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DEEMED TO BE UNIVERSITY

21AIE211
COMPUTER NETWORKS
2-0-3 3

Network Topology

Types of Networks

- Local Area Networks
- Metropolitan Area Networks
- Wide Area Networks
- Wireless Networks
- Home Networks

There are many different types of network, which can be used for different purposes and by different types of people and organization. Here are some of the networks

Classification of interconnected processors by scale

Interprocessor distance	Processors located in same	Example
1 m	Square meter	Personal area network
10 m	Room	Local area network
100 m	Building	
1 km	Campus	
10 km	City	Metropolitan area network
100 km	Country	Wide area network
1000 km	Continent	
10,000 km	Planet	The Internet

Personal Area Network (PAN)

Local Area Networks (LANs)

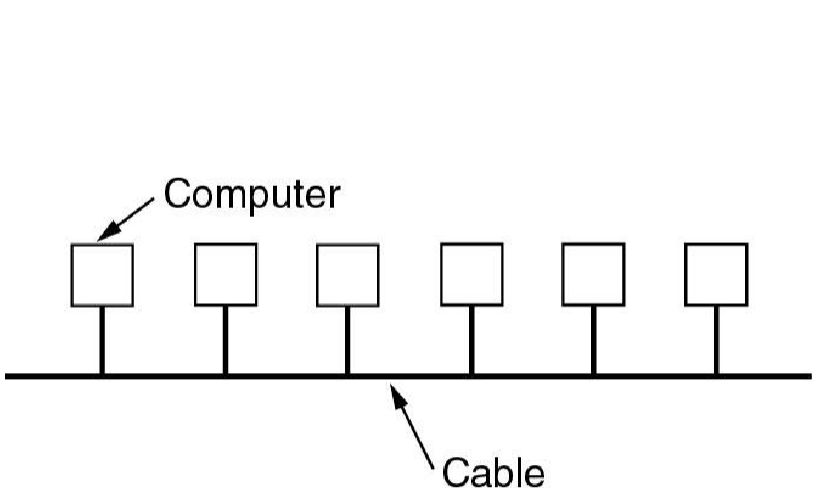
- Group of devices (computers servers, printers , switches etc located in the same building
- In close proximity to each other
- Most common type of LAN is ethernet LAN

Courtesy: powerCert Animation Videos

Local Area Networks (LANs)

A local area network or LAN is a network that connects computers within a limited area. This might be in a school, an office or even a home.

- Ethernets are most popular (up to 10 Gb/s)



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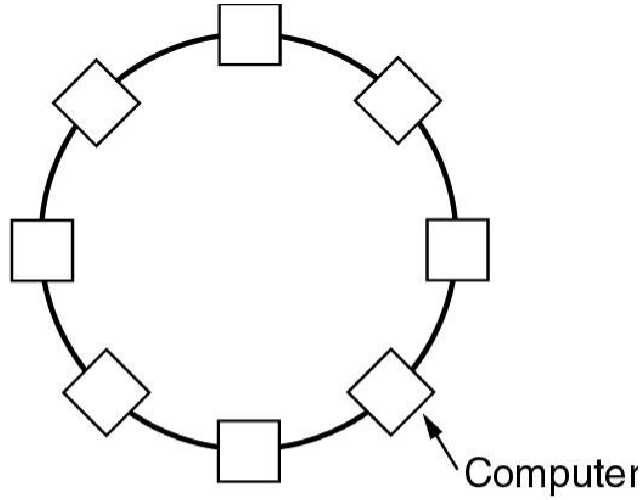


(b)

Local Area Networks

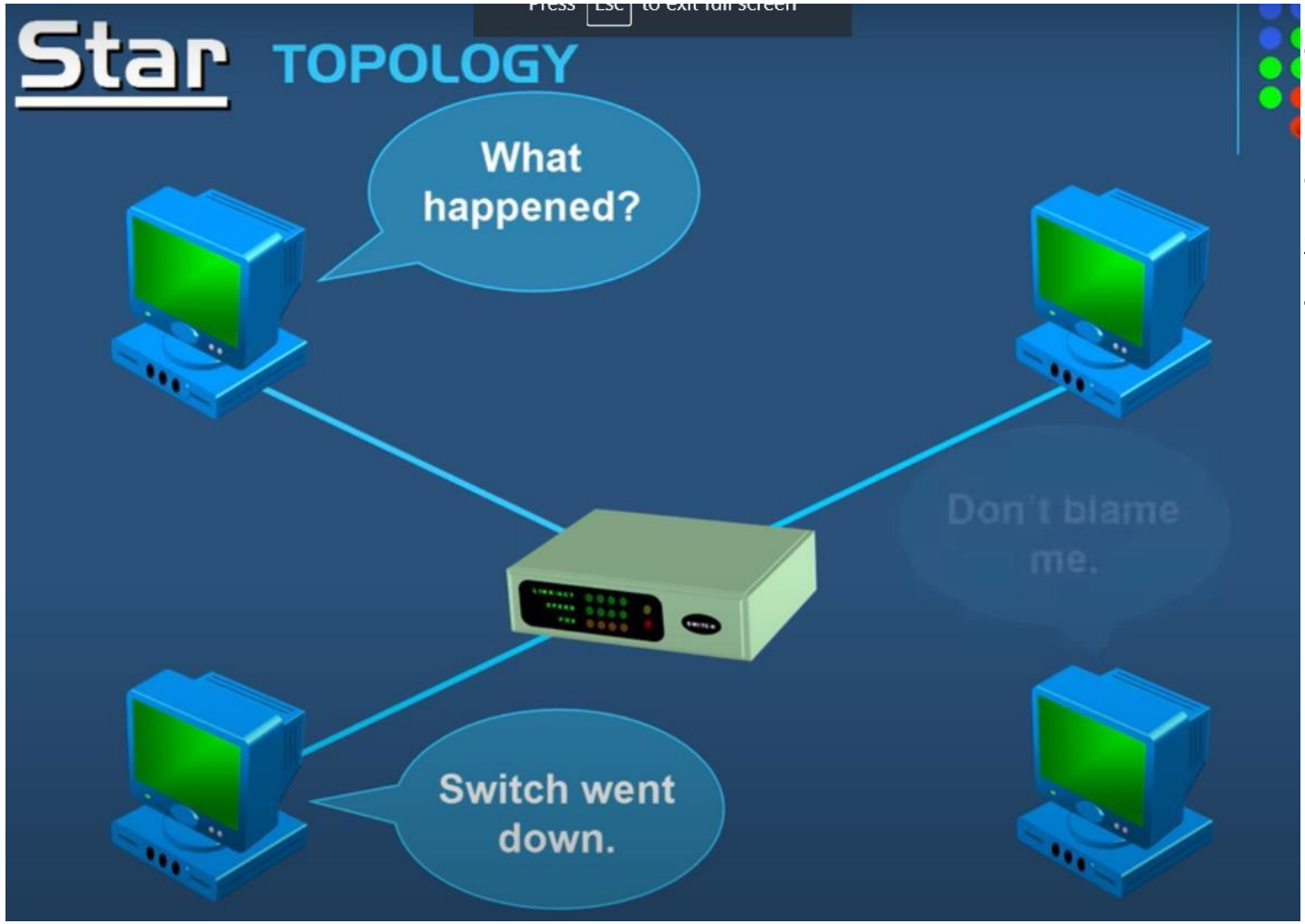
- Characteristics of LAN
  - small size
  - transmission technology
    - single cable
    - 10Mbps ~ 10Gb/s
  - topology:
    - bus
      - Ethernet (IEEE 802.3): 10 or 100 Mbps (10Gb/s)
    - ring
      - IBM token ring (IEEE 802.5): 4 or 16 Mbps

