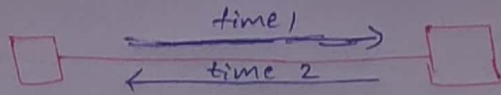


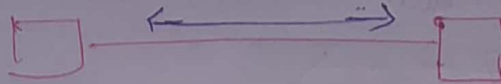
Data Flow

Direction of data

Half duplex:



Full duplex:



Simplex:



Network criteria:

Performance: Depends on Network Elements
Measured in terms of Delay & Throughput

Reliability: Failure rate of network components
Measured in terms of availability / robustness

Security: Data protection against corruption / loss of data
• Errors • Malicious users

Physical structures

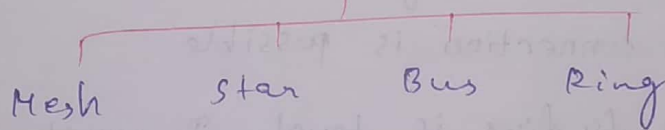
Type of connection: Point to point: single transmitter & receiver;

Multipoint: multiple recipients of single transmission

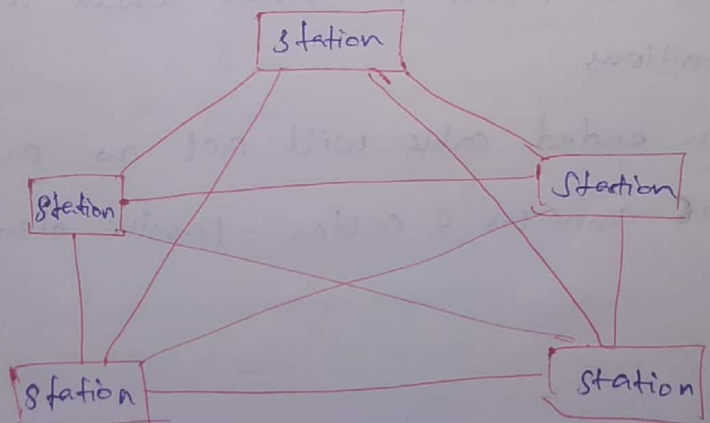
Physical topology: connection of device

Type of transmission - Unicast, multicast, broadcast

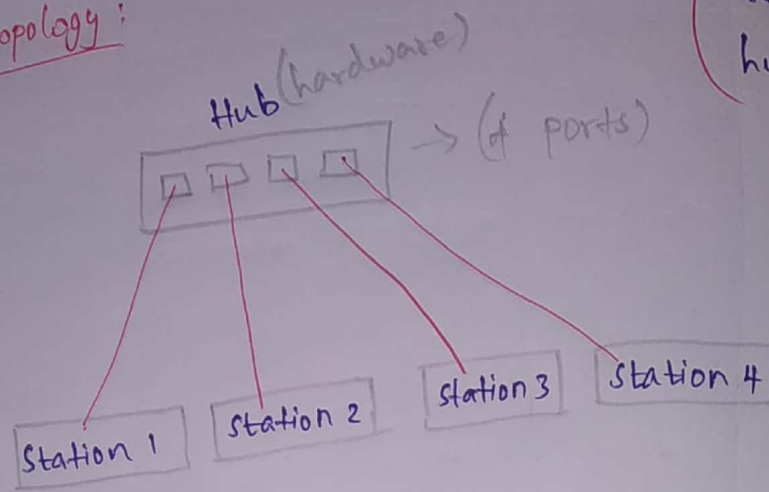
Topology



Mesh



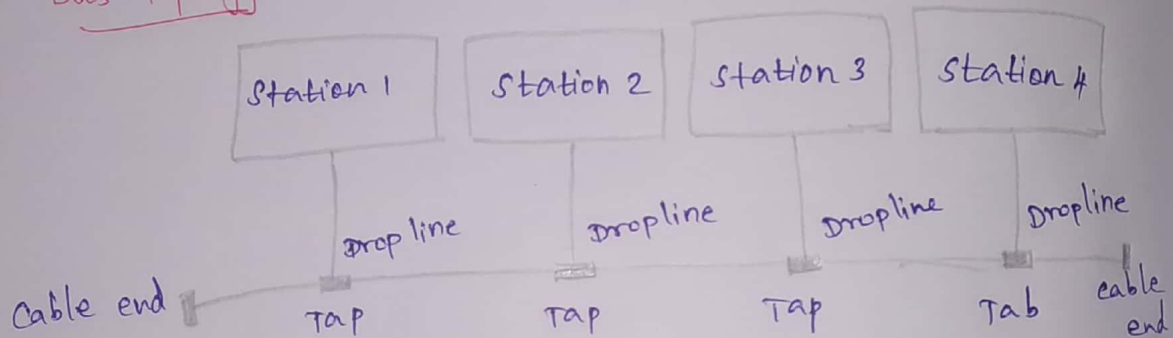
Star topology:



