# Living in a Network Centric World

**Network Fundamentals – Chapter 1**

Cisco | Networking Academy®
Mind Wide Open™

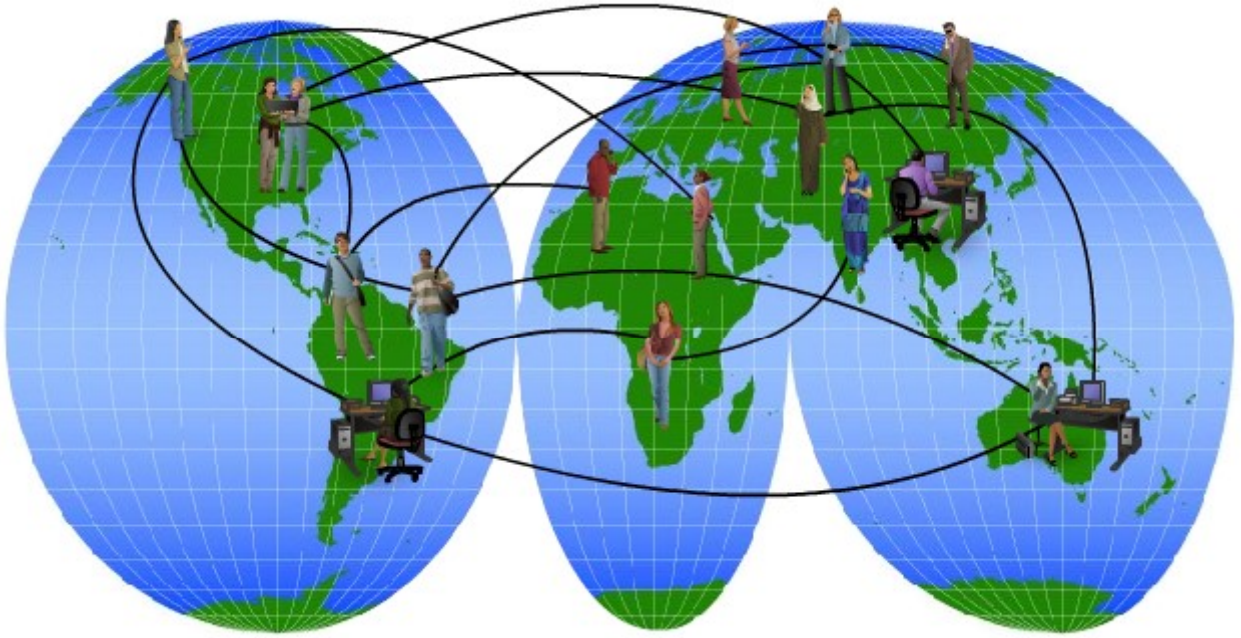

© 2007 Cisco Systems, Inc. All rights reserved.

# Objectives

- Describe how networks impact our daily lives.
- Describe the role of data networking in the human network.
- Identify the key components of any data network.
- Identify the opportunities and challenges posed by converged networks.
- Describe the characteristics of network architectures: fault tolerance, scalability, quality of service and security.
- Install and use IRC clients and a Wiki server.


© 2007 Cisco Systems, Inc. All rights reserved.

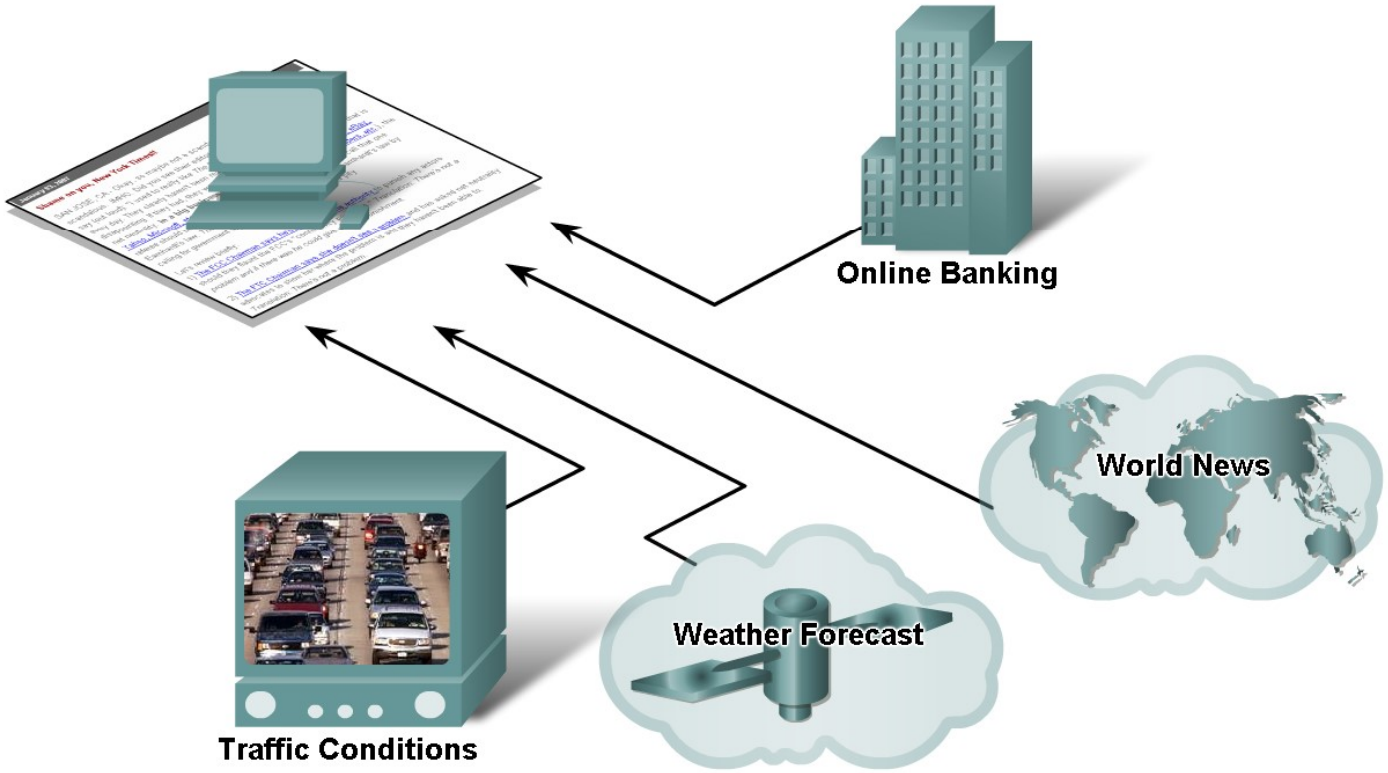
# Communication is almost as important to us as our dependence on air, water, food, and shelter




© 2007 Cisco Systems, Inc. All rights reserved.

# How Networks Impact Daily Life

- The way life is supported by services delivered by the data network.





© 2007 Cisco Systems, Inc. All rights reserved.

