IT1201 Computer Networks

Tutorial 11

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1. What is an IPv4 address, and why is it important in networking?

An IPv4 address is a numerical label assigned to each device connected to a computer network that uses the Internet Protocol for communication. It serves two main purposes: identifying the host (or device) and providing the host's location in the network, thus enabling data packets to reach the correct destination. IPv4 addresses are essential because they provide a unique identifier for each device on a network, allowing devices to communicate and share resources across networks.

2. Explain the structure of an IPv4 address. How many bits does it contain, and how is it represented?

An IPv4 address is a 32-bit number

represented in decimal as four groups octets of numbers separated by dots

full IPv4 address 32 bits

Each octet have a value from 0 to 255 or 00000000 and 11111111 in binary

3. What are the two main parts of an IP address? Why are they important?

Network part: This portion of the IP address identifies the specific network to which the device belongs. Routers use this information to forward data across networks.

Host part: This portion identifies the individual device (or host) within the network. It is used to deliver data to the correct device on a network.

These two parts are important because they enable hierarchical addressing, which simplifies routing and ensures data packets are directed efficiently across large networks.

4. **List the different classes of IPv4 addresses and their primary use cases.**

Class A: Designed for large networks with many hosts. It supports approximately 16 million hosts, making it suitable for organizations with extensive networking needs.

Class B: Meant for medium-sized networks. It supports around 65,000 hosts, making it ideal for universities and mid-sized organizations.

Class C: Intended for small networks. It supports up to 254 hosts, making it suitable for small businesses and residential networks.

Class D: Reserved for multicast groups, used for applications such as streaming and broadcasting data to multiple devices.

Class E: Reserved for experimental purposes

5. What is the range of the first octet for each of the following IP classes: Class A, Class B, and Class C?

Class A: 1 to 126

Class B: 128 to 191

Class C: 192 to 223

6. Why is subnetting important in a network?

Efficient IP Address Management

Improved Network Performance

Enhanced Security

Simplified Administration

Scalability

7. Explain what a subnet mask is and how it works with an IP address

subnet mask is a 32-bit number that divides an IP address into the network and host portions. It works alongside the IP address to define which part of the IP address refers to the network and which part refers to the host within that network.

The subnet mask is written in a form similar to an IP address (e.g., 255.255.255.0). Each bit of the subnet mask is compared to the corresponding bit in the IP address. If the subnet mask bit is 1, the corresponding bit in the IP address is part of the network address. If it's 0, it's part of the host address

8. If you have an IP address of 192.168.10.25 with a subnet mask of 255.255.255.0, identify the network and host portions.

192.168.10. 25

Network potions Host portions

9. How many hosts can a Class C network with a subnet mask of 255.255.255.0 support?

2^8 - 2 = 256 - 2 = 254

10. What would be the subnet mask for a network that requires at least 30 hosts per subnet?

Network bits: 32 - 5 = 27 this leaves 5 bits for hosts

Subnet Mask in binary: 11111111.11111111.11111111.11100000

Subnet Mask in decimal: 255.255.255.224

11. Convert the IP address 192.168.1.1 to binary format.

11000000.10101000.00000001.00000001

12. Given an IP address 10.0.0.0/8, identify the class of the IP address and the default subnet mask

Class A

255.0.0.0

13. If you need to create 4 subnets from a 192.168.1.0/24 network, what would be the subnet mask for each subnet? Show your calculation

Original subnet mask: 255.255.255.0 (/24)

New subnet mask: 255.255.255.192 (/26)

14. Calculate the number of subnets and hosts per subnet for a network with the IP range 172.16.0.0/20

20 - 16 = 4 bits

2^4 = 16

32 - 20 = 12

2^12 - 2 = 4096 - 2 = 4094

15. Given an IP address 172.16.5.32 with a subnet mask 255.255.255.224, determine the network address and broadcast address of the subne