

DATA COMMUNICATION AND COMPUTER NETWORKS

(05101202)

Course Outcomes of DCN

2

- Understand basics of data communications and computer network
- Describe OSI reference model and basic functionalities of DNS, WWW and Selected protocols
- Identify relevant data transmission technique and media
- Implement framing error handling and congestion control techniques
- Describe need for computer network security
- Understand campus area network and its establishment

Online Examinations for Networking by Cisco

3

- ❑ **CCNA** (Cisco Certified Network Associate) is an information technology (IT) certification from Cisco Systems. **CCNA** certification is an associate-level Cisco Career certification. ... Passing the ICND1 exam grants the candidate the Cisco Certified Entry Networking Technician (CCENT) certification.
- ❑ **CCNP** (Cisco Certified Network Professional) is a person in the IT industry who has achieved the professional level of Cisco Career Certification.

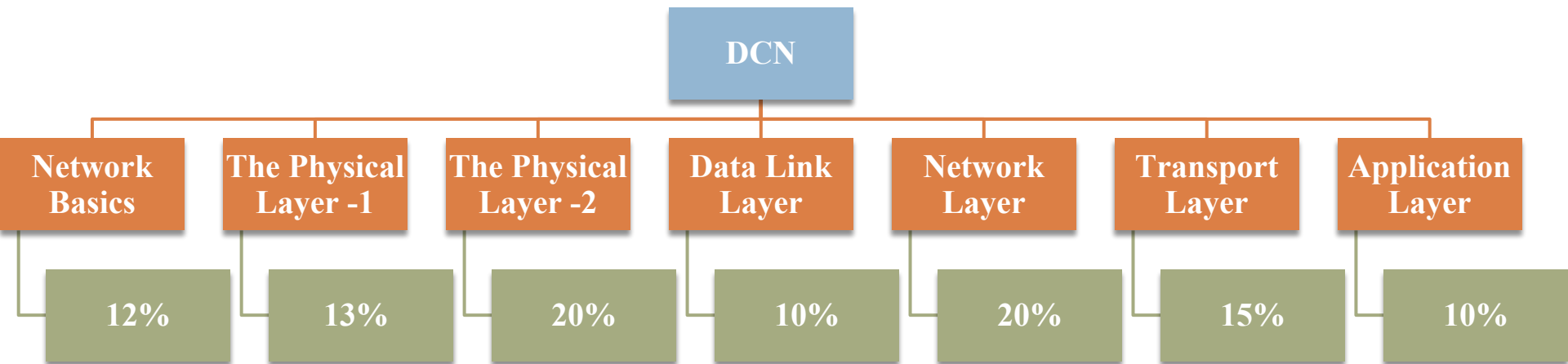
Online Examinations for Networking by MICROSOFT

4

- The new **Microsoft Certified Solutions Associate (MCSA)** credential focuses on the ability to design and build technology solutions. The previous **Microsoft Certified Systems Administrator** certifications focused on a specific job role.
- **Microsoft Certified Solutions Expert (MCSE)**
Certification | Microsoft Learning

