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Introduction to networking

Networking Fundamentals

What you will learn

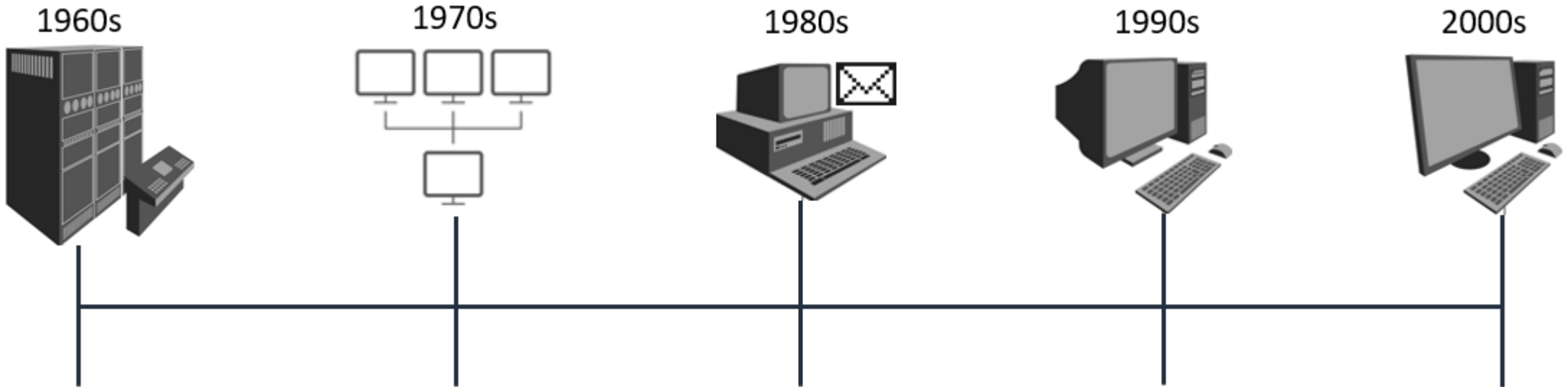
At the core of the lesson

You will learn how to:

- Define basic networking terms
- Explain what the Internet is, its purpose, and its function for users.
- Identify the main components of a computer network

What is the Internet?

Basic history of how the internet was born



Packet-switching theory was tested.

Transmission Control Protocol (TCP)/Internet Protocol (IP) was developed.

Dial-up was introduced and allowed email communication.

World Wide Web, Windows 95, and the uniform resource locator (URL) are used.

Networking, the internet, and devices evolved from LAN devices to wireless devices.

What is computer networking?

A network is like a highway

Networking is like an interstate highway system that connects cities and states together, from one point to another.

A network is like a highway system, where a car travels (like a message) from point A to point B.

What is computer networking?

