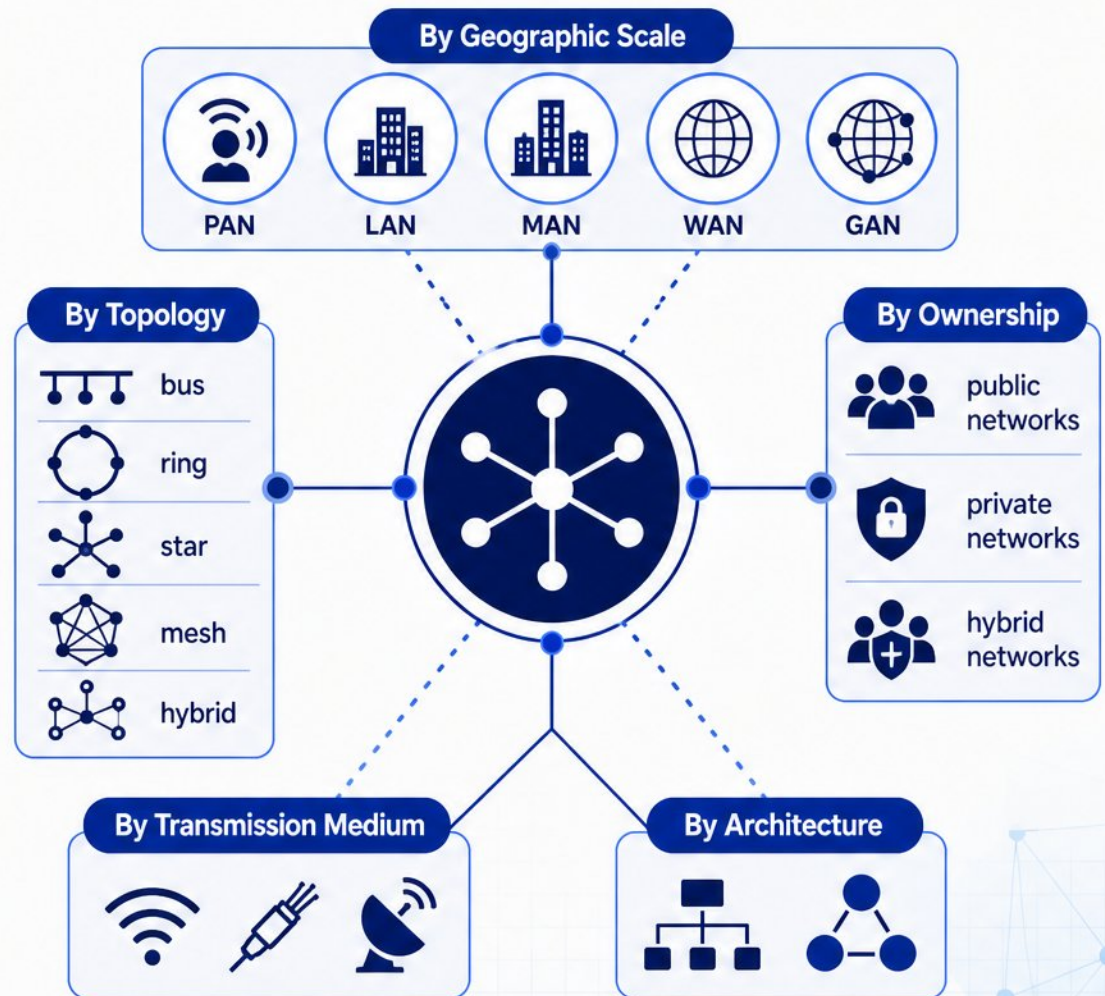
