

Computer Networks

BCST -502 BCSP- 502

B.Tech (CSE) 5th Semester

Course Instructor: Dr Bishwajeet Pandey



New 2020 Syllabus

Unit –I

Computer Network: Definitions, goals, components, Architecture, Classifications & Types. Layered Architecture: Protocol hierarchy, Design Issues, Interfaces and Services, Connection Oriented & Connectionless Services, Service primitives, Design issues & its functionality. ISO OSI Reference Model: Principle, Model, Descriptions of various layers and its comparison with TCP/IP. Principles of physical layer: Media, Bandwidth, Data rate and Modulations

Unit-II

Data Link Layer: Need, Services Provided, Framing, Flow Control, Error control. Data Link Layer Protocol: Elementary & Sliding Window protocol: 1-bit, Go-Back-N, Selective Repeat, Hybrid ARQ. Protocol verification: Finite State Machine Models & Petri net models. ARP/RARP/GARP

Unit-III

MAC Sub layer: MAC Addressing, Binary Exponential Back-off (BEB) Algorithm, Distributed Random Access Schemes/Contention Schemes: for Data Services (ALOHA and Slotted- ALOHA), for Local-Area Networks (CSMA, CSMA/CD, CSMA/CA), Collision Free Protocols: Basic Bit Map, BRAP, Binary Count Down, MLMA Limited Contention Protocols: Adaptive Tree Walk, Performance Measuring Metrics. IEEE Standards 802 series & their variant.



New 2020 Syllabus

Unit-IV

Network Layer: Need, Services Provided, Design issues, Routing algorithms: Least Cost Routing algorithm, Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multicast Routing. IP Addresses, Header format, Packet forwarding, Fragmentation and reassembly, ICMP, Comparative study of IPv4 & IPv6

Unit-V

Transport Layer: Design Issues, UDP: Header Format, Per-Segment Checksum, Carrying Unicast/Multicast Real-Time Traffic, TCP: Connection Management, Reliability of Data Transfers, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP Timer Management. Application Layer: WWW and HTTP, FTP, SSH, Email (SMTP, MIME, IMAP), DNS, Network Management (SNMP).



About Course Instructor



- PhD from Gran Sasso Science Institute, Italy
- PhD Supervisor Prof Paolo Prinetto from Politecnico Di Torino, World Rank 13 in Electrical Engineering
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About Course Outline

- UNIT 1: Lecture No 1-4
- UNIT 2: Lecture No 5-8
- UNIT 3: Lecture No 9-13
- UNIT 4: Lecture No 14-10
- UNIT 5: Lecture No 20-25
- Lecture No 26-35 to Discuss Question Paper of Previous 5 Years
- Out of 35 Lectures: 10 will delivered by Professor From Foreign University



