OSI Model

| # | Layer | Key Role | Protocols/Examples |
| --- | --- | --- | --- |
| 1 | Physical | Bits, cables, signals | Cables, hubs |
| 2 | Data Link | Frames, MAC, errors | Ethernet, Wi-Fi |
| 3 | Network | Routing, IP addresses | IP, ICMP |
| 4 | Transport | Reliable/fast delivery | TCP, UDP |
| 5 | Session | Session management | NetBIOS, RPC |
| 6 | Presentation | Data format, encryption | SSL, JPEG |
| 7 | Application | User services | HTTP, FTP, DNS |
| Topology | Description | Pros | Cons |
| Bus | All devices on single cable | Simple, cheap | Single point of failure, collisions |
| Star | Devices connect to central hub/switch | Easy to manage, scalable | Hub failure, cabling cost |
| Ring | Each device connects to next, forming loop | Equal access, predictable | Single break disrupts network |
| Mesh | All devices interconnected | Highly reliable, no single failure | Expensive, complex wiring |
| Tree | Hierarchical star (stars linked) | Scalable, organized | Complex, hub dependency |
| Hybrid | Combines multiple topologies | Flexible, reliable | Complex to design/maintain |