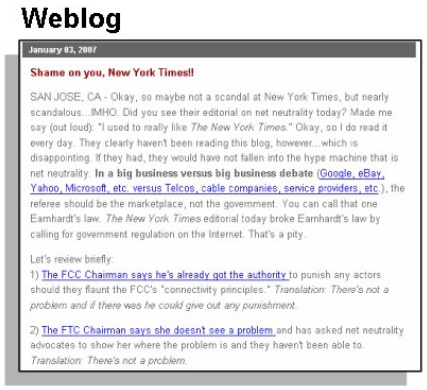
# Examples of today's popular communication tools

## Instant messaging

- Real time communication between 2 or more people based on typed text

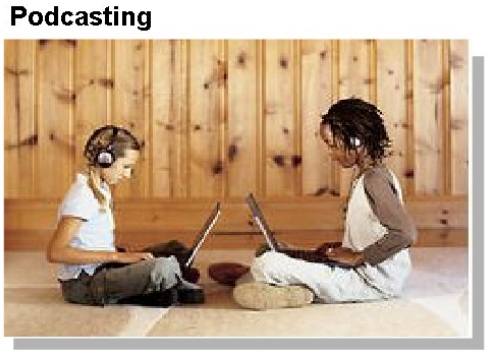
## Weblogs (Blogs)

- Web pages created by an individual, Weblogs are web pages that are easy to update and edit.




## Podcasting

- Website that contains audio files available for downloading. Podcasting is an audio-based medium that originally enabled people to record audio and convert it for use with iPods



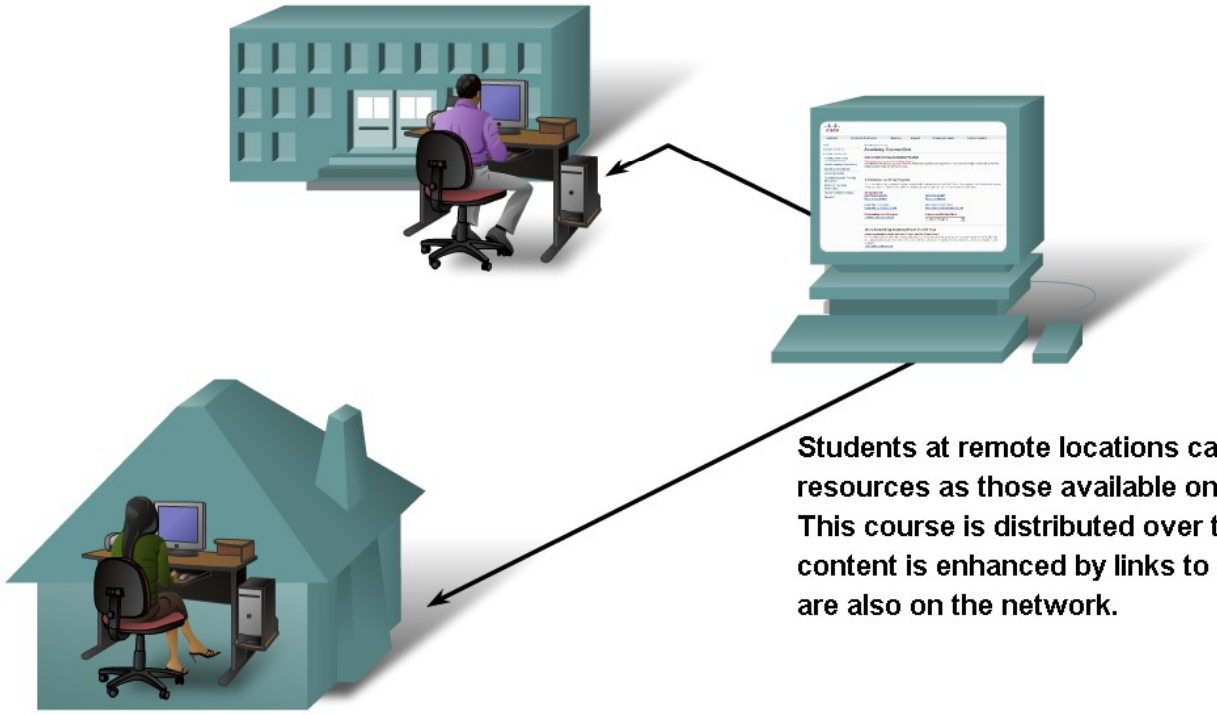

## Wikis

- Wikis are web pages that groups of people can edit and view together.


© 2007 Cisco Systems, Inc. All rights reserved.

# How Networks Impact Daily Life

- Explain ways that using information networks to share and collaborate improves teaching and learning

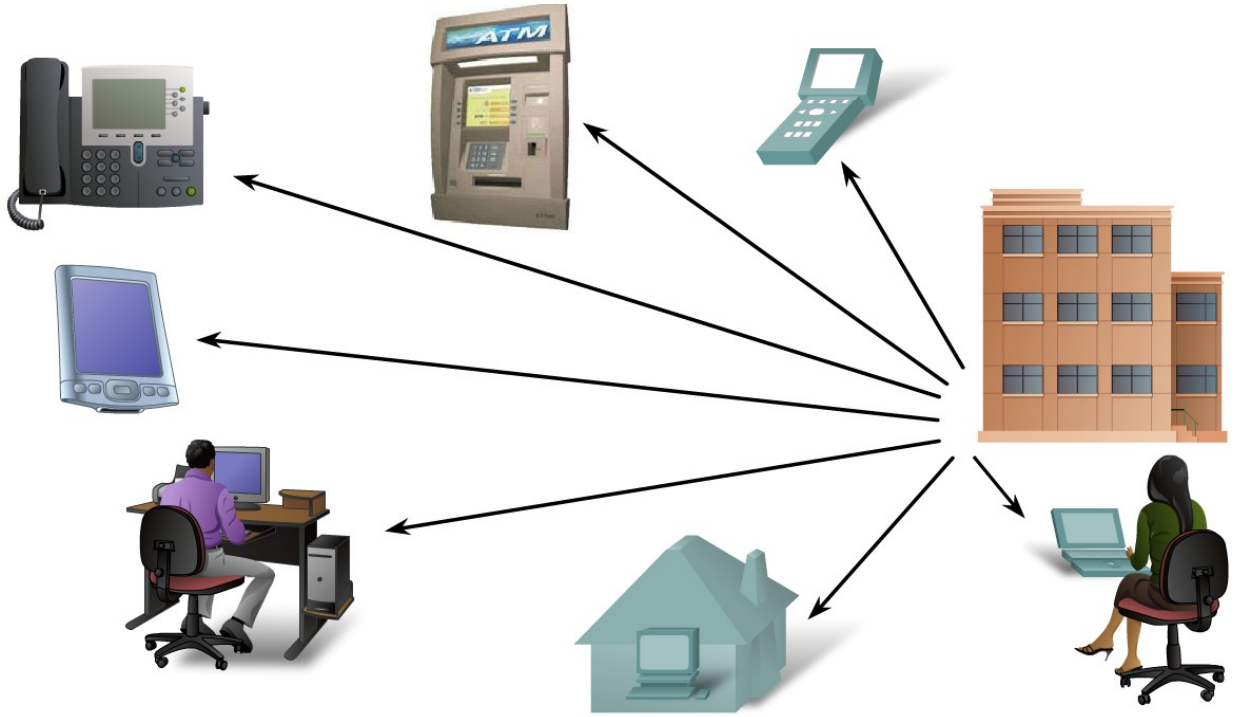




© 2007 Cisco Systems, Inc. All rights reserved.

