

Syllabus

Module I (10 Hours)

Syllabus

- Overview of Computer Networks and the Internet. History. Protocols, Review of last mile technologies used for internet access. Packet switching. Basic ideas about delay queuing throughput. Concept of Quality of Service, Protocol layering. OSI model and TCP model
- Application layer protocols - Client-server architecture Network layer 7 application architecture, Web, HTTP, FTP, SMTP, POP3, and DNS, Peer-to-peer file sharing networks.
- Behrouz A Forouzan, Firouz Mosharraf, "Computer Networks: A top down Approach", McGraw Hill Education, 1 st Edition (2011).
- James F Kurose and Keith W Ross, "Computer Networking: A Top - Down Approach", Pearson Education; 6 th Edition (2017)

Overview of the Internet

- **Network**

- A network capability

- A device system

- A router switch (moving data)

- **Internet**

- A collection

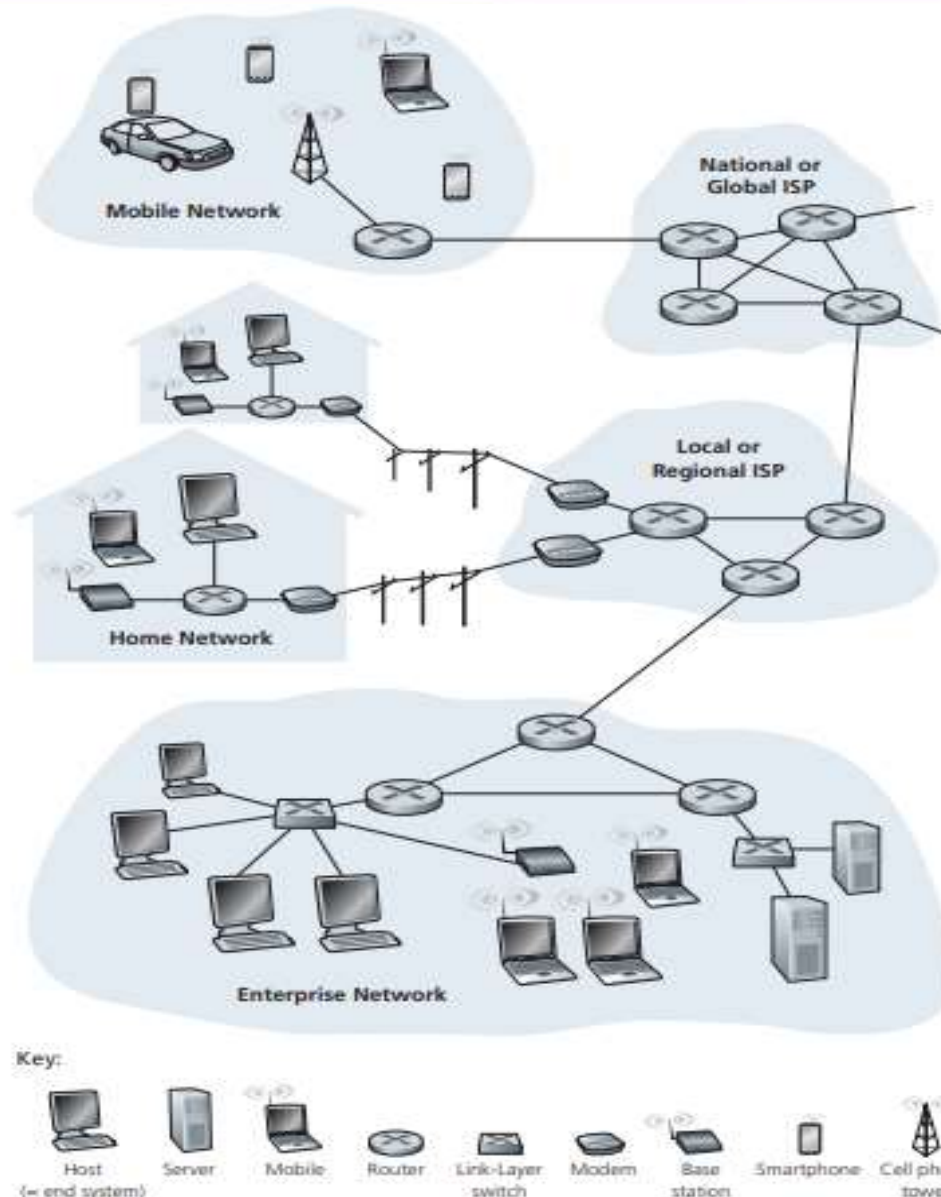


Figure 1.1 • Some pieces of the Internet

of devices

computer,
security



such as a
works, a
modem
form of

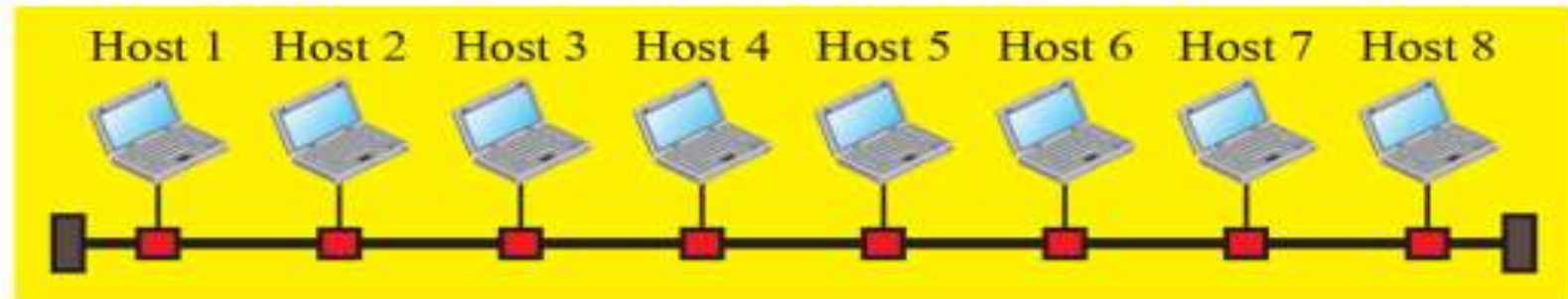
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Overview of the Internet

