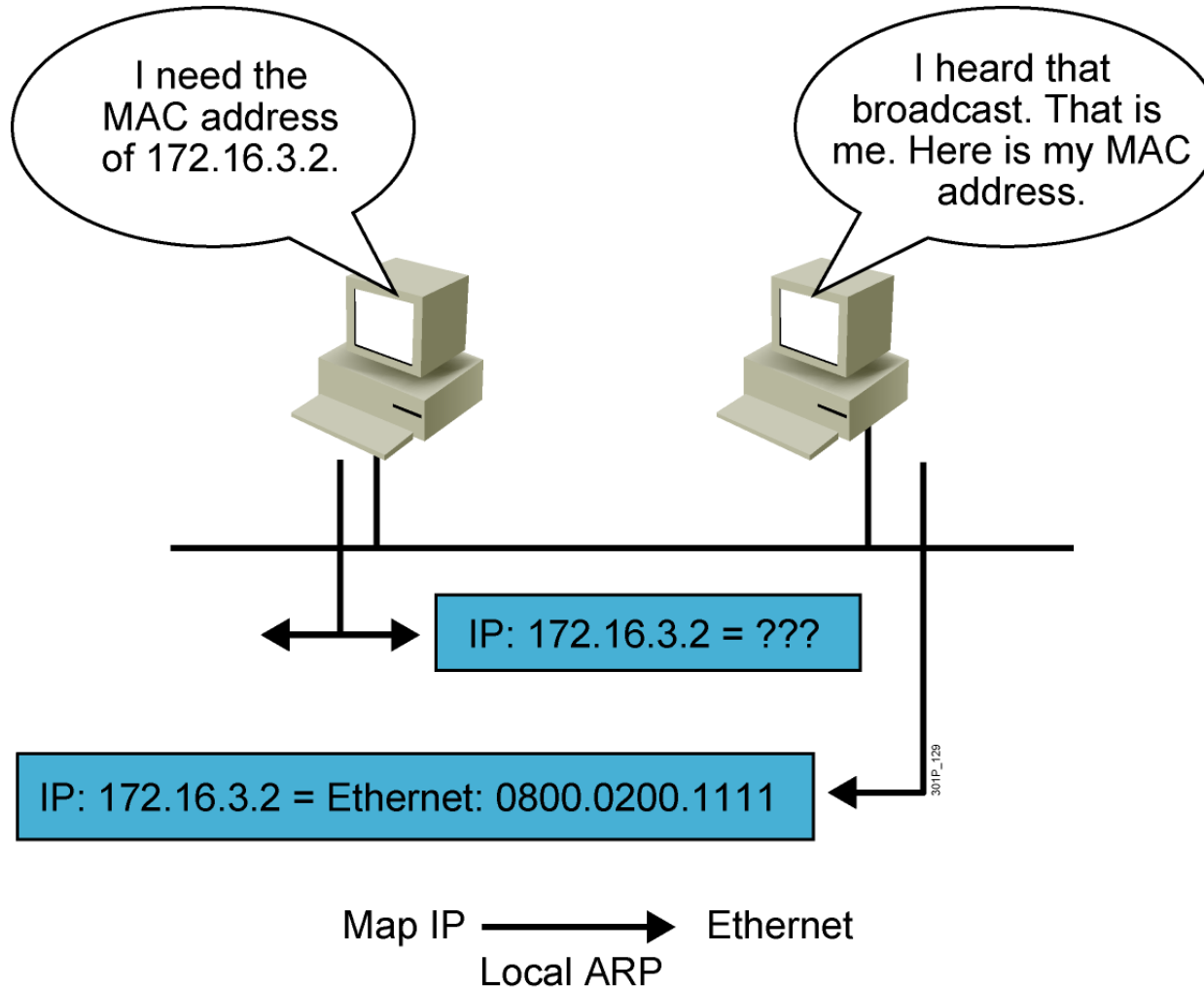




# ARP

## Exploring the Packet Delivery Process

# ARP



# ARP Example

**ARP Request**  
**Source MAC: AAAA**  
**Des MAC: FF:FF:FF:FF:FF:FF**



PC 1  
192.168.1.1/24  
MAC: AAAA



PC 2  
192.168.1.2/24  
MAC: BBBB

# ARP Example

**ARP Reply**  
**Source MAC: BBBB**  
**Des MAC: AAAA**



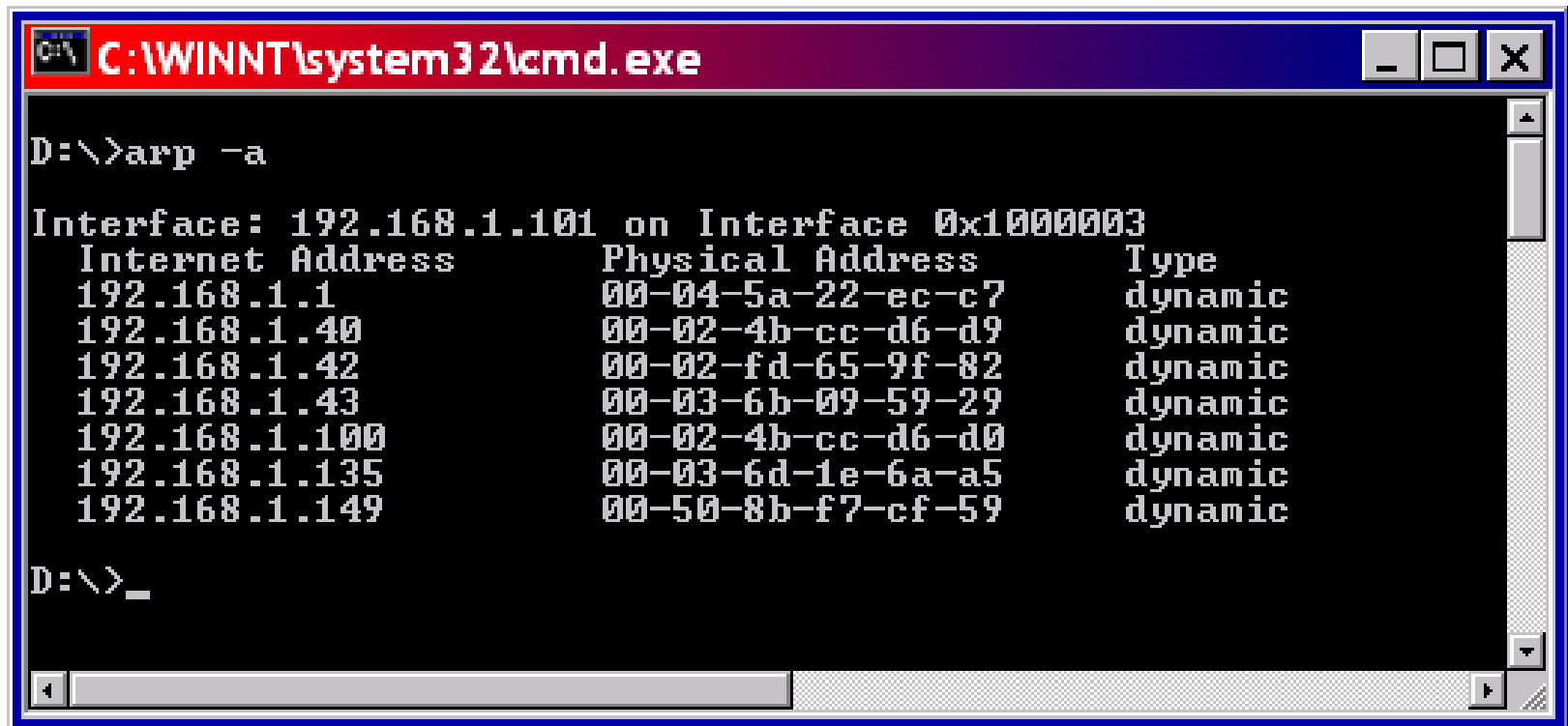
PC 1  
192.168.1.1/24  
MAC: AAAA



PC 2  
192.168.1.2/24  
MAC: BBBB



# ARP Table



```
C:\WINNT\system32\cmd.exe

D:\>arp -a

Interface: 192.168.1.101 on Interface 0x1000003
  Internet Address      Physical Address      Type
  192.168.1.1           00-04-5a-22-ec-c7     dynamic
  192.168.1.40          00-02-4b-cc-d6-d9     dynamic
  192.168.1.42          00-02-fd-65-9f-82     dynamic
  192.168.1.43          00-03-6b-09-59-29     dynamic
  192.168.1.100         00-02-4b-cc-d6-d0     dynamic
  192.168.1.135         00-03-6d-1e-6a-a5     dynamic
  192.168.1.149         00-50-8b-f7-cf-59     dynamic

D:\>_
```

