



WALCHAND COLLEGE OF ENGINEERING, SANGLI
(Government Aided Autonomous Institute)
WALCHAND LINUX USERS' GROUP



**EXCITING
PRIZES**

**LIMITED
SEATS**

01

**BORN TO
BOOT**

**16
AUG**

WARGAMES

**17
AUG**

**FILE
FORGE**

03

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02

**COMMAND
QUEST**

**NET
NAVIGATORS**



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COMPUTER NETWORKING



CONTENTS

- What is a Network
- Components of a Network
- IP addresses
- Ports
- Socket Address
- OSI Model
- Networking commands





“People after learning computer networking”

WHAT IS A NETWORK?

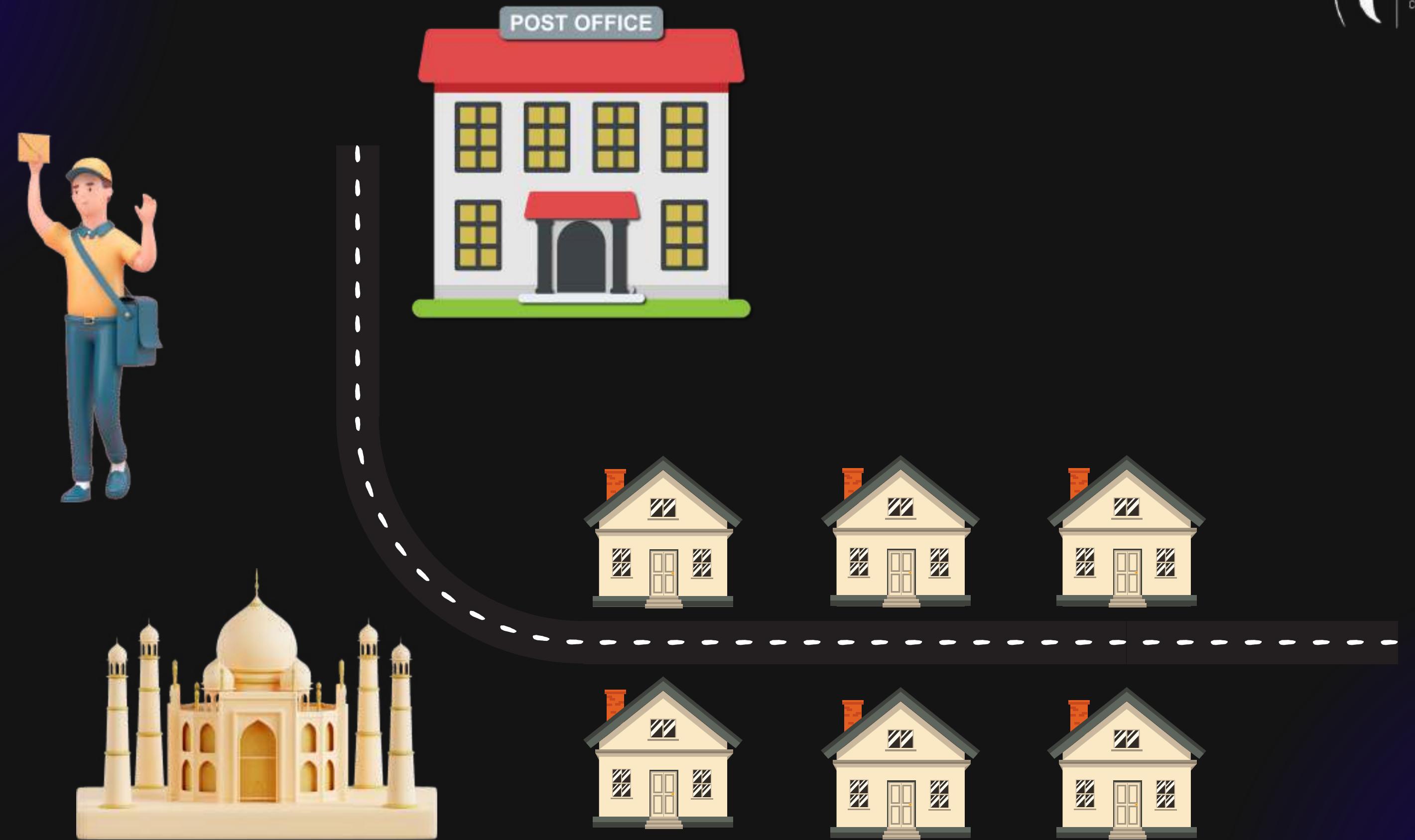
- A collection of devices connected together to share resources and data
- Share resources and data
- Enables communication between computers, servers, routers, etc.



Terms in a network

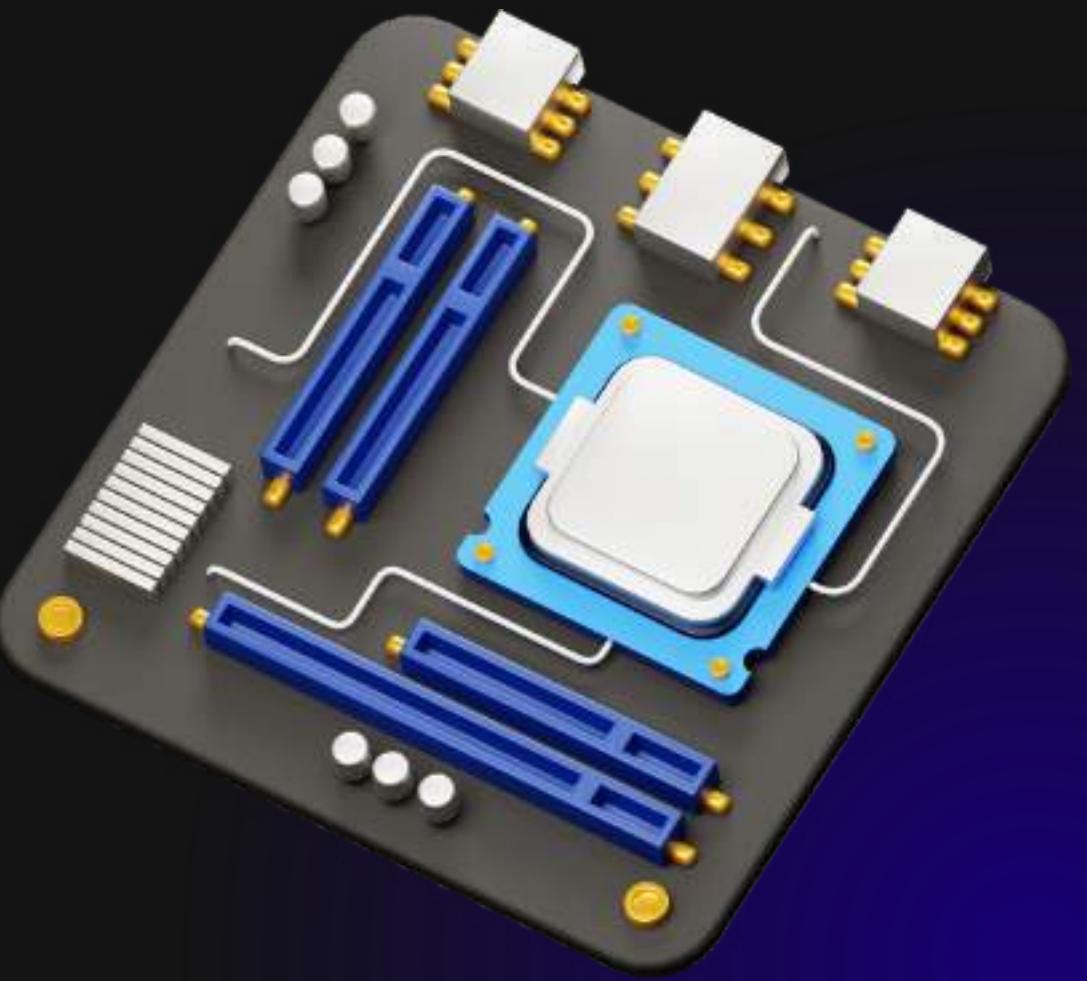
- Client - Requests services
(e.g., your laptop accessing a website)
- Server – Provides services/data
(e.g., web server, file server)





Components of a network

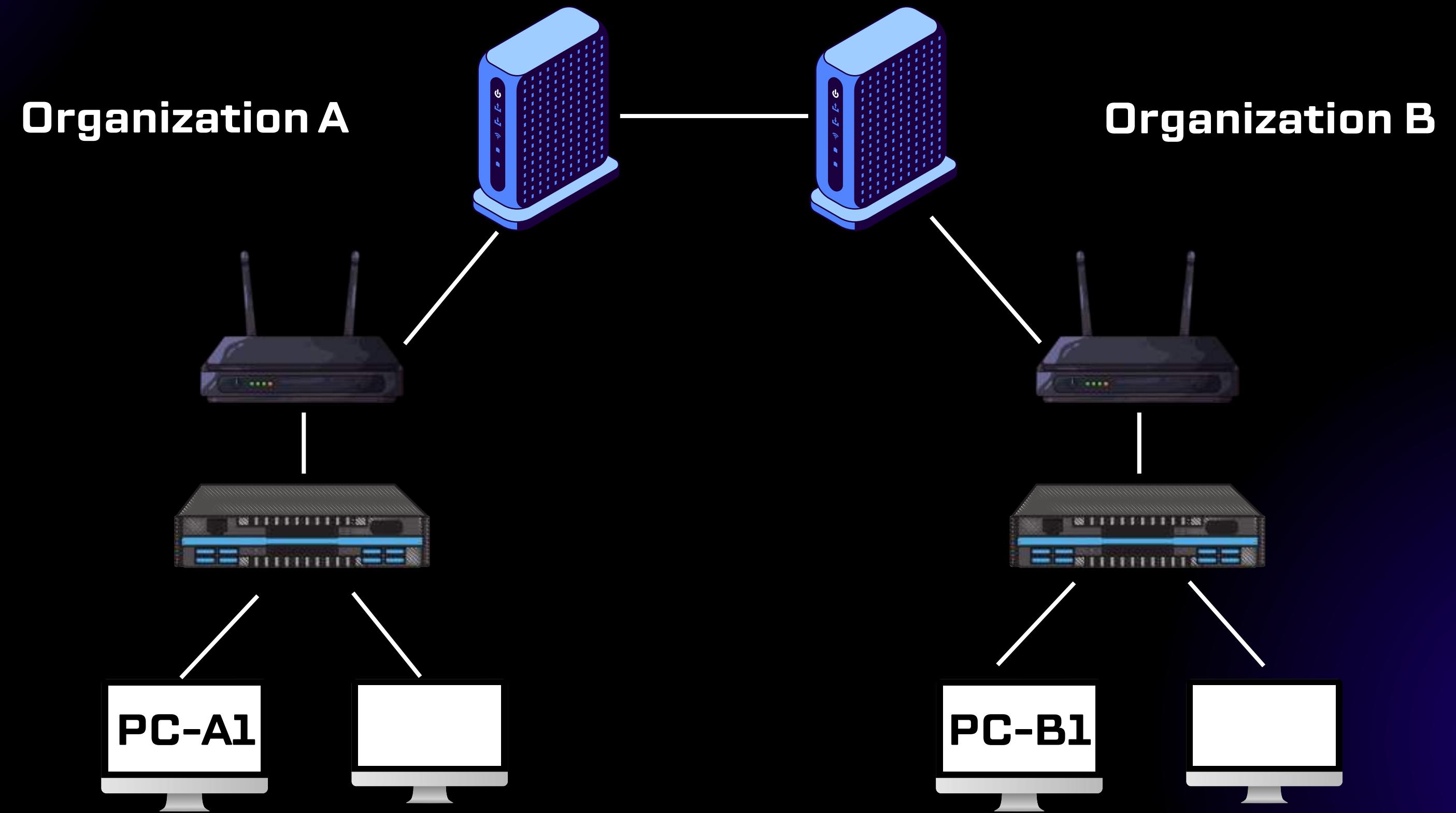
- Router – Forwards data between networks
- Switch – Connects devices within the same network (LAN)
- Modem – Connects the network to the internet via ISP

