

Assignment : 2

1. Draw and explain all the fields of IPv4 header.

ans - IPv4 uses 32 bits addressing which means that the address space is $2^{32} = 4,29,49,67,296$

\Rightarrow In IPv4 addressing are usually written in dotted decimal notation. The address broken into four bytes with each byte represented by a decimal number and separated by a dot.

Eg - 192.168.1.5

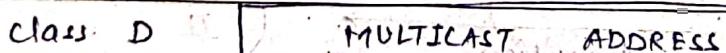
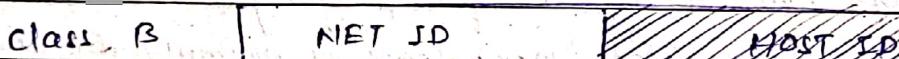
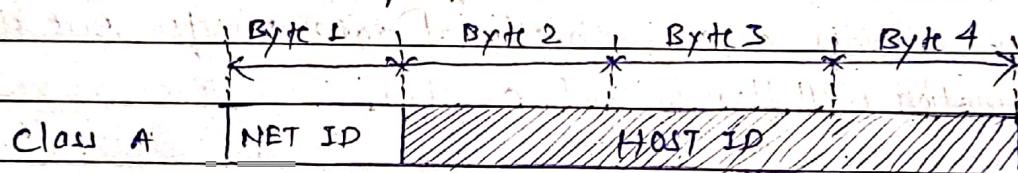
Class A	0 to 127	0.0.0.0 to 127.255.255.255
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Class B	128 to 191	128.0.0.0 to 191.255.255.255
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Class C	192 to 223	192.0.0.0 to 223.255.255.255
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Class D	224 to 239 - Multicasting	224.0.0.0 to 239.255.255.255
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Class E	240 to 255 - Reserved for future use	240.0.0.0 to 255.255.255.255
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Q. what is IP address? write the classes of IPv4 address. Explain the concept of subnetting.

Ans - IP address stands for Internet Protocol address. An IP provides and identity to a networked device. It has two level hierarchy Network IP and Host ID.

⇒ The network ID identifies the network in which the host is connected. The host ID identifies the network connection to host.

Class A	0 to 127	0.0.0.0 to 127.255.255.255
Class B	128 to 191	128.0.0.0 to 191.255.255.255
Class C	192 to 223	192.0.0.0 to 223.255.255.255
Class D	224 to 239 Multicasting	224.0.0.0 to 239.255.255.255
Class E	240 to 255 Reserved	240.0.0.0 to 255.255.255.255

• Subnetting :- When a bigger network is divided into smaller networks then that is known as subnetting. So maintenance is easier for smaller networks.

For example, if we consider a class A address the possible number of hosts is 2^{24} for each network it is obvious that it is difficult to maintain such a huge number of hosts, but it would be quite easier to maintain if we divide the network into smaller parts.

