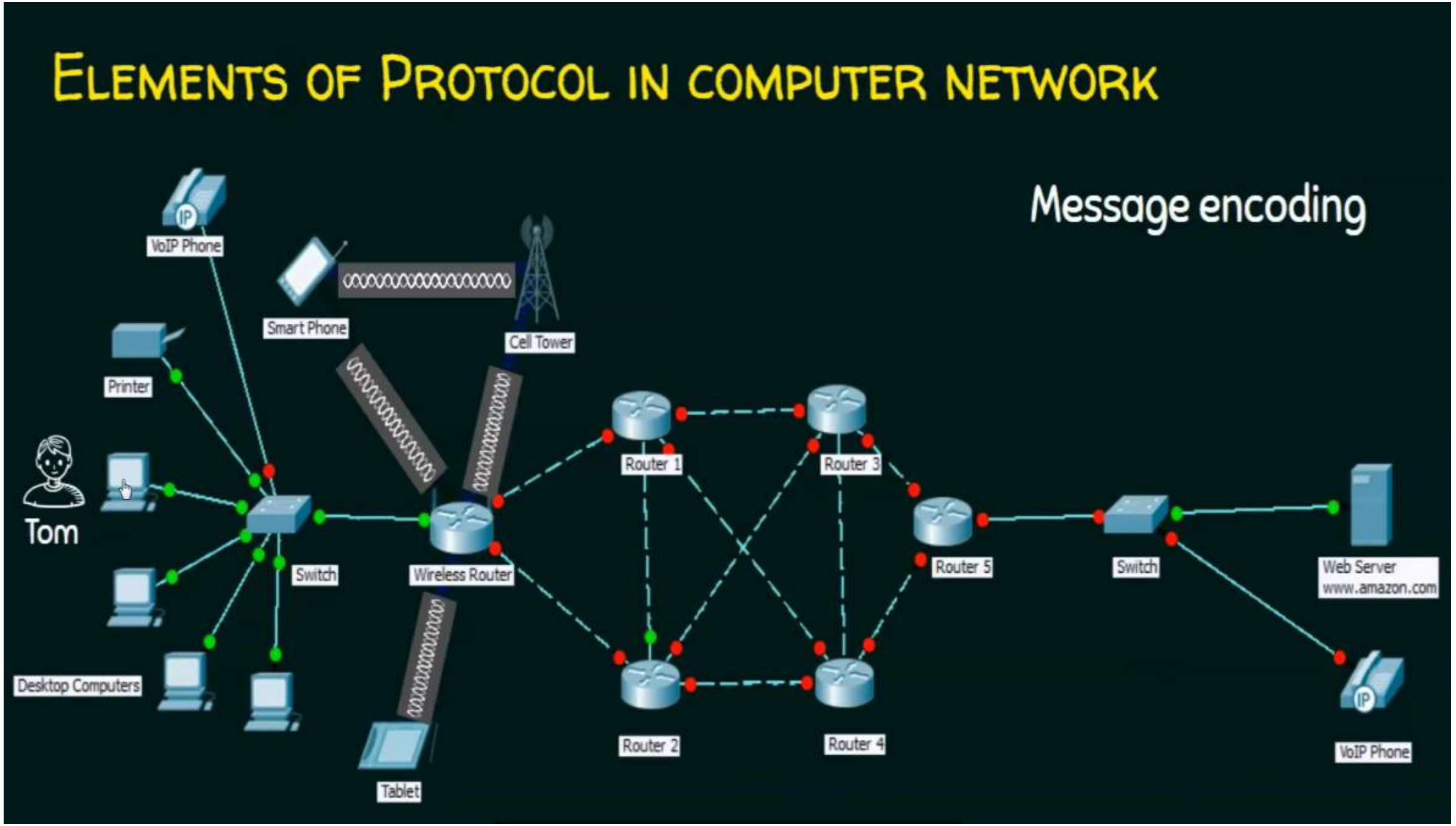
Elements of a Protocol

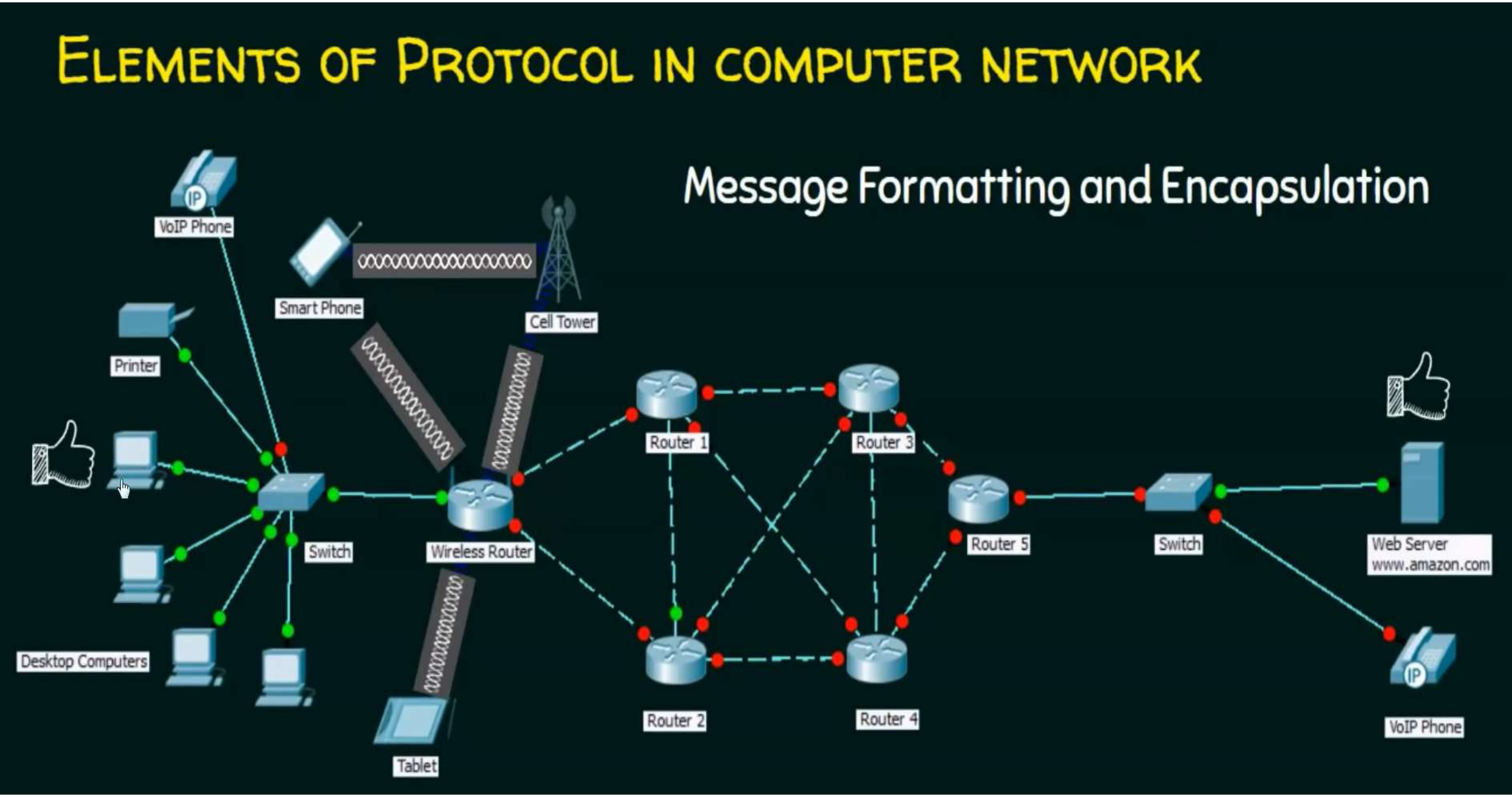
1. Message encoding
2. Message formatting and encapsulation
3. Message timing
4. Message size
5. Message delivery options

1. Message Encoding

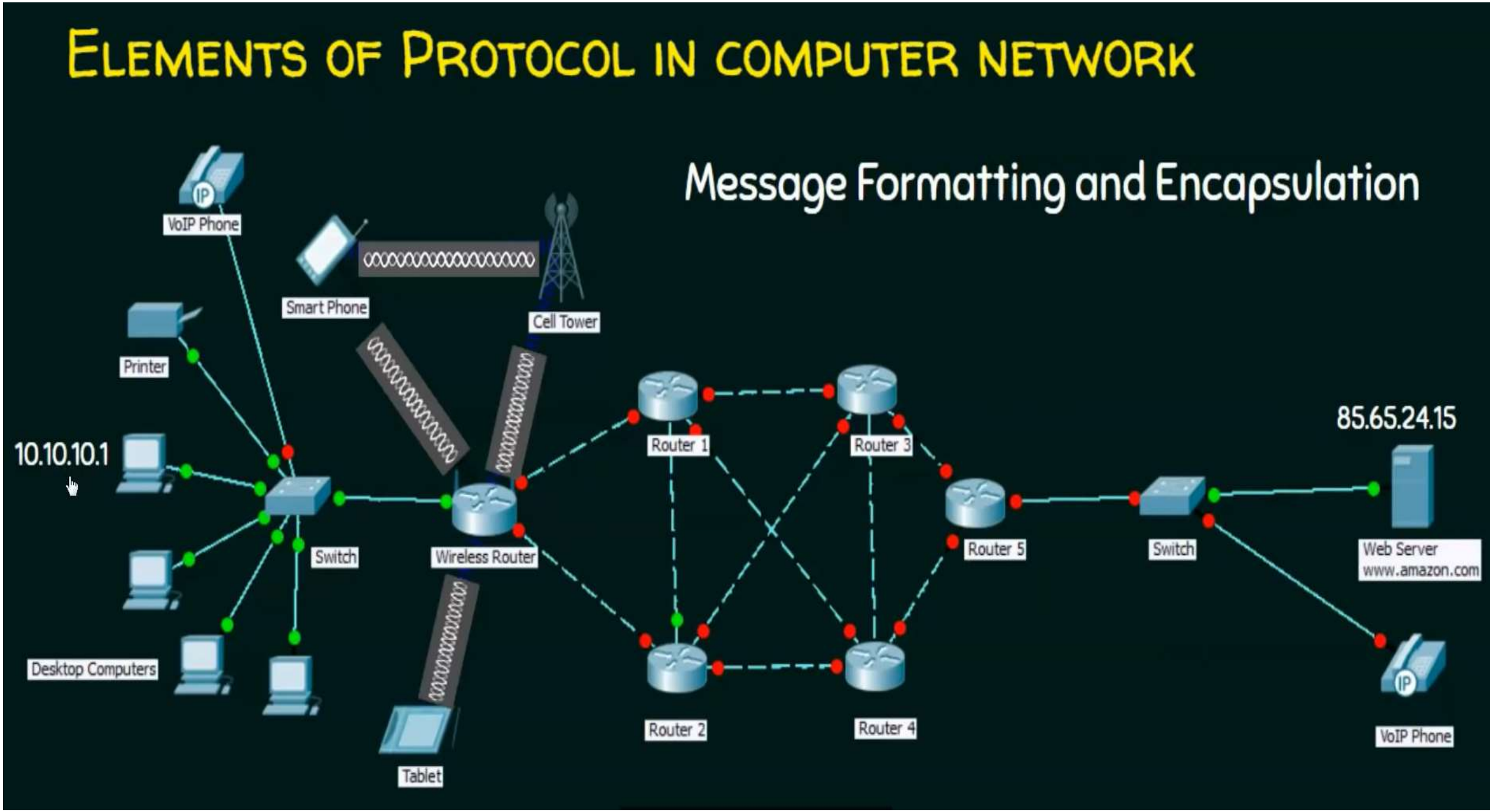
Elements of Protocol in computer network



