

Computer Networking Skills:

Core Skills and Practice

- - Covers essential networking for junior IT, helpdesk, and support teams
- - Builds practical skills in concepts, troubleshooting, and common tasks
- - Pairs every idea with realistic scenarios for hands-on learning
- - Path: foundations, addressing, devices, protocols, security, wireless, and next steps



Foundations



Addressing



Devices



Protocols



Security



Wireless



Next Steps

Networking Foundations and Reference Models



- What a network is and why it matters in IT support



- Network types: LAN, WAN, PAN, MAN, and common topologies



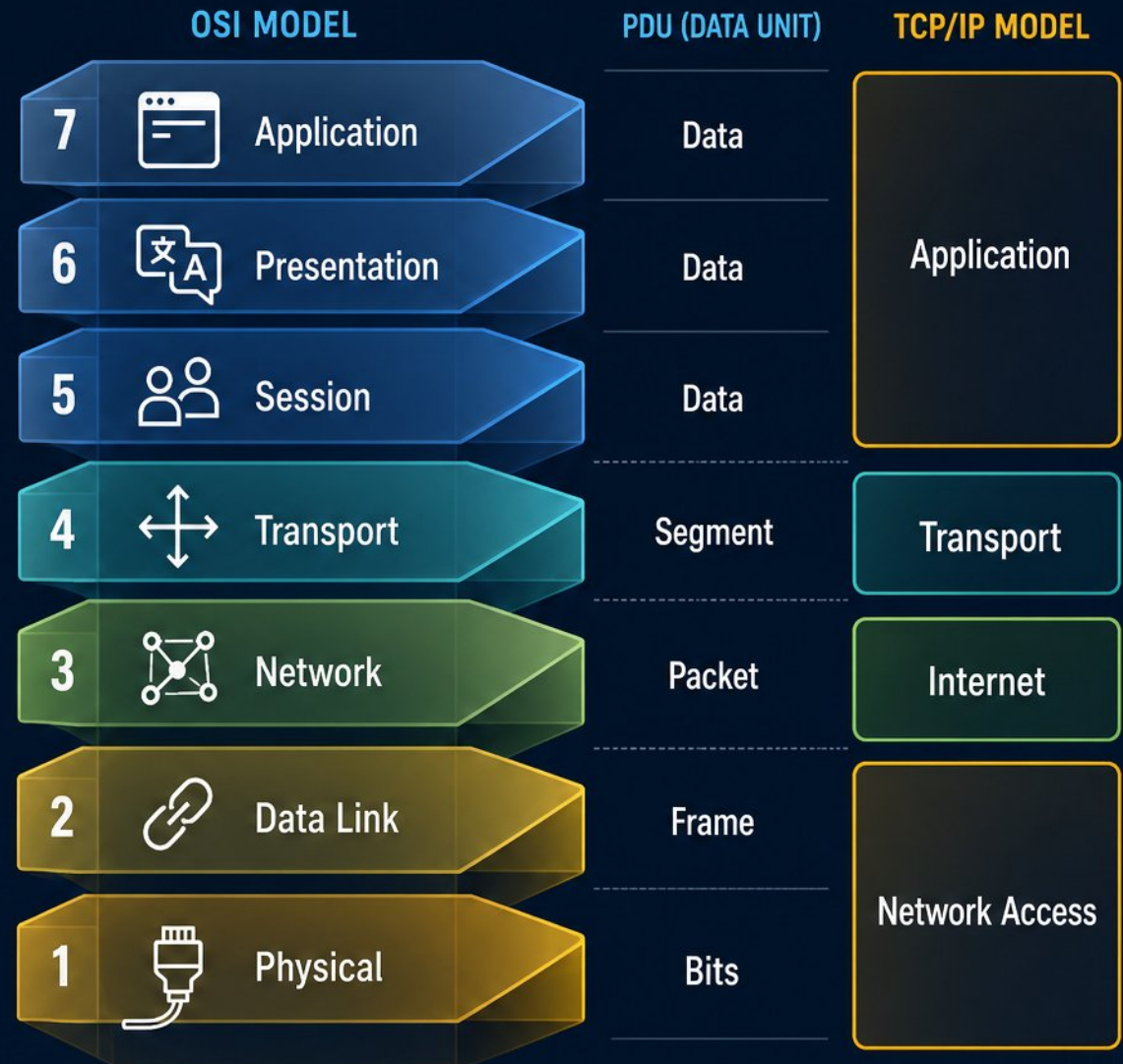
- OSI model: seven layers, PDU names, and practical examples