Channel allocation of broadcast networks

- static: each machine has an allocated time slot
- dynamic

IEEE 802 is a collection of **networking standards** that cover the physical and data-link layer specifications for technologies such as Ethernet and wireless

Network Topologies- STAR

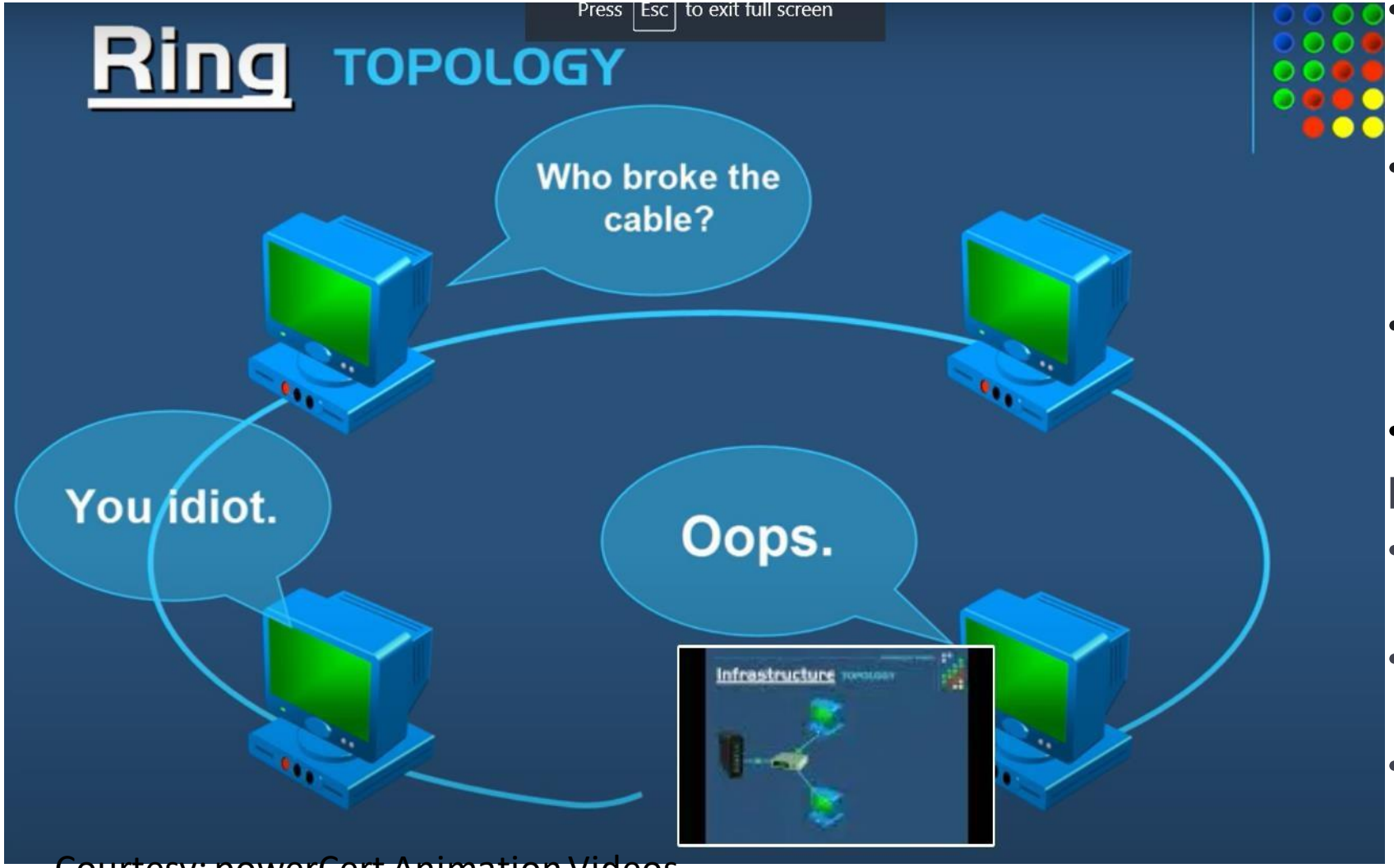


Courtesy: powerCert Animation Videos

- Pros
- If N devices are connected to each other in star topology, then the number of cables required to connect them is N. So, it is easy to set up.
- Each device require only 1 port i.e. to connect to the hub.

- Cons
- If the concentrator (hub) on which the whole topology relies fails, the whole system will crash down.
- Cost of installation is high.
- Performance is based on the single concentrator i.e. hub.

Network Topologies- RING



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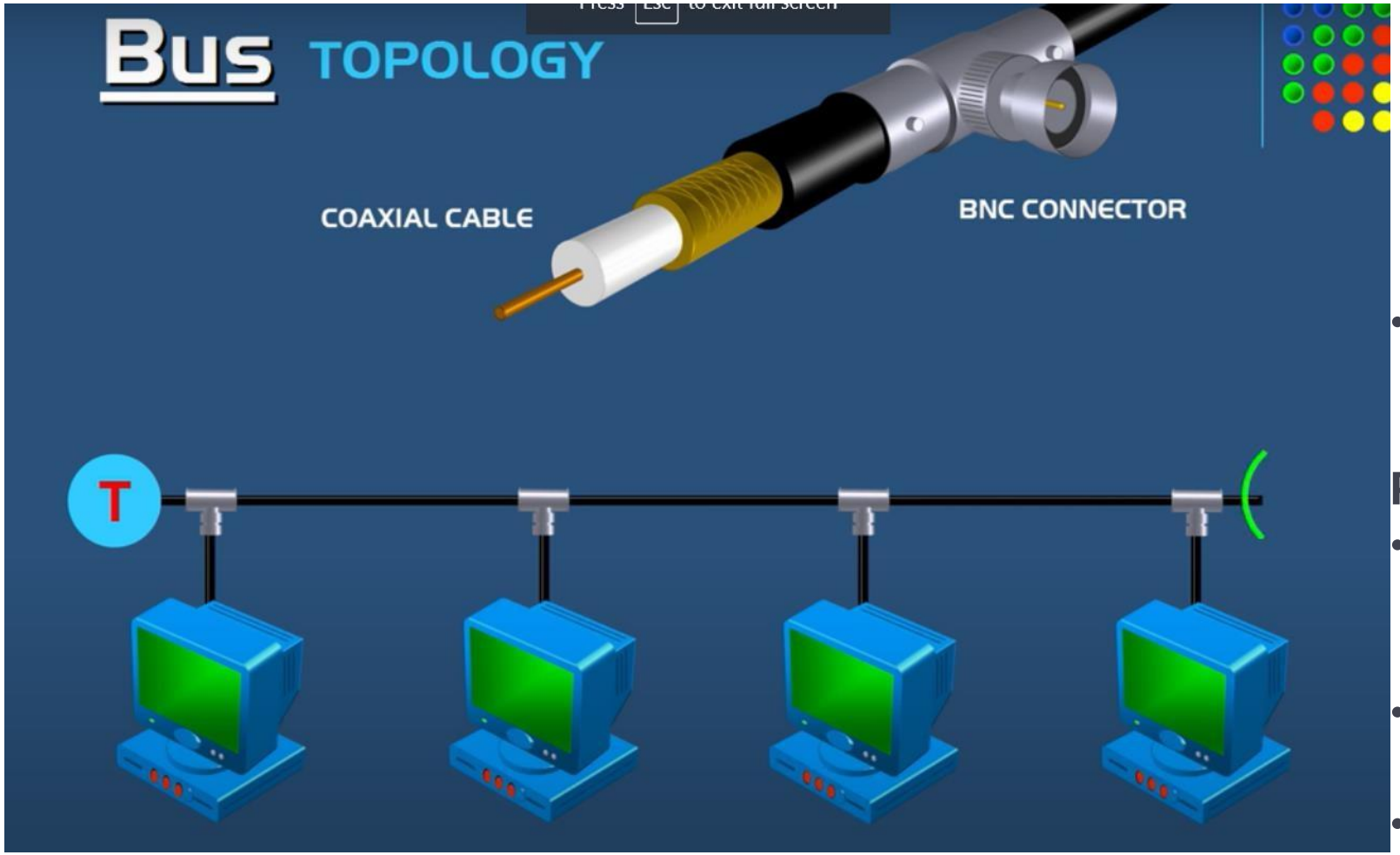
Advantages of this topology :

- All data flows in one **direction**, reducing the chance of packet collisions.
- A network server is not needed to control network connectivity between each workstation.
- Data can transfer between workstations at high speeds.
- Cheap to install and expand.

