

# Network Routing Algorithm. (UNIT-1)

## Syllabus.

- ✓ ① Router, Application, function.
- ✓ ② Types of Routing Protocols.
- ✓ ③\* Classful IP addressing.
- ✓ ④\* OSI Reference Model
- ⑤ IP Protocol Stack Architecture.
- ⑥ Network Topology Architecture
- ⑦\* PSTN (Public Switched Telephone Network).
- ⑧ Communication & Technology
- ⑨ Network Protocol Analyzers.

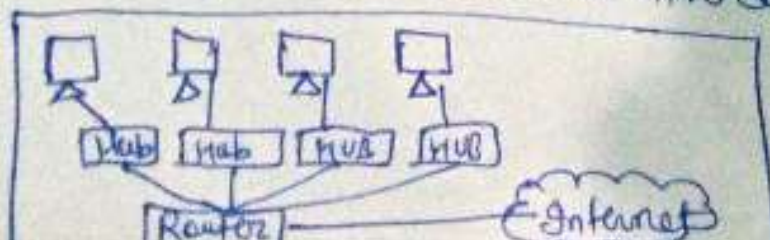
### Topic-1

\* Router: Router is a physical or virtual interconnecting/inter networking device that is designed to receive, analyze and forward data packet between computer networks. A router examines the IP address of a given data packet and it uses the headers and forwarding table to decide the best way or path to transfer the packets. Popular companies develop routers are: Cisco, Juniper, HP, Nokia etc.

- A router works on third layer of OSI model and it uses protocol ICMP to communicate b/w two or more networks. It is also known as intelligent device.
- A router is used in LAN & WAN ex: used in offices for connectivity, we can also establish connection b/w distant network like from Delhi to Agartala.
- It is more expensive than other n/w device like hub, switch.

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Diagram:





# Function of Router

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① Forwarding : Router receives packet from its input port and perform some basic function like it checks header, checksum look upto the routing table to find the appropriate output port in order to transfer/forward the packet.

② Routing : It is the process in which router finds the best path to reach the destination.

## Types of Routers :

- 1) Wireless Router
- 2) Brouter
- 3) Core Router
- 4) Edge Router.
- 5) Broadband Router :

It provide high speed internet access to computer. also known as Broadband modem, ADSL or DSL (Digital Subscriber line).

⊛ Wireless Router : It offers wifi connectivity to laptops, Smartphone, other devices with wifi capabilities. It is capable of generating wireless signal in office, allow computers to connect with router within a range, & use the internet. 150 feet range in indoor connection & 300 feet range in outdoor connection.

⊛ Brouter : It is a combination of bridge & router. It allows transferring the data b/w network like a bridge & like a router It can also route the data within network to the individual system.

⊛ Core Router : It routes the data within a network, but not capable to route the data b/w networks. It is used by (ISP) and it provide fast & powerful data communication interfaces

⊛ Edge Router : It is a lower capacity device that is placed at the boundary of the network. It allows internal network to connect with external network, also called access router. It uses external BGP.

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## Advantage of Router

- ① Security: It provide security as LAN work in broadcast mode, the data is available to each station but the station which is specially addressed reads the data.
- ② Performance enhancement: It improves performance within individual network. It reduces <sup>volume of</sup> traffic in network by dividing it into sub-networks.
- ③ Reliability: If one network gets down when server was stopped then the routers services & other networks will not be affected.
- ④ Networking Range: Cable used to connect the devices, but its length cannot exceed 1000 mtrs.

### Topic-2

## Routing Protocol

Routing protocol are mechanism by which routing information is exchanged b/w routers so that routing decisions can be made.

- ① Open Short Path first (OSPF): It is used to calculate the best route route for given packet to reach destination in a set of connected networks. It is identified by Internet engineering task force (IETF) as Interior gateway protocol.
- ② Border Gateway protocol (BGP): Routed information exchanged b/w edge routers. It provide network stability for router, If one internet connection gets down while forwarding the packets, it can adapt other connection quickly to send the packets.



③ Interior Gateway Protocol :- It specifies how routing information will be exchanged between gateways within an independent network.

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Topic : ④ Enhanced Interior gateway Routing Protocol :- In this

Aim/Objective : protocol, if routers unable to find path to a destination from the tables, it asks route to its neighbours,

⑤ Exterior Gateway protocol :- It decides how routing information can be exchanged between two neighbor gateway hosts, each of which has its own router. In this exchange routing table information blur hosts.

⑥ Routing Information Protocol (RIP) :- It determines how routers can share information while transferring traffic among connected group of LAN.