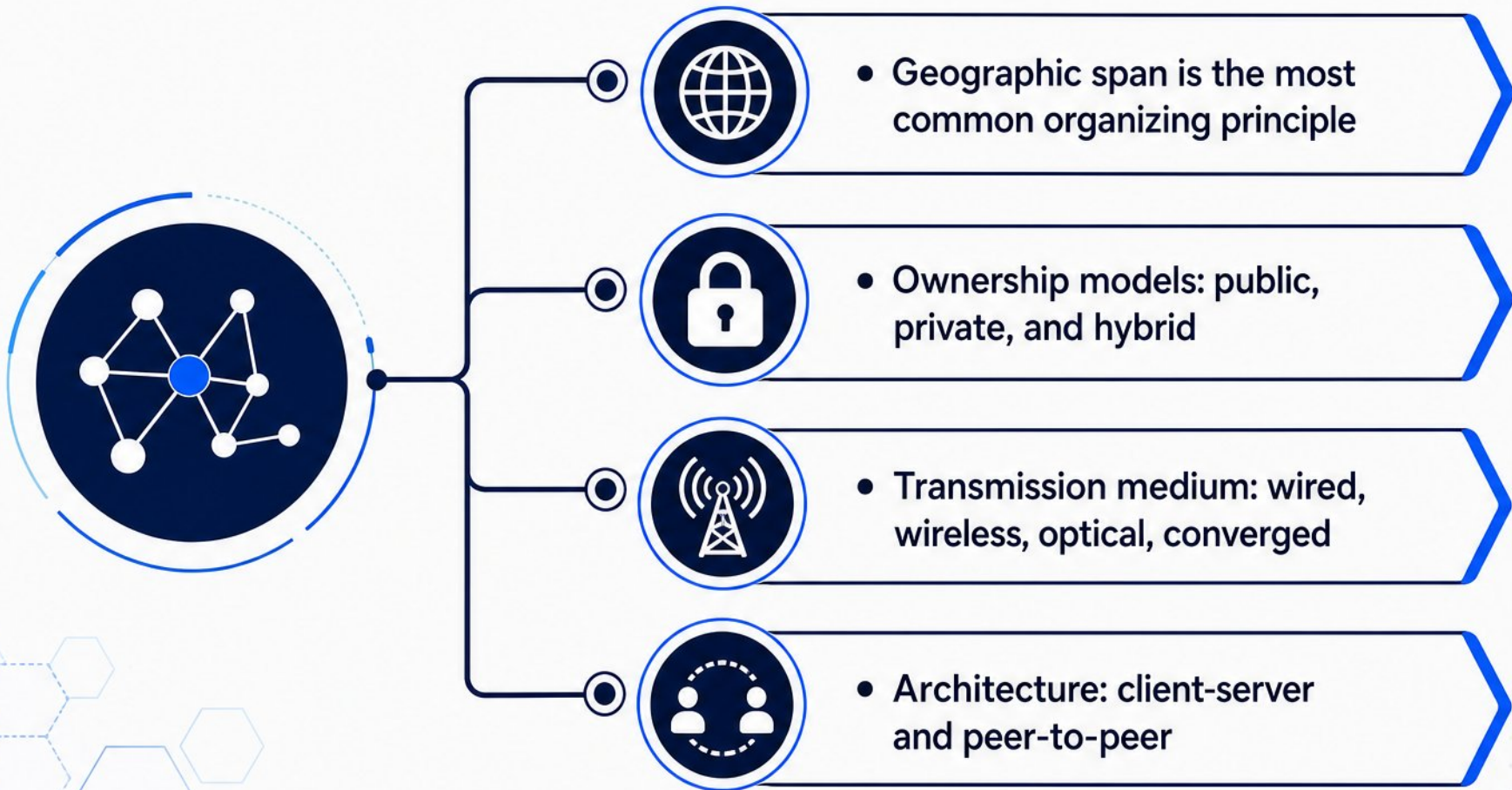