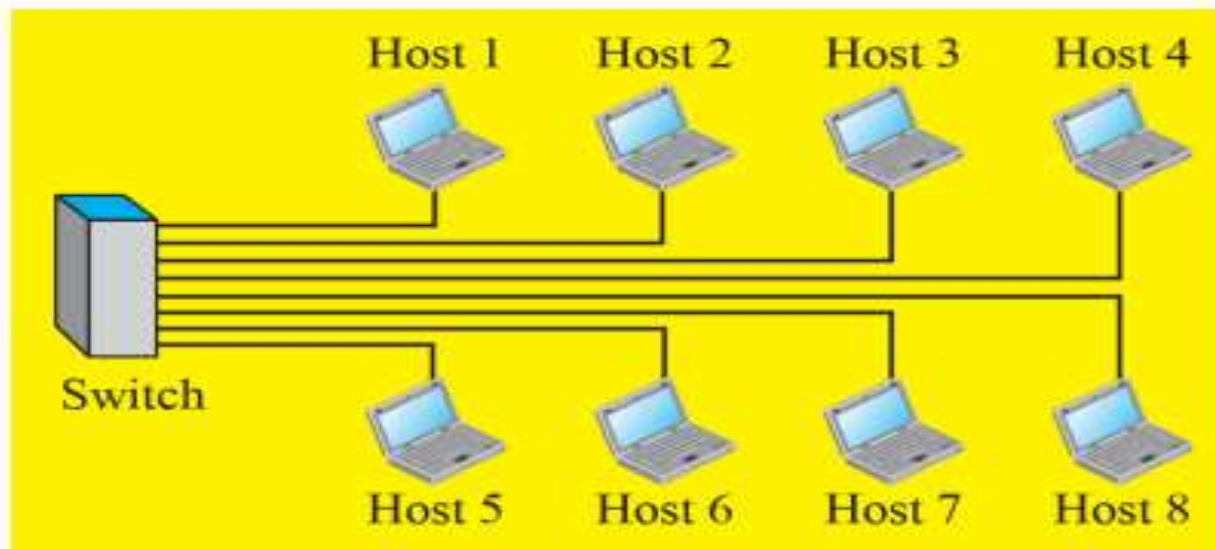
- **Local Area Networks**
 - Usually privately owned and connects some host in an office, building or campus. [Figure](#)
- **Wide Area Networks**
 - Wider geographical span
 - A **LAN interconnects hosts**; a **WAN interconnects connecting devices** such as switches, routers, or modems.
 - A LAN is normally privately owned by the organization that uses it; a WAN is normally created and run by communication companies and leased by an organization that uses it.
 - **Point-to-Point WANs**: connects two communicating devices through a transmission media. [Figure](#)
 - **Switched WANs**: network with more than two ends. [Figure](#)
- **Internetwork(internet)**
 - Two or more networks are connected [Figure](#)

Overview of the Internet

Figure 1.1: *An Isolated LAN in the past and today*

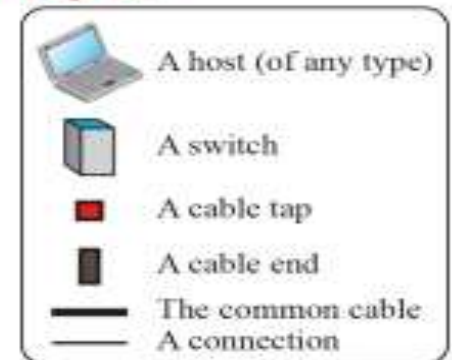


a. LAN with a common cable (past)



b. LAN with a switch (today)