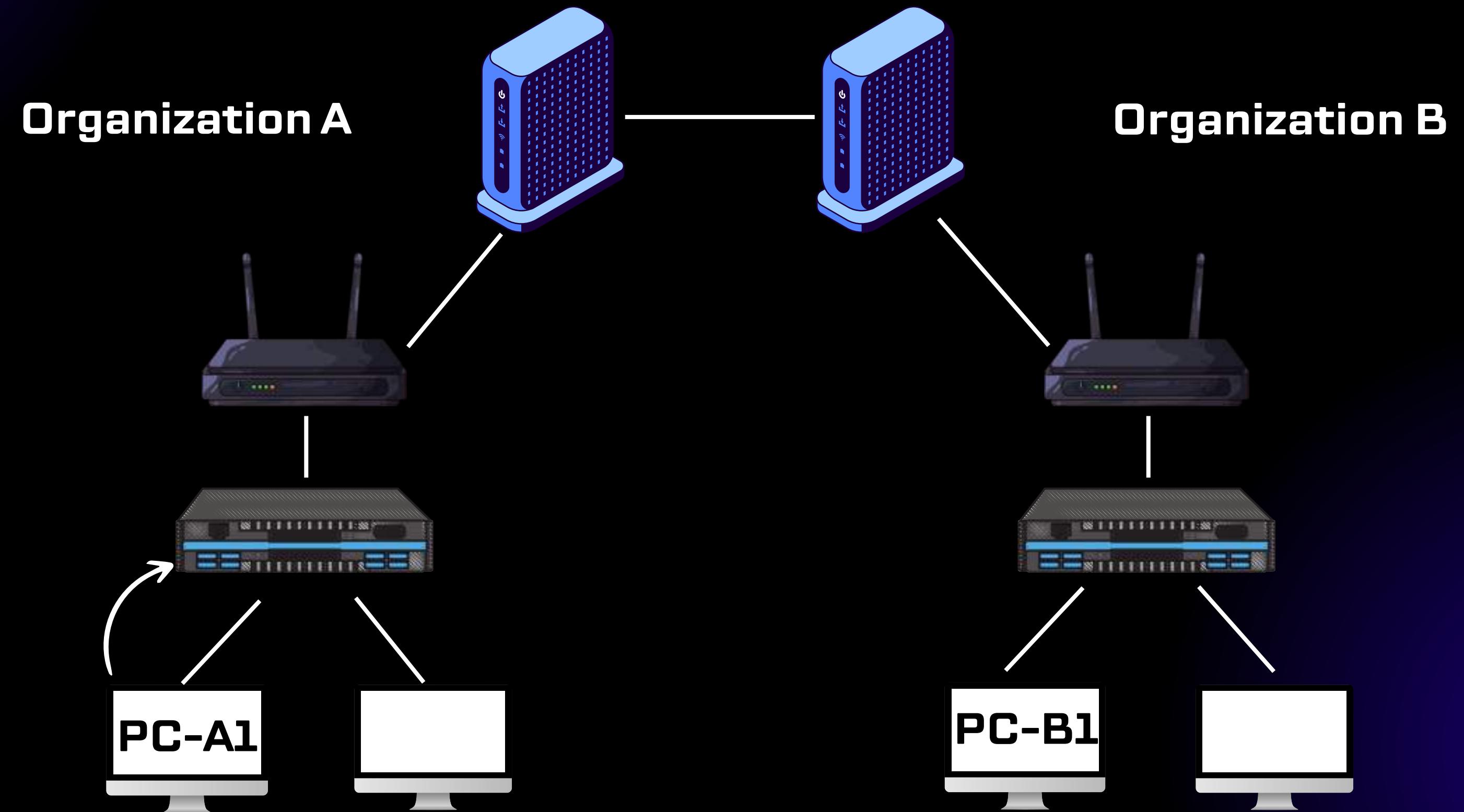


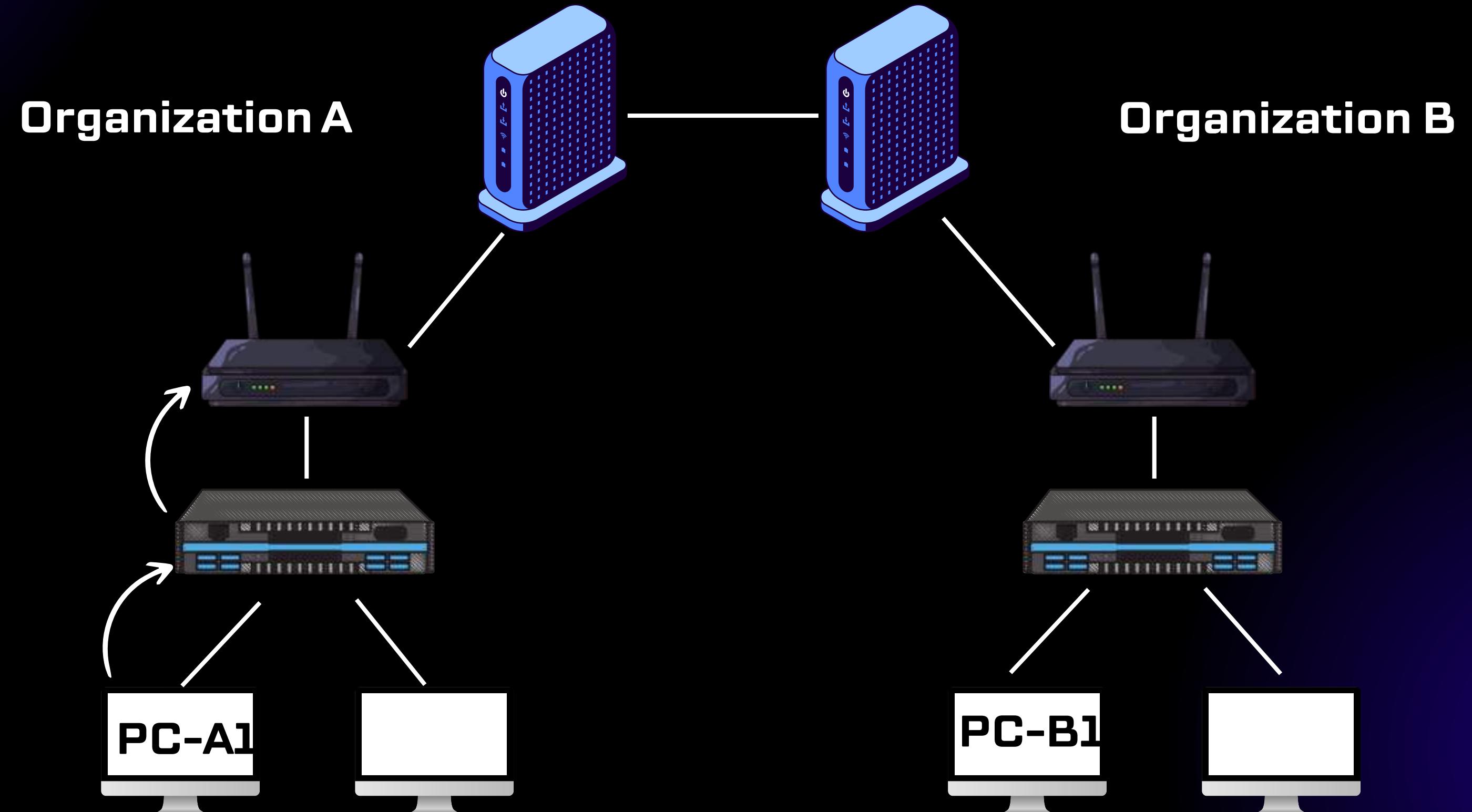
Components of a network

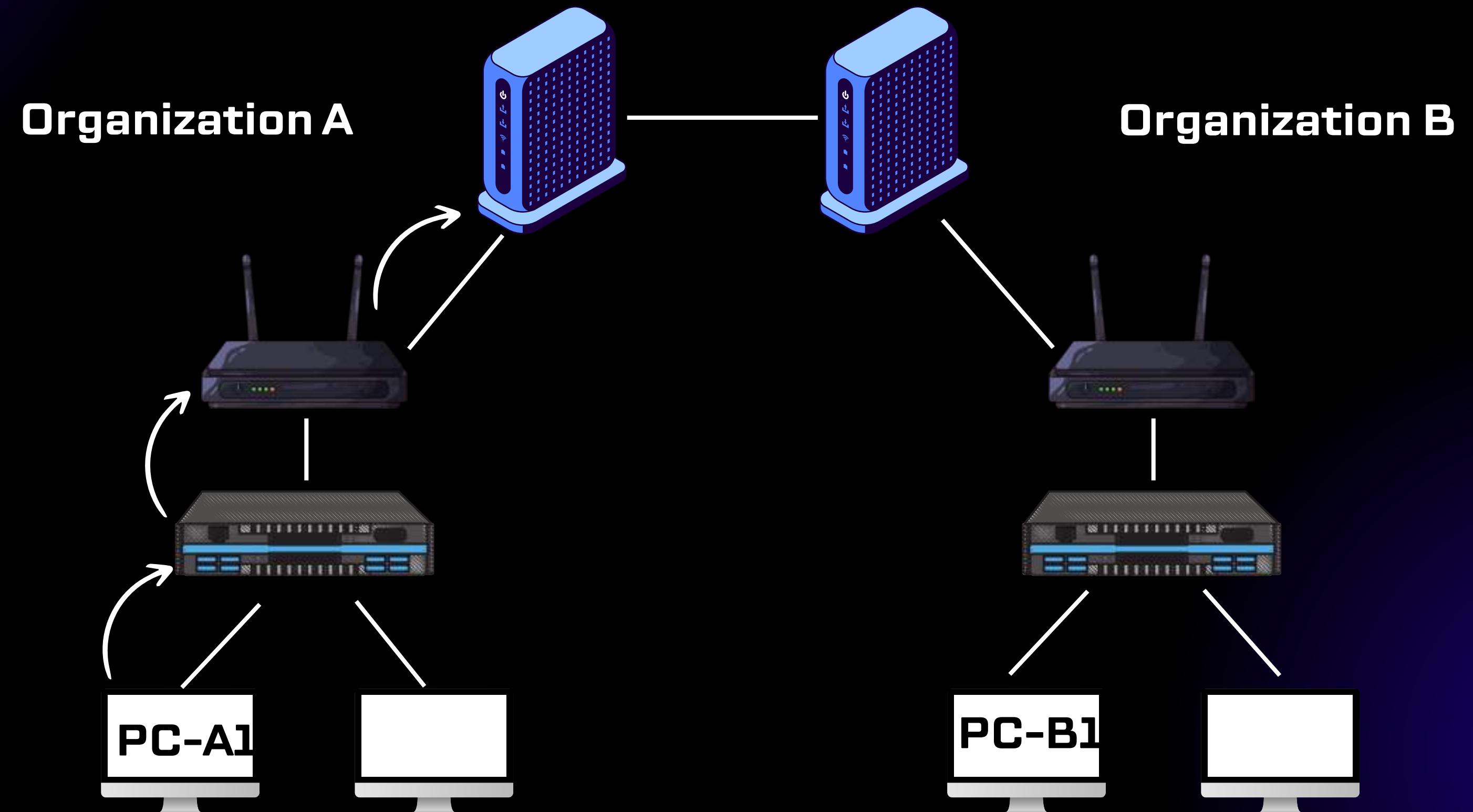
- Nodes – Any device connected to a network (clients, servers, printers, etc.)
- Transmission Media – Wired (Ethernet) or wireless (Wi-Fi)

