Internet Layer Overview

The Internet Layer is tasked with routing data packets from one network to another according to their associated IP address.

It lies in between the Transport Layer and Network Access Layer in the TCP/IP model.

Its primary functions are logical addressing, routing, packetization, and fragmentation.

IP Addressing and Hierarchical Structure

IPv4 addresses: 32-bit addresses subdivided into four octets, e.g., 192.168.1.1.

Classful addressing: Class A, B, C, D, and E, with different ranges and subnet masks.

Private IP address: This is allowed for internal networks such as 10.0.0.0/8, 172.16.0.0/12, and 192.168.0.0/16.

CIDR Classless Inter-Domain Routing: This gives a lot more flexibility to subnetting and allows for the use of arbitrary-length subnet masks.

DHCP and Address Management

DHCP: (Dynamic Host Configuration Protocol) It assigns dynamically IP addresses to the devices when they join the network.

Apart from IP addresses, DHCP also provides other information such as default gateway and DNS server addresses.

DHCP involves four steps for its implementation, namely Discover, Offer, Request, and Acknowledgment (DORA).

NAT and Subnets

NAT means Network Address Translation, which allows for many devices in a local network to share one public IP address.

NAT also provides some security as well as lessening the need for many public IP addresses.

Subnets: Some logical divisions of an IP network, which can be used for more efficient routing and management of IP addresses.

Routing and Forwarding

Routing: The routing shall determine the most efficient path for the transmission of data, from the original source through the routing tables and the protocols into the destination.

Forwarding: Moving the packets according to the decisions made on routing.

Static Routing: Manually configured routes; very suitable for small networks.

Dynamic Routing: Automatically adapts on the fly to any changes taking place in the network through the use of protocols such as RIP, OSPF, and BGP.