(If any failure hub is replaced)

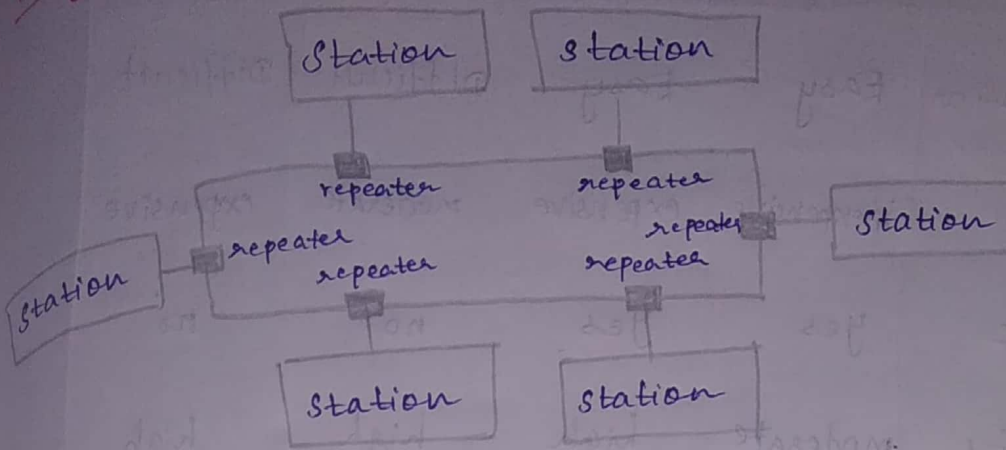
If any new station, then the last port will be connected to new hub.

Bus Topology



- * connected by cable
- * cheaper
- * If cable is damaged, network will be collapsed.
- * loose connection is possible
- * Fault finding is tough. In worst case, we have to check 'n' times where n is no. of stations.
- * open ended cable will act as antenna
- BNC connector & cables - passive elements

Ring Topology:

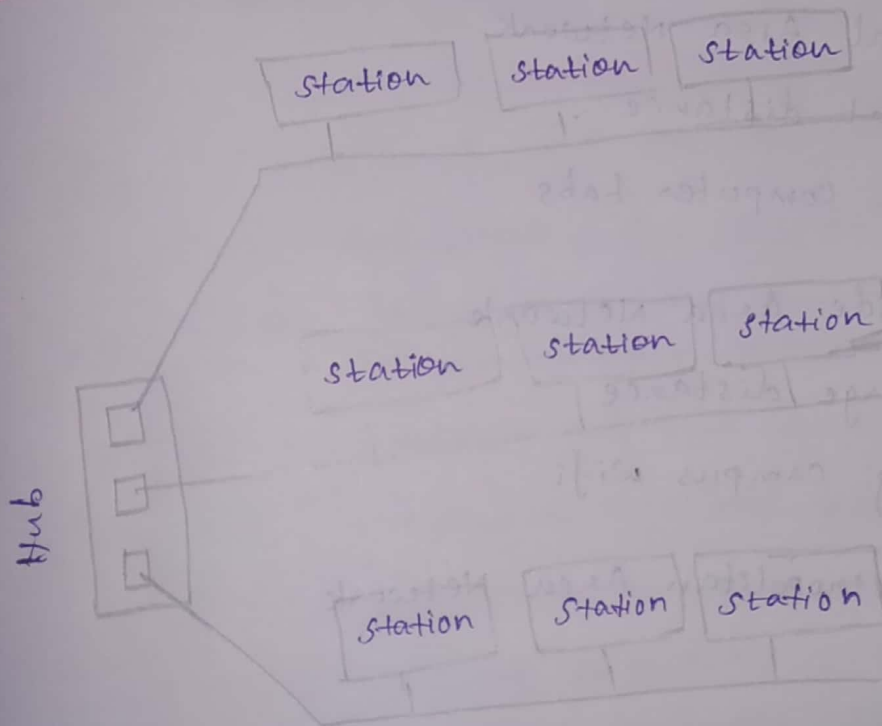


single time failure occurs in two ways

* cut in cable

* failure of repeater (active element)