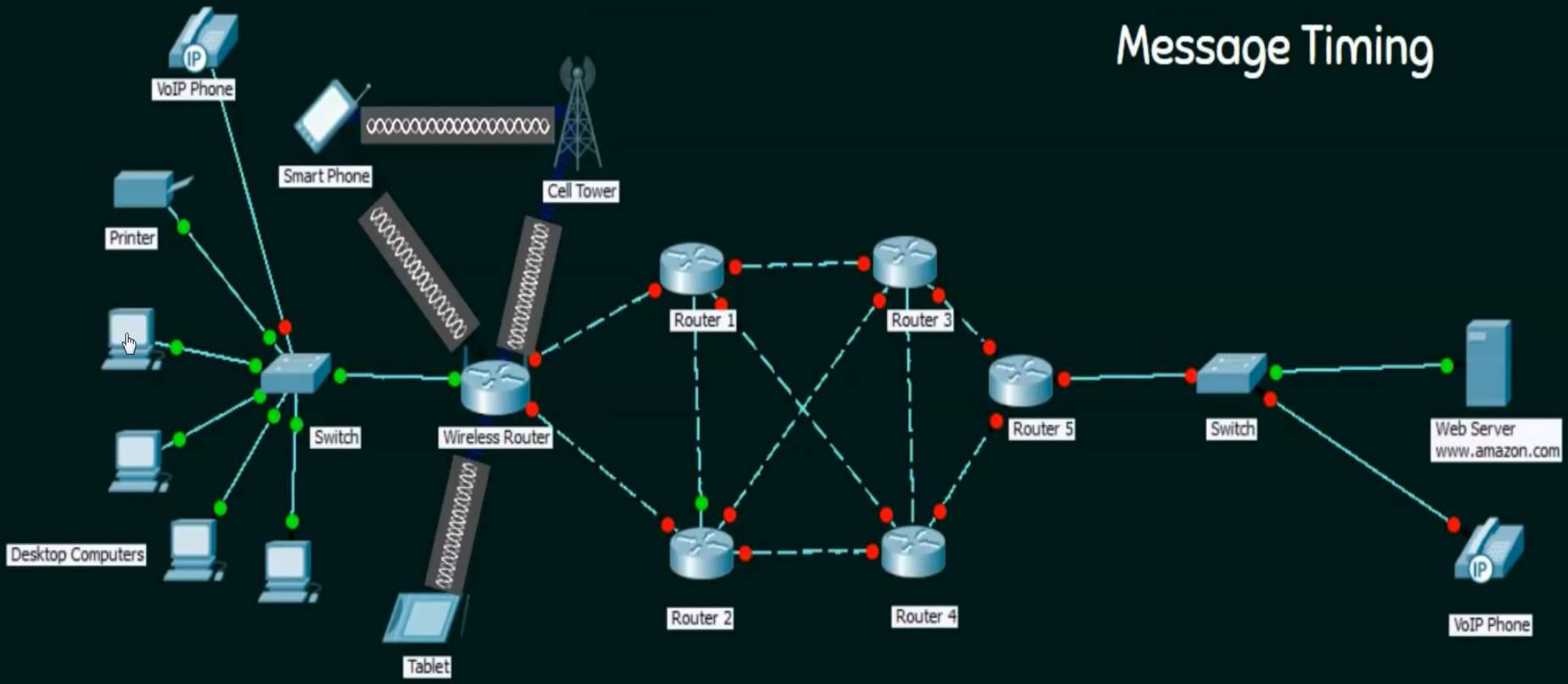
Elements of Protocol in computer network



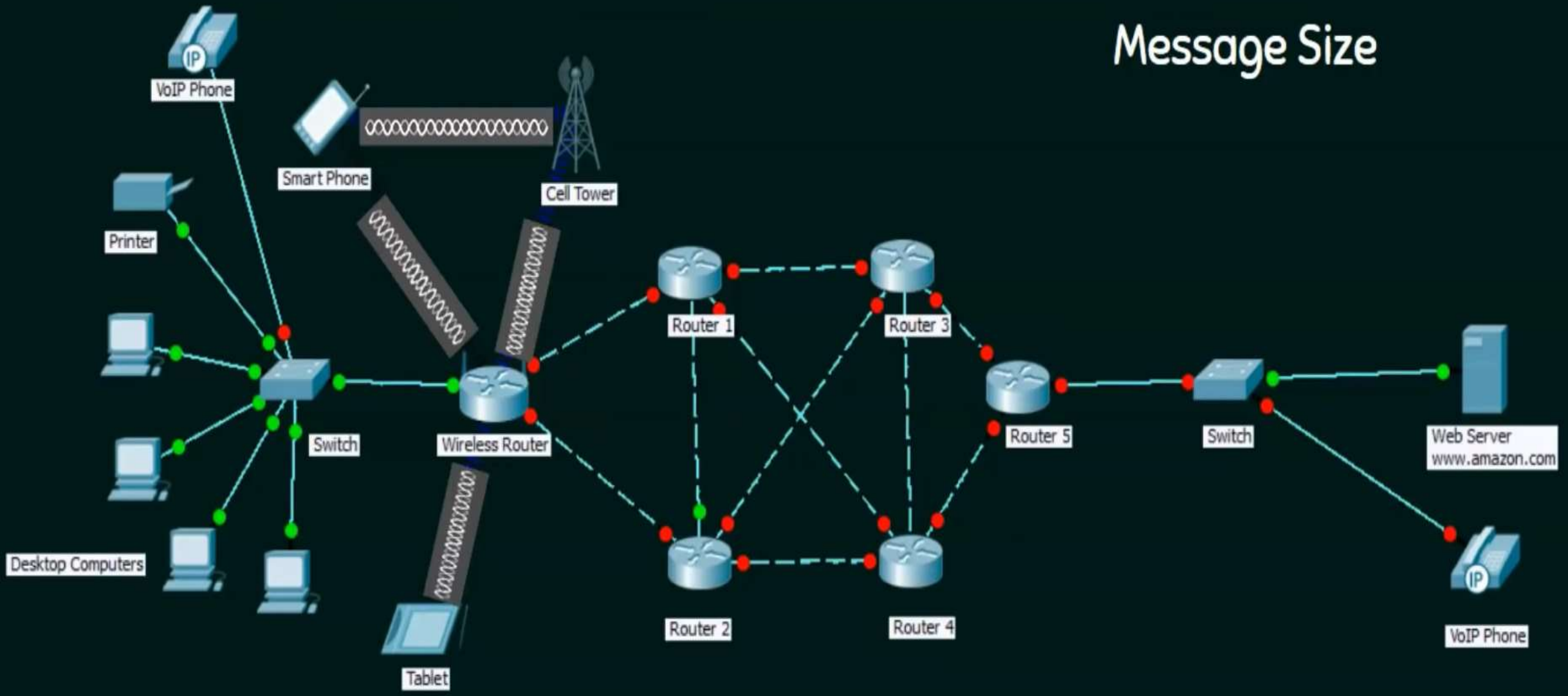
Elements of Protocol in computer network



