

Layered OSI

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★ Layered Architecture

Layered Architecture is a designed approach that divides a complex system into a series of hierarchical layers, each with a specific function & responsibility.

Each layer communicates with its adjacent layers through standardized interfaces, enabling modularization, flexibility & scalability.

Key Characteristics -

- A network consists of specific functions, layers & tasks to perform
- Layered Architecture divides the network into smaller sub-tasks
- Each sub-task is assigned to a specific layer
- Lower layers add their services to higher layers to run applications & provide services to clients.

Benefits -

- Modification in one layer does not affect the other layer
- Provides flexibility & scalability to the network
- Enables easy troubleshooting & maintenance
- Allows for standardized communication between layers

Divide & Conquer Approach

Easy to Modify

Modularity

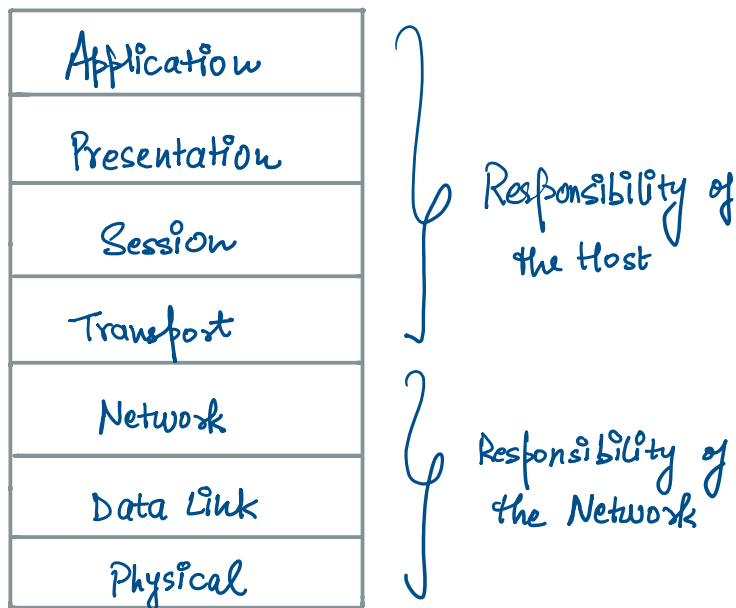
Easy to Test

★ OSI Model

OSI (Open System Interconnection) a reference model for network communication.

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① PHYSICAL LAYER

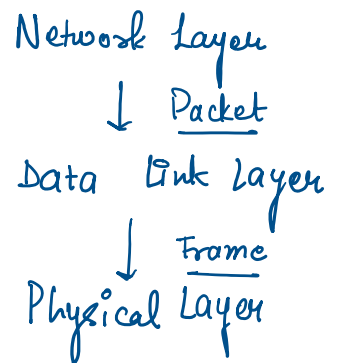
- The Primary Function of the Physical Layer is to transmit individual bits btw nodes.
- It establishes, maintains & deactivates physical connections
- It defines the mechanical, electrical & procedural specifications for network interfaces
- Physical Media : Specifies types of cables, connectors & other hardware
- Signal Encoding
- Data Rates (10 Mbps, 1 Gbps)
- Topology (star, ring, etc-)

② DATA LINK LAYER

- Responsible for the error-free transfer of data frames (packets)
- Defines format of data on the network
- Responsible for the unique identification of each device on a local network
- Sub Layer — LLC - Logical Link Control

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- Sub Layers
 - LLC - Logical Link Control
 - MAC - Media Access Control

- Framing
- Physical Addressing (MAC Address)
- Error Control
- Flow Control
- Access Control
- Switch & Bridge are Data Link layer devices



③ NETWORK LAYER

- Decides which physical path the data will take
- Primary Function: Internetworking
- IP Addressing (IPv4, IPv6)
- Routing (Protocols like RIP [Routing Information Protocol], OSPF [Open Shortest Path First], BGP [Border Gateway Protocol], etc.)
- Packetizing
- Devices: Routers & Layer 3 Switches

④ TRANSPORT LAYER

- Transmits data using transmission protocols including TCP/UDP
- Transport layer is operated by the Operating System. Part of OS that communicates with Application layer by making system calls.
- Heart of the OSI model
- Connection Oriented (TCP), Connectionless (UDP)
- Data is called Segments in this layer

⑤ SESSION LAYER

- Maintains connections & is responsible for controlling parts of sessions
- Used to establish, maintain & synchronize interactions between communicating devices

- Dialog Controller
- Synchronization

⑥ PRESENTATION LAYER

- Focuses on the syntax & semantics of information exchanged btw systems.
- Functions as a data translator for the network.
- Converts data from one presentation to another format
- Also known as the Syntax layer
- Translation
- Encryption
- Compression

⑦ APPLICATION LAYER

- Interface for users of application
- Manages network transparency of resource allocation
- Network services directly to end-users
- FTAM (File Transfer, Access & Management)
- Mail Services
- Directory Services