# ARP Table

```
Router#sh arp
```

Protocol	Address	Age (min)	Hardware Addr	Type	Interface
Internet	2.2.2.1	0	0007.ECB2.7A02	ARPA	FastEthernet0/0
Internet	2.2.2.2	-	0030.F2E9.1C01	ARPA	FastEthernet0/0
Internet	3.3.3.2	-	0030.F2E9.1C02	ARPA	FastEthernet0/1
Internet	3.3.3.3	0	000B.BEAE.1701	ARPA	FastEthernet0/1

```
Router#
```

```
Router#sh ip arp
```

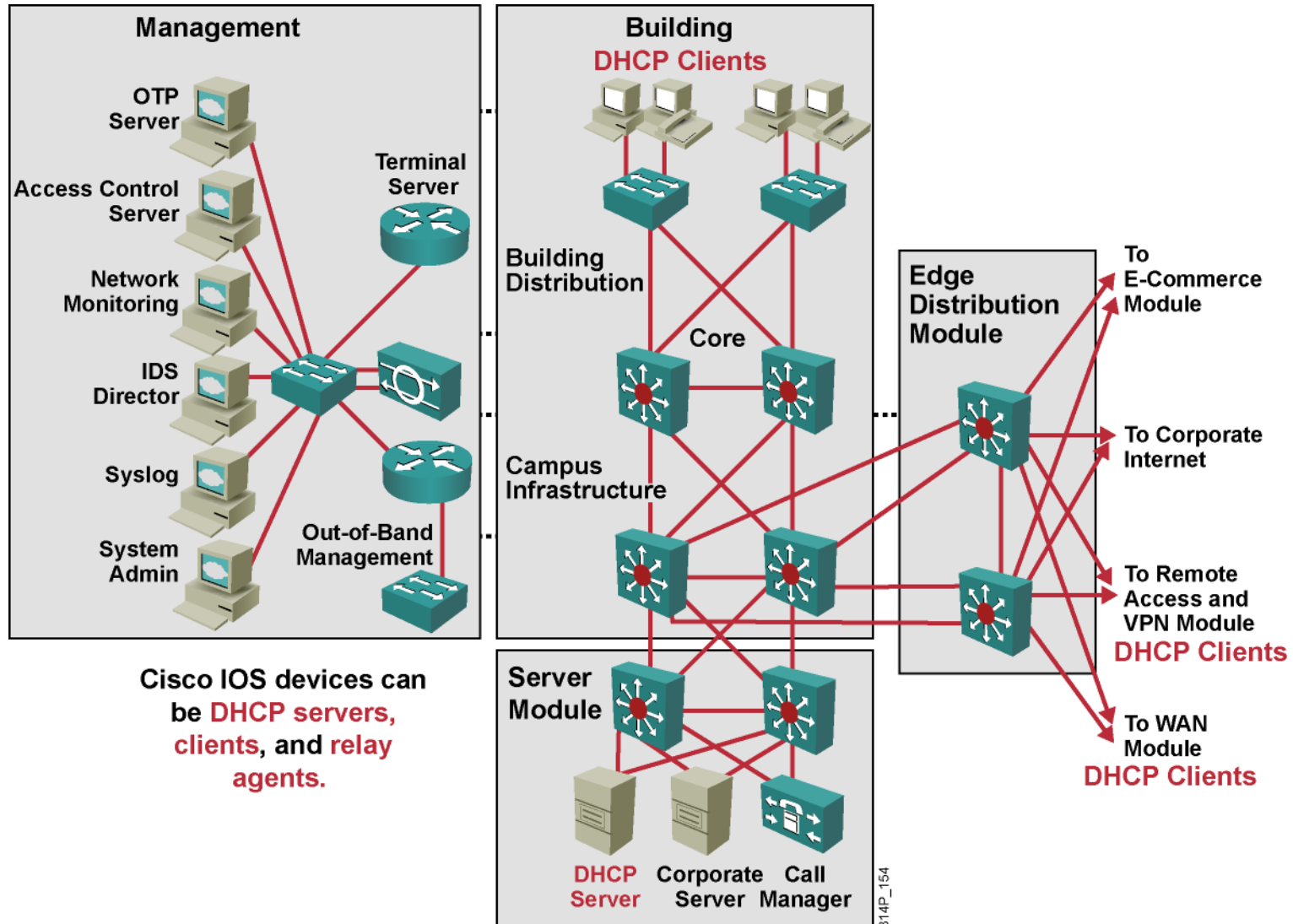
Protocol	Address	Age (min)	Hardware Addr	Type	Interface
Internet	2.2.2.1	0	0007.ECB2.7A02	ARPA	FastEthernet0/0
Internet	2.2.2.2	-	0030.F2E9.1C01	ARPA	FastEthernet0/0
Internet	3.3.3.2	-	0030.F2E9.1C02	ARPA	FastEthernet0/1
Internet	3.3.3.3	0	000B.BEAE.1701	ARPA	FastEthernet0/1

```
Router#
```