### \* Routing algorithm

:- Routing protocol is a routing algorithm that provides the best path from source to the destination. The best path is the path which has "least-cost-path". from source to destination. Network layer provide the best route to transmit data packet.

Two types

Adaptive Routing algo.

Non-adaptive Routing algo.

① Define :- an algorithm that constructs the routing table based on n/w condition.

② Usage :- It is used by dynamic routing.

③ Routing decision :- Routing decision made based on topology & network traffic.

④ Categorization :- Centralized isolation.

⑤ Complexity :- It is more complex

→ Construct static table to determine which node to send the packet.

→ It is used by static routing.

→ Routing decision over the static tables.

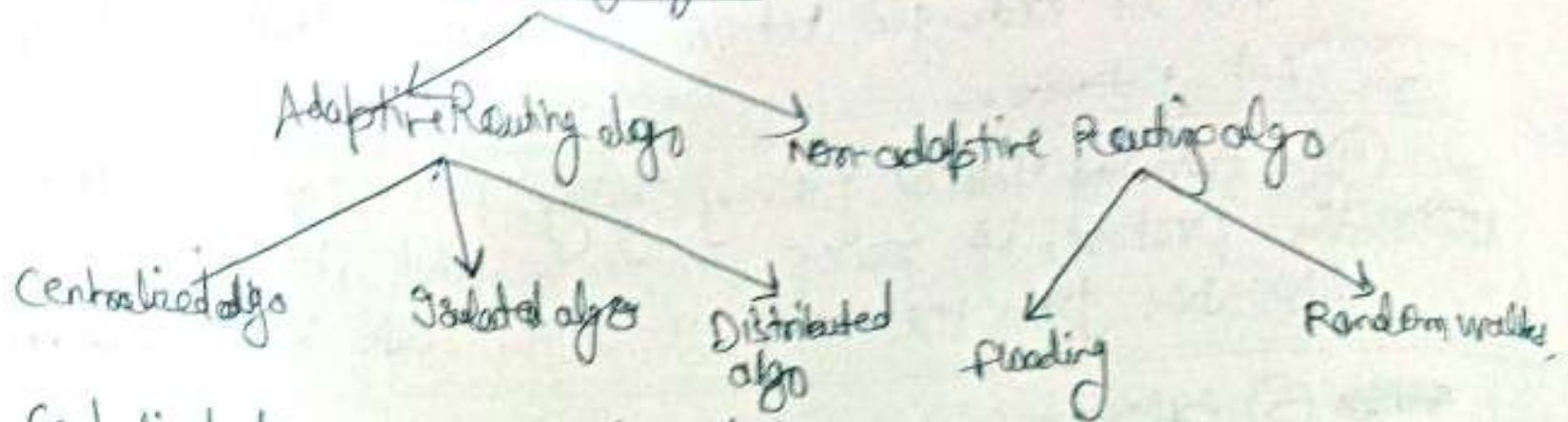
→ used by static routing.

→ It is simple algo.

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## Routing algo



→ Centralized algo: In this method a node has whole info. regarding n/w so it can make all decision of routing.

→ Isolation algo: is an algo that obtains information by using local information rather than gather info from other nodes.

→ Distributed algo: In this method, the node receive info from its neighbours & decide to route the packets.

→ flooding: in case of flooding, every incoming packet is sent to all outgoing links except one from it has been reached.

→ Random walks: a packet sent by the node to one of its neighbours randomly.

## Classful IP addressing.

### Topic-3

IP address is an address having information about how to reach a specific host, especially outside the LAN. IP address is a 32 bit unique address having an address space of  $2^{32}$ . There are two notations in which IP address is written, dotted decimal notation & hexadecimal notation.

