC: 0
     Type: 4621                         Security Code: *                TN: 1
     Port: IP                         Coverage Path 1:                 COR: 1
     Name: IP-Softphone               Coverage Path 2:                 COS: 1
                                      Hunt-to Station:
STATION OPTIONS
                                          Time of Day Lock Table:
              Loss Group: 19         Personalized Ringing Pattern: 1
                                                Message Lamp Ext: 333-1666
           Speakerphone: 2-way               Mute Button Enabled? y
        Display Language: english               Expansion Module? n
 Survivable GK Node Name:
          Survivable COR: internal              Media Complex Ext:
   Survivable Trunk Dest? y                          IP SoftPhone? y

                                               IP Video Softphone? N
```

- Enter **y** for Direct IP-IP Audio Connections?

```
add station 3331666                                          Page   2 of   5
                                      STATION
FEATURE OPTIONS
           LWC Reception: spe              Auto Select Any Idle Appearance? n
          LWC Activation? y                         Coverage Msg Retrieval? y
  LWC Log External Calls? n                                   Auto Answer: none
             CDR Privacy? n                                Data Restriction? n
   Redirect Notification? y                     Idle Appearance Preference? n
 Per Button Ring Control? n                   Bridged Idle Line Preference? n
   Bridged Call Alerting? n                       Restrict Last Appearance? y
  Active Station Ringing: single
                                                          EMU Login Allowed? n
        H.320 Conversion? n          Per Station CPN - Send Calling Number?
       Service Link Mode: as-needed
         Multimedia Mode: enhanced
    MWI Served User Type:                        Display Client Redirection? n
             AUDIX Name:                       Select Last Used Appearance? n
                                                 Coverage After Forwarding? S
                                                   Multimedia Early Answer? n
 Remote Softphone Emergency Calls: as-on-local Direct IP-IP Audio Connections? y
  Emergency Location Ext: 333-1888      Always Use? n IP Audio Hairpinning? N
```

## 6.2. IP Codec Sets Configuration

Use the **`change ip-codec-set n`** command to configure IP Codec Set parameters where n is the IP Codec Set number. Use the **`change ip-codec-set 2`** command to define a codec set for the G.729 codec with no media encryption as shown below. Since the call is going through the VPN tunnel, the media encryption is not necessary. Note the ip-codec-set 1 is configured to use G.711mulaw and the configuration is not shown here since it's similar to ip-codec-set 2 configuration.

```
change ip-codec-set 2                                        Page   1 of   2
                           IP Codec Set
    Codec Set: 1

    Audio        Silence      Frames   Packet
    Codec        Suppression  Per Pkt  Size(ms)
 1: G.729             n         2        20
 2:

     Media Encryption
 1: none
 2:
```

## 6.3. IP Network Region Configuration

Use the **`change ip-network-region n`** command to configure IP Network Region parameters where n is the IP Network Region number. Below is the display for ip-network-region 2 configuration. Configure the highlighted fields shown below. All remaining fields can be left at their default values.

The **Intra-region IP-IP Direct Audio** and **Inter-region IP-IP Direct Audio** fields determine the flow of RTP audio packets. Setting these fields to **yes** enable the most efficient audio path to be taken. Codec Set 2 is used for IP Network Region 2.

```
change ip-network-region 2                                      Page   1 of  19
                              IP NETWORK REGION
  Region: 2
Location:         Authoritative Domain: avaya.com
    Name:
MEDIA PARAMETERS                Intra-region IP-IP Direct Audio: yes
      Codec Set: 2              Inter-region IP-IP Direct Audio: yes
   UDP Port Min: 2048                      IP Audio Hairpinning? y
   UDP Port Max: 65535
DIFFSERV/TOS PARAMETERS                  RTCP Reporting Enabled? y
 Call Control PHB Value: 26      RTCP MONITOR SERVER PARAMETERS
        Audio PHB Value: 46       Use Default Server Parameters? y
        Video PHB Value: 26
802.1P/Q PARAMETERS
 Call Control 802.1p Priority: 3
        Audio 802.1p Priority: 5
        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 IP NETWORK REGION
```

Page 3 of the IP-Network-Region form, shown below, defines the codec set to use for intra-region and inter-region calls. Since only ip-network-region 1 is defined in this configuration, Avaya IP Softphones are in Region 1 and use codec set 1 for audio.

```
change ip-network-region 2                                      Page   3 of  19