Hybrid Topology:



Star topology + Bus topology

⇒ Hybrid topology

(combination of any topology networks)

Parameter	Bus	Star	Ring	Mesh
Installation	Easy	Easy	Difficult	Difficult
Cost	inexpensive	expensive	moderate	expensive
Flexible	yes	yes	no	no
Reliability	moderate	high	high	high
Extension	easy	easy	easy	difficult
Robust	no	yes	no	yes

CATEGORIES OF NETWORKS :

Lan : Local Area Network
 short distance
 eg: computer labs

wan : wide Area Network
 large distance
 eg: campus wifi

Man : Metropolitan Area Network

09/02/2021

Open system Interface (OSI Layers)

7) Application

6) Presentation

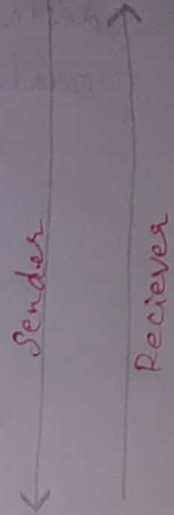
5) Session

4) Transport

3) Network

2) Data Link

1) Physical (entry or exit layer)
(receiver) (sender)



MAC - Media Access Control Address

48 bits \Rightarrow 6 octanes (by IASA)

10/02/2021

Physical layer: converts input into bits and sends it as frames

Devices {
 Modem: Modulation & Demodulation
 Repeater: Reconstructs the weak signal, eliminates noise, amplifies the signal
 Hub: Connects different LAN system
 NIC: Network interface cards \rightarrow has buffer in form of QUEUE

Data Link Layer: \Rightarrow Access to media

1) MAC Layer - give hardware addressing scheme

2) LLC Layer - reduce noise

Devices - switches & bridges

Error detection & correction

\downarrow

parity check

\downarrow

hamming code

~~Problem~~ Problem: Fast sender & slow receiver

Soln: Flow control mechanism

\downarrow

(stop & wait, Go back)

Receiver input from physical layer as Frame and sends as packet to network layer

Network Layer:

* If packets are to be transmitted over a long distance, Network Layer takes care of Quantitative & Qualitative parameters.

* More ^{hardware device} routers — more complexity in computation at each router — more space & time.

* IP addressing (48 bit touch to remember (MAC))

* ICMP - Internet Control Message Protocol
Administers the error

Transport Layer:

* communication will happen b/w devices in other layers. But here end-to-end connection.

* UDP - User Datagram Protocol

services - reliable - TCP

- unreliable - UDP

* Sockets = IP address + port address

Session Layer:

Interhost communication

establish, maintain, close dialog

Presentation:

* UNICODE, ASCII - Data representation

* It can compress the data from Application layer. Decompression from receiver side

* Then encrypts the data and sends to lower layers.

Session Layer + Presentation Layer + Application Layer = 1 device = computing node

Application Layer: SNMP - Network related application

* SMTP protocol }
POP3 protocol } \Rightarrow for Email application

* FTP protocol \Rightarrow File Host services

* needs to provide service and interface to Application Developer

11/02/2021

Network Interface: An active/intelligent device that interfaces or links the computer to the communication networks

Repeater: An active device that repeats (powering & reshaping) data signals for longer distances and has no logical function. *intelligent than hub*

Hub: A passive device that links the trunk cable to the spurs, making a physical star network.

Switch: An active/intelligent similar to the hub that routes or switches data to its destination.

Bridge: An active/intelligent device that links two networks of different characteristics such as speed, messages format etc.

Router: An active/intelligent device that links different networks and routes data around the network.

Gateway: An active/intelligent device that links one network to another with remote networks of different or dissimilar communications protocols.

