

Grandstream Networks, Inc.

GRP26XX Carrier-Grade IP Phones

DHCP Options Guide - Linux



Table of Contents

SUPPORTED DEVICES	5
INTRODUCTION.....	6
ENVIRONMENT SETUP	7
Step 1: Install DHCP Server	7
Step 2: DHCP Server Basic Configuration	7
Start and Stop DHCP service.....	8
DHCP OPTIONS	9
DHCP Option 42 (NTP Server)	9
DHCP Option 2 (Time Offset)	10
DHCP Option 66 (TFTP Server Name).....	11
DHCP Option 43 (Vendor Specific Information).....	12
DHCP Option 12 (Host Name).....	13
DHCP Option 60 (Vendor Class Identifier).....	14
DHCP Option 120 (SIP Server).....	15
DHCP Option 125 (Vendor-Identifying Vendor Options)	16
DHCP Option 132 (Vlan ID).....	17
DHCP Option 133 (QoS priority level).....	18
DHCP Option 150 (TFTP Servers List)	19
DHCP Option 160 (Configuration Server Address)	20
DHCP Option 242 (Avaya IP Phones).....	21



Table of Figures

Figure 1: DHCP Flow	6
Figure 2: Installing isc-dhcp-server	7
Figure 3: isc-dhcp-server file.....	7
Figure 4: Edit isc-dhcp-server file	7
Figure 5: “dhcpd.conf” file	8
Figure 6: “dhcpd.conf”	8
Figure 7: Restart/Start/Stop Services	8
Figure 8: DHCP Option 42	9
Figure 9: DHCP Discover Request for Option 42	9
Figure 10: DHCP Offer Reply for the Option 42.....	9
Figure 11: DHCP Option 2	10
Figure 12: DHCP Discover Request for Option 2	10
Figure 13: DHCP Offer Reply for the Option 2.....	10
Figure 14: DHCP Option 66	11
Figure 15: DHCP Discover Request for Option 66	11
Figure 16: DHCP Offer Reply for the Option 66.....	11
Figure 17: DHCP Option 43	12
Figure 18: DHCP Discover Request for Option 43	12
Figure 19: DHCP Offer Reply for the Option 43.....	12
Figure 20: DHCP Discover Advertisement for Option 12	13
Figure 21: DHCP Option 60	14
Figure 22: DHCP Discover Advertisement for Option 60	14
Figure 23: DHCP Offer Reply for Option 60.....	14
Figure 24: DHCP Option 120	15
Figure 25: DHCP Discover Request for Option 120	15
Figure 26: DHCP Offer Reply for Option 120.....	15
Figure 27: DHCP Discover Advertisement for Option 125.....	16
Figure 28: DHCP Option 132	17
Figure 29: DHCP Discover Request for Option 132	17



Figure 30: DHCP Offer Reply for Option 132.....	17
Figure 31: DHCP Option 133	18
Figure 32: DHCP Discover Request for Option 133	18
Figure 33: DHCP Offer Reply for Option 133.....	18
Figure 34: DHCP Option 150	19
Figure 35: DHCP Discover Request for Option 150	19
Figure 36: DHCP Offer Reply for Option 150.....	19
Figure 37: DHCP Option 160	20
Figure 38: DHCP Discover Request for Option 160	20
Figure 39: DHCP Offer Reply for Option 160.....	20
Figure 40: DHCP Option 242	21
Figure 41: DHCP Discover Request for Option 242	21
Figure 42: DHCP Offer Reply for Option 242.....	21



SUPPORTED DEVICES

Following table shows Grandstream products supporting DHCP Options:

		DHCP Options																			
		1	2	3	6	12	15	28	43	53	55	57	60	61	66	120	125	132	150	160	255
GRP2612		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
GRP2613		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
GRP2614		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
GRP2615		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓



INTRODUCTION

Dynamic Host Configuration Protocol (DHCP) is a standardized network protocol used on Internet Protocol (IP) networks for dynamically distributing network configuration parameters, such as IP addresses for interfaces and services. With DHCP, network devices request IP addresses and networking parameters automatically from a DHCP server, reducing the need for a network administrator or a user to configure these settings manually.