Data Communication and Computer Networks

5



Network Basics

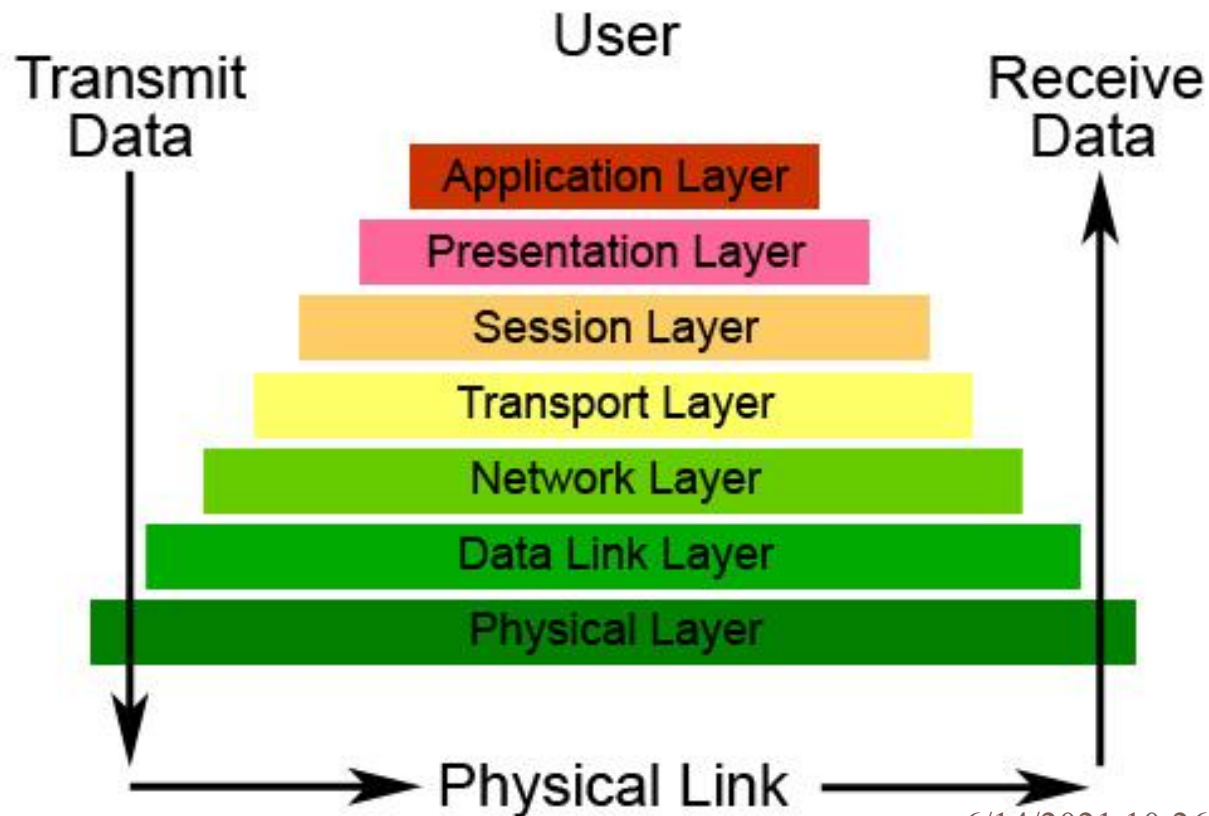
6

- What is Network?
- Use of Network.
- Network Hardware
- Network Software
- Reference Model

Reference Model

7

The Seven Layers of OSI



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Physical Layer -1

8

- Transmission media, Magnetic media, Twisted pair , coaxial cable, Fiber optic , Wireless transmission, Electromagnetic spectrum, Radio transmission, Microwave transmission, Infrared, light wave.

The physical layer -II

9

- The Telephone system structure, Local loop, Transmission impairment, Modem, Fibre in local loop
- Trunks and multiplexing, FDM, TDM, Switching, Circuit switching, cross bar and space division multiplexing
- Time division switching, Cellular radio, Cordless phone, Analog phone, Advance telephone system, Communication satellite, Geosynchronous satellite, low-orbit satellite, satellite versus fiber.

Data Link Layer

10

- Design issues, Framing, Error control , Flow control, Error-detection and correction static, Sliding window protocol.

Network Layer

11

- Routing algorithm, Shortest path, Flooding, Flow based, Distance vector, Link state , Hierarchical, broadcast ,Multicast routing, Network layer in internet, The IP protocol, IP address, subnets, internet control protocol, IGRP, OSPF, EIGRP,BGP,CIDR, IPV6.

Transport Layer

12

- Transport services, Element of transport protocol, The internet transport protocol (TCP and UDP), Congestion control, Principle of reliable data transfer

Application layer

13

- Network security, DNS, Electronic Mail, The world wide web.