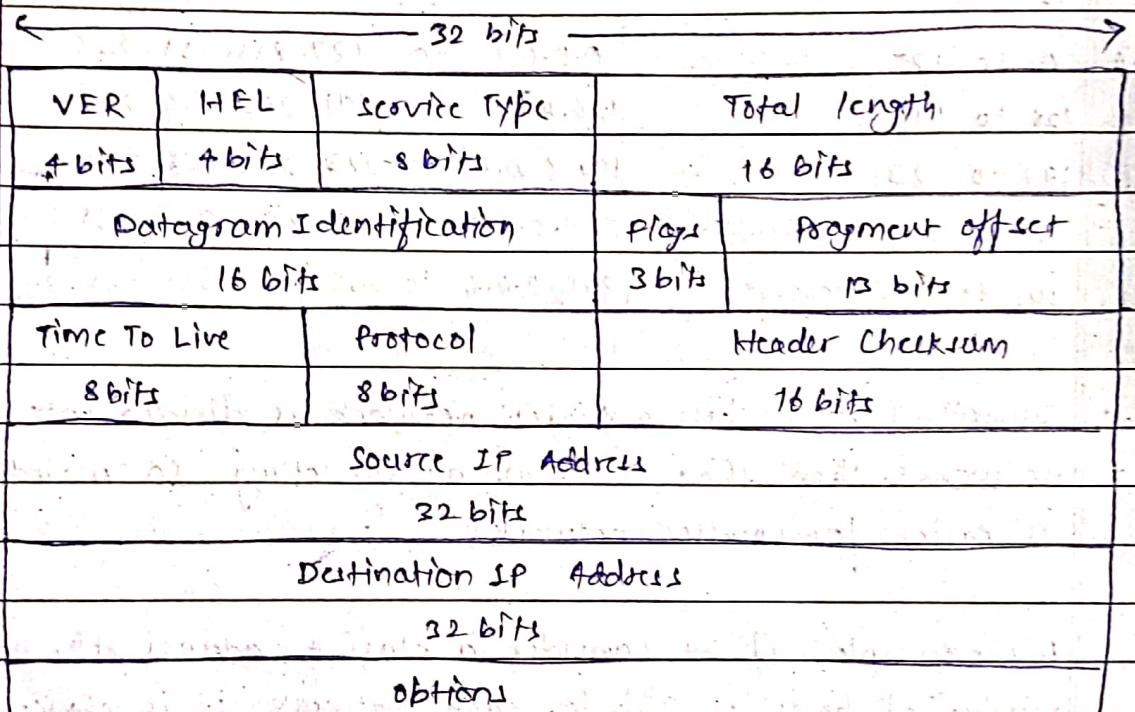
• Default subnet mask.

Class	IP Range	Hosts per network	Default subnet mask	slash Notation
A	1 - 126	16,777,214	255.0.0.0	/8
B	128 - 191	65,534	255.255.0.0	/16
C	192 - 223	254	255.255.255.0	/24
D	224 - 239			
E	240 - 255			

Q. Draw and explain all the fields of IPv4 headers.

Ans - IPv4, where IP stands for Internet Protocol and v4 stands for version four is used to route Internet traffic and other packet switched layer network, such as Ethernet.

⇒ It is a 32 bit address that is organised into four octets of 8 bits, which is often expressed in dotted decimal number and looks like this: 172.140.153.12.



VER - This field contains the version of IP.

HLEN - It is the length of the IP header. It specifies the no. of 32 bits.

Service Type - It is an indication of the quality of service required for this IP datagram. Ex - Delay, High, Throughput, etc.

Total Length - It specifies the total length of the datagram. Datagram = header + Data.

Datagram Iden. - It is a unique no. assigned by the sender. Header = 20 bytes to 60 bytes.

Flags :- It contains 3 bits: 1st bit is reserved & must be 0. Data = 20 bytes to 65535.

: 2nd bit is DF (Do not fragment) 0 means all fragment

: 3rd bit is MF (more fragment) 0 means least "