# How Networks Impact Daily Life

- Describe ways communication over a network changes the way we work. Today, networks provide a greater integration between related functions and organizations than was possible in the past.





© 2007 Cisco Systems, Inc. All rights reserved.

# How Networks Impact Daily Life

- Describe ways communication over a network supports the way we play
- The Internet is used for traditional forms of entertainment, as well. We listen to recording artists, preview or view motion pictures, read entire books and download material for future offline access. Live sporting events and concerts can be experienced as they are happening, or recorded and viewed on demand.
- Networks enable the creation of new forms of entertainment, such as online games. Players participate in any kind of online competition that game designers can imagine.
- Even offline activities are enhanced using network collaboration services.
- Online markets and auction sites provide the opportunity to buy, sell and trade all types of merchandise.


© 2007 Cisco Systems, Inc. All rights reserved.

# Establishing the Rules

- Before beginning to communicate with each other, we establish rules or agreements to govern the conversation. These rules, or protocols, must be followed in order for the message to be successfully delivered and understood. Among the protocols that govern successful human communication are:
  - An identified sender and receiver
  - Agreed upon method of communicating (face-to-face, telephone, letter, photograph)
  - Common language and grammar
  - Speed and timing of delivery
  - Confirmation or acknowledgement requirements

**see 1.2.1**

*The techniques that are used in network communications share these fundamentals with human conversations. In establishing data networks, it is necessary to be much more explicit about how communication takes place and how it is judged successful.*


© 2007 Cisco Systems, Inc. All rights reserved.

# Quality of communication

- Communication between individuals is determined to be successful when the meaning of the message understood by the recipient matches the meaning intended by the sender.
- For data networks, we use the same basic criteria to judge success. However, as a message moves through the network, many factors can prevent the message from reaching the recipient or distort its intended meaning. These factors can be either external or internal.


© 2007 Cisco Systems, Inc. All rights reserved.

# External Factors

- The external factors affecting communication are related to the complexity of the network and the number of devices a message must pass through on its route to its final destination.

- External factors affecting the success of communication include:
  - The quality of the pathway between the sender and the recipient
  - The number of times the message has to change form
  - The number of times the message has to be redirected or readdressed
  - The number of other messages being transmitted simultaneously on the communication network
  - The amount of time allotted for successful communication


© 2007 Cisco Systems, Inc. All rights reserved.

# Internal Factors

- Internal factors that interfere with network communication are related to the nature of the message itself.

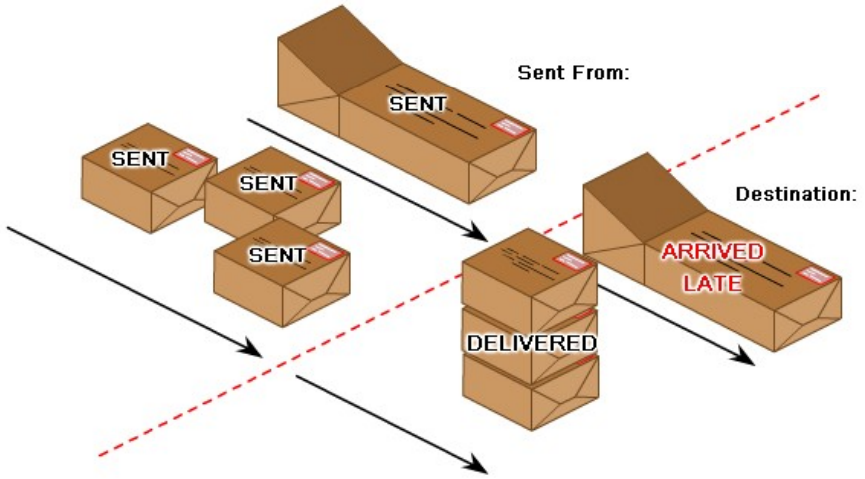
- Different types of messages may vary in complexity and importance. Clear and short messages are usually easier to understand than complex messages. Important communications require more care to ensure that they are delivered and understood by the recipient.

- Internal factors affecting the successful communication across the network include:
- The size of the message
- The complexity of the message
- The importance of the message


© 2007 Cisco Systems, Inc. All rights reserved.

# Cont…

- Large messages may be interrupted or delayed at different points within the network. A message with a low importance or priority could be dropped if the network becomes overloaded.

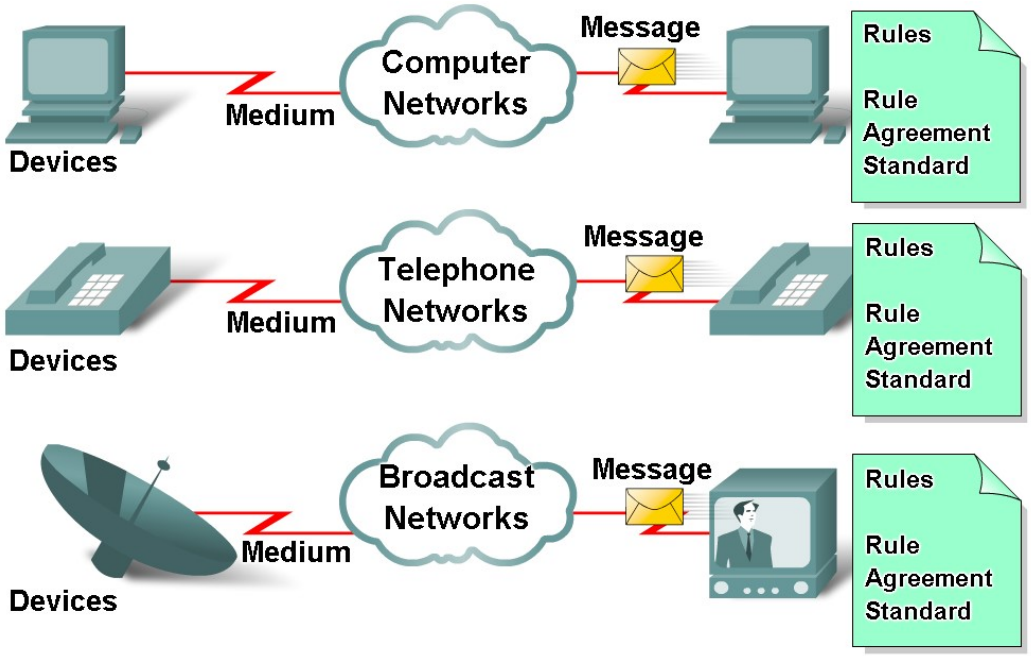



It is more difficult to deliver a large bulky package, quickly and without damage, than it is to deliver a number of smaller, less complex packages.