                    Inter Network Region Connection Management

 src dst codec direct   WAN-BW-limits   Video                            Dyn
 rgn rgn  set   WAN  Units    Total Norm  Prio Shr Intervening-regions  CAC IGAR
 2   1    2     y    NoLimit                                                n
 2   2    2
 2   3
```

Use the **change ip-network-map** command to map all IP Softphones to IP Network Region 2, which is using G.729 codec.

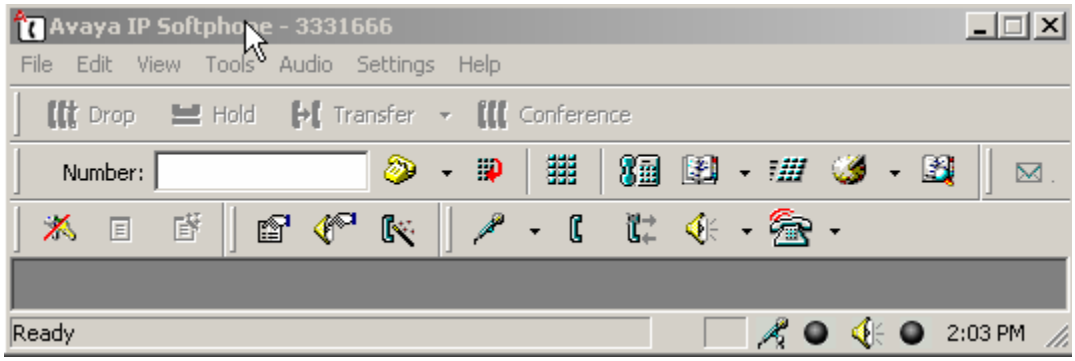
```
change ip-network-map                                          Page   1
                         IP ADDRESS MAPPING

                                                            Emergency
                                        Subnet              Location
 From IP Address  (To IP Address    or Mask)  Region    VLAN   Extension
 192.168.1  .1    192 .168.1 .254      24       1        n
 14 .1  .1  .100  14 .1  .1  .150      24       2        n
```

# 7. Verification

## 7.1. Avaya IP Softphone Statistics

On client PC, pinging the Cisco 3825 router's public interface IP address to verify the connectivity before launching the VPN client. Once the Cisco VPN Client establishes an IPSec tunnel with VPN Server, launch a ping from the client PC to C-LAN and verify that the ping is successful. Start the Avaya IP Softphone from the client PC 1 and verify that the IP Softphone is registered with Avaya Communication Manager and becomes functional. The screen capture below shows the status of the IP Softphone station 3331666.




Also, from the Avaya Communication Manager SAT terminal, use the command **list registered-ip-stations** to show both IP Softphones are registered with Avaya Communication Manager with their inner IP addresses assigned from the address pool on Cisco 3825 VPN router.

```
list registered-ip-stations
                              REGISTERED IP STATIONS

Station Ext/  Set     Product    Prod  Station         Net Gatekeeper     TCP
 Orig Port    Type    ID         Rel   IP Address      Rgn IP Address     Skt
50000         4621    IP_Phone   2.800 60.1.1.66       1   192.168.1.10    y
50008         4620    IP_Phone   1.500 60.1.1.67       1   192.168.1.10    y
333-1666      4621    IP_Soft    5.620 14.1.1.100      2   192.168.1.10    y
333-1667      4621    IP_Soft    5.242 14.1.1.101      2   192.168.1.10    y
```

Make a call from the IP Softphone 1 (x333-1666) to the IP softphone 2 (x333-1667). Use the command **status station x** (x represent the extension #) to verify the status of the IP Softphone 1 as shown below. Notice on **Page 1**, the IP Softphone Service State is **in-service/off-hook**.

```
status station 3331666                                        Page   1 of   7
                              GENERAL STATUS
     Administered Type: 4620               Service State: in-service/off-hook
        Connected Type: N/A            TCP Signal Status: connected
             Extension: 333-1666
                  Port: S00002        Parameter Download: complete
           Call Parked? no                 SAC Activated? no
      Ring Cut Off Act? no
Active Coverage Option: 1

          EC500 Status: N/A        Off-PBX Service State: N/A
   Message Waiting:
   Connected Ports: S00020
```

On **Page 3**, the IP Softphone uses IP address **14.1.1.100**, which is assigned from the IP address pool defined on the Router. Note the IP address **192.168.1.10** is C-LAN IP address and is in Region 1 as shown below.

```
status station 3331666                                        Page   3 of   7
                              CALL CONTROL SIGNALING
Port: S00002         Switch-End IP Signaling Loc: 01A0217  H.245 Port:
            IP Address                                Port  Node Name       Rgn
Switch-End: 192.168.  1. 10                           1720  c-lan           1
   Set End:  14.  1.  1.100                           31244                 2
H.245 Near:
 H.245 Set:
```

**Page 4** shows that the audio is between the two IP Softphones and the **Audio Connection Type** is **ip-direct**.

```
status station 3331666                                        Page   4 of   7

