Sun Ethernet Fabric Operating System

DHCP Administration Guide

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Contents

Using This Documentation

SEFOS DHCP is a portable implementation of the dynamic host configuration protocol specification provided in RFC 2131. The product design supports portability on a wide range of routers and gateways, from monolithic to distributed-shared memory or message passing architectures. This document describes the basic and advanced configuration tasks of SEFOS DHCP.

Product Notes

For late-breaking information and known issues about the following products, refer to the product notes at:

Sun Network 10GbE Switch 72p:

`http://www.oracle.com/pls/topic/lookup?ctx=SN-10GbE-72p`

Related Documentation

Documentation	Links
All Oracle products	http://oracle.com/documentation
Sun Blade 6000 Ethernet Switched NEM 24p 10GbE	http://www.oracle.com/pls/topic/lookup?ctx=SB6K-24p-10GbE
Sun Network 10GbE Switch 72p	http://www.oracle.com/pls/topic/lookup?ctx=SN-10GbE-72p
Sun Blade 6000 modular system	http://www.oracle.com/pls/topic/lookup?ctx=sb6000
Oracle Integrated Lights Out Manager (Oracle ILOM) 3.0	http://www.oracle.com/pls/topic/lookup?ctx=ilom30

For detailed information about the commands and options described in this document, refer to the *Sun Ethernet Fabric Operating System CLI Base Reference Manual*.

Acronyms and Abbreviations

Acronym or Abbreviation	Explanation
CLI	Command-line interface
DHCP	Dynamic Host Configuration Protocol
DNS	Domain name system
ICMP	Internet Control Message Protocol
IP	Internet Protocol

CLI Command Modes

The following table lists the configuration modes used in this document with their access and exit methods.

Command Mode	Access Method	Prompt	Exit Method
User EXEC	Access SEFOS from Oracle ILOM with read-only rights (privilege level 1).	`SEFOS>`	Use the `logout` or `exit` command to return to the Oracle ILOM prompt.
Privileged EXEC	Access SEFOS from Oracle ILOM with full administrative rights (privilege level 15).	`SEFOS#`	Use the `logout` or `exit` command to return to the Oracle ILOM prompt.
Global Configuration	From User EXEC mode, use the `enable` command.	`SEFOS(config)#`	Use the `end` command to return to Privileged EXEC mode.
Interface Configuration	From Global Configuration mode, use the `interface interface-type interface-id` command.	`SEFOS(config-if)#`	Use the `exit` command to return to Global Configuration mode, or use the `end` command to return to Privileged EXEC mode.
DHCP configuration	From Global Configuration mode, use the `dhcp pool integer` command (where integer can be any number, 1-2147483647) to create a DHCP server address pool and enter DHCP pool configuration mode.	`SEFOS(dhcp-config)#`	Use the `exit` command to return to Global Configuration mode, or use the `end` command to return to Privileged EXEC mode.

Feedback

Provide feedback on this documentation at:

http://www.oracle.com/goto/docfeedback

Support and Accessibility

Description	Links
Access electronic support through My Oracle Support	http://support.oracle.com For hearing impaired: http://www.oracle.com/accessibility/support.html
Learn about Oracle's commitment to accessibility	http://www.oracle.com/us/corporate/accessibility/index.html

Protocol Description

DHCP enables dynamic configuration of a host computer. When a DHCP client is turned on, it issues a broadcast message to any DHCP server that is on the network. An exchange takes place during which the DHCP server assigns an IP address to the client and informs the client of certain key network configuration parameters.

The SEFOS DHCP implementation complies with RFC 2131.

DHCP Server

The DHCP server maintains a configured set of IP address pools from which IP addresses are allocated to DHCP clients in the same subnet, whenever they request the server dynamically. Once the IP address is allocated, the server reserves this IP until the lease time for that IP expires. If the client does not renew the IP before the lease time expires, the IP will be returned to the free pool and will be offered to new clients.

DHCP Client

The DHCP client is the host that requests IP address for its interface. The client also configures the parameters, such as default router, DNS, subnet mask, and so on, offered by the server. See "Configuration Guidelines" on page 8. Note that the Sun Network 10GbE Switch 72p cannot function as a DHCP client at the time of this release.

DHCP Relay Agent

The DHCP relay agent is used to forward the DHCP packets between client and server when they are not in the same subnets. The relay receives packets from the client and inserts certain information, such as the network in which the packet is received, and then forwards it to the server. The server identifies the client's network from this information and allocates the IP accordingly, then sends the reply to the relay. The relay then strips the information inserted and broadcasts the packets into the client's network. See "Configuration Guidelines" on page 8.

Configuring DHCP

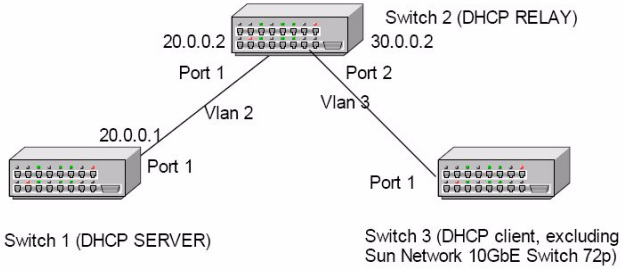
This section provides examples of DHCP configurations that have multiple switches.

Two-Switch Configuration

This figure shows the topology for a two-switch configuration. In this example, switch 2 is the DHCP client, except for cases where the Sun Network 10GbE Switch 72p is used.

Multiple-Switch Configuration

This figure shows the topology for a multiple-switch configuration. In this example, switch 1 is the DHCP server, switch 2 is the DHCP relay, and switch 3 is the DHCP client, except for cases where the Sun Network 10GbE Switch 72p is used.



Configuration Guidelines

The guidelines in this section apply to SEFOS DHCP configurations.

Refer to the *Sun Ethernet Fabric Operating System CLI Base Reference Manual* for the complete set of commands and the various options available for configuring DHCP.

DHCP Client

The DHCP server must assign an IP address to the router interface. If it does not, the DHCP `renew` command fails and displays the following error message:

```
Interface does not have a DHCP originated address
```

DHCP Relay Agent

The following requirements must be satisfied for the DHCP relay agent to work properly:

- The DHCP server must be disabled before enabling the DHCP relay agent.
- The relay agent must be enabled in order to become active.

