DHCP—Static Mapping

The DHCP—Static Mapping feature enables assignment of static IP addresses without creating numerous host pools with manual bindings by using a customer-created text file that the DHCP server reads. The benefit of this feature is that it eliminates the need for a long configuration file and reduces the space required in NVRAM to maintain address pools.

Feature History for the DHCP—Static Mapping Feature

Release	Modification
12.3(11)T	This feature was introduced.
12.2(27)SBA	This feature was integrated into Cisco IOS Release 12.2(27)SBA.

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

Contents

Information About DHCP—Static Mapping

To configure this feature, you should understand the following concept:

CISCO SYSTEMS

DHCP Database and DHCP Server

A DHCP database contains an external file that is configured by a DHCP server. The file contains the mappings between a client IP address and the hardware address. There are two types of bindings: manual bindings that are special address pools stored in NVRAM, and automatic bindings that are assigned from an address pool by the DHCP server. Automatic bindings are stored on a remote host called the database agent and are saved as text records for easy maintenance. Both manual and automatic bindings are static.

The DHCP—Static Mapping feature enables the capability of reading the static bindings in a separate text file (similar in format to the DHCP database file) and configuring special pools to store bindings read from the files. The static-binding files are read when the existing database files are read, for example, when a router reloads or the service restarts. The files are read-only.

The read automatic bindings are treated just like the manual bindings, in that they are:

- Retained across DHCPRELEASEs from the clients.

- Not timed out.

- Deleted only upon deletion of the pool.

- Provided appropriate exclusions for the contained addresses, which are created at the time of the read.

Just like automatic bindings and manual bindings, the static bindings are also displayed by using the **show ip dhcp binding static** command.

How to Configure DHCP—Static Mapping

This section contains the following procedure:

- Configuring the DHCP Server and the Text File URL, page 2 (required)

Configuring the DHCP Server and the Text File URL

Perform this task to configure the DHCP server and text file URL. You will input your addresses in the text file, which is stored in the DHCP database for the DHCP server to read. There is no limit on the number of addresses or the number of address pools. The file format has the following elements:

- IP address

- Hardware type

- Hardware address

- Lease expiration

Legal values are defined in the ARP section of the *Dynamic Host Configuration Protocol*, RFC 2131. There is also a special type ID that indicates that a field is a DHCP client identifier. A sample file is as follows:

```
*time* January 21 2005 03:52 PM
*version* 2
!IP address     Type      Hardware address            Lease expiration
2.0.0.4 /24        1          0090.bff6.081e              Infinite
2.0.0.5 /28        id         00b7.0813.88f1.66
3.0.0.2 /21        1          0090.bff6.081d          Infinite
*end*
```

If the subnet mask is not specified, a natural mask is assumed depending on the IP address.

Prerequisites

The administrator should create the static-binding text file in the correct format and configure the address pools before performing this task.

Before editing the file, you must disable the DHCP server using the **no service dhcp** command.

In the static-binding text file, there must be a space between the IP address and mask.

Restrictions

The bindings must not be deleted when a DHCPRELEASE is received or must not be timed out by the DHCP timer. The automatic bindings should be treated just like manual bindings created by using the **ip dhcp pool** command.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip dhcp pool** *name*
4. **origin file** *url*
5. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** Router> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** Router# configure terminal	Enters global configuration mode.
Step 3	**ip dhcp pool** *name* **Example:** Router(config)# ip dhcp pool abcpool	Assigns a name to a DHCP pool and enters DHCP configuration mode. Note If you have already configured the IP DHCP pool name using the **ip dhcp pool** command and the static file URL using the **origin file** command, you must perform a fresh read using the **no service dhcp** command and **service dhcp** command.

	Command or Action	Purpose

Step 4	`origin file url`
	
	Example:
	`Router(dhcp-config)# origin file tftp://10.1.0.1/static-bindings`
		Specifies the URL from which the DHCP server can locate the text file.

Step 5	`exit`
	
	Example:
	`Router(dhcp-config)# exit`
		Exits to global configuration mode.

Examples

The following example shows what has been configured:

```
Router# show ip dhcp binding

00:05:14:%SYS-5-CONFIG_I: Configured from console by console

Bindings from all pools not associated with VRF:
IP address   Client-ID/              Ls expir    Type     Hw address            User name
10.9.9.4/8   0063.7363.2d30.3036.    Infinite    Static   302e.3762.2e39.3634.  632d.4574.8892.
10.9.9.1/24  0063.6973.636f.2d30.    Infinite    Static   3036.302e.3437.3165.  2e64.6462.342d.
```

The following sample shows each entry in the static-binding text file:

```
*time* January 21 2005 22:52 PM
!IP address      Type        Hardware address                              Lease expiration
10.19.9.1 /24    id          0063.6973.636f.2d30.3036.302e.3437
10.9.9.4         id          0063.7363.2d30.3036.302e.3762.2e39.3634.632d  Infinite
*end*
```