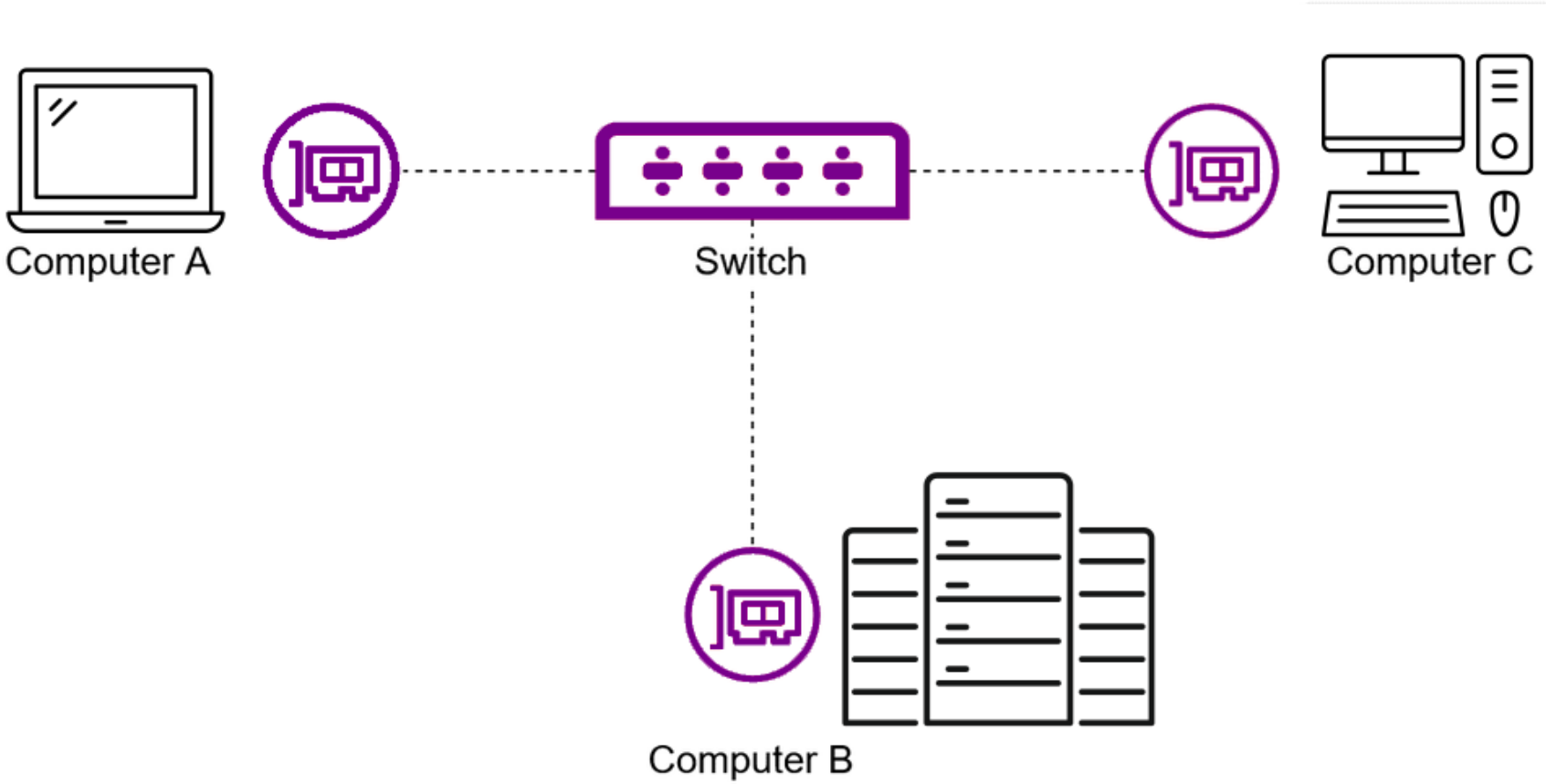
What is computer networking?

- A **computer network** is a collection of computing devices that are logically connected together to communicate and share resources.

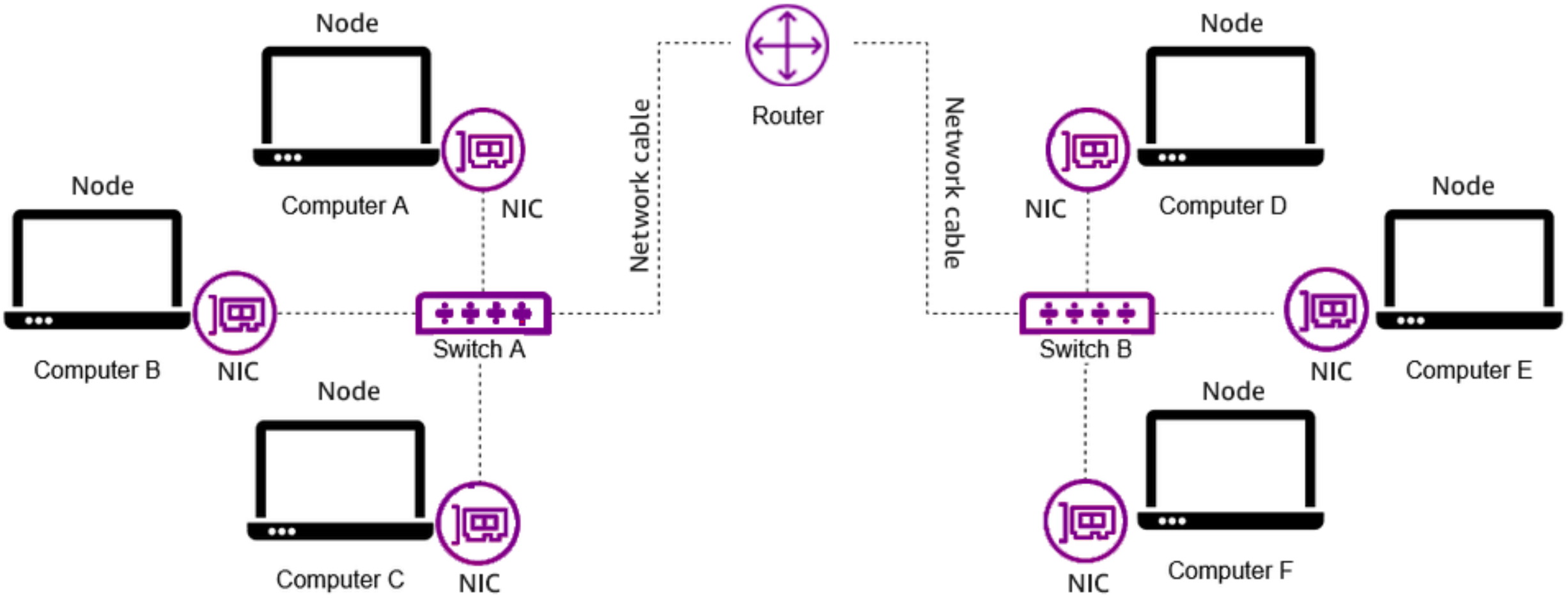
- A **node** refers to any device on the network. (Examples: computer, routers, printers)