Once the relay agent becomes active, it forwards the packets from the client to a DHCP server. The relay agent also performs any processing related to relay agent information options, such as inserting the necessary options while relaying a packet from a client to a server, and examining or stripping options when relaying a packet from a server to a client.

DHCP Server

The DHCP server has the following requirement and assumption about pool address assignment:

- DHCP relay must be disabled before enabling the DHCP server.
- The DHCP server assumes that all pool addresses may be assigned to clients.

Default Configurations

Feature	Default Setting
DHCP server status	Disabled
ICMP echo	Disabled
Offer reuse time out	5 seconds
DHCP next server address	0.0.0.0 (none)

Feature	Default Setting
Boot file name	Blank (none)
DHCP server pool lease time	3600 seconds
DHCP server pool utilization threshold	75%
DHCP server debug level	None
DHCP relay status	Disabled
DHCP relay server address	0.0.0.0 (none)
RAI option	Disabled
DHCP relay debug level	0x1

Enabling and Disabling the DHCP Server

▼ Enable the DHCP Server

The DHCP server is disabled by default. Complete the following task to enable the DHCP server.

1. Enable the DHCP server in switch 1.

```
SEFOS# configure terminal
SEFOS(config)# service dhcp-server
SEFOS(config)# end
```

2. View the DHCP server status.

```
SEFOS# show ip dhcp server information
```

The output in switch 1 appears as follows:

```
DHCP server status                          : Enable
Send Ping Packets                           : Disable
Debug level                                 : None
```

```
Server Address Reuse Timeout                : 5 secs
Next Server Address                         : 0.0.0.0
Boot file name                              :
```

▼ Disable the DHCP Server

The DHCP server is disabled by default. To disable it after it has been enabled, complete the following task.

1. Disable the DHCP server.

```
SEFOS# configure terminal
SEFOS(config)# no service dhcp-server
SEFOS(config)# end
```

2. View the DHCP server status.

```
SEFOS# show ip dhcp server information
```

The output in switch 1 is:

```
DHCP server status                          : Disable
Send Ping Packets                           : Disable
Debug level                                 : None
Server Address Reuse Timeout                : 5 secs
Next Server Address                         : 0.0.0.0
Boot file name                              :
```

▼ Enable ICMP Echo

Before the server offers a particular IP address to a client, generate an ICMP request to ensure that the address to be offered is not in use by any host in the network. In this example, this is performed in switch 1.

1. Enable an ICMP echo request.

```
SEFOS# configure terminal
SEFOS(config)# ip dhcp ping packets
SEFOS(config)# end
```

2. View the ICMP echo configuration for the DHCP server.

```
SEFOS# show ip dhcp server information

DHCP server status                          : Enable
Send Ping Packets                           : Enable
Debug level                                 : None
Server Address Reuse Timeout                : 5 secs
Next Server Address                         : 0.0.0.0
Boot file name                              :
```

▼ Specify the Amount of Time After Which an IP Address Is Made Available

Use the `offer-reuse` command to specify the maximum timeframe after which an offered IP address can be returned to the pool of free addresses. This timeframe can be from 1-120 seconds. In this example, the timeout is set to 10 seconds.

1. Configure the `offer-reuse` property to time out on switch 1.

```
SEFOS# configure terminal
SEFOS(config)# ip dhcp server offer-reuse 10
SEFOS(config)# end
```

2. View the change to the configuration.

```
SEFOS# show ip dhcp server information

DHCP server status                          : Enable
Send Ping Packets                           : Enable
Debug level                                 : None
Server Address Reuse Timeout                : 10 secs
Next Server Address                         : 0.0.0.0
Boot file name                              :
```

▼ Configure the Next Server

You can configure the IP address for the next server so the client avoids unnecessary broadcast packets if the server that offered the IP address is currently unavailable for renewal. In this example, the next server in the DHCP configuration is assigned an IP address of `12.0.0.5`.

1. Configure the server's IP address in switch 1.

```
SEFOS# configure terminal
SEFOS(config)# ip dhcp next-server 12.0.0.5
SEFOS(config)# end
```

2. View the changes to the configuration in switch 1.

```
SEFOS# show ip dhcp server information

DHCP server status                          : Enable
Send Ping Packets                           : Enable
Debug level                                 : None
Server Address Reuse Timeout                : 10 secs
Next Server Address                         : 12.0.0.5
Boot file name                              :
```

▼ Configure the Boot File Name

The boot file is used by the clients to identify the boot image. In this example, the boot file name is `Image.exe`.

1. Specify the name of the boot file in use on switch 1.

```
SEFOS# configure terminal
SEFOS(config)# ip dhcp bootfile Image.exe
SEFOS(config)# end
```

2. View the changes to the configuration in switch 1.

```
SEFOS# show ip dhcp server information

DHCP server status                              : Enable
Send Ping Packets                               : Enable
Debug level                                     : None
Server Address Reuse Timeout                    : 10 secs
Next Server Address                             : 12.0.0.5
Boot file name                                  : Image.exe
```

Configuring DHCP Global Options

▼ Configure DHCP Global Options

You can configure DHCP global options as described in this section. Global options are available to DHCP clients only when there is no host-specific option and there is no pool-specific option. The value applies to the complete DHCP pool in the specified switch.

In this example, `option 3` is the default router option for switch 1.

1. Configure the DHCP global option for the default router.

```
SEFOS# configure terminal
SEFOS(config)# ip dhcp option 3 ip 12.0.0.2
SEFOS(config)# end
```

2. View the global options configured in switch 1.

```
SEFOS# show ip dhcp server pools

Global Options
--------------
Code       :     3, Value      : 12.0.0.2
```

▼ Delete DHCP Global Options

In this example, `option 3` is the default router option for switch 1.

