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NETWORK LAB VIEW

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1. INTRODUCTION OF NETWORKING

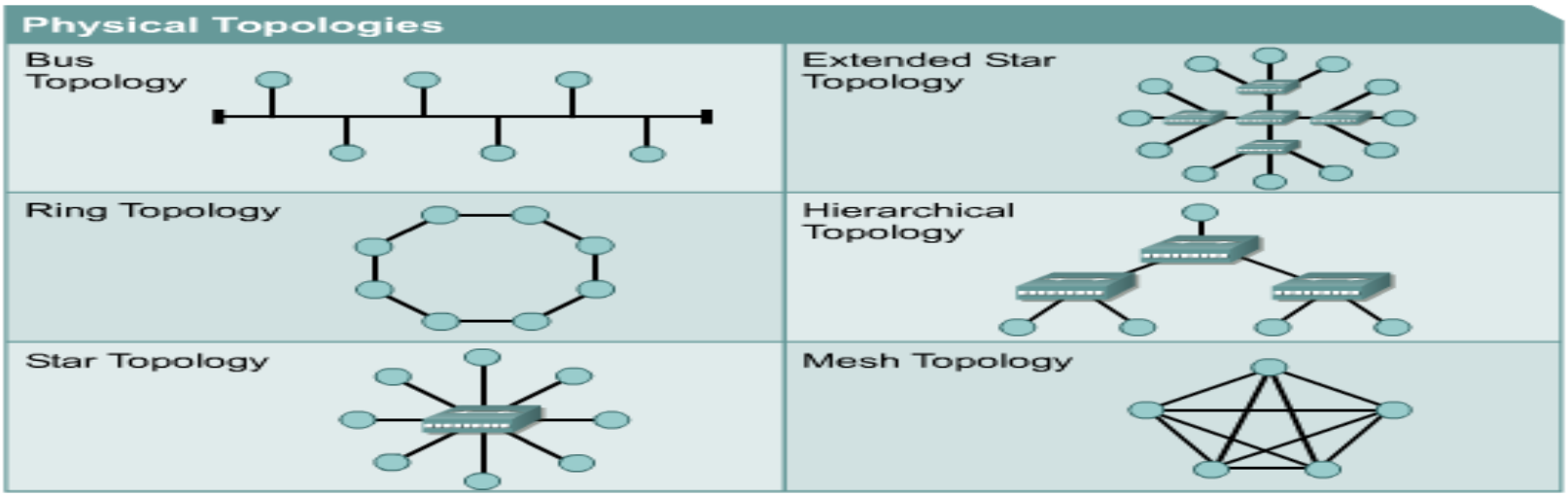
A network connects devices to share information, resources, and services. It supports business needs and modern technologies like IP telephony and video conferencing.

Basic communication elements: source, encoder, transmitter, channel, receiver, decoder, destination.

Networks consist of **end devices**, **transmission media**, intermediate devices

2.CLASSIFICATION OF NETWORKING

Category	Type	Description / Example
Geographical Range	**LAN**	**Small area like office or home network.**
	MAN	**Covers a city or campus (e.g., university network).**
	WAN	**Large area, connects countries (e.g., the Internet).**
Topology (Connection)	**Bus**	**All devices share a single backbone cable.**
	Star	**Devices connected to a central hub or switch.**
	Ring	**Each device connects to two others forming a circle.**
	Mesh	**Devices interconnected, high reliability.**

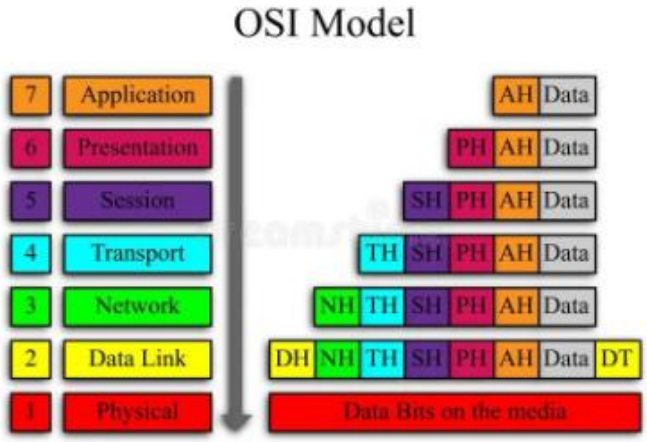


5.ADDRESSING

Layer	Address Type	Example	Purpose	Extra Notes
Data Link (Layer 2)	**MAC Address**	00:1A:2B:3C:4D:5E	Unique hardware identity for local network communication	Fixed, burned into NIC
Network (Layer 3)	**IP Address**	192.168.1.10 (IPv4), 2001:db8::1 (IPv6)	Logical address to locate devices across networks	**IPv4:** 32-bit, ~4.3B addresses, uses NAT. **IPv6:** 128-bit, ~3.4×10^{38} addresses, no NAT needed, better security & mobility.
Transport (Layer 4)	**Port Number**	80 (HTTP), 443 (HTTPS)	Identifies specific application/service on a device	Works with both IPv4 & IPv6

