



TRƯỜNG ĐẠI HỌC CÔNG NGHỆ THÔNG TIN - ĐHQG-HCM  
**KHOA MẠNG MÁY TÍNH VÀ TRUYỀN THÔNG**

# NETWORK SERVICES

**QUẢN TRỊ MẠNG VÀ HỆ THỐNG**  
Networks and Systems Administration

MSc. Trần Thị Dung



# Content

- DHCP
- NAT
- ACL

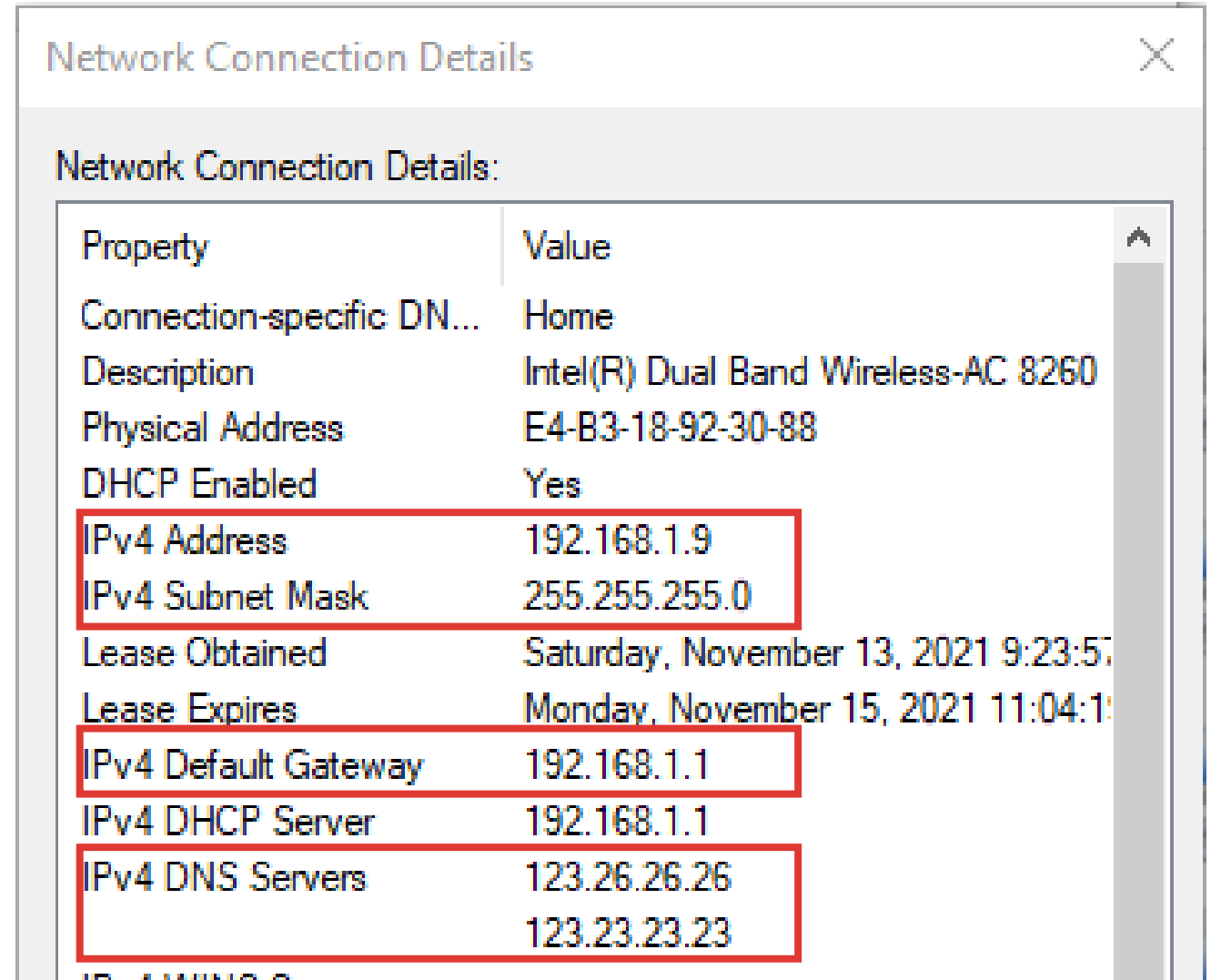
# Content

- DHCP
- NAT
- ACL

- DHCP Overview
- DHCP Operation
- DHCP Implementation

# DHCP overview

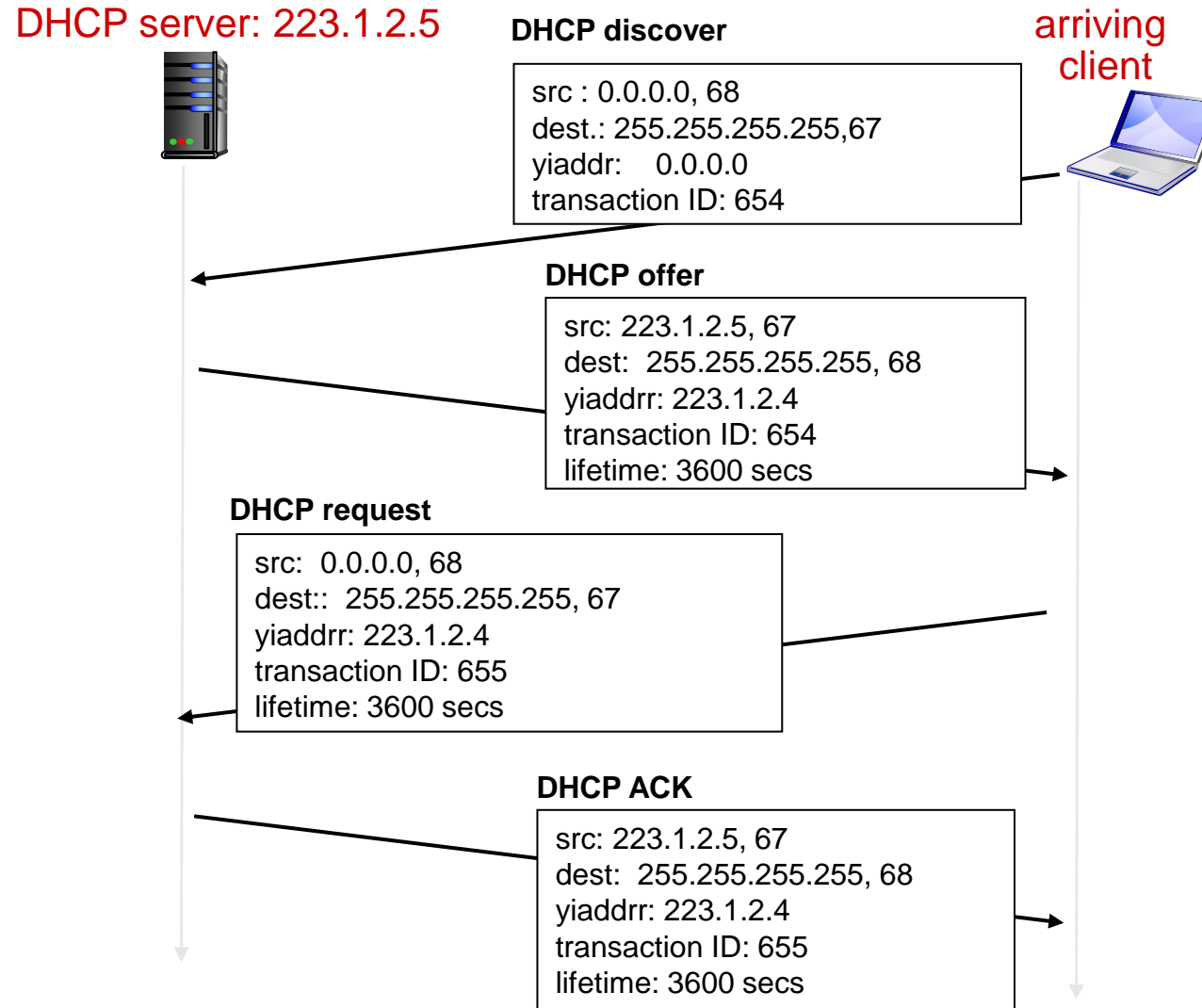
- DHCP assigns IP addresses and other network configuration information dynamically
- DHCP server provides
  - IP address
  - Subnet mask
  - Default gateway
  - DNS server