1. Remove the DHCP global option in switch 1.

```
SEFOS# configure terminal
SEFOS(config)# no ip dhcp option 3
SEFOS(config)# end
```

2. Ensure that the global option is removed.

```
SEFOS# show ip dhcp server pools
```

Configuring Address Pools

▼ Configure DHCP Address Pools

Address pools are used by servers to allocate the IP addresses to the client. You can specify the IP addresses that are available in the server to configure the clients. In this example, the address pool is `pool 1`, the network is `12.0.0.0`, and the mask is `255.0.0.0`.

1. Configure the address pool.

```
SEFOS# configure terminal
SEFOS(config)# ip dhcp pool 1
```

2. Configure the network and mask.

```
SEFOS(dhcp-config)# network 12.0.0.0 255.0.0.0
SEFOS(dhcp-config)# end
```

3. View the DHCP server pools that are available.

```
SEFOS# show ip dhcp server pools
```

The output in switch 1 is:

```
Pool Id                  : 1
-----------------------------------------
Subnet                    : 12.0.0.0
Subnet Mask               : 255.0.0.0
Lease time                : 3600 secs
Utilization threshold     : 75%
Start Ip                  : 12.0.0.1
End Ip                    : 12.255.255.255
Subnet Options
--------------
Code       :     1, Value      : 255.0.0.0
```

▼ Configure the End IP for the Address Pool

In this example, the address pool is `pool 1`, the network is `12.0.0.0`, the mask is `255.0.0.0`, and the end IP is `12.0.0.0`.

1. Create the address pool.

```
SEFOS# configure terminal
SEFOS(config)# ip dhcp pool 1
```

2. Configure the network as `12.0.0.0`, mask `255.0.0.0`, and end IP as `12.0.0.100`.

```
SEFOS(dhcp-config)# network 12.0.0.0 255.0.0.0 12.0.0.100
SEFOS(dhcp-config)# end
```

3. View the end IP value for the address pools.

```
SEFOS# show ip dhcp server pools
```

The output in switch 1 is:

```
Pool Id                  : 1
-----------------------------------------
Subnet                    : 12.0.0.0
```

```
Subnet Mask                : 255.0.0.0
Lease time                 : 3600 secs
Utilization threshold      : 75%
Start Ip                   : 12.0.0.1
End Ip                     : 12.0.0.100
```

▼ Configure the Lease Time

You can specify the amount of time the client can use (or lease) the IP address assigned by the server. This parameter is specific to each IP address pool. Every IP address allocated from a pool will be returned to the pool if the client does not renew the address before the lease-time expire interval.

In this example, the address pool is `pool 1`, and the lease time is specified as one day, two hours, and thirty minutes.

1. Create the address pool.

```
SEFOS# configure terminal
SEFOS(config)# ip dhcp pool 1
```

2. Specify the amount of time the client will use the IP address assigned to it by the server.

```
SEFOS(dhcp-config)# lease 1 2 30
SEFOS(dhcp-config)# end
```

3. View the lease time for address pools.

```
SEFOS# show ip dhcp server pools
```

The output in switch 1 is:

```
Pool Id                   : 1
-------------------------------------------
Subnet                     : 12.0.0.0
Subnet Mask                : 255.0.0.0
Lease time                 : 95400 secs
Utilization threshold      : 75%
Start Ip                   : 12.0.0.1
End Ip                     : 12.0.0.100
```

▼ Configure the Utilization Threshold

The utilization threshold specifies the upper limit (as a percentage) for the address pool utilization. The range of possible values is 0-100 percent. If the number of IP addresses allocated from the pool is near or above the utilization threshold percentage, the server will log an event in SYSLOG and send an SNMP trap message to the SNMP manager.

In this example, the address pool is `pool 1`, and the utilization threshold is 50%.

1. Create the address pool.

```
SEFOS# configure terminal
SEFOS(config)# ip dhcp pool 1
```

2. Specify the utilization threshold.

```
SEFOS(dhcp-config)# utilization threshold 50
SEFOS(dhcp-config)# end
```

3. View the utilization threshold of the address pools.

```
SEFOS# show ip dhcp server pools
```

The output in switch 1 is:

```
Pool Id                  : 1
-------------------------------------------
Subnet                    : 12.0.0.0
Subnet Mask               : 255.0.0.0
Lease time                : 95400 secs
Utilization threshold     : 50%
Start Ip                  : 12.0.0.1
End Ip                    : 12.0.0.100
```

▼ Create an Excluded Address in the Pool

You can use this option to specify a range of IP addresses that cannot be allocated for the client. The `no` form of the command deletes the excluded pool.

In this example, the range of excluded address pools is `12.0.0.1` through `12.0.0.10`. The first available IP in this pool will be `12.0.0.11`.

1. **Create the address pool.**

```
SEFOS# configure terminal
SEFOS(config)# ip dhcp pool 1
```

2. **Specify the excluded address pool.**

```
SEFOS(dhcp-config)# excluded-address 12.0.0.1 12.0.0.10
SEFOS(dhcp-config)# end
```

3. **View the excluded address pools.**

```
SEFOS# show ip dhcp server pools
```

The output in switch 1 is:

```
Pool Id                          : 1
-------------------------------------------
Subnet                           : 12.0.0.0
Subnet Mask                      : 255.0.0.0
Lease time                       : 95400 secs
Utilization threshold            : 50%
Start Ip                         : 12.0.0.1
End Ip                           : 12.0.0.100
Exclude Address Start IP         : 12.0.0.1
Exclude Address End IP           : 12.0.0.10
```

Configuring Pool-Specific Options

▼ Configure a Domain Name Option

You can use this option to set the domain name in the DHCP server configuration parameters. The `no` form of the command deletes the domain name from the DHCP server configuration parameters. This pool-specific configuration parameter is offered to DHCP clients in the pool only when there is no host-specific option for the client. If this option is not configured and there is no host option, the global option is used.

In this example, the domain name for the network is "future."