DHCP servers can be configured to provide optional data that fully configures TCP/IP on a client. Some of the most common DHCP option types configured and distributed by the DHCP server during leases include default gateway, router, DNS, and WINS parameters.

This guide describes advanced DHCP options supported on Grandstream products. Administrators can use these DHCP options for easy setup, to provide specific configuration per device model, synchronize time with NTP servers, configure ACS server URL on devices and more...

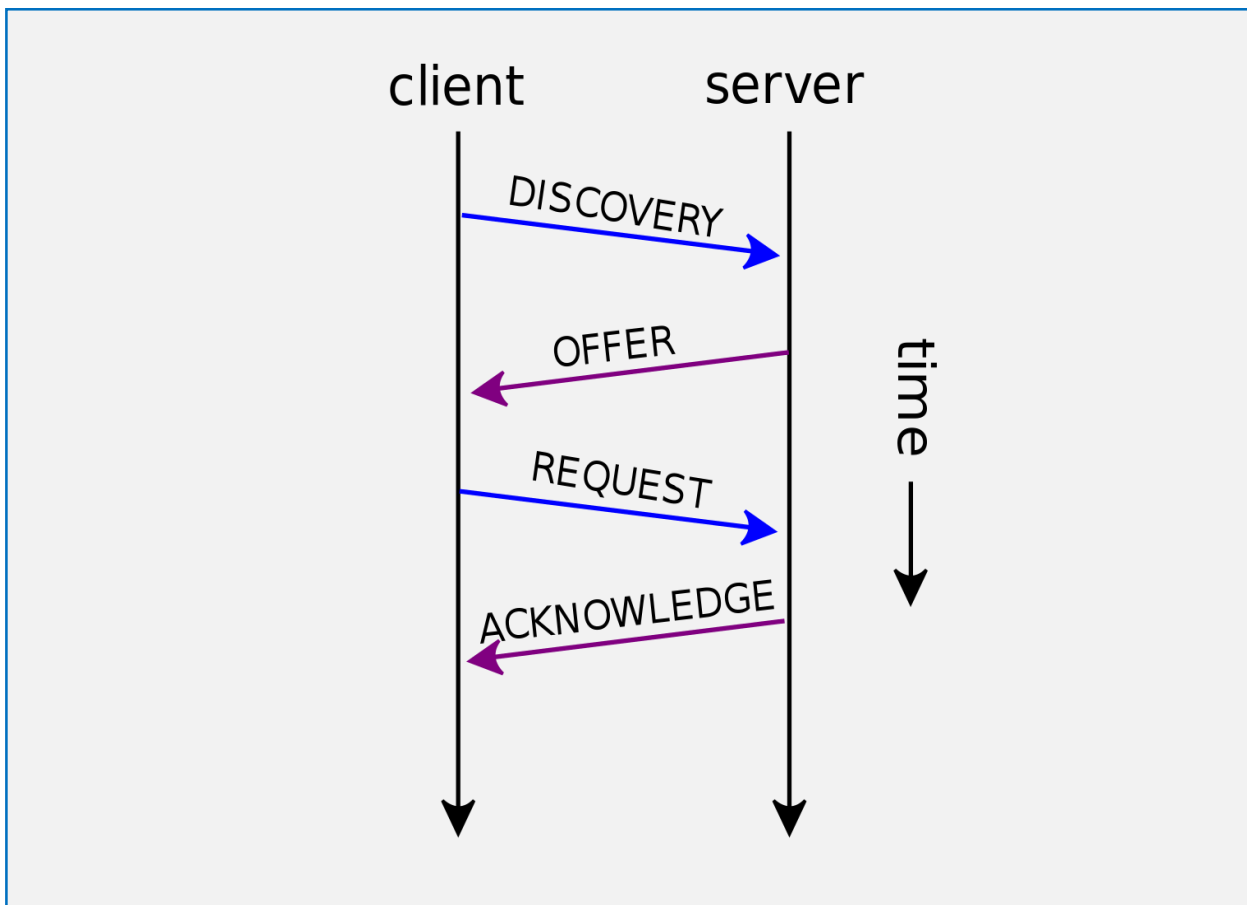


Figure 1: DHCP Flow

ENVIRONMENT SETUP

This chapter provides steps to setup a minimal test environment to run DHCP options described in this guide. In this guide, we will use isc-dhcp-server on an Ubuntu 12 machine with static IP 192.168.1.11. Administrators can use other Windows or Linux based DHCP servers at their convenience.