# Configuring DHCP

# DHCP in an Enterprise Network

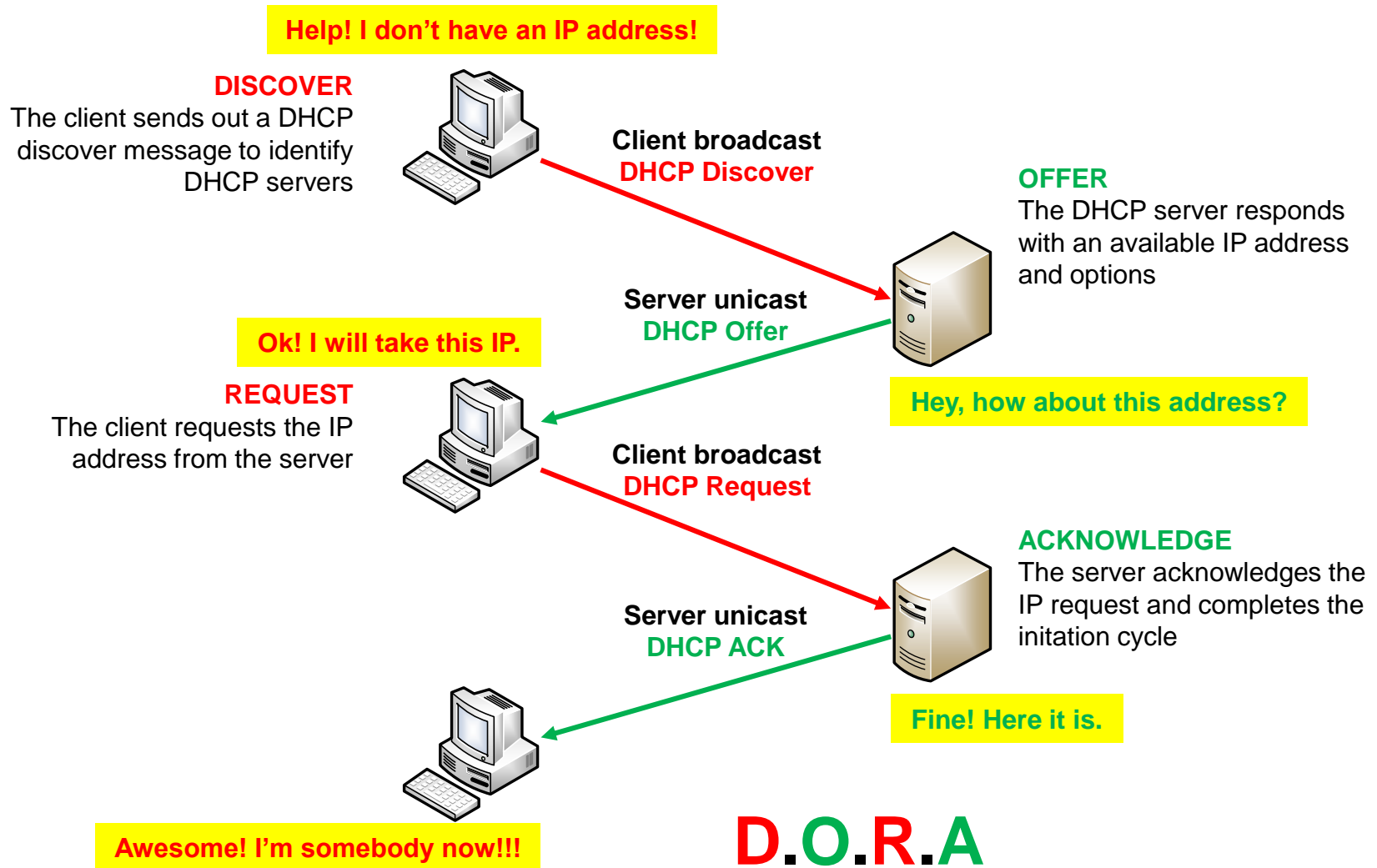




# DHCP Allocation Methods

- **Automatic Allocation:** DHCP automatically assigns a static IP address permanently to a device, selecting it from a pool of available addresses. There is no lease and the address is permanently assigned to a device.
- **Dynamic Allocation:** DHCP automatically assigns, or leases, an IP address from a pool of addresses for a limited period of time chosen by the server, or until the client tells the DHCP server that it no longer needs the address.
- **Manual Allocation:** The administrator assigns a pre-allocated IP address to the client and DHCP only communicates the IP address to the device.

# Dynamic Host Configuration Protocol



# Configuring a DHCP Server

```
Router (config) #ip dhcp pool [pool name]
```

- Enables a DHCP pool for use by hosts

prefix\_length (/nn) or  
subnet\_mask (A.B.C.D)

```
Router (config-dhcp) #network [network address] [subnet mask]
```

- Specifies the network and subnet mask of the pool

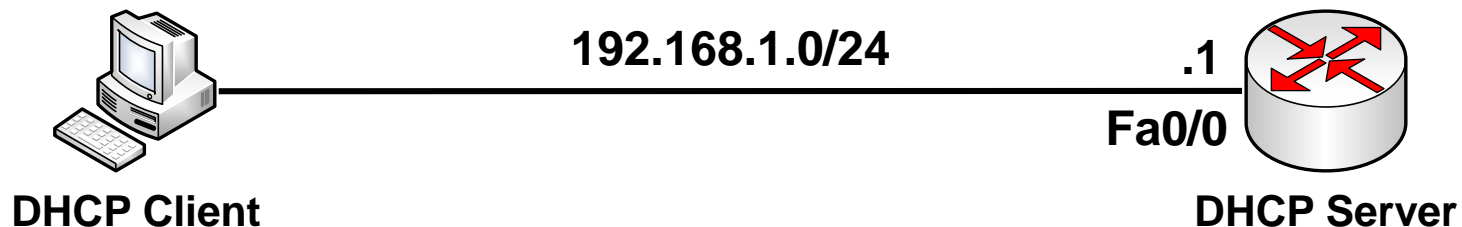
default gateway for that  
subnet

```
Router (config-dhcp) #default-router [host address]
```

