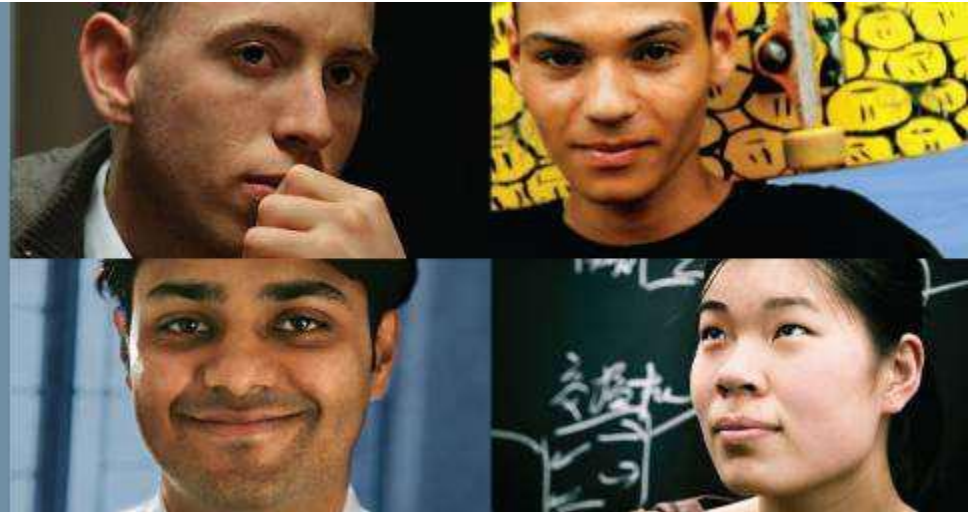




Chapter 1: Exploring the Network



Introduction to Networks



Chapter 1: Objectives

After completing this chapter, students will be able to:■

Explain how multiple networks are used in everyday life.

- Explain the topologies and devices used in a small- to medium-sized business network.
- Explain the basic characteristics of a network that supports communication in a small- to medium-sized business.
- Explain trends in networking that will affect the use of networks in small to medium-sized businesses.

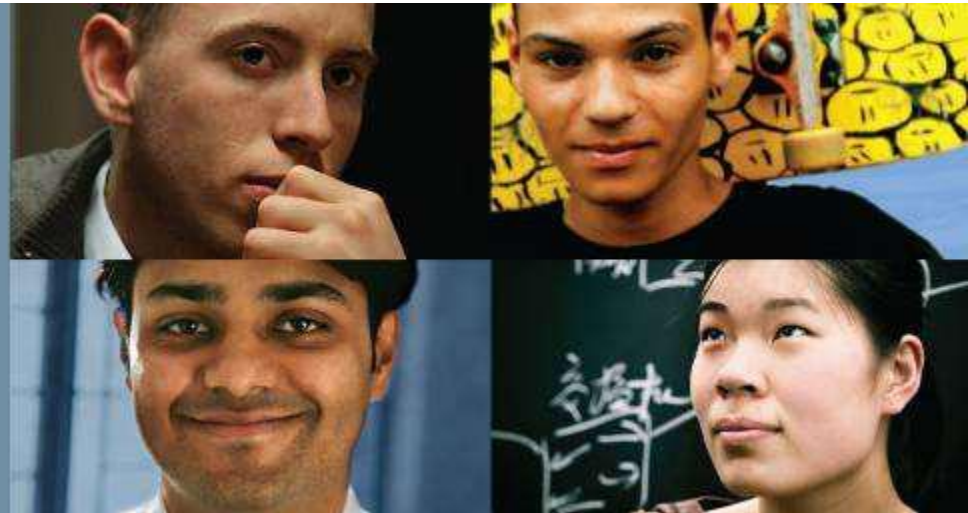


Chapter 1

- 1.1 Globally Connected
- 1.2 LANs, WANs, and the Internet
- 1.3 The Network as a Platform
- 1.4 The Changing Network Environment
- 1.5 Summary



1.1 Globally Connected



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Networking Today

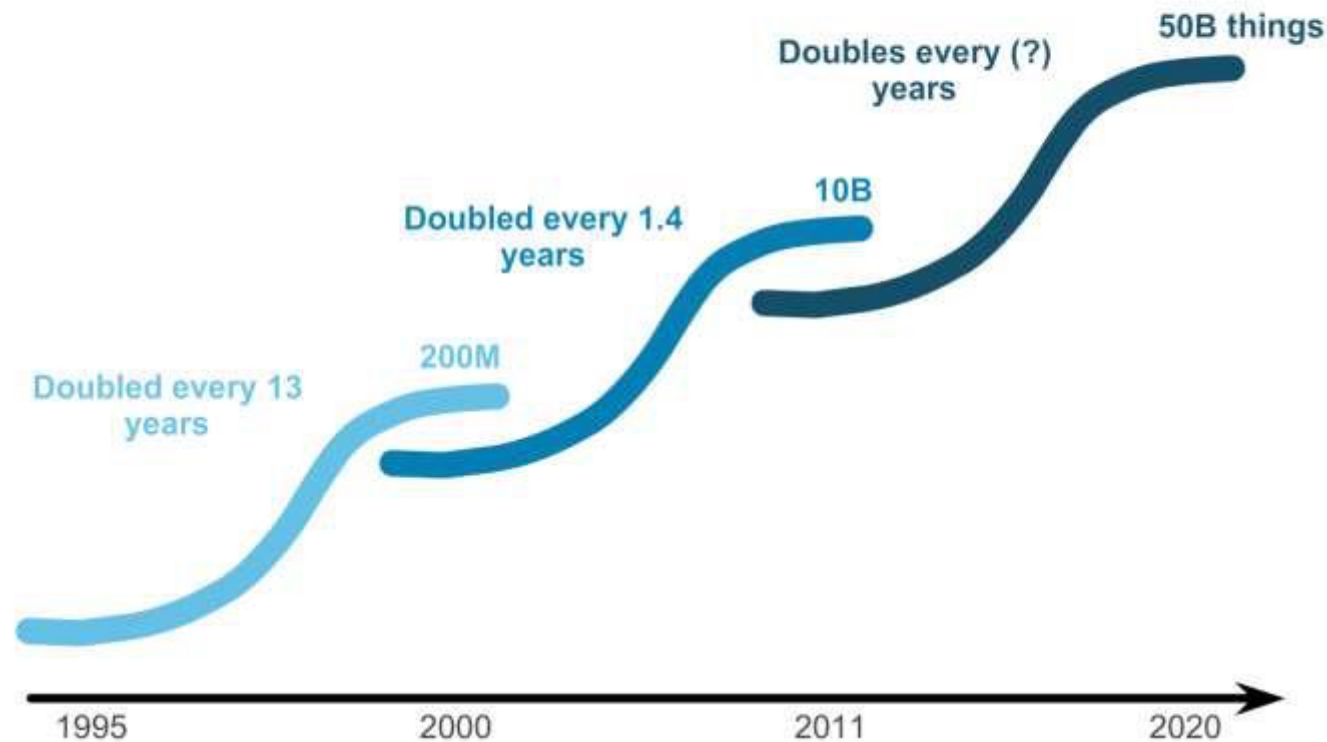
Networks in Our Past and Daily Lives

"Fixed" Computing
(You go to the device)

Mobility/BYOD
(The device goes with you)

Internet of Things
(Age of Devices)

Internet of Everything
(People, Process, Data, Things)





Networking Today

The Global Community





Interconnecting Our Lives

Networking Impacts in Our Daily Lives

- Networks support the way we learn.
- Networks support the way we communicate. ■

Networks support the way we work.

- Networks support the way we play.



Providing Resources in a Network

Networks of Many Sizes



Small Home Networks



Small Office/Home Office Networks



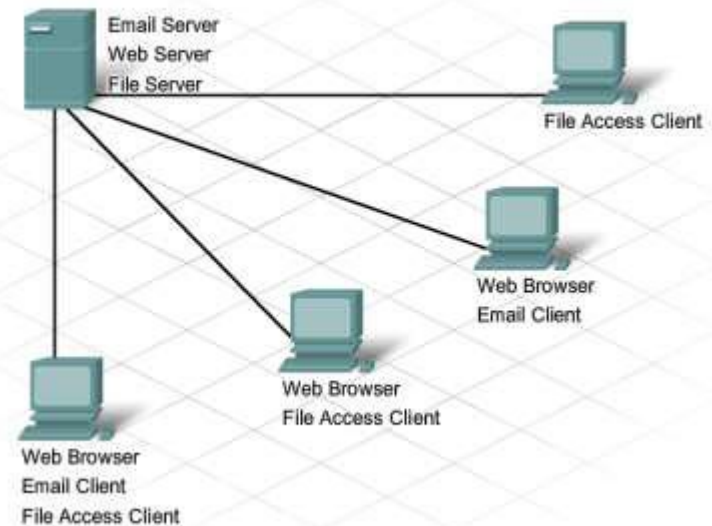
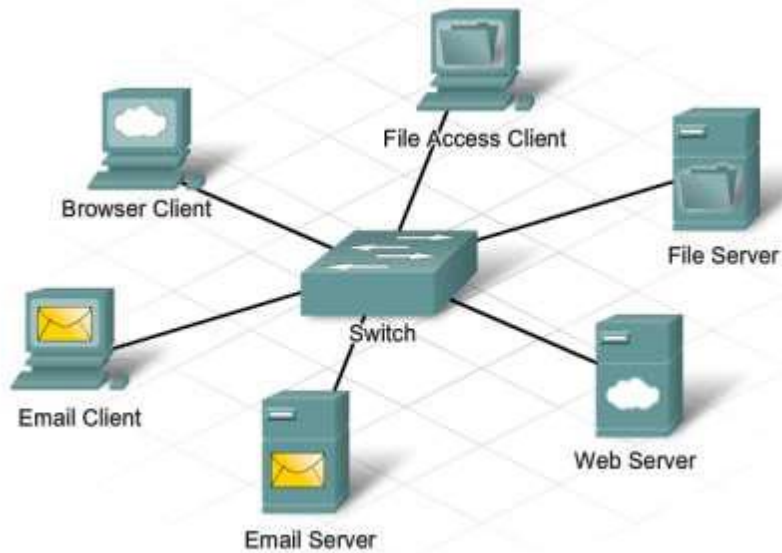
Medium to Large Networks