- A **host** is a node that has a unique function. Other devices connect to nodes so they can access data or other services. (Example: server)

Basic a computer network



Elements of a computer network



Data and the OSI model

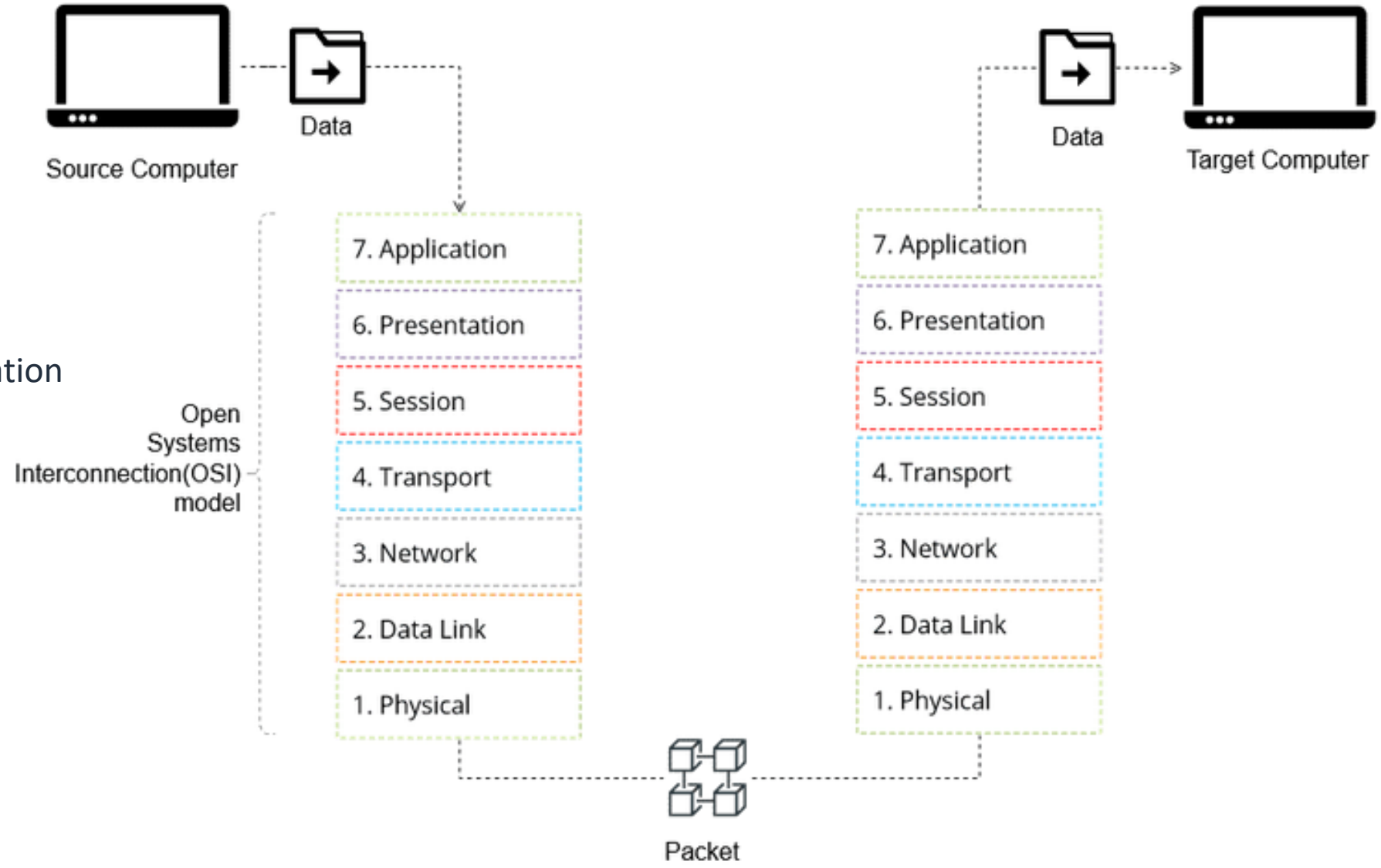
What is data?