Communication

14

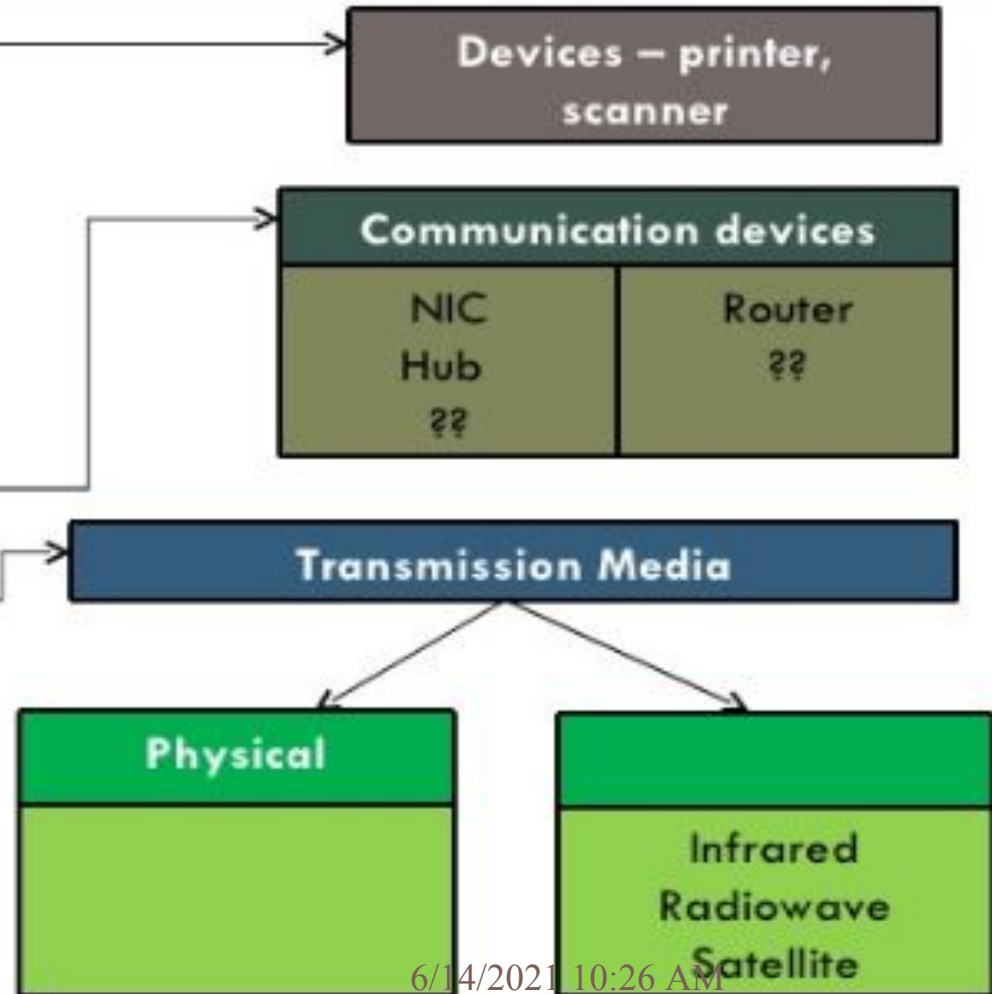
Communication describes a process in which two or more computer or **devices** transfer data, instructions and information.