Problems with this topology :

- If one computer goes wrong all will go wrong
- Troubleshooting is difficult in this topology.
- Addition of stations in between or removal of stations can disturb the whole topology.

Network Topologies- BUS



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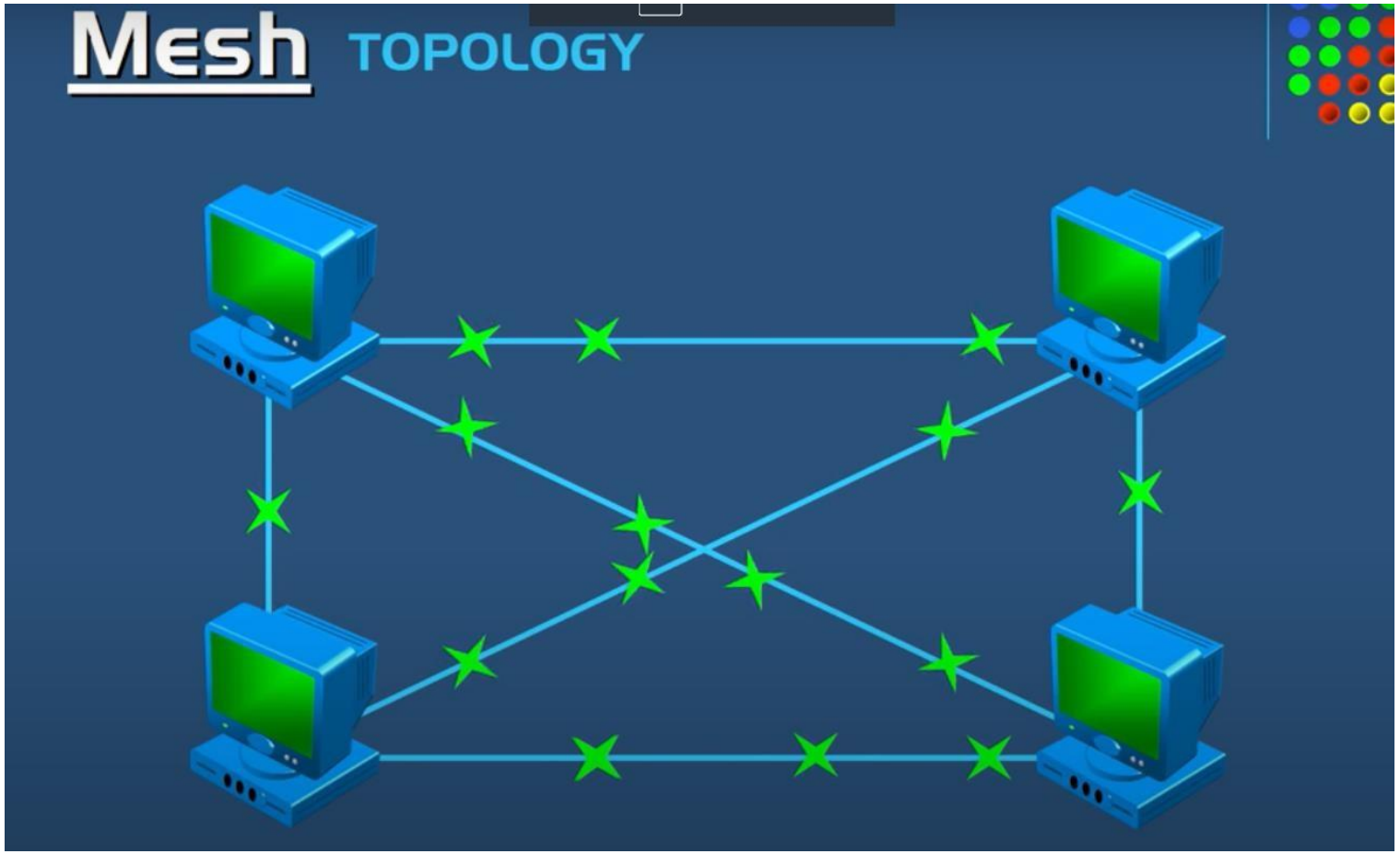
Advantages of this topology :

- If N devices are connected to each other in bus topology, then the number of cables required to connect them is 1 ?which is known as backbone cable and N drop lines are required.
- Cost of the cable is less as compared to other topology, but it is used to built small networks.

Problems with this topology :

- If the common cable fails, then the whole system will crash down.
- If the network traffic is heavy, it increases collisions in the network..
- Terminator gets open data flow disrupted

Network Topologies- MESH



Advantages of a mesh topology

- Manages high amounts of traffic, because multiple devices can transmit data simultaneously.
- A failure of one device does not cause a break in the network or transmission of data.
- Adding additional devices does not disrupt data transmission between other devices.

Disadvantages of a mesh topology

- The cost to implement is higher than other network topologies, making it a less desirable option.
- Building and maintaining the topology is difficult and time consuming.
- The chance of redundant connections is high, which adds to the high costs and potential for reduced efficiency.

