



# Module 1: Networking Today

Introduction to Networks v7.0  
(ITN)



# Module Objectives

**Module Title:** Networking Today

**Module Objective:** Explain the advances in modern technologies.

Topic Title	Topic Objective
Networks Affect our Lives	Explain how networks affect our daily lives.
Network Components	Explain how host and network devices are used.
Network Representations and Topologies	Explain network representations and how they are used in network topologies.
Common Types of Networks	Compare the characteristics of common types of networks.
Internet Connections	Explain how LANs and WANs interconnect to the internet.
Reliable Networks	Describe the four basic requirements of a reliable network.
Network Trends	Explain how trends such as BYOD, online collaboration, video, and cloud computing are changing the way we interact.
Network Security	Identify some basic security threats and solution for all networks.
The IT Professional	Explain employment opportunities in the networking field.

# 1.2 Network Components

# Network Components

## Host Roles

Every computer on a network is called a host or end device.

Servers are computers that provide information to end devices:

- email servers
- web servers
- file server

Clients are computers that send requests to the servers to retrieve information:

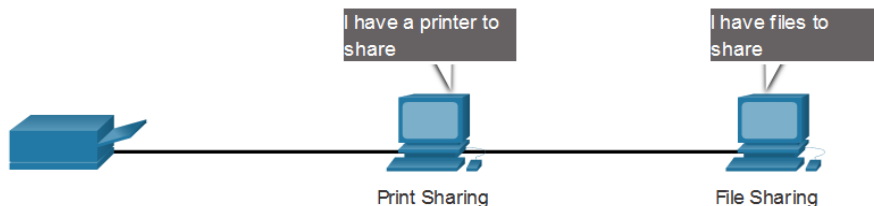
- web page from a web server
- email from an email server



Server Type	Description
Email	Email server runs email server software. Clients use client software to access email.
Web	Web server runs web server software. Clients use browser software to access web pages.
File	File server stores corporate and user files. The client devices access these files.

# Peer-to-Peer

It is possible to have a device be a client and a server in a Peer-to-Peer Network. This type of network design is only recommended for very small networks.



### Advantages

Easy to set up

Less complex

Lower cost

Used for simple tasks: transferring files and sharing printers

### Disadvantages

No centralized administration

Not as secure

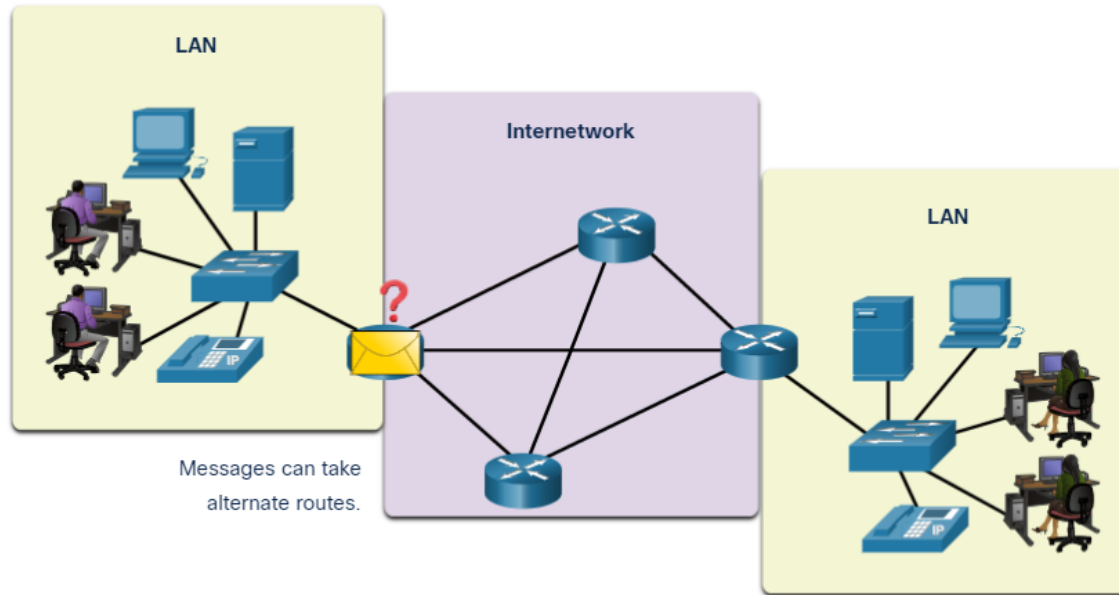
Not scalable

Slower performance

# Network Components

## End Devices

An end device is where a message originates from or where it is received. Data originates with an end device, flows through the network, and arrives at an end device.

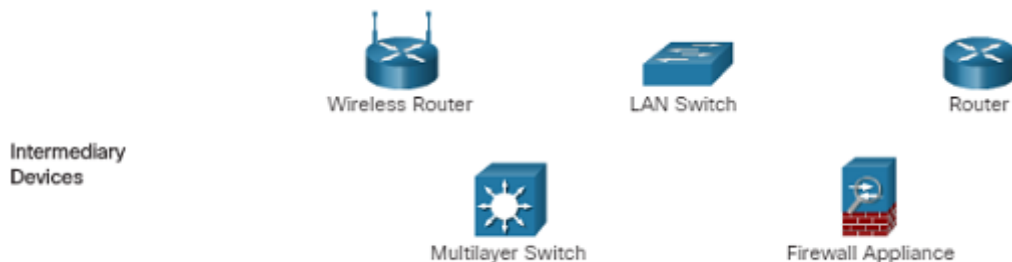


# Intermediary Network Devices

An intermediary device interconnects end devices. Examples include switches, wireless access points, routers, and firewalls.

Management of data as it flows through a network is also the role of an intermediary device, including:

- Regenerate and retransmit data signals.
- Maintain information about what pathways exist in the network.
- Notify other devices of errors and communication failures.