Lecture 1: Computer Network

Lecture 2: Network Architecture

Lecture 3: TCP/IP and OSI Model

Lecture 4: Principles of Physical Layer

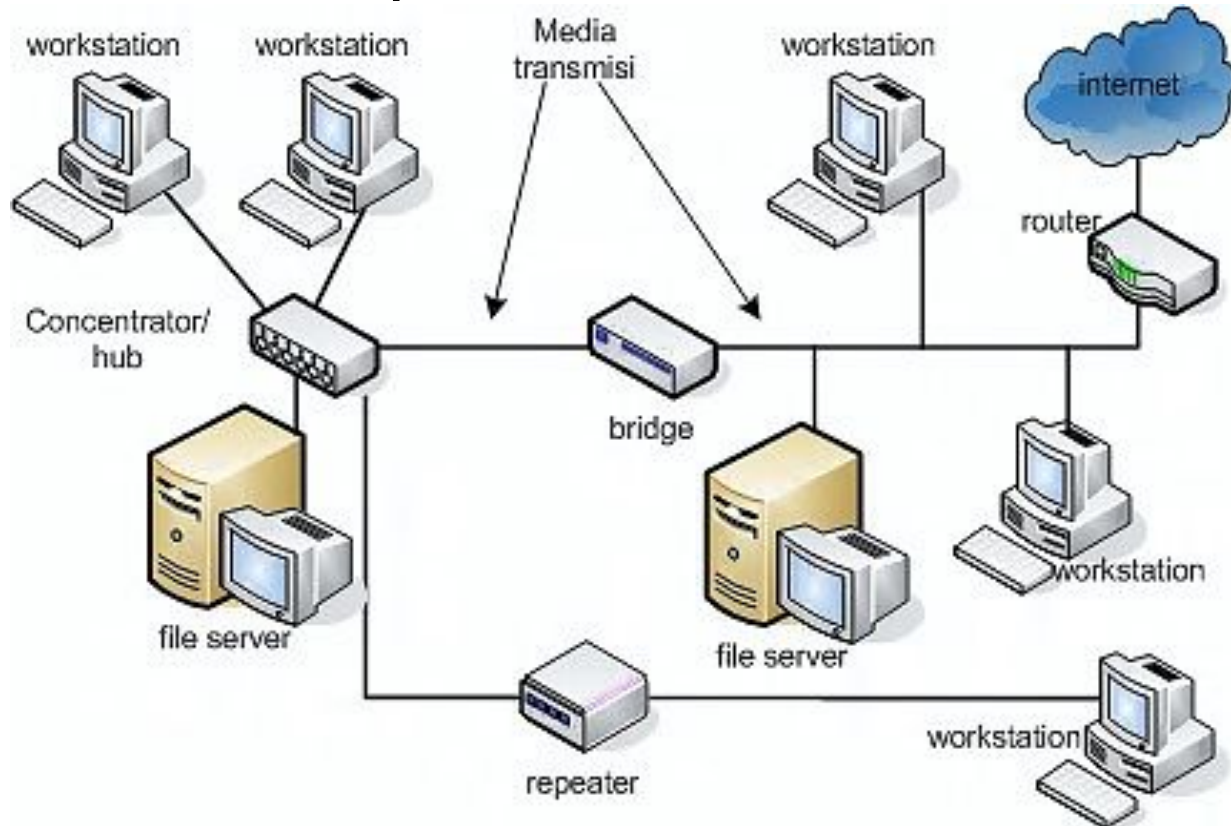


Lecture 1: Computer Network

- Definitions
- Goals
- Components
- Architecture
- Classifications & Types.



Schematic of Computer Network



Definitions of Computer Network

1. A **computer network** is a group of **computers** that use a set of common communication protocols over digital interconnections for the purpose of sharing resources located on or provided by the **network** nodes.
2. **Computer network**, two or more computers that are connected with one another for the purpose of communicating data electronically.
3. A **computer network** is a set of **computers** connected together for the purpose of sharing resources.



Definitions of Computer Network Course

4. A **computer network** is a broad term for one of the biggest technological advances in computer science over the last 40 years.
5. **Computer networks** are the basis of communication in IT.
6. A **computer network** is a group of two or more computer systems linked together.
7. The definition of a **computer network** is a connected group of computers.



Definitions of Computer Network Course

8. A **computer network** consists of multiple devices that communicate with one another.
9. A group of two or more computing devices connected via a form of communications technology is called **computer network**.
10. The term **computer networking** refers to linking multiple devices so that they can readily share information and software resources.
11. A **computer network** is a group of computers connected with each other through a transmission medium such as cable, wire etc.



Goals of Computer Network Course

- There are a variety of jobs you can find if you read this subject honestly.
 - **Network and Computer Systems Administrator.**
 - Average salary (US): \$87,070 per year, \$41.86 per hour (source: [Bureau of Labor Statistics](#))
 - Job outlook: 5% increase from 2018-2028 (source: [Bureau of Labor Statistics](#))
 - **Computer and Information Systems Manager.**
 - Average salary: \$152,860 per year, \$73.49 per hour (source: [Bureau of Labor Statistics](#))
 - Job outlook: 11% increase from 2018-2028 (source: [Bureau of Labor Statistics](#))
- The **typical Infosys Fresher salary** is ₹4,39,934 i.e \$ 5,877.17 per year.