Types of Computer Networking

- Network type affects design, cost, performance, security, and troubleshooting
- Classify by geographic scale, topology, ownership, transmission medium, and architecture
- Scale examples: PAN, LAN, MAN, WAN, GAN
- Topology examples: bus, ring, star, mesh, hybrid
- Ownership models: public, private, and hybrid networks
- Learners gain a practical framework for identifying, comparing, and choosing network types



How Networks Are Classified



Networks by Geographic Scale: **PAN** and **LAN**

- PAN/WPAN cover personal space, usually up to 10 meters
- PAN uses Bluetooth, USB, Zigbee, and NFC links
- LAN/WLAN connects devices across one building or campus
- LANs rely on Ethernet or Wi-Fi for fast local access
- LANs are privately owned, fast, and manageable in-house



Networks by Geographic Scale: MAN, WAN, and GAN

- MAN: connects LANs across a city or metro area via fiber or carrier services
- WAN: spans countries and continents through leased, cellular, or satellite links
- GAN: unites WANs and LANs globally; the internet is the largest example
- Enterprise setups now mix LAN, WAN, and cloud connectivity

MAN

Metropolitan Area Network
City / Metro



WAN

Wide Area Network
Countries / Continents



Leased Links



Cellular Links



Satellite Links

GAN

Global Area Network
Global

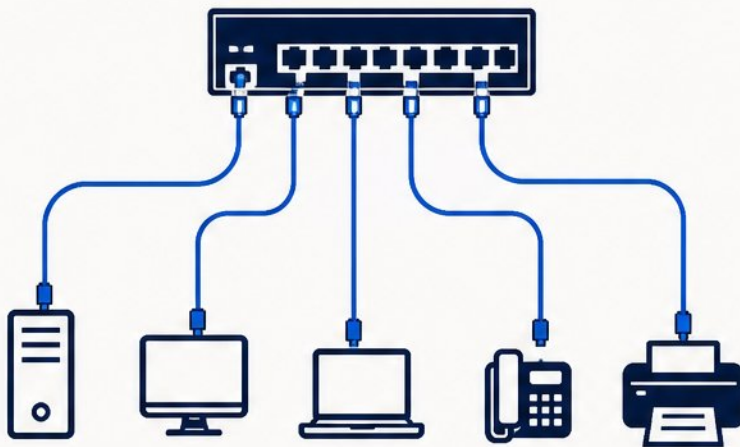
Unites WANs and LANs globally; the internet is the largest example



Physical vs. Logical Topology

Physical Topology

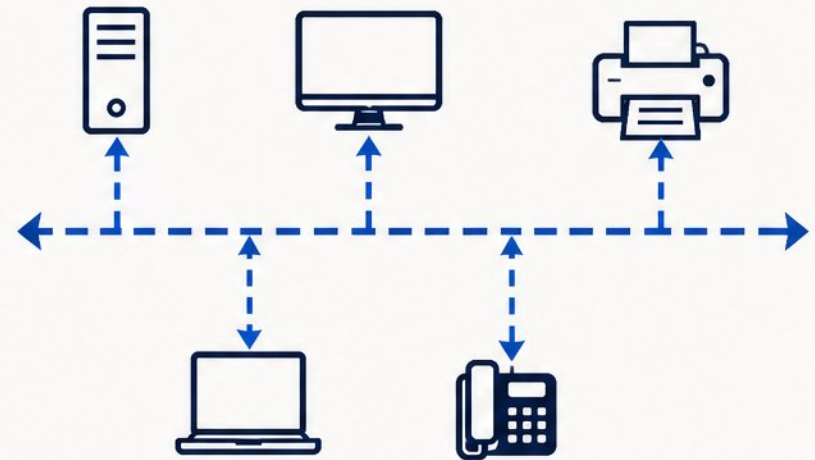
Actual cables and physical connections



VS.

Logical Topology

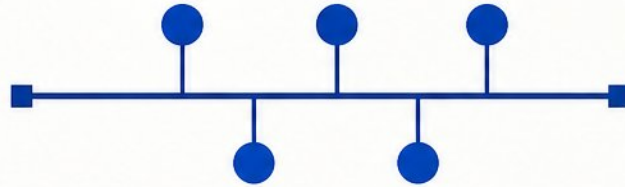
Data flows regardless of physical layout



- - Physical topology maps cables, devices, and actual physical connections
- - Logical topology shows how data flows regardless of physical layout
- - Physical and logical topologies can differ; older Ethernet was logical bus over physical star
- - Modern design emphasizes flexible logical overlays on robust physical underlays

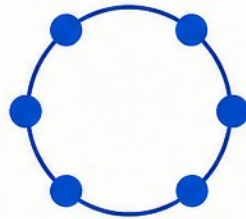
Common Topologies: Bus, Ring, Star, and Tree

Bus



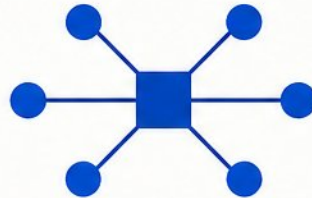
- Bus: one shared backbone; cheap but a single point of failure

Ring



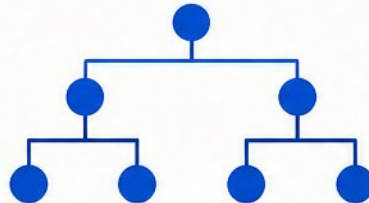
- Ring: each node connects to two neighbors; dual rings add redundancy

Star



- Star: all nodes connect to a central switch; most common LAN topology

Tree

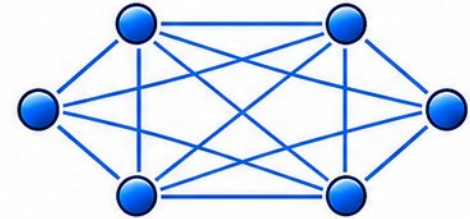


- Tree: hierarchical parent-child structure; scales well for larger organizations