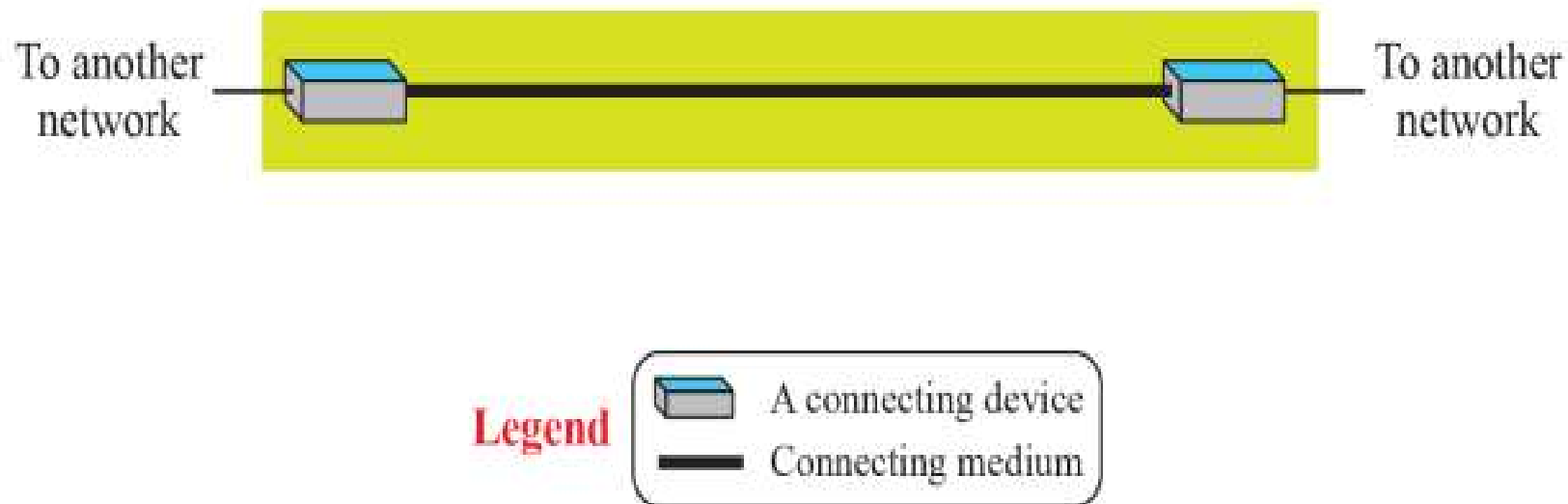
Legend



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Overview of the Internet

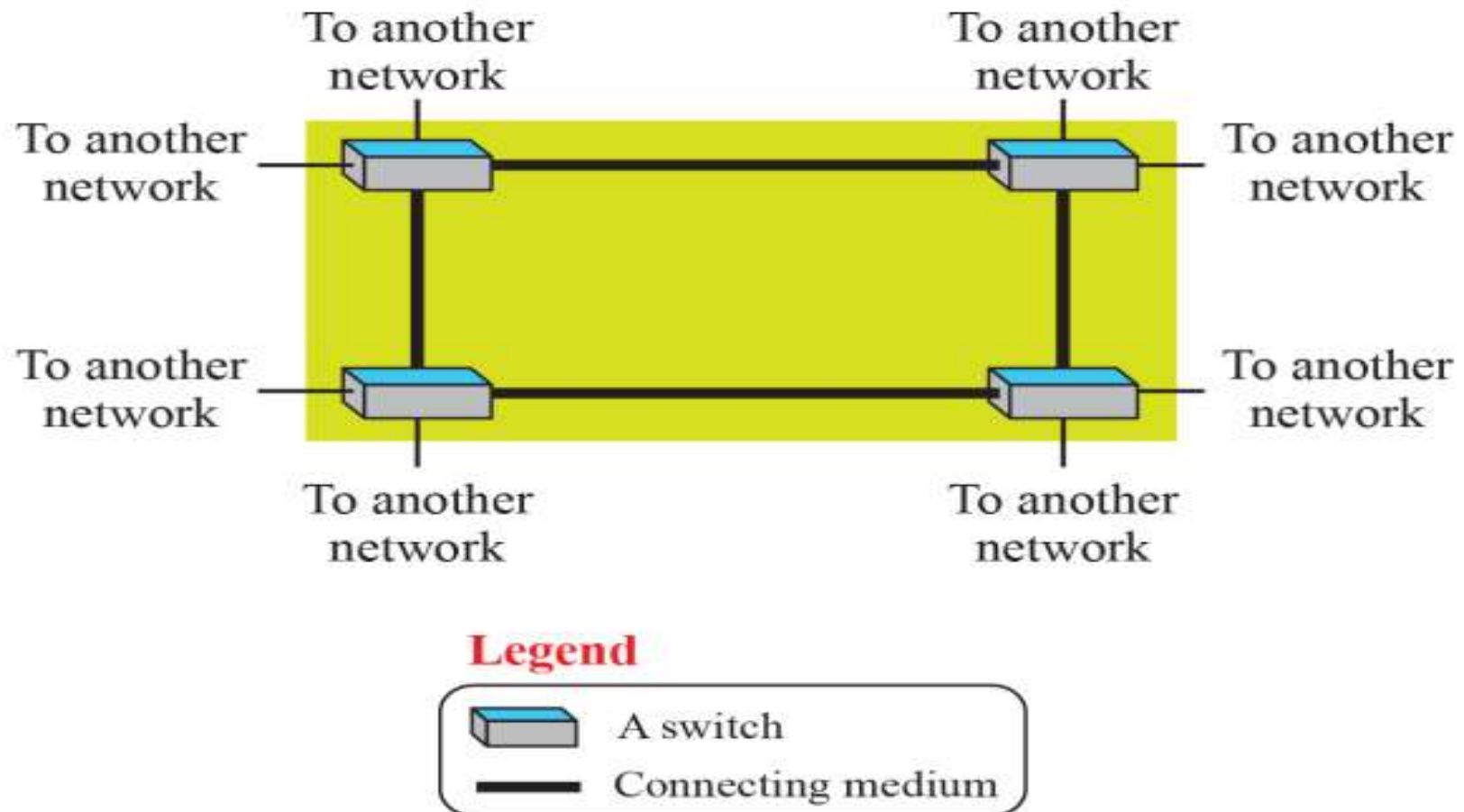
Figure 1.2: A Point-to-Point WAN



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Overview of the Internet

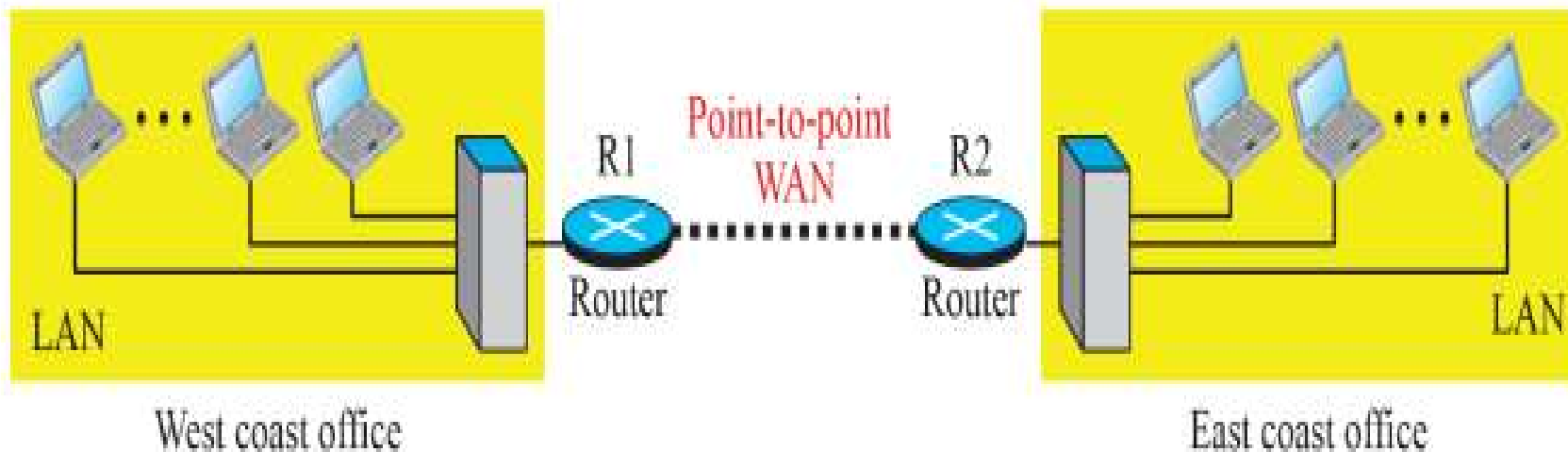
Figure 1.3: A Switched WAN



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Overview of the Internet

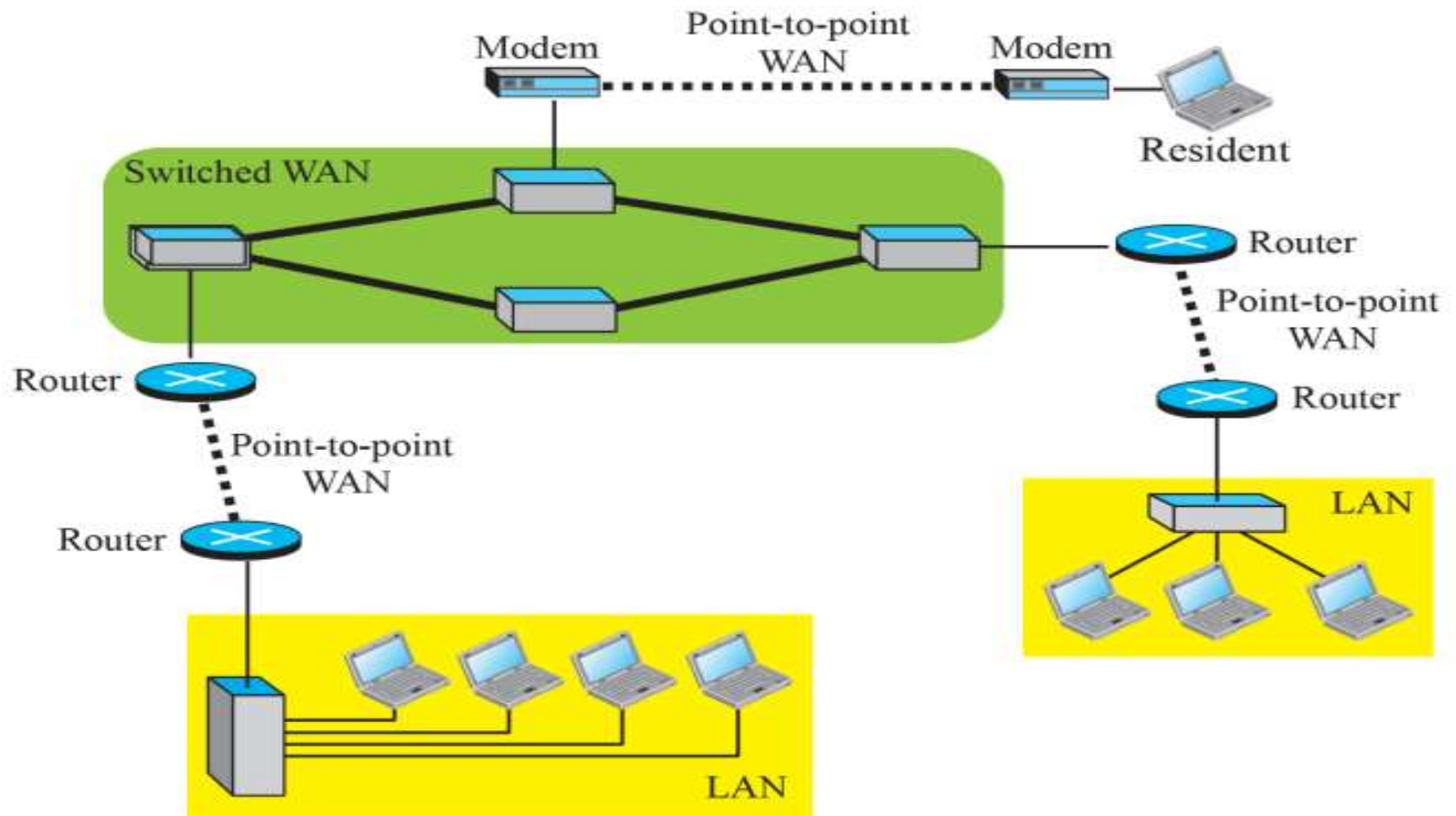
Figure 1.4: An internetwork made of two LANs and one WAN



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Overview of the Internet

Figure 1.5: A heterogeneous network made of WANs and LANs



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Overview of the Internet

What is Network Topology?

