

Module 3 - Progress Assessment

Essay Question 1:

Explain the significance of server configuration in the setup of a robust and efficient computer system. Describe the key aspects involved in server configuration, including network settings, security measures, and service/application configurations. Discuss how proper server configuration ensures optimal performance and security in delivering services over the network.

- Server configuration is a vital step after operating system installation, as it ensures the system is tailored to its role and operates securely and efficiently. Key aspects include network settings, such as IP addresses, hostnames, and domains, which enable proper communication across the network. Security measures like firewalls, secure authentication, and user account management protect the server from unauthorized access and threats. Service and application configurations, whether for web hosting, databases, or email, must also be fine-tuned for performance and safety. Overall, proper configuration ensures stability, optimal performance, and reliable service delivery in a secure environment.

Essay Question 2:

Discuss the importance of user accounts and permissions in server configuration. Explain the principle of least privilege and how it enhances security on the server. Provide examples of how user management and access controls can be configured to protect sensitive resources and data.

- User accounts and permissions are critical in protecting server resources. The principle of least privilege limits user access to only what is necessary, reducing risks of misuse or breaches. For example, disabling root login, using sudo for administrative tasks, and enforcing strong passwords or MFA strengthens security. Configuring permissions on sensitive files and directories ensures data remains safe from unauthorized access.

Essay Question 3:

Describe the server configuration requirements for hosting different types of services and applications. Choose three server roles, such as web server, database server, and email server, and explain the specific configurations needed for each role to ensure efficient and secure service delivery.

- Different server roles require specific configurations for secure and efficient operation. A web server must set up virtual hosts, secure traffic with SSL/TLS, and allow only HTTP/HTTPS ports. A database server needs secure user privileges, backups, encryption, and performance tuning. An email server requires mailbox management, spam filtering, TLS encryption, and quotas to prevent misuse. Tailored configurations ensure each service runs smoothly and securely.

Essay Question 4:

Discuss the significance of resource management in server configuration. Explain how proper allocation of CPU, memory, and disk space impacts server performance. Provide examples of potential performance bottlenecks and how they can be addressed through resource configuration.

- Resource management ensures servers operate efficiently by allocating CPU, memory, and disk space appropriately. Poor CPU allocation can cause slowdowns, while insufficient memory leads to excessive swapping. Disk space issues, such as full logs, can disrupt

operations. These bottlenecks are addressed through load balancing, memory tuning, disk cleanup, and faster storage. Proper resource management prevents performance issues and ensures reliability.

Essay Question 5:

Explain the importance of monitoring and maintenance in server administration. Discuss the role of monitoring tools in tracking server performance metrics, resource usage, and service availability. Describe the essential maintenance tasks, such as software updates, backups, and optimization, and their impact on the server's stability and reliability.

- Monitoring and maintenance keep servers stable and secure. Tools like Nagios or Zabbix track CPU use, memory, uptime, and logs, alerting administrators to potential issues. Maintenance tasks such as software updates, backups, optimization, and disk cleanup prevent failures and data loss. Together, monitoring and maintenance ensure reliability, reduce downtime, and improve server performance over time.

Module 4 - Progress Assessment

Essay Question 1:

Discuss the characteristics and advantages of Transmission Control Protocol (TCP) as a reliable and connection-oriented transport layer protocol. How does TCP ensure data delivery accuracy and maintain the correct order of data packets? Illustrate the importance of TCP's reliability in critical applications like web browsing and file transfers.

- Transmission Control Protocol (TCP) is a reliable, connection-oriented protocol that guarantees accurate and orderly data delivery. Before data transfer begins, it establishes a connection using the three-way handshake, ensuring both devices are ready to communicate. By assigning sequence numbers to packets, TCP makes sure data arrives in the correct order. TCP also uses acknowledgments and retransmissions to guarantee delivery. If a packet is lost or corrupted, it is resent until confirmed. This reliability is critical in applications such as web browsing, file transfers, and email, where even small errors could break functionality or corrupt data. For these reasons, TCP forms the backbone of secure, dependable online communication.

Essay Question 2:

Describe the mechanisms employed by TCP for acknowledgment and retransmission of data packets. How does TCP ensure that lost or corrupted packets are retransmitted and received successfully? Discuss the role of acknowledgment in guaranteeing error-free data transmission and the impact of retransmission on network performance.

- TCP maintains reliability through its acknowledgment and retransmission process. When a packet is received, the receiver sends back an acknowledgment (ACK). If the sender does not receive an ACK within a certain time, it assumes the packet was lost and retransmits it. This cycle continues until the data is successfully delivered.

Acknowledgments ensure error-free communication by confirming delivery, while retransmissions correct for data loss or corruption. Although retransmissions may cause slight delays or increased traffic, TCP balances this with flow and congestion control. As a result, it provides reliable, accurate communication even across unstable networks.

Essay Question 3:

Compare and contrast TCP and User Datagram Protocol (UDP) as two widely used transport layer protocols. Discuss the key differences in their communication approach, reliability, and error handling mechanisms. Explain the scenarios where TCP is more suitable, and those where UDP shines, considering applications like real-time video streaming, online gaming, and voice over IP (VoIP).

- TCP and UDP are two common transport layer protocols, but they differ in design and use. TCP is connection-oriented and reliable, providing ordered data delivery with mechanisms like acknowledgments and retransmissions. This makes it suitable for activities where accuracy is critical, such as file transfers, emails, or web browsing. While UDP, on the other hand, is connectionless and lightweight. It does not guarantee delivery or order, but its low overhead makes it faster and more efficient. This is ideal for real-time applications like video streaming, online games, and VoIP, where occasional packet loss is acceptable. TCP prioritizes accuracy, while UDP prioritizes speed.

Essay Question 4:

Explain the three-way handshake process of TCP for establishing a connection between devices. How does the three-way handshake guarantee the readiness of both the client and server for data exchange? Describe the sequence of steps involved in the handshake and its significance in ensuring a reliable communication channel.

- The TCP three-way handshake is used to establish a reliable connection between client and server before data transfer begins. The process involves three steps: the client sends a SYN request, the server responds with a SYN-ACK, and the client replies with an ACK. Once complete, the connection is established and ready for communication. This process guarantees that both client and server are prepared for data exchange and that sequence numbers are synchronized. Its importance lies in creating a reliable, stable channel where data can be transferred securely and in order. Without this step, TCP could not provide dependable communication.