Configuring DHCP for ShoreTel IP Phones

The ShoreTel server provides the latest application software and configuration information to ShoreTel IP phones. To receive this information, the ShoreTel IP phone must have the server's IP address. The configuration task in this section is for specifying the IP address and other necessary information.

Note

For information about DHCP settings for the ShoreTel 400-Series IP phones, see the *ShoreTel Connect Maintenance Guide*.

The phone receives the necessary information through a vendor-specific DHCP option. ShoreTel IP phones have a built-in configuration to seek the ShoreTel server's address as Vendor Specific DHCP option 156. If these options are not available, ShoreTel's IP phones use option 66. ShoreTel IP phones that support DHCP option 156 are ShoreTel models IP110, IP115, IP212k, IP230, IP230g, IP265, IP420, IP480, IP480g, IP485g, IP560, IP560g, and IP655.

Note

The ShoreTel IP Phone 8000 does not support option 156 for this application.

The configuration task in this section involves a number for the country of the network or subnet where the phones reside. If necessary, find the number for a country in Table 13.

If your network has separate subnets, be sure to select the correct subnet. For example, if a multi-national organization needs the DHCP server to deliver Spanish tones and cadences to the IP phones in an office in Spain, specify the subnet for that office. Without this specification, all phones that boot from this DHCP server receive Spanish tones and cadences.

Another value for the configuration task is a number that points to a language by its country. Although this number refers to a language, it is bound to a country, not a language. For this reason, some countries with different languages have the same language number in the configuration of DHCP option 156. Table 14 lists the language numbers. (As Table 14 shows, language number 4 is a good example.) Selecting the correct language code ensures that the phone shows text in the desired language. Examples of this text are abbreviations for days and months and messages indicating that a requested service is unavailable.

Note

ShoreTel 400-Series IP phones do not use the language or country parameters in DHCP Option 156. Instead, these phones obtain country and language settings from ShoreTel Connect Director as follows:

- The country is determined by the Country parameter on the Sites page.
- For an Available phone, the language is determined by the Language parameter on the Sites page. For an assigned phone, the language is determined by the Language parameter on the Users page.

To configure DHCP Option 156 on a Microsoft DHCP Server for ShoreTel IP110, IP115, IP212k, IP230, IP230g, IP265, IP560, IP560g, and IP655 phone models:

1. Open DHCP Manager on the Microsoft DHCP server.
2. Right-click the DHCP server, and then select **Set pre-defined options**.
3. Click **Add**.
4. Set **Name** to IP Phone Boot Server.
5. Set **Data Type** to String.
6. Set **Code** to 156 and add a description, if desired.
7. Navigate to the **scope** options and add option 156.
8. Type the values for option 156 with the following syntax:

   `ftpservers=`*`ip_address`*`, country=`*`n`*`, language=`*`n`*`, layer2tagging=`*`n`*`, vlanid=`*`n`*

   Where

   - *`ip_address`* is the IP address of the ShoreTel Headquarters server.
   - *`n`* in `country=`*`n`* corresponds to the country number in Table 13.
   - *`n`* in `language=`*`n`* corresponds to the language number in Table 14.

   For example, the following syntax specifies Germany as the country and German as the language:

   ```
   FtpServers=192.168.0.13, country=5, language=3 layer2tagging=1,
   vlanid=10
   ```

Note

It is possible to configure two FTP servers for option 156. Each parameter is enclosed in quotes, and separated by commas. For example, you can configure two FTP servers as follows:

```
ftpservers = "192.168.0.13, 192.168.0.23"
```

Table 13: Country Numbers for DHCP Option 156

Number	Country
1	United States of America
2	Canada
3	France
4	Italy
5	Germany
6	Spain
7	United Kingdom
8	Australia

Table 13: Country Numbers for DHCP Option 156 (Continued)

Number	Country
9	Hong Kong
10	Malaysia
11	Singapore
12	Brazil
13	Netherlands
14	New Zealand
15	Portugal
16	Ireland
17	Belgium
18	Mexico
19	Denmark
20	Sweden
21	Switzerland
22	Austria
23	India
24	China
25	Norway
26	United Arab Emirates
28	Japan
29	Taiwan
30	South Korea
31	Luxembourg
32	Finland
33	Philippines
34	Thailand
35	Poland
36	Czech Republic
37	South Africa
38	Costa Rica
39	Greece
41	Monaco (France)
42	Israel
44	Indonesia

Table 13: Country Numbers for DHCP Option 156 (Continued)

Number	Country
46	Hungary
48	Fiji
49	Mongolia

Table 14: Language Numbers by Country for DHCP Option 156

Number	Language (Country)
1	U.S., Canada, Mongolia, Philippines, Thailand
2	Spain (CALA)
3	Germany, Austria
4	English (UK), Czech Republic, Ireland, Malaysia, Greece, Hong Kong, New Zealand, Poland, India, Romania, Singapore, South Africa, United Arab Emirates, Indonesia, Finland
5	France (Parisian), Belgium, Luxembourg, Switzerland, Monaco (France)
6	Netherlands
7	Mexico, Cost Rica, Chile
8	Denmark
9	Italy
10	Sweden
11	China
12	Norway, Finland
13	Brazil (Portuguese)
14	Japan
15	South Korea
17	Taiwan (Mandarin)
18	Portugal
22	Bulgaria
23	Australia, Fiji

Configuring Automatic VLAN Assignment Using DHCP

You can configure an IP phone to automatically determine its VLAN ID through DHCP. When the phone boots for the first time, it acquires an IP address via DHCP similar to any other network device. However, the DHCP response also specifies (using a proprietary DHCP option) the VLAN ID for the phone to use. The phone then releases the IP address originally assigned to it and reboots. After the phone reboots, all packets are tagged with the VLAN ID specified in the original DHCP response.