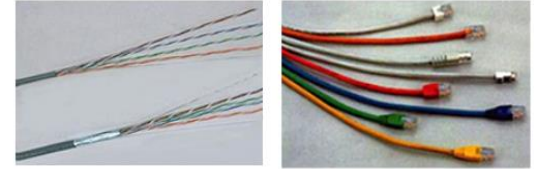
# Network Components

## Network Media

Communication across a network is carried through a medium which allows a message to travel from source to destination.

Media Types	Description
Metal wires within cables	Uses electrical impulses
Glass or plastic fibers within cables (fiber-optic cable)	Uses pulses of light.
Wireless transmission	Uses modulation of specific frequencies of electromagnetic waves.

Copper



Fiber-optic



Wireless





# 1.3 Network Representations and Topologies

# Network Representations and Topologies

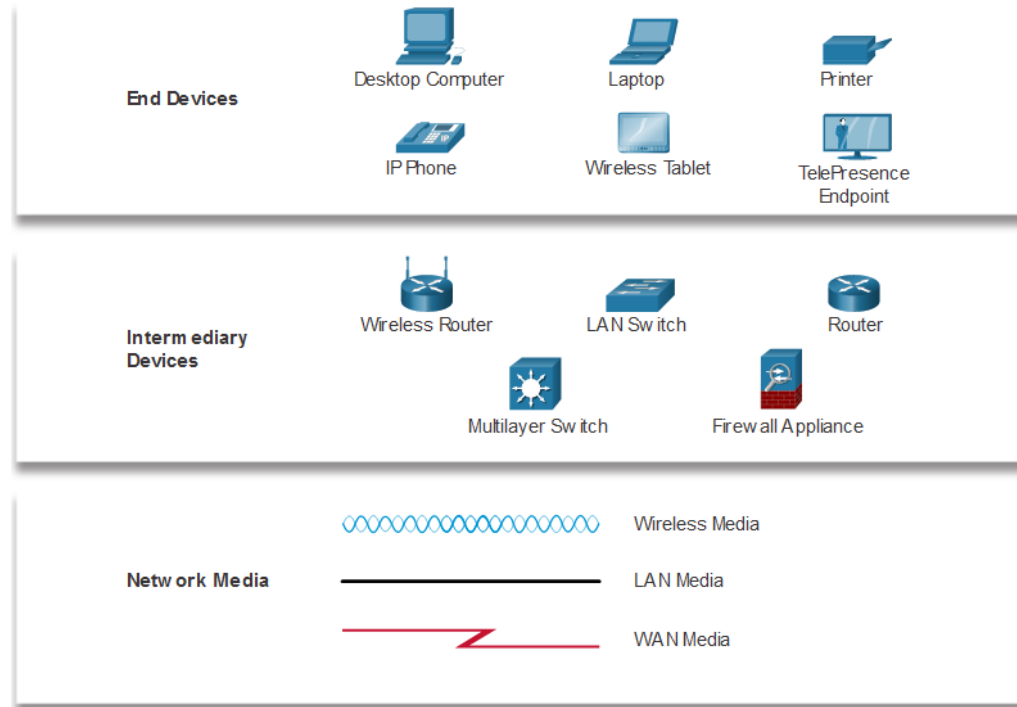
## Network Representations

Network diagrams, often called topology diagrams, use symbols to represent devices within the network.

Important terms to know include:

- Network Interface Card (NIC)
- Physical Port
- Interface

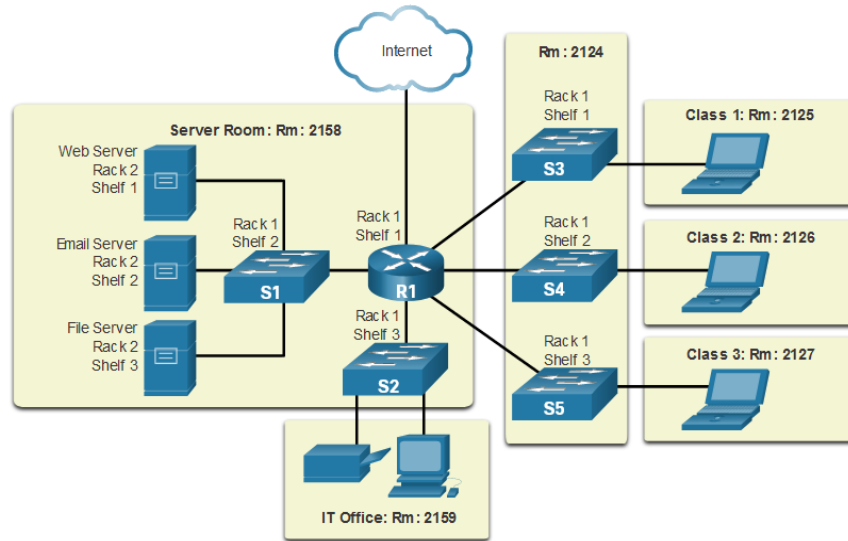
**Note:** Often, the terms port and interface are used interchangeably



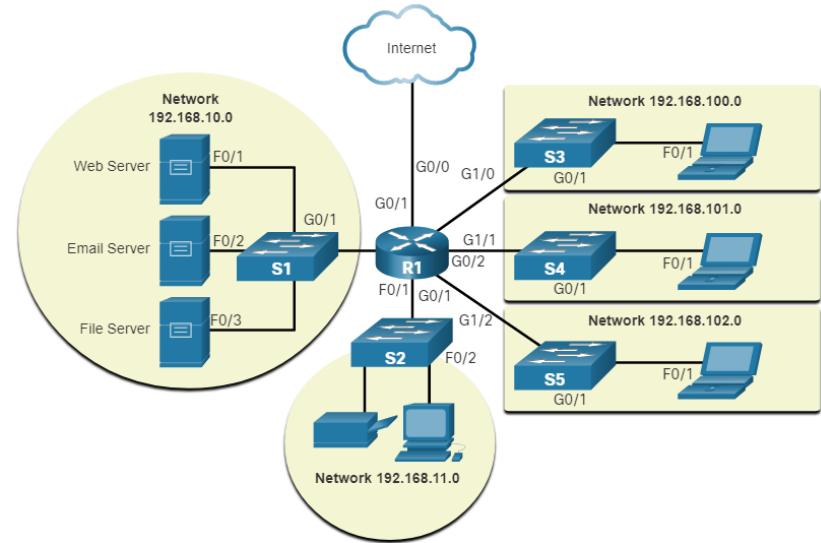
# Network Representations and Topologies

## Topology Diagrams

Physical topology diagrams illustrate the physical location of intermediary devices and cable installation.



