KONERU LAKSHMAIAH EDUCATION FOUNDATION
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Academic year: 2024-25
Home Assignment-II
B. Tech. (ECE,CSE,IOT,CSIT), 2023 Batch
II/IV, 2nd Semester

23EC2210R: NETWORK PROTOCOLS & SECURITY

1. Show the operation of dual stack technique and explain its importance in transition from IPv4 to IPv6.

The **dual stack technique** allows both IPv4 and IPv6 to run on the same device, ensuring compatibility and communication between IPv4-only and IPv6-only systems.

Operation:

- Devices have both IPv4 and IPv6 addresses.
- Communication occurs based on the destination protocol.
- NAT64 and similar techniques enable communication between IPv4 and IPv6 devices.

Importance:

- **Smooth Transition**: Enables gradual IPv4 to IPv6 migration without interrupting IPv4.
- **Compatibility**: Allows interaction between IPv4 and IPv6 devices.
- **Future-Proofing**: Supports IPv6 adoption while maintaining IPv4 connectivity.

2. Using fixed length subnetting divides the given network 196.220.84.32 into two parts. Give the first host ID, Last host ID, Subnet mask, and the number of hosts connected.

Subnet 1: `196.220.84.32/25`

- **First Host ID:** `196.220.84.33`
- **Last Host ID:** `196.220.84.126`
- **Subnet Mask:** `255.255.255.128`
- **Number of Hosts:** `126`

Subnet 2: `196.220.84.128/25`

- **First Host ID:** `196.220.84.129`
- **Last Host ID:** `196.220.84.254`
- **Subnet Mask:** `255.255.255.128`
- **Number of Hosts:** `126`

3. Explain the functions of the following devices: a) Hub b) Bridge c) Router d) Gateway.

a) Hub: A basic device that connects multiple devices in a network, broadcasting data to all connected devices, leading to potential network congestion.

b) Bridge: Connects and filters traffic between network segments, improving efficiency by reducing collisions, operating at the Data Link Layer.

c) Router: Connects different networks, routes data between them using IP addresses, and selects the best path for data. Operates at the Network Layer.

d) Gateway: Connects networks with different protocols, translating data between them. It operates at various layers, often at the Application Layer.

4. Compare and contrast the characteristics of Class A, B, and C address ranges in terms of their default subnet masks, address space, and the number of available host addresses.

Class	Default Subnet Mask	Address Range	Available Host Addresses
A	255.0.0.0 (/8)	1.0.0.0 to 127.255.255.255	16,777,214
B	255.255.0.0 (/16)	128.0.0.0 to 191.255.255.255	65,534
C	255.255.255.0 (/24)	192.0.0.0 to 223.255.255.255	254

5. Paraphrase carrier sense multiple access protocol and differentiate CSMA/CD and CSMA/CA?

CSMA Protocol: It allows devices to listen to the channel before transmitting. If the channel is free, they send data; otherwise, they wait for a random period before retrying.

CSMA/CD:

- **Collision Detection**: Detects and handles collisions during transmission.
- **Used in**: Wired networks (e.g., Ethernet).

CSMA/CA:

- **Collision Avoidance**: Prevents collisions by using methods like random backoff or request-to-send (RTS).
- **Used in**: Wireless networks (e.g., Wi-Fi).

6. Inspect the significance of each field within the IPV6 header and compare it with IPV4 header.

IPv6 Header Fields:

1. **Version (4 bits)**: Identifies the IP version (always 6 for IPv6).
2. **Traffic Class (8 bits)**: Used for QoS (like IPv4's TOS).
3. **Payload Length (16 bits)**: Length of data (excluding header).
4. **Next Header (8 bits)**: Identifies the next protocol (similar to IPv4's Protocol field).
5. **Hop Limit (8 bits)**: Limits the number of hops (same as IPv4's TTL).
6. **Source & Destination Address (128 bits each)**: Sender and receiver's addresses.

Key Differences:

- **Header Size**: IPv6 is 40 bytes (fixed); IPv4 is 20 bytes (variable).
- **Fragmentation**: IPv6 handles fragmentation outside the header; IPv4 includes fragmentation fields.
- **Checksum**: IPv6 removes the checksum; IPv4 includes it.

7. Identify the need for Classless addressing in network layer in comparison with classful addressing

Classful Addressing:

- Fixed classes (A, B, C).
- Wastes IP addresses (e.g., Class A with too many unused addresses).
- Limited flexibility in subnetting.

Classless Addressing (CIDR):

- Allows variable-length subnet masks (VLSM).
- Efficient IP address allocation (no wastage).
- Supports route aggregation, reducing routing table size.
- More scalable and flexible for growing networks.

8. Employing the 3 levels of hierarchy in IP Addressing?

1. **Network Level (Network ID)**
    - Identifies the network.
    - Common part for all devices in the network.
2. **Subnetwork Level (Subnet ID)**
    - Divides the network into smaller subnets.
    - Helps in better traffic management.
3. **Host Level (Host ID)**
    - Identifies individual devices within a subnet.
    - Unique for each device in the subnet.