Living in a Network Centric World

Network Fundamentals – Chapter 1

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Mind Wide Open™

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.

How Networks Impact Daily Life

- Explain the benefits of instantaneous communication and how it supports and improves our lives.

Online Banking

World News

Weather Forecast
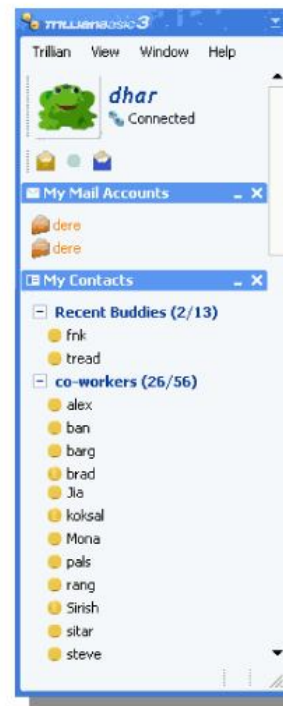
Traffic Conditions
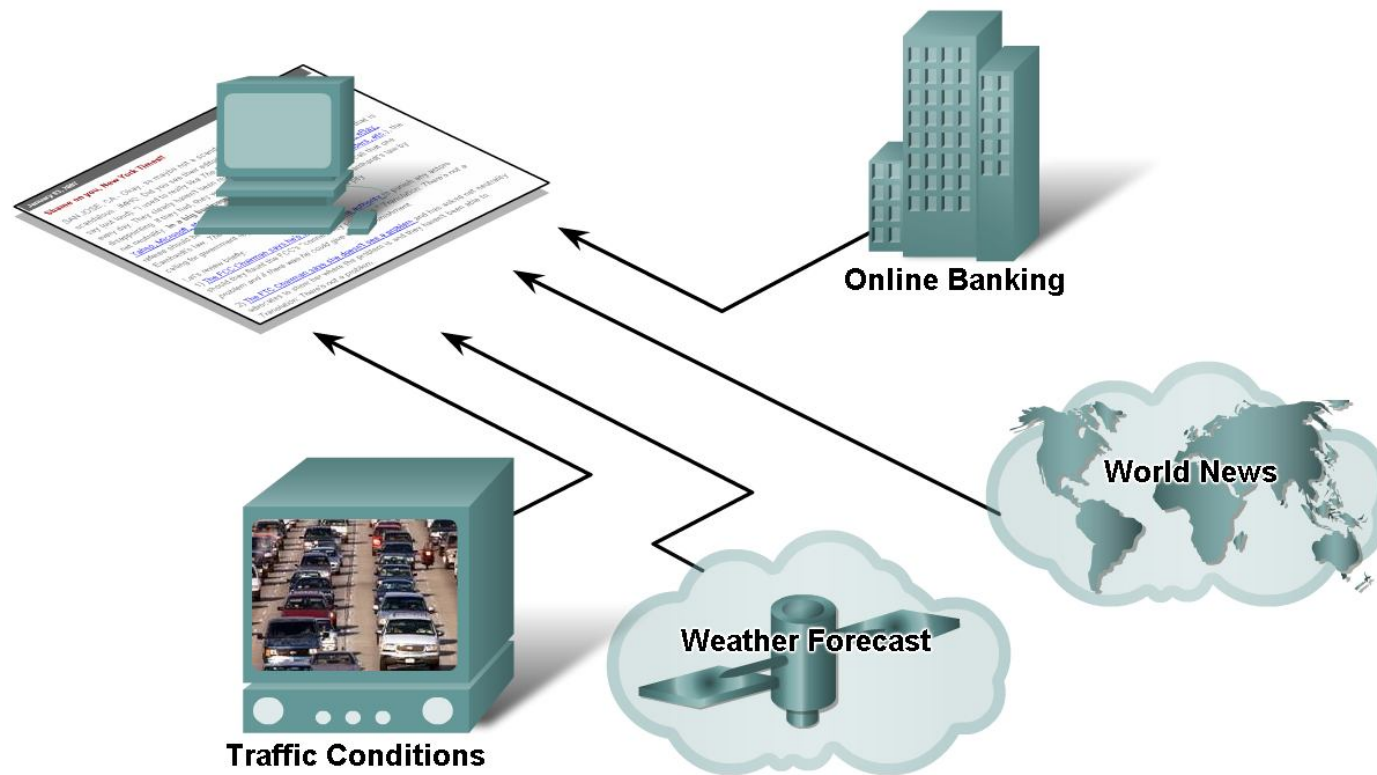
How Networks Impact Daily Life