A screenshot of the 'Network Connection Details' window in Windows. The window title is 'Network Connection Details' with a close button. The main content area is titled 'Network Connection Details:' and contains a table of network properties. The table has two columns: 'Property' and 'Value'. The properties listed are: Connection-specific DN... (Home), Description (Intel(R) Dual Band Wireless-AC 8260), Physical Address (E4-B3-18-92-30-88), DHCP Enabled (Yes), IPv4 Address (192.168.1.9), IPv4 Subnet Mask (255.255.255.0), Lease Obtained (Saturday, November 13, 2021 9:23:57), Lease Expires (Monday, November 15, 2021 11:04:11), IPv4 Default Gateway (192.168.1.1), IPv4 DHCP Server (192.168.1.1), and IPv4 DNS Servers (123.26.26.26 and 123.23.23.23). The last five rows are highlighted with a red border.

Property	Value
Connection-specific DN...	Home
Description	Intel(R) Dual Band Wireless-AC 8260
Physical Address	E4-B3-18-92-30-88
DHCP Enabled	Yes
IPv4 Address	192.168.1.9
IPv4 Subnet Mask	255.255.255.0
Lease Obtained	Saturday, November 13, 2021 9:23:57
Lease Expires	Monday, November 15, 2021 11:04:11
IPv4 Default Gateway	192.168.1.1
IPv4 DHCP Server	192.168.1.1
IPv4 DNS Servers	123.26.26.26 123.23.23.23

- DHCP Overview
- **DHCP Operation**
- DHCP Implementation

# DHCP overview



# DHCP Server on modem/AP



450M Wireless N Router  
Model No. TL-WR940N

StatusQuick SetupWPSWorking ModeNetworkWirelessGuest NetworkDHCP- DHCP Settings- DHCP Client List- Address ReservationForwardingSecurityParental ControlAccess ControlAdvanced Routing

### DHCP Settings

DHCP Server: ☐ Disable ☒ Enable

Start IP Address:

192.168.0.100

End IP Address:

192.168.0.199

Address Lease Time: 

120

 minutes (1~2880 minutes, the default value is 120 min)

Default Gateway:

192.168.0.1

(Optional)

Default Domain:

(Optional)

Primary DNS:

0.0.0.0

(Optional)

Secondary DNS:

0.0.0.0

(Optional)

Save



# DHCP Server on modem/AP

**Network Setup**

Router IP

DHCP Server Settings

IP Address: 192 . 168 . 0 . 1

Subnet Mask: 255.255.255.0

DHCP Server: ☒ Enabled ☐ Disabled

DHCP Reservation

Start IP Address: 192.168.0. 100

Maximum number of Users: 50

IP Address Range: 192.168.0. 100 - 149

Client Lease Time: 0 minutes (0 means one day)

