322 (interior)
1 (exterior)

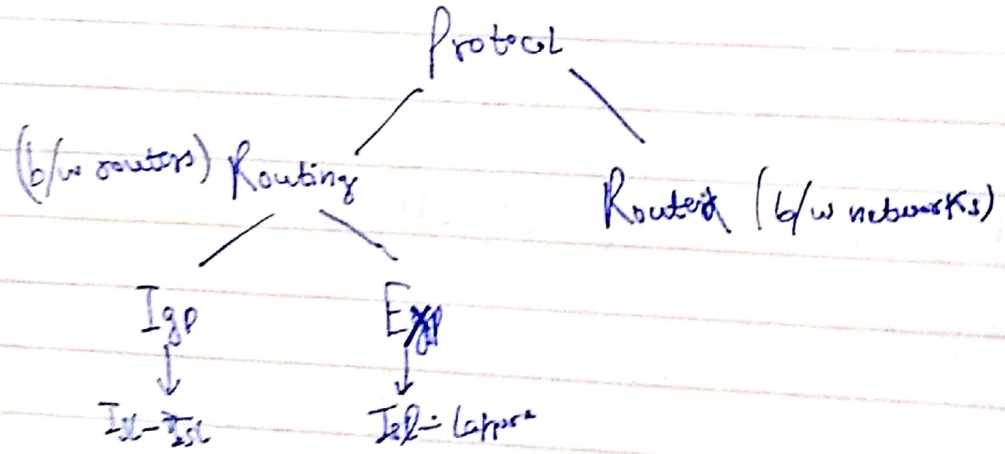
Routing:- (323)

↳ Routing Protocol
↳ selection of best path for communication.

Static → Total 16 (5-6)
Dynamic → 200/250 routes
default → when destination not known

permanent → entry save when refresh

Destination
Mask → 0 → Default route



Why we need two protocols or more at same time?

Timer
↓
5 sec by default

1 Hop = 1 router

RIP
16

IGRP
255
Bandwidth / load ---
↓
Cost
255 30

Link state → Shortest Path First

OSPF

Is-Is

Auxiliary → remotely used

TFTP → Trivial File Transfer Protocol (solarwinds TFTP)

> enabled ↵

config terminal ↵

Config # interface s0/- ↵

Config if ( )#

ambers → yellow → physical damage

Running Config → RAM

Startup config → Hard Drive (N-V RAM)

Switch Model no. → First two integers

Setup command is used for fresh router.

? → Exec commands for help

Path selection (routing perform) → Parameters → Bandwidth, load, how much link is reliable, delay, maximum transmission unit.

routing → best path selection

Ethernet = 10 Mega Bits

Router → Router (serial Interface)

Static Route

⇒ Manually

⇒ Uses a route that a network administrator enters into a router Manually.

⇒ Uses a fixed route decide by administrator.

e.g:- driver, local person

Dynamic Route

⇒ Uses a route that a network routing protocol adjusts automatically for topology or traffic changes.

⇒ If one path has more load, than it selects the other path.

⇒ prefferable

Router (config)# ip route network [mask]

(destination address) (default subnet mask)

{address | interface} [distance] [parmanent]

predefined - administrators distance

Entries saved permanently in RAM.

Default Route :-

⇒ when destination not known where we have to send a packet.

if route 0.0.0.0 0.0.0.0 172.16.2.2

Routing Protocol :-

(1) (RIP)

(No routers) Routing

(2) Interior Gateway Routing Protocol (IGRP)

(3) Exterior Gateway Routing Protocol (EGP)

⇒ To determine paths and maintain routing protocols. (RIP, IGRP)

Routed (b/w networks)