- TCP/IP model: four practical layers and how they map to OSI



- Using layer vocabulary to communicate issues clearly



LANs, WANs, and Network Topologies



- LAN spans a building; WAN spans cities and countries



- PAN, MAN, CAN, and SAN serve distinct scopes



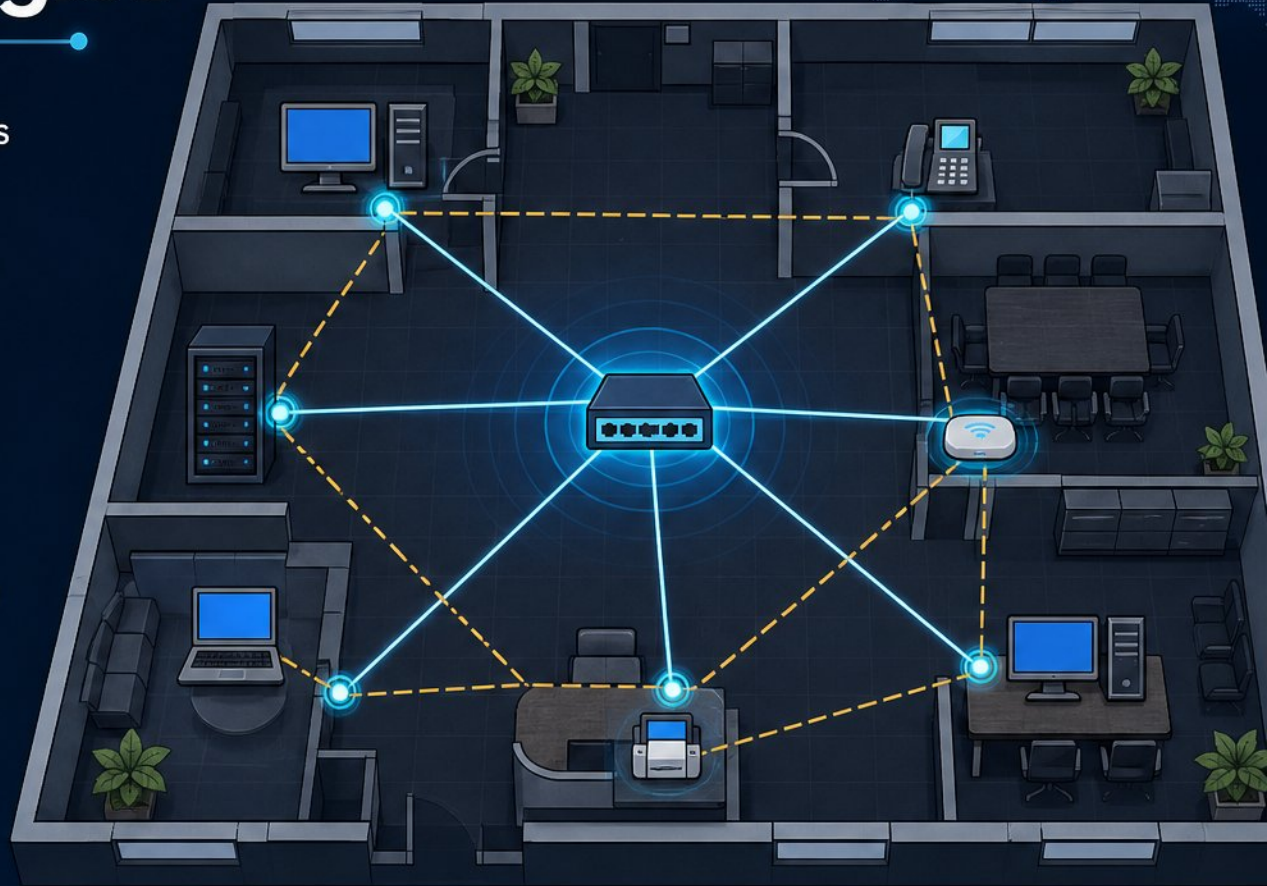
- Star, bus, ring, mesh, and hybrid topologies organize connections



