

Network Protocols

Textbook

Network Protocols



Predict: What do you think an internet protocol is? Have you heard the word protocol before?

Networks depend on certain guidelines (protocols), specific identification numbers (addresses), and particular radio waves to communicate.

Common Network Protocols: The Rules of the Road

Network protocols are sets of rules that explain how information is put together, sent, and received.

HTTP/HTTPS: Used for looking at websites; HTTPS adds a layer of security by scrambling the information.

FTP: Used for moving files from one computer to another.

Email Protocols (SMTP, POP3, IMAP): These handle sending emails (SMTP) and getting/organizing emails (POP3/IMAP).

TCP/IP: This is the main set of rules for the Internet. TCP makes sure that information gets delivered reliably, while IP manages how information packets are addressed and sent to the right place.

How Devices Are Identified on a Network: Digital Addresses

Devices need special identification numbers, mostly IP addresses.

IP Address (Internet Protocol Address): This is a number that tells you where a device is on a network and identifies it.

Public IP Addresses: These are unique addresses given out by your internet provider. They can be seen by the rest of the Internet, allowing information from outside to reach your network (like the address of your home router).

Private IP Addresses: These are only used inside your own local network (like your home Wi-Fi) and cannot be seen directly by the Internet. Many devices can share one public IP address through a router.

MAC Address (Media Access Control Address): This is a special, permanent number built into the hardware of your network card that identifies it.

Internet Protocol Versions: IPv4 vs. IPv6

As the Internet grew, new versions of IP addresses were created.

IPv4 (Internet Protocol Version 4):

These addresses are 32 bits long and are shown as four numbers separated by dots (for example, 192.168.1.100).

Underneath, they are based on a binary system (using 0s and 1s).

There are only about 4.3 billion possible addresses, which has led to them running out.

IPv6 (Internet Protocol Version 6):

These addresses are 128 bits long and are shown as eight groups of letters and numbers (for example, 2001:0db8:85a3::8a2e:0370:7334).

There are a lot more possible addresses (around 340 undecillion).

Similarities: Both types of IP addresses identify devices and allow information to be sent to the correct place.

Differences: They differ in their length, how they are written (binary vs. letters and numbers), and how many addresses they can provide. IPv6 is the direction the Internet is heading.

2.4 GHz and 5 GHz Wireless Networks: Speed vs. Range

Wi-Fi uses different radio frequencies, and each has its own pros and cons:

2.4 GHz Wireless Networks:

Advantages: They can reach further and are better at going through walls and other things that are in the way.

Disadvantages: They are slower and can be affected by interference from other devices (like microwave ovens).

5 GHz Wireless Networks:

Advantages: They offer faster speeds and have less interference because there are more channels available.

Disadvantages: They have a shorter range and don't go through obstacles as well.

Which to use? The 2.4 GHz band is good for everyday use or for devices that are far away from your router. The 5 GHz band is better for things that need a lot of internet data, like streaming videos or playing games, especially when you are close to the router.

Critical Thinking Questions

1. Imagine you're trying to watch a high-definition movie online and it keeps buffering. Which Wi-Fi frequency band do you think would be better for a smoother streaming experience, and why? What are some reasons you might not be able to use that particular band in your situation?

2. When you connect a new device, like a tablet or a smart speaker, to your home Wi-Fi, how do you think it gets its "digital address" so it can talk to other devices and the internet? What's the process behind that?
3. Think about a large company with thousands of computers and devices. If they had to switch all their internet traffic from using IPv4 to IPv6 overnight, what kinds of major problems or challenges might they run into?

Questions (5)

1. A user is accessing their online banking website. Which network protocol ensures that the data exchanged, like their password and account details, is encrypted and secure?

MULTIPLE CHOICE

Choose the correct answer:

- A. HTTP
- B. FTP
- C. HTTPS
- D. SMTP

2. You need to send a large video file from your computer to a friend's computer directly, without using email or a cloud storage service. Which network protocol is designed specifically for transferring files between computers?

MULTIPLE CHOICE

Choose the correct answer:

- A. HTTP
- B. FTP
- C. TCP/IP
- D. IMAP

3. A gamer wants the fastest possible Wi-Fi connection for their online game, even if they have to be close to the router. Which wireless network frequency band would you recommend for the best experience?

MULTIPLE CHOICE

Choose the correct answer:

- A. 2.4 GHz
- B. 5 GHz
- C. Both 2.4 GHz and 5 GHz, as they offer the same speed.
- D. Neither, as Wi-Fi is unsuitable for gaming.

4. Your home network has multiple devices, including a laptop, a smart TV, and a smart refrigerator. How do these devices likely obtain their IP address within your home network?

MULTIPLE CHOICE

Choose the correct answer:

- A. They all receive a unique public IP address directly from the Internet.
- B. They are all assigned the same public IP address by the router.
- C. They each obtain a private IP address from the router, which then uses a single public IP to access the Internet.
- D. They do not need IP addresses as long as they have a MAC address.

5. What is the primary function of the Internet Protocol (IP) part of the TCP/IP suite?

MULTIPLE CHOICE

Choose the correct answer:

- A. To ensure reliable data delivery.
- B. To encrypt web traffic.
- C. To handle addressing and routing data packets.
- D. To manage email sending.

Answer Keys & Solutions

Questions

1. A user is accessing their online banking website. Which network protocol ensures that the data exchanged, like their password and account details, is encrypted and secure?

MULTIPLE CHOICE

Correct Answer:

- | | |
|----------|-------------|
| A. HTTP | ✗ Incorrect |
| B. FTP | ✗ Incorrect |
| C. HTTPS | ✓ Correct |
| D. SMTP | ✗ Incorrect |

Explanation:

Look for the protocol specifically noted for adding encryption for security during web Browse.

2. You need to send a large video file from your computer to a friend's computer directly, without using email or a cloud storage service. Which network protocol is designed specifically for transferring files between computers?

MULTIPLE CHOICE

Correct Answer:

- | | |
|-----------|-------------|
| A. HTTP | ✗ Incorrect |
| B. FTP | ✓ Correct |
| C. TCP/IP | ✗ Incorrect |
| D. IMAP | ✗ Incorrect |

Explanation:

Recall the protocol whose name explicitly refers to "File Transfer."

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MULTIPLE CHOICE

Correct Answer:

- A. 2.4 GHz ✗ Incorrect
- B. 5 GHz ✓ Correct
- C. Both 2.4 GHz and 5 GHz, as they offer the same speed. ✗ Incorrect
- D. Neither, as Wi-Fi is unsuitable for gaming. ✗ Incorrect

Explanation:

Think about which frequency band offers faster speeds and less interference.

4. Your home network has multiple devices, including a laptop, a smart TV, and a smart refrigerator. How do these devices likely obtain their IP address within your home network?

MULTIPLE CHOICE

Correct Answer:

- A. They all receive a unique public IP address directly from the Internet. ✗ Incorrect
- B. They are all assigned the same public IP address by the router. ✗ Incorrect
- C. They each obtain a private IP address from the router, which then uses a single public IP to access the Internet. ✓ Correct
- D. They do not need IP addresses as long as they have a MAC address. ✗ Incorrect

Explanation:

Consider how many devices can share one internet connection and still communicate individually within a home network.

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MULTIPLE CHOICE

Correct Answer:

A. To ensure reliable data delivery.

✗ Incorrect

B. To encrypt web traffic.

✗ Incorrect

C. To handle addressing and routing data packets.

✓ Correct

D. To manage email sending.

✗ Incorrect

Explanation:

Recall which part of TCP/IP is responsible for getting packets to the right place.