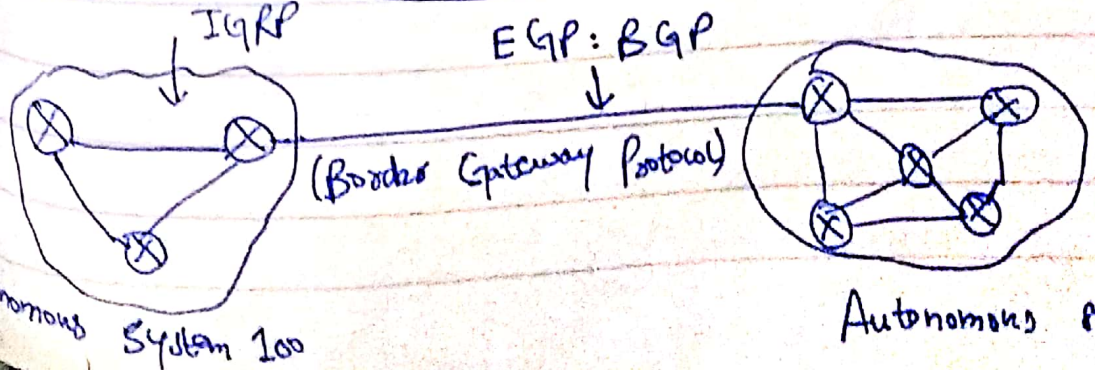
Transmission Control Protocol (TCP) X So on (IP)

⇒ One path is determined, a router can route a routed Protocol. (IP)

⇒ Collection of common networks under a common administrative domain.

Autonomous Systems → Lahore → Work in one Network

Peshawar → work in one Network



e.g (RIP, IS-IS, OSPF, EIGRP)

⇒ IGRP operate with in a autonomous system.

⇒ EGP connect different autonomow system.

e.g (BGP)

Administrative Distance :-

⇒ Every routing protocol have predefined administrative distance.

IGRP = 100
RIP = 120
OSPF = 90

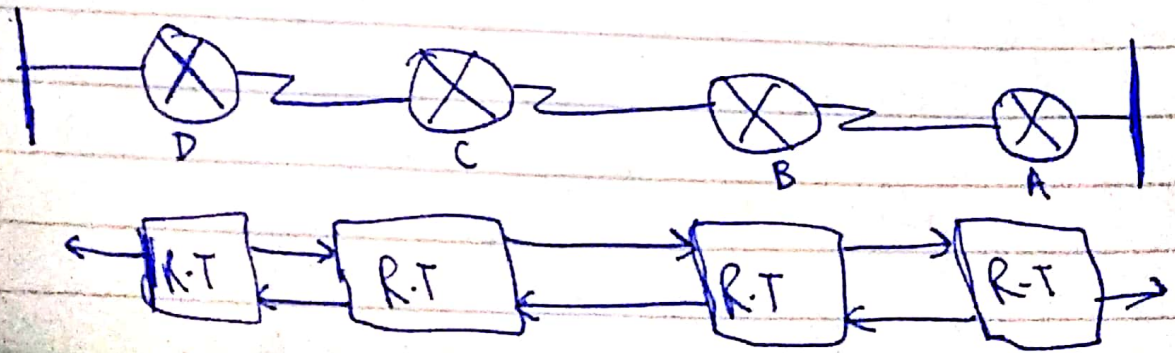
(used when more than on routing protocols are used).

⇒ less administrative distance will be prefferred for communication.

Classes of Routing Protocol :-

Hybrid Routing ⇒ Combination (EIGRP) of distance vector and Link state.

Distance Vector ⇒ Routing perform in terms of distance and direction.



⇒ To schronize the change → Routing Table

Drawback of distance vector ⇒ If c have 30 entries, and one entry more is added then, whole routing table will do the whole table broadcast again. (C → D, B, A).

⇒ Bandwidth wastage

⇒ Pass periodic copies of routing table to neighbours routers and accumulate distance vectors.

Distance Vector with Metrics:-

No. of Hop counts less are efficient. (Less no. of routers)

RIP metric → Hop Count → Maximum Limit = 16

e.g.- If we want to sent packet to Lahore:-

1st path → 20 routers, 20 GB Bandwidth

2nd path → 5 routers, 30 GB Bandwidth

3rd path → 2 routers, 2 MB Bandwidth (Best path) ?

↓

Incase of RIP

RIP will pick that path which has less no. of Hop counts.

