# Introduction to Networks

Network Principles

UC1NPR052

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# What this course includes?

- Moodle Site
  - UC1NPR052
- Microsoft Teams Chat
  - LINK
- Streaming
  - Mon – Thu @ 08h30 – 09h30
    - TUT (Online ZOOM) 09h35 – 10h30
- Duration
  - 2 Weeks (2 weeks teaching + 1 week self study)
- Assessments
  - 20% Assignment 1: Online Test on Moodle
  - 80% Assignment 2: Final Assessment

**NOTE: Read everything on Moodle carefully**

# Lecture Overview

- LANs, WANs, and the Internet
  - Explain how topologies and devices are connected in a small to medium-sized business network.
    - Explain the use of network devices..
    - Compare the devices and topologies of a LAN to the devices and topologies of a WAN.
    - Describe the basic structure of the Internet.
    - Explain how LANs and WANs interconnect to the Internet.
- The Network as a Platform
  - Explain the basic characteristics of a network that supports communication in a small to medium-sized business.
    - Explain the concept of a converged network.
    - Describe the four basic requirements of a reliable network.

# Networks in Everyday Life




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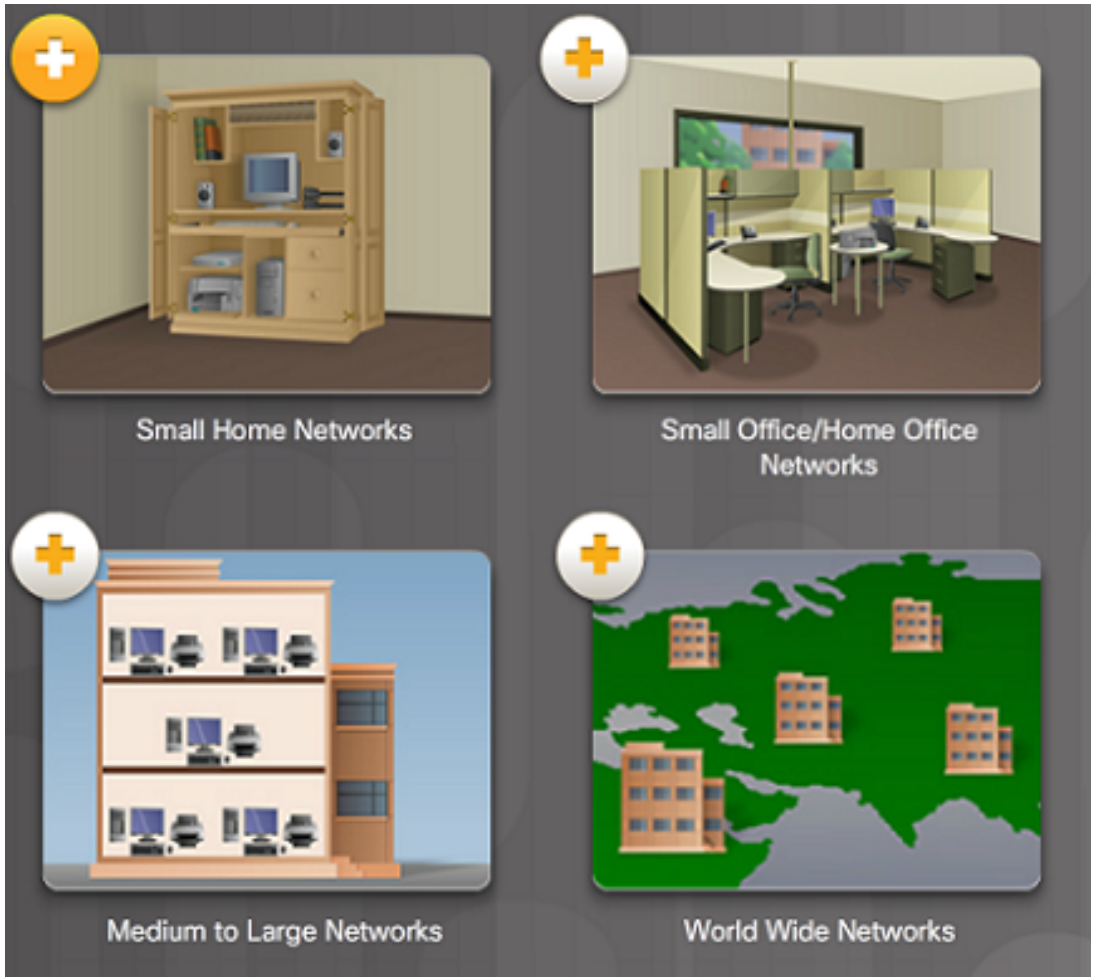
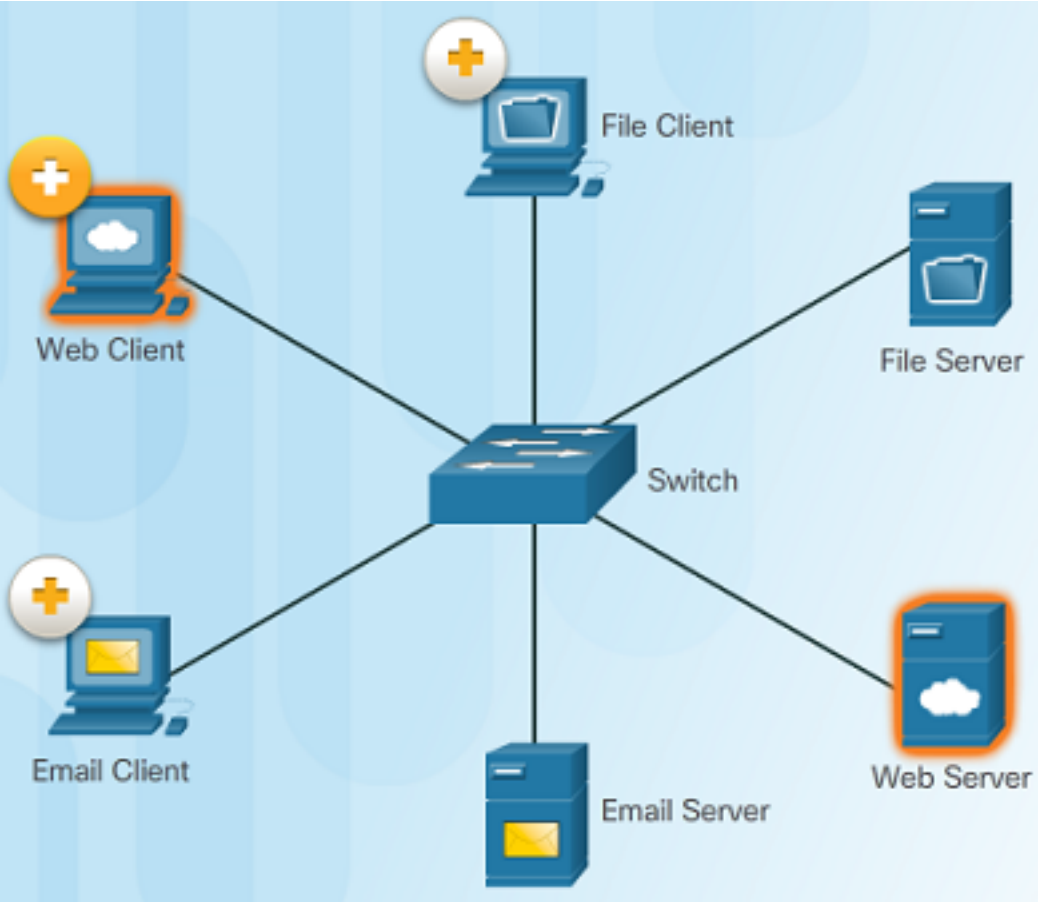
# Where we use networks…




- **Small Home Networks** – connect a few computers to each other and the Internet
- **Small Office/Home Office** – enables computer within a home or remote office to connect to a corporate network
- **Medium to Large Networks** – many locations with hundreds or thousands of interconnected computers
- **World Wide Networks** – connects hundreds of millions of computers world-wide – such as the Internet

Image source: CISCO CCNA Routing and Switching

# Servers and Clients




- Every computer = host or end device.
- Servers provide information to end devices
- Clients send requests to the servers

Image source: CISCO CCNA Routing and Switching

# LANs, WANs, and the Internet

# Network Components

**Three broad categories** of network components:

- **Devices**
- **Media**
- **Services**

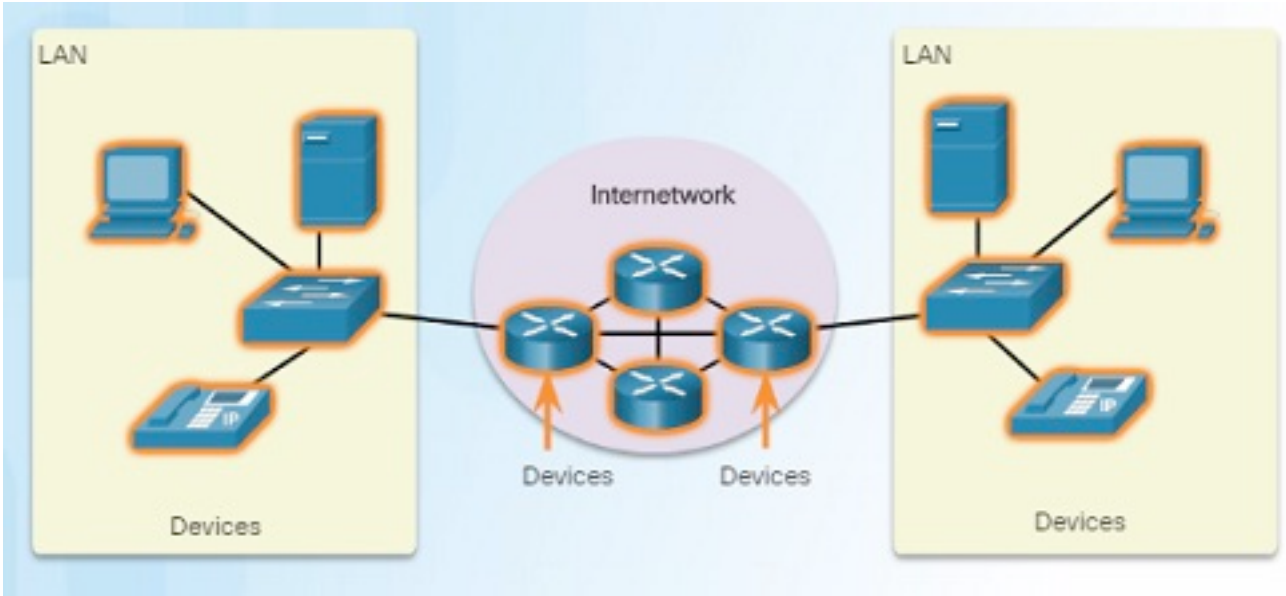



Image source: CISCO CCNA Routing and Switching

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# Network Components

- **End Devices**
  - Source and destination
  - Data originates with an end device (source), flows through the network, and arrives at an end device (destination)