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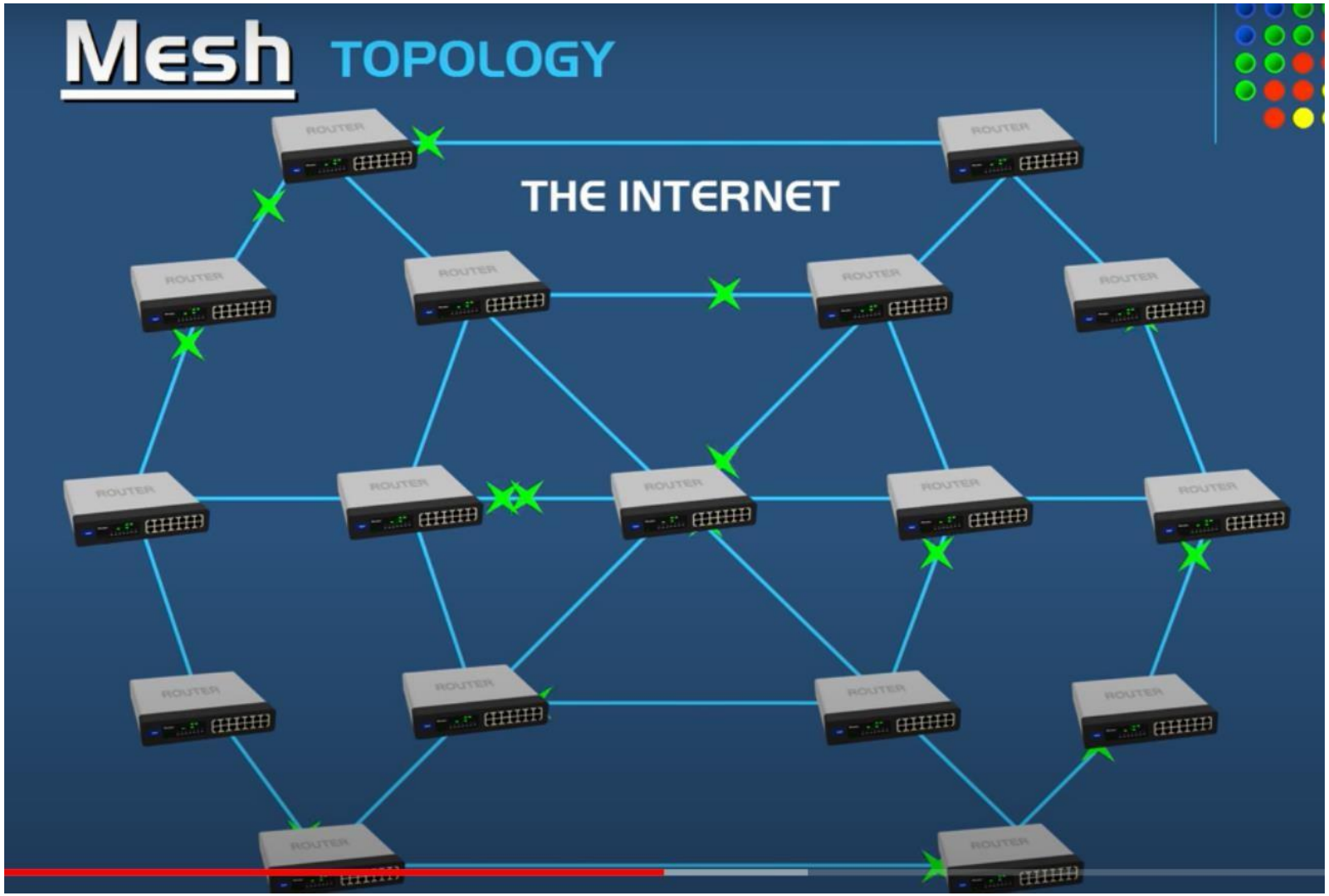

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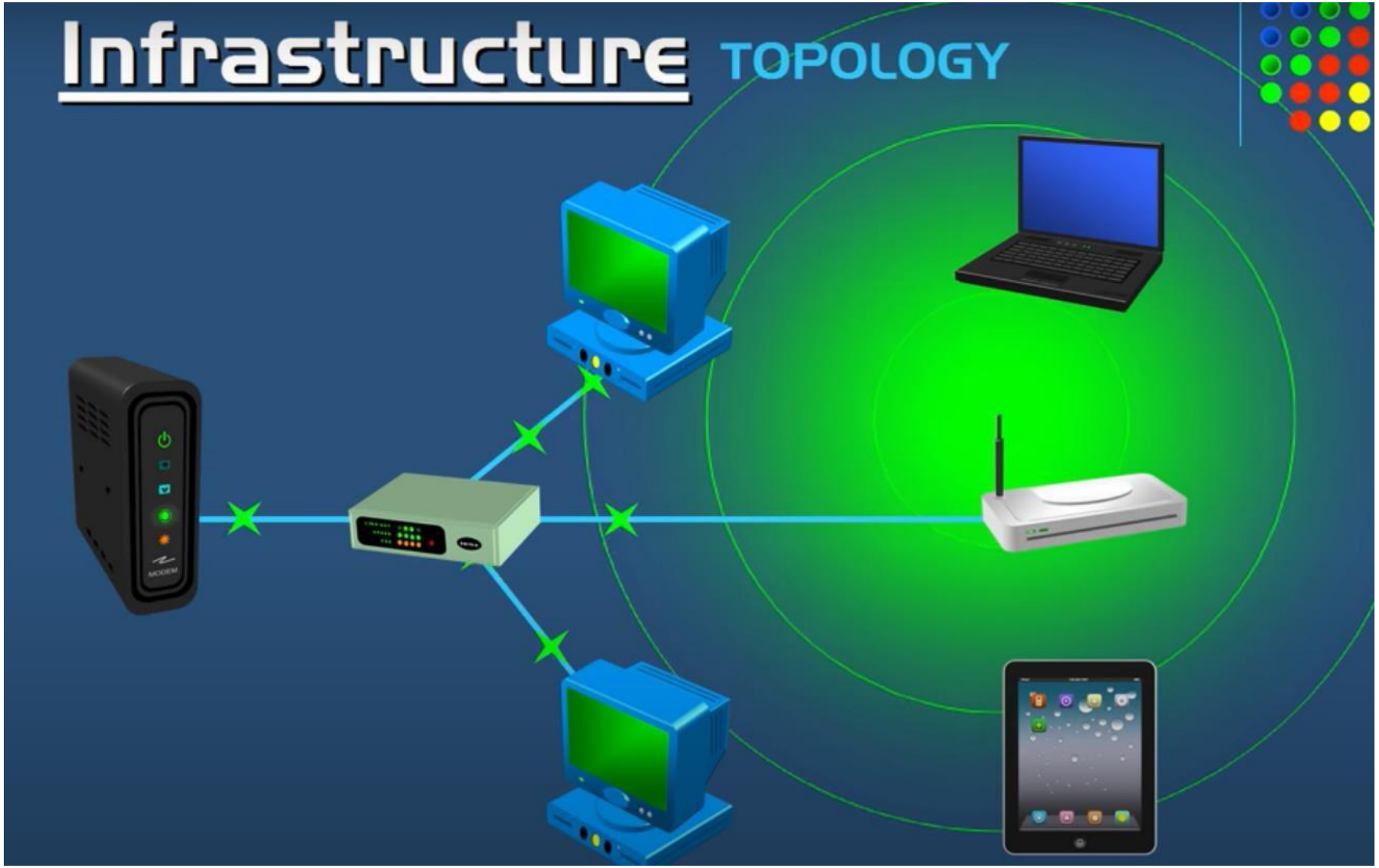
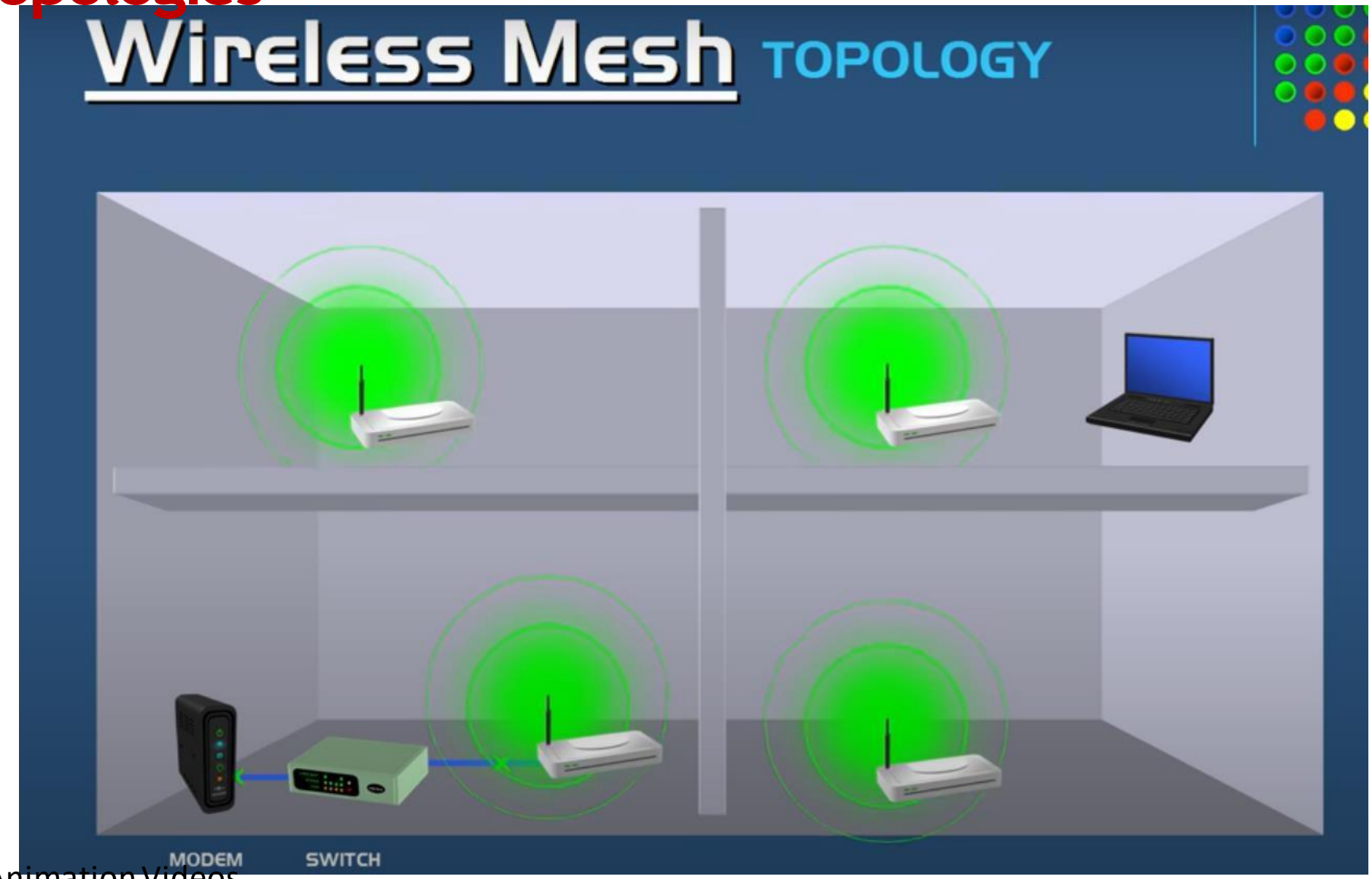
Wireless Topologies