- Describe the characteristics and purpose of popular communication media such as, IM, Wikis , Blogs, Podcasting, and Collaboration Tools
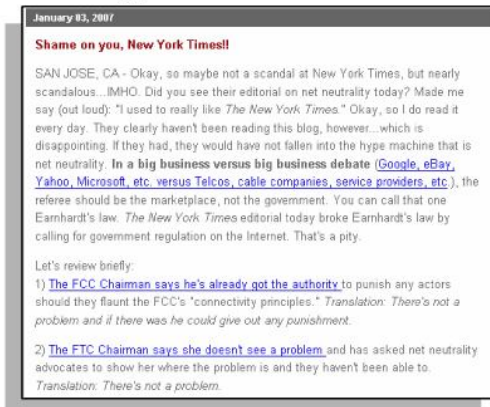   - Instant messaging
        - Real time communication between 2 or more people based on typed text
    - Weblogs (Blogs)
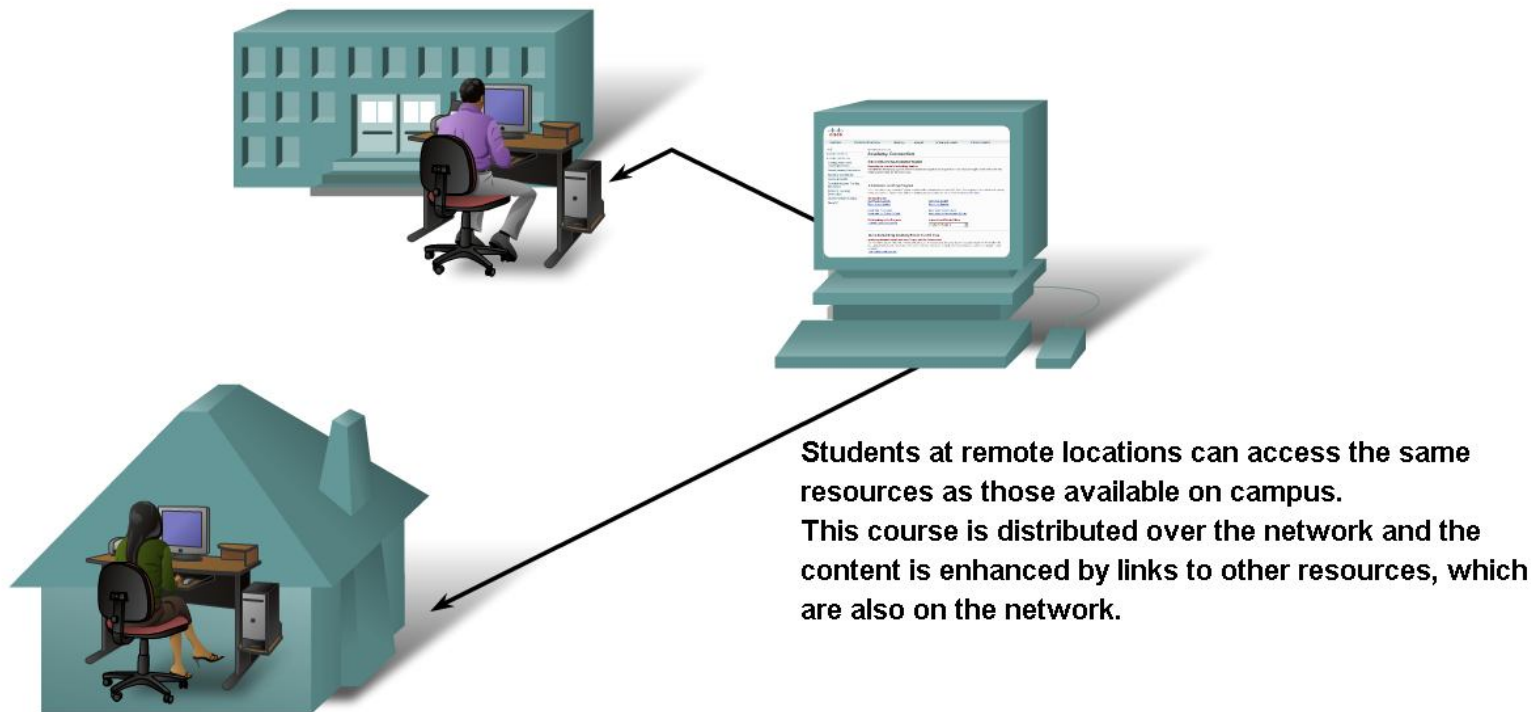   - Web pages created by an individual
    - Podcasting
        - Website that contains audio files available for downloading