Computer Network

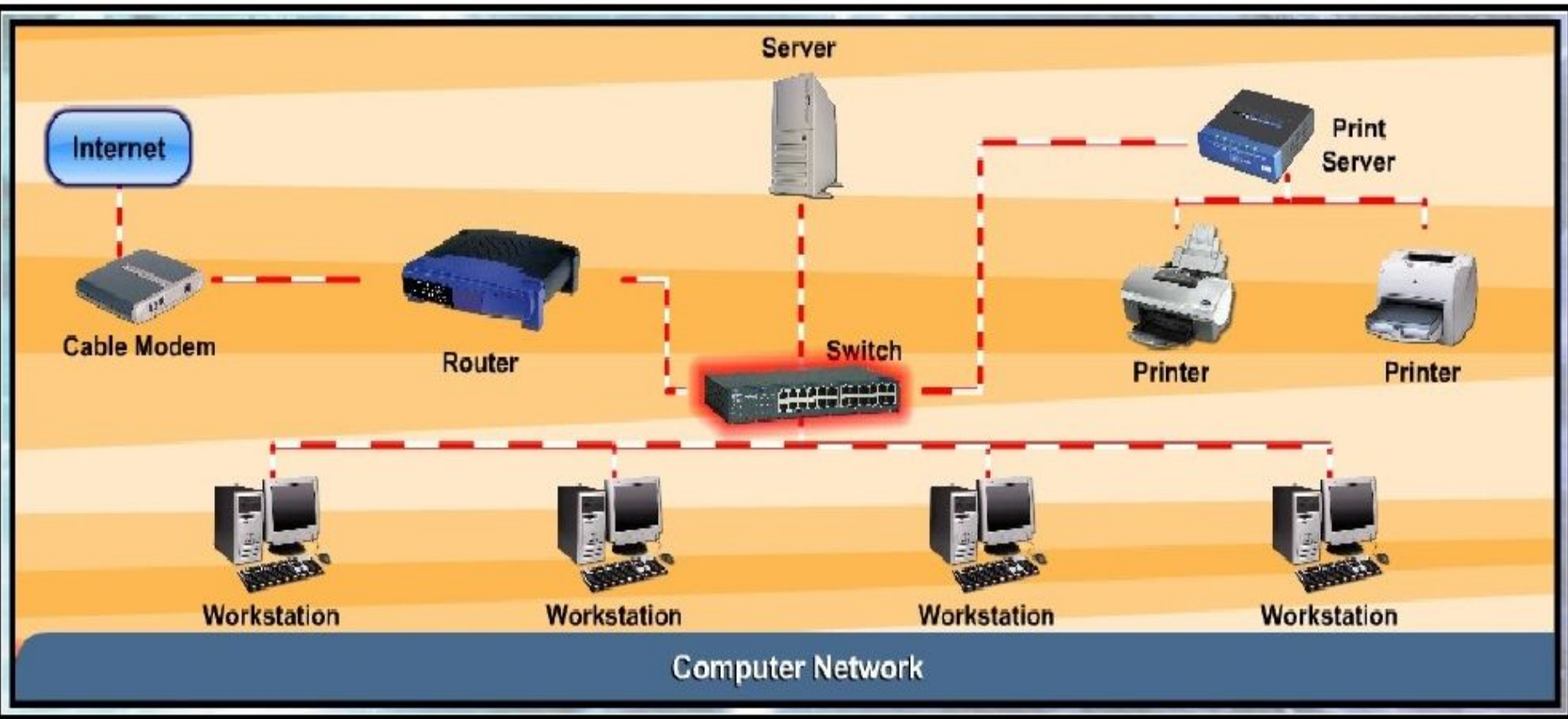
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A computer network is a collection of **computers** and **devices** connected together via **communication devices** and **transmission media**. For examples it may connect computers, printers and scanners.



Network Resources

16



Components of Computer Network

17

- Two or more computers (Client / Server)
- Transmission Media (Cables as links between the computers)
 - Guided Vs Unguided (wireless and wired)
- A network interfacing card(NIC) on each computer
- Internetworking devices
 - Repeater
 - Switches
 - Hub (Active and Passive)
 - Bridge
 - Router
 - Gateway
- Software called Networking Operating system(NOS)

Applications of Computer Network

18

- A computer network is defined as the interconnection of two or more computers. It is done to enable the computers to communicate and share available resources.
- **Applications:**
 - i. Sharing of resources such as printers
 - ii. Sharing of expensive software's and database
 - iii. Communication from one computer to another computer
 - iv. Exchange of data and information among users via network
 - v. Sharing of information over geographically wide areas.