Wireless Topologies



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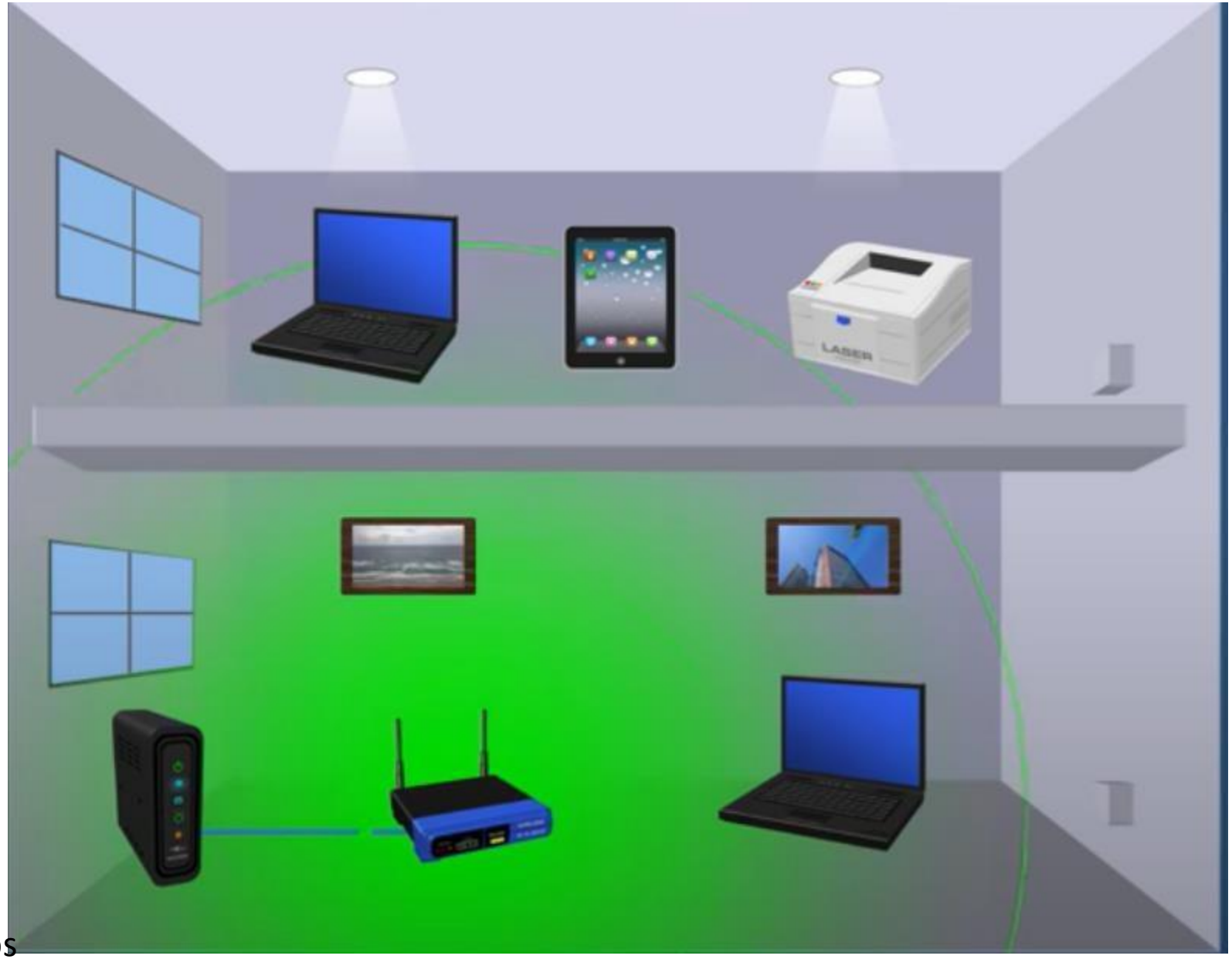
Wireless LAN