Note: This chapter can be skipped if a DHCP server supporting customizing options is already setup.

Step 1: Install DHCP Server

1. Launch a Linux terminal.
2. Login as root by typing **sudo su**
3. Download and install DHCP server using following command: **apt-get install isc-dhcp-server**

```
root@admin:/# apt-get install isc-dhcp-server
```

Figure 2: Installing isc-dhcp-server

Step 2: DHCP Server Basic Configuration

There are two main files to be configured:

/etc/default/isc-dhcp-server (specify network interface to use for DHCP server)

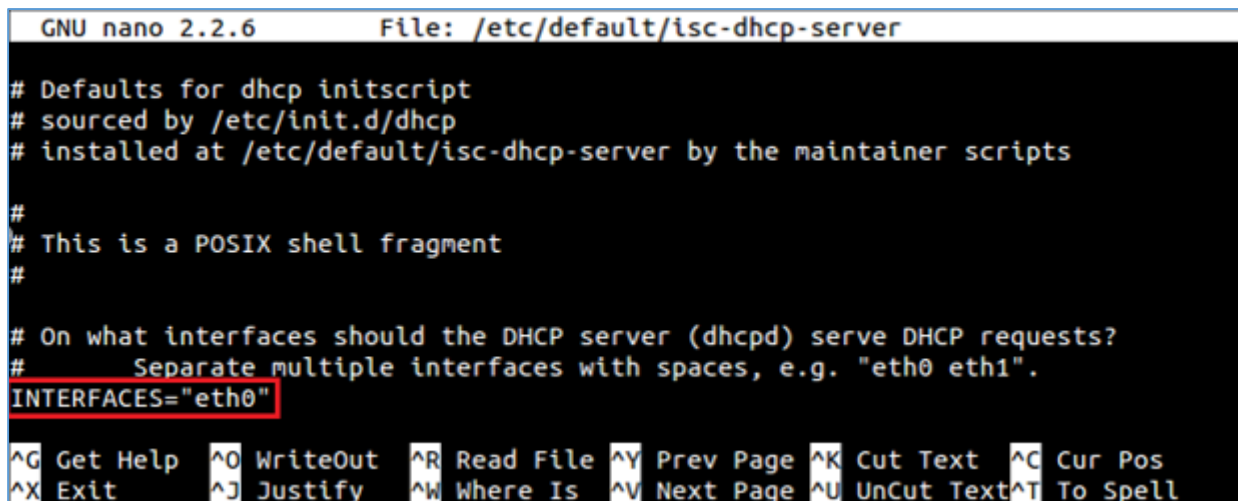
/etc/dhcp/dhcpd.conf (all DHCP Options in this guide can be defined in dhcpd.conf file)

1. Enter **nano /etc/default/isc-dhcp-server** to edit **isc-dhcp-server** file

```
# nano /etc/default/isc-dhcp-server
```

Figure 3: isc-dhcp-server file

2. Replace **eth0** with the network interface to use for DHCP server.



```
GNU nano 2.2.6      File: /etc/default/isc-dhcp-server

# Defaults for dhcp initscript
# sourced by /etc/init.d/dhcp
# installed at /etc/default/isc-dhcp-server by the maintainer scripts
#
# This is a POSIX shell fragment
#
# On what interfaces should the DHCP server (dhcpd) serve DHCP requests?
#       Separate multiple interfaces with spaces, e.g. "eth0 eth1".
INTERFACES="eth0"

^G Get Help  ^O WriteOut  ^R Read File ^Y Prev Page ^K Cut Text  ^C Cur Pos
^X Exit      ^J Justify   ^W Where Is ^V Next Page ^U UnCut Text ^T To Spell
```

