

# CS & IT ENGINEERING



## Computer Network

### Introduction

**Lecture No. - 05**



**By - Abhishek Sir**



# Recap of Previous Lecture



Topic

Network Layer

Topic

Data Link Layer





# Topics to be Covered



Topic

Physical Layer

Topic

Network Topology

Topic

Framing

# ABOUT ME



Hello, I'm **Abhishek**

- GATE CS AIR - 96
- M.Tech (CS) - IIT Kharagpur
- 12 years of GATE CS teaching experience

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## Topic : Physical Layer



=> Responsible for transmission of "bit"

→ Copper Cable

→ Fiber Cable

→ Wireless

=> Encoding / Signaling



## Topic : Physical Layer



- Physical Layer Networking Device : “Repeater and Hub”  
[Layer - 1 device]
- Hub : Multi-port Repeater





## Topic : Protocol Data Unit



Layer	PDU
Application	Message
Transport	Segment
Network	Datagram
Data Link	Frame
physical	bit



## Topic : Layer Services



Layer	Provide Services (to its upper layer)
Transport	Process-to-Process [end-to-end]
Network	Host-to-Host
Data Link	Node-to-Node





# Topic : Networking Devices



Layer-7  
Layer-3  
Layer-2  
Layer-1

Layer	Networking Device
Application	Gateway
Network	Router
Data Link	Switch or Bridge
Physical	Hub, Repeater

Routing between  
different type  
of networks  
→ Protocol Converter  
⇒ Routing between  
similar type of  
Networks



## Topic : Line Configuration

→ Attachment of communication devices to a link.

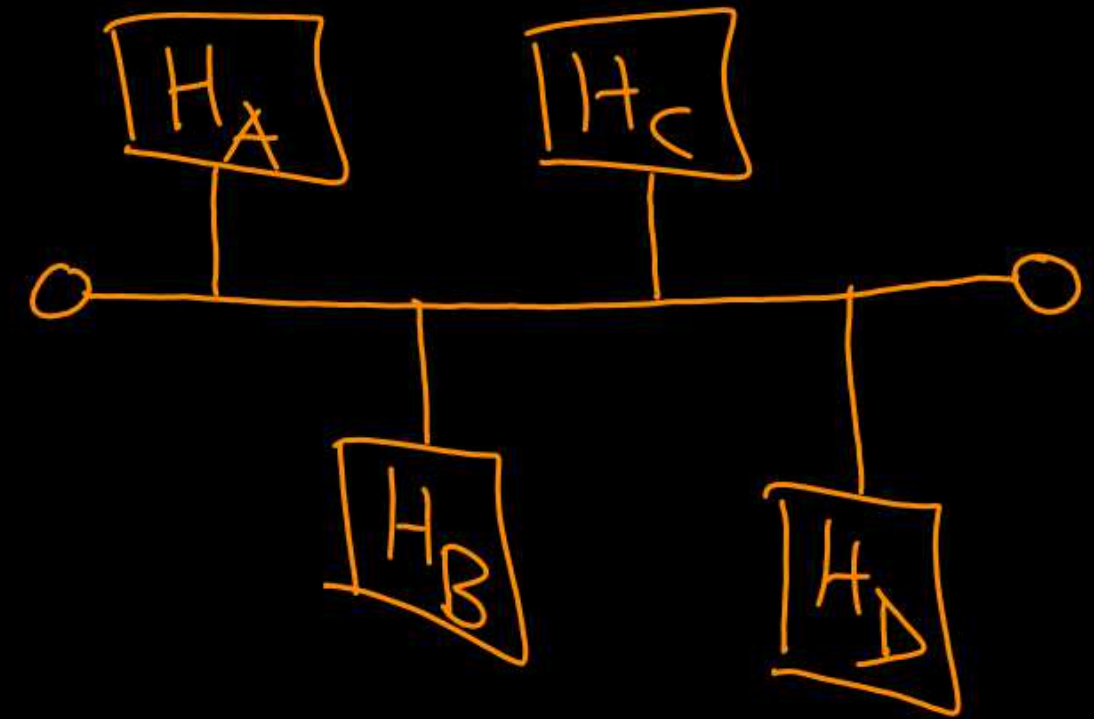
### 1. Point-to-Point

→ Dedicated link between two device  
[One sender and one receiver]



### 2. Multipoint (Multidrop)

→ More than two devices share a single link  
→ Broadcast medium  
[One sender and all are receiver]  
→ e.g. Bus topology







# Topic : Transmission Mode



→ Define the direction of signal flow between two linked devices.