- Peer-to-peer suits small setups; client-server offers central control



- Support teams match topology to office scale and traffic flow



NETWORK SCOPE



PAN



MAN



CAN



SAN

TOPOLOGY TYPES



STAR



BUS



RING



MESH



HYBRID

NETWORK ARCHITECTURE



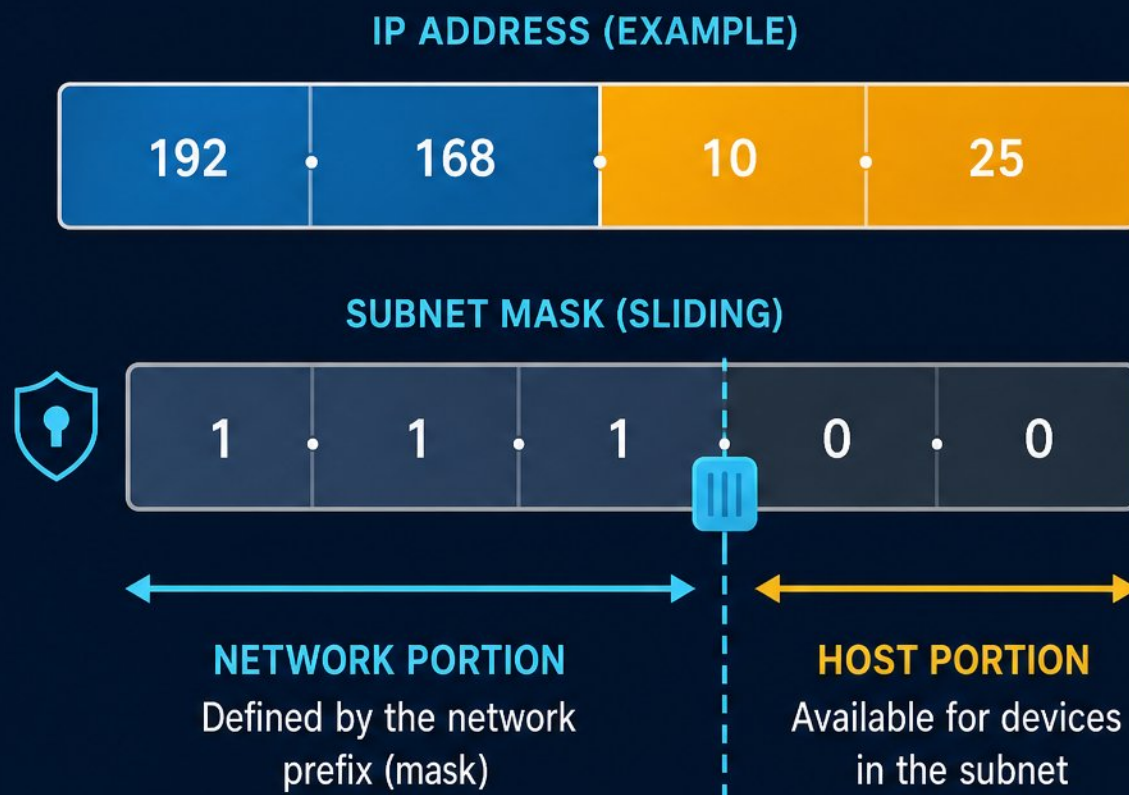
PEER-TO-PEER



CLIENT-SERVER

IP Addressing and Subnetting Essentials

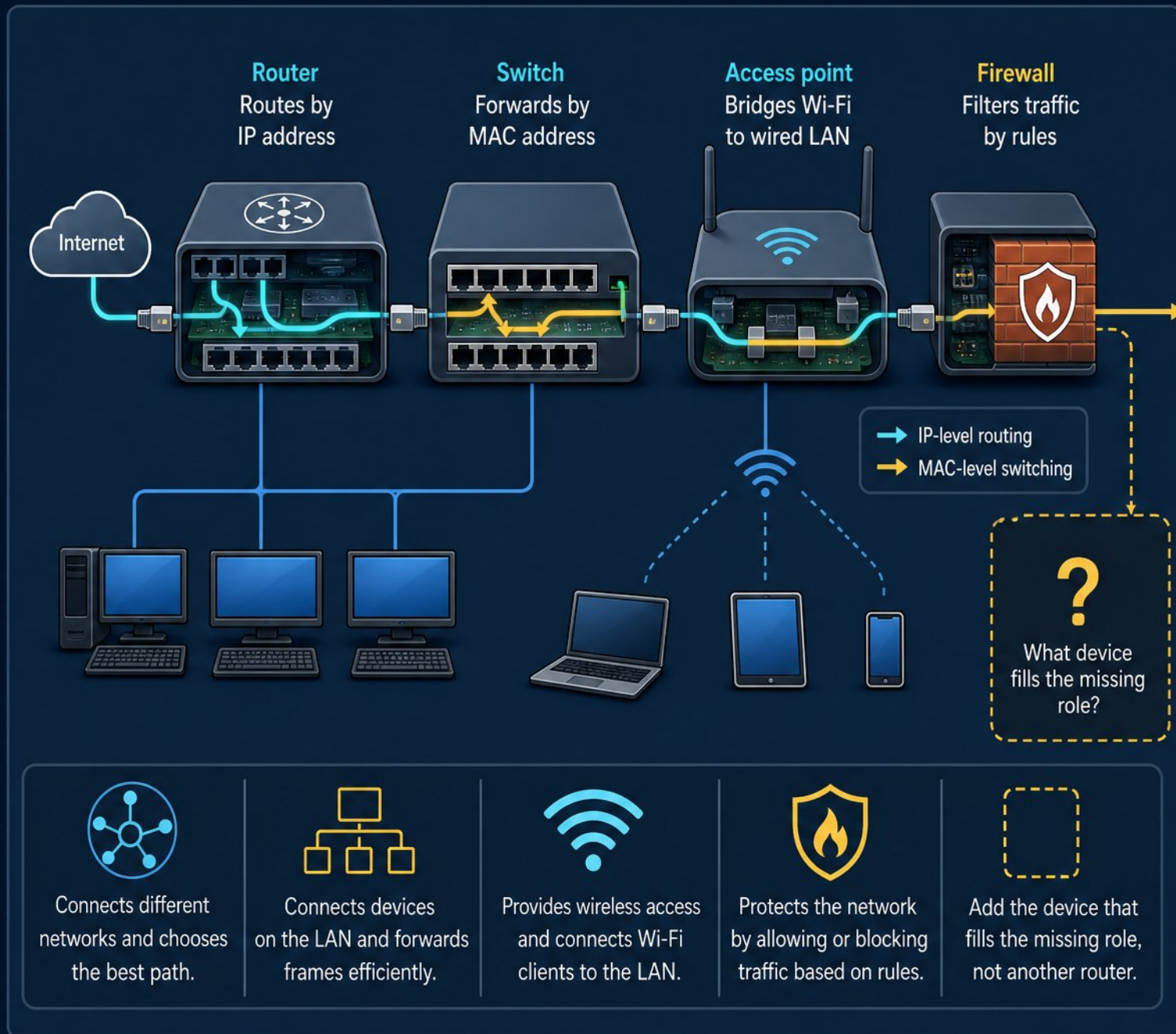
- IPv4 uses 32-bit dotted decimal; IPv6 uses 128-bit hexadecimal
- Public addresses route on the internet; private ranges are for internal use
- CIDR notation like /24 defines the network prefix length
- Subnetting borrows host bits to create smaller logical networks
- VLSM allocates different mask lengths efficiently by host count