Figure 4: Edit isc-dhcp-server file



3. Save and exit the file using **Ctrl+X**
4. Enter **nano /etc/dhcp/dhcpd.conf** to edit **dhcpd.conf** file

```
root@admin:/# nano /etc/dhcp/dhcpd.conf
```

Figure 5: “dhcpd.conf” file

5. Configure DHCP server with basic options including *subnet*, *netmask*, *range*...
Screenshot below shows an example of configuration; in this example DHCP server will provide clients IP addresses from range 192.168.1.10 to 192.168.1.200. The server will lease an IP address for 180 seconds if no specific time frame requested by the client; otherwise, maximum (allowed) lease is 7200 seconds. DHCP server will also advise clients to use 255.255.255.0 as subnet mask, 192.168.1.10 as router/gateway, 192.168.1.1 and 192.168.1.2 as DNS servers.

```
# Sample configuration file for ISC dhcpd for Debian
#
# Attention: If /etc/ltsp/dhcpd.conf exists, that will be used as
# configuration file instead of this file.

authoritative;
default-lease-time 180;
max-lease-time 7200;
option routers 192.168.1.10;
option domain-name-servers 192.168.1.1, 192.168.1.2;
option domain-name "EMEA.com";

subnet 192.168.1.0 netmask 255.255.255.0 {
    range 192.168.1.10 192.168.1.200;
}

^G Get Help  ^O WriteOut  ^R Read File  ^Y Prev Page  ^K Cut Text   ^C Cur Pos
^X Exit      ^J Justify   ^W Where Is  ^V Next Page  ^U UnCut Text ^T To Spell
```

Figure 6: “dhcpd.conf”

6. Restart DHCP server

Start and Stop DHCP service

```
service isc-dhcp-server restart
service isc-dhcp-server start
service isc-dhcp-server stop
```

Figure 7: Restart/Start/Stop Services



DHCP OPTIONS

DHCP Option 42 (NTP Server)

Description

DHCP option 42 specifies a list of NTP servers available to the client by IP address.

Please refer to RFC2132 for more details.

Example

```
option ntp-servers 192.168.1.12;
```

Figure 8: DHCP Option 42

Screenshots

Below screenshots of DHCP Discover/Offer for Option 42.

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678
Parameter Request List Item: (28) Broadcast Address					
Parameter Request List Item: (42) Network Time Protocol Servers					
Parameter Request List Item: (43) Vendor-Specific Information					

Figure 9: DHCP Discover Request for Option 42

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678
+ Option: (15) Domain Name					
+ Option: (42) Network Time Protocol Servers					
Length: 4					
Network Time Protocol Server: 192.168.1.12 (192.168.1.12)					
+ Option: (43) Vendor-Specific Information					

Figure 10: DHCP Offer Reply for the Option 42



DHCP Option 2 (Time Offset)

Description

DHCP option 2 informs the client about the time zone offset (in seconds).

A positive offset indicates a location east of the zero meridian and a negative offset indicates a location west of the zero meridian.

Please refer to RFC2132 for more details.

Example

```
option time-offset 3600;
```

Figure 11: DHCP Option 2

In above example, GMT+1 was set as an offset value
 (one hour * 60 minutes/hour * 60 seconds/minute) = 3600.

To set Pacific Standard Time (GMT-8). This field would be filled with “-28800”.
 (Eight hours * 60 minutes/hour * 60 seconds/minute).

Screenshots

Below screenshots of DHCP Discover/Offer for Option 2

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678
Parameter Request List Item: (3) Router					
Parameter Request List Item: (2) Time Offset					
Parameter Request List Item: (6) Domain Name Server					

Figure 12: DHCP Discover Request for Option 2

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678
Option: (1) Subnet Mask					
Option: (2) Time Offset					
Length: 4					
Time Offset: (3600s) 1 hour					
Option: (6) Domain Name Server					

Figure 13: DHCP Offer Reply for the Option 2



DHCP Option 66 (TFTP Server Name)

Description

DHCP option 66 provides the IP address or the hostname of a single provisioning server where devices will be redirected to get their configuration files. Without this DHCP option, a manual configuration is requested on each phone the first time it boots.

Please refer to RFC2132/RFC5859 for more details.

