TCP/IP reference model

1. Introduction: The TCP/IP reference model is a suite of communication protocols that provides a framework for data transmission over a network. It consists of four layers: Application, Transport, Internet, and Network Access.

2. Layers of TCP/IP: The Application layer provides a standard interface for applications to access network services. The Transport layer ensures reliable data transfer between applications running on different hosts. The Internet layer provides logical addressing and routing services, while the Network Access layer provides physical access to the network.

3. Protocols in each layer: Each layer has specific protocols that perform various functions. For example, the Application layer includes protocols like HTTP, FTP, and SMTP, while the Transport layer includes protocols like TCP and UDP.

Data Link Layer

1. Function of Data Link Layer: The Data Link Layer provides error-free transmission of data over a physical link between two devices. It ensures that data is transmitted without errors and that it is received correctly by the destination device.

2. Sublayers of Data Link Layer: The Data Link Layer is divided into two sublayers: the Logical Link Control (LLC) sublayer and the Media Access Control (MAC) sublayer. The LLC sublayer provides error-free transmission of data, while the MAC sublayer controls access to the physical medium.

3. Framing: Framing is the process of dividing data into smaller units called frames for transmission over the network. Framing can be done using fixed length, variable length, bit stuffing, or byte stuffing.

4. Error Detection Techniques: Error detection techniques are used to ensure that data is transmitted accurately. The most common error detection techniques used

in the Data Link Layer are 1d and 2d parity, checksum, and Cyclic Redundancy Check (CRC).

5. Error Correction Techniques: Error correction techniques are used to correct errors in data. Hamming code is an error correction technique that is used to correct errors in data.

6. Network Devices at Data Link Layer: Network devices that operate at the Data Link Layer include switches, bridges, and hubs. Switches are used to connect devices on a network and to forward data between devices. Bridges are used to connect two or more networks and to forward data between networks. Hubs are used to connect devices on a network and to forward data between devices.

Network Layer

1. Function of Network Layer: The Network Layer is responsible for the transmission of data over a network. It is responsible for routing, addressing, and subnetting.

2. Routing: Routing is the process of determining the best path for data to travel over a network. Routing algorithms are used to determine the best path for data to travel over a network.

3. Addressing: Addressing is the process of assigning unique addresses to devices on a network. Classful and classless addressing are two methods of addressing that are used in the Network Layer.

4. Subnetting: Subnetting is a technique that is used to divide a large network into smaller networks. Subnetting is used to improve the performance of a network by reducing the number of devices on a network.

5. IPV4: IPV4 is the most widely used version of the Internet Protocol. IPV4 is a 32-bit addressing scheme that is used to assign unique addresses to devices on a network.

6. Connection Oriented vs Connection Less: Connection oriented and connectionless are two modes of operation that are used in the Network Layer.

Connection oriented is a mode of operation that is used to establish a dedicated connection between two devices before data is transmitted. Connectionless is a mode of operation that is used to transmit data without establishing a dedicated connection between two devices.

7. QOS: QOS is a technique that is used to ensure that data is transmitted with a certain level of quality. QOS is used to ensure that data is transmitted with a certain level of reliability, delay, and jitter.

8. ARP and RARP: ARP and RARP are two protocols that are used in the Network Layer. ARP is a protocol that is used to map IP addresses to MAC addresses. RARP is a protocol that is used to map MAC addresses to IP addresses.

9. Multicasting and Broadcasting: Multicasting and broadcasting are two methods of transmitting data over a network. Multicasting is a method of transmitting data to a group of devices on a network. Broadcasting is a method of transmitting data to all devices on a network.

10. IPV4 to IPV6 Transformation: IPV4 to IPV6 transformation is the process of converting IPV4 addresses to IPV6 addresses. IPV4 addresses are running out, and IPV6 addresses are needed to support the growing number of devices on the network.

11. ICMP: ICMP is a protocol that is used to report errors and provide diagnostic information. ICMP is used to report errors when data is transmitted over a network.

12. VLAN: VLAN is a technique that is used to divide a large network into smaller networks. VLAN is used to improve the performance of a network by reducing the number of devices on a network.

Data Link Layer Sublayers

1. Logical Link Control (LLC) Sublayer: The LLC sublayer is responsible for error-free transmission of data. It provides flow control, error control, and acknowledgement services.

2. Media Access Control (MAC) Sublayer: The MAC sublayer is responsible for controlling access to the physical medium. It provides a mechanism for devices to request access to the medium and to detect collisions.

Framing

1. Fixed Length Framing: Fixed length framing is a method of framing where each frame has a fixed size.

2. Variable Length Framing: Variable length framing is a method of framing where each frame has a variable size.

3. Bit Stuffing: Bit stuffing is a method of framing where extra bits are added to the data to ensure that the receiver can identify the end of the frame.

4. Byte Stuffing: Byte stuffing is a method of framing where extra bytes are added to the data to ensure that the receiver can identify the end of the frame.

Error Detection Techniques

1. 1D and 2D Parity: 1D and 2D parity are simple error detection techniques that are used to detect errors in data.

2. Checksum: Checksum is a more complex error detection technique that is used to detect errors in data by adding a checksum value to the data.

3. Cyclic Redundancy Check (CRC): CRC is a more complex error detection technique that is used to detect errors in