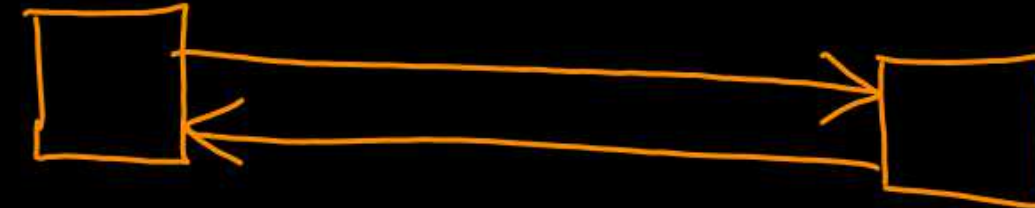
## 1. Simplex mode

→ One-way communication



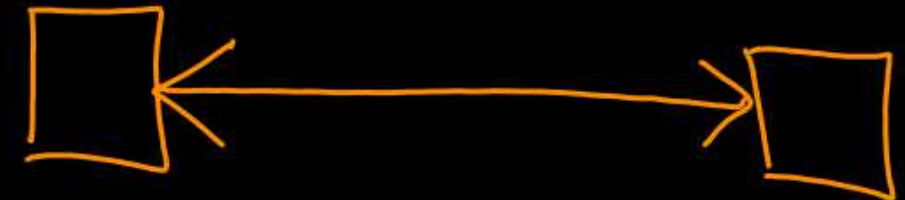
## 2. Half-Duplex mode

→ Either side communication at a time



## 3. Full-Duplex (Duplex) mode

→ Both side communication is possible at same time







## Topic : Network Topology



- Arrangement of hosts inside a network.
- Different types of topology are :
  1. Mesh
  2. Star
  3. Bus
  4. Ring