The following sample debug output shows the reading of the bindings from the TFTP server:

```
Router# debug ip dhcp server

Loading abc/static_pool from 10.19.192.33 (via Ethernet0):
[OK - 333 bytes]

*May 26 23:14:21.259: DHCPD: contacting agent tftp://10.19.192.33/abc/static_pool (attempt
0)
*May 26 23:14:21.467: DHCPD: agent tftp://10.19.192.33/abc/static_pool is responding.
*May 26 23:14:21.467: DHCPD: IFS is ready.
*May 26 23:14:21.467: DHCPD: reading bindings from
                            tftp://10.19.192.33/abc/static_pool.
*May 26 23:14:21.707: DHCPD: read 333 / 1024 bytes.
*May 26 23:14:21.707: DHCPD: parsing text line
*time* Apr 22 2002 11:31 AM
*May 26 23:14:21.707: DHCPD: parsing text line ""
*May 26 23:14:21.707: DHCPD: parsing text line
!IP address Type Hardware address Lease expiration
*May 26 23:14:21.707: DHCPD: parsing text line
"10.9.9.1 /24 id 0063.6973.636f.2d30.3036.302e.3437"
*May 26 23:14:21.707: DHCPD: creating binding for 10.9.9.1
*May 26 23:14:21.707: DHCPD: Adding binding to radix tree (10.9.9.1)
*May 26 23:14:21.707: DHCPD: Adding binding to hash tree
*May 26 23:14:21.707: DHCPD: parsing text line
"10.9.9.4 id 0063.7363.2d30.3036.302e.3762.2e39.3634.632d"
*May 26 23:14:21.711: DHCPD: creating binding for 10.9.9.4
```

```
*May 26 23:14:21.711: DHCPD: Adding binding to radix tree (10.9.9.4)
*May 26 23:14:21.711: DHCPD: Adding binding to hash tree
*May 26 23:14:21.711: DHCPD: parsing text line "Infinite"
*May 26 23:14:21.711: DHCPD: parsing text line ""
*May 26 23:14:21.711: DHCPD: parsing text line
!IP address Interface-index Lease expiration VRF
*May 26 23:14:21.711: DHCPD: parsing text line "*end*"
*May 26 23:14:21.711: DHCPD: read static bindings from
tftp://10.19.192.33/abcemp/static_pool.
```

Configuration Examples for DHCP—Static Mapping

This section contains the following configuration example:

Configuring the DHCP Server and the Static-Binding File URL: Example

The following example shows how to restart the DHCP server, configure the pool, and specify the URL at which the static-binding file is stored:

```
no service dhcp
service dhcp
ip dhcp pool abcpool
 origin file tftp://10.1.0.1/staticfilename
```

Additional References

The following sections provide references related to the DHCP—Static Mapping feature.

Related Documents

Related Topic	Document Title
DHCP overview and configuration	*Cisco IOS IP Configuration Guide*, Release 12.3
DHCP commands: complete command syntax, command mode, defaults, usage guidelines, and examples	*Cisco IOS IP Command Reference, Volume 1 of 4: Addressing and Services*, Release 12.3 T

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIBs	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFCs	Title
RFC 2131	*Dynamic Host Configuration Protocol*

Technical Assistance

Description	Link
Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/public/support/tac/home.shtml

Command Reference

This section documents modified commands only.

- **debug ip dhcp server**
- **origin**

debug ip dhcp server

To enable Cisco IOS Dynamic Host Configuration Protocol (DHCP) server debugging, use the **debug ip dhcp server** command in privileged EXEC mode. To disable DHCP server debugging, use the **no** form of this command.

debug ip dhcp server {**events** | **packets** | **linkage** | **class**}

no debug ip dhcp server {**events** | **packets** | **linkage** | **class**}

Syntax Description

events	Reports server events, such as address assignments and database updates.
packets	Decodes DHCP receptions and transmissions.
linkage	Displays database linkage information, such as parent-child relationships in a radix tree.
class	Displays DHCP class-based information.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(1)T	This command was introduced.
12.2(13)ZH	The **class** keyword was added.
12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T.
12.3(8)YA	This command was integrated into Cisco IOS Release 12.3(8)YA.
12.3(11)T	The output was enhanced to show the static mappings.
12.2(27)SBA	This command was integrated into Cisco IOS Release 12.2(27)SBA.