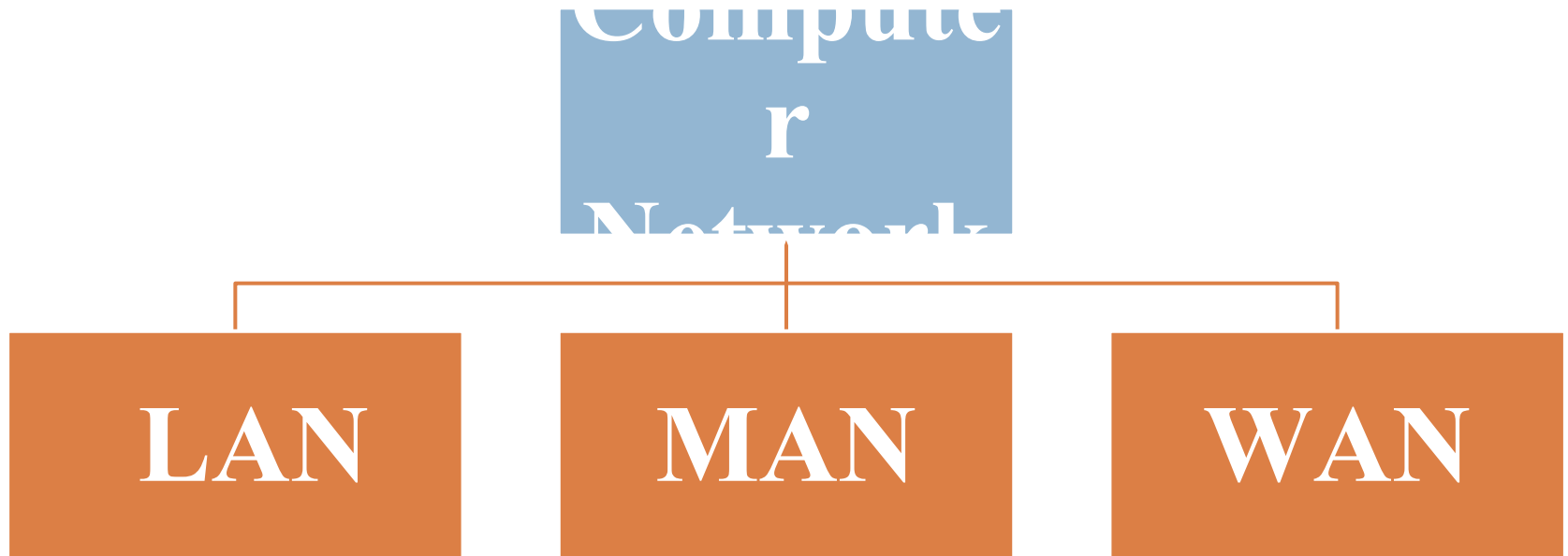
Importance and Advantages of Computer Network

19

- s Sharing of **devices** such as printer and scanner
- a Sharing of **program**/software
- a Sharing of **files**
- ,
- a Sharing of **information**
- ,
- d Can access server centered **database**
- B **Better communication** using internet services such as email, mailing list and Internet Relat Chat (IRC)

Types of Computer Network

20

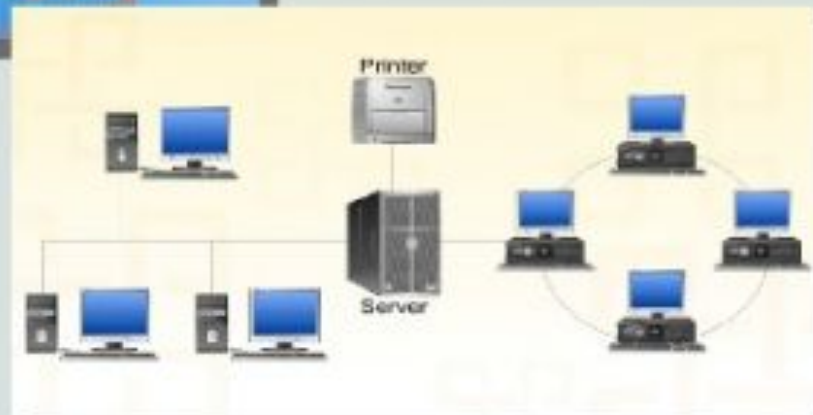
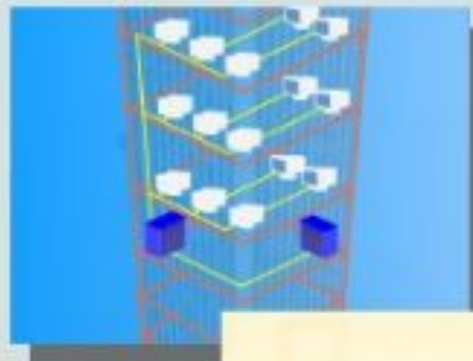