Logical topology diagrams illustrate devices, ports, and the addressing scheme of the network.



# 1.4 Common Types of Networks

# Common Types of Networks

## Networks of Many Sizes



Small Home



SOHO



Medium/Large



World Wide

- 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

# Common Types of Networks

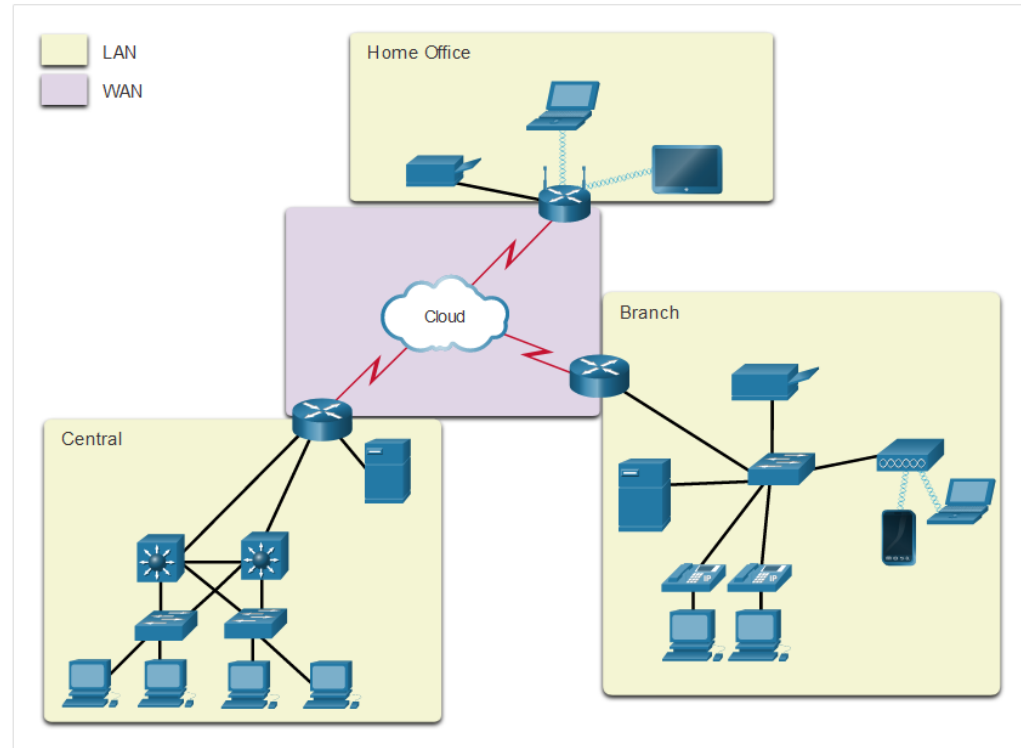
## LANs and WANs

Network infrastructures vary greatly in terms of:

- Size of the area covered
- Number of users connected
- Number and types of services available
- Area of responsibility

Two most common types of networks:

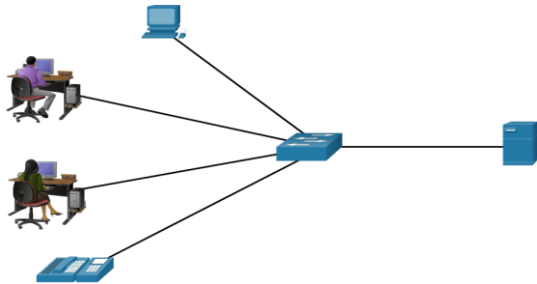
- Local Area Network (LAN)
- Wide Area Network (WAN).



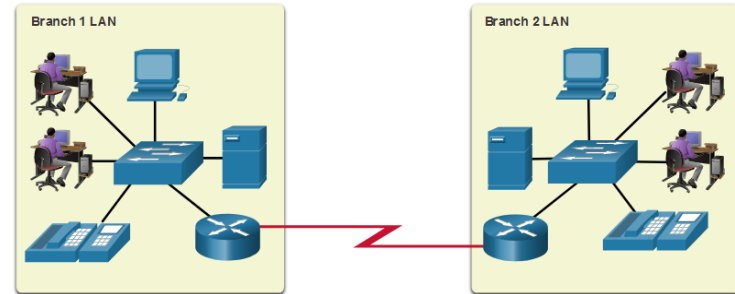
## Common Types of Networks

# LANs and WANs (cont.)

A LAN is a network infrastructure that spans a small geographical area.



A WAN is a network infrastructure that spans a wide geographical area.



### LAN

Interconnect end devices in a limited area.

Administered by a single organization or individual.

Provide high-speed bandwidth to internal devices.

### WAN

Interconnect LANs over wide geographical areas.

Typically administered by one or more service providers.

Typically provide slower speed links between LANs.