© 2007 Cisco Systems, Inc. All rights reserved.

# Data Networking Role, Components, and Challenges

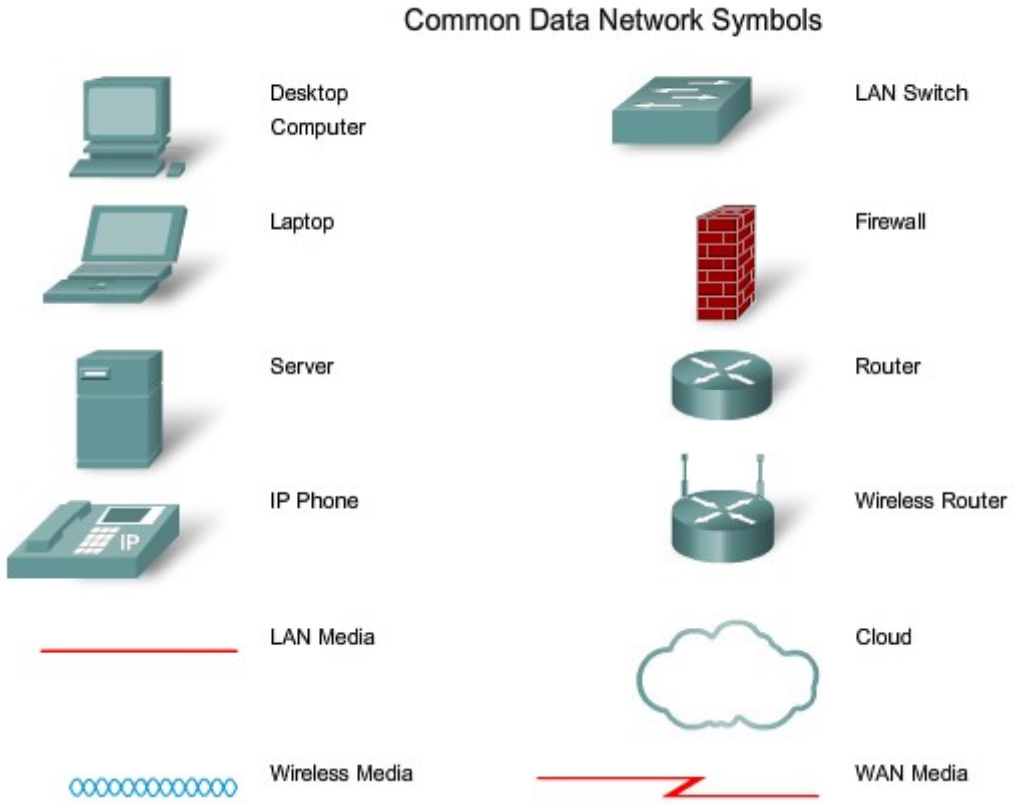
- Describe the various elements that make up a network
  - Devices
    - These are used to communicate with one another
  - Medium
    - This is how the devices are connected together
  - Messages
    - Information that travels over the medium
  - Rules
    - Governs how messages flow across network





© 2007 Cisco Systems, Inc. All rights reserved.

# Elements of Network





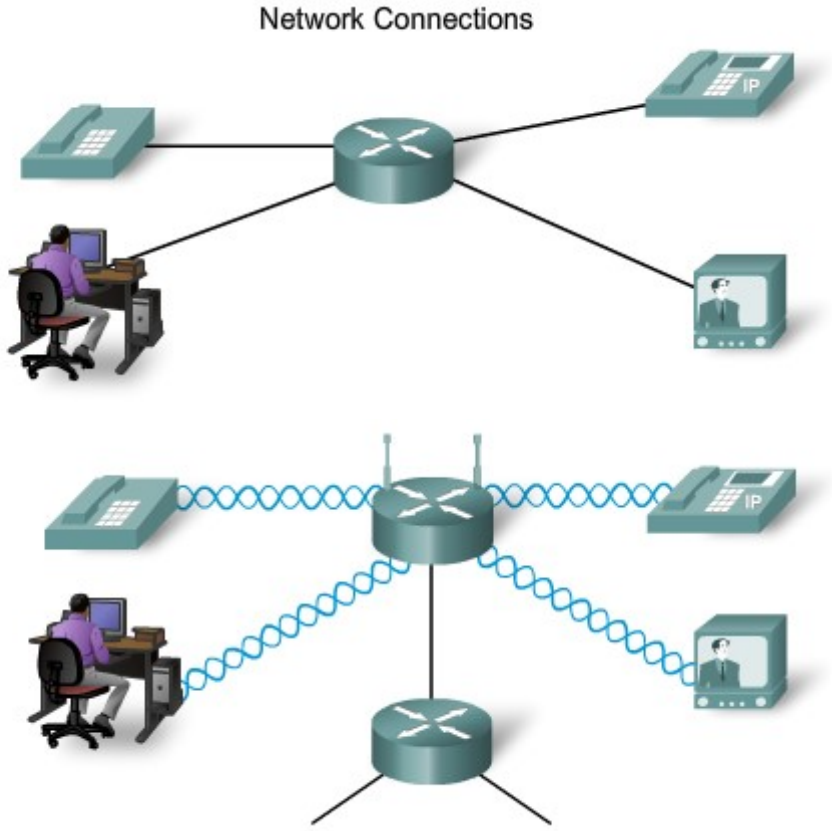
© 2007 Cisco Systems, Inc. All rights reserved.
Cisco Public

# Network Connection

Wired networks used physical cables to connect devices.

Wireless networks use radio waves to communicate between devices.

Wireless networks are also connected to wired networks, at some point.

