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TOPIC : LAYED PROTOCOLS

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PROTOCOLS LAYERS

DEFINATION

The **Layered Protocols** model is an organized approach to network communication, dividing the processes of data transmission into layers. Each layer is designed to handle specific tasks, making the system modular and easier to manage, understand, and troubleshoot.

The most widely referenced layered protocol model is the **OSI (Open Systems Interconnection) Model**, but the **TCP/IP Model** is more commonly used in practice. Below, I'll describe each layer of the OSI model in detail, along with corresponding TCP/IP layers where applicable.

(OSI Model)

The OSI model has **7 layers**, starting from the physical transmission of data and working up to the application layer where user interactions occur.

LAYERS

1: physical layer

2: Data link layer

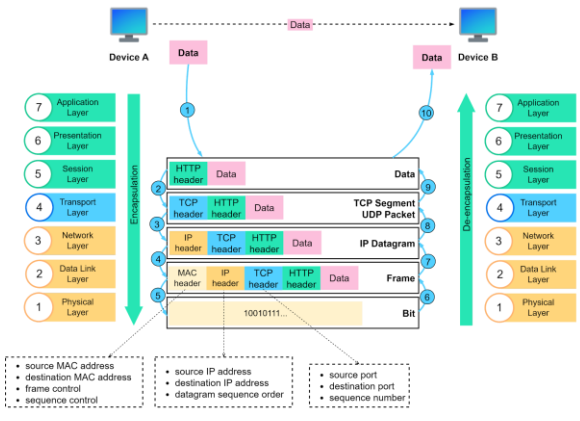
3: Network layer

4: Transport layer

5: session layer

6: presentation layer

7: Application layer



(Physical Layer)

Function: Deals with the actual hardware transmission of raw data bits over a physical medium.

Key Responsibilities

Transmission of electrical, optical, or radio signals.

Specification of cables, connectors, and transmission media.

Managing bit rate control and synchronization.

Encoding data into physical signals.

Examples

Ethernet cables, fiber optics, hubs, repeaters.

(Data Link Layer)

Function: Ensures reliable data transfer between devices on the same network (local link).

Key Responsibilities:

Framing: Dividing data into frames.

Error detection and correction.

Flow control and managing access to the medium (e.g., collision detection in Ethernet).

Addressing via MAC (Media Access Control) addresses.

Examples

Ethernet, Wi-Fi (IEEE 802.11), PPP (Point-to-Point Protocol).

(Network Layer)

Function Handles logical addressing and routing of data packets across different networks.

Key Responsibilities

Logical addressing (e.g., IP addresses).

Routing: Determining the optimal path for data.

Fragmentation and reassembly of packets.

Examples

IP (Internet Protocol), ICMP (Internet Control Message Protocol).

(Transport Layer)

Function Provides end-to-end communication and ensures reliable data transfer.

Key Responsibilities

Error recovery, retransmissions.

Flow control to prevent overwhelming the receiver.

Multiplexing: Differentiating multiple applications using ports.

Examples

TCP (Transmission Control Protocol): Reliable, connection-oriented.

UDP (User Datagram Protocol): Unreliable, connectionless.

(Session Layer)

Function Manages sessions or dialogs between applications.

Key Responsibilities

Establishing, maintaining, and terminating communication sessions.

Synchronization (e.g., checkpoints for recovery in file transfers).

Examples

APIs, such as those used in video conferencing or database access.

(Presentation Layer)

Function Ensures data is presented in a usable format for the application layer.

Key Responsibilities

Data translation (e.g., converting between character encodings like ASCII and Unicode).

Data compression and decompression.

Data encryption and decryption.

Examples

SSL/TLS (for encryption), codecs (e.g., JPEG, MPEG).

(Application Layer)

Function Interface for end-user applications and provides network services to them.

Key Responsibilities

Application-specific services like file transfers, emails, browsing.

Identifying communication partners and ensuring sufficient resources.

Examples

HTTP/HTTPS, FTP, SMTP, DNS, SSH.

(TCP/IP Model)

The **TCP/IP** model simplifies the OSI model into **4 layers**:

Application Layer (merges OSI's Application, Presentation, and Session layers).

Transport Layer (same as OSI Transport layer).

Internet Layer (equivalent to OSI Network layer).

Network Access Layer (merges OSI's Data Link and Physical layers).

(Layer Mapping)

TCP/IP Model	**OSI Model Layers**
Application Layer	Application, Presentation, Session
Transport Layer	Transport
Internet Layer	Network
Network Access Layer	Data Link, Physical

Protocols by Layer (Examples Across Both Models)

Layer	Protocol Examples
Physical	Ethernet, USB, DSL
Data Link	Ethernet, PPP, Wi-Fi (802.11), ARP
Network	IPv4, IPv6, ICMP, OSPF, RIP
Transport	TCP, UDP
Session	NetBIOS, RPC, PPTP
Presentation	SSL/TLS, JPEG, GIF, MPEG
Application	HTTP, FTP, SMTP, SNMP, DNS, Telnet

By dividing communication into layers, **layered protocols** improve modularity, simplify troubleshooting, and enable interoperability across different hardware and software systems.