Elements of Protocol in computer network

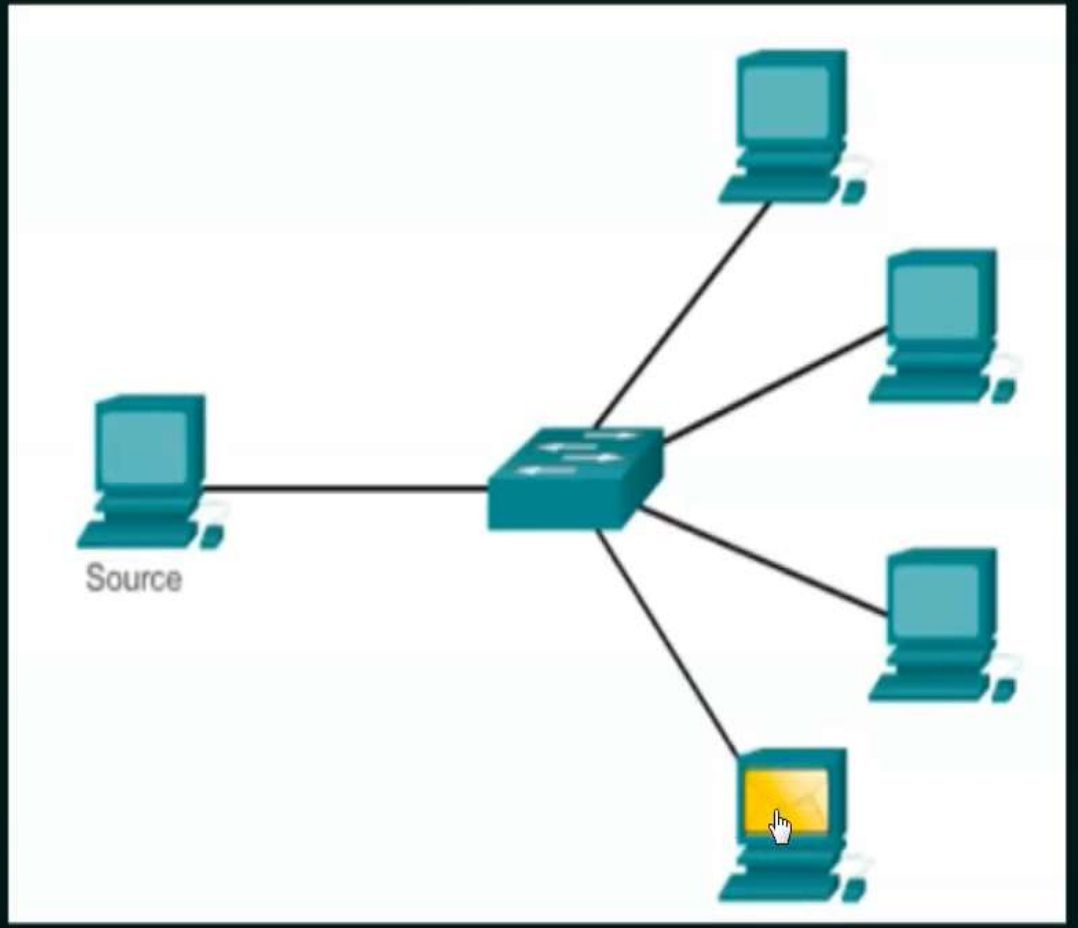


Elements of Protocol in computer network



5. Message Delivery Options

- ★ Unicast
- ★ Multicast
- ★ Broadcast



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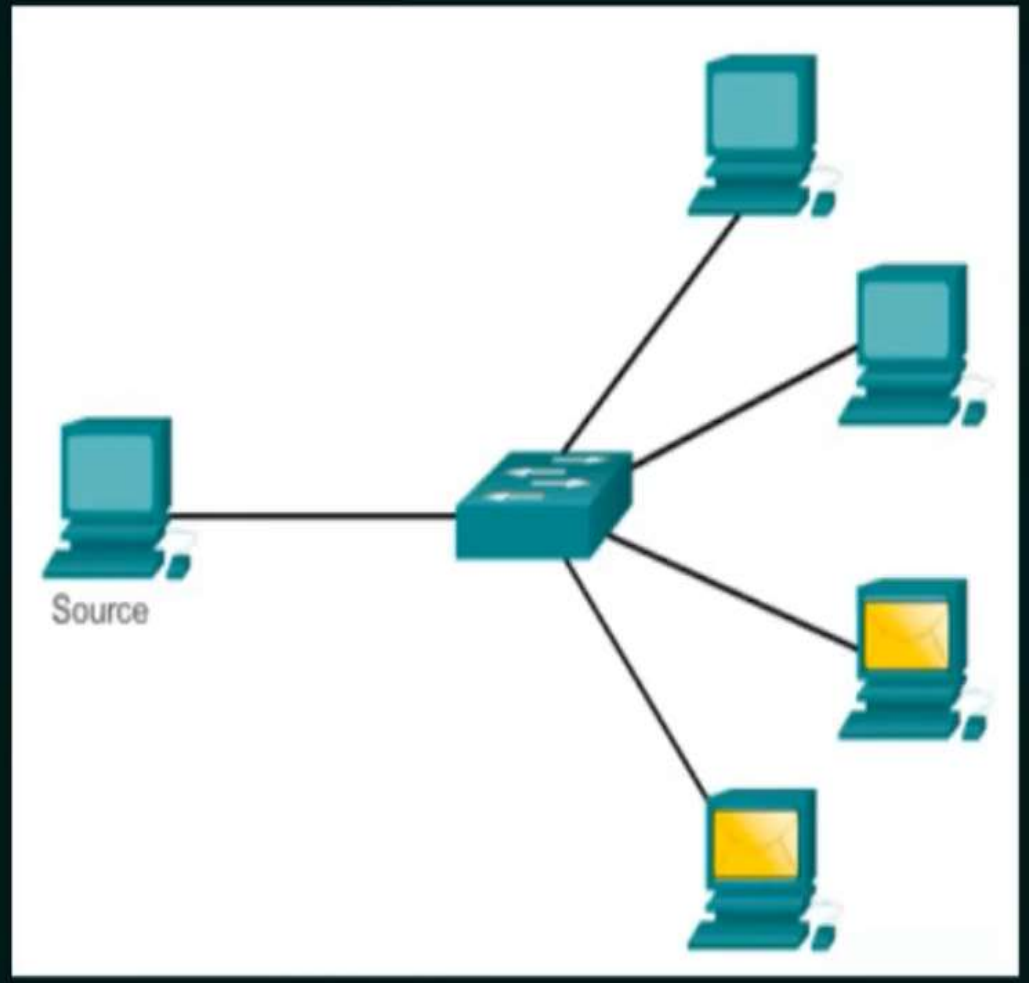

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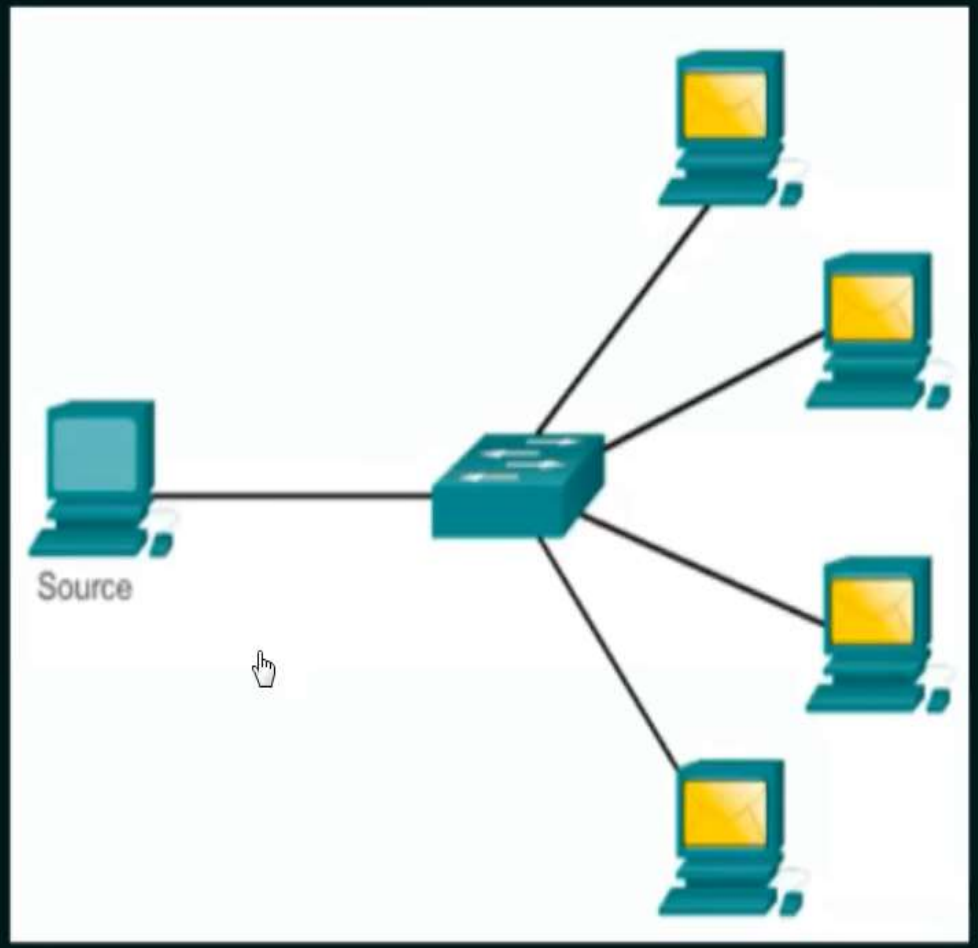
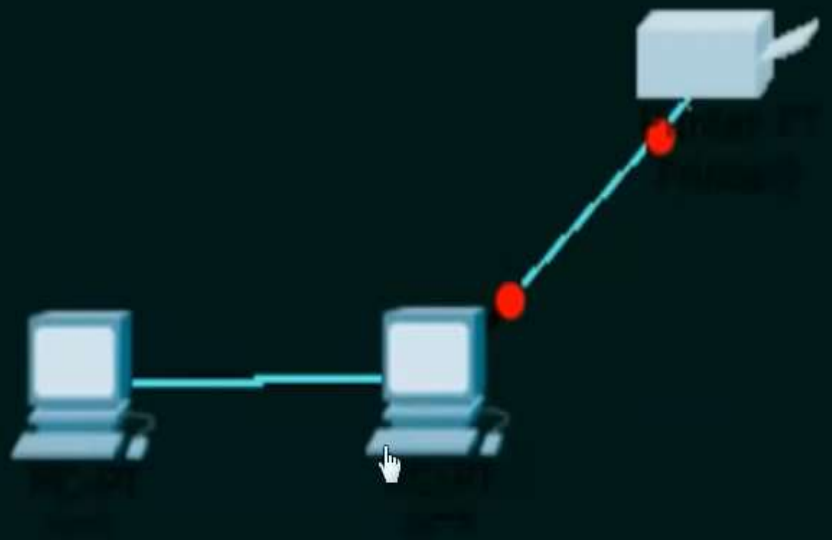