What is Data?

- In computing, it’s bits and bytes, which equal the value of zero or one.
- There are many types of data:
    - Character
    - Text
    - Number
    - Media

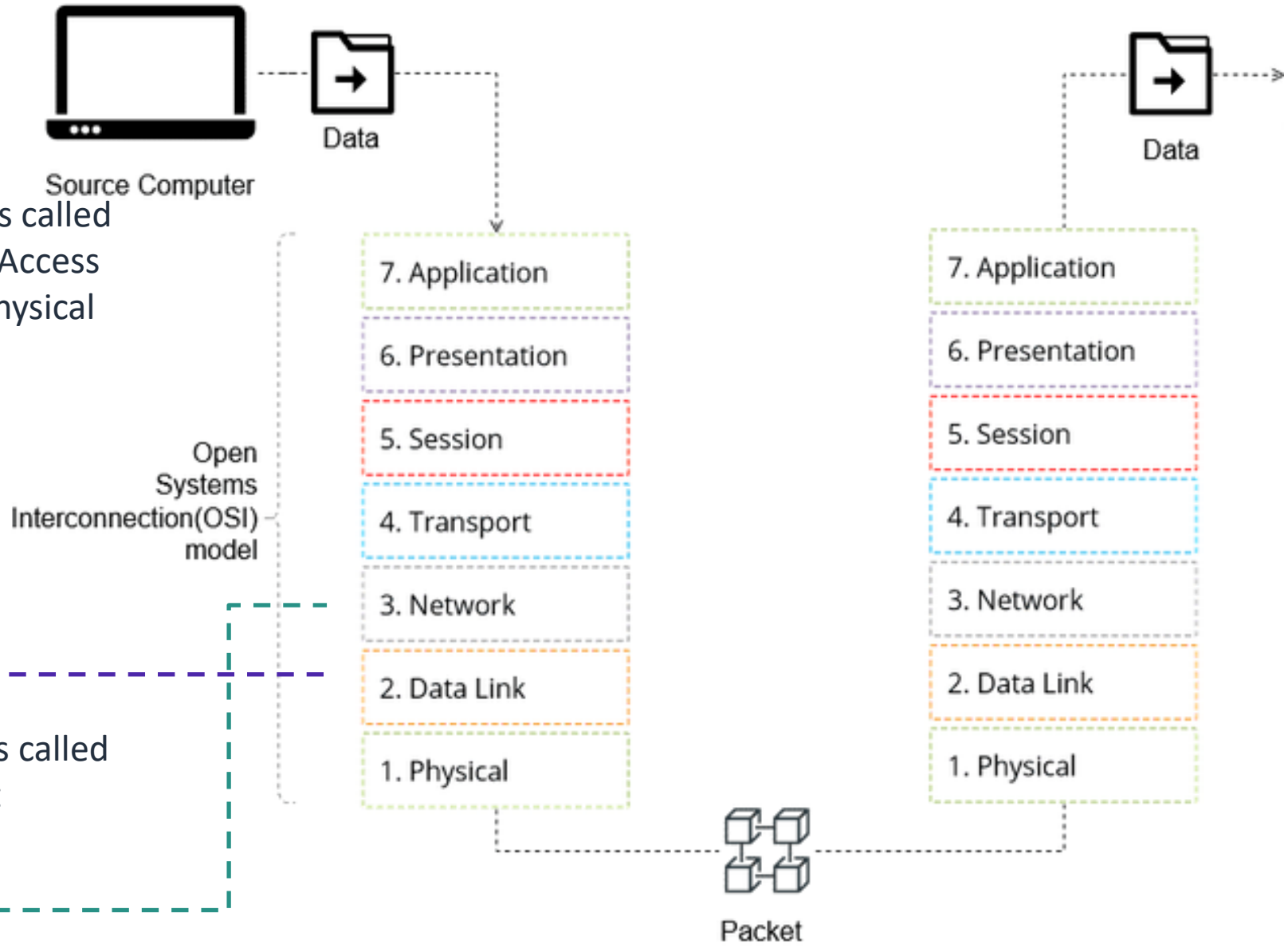
The OSI Model

The **Open Systems Interconnection (OSI) model** defines a standard for how computers can share information over a network.