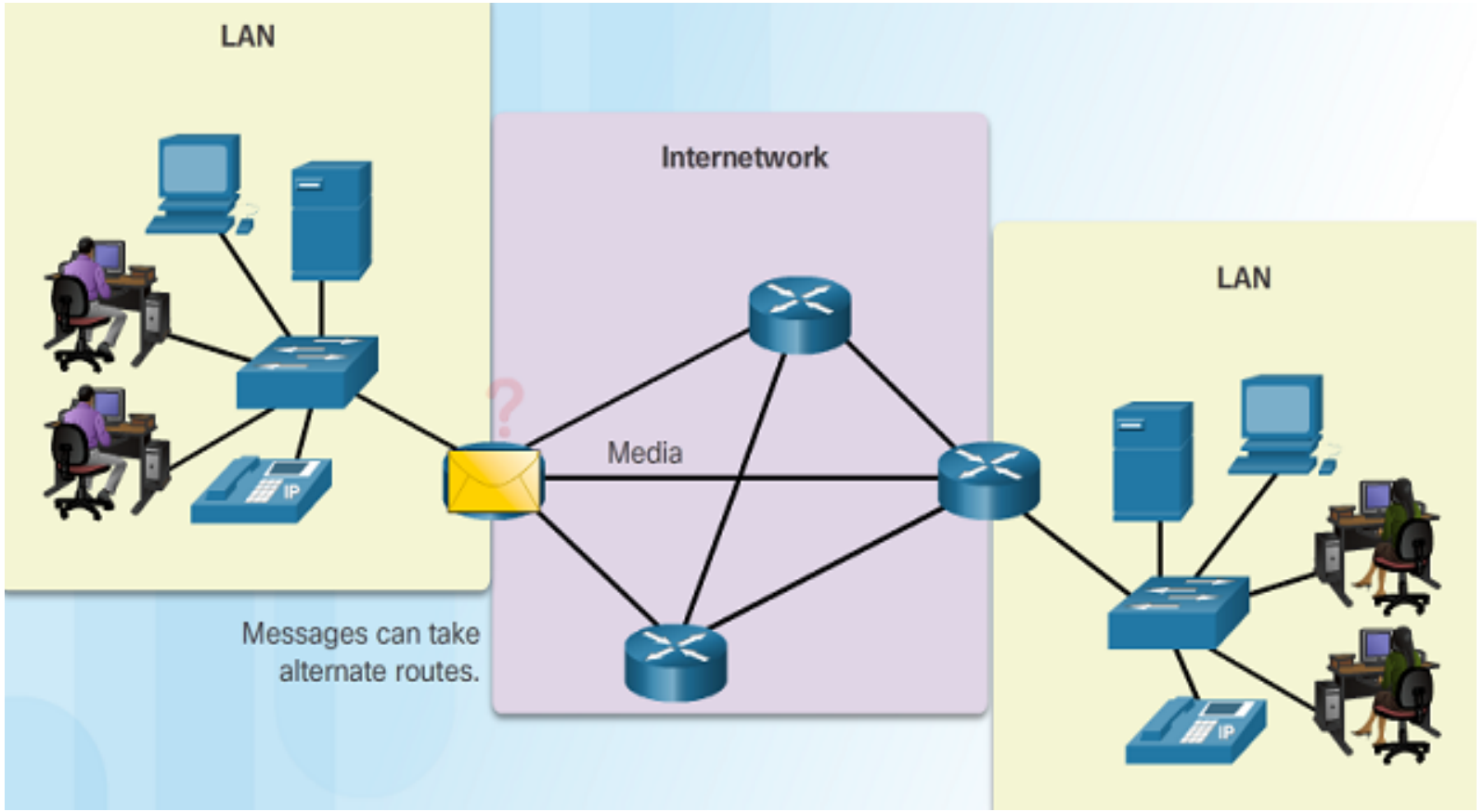


Image source: CISCO CCNA Routing and Switching

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# Intermediary Devices

- **Interconnects** end devices in a network.
  - switches, wireless access points, routers, and firewalls.
- The **management of data** as it flows through a network:
  - Regenerate and retransmit data signals.
  - Maintain information about pathways through the network.
  - Notify other devices of errors and communication failures.

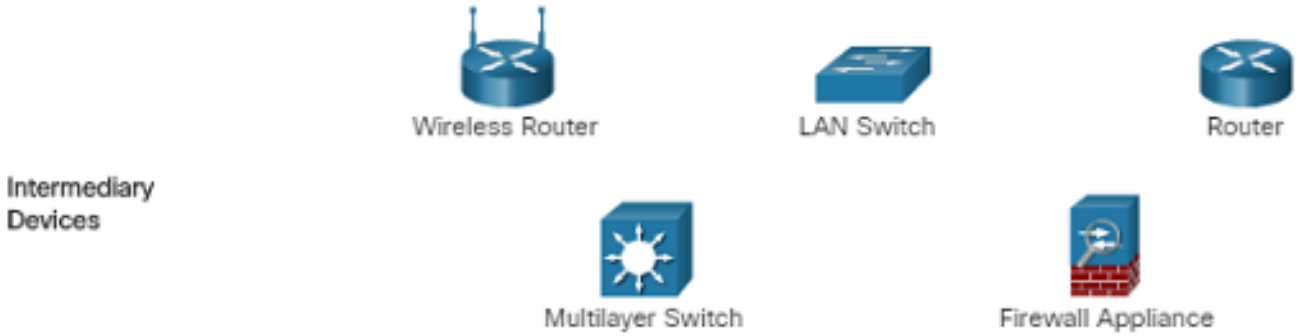


Image source: CISCO CCNA Routing and Switching

# Network Media

- **3 Types of media**:
  - Metallic wires within cables, such as copper
  - Glass, such as fiber optic cables
  - Wireless transmission