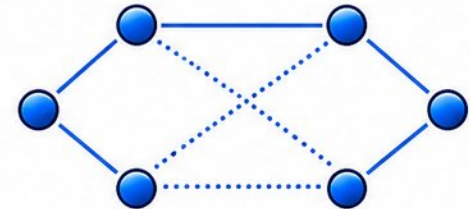
Mesh and Hybrid Topologies

- - Full mesh links every node directly for maximum redundancy
- - Partial mesh balances resilience against implementation cost
- - Hybrid topology blends standards to match business needs
- - Wireless mesh makes flexible, resilient deployments practical

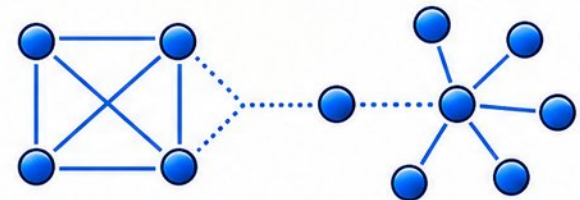
**FULL
MESH**



**PARTIAL
MESH**



**HYBRID
TOPOLOGY**



**WIRELESS
MESH**



Public, Private, and Hybrid Networks

- Public networks are shared infrastructure like the internet and public Wi-Fi
- Private networks are dedicated to one organization, such as enterprise LANs
- Hybrid networks combine on-premises, cloud, VPN, and managed services
- Security and access control expectations differ across ownership models



Wired, Wireless, and Converged Networks



- **Wired:** Ethernet, fiber, and legacy copper standards



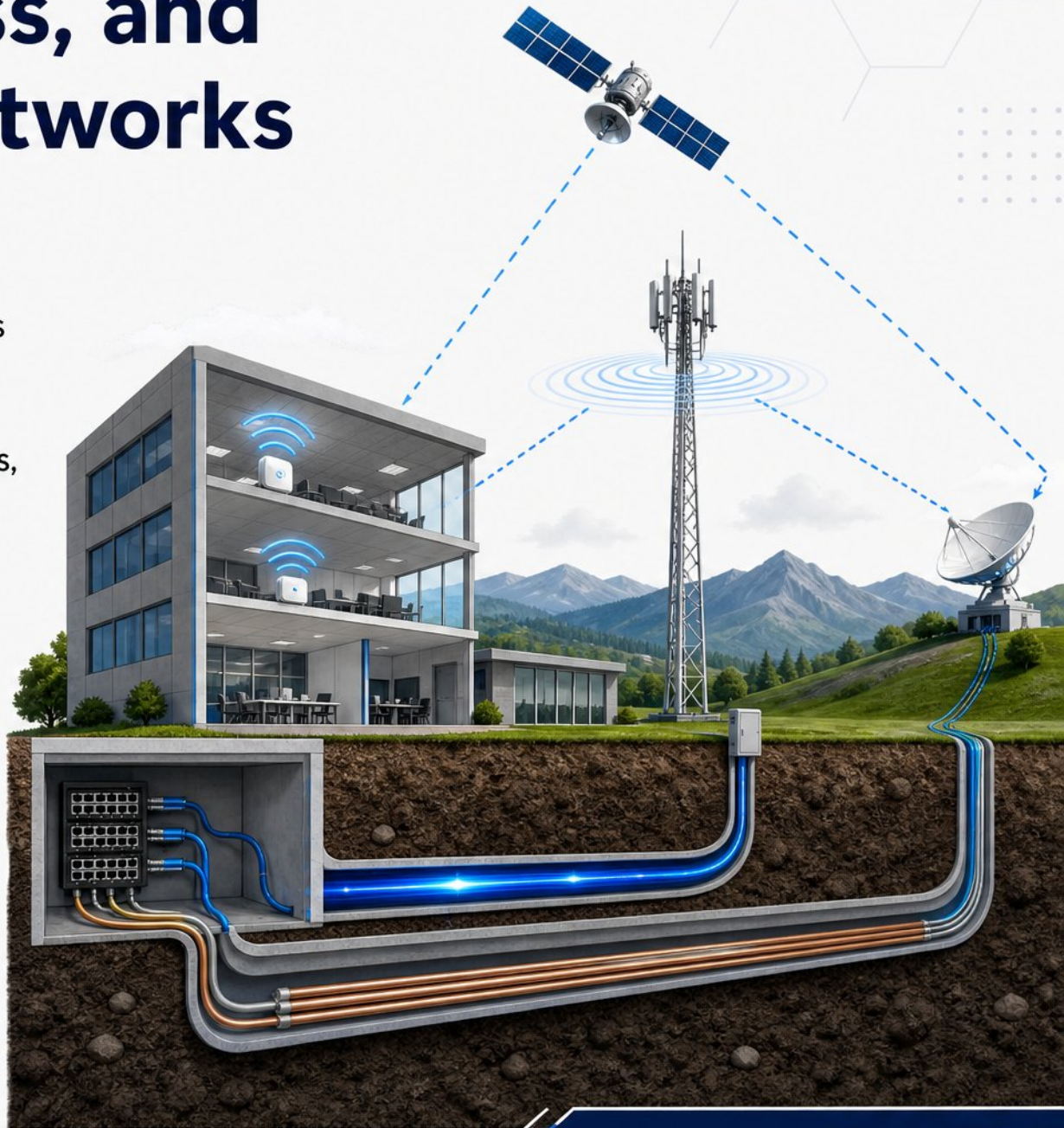
- **Wireless:** Wi-Fi generations, cellular, satellite, short-range