- Use wireless connection instead of wired



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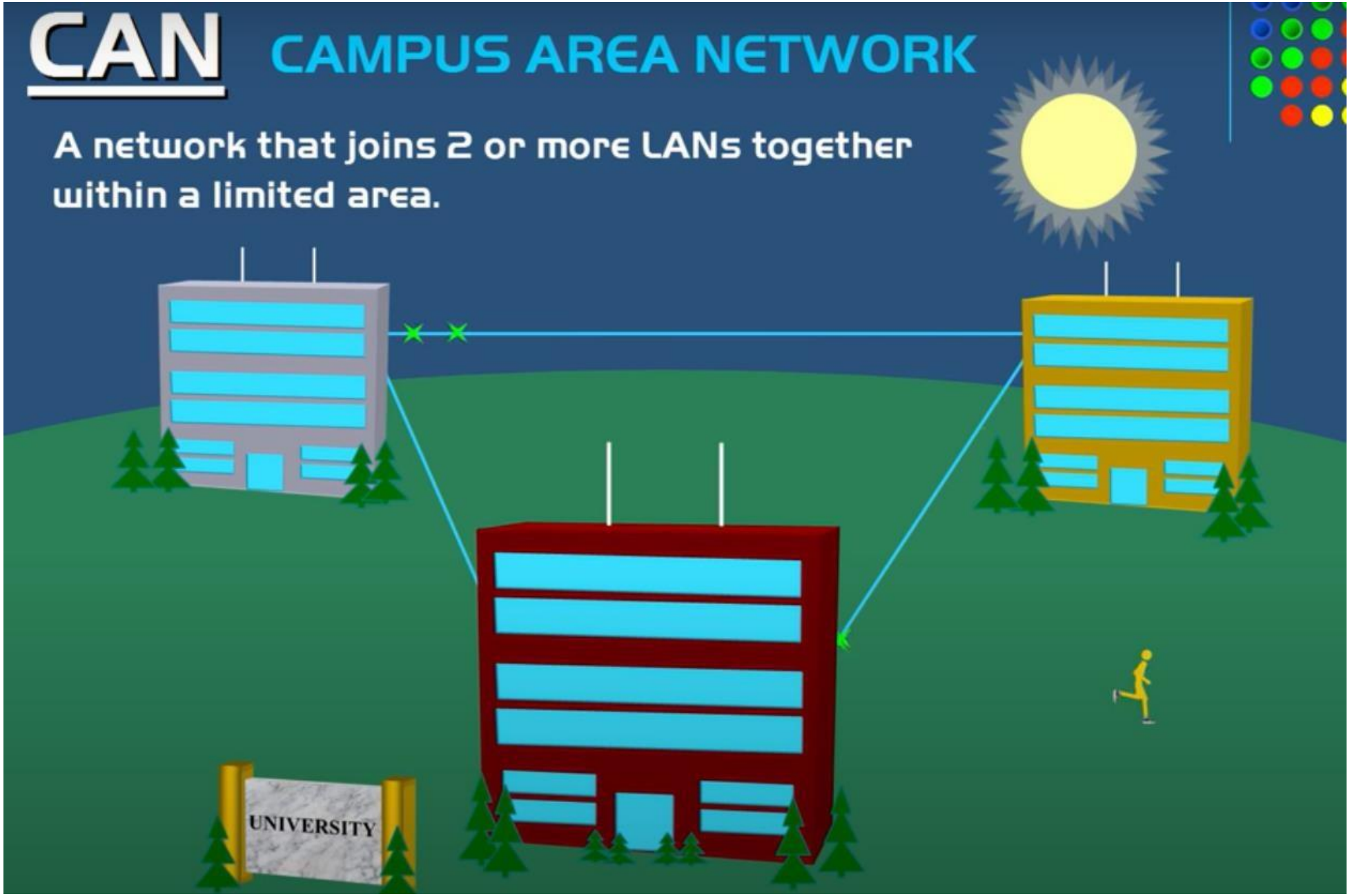
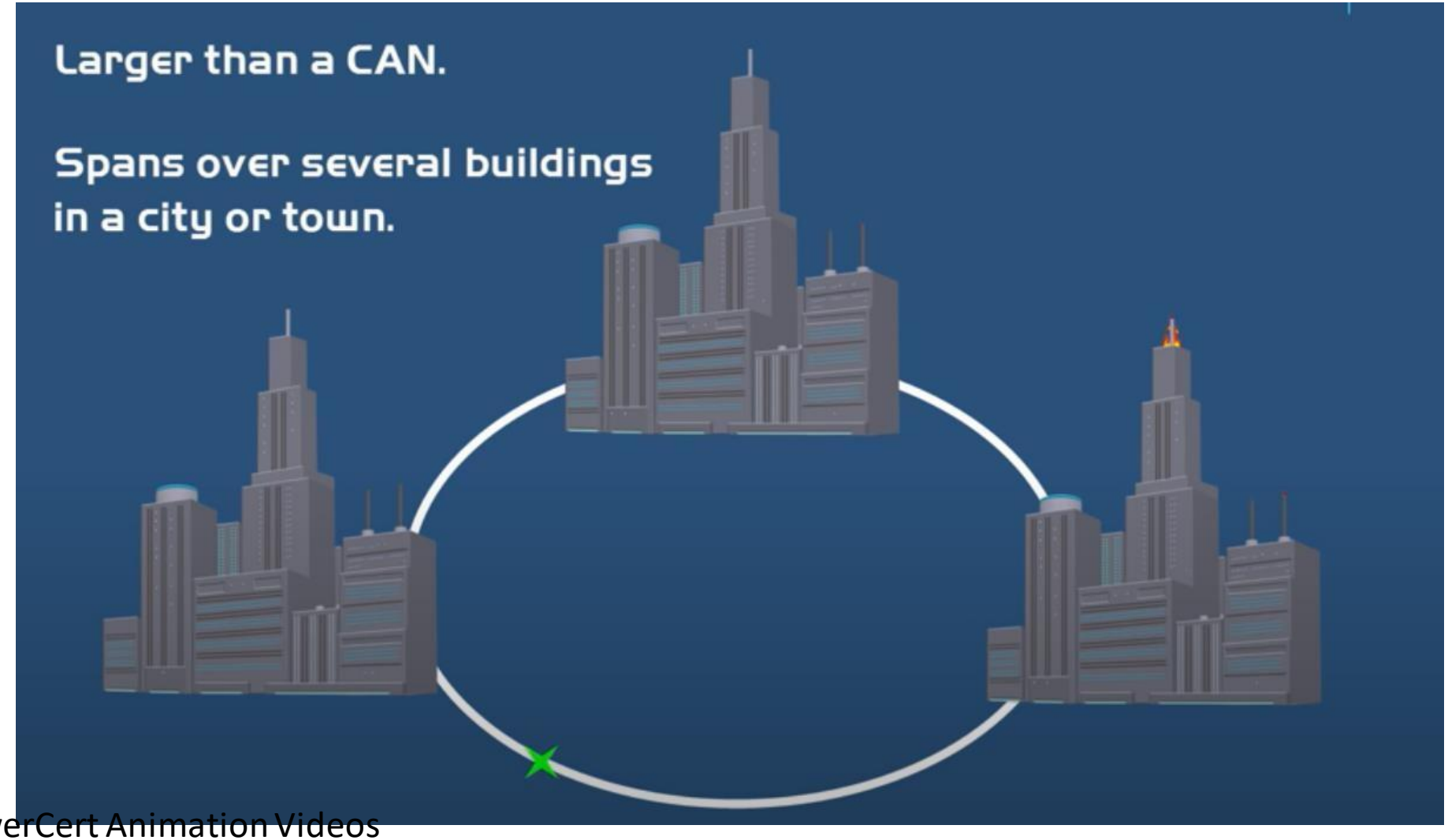

CAN
CAMPUS AREA NETWORK
A network that joins 2 or more LANs together within a limited area.
UNIVERSITY

MAN (Metropolitan Area Network)