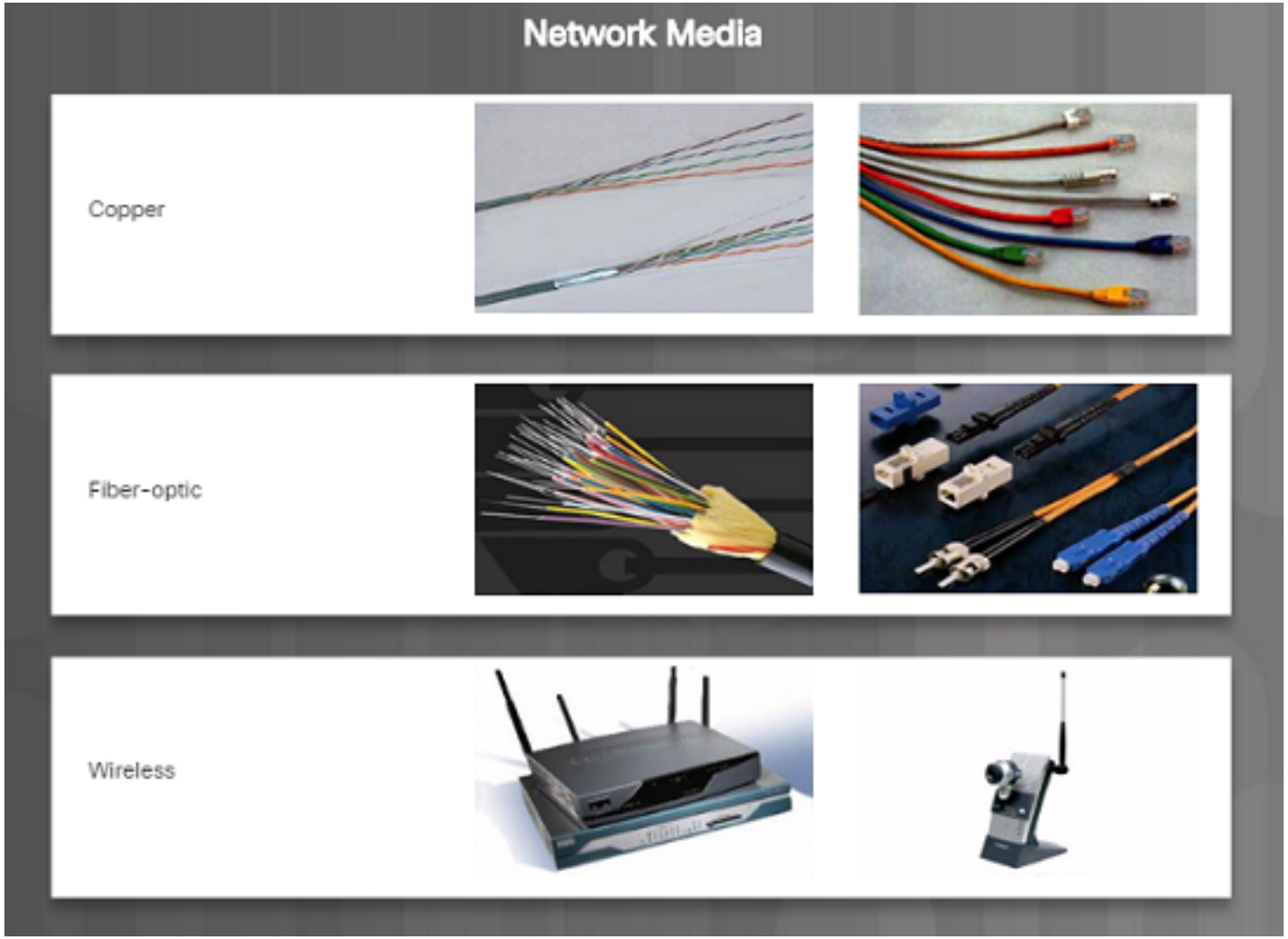


Image source: CISCO CCNA Routing and Switching

# Network Representations (icons/symbols)

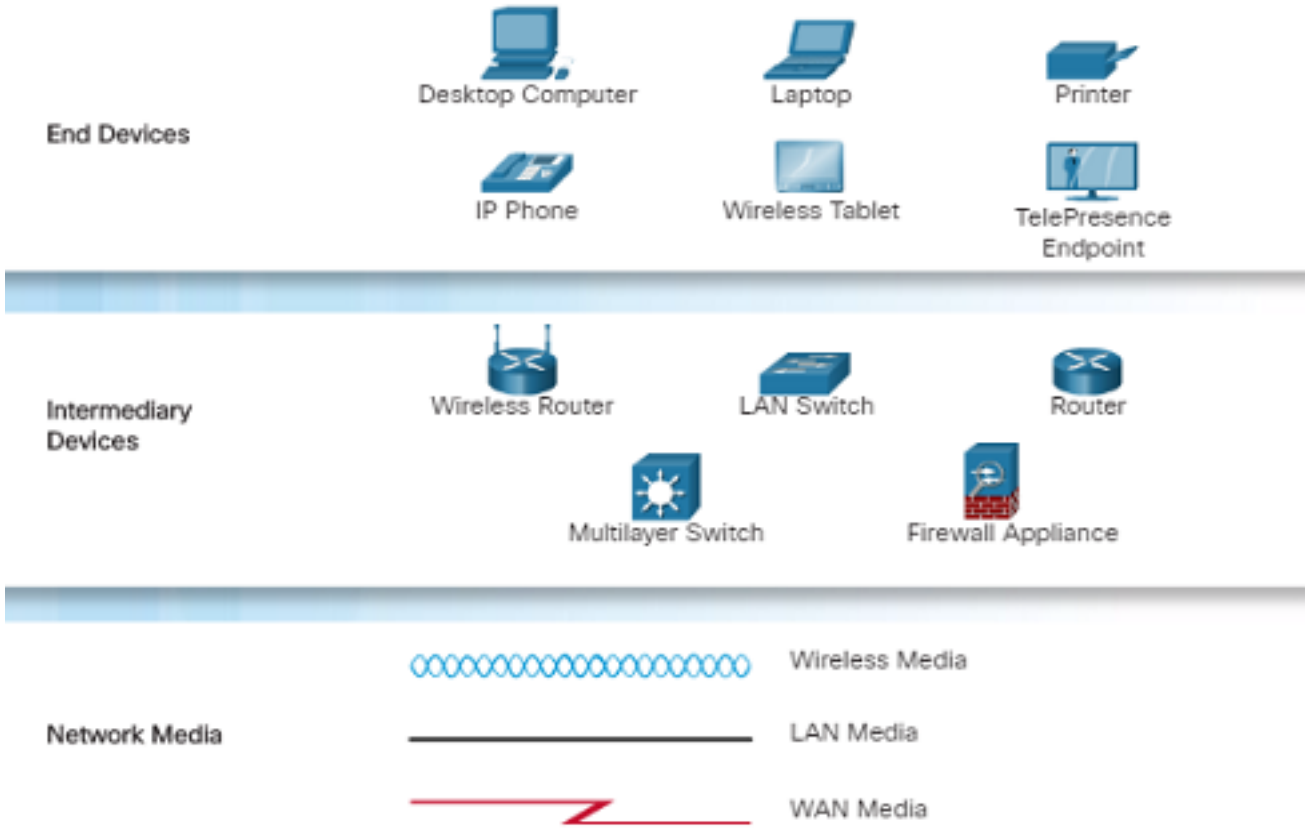


Image source: CISCO CCNA Routing and Switching

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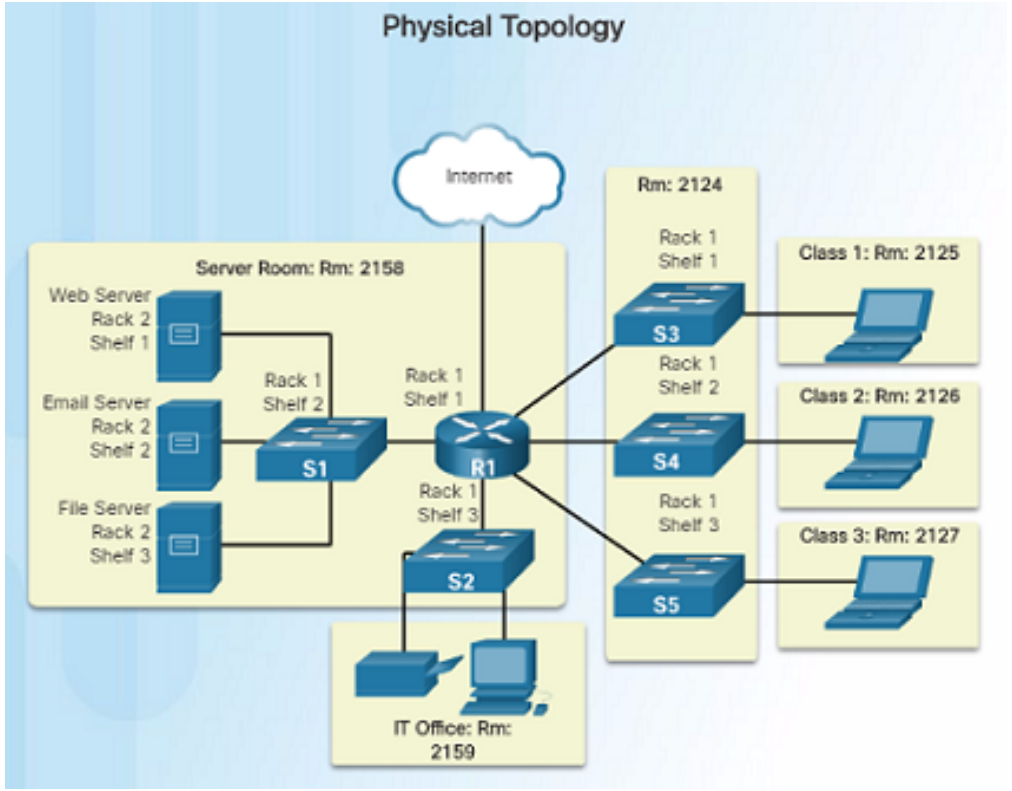
# Topology Diagrams

- Physical location of devices vs. Ports and network addressing schemes



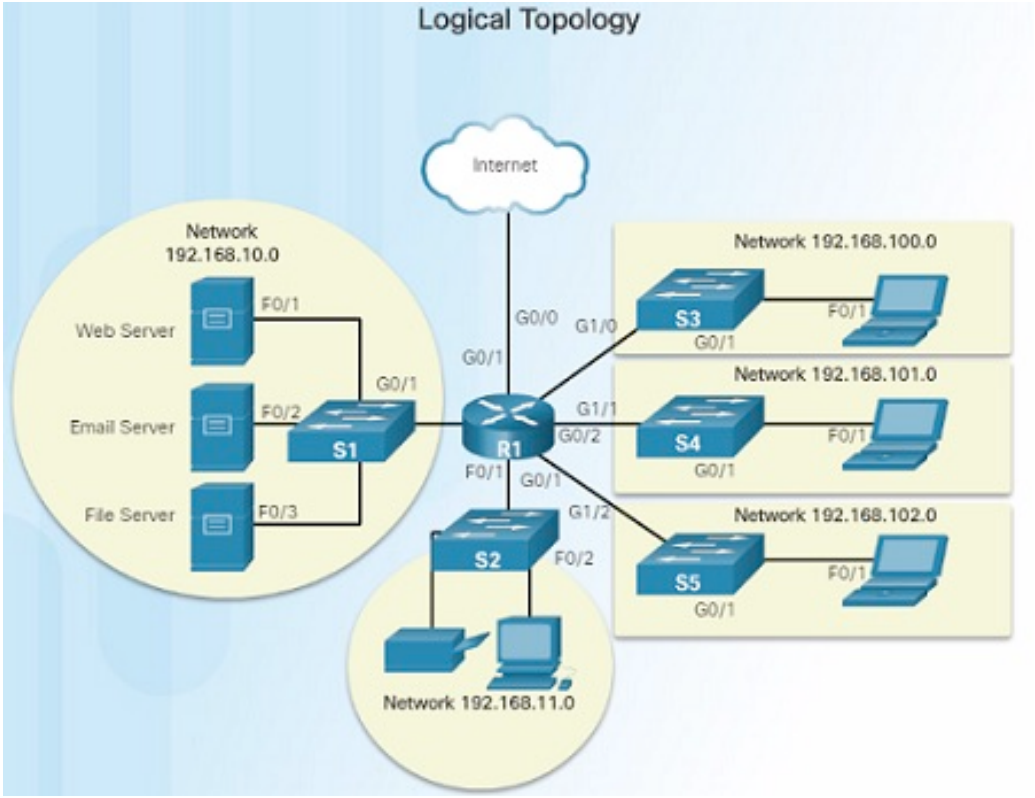




Image source: CISCO CCNA Routing and Switching

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# Networks Types

- Two most common types of networks:
  - **Local Area Network (LAN)**
  - **Wide Area Network (WAN)**
  - Other types of networks:
    - Metropolitan Area Network (**MAN**)
    - Wireless LAN (**WLAN**)
    - Storage Area Network (**SAN**)

