Day 7 - OSI Model, TCP/IP, DNS, DHCP, NAT, Common Ports and Protocols

OSI Model – 7 Layers Explained

The OSI (Open Systems Interconnection) model standardizes how communication happens over a network in 7 layers:

1. **Physical** – Cables, switches, and physical connections (hardware).
2. **Data Link** – MAC addresses, switches; handles error detection and frame delivery.
3. **Network** – IP addresses, routers; finds the best path for data (routing).
4. **Transport** – Ensures reliable delivery (TCP/UDP).
5. **Session** – Manages sessions and connections between devices.
6. **Presentation** – Translates data formats (e.g., encryption, compression).
7. **Application** – Closest to the user; handles protocols like HTTP, FTP, etc.

TCP/IP (Transmission Control Protocol/Internet Protocol)

- The foundational protocol suite of the internet.
- TCP ensures reliable, ordered delivery.
- IP routes packets between devices.
- Layers: Application, Transport, Internet, Network Access (simplified vs OSI).

DNS (Domain Name System)

- Translates domain names (like google.com) into IP addresses.
- like the "phonebook" of the internet.

DHCP (Dynamic Host Configuration Protocol)

- Automatically assigns IP addresses to devices on a network.
- Saves time vs manual IP setup.

NAT (Network Address Translation)

- Translates private IP addresses to a public one (used in routers).
- Helps multiple devices share a single internet connection.

Common Ports and Protocols

Port	Protocol	Used For
20, 21	**FTP**	File Transfer Protocol (file transfers)
22	**SSH**	Secure Shell (remote login, encrypted)
23	**Telnet**	Remote login (not secure)
25	**SMTP**	Sending emails
53	**DNS**	Resolving domain names
67, 68	**DHCP**	Assigning IP addresses dynamically
80	**HTTP**	Unencrypted web traffic
110	**POP3**	Receiving emails (older method)
143	**IMAP**	Receiving emails (more modern)
123	**NTP**	Network time synchronization
161, 162	**SNMP**	Network management and monitoring
443	**HTTPS**	Secure web traffic (SSL/TLS)
445	**SMB**	File sharing (Windows networks)
3389	**RDP**	Remote Desktop Protocol (Windows)