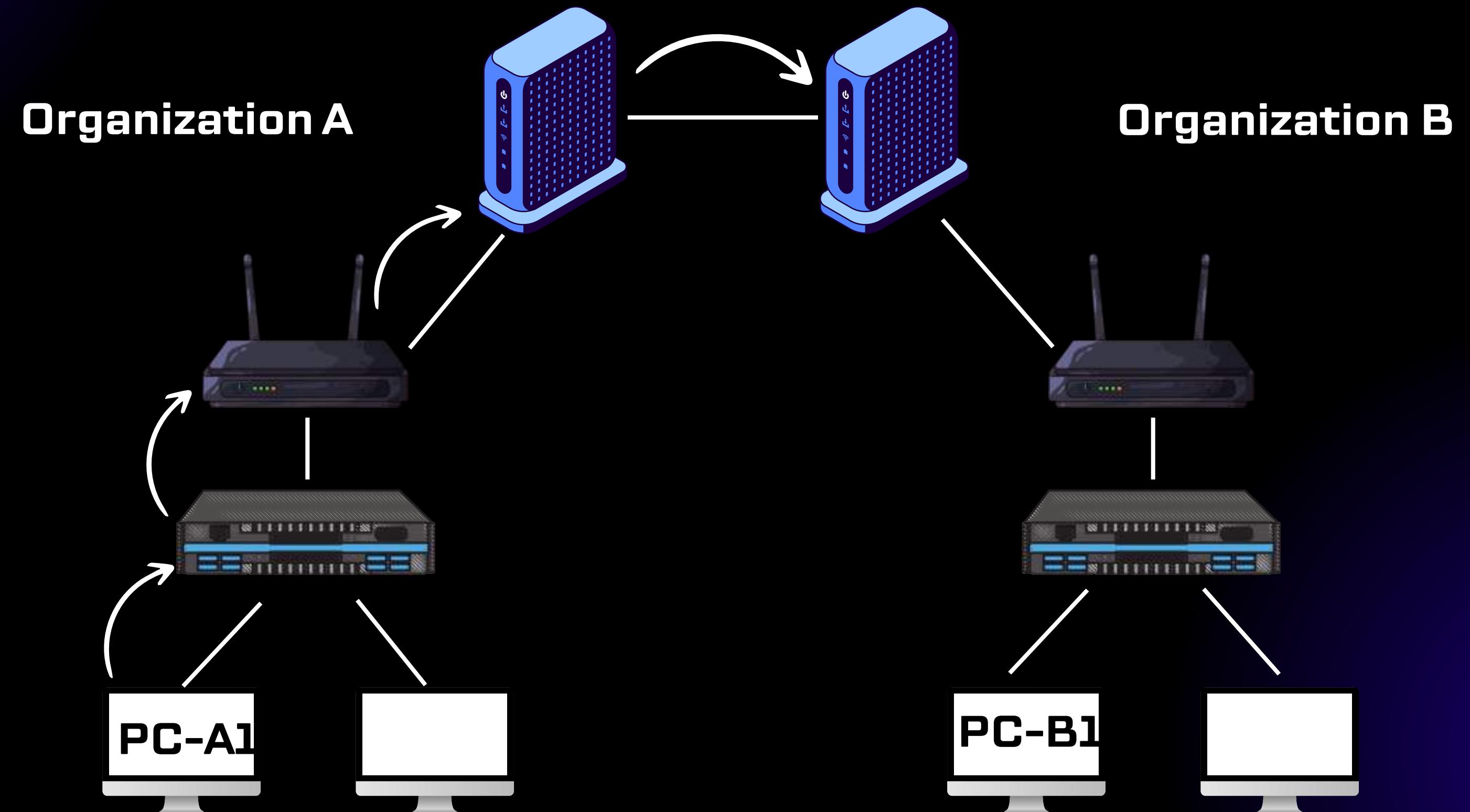


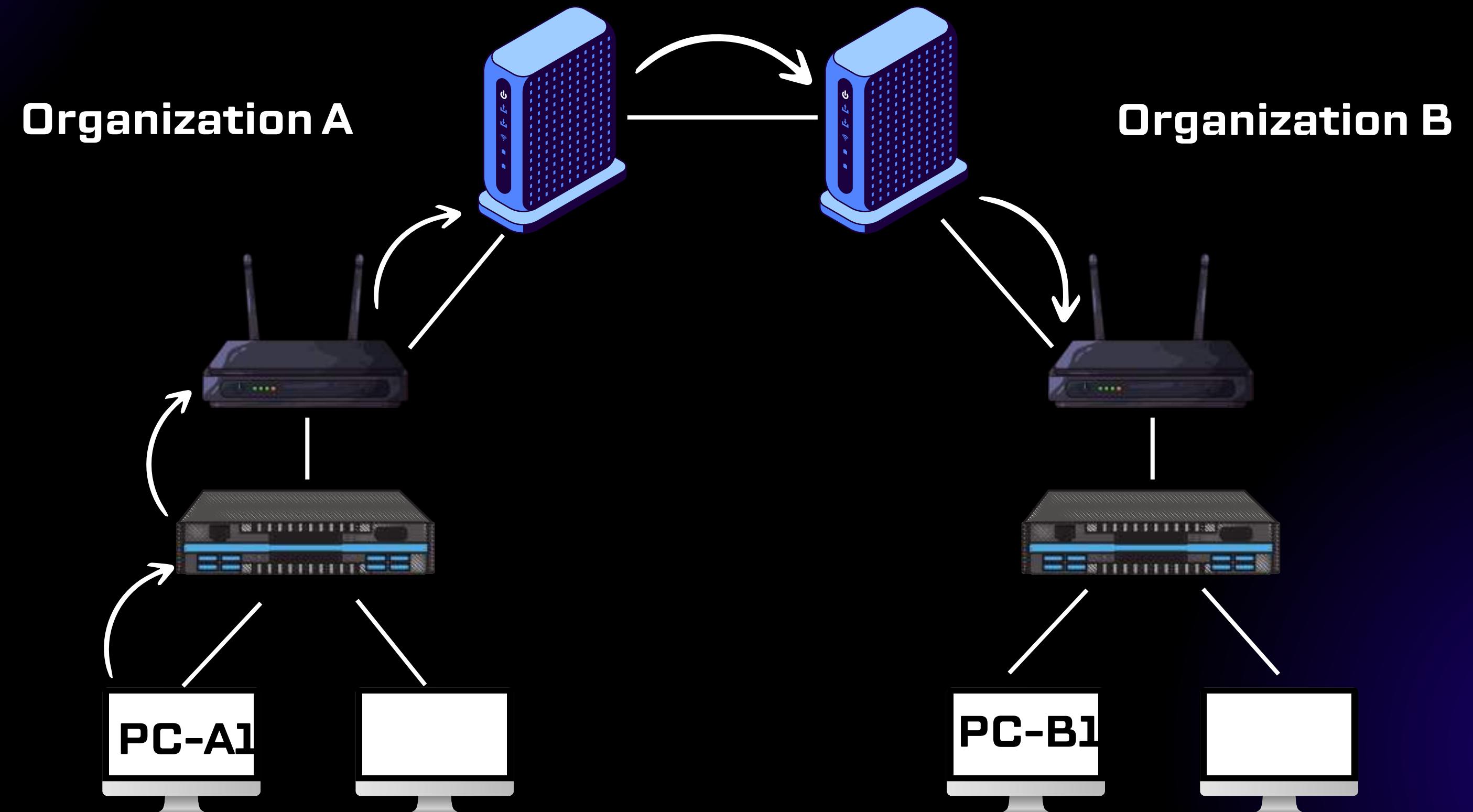


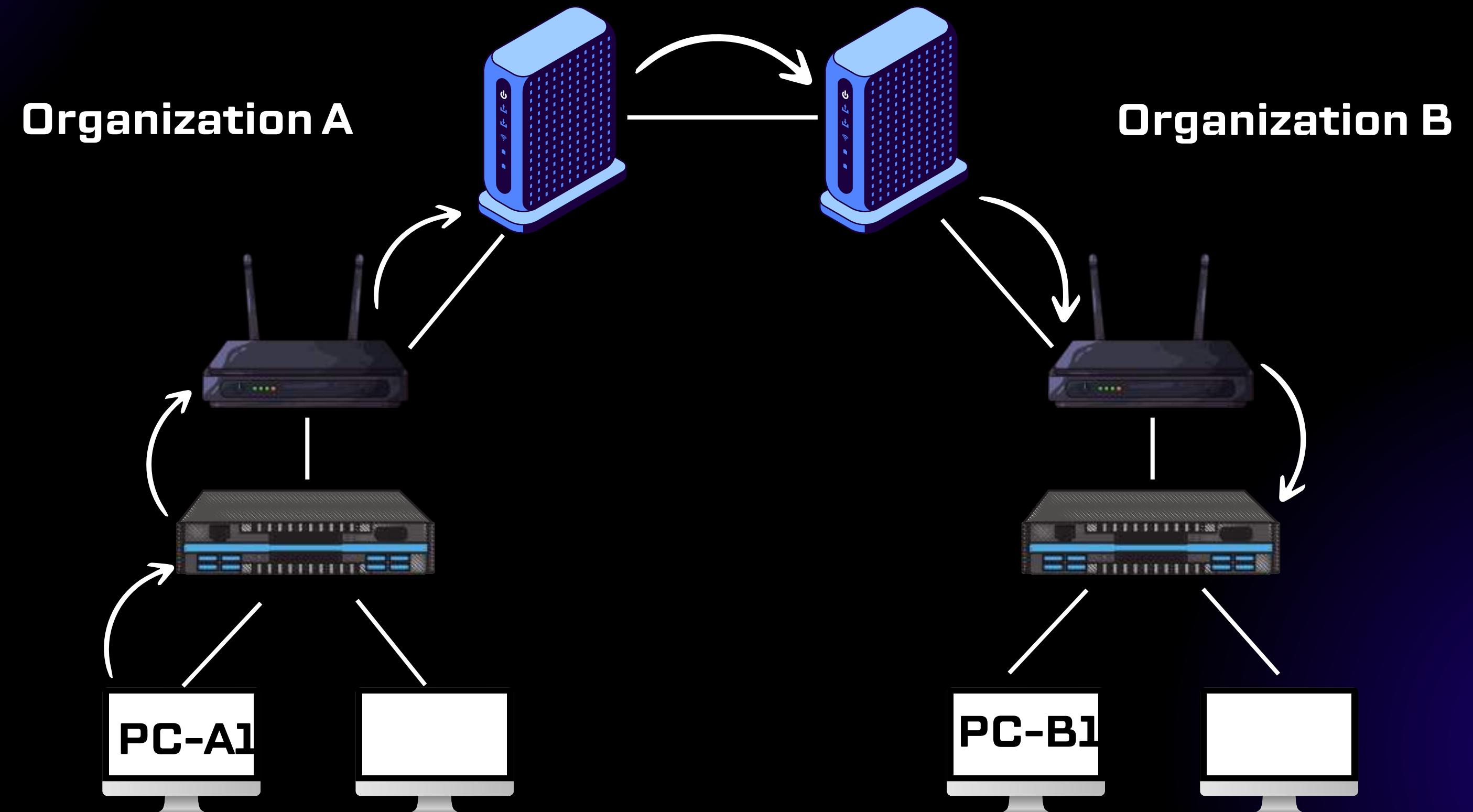


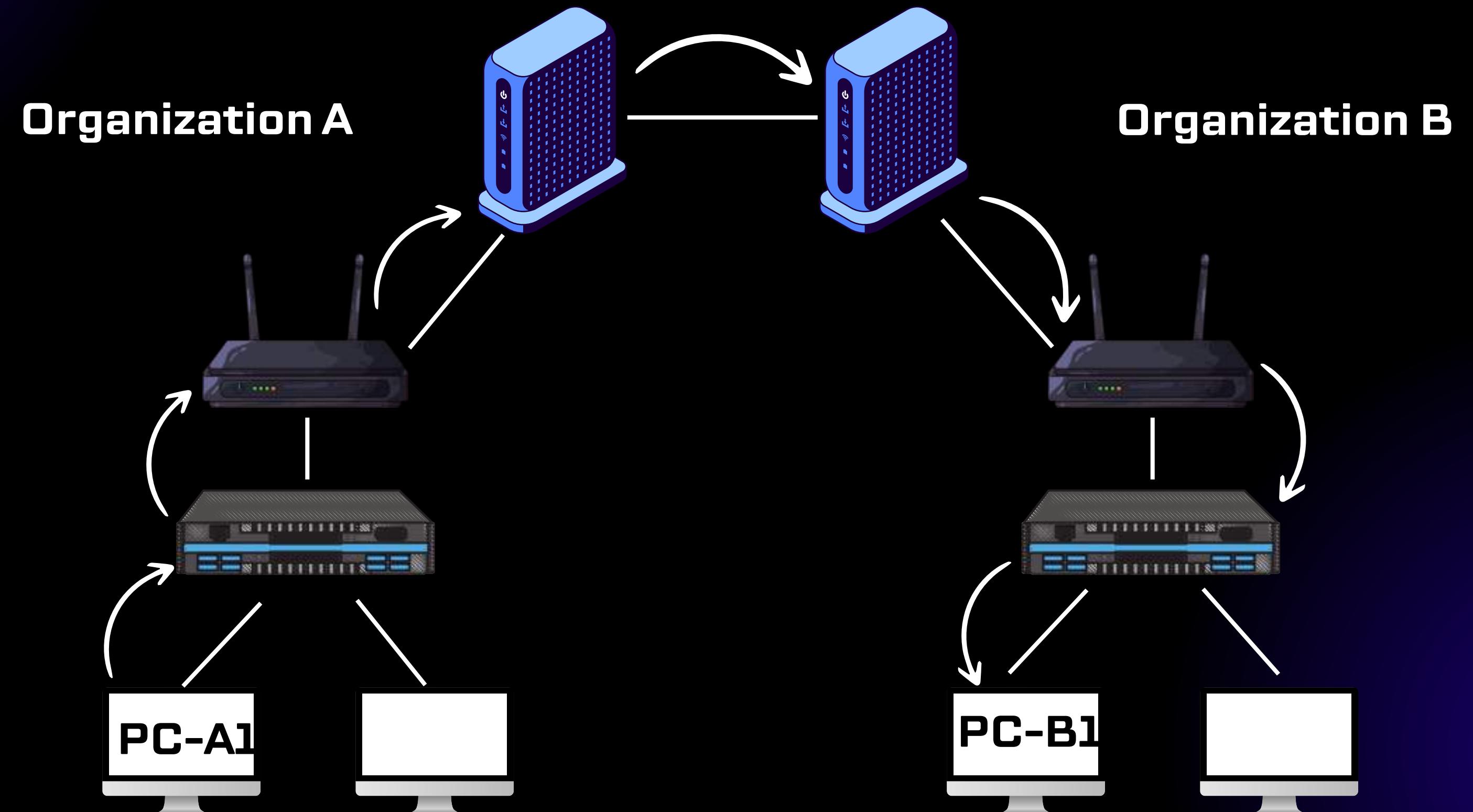






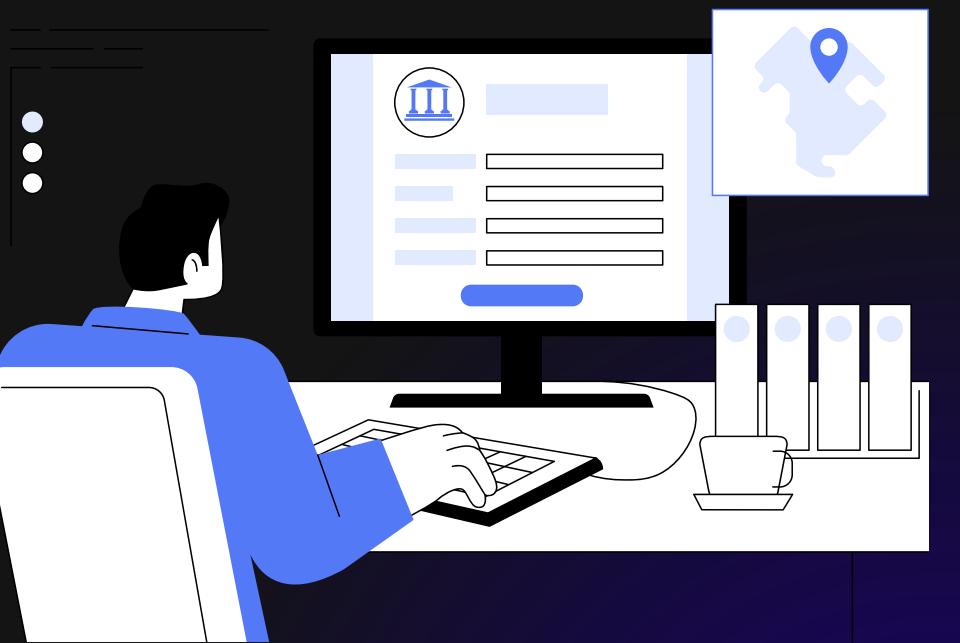






IP Address

- IP (Internet Protocol) Address is a unique identifier for each device on a network
- It allows devices to locate and communicate with each other