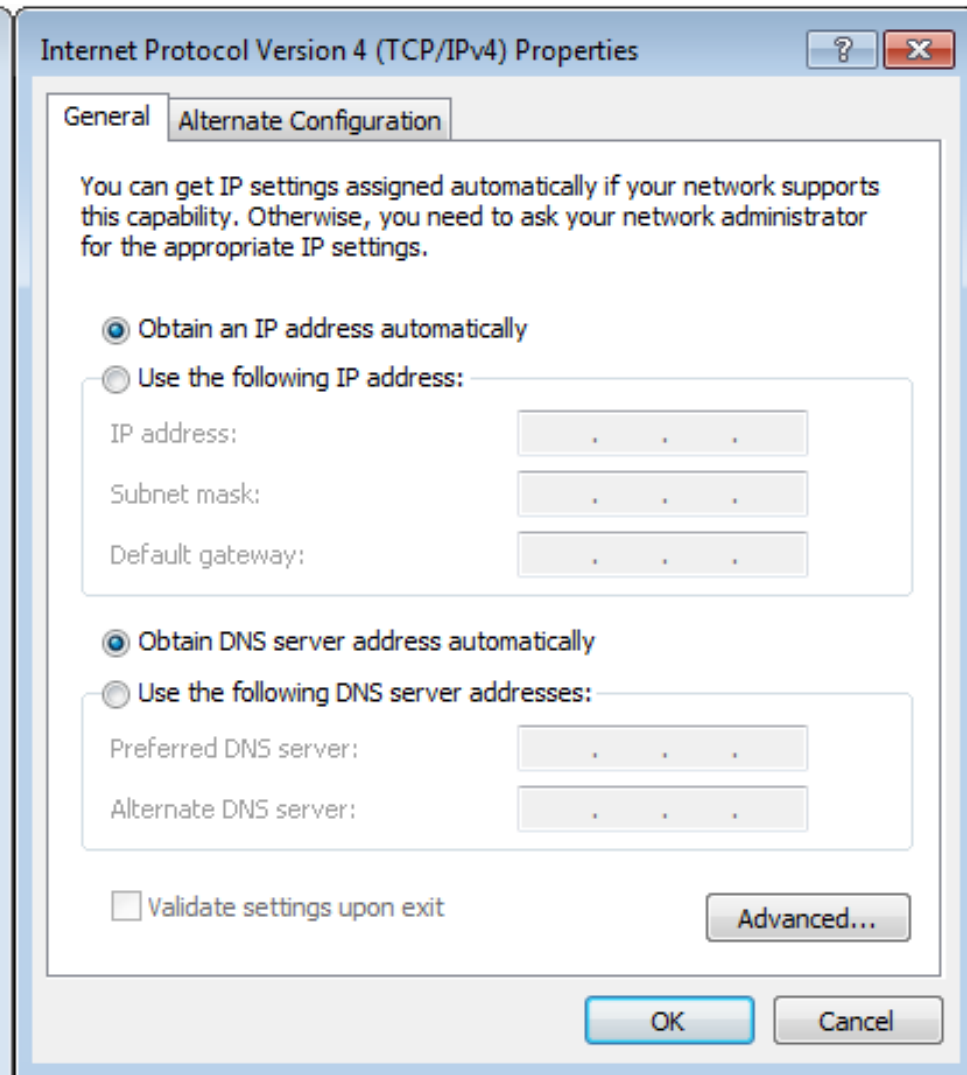
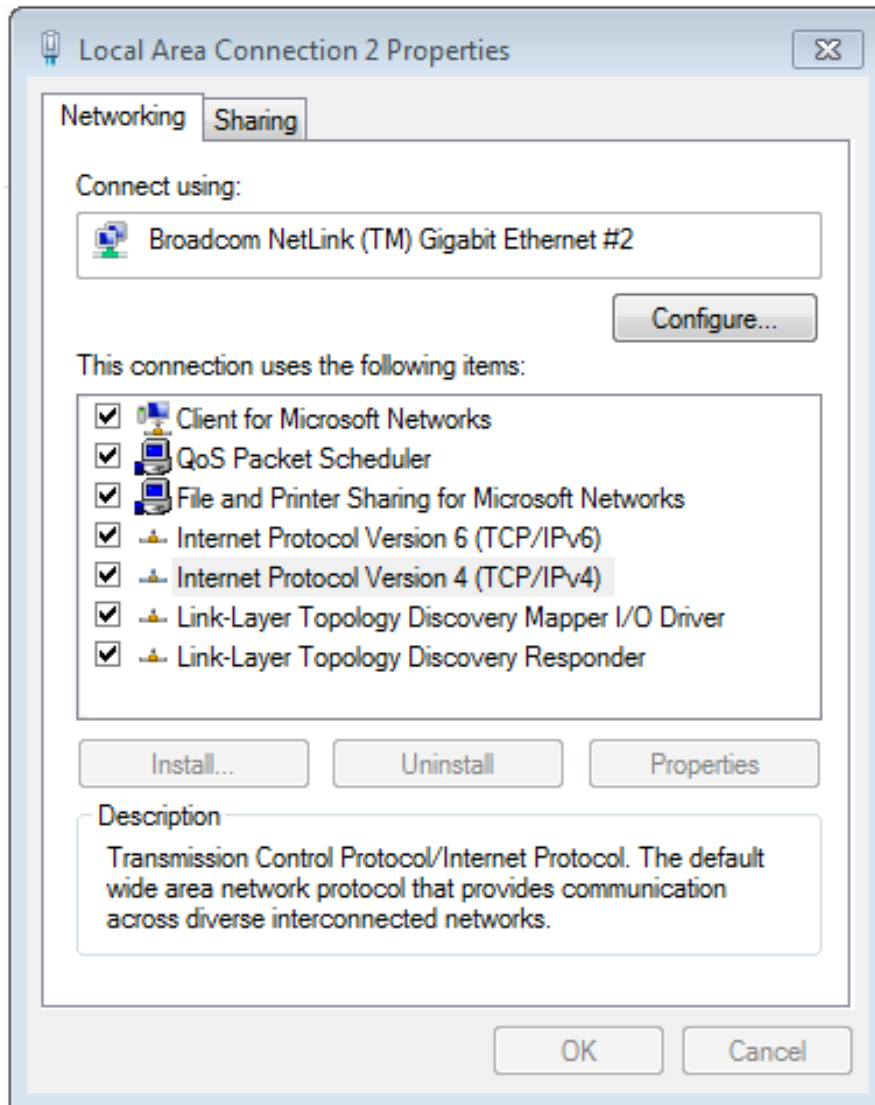
- Specifies the default router for the pool to use