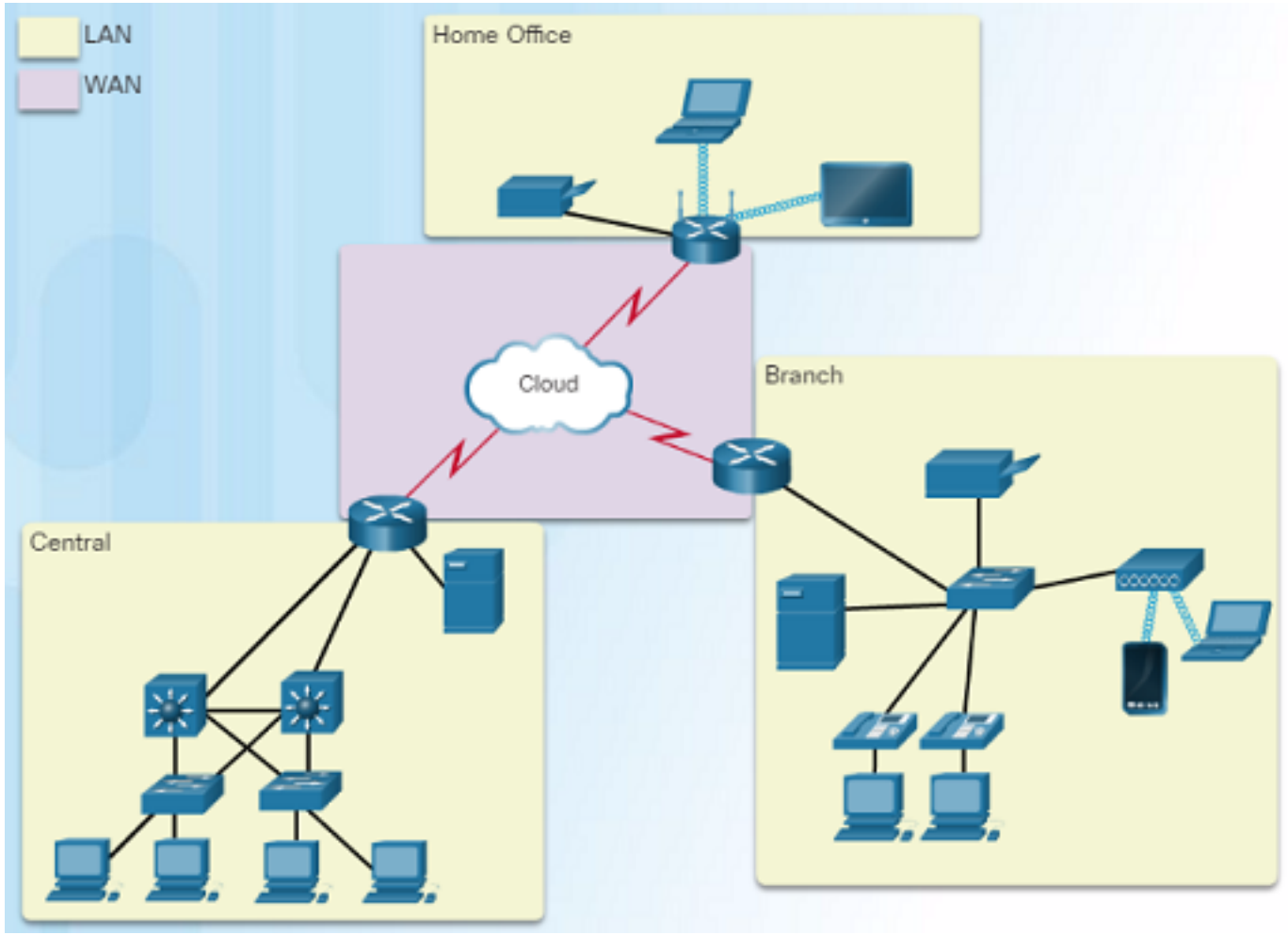


Image source: CISCO CCNA Routing and Switching

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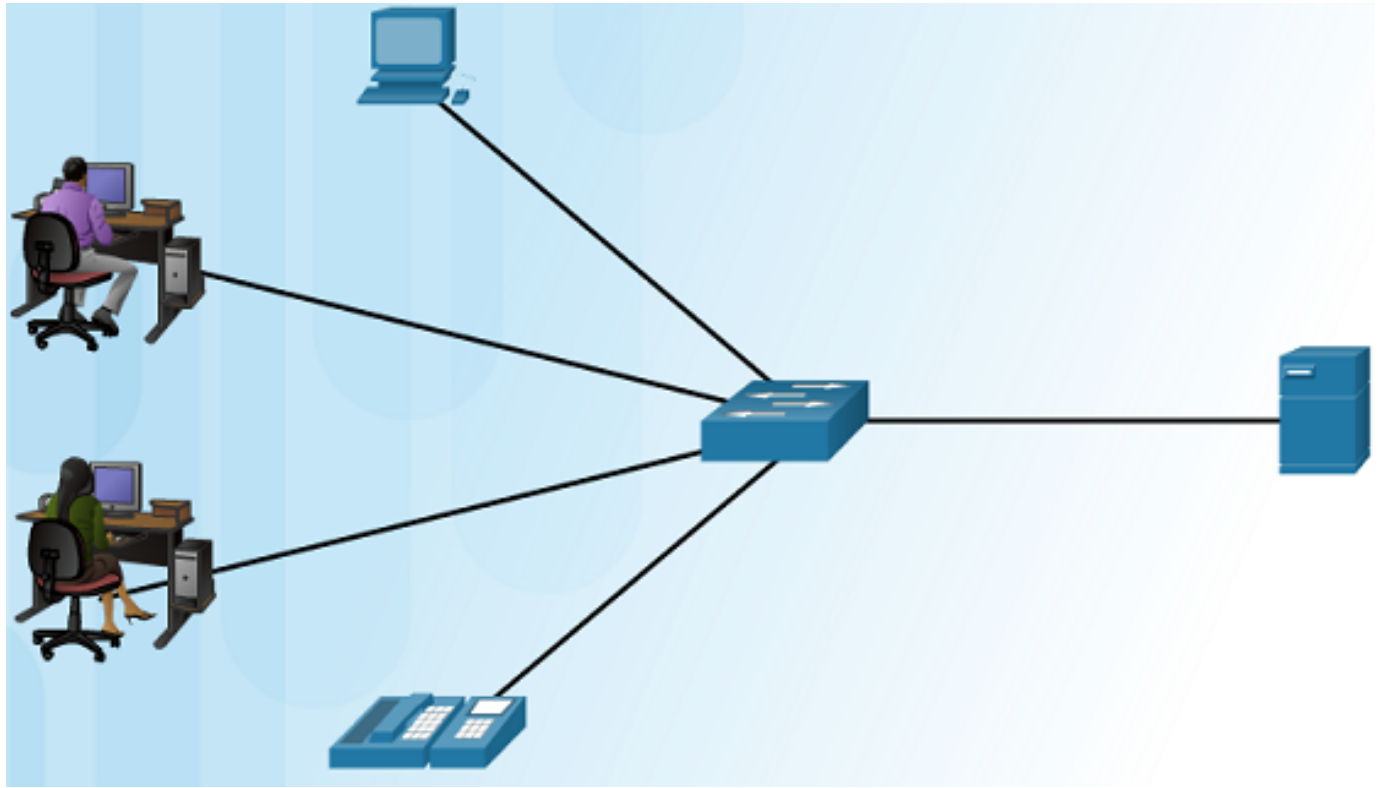
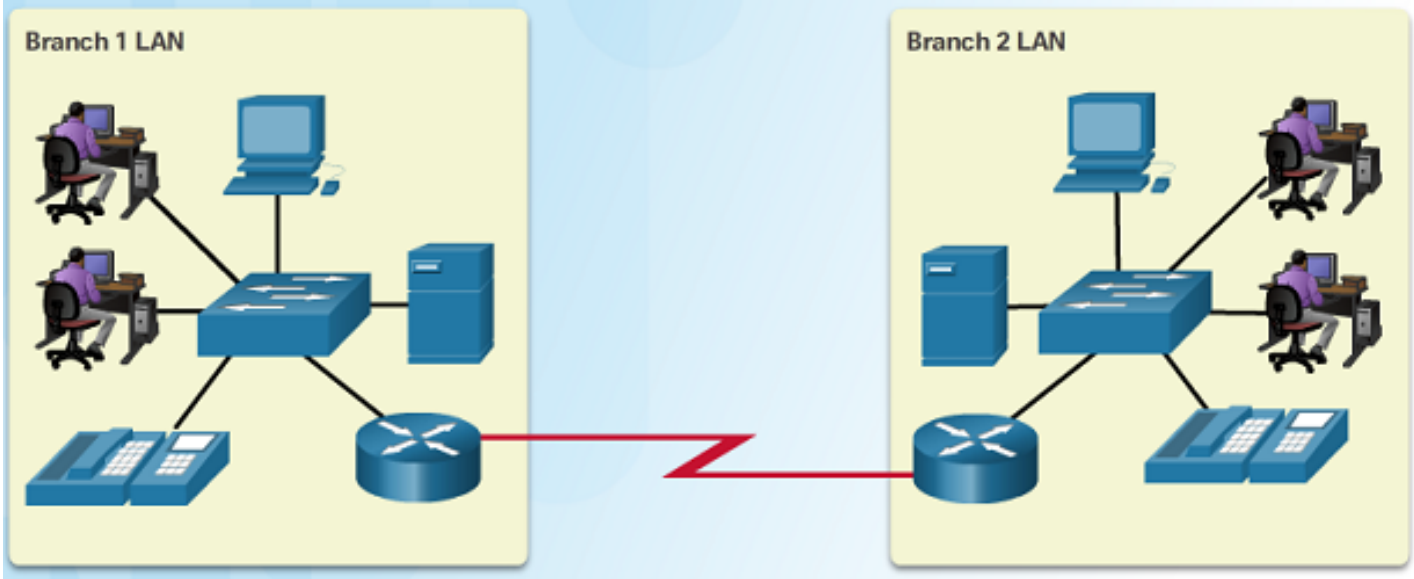
# LAN



- Three characteristics of LANs:
  - Spans a small geographic area
  - Administered by single organization/individual.
  - Provides high speed bandwidth.