Data

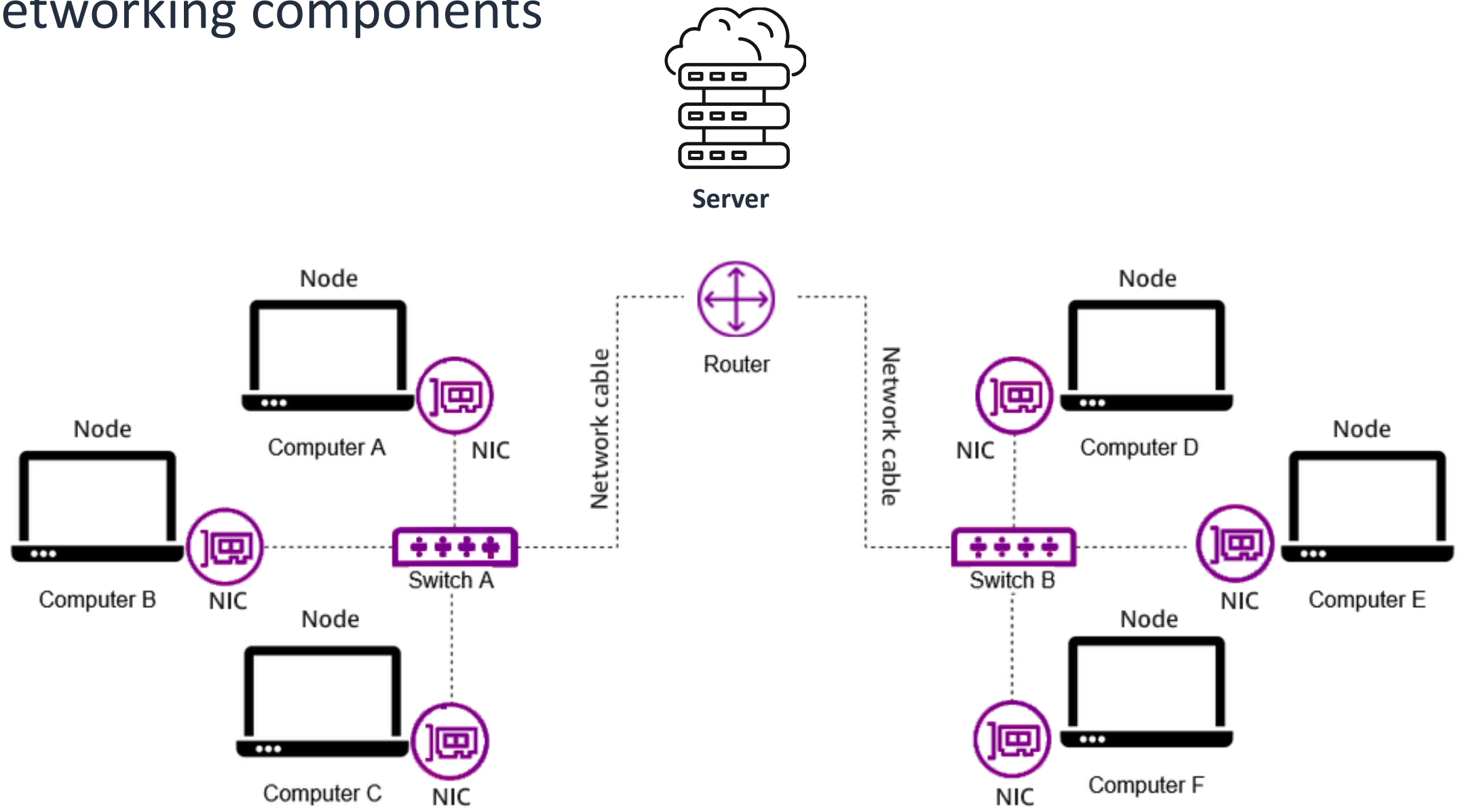
At **layer 2** (data link layer) a message or data is called a **frame**. Frames are associated with a Media Access Control (**MAC**) **address** which is known as a physical address.



At **layer 3** (network layer) a message or data is called a **packet**. Packets are associated with Internet Protocol (**IP**) **addresses**.