# DHCP Server Configuration Example

	From this address	To this address
<code>ip dhcp <u>excluded-address</u></code>	<u><code>192.168.1.2</code></u>	<u><code>192.168.1.10</code></u>
<code>ip dhcp excluded-address</code>	<u><code>192.168.1.1</code></u>	
	Only this address	
 <code>ip dhcp pool LAN</code>		
<code>network 192.168.1.0/24</code>		
<code>default-router 192.168.1.1</code>		
<code>dns-server 8.8.8.8</code>		



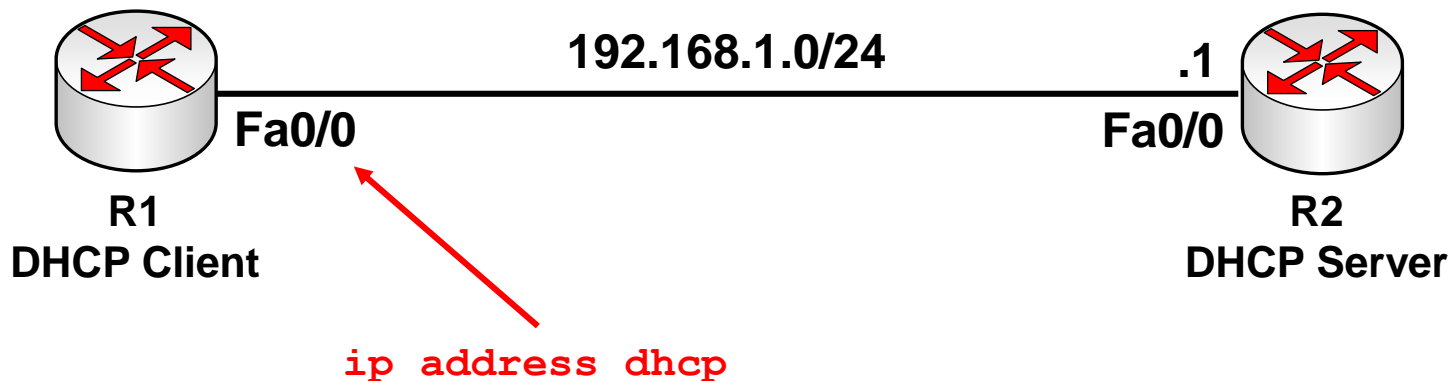
# DHCP Client (PC)



# DHCP Client (Cisco device)

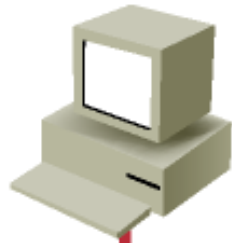
```
Router(config-if) # ip address dhcp
```

- Enables a Cisco IOS device to obtain an IP address dynamically from a DHCP server