LAN

21

Local Area Network (LAN)

A local area network is a network that connects computers and device in **a limited geographical area** such as a **home**, school **computer laboratory**, office building



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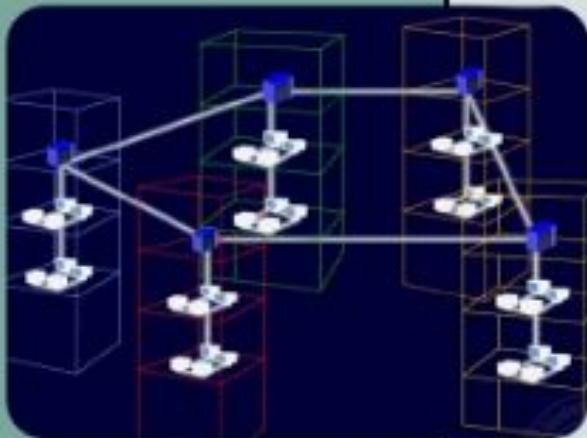
MAN

22

Metropolitan Area Network (MAN)

A metropolitan area network (MAN) is a high speed network that connects local area networks **in a metropolitan area** such as **city or town** and handles bulk of communication activity across the region

A MAN typically includes one or more LAN but covers a smaller geographic area than a WAN



WAN

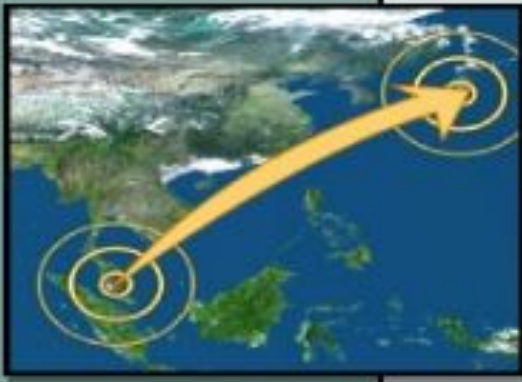
23

Wide Area Network (WAN)

A wide area network is a network that **covers a large geographical area** such **country or the world**

WAN combines many types of media such as telephone lines, cables and radio wave. A WAN can be one large network or can consist of two or more LANs connected together

