



July 2007

## AOS Configuration and Troubleshooting Guide

### Configuring Dynamic Host Control Protocol (DHCP) in AOS

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This configuration and troubleshooting guide will aid in the setup of many aspects of Dynamic Host Control Protocol (DHCP) within ADTRAN Operating System (AOS) products. An overview of DHCP has been provided along with step-by-step instructions on how to set up DHCP in both the Command Line Interface (CLI) as well as the Graphical User Interface (GUI). The troubleshooting section outlines several useful commands to help isolate problems with a setup and verify that the AOS device has been configured correctly.

This guide consists of the following sections:

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## DHCP Overview

Dynamic Host Control Protocol (DHCP) is used to simplify network administration. Every computer that connects to the internet or an IP network needs an IP address. In a small network, it is not nearly as difficult to manually assign IP addressing information to every PC. As systems become larger and more complex, and mobile users are added to the mix, it becomes increasingly difficult to manage and keep track of IP assignments. This is where DHCP comes in. DHCP allows you to assign a range or subnet of addresses to a DHCP server which it will dynamically distribute and maintain. In addition to IP addresses, DHCP servers give out information for default routers, DNS servers, and can also give out proprietary information for devices such as IP phones.

Dynamic Host Configuration Protocol (DHCP) enables hosts on an IP network, called DHCP clients, to lease a temporary IP address from a DHCP server. The server can also issue other configurations to the client that help it function on the network (such as the addresses of Domain Name System [DNS] and Windows Internet Naming Service [WINS] servers). This protocol helps reduce administrative overhead on an IP-based network.

## DHCP Request Process

Understanding the basics of DHCP will help you understand and remember how to configure a DHCP pool. If you can track the DHCP process, you will also find it much easier to troubleshoot the router's DHCP activity.

The DHCP request process breaks down into four steps (see Figure 1):

1. The client broadcasts a **DHCPDISCOVER** packet, requesting an IP address and other configurations.
2. The server responds with a **DHCPOFFER**, which includes an available network address.
3. The client sends a **DHCPREQUEST**, accepting the offer and requesting the complete configuration from the server.
4. The server responds with a **DHCPACK**, which includes the following:
  - The agreed-upon network address
  - A default gateway
  - A lease time
  - The address of one or more DNS servers (optional)
  - The address of one or more WINS servers (optional)

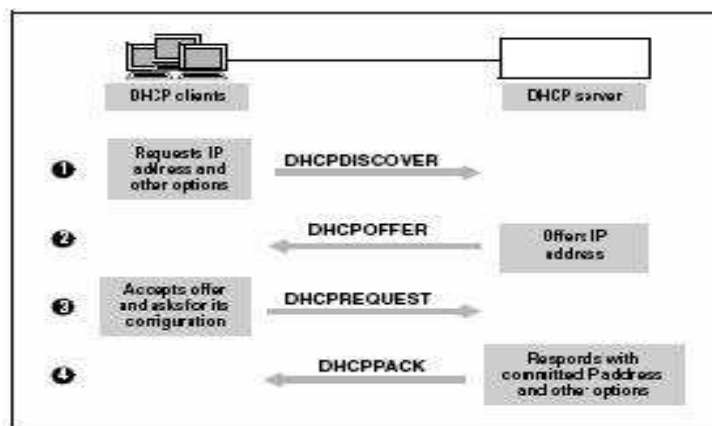


Figure 1. DHCP Request Process

## The AOS Product as a DHCP Server

A router that also functions as a DHCP server is particularly useful for a small to medium site at which all subnets connect to the WAN router.

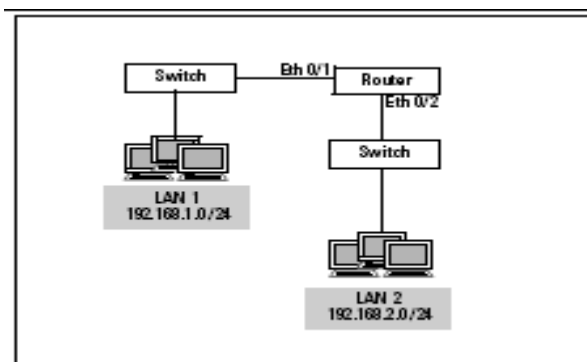


Figure 2. AOS Product DHCP Server

You should configure one DHCP pool for each subnet. For the default gateway, you would specify the IP address of the Ethernet interface through which the router connects to the subnet. (See Figure 2.) You would then create a DHCP pool for each VLAN. A WAN interface can also act as a server for DHCP clients. However, usually the router at the remote site or a DHCP server would act as the remote network's server. On the other hand, when you bridge two remote sites, one router should act as a DHCP server for all clients in the network.