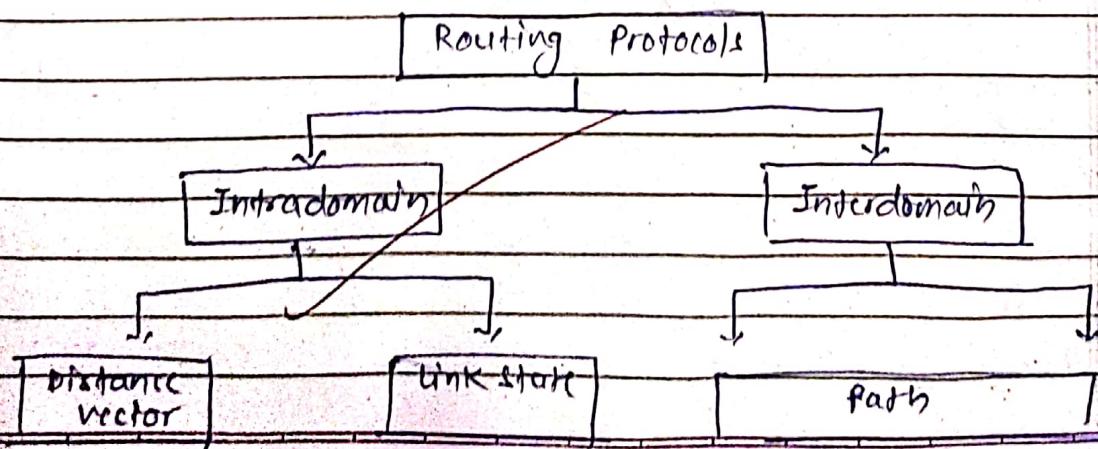
Fragment

- fragment offset : It is used to assemble the full datagram.
- Time to Live : It specifies the time datagram is allowed to travel.
- Protocol No. : It indicates the higher layer protocol to which IP should deliver the data in this datagram Eg. ICMP=1, TCP=6
- Header checksum : It is a checksum for the information contained in the header, if it does not match the content datagram is discarded.
- Source IP address : It specifies the logical address of sender.
- Destination IP address : It specifies the logical address of destination.
- Options : It is used for control or debugging and measurement.

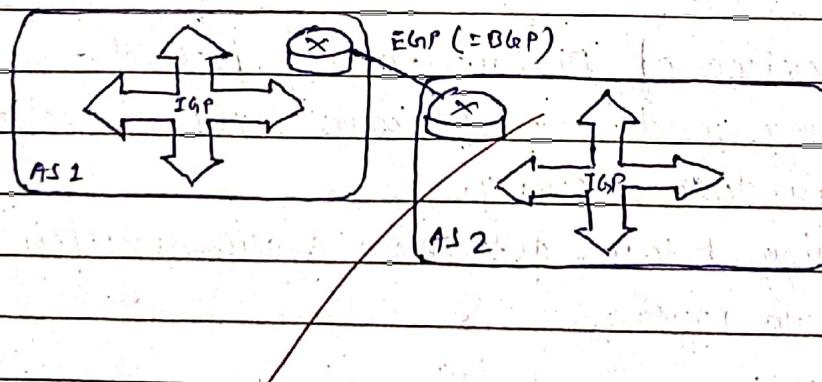
3. Give the classification of unicast routing protocol. Explain interdomain routing protocol.

ans: In unicast, the router forwards the received packet through only one of its interface.

- Classification of Unicast Routing Protocol –
 - (i) Routing inside an autonomous system is referred to as intra-domain routing.
 - (ii) Routing between autonomous systems is referred to as inter-domain routing.