World Wide Networks

Providing Resources in a Network

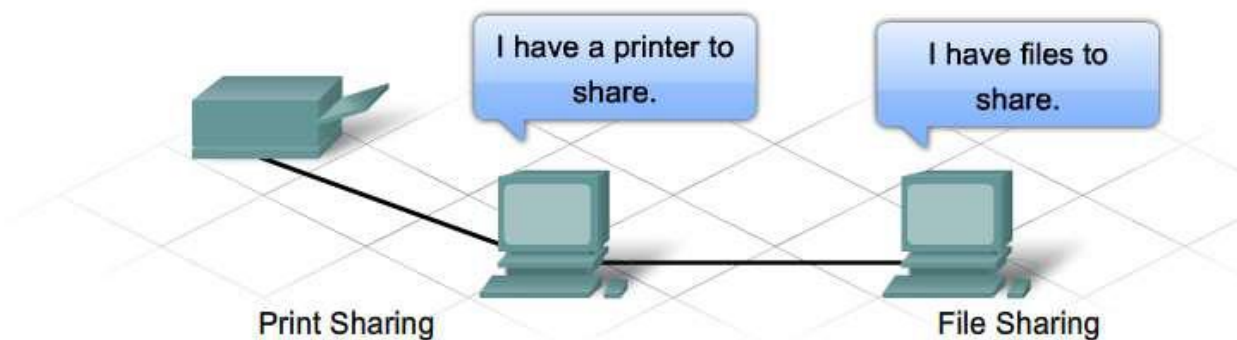
Clients and Servers





Providing Resources in a Network

Peer-to-Peer



The advantages of peer-to-peer networking:

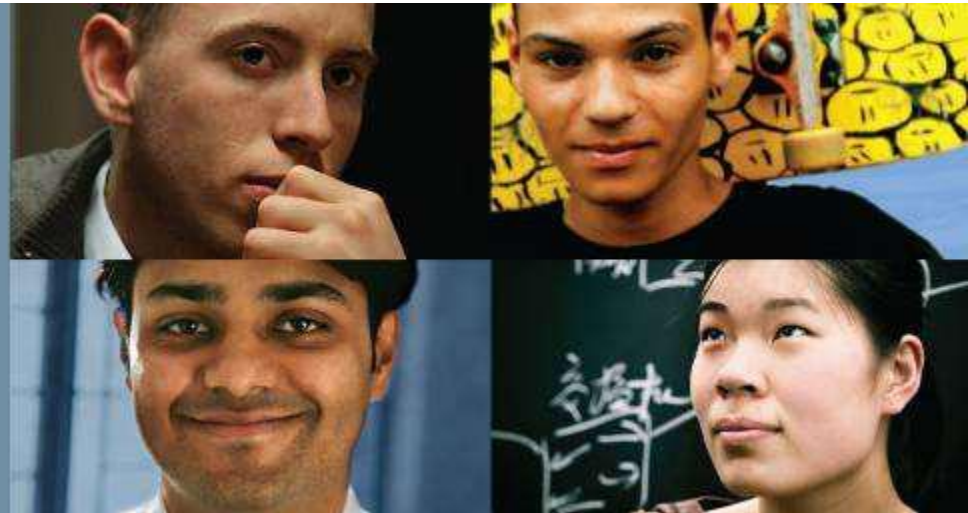
- Easy to set up
- Less complexity
- Lower cost since network devices and dedicated servers may not be required
- Can be used for simple tasks such as transferring files and sharing printers

The disadvantages of peer-to-peer networking:

- No centralized administration
- Not as secure
- Not scalable
- All devices may act as both clients and servers which can slow their performance



1.2 LANs, WANs, and the Internet



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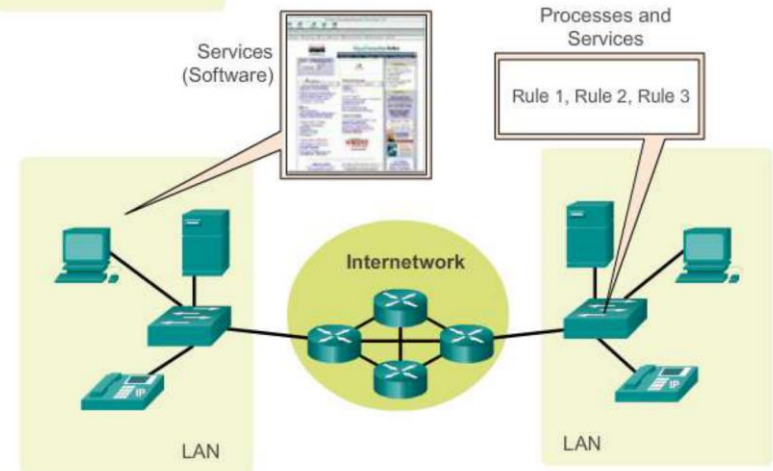
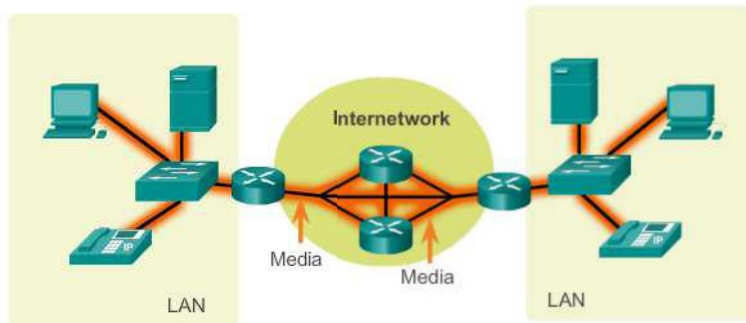
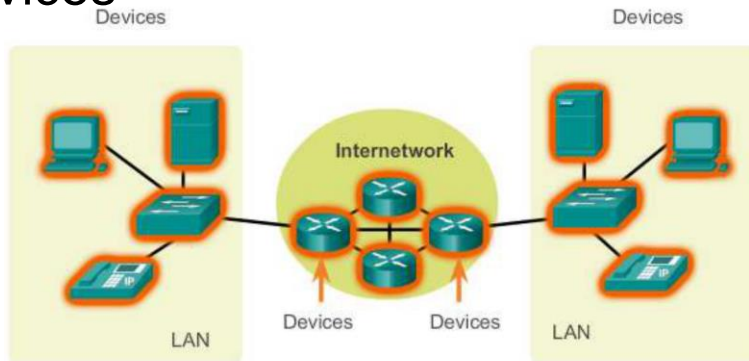
LANs, WANs, and Internets

Components of a Network

There are three categories of network components:

- Devices

- Media
- Services





Components of a Network

End Devices

Some examples of end devices are:

- Computers (work stations, laptops, file servers, web servers)
- Network printers
- VoIP phones
- TelePresence endpoint
- Security cameras
- Mobile handheld devices (such as smart phones, tablets, PDAs, and wireless debit / credit card readers and barcode scanners)



Components of a Network

Network Infrastructure Devices

Examples of intermediary network devices are:

- Network Access Devices (switches, and wireless access points) ■

Internetworking Devices (routers)

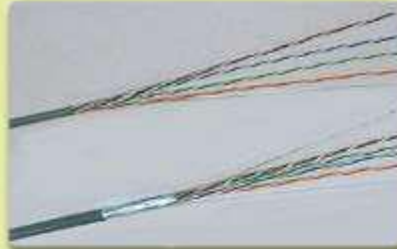
- Security Devices (firewalls)