## Topic : Mesh Topology

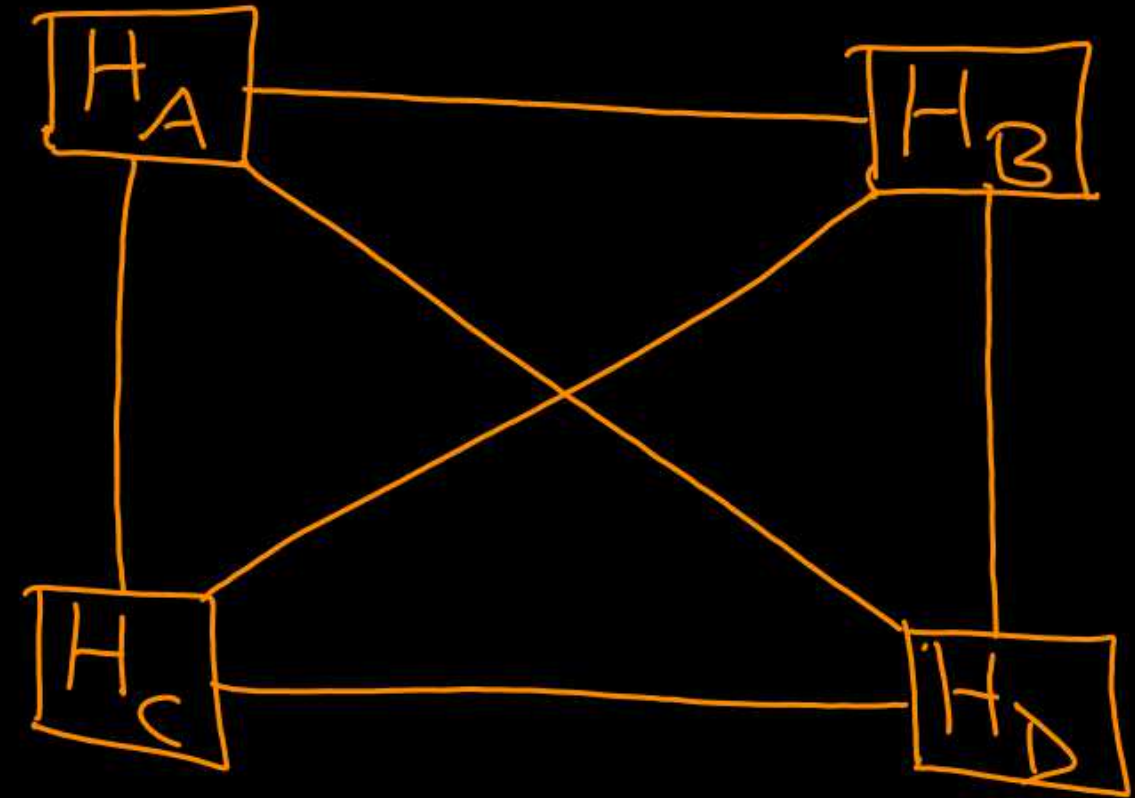


→ Every device has dedicated point-to-point link to every other device.

Total number of nodes =  $n$

Total number of links =  ${}^nC_2$

$$= \frac{n * (n - 1)}{2} = O(n^2)$$





## Topic : Mesh Topology



### Advantages :-

- Faster Communication

### Disadvantages :-

- Installation cost is very high  
[Preferable for small area network]
- Inefficient utilization of links
- $(n - 1)$  input-output (I/O) port per device