Image source: CISCO CCNA Routing and Switching

# WAN

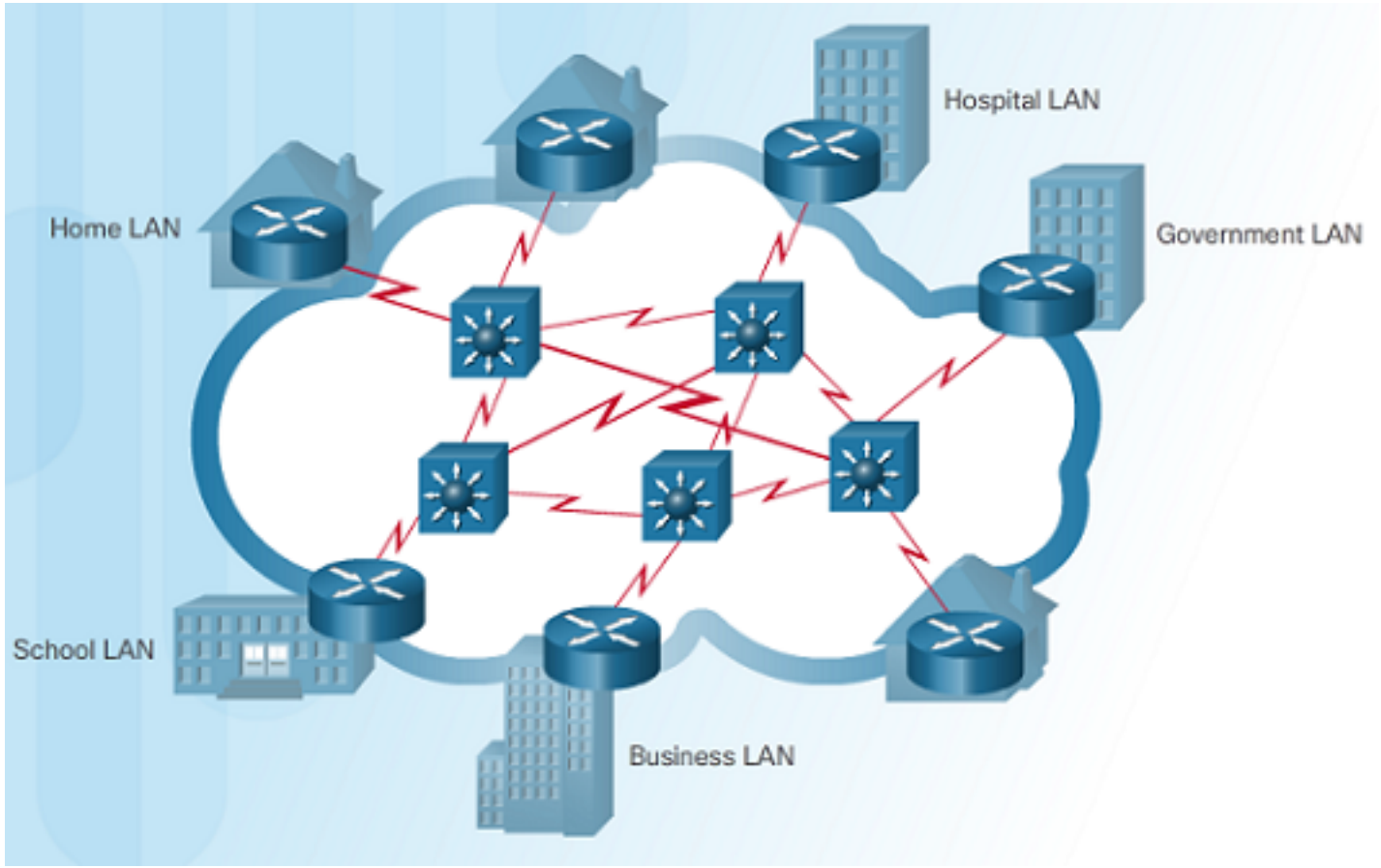



Three characteristics of WANs:

- WANs interconnect LANs over wide geographical areas
- Administered by multiple service providers
- Slower speed links.

Image source: CISCO CCNA Routing and Switching

# The Internet

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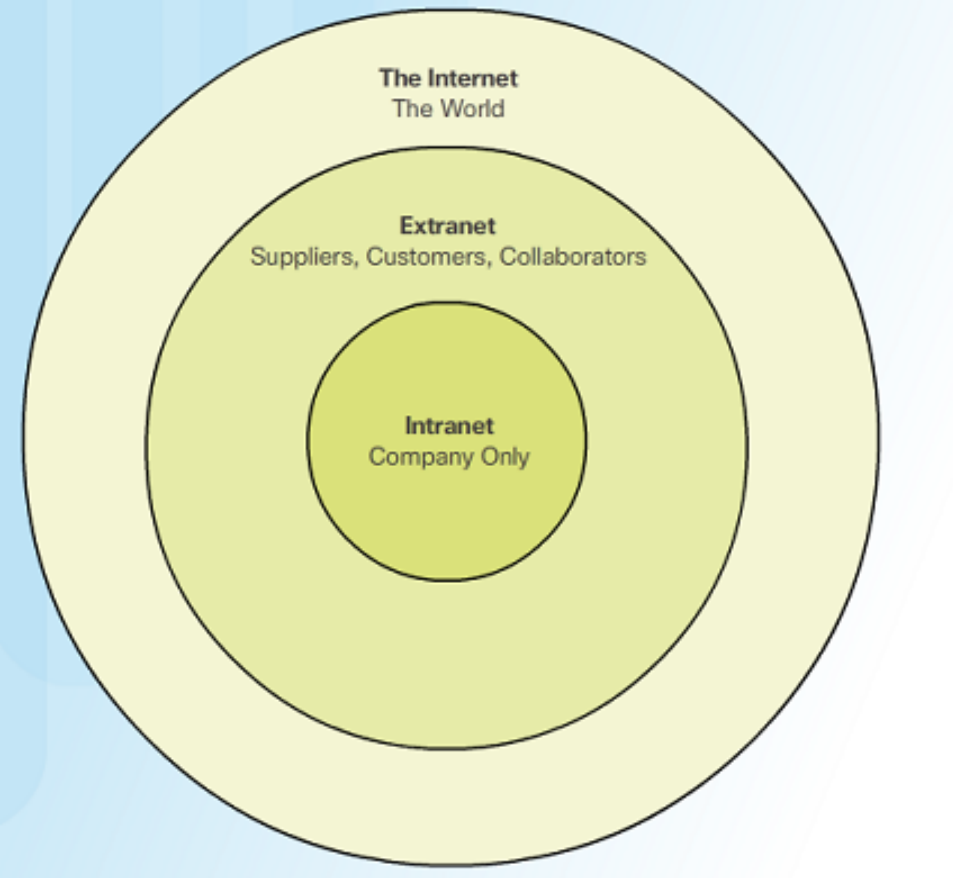
# Intranets and Extranets




- Intranet
  - Noroff KRS and Noroff OSL
- Extranet
  - Noroff and ATEA

Image source: CISCO CCNA Routing and Switching

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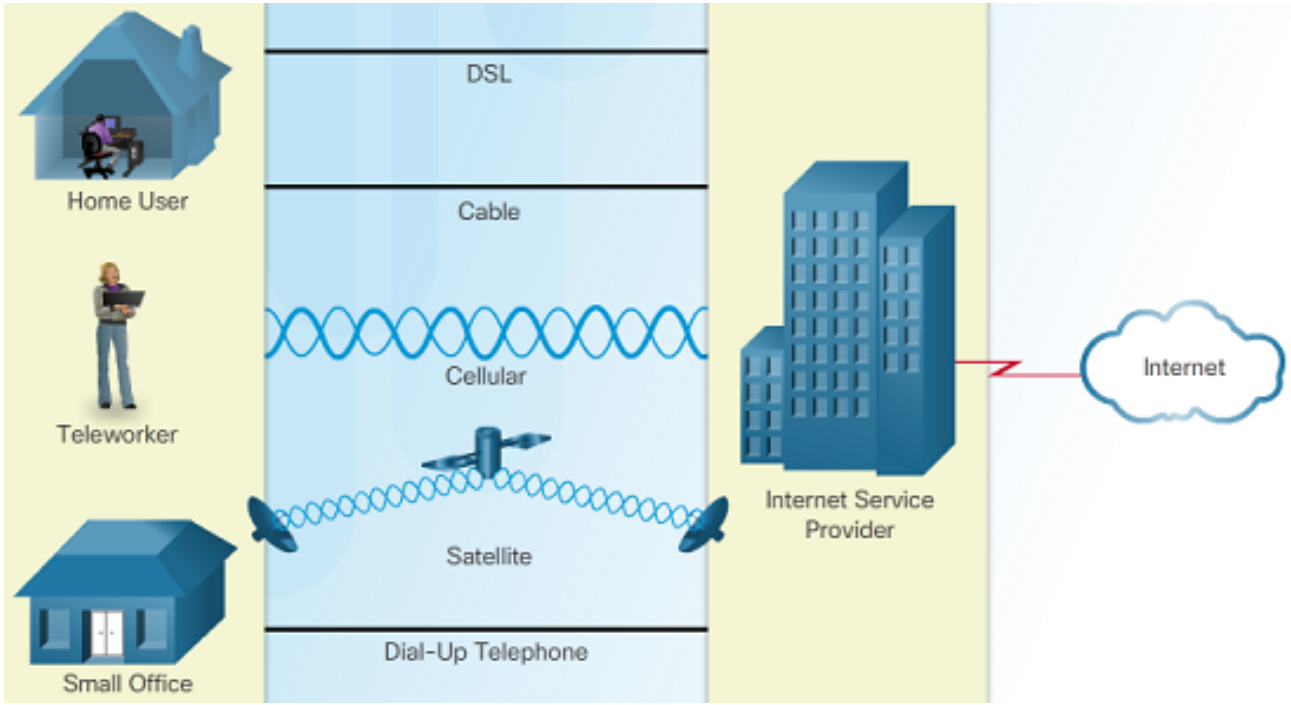
# Internet Access Technologies

- There are many ways to connect users and organizations to the Internet:
  - DSL
  - Fiber
  - WiMax
  - Cable
  - Starlink