## DHCP Relay

Rather than acting as the server for connected DHCP clients, the router can run DHCP relay. The router receives DHCP packets from clients and forwards them to a remote server on behalf of the clients. Similarly, it receives the committed IP addresses from the server and forwards them to the clients.

## Hardware/Software Requirements/Limitations

DHCP can be configured on any AOS device running any version of firmware.

## Configuring DHCP in AOS

You configure the AOS product to act as a DHCP server by configuring a DHCP pool for each connecting subnet. The pool specifies the subnet's address and default gateway. It can also include other configurations such as a DNS server address.

To configure the router as a DHCP server, you must:

1. Exclude static addresses from DHCP.
  - Often you will have servers or other devices that you would like to assign static addresses to. Those addresses must be excluded from the DHCP pool so that they are not assigned to other devices.
2. Create a DHCP pool:
  - Specify the network address and subnet mask.
  - Define the default gateway.
  - Specify DNS and WINS (NetBIOS) server addresses – You should specify at least one DNS server.

Optionally:

- For a DHCP pool, you can:
  - Change the lease time
  - Assign a fixed DHCP address to a single client

## Configuring DHCP in CLI

### Step 1: Exclude Static Addresses

To specify that a range of addresses cannot be assigned to DHCP clients, move to the Global Configuration mode and enter the following command:

*Syntax:* **ip dhcp-server excluded-address** <first A.B.C.D> [<last A.B.C.D>]

For example, your organization uses the first ten addresses on a subnet for routers and switches and the second ten for servers. You enter:

```
(config)#ip dhcp-server excluded-address 192.168.1.1 192.168.1.20
```

You can also exclude a single address:

```
(config)#ip dhcp-server excluded-address 192.168.1.254
```

Use the **no** form of this command to remove an IP address from the restricted list.

### Step 2: Create a DHCP Pool

You should create a DHCP pool for each subnet that connects directly to the AOS product and for which you want the router to act as a DHCP server.

Use the following command to create the pool:

*Syntax:* **ip dhcp-server pool** <poolname>

The command-line interface (CLI) displays *Configuring New Pool <poolname>* and moves you into the DHCP server pool configuration mode context.

You can also edit a pool with the same command. The CLI displays *Configuring Existing Pool <poolname>*.

### Address Pool

You assign the DHCP server address pool a subnet by specifying the network address and subnet mask:

*Syntax:* **network** <network A.B.C.D> <subnet mask /prefix length>

For example, specify a private Class C subnet:

```
(config-dhcp)#network 192.168.1.0 255.255.255.0
```

### Default Gateway

A DHCP pool's default gateway, or default router, is the interface through which the clients for the pool connect. This interface is almost always an Ethernet or VLAN interface

You specify a pool's default gateway by entering the connected interface's IP address in the DHCP pool

configuration mode context:

*Syntax:* default-router <A.B.C.D> [<secondary A.B.C.D>]

## DNS Server

A DNS server tracks the IP addresses associated with specific hostnames. It translates a hostname into its IP address in response to requests from DNS clients. Clients need a DNS server so that users can enter hostnames to reach other hosts and browse the Internet. You should designate at least one DNS server for the DHCP client by entering the following command:

*Syntax:* **dns-server** <A.B.C.D> [<secondary A.B.C.D>]

You may specify an optional secondary DNS server by adding a second IP address. For example:

(config-dhcp)# **dns-server** 192.168.1.25 15.3.1.20

## WINS (NetBIOS) Server.

A WINS server maps computers' NetBIOS names to IP addresses. It ensures that hosts on the same network do not have the same hostname, and it performs DNS-type services for hosts with dynamic addresses. When a computer changes location in the network, the WINS server automatically updates the entry for its hostname with its new DHCP address. If your private network uses NetBIOS, you should give the DHCP client the address of the WINS server.

*Syntax:* **netbios-name-server** <A.B.C.D> [<secondary A.B.C.D>]

## Other Servers

You can also assign clients a Trivial File Transfer Protocol (TFTP) server and a Network Time Protocol (NTP) server. Clients download config files from TFTP servers. NTP servers ensure that all clients' clocks are synchronized, which can be very important for some organizations. If the NTP server is in a different timezone than the DHCP clients, you must set a timezone offset. The range for the offset is -12 to 12. For example, to set an offset for a server 2 hours ahead of the local router, enter **timezone-offset -2**. Enter these commands:

*Syntax:* **tftp-server** <A.B.C.D>  
**ntp-server** 192.168.3.26 <A.B.C.D>  
**timezone-offset** <-12 to 12>

## Domain Name

If your network wishes users to have the organization's domain name, you should configure the DHCP server to issue this name with the IP address. Specify the domain name for the subnet from the configuration mode context of the corresponding DHCP server pool:

*Syntax:* **domain-name** <domain name>

Do not include the period before the name. For example:

(config-dhcp)#**domain-name** Adtran.com

## Optional: Change the Lease Time

The default lease time for DHCP pools on the AOS product is 1 day. This setting suits many environments, allowing clients to keep configurations throughout the workday, but also making it easy for a client to receive a new address when it changes location in the network.