The internet is the worlds largest WAN



DIFF : LAN, MAN, WAN

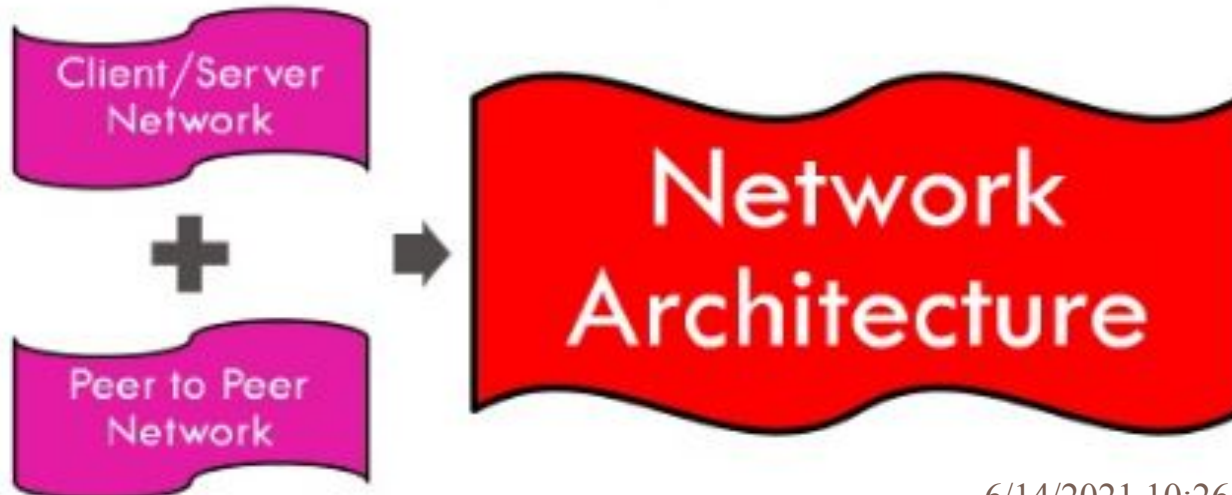
24

| Different | LAN | MAN | WAN |
|---------------------|--------------|------------------------------------|--|
| Cost | Low optic | High | Higher |
| Network Size | Small | Larger | Largest |
| Speed | Fastest | Slower | Slowest |
| Transmission Media | Twisted-pair | Twisted-pair Fibre-optic cables | Fiber optic Radio wave Satellite |
| Number of Computers | Smallest | Large | Largest |

Network Architecture

25

- **Network architecture** is the overall **design of a computer network** that describes how a computer network is configured and what strategies are being used.
- It is mainly focuses on the function of the networks.
- It is also known as **network model** or **network design**.
- Two main network architecture:



Peer to Peer Network

26

- In peer to peer network each computer is responsible for making its own resources available to other computers on the network.
- Each computer is responsible for setting up and maintaining its own security for these resources.
- Also each computer is responsible for accessing the required network resources from peer to peer relationships.
- Peer to peer network is useful for a small network containing less than 10 computers on a single LAN .
- In peer to peer network each computer can function as both client and server.
- Peer to peer networks do not have a central control system.
- There are no servers in peer networks.
- Peer networks are amplified into home group.

Peer to Peer Network

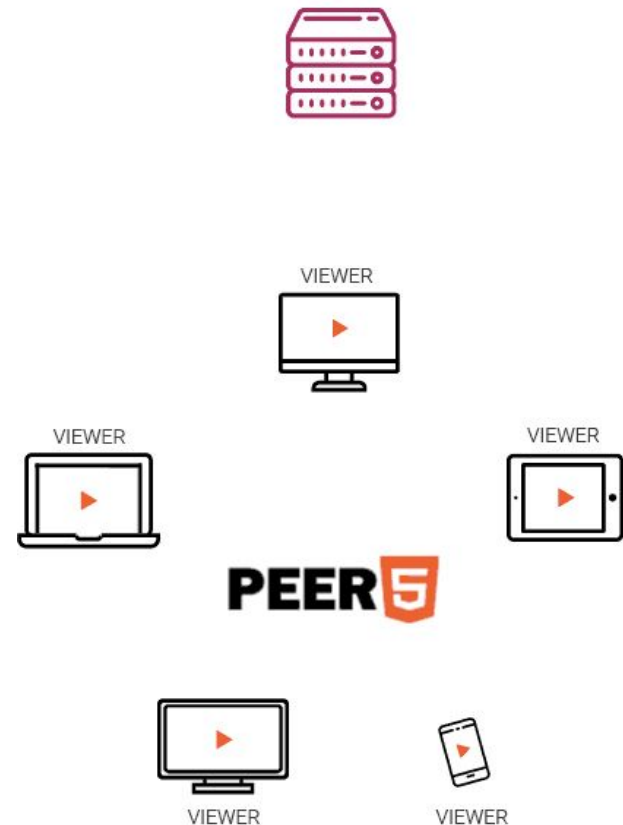
27

| | |
|---|-------------|
| 2 | Engineering |
| 5 | Law |
| 4 | Management |
| 1 | BCA & MCA |
| 6 | Physio |



There are two methods to identify which node provides which service

1. Look-up Table(1-1)
2. Broadcast Method (1-N)



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Advantages and Disadvantages of P2P Network

28

Advantages:

- **Use less expensive computer hardware**
- **Easy to administer**
- **No NOS required**
- **More built in redundancy**
- **Easy setup & low cost**

Disadvantages:

- **Not very secure**
- **No central point of storage or file archiving**
- **Additional load on computer because of resource sharing**
- **Hard to maintain version control**

Client/Server Network

29

- In client-server network relationships, certain computers act as server and other act as clients. A server is simply a computer, that available the network resources and provides service to other computers when they request it.
- A client is the computer running a program that requests the service from a server. Local area network(LAN) is based on client server network relationship.
- A client-server network is one in which all available network resources such as files, directories, applications and shared devices, are centrally managed and hosted and then are accessed by client.
- Client serve network are defined by the presence of servers on a network that provide security and administration of the network.