- Dynamic allocation



IPv4 AND IPv6

- IPv4 and IPv6 are Internet Protocol versions for addressing devices on a network
- IPv6 was developed to overcome IPv4 address exhaustion

IPV4

123.45.67.89



IPV6

2001:db8::f00:42:5555



IPv4

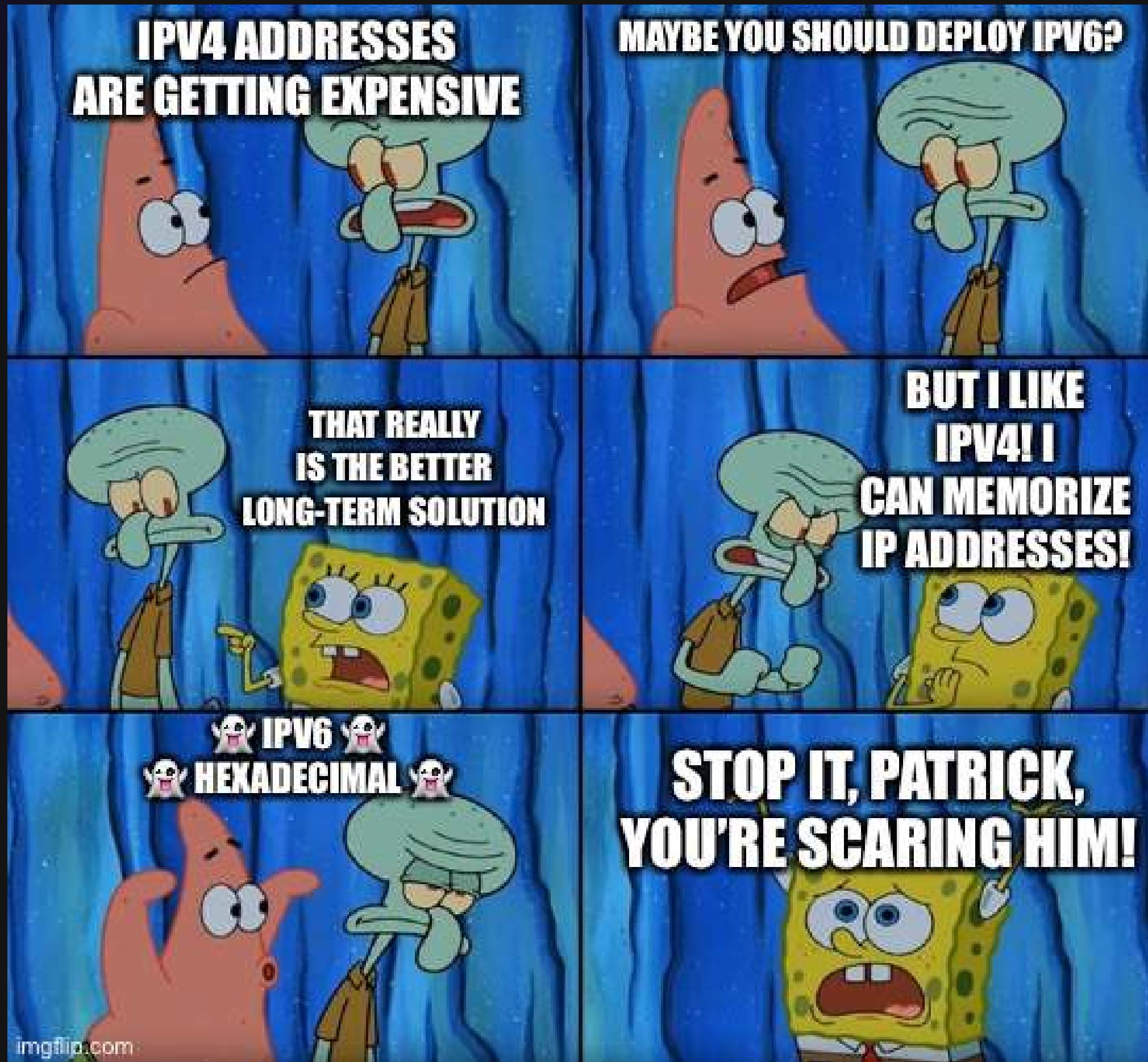
- 32-bit size
- Decimal, dot-separated
e.g. 127.6.5.78
- 2^{32} addresses
- Optional IPSec
- Older, but widely used