                          AUDIO CHANNEL Port: S00002
G.729A        Switch-End Audio Location:
            IP Address                                Port  Node Name       Rgn
Other-End:  14.  1.  1.101                            2048                  2
  Set-End:  14.  1.  1.100                            2048                  2
Audio Connection Type: ip-direct
```

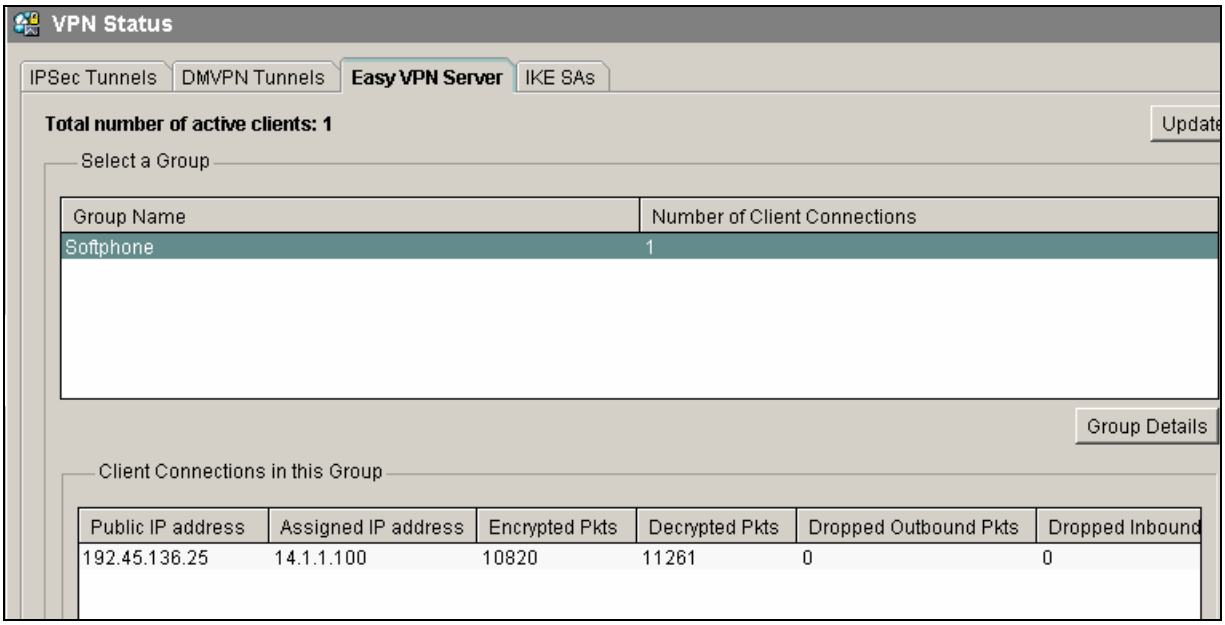
**Page 6** shows the g729a codec is used for this call.

```
status station 3331666                                        Page   6 of   7
                       SRC PORT TO DEST PORT TALKPATH
src port: S00002
S00002:TX:14.1.1.100:2048/g729a/20ms
S00085:RX:14.1.1.101:2048/g729a/20ms
```

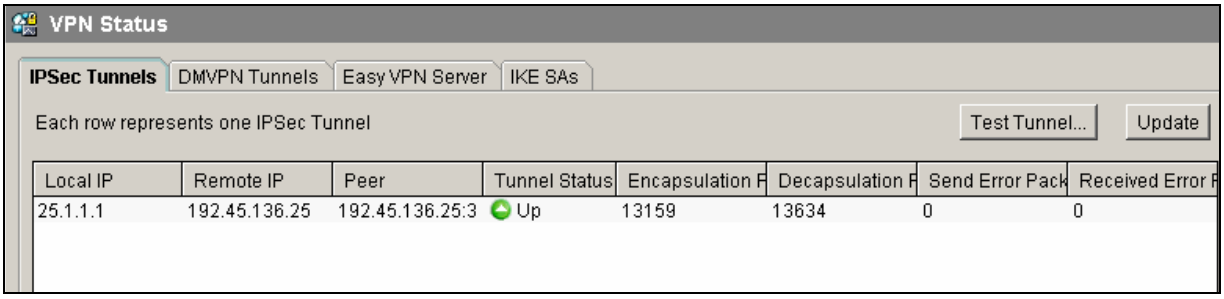
## 7.2. Cisco 3825 VPN Router Logging

The Cisco VPN Router **VPN Status** displays the current client login status. To access to the VPN Status, select **VPN Status → Easy VPN Server** from the main web management interface.

The detailed client connection information is shown below. Note that the VPN client's Public IP address is 192.45.136.25 and the Assigned IP address is 14.1.1.100.




Click **IPSec Tunnels** tab to show the IPSec tunnel status. Note that the Local IP address **25.1.1.1** is the router's public interface and the Remote IP address **192.45.136.25** is the Cisco VPN client's (PC1) outer IP address. The **Tunnel Status** column shows Up.




# 8. Conclusion

The Avaya IP Softphones can utilize the IPSec tunnel established between Cisco VPN Router and VPN Client to provide a secure solution for remote worker telephony over any broadband Internet connection. These Application Notes verify that Avaya IP Softphone can successfully interoperate with the Cisco 3825 VPN Router using the Cisco VPN client application.

# 9. References


[1] ***Cisco Router as a Remote VPN Server using SDM Configuration Example,*** Doc ID: 70374 at http://www.cisco.com/

[2] ***Downloading and Installing Cisco Router and Security Device Manager*** at http://www.cisco.com/

[3] ***Administrator Guide for Avaya Communication Manager,*** Doc ID: 03-300509, Issue 3.0, February 2007 at http://www.support.avaya.com/

[4] ***Avaya IP Softphone Release 6.0 User Reference,*** Issue 1, May 20007 at http://www.support.avaya.com

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