Definitions and Concepts for AQA Computer Science GCSE

Topic 5: Fundamentals of computer networks

Computer Network: A group of connected devices that can share data and resources.

Personal Area Network (PAN): A computer network used for data transmission among devices, typically for one person, covering a very small area (e.g., using Bluetooth).

Local Area Network (LAN): A computer network that usually covers a relatively small geographical area, such as a home, school, or office, and is often owned and managed by a single person or organisation.

Wide Area Network (WAN): A computer network that covers a wide geographic area, connecting multiple LANs, often under collective or distributed ownership (the Internet is the biggest example).

Wired Networks: Networks that use physical cables (like fibre optic or copper) for data transmission.

Wireless Networks: Networks that use radio waves or other wireless technologies to transmit data without physical cables.

LAN Topology: The arrangement of devices in a network.

Star Topology: A LAN topology where all network devices are connected to a central hub or switch.

Bus Topology: A LAN topology where all devices are connected to a single central cable, which has terminators at both ends.

Network Protocol: A set of rules that allow devices to communicate across a network.

Ethernet: A common method for connecting devices in a local area network (LAN) using wired connections.

Wi-Fi (Wireless Fidelity): A wireless technology that allows devices to connect to a local area network (LAN) and access the internet without using cables.

TCP (Transmission Control Protocol): A core protocol of the Internet Protocol Suite that provides reliable, ordered, and error-checked delivery of a stream of data between applications. Operates at the transport layer.

UDP (User Datagram Protocol): A core protocol of the Internet Protocol Suite that offers a connectionless and unreliable alternative to TCP, suitable for applications where speed is more critical than guaranteed delivery. Operates at the transport layer.

IP (Internet Protocol): A protocol used for addressing and routing data packets across networks, enabling global communication on the Internet. Operates at the internet layer.

HTTP (Hypertext Transfer Protocol): An application layer protocol for transferring web pages and other content between web servers and browsers.

HTTPS (Hypertext Transfer Protocol Secure): A secure version of HTTP that encrypts communications between a web browser and a website, providing secure web transactions.

FTP (File Transfer Protocol): An application layer protocol used for transferring files between a client and a server on a computer network.

SMTP (Simple Mail Transfer Protocol): An email protocol primarily used for sending outgoing email messages between mail servers and from a client to a server. Operates at the application layer.

IMAP (Internet Message Access Protocol): An email protocol used for retrieving and managing email messages directly on a mail server, allowing multiple devices to access the same mailbox. Operates at the application layer.

Network Security: Measures implemented to protect computer networks and the data transmitted over them from unauthorized access, misuse, disclosure, modification, or destruction.

Authentication: The process of verifying the identity of a user or device before allowing access to a system or network.

Encryption: The process of converting data into a coded format to prevent unauthorized access, making it unreadable without the correct decryption key.

Firewall: A network security device (hardware or software) that monitors incoming and outgoing network traffic and decides whether to allow or block specific traffic based on a defined set of security rules.

MAC Address Filtering: A network security method that controls access to a network based on the unique physical address (MAC address) embedded in a device's network adapter.

4-layer TCP/IP Model: A conceptual model describing network communication functions, divided into four layers.

Application Layer: This is where network applications, such as web browsers or email programs, operate and interact with the network. Protocols like HTTP, HTTPS, SMTP, IMAP, and FTP operate here.

Transport Layer: This layer sets up communication between two hosts and is where they agree on settings such as the size of packets (e.g., TCP and UDP operate here).

Internet Layer: This layer addresses and packages data for transmission and routes the packets across the network (e.g., IP protocol operates here).

Link Layer (Network Access Layer/Network Interface Layer): This is where the network hardware, such as the Network Interface Card (NIC), is located, and OS device drivers also operate here.