School of Electrical Engineering

TYBTech (Electrical and Computer Engineering)
AY 2023 - 24

Communication Networks

Assignment No. 1

Semester: V (2023-24)   **Subject: Communication Networks**

Name: Shreerang Mhatre   **Class: T.Y.B.Tech. El&CE**

Roll No: 52   **Batch: A3**

Date of Submission: Oct 10, 2023

Note:
1. All students should submit handwritten assignments in the form of scanned copies.
2. All copied/plagiarised assignments would be rejected.
3. Scanned copies of assignments should be submitted through a shared folder on Google Drive (CN_2023/Theory Assignments). Each student to create their own folder (Folder name: Roll No_first name.last name and keep the assignment copy in it (File name: Roll No._first name.last name_1)

Q. 1.

Describe in detail the concept and necessity of subnetting in computer/communication networks? Design and discuss in detail your own network without and with subnetting by taking appropriate IPv4 IP addresses.

Roll No 1 – 20: Use suitable Class A Public IPs (Different for each student)
Roll No 21 – 40: Use suitable Class B Public IPs (Different for each student)
Roll No 41 onwards: Use suitable Class C Public IPs (Different for each student)

Q. 2. Differentiate in tabular format the features and differences in between IPv4 and IPv6 addresses.

Q. 3. Discuss the steps of DORA process used by DHCP.

Name: Shreerang Mhatre
Roll no: 52
Batch: A3
Date: 30/10/2023

Q1) Describe in detail the concept and necessity of subnetting in computer/ communication networks? Design and discuss in detail your own network without and with subnetting by taking appropriate IPv4 addresses.

→ Subnetting is a fundamental concept in computer and communication networks that involves dividing a larger IP network into smaller, more managable sub-networks or subnets. It is essential for several reasons, including efficient address space utilization, improved network management, enhanced security, & routing optimization. Subnetting primarily applies to IPv4 networks, where IP addresses are 32-bit numbers.

→

* Concept & Necessity of Subnetting -

① Efficient Address space Utilization.
      Subnetting allows organizations to break down a larger IP address space into smaller, more manageable segments

② Improved Network Management.
      Subnetting facilates network management by dividing a large network into smaller, more manageable segments.

③ Enhanced Security -
      Subnetting enhances network security by isolating different segments of a network Network administrators can apply security policies and access control lists at the subnet level.

④ Routing Optimization -
      Subnetting allows for more efficient routing in larger networks. Routing tables can grow significantly when using a flat network structures.

* Network Design without subnetting:

① Lets consider a network without subnetting using a class C public IP address

② Class C IP Range : 203.0.113.0 to 203.0.113.255 (256 addresses)

③ In this scenario, you have a small company with a single network segment. All devices in the company are on the same network with the IP address range 203.0.113.0 to 203.0.113.255.

④ This can be in efficient because the company might not use all 256 addresses and has no way to allocate addresses to different departments or services.

* Network Design with Subnetting:

① Now lets subnet the class C network to optimize address space utilization and improve network management.

② well divide the network into three subnets: HR, IT & Guest

$\rightarrow$

③ Class C IP Range: 203.0.113.0 to 203.0.113.255
(64 addresses)
  i) HR subnet → 203.0.113.0 to 203.0.113.63
  ii) IT subnet → 203.0.113.64 to 203.0.113.127
  iii) Guest subnet → 203.0.113.128 to 203.0.113.191

④ By subnetting, we can now allocate
addresses more efficiently and each
department has its own address space.
⑤ This approach allows for better
simplified management & optimal use
of the available IP addresses.

05/21

(32) Diff in tabular format the features & differences

Features / Differences	IPv4	IPv6
Address Format	32-bit binary address	128 bit hexadecimal address
Address space	Approx 4.3 billion unique addresses	2^{128} providing 340 udecillion unique
Address Notation	Dotted-decimal format	Colon-hexadecimal format
Address configuration	Manual or DHCP for dynamic assignment	Auto-configuration through SLACC
Address Types	Unicast, Broadcast, Multicast	Unicast, Anycast, Multicast
Subnetting	Often used with subnet masks	Subnetting is simplified
Network Address Translation	Commonly used to conserve IPv4	Less need for NAT
Header Length	Fixed 20 bytes	Fixed 40 bytes
checksum	Includes a header checksum field	No header checksum
Broadcast	Supports broadcast addressing	No broadcast; replaced with multicast
Addressing length in bits	32 bits	128 bits

Q3) Discuss the steps of DORA process used by DHCP.

→ ① Discover (D)
- when a device, such as a computer or network-enabled device connects to a network, it often needs an IP address and other network configuration parameters.

② Offer (O):
- DHCP servers on the network that receive the Discover message and have available IP addresses to allocate will send a DHCP offer message in response

③ Request (R):
- Once the device receives offer messages, it reviews them and selects one of the offers, typically based on the IP address and configuration parameters it prefers.

→

④ Acknowledge (A):
- The DHCP server, upon receiving the Request message, finalizes the IP address lease.

⑤ Renewal and Rebinding:
- After some time, the device will attempt to renew its lease by sending a DHCP Request message to the DHCP server that initially provided the lease.