Components of a Network

Network Media

Copper



Fiber Optic



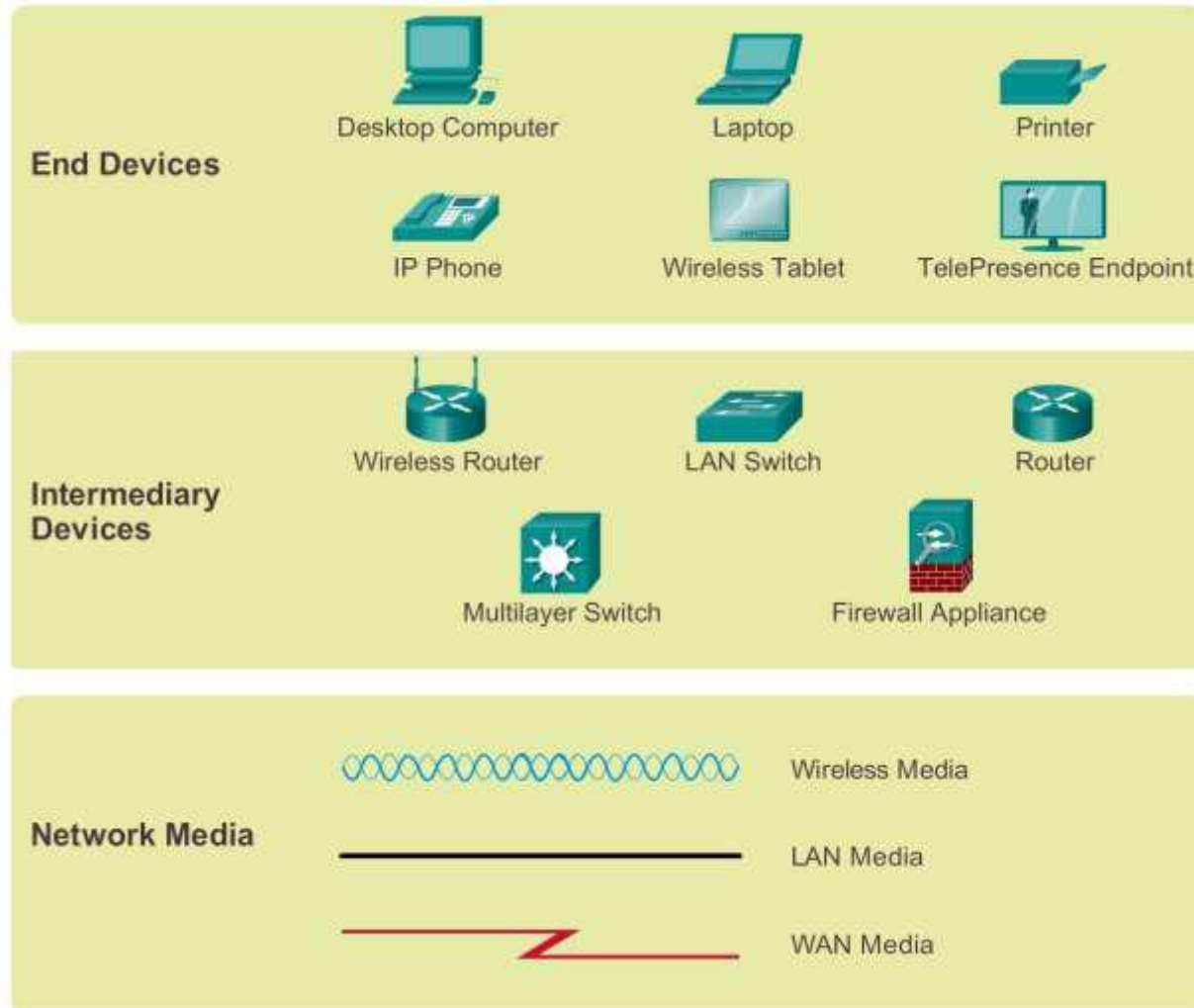
Wireless





Components of a Network

Network Representations

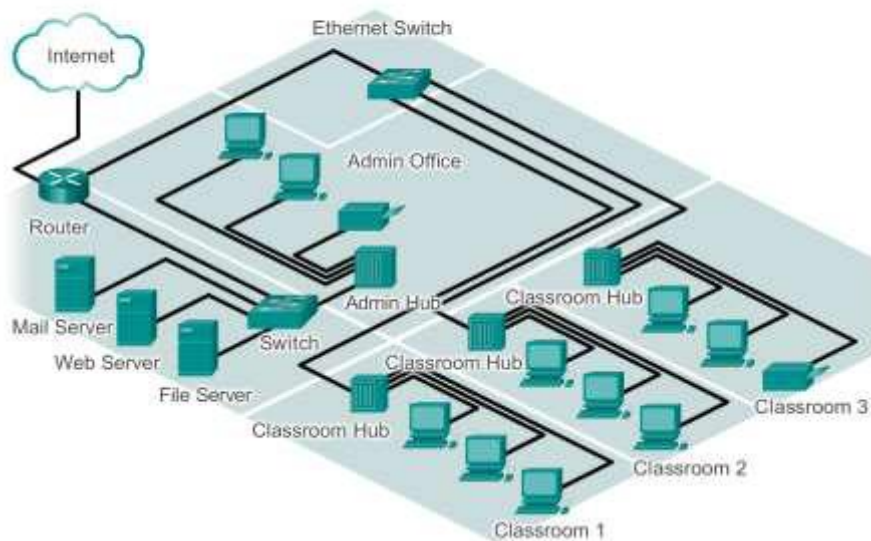




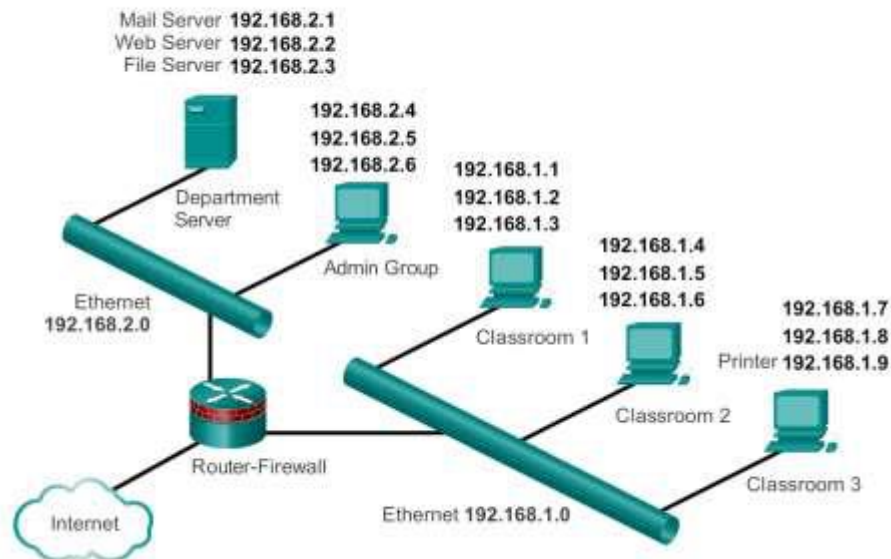
Components of a Network

Topology Diagrams

Physical Topology



Logical Topology





LANs and WANs

Types of Networks

The two most common types of network infrastructures are:

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

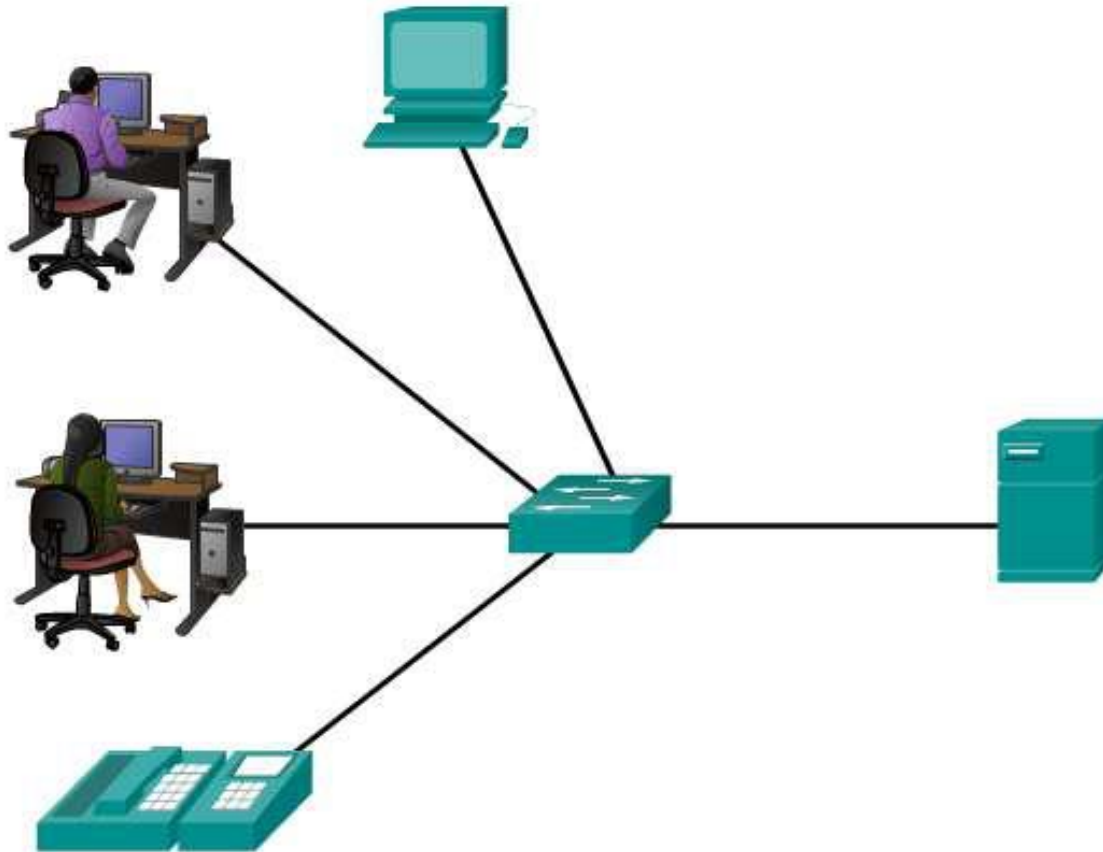
Other types of networks include:

- Metropolitan Area Network (MAN)
- Wireless LAN (WLAN)
- Storage Area Network (SAN)



LANs and WANs

Local Area Networks (LAN)



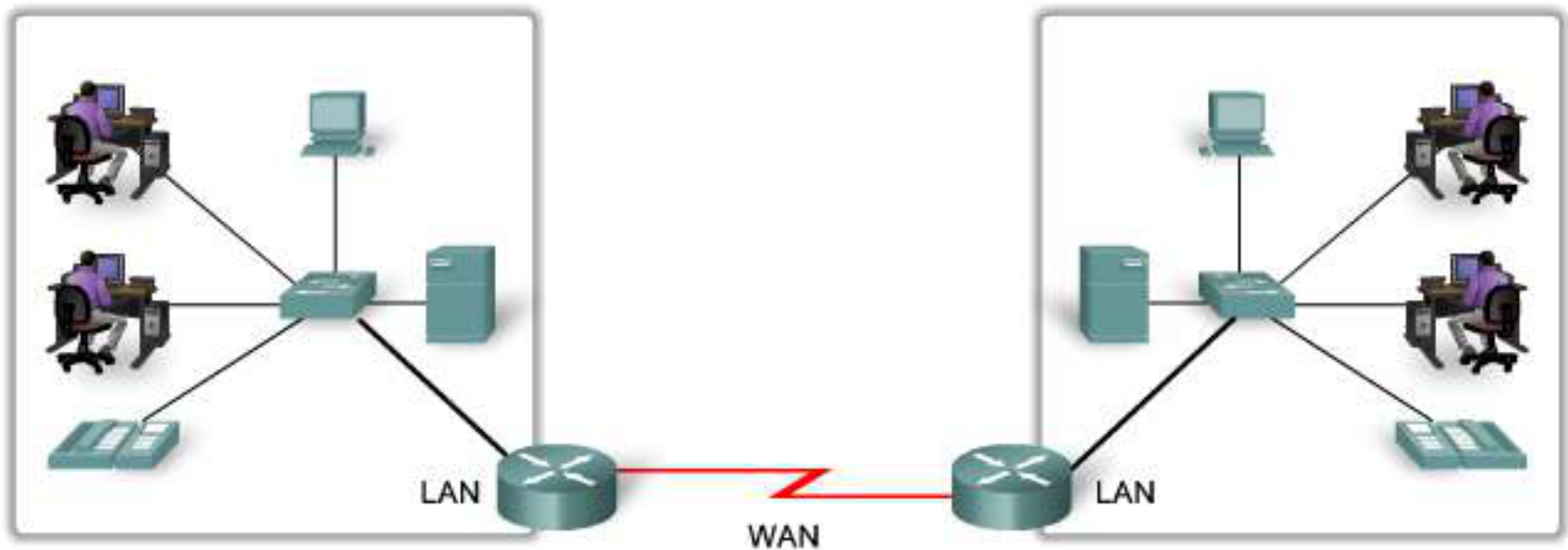
A network serving a home, building, or campus is considered a LAN.



LANs and WANs

Wide Area Networks (WAN)

LANs separated by geographic distance are connected by a network known as a Wide Area Network (WAN).