The Automatic VLAN Assignment feature is configured on the DHCP server rather than through ShoreTel Connect Director.

Configuring Automatic VLAN Assignment on a DHCP Server

1. Open DHCP Manager on your Microsoft DHCP server.
2. Right-click the **DHCP server** and select **Set pre-defined options**.
3. Click **Add**.
4. Set Name to IP Phone Boot Server.
5. Set Data Type to String.
6. Set Code to 156 and add a description, if desired.
7. Navigate to the scope options and add option 156.
8. Set the value of option 156 as follows:

   `ftpservers=`*`ip_address`*`, layer2tagging=`*`n`*`, vlanid=`*`x`*

   Where

   - *`ip_address`* is the IP address of the ShoreTel Headquarters server.
   - *`n`* in `layer2tagging=`*`n`* is `0` (to disable 802.1Q) or `1` (to enable 802.1Q). The default is 0.
   - *`x`* in `vlanid=`*`x`* corresponds to a VLAN ID number between 0 and 4094 when 802.1Q is enabled. The default is 0.

   For example, the following would enable VLAN tagging using a VLAN ID of 10:

   ```
   FtpServers=192.168.0.13, Layer2Tagging=1, vlanid=10
   ```

Configuring Automatic VLAN Assignment Using DHCP During ShoreTel IP Phone Standard Boot Process

1. As the ShoreTel IP Phone powers up, a DHCP request is sent to the data network on the default, untagged VLAN.

2. The DHCP Server is on the same VLAN as the phone and replies back with the Option 156 information configured on the untagged Data VLAN DHCP Scope redirecting to the Voice VLAN ID 20.
3. Upon receipt of this information, the IP phone immediately resets and releases its Data VLAN IP address. The IP phone display briefly shows "Redirecting Network".
4. The ShoreTel IP Phone sends a second DHCP request but this time to the Voice VLAN 20 DHCP Scope.
5. The L3 data switch receives this request on the Voice VLAN and forwards it, via the "IP helper address" 10.10.10.10 to the DHCP server and the Data VLAN.
6. The DHCP server replies to the IP phone with a new IP address from the Voice VLAN DHCP Scope Address Pool as well as its Option 156 network settings and other scope options.
7. The IP Phone via FTP downloads its configuration file, upgrades the Boot Image, if needed, as well as other required files and finally reboots.
8. The Phone registers successfully and is ready for service.

Configuring Automatic VLAN Assignment Using LLDP

LLDP (IEEE 802.1AB) is a vendor agnostic Layer 2 protocol designed to be used by network devices for advertising their identity, capabilities, and neighbors on a IEEE 802 Ethernet LAN. LLDP performs similar functions as several proprietary protocols such as the Cisco Discovery Protocol (CDP), Extreme Discovery Protocol, Nortel Discovery Protocol and Microsoft's Link Layer Topology Discovery. An enhancement to LLDP is LLDP-MED, Link Layer Discovery Protocol-Media Endpoint Discovery. LLDP eliminates the phone from using the untagged Data VLAN and allows only one DHCP request directly on the Voice VLAN.

Configuring Automatic VLAN Assignment Using LLDP-MED During the ShoreTel IP Phone Standard Boot Process

1. As the phone powers up, the Ethernet switch sends LLDP Data Units defined as LLDP_Multicast packets to the Phone.
2. The Phone responds in kind adding TIA Organizationally Specific LLDP-MED TLV's such as "TIA - Network Policy" with "VLAN Id: 0" among many other TLV extensions. "VLAN Id: 0" is the request from the phone asking the Ethernet switch for the Voice VLAN ID as well as L2 Priority, DSCP value, and etc.
3. The Ethernet switch in turn responds to the phone with the same TIA LLDP-MED TLV extensions and in the "TIA - Network Policy" TLV, the designated VLAN Id of the Voice VLAN is offered to the phone (e.g. VLAN Id: 50)

4. The Phone performs a typical DHCP sequence of Discover, Offer, Request, Ack to get an IP address plus available DHCP Options from the Voice VLAN.
5. The Phone via FTP downloads its configuration file, upgrades the Boot Image if needed as well as other required files and finally reboots.
6. The Phone registers successfully and is ready for service.

Time Services

For ShoreTel IP phones, time services must be available to provide the telephone's date and time display. This requires a server that supports Simple Network Time Protocol (SNTP).

If an organization does not have an NTP server, it can use a publicly accessible time server. For information about publicly accessible time servers, see http://support.ntp.org/bin/view/Servers/WebHome.

ShoreTel 100-, 200-, 500-, and 600-Series IP phones receive SNTP server information from the DHCP server.

ShoreTel 400-Series IP phones depend on a Network Time Protocol (NTP) server to authenticate a secure connection and to provide the date and time to be displayed on for the phone's screen. The time displayed on the phone is the GMT value provided by the NTP server plus the offset from the time zone setting of the phone. On the ShoreTel IP480, IP480g, and IP485g phone models, users can change the time zone from the default value through the Options menu on the phone.

Virtual Private Network (VPN)

Internet Protocol Virtual Private Networks (IP VPNs) are often the secure access of choice. IP VPNs establish secure communications between employees, branches, or partners by using strong IP-based encryption and authentication techniques for transport security over the public Internet.

IP VPNs are typically viewed as falling into three major categories: remote access VPNs, intranets (company site-to-site), and extranets (business-to-business). These services are used by companies of all sizes because of the powerful combination of high-speed access links and public networks. An example is the use of high-speed, low-cost broadband DSL connectivity to enable teleworkers or branch offices to link securely with the company network via the Internet, as if they were accessing the LAN, including all network applications, at the office. A sample VPN configuration is shown in Figure 1 on page 60.