Image source: CISCO CCNA Routing and Switching

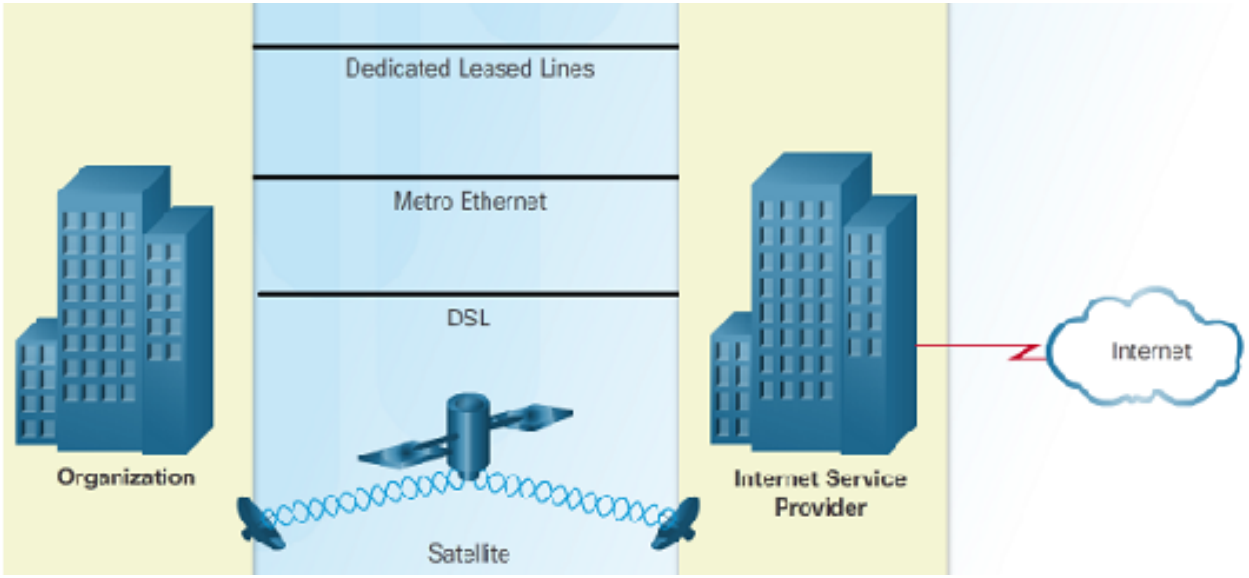
# Home and Small Office Internet Connections




- **Cable** – high bandwidth, always on, Internet connection offered by cable television service providers.
- **DSL** – high bandwidth, always on, Internet connection that runs over a telephone line.
- **Cellular** – uses a cell phone network to connect to the Internet; only available where you can get a cellular signal.
- **Satellite** – major benefit to rural areas without Internet Service Providers.
- **Dial-up telephone** – an inexpensive, low bandwidth option using a modem.

Image source: CISCO CCNA Routing and Switching

# Businesses Internet Connections

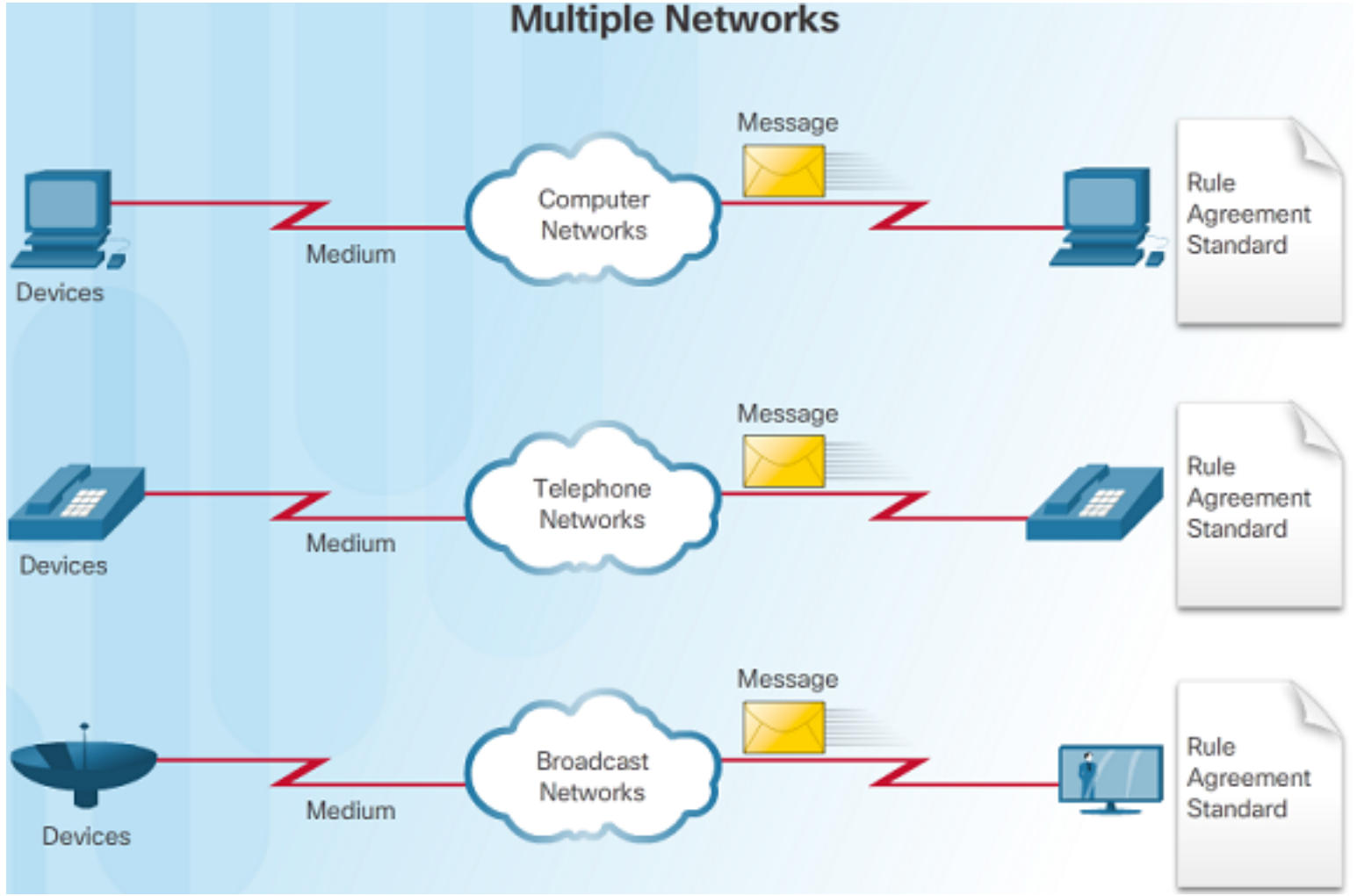



- Corporate business connections may require higher bandwidth, dedicated connections, or managed services. Typical connection options for businesses:
  - **Dedicated Leased Line** – reserved circuits within the service provider's network that connect distant offices with private voice and/or data networking.
  - **Ethernet WAN** – extends LAN access technology into the WAN.
  - **DSL** – Business DSL is available in various formats including Symmetric Digital Subscriber Lines (SDSL).
  - **Satellite** – can provide a connection when a wired solution is not available.

Image source: CISCO CCNA Routing and Switching

# Network as a Platform

# Traditional Separate Networks

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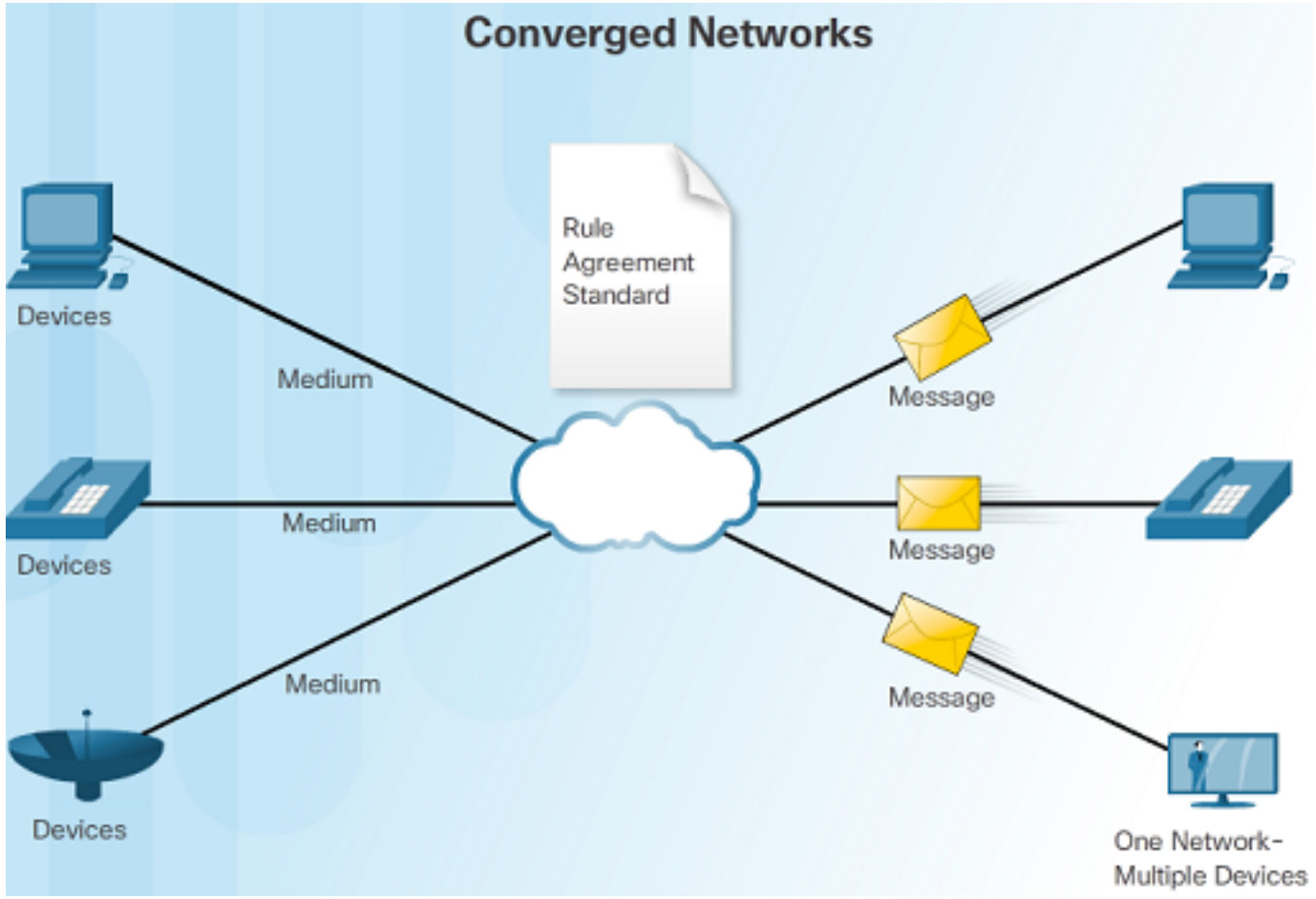
# The Converging Network