4.PDU DURING ENCAPSULATION

OSI Layer	PDU (Protocol Data Unit)
Application / Presentation / Session	Data
Transport Layer	Segment (or Datagra
Network Layer	Packet
Data Link Layer	Frame
Physical Layer	Bits



6.SOME CONCEPTS

Physical Topology: The actual layout of cables, devices, and connections in the network (e.g., star, bus, ring).

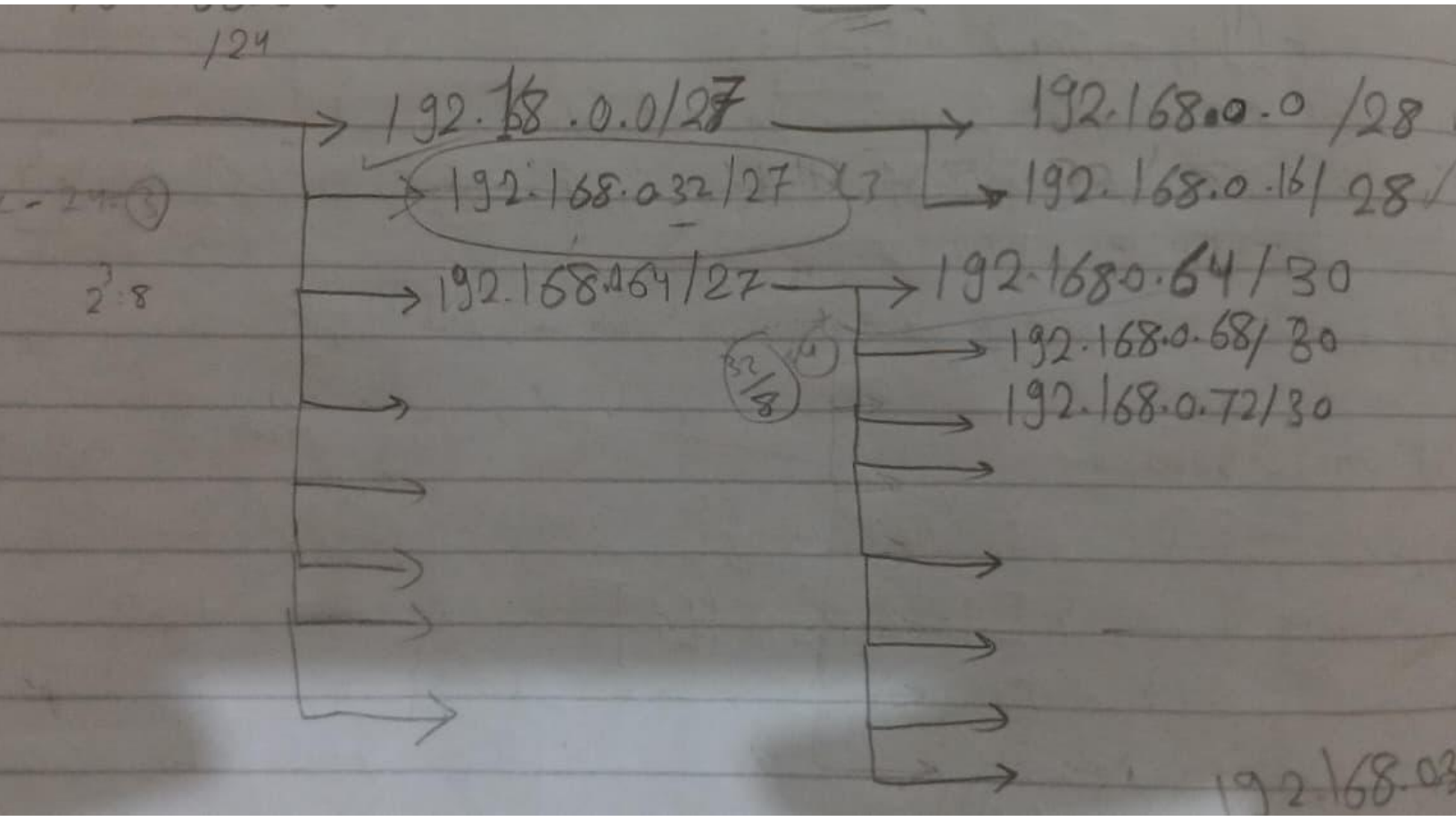
Logical Topology: The way data flows and devices communicate across the physical network (e.g., how signals travel in Ethernet or Token Ring).