The subnet mask slides to change the boundary between the network portion and the host portion.

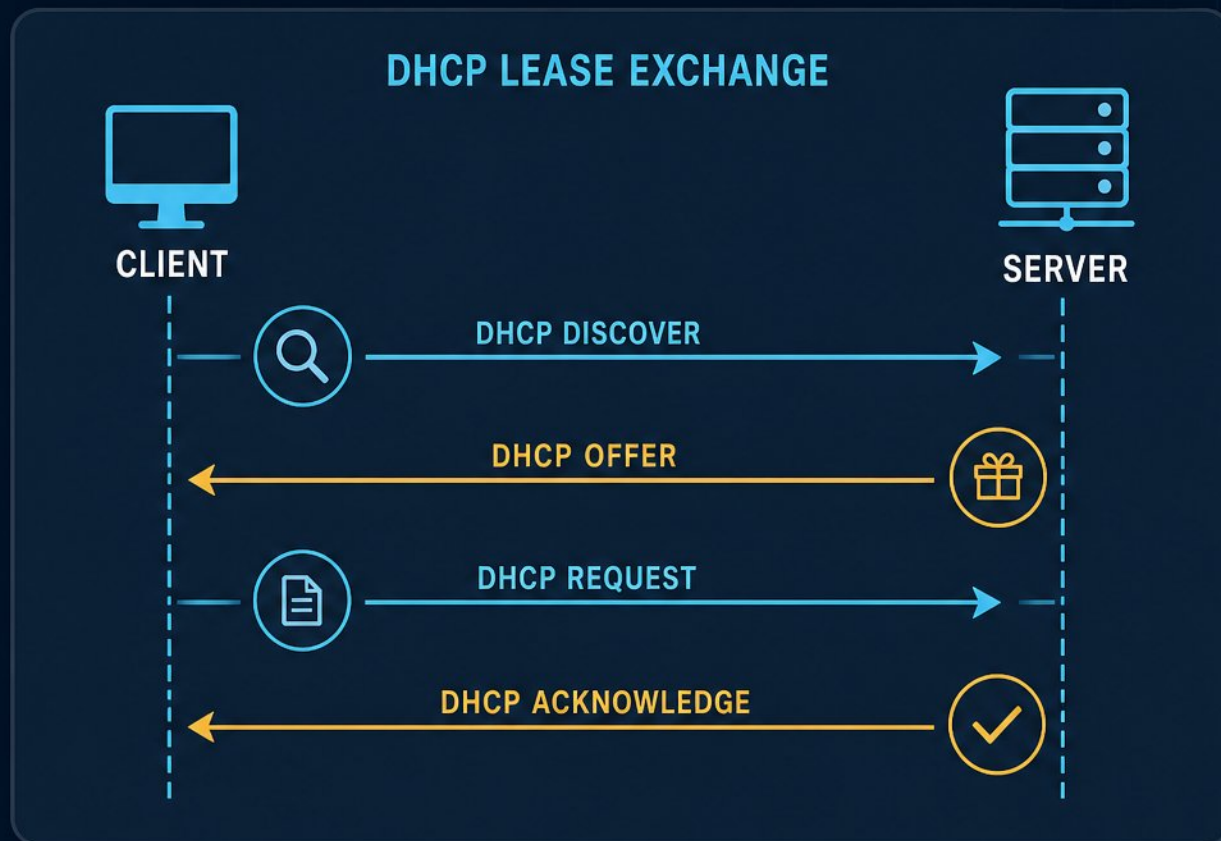
Core Network Devices and Their Roles

- **Router** connects networks and routes traffic by **IP address**
- **Switch** connects wired devices and forwards frames by **MAC address**
- **Access point** bridges Wi-Fi clients to the wired LAN
- **Firewall** filters traffic based on security rules
- Add the device that fills the missing role, not another router



Essential Protocols and Network Services

- DHCP leases IP addresses; DNS resolves names to IPs
- HTTP/80 and HTTPS/443 carry web traffic
- TCP is reliable, connection-oriented; UDP is fast, connectionless
- ICMP powers ping and basic connectivity tests
- Web request path: DHCP, DNS, TCP, then IP



Hands-On Connectivity and Command-Line Skills



- **ping:** tests reachability, latency, and packet loss with ICMP



- **traceroute/tracert:** maps each hop to find where the path breaks



- **nslookup/dig:** separates DNS resolution failures from network issues



