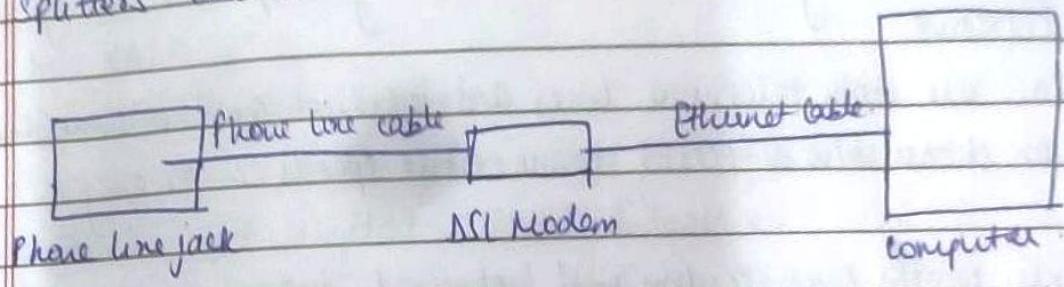


### DSL (Digital Subscriber Line)

- Communication medium used to transfer high speed internet over standard copper wire telecommunication line.
- Offers best cost and connectivity services over other internet access types like broadband.
- Data transfer and telephone conversation can be done simultaneously.
- Voice signal is transmitted using low frequencies.
- Digital signals are transmitted through high frequencies.
- To make sure that phone calls are not interrupted, DSL filters or splitters are used.



### Types of DSL:

- ① SDSL → Symmetric DSL. Provides equal bandwidth for both uploading and downloading. Preferred by small organizations.
- ② ADSL → Asymmetric DSL. Most users download more data than they upload. 20Mbps for downloading & 1.5Mbps for uploading.
- ③ HDSL → High bit Rate DSL. Used within a corporate site and between the telephone company and its customers. It is a symmetrical line, offers equal bandwidth in both directions.
- ④ RADSL → Rate Adaptive DSL. The modem is capable of adjusting bandwidth and operating speed to maximize the data transfer. Supports both symmetrical & asymmetrical applications.
- ⑤ VDSL → Very High Data Rate DSL. A developing DSL technology. Offers more reliable internet experience than basic broadband. Offers much higher data transfer rate.

### Features:

- Widely available.
- less costly.
- Offers more security.
- Reliable.
- Offers less speed than broadband service.
- Provides a limited range.

### Benefits:

- No additional wiring: makes use of existing telephone wiring.
  - Cost-effective.
  - Users can use both telephone lines and internet at the same time.
  - Users can choose b/w different connection speeds & pricing.
- 
- DSL only works over a limited physical distance.
  - The connection is faster for receiving data over the internet than it is for sending data.

## Q2 Computer Cables:

- also known as a cord, plug or connector.
- transmits power / data b/w devices.
- Usually covered in plastic by one or more wires.
- 2 primary types of computer cables:

(a) Power Cable: A cable that powers the device is known as power cable. Eg. Molex-style cable and power cord.

(b) Data Cable: The cable that creates communication b/w devices. Eg: HDMI.

Used to attach to computer monitor and enable it to display an image or picture.

## \* Types of Computer Cables:

### → HDMI Cable:

- ① Transmits audio and video signals with the original quality of images.
- ② Stands for High Definition Multimedia Interface
- ③ Can send crystal clear images.
- ④ Used to connect electronic devices.
- ⑤ Ability to transmit audio and video signals in one go.

### → DVI cable:

- ① Video display Interface
- ② Used to connect video cards and LCD monitor.
- ③ Stands for Digital Visual Interface.
- ④ Users can see pictures of high quality without any disturbance.
- ⑤ Able to transmit video content at high resolutions.

### → VGA cable:

- ① Stands for Video Graphics Array / Video Graphics Adapter.
- ② Used to link monitor and CPU to transfer video signals.
- ③ HD televisions use VGA cable.
- ④ 256 colors are shown if resolution is lowered to 320x200.
- ⑤ Offers 640 x 480 resolution color display screens.

### → Ethernet cable:

- ① Generally used for a wired network.
- ② Quality of connection is described by length and durability of the ethernet cable.
- ③ Can be used to connect devices such as PCs, routers, switches, etc. within a LAN.
- ④ Quality will not be the best if the cable is not durable & too long.

⑤ It contains eight wires

→ PS/2 Cable:

- ① Standard cable contains a round connector and a total of 6 pins.
- ② It is used to attach mouse and keyboard to the computer system.
- ③ It stands for Personal systems / 2.