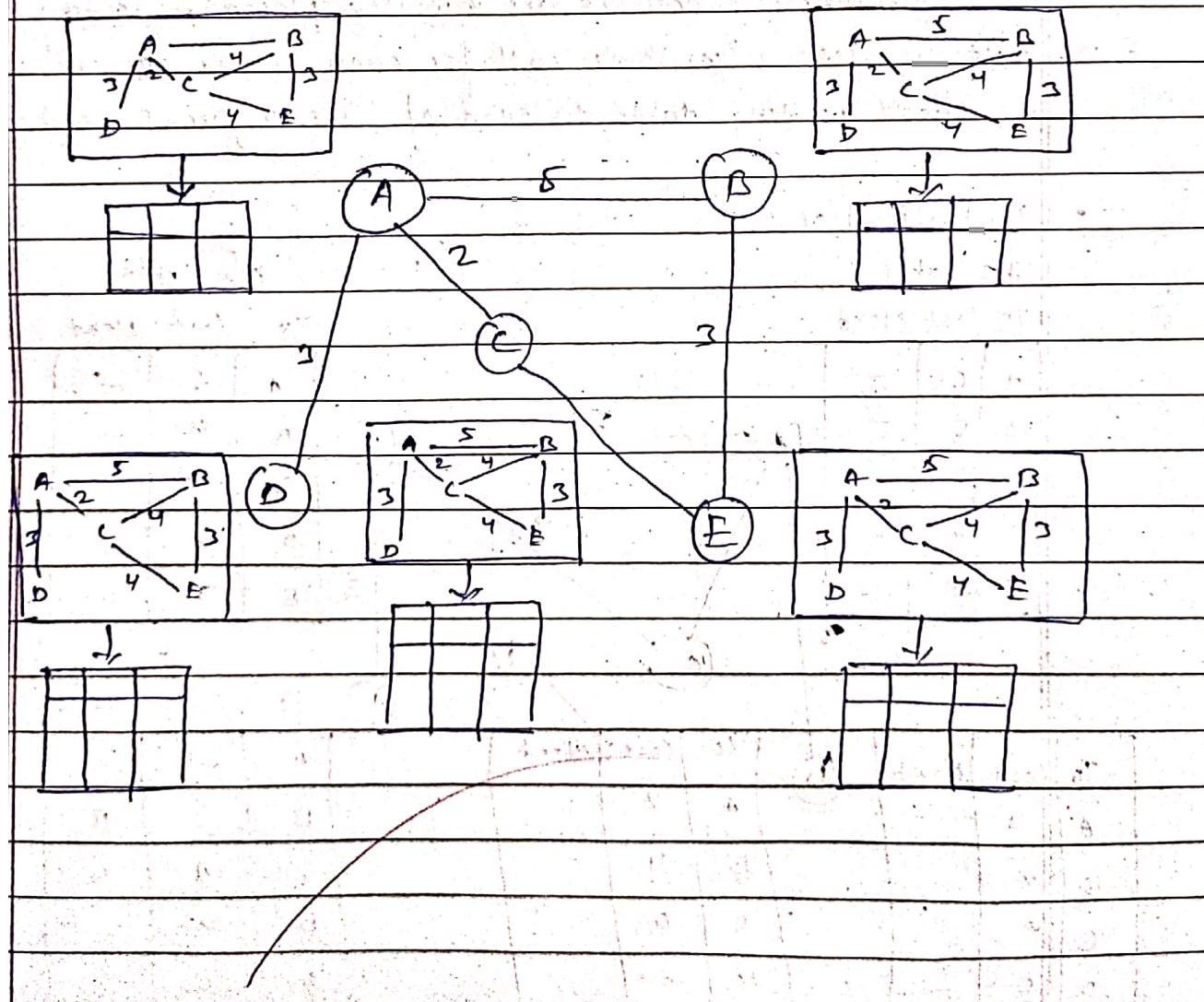
- Interdomain - Routing protocol : path vector routing.
Border gateway protocol is path vector routing, BGP also called exterior gateway protocol.
- ⇒ There is at least one node, called the speaker node, in each AS that creates a routing table and advertises it to speaker nodes in the neighbouring AS's.
- ⇒ Only speaker nodes in ~~as~~ each AS can communicate with each other. Speaker nodes advertise the path, not the metric.
- sharing : A speaker is an autonomous system shares its table with immediate neighbours.
- updating : when a speaker node receive a table from its neighbor it updates its own table by adding the nodes that are not in its routing table. It also adds its own AS and the AS that sent the table.



Explain link-state vector routing protocol with appropriate diagram.

Link state routing was developed to overcome the disadvantage of the distance vector protocol. Each router learns about its own directly connected networks.

Each router builds its own Link State Packet (LSP) which includes information about neighbor such as neighbor ID, link type etc. Once all the routers have received all the LSPs, the routers then construct a topological map of the network which is used to determine the best routes to a destination.



5. Explain Distance vector routing protocol with necessary diagram.

- Sol:- A router using distance vector routing protocols knows two things:
- Distance to final destination.
 - Vector, or direction, traffic should be directed.
- Characteristics:
- Periodic update
 - Alive neighbors
 - Broadcast updates
 - Entire routing table is included with routing info.

- Routing Updates:
- Routing table updates occur periodically or when topology changes.
- Directly connected network are initially placed in routing table.
- Distance vector algorithms call for each router to send its entire routing table to each of its adjacent neighbor.