- **Read output** for time jumps, timeouts, APIPA, and NXDOMAIN



- **Follow the order:** reachability, path, name, then port/service

```
> ping example.com
```

Pinging example.com with 32 bytes of data:

```
Reply from example.com: bytes=32 time=12ms TTL=55
```

```
Reply from example.com: bytes=32 time=13ms TTL=55
```

```
Request timed out.
```

```
Reply from example.com: bytes=32 time=285ms TTL=55
```

```
Reply from example.com: bytes=32 time=14ms TTL=55
```

Look for
timeouts
and time
jumps

```
> traceroute example.com
```

Tracing route to example.com over a maximum of 30 hops:

```
1      *      *      *      Request timed out.
```

```
2      *      *      *      Request timed out.
```

```
3    12 ms   13 ms   14 ms   *
```

```
4    45 ms   46 ms   45 ms   *
```

```
5      *      *      *      Request timed out.
```

```
6    67 ms   66 ms   67 ms   example.com
```

Find where
the path
breaks

```
> nslookup example.com
```

```
Server:    UnKnown
```

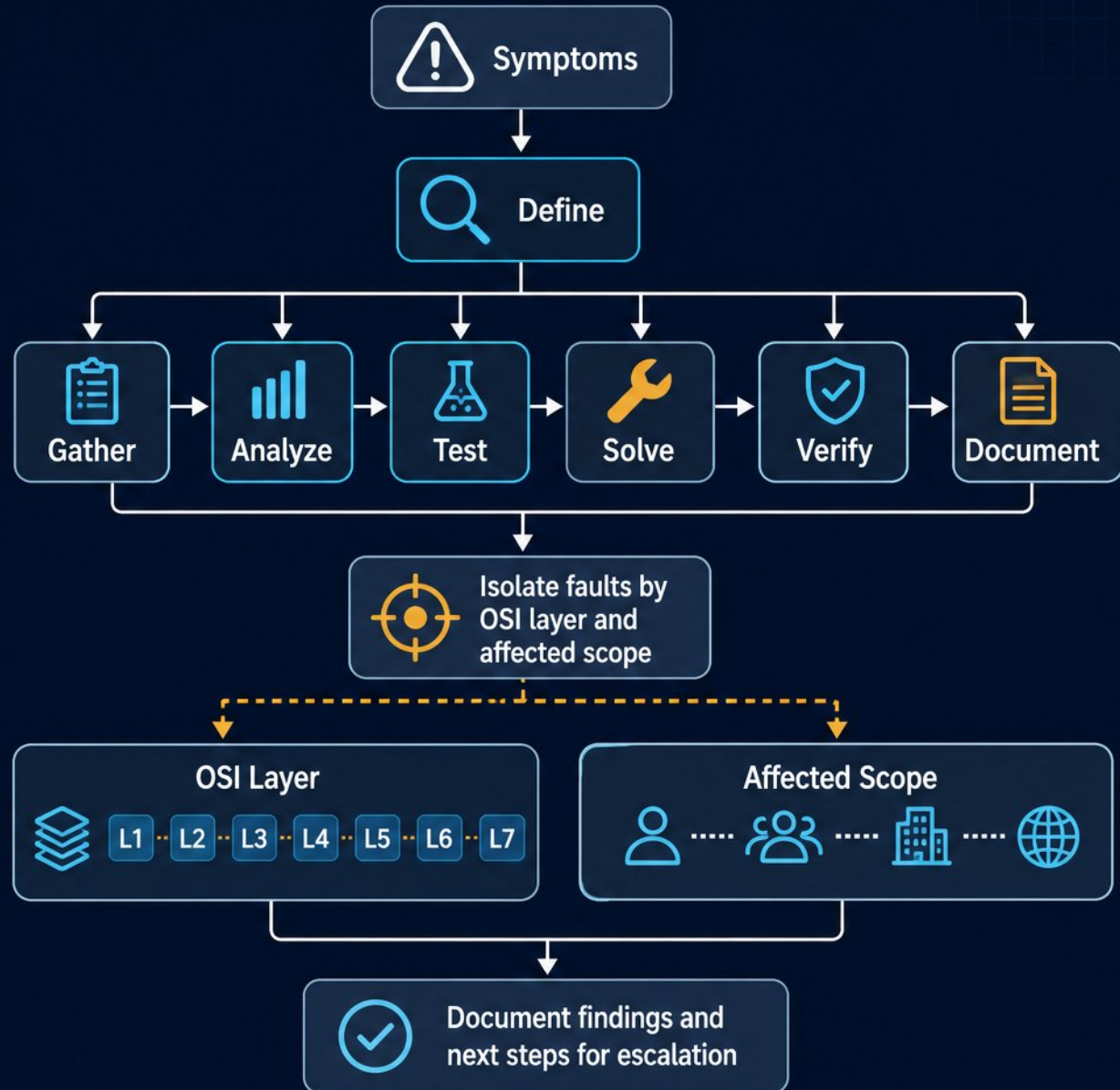
```
Address:   169.254.x.x
```

```
** server can't find example.com: NXDOMAIN
```