→ 5mm Audio Cable:

- ① Used to connect earphones & headphones to the system.
- ② Also used for connecting portable CD player to any multimedia speaker.

→ USB cables:

- ① Popular standard cable that enables a computer to interact with peripheral and other devices.
- ② Stands for Universal Serial Bus.
- ③ Various devices can be connected through USB cable such as keyboards and mice, music players, flash drives, etc.
- ④ USB ports are present on the computer system.

→ MIDI:

- ① Simple procedure to connect two different musical components of different brands.
- ② Stands for Musical Instrument Digital Interface.
- ③ Provides more control over the other equipment as it does not transfer the audio signal and transfers the messages in the form of data.

→ Molex:

- ① Power cable used inside the computer.
- ② ~~Molex~~ Molex is the name of the company that develops computers and

other related equipment.

- ⑤ Also referred to as a 4-pin connector or Molex power connector.

→ SATA:

- ① Also known as Serial ATA.
- ② Interface used with hard drives.
- ③ Provides a small, thin cable solution that transfer rates start at 150 Mbps.

→ SCSI:

- ① Pronounced as "Scuzzy". It stands for Small Computer Systems Interface.
- ② Has a potential to support ~~to~~ eight or sixteen devices.
- ③ Designed to connect devices to a computer.
- ④ SCSI connector is either internal or external.

→ Thunderbolt:

- ① Used to connect peripheral devices with computer.
- ② Primarily used with Apple displays and devices.
- ③ Developed by Apple and Intel.

\* Advantages of Computer Cables:

- ① To connect several devices to computer.
- ② for performing different operations.
- ③ Used to transmit the digital and analog signals.
- ④ Some cables have the ability to transmit electric power.
- ⑤ Other tasks include listening to music, watching movies, playing games, etc.

### \* DSL

- ① Uses telephone lines.
- ② Slowest option
- ③ Less bandwidth.
- ④ Great option for people in rural areas.
- ⑤ Better if you only check your mail once in a while

### Cable

- ① Transmits data over copper TV lines.
- ② Works faster.
- ③ Carries more bandwidth.
- ④ Great option for people who want to choose satellite internet.
- ⑤ Ideal if you stream on multiple devices, download large files, etc.

### \* Cable

- ① less bandwidth as compared to fiber.
- ② Speed slows down during peak use times.
- ③ Average speed of 10 to 500 Mbps.

### Fiber

- ① Higher bandwidth than a cable.
- ② Offers speed upto 1Gbps.
- ③ Great for competitive online games.

### \* DSL

- ① DSL is old.
- ② More coverage than fiber.
- ③ Usually runs over pre-existing lines.

### Fiber

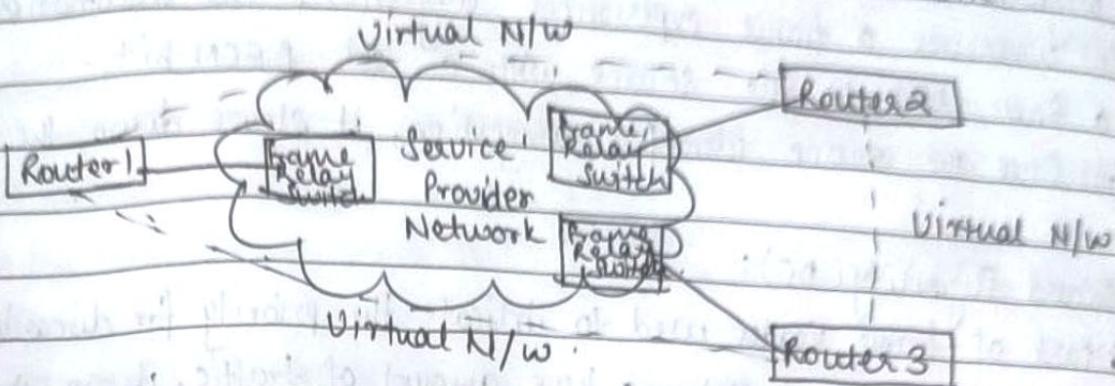
- ① Fiber is New.
- ② Less coverage than DSL.
- ③ Fiber requires professional installation services.

### \* Frame Relay:

- ① Packet Switching network protocol.
- ② Designed to work at data link layer.
- ③ Used to connect LANs and transfer data across WAN.
- ④ Alternative for a point-to-point network for connecting multiple nodes.