Goals of Computer Network Course

- There are a variety of jobs you can find if you read this subject honestly.
 - **Computer Network Architect.**
 - Average salary: \$111,130 per year, \$53.43 per hour (source: [Bureau of Labor Statistics](#))
 - Job outlook: 5% increase from 2018-2028 (source: [Bureau of Labor Statistics](#))
 - **Computer Network Support Specialist.**
 - Average salary: \$68,050 per year, \$32.72 per hour (source: [Bureau of Labor Statistics](#))
 - Job outlook: 6% increase from 2018-2028 (source: [Bureau of Labor Statistics](#))
- The **average Microsoft salary** is ₹1,716,434 i.e \$ 22,930.21 per year



Component of Computer Network

Hub



Gateway



Router



Repeater



Bridge



Switch



Major computer network components

Computer network involves the following components and devices:

- Network Interface Card (NIC)
- Hub
- Switches
- Router
- Modem
- Cables and connectors



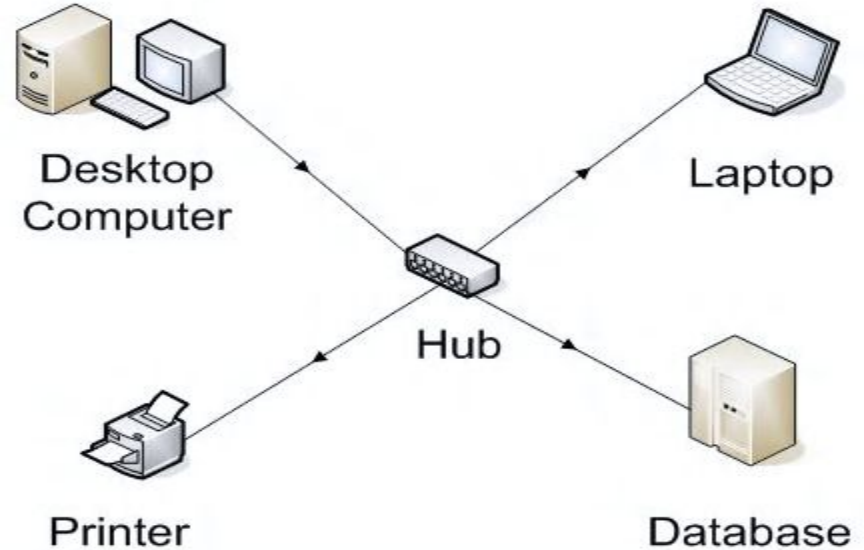
Component of Computer Network: NIC

- Network adapter or NIC is a device which allows a computer to communicate with other computer/network.
- There are two forms of network cards: wired and wireless. The wired NIC employs cables and connectors as a medium to transfer data, while in the wireless card, the connection is made using antenna that uses radio wave technology.



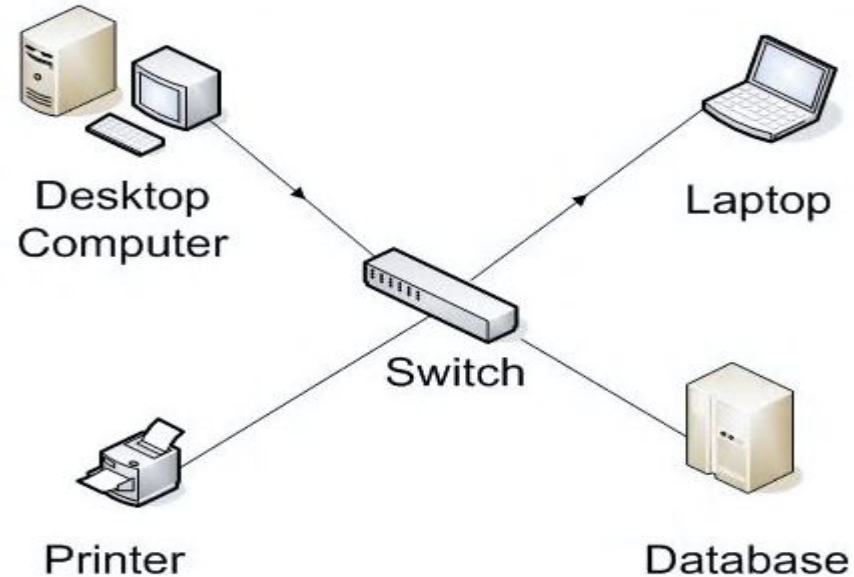
Component of Computer Network: Hub

- The hub receives the request and broadcasts it to the entire network.
- Each device in the network would then work out if the broadcast data is for them or just drop it if it is not.
- Currently Hubs are almost obsolete and superseded by more advanced network communication equipment such as Switches and Routers.