IPv6

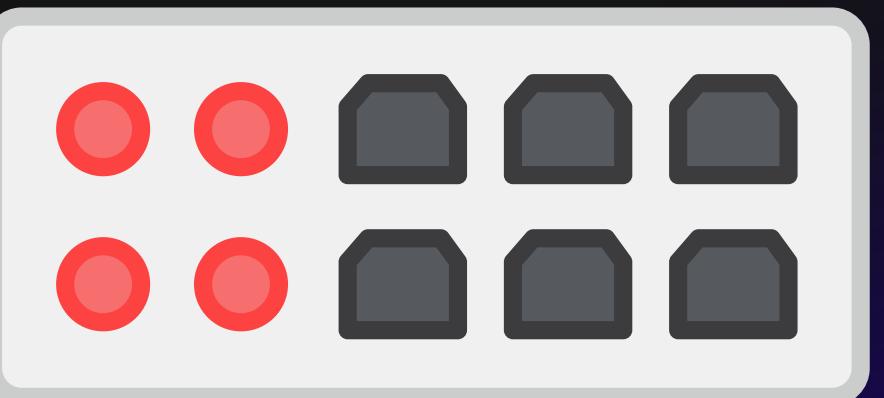
- 128-bit size
- Hexadecimal, colon-separated
e.g. 2001:db8::ff00:42:8329
- 2^{128} addresses
- Built-in IPSec
- Newer, but gradually replacing IPv4





PORTS

- A communication endpoint for a specific process or service
- Helps differentiate multiple services running on the same device





- Red → Subject 1
- Orange → Subject 2
- Yellow → Subject 3
- Green → Subject 4
- Blue → Subject 5

SOCKET ADDRESS

- A Socket Address = IP Address + Port Number

192.168.1.8 : 8090

IP address Port

- Uniquely identifies a process on a network device

COMMON PORTS

- HTTP - Hypertext Transfer Protocol
Default port - 80
- HTTPS - Hypertext Transfer Protocol Secure
Default port - 443
- SSH - Secure Shell
Default port - 22

COMMON PORTS

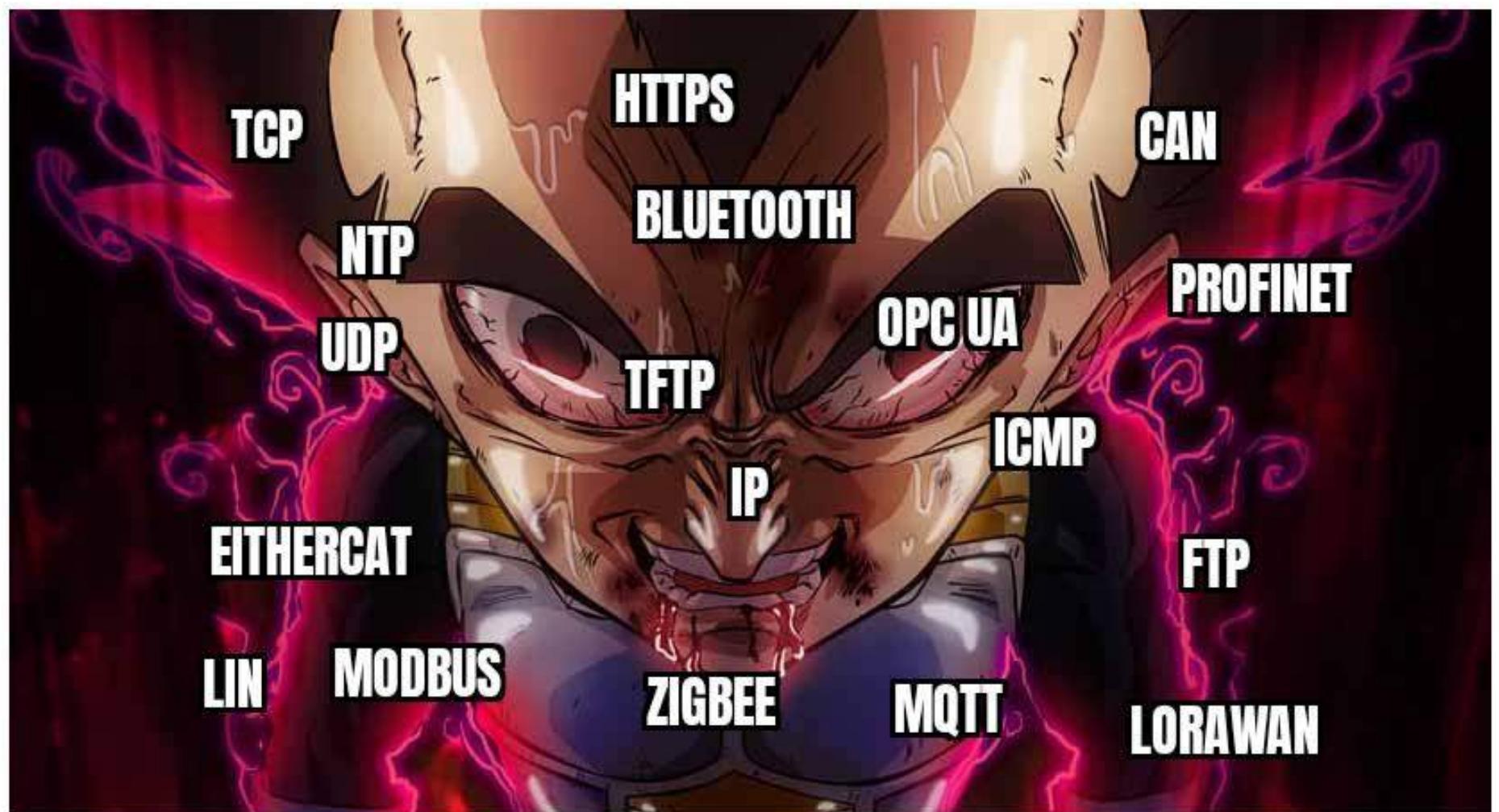
- DNS - Domain Name System
Default port - 53
- FTP - File Transfer Protocol
Default ports - 20, 21

COMMON PORTS

- DNS - Domain Name System
Default port - 53
- FTP - File Transfer Protocol
Default ports - 20, 21
 - 20 - Data transfer
 - 21 - Control connection

Please follow protocol.

Programmers:



ONE WORLD, MANY NETWORKS



Internet – A global network connecting millions of public, private, academic, business and government networks worldwide



ONE WORLD, MANY NETWORKS

- Intranet – A secure, private network used within an organization (e.g., a company or school) for internal communication and data sharing



ONE WORLD, MANY NETWORKS

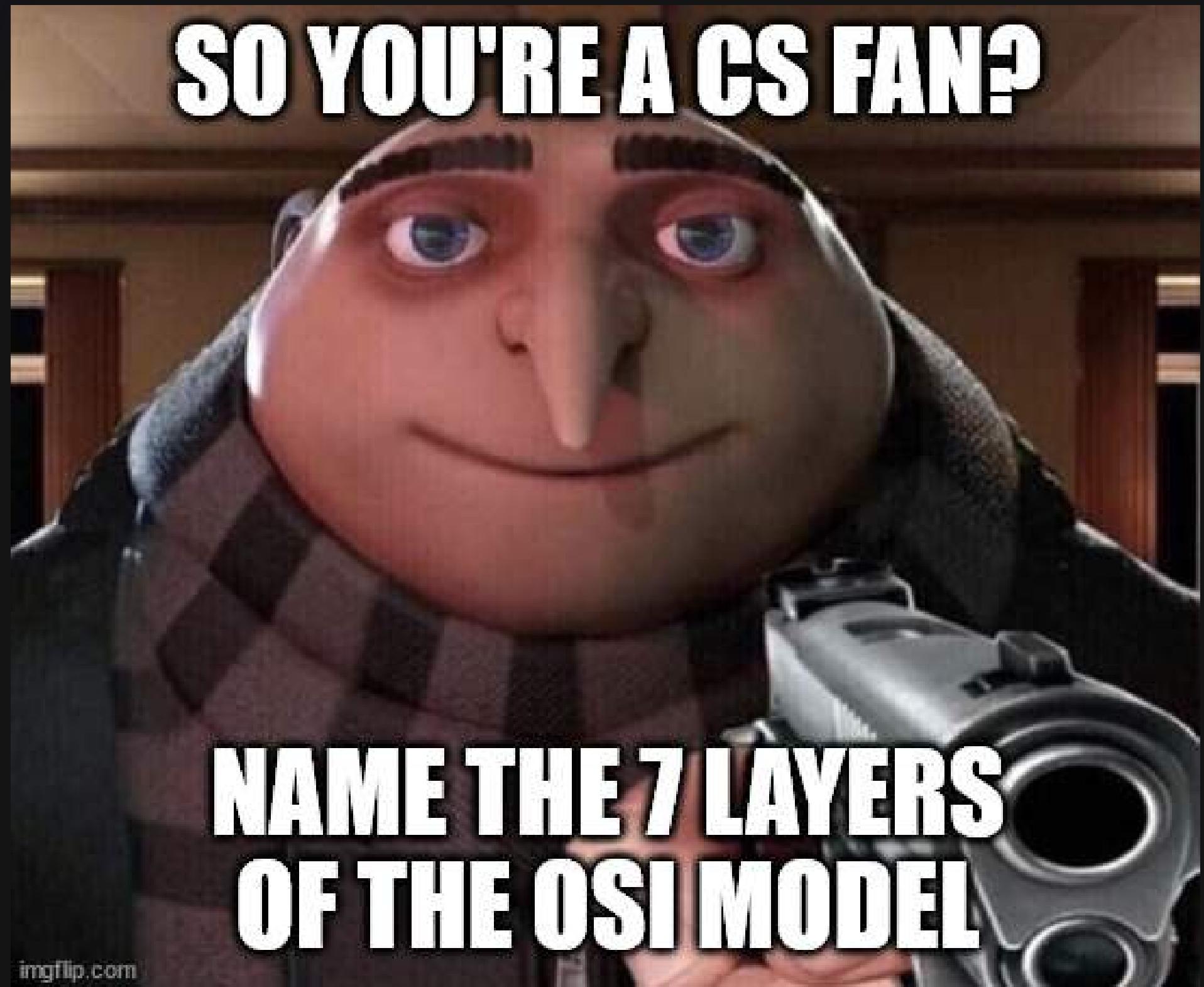
- Extranet – A restricted extension of an intranet that grants limited access to external partners, vendors or authorized users for specific data or services.