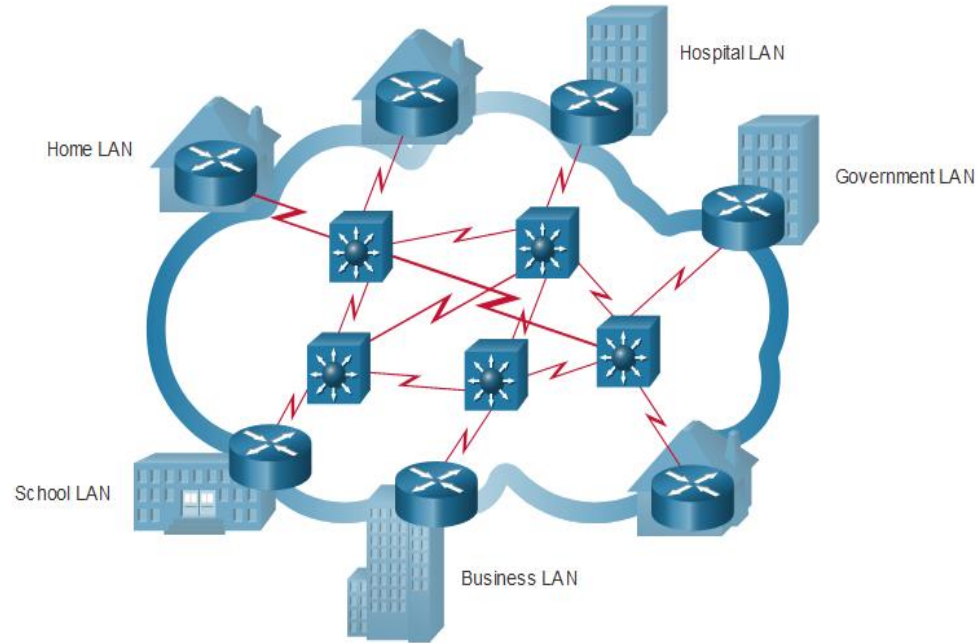
# The Internet

The internet is a worldwide collection of interconnected LANs and WANs.

- LANs are connected to each other using WANs.
- WANs may use copper wires, fiber optic cables, and wireless transmissions.

The internet is not owned by any individual or group. The following groups were developed to help maintain structure on the internet:

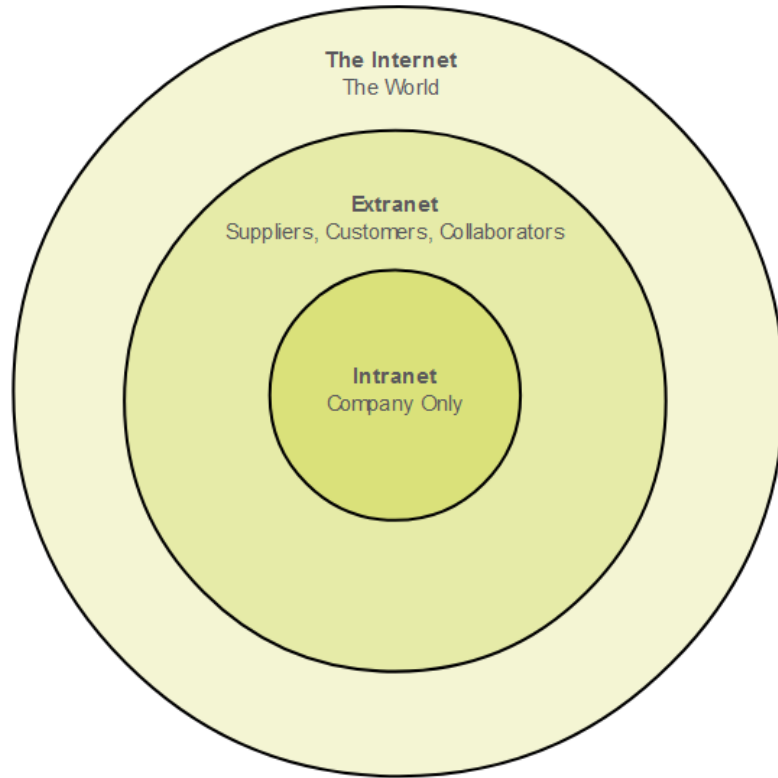
- IETF
- ICANN
- IAB





## Common Types of Networks

# Intranets and Extranets



An intranet is a private collection of LANs and WANs internal to an organization that is meant to be accessible only to the organizations members or others with authorization.

An organization might use an extranet to provide secure access to their network for individuals who work for a different organization that need access to their data on their network.

# 1.5 Internet Connections

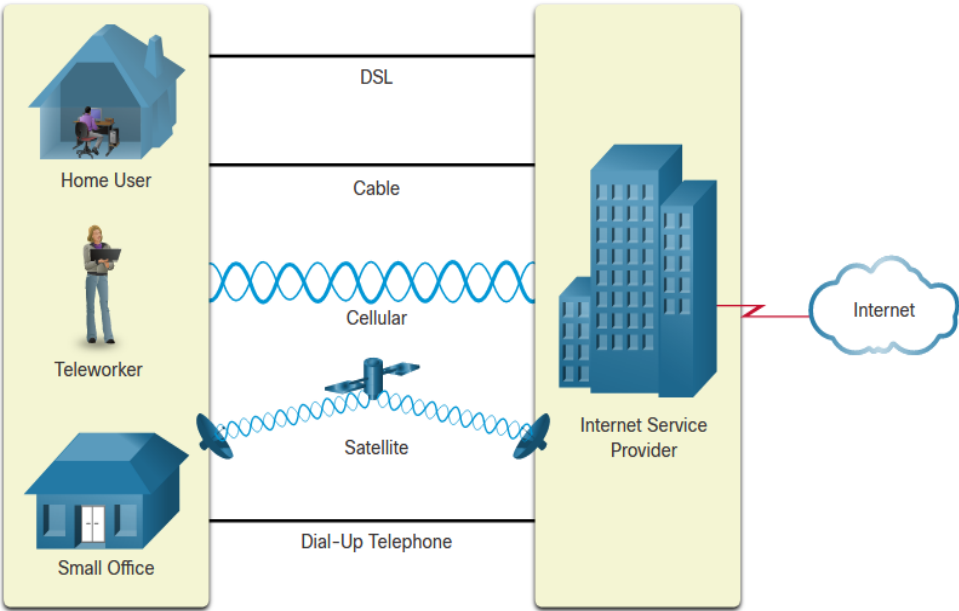
# Internet Access Technologies



There are many ways to connect users and organizations to the internet:

- Popular services for home users and small offices include broadband cable, broadband digital subscriber line (DSL), wireless WANs, and mobile services.
- Organizations need faster connections to support IP phones, video conferencing and data center storage.
- Business-class interconnections are usually provided by service providers (SP) and may include: business DSL, leased lines, and Metro Ethernet.