Please refer to below link to learn how to provision Grandstream devices:

http://www.grandstream.com/sites/default/files/Resources/gs_provisioning_guide.pdf

Example

```
option tftp-server-name "192.168.1.18";
option tftp-server-name "http://192.168.1.18";
```

Figure 14: DHCP Option 66

If **http://** is not specified, default TFTP protocol is used for configured server.

Screenshots

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678
Parameter Request List Item: (59) Rebinding Time Value					
Parameter Request List Item: (66) TFTP Server Name					
Parameter Request List Item: (120) SIP Servers					

Figure 15: DHCP Discover Request for Option 66

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678
Option: (43) Vendor-Specific Information					
Option: (66) TFTP Server Name					
Length: 12					
TFTP Server Name: 192.168.1.18					
Option: (120) SIP Servers					

Figure 16: DHCP Offer Reply for the Option 66



DHCP Option 43 (Vendor Specific Information)

Description

This option is used by clients and servers to exchange vendor-specific information.

DHCP server can send one or more vendor specific parameters to clients, encoded in the form **option_code/value_length/value** in hexadecimal format.

Please refer to RFC2132 for more details.

Example

In following example, DHCP server is configured to send CWMP information (ACS URL <http://192.168.1.18>) encapsulated in option 43.

```
option vendor-encapsulated-options 01:13:68:74:74:70:3A:2F:2F:31:39:32:2E:31:36:38:2E:31:2E:31:38;
```

Figure 17: DHCP Option 43

Above DHCP option 43 contains the following:

0x01 (CWMP option for ACS URL)

0x13 (hex of decimal 19 = length of the URL)

19 bytes forming the URL in hexadecimal format (<http://192.168.1.18>)

Screenshots

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678
Parameter Request List Item: (42) Network Time Protocol Servers					
Parameter Request List Item: (43) Vendor-Specific Information					
Parameter Request List Item: (51) IP Address Lease Time					

Figure 18: DHCP Discover Request for Option 43

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678
Option: (42) Network Time Protocol Servers					
Option: (43) Vendor-Specific Information					
Length: 21					
Value: 0113687474703a2f2f3139322e3136382e312e3138					
Option: (58) Renewal Time value					

Figure 19: DHCP Offer Reply for the Option 43



DHCP Option 12 (Host Name)

Description

This option specifies the name of the client.

Option 12 is used to identify the client's name against the DHCP server in order to make special configuration from the server side, this is similar to option 60 and 125.

Please refer to RFC1533/RFC2132 for more details

Screenshots

Below screenshot is taken from GRP2614, the value of Option 12 can be modified from the WebGUI under **Network Settings > Basic Settings**.

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678
<div> <input type="checkbox"/> Option: (12) Host Name Length: 10 Host Name: Production </div>					

Figure 20: DHCP Discover Advertisement for Option 12



DHCP Option 60 (Vendor Class Identifier)

Description

Option 60 is used by clients to optionally identify the vendor type and configuration of a DHCP client. When using multiple devices from different vendors, DHCP server can provide specific configuration for each client based on received Option 60.

Please refer to RFC1533/RFC2132 for more details.

Example

In following example, option 60 is configured to identify GRP2614 with its value "Grandstream GRP2614 dslforum.org".

If option 60 received matches the one configured, GRP2614 phone will get option 66 (tftp-server-name) with value 192.168.1.20. For all other clients, they will get option 66 with value 192.168.1.18

```
option time-offset 3600;
option tftp-server-name "192.168.1.18";

if ( substring (option vendor-class-identifier, 0, 32) = "Grandstream GXP2170 dslforum.org")
{
  option tftp-server-name "192.168.1.20";
}
```

Figure 21: DHCP Option 60

Note: 32 is the number of digits that "Grandstream GRP2614 dslforum.org" contains.

Screenshots

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678

✓ Option: (60) Vendor class identifier
 Length: 32
 Vendor class identifier: Grandstream GRP2614 dslforum.org

Figure 22: DHCP Discover Advertisement for Option 60

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678

⊕ Option: (42) Network Time Protocol Servers
 ⊖ Option: (43) Vendor-Specific Information
 Length: 21
 Value: 0113687474703a2f2f3139322e3136382e312e3138
 ⊕ Option: (66) TFTP Server Name

Figure 23: DHCP Offer Reply for Option 60



DHCP Option 120 (SIP Server)

Description

The option is used to provide SIP server IP address or FQDN to SIP clients.