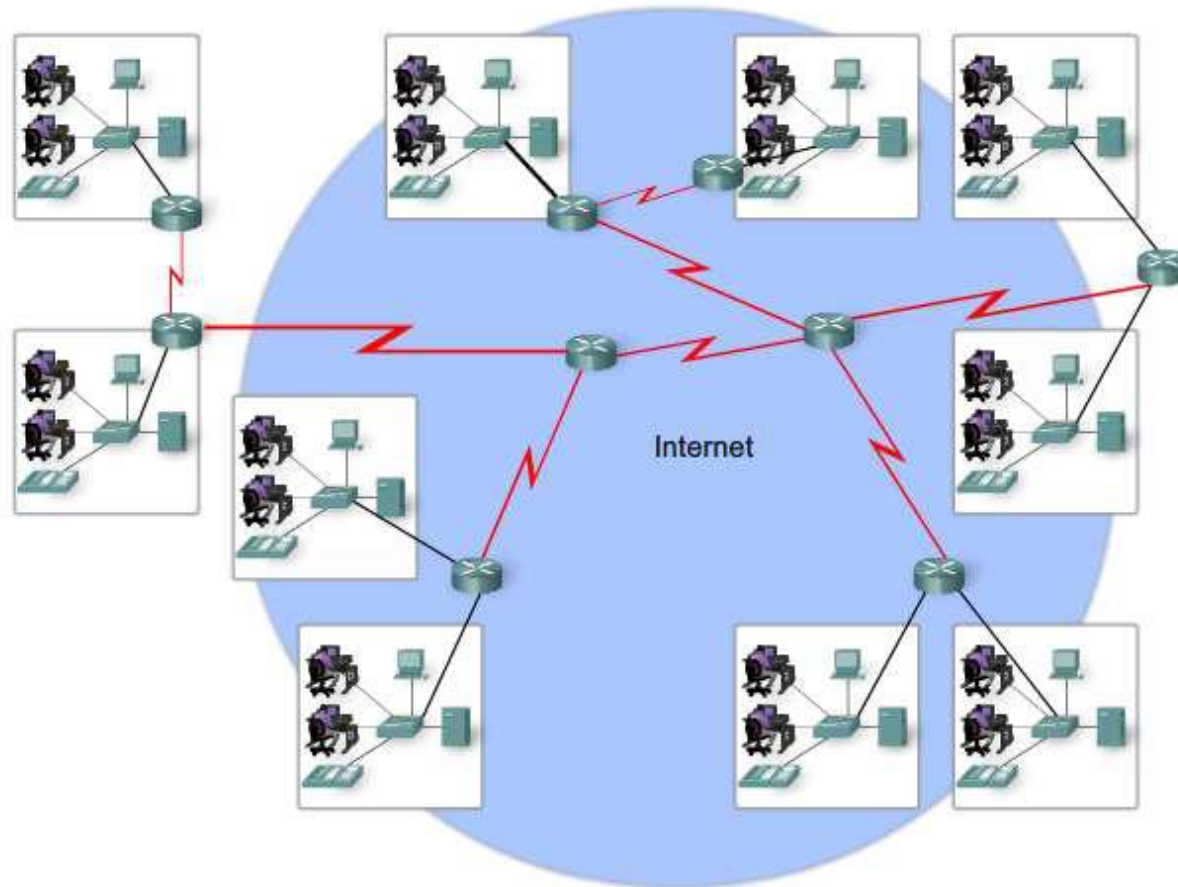




LANs, WANs, and the Internet

The Internet

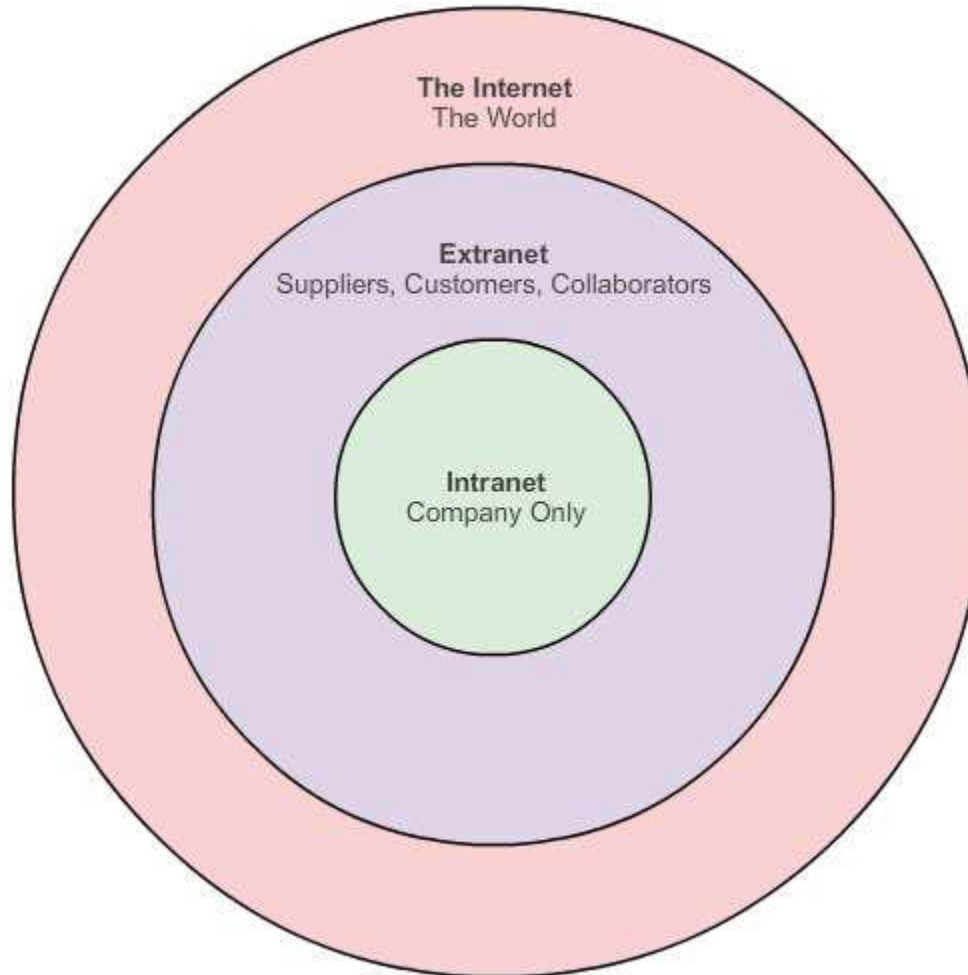
LANs and WANs may be connected into internetworks.