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- ④ Dynamic Bandwidth Allocation
- ⑤ Provides Congestion Control Mechanism.
- ⑥ Does not have error and flow control mechanism.



### Frame Relay Network

Working:

- ① Frame relay switches set up virtual circuits to connect multiple LANs to build a WAN (Wide Area Network).
  - ② Frame relay transfers data over LAN by dividing it in packets.
  - ③ It supports communication with multiple LANs.
  - ④ Routers and service provider N/Ws connect all the LAN N/Ws.
  - ⑤ Frame relay switch is responsible for providing services.
  - ⑥ For data transmission, LAN sends the data packet over access link.
  - ⑦ The packet sent is then examined by a frame relay switch.
  - ⑧ Frame Relay Switch has information about the addresses of LANs connected to the network.
- \* Frame relay also deals with congestion within a network. Following methods are used to identify the congestion:

- ① Forward Explicit Congestion N/W (FECN) - (i) a part of frame header.  
(ii) used to notify destination.  
(iii) whenever a frame experiences congestion, the frame relay switch sets the FECN bit that allows destination to identify that packet has experienced congestion.

## ② Backward Explicit Congestion Notification (BECN):

- (i) Part of frame header that is used to notify the source about congestion in the network.
- (ii) Whenever a frame experiences congestion, the destination sends a frame back to the source with a set BECN bit.
- (iii) Once the source identifies congestion, it slows down the transmission.

## ③ Discard Eligibility (DE):

- (i) Part of frame header used to indicate the priority for discarding packets.
- (ii) If the source is generating a huge amount of traffic, it can set DE bits to prioritize less significant packets.
- (iii) Packets with set DE bits are discarded before the packets with unset DE bits in case of congestion.

### \* Type:

#### ① Permanent Virtual Circuit (PVC):

- Permanent connection b/w frame relay nodes that exist for long duration.
- Always available for communication even when not in use.
- Static connections. They do not change with time.

#### ② Switched Virtual Circuit (SVC):

- Temporary connection b/w frame relay nodes.
- Exists only for the duration for which nodes are communicating with each other.
- Closed / discarded after communication.
- Connections are dynamically established as per requirements.

### \* Advantages →

① High Speed  
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AI DUAL CAMERA ② Scalable

③ Reduced Network Congestion

④ Cost-efficient

⑤ Secured Connection

- \* Disadvantages:
  - ① Lacks error control mechanism.
  - ② Delay in packet transfer.
  - ③ Less Reliable.

### \* ATM : Automated Teller Machine.

- facilitates easy transactions without involving a bank employee.
- Reduction in bank workload.
- for transactions using an ATM, it is necessary to have a Credit/Debit card.
- Successful transactions can be made without filling slips, forms and without standing in long queues.
- An ATM charges fees for cash withdrawal. This fee is charged by the bank, the ATM operator, or both.
- To avoid cash withdrawal fees, one should use the ATM of same bank in which they hold their account.

### \* How to use :

- ① After visiting the ATM, insert the card in the card slot.
- ② Select the options from the display.
- ③ Select the function to be performed. (deposit, balance enquiry, transfer, etc)
- ④ Select the account type.
- ⑤ Type the amount & provide ATM pin.
- ⑥ Collect your cash from cash slot and receipt from the printer.

### \* -ATM cards:

- Help the user to access their accounts through ATM.
- Contains the customer account information in the form of magnetic strip.
- An identification code is encrypted in the magnetic strip & contains all the account details of the customer.
- ATM cards are available in different forms: VISA, MasterCard,

\* functions of ATM :

- ① Cash withdrawal
- ② Cash deposit
- ③ Cash transfer
- ④ Balance inquiry

\* Types of ATMs : (a) Complex : Responsible for multiple functions like displaying account info. & providing transaction history & cash deposit.  
(b) Basic : facilitating cash withdrawal along with an available balance statement.

Other types of ATMs are :

- Brown label ATM : Service provider of ATM over lease of the machine.
- Cash Dispenser : ATM that only dispense cash & are used for balance inquiry & mini statement.
- Green label : facilitates agricultural transactions.
- Mobile ATM : moves from one place to another providing service to customers.
- Off-site ATM : Machines are installed outside bank premises.
- On-site ATM : Machines are installed within bank premises.
- Orange label : facilitates share transactions.
- Pink label : specially made for women.
- Work site : Machines in bank premises but only bank employees can withdraw.
- Yellow label : Used for online shopping.