Please refer to RFC3361 for more details.

Example

```
option sip-servers code 120 = { integer 8, ip-address};
option sip-servers 1 192.168.1.17;
```

Figure 24: DHCP Option 120

Screenshots

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678
Parameter Request List Item: (66) TFTP Server Name					
Parameter Request List Item: (120) SIP Servers					
Parameter Request List Item: (125) V-I Vendor-specific Information					

Figure 25: DHCP Discover Request for Option 120

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678
⊕ Option: (66) TFTP Server Name					
⊖ Option: (120) SIP Servers					
Length: 5					
SIP Server Encoding: IPv4 Address (1)					
SIP Server Address: 192.168.1.17 (192.168.1.17)					
⊕ Option: (160) Unassigned					

Figure 26: DHCP Offer Reply for Option 120



DHCP Option 125 (Vendor-Identifying Vendor Options)

Description

DHCP clients may use this option to identify the vendor that manufactured the hardware on which the client is running the software in use in a unique way.

Option 125 is similar to option 12 & 60 but advertising more parameters of a device:

- **DeviceManufacturerOUI**
- **DeviceSerialNumber** (Grandstream products set DeviceSerialNumber with MAC address)
- **DeviceProductClass**

Please refer to RFC3925 for more details.

Screenshots

During DHCP initiation, **DHCP Discover/DHCP Request** including option 125 are sent from client, the server checks **V-I Vendor-specific information**, if matching configured values, specific configuration will be provided to client, otherwise, common configuration is provided to client.

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678

✓ Option: (125) V-I Vendor-specific Information
 Length: 36

✓ Enterprise: The Broadband Forum (3561)
 Length: 31

✓ Option 125 Suboption: (1) DeviceManufacturerOUI
 Length: 6
 DeviceManufacturerOUI: 00:0b:82 (Grandstream Networks,

✓ Option 125 Suboption: (2) DeviceSerialNumber
 Length: 12
 DeviceSerialNumber: 000b82f55284

✓ Option 125 Suboption: (3) DeviceProductClass
 Length: 7
 DeviceProductClass: GRP2614

Figure 27: DHCP Discover Advertisement for Option 125

Advertised information in above option 125 are:

- DeviceManufacturerOUI = **00:0b:82**
- DeviceSerialNumber = DeviceMACaddress = **000b82XXXXXX**
- DeviceProductClass = **GRP2614**



DHCP Option 132 (Vlan ID)

Description

This option allows to assign a VLAN ID tag to devices during booting stage/DHCP renewal.

Please refer to RFC4578 / IEEE_802.1Q for more details.

Example

```
option vlan-id code 132 = text;
option vlan-id "20";
```

Figure 28: DHCP Option 132

Screenshots

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678
Parameter Request List Item: (125) V-I Vendor-specific Information					
Parameter Request List Item: (132) PXE - undefined (vendor specific)					
Parameter Request List Item: (133) PXE - undefined (vendor specific)					

Figure 29: DHCP Discover Request for Option 132

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678
+ Option: (120) SIP Servers					
- Option: (132) PXE - undefined (vendor specific)					
Length: 2					
Value: 3230					
+ Option: (133) PXE - undefined (vendor specific)					

Figure 30: DHCP Offer Reply for Option 132

In above screenshot, value 3230 is 20 (vlan-id) converted from text to hexadecimal.

Note: After getting VLAN ID from DHCP server and finishing DHCP process, the device will send a second DHCP discover its new assigned VLAN tag to get an IP address on the VLAN range.



DHCP Option 133 (QoS priority level)

Description

This option assigns the priority within an Ethernet frame header when using VLAN tag, it specifies a priority value between 0 and 7 to differentiate the traffic priority.

