Chapter 1: Exploring the Network

ITP172 – Networking Fundamentals & Project

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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.

1.1 Globally Connected

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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.

Networks of Many Sizes

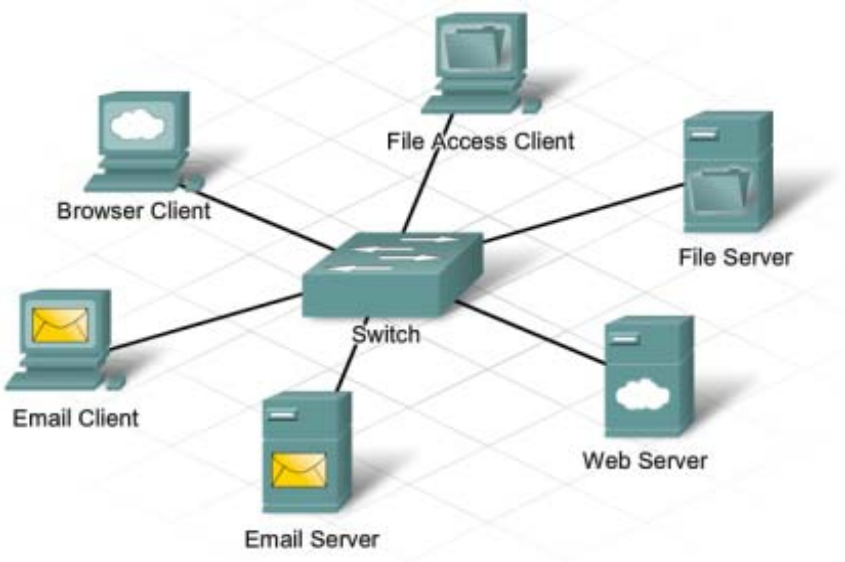
Small Home Networks

Small Office/Home Office Networks **(SOHO)**

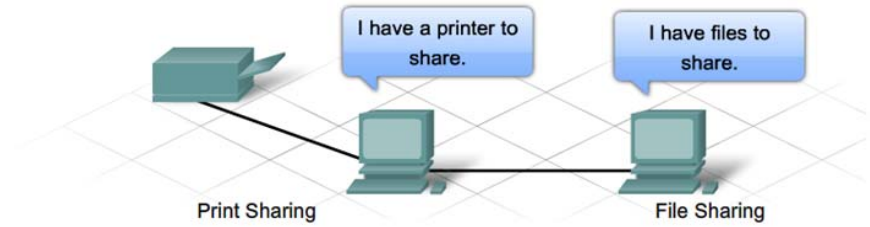
Medium to Large Networks

World Wide Networks

Clients and Servers



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

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1.2 LANs, WANs, and the Internet

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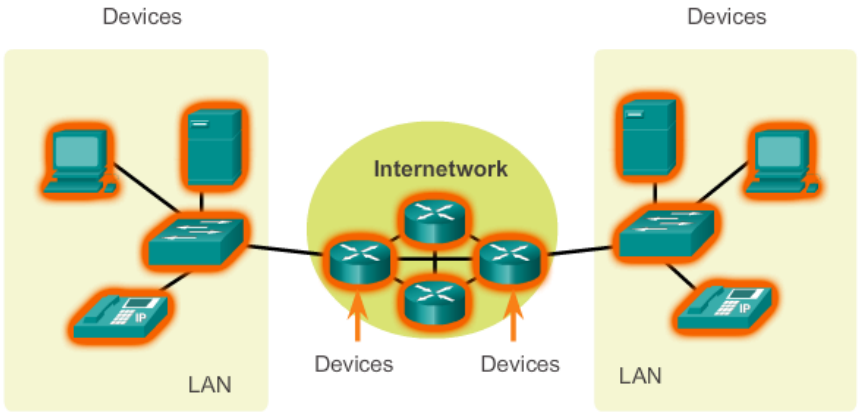
Components of a Network

There are three categories of network components:

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



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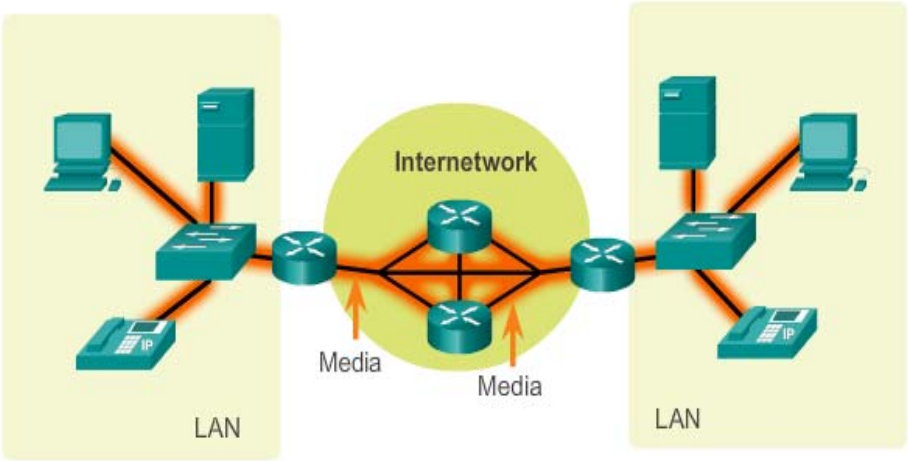
Components of a Network

Media



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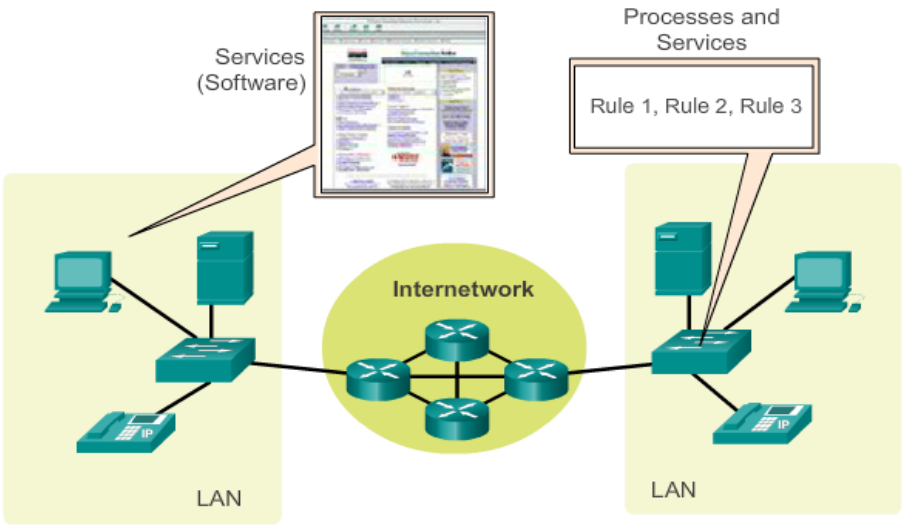
Components of a Network

Services (Software)



End Devices

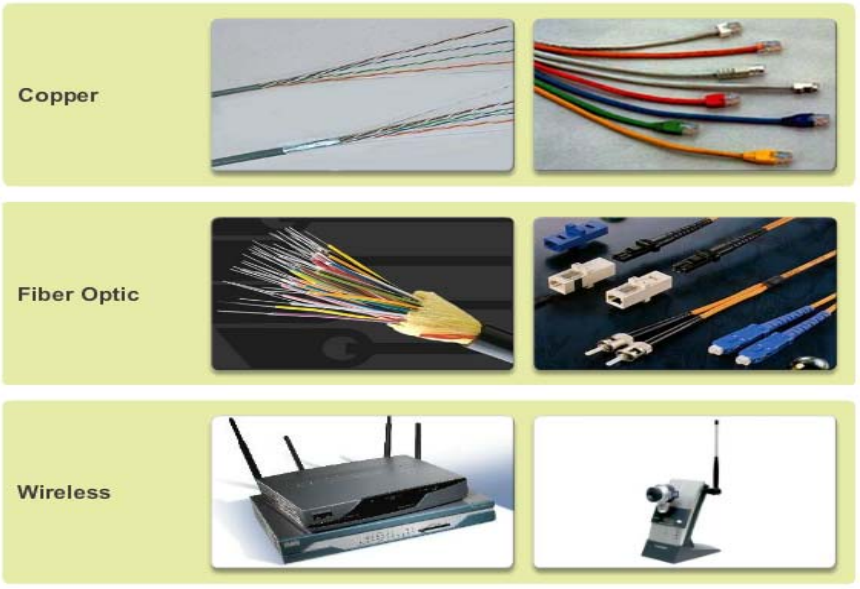
Some examples of end devices are:

- 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)

Examples of intermediary network devices are:

- Network Access Devices (switches, and wireless access points)
- Internetworking Devices (routers)
- Security Devices (firewalls)

Network Media



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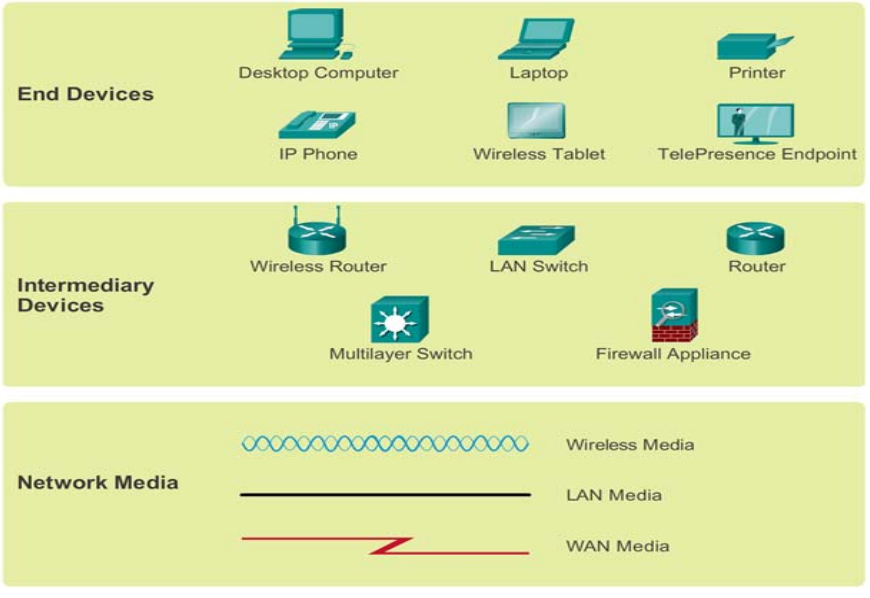
Network Representations



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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)

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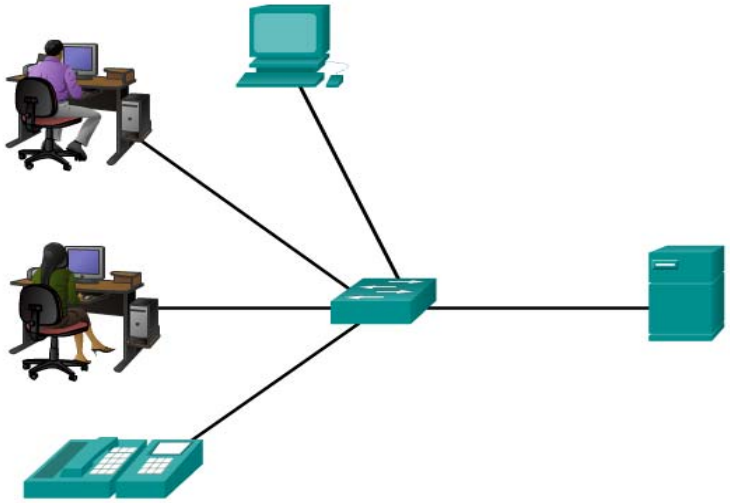
Local Area Networks (LAN)



