**Ethernet**

***A. What is Ethernet?***

Ethernet is a set of networking technologies used primarily for local area networks (LANs). It defines how devices on a network can communicate with each other through a ***wired connection (kết nối có dây).***

***B. Why is the Ethernet used?***

- **Reliability**: Ethernet is known for its stable and dependable connections.

- **Speed**: Ethernet offers high-speed data transfer, crucial for tasks like streaming, online gaming, and large file transfers.

- **Security**: Wired connections are generally more secure than wireless, making the Ethernet a preferred choice for sensitive data.

- **Simplicity**: Setting up an Ethernet network is relatively straightforward.

***C. Who uses Ethernet?***

- **Home users**: For connecting computers, gaming consoles, and smart TVs to the internet.

- **Businesses**: In offices for connecting computers, printers, servers, and other network devices.

- **Organizations**: Schools, hospitals, and other institutions rely on Ethernet for their internal networks.

***D. When is Ethernet used?***

- **When a wired connection is preferred or required**: Situations where wireless signals might be weak or unreliable, or where security is a top priority.

- **For high-bandwidth activities**: Streaming high-definition video, online gaming, transferring large files.

- **In environments where interference is a concern**: Wired connections are less susceptible to interference from other devices.

***E. Where is the Ethernet used?***

- **Homes**: Connecting devices within a home network.

- **Offices**: Connecting computers and devices within a business network.

- **Data centers**: For high-speed connections between servers and network equipment.

-Anywhere a reliable, high-speed wired network is needed.

***F. How does Ethernet work?***

- **Cables (Dây Cáp)**: Ethernet uses cables (typically Cat5e or Cat6) to connect devices to a central hub, switch, or router.

- **Network Interface Cards (NICs)**: Devices need a NIC to connect to an Ethernet network. Most modern computers have built-in NICs.

- **Protocols (Giao thức)**: Ethernet uses protocols like TCP/IP to ensure data is transmitted correctly between devices.

- **Switches**: In modern Ethernet networks, switches are used to direct traffic between devices efficiently.

**ETHERNET FRAME**

A diagram of different types of information

Description automatically generated

**I. Preamble (Mẫu - 7 bytes):**

This is a sequence of alternating 1s and 0s that helps the receiving device synchronize its clock with the incoming data.

**II. Start Frame Delimiter (SFD - Giới hạn Bắt đầu khung – 1 byte)**

This marks the end of the preamble and indicates the start of the frame.

**III. Destination MAC Address (Địa chỉ MAC Đích – 6 bytes)**

This is the *unique identifier (mã định danh duy nhất)* of the device that should **receive the frame**

**IV. Source MAC Address – 6 bytes:**

This is the unique identifier of the device that **sent the frame**

**V. EtherType/Length (Kiểu Ether/Độ dài – 2 bytes):**

This field indicates the type of protocol in the payload or the length of the payload data (Trường này cho biết loại giao thức trong payload hoặc độ dài của dữ liệu payload).

**Vi. Payload (46 to 1500 bytes):** This is the actual data being transmitted.

**VII. Frame Check Sequence (FCS – 4 bytes):** This is a checksum that helps the receiving device detect any errors in the frame.

**VII. FastEthernet and GigabitEthernet**

|  |  |  |
| --- | --- | --- |
| **Feature** | **FastEthernet (100BASE-TX)** | **Gigabit Ethernet (1000BASE-T)** |
| **Speed** | 100 Mbps | 1000 Mbps (1 Gbps) |
| **Standard** | IEEE 802.3u | IEEE 802.3ab |
| **Cabling** | Cat5, Cat5e, Cat6 | Cat5e, Cat6, Cat6a, Cat7 |
| **Signaling** | Primarily uses two pairs of wires | Uses all four pairs of wires |
| **Encoding** | 4B/5B, MLT-3 | 8B/10B, PAM-5 |
| **Maximum Cable Length (Typical)** | 100 meters (328 feet) | |
| **Collision Domain** | Shared (Hub) or switched | Switched (Dedicated) |
| **Cost (Historically)** | Lower | Higher (Initially), now comparable |
| **Prevalence** | Less common now | More common |
| **Key Advantage** | Cost-effective for basic needs (now less relevant) | High speed, suitable for demanding applications |
| **Key Disadvantage** | Limited bandwidth compared to Gigabit | More expensive equipment (initially) |