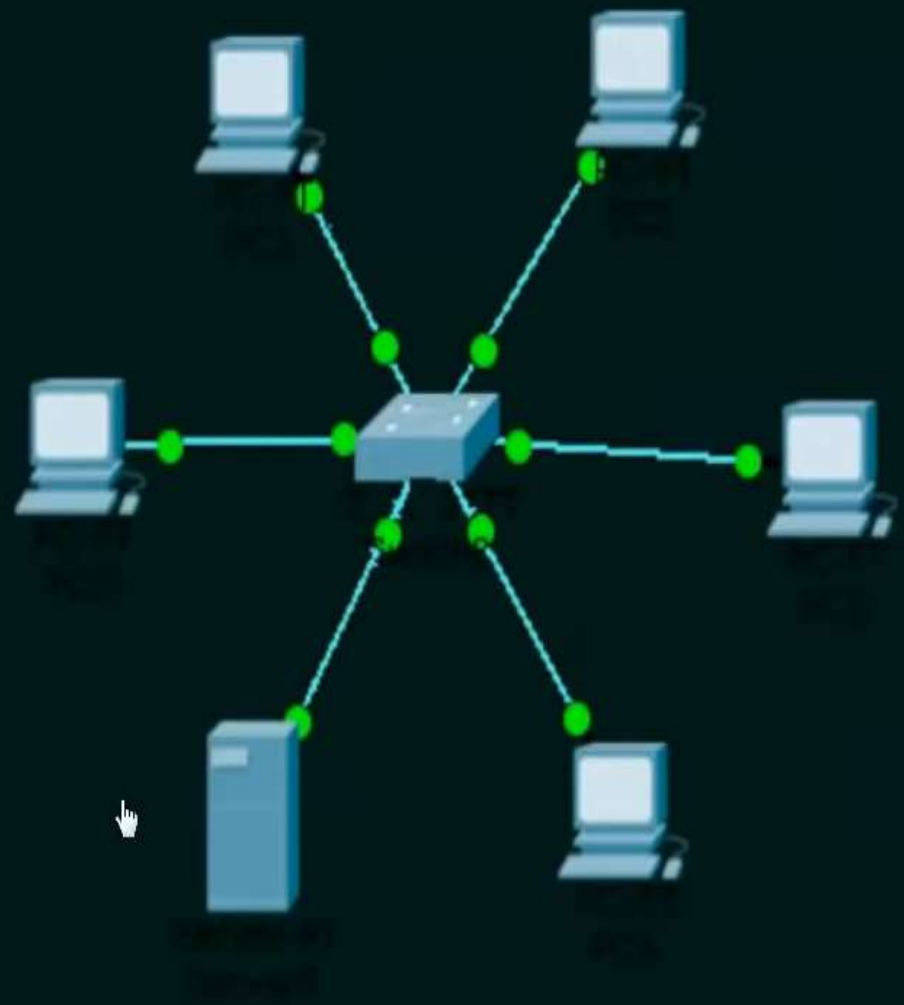
Peer-to-Peer Network

- ★ No Centralized administration.
- ★ All peers are equal.
- ★ Simple sharing applications.
- ★ Not scalable.



Client Server Network

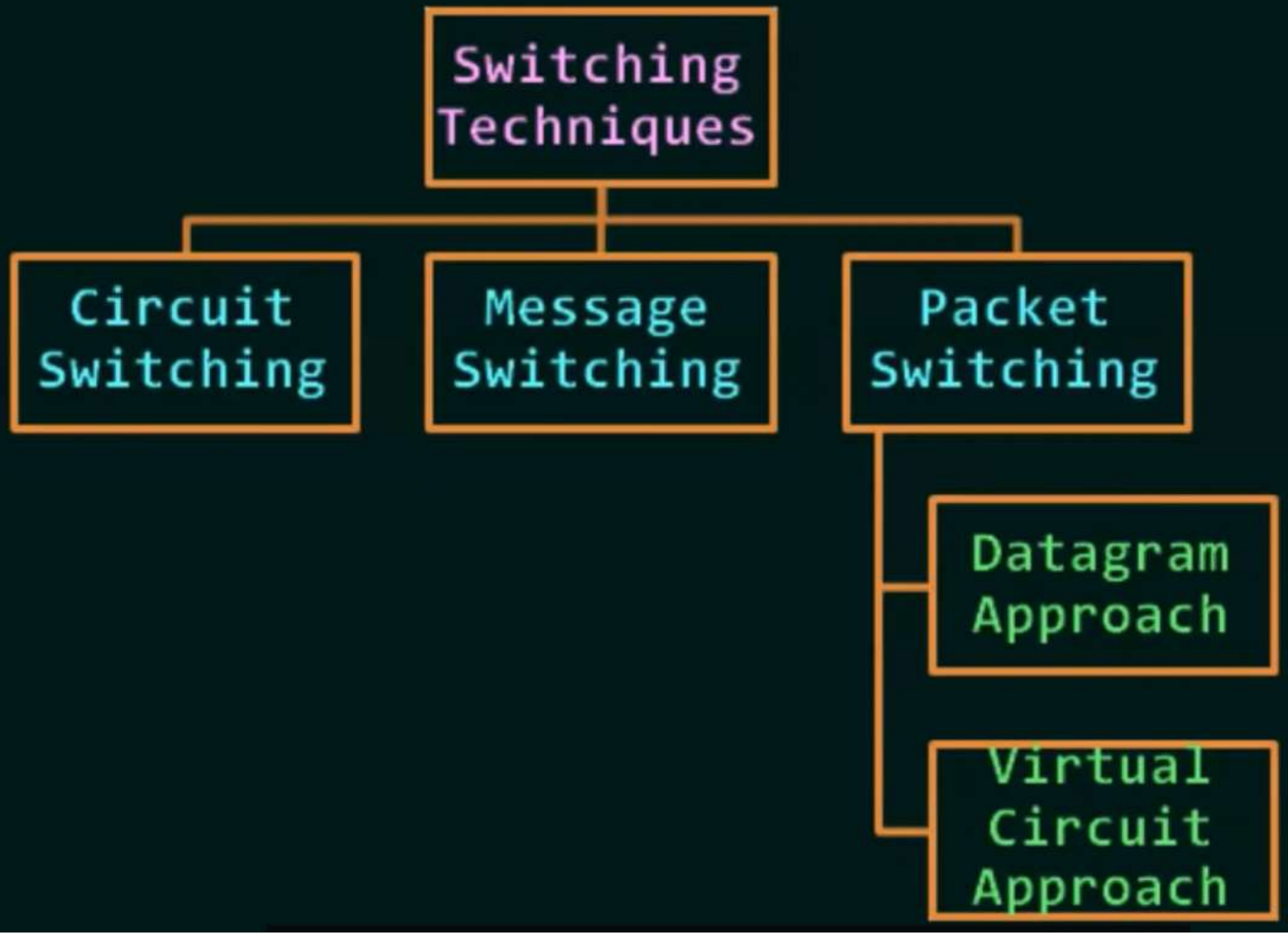
- ★ Centralized administration.
- ★ Request-Response model.
- ★ Scalable.
- ★ Server may be overloaded.



Switching

- ★ Switching in computer network helps in deciding the best route for data transmission if there are multiple paths in a larger network.
- ★ One-to-One connection.

Switching techniques



Circuit switching

★ A dedicated path is established between the sender and receiver.

★ Before data transfer, connection will be established first.

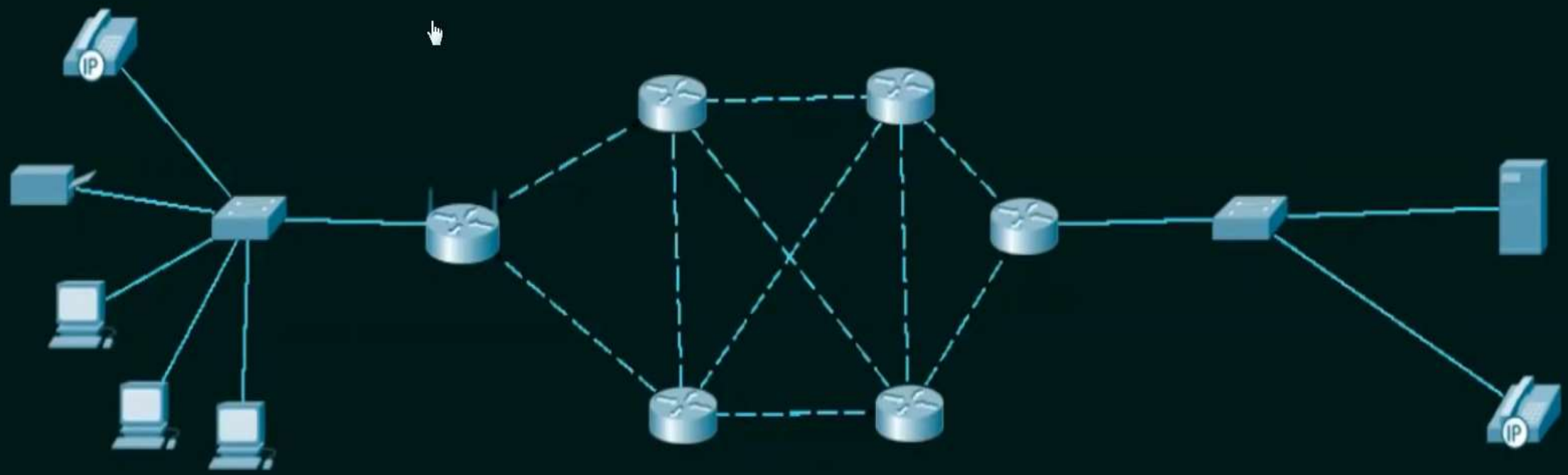
★ Example: Telephone network.

3 phases in circuit switching:

1. Connection establishment.
2. Data transfer
3. Connection Disconnection.

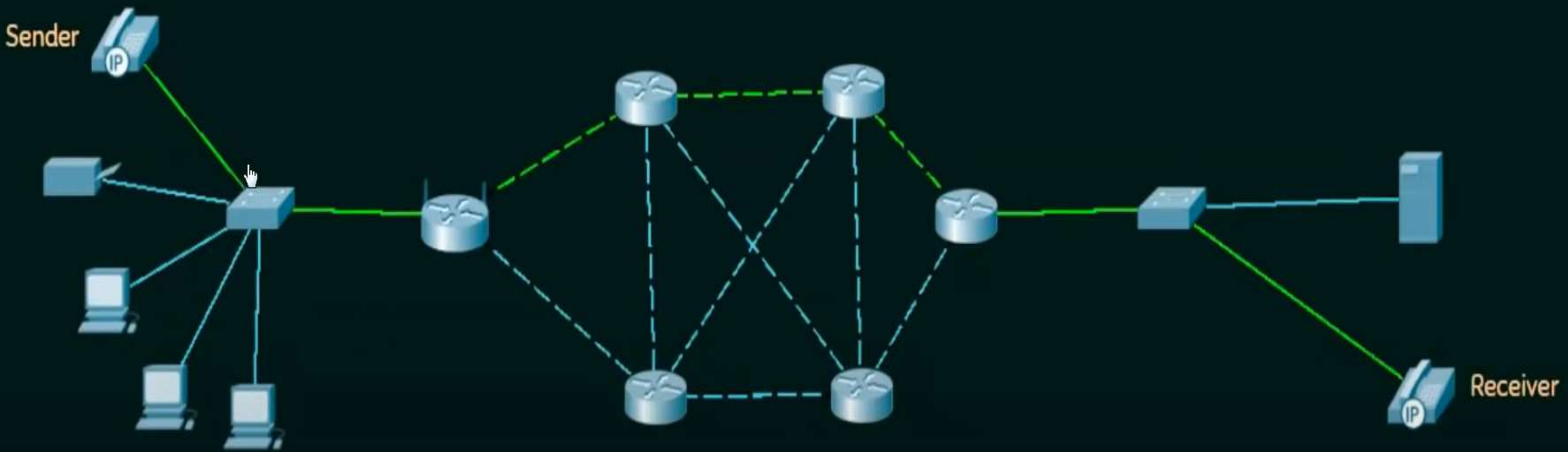
Example for circuit switching

Phase 1: Connection establishment

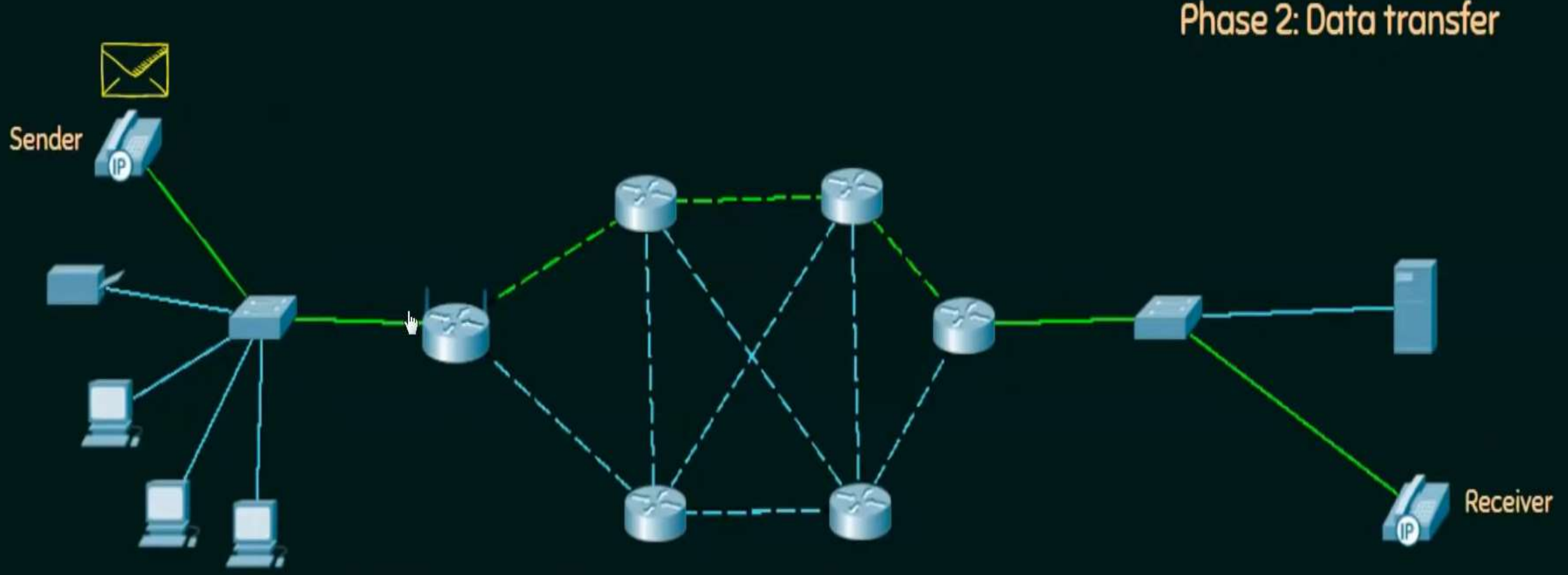


EXAMPLE FOR CIRCUIT SWITCHING

Phase 1: Connection establishment

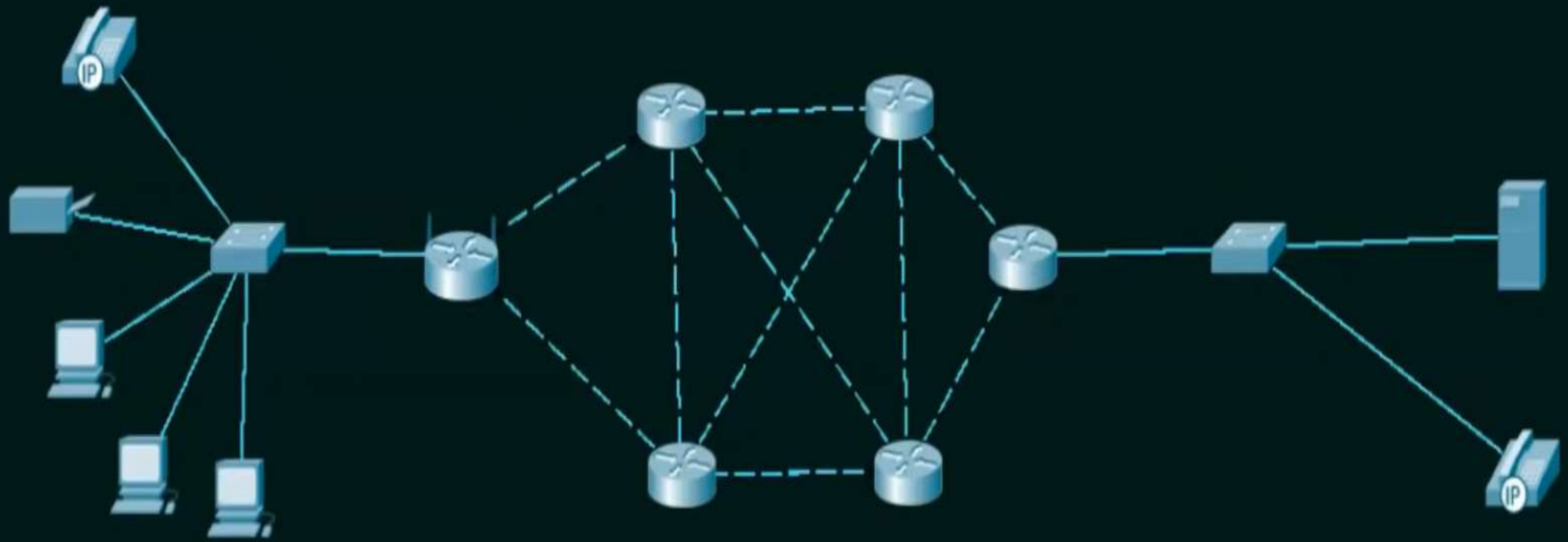


EXAMPLE FOR CIRCUIT SWITCHING



Example for circuit switching

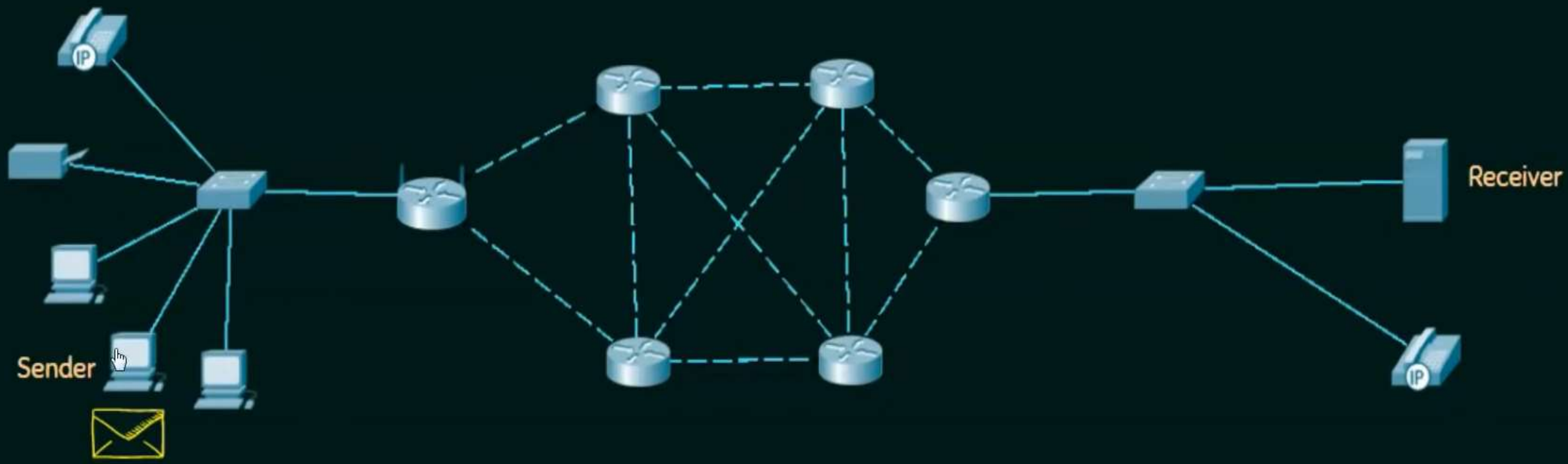
Phase 3: Connection Disconnection



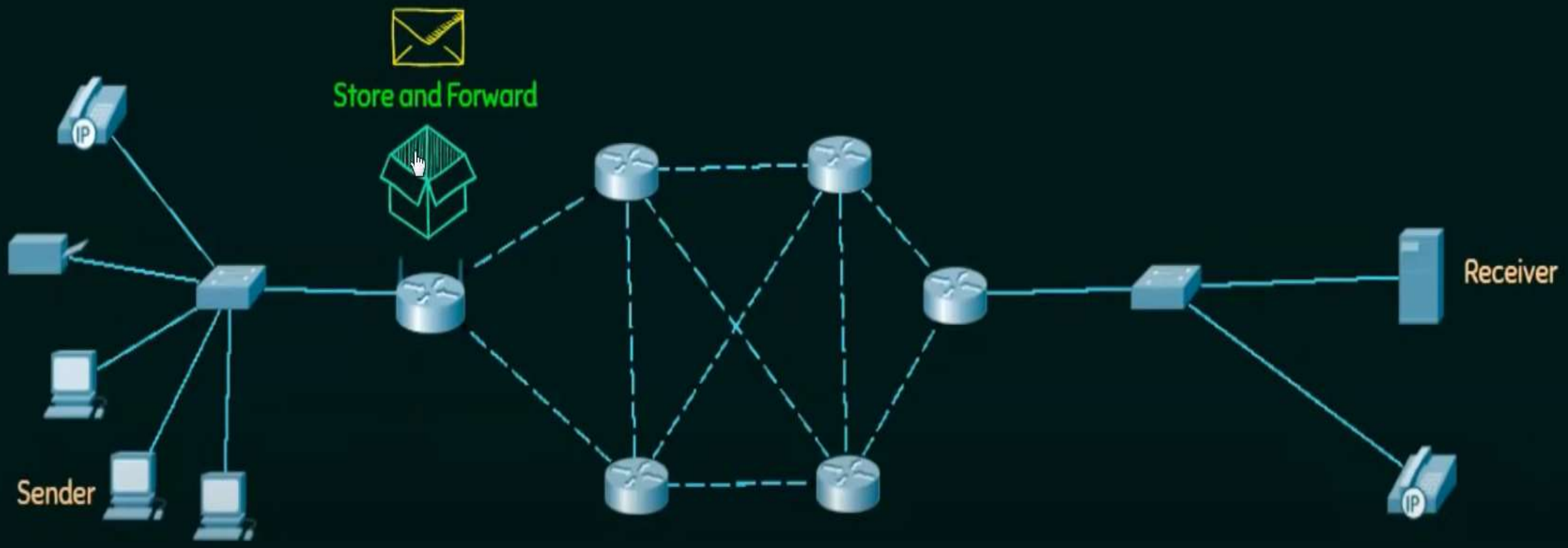
Message switching

- ★ Store and forward mechanism.
- ★ Message is transferred as a complete unit and forwarded using store and forward mechanism at the intermediary node.
- ★ Not suited for streaming media and real-time applications.