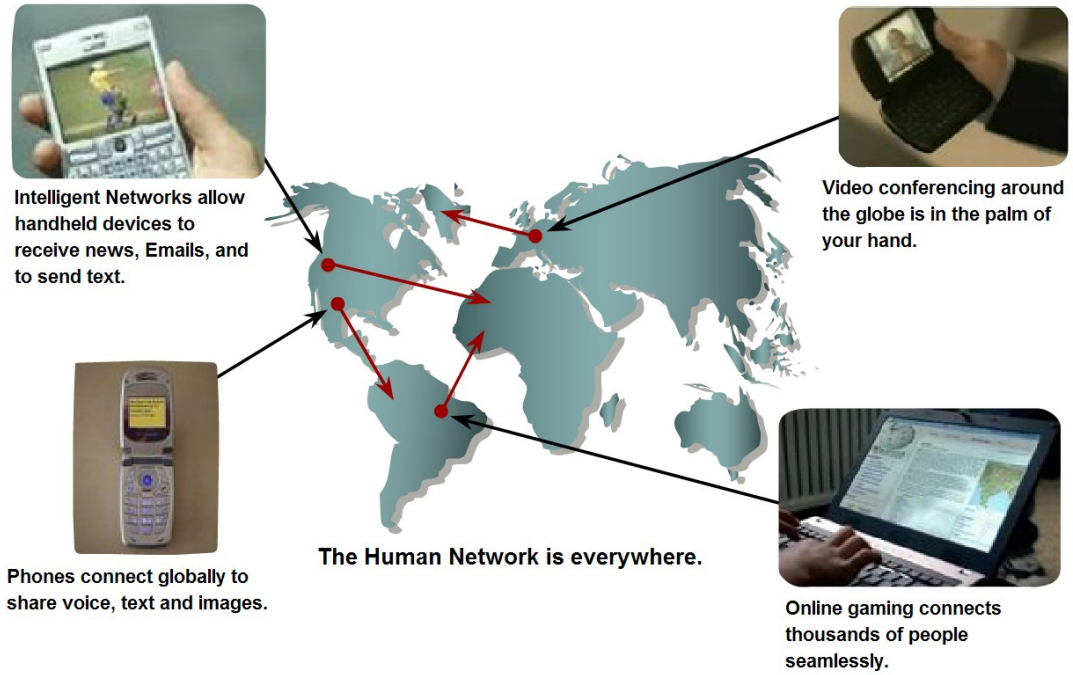




© 2007 Cisco Systems, Inc. All rights reserved.
Cisco Public

# Data Networking Role, Components, and Challenges

- Describe the role of converged networks in communications
  - –Converged network
    - A type of network that can carry voice, video & data over the same network





© 2007 Cisco Systems, Inc. All rights reserved.

# Network Architecture Characteristics

- Explain four characteristics that are addressed by network architecture design
  - Fault tolerance
  - Scalability
  - Quality of service
  - Security

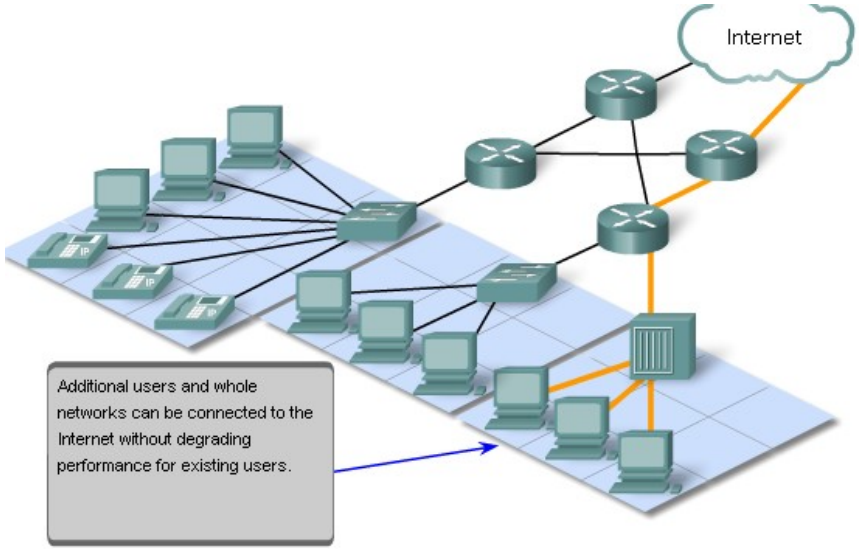

© 2007 Cisco Systems, Inc. All rights reserved.

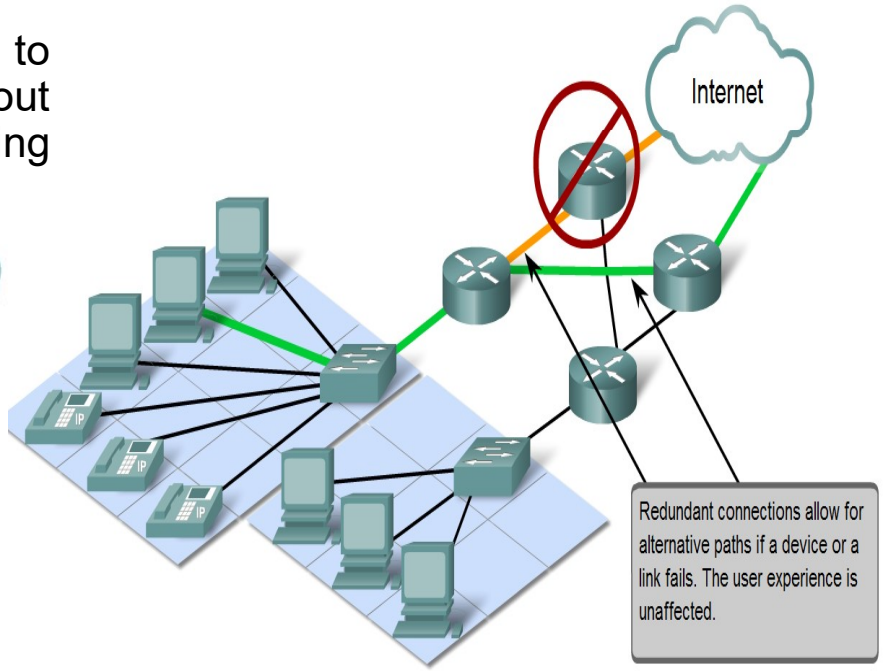
# Fault Tolerance

- The expectation that the Internet is always available to the millions of users who rely on it requires a network architecture that is designed and built to be fault tolerant. A fault tolerant network is one that limits the impact of a hardware or software failure and can recover quickly when such a failure occurs.

## Scalability

A scalable network can expand quickly to support new users and applications without impacting the performance of the service being delivered to existing users.