Instant Messaging

Weblog

January 03, 2007

Shame on you, New York Times!!

SAN JOSE, CA - Okay, so maybe not a scandal at New York Times, but nearly scandalous...IMHO. Did you see their editorial on net neutrality today? Made me say (out loud): "I used to really like *The New York Times.*" Okay, so I do read it every day. They clearly haven't been reading this blog, however...which is disappointing. If they had, they would have not fallen into the hype machine that is net neutrality. **In a big business versus big business debate** (Google, eBay, Yahoo, Microsoft, etc. versus Telcos, cable companies, service providers, etc.), the referee should be the marketplace, not the government. You can call that one Earnhardt's law. *The New York Times* editorial today broke Earnhardt's law by calling for government regulation on the Internet. That's a pity.

Let's review briefly:
1) The FCC Chairman says he's already got the authority to punish any actors should they flaunt the FCC's "connectivity principles." *Translation: There's not a problem and if there was he could give out any punishment.*

2) The FTC Chairman says she doesn't see a problem and has asked net neutrality advocates to show her where the problem is and they haven't been able to. *Translation: There's not a problem.*

Podcasting

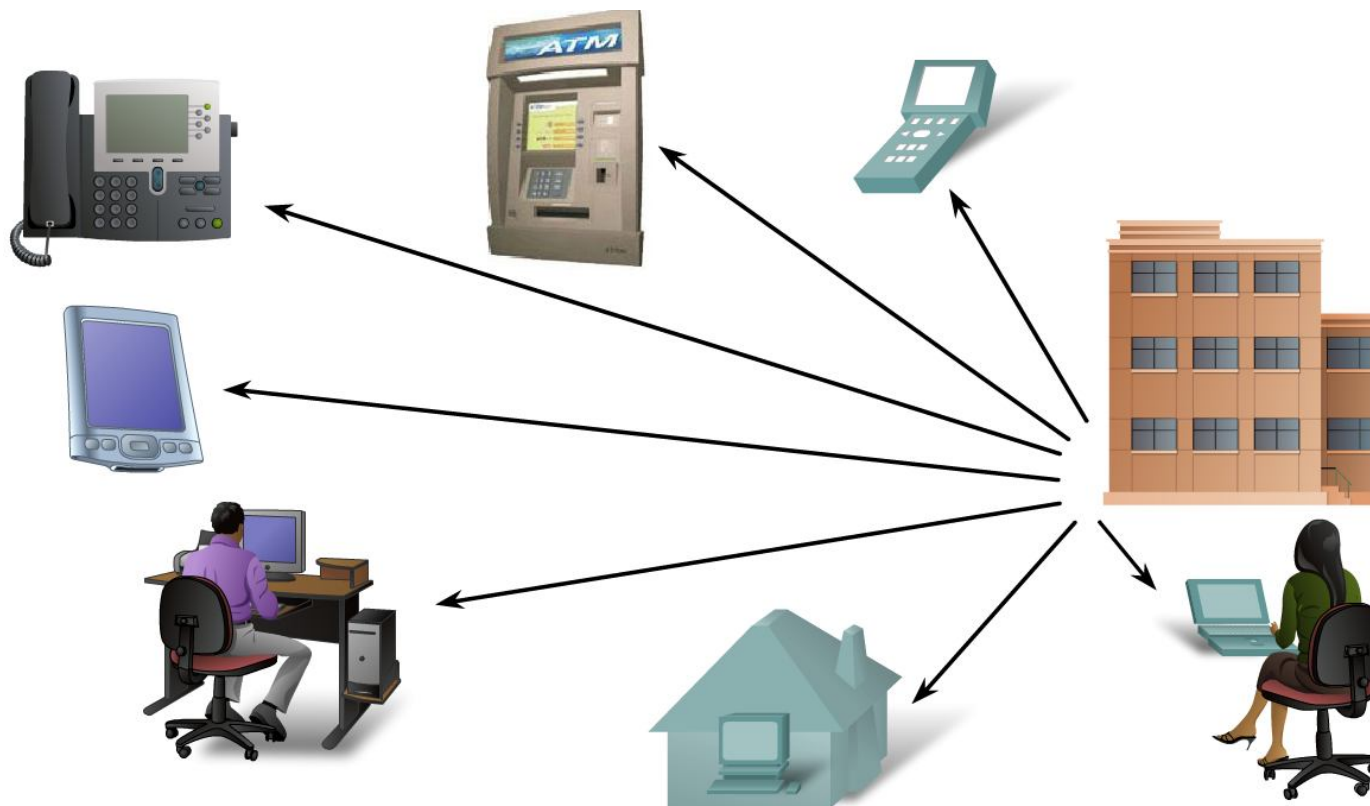# How Networks Impact Daily Life

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

Students at remote locations can access the same resources as those available on campus.
This course is distributed over the network and the content is enhanced by links to other resources, which are also on the network.

How Networks Impact Daily Life

- Describe ways communication over a network changes the way we work

How Networks Impact Daily Life

- Describe ways communication over a network supports the way we play
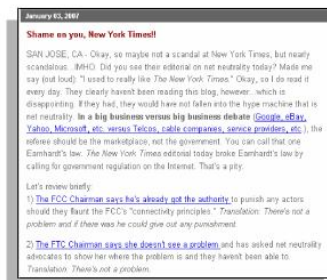
Online Interest Groups

Online Games

Online Entertainment

Online Travel

The onboard data network provides a range of services to airline personal seatback video systems.
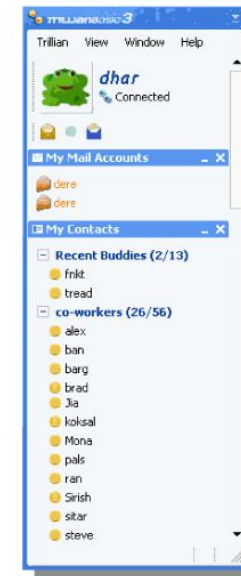
Instant Messaging

Data Networking Role, Components, and Challenges

- Basic characteristics of communication
  - Rules or agreements are 1st established
  - Important information may need to be repeated
  - Various modes of communication may impact the effectiveness of getting the message across.