However, subnets for various kinds of users require different lease times. For example, a subnet that provides public access computers, which are randomly used by many different people, may need a shorter lease time. Try not to set the lease shorter than necessary because DHCP exchanges consume bandwidth and router processes.

You can configure an individual lease time for each DHCP pool established on the router, according to your organization's policies. For example, you can set a lease time of 1 hour. From the configuration mode context of the pool, enter:

*Syntax:* **lease** <days> <hours> <minutes>

AOS always sets the first number entered as the number of days for the lease, the second as hours, and the third as minutes. You must enter a zero to indicate that you are skipping a number. For example, to set a lease time of 15 minutes, enter:

(config-dhcp)#**lease 0 0 15**

You do not have to input zeroes after the last significant number. For example, a lease time of 30 days is specified as:

(config-dhcp)#**lease 30**

### **Optional: Assign a fixed DHCP address to a single client**

Certain devices should almost always be given static addresses so that routes remain accurate, the network design logical and consistent, and traffic flow uninterrupted. However, sometimes such a device is also required to take a dynamic address from a DHCP server. You can configure the router to assign a fixed DHCP address to this device. Also, when you want to assign a particular host a permanent address, sometimes it is better to configure this address through a server, rather than through whatever application is on the host. DHCP automatically tracks addresses so that two devices are not inadvertently given the same address.

To assign a fixed address to a single host:

1. Create a new DHCP server pool with a name indicative of the host.
2. Identify the host allowed to take the address in the pool by its MAC address:
  - *Syntax:* **hardware-address** <MAC address>
  - For example:
    - (config-dhcp)#**hardware-address d2:17:04:91:11:50**
3. Specify the IP address for the host. The router automatically assigns the address with its natural mask. If your organization uses variable-length subnetting, make sure to include the subnet mask or prefix length for the host's subnet:
  - *Syntax:* **host** <A.B.C.D> <subnet mask /prefix length>
4. Specify the default gateway:
  - *Syntax:* **default-router** <A.B.C.D>
5. Configure other settings such as DNS and WINS servers and a domain name.
6. You can also assign the client a name:
  - *Syntax:* **client-name** <name>

- For example: (config-dhcp)#**client-name LAN2Switch**

### **Optional: Configuring DHCP Ping Settings**

The DHCP server sends ping packets to verify that an address is available before assigning it to a DHCP client. You can configure two settings for DHCP server pings:

- Timeout – This determines how long the DHCP server waits for a reply to a ping.
- Ping packet count – The DHCP server pings an address without result this many times before assigning the address to a requesting client.

By default, the router times out a ping after 500 ms and pings an address twice before assuming it is available.

Ping settings apply to the router as a whole, not to individual DHCP pools. You configure them from the Global Configuration mode.

To change the timeout setting, enter:

*Syntax:* **ip dhcp-server ping timeout** <milliseconds>

The valid range is from 10 to 1000 ms.

To change the ping packet count, enter:

*Syntax:* **ip dhcp-server ping packets** <count>

The count can be from 0 to 100.

For example, enter:

```
(config-dhcp)#ip dhcp-server ping timeout 700  
(config-dhcp)#ip dhcp-server ping packets 5
```

If you do not want the router to use ping packets to check that an address is available, enter 0 for the ping packet count.

### **Optional: Configuring Parent and Child Pools**

If your AOS product supports contiguous subnets, you can configure a single parent pool for the range of subnets. In this pool, you would specify settings that apply to all of the subnets, such as domain name, DNS servers, WINS servers, and lease time.

You would then configure child pools, each of which would have its own subnet address and default gateway. The other settings would be automatically imported from the parent pool, saving you time and minimizing opportunities for miskeying a server address.

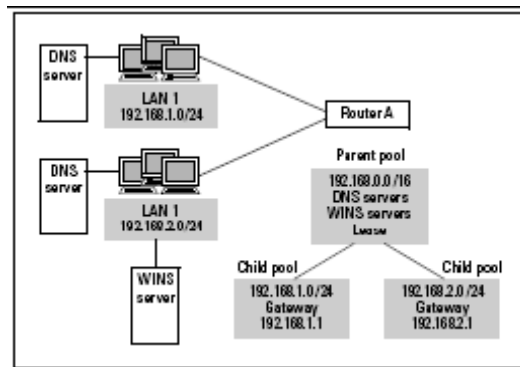
When you configure a parent pool, you specify the range of subnets by entering the network address bits the subnets have in common followed by the (now shorter) prefix length.