Networking components

Networking components



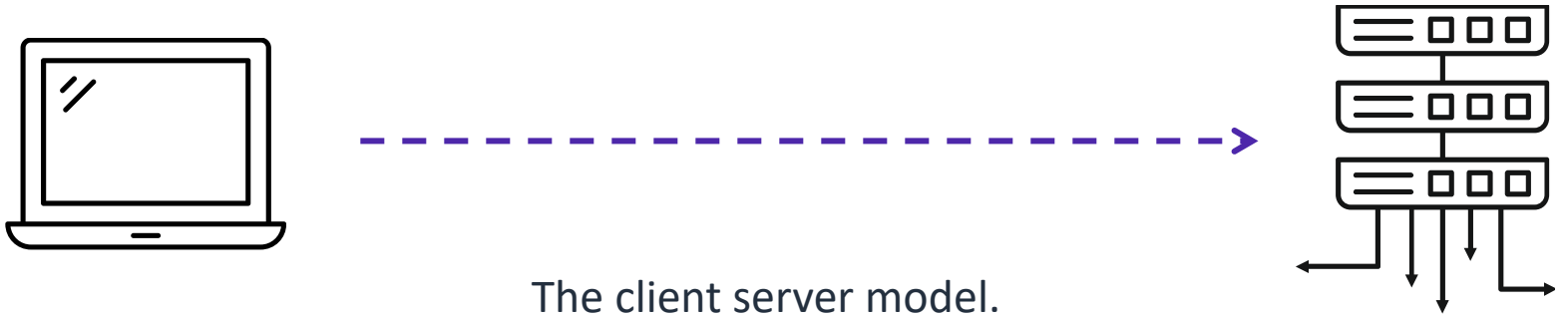
Client

What is a client

A **client** is a computer hardware device that allows users to access data and a network.

How it works

The client makes the request to the server.



The client

The client server model.

The server

Example

A user orders an item from amazon.com. The client sends the request to Amazon's servers. The client connects to the server over a network.

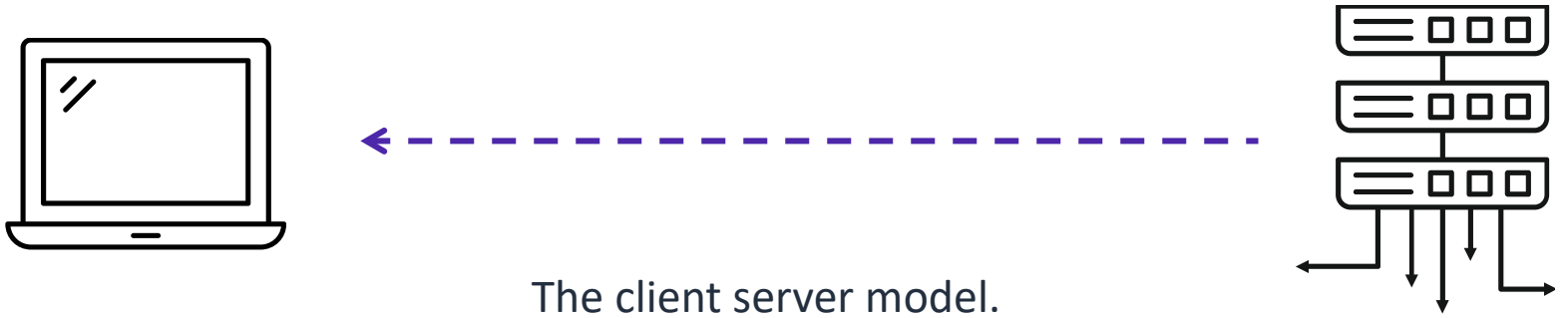
Server

What is a server

A **server** provides a response to a request from a client computer over a network.

How it works

The server responds to the client's request with the requested content.



The client

The client server model.

The server

Example

Once the customer purchases an item from amazon.com, the server from Amazon sends the response with an order number.

Data

- At **layer 2** (data link layer) a message or data is called a **frame**. Frames are associated with a Media Access Control (**MAC**) **address** which is known as a physical address.
- At **layer 3** (network layer) a message or data is called a **packet**. Packets are associated with Internet Protocol (**IP**) **addresses**.