\* Dotted decimal Notation

10000000 00001011 00000011 00011111  
↓ ↓ ↓ ↓  
128 . 11 . 3 . 31

\* Hexadecimal Notation

10000001 00001011 00001011 11101111  
↓ ↓ ↓ ↓  
(810B0B EF)<sub>16</sub>



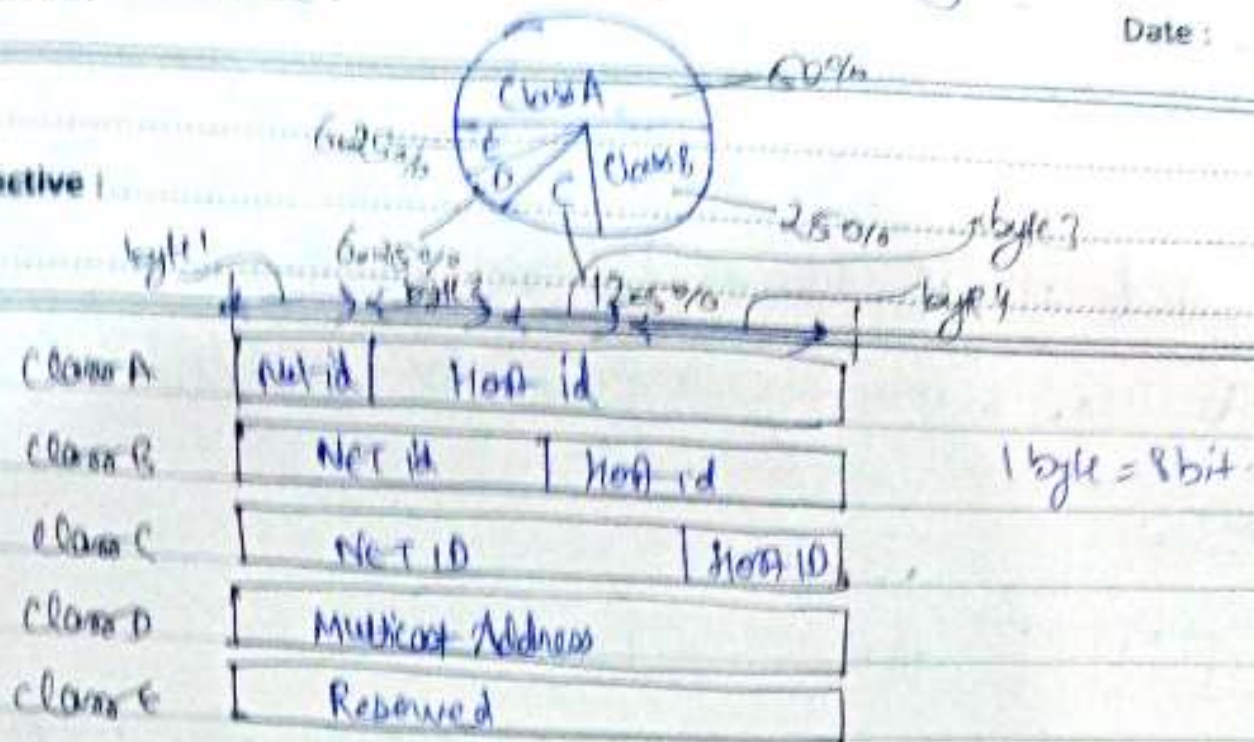
Classes: In classful addressing IP addressing is divided into 5 classes.

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① Class A

Field	Size
Net id	8 bit
Host	24 bit

If address belongs to class A contains

Large no. of hosts.

Network id = 8 bit, host id = 24 bit long.

first octet in class A is always set to zero and rest used to determine network ID. used to determine host in any n/w.

② Class B

Field	Size
Net id	16 bit
Host	16 bit

first octet of class B is set to 10 and rest 14 is used to determine network ID.

$2^{14} = \text{net address}$   
 $2^{16} - 2 = \text{host address}$

③ Class C

Field	Size
Net id	24 bit
Host	8 bit

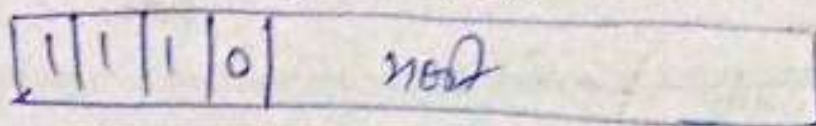
first octet of class C are always 110. rest used to determine network ID & 8 bit of host id used to determine host in any n/w.

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$2^{21} = \text{Net address}$   
 $2^8 - 2 = \text{Host address}$

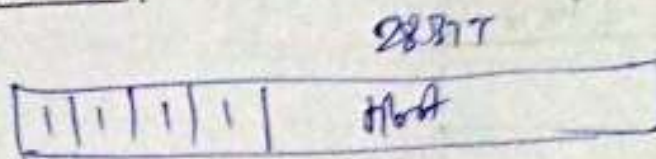


④ Class D: - 28877



IP addresses belonging to Class D are reserved for multicasting. first octet of IP addresses belonging to class D are always set to 1110, remaining are used to recognize host.

⑤ Class E:



IP addresses belonging to class E are reserved for experimental and research purposes. first octet are always set to 1111. This class doesn't have any subnet mask. address of this class range from 240.0.0.0 - 255.255.255.255.

### ⑥ Classless Addressing

Problems of Classful addressing: millions of class A, many of B address are wasted, whereas the no of address available in class C is so small. ~~to~~ ~~so~~ so that it cannot cater the need of organizations. Class D are used for multicast addresses & E for reserved.