# Home and Small Office Internet Connections

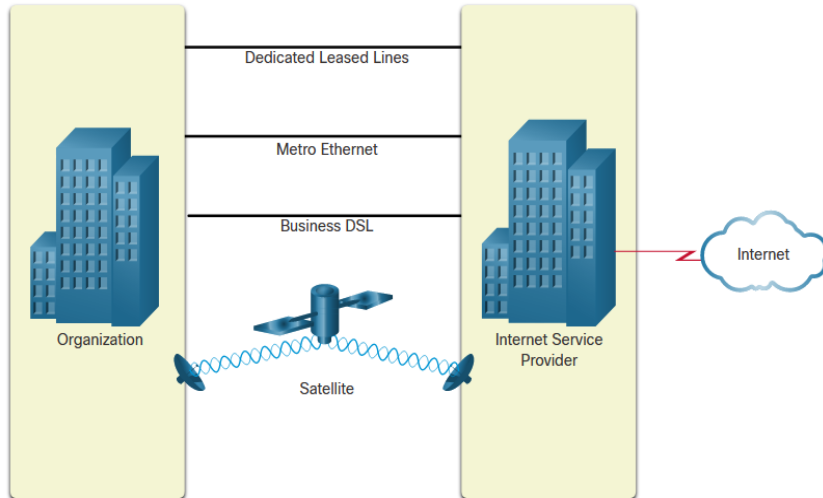


Connection	Description
Cable	high bandwidth, always on, internet offered by cable television service providers.
DSL	high bandwidth, always on, internet connection that runs over a telephone line.
Cellular	uses a cell phone network to connect to the internet.
Satellite	major benefit to rural areas without Internet Service Providers.
Dial-up telephone	an inexpensive, low bandwidth option using a modem.

# Businesses Internet Connections

Corporate business connections may require:

- higher bandwidth
- dedicated connections
- managed services

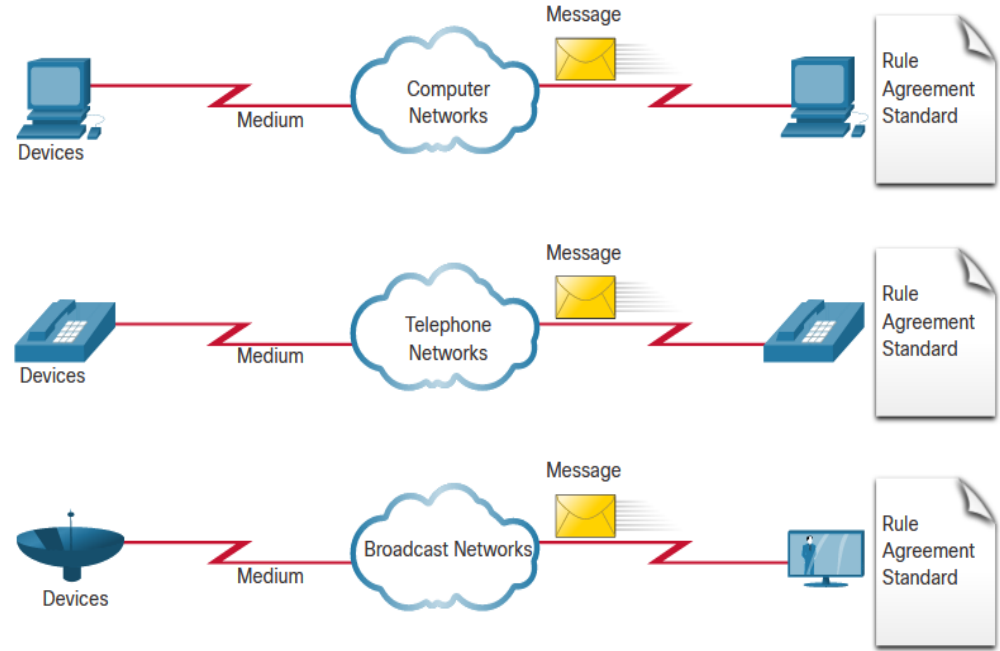


Type of Connection	Description
Dedicated Leased Line	These are reserved circuits within the service provider's network that connect distant offices with private voice and/or data networking.
Ethernet WAN	This extends LAN access technology into the WAN.
DSL	Business DSL is available in various formats including Symmetric Digital Subscriber Lines (SDSL).
Satellite	This can provide a connection when a wired solution is not available.

# The Converging Network

Before converged networks, an organization would have been separately cabled for telephone, video, and data. Each of these networks would use different technologies to carry the signal.

Each of these technologies would use a different set of rules and standards.

