

# Networking Today

# Network components

- **Host:** every computer in a network
  - **Server:** computers that provide information to end devices (email server, web server, ftp server)
  - **Clients:** computers that send requests to the servers to retrieve information (email from an email server, web page from a web server)
- **Peer-to-peer:** Network design only recommended for very small network where the same device acts as a client and as a server.

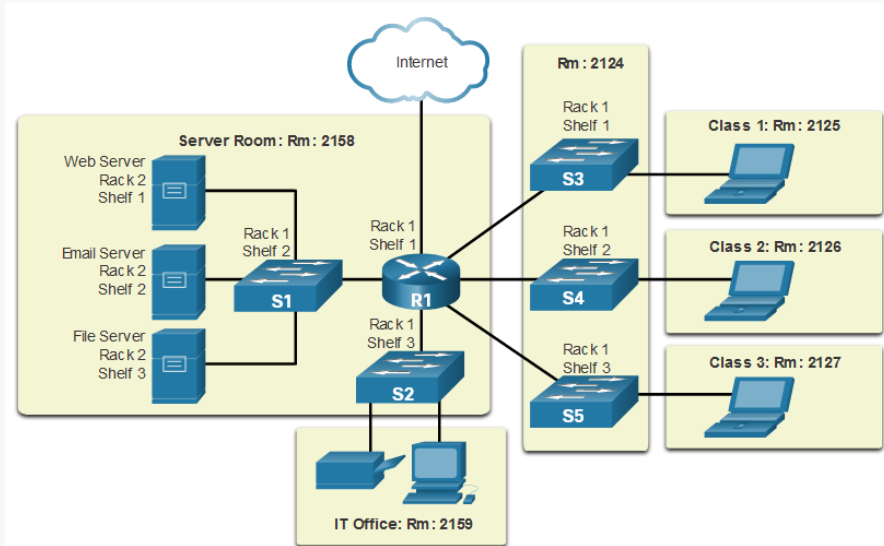
# Network components

- **End Devices:** where a message originates from or where it is received.
- **Intermediary Network Devices:** interconnects end devices. E.g.: switches, wireless access points, routers, firewalls.
- **Media:** communication across a network is carried through a medium which allows a message to travel from source to destination.
  - **Metal wires within cables:** Uses electrical pulses ⚡
  - **Glass or plastic fiber within cables (fiber-optic cable):** Uses pulses of light 💡
  - **Wireless transmission:** Uses modulation of specific frequencies of electromagnetic waves. 📡

# Topology Diagrams

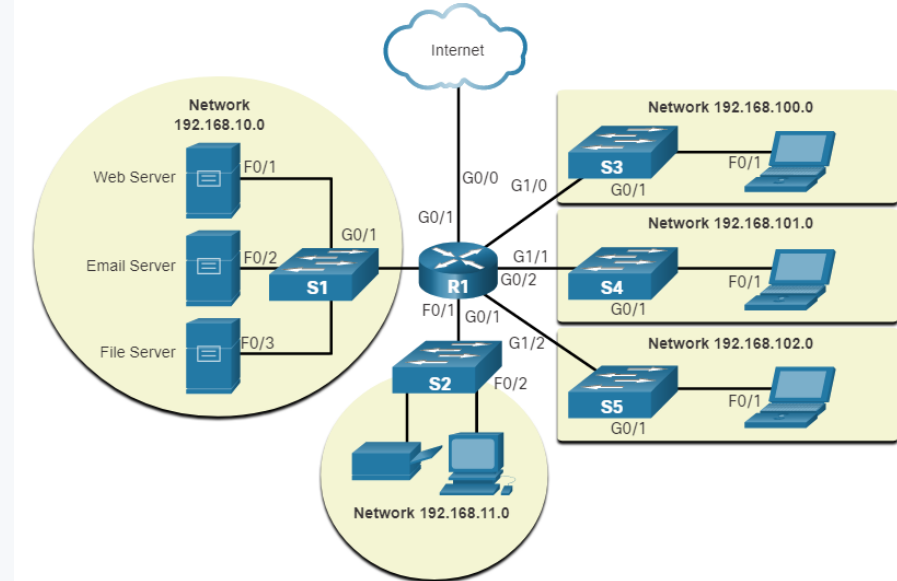
## Physical topology

Illustrate the physical location of intermediary devices and cable installation.



## Logical Topology

Illustrate devices, ports, and the addressing scheme of the network



# Networks of many sizes

- Small network computers: few computers to each other and internet
- Small Office/Home Office (SOHO): home or remote office to corporate network
- Medium to Large Networks: many locations with hundreds or thousands of PCs
- World Wide Networks: hundreds of millions of PCs world-wide (internet)

## LANs and WANs

- LAN (Local Area Network): network that spans a small geographic area
- WAN (Wide Area Network): network that spans a wide geographic area

# Intranet and Extranets

- **Intranet:**
  - Private collection of LANs and WANs internal to an organization
  - Accessible only to the organization members
- **Extranet:**
  - Provide secure access to their network to individuals
    - Suppliers
    - Customers
    - Collaborators
- **Internet:** Worldwide collection of interconnected LANs and WANs.

# Home and Small Office Internet Connections

- **Cable:** internet offered by cable TV service providers
- **DSL** (Digital Subscriber Line): ADSL (Asymmetric), SDSL (Symmetric)
- **Cellular:** cell phone network to connect to internet
- **Satellite:** rural areas without ISP (Internet Service Provider)
- **Dial-up telephone:** modem

## Business Internet Connections

- **Dedicated Leased Line:** reserved circuits within service provider
- **Ethernet WAN:** extends LAN access technology into the WAN
- **DSL**
- **Satellite**

# Converging Network

Carry multiple services on one link: data + voice + video

## Network Architecture

Technologies that support the infrastructure that moves data across the network.

4 basic characteristics that the underlying architecture need to address to meet users expectations:

- **1 Fault Tolerance:** Redundancy (alternative paths if a device or link fails)
- **2 Scalability:** expand quickly and easily to support new users/apps
- **3 Quality of Service (QoS):** mechanism to ensure reliable delivery for all users
- **4 Security:** network infrastructure security and information security



# Goals of network security

- **Confidentiality:** only intended recipients can read the data
- **Integrity:** assurance that the data has not been altered with during transmission
- **Availability:** assurance of timely and reliable access to data for authorized users

## Network trends

- Bring Your Own Device (BYOD)
- Online Collaboration. Video communications
- Cloud computing
- Powerline Networking (PLC)
- Wireless Broadband: WISP (Wireless ISP)

# Network Security Threats

- **External threats:** viruses, worms, trojans horses. Spyware and adware. 0-day attacks. Threat actor attacks. Denial of Service (DoS) attacks. Data interception and theft. Identity theft.
- **Internal threats:** lost or stolen devices. Accidental misuse by employees. Malicious employees.

## Security Solutions

- **Home or Small Office Networks:** Antivirus, antispyware, firewall
- **Large networks:** dedicated firewall system, Access Control Lists (ACL), Intrusion Prevention System (IPS), Virtual Private Network (VPN)