Identify DNS
resolution
failures

Network Troubleshooting Method

- ▶ - Define, gather, analyze, test, solve, verify, document
- ▶ - Top-down, bottom-up, or divide-and-conquer approaches
- ▶ - Isolate faults by OSI layer and affected scope
- ▶ - Compare symptoms against a known-good baseline
- ▶ - Document findings and next steps for escalation



Network Security Fundamentals



- Confidentiality, integrity, and availability guide all security decisions



- Default-deny firewalls and VLAN segmentation limit attack scope



- Secure remote access requires VPN, WPA3, and multi-factor authentication



- Phishing and default credentials are leading small business threats



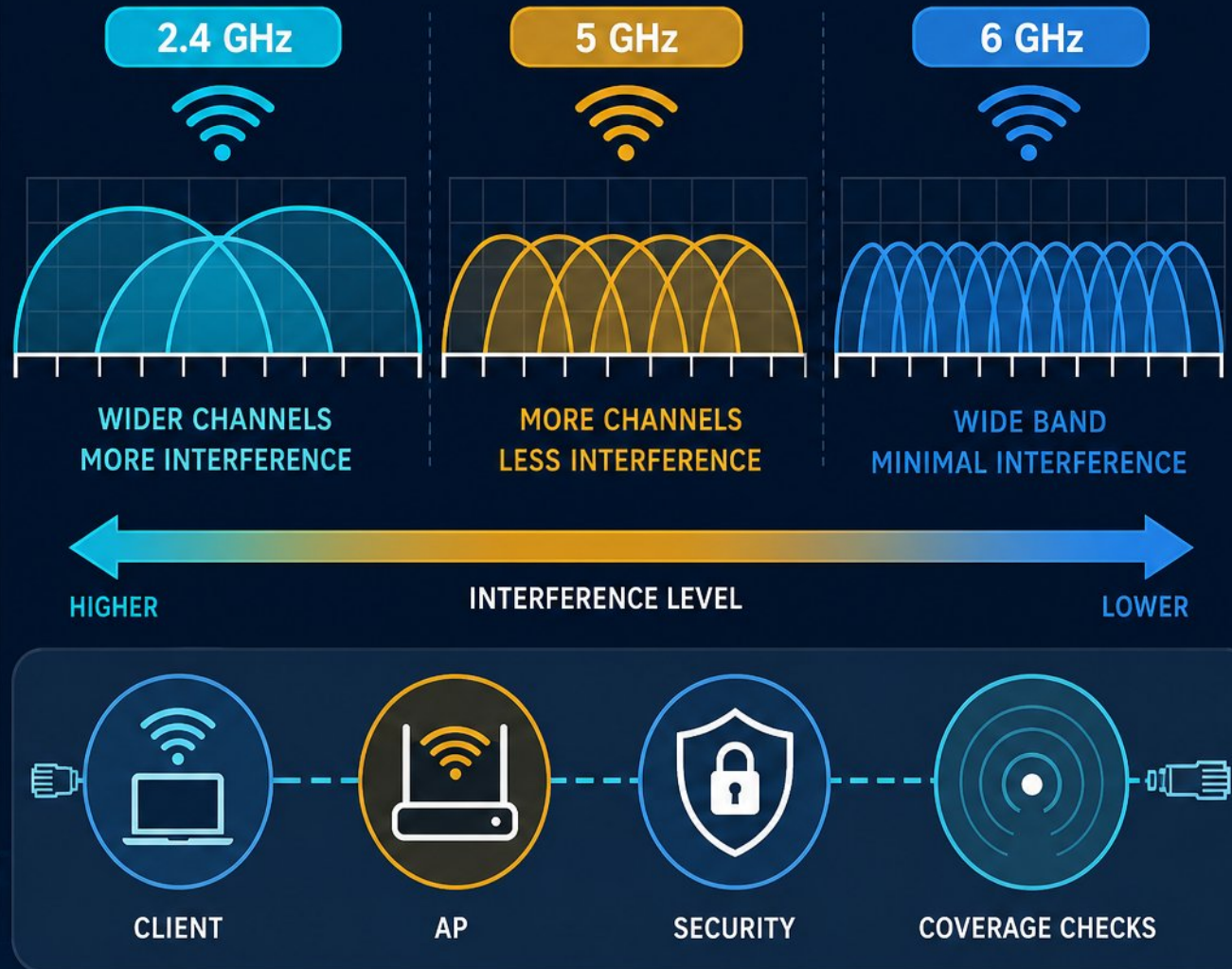
- Follow the 3-2-1 backup rule with tested recovery procedures