Static DNS 1: 0 . 0 . 0 . 0

Static DNS 2: 0 . 0 . 0 . 0

Static DNS 3: 0 . 0 . 0 . 0

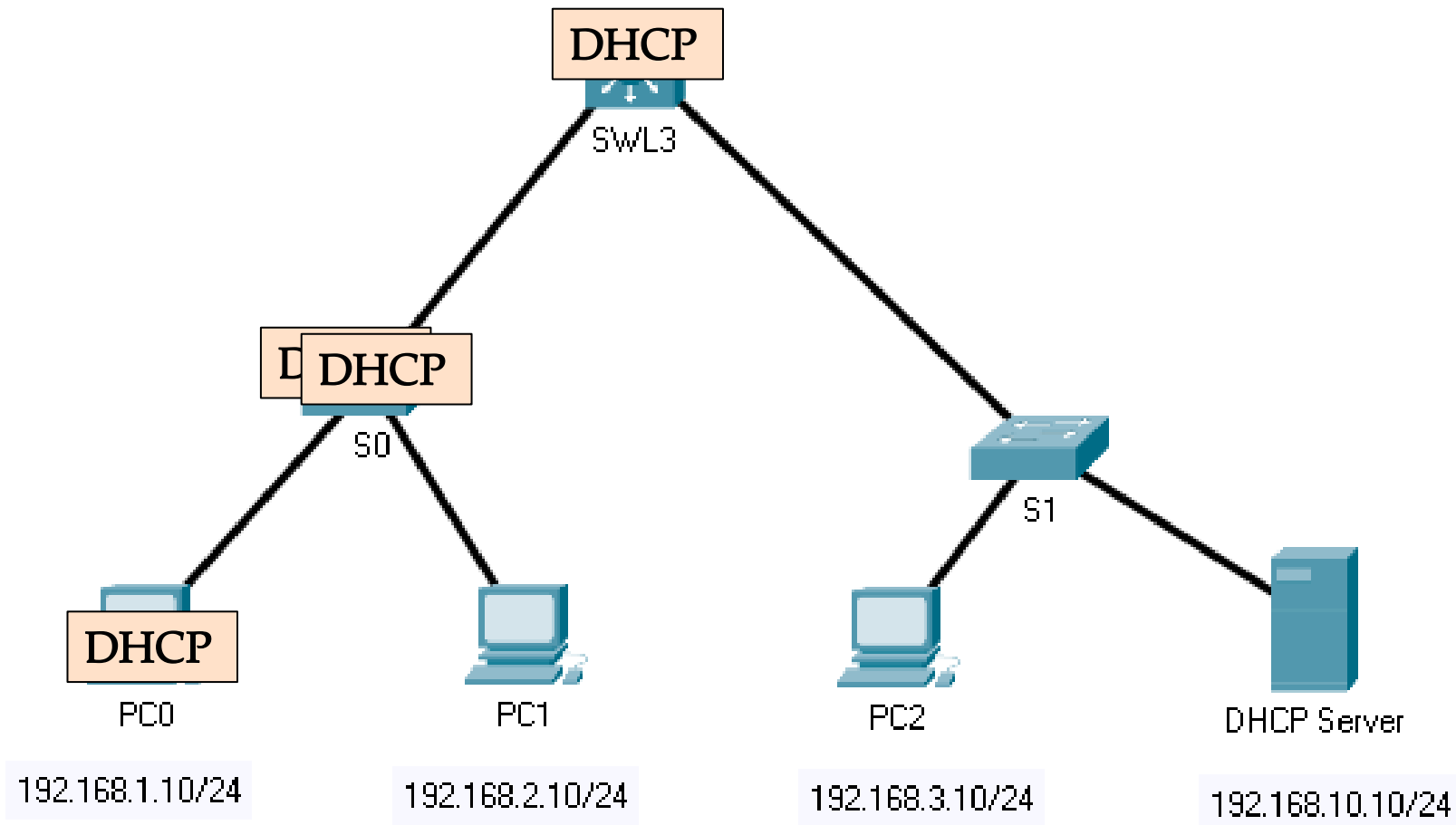
WINS: 0 . 0 . 0 . 0

- DHCP Overview
- DHCP Operation
- **DHCP Implementation**

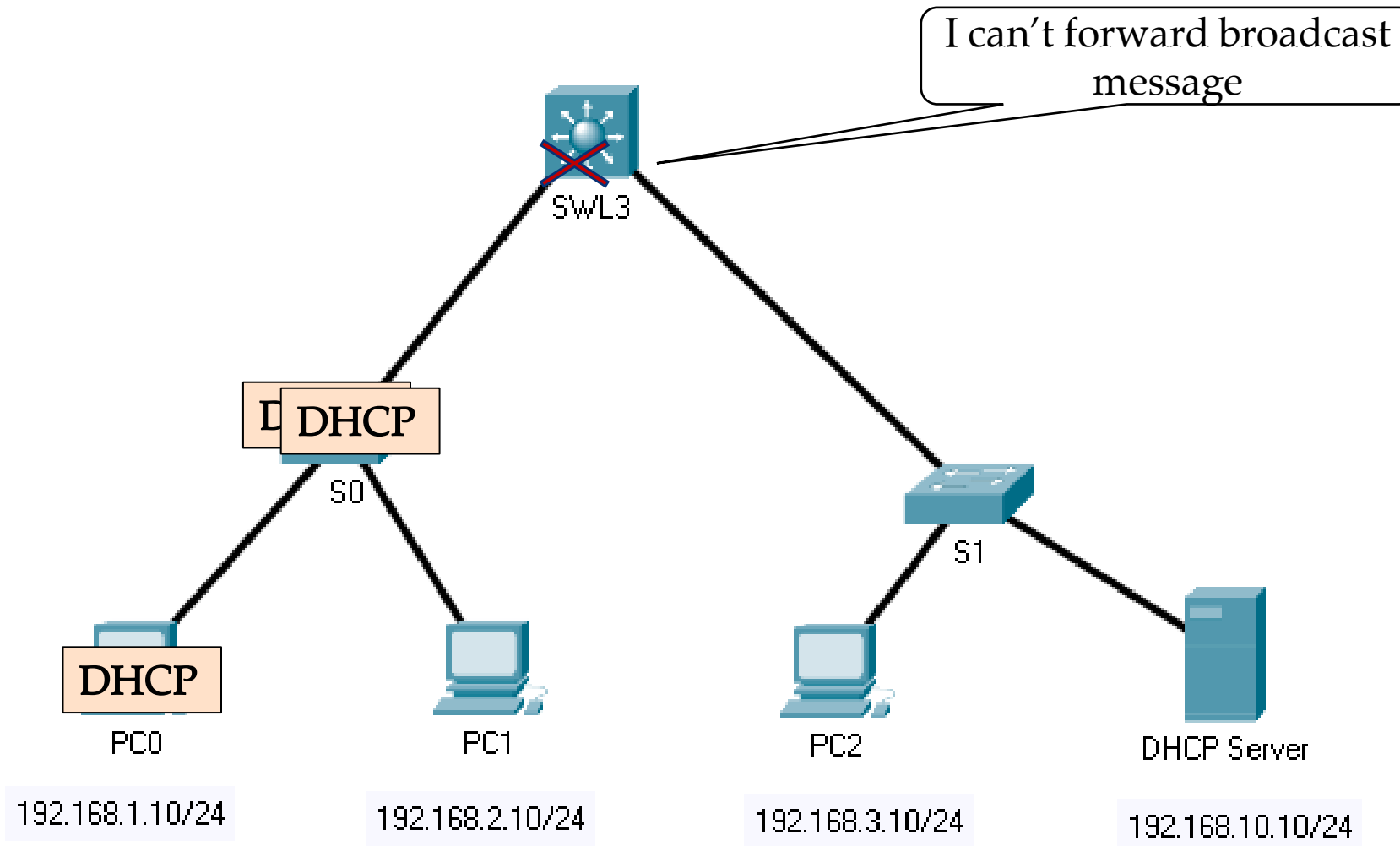
# DHCP Operation

- Router as a DHCP server
- Router as a DHCP Relay agent