- **Converged:** fixed, mobile, and satellite for resilience



- **Selection** balances distance, bandwidth, mobility, latency, and cost



Network Architectures: Client-Server and Peer-to-Peer



- Client-server centralizes resources, services, and administration on dedicated servers



- Peer-to-peer treats all nodes as equals for small or decentralized environments

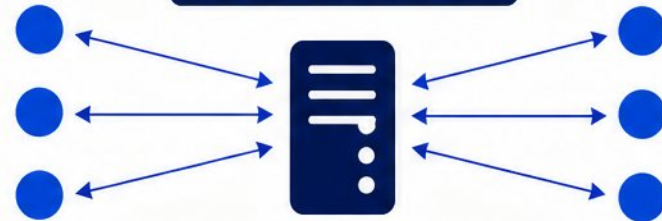


- Centralized, decentralized, and distributed models describe control and data sharing

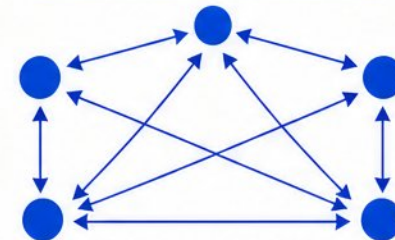


- Real-world networks often blend architectural models across different segments

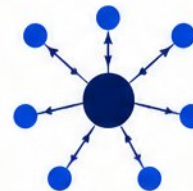
CLIENT-SERVER



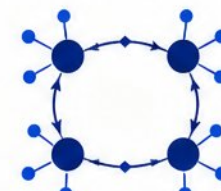
PEER-TO-PEER



MODELS OF CONTROL AND DATA SHARING



CENTRALIZED



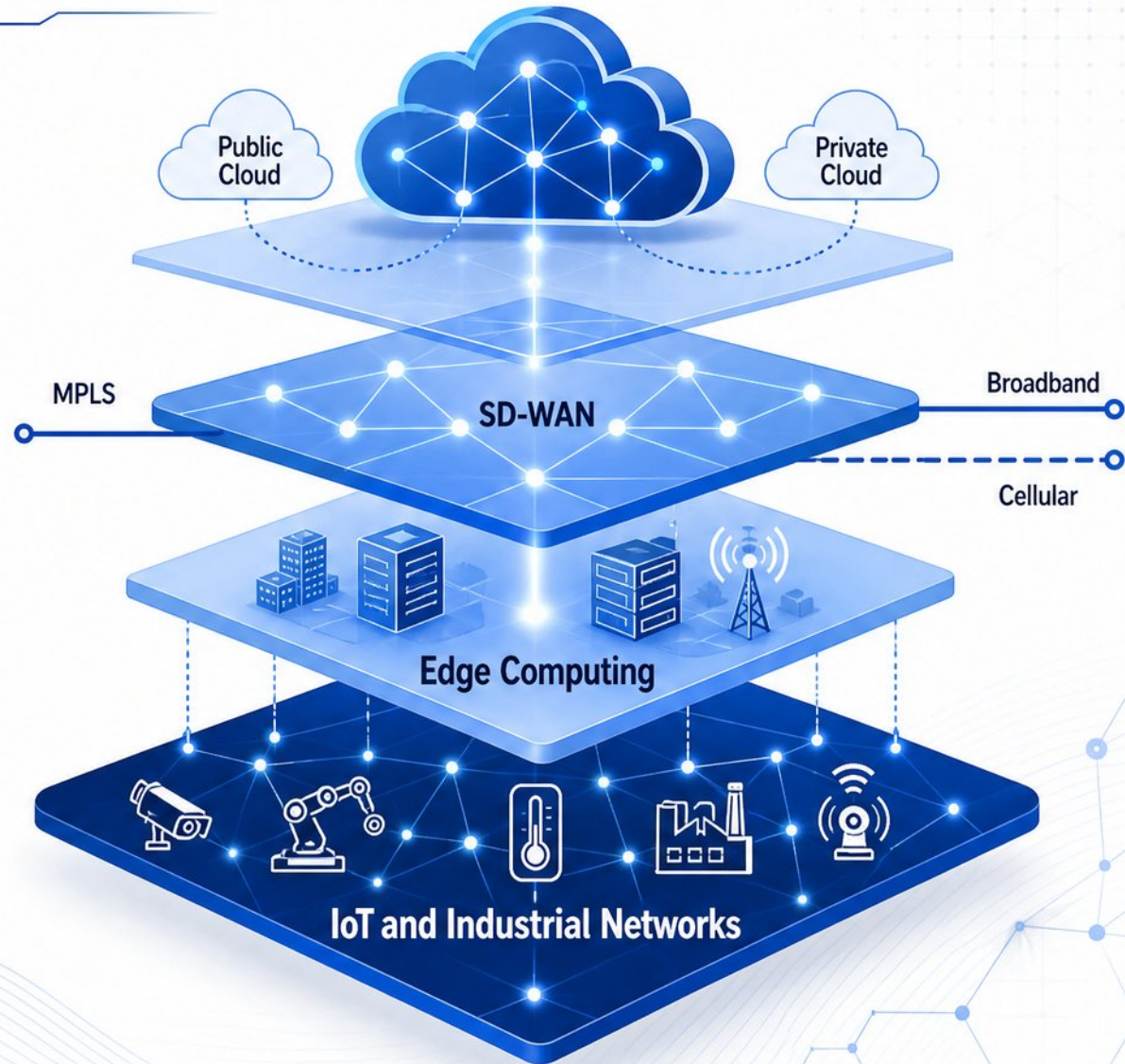
DECENTRALIZED



DISTRIBUTED

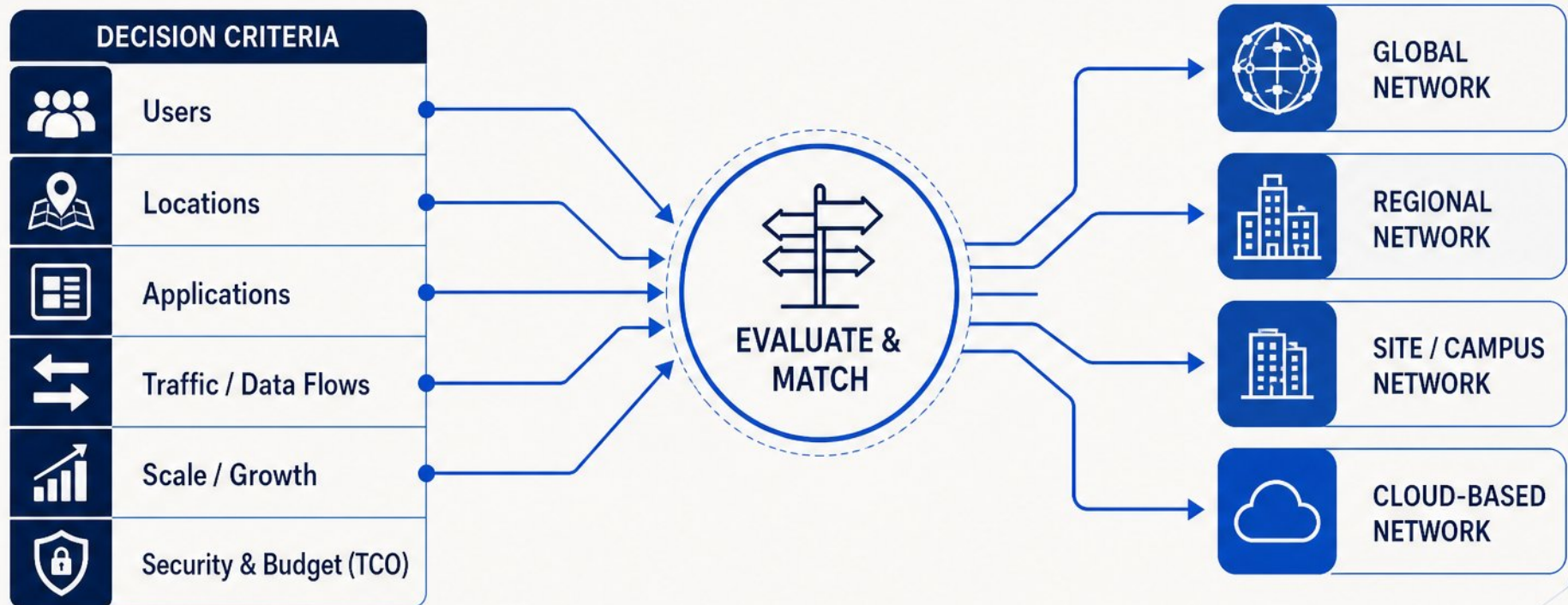
Emerging Network Models: Cloud, SD-WAN, Edge, and IoT