Default Gateway: The router that forwards traffic from the local network to external networks (e.g., Internet)

The **Subnet Mask** is a 32-bit number used in IP networking to divide an IP address into **network** and **host**

7.SUBNETING VS VLSM

Feature	Subnetting (Fixed)	VLSM (Variable)
Subnet Mask	Same for all subnets	Different masks for different subnets
Flexibility	Low – all subnets must be equal size	High – subnets can be tailored to host needs
IP Address Usage	May waste addresses	More efficient, less wasted addresses
Example	All subnets /24	Some /24, some /26, some /30, etc.



8.STATIC ROUTING VS DYNAMIC

- **Static Routing = Manual, simple, secure, but not adaptive.**
- **Dynamic Routing = Automatic, adaptive, resource-consuming, suitable for large networks.**

9. CISCO IOS BOOTING STEPS

Step	Process	Description
1	**POST (Power On Self Test)**	Runs hardware diagnostics from ROM (CPU, RAM, NVRAM).
2	**Bootstrap Loading**	Copied from ROM to RAM; executed by CPU to locate IOS.
3	**IOS Location**	Usually in Flash; if not found, a minimal IOS from ROM is used.
4	**IOS Loading**	IOS copied into RAM (current models); older models ran IOS directly from Flash.
5	**Config File Search**	Bootstrap looks for **startup-config** in NVRAM.
6	**Config File Loading**	If found, loaded into RAM as **running-config**; if not, user is prompted for setup mode.

10. SOME COMMENDS IN CISCO CMD

Section	Command Example	Purpose
CLI First Look	enable configure terminal	Enter privileged EXEC mode and global configuration mode
Basic Configuration	hostname R1 enable secret cisco123 line console 0 → password cisco → login interface g0/0 → ip address 192.168.1.1 255.255.255.0 → no shutdown	Set hostname, passwords, console access, interface IP, and warning banner
Viewing, Saving, Erasing	show running-config show startup-config copy running-config startup-config erase startup-config	View, save, delete configuration files and reload device
Discovering & Testing	show ip interface brief ping 192.168.1.2 traceroute 8.8.8.8	Check interfaces, test connectivity, trace path
TELNET	line vty 0 4 password telnet123 login	Configure Telnet remote access

LAB VIEW

1. Introduction to the LabVIEW Environment

LabVIEW (Laboratory Virtual Instrument Engineering Workbench) is a graphical programming environment based on **dataflow**. Unlike text-based languages (C#, Python), it uses **graphical blocks and wires** to create programs, making it intuitive for engineers and scientists.

Core Concepts:

- **Graphical Programming:** Build logic using icons and wires (like a flowchart).
- **Virtual Instruments (VIs):** Every program is a VI, simulating real instruments.

Key Components of a VI:

1. **Front Panel:** User interface with controls (inputs) and indicators (outputs).
2. **Block Diagram:** Graphical source code connecting functions and data flow.
3. **Icon & Connector Pane:** Enable reuse of a VI as a SubVI.

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2. Fundamental Programming Structures in LabVIEW

- **While Loop:** Repeats until a stop condition is met.
- **For Loop:** Runs a set number of times.
- **Case Structure:** Executes different code based on input (like if-else).
- **Sequence Structure:** Forces execution order in a program.

- **Control via LabVIEW (LINX Library):**
    - Upload firmware to Arduino.
    - LabVIEW sends commands (e.g., read sensor, turn LED ON).
    - Arduino executes and returns data to LabVIEW.

3. Working with Data: Arrays & Clusters

- **Arrays:** Collections of same-type data (numbers, strings), 1D or multi-D.
- **Clusters:** Group mixed-type data (like a struct). Managed with Bundle/Unbundle.

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4. Data Visualization: Charts & Graphs

- **Charts:** Show data continuously with history. Types: Strip, Scope, Sweep.
- **Graphs:** Display complete datasets at once, no history buffer.

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5. Arduino UNO: Hardware Gateway

- **Role:** Open-source microcontroller bridging LabVIEW with the real world.
    - 6 analog inputs (sensors).
    - 14 digital I/O pins (LEDs, motors, relays).
    - 6 PWM pins (control speed, dimming, etc.).

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6. Project Overview

We use these Express VIs:

- **Acquire Sound:** Record sound from microphone.
- **Filter:** Apply band-pass filter to the sound.
- **Play Waveform:** Output filtered sound through speakers.
- **Tone Measurements:** Measure average frequency and amplitude.