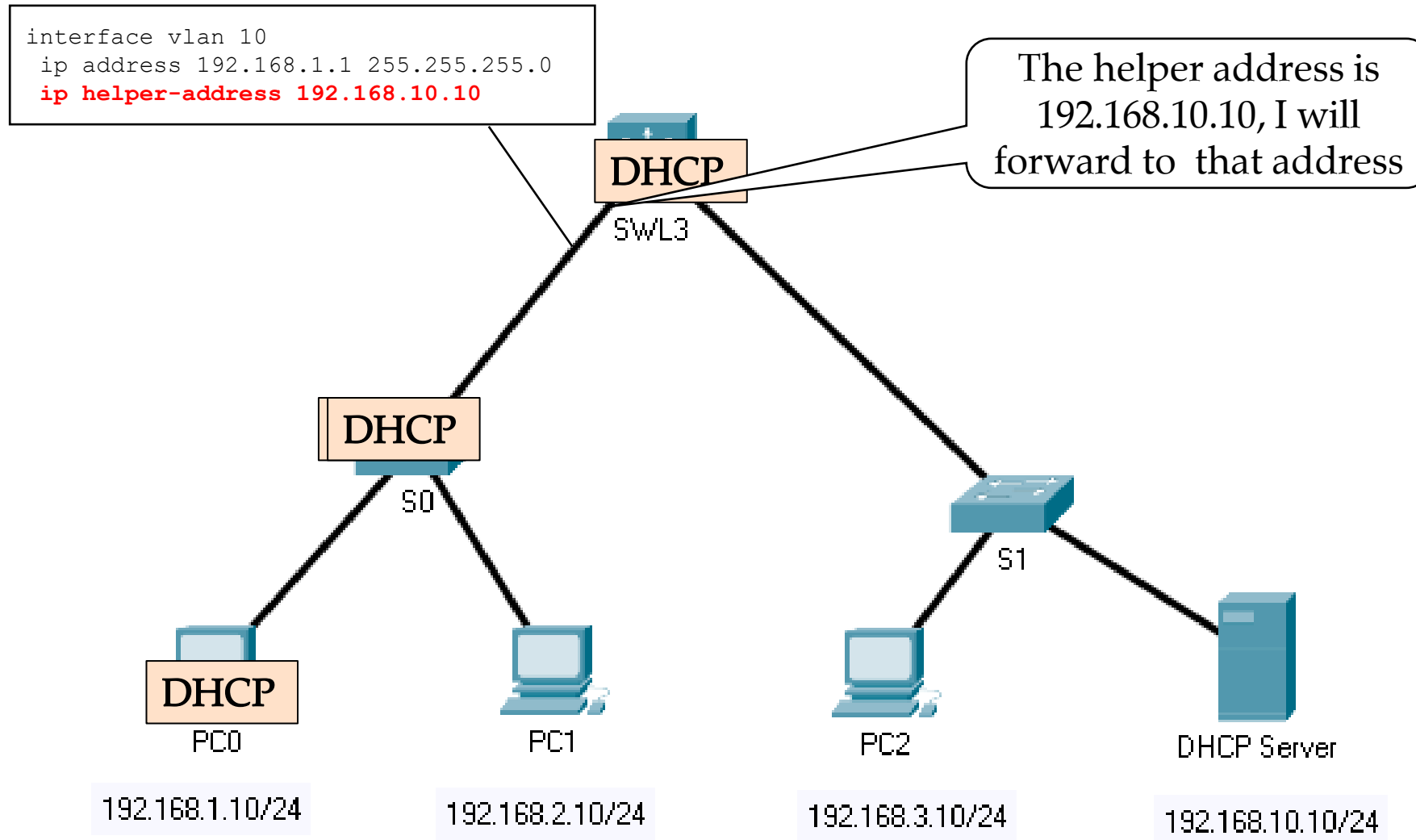
# Router as a DHCP Server



# Router as a DHCP Relay agent



# Router as a DHCP Relay agent



# Content

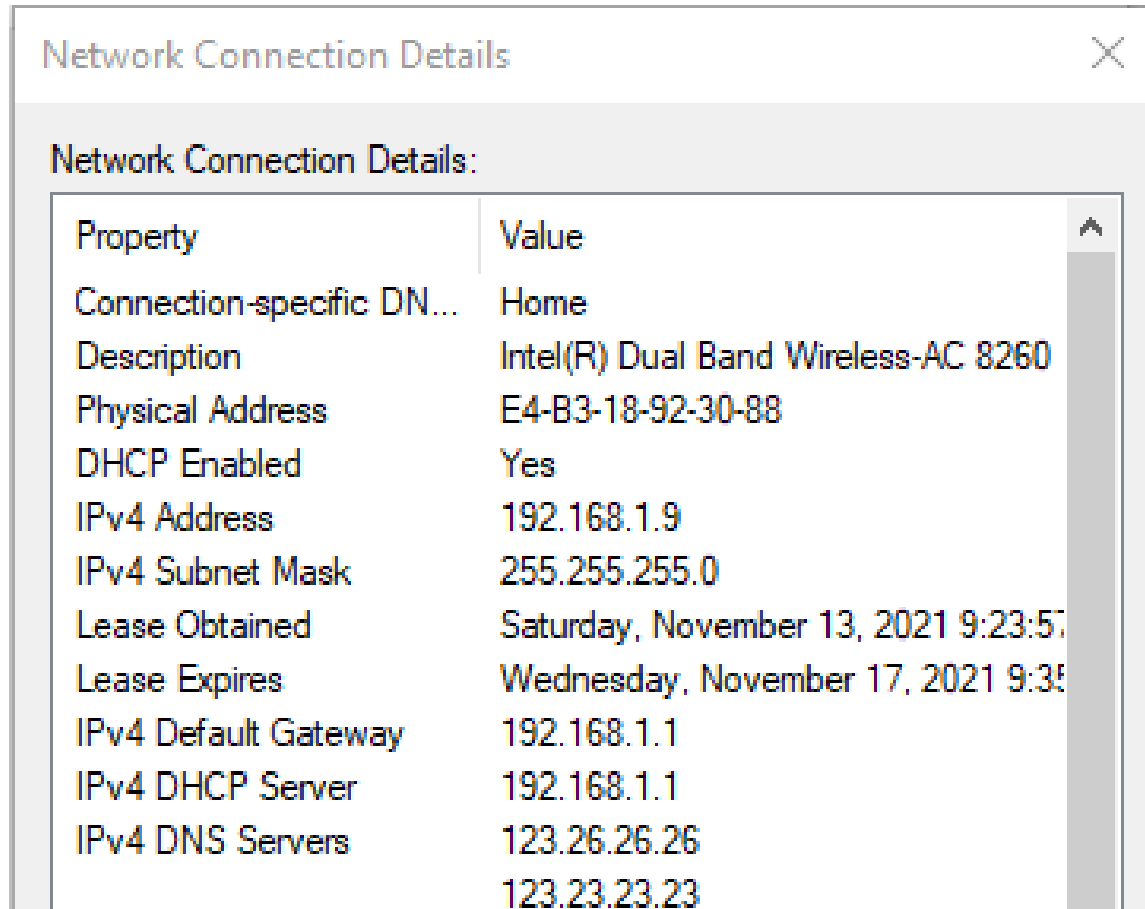
- DHCP
- NAT
- ACL

- NAT Overview
- NAT Operation



# NAT overview

- Private IP addresses are used within an organization and home networks.