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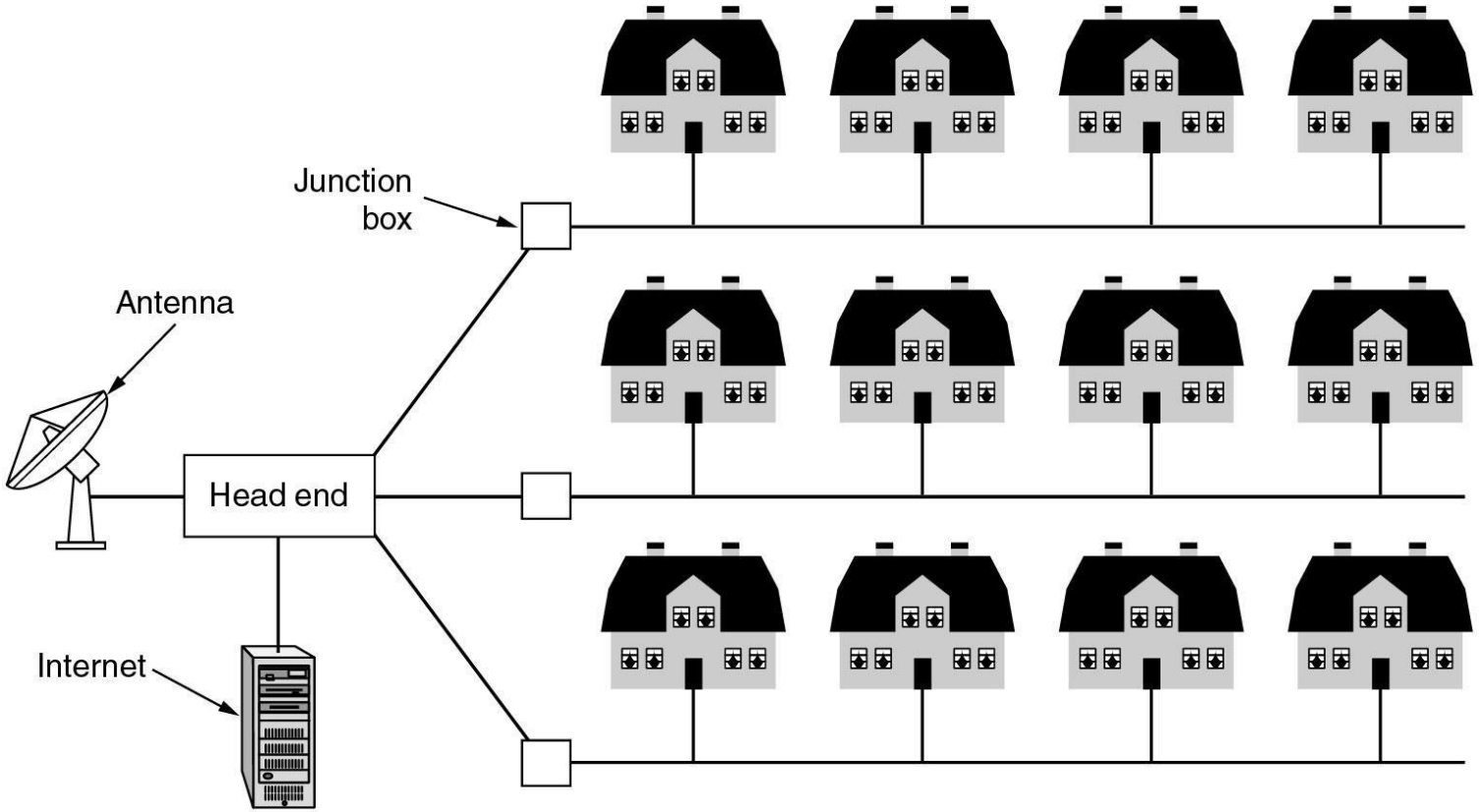
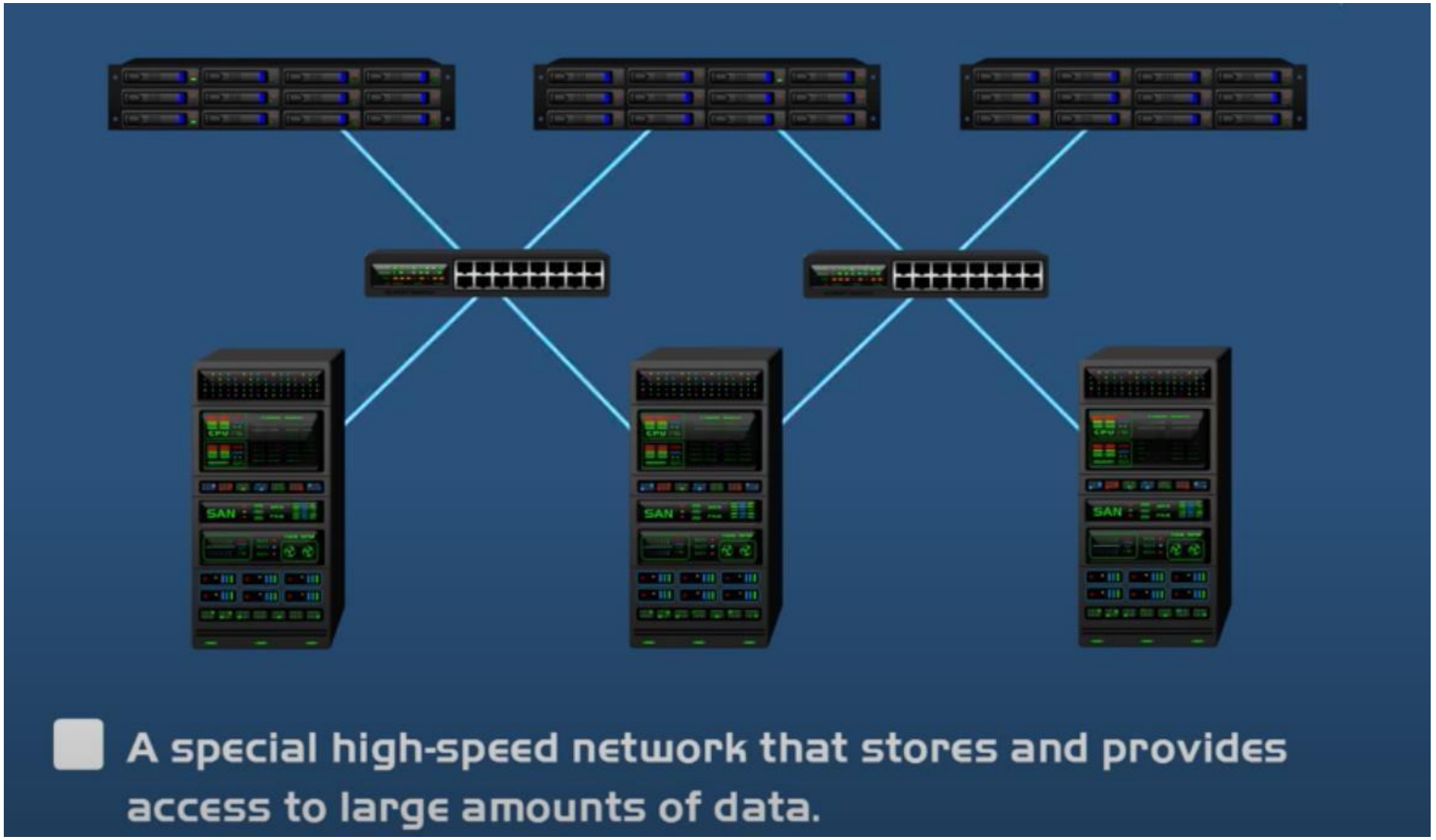
Metropolitan Area Networks