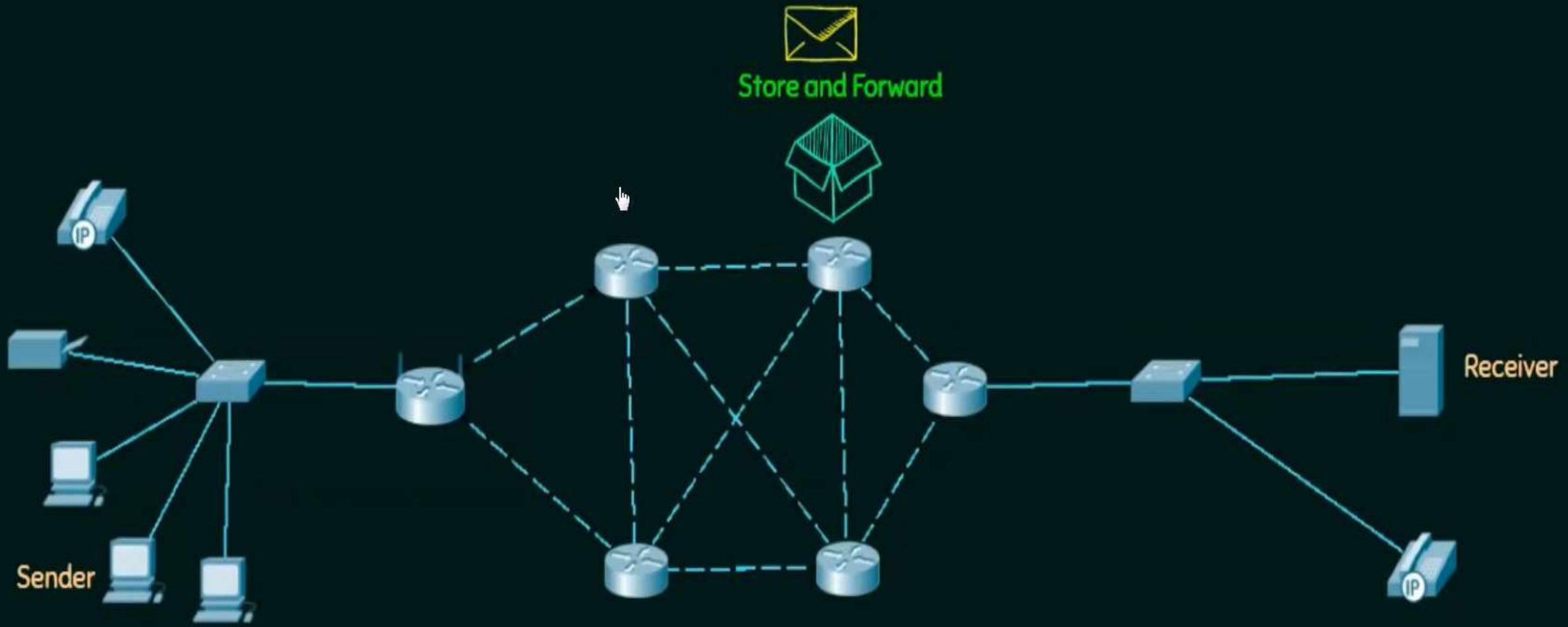
Example for message switching



EXAMPLE FOR PACKET SWITCHING



EXAMPLE FOR MESSAGE SWITCHING



Packet switching

- ★ The internet is a packet switched network.
- ★ Message is broken into individual chunks called as packets.
- ★ Each packet is sent individually.
- ★ Each packet will have source and destination IP address with sequence number.
- ★ Sequence numbers will help the receiver to
  - ○ Reorder the packets.
  - ○ Detect missing packets and

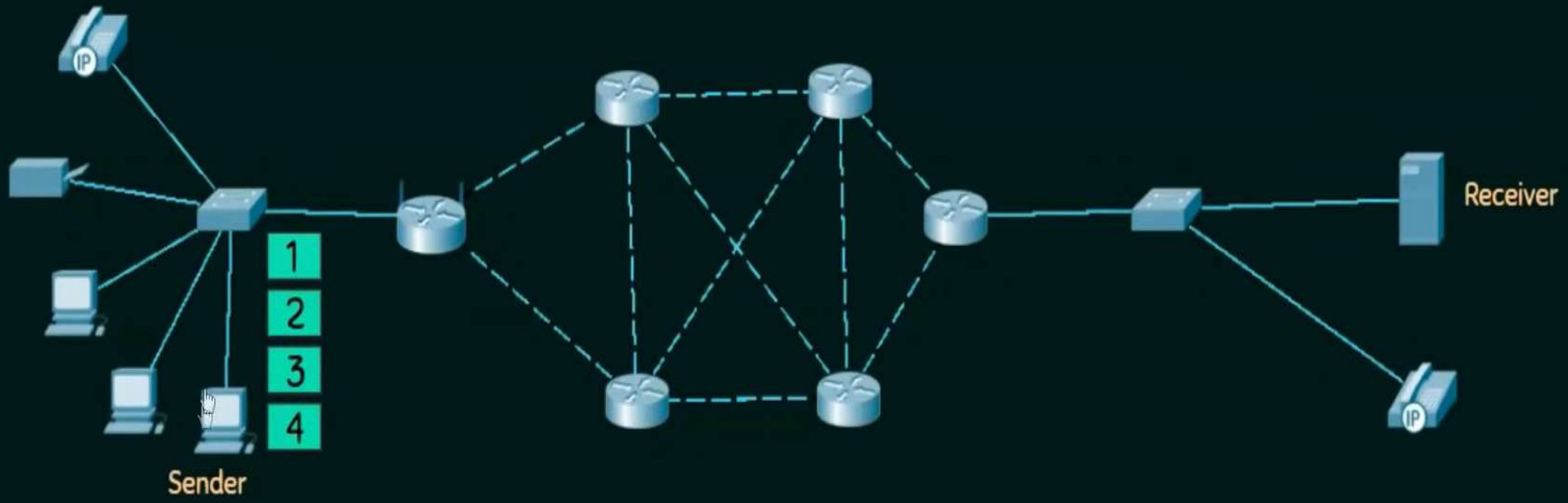
Two approaches to packet switching

1. Datagram Approach.
2. Virtual Circuit Approach.

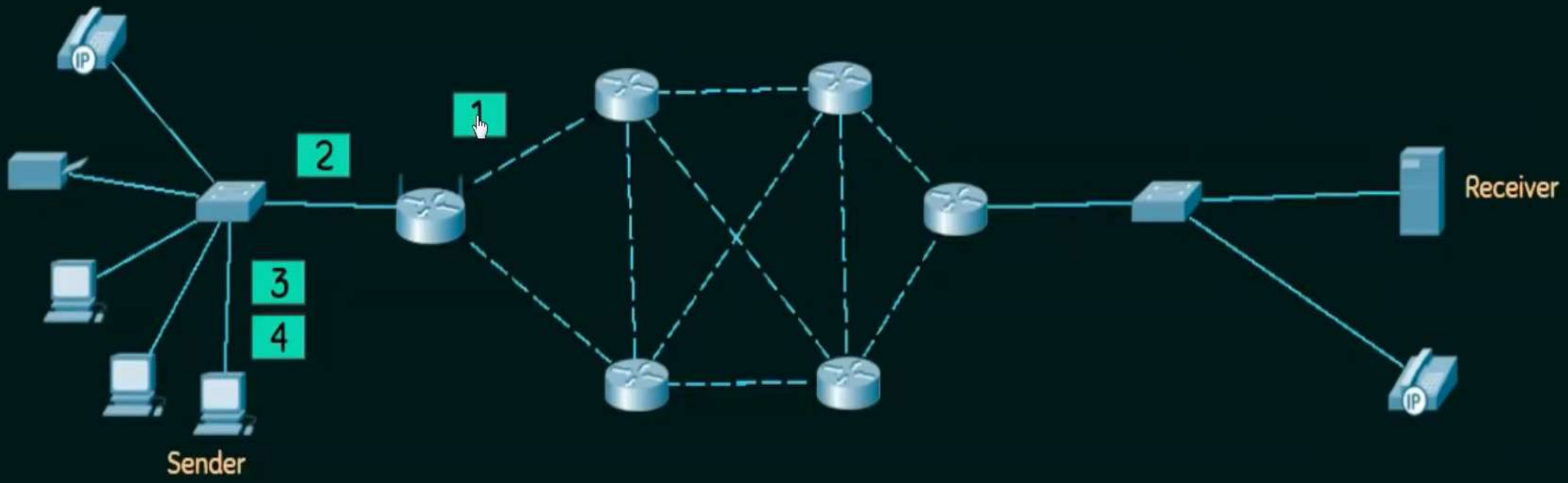
Packet switching – Datagram approach

- ★ Datagram Packet Switching is also known as connectionless switching.
- ★ Each independent entity is called as datagram.
- ★ Datagrams contain destination information and the intermediary devices uses this information to forward datagrams to right destination.
- ★ In Datagram Packet Switching approach, the path is not fixed.
- ★ Intermediate nodes take the routing decisions to forward the packets.