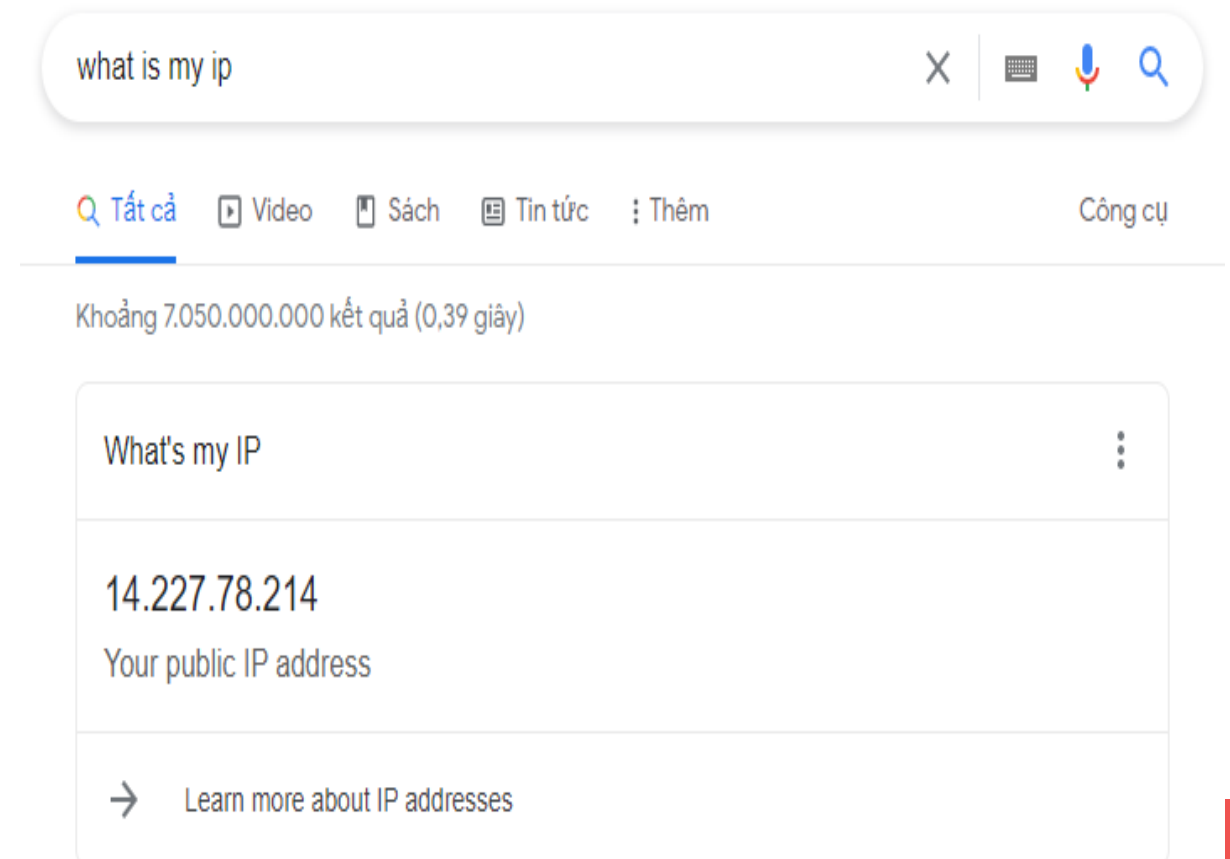


Network Connection Details

Network Connection Details:

Property	Value
Connection-specific DN...	Home
Description	Intel(R) Dual Band Wireless-AC 8260
Physical Address	E4-B3-18-92-30-88
DHCP Enabled	Yes
IPv4 Address	192.168.1.9
IPv4 Subnet Mask	255.255.255.0
Lease Obtained	Saturday, November 13, 2021 9:23:57
Lease Expires	Wednesday, November 17, 2021 9:35
IPv4 Default Gateway	192.168.1.1
IPv4 DHCP Server	192.168.1.1
IPv4 DNS Servers	123.26.26.26
	123.23.23.23

- Public IP address can be routed over the Internet



what is my ip

Tất cả Video Sách Tin tức Thêm Công cụ

Khoảng 7.050.000.000 kết quả (0,39 giây)