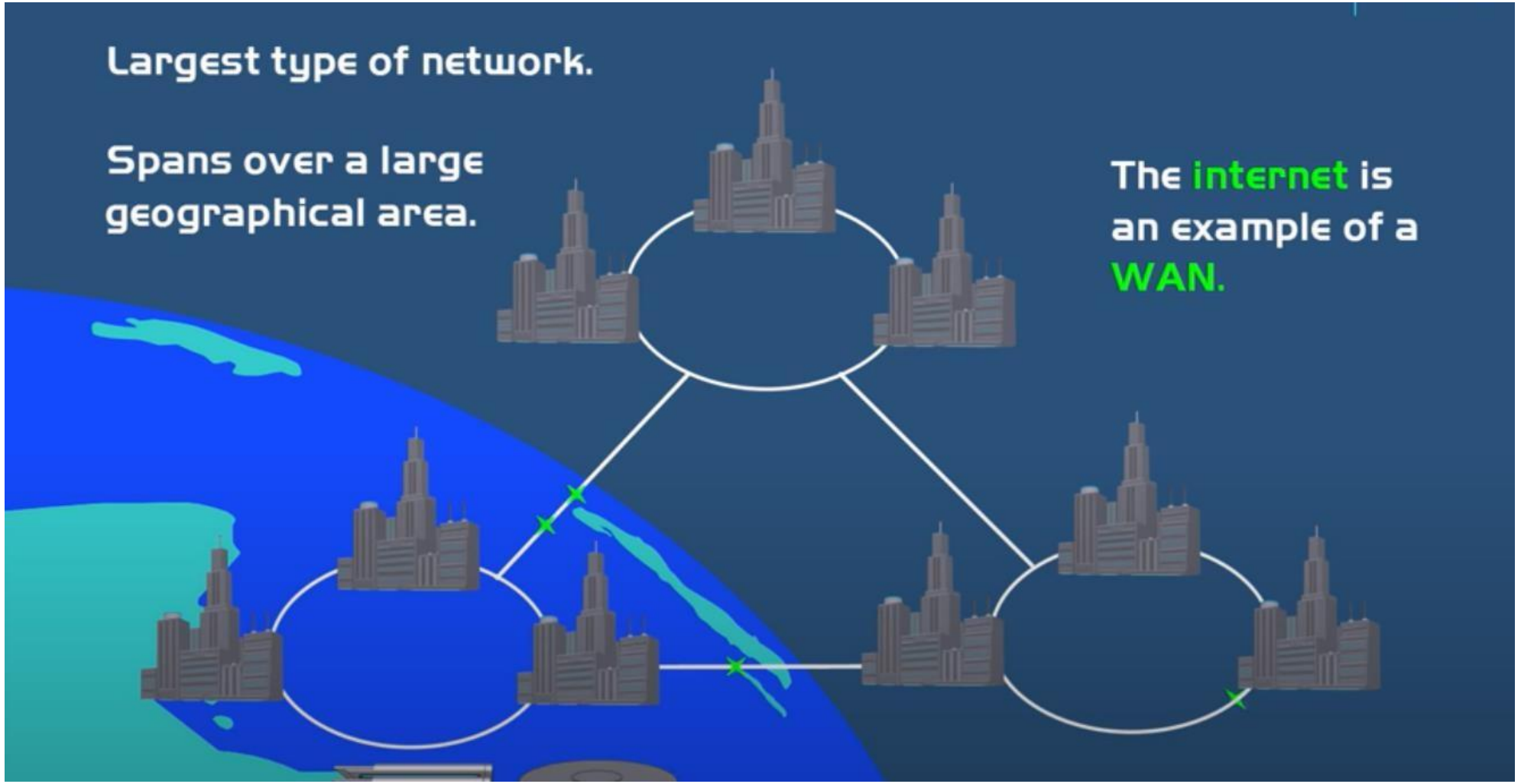
- A metropolitan area network based on cable TV.



SAN (Storage Area Network)



WAN(Wide Area Network)

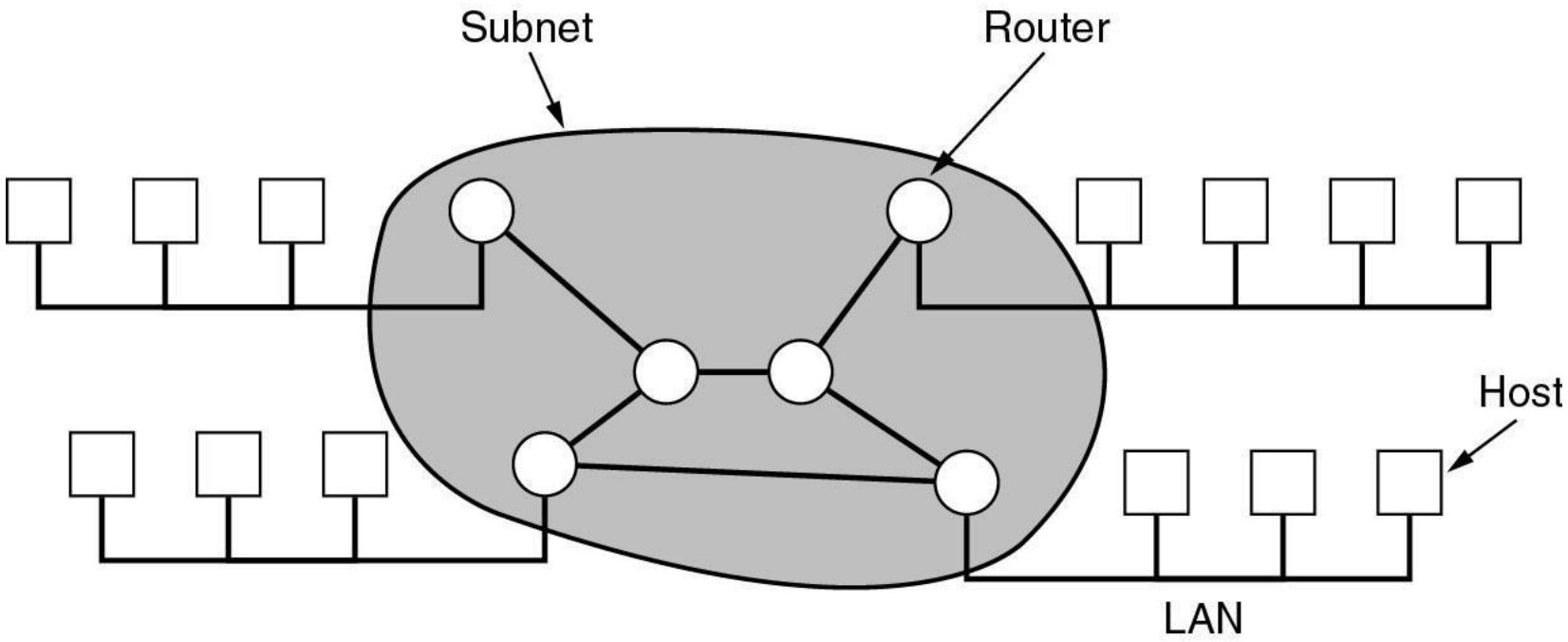


Wide Area Networks (WANs)

- WANs are **point-to-point** networks
- WANs consist of two distinct components:

transmission lines (copper, fiber, microwave) and **switches** (electronics, optics)

- **Store-and-forward** or **packet-switched** subnet



- Relation between hosts on LANs and the subnet.

Wide-Area Wireless Access: 3G 4G and LTE

- Wireless infrastructure used for cellular telephony to send/receive packets through a base station that is operated by the cellular network provider.
  - iPhones and Android devices are being used to message, share photos in social networks, watch movies, and stream music while on the run
  - Unlike WiFi, a user need only be within a few tens of kilometers of the base station.
- The fourth-generation (4G) of wide-area wireless networks—are already being deployed pretty much everywhere.
- LTE (for "Long-Term Evolution has its roots in 3G technology, and can achieve rates in excess of 10 Mbps.
- LTE downstream rates of many tens of Mbps have been reported in commercial deployments
  - Difference between them is the speed of the network.
  - When selecting a smartphone, the older models may not support the newer data network technology. It is important to select a model that supports a data speed appropriate for your needs.

Generation of network technology: The third generation network, known as **3G**, is the oldest technology of the group. **4G** is the fourth generation data network and **LTE** stands for Long Term Evolution.

History of Networking

- 1969: ARPANET
- 1970's: ALOHA, Ethernet, DECNet, SNA
- 1980's: Proliferation of LAN (Ethernet, Token Ring)
- 1987: High speed LAN/MAN (FDDI), BISDN (ATM)
- 1990: High speed WAN (NSFNET, 45 Mbps)
- 1993: High speed Ethernet (Fast Ethernet, EtherSwitch)
- 1996: Interent II (622Mbps)
- 1998: Gigabit Ethernet

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