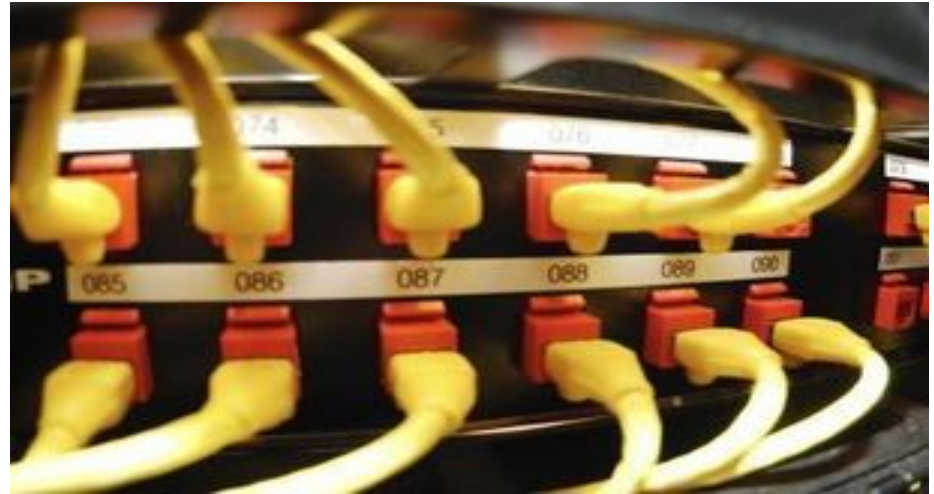
Component of Computer Network: Switches

- Switch is like a smart Hub made in with advanced features like the ability to form tables that keep updated about all the computer or device and on which switch port it is on.
- Switches do not broadcast the received message to entire network like the Hub but rather before transmitting, it analyses which system or port should the message be transmitted to.



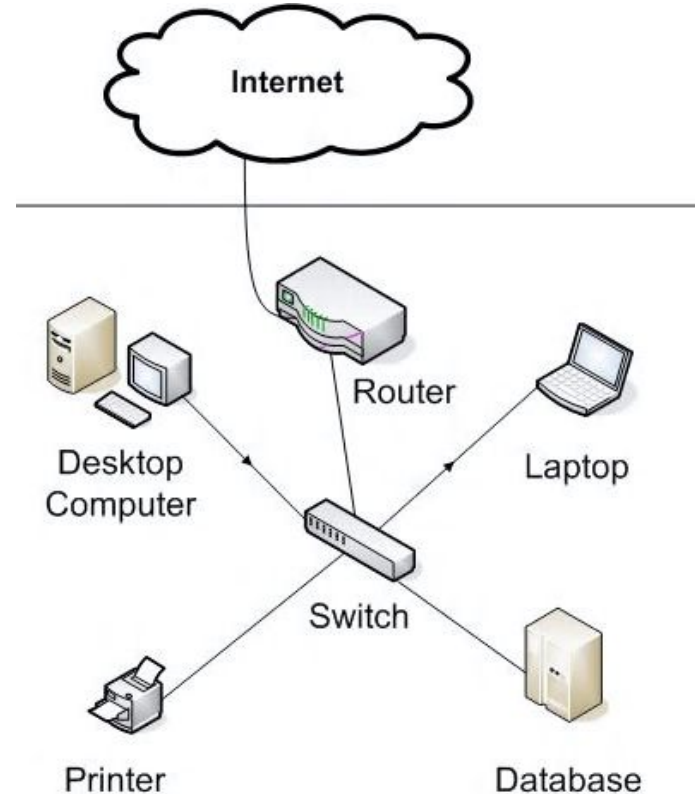
Component of Computer Network: Switches

- The switch connects the source and destination directly which increases the speed of the network.
- Switching technology aids to ease congestion on a network and is usually used for networks of ten or more devices.



