Internet Architecture

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Contents

1 Layered Model

- Standardises
- Separates tasks
- IETF: The Internet Engineering Taskforce maintaince the standards

1.1 TCP/IP Model

The TCP/IP model, also known as the Internet Protocol Suite, is a set of communication protocols used for the Internet and similar networks. It is organized into four abstraction layers:

- **Link Layer**: This layer is responsible for the physical transmission of data on the network. It includes protocols like Ethernet and Wi-Fi.
- **Internet Layer**: This layer handles the routing of data packets across the network. The primary protocol in this layer is the Internet Protocol (IP).
- **Transport Layer**: This layer provides end-to-end communication services for applications. Key protocols include the Transmission Control Protocol (TCP) and the User Datagram Protocol (UDP).
- **Application Layer**: This layer includes protocols that provide network services directly to applications. Examples include the Hypertext Transfer Protocol (HTTP), File Transfer Protocol (FTP), and Simple Mail Transfer Protocol (SMTP).

1.2 OSI Model

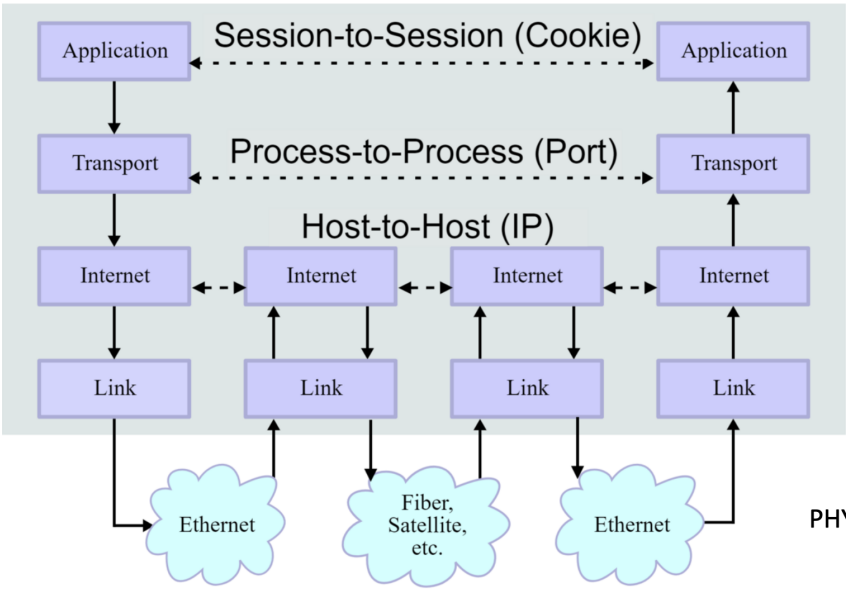
The OSI (Open Systems Interconnection) model is a conceptual framework used to understand and implement network protocols in seven layers:

- **Physical Layer**: This layer deals with the physical connection between devices and the transmission and reception of raw bit streams over a physical medium.
- **Data Link Layer**: This layer provides node-to-node data transfer and handles error correction from the physical layer. It includes protocols like Ethernet.
- **Network Layer**: This layer is responsible for packet forwarding, including routing through intermediate routers. The Internet Protocol (IP) operates at this layer.
- **Transport Layer**: This layer provides reliable data transfer services to the upper layers. Protocols such as TCP and UDP operate at this layer.
- **Session Layer**: This layer manages sessions between applications. It establishes, manages, and terminates connections between local and remote applications.
- **Presentation Layer**: This layer translates data between the application layer and the network format. It handles data encryption, compression, and translation.
- **Application Layer**: This layer provides network services directly to end-user applications. Protocols include HTTP, FTP, SMTP, and others.

1.3 Differences between OSI and TCP/IP Models

- **Number of Layers**: The OSI model has seven layers, while the TCP/IP model has four layers.
- **Layer Functions**: The OSI model separates the presentation and session functionalities into distinct layers, whereas the TCP/IP model combines these functions into the application layer.
- **Development and Usage**: The OSI model was developed as a theoretical framework and is less commonly used in practice. The TCP/IP model was developed based on practical implementation and is the foundation of the Internet.
- **Protocol Specification**: The OSI model specifies ideal functions of each layer, while the TCP/IP model specifies standard protocols to be used at each layer.

2 Data Flow



- Session-Session (Cookie)
  - Acts between application layers
- Process-to-Process (PORT)
  - Acts between transport layers
- Host-to-Host (IP)
  - Acts between internet layers

3 Internet Exchange points

Internet Exchange Points (IXPs) are physical infrastructure locations where different Internet Service Providers (ISPs) can directly interconnect their networks to exchange internet traffic. Key aspects include:

- **Purpose**: Allows networks to connect directly rather than through third-party networks
- **Benefits**:
  - Reduced costs as traffic between IXP participants is typically not billed
  - Lower latency due to direct local connections
  - Improved bandwidth, especially beneficial in regions with limited connectivity
- **Technical Implementation**:
  - Uses network switches to connect participating ISPs
  - Employs Border Gateway Protocol (BGP) for traffic routing
  - Can serve as backup links if direct connections fail
- **Organization**: Usually operated as non-profit associations, though some are run by for-profit companies, universities, or government agencies

4 Domain Name System

- DNS allows for user friendly names to be attributed to IP addresses

- Regionally organised
- Uses very large distributed systems
- Not every machine needs to know hte whole internet