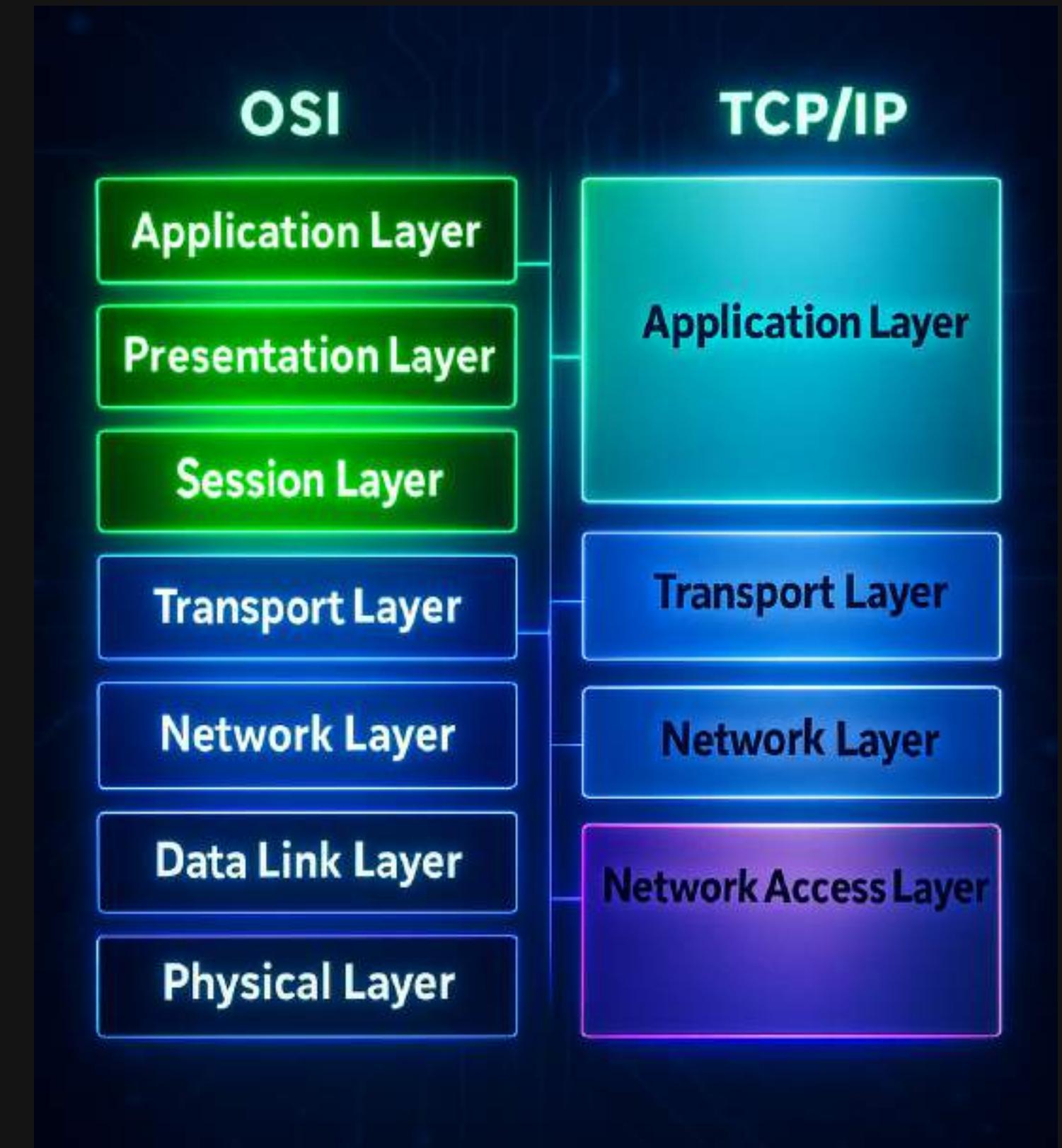
ONE WORLD, MANY NETWORKS

- Local Area Network (LAN)
Like a home/office Wi-Fi
- Metropolitan Area Network (MAN)
Cable TV network or ISP connection
- Wide Area Network (WAN)
Nationwide internet connection



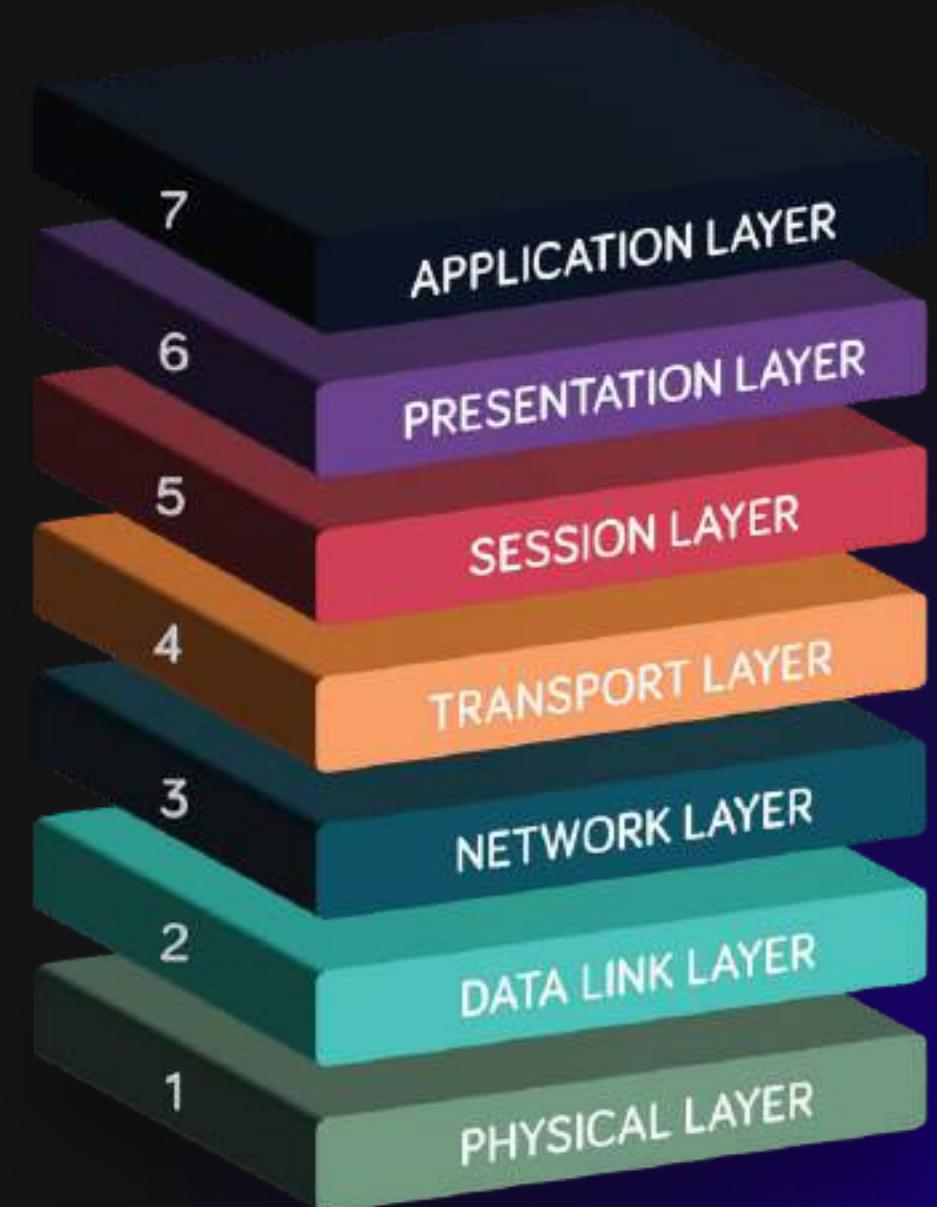


OSI MODEL

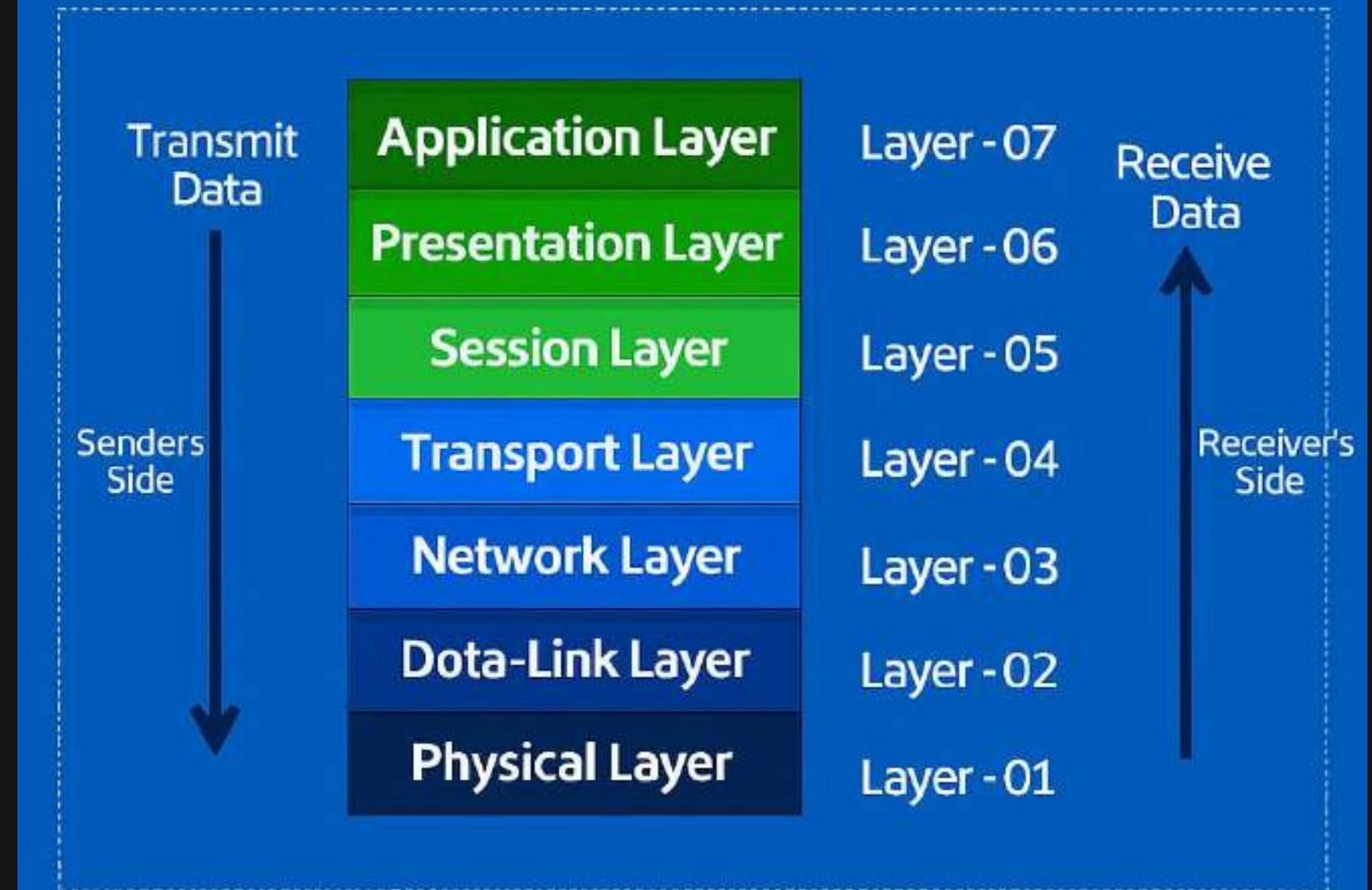


TCP/IP MODEL

- Application Layer – Interfaces for apps (HTTP, FTP)
- Transport Layer – Ensures delivery (TCP/UDP)
- Network Layer – Routes data (IP)
- Data Link Layer – Handles MAC addressing