What's my IP

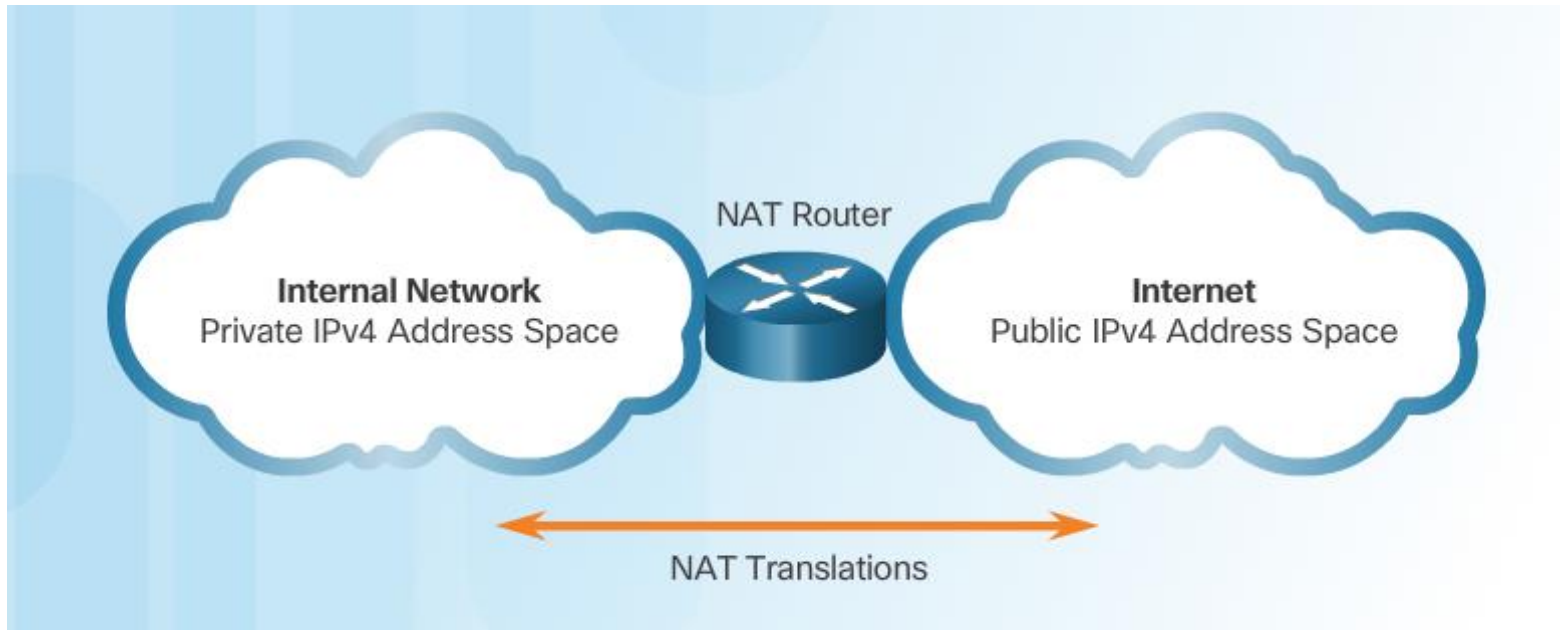
14.227.78.214

Your public IP address

→ Learn more about IP addresses

# NAT overview (Cont.)

- Private IP addresses cannot be routed over the Internet.
- NAT is used to translate private IP addresses to public addresses that can be routed over the Internet.
- One public IPv4 address can be used for thousands of devices that have private IP addresses.



# NAT overview (Cont.)

- Network Address Translation - NAT
- Case 1: All devices in local network share one or many public IPv4 addresses to access Internet
- Case 2: The Internet client wants to connect to server behind NAT with public IP address



# Content

- NAT Overview
- **NAT Operation**



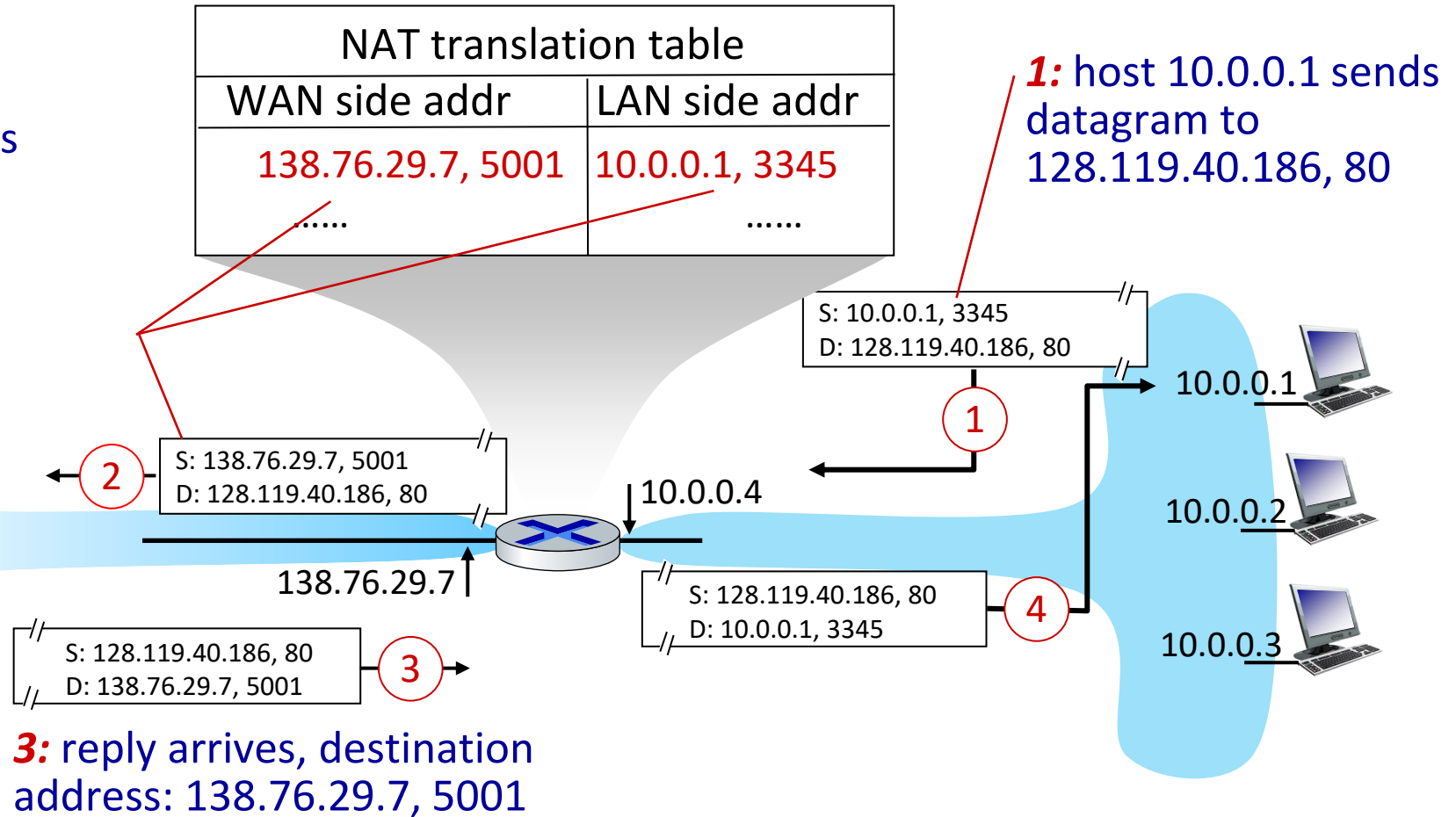
# NAT operation

- Case 1: All devices in local network share one or many public IPv4 addresses to access Internet



# NAT Operation

**2:** NAT router changes datagram source address from 10.0.0.1, 3345 to 138.76.29.7, 5001, updates table



# NAT Operation

- Case 2: The Internet client wants to connect to server behind NAT with public IP address