Component of Computer Network: Routers

- A Router is the network component that is employed to connect a LAN to an internet connection.
- Routers are actually smart switches in that they are conscious of other networks.



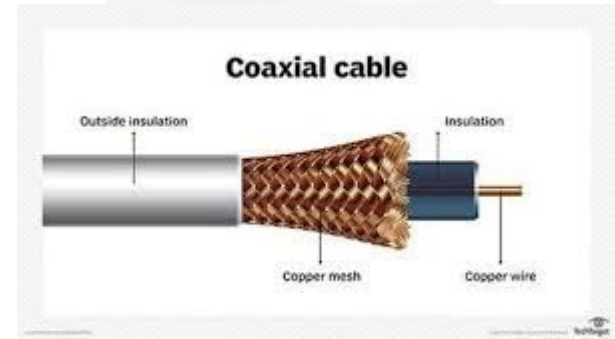
Component of Computer Network: Modem

- An analogue or digital modem allows connection to the internet over the existing telephone line.
- A modem is not required for LAN, but needed for internet connection via dial-up and DSL.



Component of Computer Network: Network Cables and Connectors

- Twisted pair wire: The most universal cable media is commonly named Ethernet cabling and it is categorised as Category 1, 2, 3, 4, 5, 5E, 6 and 7. The categories 5E, 6 and 7 are meant for high-speed that can transmit 1Gbps or more.
- Coaxial cable: is similar to TV installation cable and it is more costly than twisted-pair cable, however provides high data transmission speed.



Component of Computer Network: Network Cables and Connectors

- Fiber-optic cable: is a high-speed cable which transmits data via light beams (uses laser or LED light instead of electrical pulses) in glass bound fibers.
- Wireless: The “media” in this case is the air, through which the wireless NICs transmit radio signals carrying data.



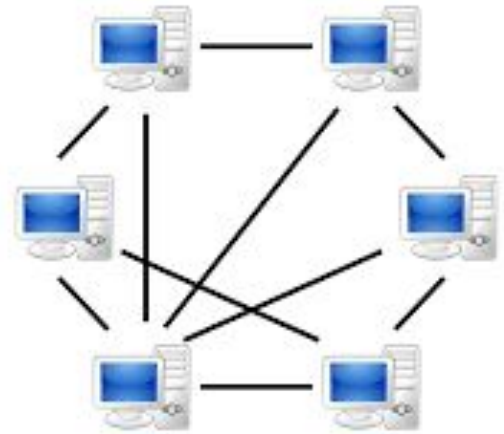
Computer Network Architecture

- **Network architecture** is the design of a computer network.
- Computer **Network Architecture** is defined as the physical and logical design of the software, hardware, protocols, and media of the transmission of data
- There are two types of Network Architecture:
 - Peer to Peer
 - Client-Server



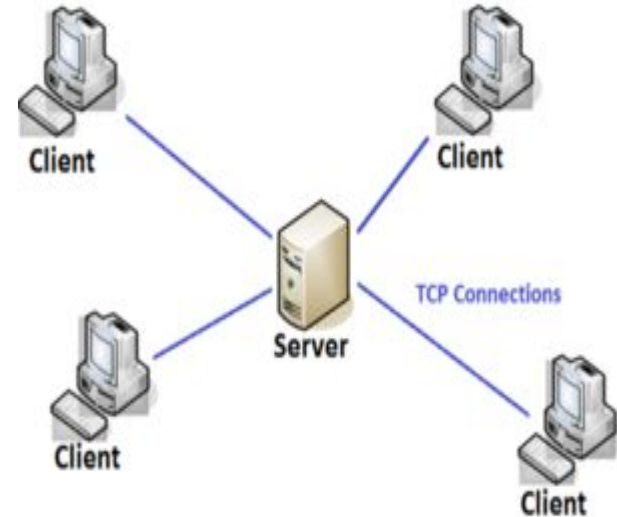
Peer to Peer Network Architecture

- In a **P2P network**, the "peers" are computer systems which are connected to each other via the Internet.
- Peer-to-peer, or P2P in its abbreviated form, refers to computer networks using a distributed architecture.
- Files can be shared directly between systems on the network without the need of a central server.
- In other words, each computer on a P2P network becomes a file server as well as a client.