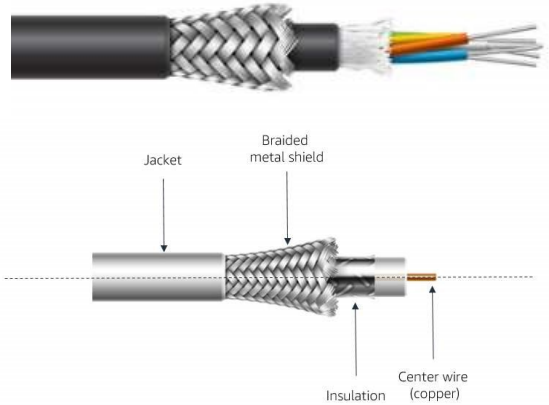
Network interface card (NIC)

A **network interface card (NIC)** connects a computer to a computer network. It is also sometimes referred to as a *network adapter*.

- It uses a cable that is connected to a hub or a switch.
- Each NIC has its own media access control (MAC) address. The MAC address is a unique physical (hardware) identifier that is assigned by the manufacturer. It's used to identify the sender and receiver of data.
- NIC works in layer 2 since it has a MAC address even though it has physical components.

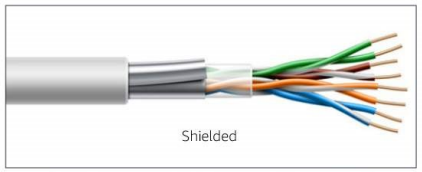
Network cables

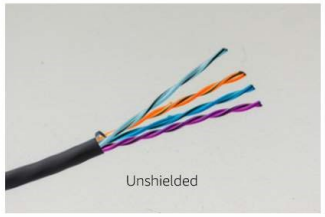
Network cables are used to physically connect networks together. Most network nodes are linked together by using some type of cabling. There are three cables:



Fiber-Optic: Most common cable today; it transmits light instead of electricity.

Coaxial: This is being replaced by fiber-optic, now mainly used to connect cable TV modems to an internet service provider (ISP).



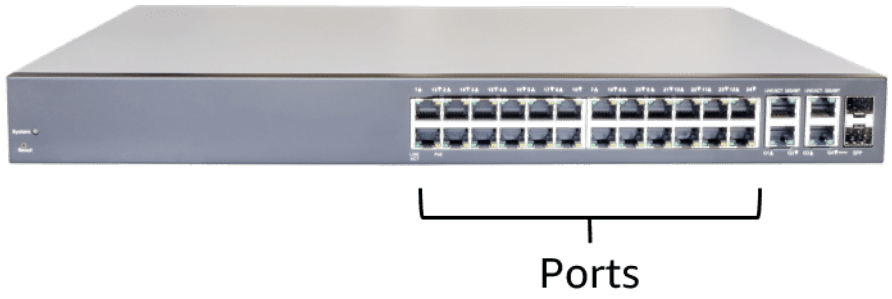


Twisted-Pair: This is the most common type of computer, telephone, and network cable. Also known as an Ethernet cable.

Switch

A **switch** is a device that connects all the *nodes* of a network together.

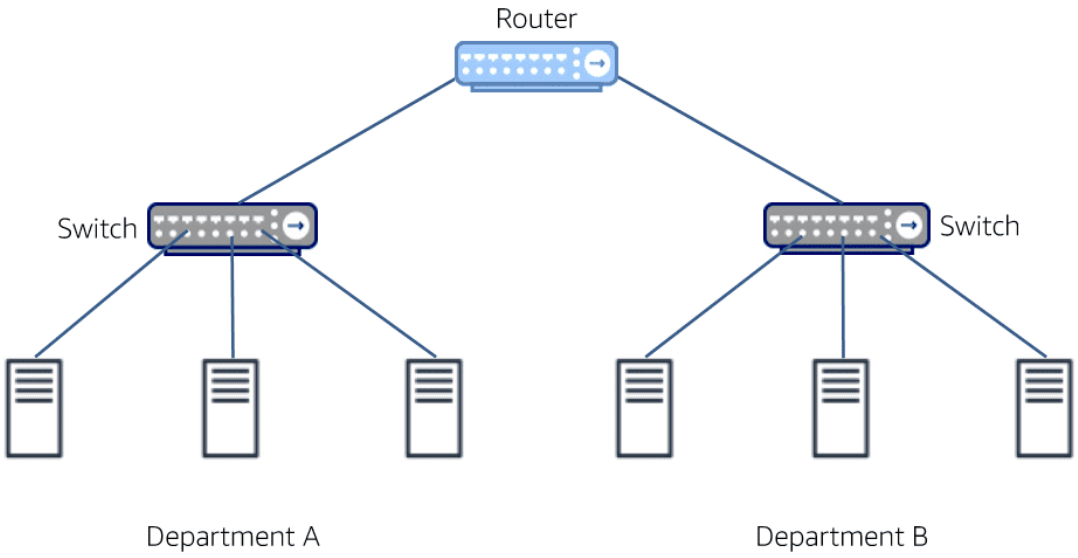
- Every hardwired device in the network uses a network adapter or NIC to connect directly to a *port* on the hub or switch through a single cable.
- It’s a device that transmits data to only the receiving device using the **MAC address**.
- This device operates at layer 2 of the OSI.



