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# Computer Network and Layers

## Computer Network

**Definition**: A computer network is a collection of interconnected computers and devices that can communicate and share resources. These connections can be established through cables, wireless signals, or optical fibers, allowing for efficient data exchange and resource utilization across various locations.

**Uses**:

- **Resource Sharing**: Sharing hardware like printers and scanners, as well as software applications.
- **Communication**: Facilitating email, instant messaging, and video conferencing.
- **Data Sharing**: Enabling file sharing and access to centralized databases.
- **Internet Access**: Providing web browsing and online services.
- **Entertainment**: Supporting streaming of music, videos, and games, as well as online gaming.
- **Remote Access**: Allowing remote work and technical support.
- **Education**: Enhancing e-learning and collaborative learning experiences.
- **Business Operations**: Integrating Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) systems.

## OSI Model: Layers and Their Uses

The OSI (Open Systems Interconnection) model is a conceptual framework used to understand and implement network protocols in seven distinct layers.

1. **Physical Layer**:
    - **Function**: Deals with the physical connection between devices, including cables, switches, and other hardware.
    - **Use**: Transmits raw bit streams over a physical medium.
2. **Data Link Layer**:
    - **Function**: Provides node-to-node data transfer and handles error detection and correction from the physical layer.
    - **Use**: Establishes and terminates connections between two physically connected nodes.
3. **Network Layer**:
    - **Function**: Manages device addressing, tracks the location of devices on the network, and determines the best way to move data.
    - **Use**: Routes data packets across different networks and handles logical addressing through IP addresses.

4. **Transport Layer**:
    - **Function**: Provides reliable data transfer services to the upper layers, ensuring complete data transfer with error checking and recovery.
    - **Use**: Segments and reassembles data into a data stream, handling flow control and error correction.
5. **Session Layer**:
    - **Function**: Manages sessions or connections between applications.
    - **Use**: Establishes, maintains, and terminates communication sessions.
6. **Presentation Layer**:
    - **Function**: Translates data between the application layer and the network format, encrypting and decrypting data as necessary.
    - **Use**: Ensures that data is in a usable format and is presented correctly to the application layer.
7. **Application Layer**:
    - **Function**: Provides network services directly to end-user applications.
    - **Use**: Facilitates user interaction with the network, handling protocols like HTTP, FTP, SMTP, and DNS.

# Difference Between OSI and TCP/IP

| Aspect | OSI Model | TCP/IP Model |
|---|---|---|
| **Origin and Development** | Developed by ISO in 1984 as a theoretical framework. | Developed by the DoD in the 1970s for practical networking. |
| **Layers** | Seven layers: Physical, Data Link, Network, Transport, Session, Presentation, Application. | Four layers: Link, Internet, Transport, Application. |
| **Layer Functions** | Each layer has specific functions and well-defined interfaces. | Combines functions of certain layers (e.g., Physical and Data Link layers into the Link layer). |
| **Protocol Specificity** | Protocol-independent, used as a universal reference model. | Protocol-specific, defining standards for TCP, IP, HTTP, FTP, etc. |
| **Implementation** | Primarily theoretical, serves as a guideline for developing protocols. | Widely implemented and used on the internet and many private networks. |
| **Modularity** | Highly modular, promoting interoperability and standardization. | Less modular but more streamlined and practical for implementation. |
| **Flexibility** | More flexible for protocol developers due to its general guidelines. | Less flexible due to its specific set of protocols and predefined standards. |

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| Aspect | OSI Model | TCP/IP Model |
|---|---|---|
| **Real-World Examples** | Not directly used in real-world implementations; serves as a reference model. | Directly used in real-world networking (e.g., internet, corporate networks). |