LANs, WANs, and the Internet

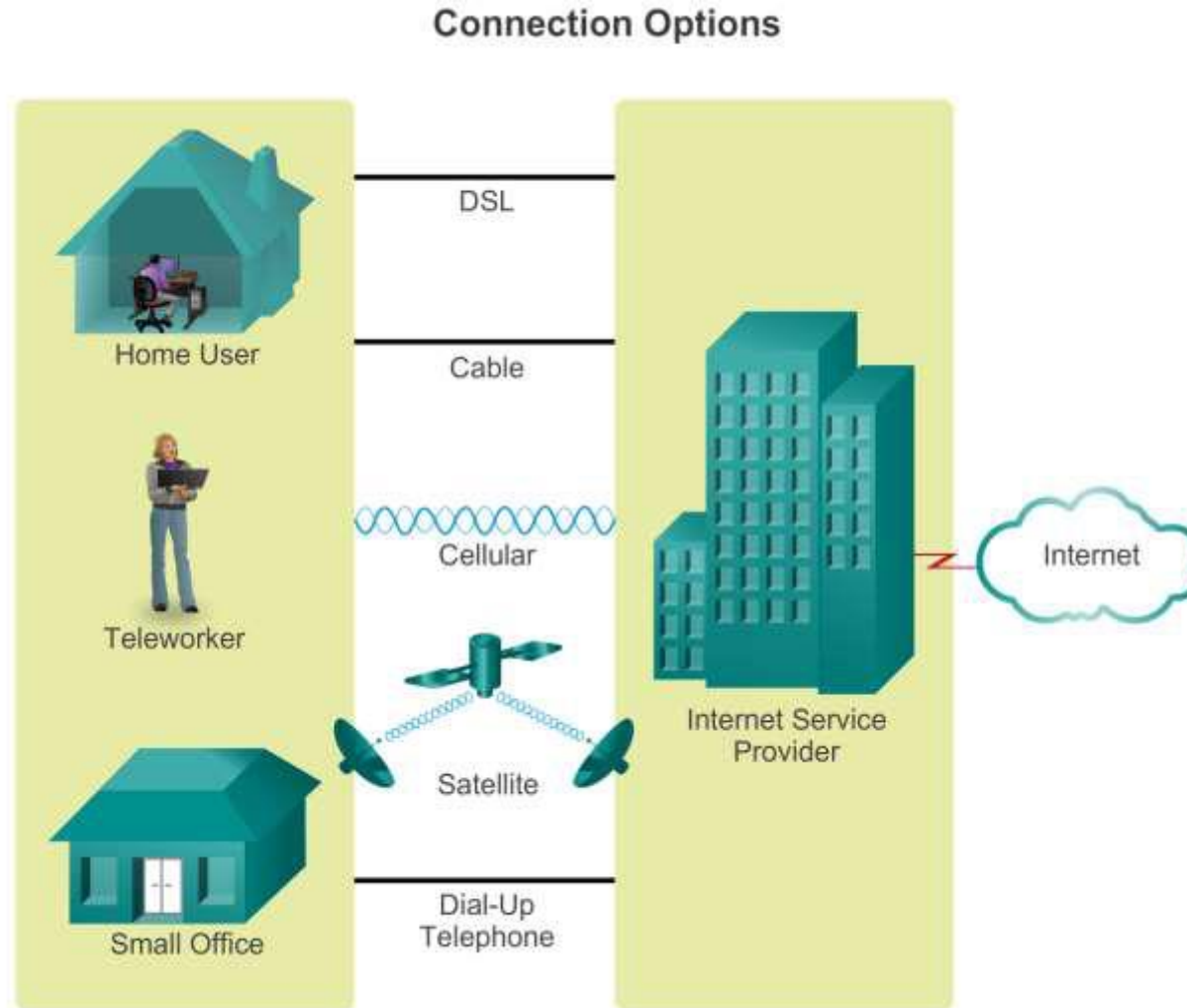
Intranet and Extranet





Connecting to the Internet

Connecting Remote Users to the Internet

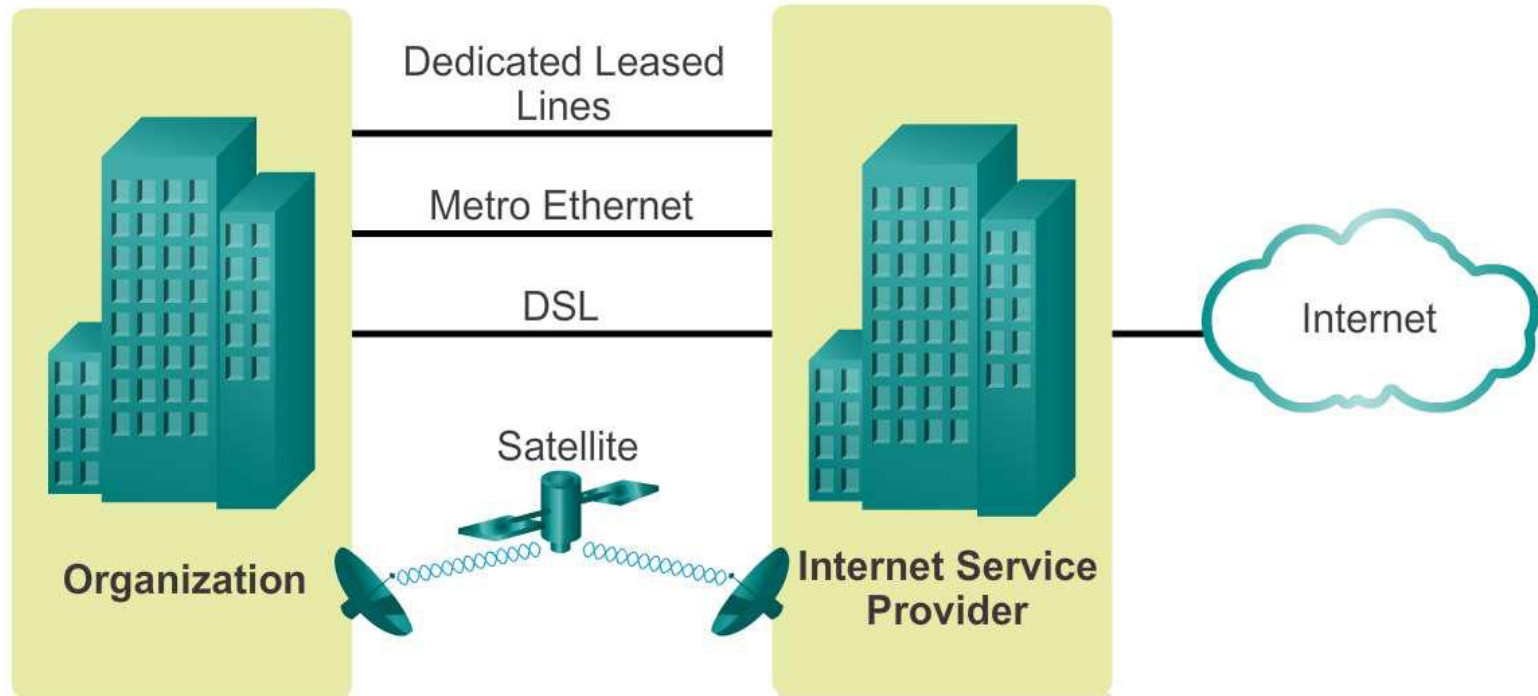




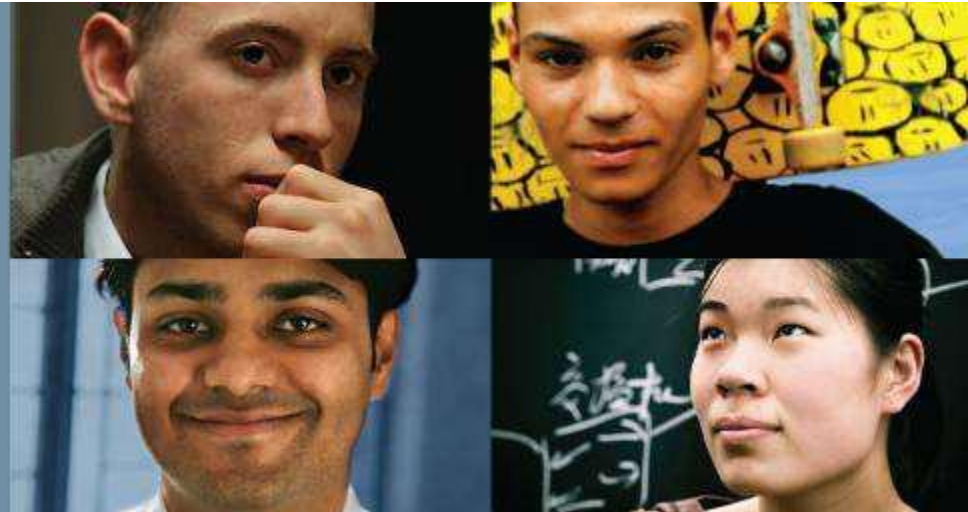
Connecting to the Internet

Connecting Businesses to the Internet

Connection Options



1.3 The Network as a Platform

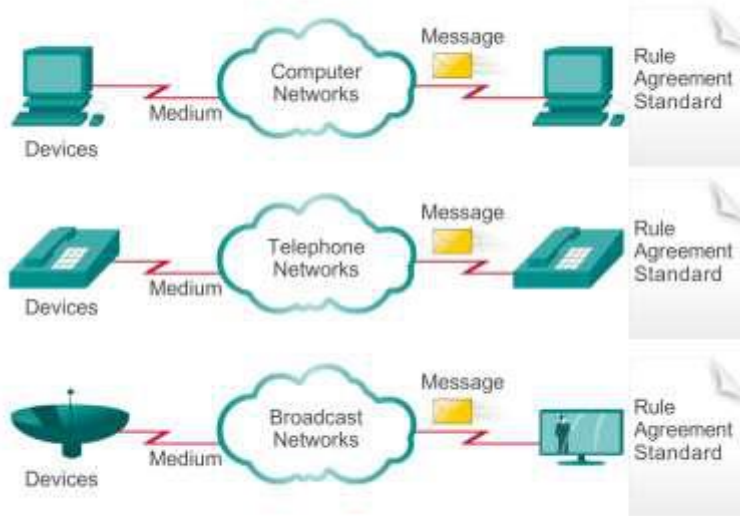




Converged Networks

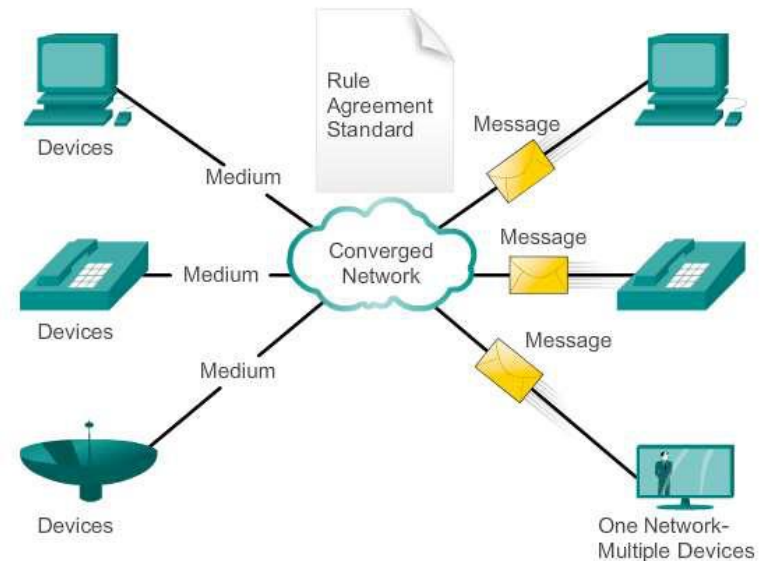
The Converging Network

Multiple Networks



Multiple services are running on multiple networks.

Converged Networks



Converged data networks carry multiple services on one network.



Converged Networks

Planning for the Future

Intelligent Networks Are Bringing the World Together



Intelligent networks allow handheld devices to receive news and emails, and to send text.



Video conferencing around the globe is in the palm of your hand.



Phones connect globally to share voice, text, and images.



The Human Network is everywhere.



Online gaming connects thousands of people seamlessly.



Reliable Network

Supporting Network Architecture

As networks evolve, we are discovering that there are four basic characteristics that the underlying architectures need to address in order to meet user expectations:

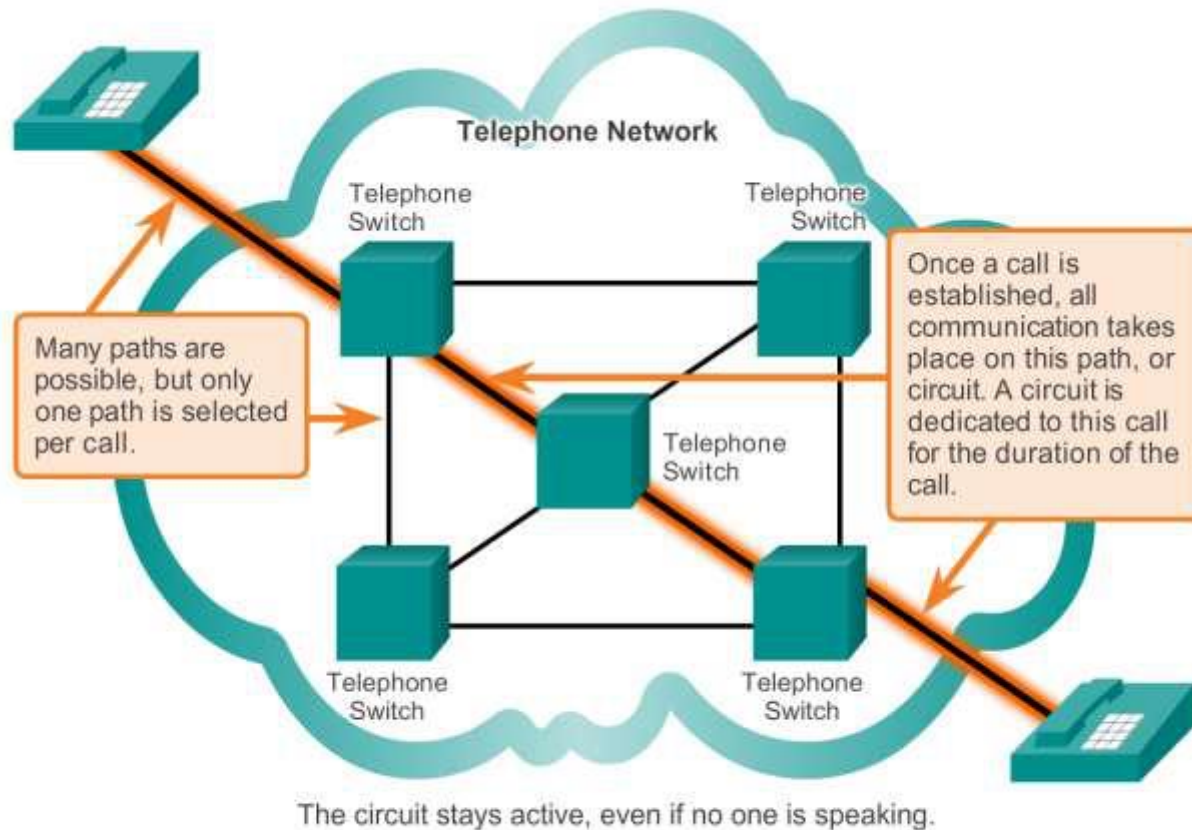
- Fault Tolerance
- Scalability
- Quality of Service (QoS)
- Security