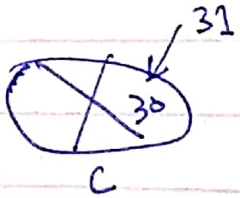
⇒ Criteria ⇒ ~~Bandwidth~~ Count no. of routers to send and receive data.

IGRP → Bandwidth (Path selection is good over RIP) (efficient)
Calculates Delay
Load
Reliability
MTU (Max Transmission Unit)

IPX (Internet Packet Exchange)
↳ (Ticks, Hop counts)

IGRP/RIP → Distance vector Routing Protocol

Link-State Routing Protocols:-



⇒ only updates the 31st entry, not the whole routing table.
⇒ Communicates on SPF. (OSPF, IS-IS)

⇒ RIP can only support 16 routers.

Ch No. 8 — Ch No. 6 :- (pdf)

Switching

LAN Switching → 96 ports

CRC → Error Checking → Reliable but time consuming
(match with previous frame)

No. of ports = No. of collision domains

Advantages:-
- → Address Learning
- → Forward / Filter decision
- → Loop avoidance

Address filtering → Saving MAC Address of each station in MAC Table.

Cut - Through Frames:-

⇒ Time delay is less.

⇒ But data error checking is not performed (not reliable data)

Store and forward:- (CRC) (Cyclic Redancy check).

⇒ Frame is received and checked before forwarding.

⇒ Time consuming

Fragment Free :-

⇒ Check first 64 Bytes

⇒ reliable and fast

CSMA/CD → Carrier Sense Multiple access Collision Detection

Half Duplex:- Drawback:-

⇒ Switch is Full Duplex
⇒ Hub is Half duplex
⇒ So, bottle neck is created

Root Bridge:- Switch which we have lowest Bridge Id will become root Bridge.
Bridge Id → Priority, Base MAC Address (6 bytes)

Root port ⇒ On a single non root Bridge, switch, there can be maximum one root port.
(Not more than one)
⇒ port which receives superior bpdu.

Designated port ⇒ On a single segment, there will be one designated port.
⇒ port which transmits superior bpdu.

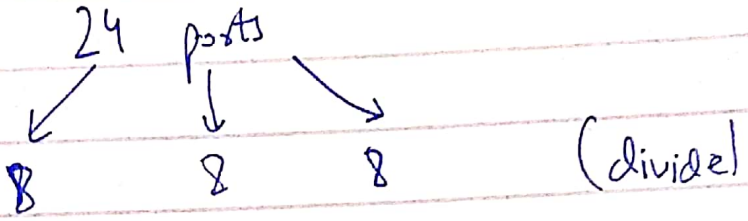
Switch → No. of ports = No. of collision Domains
Hub → Collision Domain = 1

Switch → Collision Domain → No. of path for send/receive data
→ Broadcast Domain → 1

VLAN:-

VLAN → Division of logical Broadcast Domain

By Default Broadcast Domain of switch = 1



(divide)

VLAN → Segmentation
→ Flexibility
→ Security

1st Solution Disadvantage:-

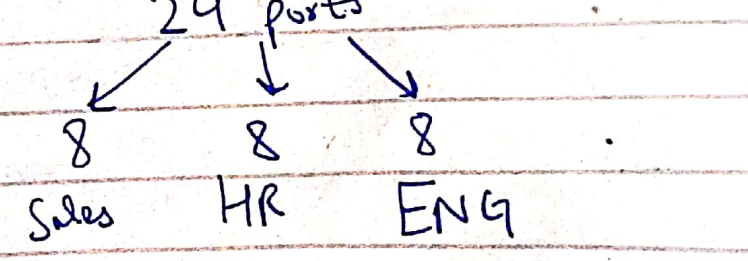
⇒ If 9 different switches are used for each department at each floor, it will increase the cost 3 times.

⇒ Wastage of no. of ports, if 3 to 4 used out of 24 ports.

2nd Solution VLAN:-

⇒ Divide the logical Broadcast Domain.

⇒ Logical B.D depends on no. of ports.



VLAN

Static VLAN → Manually configure By us.