Router

A **router** is a network device that connects multiple network segments into one network.

- It connects multiple switches and their respective networks to form a larger network (that is, it acts as a switch between networks).
- It can also filter the data that goes through it, which enables data to be routed differently.
- This device operates at layer 2 and 3 of the OSI.



This diagram shows two switched networks (subnets) – Department A and B that are interconnected through a router.

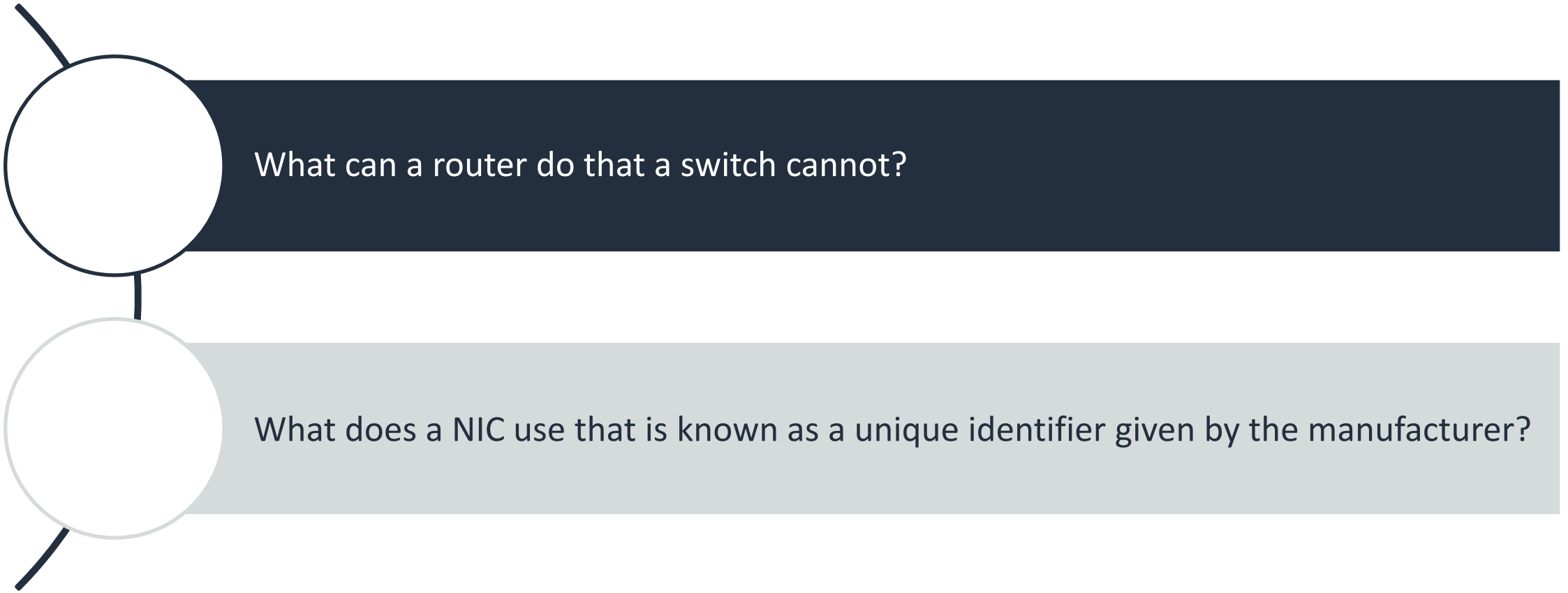
Modem

A **modem** connects your home to the internet.

There are usually two ports that are used in a modem, one that connects your modem to the outside internet, and the other to your router if you have one.

An example of a modem, where the coaxial cable connects from internet service provider (ISP) to your modem. Depending on the modem, you will then have wireless internet or connect it to a router.

Checkpoint questions



Key takeaways

- A computer network is a collection of computing devices that are logically connected to communicate and share resources.
- The main components of a computer network include:
  - Client devices
  - Servers
  - Network adapters (NIC) and cables
  - Switches
  - Routers
- The OSI model is a standard of how computers share information.

Thank you

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