1. Create the address pool.

```
SEFOS# configure terminal
SEFOS(config)# ip dhcp pool 1
```

2. Specify the domain name for the network.

```
SEFOS(dhcp-config)# domain-name future
SEFOS(dhcp-config)# end
```

3. Ensure that the domain name option has been configured.

```
SEFOS# show ip dhcp server pools
```

The output in switch 1 is:

```
Pool Id                          : 1
-----------------------------------------
Subnet                           : 12.0.0.0
Subnet Mask                      : 255.0.0.0
Lease time                       : 95400 secs
Utilization threshold            : 50%
Start Ip                         : 12.0.0.1
End Ip                           : 12.0.0.100
Exclude Address Start IP         : 12.0.0.1
Exclude Address End IP           : 12.0.0.10

Subnet Options
--------------
Code       :     1, Value      : 255.0.0.0
Code       :    15, Value      : future
```

▼ Configure the DNS Option

This pool-specific option is offered to the DHCP client as a configuration parameter. This option is offered to DHCP clients in the pool only when there is no host-specific option for the client. If this option is not configured and there is no host option, the global option is used.

In this example, the DNS server address is `12.0.0.6`.

1. Create the address pool.

```
SEFOS# configure terminal
SEFOS(config)# ip dhcp pool 1
```

2. Specify the DNS IP address.

```
SEFOS(dhcp-config)# dns server 12.0.0.6
SEFOS(dhcp-config)# end
```

3. Ensure that the DNS IP address has been configured.

```
SEFOS# show ip dhcp server pools
```

The output in switch 1 is:

```
Pool Id                          : 1
-----------------------------------------
Subnet                           : 12.0.0.0
Subnet Mask                      : 255.0.0.0
Lease time                       : 95400 secs
Utilization threshold            : 50%
Start Ip                         : 12.0.0.1
End Ip                           : 12.0.0.100
Exclude Address Start IP         : 12.0.0.1
Exclude Address End IP           : 12.0.0.10

Subnet Options
--------------
Code       :     1, Value      : 255.0.0.0
Code       :     6, Value      : 12.0.0.6
Code       :    15, Value      : future
```

▼ Configure the NetBIOS Name Server

This pool-specific option is offered to DHCP clients as a configuration parameter. This option is offered to DHCP clients in the pool only when there is no host-specific option for the client. If this option is not configured and there is no host option, the global option is used.

In this example, the NetBIOS name server is configured as `12.0.0.7`.

1. Create the address pool.

```
SEFOS# configure terminal
SEFOS(config)# ip dhcp pool 1
```

2. Configure the NetBIOS name server in switch 1.

```
SEFOS(dhcp-config)# netbios-name-server 12.0.0.7
SEFOS(dhcp-config)# end
```

3. Ensure that the NetBIOS name server has been configured.

```
SEFOS# show ip dhcp server pools
```

The output in switch 1 is:

```
Pool Id                          : 1
-----------------------------------------
Subnet                           : 12.0.0.0
Subnet Mask                      : 255.0.0.0
Lease time                       : 95400 secs
Utilization threshold            : 50%
Start Ip                         : 12.0.0.1
End Ip                           : 12.0.0.100
Exclude Address Start IP         : 12.0.0.1
Exclude Address End IP           : 12.0.0.10

Subnet Options
--------------
Code       :     1, Value      : 255.0.0.0
Code       :     6, Value      : 12.0.0.6
Code       :    15, Value      : future
Code      :    44, Value      : 12.0.0.7
```

▼ Configure the NetBIOS Node Type

This pool-specific option is offered to DHCP clients as a configuration parameter. This option is offered to DHCP clients in the pool only when there is no host-specific option for the client. If this option is not configured and there is no host option, the global option is used.

In this example, the address pool is `pool 1`, and the NetBIOS node type is `b-node`.

1. Create the address pool.

```
SEFOS# configure terminal
SEFOS(config)# ip dhcp pool 1
```

2. Configure the NetBIOS node type.

```
SEFOS(dhcp-config)# netbios-node-type
SEFOS(dhcp-config)# end
```

3. Ensure that the NetBIOS node type has been configured.

```
SEFOS# show ip dhcp server pools
```

The output in switch 1 is:

```
Pool Id                          : 1
-----------------------------------------
Subnet                           : 12.0.0.0
Subnet Mask                      : 255.0.0.0
Lease time                       : 95400 secs
Utilization threshold            : 50%
Start Ip                         : 12.0.0.1
End Ip                           : 12.0.0.100
Exclude Address Start IP         : 12.0.0.1
Exclude Address End IP           : 12.0.0.10

Subnet Options
--------------
Code       :     1, Value      : 255.0.0.0
Code       :     6, Value      : 12.0.0.6
Code       :    15, Value      : future
Code       :    46, Value      : 1
```

▼ Configure the Default Router

This pool-specific option is offered to DHCP clients as a configuration parameter. This option is offered to DHCP clients in the pool only when there is no host-specific option for the client. If this option is not configured and there is no host option, the global option is used.

In this example, the address pool is `pool 1`, and the default router for the pool is `12.0.0.3`.

1. Create the address pool.

```
SEFOS# configure terminal
SEFOS(config)# ip dhcp pool 1
```

2. Configure the default router for the pool.

```
SEFOS(dhcp-config)# default-router 12.0.0.3
SEFOS(dhcp-config)# end
```

3. Ensure that the default router has been configured.

```
SEFOS# show ip dhcp server pools
```

The output in switch 1 is:

```
Pool Id                          : 1
-----------------------------------------
Subnet                           : 12.0.0.0
Subnet Mask                      : 255.0.0.0
Lease time                       : 95400 secs
Utilization threshold            : 50%
Start Ip                         : 12.0.0.1
End Ip                           : 12.0.0.100
Exclude Address Start IP         : 12.0.0.1
Exclude Address End IP           : 12.0.0.10

Subnet Options
--------------
Code       :     3, Value      : 12.0.0.3
Code       :     6, Value      : 12.0.0.6
Code       :    15, Value      : future
Code       :    44, Value      : 12.0.0.7
Code       :    46, Value      : 1
```

▼ Remove a Configured Default Router Subnet Option

This pool-specific option is offered to clients as a configuration parameter.

In this example, the address pool is `pool 1`, and the default router for the pool is `12.0.0.3`.