Figuring out the exact number of bits that two subnets have in common involves converting from decimal to binary and can be complicated. The simplest method is to use the address and bit length for the last common octet.

For example, you want to configure a parent pool for subnets 192.168.1.0 /24 and 192.168.2.0 /24. The parent pool network address could be 192.168.0.0 /16.



However, you should be careful using this method, especially when your network uses variable-length subnets.



**Example DHCP Pool Configuration**

You do *not* specify a default router for a parent pool.

You configure the child pools just as you do any DHCP pool, but you only have to configure the subnet address and default router. If you alter a setting, such as the lease time, the configuration in the child pool overrides that in the parent pool.

In the above example, a router connects to two subnets. The figure also shows the network's DNS and WINS servers. This LAN reserves addresses 1 to 29 on each subnet for various network devices, such as routers, switches, and servers. To configure this router to act as a DHCP server for its local subnets, you would complete these steps:

1. Exclude static addresses:

```
(config)#ip dhcp-server excluded-address 192.168.1.1 192.168.1.29  
(config)#ip dhcp-server excluded-address 192.168.2.1 192.168.2.29
```

2. Create the parent pool with global settings:

```
(config)#ip dhcp-server pool Parent  
(config-dhcp)#network 192.168.0.0 /16  
(config-dhcp)#dns-server 192.168.1.25 192.168.2.23  
(config-dhcp)#netbios-name-server 192.168.2.26  
(config-dhcp)#lease 0 12
```

3. Create the child pools, each with its own subnet and default gateway:

```
(config-dhcp)#ip dhcp-server pool LAN1  
(config-dhcp)#network 192.168.1.0 /24  
(config-dhcp)#default-router 192.168.1.1  
(config-dhcp)#ip dhcp-server pool LAN2  
(config-dhcp)#network 192.168.2.0 /24  
(config-dhcp)#default-router 192.168.2.1
```

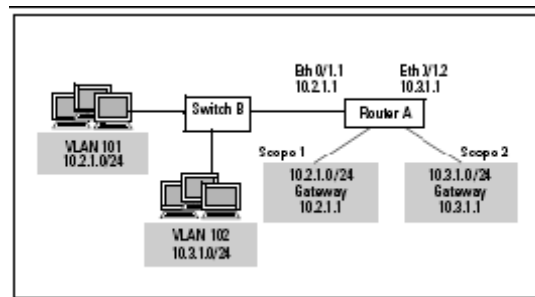
## Configuring DHCP Scopes

The AOS product supports VLAN tagging so that it can receive traffic from more than one VLAN on the same Ethernet interface. Therefore, the AOS product might receive DHCP requests from clients on different subnets on the same physical interface.

You can configure a separate DHCP scope to accommodate each VLAN. Simply configure the DHCP pool with the VLAN's network address just as you would configure a typical DHCP pool.

After you enable 802.1Q encapsulation (for VLAN tagging) on the Ethernet interface, you can configure Ethernet sub-interfaces. You assign the sub-interfaces a VLAN ID and an IP address. To configure the DHCP scope, you simply specify that IP address as the default router of the DHCP pool configured for the VLAN.

These are the only configurations that you must make on the AOS product. You can add options for the server addresses and lease time in the same way that you would for any pool. (You would also configure the connecting switch to pass DHCP packets from hosts on a specific VLAN to the address of the corresponding Ethernet sub-interface on the router. This configuration ensures that clients receive an address on the correct subnet.)



**DHCP Scopes with VLANs**

In this example, Router A connects to Switch B on its Ethernet 0/1 interface. Switch B connects to hosts in VLANs 101 and 102. You enable VLAN tagging on the router so that traffic to both VLANs can be carried over the same cable. You configure IP address 192.168.1.1 /24 on Ethernet sub-interface 0/1.1 and IP address 192.168.2.1 /24 on Ethernet sub-interface 0/1.2.