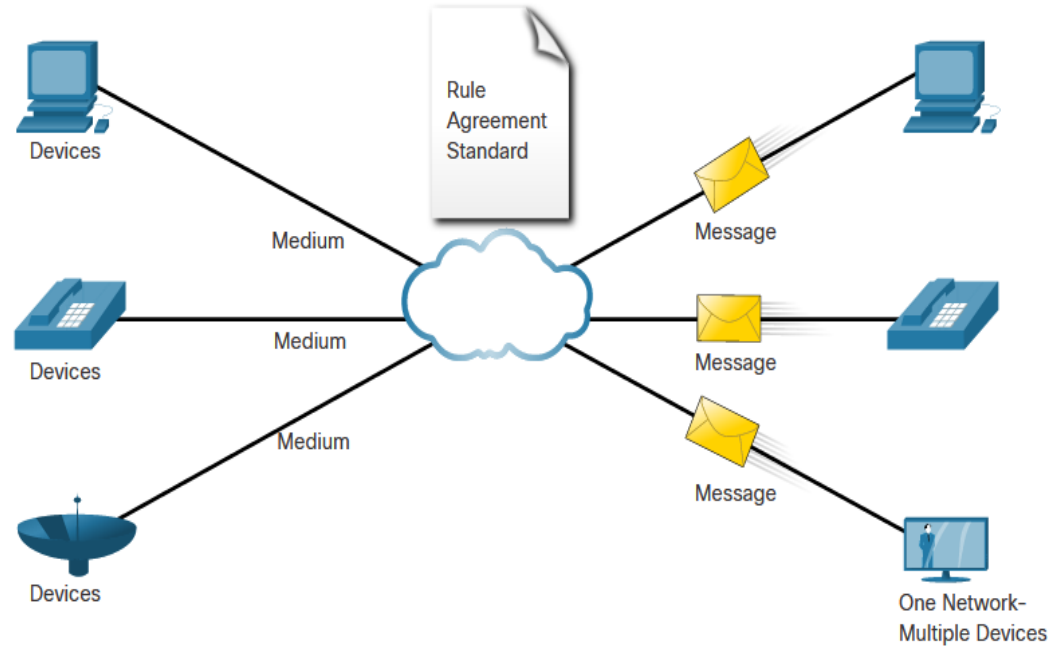


# The Converging Network (Cont.)

Converged data networks carry multiple services on one link including:

- data
- voice
- video

Converged networks can deliver data, voice, and video over the same network infrastructure. The network infrastructure uses the same set of rules and standards.



# Download and Install Packet Tracer

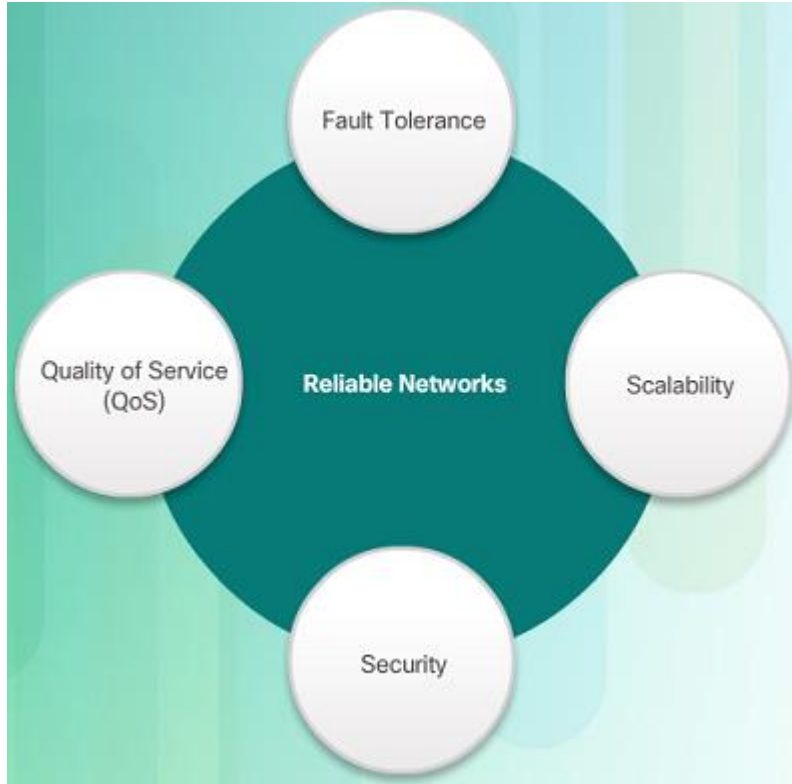
<https://www.netacad.com/courses/packet-tracer/introduction-packet-tracer>



# 1.6 Reliable Networks

## Reliable Network

# Network Architecture



Network Architecture refers to the technologies that support the infrastructure that moves data across the network.

There are four basic characteristics that the underlying architectures need to address to meet user expectations:

- Fault Tolerance
- Scalability
- Quality of Service (QoS)
- Security

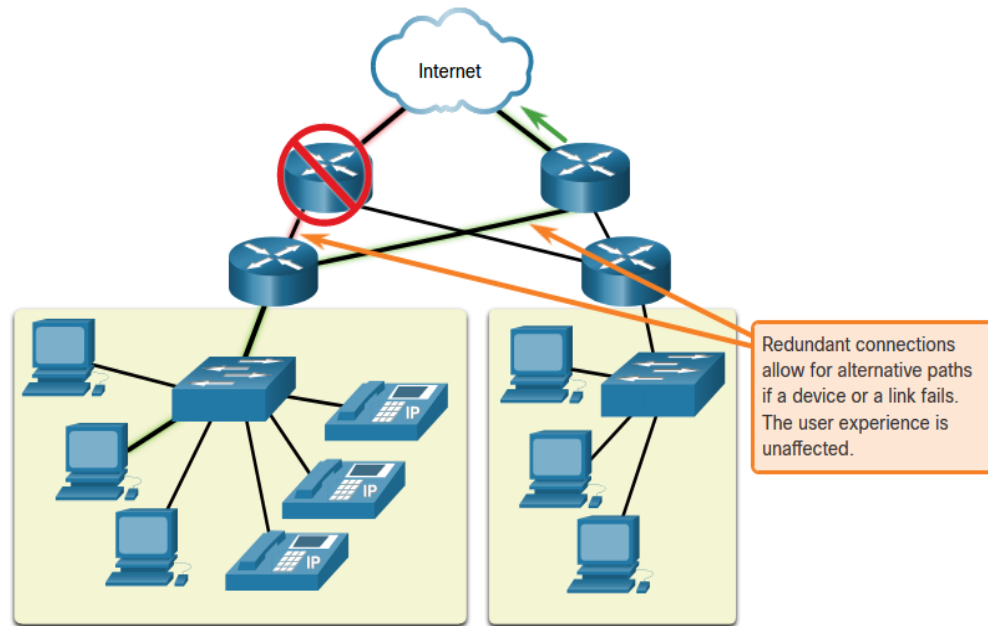
# Fault Tolerance

A fault tolerant network limits the impact of a failure by limiting the number of affected devices. Multiple paths are required for fault tolerance.