1. Create the address pool.

```
SEFOS# configure terminal
SEFOS(config)# ip dhcp pool 1
```

2. Remove the configured code 3 from the subnet option.

```
SEFOS(dhcp-config)# no default-router
```

3. View the remaining configured options.

```
SEFOS# show ip dhcp server pools
```

The output in switch 1 is:

```
Pool Id                          : 1
-----------------------------------------
Subnet                           : 12.0.0.0
Subnet Mask                      : 255.0.0.0
Lease time                       : 95400 secs
Utilization threshold            : 50%
Start Ip                         : 12.0.0.1
End Ip                           : 12.0.0.100
Exclude Address Start IP         : 12.0.0.1
Exclude Address End IP           : 12.0.0.10

Subnet Options
--------------
Code       :     6, Value      : 12.0.0.6
Code       :    15, Value      : future
Code       :    44, Value      : 12.0.0.7
Code       :    46, Value      : 1
```

▼ Configure Options Specific to Address Pools

You can specify options using the option codes specified in RFC 2132. This pool-specific option is offered to DHCP clients as a configuration parameter. This option is offered to DHCP clients in the pool only when there is no host-specific option for the client. If this option is not configured and there is no host option, the global option is used. See RFC 2132 for the complete list of DHCP options and their corresponding codes.

In this example, the address pool is `pool 1`, and the subnet mask option is `255.255.0.0`.

1. Create the address pool.

```
SEFOS# configure terminal
SEFOS(config)# ip dhcp pool 1
```

2. Configure option 1 (subnet mask option).

```
SEFOS(dhcp-config)# option 1 ip 255.255.0.0
SEFOS(dhcp-config)# end
```

3. View the options configured in the switch.

```
SEFOS# show ip dhcp server pools
```

The output in switch 1 is:

```
Pool Id                          : 1
-----------------------------------------
Subnet                           : 12.0.0.0
Subnet Mask                      : 255.0.0.0
Lease time                       : 95400 secs
Utilization threshold            : 50%
Start Ip                         : 12.0.0.1
End Ip                           : 12.0.0.100
Exclude Address Start IP         : 12.0.0.1
Exclude Address End IP           : 12.0.0.10

Subnet Options
--------------
Code        :    1, Value      : 255.255.0.0
Code        :    6, Value      : 12.0.0.6
Code        :   15, Value      : future
Code        :   44, Value      : 12.0.0.7
Code        :   46, Value      : 1
```

▼ Configure Host-Specific Options

In addition to configuring global and subnet options, you can also configure host-specific options. This configuration is used for specific hosts as a configuration parameter. See RFC 2132 for the complete list of DHCP options and their corresponding codes.

In this example, the address pool is `pool 1`, the MAC address is `00:11:22:33:44:55`, and the subnet mask option is `255.255.0.0`. This option is offered to DHCP clients with a hardware address of `00:11:22:33:44:55` even if there is a pool-specific option or global option with this option code.

1. Create the address pool.

```
SEFOS# configure terminal
SEFOS(config)# ip dhcp pool 1
```

2. Configure option 1 (subnet mask) and the MAC address.

```
SEFOS(dhcp-config)# host hardware-type 1 client-identifier
00:11:22:33:44:55 option 1 ip 255.255.0.0
SEFOS(dhcp-config)# end
```

3. View the options configured in the switch.

```
SEFOS# show ip dhcp server pools
```

The output in switch 1 is:

```
Pool Id                          : 1
-----------------------------------------
Subnet                           : 12.0.0.0
Subnet Mask                      : 255.0.0.0
Lease time                       : 3600 secs
Utilization threshold            : 75%
Start Ip                         : 12.0.0.1
End Ip                           : 12.255.255.255

Host Options
--------------
Client Identifier     Hardware type     Code      Value
00:11:22:33:44:55     1                 1         255.255.255.0
```

Enabling and Disabling Debug Traces for the DHCP Server

▼ Enable Debug Traces for the DHCP Server

1. Enable the debug trace for the DHCP server.

```
SEFOS# debug ip dhcp server all
```

2. View the debug trace level.

```
SEFOS# show ip dhcp server information
```

The output in switch 1 is:

```
DHCP server status                      : Enable
Send Ping Packets                       : Disable
Debug level                             : All
Server Address Reuse Timeout            : 5 secs
Next Server Address                     : 0.0.0.0
Boot file name                          :
```

▼ Disable Debug Traces for the DHCP Server

1. Disable the debug trace for the DHCP server.

```
SEFOS# no debug ip dhcp server all
```

2. Ensure that debugging has been deactivated.

```
SEFOS# show ip dhcp server information
```

The output in switch 1 is:

```
DHCP server status                      : Enable
Send Ping Packets                       : Disable
Debug level                             : None
Server Address Reuse Timeout            : 5 secs
Next Server Address                     : 0.0.0.0
Boot file name                          :
```

Configuring an Interface to Acquire or Use an IP Address

▼ Configure an Interface to Acquire a Dynamic IP Address

In this example, switch 1 is the DHCP server, and switch 2 is the DHCP client. `vlan1` of switch 2 must be allocated with a dynamic IP. In addition, the address pool is `pool 1`, the network address is `12.0.0.0`, and the mask option is `255.255.0.0`.

1. Enable the DHCP server in switch 1.

```
SEFOS# configure terminal
SEFOS(config)# service dhcp-server
```

2. Create the address pool.

```
SEFOS(config)# ip dhcp pool 1
```

3. Configure the network and mask.

```
SEFOS(dhcp-config)# network 12.0.0.0 255.0.0.0
SEFOS(dhcp-config)# end
```

4. View the configuration.

```
SEFOS# show ip dhcp server pools
Pool Id                                 : 1
-----------------------------------------
Subnet                                   : 12.0.0.0
Subnet Mask                              : 255.0.0.0
Lease time                              : 3600 secs
Utilization threshold                   : 75%
Start Ip                                : 12.0.0.1
End Ip                                  : 12.255.255.255

Subnet Options
--------------
Code        :    1, Value      : 255.255.0.0
```

5. View additional configuration details.

Note that DHCP does not cross the subnet.

```
SEFOS# show ip dhcp server information

DHCP server status                      : Enable
Send Ping Packets                       : Disable
Debug level                             : None
Server Address Reuse Timeout            : 5 secs
Next Server Address                     : 0.0.0.0
Boot file name                          : NULL
```