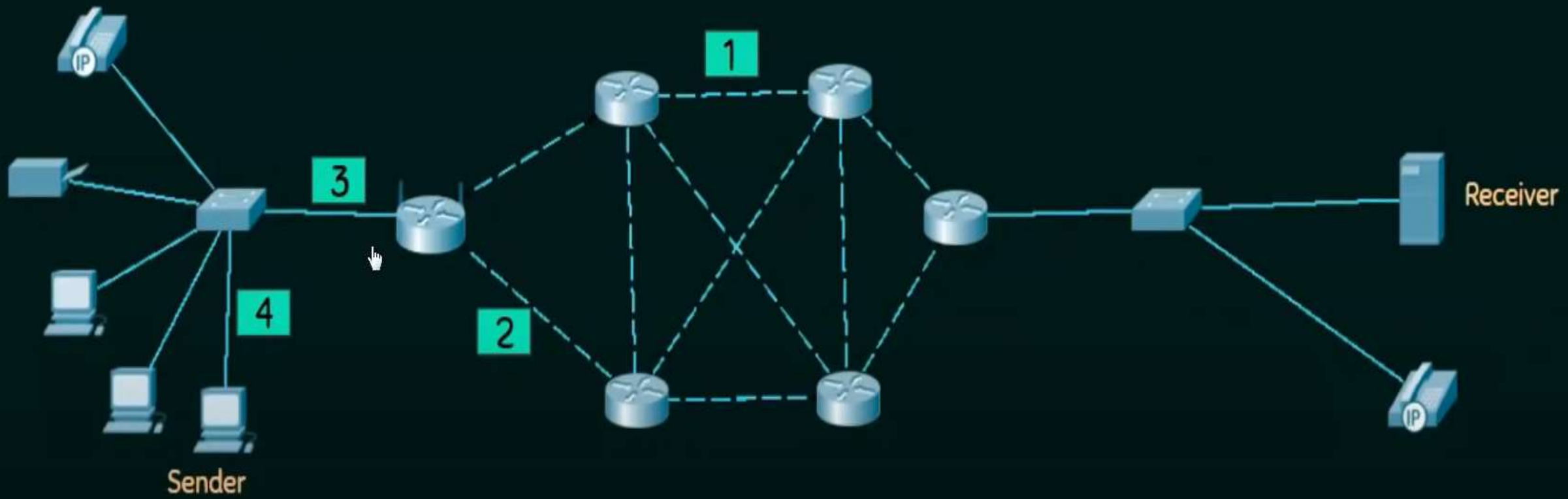
EXAMPLE FOR PACKET SWITCHING – DATAGRAM



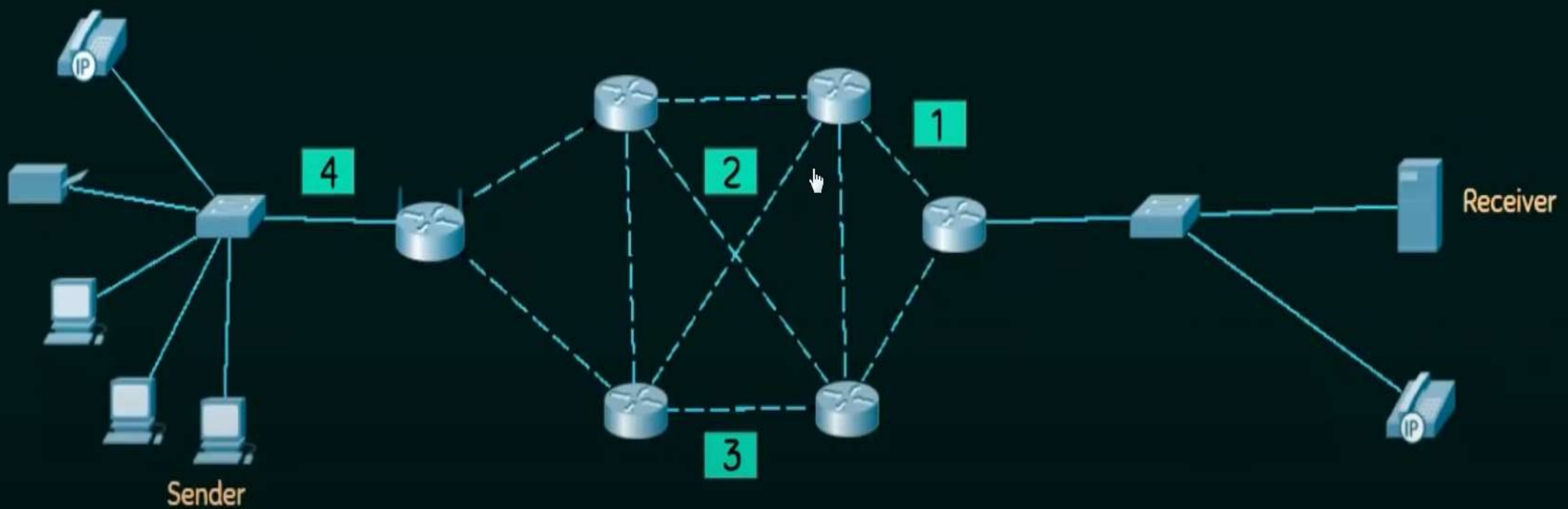
Example for packet switching – datagram



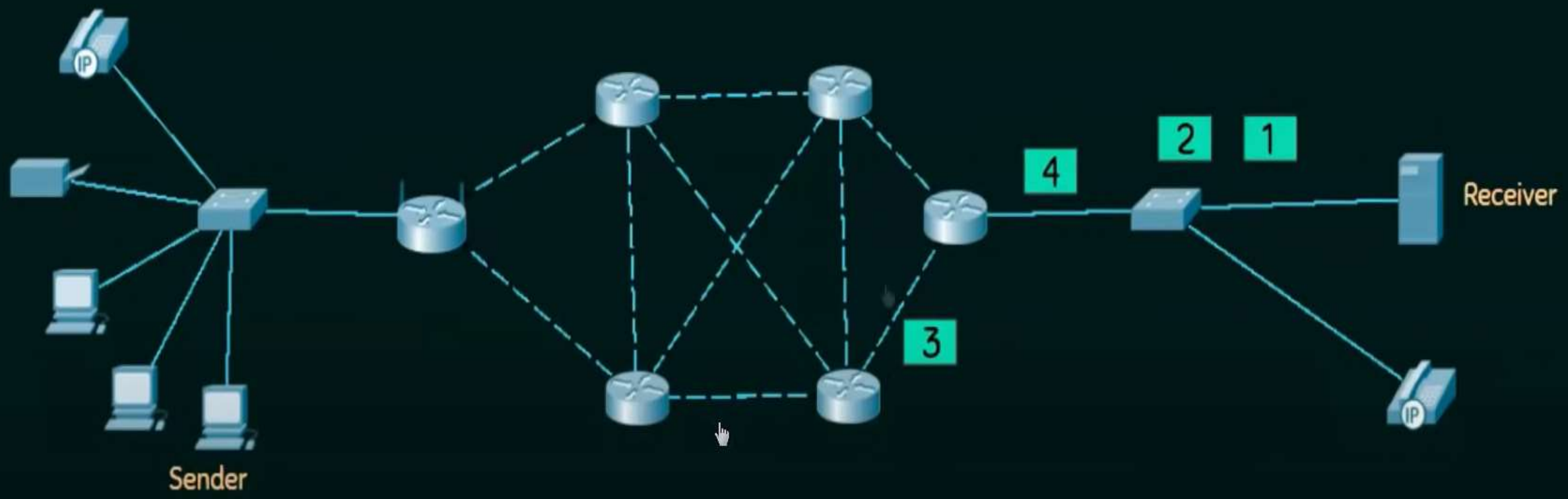
Example for packet switching – datagram



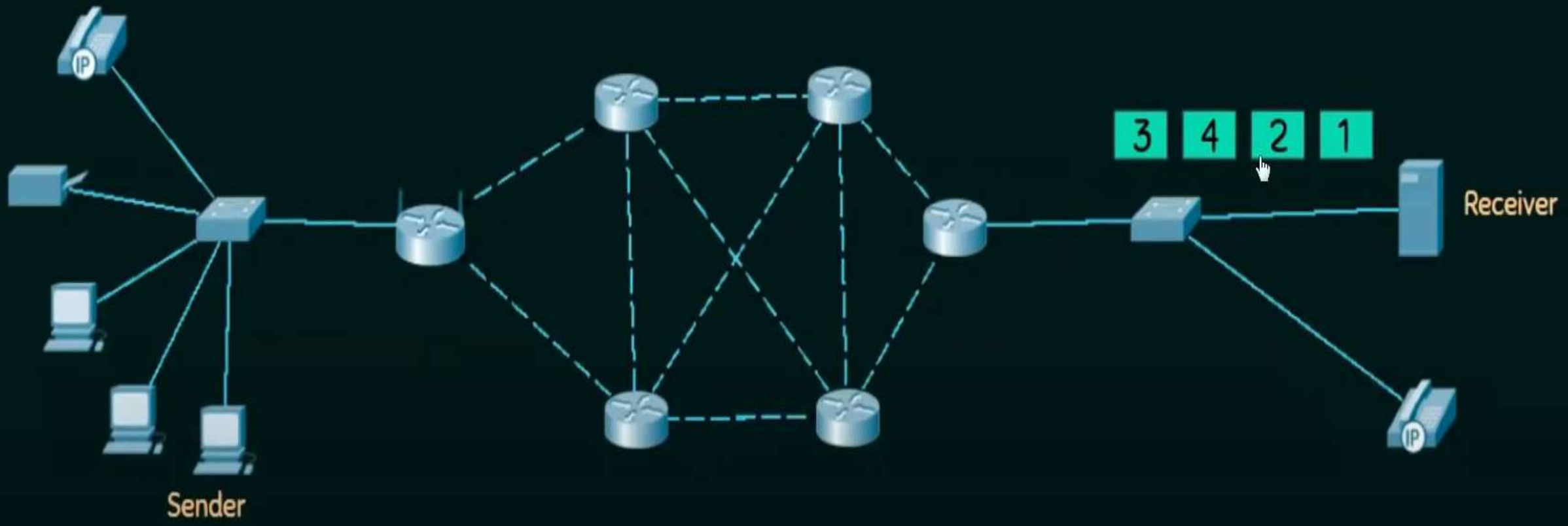
EXAMPLE FOR PACKET SWITCHING – DATAGRAM



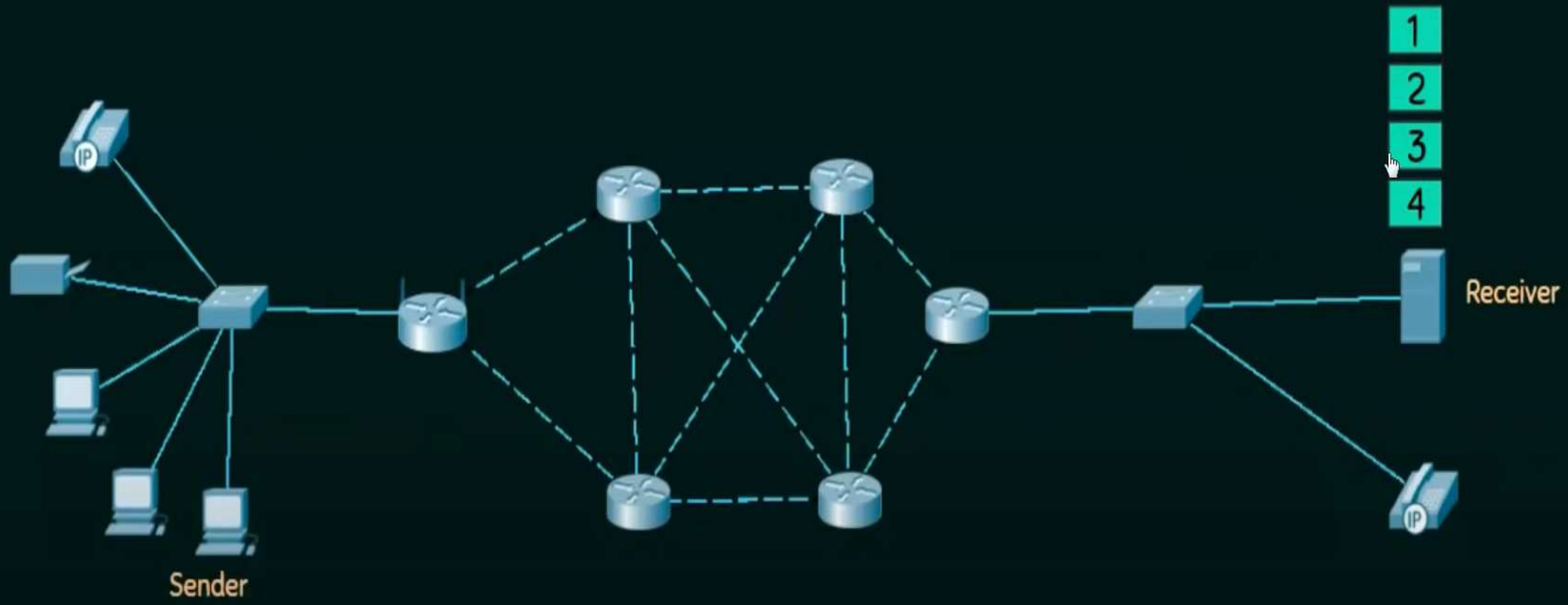
EXAMPLE FOR PACKET SWITCHING – DATAGRAM



EXAMPLE FOR PACKET SWITCHING – DATAGRAM



Example for packet switching – datagram



Packet switching – Virtual Circuit approach

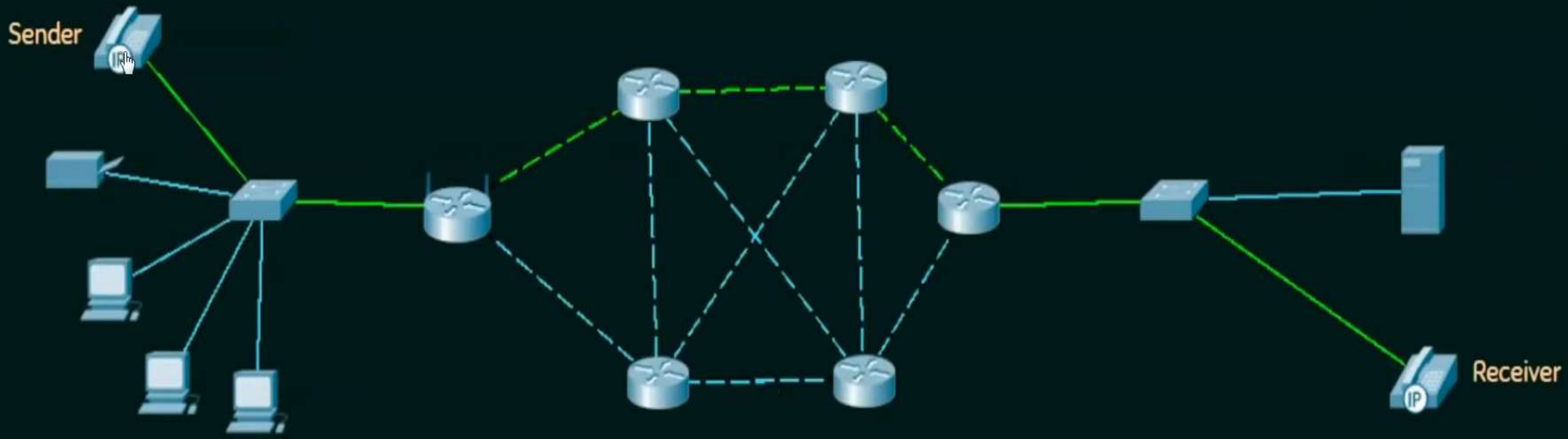
★ Virtual Circuit Switching is also known as connection-oriented switching.

★ In the case of Virtual circuit switching, a preplanned route is established before the messages are sent.

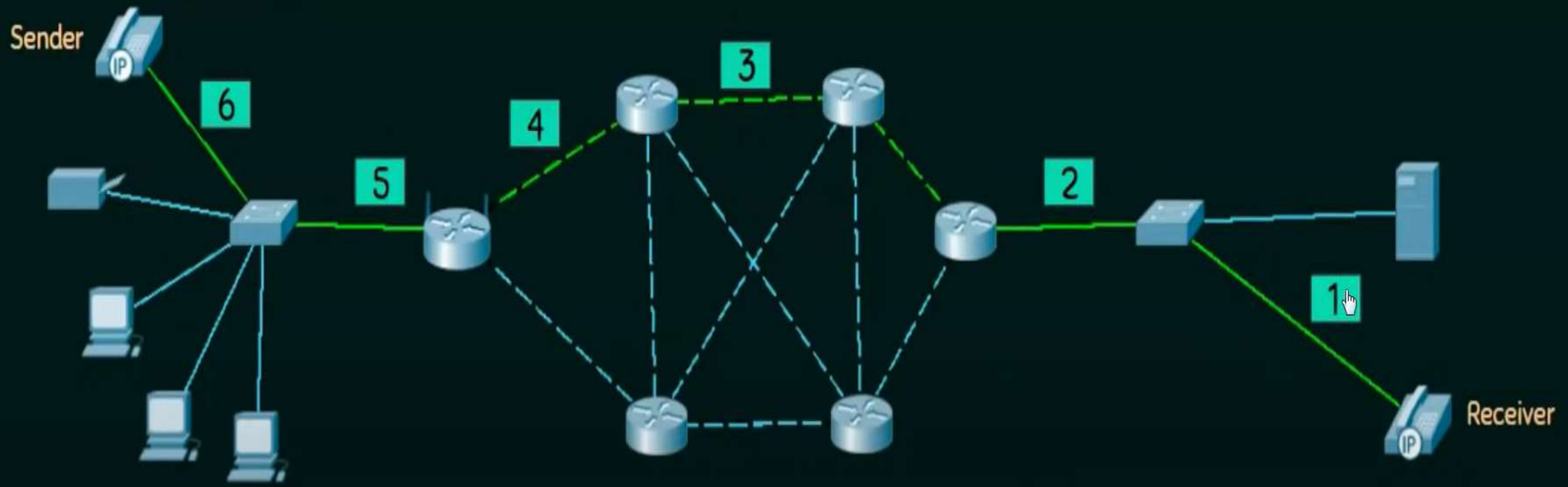
★ Call request and call accept packets are used to establish the connection between sender and receiver.

★ In this approach, the path is fixed for the duration of a logical connection.

Example for packet switching – virtual circuit



EXAMPLE FOR PACKET SWITCHING – VIRTUAL CIRCUIT



Layering

Layering means decomposing the problem into more manageable components (Layers).

Advantages:

- ★ It provides more modular design.
- ★ Easy to troubleshoot.

PROTOCOLS

- ★ It is a set of rules that governs data communication.
- ★ The protocols in each layer governs the activities of the data communication.

Layered Architectures

- ★ The OSI Reference Model.
- ★ The TCP/IP Model.