- Network topology is the way devices are connected in a network.
- It defines how these components are connected and how data transfer between the network.
- **Types of Network Topology**
 - Point to Point Topology
 - Mesh Topology
 - Star Topology
 - Hybrid Topology
 - Bus Topology
 - Ring Topology
 - Tree Topology

Overview of the Internet

- Types of Network Topology

- Point to Point Topology

- Mesh Topology

- Star Topology

- Hybrid Topology

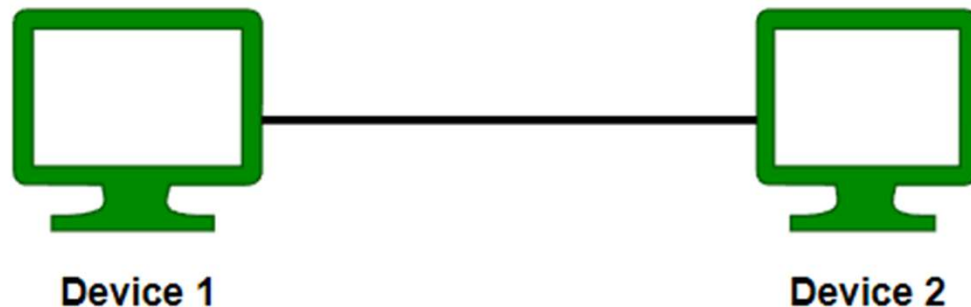
- Bus Topology

- Ring Topology

- Tree Topology



Point to Point Topology



Overview of the Internet

- Types of Network Topology

- Point to Point Topology

- Mesh Topology

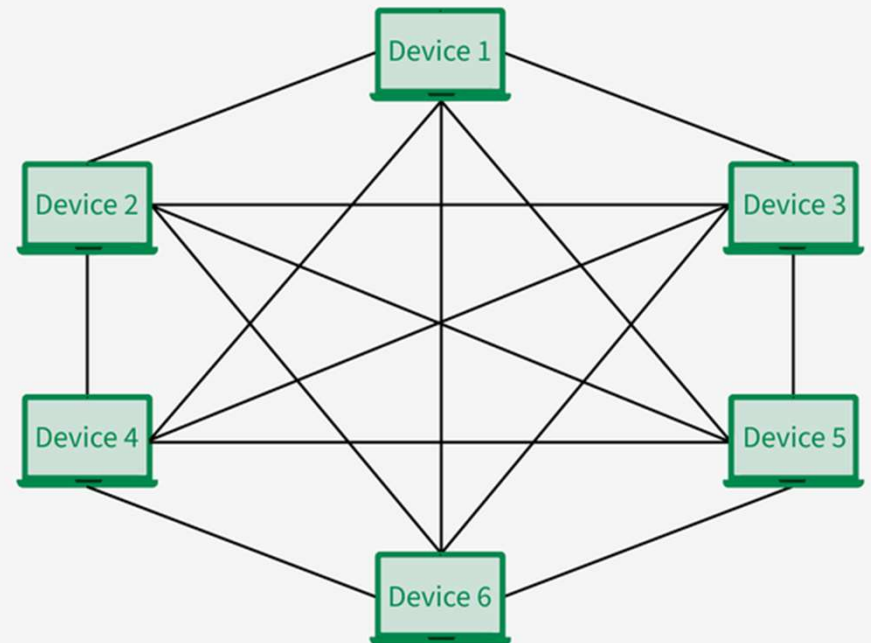
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Overview of the Internet