Wireless Networking Skills

- Wi-Fi standards and bands: 2.4 GHz, 5 GHz, and 6 GHz
- Wi-Fi 6, 6E, and 7: compatibility and enhancements
- SSID, authentication, and encryption: WPA2 vs WPA3
- Signal strength, channels, interference, and band steering
- Basic workflow: client, AP, security, and coverage checks

WI-FI FREQUENCY SPECTRUM



Practical Network Support Scenarios



- Apply a layer-by-layer method to realistic user tickets



- Start with scope and baseline: who is affected, what changed?



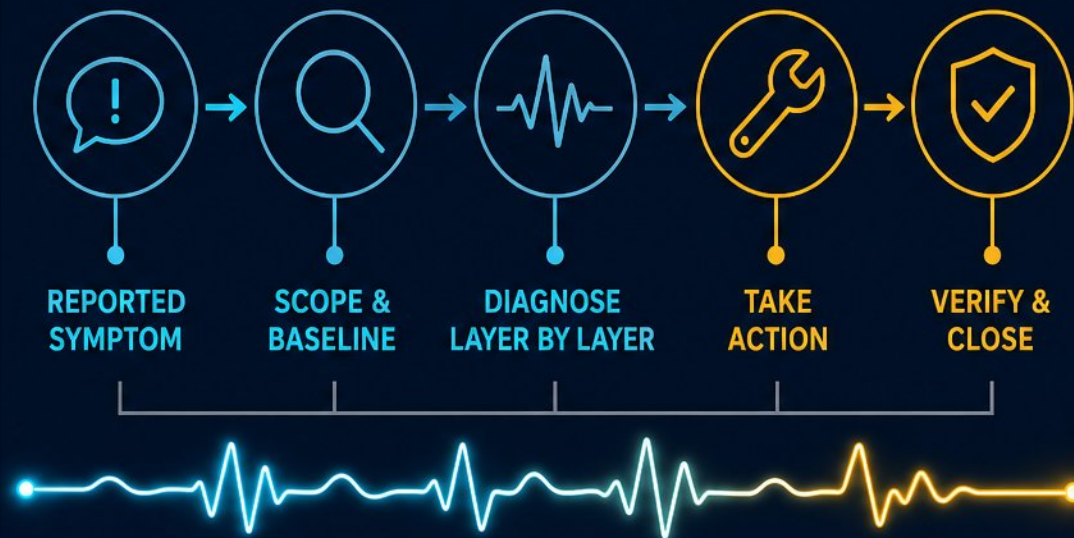
- Use ping, traceroute, nslookup, and port checks in sequence