Client-Server Network Architecture

- Client-server architecture is an architecture of a computer network in which many clients (remote processors) request and receive service from a centralized server (host computer).
- **Client/server architecture** is also known as a networking computing model or client/server network because all the requests and services are delivered over a network.

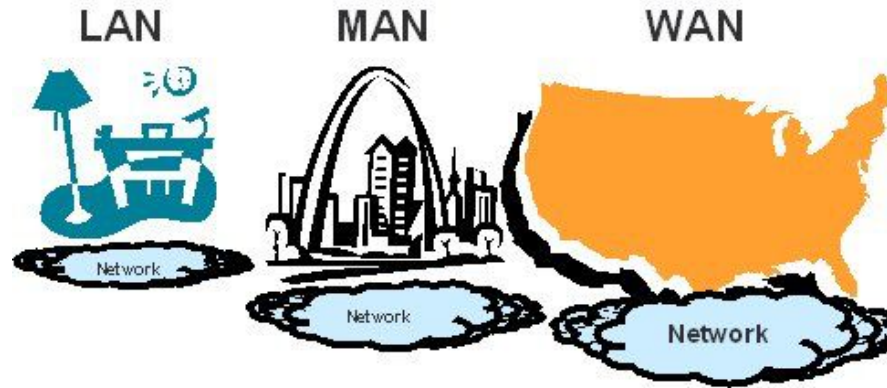


Classifications & Types.

- Based on scale (physical size), we classify network into four types:
- Personal Area Network (PAN)
- Local Area Network (LAN)
- Metropolitan Area Network (MAN)
- Wide Area Networks (WAN)



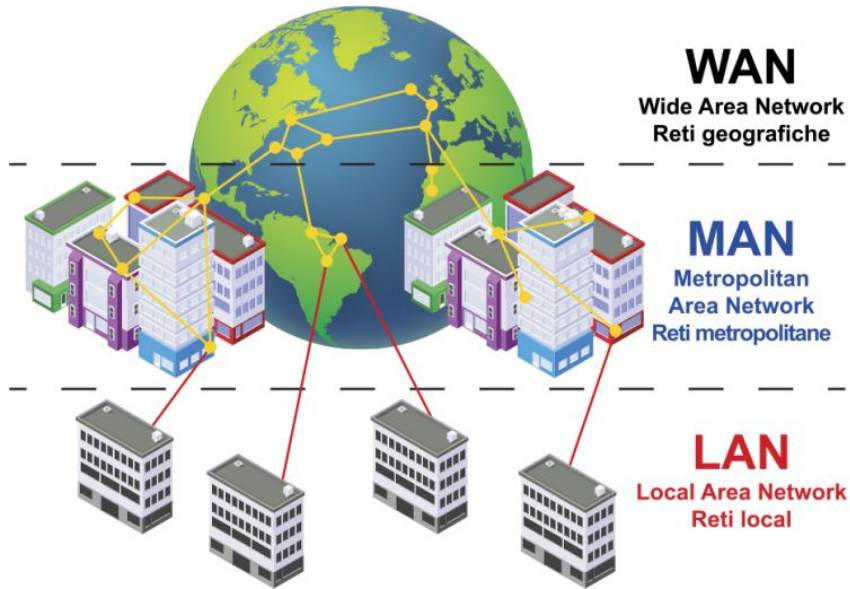
Classifications & Types.



Types of Computer Networks



Classifications & Types.



Difference b/w LAN MAN WAN		
LAN LOCAL AREA NETWORK	MAN METROPOLITAN AREA NETWORK	WAN WIDE AREA NETWORK
Use Building Office School , house	Multiple building , or in a city	Multiple city , country
Network Range 10m – 1000m	5km – 50km	1000000km
Example Ethernet , Wifi	Cable tv network	Internet