Please refer to RFC4578 / IEEE_P802.1p for more details

Example

```
option vlan-qos code 133 = text;  
option vlan-qos "5";
```

Figure 31: DHCP Option 133

Screenshots

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678
Parameter Request List Item: (132) PXE - undefined (vendor specific)					
Parameter Request List Item: (133) PXE - undefined (vendor specific)					
Parameter Request List Item: (160) Unassigned					

Figure 32: DHCP Discover Request for Option 133

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678
⊕ Option: (132) PXE - undefined (vendor specific)					
⊖ Option: (133) PXE - undefined (vendor specific)					
Length: 1					
Value: 35					
⊕ Option: (160) Unassigned					

Figure 33: DHCP Offer Reply for Option 133

In above screenshot, value 35 is 5 (priority level) converted from text to hexadecimal.



DHCP Option 150 (TFTP Servers List)

Description

DHCP option 150 provides one or more IP addresses of TFTP server(s) where devices will be redirected to download their configuration files. Without this DHCP option, a manual configuration is requested on each phone the first time it boots.

Please refer to RFC5859 for more details.

Please refer to below link to learn how to provision Grandstream devices:

http://www.grandstream.com/sites/default/files/Resources/gs_provisioning_guide.pdf

Example

```
option option-150 code 150 = ip-address;
option option-150 192.168.1.18;
```

Figure 34: DHCP Option 150

Screenshots

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678
Parameter Request List Item: (120) SIP Servers					
Parameter Request List Item: (125) V-I Vendor-specific Information					
Parameter Request List Item: (150) TFTP Server Address					

Figure 35: DHCP Discover Request for Option 150

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678
+ Option: (120) SIP Servers					
- Option: (150) TFTP Server Address					
Length: 4					
TFTP Server Address: 192.168.1.18 (192.168.1.18)					
+ Option: (255) End					

Figure 36: DHCP Offer Reply for Option 150



DHCP Option 160 (Configuration Server Address)

Description

Similar to option 66, DHCP option 160 can provide one or more configuration server(s) to clients to get automatically provisioned. Without this DHCP option, a manual configuration is requested on each phone the first time it boots.

Example

```
option option-160 code 160 = text;  
option option-160 "tftp://192.168.1.12";
```

Figure 37: DHCP Option 160

Screenshots

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678
Parameter Request List Item: (133) PXE - undefined (vendor specific)					
Parameter Request List Item: (160) Unassigned					
Parameter Request List Item: (242) Private					

Figure 38: DHCP Discover Request for Option 160

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678
⊕ Option: (133) PXE - undefined (vendor specific)					
⊖ Option: (160) Unassigned					
Length: 19					
Value: 746674703a2f2f3139322e3136382e312e3132					
⊕ Option: (242) Private					

Figure 39: DHCP Offer Reply for Option 160

In above screenshot, the value of the TFTP server was converted to hexadecimal. The phone contacts this IP address to get provisioned after receiving TFTP server value.



DHCP Option 242 (Avaya IP Phones)

Description

Once this option enabled, the phone will use configuration info issued by DHCP sever.

Option 242 can include following parameters:

- MC IP address
- VLAN configuration
- HTTP server, Proxy
- Transport Protocol

Example

```
option option-242 code 242 = string;
option option-242 "MCIPADD=192.168.1.30,HTTPSRVR=192.168.1.31";
```

Figure 40: DHCP Option 242

Screenshots

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678
Parameter Request List Item: (133) PXE - undefined (vendor specific)					
Parameter Request List Item: (160) Unassigned					
Parameter Request List Item: (242) Private					

Figure 41: DHCP Discover Request for Option 242

No.	Time	Source	Destination	Protocol	Info
52	4.224	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0x8119678
64	5.227	192.168.1.1	192.168.1.16	DHCP	DHCP Offer - Transaction ID 0x8119678
67	5.231	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0x8119678
68	5.256	192.168.1.1	192.168.1.16	DHCP	DHCP ACK - Transaction ID 0x8119678
Option: (160) Unassigned					
Option: (242) Private					
Length: 42					
Value: 4d4349504144443d3139322e3136382e312e33302c485454...					
Option: (255) End					

Figure 42: DHCP Offer Reply for Option 242

In above screenshot, MCIPADD and HTTPSRVR are converted to hexadecimal.

