**Operating Systems**

Shyam Rajendren

Operating Systems Environments & Administration

1. List at least one (1) **advantage** and one (1) **disadvantage** for the Bus, Ring and Star network topologies.

Answer:

Bus:

Advantages: Data flows from host to host and can be received by all hosts

Disadvantages: Only one host can send messages at any given time, a control mechanism is needed to prevent collisions

Ring:

Advantages: All data flows in one direction (this reduces the chance of packet collisions), if the other network has the same protocol; a bridge is used, if the other network has a different protocol; a gateway is used

Disadvantages: Every node must be functional for the network to work properly, however, rings can be designed in such a way that failed nodes are bypassed

Star:

Advantages: Permits easy routing, access to the network can be controlled easily, and priority status can be given to selected sites

Disadvantages: Central site must be extremely reliable and able to handle all network traffic, no matter how heavy

1. Compare and contrast the following network types:
   1. Personal Area Network (PAN)

Answer: A network that is centered around a person and operates within approximately 10 meters of that individual. Also called body area networks (BANs) and is used wearable technologies such as gloves and monitors. These smaller networks can usually connect to larger networks.

* 1. Local Area Network (LAN)

Answer: A data network that spans a few square kilometers or less. They are generally used and operated by a single organization. It is typically a cluster of personal computers or workstations located in the same general area.

* 1. Metropolitan Area Network (MAN)

Answer: A data network that spans the area of a large city. A high-speed network that can be configured as logical rings. MANs can operated as public utilities, and can be used for interconnecting several LANs.

* 1. Wide Area Network (WAN)

Answer: A data network constructed with large distance lines and which spans a large geographic area. WANs are used to interconnect communication facilities across the globe. They are operated as part of a public utility and use the communication lines of common carriers such as telephone companies which already provide homes and offices with communication facilities. WANs use a broad range of communication media and are generally slower than LANs.

* 1. Wireless Local Area Network (WLAN)

Answer: A local area network that uses wireless nodes. These nodes connect computers. smartphones, etc. within the range of the network to a larger network or the Internet. Due to their open architecture, WLANs have significant security vulnerabilities.

1. What is the purpose of the Domain Naming Service (DNS)?

Answer: The DNS is a general-purpose, distributed, replicated data query service. Its main purpose is the resolution of Internet addresses based on fully qualified domain names.

1. Compare and contrast the following network devices:
   1. Bridge

Answer: A data-link layer device that is used to interconnect with other networks that use the same protocol.

* 1. Gateway

Answer: A device that passes data between networks with similar functions but different protocols.

* 1. Router

Answer: A device that is connected to at least two networks and passes data packets between them. Routers are located at gateways.

1. List at least one (1) **advantage** and one (1) **disadvantage** of the Routing Information Protocol (RIP) and Open Shortest Path First (OSPF) routing strategies.

Answer:

Routing Information Protocol (RIP):

Advantages: The distance vector algorithm is easy to implement.

Disadvantages: Does not take into account important factors such as bandwidth, data priority, or the type of network.

Open Shortest Path First (OSPF):

Advantages: Routing update messages are sent only when changes in the routing environment occur. This reduces the number of messages in the internetwork and reduces the size of the messages by not sending the entire routing table

Disadvantages: Savings in bandwidth consumption are offset by the higher CPU usage needed for the calculation of the shortest path (based on Dijkstra’s algorithm).

1. List at least two (2) **advantages** and two (2) **disadvantages** of the Circuit Switching and Packet Switching connection models.

Answer:

Circuit Switching:

Advantages: Once the circuit is completed: 1. The network is transparent to users. 2. Information is transmitted at a fixed rate of speed with insignificant delays at intermediate nodes.

Disadvantages: 1. Messages cannot be transmitted if the circuit is not completed. 2. There is a delay before signal transfer begins while the connection is set up.

Packet Switching:

Advantages: 1. Permits data transmission between devices that receive or transmit data at different rates. 2. Provides greater line efficiency because a single node-to-node circuit can be shared by several packets preventing lines from remaining idle over long periods of time.

Disadvantages: 1. Not good for voice communications as packets from one message may intersperse with others. 2. No guarantee that packets will travel to their destination along the same path or arrive in sequential order.

1. Describe at least one (1) situation where a Circuit Switching connection would be preferred over a Packet Switching connection.

Answer: For voice communications.

1. Answer the following questions about the CSMA/CD and CSMA/CA Access Control Techniques:
   1. What does the CS stand for?

Answer: Carrier Sense

* 1. What does the MA stand for?

Answer: Multiple Access

* 1. What does CD stand for?

Answer: Collision Detection

* 1. What does CA stand for?

Answer: Collision Avoidance

* 1. How much data is affected if a **collision** occurs between two (2) network nodes using **CSMA/CA**?

Answer: None of the collided data will reach its destination.

1. Which Access Control Technique (CSMA/CD, CSMA/CA or Token Passing) is the **most popular** in a Ring network?

Answer: Token Passing

1. Answer the following questions about the OSI and TCP/IP Reference Models:
   1. How many layers exist in the OSI model?

Answer: 7

* 1. How many layers exist in the TCP/IP model?

Answer: 4

* 1. Which layer in the OSI model is responsible for data compression and encryption?

Answer: Layer 6 – Presentation Layer

* 1. Which layer in the TCP/IP model is responsible for error checking and flow control?

Answer: Layer 1 – Network Access Layer

* 1. Which layer(s) of the OSI model are aligned with the Process/Application Layer of the TCP/IP model?

Answer: Layer 6 – Presentation Layer and Layer 7 – Application Layer

* 1. Which layer(s) of the OSI model are aligned with the Host-Host Layer of the TCP/IP model?

Answer: Layer 4 – Transport Layer and Layer 5 – Session Layer

* 1. Which layer(s) of the OSI model are aligned with the Internet Layer of the TCP/IP model?

Answer: Layer 3 – Network Layer

* 1. Which layer(s) of the OSI model are aligned with the Network Access Layer of the TCP/IP model?

Answer: Layer 1 – Physical Layer, Layer 2 – Data Link Layer, and Layer 3 – Network Layer