Client/ Server Network

30



Client/ Server Network

31

Advantages:

- **Very secure**
- **Better performance**
- **Centralized backup**
- **very reliable**

Disadvantages:

- **requires professional administration**
- **More hardware-intensive**
- **More software intensive**
- **Expensive dedicated software**

PEER TO PEER NETWORK VERSUS CLIENT SERVER NETWORK

32

PEER TO PEER NETWORK

A distributed application architecture that partitions tasks or workloads between peers

Each node can request for services and provide services

A decentralized network

Reliable as there are multiple service providing nodes

Service requesting node does not need to wait long

Expensive to implement

Comparatively less stable

CLIENT SERVER NETWORK

A distributed application structure based on resource or service providers called servers and service requesters called clients

Client requests for service and server responds with a service

A centralized network

Clients depend on the server - failure in the server will disrupt the functioning of all clients

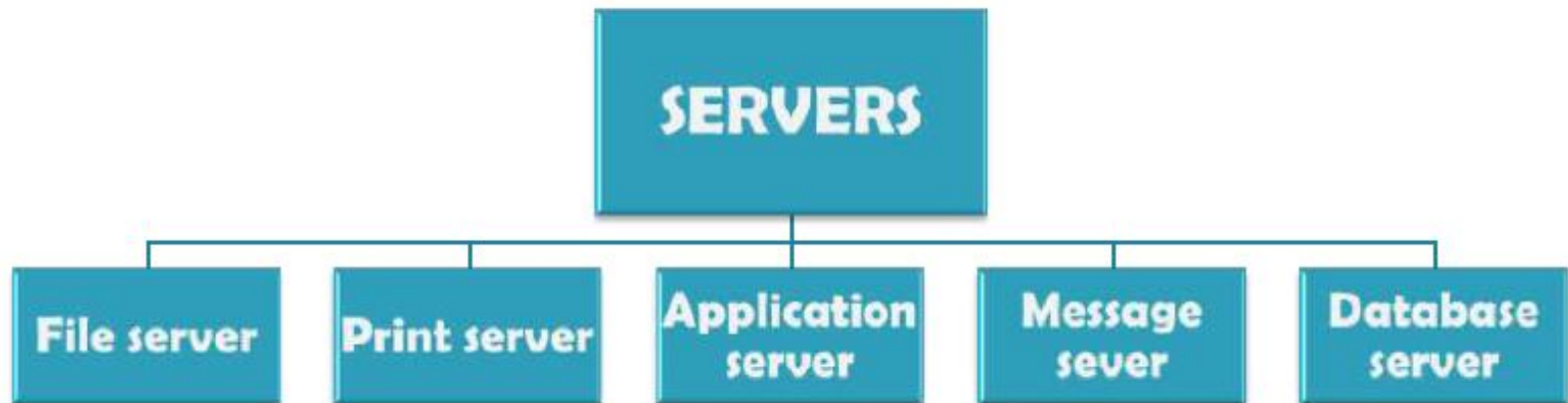
Access time for a service is higher

Does not require extensive hardware to set up the network

More stable and secure

Types of Server

33



Types of Server

34

- ❑ **File server:** These servers provide the services for storing, retrieving and moving the data. A user can read, write, exchange and manage the files with the help of file servers.
- ❑ **Printer server:** The printer server is used for controlling and managing printing on the network. It also offers the fax service to the network users.
- ❑ **Application server:** The expensive software and additional computing power can be shared by the computers in a network with the help of application servers.
- ❑ **Message server:** It is used to co-ordinate the interaction between users, documents and applications. The data can be used in the form of audio, video, binary, text or graphics.
- ❑ **Database server:** It is a type of application server. It allows the users to access the centralised strong database.