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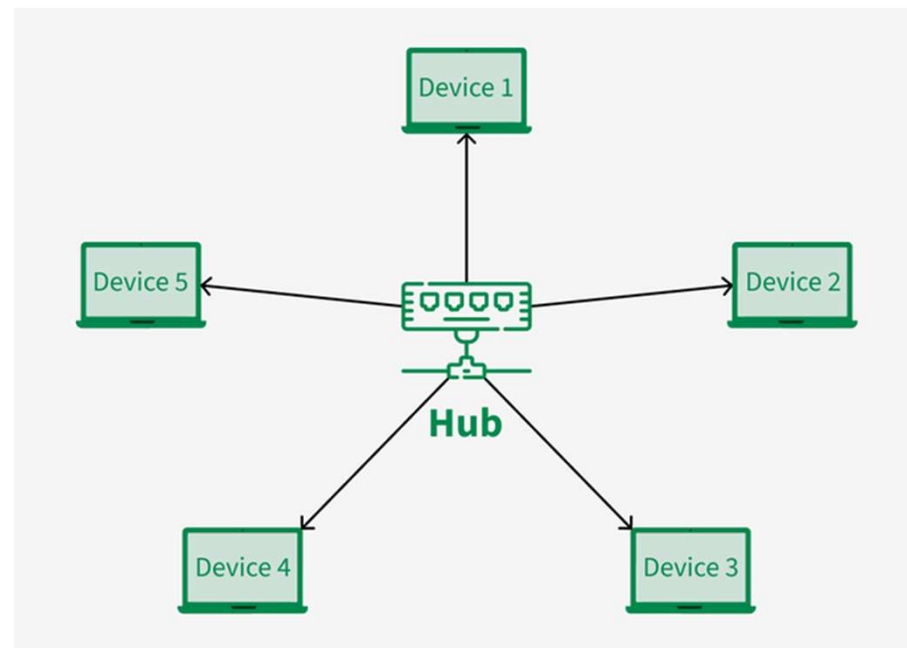
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Overview of the Internet

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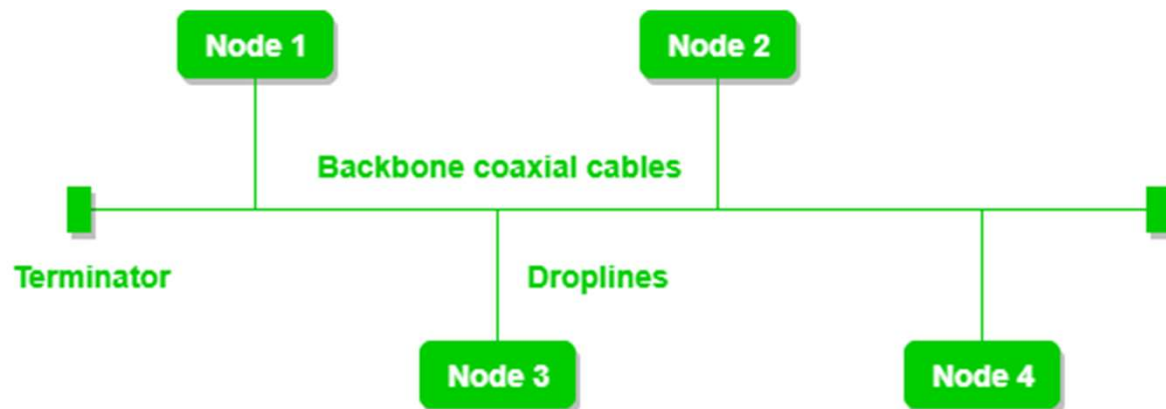
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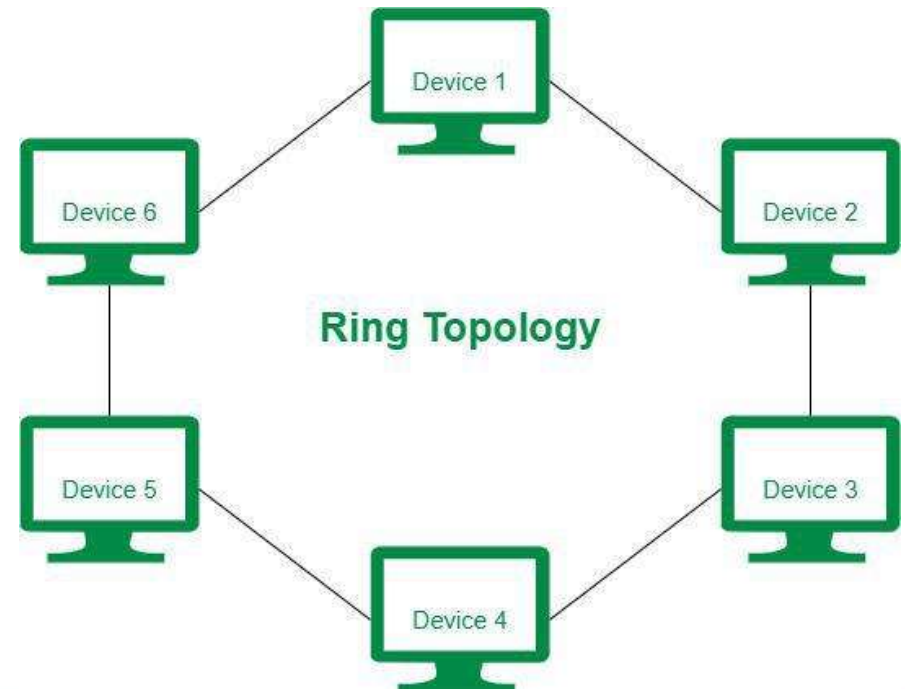