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

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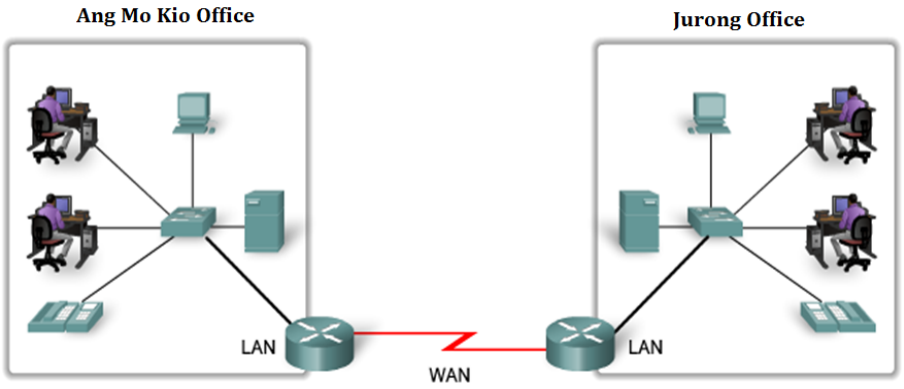
Wide Area Networks (WAN)

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



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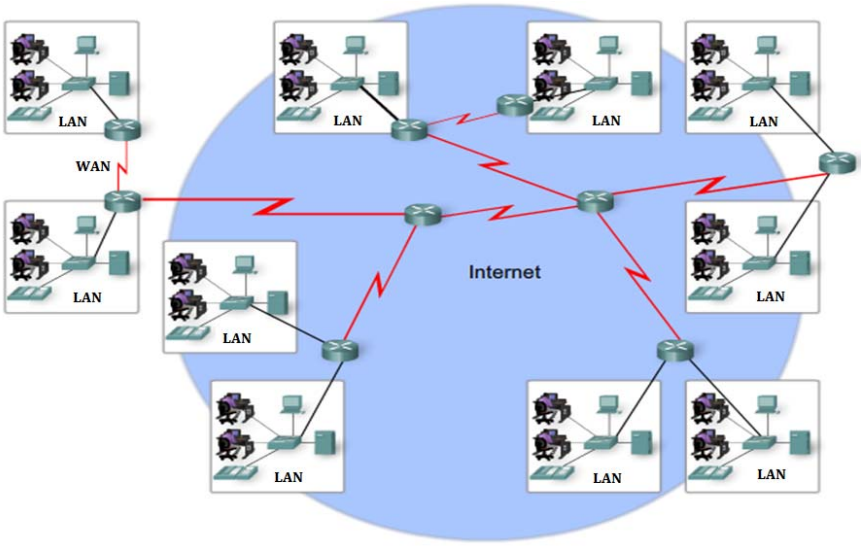
The Internet – Network of (many) networks

LANs and WANs may be connected into internetworks.



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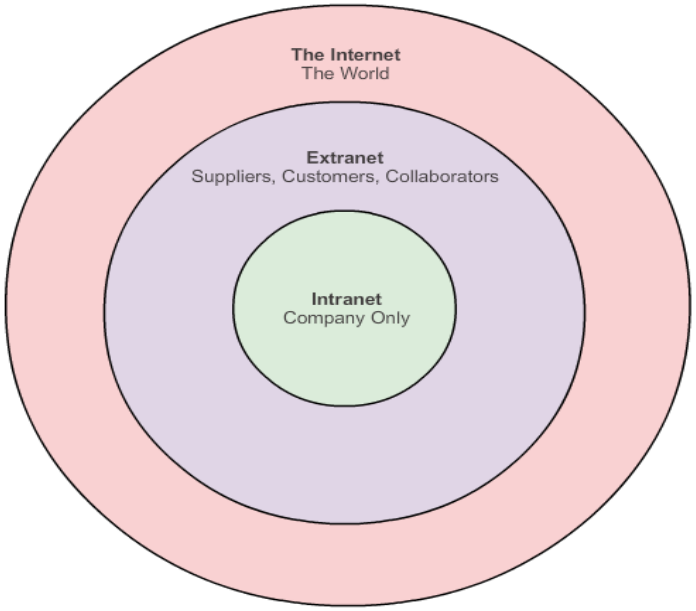
Intranet and Extranet



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1.3 The Network as a Platform