# Design of ATM : ① Screen : To display.

- ② Keypad : To type.
- ③ Card Reader : Intercepts the account information.
- ④ Cash dispenser : Slot that provides cash to the customers.
- ⑤ Printer : Used to print receipts.

### \* Advantages of ATM:

- ① Convenience: Way more convenient than standing in long queues.
- ② Not time bound: Unlike banks, ATMs provide service 24x7 hours a week.
- ③ Faster transactions: ATM transactions are faster as compared to bank transactions.
- ④ Easy Accessibility: Accessible in any area.
- ⑤ Minimize bank workload: Bank employees can manage people efficiently.
- ⑥ Minimize transaction cost: ATM usage has reduced overall cost of transactions.

### \* Disadvantages of ATM:

- ① Cash withdrawal limit: Restrictions on daily cash withdrawal.
- ② Transaction charges: Fees is charged for various bank transactions.
- ③ Increased frauds: Online transactions and ATMs ~~are~~ transactions are more susceptible to fraud.
- ④ Non-reachable in Remote areas: Due to lack of proper structure and maintenance.

### \* Point to Point Protocol (PPP)

- ① It can share multiple types of packets along with IP packets.
- ② Usually provides framing methods to describe frames.
- ③ It can support the responsibility and management of IP addresses.

### \* PPP Components:

- Encapsulating Diagrams: Encapsulates diagrams over point-to-point connection.  
PPP frame adds protocol field to primary HDLC frame to identify the type of packet transferred/transported.

- Implementing LCP: Extensible Link - Control Protocol can start, generate and test data - link connections.
- Implementing NCP: Network connection protocol.

\* PPP frame:

1 byte	1 byte	1 byte	2 bytes	Variable 2 or 4 bytes
Flag	Address	Control	Protocol	Data / Pcs

- Flag → Indicates starting / ending of a frame.
- Address → Includes the binary sequence.
- Control → Contains the binary sequence which calls for user data communication.
- Protocol → Identify the protocol encapsulated in frames data field.
- Data → Containing the datagram of protocol.
- FCS (Frame check Sequence) → for error detection.

\* HDLC (High - level Data link Control):

- ① Each and every frame begins and ends with flag sequence field (A).
- ② Six fields.
- ③ Ending flag field of one frame can serve as beginning flag field of next frame.

Flag	Address	Control	Information	Parity	Flag
8 bits	8 bits	8 bits	variable 16 bits	16 or 32 bits	8 bits

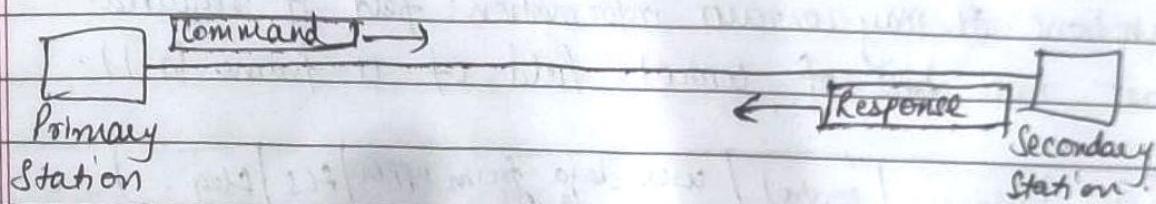
- Group of communication protocols of Data link layer for transmitting data b/w network points or nodes.

- Data is organized into frames.
- frame is transmitted via network to the destination that verifies its successful arrival.
- It is bit-oriented protocol.
- available for both point-to-point and multipoint communications.

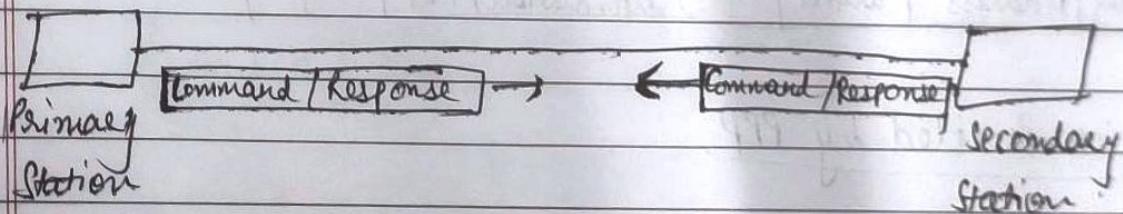
### \* Transfer Modes:

- ① Normal Response Mode: 2 types of stations.