- Verify physical, IP, DNS, and application layers before changing anything



- Document findings and close with a known-good functionality check



Practice Labs and Certification Paths



- Build labs with Packet Tracer, GNS3, VMs, or physical gear



- Practice subnetting, VLANs, DHCP, DNS, and troubleshooting workflows



- CompTIA Network+ N10-009 exam: 5 domains, troubleshooting weighted highest

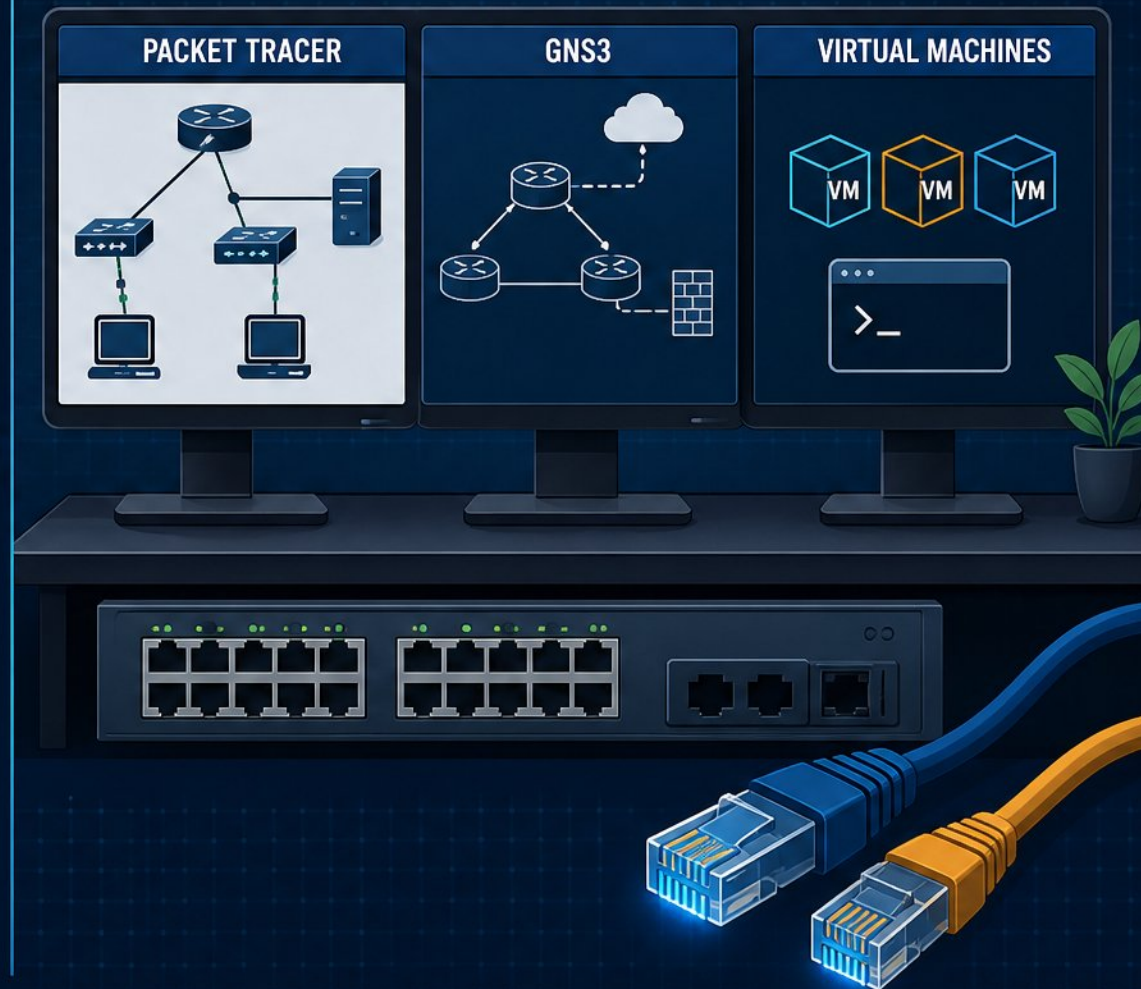


- After Network+: CCNA, Security+, cloud, and Linux paths



- Use CertMaster, Professor Messer, and free practice question banks

HOME LAB ENVIRONMENT



Checklist Review and Common Pitfalls



- Quick reference: ports, protocols, and core troubleshooting commands



- Subnetting mistakes: miscounting hosts, misreading boundaries, wrong VLSM order



- Device selection errors: adding routers for ports, unmanaged switches for VLANs



- Security pitfalls: default credentials, open ports, flat networks, weak Wi-Fi



- Build a personal skills checklist and verify each item with a lab

POCKET REFERENCE CARD



COMMON PORTS

▶ HTTP	TCP	
▶ HTTPS	TCP	
▶ SSH	TCP	
▶ DNS	UDP	
▶ DHCP	UDP	



CORE TROUBLESHOOTING COMMANDS

- ▶ `ping <target>`
- ▶ `tracert <target>`
- ▶ `ipconfig /all`
- ▶ `show ip interface brief`
- ▶ `show running-config`
- ▶ `show vlan brief`



SUBNETTING SHORTCUTS

- ✓ Count usable hosts correctly
- ✓ Identify network & broadcast
- ✓ Use correct subnet mask
- ✓ Plan VLSM from largest to smallest



Next Steps and Continuing Practice



- Turn knowledge into habit with a structured lab practice plan.



- Prioritize labs that build, break, and fix, especially troubleshooting and subnetting.



- Use official practice tests and objectives to confirm exam readiness.



- Apply the repeatable troubleshooting method to real-world support tickets.



- Document your work, track weak domains, and continue building your home lab.



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