Duties of Data Link Layer

Packetizing

Addressing

Error control

Flow control

Access control

Error Control:

Detection:

concept of redundancy

extra bits of detecting errors

Methods:

1) parity check:

even parity \rightarrow make no. of 1's to even @
(parity generator)

check the no. of 1's Even @
(parity checker)

EX-1

Error Detection and Correction

Demonstrate the following Error Detection techniques

a) single parity

b) 2-Dimensional parity

c) check sum

d) CRC

and following error correction technique

a) Hamming code.

1) AIM

2) Problem Analysis with eg

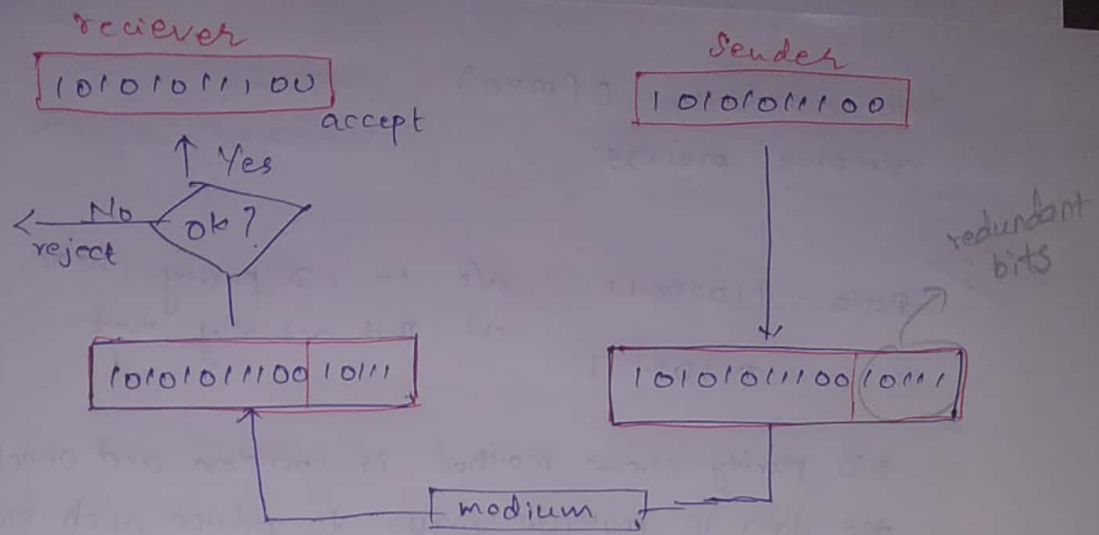
3) Flow chart

4) Implementation (code)

5) Test cases

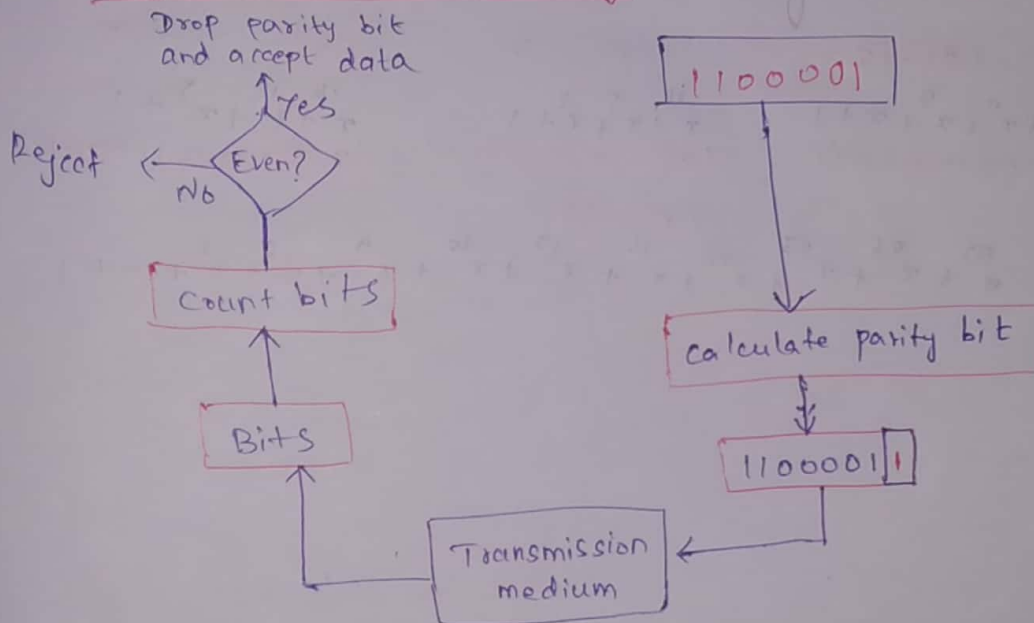
6) Result & Analysis
(output screenshot)