6. Instead of using port 1 as shown in the topologies presented in this guide, use port 41 of both switches as follows. The DHCP server must be enabled and there must be a pool available in the server for the client's subnet.

a. Connect a cable between port 41 of switch 1 and 2.

b. Activate interface 41.

```
SEFOS# configure terminal
SEFOS(config)# interface ex 0/41
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
```

c. Define a VLAN using port 41.

```
SEFOS(config)# vlan 41
SEFOS(config-vlan)# port ex 0/41
SEFOS(config-vlan)# exit
```

d. Assign IP `12.0.0.1` **to** `vlan 41`**.**

```
SEFOS(config)# interface vlan 41
SEFOS(config-if)# no shutdown
SEFOS(config-if)# ip address 12.0.0.1 255.255.255.0
SEFOS(config-if)# end
SEFOS#
```

7. Execute the following commands in switch 2 to acquire a dynamic IP for `vlan1` **(note that DHCP does not cross the subnet).**

a. Activate interface 41.

```
SEFOS# configure terminal
SEFOS(config)# interface ex 0/41
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
```

b. Create the same VLAN.

```
SEFOS(config)# vlan 41
SEFOS(config-vlan)# port ex 0/41
SEFOS(config-vlan)# exit
```

c. Change the IP allocation mode to dynamic.

```
SEFOS(config)# interface vlan 41
SEFOS(config-if)# no shutdown
SEFOS(config-if)# ip address dhcp
SEFOS(config-if)# end
SEFOS#
```

d. Wait for the protocol operation to complete (approximately 20 seconds).

e. View the dynamic IP allocated to the client in switch 2.

```
SEFOS# show ip interface
```

The output in the switch 2 is:

```
vlan41 is up, line protocol is up
Internet Address is 12.0.0.2/8
Broadcast Address  12.255.255.255
IP address allocation method is dynamic
IP address allocation protocol is dhcp
```

f. View the DHCP server binding table to observe the allocated IP addresses in switch 1.

```
SEFOS# show ip dhcp server binding

Ip          Hw                Hw                Binding       Expire
Address     Type              Address            State         Time
---------   -------    ---------------        ----------
----------
12.0.0.2    Ethernet    00:02:02:03:04:01      Assigned       Jan
7  11:22:37 2007
```

g. View the DHCP packets statistics in switch 1.

```
SEFOS# show ip dhcp server statistics

Address pools : 1

Message             Received
-------             --------
DHCPDISCOVER         1
DHCPREQUEST          1
DHCPDECLINE          0
DHCPRELEASE          0
DHCPINFORM           0

Message              Sent
-------              ----
DHCPOFFER            1
DHCPACK              1
DHCPNAK              0
```

▼ Delete a Binding Entry From the Server

You can acquire an IP address dynamically for `vlan1` in switch 2.

1. View the binding table in switch 1.

```
SEFOS# show ip dhcp server binding

Ip          Hw              Hw            Binding      Expire
Address     Type          Address         State        Time
-------     -------         ------        --------     ----------
12.0.0.2   Ethernet  00:02:02:03:04:01  Assigned    Jan  7 12:19:45
2007
```

2. Delete the binding entry for `12.0.0.2`**.**

```
SEFOS# configure terminal
SEFOS(config)# no ip dhcp binding 12.0.0.2
SEFOS(config)# end
```

3. View the binding table in switch 1.

```
SEFOS# show ip dhcp server binding
SEFOS#
```

Ensure that entry `12.0.0.2` is deleted and that the table is empty.

▼ Configure an Interface to Use a Manual IP Address

You can configure a switch to stop running DHCP and to use a manual IP allocation method for an interface.

1. Create a VLAN for port 41 to receive an IP address.

```
SEFOS# configure terminal
SEFOS(config)# vlan 41
SEFOS(config-if)# port ex 0/41
SEFOS(config-if)# exit
```

2. Assign a manual IP.

a. Specify the VLAN that should receive the IP.

```
SEFOS(config-if)# interface vlan 41
```

b. Activate the interface if it is not already active.

```
SEFOS(config-if)# no shutdown
```

c. Remove the IP from DHCP if the port is already under DHCP control.

```
SEFOS(config-if)# no ip address
```

d. Assign an IP address and the netmask.

```
SEFOS(config-if)# ip address 12.0.0.1 255.255.255.0
SEFOS(config-if)# end
```

e. Display the newly assigned IP.

```
SEFOS# show ip interface vlan 41

vlan41 is up, line protocol is up
Internet Address is 10.0.0.1/8
Broadcast Address  10.255.255.255

vlan41 is up, line protocol is down
Internet Address is 12.0.0.1/24
Broadcast Address  12.0.0.255
```

▼ Enable DHCP Relay

DHCP relay is disabled by default. You can enable DHCP relay by performing the following steps.

1. Enable DHCP relay in switch 2.

```
SEFOS# configure terminal
SEFOS(config)# service dhcp-relay
SEFOS(config)# end
```

2. View the DHCP relay status.

```
SEFOS# show ip dhcp relay information
```

The output in the switch is:

```
Dhcp Relay                              : Enabled
Dhcp Relay Servers only      : Disabled

DHCP server                            : 0.0.0.0

Dhcp Relay RAI option        : Disabled
Default Circuit Id information : router-index
Debug Level                             : 0x1

No of Packets inserted RAI option               : 0
No of Packets inserted circuit ID suboption     : 0
No of Packets inserted remote ID suboption      : 0
No of Packets inserted subnet mask suboption    : 0
No of Packets dropped                           : 0
No of Packets which did not inserted RAI option : 0
```

▼ Configure a DHCP Server Address

You can configure a DHCP server address in the DHCP relay agent. A maximum of five servers can be configured. If no servers are configured, the DHCP packets will be broadcast to the entire network, except to the network from which the packet is received.

In this example, the server address is `20.0.0.1`.