You would configure the DHCP scopes as follows:

1. Enable VLAN tagging:

```
(config)#interface eth 0/1
(config-eth 0/1)#encapsulation 802.1q
(config-eth 0/1)#no shutdown
```

2. Configure the VLAN interfaces:

```
(config-eth 0/1)#interface eth 0/1.1
(config-eth 0/1.1)#description Scope 1 interface
(config-eth 0/1.1)#vlan-id 101
(config-eth 0/1.1)#ip address 10.2.1.1 255.255.255.0
(config-eth 0/1.1)#no shutdown
(config-eth 0/1.1)#interface eth 0/1.2
(config-eth 0/1.2)#description Scope 2 interface
(config-eth 0/1.2)#vlan-id 102
(config-eth 0/1.2)#ip address 10.3.1.1 255.255.255.0
(config-eth 0/1.2)#no shutdown
```

3. Reserve addresses for the VLAN interfaces and other servers by excluding them from DHCP:

```
(config)#ip dhcp excluded-address 10.2.1.1 10.2.1.20
(config)#ip dhcp excluded-address 10.3.1.1 10.3.1.20
```

4. Configure a DHCP pool for each VLAN, setting the IP address of the default router to that of the corresponding VLAN interface:

```
(config)#ip dhcp-server pool Scope1
```

```
(config-dhcp-pool)#network 10.2.1.0 255.255.255.0
(config-dhcp-pool)#default-router 10.2.1.1
(config-dhcp-pool)#ip dhcp-server pool Scope2
(config-dhcp-pool)#network 10.3.1.0 255.255.255.0
(config-dhcp-pool)#default-router 10.3.1.1
```

### Optional: Configuring a Router Interface as a DHCP Client

Your service provider may require the router to receive an address from one of its DHCP servers. In this case, you must configure the WAN interface that connects to the provider as a DHCP client.

Ethernet interfaces can also be DHCP clients. For example, the interface could take an address from a server on the local network. When possible, it is a good idea to assign network devices static addresses. However, DHCP does automatically track IP addresses assigned to devices as well as which addresses are still available, relieving IT staff of this task. You can configure the DHCP server to assign the Ethernet interface a fixed DHCP address. Interfaces that receive a DHCP address can receive other configurations, too. This is particularly useful for interfaces that connect to the Internet. For example, an ATM sub-interface can receive the address for a DNS server.

To configure an interface as a DHCP client, you must:

- Configure the interface with a dynamic address

You can also:

- Set the interface's client ID
- Set the interface's hostname
- Enable the interface to take configurations other than the IP address

You enable the DHCP client on an individual interface. Interfaces that can act as DHCP clients are:

- Frame Relay sub-interfaces
- ATM sub-interfaces
- Ethernet interfaces
- PPP interfaces (only when bridging traffic)
- VLAN interfaces
- Ethernet interfaces
- BVI interfaces

Move to the appropriate interface configuration mode context and enter one of these commands:

```
Syntax: ip address dhcp [hostname <name> | no-default-route | no-domain-name | no-nameservers]
```

```
Syntax: ip address dhcp [client-id { <ethernet <slot>/<port> | HH:HH:HH:HH:HH:HH } |  
hostname <name>]
```

You can enter this command without any options to initiate the client with the default client ID and host name:

```
(config-fr 1.101)#ip address dhcp
```

### Configuring DHCP in GUI

For this example, we will be creating a DHCP pool for the 192.168.1.0 subnet. The addresses from 192.168.1.1 through 192.168.1.100 will be set aside for static reservations. The router at 192.168.1.1 will be acting as both the default gateway and the DNS server.

#### Step 1: Exclude Static Addresses

First, navigate to the DHCP Server tab to access DHCP server options. Then, click the “Excluded Ranges” tab and enter the starting and ending addresses of your range. Click “Add” to add the exclusion to the router.



## Step 2: Create a DHCP Pool

Next, click the “DHCP Pools” tab and enter a descriptive name for your pool. Click “Add” and you will be taken to the DHCP configuration window.



Next, click the “DHCP Pools” tab and enter a descriptive name for your pool. Click “Add” and you will be taken to the DHCP configuration window.

From this menu, you will enter the network address and subnet mask of the network you are trying to set up DHCP for. You will also enter the default gateway and DNS servers.

**DHCP Server Pool "Test\_Pool"**

Required Configuration    Optional Configuration    Numbered Options

Create a pool for each subnet containing DHCP clients. A pool must also be created for each host requiring a reserved (fixed) IP address.

**IP Addresses**

Assign IP addresses to all DHCP clients on a subnet.

Subnet Address: 192 . 168 . 1 . 0

Subnet Mask: 255 . 255 . 255 . 0

Reserve a fixed IP address for a single host.

MAC Address: [ ] : [ ] : [ ] : [ ] : [ ] : [ ]

IP Address: [ ] . [ ] . [ ] . [ ]

Subnet Mask: [ ] . [ ] . [ ] . [ ]

**DHCP Options**

Default Gateway: 192 . 168 . 1 . 1

Primary DNS: 192 . 168 . 1 . 1

Lease Time: 1 days 0 hours 0 min.

