**INTERNSHIP**

**REPORT**

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| **Course Module :** | OSI Layers |
| **Course Name:** | Networking |
| **Assignment** | 1 |
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| **Submission Date:** | Sept ,2025 |

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14. **INTRODUCTION:**

* **What is the OSI Model?**  
  The Open Systems Interconnection (OSI) model is a conceptual framework used to understand and standardize how different networking and computing devices communicate. Created by the International Organization for Standardization (ISO) in 1984, it partitions the complex process of network communication into seven distinct, hierarchical layers.
* **The Problem it Solves**  
  In the early days of networking, proprietary protocols ruled. A device from one manufacturer (e.g., IBM) could not communicate with a device from another (e.g., DEC). This was akin to speakers of different languages trying to hold a conversation without a translator. The OSI model was designed to break down these vendor-specific barriers and promote interoperability between open systems.

1. **Key Objectives of the Model:**

* **Interoperability:** To allow products from different vendors to communicate.
* **Standardization:** To provide a universal set of rules and conventions.
* **Modularity:** To break down a complex process into smaller, manageable pieces. A change in one layer does not necessitate a change in others.
* **Simplified Learning & Troubleshooting:** Provides a structured way to understand and diagnose network problems.

1. **THE CORE: LAYERED ARCHUTTECTURE:**

OSI Model contains 7 Layers all linked in a sequence. It is a conceptual framework used to understand and standardize how different networks work. These layers help ensure interoperability between different devices, systems, and protocols.



1. **LAYER 7: APPLICATION LAYER:**

**FUNCTIONALITY:** Provides user interface to end users and provides services directly to applications.

**EXAMPLE:**

* HTTP, FTP, SMTP, DNS, Telnet

1. **LAYER 6: PRESENTATION LAYER:**

**FUNCTIONALITY:** Translates, Encrypt or Compresses data so that it can be understood by the application.

* Translate the data format
* Performs Encryption & Decryption
* Compressing the data

**EXAMPLE:**

* JPEG, MPEG, SSL/TLS, ASCII, EBCDIC.

1. **LAYER 5: SESSION LAYER:**

**FUNCTIONALITY:** Manages and Controls the connections between applications

* Establishes or Terminates the session between apps.
* Synchronization of data exchanges

**EXAMPLE:**

* NetBIOS, RPC, PPTP.

1. **LAYER 4: TRANSPORT LAYER:**

**FUNCTIONALITY:** Ensures the reliable data transmission between the systems.

* Controls the flow of data
* Detects error & recovers it
* Provides Segmentation and reassembling of data

**EXAMPLE:**

* TCP/IP, UDP

1. **LAYER 3: NETWORK LAYER:**

**FUNCTIONALITY:** It handles logical reasoning and routing of data between devices across a network.

* Determines the best possible path for data transmission
* Provides Logical addressing (IP Addresses)
* Enables routing

**EXAMPLE:**

* IP’s(IPv4, IPv6), Routers

1. **LAYER 2: DATA LINK LAYER:**

**FUNCTIONALITY:** Provides Node-to-Node data transmission in a system.

* Provides Reliability
* Uses Frames for data transmission
* Controls how devices will connect to physical mediums.
* Detects and Corrects Error

**EXAMPLE:**

* Ethernet (MAC Addresses), Switches etc.

1. **LAYER 1: PHYSICAL LAYER:**

**FUNCTIONALITY:** It deals with physical connection between the devices. It transmits bit streams to establish or disconnect the physical connection between the devices.

* 0 bitstream means the connection is not established (OFF)
* 1 bitstream means the connection is established (ON)

**EXAMPLE:**

* Ethernet cables, switches, hubs, Wi-Fi signals

1. **FLOW OF DATA:**

The data that passes through each layers has some info from the last layer so that it becomes a block of information i.e. how data traverse from layer to layer and how it behaves on certain layers. These blocks of data are known as Protocol Data Unit (PDU).

| **Layer** | **PDU Name** |
| --- | --- |
| Application | **Message / Data** |
| Presentation | **Message / Data** |
| Session | **Message / Data** |
| Transport | **Segment** (TCP) or **Datagram** (UDP) |
| Network | **Packet** |
| Data Link | **Frame** |
| Physical | **Bits** |

1. **Real time Example:**

**Scenario**: Sending a WhatsApp message with an image from your phone to a friend.  
  
1. Application Layer (Layer 7): You open WhatsApp and type a message + attach an image. The app provides the interface to communicate.  
  
2. Presentation Layer (Layer 6): The image is compressed (JPEG/PNG) and your message might be encrypted with end-to-end encryption before transmission.  
  
3. Session Layer (Layer 5): WhatsApp establishes a communication session with your friend’s device. If the session breaks, it can be resumed.  
  
4. Transport Layer (Layer 4): The data is divided into chunks (segments). TCP ensures reliable delivery, resending lost packets if needed.  
  
5. Network Layer (Layer 3): Each segment is placed into a packet with source (your IP) and destination (friend’s IP). Routers use these IP addresses to forward packets across the internet.  
  
6. Data Link Layer (Layer 2): The packets are wrapped into frames with MAC addresses for delivery over the local Wi-Fi or mobile network. Error detection ensures frames are not corrupted.  
  
7. Physical Layer (Layer 1): Finally, bits (0s and 1s) are transmitted as electrical signals over Wi-Fi radio waves or through cellular towers until they reach your friend’s phone.  
  
On your friend’s side, the process is reversed layer by layer until the original message + image is displayed in WhatsApp.

1. **OSI vs TCP/IP**

| **Feature** | **OSI Model** | **TCP/IP Model** |
| --- | --- | --- |
| **Origin** | Developed by ISO as a theoretical standard. | Developed by DoD for practical communication. |
| **Layers** | 7 layers (Application → Physical). | 4 layers (Application → Network Access). |
| **Approach** | Strict layering, each layer has a defined role. | Flexible layering, less rigid separation. |
| **Protocol Dependence** | Protocol-independent, conceptual model. | Protocol-dependent, built around TCP/IP suite. |
| **Usage** | Mainly a reference/teaching tool. | Used in real-world networking & Internet. |

1. **SUMMARY:**

The OSI model is a seven-layer conceptual framework that standardizes network communication functions to ensure interoperability between diverse systems. Each layer has a specific role, from the application layer (user interface) down to the physical layer (raw data transmission). The model simplifies design, troubleshooting, and learning by modularizing complex processes into manageable segments.