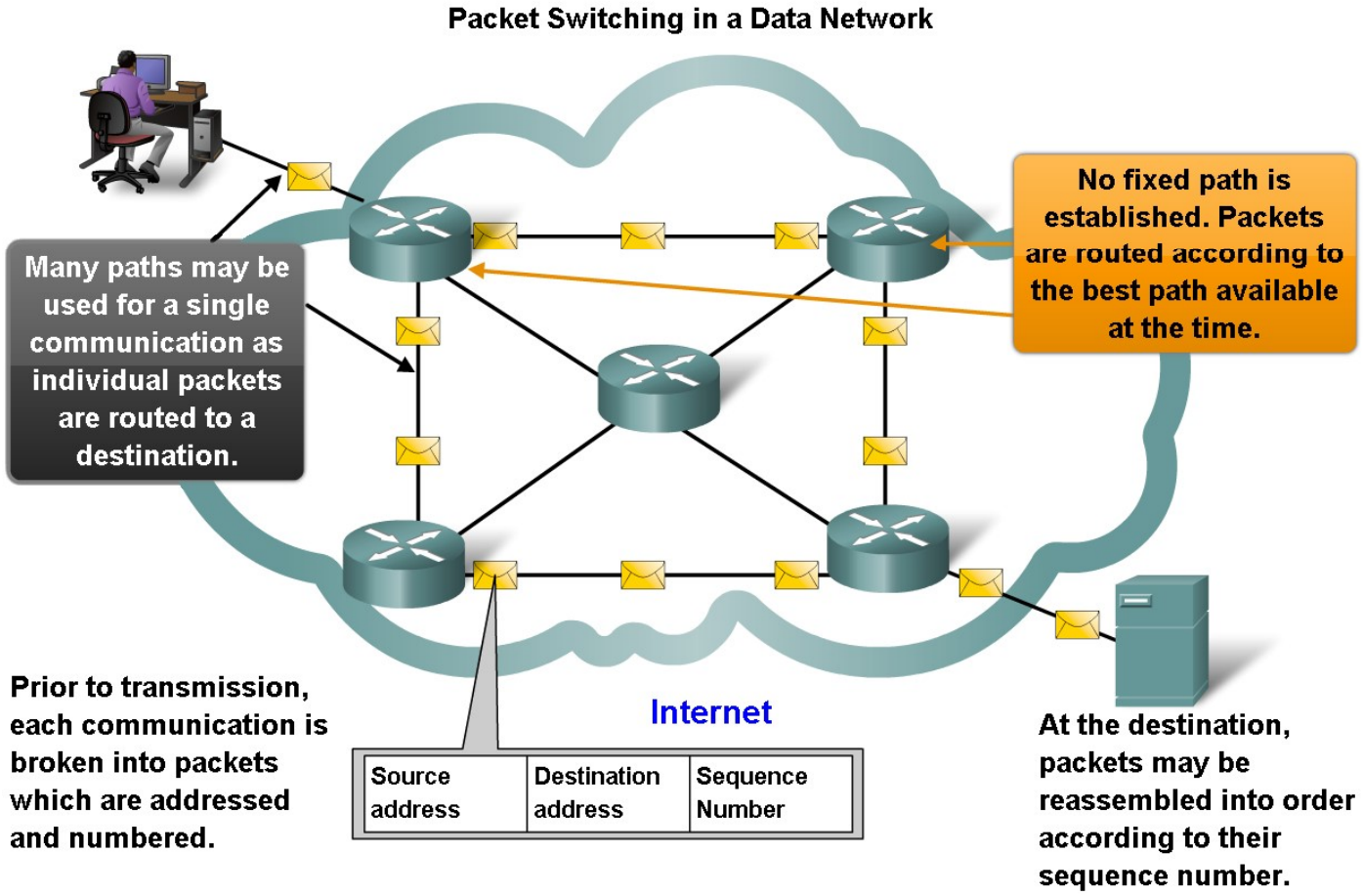




Fault tolerance


© 2007 Cisco Systems, Inc. All rights reserved.

# Network Architecture Characteristics

- Describe how packet switching helps improve the resiliency and fault tolerance of the Internet architecture

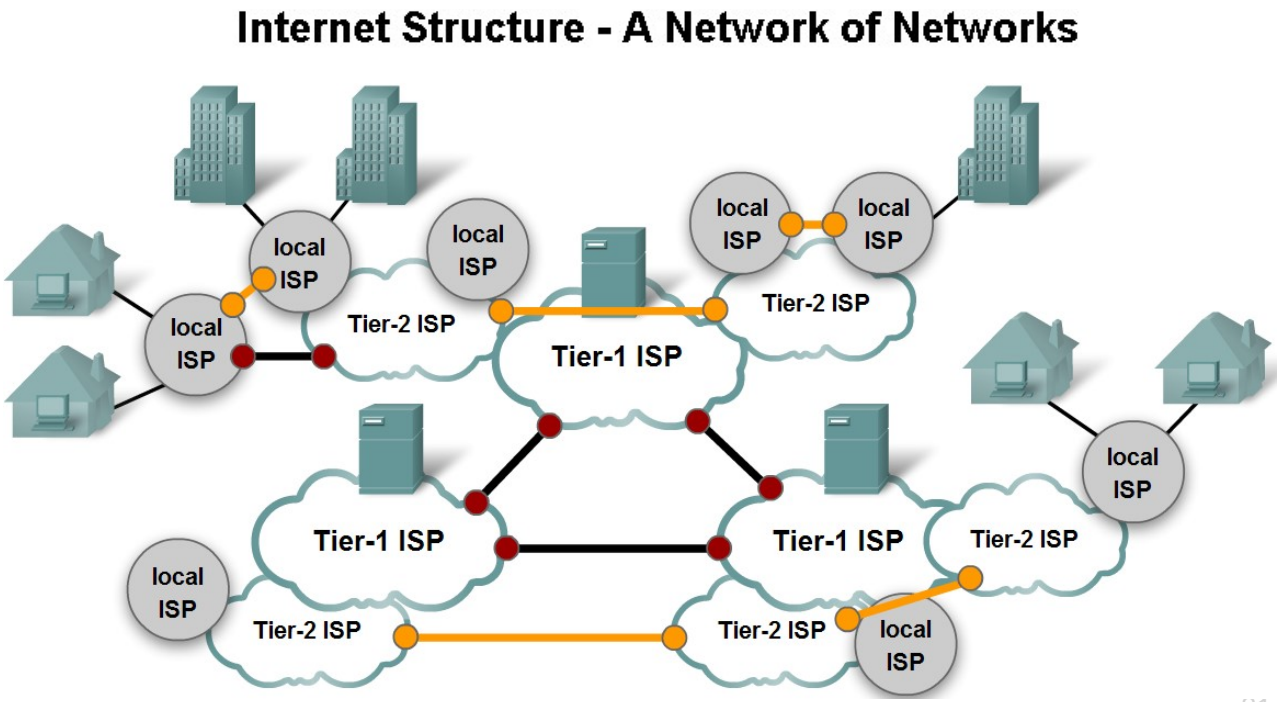




© 2007 Cisco Systems, Inc. All rights reserved.
Cisco Public

# Network Architecture Characteristics

- Describe characteristics of the Internet that help it scale to meet user demand see 1.4.3
  - Hierarchical
  - Common standards
  - Common protocols