Reliable Network

Fault Tolerance in Circuit Switched Network

Circuit Switching in a Telephone Network



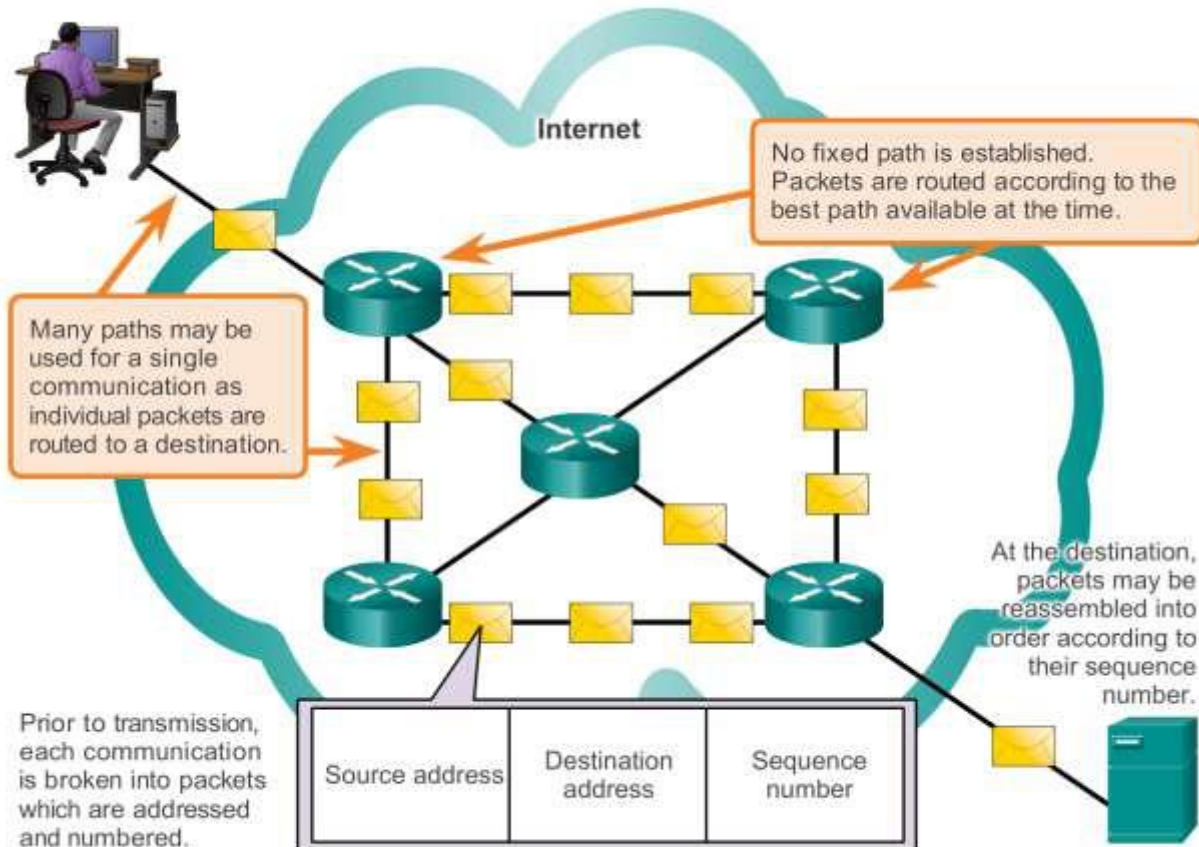
There are many, many circuits, but a finite number. During peak periods, some calls may be denied.



Reliable Network

Packet-Switched Networks

Packet Switching in a Data Network



During peak periods, communication may be delayed, but not denied.



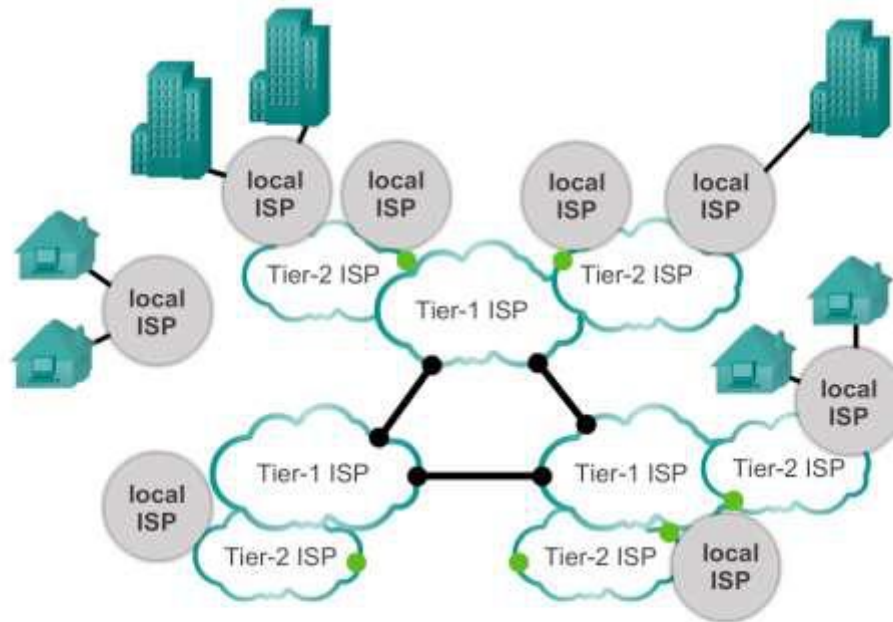
Reliable Network

Scalable Networks

At the center of the Internet, Tier-1 ISPs provide national and international connections. These ISPs treat each other as equals.

Tier-2 ISPs are smaller and often provide regional service. Tier-2 ISPs usually pay Tier-1 ISPs for connectivity to rest of the Internet.

Peer connections between networks at the same level provide direct connections, bypassing longer routes and preventing congestion on the backbone.



Tier-3 ISPs are the local providers of service directly to end users. Tier-3 ISPs are usually connected to Tier 2 ISPs and pay Tier 2 providers for Internet access.



Reliable Network

Providing QoS

Examples of priority decisions for an organization might include:■

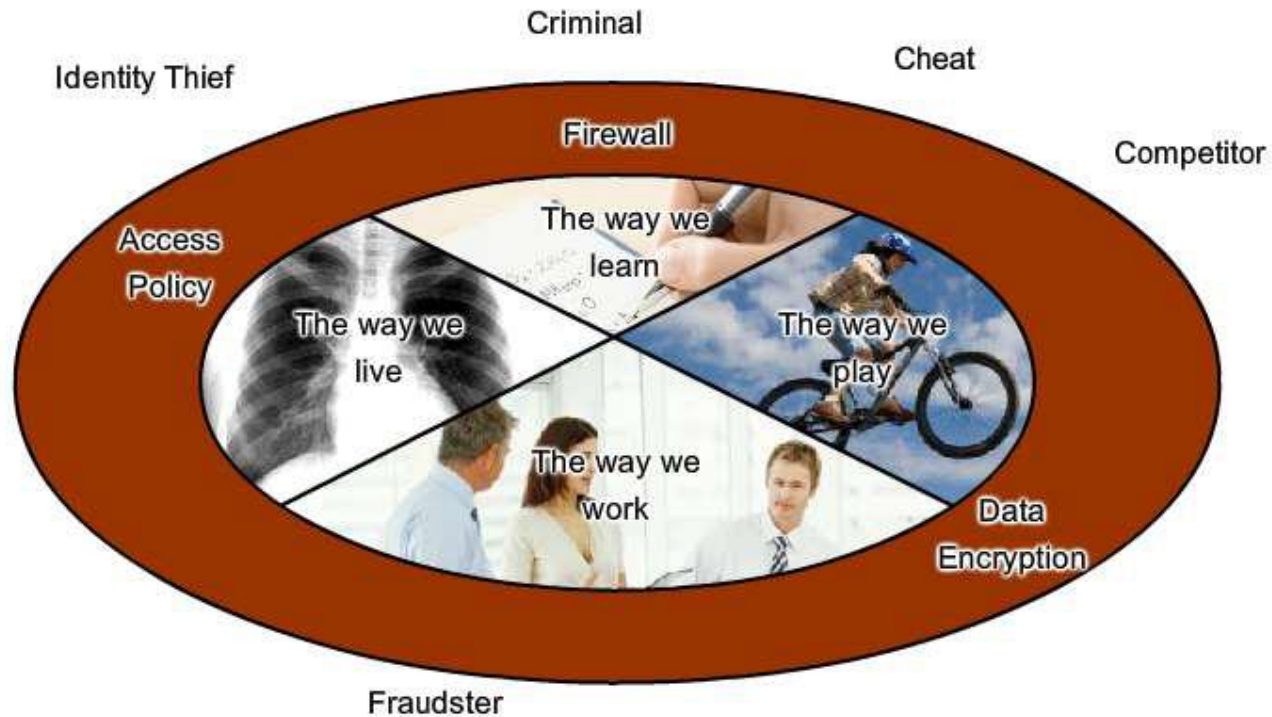
Time-sensitive communication - increase priority for services like telephony or video distribution.

- Non time-sensitive communication - decrease priority for web page retrieval or email.
- High importance to organization - increase priority for production control or business transaction data.
- Undesirable communication - decrease priority or block unwanted activity, like peer-to-peer file sharing or live entertainment.