Primary station that sends commands and secondary that can respond to received commands. Used for both point-to-point & multipoint communications.



- ② Asynchronous Balanced Mode (ABM): Each station can both send commands and respond to commands. For only point-to-point communication.



### \* HDLC frame:

- ① Flag → Marks the beginning and end of the frame.
- ② Address → Contains the address of receiver.
- ③ Control → Contains flow & error control information.
- ④ Payload → Carries data from N/W layer.
- ⑤ FCS → frame check sequence for error detection.

\* Types of HDLC frames: Type of frame is determined by the control field.

① I-frame: Information frames carry user data from N/W layer. Include flow & error control information.  
The first bit of control field of I-frame is 0.

② S-frame: Supervisory frames do not contain information field. Used for flow and error control when piggybacking is not required. First two bits of control field of S-frame is 10.

③ U-frame: Un-numbered frame are used for miscellaneous functions. It may contain information field if required. First two bits of control field of U-frame is 11.

I-frame [Flag | Address | control] | user data from upper layers | Fcs | Flag - ]

S-frame [Flag | Address | control | Fcs | Flag - ]

U-frame [Flag | Address | control | Management information | Fcs | Flag - ]

\* Services Provided by PPP

- ① It defines format of frames through which transmission occurs.
- ② It defines the link establishment process.
- ③ It defines data exchange process.
- ④ It provides encapsulation.
- ⑤ It defines authentication process b/w 2 devices. How the password will be exchanged b/w two devices.

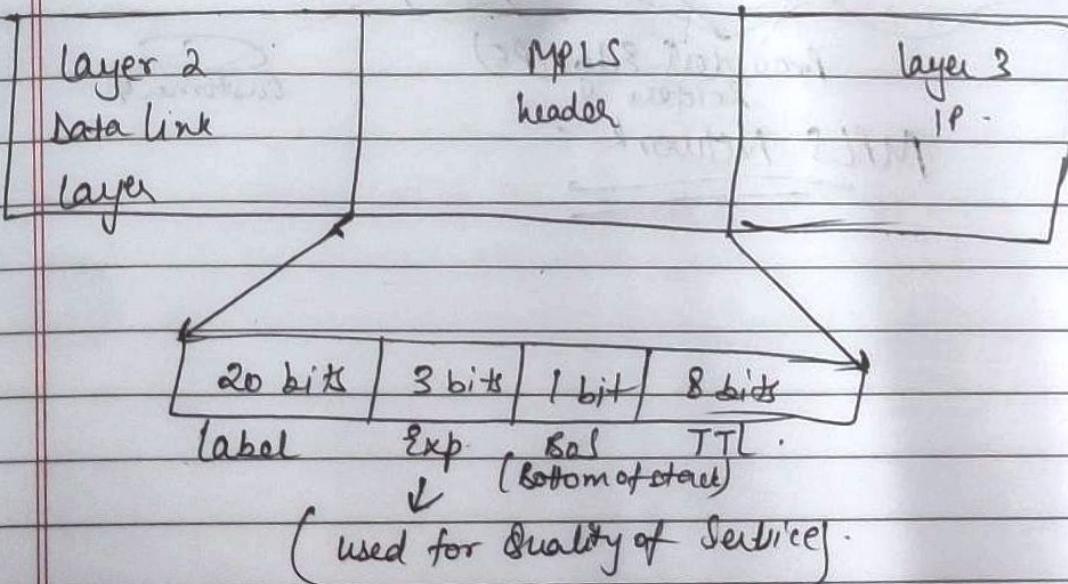
(PPP → byte oriented)

\* Services Not Provided by PPP:

- ① Does not support flow control mech.
- ② Very simple error control mech.
- ③ Lacks addressing mech. to handle frames in multipoint configuration.

\* Multi Protocol Label Switching (MPLS)

- ① IP packet Routing technique that routes IP packets via labels instead of looking at complex routing tables.
- ② This feature helps in increasing delivery rate of IP packets.
- ③ MPLS uses router as a forwarding device.
- ④ MPLS header is added to packet that lies b/w layer 2 and 3. Hence it is also considered to be layer 2.5 protocol.



- **BOS → Bottom of stack**: If there is only one label remained in MPLS header, then its value will otherwise 0.
- **Time to live (TTL)**: Value is decreased by one at each hop.
- **Push, Pop and Swap**: Action of addition, removal and swapping of labels.