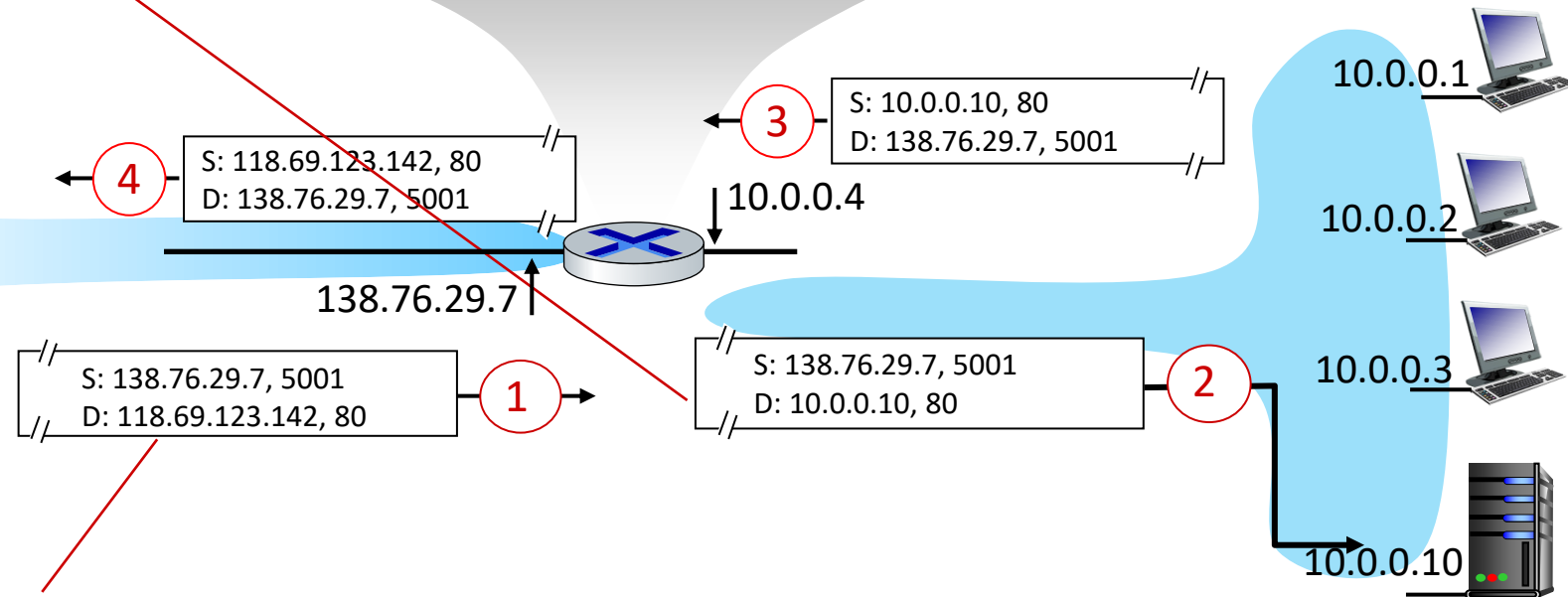


# NAT Operation

**2:** NAT router changes datagram destination address from 118.69.123.142, 80 to 10.0.0.10, 80, that is pre-defined in the table

NAT translation table	
WAN side addr	LAN side addr
118.69.123.142, 80	10.0.0.10, 80
.....	.....

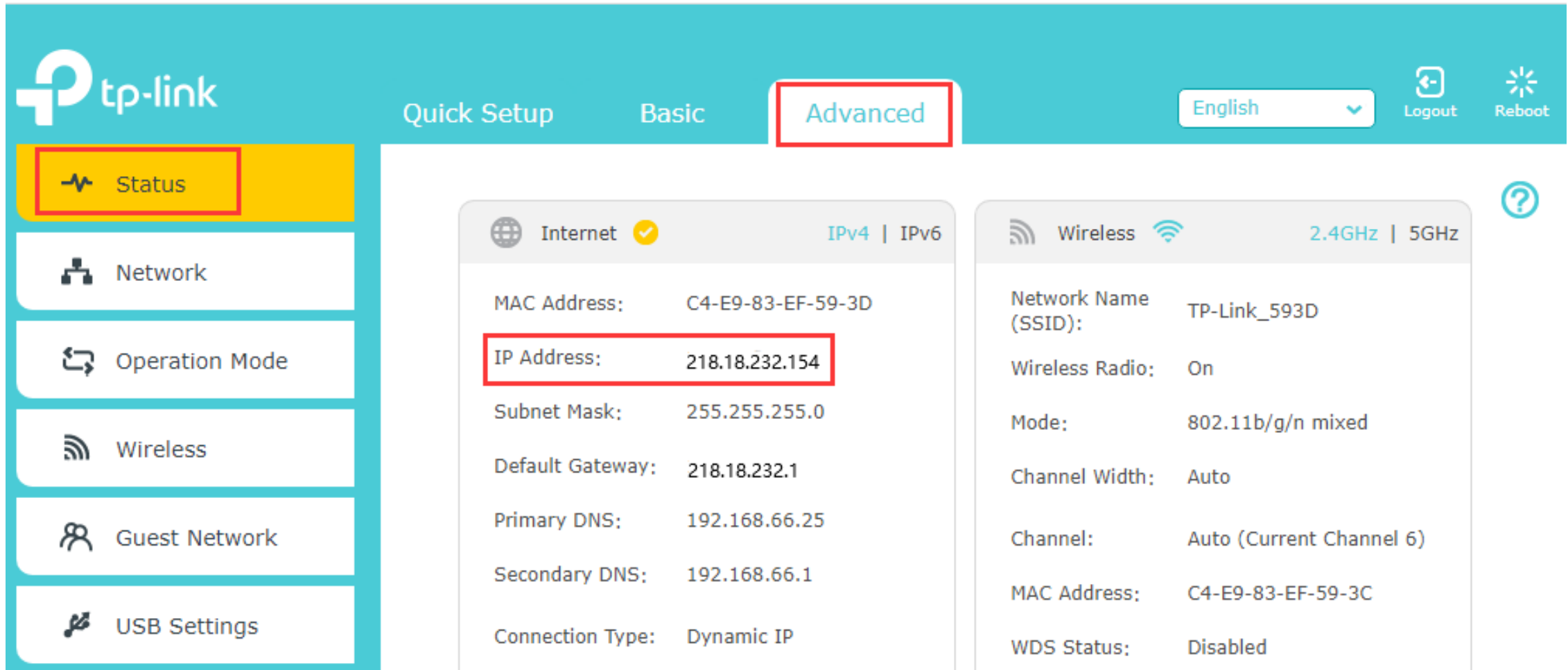
**3:** server replies, source address: 10.0.0.10, 80