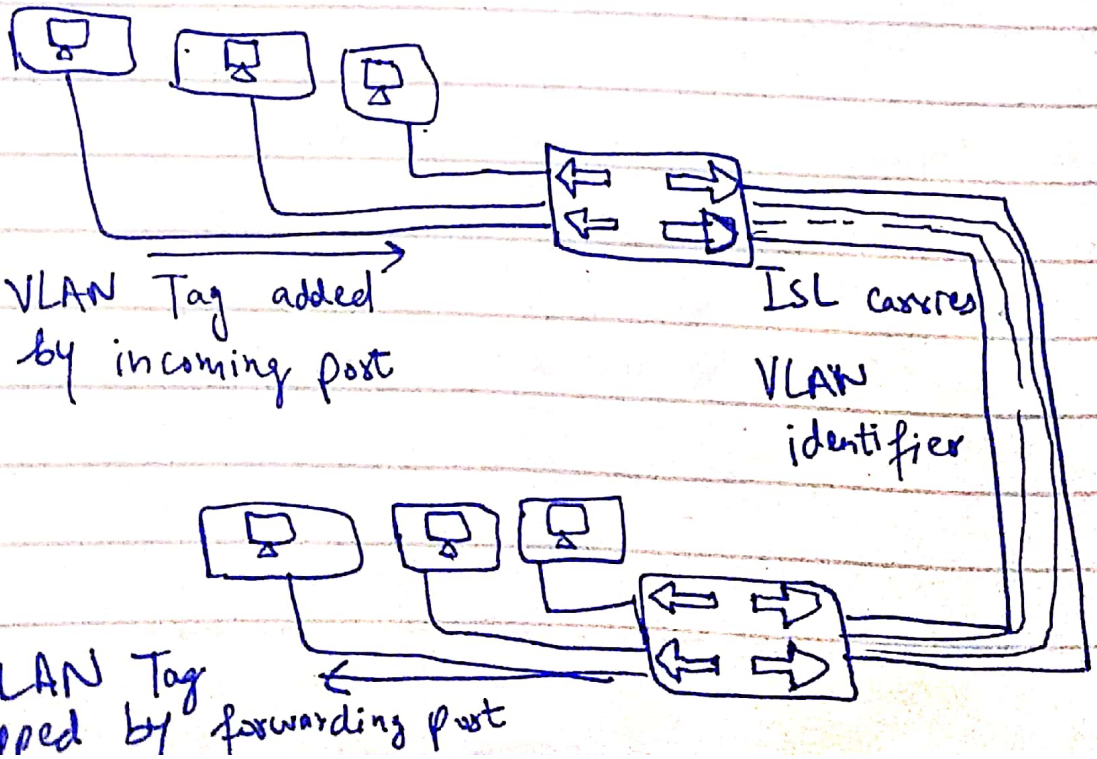
Dynamic VLAN → Switch autosense the systems those communications are at higher rate and pick them and include them in a 1 VLAN.

VLAN → Port no. / MAC Addresses } Created

Which protocol is used for communications in VLAN?

⇒ Inter Switch Link Tagging

VLAN Identifier → We can identify that this information is for which VLAN/Network



ISL Encapsulation:-

User Information → Data → Segments →
Packets → Frames → Bits (0, 1s)

ISL Header → 26 Bytes
CRC → 4 Bytes

Total Ethernet frame Encapsulated = 30 Bytes

⇒ Support for many VLAN's (1024)

VLAN Trunking Protocol (VTP):-

⇒ Used for communication b/w two VLAN's.
⇒ Tells if new VLAN is added / deleted.
⇒ A messaging system that advertises VLAN configuration information.
⇒ VTP send advertisments on trunk ports.

VTP modes:-

⇒ Server
⇒ Client
⇒ Transparent → temprory mode

How VTP works?

Class D in IP Addressing → MultiCasting
⇒ VTP advertisements are sent as multicast frames.
⇒ VTP advertisement are sent every 5 min or when there is ch
⇒ VTP servers and Clients synchronized to latest revision number.

VTP Pruning:-

⇒ Increases available bandwidth by reducing unnecessary flooded traffic.