1. Configure a DHCP server address in switch 2.

```
SEFOS# configure terminal
SEFOS(config)# ip dhcp server 20.0.0.1
SEFOS(config)# end
```

2. Ensure that the server address has been configured in the relay.

```
SEFOS# show ip dhcp relay information
```

The output in the switch is:

```
Dhcp Relay                              : Enabled
Dhcp Relay Servers only       : Enabled

DHCP server                             : 20.0.0.1

Dhcp Relay RAI option         : Disabled
Default Circuit Id information : router-index
Debug Level                             : 0x1

No of Packets inserted RAI option               : 0
No of Packets inserted circuit ID suboption     : 0
No of Packets inserted remote ID suboption      : 0
No of Packets inserted subnet mask suboption    : 0
No of Packets dropped                           : 0
No of Packets which did not inserted RAI option : 0
```

Configuring Relay Agent Options

▼ Enable the Relay Agent Information

1. Enable the relay agent information option in switch 2.

```
SEFOS# configure terminal
SEFOS(config)# ip dhcp relay information option
SEFOS(config)# end
```

2. View the relay agent information status.

```
SEFOS# show ip dhcp relay information
```

The output in the switch is:

```
Dhcp Relay                              : Enabled
Dhcp Relay Servers only      : Enabled

DHCP server                           : 20.0.0.1

Dhcp Relay RAI option        : Enabled
Default Circuit Id information : router-index
Debug Level                           : 0x1

No of Packets inserted RAI option               : 0
No of Packets inserted circuit ID suboption     : 0
No of Packets inserted remote ID suboption      : 0
No of Packets inserted subnet mask suboption    : 0
No of Packets dropped                           : 0
No of Packets which did not inserted RAI option : 0
```

▼ Configure Relay Agent Suboptions

In this example, `circuit-id` is `500`, and `remote-id` is `hello`.

1. Configure the `circuit-id` and `remote-id` relay agent information options in switch 2.

```
SEFOS# configure terminal
SEFOS(config)# interface vlan 1
SEFOS(config-if)# ip dhcp relay circuit-id 500
SEFOS(config-if)# ip dhcp relay remote-id hello
SEFOS(config-if)# end
```

2. View the relay agent information.

```
SEFOS# show ip dhcp relay information
```

The output in the switch is:

```
Dhcp Relay                              : Enabled
Dhcp Relay Servers only      : Enabled
```

```
DHCP server                          : 20.0.0.1

Dhcp Relay RAI option        : Enabled
Default Circuit Id information : router-index
Debug Level                          : 0x1

No of Packets inserted RAI option               : 0
No of Packets inserted circuit ID suboption     : 0
No of Packets inserted remote ID suboption      : 0
No of Packets inserted subnet mask suboption    : 0
No of Packets dropped                           : 0
No of Packets which did not inserted RAI option : 0

Interface  vlan1
Circuit ID : 500
Remote  ID : hello
```

- Alternatively, if you want to view just the information specified for `VLAN 1`, use the following command:

```
SEFOS# show ip dhcp relay information vlan 1

Interface    vlan1
Circuit ID : 500
Remote  ID : hello
```

Note – Configuration of the DHCP relay circuit ID should be greater than the value of the macro DHRL_MAX_L3_IF_INDEX. The value of the macro DHRL_MAX_L3_IF_INDEX is different for SEFOS packages. For the METRO package the value of the macro is 1136 and for the enterprise package the value of macro is 160.

▼ Enable Traces for the DHCP Relay Agent

1. Enable DHCP relay debug traces in switch 2.

```
SEFOS# debug ip dhcp relay all
```

2. **View the debug trace level.**

```
SEFOS# show ip dhcp relay information

Dhcp Relay                          : Enabled
Default Circuit Id information    : router-index
Dhcp Relay Servers only             : Enabled

DHCP server                         : 20.0.0.1

Dhcp Relay RAI option               : Enabled
Default Circuit Id information    : router-index
Debug Level                         : 0xff

No of Packets inserted RAI option               : 0
No of Packets inserted circuit ID suboption     : 0
No of Packets inserted remote ID suboption      : 0
No of Packets inserted subnet mask suboption    : 0
No of Packets dropped                           : 0
No of Packets which did not inserted RAI option : 0
```

▼ Acquire an IP Address From a Server Residing Outside the Client Network

In this example, a DHCP relay server is set up using various DHCP server and DHCP relay commands and options from the preceding sections. The example connects port 1 of switch 1 to port 1 of switch 2, and connects port 2 of switch 2 to port 1 of switch 3.

1. **Create** `vlan 2` **in switch 1 with port 1 as the member port. Then, add a route to the** `30.0.0.0` **network through** `20.0.0.2` **(switch 2).**

```
SEFOS# configure terminal
SEFOS(config)# vlan 2
SEFOS(config-vlan)# ports extreme-ethernet 0/1
SEFOS(config-vlan)# exit
SEFOS(config)# interface vlan 2
SEFOS(config-if)# shutdown
SEFOS(config-if)# ip address 20.0.0.1 255.0.0.0
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
SEFOS(config)# interface extreme-ethernet 0/1
```

```
SEFOS(config-if)# switchport pvid 2
SEFOS(config-if)# exit
SEFOS(config)# ip route 30.0.0.0 255.0.0.0 vlan 2
SEFOS(config)# end
```

2. View the VLAN configurations and route configuration.

```
SEFOS# show ip interface vlan 2

vlan2 is up, line protocol is up
Internet Address is 20.0.0.1/8
Broadcast Address  20.255.255.255

SEFOS# show vlan id 2

Vlan database
-------------
Vlan ID             : 2
Member Ports        : Ex0/1
Untagged Ports      : None
Forbidden Ports     : None
Name                :
Status              : Permanent
-----------------------------------------------------

SEFOS# show ip route

Codes: C - connected, S - static, R - rip, B - bgp, O - ospf
C 10.0.0.0/8  is directly connected, vlan1
C 20.0.0.0/8  is directly connected, vlan2
S 30.0.0.0/8  is directly connected, vlan2
```