Cancel    Apply

The "Optional Configuration" tab allows you to enter additional information for your DHCP pool. Once you have completed configuration, click the "Apply" button.

**DHCP Server Pool "Test\_Pool"**

Required Configuration    Optional Configuration    Numbered Options

Use this tab to configure values for DHCP named options.

Domain Name: [ ]

Secondary DNS: [ ] . [ ] . [ ] . [ ]

Primary WINS: [ ] . [ ] . [ ] . [ ]

Secondary WINS: [ ] . [ ] . [ ] . [ ]

TFTP Server: [ ]

NTP Server: [ ] . [ ] . [ ] . [ ]

Timezone offset: 0

Cancel    Apply

The "Optional Configuration" tab allows you to enter additional information for your DHCP pool. Once you have completed configuration, click the "Apply" button.

After clicking "Apply", you will be returned to the DHCP Server screen. You will see the DHCP pool you have created listed.

**DHCP Server Settings**

DHCP Pools | Excluded Ranges

Create a pool for each subnet containing DHCP clients. A pool must also be created for each host requiring a reserved (fixed) IP address.

**Add New DHCP Server pool**

Pool Name:

**Modify/Delete a DHCP Server Pool**

To view or modify an existing DHCP server pool, click the link in the desired row.

Name	Subnet/Host	IP Address	
<a href="#">Test_Pool</a>	subnet	192.168.1.0/24	<input type="button" value="Delete"/>

Scrolling down on the DHCP Server page will allow you to see the leases that the router has currently granted to DHCP clients.

**DHCP Leases**

**Lease Persistence**

Enable Lease Persistence:  Enabled

**Current Leases**

Below is a list of all currently maintained DHCP leases and relevant information.

<input type="checkbox"/>	Name	Client Id	IP Address	Expires
There are no DHCP Leases registered in the system.				

Refresh in 2 seconds...

### Optional: Change the Lease Time

This configuration change can be made either from the initial setup or at a later time. Navigate to the DHCP Setup page by either creating a pool or clicking on an existing pool. Modify the numbers next to “Lease Time” in order to modify the lease.

**DHCP Server Pool "Test\_Pool"**

Required Configuration | Optional Configuration | Numbered Options

Create a pool for each subnet containing DHCP clients. A pool must also be created for each host requiring a reserved (fixed) IP address.

**IP Addresses**

Assign IP addresses to all DHCP clients on a subnet.

Subnet Address:  .  .  .

Subnet Mask:  .  .  .

Reserve a fixed IP address for a single host.

MAC Address:  :  :  :  :  :

IP Address:  .  .  .

Subnet Mask:  .  .  .

**DHCP Options**

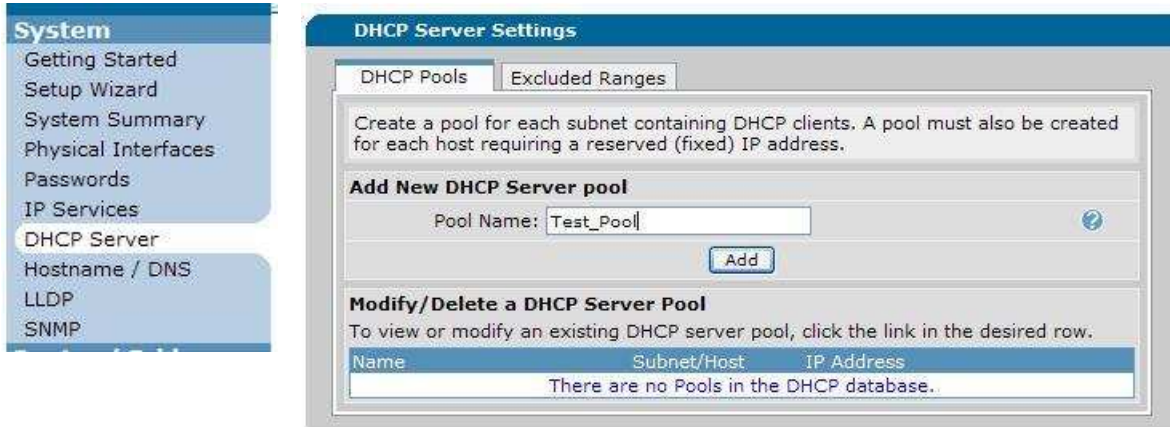
Default Gateway:  .  .  .

Primary DNS:  .  .  .

Lease Time:  days  hours  min.

