

Computer Networks Protocols

Lecture No.1: Introduction

Network Architecture

A *set of layers and protocols* is called the network architecture.

Protocol Hierarchies

- Networks are organized as layers to **reduce design complexity**.
- Each layer offers services to the higher layers. Between adjacent layers is an interface.

<i>Services</i>	<i>Interface</i>	<i>Primitives</i>
connection oriented and connectionless.	defines which primitives and services the lower layer will offer to the upper layer.	operations such as request, indicate, response, confirm.

Design Issues for the Layers(functions)

1. Mechanism for **connection establishment**
2. Rules for **data transfer**
3. **Error** control
4. Fast sender **swamping** a slow receiver
5. **Routing** in the case of multiple paths

Network Protocols

• **Protocol**: is a format order of messages sent and received among the net entities and action taken on msgs transmission receipt.

• **Protocol process** :

1. The **format** or structure of the message
2. The **process** by which networking devices share information about **pathways** with other networks
3. How and when **error and system messages** are passed between devices
4. The **setup and termination** of data transfer sessions

Layering In Networked Computing

- OSI Model (open system interconnection)
- TCP/IP Model

Why a layered model?

1. **Breaks down** communication into smaller, simpler parts.

2. **Easier to teach** communication process.
3. **Allows** different hardware and software to work together.
4. **Reduces** complexity

The OSI model

The Open Systems Interconnection is the model developed by the International Standards Organization.

- helps us understand **how data gets from one user's** computer to another.

-It aids to **provide an organized structure for hardware and software developers to follow.**

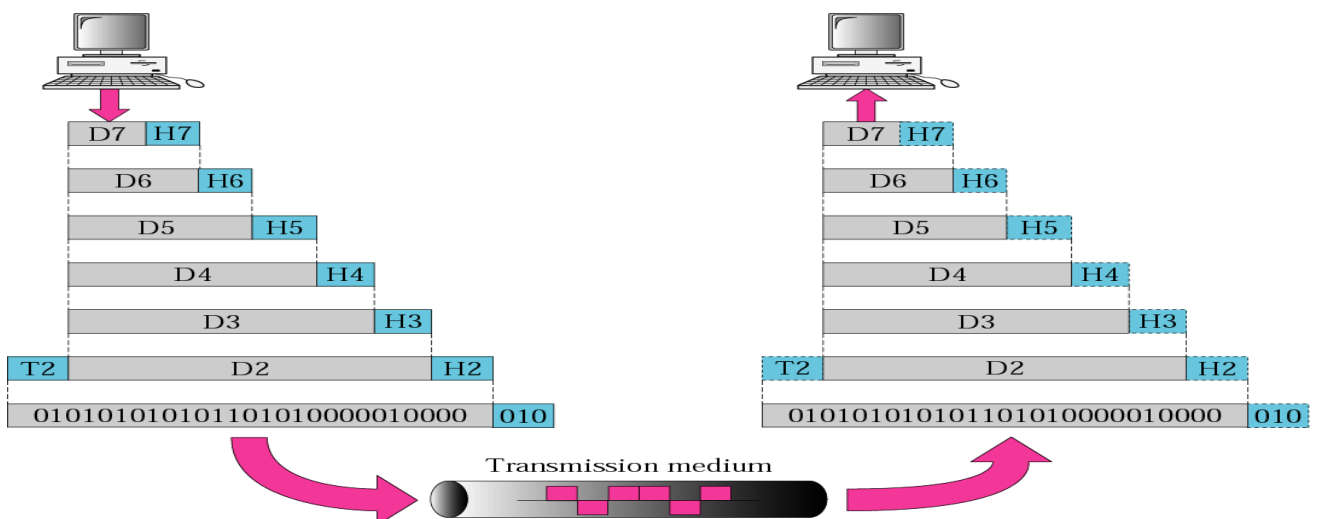
Why use a reference model?

– **Serves** as an outline of rules for **how protocols can be used to allow communication between computers.**

– Each layer has its **own function and provides support to other layers.**

OSI model

Layer	Name	Example protocols
7	Application Layer	HTTP, FTP, DNS, SNMP, Telnet
6	Presentation Layer	SSL, TLS
5	Session Layer	NetBIOS, PPTP
4	Transport Layer	TCP, UDP
3	Network Layer	IP, ARP, ICMP, IPSec
2	Data Link Layer	PPP, ATM, Ethernet
1	Physical Layer	Ethernet, USB, Bluetooth, IEEE802.11



Benefits(Advantage)	Negative Aspect (disadvantage)
<ul style="list-style-type: none"> • Interconnection of different systems (open) • Not limited to a single vendor solution 	<ul style="list-style-type: none"> • Systems might be less secure • Systems might be less stable

<u>Layer</u>	<u>Main Topics</u>
Physical Layer	<ul style="list-style-type: none"> • Transmission mediums (transmit bits over medium) • Encoding • Modulation • Repeaters • Hubs (multi-port repeater) • To provide mechanical and electrical specification
Data Link Layer	<ul style="list-style-type: none"> • Error detection and correction methods • Hop to hop delivery • Flow control • Frame format • IEEE LAN standards • Bridges & Switches (multi-port bridges) • physical addressing(MAC Address)
Network Layer	<ul style="list-style-type: none"> • Internetworking • Controls the operation of the subnet. • Routing algorithms(Routing packets from source to destination) • Internet Protocol (IP) addressing (Logical addressing) • Routers
Transport Layer	<ul style="list-style-type: none"> • Connection-oriented and connectionless services • Provide reliable process to process message delivery & error recovery • Transmission Control Protocol (TCP) • User Datagram Protocol (UDP) • Provides additional Quality of Service. • Port address • End-to-end flow control.
Session Layer	<ul style="list-style-type: none"> • Allows users on different machines to establish sessions (dialogue) between them. • managing dialogue control. • Token management. • Synchronization.

Presentation Layer	<ul style="list-style-type: none"> • Concerned with the syntax and semantics of the information. • Preserves the meaning of the information. • Data compression. • Data encryption.
Application Layer	<ul style="list-style-type: none"> • Provides protocols that are commonly needed. • To allow access to network resource • (FTP), (HTTP), (SMTP), (SNMP),(NFS),(Telnet)

SERVICES

Connection-Oriented	Connectionless
before data is sent, the service from the sending computer must establish a connection with the receiving computer.	data can be sent at any time by the service from the sending computer.

OSI(Open System Interconnection)	TCP/IP(Transmission Control Protocol / Internet Protocol)
1. OSI provides layer functioning and also defines functions of all the layers.	1. TCP/IP model is more based on protocols and protocols are not flexible with other layers.
2. OSI model has a separate presentation layer	2. TCP/IP does not have a separate presentation layer
3. OSI is a general model.	3. TCP/IP model cannot be used in any other application.
4. Network layer of OSI model provide both connection oriented and connectionless service.	4. The Network layer in TCP/IP model provides connectionless service.
5. OSI model has a problem of fitting the protocols in the model	5. TCP/IP model does not fit any protocol

6. Protocols are hidden in OSI model and are easily replaced as the technology changes.	6. In TCP/IP replacing protocol is not easy.
7. OSI model defines services, interfaces and protocols very clearly and makes clear distinction between them.	7. In TCP/IP it is not clearly separated its services, interfaces and protocols.
8. It has 7 layers	8. It has 4 layers