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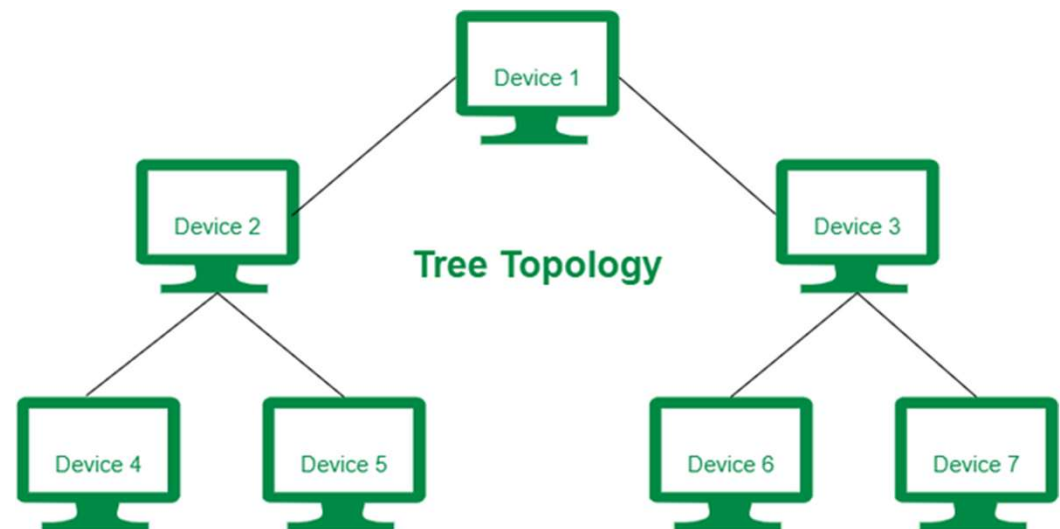


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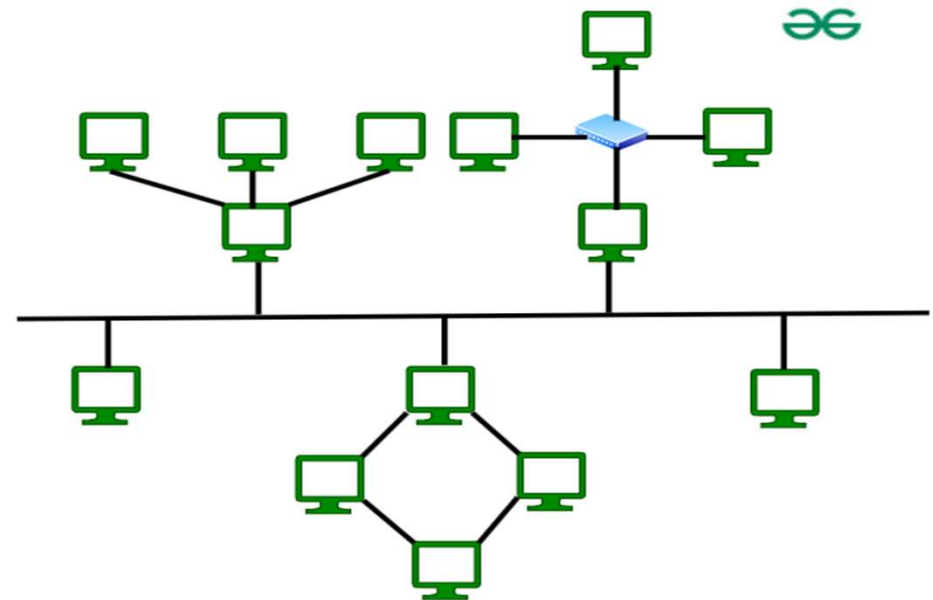
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Overview of the Internet

Switching

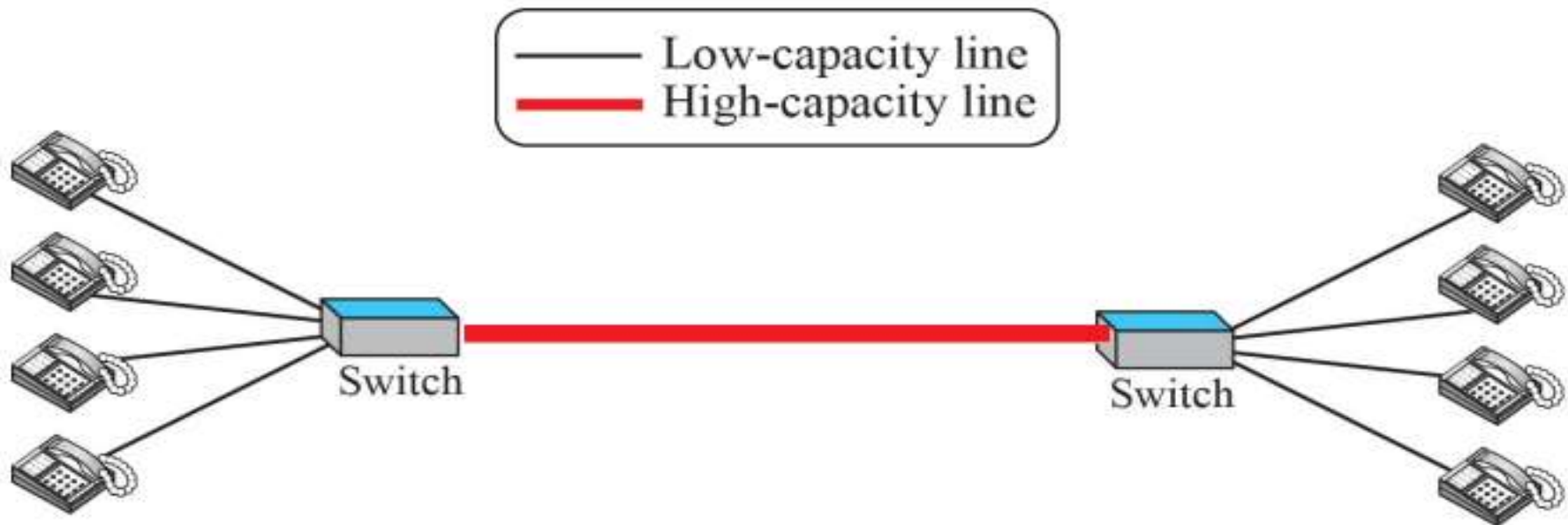
- An internet is a switched network in which a switch connects at least two links together.
- A switch needs to **forward data** from a link to another link when required.
 - Circuit-Switched Network
 - Packet-Switched Network

Overview of the Internet

Circuit-switched network

- A dedicated connection, called **circuit**, is always available between the two end systems; the **switch** can only make it active or inactive. Eg: Telephone networks
- Switches have **only forwarding capability**.