© 2007 Cisco Systems, Inc. All rights reserved.
Cisco Public

# Assigning priorities

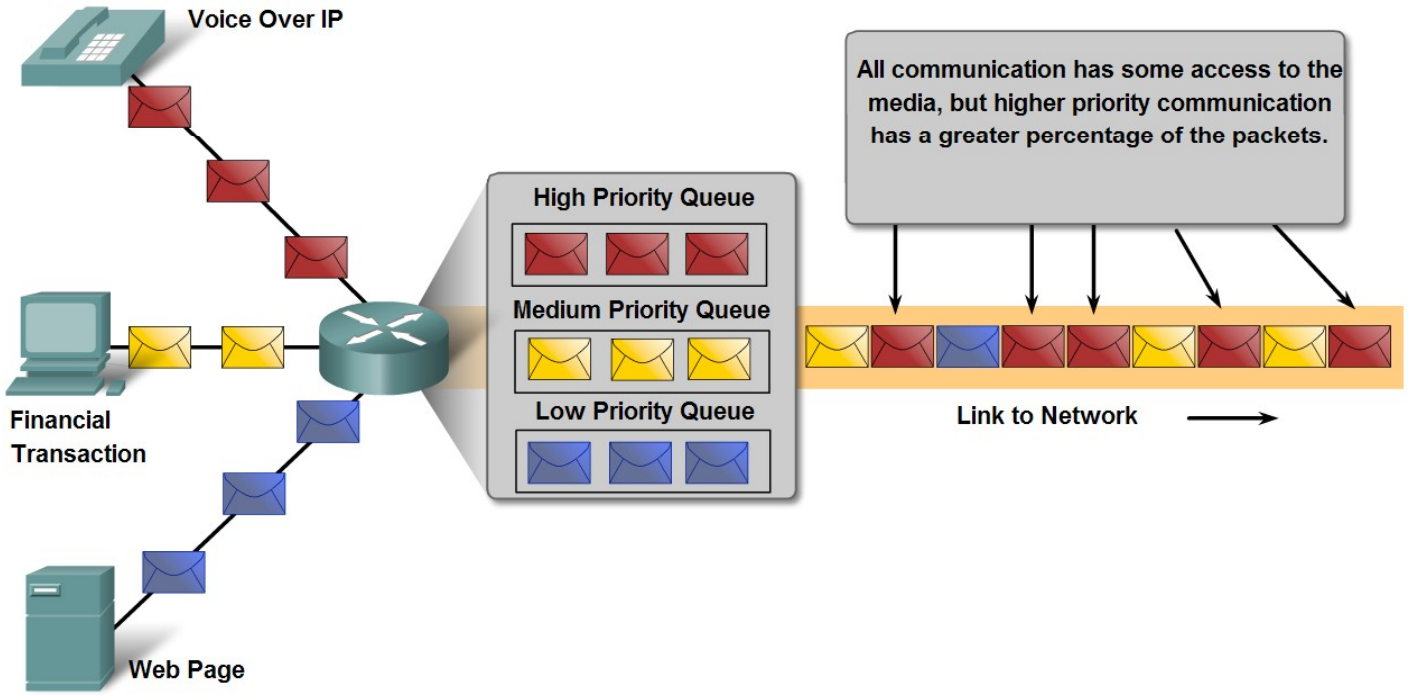
- The characteristics of the information being communicated also affect its management. For example, the delivery of a movie uses a relatively large amount of network resources when it is delivered continuously without interruption. Other types of service - e-mail, for example - are not nearly as demanding on the network. In one company, an administrator might decide to allocate the greatest share of the network resources to the movie, believing that this is the priority for his customers. This administrator may decide that the impact will be minimal if e-mail users have to wait a few additional seconds for their e-mail to arrive. In another company, the quality of a video stream is not as important as critical process control information that operates the manufacturing machinery.


© 2007 Cisco Systems, Inc. All rights reserved.

# Network Architecture Characteristics

- Explain the factors that necessitate Quality of Service and the mechanisms necessary to ensure it

**Using Queues to Prioritize Communication**

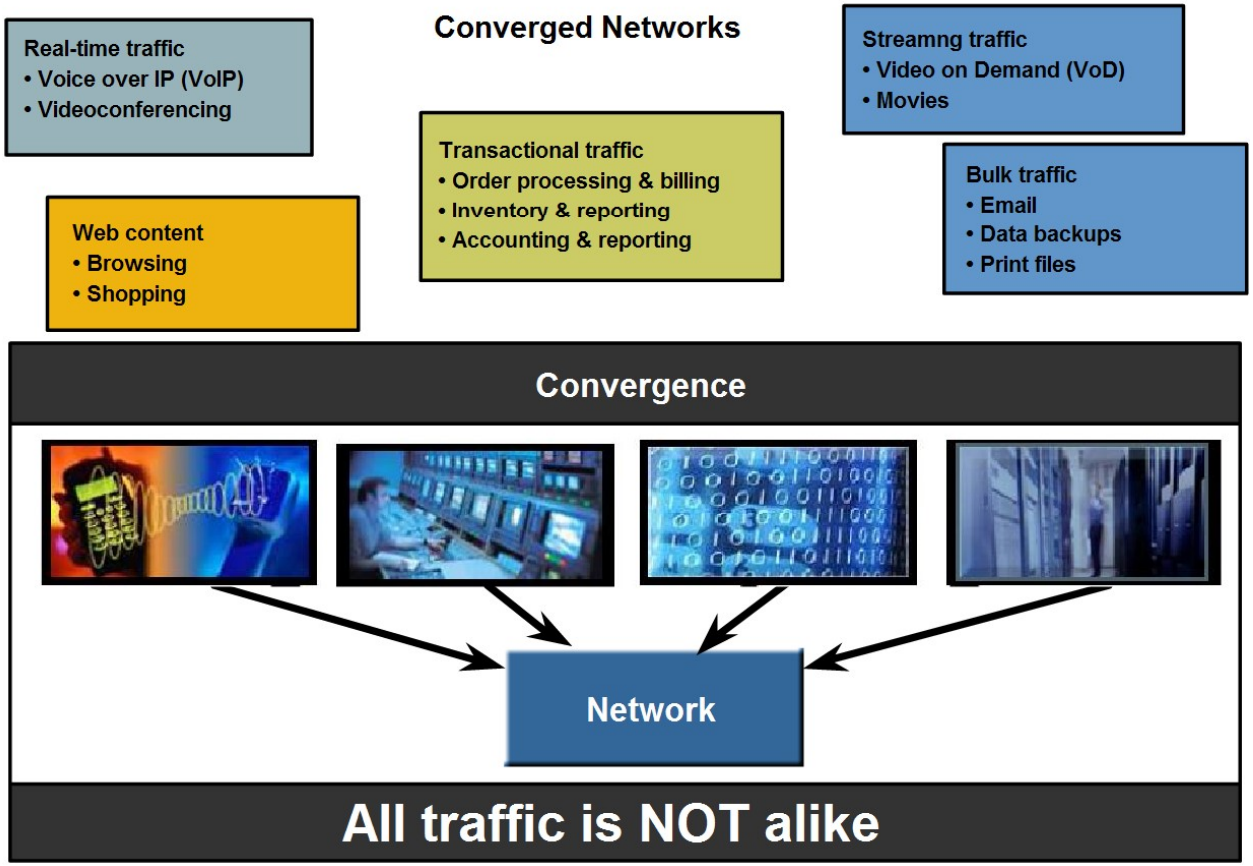



**Queuing according to data type enables voice data to have priority over transaction data, which has priority over web data.**


© 2007 Cisco Systems, Inc. All rights reserved.
Cisco Public

# Network Architecture Characteristics

- Describe how QoS mechanisms work to ensure quality of service for applications that require it.