These all problems overcome by classless addressing was replaced by (CIDR) in 1993.

→ To reduce the wastage of IP addresses in a block, we use sub-netting. we use host id bits as net id bits of classful address.

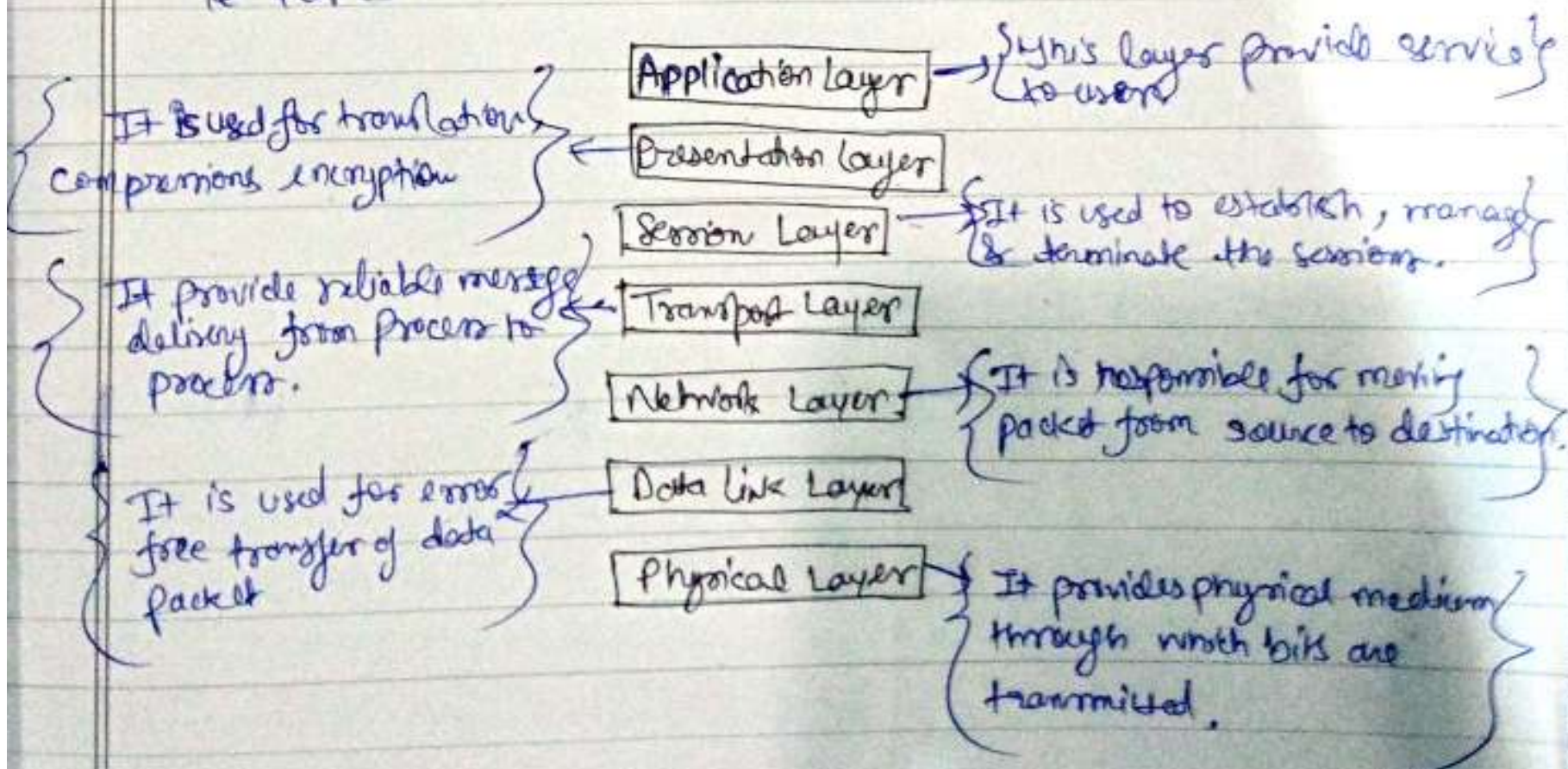


Topic : \_\_\_\_\_

Aim/Objective : \_\_\_\_\_

### ⊗ OSI Reference Model

- OSI stands for Open System Interconnection. is a reference model that describes how information from a SW application in one computer moves through a physical medium to the software application in other computer.
- OSI consist of seven layers & each perform a particular function.
- OSI model was developed by ISO (International organization for standardization) in 1984, now considered as architectural model for inter-computer communication.
- OSI model divides the whole task into seven smaller, manageable task.



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