- **Cloud networking** virtualizes services on public and private cloud platforms
- **SD-WAN** uses software control across MPLS, broadband, and cellular links
- **Edge computing** processes data closer to users for lower latency
- **IoT and industrial networks** combine PAN, LAN, WAN, and LPWAN protocols

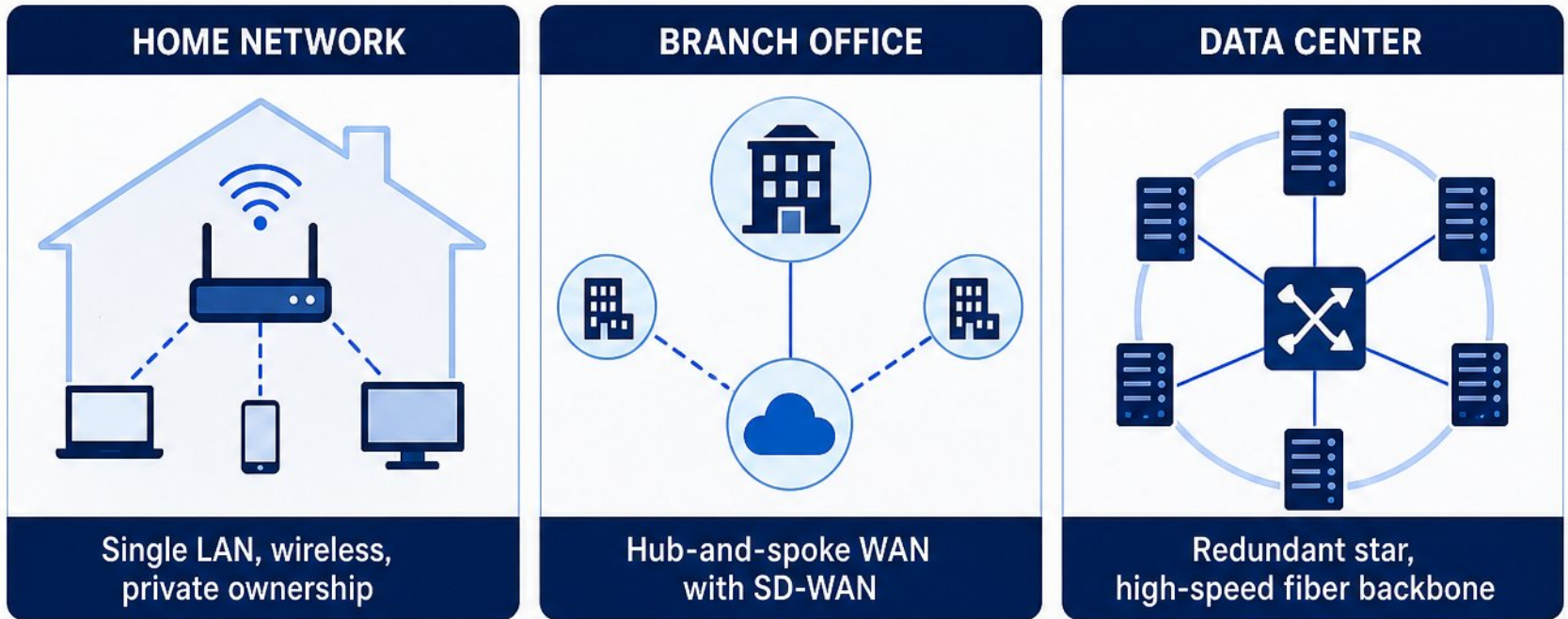


Choosing the Right Network Type

- - Translate business needs into users, locations, apps, and data flows
- - Balance capacity, latency, reliability, security, scalability, and TCO
- - Use decision criteria: geographic scope, site type, traffic, growth
- - Avoid overprovisioning without traffic analysis or ignoring future scalability