Figure 1.6: A circuit-switched network

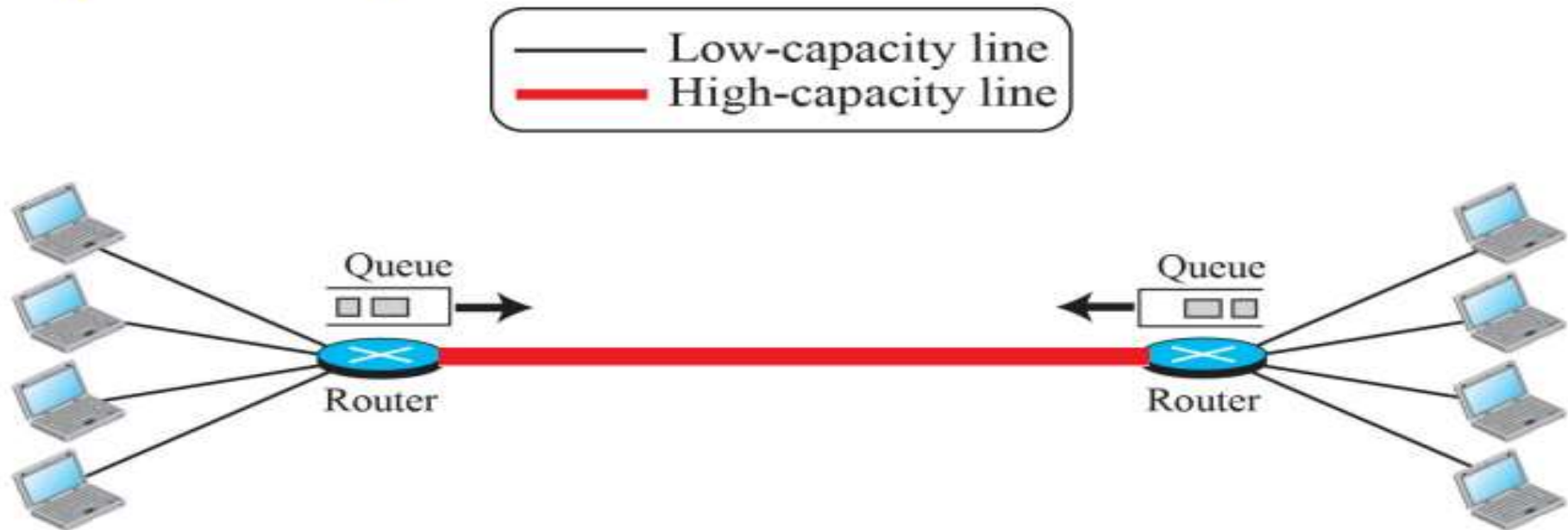


Overview of the Internet

Packet-switched network

- Communication between the two ends is done in blocks of data called **packets**.
- Switches have **forwarding and storing** capability.

Figure 1.7: A packet-switched network

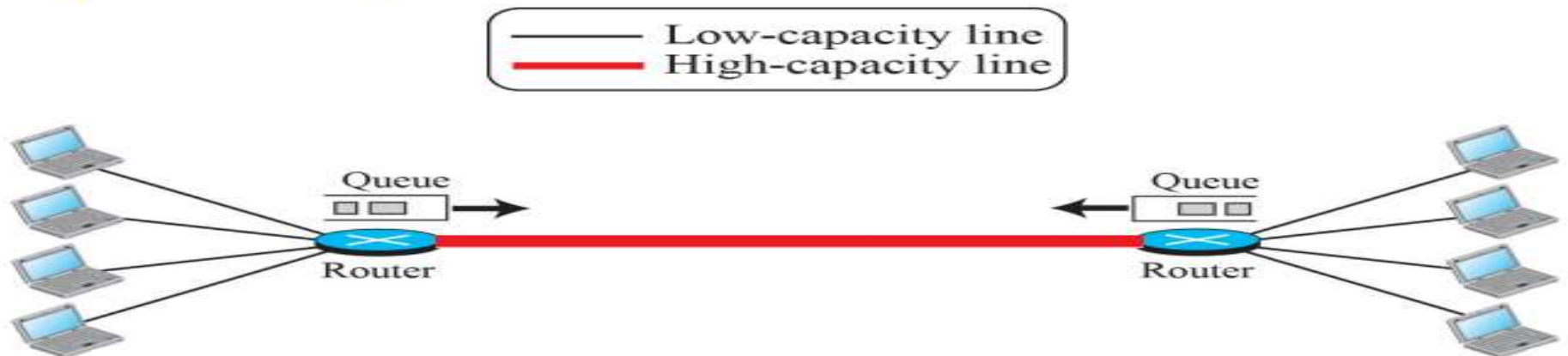


Overview of the Internet

Packet-switched network

- A **router** in a packet-switched network has a **queue** that can store and forward the packet.
- If packets arrive at one router when the communication line is already working at its full capacity, the packets should be **stored and forwarded** in the order they arrived.
- A packet-switched network is **more efficient than** a circuit switched network, but the packets **may encounter some delays**.