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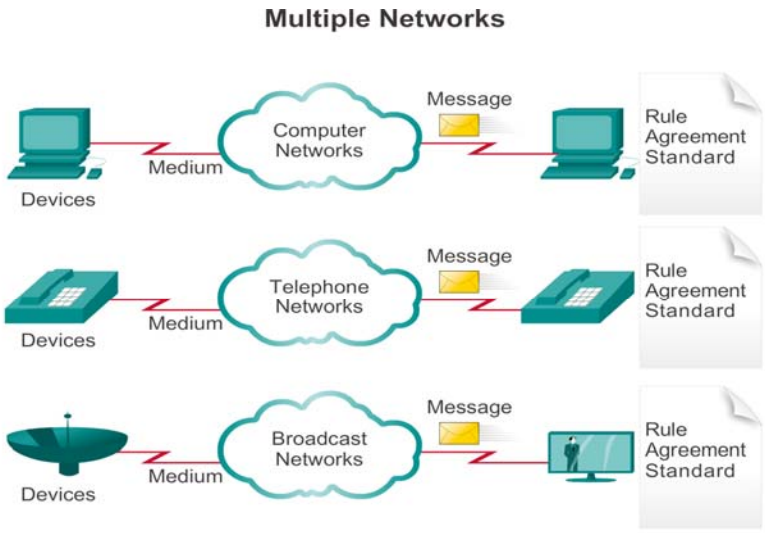
The Converging Network



Multiple services are running on multiple networks.

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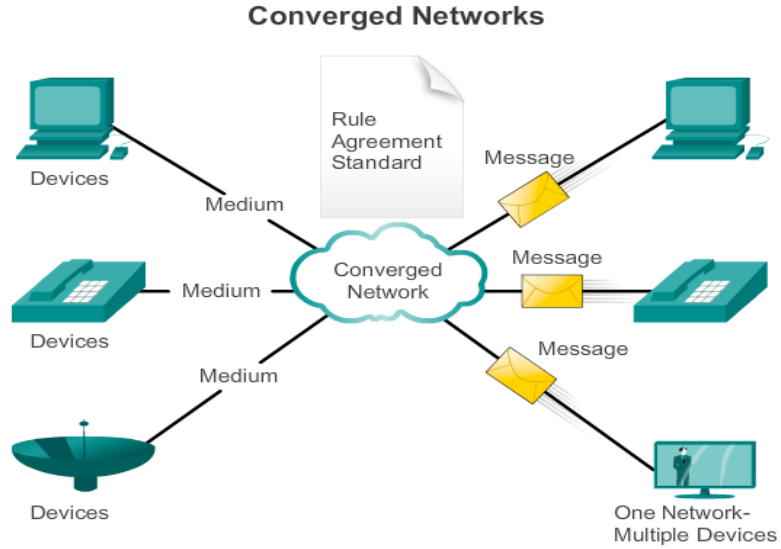
The Converging Network



Converged data networks carry multiple services on one network.

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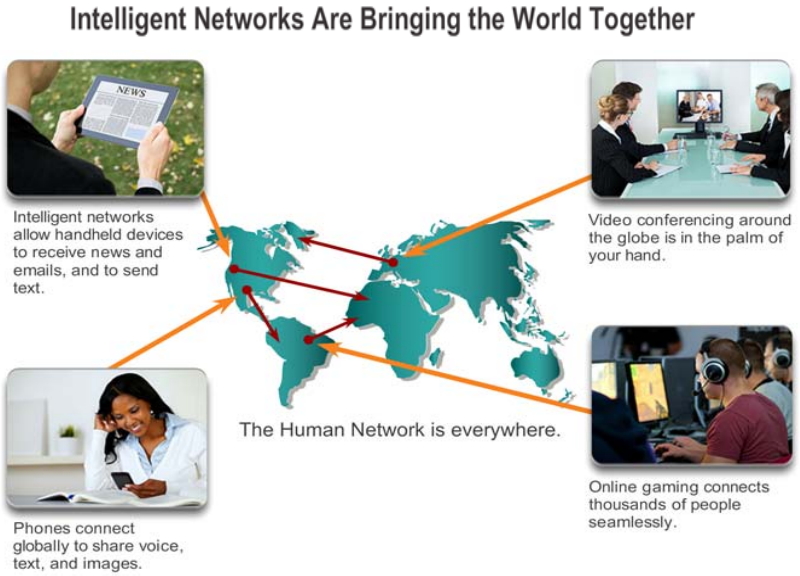
Planning for the Future