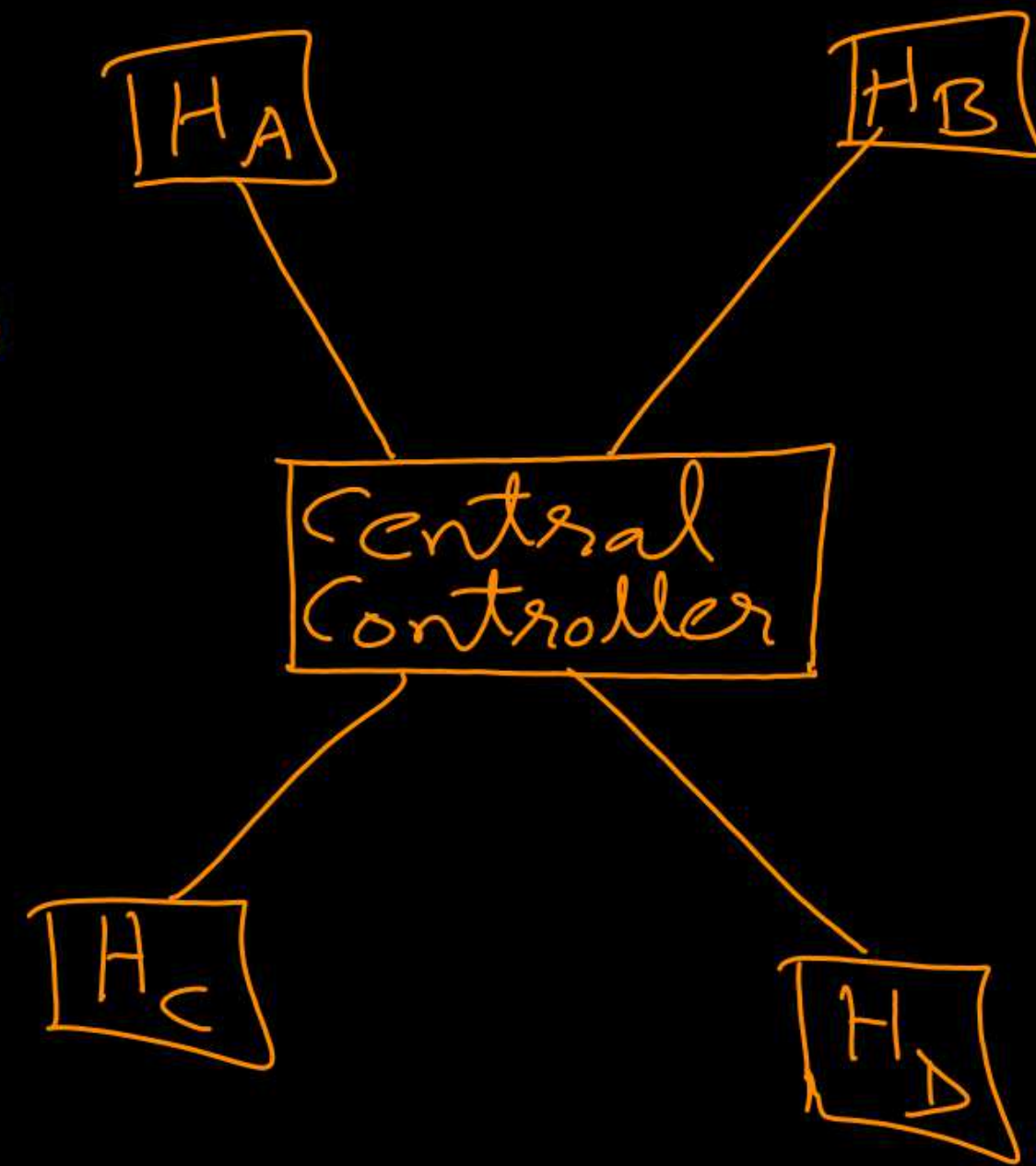
## Topic : Star Topology

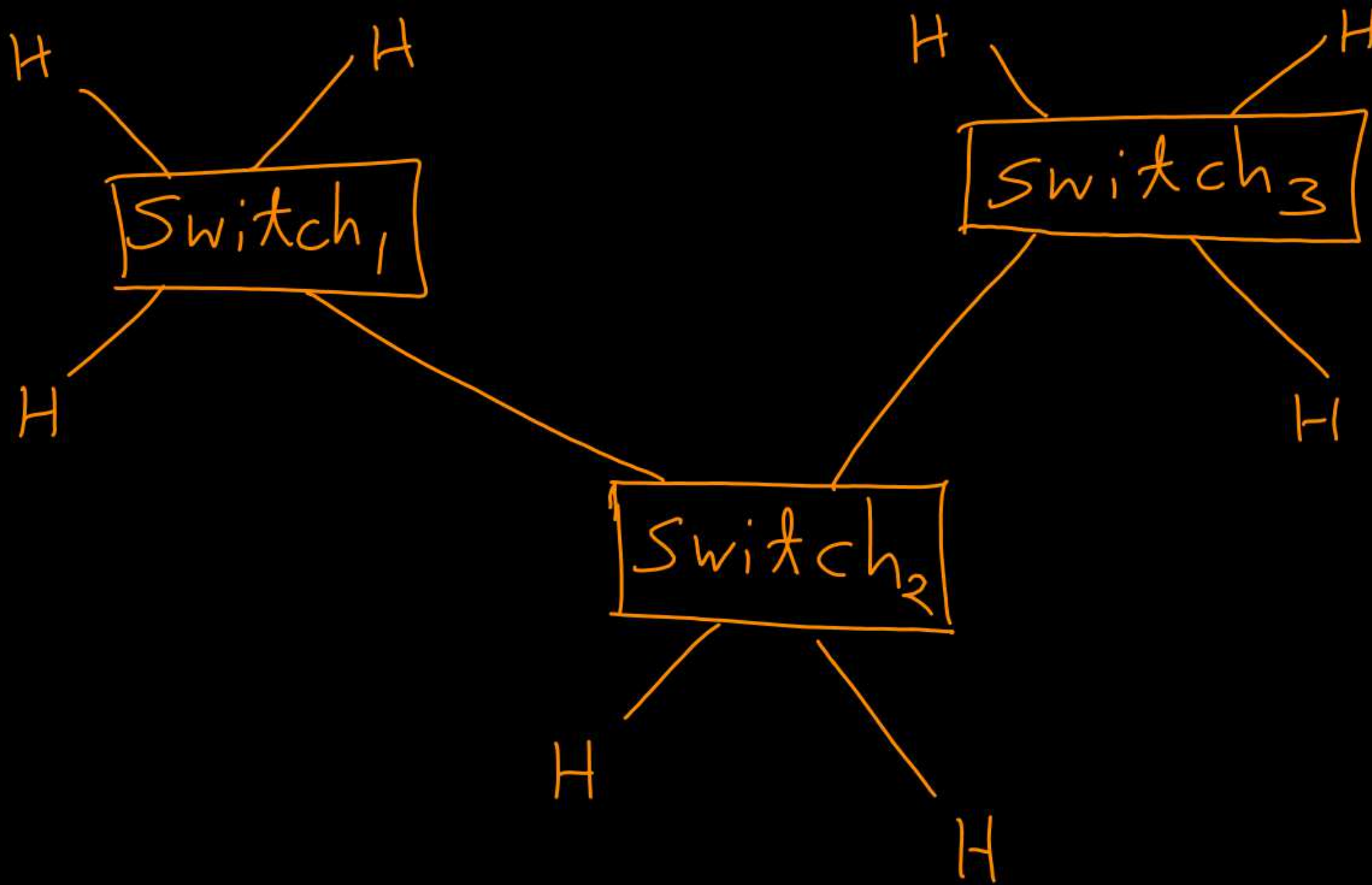
→ Every device has dedicated point-to-point link only to a central controller.