3. Create `vlan 2` with port 1 as a member port and `vlan 3` with port 2 as a member port in switch 2.

```
SEFOS# configure terminal
SEFOS(config)# vlan 2
SEFOS(config-vlan)# ports extreme-ethernet 0/1
SEFOS(config-vlan)# exit
SEFOS(config)# interface vlan 2
SEFOS(config-if)# shutdown
SEFOS(config-if)# ip address 20.0.0.2 255.0.0.0
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
SEFOS(config)# interface extreme-ethernet 0/1
SEFOS(config-if)# switchport pvid 2
SEFOS(config-if)# exit
```

```
SEFOS(config)# vlan 3
SEFOS(config-vlan)# ports extreme-ethernet 0/2 untagged
extreme-ethernet 0/2
SEFOS(config-vlan)# exit
SEFOS(config)# interface vlan 3
SEFOS(config-if)# shutdown
SEFOS(config-if)# ip address 30.0.0.2 255.0.0.0
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
SEFOS(config)# interface extreme-ethernet 0/2
SEFOS(config-if)# switchport pvid 3
SEFOS(config-if)# no shutdown
SEFOS(config-if)# end
SEFOS# show vlan id 2

Vlan database
-------------
Vlan ID             : 2
Member Ports        : Ex0/1
Untagged Ports      : None
Forbidden Ports     : None
Name                :
Status              : Permanent
-----------------------------------------------------

SEFOS# show vlan id 3

Vlan database
-------------
Vlan ID             : 3
Member Ports        : Ex0/2
Untagged Ports      : Ex0/2
Forbidden Ports     : None
Name                :
Status              : Permanent
-----------------------------------------------------

SEFOS# show ip interface vlan 2

vlan2 is up, line protocol is up
Internet Address is 20.0.0.2/8
Broadcast Address  20.255.255.255


SEFOS# show ip interface vlan 3

vlan3 is up, line protocol is up
Internet Address is 30.0.0.2/8
Broadcast Address  30.255.255.255
```

4. **Enable the DHCP server in switch 1.**

   Since the client is in `vlan 3`, an address pool with the `30.0.0.0` network must be configured in the server.

```
SEFOS# configure terminal
SEFOS(config)# service dhcp-server
SEFOS(config)# ip dhcp pool 1
SEFOS(dhcp-config)# network 30.0.0.0
SEFOS(dhcp-config)# lease 0 0 30
SEFOS(dhcp-config)# end
SEFOS# show ip dhcp server information

DHCP server status              : Enable
Send Ping Packets               : Disable
Debug level                     : None
Server Address Reuse Timeout    : 5 secs
Next Server Adress              : 0.0.0.0
Boot file name                  :

SEFOS# show ip dhcp server pools

Pool Id                         : 1
---------------------------------
Subnet                          : 30.0.0.0
Subnet Mask                     : 255.0.0.0
Lease time                      : 1800 secs
Utilization threshold           : 75%
Start Ip                        : 30.0.0.1
End Ip                          : 30.255.255.255
```

5. **Enable DHCP relay in switch 2.**

   This action connects the networks between the client and server.

```
SEFOS# configure terminal
SEFOS(config)# service dhcp-relay
SEFOS(config)# end
SEFOS# show ip dhcp relay information

Dhcp Relay                  : Enabled
Dhcp Relay Servers only     : Disabled

DHCP server                 : 0.0.0.0

Dhcp Relay RAI option       : Disabled
Debug Level                 : 0x1

No of Packets inserted RAI option               : 0
```

```
No of Packets inserted circuit ID suboption     : 0
No of Packets inserted remote ID suboption      : 0
No of Packets inserted subnet mask suboption    : 0
No of Packets dropped                           : 0
No of Packets which did not inserted RAI option : 0
```

6. **Configure the DHCP client.**

   This example uses a SPARC computer running Oracle Solaris 10 OS as the DHCP client. The dual 10-Gigabit Ethernet XFR SR network interface card (option X1109A-Z) is installed in the SPARC computer and uses the instance `ixgbe`. The DHCP daemon is active in Oracle Solaris 10 by default, so no DHCP configuration is needed.

7. **Use the correct cable to connect a port on the NIC to port 70 of switch 2.**

   See "Multiple-Switch Configuration" on page 8. Issue the following commands after connecting the cables. If a different DHCP client is used, follow the appropriate instructions in the administration guide for the client.

```
# ifconfig ixgbe1 plumb up
# ifconfig -a
lo0: flags=2001000849<UP,LOOPBACK,RUNNING,MULTICAST,IPv4,VIRTUAL>
mtu 8232 index 1
        inet 127.0.0.1 netmask ff000000
e1000g0: flags=1000803<UP,BROADCAST,MULTICAST,IPv4> mtu 1500 index
2
        inet 10.7.58.46 netmask ffffff00 broadcast 10.7.58.255
        ether 0:14:4f:20:f4:cc
ixgbe1: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu
1500 index 12
        inet 0.0.0.0 netmask ff000000
        ether 0:1b:21:4a:6f:fc
```

8. **Execute the DHCP request, and wait 15-20 seconds for the command prompt to return.**

```
# ifconfig ixgbe1 dhcp
```

9. **Show that IP `30.0.0.1` is assigned to the DHCP client port.**

```
# ifconfig -a

lo0: flags=2001000849<UP,LOOPBACK,RUNNING,MULTICAST,IPv4,VIRTUAL>
mtu 8232 index 1
            inet 127.0.0.1 netmask ff000000
e1000g0: flags=1000803<UP,BROADCAST,MULTICAST,IPv4> mtu 1500 index
2
```

```
            inet 10.7.58.46 netmask ffffff00 broadcast 10.7.58.255
             ether 0:14:4f:20:f4:cc
ixgbe1: flags=1004843<UP,BROADCAST,RUNNING,MULTICAST,DHCP,IPv4>
mtu 1500 index 12
           inet 30.0.0.1 netmask ff000000 broadcast 30.255.255.255
            ether 0:1b:21:4a:6f:fc
```

10. Display the IP binding by issuing the following command in switch 1 (DHCP server).

```
SEFOS# show ip dhcp server binding

Ip          Hw            Hw                    Binding     Expire
Address    Type          Address               State       Time
-------  -------       ------                --------    ----------
30.0.0.1 Ethernet   00:1b:21:4a:6f:fc   Assigned   Apr 10 11:39:28
2010
```