### Optional: Assign a fixed DHCP address to a single client

First, navigate to the DHCP Server configuration page. Create a pool for the PC whose address you wish to be statically assigned and click “Add”.



Next, click the radio button for reserving a fixed IP address and fill in the desired IP, subnet, and MAC address of the host PC. Fill in the remaining fields and click apply.



Required Configuration   Optional Configuration   Numbered Options

Create a pool for each subnet containing DHCP clients. A pool must also be created for each host requiring a reserved (fixed) IP address.

**IP Addresses**

Assign IP addresses to all DHCP clients on a subnet.

Subnet Address: 192 . 168 . 17 . 0

Subnet Mask: 255 . 255 . 255 . 0

Reserve a fixed IP address for a single host.

MAC Address: AA : BB : CC : DD : EE : FF

IP Address: 192 . 168 . 1 . 15

Subnet Mask: 255 . 255 . 225 . 0

**DHCP Options**

Default Gateway: 192 . 168 . 1 . 1

Primary DNS: 192 . 168 . 1 . 1

Lease Time: 1 days 0 hours 0 min.

Cancel   Apply

### Optional: Configuring a Router Interface as a DHCP Client

Navigate to the interface configuration menu for your desired menu and set the “Address Type” to DHCP.

**IP Settings**

Address Type: **DHCP**

*Set to 'None' if connecting to a [Bridge](#) with [IP routing](#) disabled.*

Track Name: <None Available>

*Removes default routes and DNS servers configured by DHCP when track is not failing. (Optional parameter used with network monitoring.)*

Dynamic DNS: <disabled>

*Used to register this interface's IP address with a DNS Name.*

**Secondary IP Settings**

IP Address	Mask
Add a new Secondary IP Address	

Reset   Apply

### Configuring DHCP Relay in AOS



DHCP relies on clients being able to reach a server by broadcasting a request. The DHCP request is limited by being broadcast to the application port for DHCP (the BOOTPS port, 67). Limited broadcasts propagate only throughout the local subnet. If the client is not on the same subnet as the server, the broadcast will not reach the server.

If you want clients to receive dynamic addresses from a server on a remote network, you must configure DHCP relay on the AOS product. To enable DHCP relay, you configure the router to forward packets received on the DHCP application port to a helper address.

## Configuring DHCP Relay in CLI

To configure the router to forward DHCP packets, move to the Global Configuration mode and enter this command:

*Syntax:* **ip forward-protocol udp bootps**

Next, set the address of the helper address. The helper address is the address of the DHCP server or a device on the same subnet as the server. You can set different helper addresses for different interfaces. Set this address from the configuration mode context of the interface that connects to the clients:

*Syntax:* **ip helper-address <A.B.C.D>**

For example:

(config-eth 0/1)#**ip helper-address 10.1.1.1**

The router does not simply forward the DHCP packets. It also examines them, checks their validity, and adds any appropriate changes, such as its own IP address (which enables the server to return the DHCP offer to the router). The remote server uses this IP address to determine from which pool it should select the IP address that it offers to the client. The router will then forward this offer to the client.

**NOTE**

*An AOS router is only capable of running a DHCP server or DHCP relay at any one time. Attempting to run both at one time can cause DHCP relay to become non-functional.*

## Configuring DHCP Relay in GUI

First, navigate to the UDP Relay configuration menu.



Next, enter the IP address of the DHCP server that you wish to forward packets to under the “IP Helper Address” section. Then select the interface on the router that will be receiving the DHCP requests. Click “Add”.

**IP Helper Address**

Enter the IP address that you would like to forward the specified broadcasted UDP protocols to. Then specify which interface to listen to these protocols on.

IP Helper Address:  .  .  .  *Enter the IP address to forward the specified UDP protocols to.*

Interface:  *The interface receiving the UDP broadcasts to be forwarded.*

**View/Delete IP Helper Address**

Interface	IP Address
There are currently no IP Helper Addresses set.	

Finally, select “bootps” as the UDP protocol and click “add”.

**UDP Forward Protocol**

Choose which UDP protocol to forward or specify your own.

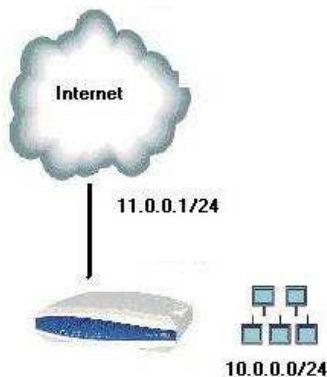
UDP Protocol:  *The UDP protocol to be forwarded to the specified IP address.*

**View/Delete UDP Forward Protocols**

UDP Port	Output Datagrams
There are currently no UDP Forward Protocols set.	