Reliable networks provide redundancy by implementing a packet switched network:

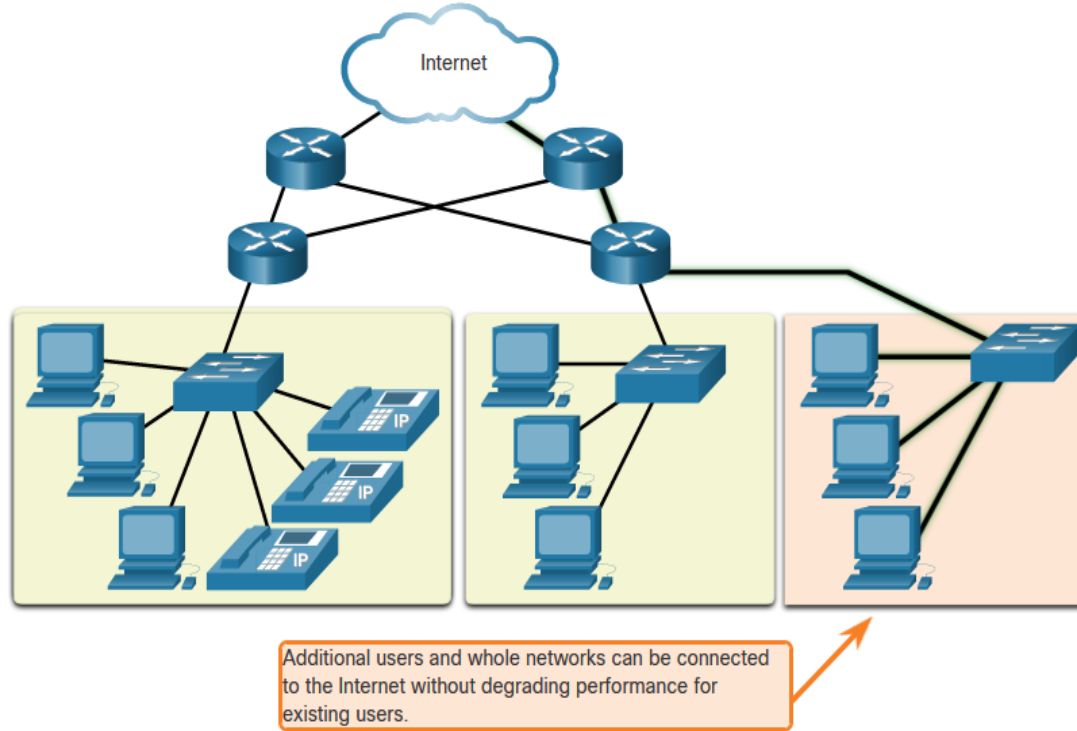
- Packet switching splits traffic into packets that are routed over a network.
- Each packet could theoretically take a different path to the destination.

This is not possible with circuit-switched networks which establish dedicated circuits.



# Reliable Network

## Scalability



A scalable network can expand quickly and easily to support new users and applications without impacting the performance of services to existing users.

Network designers follow accepted standards and protocols in order to make the networks scalable.

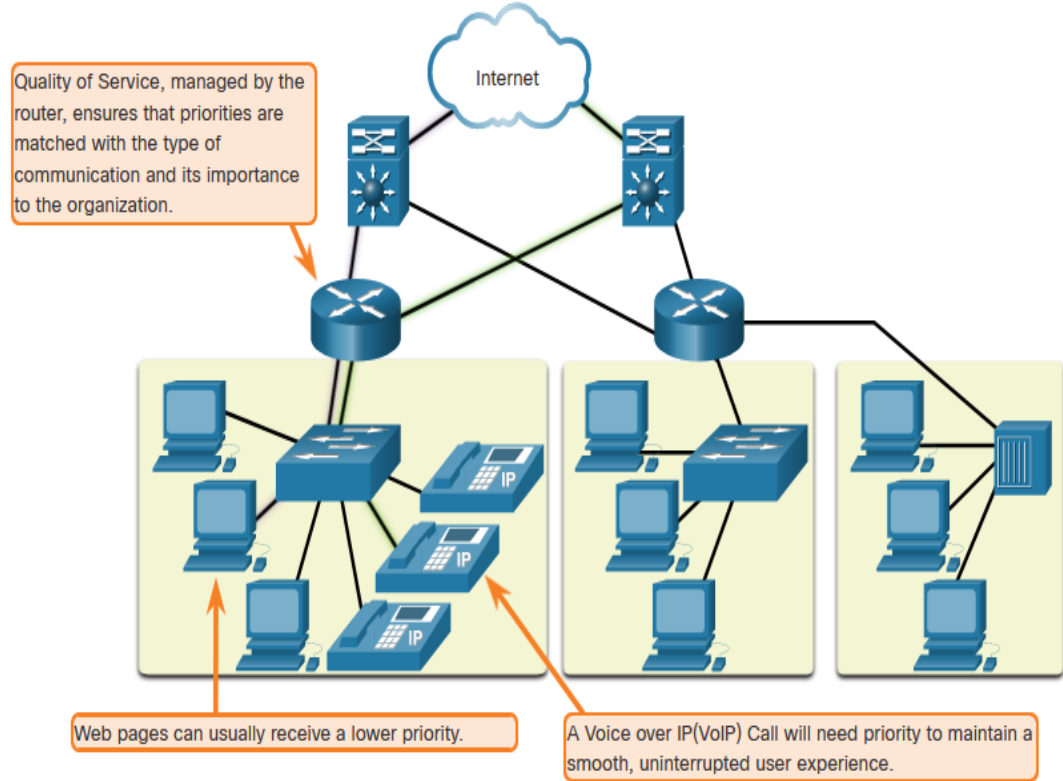
## Reliable Network

# Quality of Service

Voice and live video transmissions require higher expectations for those services being delivered.