# Helper Addressing Overview

**DHCP Client**

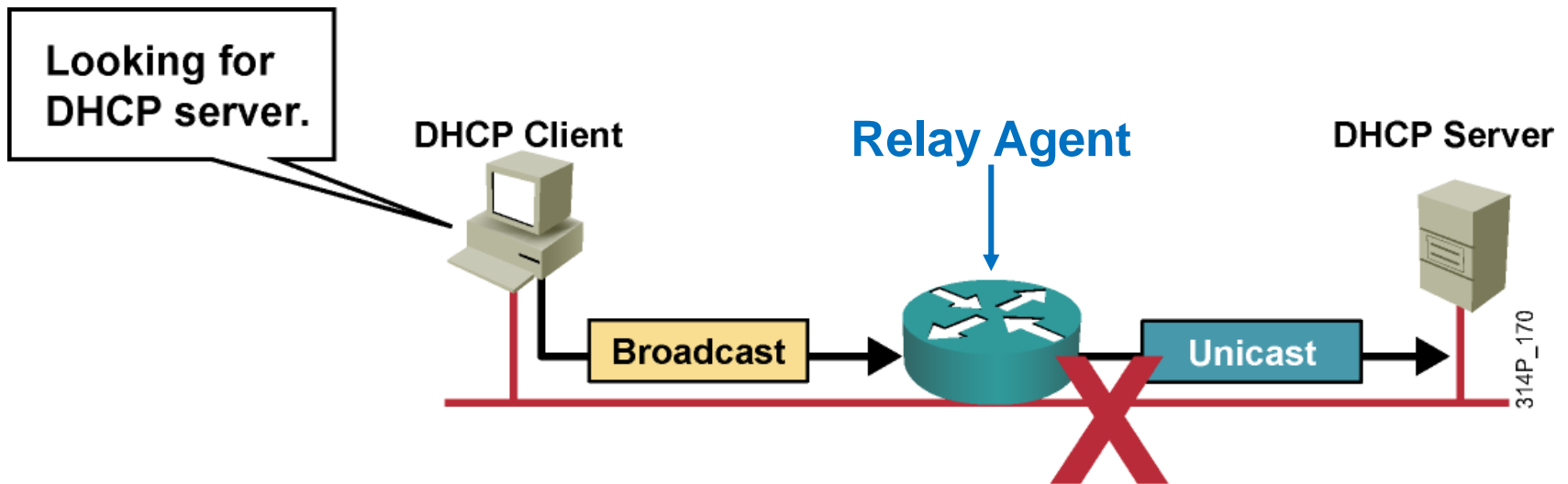


**DHCP Server**



- **Routers do not forward broadcasts, by default.**
- **Helper address provides selective connectivity.**

# Why Use a Helper Address?



- Sometimes clients do not know the server address.
- Helpers change broadcast to unicast to reach server.

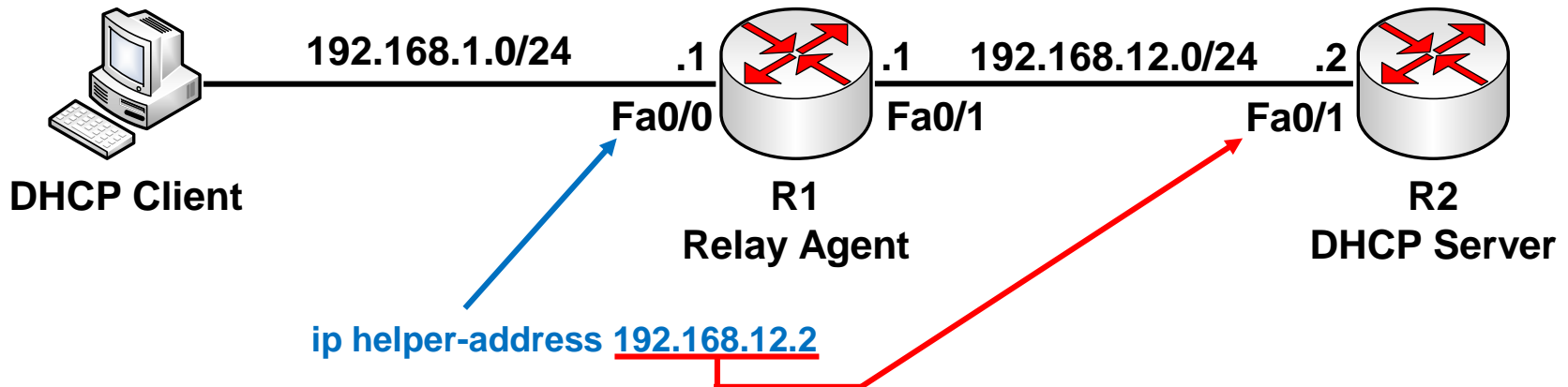


# IP Helper Address Commands

IP address of DHCP Server

```
RelayAgent(config-if)# ip helper-address address
```

- Enables forwarding and specifies destination address for main UDP broadcast packets
- Changes destination address from broadcast to unicast or directed broadcast address



# DHCP Verification Command

```
Router# show ip dhcp binding
```

- Displays address bindings on the Cisco IOS DHCP Server

```
DHCP_SERVER#show ip dhcp binding
```

IP address	Client-ID/ Hardware address	Lease expiration	Type
192.168.1.6	0000.0C31.39C2	may 03 2013 11:30AM	Automatic
192.168.1.9	0001.425A.39C2	may 03 2013 11:31AM	Automatic
192.168.1.10	0001.43B7.215D	may 03 2013 11:31AM	Automatic
192.168.1.8	000A.4148.557B	may 03 2013 11:32AM	Automatic
192.168.1.7	0030.F2A7.D4DA	may 03 2013 11:32AM	Automatic