**Example configuration**

**Standard DHCP Configuration**



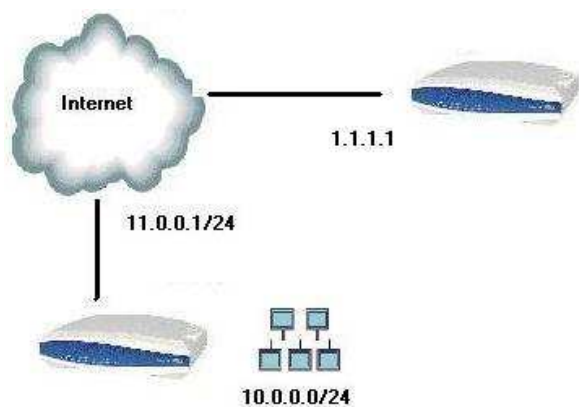
This configuration assumes a network with a local subnet of 10.0.0.0/24. The router, with an address of 10.0.0.1 is serving as both the default gateway and the DNS server for the network. Finally, an excluded range of 10.0.0.1 to 10.0.0.100 will be set aside for static assignments to servers and other devices.

```

Router(config)# ip dhcp-server pool DHCP
Router(config-dhcp)# network 10.0.0.0 255.255.255.0
Router(config-dhcp)# dns-server 10.0.0.1
Router(config-dhcp)# default-router 10.0.0.1
Router(config-dhcp)# lease 1 0 0
Router(config-dhcp)# exit
Router(config)# ip dhcp-server excluded-address 10.0.0.1 10.0.0.100

```

### DHCP Relay Configuration



In this configuration, local users in the 10.0.0.0/24 subnet are attempting to retrieve a DHCP address from a server located on the internet at 1.1.1.1

```

Router(config)# ip forward-protocol udp bootps
Router(config-eth 0/1)# ip helper-address 1.1.1.1

```

### Command Summary Table Standard DHCP

	Command	Description
<b>Step 1</b>	(config)# <b>ip dhcp-server pool</b> <pool name>	Create a DHCP pool
<b>Step 2</b>	(config-dhcp)# <b>network</b> <network address> <subnet mask>	Define the subnet in which DHCP will hand out addresses
<b>Step 3</b>	(config-dhcp)# <b>dns-server</b> <router address>	Define the DNS server to be distributed
<b>Step 4</b>	(config-dhcp)# <b>default-router</b> <router address>	Define the default router to be distributed
<b>Step 5</b> (Optional)	(config-dhcp)# <b>lease</b> <days> <hours> <minutes>	Define the amount of time before the lease expires
<b>Step 6</b>	(config)# <b>ip dhcp-server excluded-address</b> <low> <high>	Define the addresses to be excluded from distribution

## DHCP Relay

	Command	Description
<b>Step 1</b>	(config)# <b>ip forward-protocol bootps</b>	Define type of traffic to be relayed by the router
<b>Step 2</b>	(config-eth 0/1)# <b>ip helper-address</b> <remote dhcp server>	Define the address of the remote DHCP server within the local interface that receives the traffic

## Troubleshooting

Viewing active leases for the Netvanta DHCP server:

```
Router# show ip dhcp-server bindings
```

```
Router#show ip dhcp-server binding
IP Address    Client Id      Lease Expiration  Client Name
10.10.18.11   01:00:0c:47:61:85:71  Jun 21 2007 4:39 PM  jxp
10.10.18.12   01:00:a0:51:31:24:82  Jun 21 2007 4:42 PM  lxp
```

Viewing detailed exchange between hosts and Netvanta DHCP server:

```
Router# debug ip dhcp-server
```

```
Router#debug ip dhcp-server
Router#
2007.06.20 23:25:21 DHCP.SERVER Processing Discover Message (Xid =
6de5fbb9) on 10.10.18.0/255.255.255.0 from 01:00:0c:47:61:85:71
2007.06.20 23:25:21 DHCP.SERVER Offering IP Address 10.10.18.11 to
01:00:0c:47:61:85:71
2007.06.20 23:25:21 DHCP.SERVER Server sent an Offer to the client
2007.06.20 23:25:21 DHCP.SERVER Processing Request Message (Xid =
6de5fbb9) on 10.10.18.0/255.255.255.0 from 01:00:0c:47:61:85:71
2007.06.20 23:25:21 DHCP.SERVER Server sent an Ack to the client
2007.06.20 23:25:24 DHCP.SERVER Processing Request Message (Xid =
cec80cae) on 10.10.18.0/255.255.255.0 from 01:00:0c:47:61:85:71
2007.06.20 23:25:24 DHCP.SERVER Server sent an Ack to the client
```