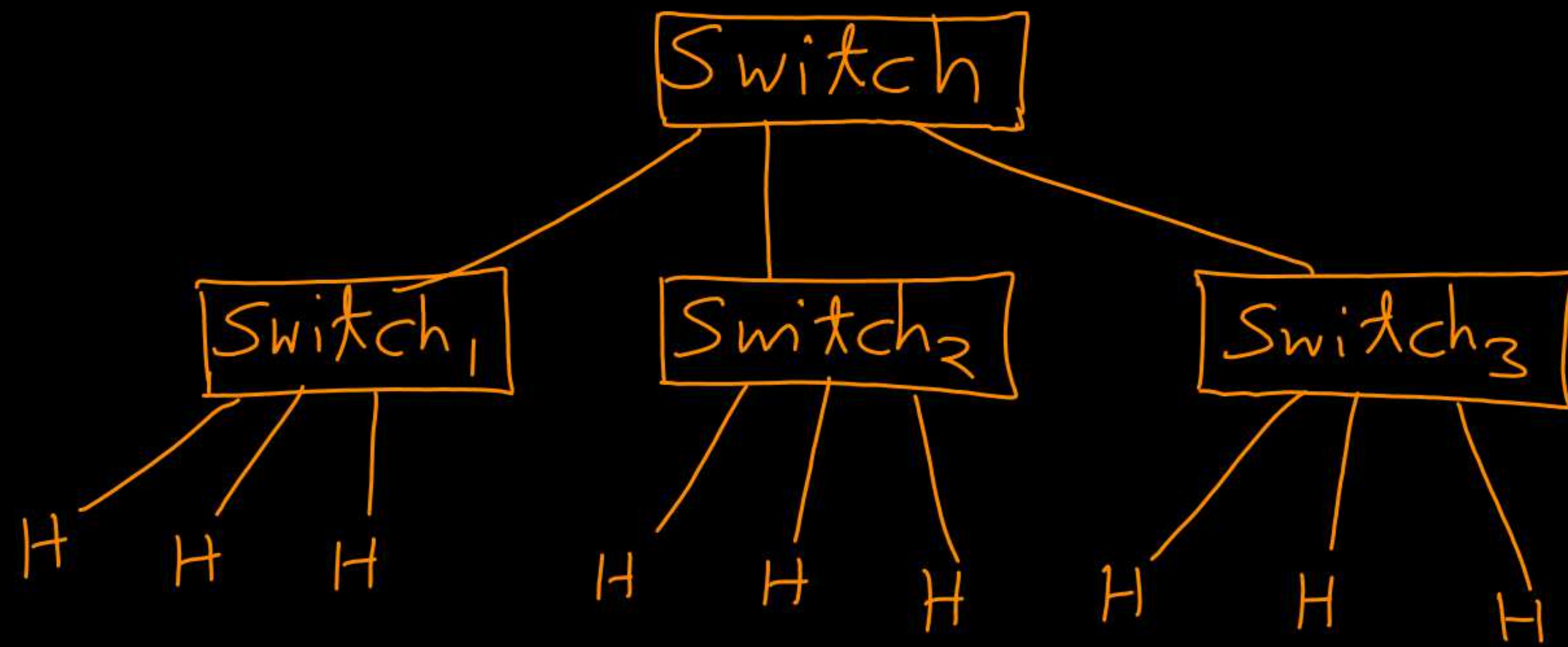
Total number of nodes =  $n$

Total number of links =  $n$

Central Controller : Hub, Switch or Router











## Topic : Star Topology



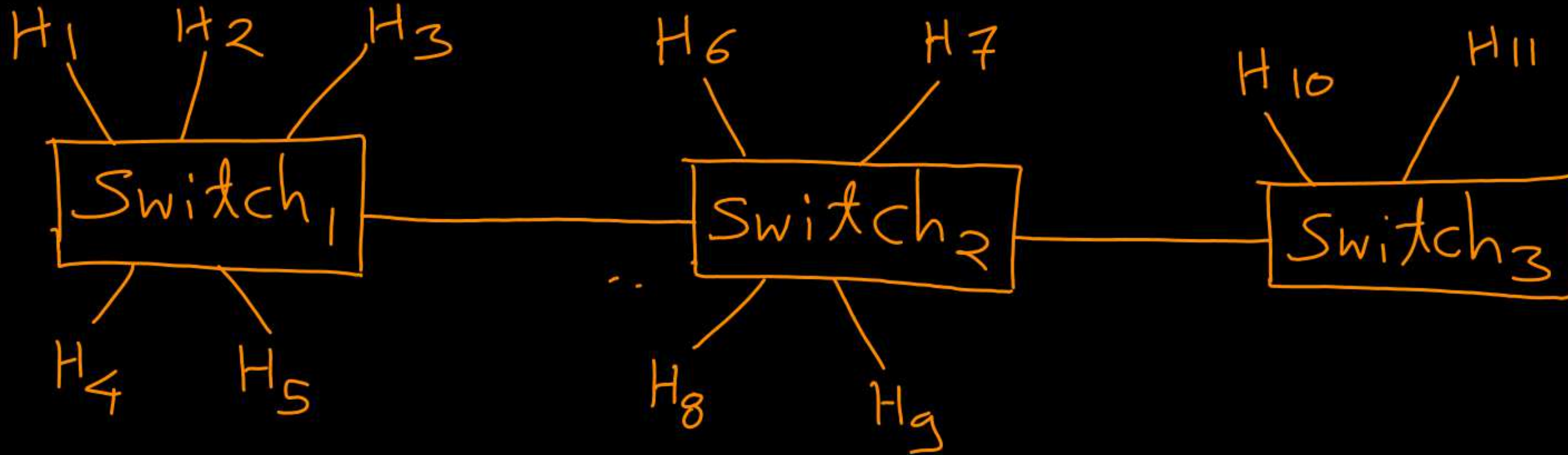
### Advantages :-

- Insertion / removal of devices are easy
- Easy to extend the topology

### Disadvantages :-

- If central controller fails  
then all communication stop

#Q. Consider that 11 machines need to be connected in a LAN using 6-port Ethernet switches. The minimum number of switches needed is \_\_\_\_.