- Initialization:

A's table:

To Cost Next

A	0	-
B	5	-
C	2	-
D	3	-
E	∞	-

B's table:

To Cost Next

A	5	-
B	0	-
C	4	-
D	∞	-
E	3	-

To Cost Next

To	Cost	Next
A	3	-
B	∞	-
C	∞	-
D	0	-
E	∞	-

To	Cost	Next
A	4	2
B	4	-
C	0	-
D	∞	-
E	4	-

E's table

A	∞	-
B	3	B
C	4	C
D	∞	-
E	0	D

D's table

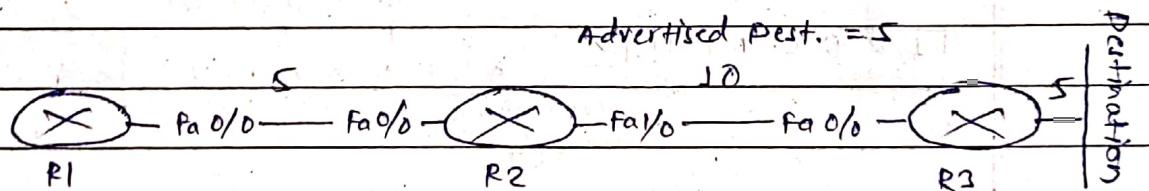
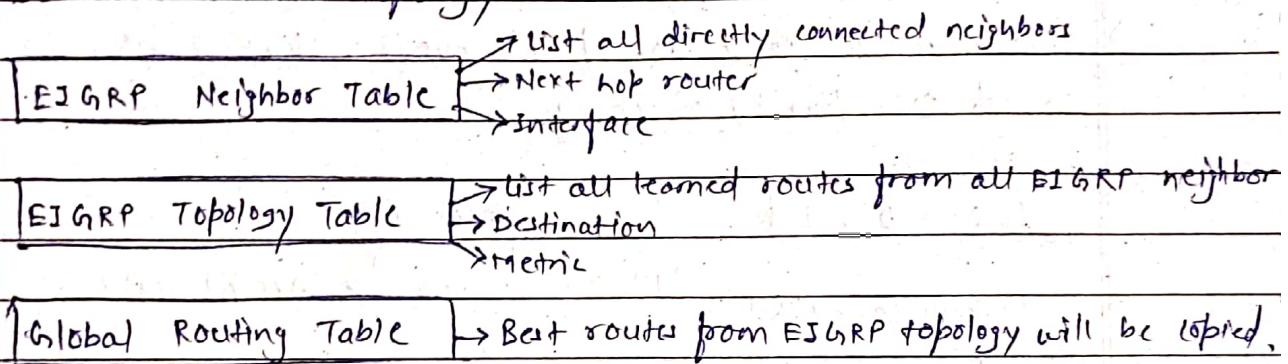
C's table

⇒ Update table of Node A.

6. Explain the working of EIGRP protocol with appropriate diagram.

Sol:- EIGRP stands for Enhanced Interior Gateway Routing protocol. It is a Cisco's proprietary routing protocol.

- ⇒ Routers will start sending packets to other routers, if you send packets and you receive them you will become neighbours.
- ⇒ EIGRP neighbours will exchange routing information which will be saved in the topology table.



Advertised Dist. = 5

10

R1

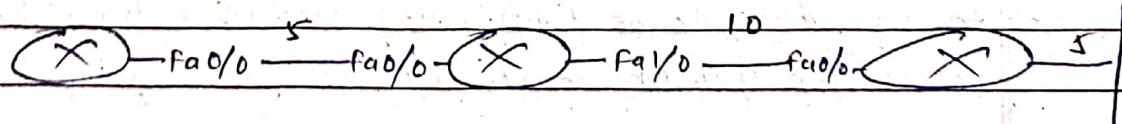
R2

R3

Cost
+
at
g

Feasible Dist. = 25

Advertised Dist. = 5



Topology table.

7. Explain all 3 methods of error correction and error detection with example.

Sol:- simple bit parity is simple error detection method that involves adding an extra bit to a data transmission.

It works as -

- * 1's added to the block if the it contains an odd no's of 1's & 0's is added if it contains an even no of 1's

\Rightarrow scheme makes total no. of 1's even, that is why it is called even parity checking.

SENDER

1 0 0 0 1 1

Receiver



Compute Parity Bit

reject data

N

Y

Even

→

Accept Data



Compute parity Bit

1 0 0 0 1 1

1 0 0 0 1 1

Transmission
medium

* Disadvantages:

Not able to detect even no. of bit error

\rightarrow For eg. data to be transmitted 101010 codeword transmitted to receiver 1010101 \rightarrow we have used even parity.