Examples

The following example shows a combination of DHCP server events and decoded receptions and transmissions:

```
Router# debug ip dhcp server events
Router# debug ip dhcp server packets

DHCPD:DHCPDISCOVER received from client 0b07.1134.a029 through relay 10.1.0.253.
DHCPD:assigned IP address 10.1.0.3 to client 0b07.1134.a029.
DHCPD:Sending DHCPOFFER to client 0b07.1134.a029 (10.1.0.3).
DHCPD:unicasting BOOTREPLY for client 0b07.1134.a029 to relay 10.1.0.253.
DHCPD:DHCPREQUEST received from client 0b07.1134.a029.
DHCPD:Sending DHCPACK to client 0b07.1134.a029 (10.1.0.3).
DHCPD:unicasting BOOTREPLY for client 0b07.1134.a029 to relay 10.1.0.253.
DHCPD:checking for expired leases.
```

The following example shows database linkage information:

```
Router# debug ip dhcp server linkage

DHCPD:child pool:10.1.0.0 / 255.255.0.0 (subnet10.1)
DHCPD:parent pool:10.0.0.0 / 255.0.0.0 (net10)
DHCPD:child pool:10.0.0.0 / 255.0.0.0 (net10)
```

```
DHCPD:pool (net10) has no parent.
DHCPD:child pool:10.1.0.0 / 255.255.0.0 (subnet10.1)
DHCPD:parent pool:10.0.0.0 / 255.0.0.0 (net10)
DHCPD:child pool:10.0.0.0 / 255.0.0.0 (net10)
DHCPD:pool (net10) has no parent.
```

The following example shows when a DHCP class is removed:

```
Router# debug ip dhcp server class

DHCPD:deleting class CLASS1
```

The following example shows the debug output when the configured pattern does not match:

```
Router# debug ip dhcp server class

DHCPD:Searching for a match to 'relay-information
0106000 40002020202080006009e80b8800' in class CLASS1
DHCPD:Searching for a match to 'relay-information 0106000400020202020800060009e80b8800' in
class CLASS1
DHCPD:Searching for a match to 'relay-information 0106000
```

The following example shows the debug output when you unconfigure a DHCP pattern in a DHCP class and then configure the pattern in the DHCP class:

```
Router# debug ip dhcp server class

DHCPD:pattern 'relay-information 123456' removed from class CLASS1
DHCPD:Added pattern 'relay-information 010600040002020202 0800060009e80b8800' for class
CLASS1
```

The following example shows the debug output when the configured pattern does match:

```
Router# debug ip dhcp server class

DHCPD:Searching for a match to 'relay-information
0106000 40002020202080006009e80b8800' in class CLASS1
DHCPD:input pattern 'relay-information 010600040002020202 0800060009e80b8800' matches
class CLASS1
DHCPD:input matches class CLASS1
```

The following example shows the debug output when static mappings are configured:

```
Router# debug ip dhcp server

Loading abc/static_pool from 10.19.192.33 (via Ethernet0): !
[OK - 333 bytes]

*May 26 23:14:21.259: DHCPD: contacting agent tftp://10.19.192.33/abc/static_pool (attempt
0)
*May 26 23:14:21.467: DHCPD: agent tftp://10.19.192.33/abc/static_pool is responding.
*May 26 23:14:21.467: DHCPD: IFS is ready.
*May 26 23:14:21.467: DHCPD: reading bindings from
                             tftp://10.19.192.33/abc/static_pool.
*May 26 23:14:21.707: DHCPD: read 333 / 1024 bytes.
*May 26 23:14:21.707: DHCPD: parsing text line "*time* Apr 22 2002 11:31 AM"
*May 26 23:14:21.707: DHCPD: parsing text line ""
*May 26 23:14:21.707: DHCPD: parsing text line

!IP address Type Hardware address Lease expiration.

*May 26 23:14:21.707: DHCPD: parsing text line
"10.9.9.1/24 id 0063.6973.636f.2d30.3036.302e.3437"
*May 26 23:14:21.707: DHCPD: creating binding for 10.9.9.1
*May 26 23:14:21.707: DHCPD: Adding binding to radix tree (10.9.9.1)
```

```
*May 26 23:14:21.707: DHCPD: Adding binding to hash tree
*May 26 23:14:21.707: DHCPD: parsing text line
"10.9.9.4 id 0063.7363.2d30.3036.302e.3762.2e39.3634.632d"
*May 26 23:14:21.711: DHCPD: creating binding for 10.9.9.4
*May 26 23:14:21.711: DHCPD: Adding binding to radix tree (10.9.9.4)
*May 26 23:14:21.711: DHCPD: Adding binding to hash tree
*May 26 23:14:21.711: DHCPD: parsing text line "Infinite"
*May 26 23:14:21.711: DHCPD: parsing text line ""
*May 26 23:14:21.711: DHCPD: parsing text line

!IP address Interface-index Lease expiration VRF.

*May 26 23:14:21.711: DHCPD: parsing text line "*end*"
*May 26 23:14:21.711: DHCPD: read static bindings from
tftp://10.19.192.33/smith/static_pool.
```