Ans: 3

#Q. Consider that 15 machines need to be connected in a LAN using 8-port Ethernet switches. Assume that these switches do not have any separate uplink ports. The minimum number of switches needed is \_\_\_\_.

[GATE 2019]

IIT-M

H.W.





## Topic : Bus Topology



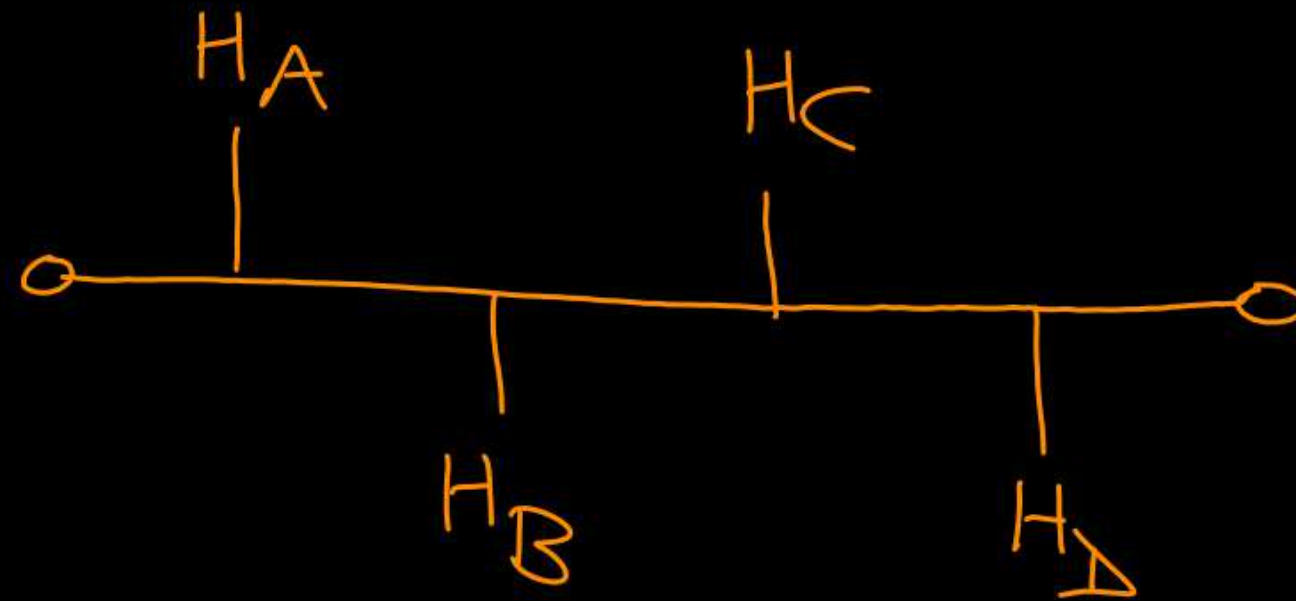
→ Every host connected to centralized backbone media (coaxial cable).

Total number of nodes = n

Total number of links = 1

→ Multipoint [Multidrop]

→ Access Control Method





## Topic : Bus Topology



### Advantages :-

- Installation cost is very low  
[Preferable for long area network]