Redundancy



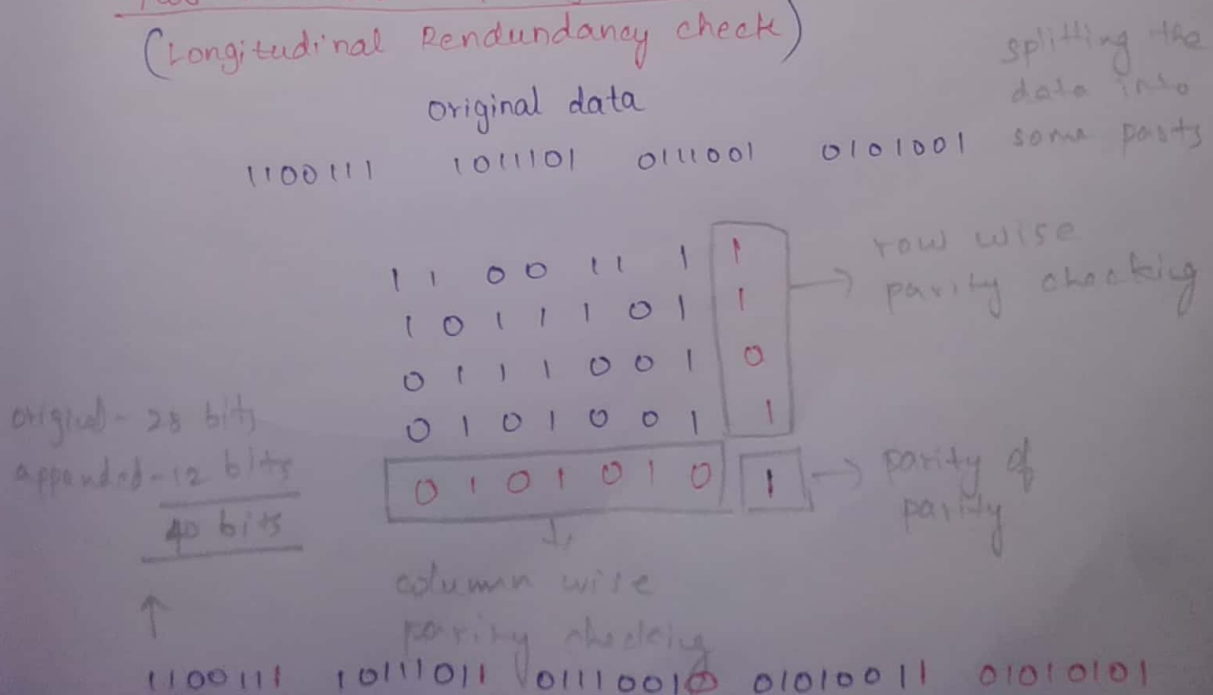
12/02/2021

Single - Dimensional parity (counting logic)



Two Dimensional parity check LRC (counting logic)

(Longitudinal Redundancy check)



~~Es~~

Data = 11000011

01100011

are to 1D parity checks, it is not. But actually not.

2D parity check method is complex and checks the data in multiple ways to reduce such errors.

CRC-12

$$x^{12} + x^{11} + x^9 + x + 1$$

CRC-16

$$\begin{array}{r} 16 \quad 15 \quad 2 \\ x + x + x + 1 \\ (10000000000000010) \end{array}$$

CRC - LTU - IT

$$x^{16} + x^{12} + x^5 + 1$$

1000000000100001

C12C-32

$$x^{32} + x^{26} + x^{23} + x^{22} + x^{16} + x^{13} + x^{10} + x^9 + x^6 + x^2 + x + 1$$