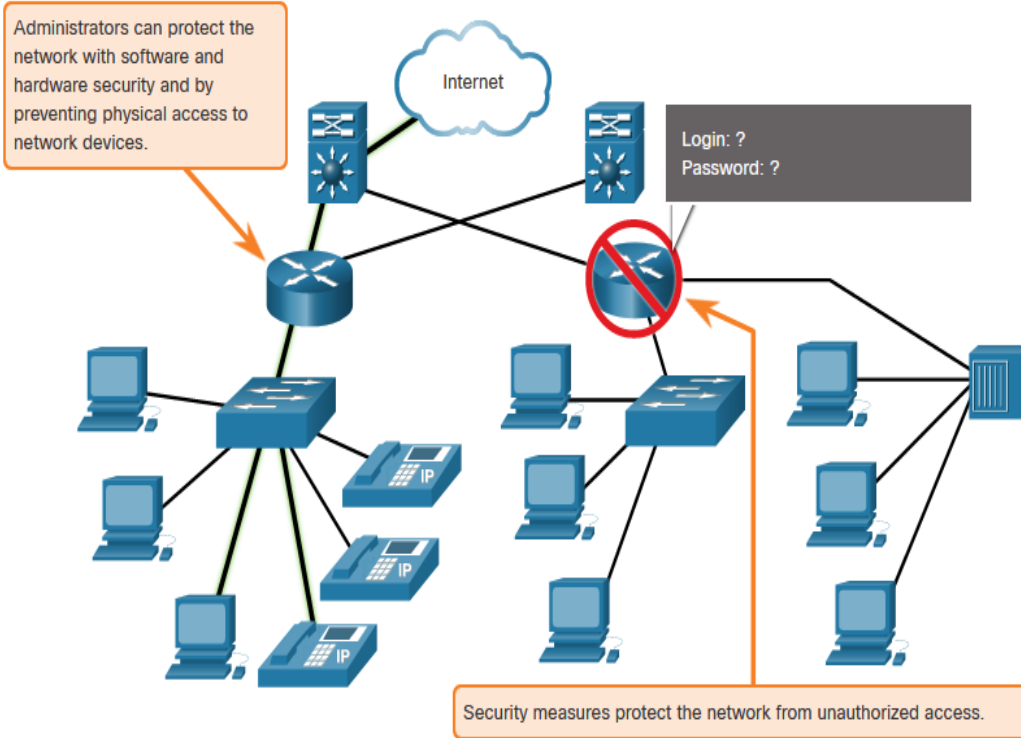
Have you ever watched a live video with constant breaks and pauses? This is caused when there is a higher demand for bandwidth than available – and QoS isn't configured.

- Quality of Service (QoS) is the primary mechanism used to ensure reliable delivery of content for all users.
- With a QoS policy in place, the router can more easily manage the flow of data and voice traffic.



# Reliable Network

## Network Security



There are two main types of network security that must be addressed:

- Network infrastructure security
  - Physical security of network devices
  - Preventing unauthorized access to the devices
- Information Security
  - Protection of the information or data transmitted over the network

Three goals of network security:

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

# 1.9 The IT Professional

# The IT Professional CCNA



## The Cisco Certified Network Associate (CCNA) certification:

- demonstrates that you have a knowledge of foundational technologies
- ensures you stay relevant with skills needed for the adoption of next-generation technologies.

### The new CCNA focus:

- IP foundation and security topics
- Wireless, virtualization, automation, and network programmability.

New DevNet certifications at the associate, specialist and professional levels, to validate your software development skills.

Specialist certification validate your skills in line with your job role and interests.



# The IT Professional Networking Jobs

## Employment Opportunities

Discover career possibilities and options from our Talent Bridge employment program.



### Talent Bridge Matching Engine

Find employment opportunities where you live with the new pilot program, the Talent Bridge Matching Engine. Search for jobs with Cisco as well as Cisco partners and distributors seeking Cisco Networking Academy students and alumni. Register now to complete your profile. Must be 18 years of age or older to register and participate in the Matching Engine.



### Be Part of Our Dream Team

We offer opportunities to gain hands-on experiences throughout the year. These are specific projects that we invite students to participate in as a Dream Team member. Learn more about this experience and how you can participate.



### Your Career, our Talent Bridge Resources

Learn about the resources we have to offer that can help you on your journey to becoming gainfully employed.



Match with Jobs



Connect with Peers



Enroll in a Career Preparation Workshop

At [www.netacad.com](http://www.netacad.com) you can click the Careers menu and then select Employment opportunities.

- Find employment opportunities by using the Talent Bridge Matching Engine.
- Search for jobs with Cisco, Cisco partners and distributors seeking Cisco Networking Academy students and alumni.

# New Terms and Commands

<ul style="list-style-type: none"> <li>• Peer-to-Peer File Sharing</li> <li>• Small Office/Home Office or SOHO</li> <li>• Medium to large network</li> <li>• Server</li> <li>• Client</li> <li>• Peer-to-Peer network</li> <li>• End device</li> <li>• Intermediary device</li> <li>• Medium</li> <li>• Network Interface Card (NIC)</li> <li>• Physical Port</li> <li>• Interface</li> <li>• Physical topology diagram</li> </ul>	<ul style="list-style-type: none"> <li>• Logical topology diagram</li> <li>• Local Area Network (LAN)</li> <li>• Wide Area Network (WAN)</li> <li>• Internet</li> <li>• Intranet</li> <li>• Extranet</li> <li>• Internet Service Provider (ISP)</li> <li>• Converged networks</li> <li>• Network architecture</li> <li>• Fault tolerant network</li> <li>• Packet-switched network</li> <li>• Circuit-switched network</li> <li>• Scalable network</li> <li>• Quality of Service (Qos)</li> </ul>	<ul style="list-style-type: none"> <li>• Network bandwidth</li> <li>• Bring Your Own Device (BYOD)</li> <li>• Collaboration</li> <li>• Cloud computing</li> <li>• Private clouds</li> <li>• Hybrid clouds</li> <li>• Public clouds</li> <li>• Custom clouds</li> <li>• Data center</li> <li>• Smart home technology</li> <li>• Powerline networking</li> <li>• Wireless Internet Service Provider (WISP)</li> <li>• Network architecture</li> </ul>
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