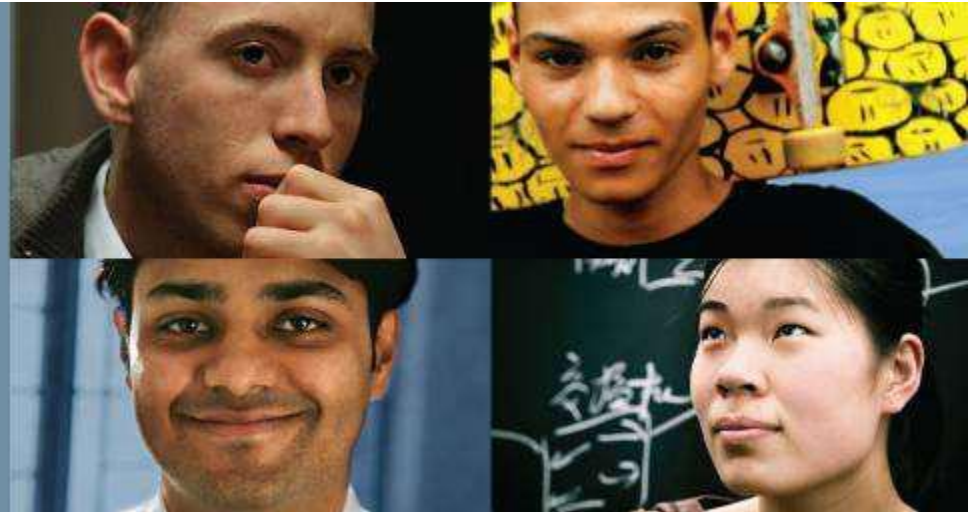
Reliable Network

Providing Network Security



The communication and information that we would like to be private is protected from those who would make unauthorized use of it.

1.4 The Changing Network Environment





Network Trends

New trends

Some of the top trends include:

- Bring Your Own Device (BYOD)
- Online collaboration
- Video
- Cloud computing



Network Trends

Bring Your Own Device (BYOD)



The concept of any device, to any content, in anyway is a major global trend that requires significant changes to the way devices are used. This trend is known as Bring Your Own Device (BYOD).



Network Trends

Online Collaboration

Collaboration



IP Communication



Mobile Applications



Telepresence



Messaging



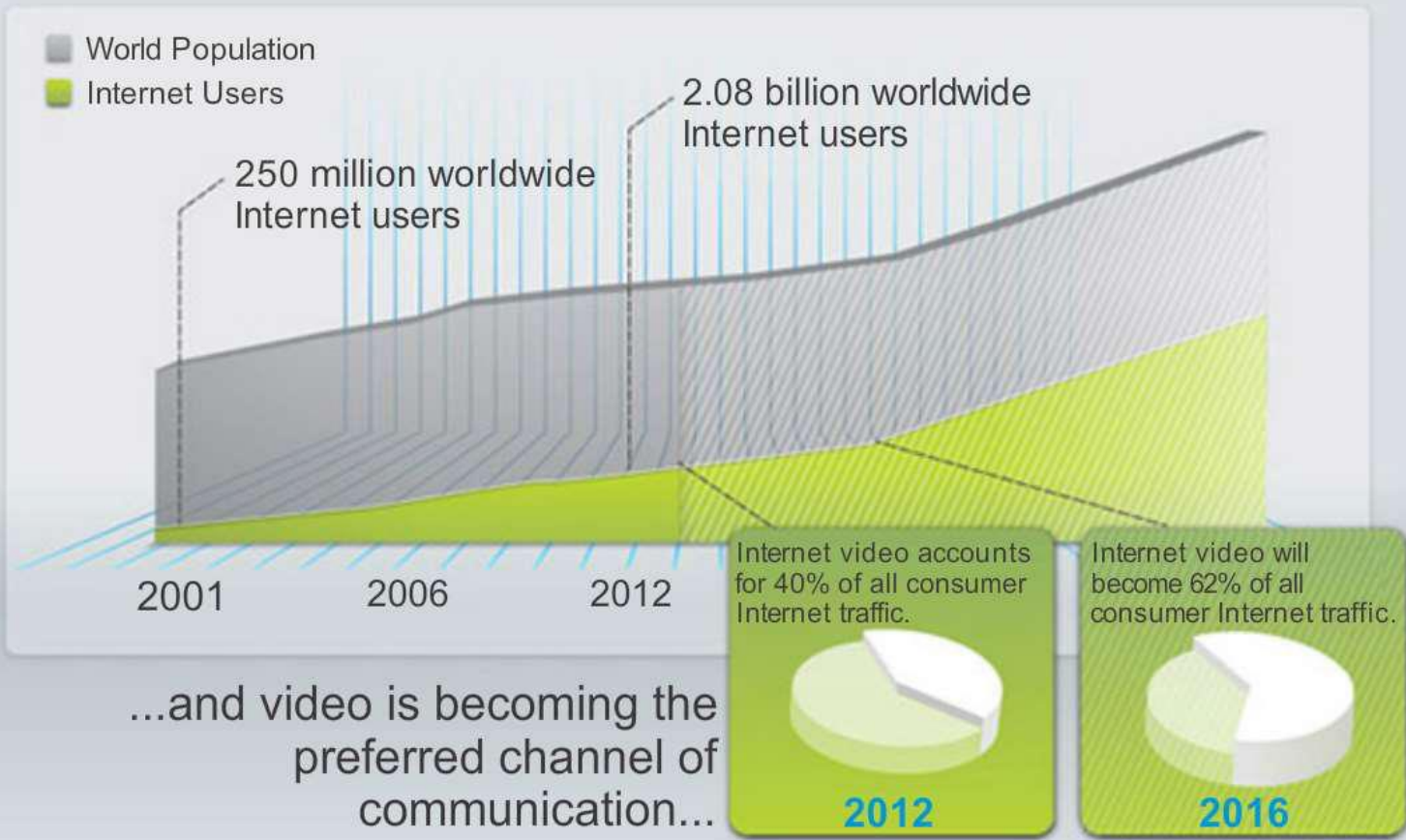
Online Conferencing



Network Trends

Video Communication

People are becoming more connected...





Network Trends

Cloud Computing

Cloud computing offers the following potential

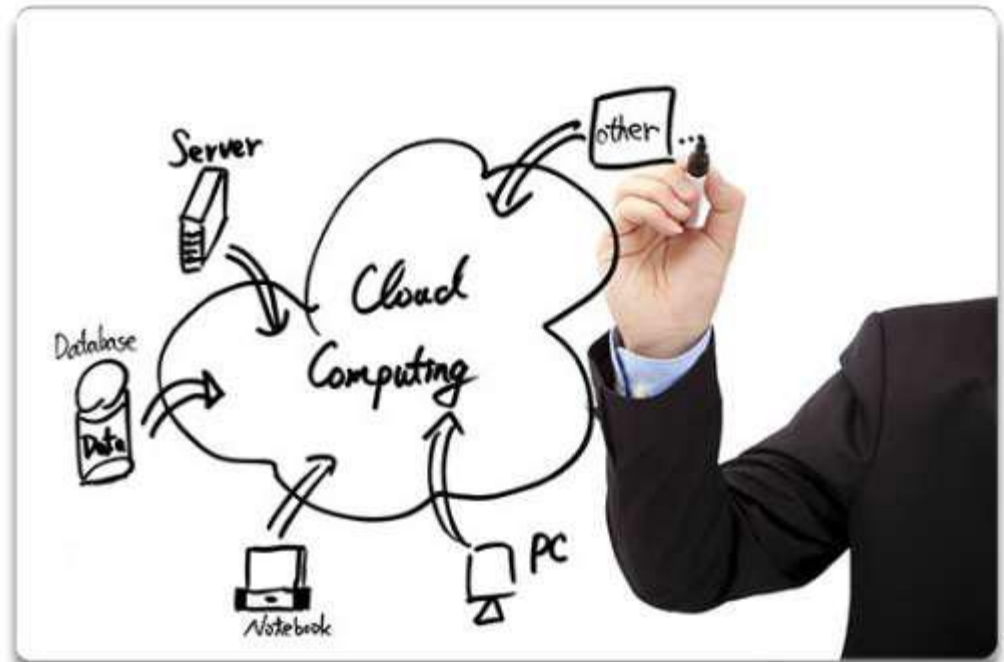
benefits: ■ Organizational flexibility

■ Agility and rapid deployment

■ Reduced cost of infrastructure ■

Refocus of IT resources

■ Creation of new business models





Network Trends

Data Centers

A data center is a facility used to house computer systems and associated components including:

- Redundant data communications connections
- High-speed virtual servers (sometimes referred to as server farms or server clusters)
- Redundant storage systems (typically uses SAN technology)
- Redundant or backup power supplies
- Environmental controls (e.g., air conditioning, fire suppression)
- Security devices



