- LAN  $\Rightarrow$ in small place
- WAN ⇒In big area like internet
- CAN  $\Rightarrow$  Bigger than LAN
- MAN  $\Rightarrow$  Bigger than CAN
- SAN $\Rightarrow$  in servers



- Router  $\Rightarrow$  Use to connect more than network (using IP)
- Hub  $\Rightarrow$  use to link more than devices in the LAN
- Switch  $\Rightarrow$  like hub but more intelligence (use MAC)
- Single duplex  $\Rightarrow$  send and not receive like radio
- Half duplex  $\Rightarrow$ Send and Receive but not in the same time like
- Full duplex  $\Rightarrow$  Send and Receive in the same time
- unicast  $\Rightarrow$  connect between to computer
- Multicast  $\Rightarrow$  connect between one computer and more one but not all
- Broadcast  $\Rightarrow$  connect between one computer and all computer

- IP ⇒ (Internet Protocol) address is a unique identifier assigned to every device connected to a network that uses the Internet Protocol for communication
- Every thing i do in the internet I can doit because i have IP address
- The most widely used version.
- Format: Four sets of numbers separated by dots (e.g., 192.168.1.1).
- Each number ranges from 0 to 255 (8 bits per number, totaling 32 bits).
- Provides approximately 4.3 billion unique addresses.
- Example: 172.16.254.1.
- and it has Network address  $\Rightarrow$  the address of the network
- Host address  $\Rightarrow$  the address of the devise in the network



#### ARP

 ARP ⇒ (Address Resolution Protocol) is a fundamental networking protocol used to map a logical IP address to a physical MAC address on a local network. It operates at the data link layer (Layer 2) of the OSI model and is essential for communication within a local area network (LAN).

## IP

## How it work?

- Request: When a device wants to communicate with another device on the same network, it checks its ARP cache (a table storing IP-to-MAC mappings). If the MAC address for the destination IP is not found, the device sends an ARP request broadcast message to all devices on the network, asking, "Who has this IP address?"
- 2. **Response**: The device with the matching IP address responds with an **ARP reply**, providing its MAC address.

#### NIC

- To make the network exist we need NIC which is hardware in devices help us to transfer data from (word) to (binary) and help the receiver to transfer in **reverse** way
- you may ask we don't have one in mobile phone but there are wire and wireless
- The mac address is Unique to every NIC
- The first three group of hexadecimal digits refer to company and last three to device

## NAT

- Maps a single private IP address to a single public IP address.
- Typically used when a specific device inside the network needs to be accessible from the outside (e.g., a web server)

#### DNS

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- DNS  $\Rightarrow$ domain name server
- when i want to search about website I write domain name
- computer doesn't understand domain name he want ip of this web site
- in this case DNS come

- **TCP**  $\Rightarrow$  (Transmission Control Protocol ) we use it if we send important data and the fast of transport not very important like (email & message )
- UDP ⇒ (User Datagram Protocol) we use it if the speed is very important but he not accurate like live videos

# OSI 7 Layer

## **Application** layer

Search for the suitable protocol and choose it

## **Presentation layer**

- 1. Trantlastion the data from (ab...) to bianry numbers
- 2. Data compression to make it easy to transfre
- 3. Make Encryption to data

### **Session layer**

- 1. choose Transmission mode (simple , half duplex , full duplex)
- 2. Session Management (like the photo appear in Facebook when you are offline)
- 3. Authentication (log in Facebook)
- 4. Authorization (the access of your email)

#### **Transport layer**

- make segmentation to data (make pieces of data and every pieces has port number and sequential number) to help in transfer and the reserve make DE segmentation)
- 2. Flow control  $\Rightarrow$  choose the flow of the data which suitable for all
- 3. Choose the best from (TCP & UDP)
- TCP ⇒ (Transmission Control Protocol) we use it if we send important data and the fast of transport not very important like (email & message)
- UDP ⇒ (User Datagram Protocol) we use it if the speed is very important but he not accurate

### **Network layer**

- Logical Addressing ⇒ give the IP of the transporter and reserve and the out of the data call Packet
- 2. Routing  $\Rightarrow$  Choose the best way to send the data

## Data Link layer

- 1. give physical address( the MAC address of the source and the destination) to data and the out of the data transfer from Packet To Frame
- 2. Access for media for upper layers
- 3. Data Detections & Correction

#### **Physical layer**

transfer Frame of data to signal (suitable for every media )



## SQL Injection

SQL Injection is a type of **hacking technique** where a bad person (attacker) tricks a website or application into running harmful commands on its database. This happens when the website doesn't properly check or clean the information that users type into forms (like login boxes or search bars).

It happen in application layer

#### How it happen

- 1. Normal Use:
  - When you type your username and password into a login form, the website sends that information to its database to check if it's correct.
  - Example: If you type username: john and password: 1234, the website might run this command:

#### SELECT \* FROM users WHERE username = 'john' AND password = '1234';

- 2. Hacker's Trick:
  - Instead of typing a normal username or password, the hacker types something sneaky like ' OR '1'='1.
  - The website then runs this command:
- SELECT \* FROM users WHERE username = " OR '1'='1' AND password = " OR '1'='1';
  - The part '1'='1' is always true, so the database lets the hacker in without needing a real username or password.