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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

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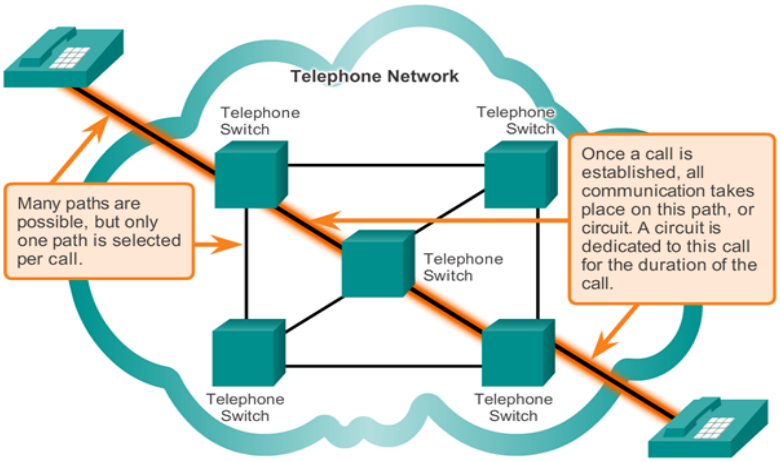
Fault Tolerance in Circuit Switched Network

Circuit Switching in a Telephone Network



The circuit stays active, even if no one is speaking.

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

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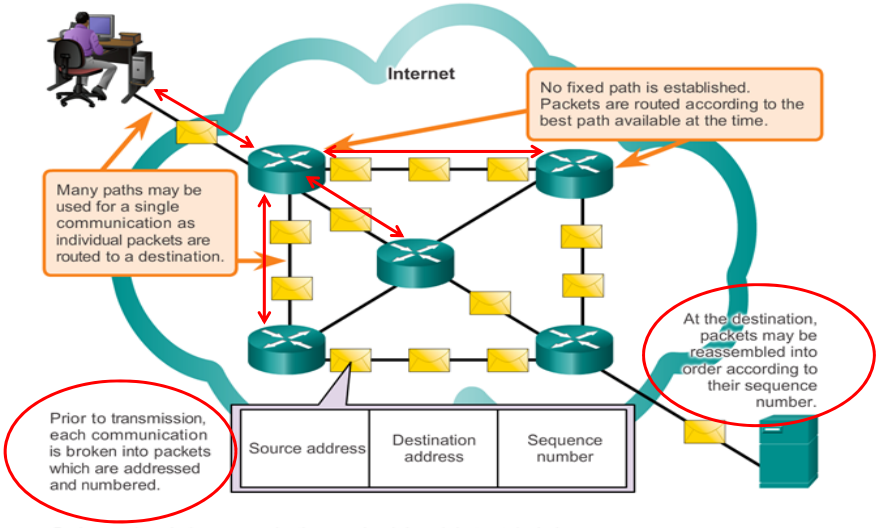
Packet-Switched Networks

Packet Switching in a Data Network



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

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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.

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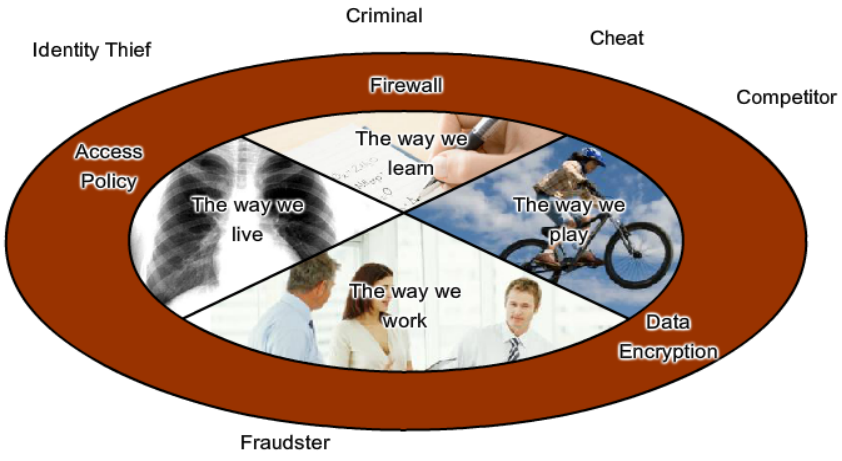
Providing Network Security



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

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1.4 The Changing Network Environment

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New trends

Some of the top trends include:

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

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).