Networking Technologies for the Home

Technology Trends in the Home

Smart Home Technology

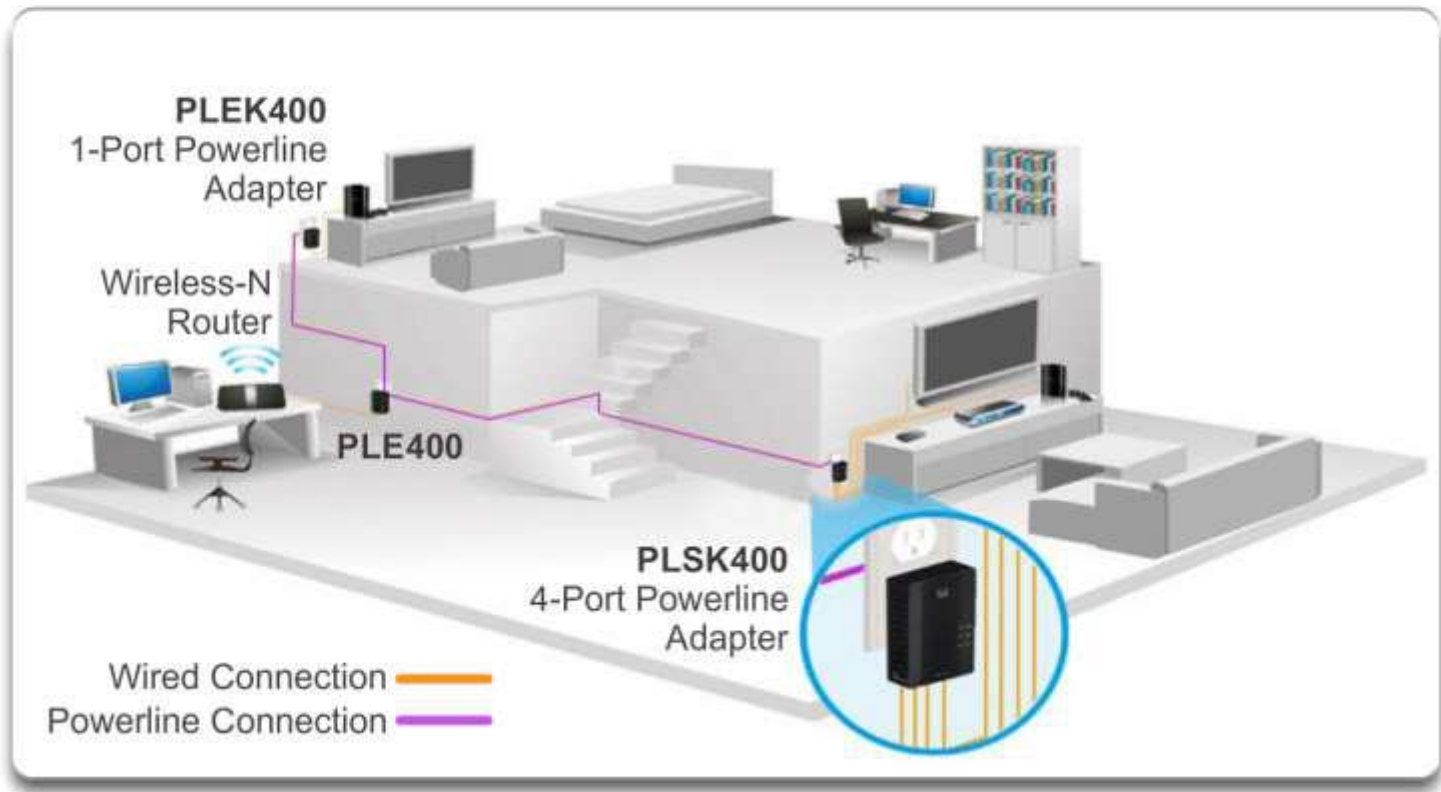




Networking Technologies for the Home

Powerline Networking

Powerline Networking





Networking Technologies for the Home

Wireless Broadband

Wireless Broadband Service

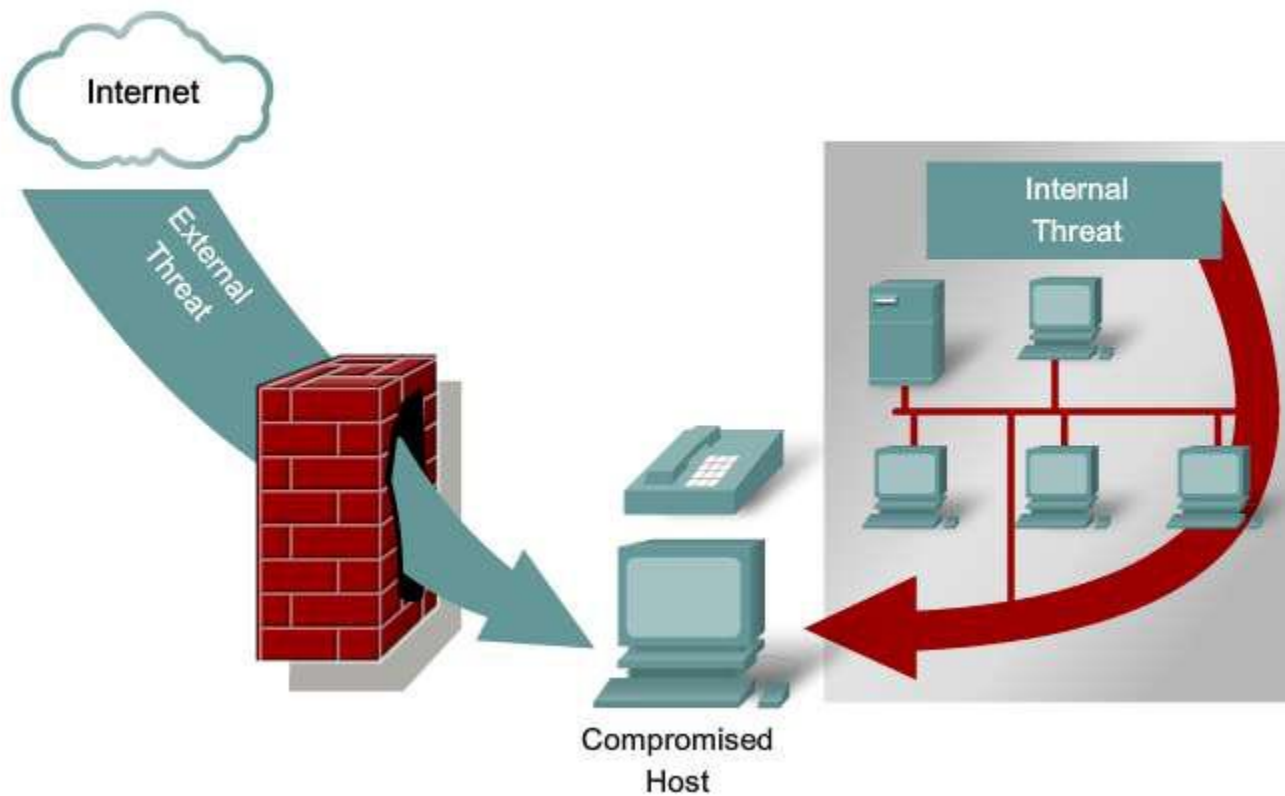




Future of Networking

Network Security

Threats to Networks





Network Security

Security Threats

The most common external threats to networks

include: ■ Viruses, worms, and Trojan horses

- Spyware and adware
- Zero-day attacks, also called zero-hour attacks
- Hacker attacks
- Denial of service (DoS) attacks
- Data interception and theft
- Identity theft



Network Security

Security Solutions

Network security components often

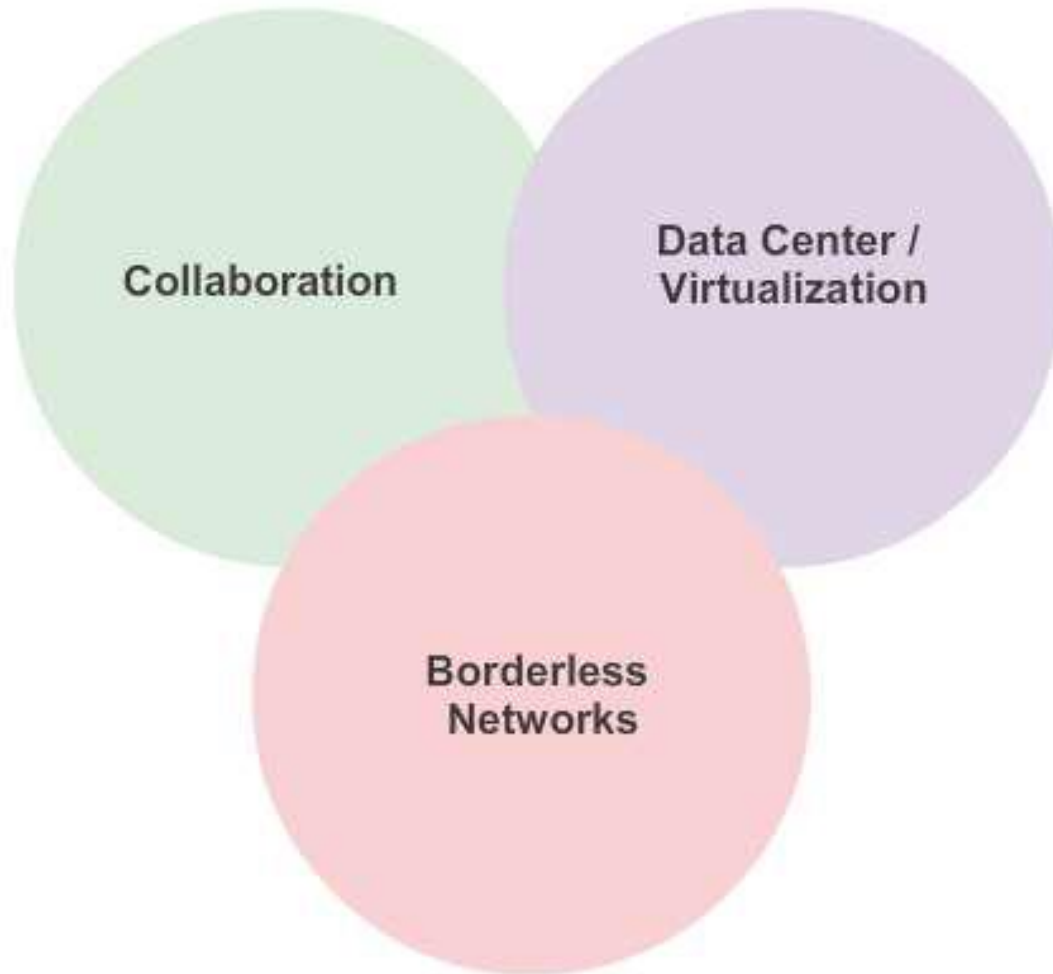
include: ■ Antivirus and antispyware

- Firewall filtering
- Dedicated firewall systems
- Access control lists (ACL)
- Intrusion prevention systems (IPS)
- Virtual Private Networks (VPNs)



Network Architectures

Cisco Network Architectures





Network Architectures

Cisco Certified Network Associate (CCNA)





Exploring the Networking Summary

In this chapter, you learned:

- Networks and the Internet have changed the way we communicate, learn, work, and even play.
- Networks come in all sizes. They can range from simple networks consisting of two computers, to networks connecting millions of devices.
- The Internet is the largest network in existence. In fact, the term Internet means a 'network of networks. The Internet provides the services that enable us to connect and communicate with our families, friends, work, and interests.
- The network infrastructure is the platform that supports the network. It provides the stable and reliable channel over which communication can occur. It is made up of network components including end devices, intermediate devices, and network media.



Exploring the Networking Summary (cont.)

In this chapter, you learned:

- Networks must be reliable.
- Network security is an integral part of computer networking, regardless of whether the network is limited to a home environment with a single connection to the Internet, or as large as a corporation with thousands of users.
- The network infrastructure can vary greatly in terms of size, number of users, and number and types of services that are supported on it. The network infrastructure must grow and adjust to support the way the network is used. The routing and switching platform is the foundation of any network infrastructure.



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