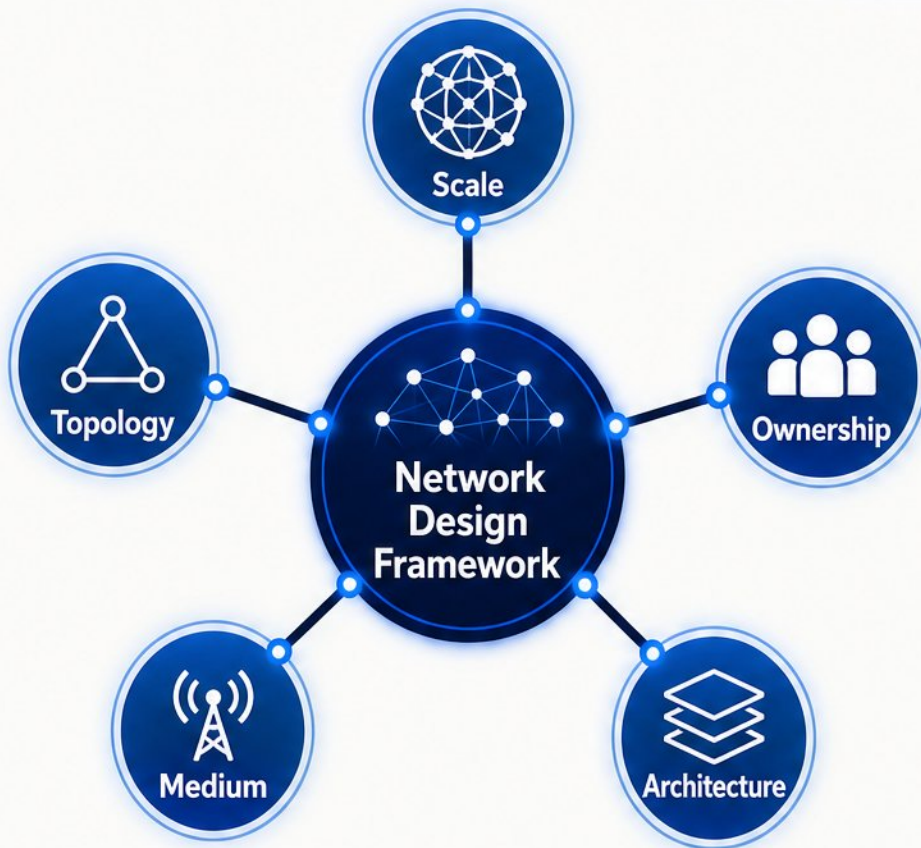


Hands-On Scenarios and Case Comparisons

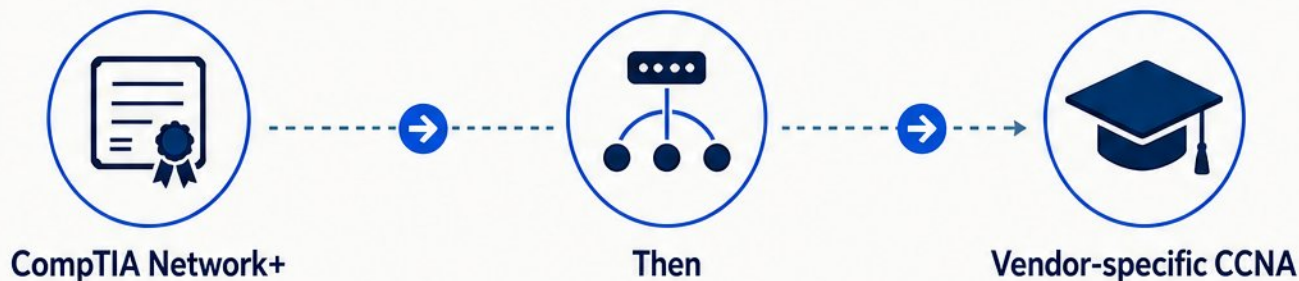


- Home network: single LAN, wireless, private ownership
- Branch office: hub-and-spoke WAN with SD-WAN
- Data center: redundant star, high-speed fiber backbone
- Match requirements to scale, topology, and medium
- Justify trade-offs using evidence from case studies

Summary, Review, and Next Steps



- - Major categories: scale, topology, ownership, medium, architecture
- - Distinguish physical layout from logical data flow
- - Choose types based on requirements, not labels alone
- - Certifications: CompTIA Network+, then vendor-specific CCNA
- - Apply framework to planning and professional development



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