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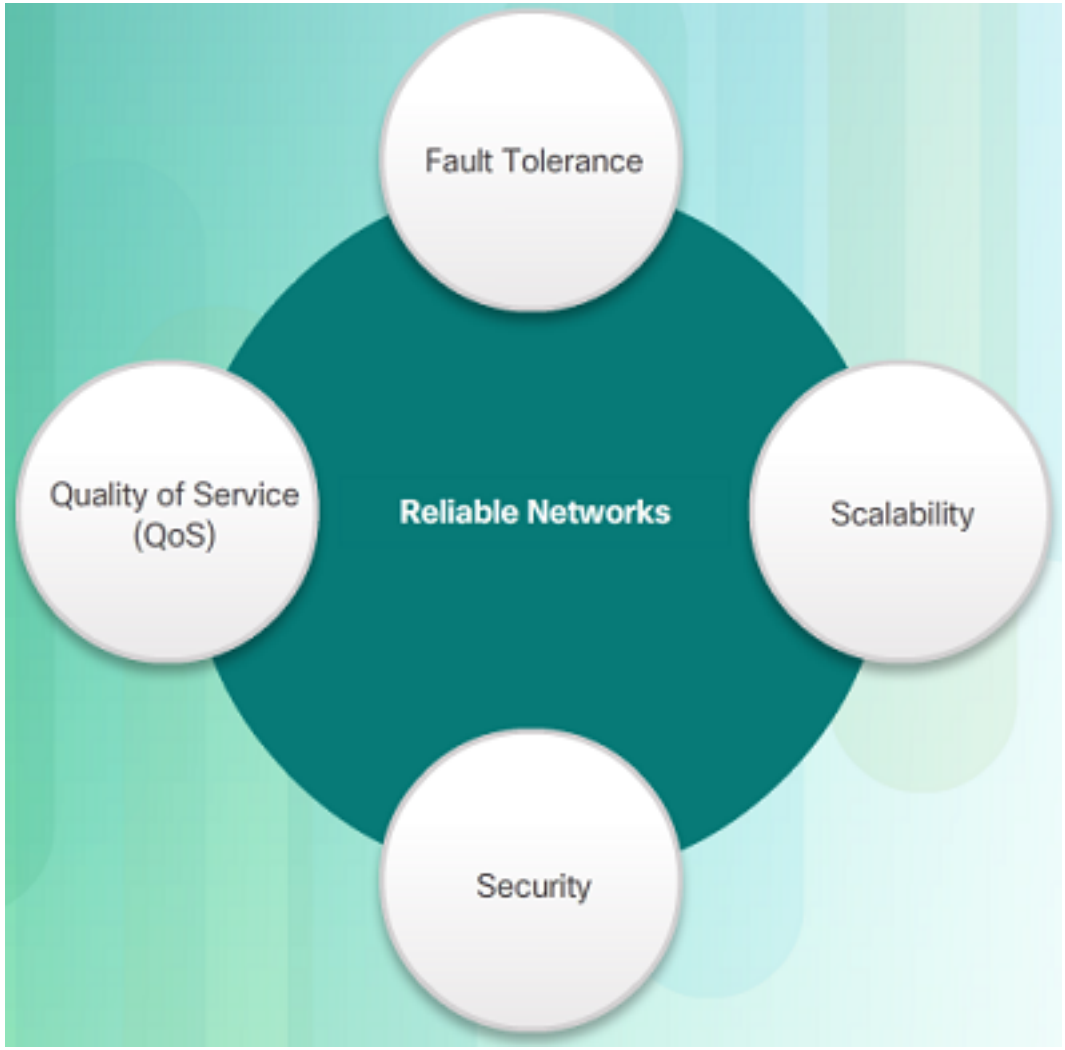
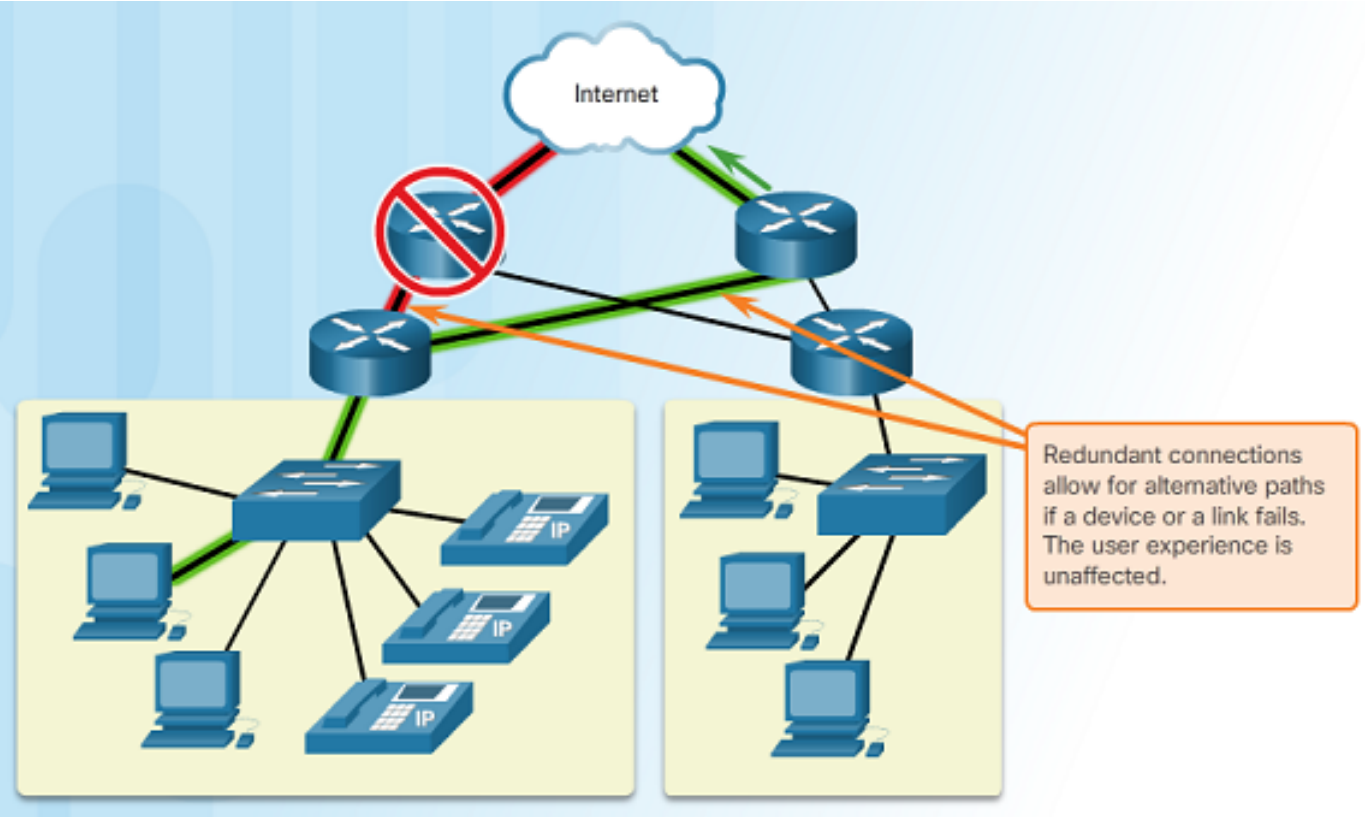
# Network Architecture




- Underlying architectures need to address the following to meet user expectations:
  - Fault Tolerance
  - Scalability
  - Quality of Service (QoS)
  - Security

Image source: CISCO CCNA Routing and Switching

# Fault Tolerance




- Impact on devices
- Multiple paths
- Packet switched network vs circuit-switched networks

Image source: CISCO CCNA Routing and Switching

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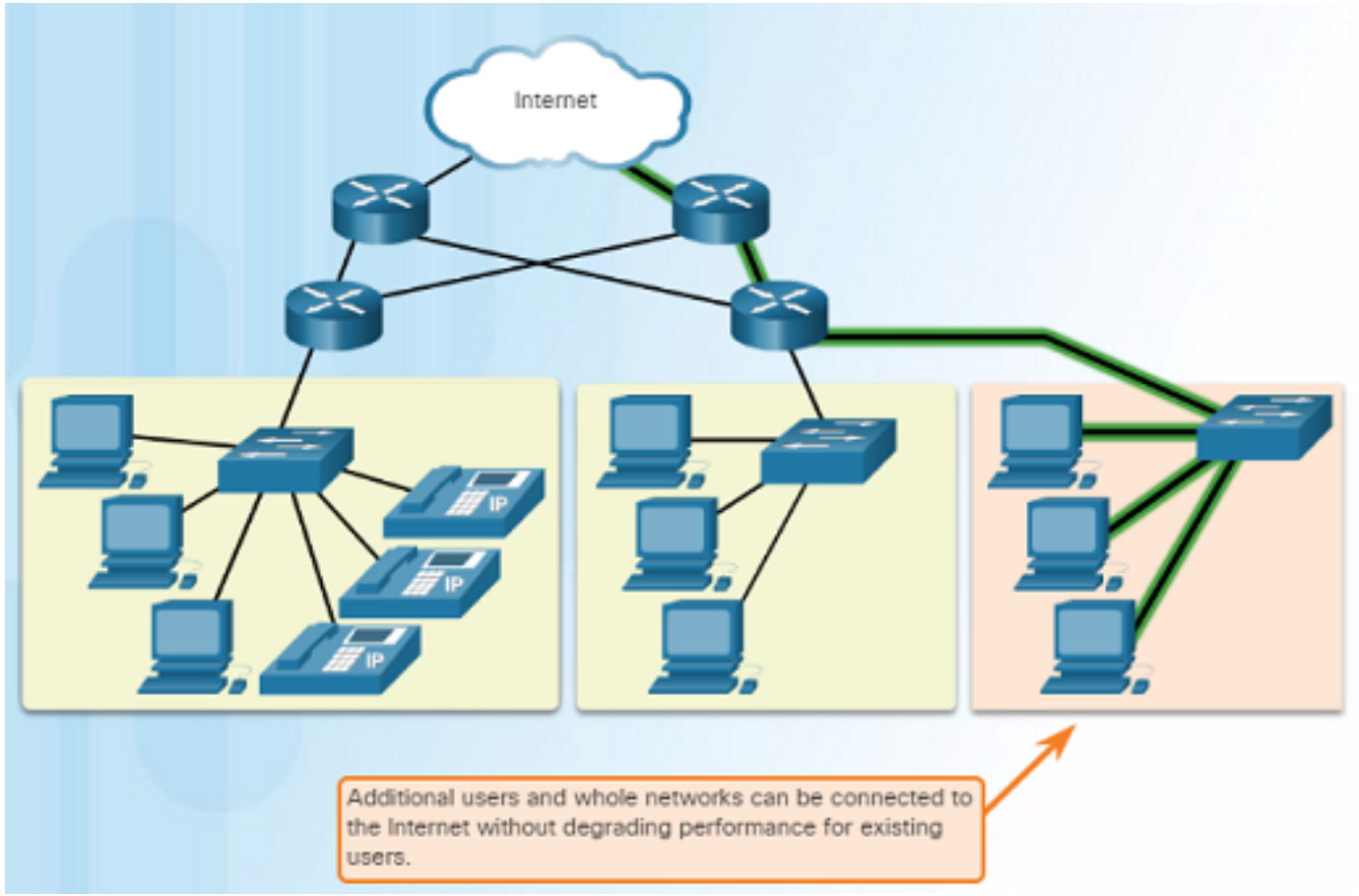
# Scalability