© 2007 Cisco Systems, Inc. All rights reserved.
Cisco Public

# Network Architecture Characteristics

- Describe how to select the appropriate QoS strategy for a given type of traffic

**Quality of Service Matters**

| Communication Type | Without QoS | With QoS |
|---|---|---|
| Streaming video or audio | Choppy picture starts and stops. | Clear, continuous service. |
| Vital Transactions | Time : Price<br>02:14:05 $1.54<br>Just one second earlier... | Time : Price<br>02:14:04 $1.52<br>The price may be better. |
| Downloading web pages (often lower priority) | Web pages arrive a bit later... | But the end result is identical. |


© 2007 Cisco Systems, Inc. All rights reserved.

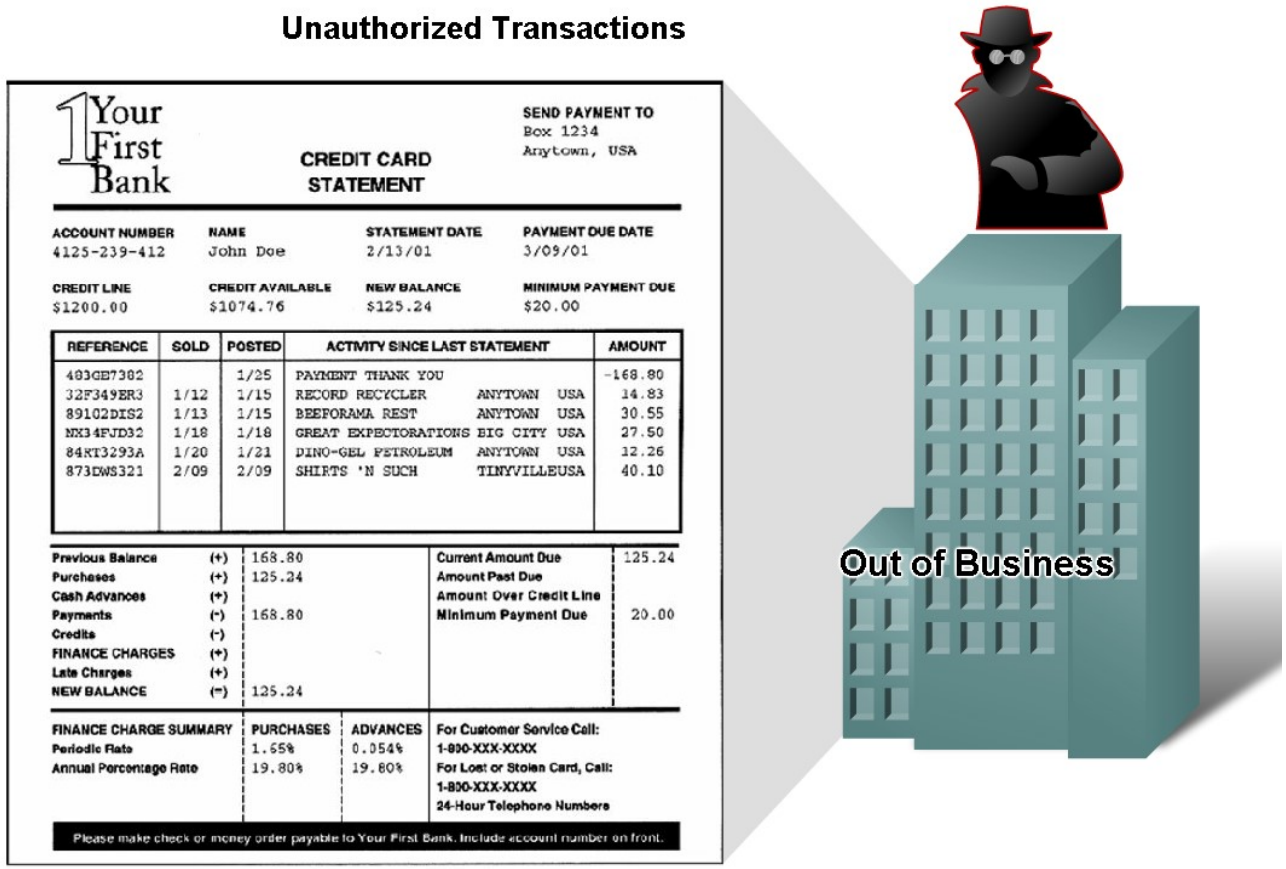
# Providing NW Security

- The network infrastructure, services, and the data contained on network attached computers are crucial personal and business assets.
- Securing a network infrastructure includes the physical securing of devices that provide network connectivity and preventing unauthorized access to the management software that resides on them.
- Content security refers to protecting the information contained within the packets being transmitted over the network and the information stored on network attached devices.


© 2007 Cisco Systems, Inc. All rights reserved.

# Network Architecture Characteristics

- Describe why networks must be secure

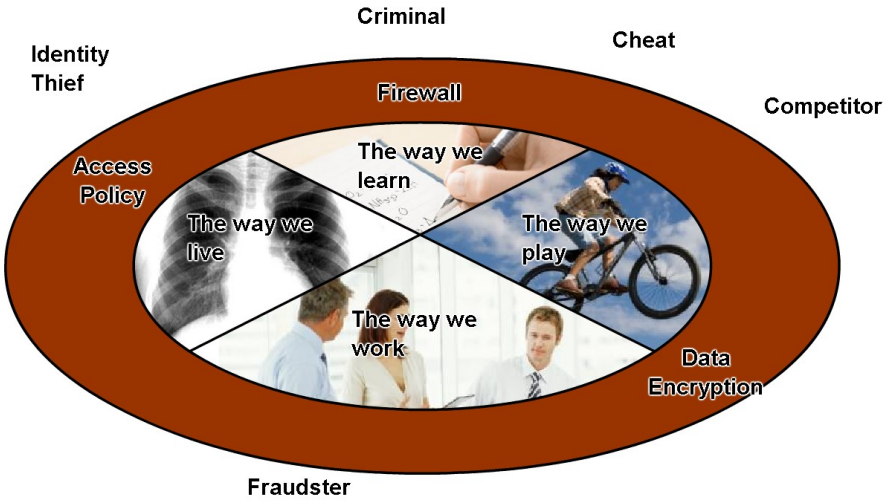




© 2007 Cisco Systems, Inc. All rights reserved.

# Network Architecture Characteristics

- Describe basic measures to secure data networks
  - Ensure confidentiality through use of
    - User authentication
    - Data encryption
  - Maintain communication integrity through use of
    - Digital signatures
  - Ensure availability through use of
    - Firewalls
    - Redundant network architecture
    - Hardware without a single point of failure





© 2007 Cisco Systems, Inc. All rights reserved.

# IRC Clients and Wiki Server

- Install and use IRC clients and a Wiki server

© 2007 Cisco Systems, Inc. All rights reserved.

# Summary

**In this chapter, you learned to:**

- Describe how networks impact our daily lives.
- Describe the role of data networking in the human network.
- Identify the key components of any data network.
- Identify the opportunities and challenges posed by converged networks.
- Describe the characteristics of network architectures: fault tolerance, scalability, quality of service and security.
- Install and use IRC clients and a Wiki server.


© 2007 Cisco Systems, Inc. All rights reserved.

© 2007 Cisco Systems, Inc. All rights reserved.
Cisco Public