

Lecture 6 - IP Addressing Quiz ANS

1. Why is hierarchical addressing crucial for scaling the Internet?

- A) It allows routers to have one table entry for an entire network rather than every host
- B) It makes IP addresses shorter and easier to type
- C) It encrypts the location of the host for privacy
- D) It forces all traffic to go through a single central server

ANS: A

The primary scaling benefit of hierarchical addressing is aggregation. A router can have a single entry like '1.*' to reach millions of hosts, drastically reducing forwarding table size and updates.

2. In the early Internet (Classful Addressing), what determined the size of the network?

- A) The first few bits of the IP address (e.g., 0, 10, 110)
- B) A separate subnet mask sent with every packet
- C) The physical location of the router
- D) The number of cables plugged into the switch

ANS: A

Classful addressing used the leading bits to define the class. '0' meant Class A (large), '10' meant Class B (medium), and '110' meant Class C (small).

3. What was the main problem with Classful Addressing (Classes A, B, C)?

- A) It was too slow for routers to process
- B) It wasted huge numbers of addresses (inflexible block sizes)
- C) It only supported 64-bit addresses
- D) It did not support email traffic

ANS: B

The fixed sizes were inefficient. Class A was too big for almost anyone, and Class C was too small (256 hosts). Everyone wanted Class B, which ran out quickly, leaving massive amounts of wasted space in Class A blocks.

4. What does CIDR stand for?

- A) Central Internet Data Routing
- B) Classless Inter-Domain Routing
- C) Computer Identity Distribution Registry
- D) Common IP Destination Resolution

ANS: B

CIDR stands for Classless Inter-Domain Routing. It replaced the rigid Class A/B/C system with flexible prefix lengths (e.g., /23 or /19) to reduce waste.

5. In the address 192.168.1.0/24, what does the '/24' indicate?

- A) There are 24 hosts in the network
- B) The first 24 bits are the Network ID (fixed)
- C) The network can support 24 subnets
- D) It is a Class A network

ANS: B

Slash notation (/N) specifies the number of fixed bits that represent the network prefix. /24 means the first 24 bits identify the network, leaving 8 bits for hosts.

6. Which organization is at the top of the IP address allocation hierarchy?

- A) ARIN
- B) Google
- C) ICANN
- D) The United Nations

ANS: C

ICANN (Internet Corporation for Assigned Names and Numbers) is the top-level authority that allocates large blocks of IP addresses to Regional Internet Registries (RIRs).

7. How does route aggregation (supernetting) help reduce routing table size?

- A) By deleting routes to unpopular websites
- B) By combining multiple adjacent small prefixes into one larger prefix
- C) By converting all IPv4 addresses to IPv6 automatically
- D) By storing tables in the cloud instead of on routers

ANS: B

Aggregation allows a router to advertise a single summary prefix (e.g., 4.0.0.0/8) that covers many smaller, specific networks (like 4.12.0.0/16 and 4.29.0.0/16) owned by the same ISP.

8. What is 'Multi-homing' and how does it affect aggregation?

- A) Connecting to multiple ISPs for redundancy; it breaks perfect aggregation
- B) Using multiple computers at home; it improves aggregation
- C) Moving a laptop between work and home; it has no effect
- D) Hosting multiple websites on one server; it reduces table size

ANS: A

Multi-homing means a network connects to two different providers (e.g., Stanford connecting to AT&T and Verizon). This forces both providers to advertise the specific route to Stanford, preventing them from just summarizing it into their general blocks.

9. If a packet matches two entries in a forwarding table (e.g., 4.0.0.0/8 and 4.29.0.0/16), which one is used?

- A) The first one in the list
- B) The one with the shortest prefix length

- C) The one with the Longest Prefix Match (most specific)
- D) The router randomly picks one to load balance

ANS: C

Routers always use Longest Prefix Match. The /16 entry is more specific (longer match) than the /8 entry, so it is preferred.

10. Approximately how many addresses does IPv4 provide?

- A) 1 million
- B) 4 billion (2^{32})
- C) 340 undecillion (2^{128})
- D) 16 million

ANS: B

IPv4 uses 32-bit addresses, providing 2^{32} unique combinations, which is roughly 4.3 billion addresses. This is not enough for the modern world.

11. How many bits are in an IPv6 address?

- A) 32 bits
- B) 64 bits
- C) 128 bits
- D) 256 bits

ANS: C

IPv6 addresses are 128 bits long, providing a virtually infinite address space (2^{128}) to solve the exhaustion problem.

12. Which of the following is a valid shorthand for the IPv6 address

2001:0DB8:0000:0000:0000:0000:0001?

- A) 2001:DB8:0:0:0:0:1
- B) 2001:DB8::1
- C) Both A and B are valid
- D) IPv6 addresses cannot be shortened

ANS: C

Leading zeros in a block can be omitted (0DB8 -> DB8). A single contiguous string of zero blocks can be replaced by '::' (but only once). Both representations are valid shorthand.

13. Why is migrating from IPv4 to IPv6 difficult?

- A) IPv6 cables are more expensive
- B) IPv4 and IPv6 are incompatible; you need two separate forwarding tables or complex translation
- C) IPv6 is slower than IPv4
- D) Governments have banned IPv6

ANS: B

The protocols are not backward compatible. A router needs separate logic and tables for IPv4 and IPv6 traffic. Hosts need to support dual stacks to talk to the whole internet.

14. What is the typical size of an IPv6 subnet prefix allocated to a user or small network?

- A) /32
- B) /64
- C) /96
- D) /120

ANS: B

Standard IPv6 practice is to allocate at least a /64 prefix to even the smallest network segment. This leaves a massive 64 bits for host IDs, simplifying auto-configuration.

15. What is the 'Default Route' typically represented as in wildcard notation?

- A) 255.255.255.255
- B) 1.1.1.1
- C) *.* (or 0.0.0.0/0)
- D) 127.0.0.1

ANS: C

The default route covers 'everything not in the table'. In the slides, it is referred to as the '*' wildcard, often implemented as 0.0.0.0/0.

16. What is the purpose of a 'Netmask'?

- A) To hide the IP address from hackers
- B) To identify which bits of an IP address are the Network ID (1s) and which are the Host ID (0s)
- C) To act as a password for the router
- D) To convert decimal numbers to hexadecimal

ANS: B

A netmask (e.g., 255.255.255.0) uses 1s to mark the fixed network portion of an address and 0s for the variable host portion. Bitwise ANDing the IP with the mask reveals the Network ID

17. What notation is used to represent an IPv4 address range like '192.168.1.0 to 192.168.1.255' concisely?

- A) 192.168.1.0/24
- B) 192.168.1.0-255
- C) 192.168.1.x
- D) Class A Network

ANS: A

Slash notation (CIDR notation) like 192.168.1.0/24 indicates that the first 24 bits are fixed, and the remaining 8 bits vary, covering the range 0-255.