- Expand quickly and easily to support new users

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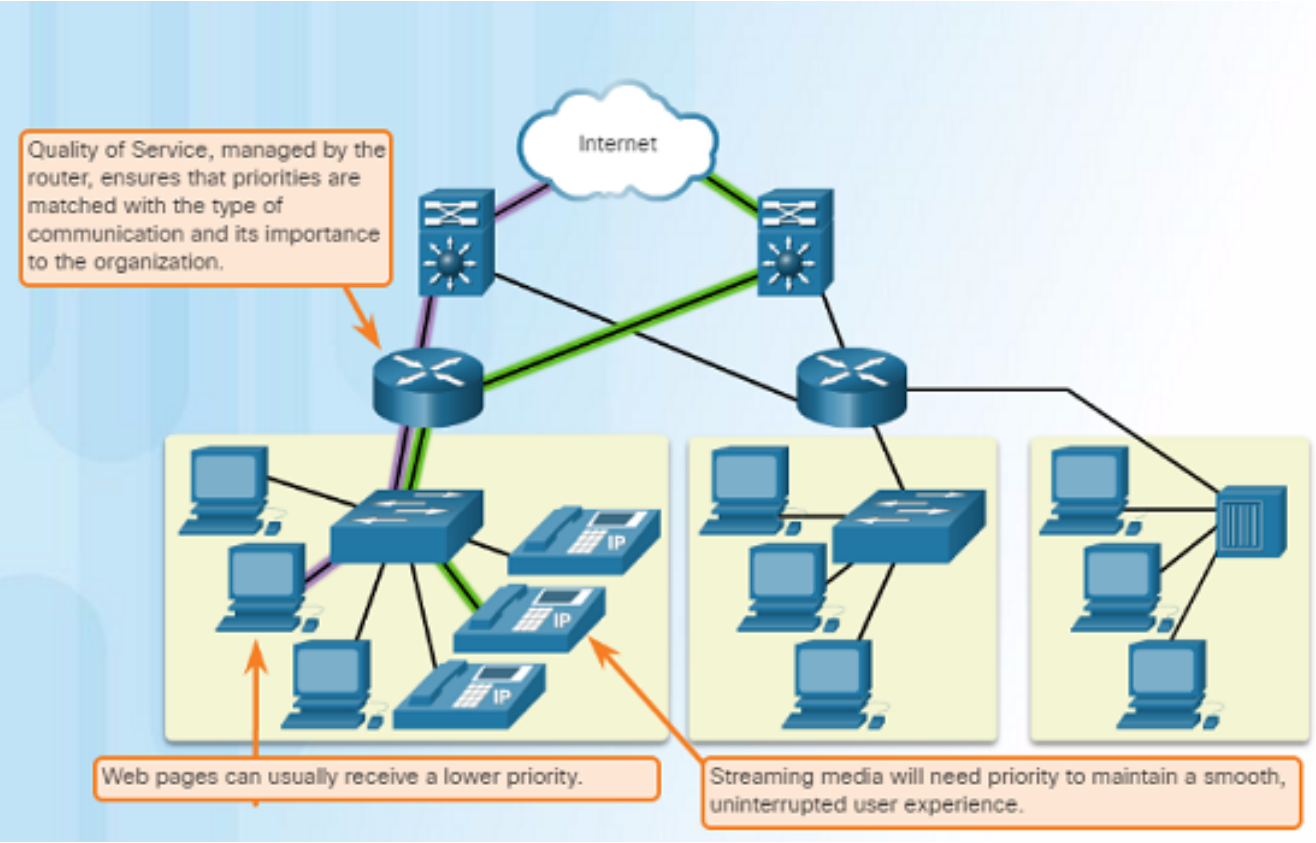
# Quality of Service




- Voice and live video transmissions require higher expectations
- Quality of Service (QoS) is the primary mechanism used to ensure reliable delivery of content for all users

Image source: CISCO CCNA Routing and Switching

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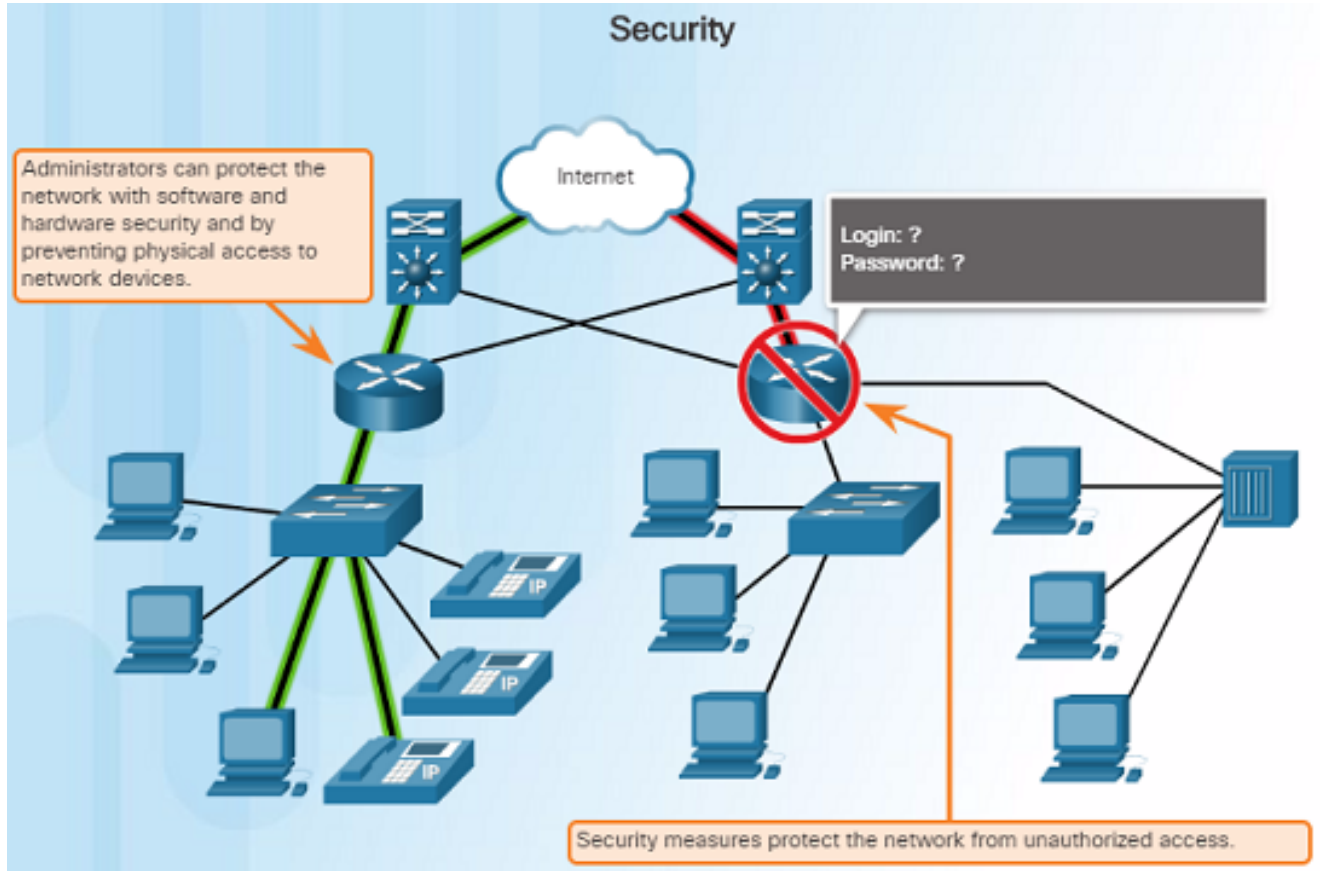
# Security




- Two main types of network security:
  - Information Security
    - Protection of the information or data transmitted over the network
  - Network infrastructure security
    - Physical security of network devices
    - Preventing unauthorized access to the management software on those devices
- Three goals of network security: C I A

Image source: CISCO CCNA Routing and Switching

# Tutorial


Source: https://mountain.burnabyschools.ca/blog/2019/04/03/tutorial-sign-up-for-grade-8-9-students/

**Self-study Topics (Lab Logbook):**

- Different network devices (end devices, intermediary devices and media – wires, glass etc.
- What, Why, When, Who, How

**Tutorial 1.pdf on Moodle**

## Questions

Any questions, comments or observations?.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