### Disadvantages :-

- If backbone media fails  
then all communication stop



## Topic : Ring Topology



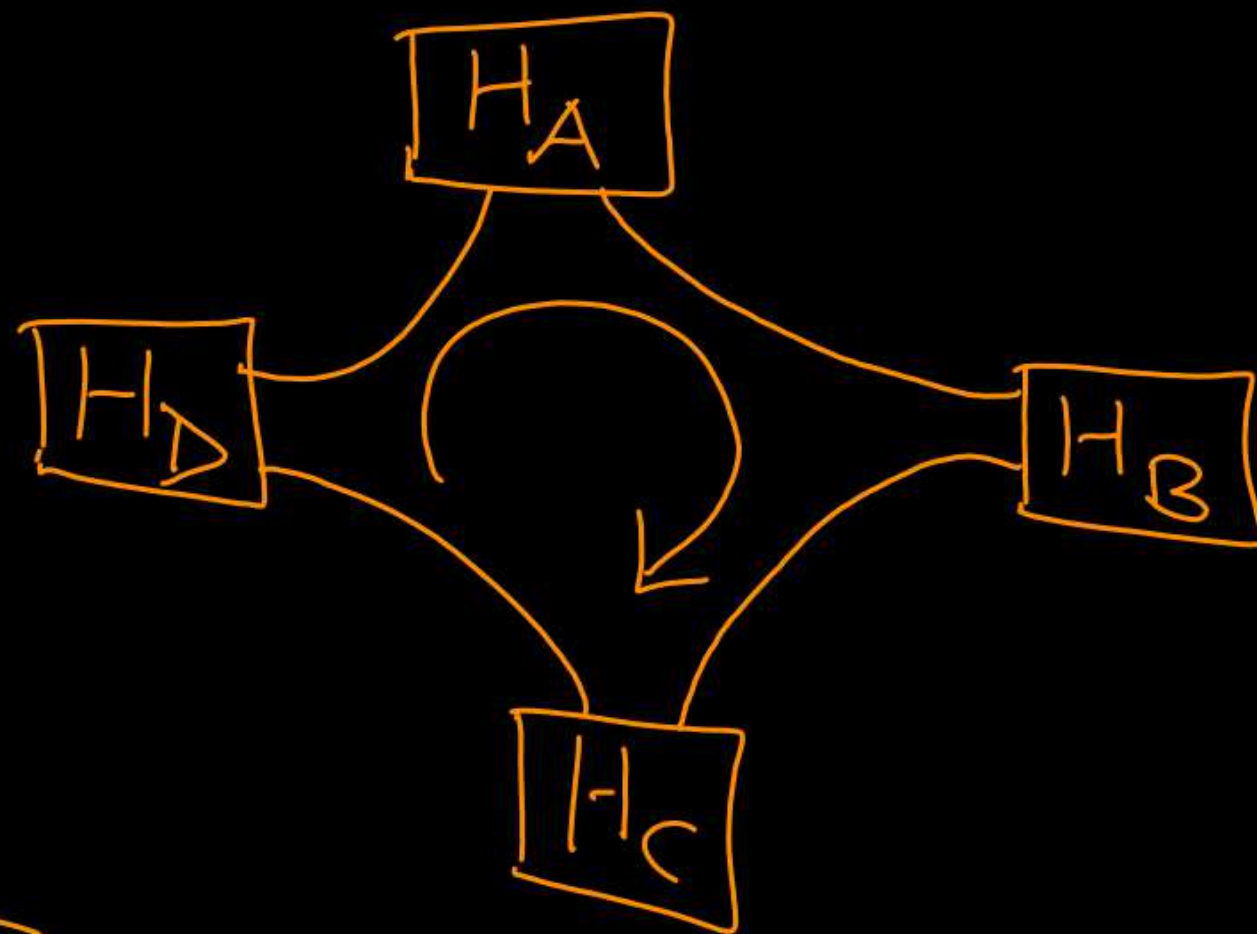
→ Every host connected to two adjacent hosts using point-to-point link in cyclic fashion.

Total number of nodes = n

Total number of links = n

→ Simplex Communication

→ Access Control Method







## Topic : Framing



Problem : How receiver identify frame boundaries while receiving multiples frames?

[Variable length frames and transmitted without time-gap]



## Topic : Framing





## Topic : Framing



**Problem :** How receiver identify **frame boundaries** while receiving **multiples frames**?

[Variable length frames and transmitted without time-gap]

### Solution :

1. Byte (Character) Count
2. Byte (Character) Stuffing
3. Bit Stuffing ✓ [2004, 2014]





## 2 mins Summary



Topic

Physical Layer

Topic

Network Topology

Topic

Framing



**THANK - YOU**