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Online Collaboration – working together

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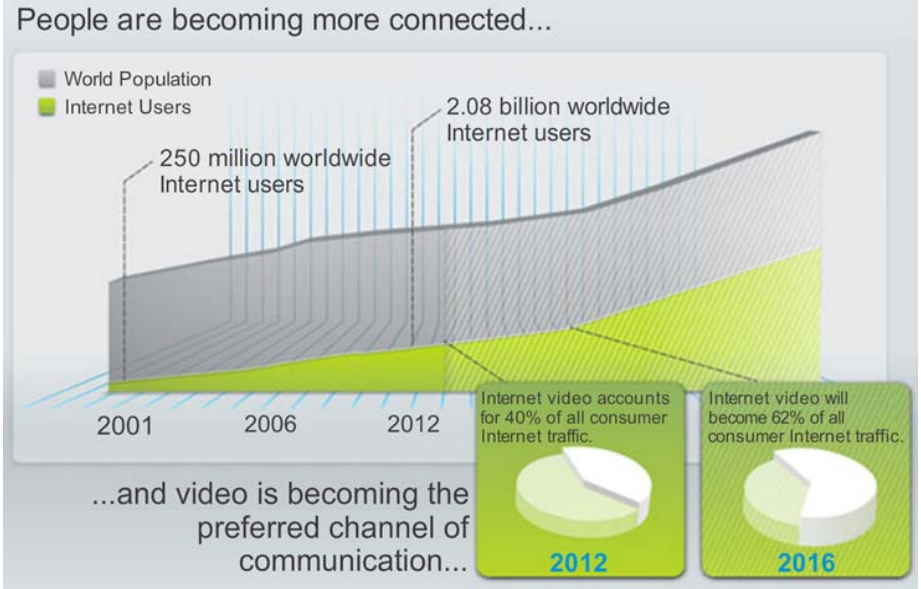
Video Communication



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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

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Data Centers

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

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

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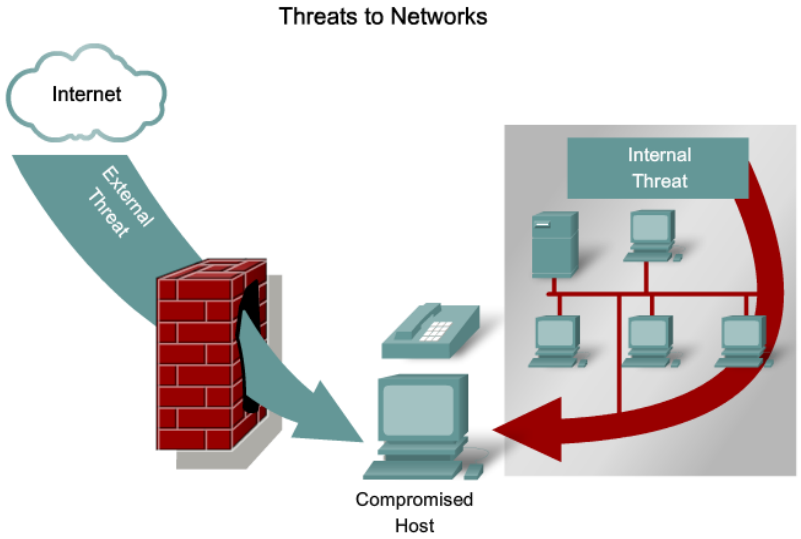
Network Security



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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

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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)

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Summary

In this chapter, you learned:

- Networks and the Internet have changed the way we communicate, learn, work, and even play.
- The Internet is the largest network in existence. In fact, the term Internet means a “network of networks”.
- Network infrastructure is made up of network components such as intermediate and end devices and network media.
- Network security is an important part of computer networks, regardless of whether it is a small home network or a large corporation with thousands of users.
- 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.