Figure 1.7: A packet-switched network



Overview of the Internet

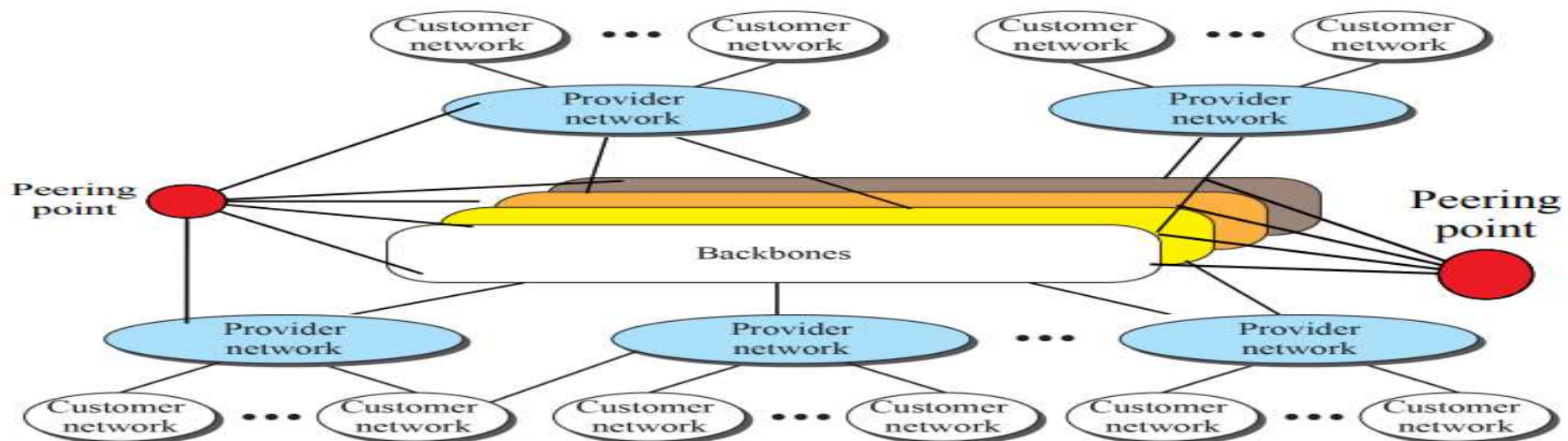
Circuit Switching	Packet Switching
In-circuit switching has there are 3 phases: i) Connection Establishment. ii) Data Transfer. iii) Connection Released.	In Packet switching directly data transfer takes place.
In-circuit switching, each data unit knows the entire path address which is provided by the source.	In Packet switching, each data unit just knows the final destination address, intermediate path is decided by the routers.
In-Circuit switching, data is processed at the source system only	In Packet switching, data is processed at all intermediate nodes including the source system.
The delay between data units in circuit switching is uniform.	The delay between data units in packet switching is not uniform.
Resource reservation is the feature of circuit switching because the path is fixed for data transmission.	There is no resource reservation because bandwidth is shared among users.
Circuit switching is more reliable.	Packet switching is less reliable.
Circuit Switching does not support store and forward transmission	Packet Switching supports store and forward transmission
In-circuit switching each packet follows the same route.	In packet switching packets can follow any route.
Circuit switching requires simple protocols for delivery.	Packet switching requires complex protocols for delivery.

Overview of the Internet

The Internet

- An **internet** (note the lowercase i) is two or more networks that can communicate with each other.
- The most notable internet is called the **Internet** (uppercase I), and is composed of thousands of inter-connected networks.
- Figure 1.8 shows a conceptual (not geographical) view of the Internet.

Figure 1.8: The Internet today

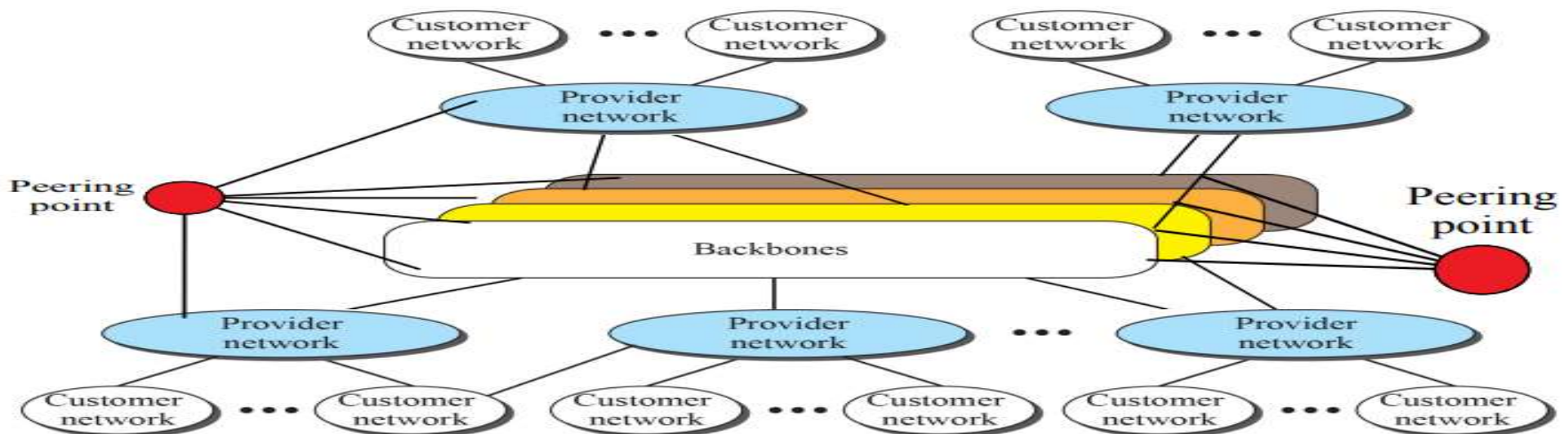


Overview of the Internet

The Internet

- **Backbones**:- large networks owned by communication companies like Verizon, Sprint, AT&T etc. These are connected through some complex switching systems, called **peering points**.
- **Provider Network**:- use the services of the backbones for a fee.
- **Customer Network**:- networks at the edge of the Internet that actually use the services provided by the Internet.

Figure 1.8: The Internet today



Overview of the Internet

Accessing the Internet

- The Internet today is an internetwork that allows any user to become part of it.
- The user needs to be physically connected to an **ISP**.
- Using Telephone Networks
 - **Dial-up Service**: Add to the telephone line a modem that converts data to voice.
 - **DSL(Digital Subscriber Line)**: Telephone companies have upgraded their telephone lines to provide **higher speed Internet services** to residences or small businesses. DSL service also allows the line to be used simultaneously for voice and data communication.
- Using Cable Networks
- Using Wireless Networks
- Direct Connection

Overview of the Internet

Accessing the Internet

- For communication to happen, we need **both hardware and software**.
 - This is similar to a complex computation in which we need both a computer and a program.
- In the next section, we learn how these combinations of hardware and software are coordinated with each other using **protocol layering**.