**1:** Client 138.76.29.7 sends datagram to 118.69.123.142, 80



# NAT Forwarding – Port Forwarding



The screenshot displays the TP-Link router's web management interface. The top navigation bar includes 'Quick Setup', 'Basic', and 'Advanced' (highlighted with a red box). The left sidebar contains menu items: 'Status' (highlighted with a red box), 'Network', 'Operation Mode', 'Wireless', 'Guest Network', and 'USB Settings'. The main content area is divided into two panels. The 'Internet' panel (IPv4) shows the following settings:

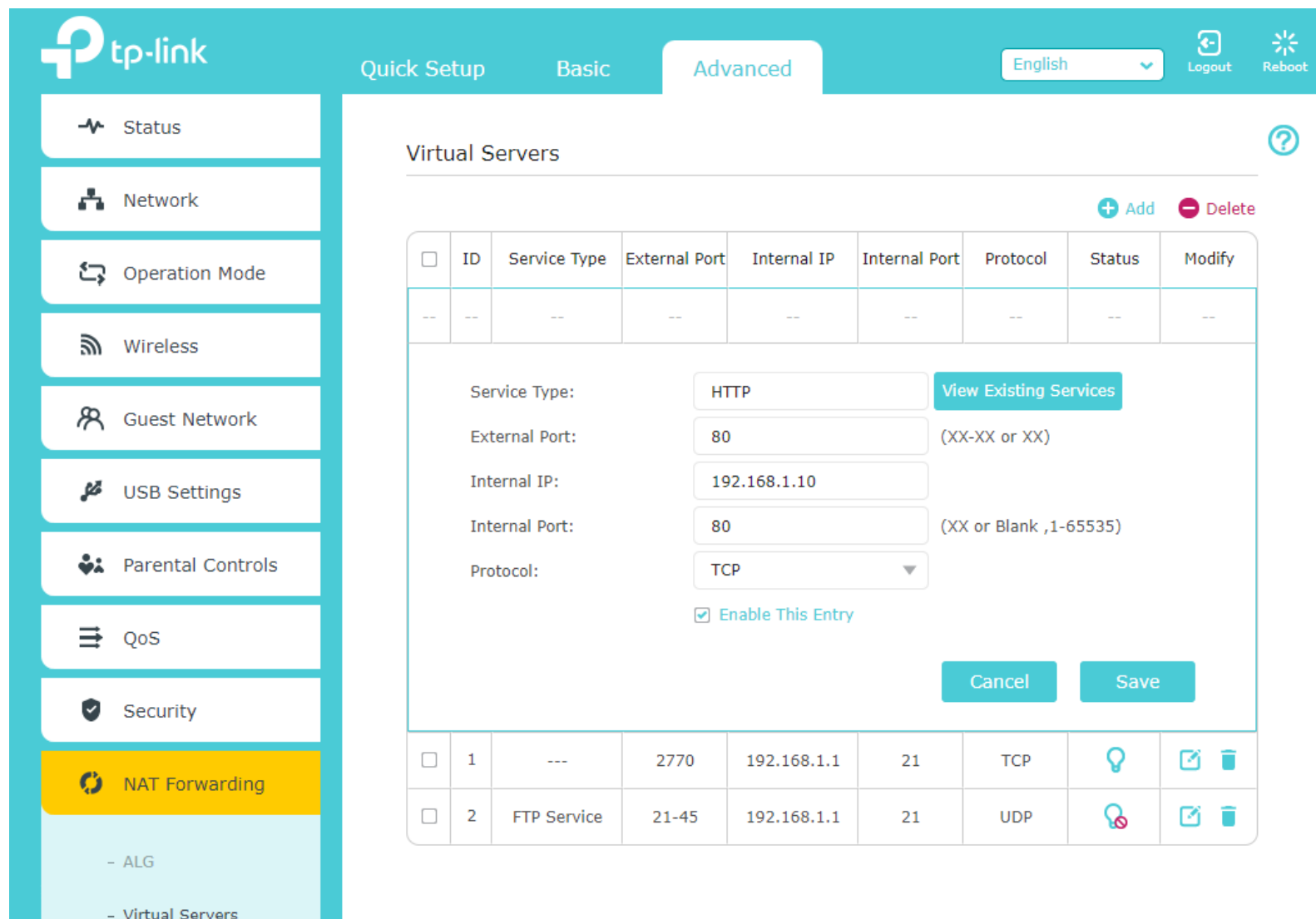
Parameter	Value
MAC Address	C4-E9-83-EF-59-3D
IP Address	218.18.232.154
Subnet Mask	255.255.255.0
Default Gateway	218.18.232.1
Primary DNS	192.168.66.25
Secondary DNS	192.168.66.1
Connection Type	Dynamic IP

The 'Wireless' panel (2.4GHz) shows the following settings:

Parameter	Value
Network Name (SSID)	TP-Link_593D
Wireless Radio	On
Mode	802.11b/g/n mixed
Channel Width	Auto
Channel	Auto (Current Channel 6)
MAC Address	C4-E9-83-EF-59-3C
WDS Status	Disabled



# NAT Forwarding – Port Forwarding



The screenshot shows the TP-Link web interface with the 'Advanced' tab selected. The left sidebar contains navigation links: Status, Network, Operation Mode, Wireless, Guest Network, USB Settings, Parental Controls, QoS, Security, NAT Forwarding (highlighted), and Virtual Servers. The main content area is titled 'Virtual Servers' and includes a table with columns: ID, Service Type, External Port, Internal IP, Internal Port, Protocol, Status, and Modify. Below the table is a form for adding a new service with fields for Service Type (HTTP), External Port (80), Internal IP (192.168.1.10), Internal Port (80), and Protocol (TCP). The form also has checkboxes for 'Enable This Entry' and buttons for 'Cancel' and 'Save'. A 'View Existing Services' button is also present.

tp-link Quick Setup Basic **Advanced** English Logout Reboot

Virtual Servers ?

+ Add - Delete

<input type="checkbox"/>	ID	Service Type	External Port	Internal IP	Internal Port	Protocol	Status	Modify
<input type="checkbox"/>	--	--	--	--	--	--	--	--

Service Type: HTTP View Existing Services

External Port: 80 (XX-XX or XX)

Internal IP: 192.168.1.10

Internal Port: 80 (XX or Blank ,1-65535)

Protocol: TCP

☒ Enable This Entry

Cancel Save

<input type="checkbox"/>	1	---	2770	192.168.1.1	21	TCP		
<input type="checkbox"/>	2	FTP Service	21-45	192.168.1.1	21	UDP		



# Content

- DHCP
- NAT
- **ACL**

# ACL overview

- An ACL is a sequential list of permit or deny statements that control whether a router forwards or drops packets based on information found in the packet header.