The OSI Model

- ★ OSI stands for Open System Interconnection.
- ★ It is a model for understanding and designing a network architecture that is flexible, robust, and interoperable.
- ★ Developed by the International Standards for Organizations (ISO).
- ★ The OSI model is not a protocol.
- ★ It is only a guideline and hence it is referred as OSI reference model.

The OSI Model

★ The purpose of the OSI model is to show how to facilitate communication between different systems without requiring changes to the logic of the underlying hardware and software.

★ The OSI model was never fully implemented.

The TCP/IP Model

- ★ TCP/IP = Transmission Control Protocol/Internet Protocol.
- ★ The TCP/IP protocol suite was developed prior to the OSI model.
- ★ Therefore, the layers in the TCP/IP protocol suite do not exactly match those in the OSI model.
- ★ TCP/IP is a hierarchical protocol made up of interactive modules, each of which provides a specific functionality.

OSI Layers , data units and Functions:

Layers	Data Units	Functions
Application Layer	Data	Mail Services,Directory Services,FTAM
Presentation Layer	Data	Encryption/Decryption, Compression
Session Layer	Data	Session Establishment, Synchronization,Dialog Controller
Transport Layer	Segments,Datagram	Segmentation
Network Layer	Packets	Traffic control,Fragmentation,Routing
Data Link Layer	Frames	Flow control,Error control,Access control
Physical Layer	Bits	Bit Synchronization,Bit rate control,Physical Topologies