\rightarrow Let's assume that during transmission, two of the bits of codeword flipped to 1111101. On receiving the code word, receiver finds the no. of 1's to be even and hence no. error, which is wrong assumption.

- Two dimensional parity check - calculated for each row, which is equivalent to a simple parity check bit. Parity check bits are also calculated for all columns, then are being sent along with the data. At receiving end, these are compared with the parity bits calculated on the receiving data.

Original data	1001101	11100010	00100100	10000100
Row Parities				
	10011001			0
	11100010			0
	00100100			0
	10000100			0
Column parities	11011011			0

- checksum : It is a method used to identify error in transmitted data. Process involves dividing the data into equally sized segments and using 1's complement to calculate the sum of these segments. The calculated sum is then over sent along with the data to the receiver's end, the same process is repeated and if all zeros are obtained in the sum, it means that the data is correct.

⇒ operation at sender side :

Data is divided into k segments each of m bits on the sender's end, the segments are added using 1's complement arithmetic to get the sum. The sum is complemented to get the checksum. The checksum segment is sent along with the data segments.

⇒ operation at receiver side :

All received segments are added using 1's complement arithmetic to get the sum. If result is zero, received data is accepted otherwise discarded.

10011001	11100010	00100100	110000100
1	2	3	4

K=4, m=8

sender

receiver

1 10011001 10011001

2 11100010 11100010

①01111011 ①01111011

↓ L ↓ L

01111100 0

3 00100100

10100000 0

4 10000100

②00100100

↓ L

checksum 100100101

Ques.

what is framing? Explain the concept of framing.

ans -

Framing is the process of dividing a stream of data into smaller, more manageable unit called frames. The frames are then transmitted over the network and reassembled at the receiving end to recreate the original stream. Framing is important in computer networks because it helps ensure data integrity and security by allowing the receivers to detect errors.

⇒ Types of framing -

(i) fixed size : The frame is of fixed size and there is no need to provide boundaries to the frame, the length of the frame itself acts as a delimiter.

⇒ Drawbacks : It suffers from internal fragmentation if the data size is less than the frame size.

Solution - Padding

(ii) variable size : In this there is a need to define the end of the frame as well as the beginning of the next frame to distinguish this can be done in two ways.

length field : we can introduce a length field in the frame to indicate the length of frame.

• End Delimiter (ED) : we can introduce an ED (pattern) to indicate the end of frame used in token ring.

Qno 9. Brief note on CSMA/CA and CSMA/CD.

ans - CSMA/CA and CSMA/CD are both media access control methods used in ethernet networks.

(i) CSMA/CA stands for carrier sense multiple access with collision avoidance. This network protocol operate in the data link layer of the OSI model. CSMA/CA aims to prevent collision by using RTS and CTS frames to coordinates data transmissions. CSMA/CA is effective after a collision wireless network uses CSMA/CA. It can sometime take twice as long as to send a data packet and each rotation consume greater bandwidth.

(ii) CSMA/CD stands for carrier sense multiple access with detection. It handle collisions by detecting them and triggering a backoff and retransmission. CSMA/CD is used in wired network. CSMA/CD is simple and inexpensive to implement and its efficient and fair. It is efficient before collision. However its efficiency decrease with distance and its performance is (-) very impact when a large no. of device are introduced.

Qno 10. write a short note on VLAN.

Sol - A virtual local area network (VLAN) is a logical grouping of device within a network, regardless of their physical location. VLAN are created to segment a network into smaller, isolated broadcast domains improving network security, efficiency and management.

VLAN ranges:

- 1) VLAN 0-4095 : Reserved VLAN's which cannot be used.
- 2) VLAN 1 : Default VLAN of switches.
- 3) VLAN 2 - 1001 : This is normal VLAN range
- 4) VLAN 1002 - 1005 : CISCO default for token rings
- 5) VLAN 1006 - 4094 : Extended range for VLAN

• Feature and benefits:

- Improved network security
- Better network performance
- Simplified network management
- Flexibility
- Low cost
- Scalability

• Key features:

- VLAN tagging
- VLAN membership
- VLAN management.

(14)
14/24