Related Commands	Command	Description
	debug dhcp	Displays debugging information about the DHCP client and monitors the status of DHCP packets.
	debug ip ddns update	Enables debugging for DDNS updates.
	host (host-list)	Specifies a list of hosts that will receive DDNS updates of A and PTR RRs.
	ip ddns update hostname	Enables a host to be used for DDNS updates of A and PTR RRs.
	ip ddns update method	Specifies a method of DDNS updates of A and PTR RRs and the maximum interval between the updates.
	ip dhcp client update dns	Enables DDNS updates of A RRs using the same hostname passed in the hostname and FQDN options by a client on an interface.
	ip dhcp-client update dns	Enables DDNS updates of A RRs using the same hostname passed in the hostname and FQDN options by a client.
	ip dhcp update dns	Enables DDNS updates of A and PTR RRs for most address pools.
	ip host-list	Specifies a list of hosts that will receive DDNS updates of A and PTR RRs.
	show ip ddns update	Displays information about the DDNS updates.
	show ip ddns update method	Displays information about the DDNS update method.
	show ip dhcp server pool	Displays DHCP server pool statistics.
	show ip host-list	Displays the assigned hosts in a list.
	update dns	Dynamically updates a DNS with A and PTR RRs for some address pools.

origin

To configure an address pool as an on-demand address pool (ODAP) or static mapping pool, use the **origin** command in DHCP pool configuration mode. To disable the ODAP, use the **no** form of this command.

origin {**dhcp** | **aaa** | **ipcp** | **file** *url*} [**subnet size initial** *size* [**autogrow** *size*]]

no origin {**dhcp** | **aaa** | **ipcp** | **file** *url*} [**subnet size initial** *size* [**autogrow** *size*]]

Syntax Description		
	dhcp	Specifies the Dynamic Host Configuration Protocol (DHCP) as the subnet allocation protocol.
	aaa	Specifies authentication, authorization, and accounting (AAA) as the subnet allocation protocol.
	ipcp	Specifies the IP Control Protocol (IPCP) as the subnet allocation protocol.
	file *url*	Specifies the external database file that contains the static bindings assigned by the DHCP server. The *url* argument specifies the location of the external database file.
	subnet size initial *size*	(Optional) Specifies the initial size of the first requested subnet. You can enter *size* as either the subnet mask (nnnn.nnnn.nnnn.nnnn) or prefix size (/nn). The valid values are /0 and /4 to /30.
	autogrow *size*	(Optional) Specifies that the pool can grow incrementally. The *size* argument is the size of the requested subnets when the pool requests additional subnets (upon detection of high utilization). You can enter *size* as either the subnet mask (nnnn.nnnn.nnnn.nnnn) or prefix size (/nn). The valid values are /0 and /4 to /30.

Defaults   The default size value is /0.

Command Modes   DHCP pool configuration

Command History

Release	Modification
12.2(8)T	This command was introduced.
12.3(11)T	The **file** keyword was added.
12.2(27)SBA	This command was integrated in to Cisco IOS Release 12.2(27)SBA.

Usage Guidelines   If you do not configure the pool as an autogrow pool, the pool will not request additional subnets if one subnet is already in the pool.

Use the **dhcp** keyword to obtain subnets from DHCP, the **aaa** keyword to obtain subnets from the AAA server, and the **ipcp** keyword to obtain subnets from IPCP negotiation. If you expect that the utilization of the pool may grow over time, use the **autogrow** *size* option.

If a pool has been configured with the **autogrow** *size* option, ensure that the source server is capable of providing more than one subnet to the same pool. Even though the Cisco IOS software specifies the requested subnet size, it can accept any offered subnet size from the source server.

Examples   The following example shows how to configure an address pool named green to use DHCP as the subnet allocation protocol with an initial subnet size of 24 and an autogrow subnet size of 24:

```
ip dhcp pool green
  vrf green
  origin dhcp subnet size initial /24 autogrow /24
  utilization mark high 80
  utilization mark low 20
```

The following example shows how to configure the location of the external text file:

```
ip dhcp pool abcpool
 origin file tftp://10.1.0.1/staticbindingfile
```

Related Commands

Command	Description
show ip dhcp pool	Displays information about the DHCP address pools.

Glossary

address binding—A mapping between the client IP and hardware addresses. The client IP address may be pre-configured by the administrator (manual address allocation) or assigned from a pool by the Dynamic Host Configuration Protocol (DHCP) server (automatic address allocation).

address pool—The range of IP addresses assigned by the DHCP server. The pool may also store client parameters, such as default router and DNS servers.

database agent—Any host storing the DHCP bindings database.

DHCP client—Any host requesting configuration parameters.

DHCP database—An external file configured in a DHCP server, which stores automatic bindings from the server.

DHCP server—Any host providing configuration parameters.

Note Refer to *Internetworking Terms and Acronyms* for terms not included in this glossary.