OSI Layers



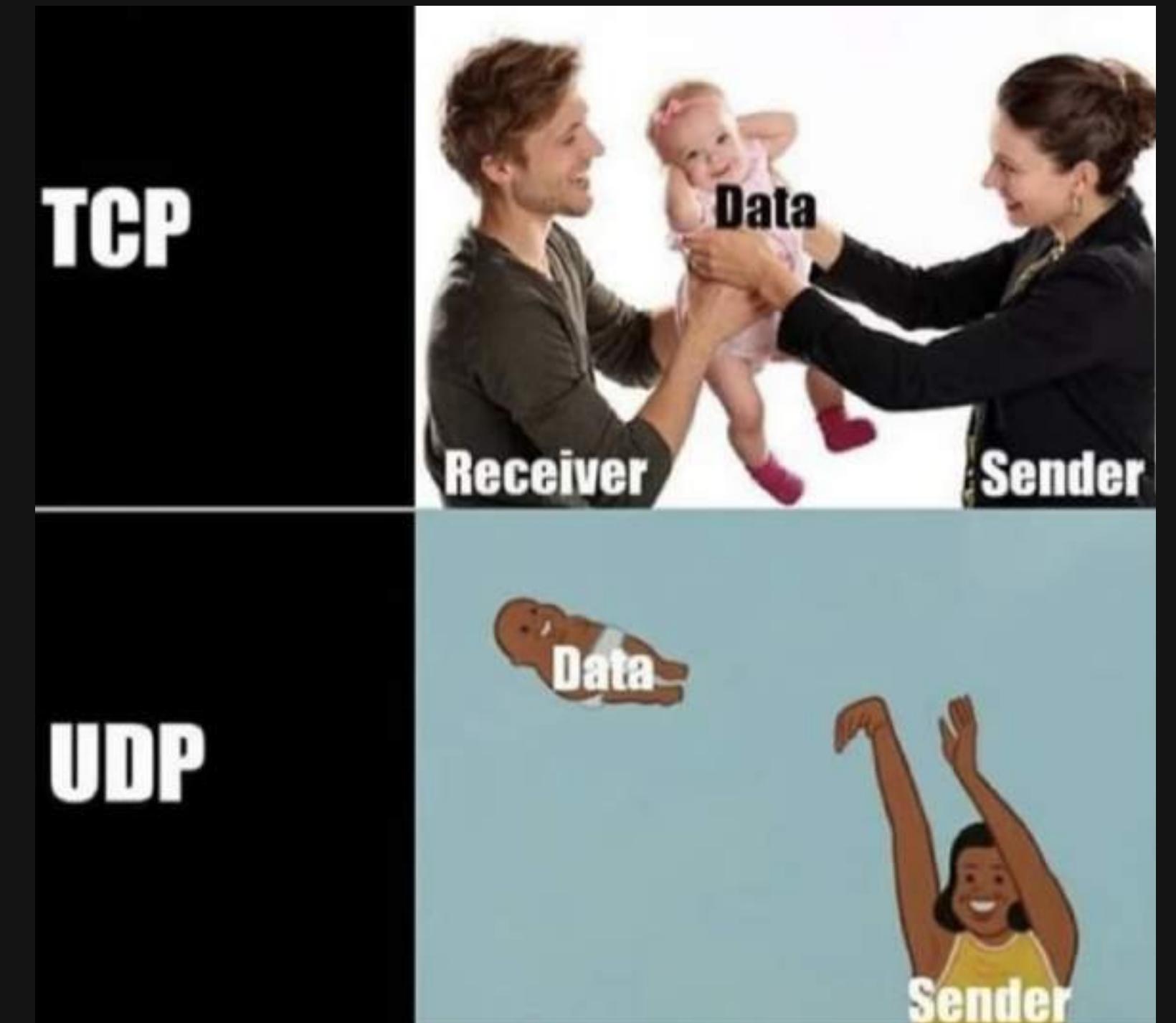
OSI MODEL



*Don't you think like OSI model looks
like burgers?!*

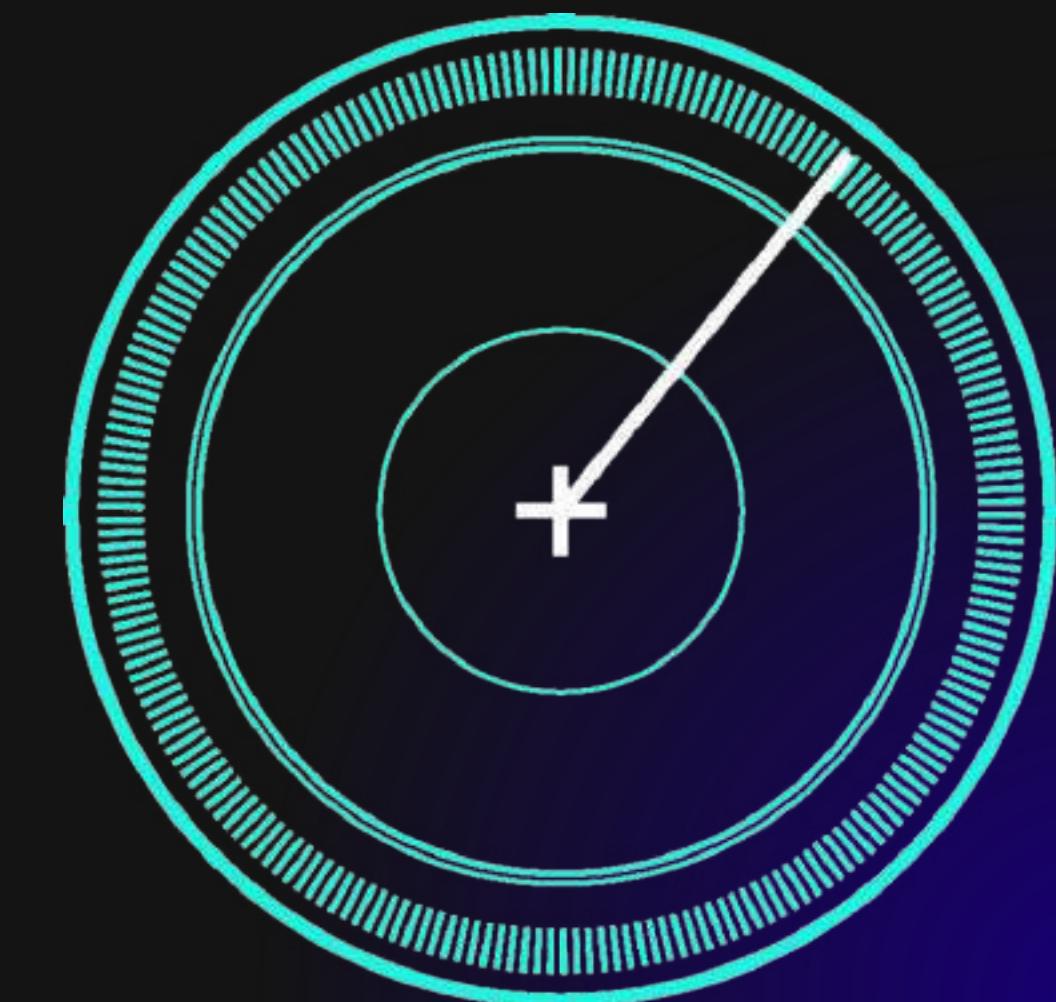
TCP v/S UDP

- Slower
 - Reliable messenger
 - Accurately delivers message to destination
-
- Faster
 - Unreliable
 - Less overhead



NETWORKING IN MODERN WARFARE

- Drones and autonomous weapons
- Cyberattacks and defence networks
- Real-time troop communication
- Satellite and mesh networks



NETWORKING COMMANDS

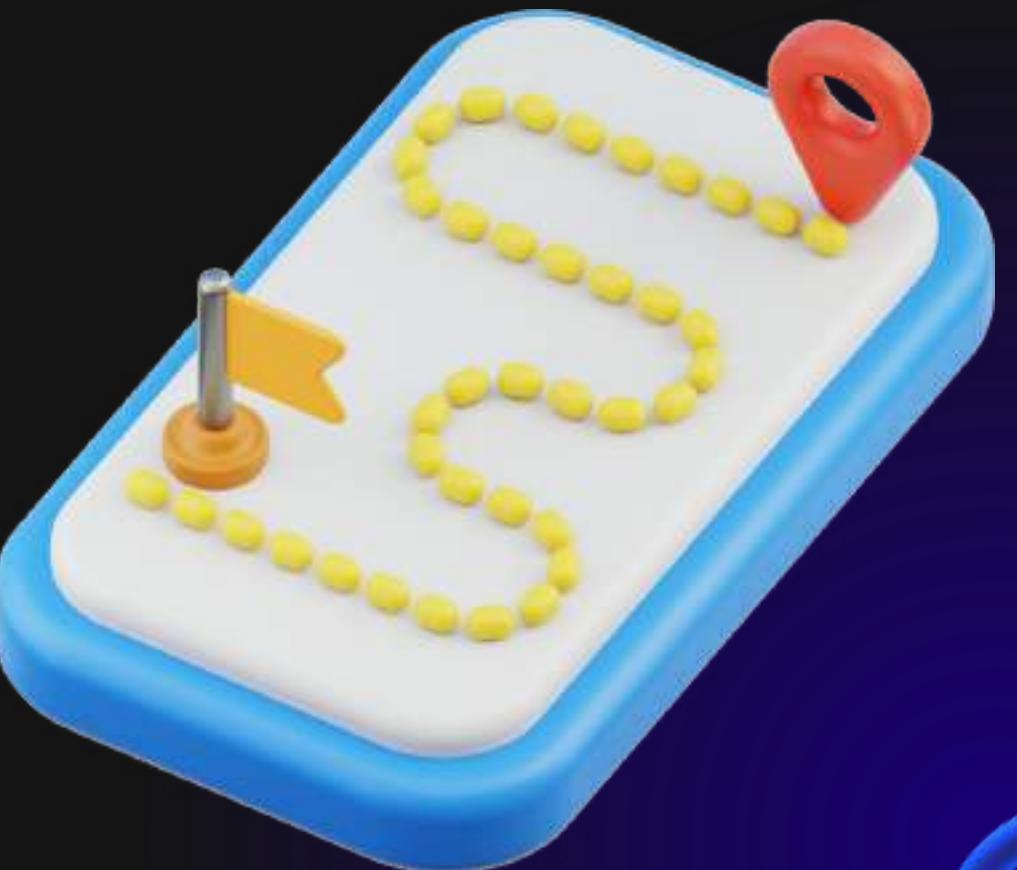


IP



It's a modern replacement for ifconfig, route and netstat

```
$ ip link show
$ ip link set eth0 up
$ ip link set eth0 down
$ ip addr show
```



PING

- Tool used to test connectivity between two hosts
- Beginner friendly output



```
$ ping google.com
$ ping -c 5 google.com
$ ping -i 3 google.com
```



CURL



A command-line tool to send HTTP requests and retrieve data



```
$ curl https://example.com
$ curl -o page.html https://example.com
```



DIG



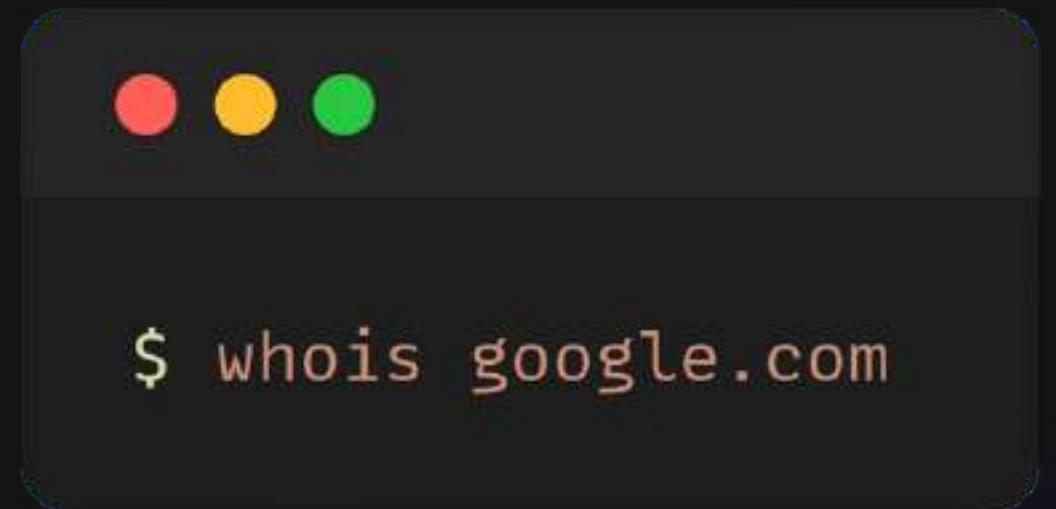
Queries DNS records

```
$ dig google.com
$ dig +short google.com
$ dig google.com A
$ dig google.com AAAA
$ dig -x 8.8.8.8
```



WHOIS

- A command-line utility that retrieves domain registration information
- Used to find who owns a domain name, when it was created, when it expires, and where it is registered



```
$ whois google.com
```

A terminal window with a dark background and three colored dots (red, yellow, green) at the top. The command \$ whois google.com is typed in and executed.

IFTOP

- iftop is like top, but for network bandwidth usage
- It shows which connections are using your network, in real time
- Examples: ethX, wlanX, wloX, enpXsY



```
$ sudo iftop -i wlo1
```





Uncomplicated Firewall



What Is a Firewall?

- Monitors and controls network traffic
- Protects against unauthorized access and cyber-attacks
- Essential for securing servers and systems





What is UFW?

- UFW is a user-friendly front-end to manage iptables
- Default firewall tool on Ubuntu-based systems

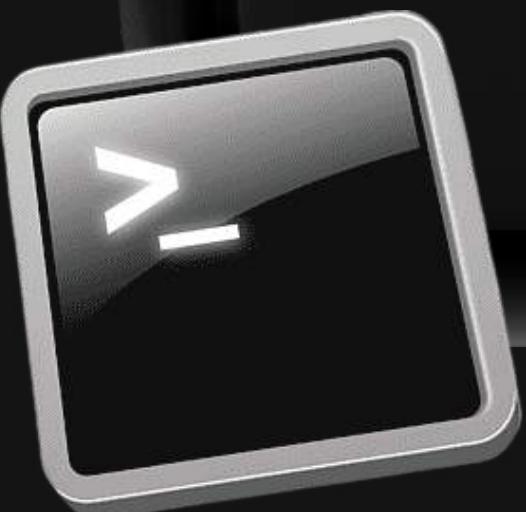


Uncomplicated Firewall

- UFW (Uncomplicated Firewall) is a simple Linux firewall management tool
- It provides an easy way to configure rules for allowing or blocking network traffic



UFW Basic Commands





Installation



```
$ sudo apt install ufw
```



enable/disable : Enabling or Disabling UFW



```
$ sudo ufw enable  
$ sudo ufw disable
```



status : Displays status of ufw



```
$ sudo ufw status
$ sudo ufw status verbose
$ sudo ufw status numbered
```

off	No logging
low	Logs blocked incoming connections only
medium	Logs blocked incoming connections and limited outgoing connections
high	Logs all blocked incoming and outgoing connections



allow

Allowing any specific port or ip address



Allow

```
$ sudo ufw allow 22
```

```
$ sudo ufw allow from 192.14.5.69
```



deny

Denying any specific port or ip address



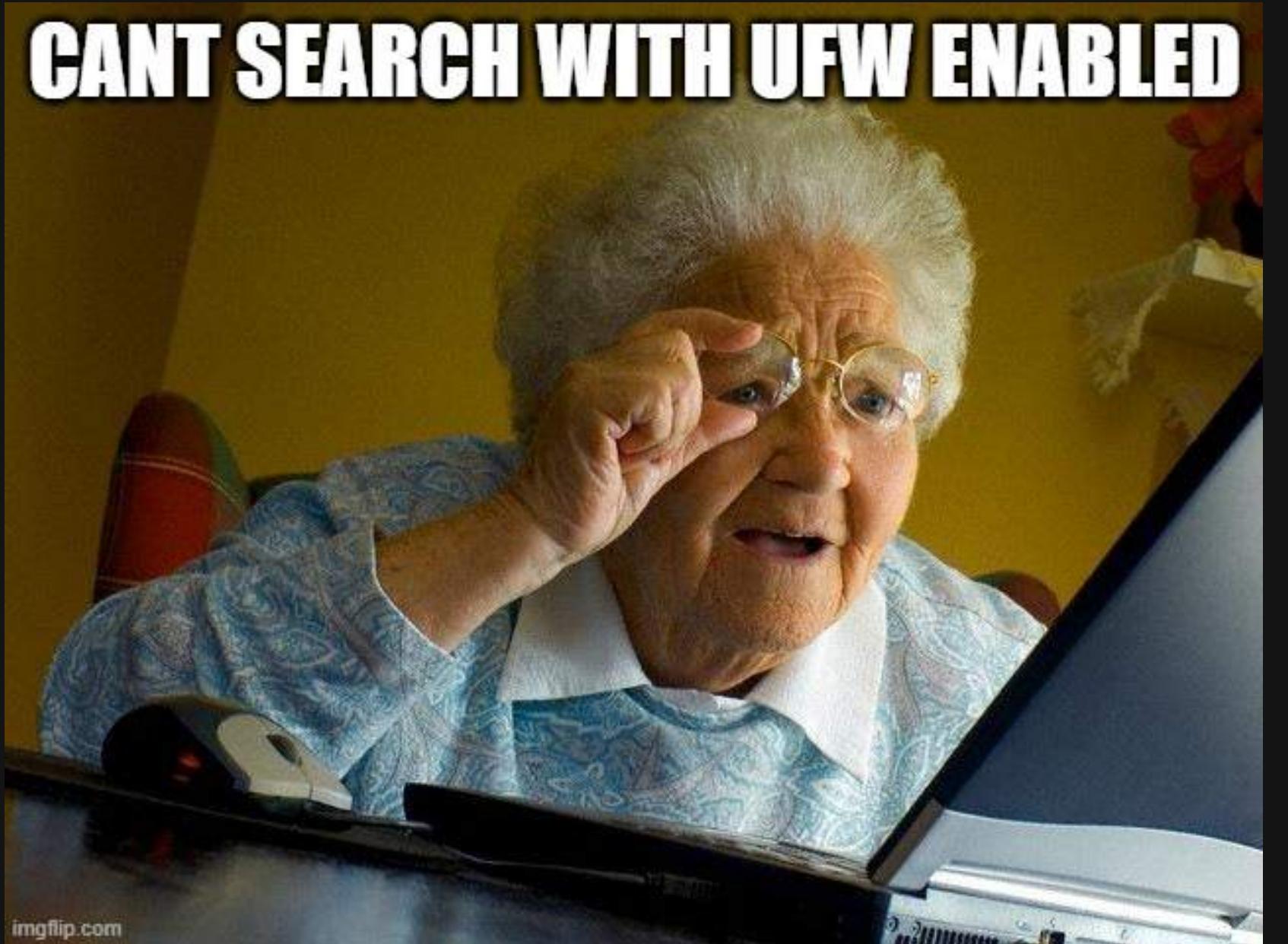
Deny

```
$ sudo ufw deny 22
```

```
$ sudo ufw deny from 192.14.5.69
```



CANT SEARCH WITH UFW ENABLED



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delete : Deletes a specific ufw rule



```
$ sudo ufw delete allow 22
```

```
$ sudo ufw delete 1
```



reset: Resets all ufw rules



```
$ sudo ufw reset
```



I USED THE FIREWALL

TO DESTROY THE FIREWALL

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Secure Shell



What Is SSH?

- Secure protocol for remote login and command execution
- Encrypts communication between client and server





Hands On





Installation



Installation

```
$ sudo apt update  
$ sudo apt install openssh-server
```



status

Displays status of ssh



Status

```
$ sudo systemctl status ssh
```



start

Make status deactive to active of ssh



Start

```
$ sudo systemctl start ssh
```



login

Remote login to server / system



Login

```
$ ssh username@ip_address
```

SSH'ED INTO THE SERVER



ON THE FIRST TRY

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UFW X SSH



Thank You!!