Data Networking Role, Components, and Challenges

- Describe the role of data networking in communications
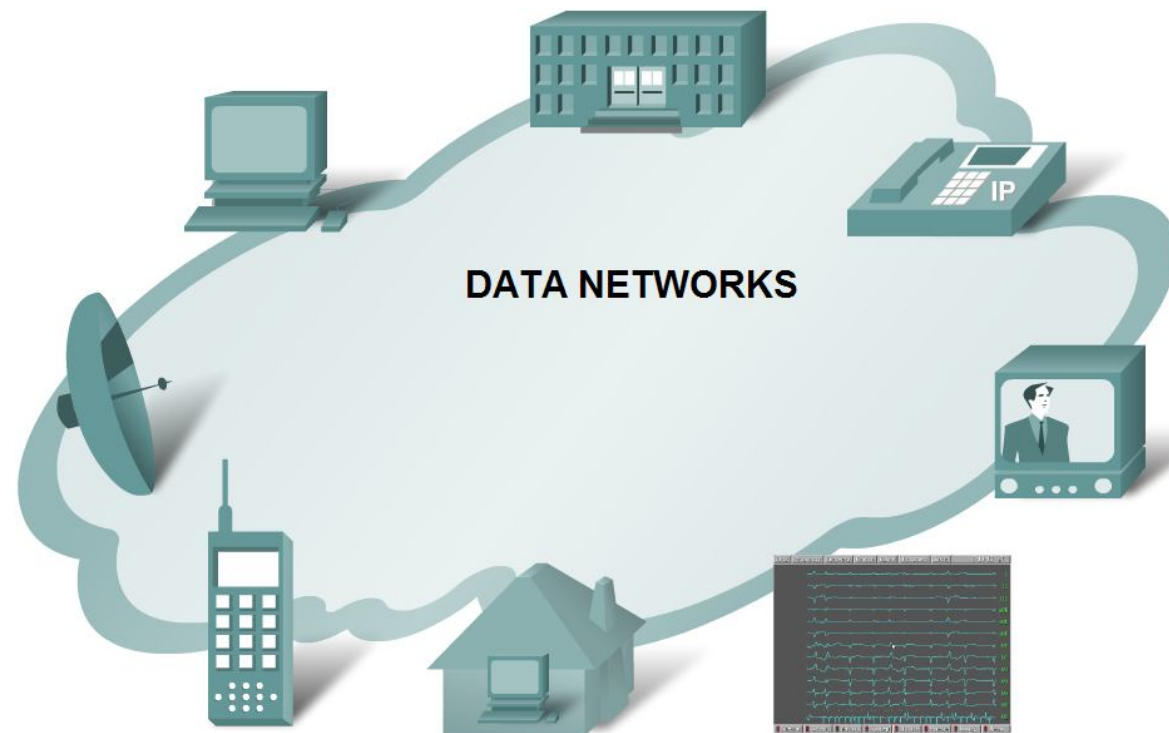
DATA NETWORKS

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
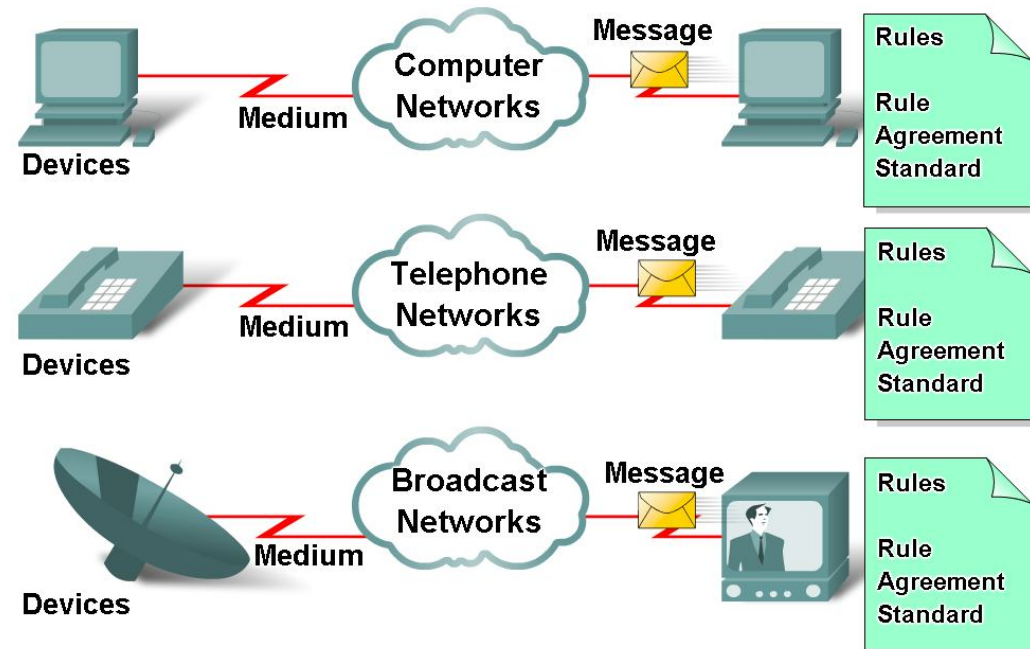
Data Networking Role, Components, and Challenges

- Describe the role of converged networks in communications

  - Converged network

    - A type of network that can carry voice, video & data over the same network

Intelligent Networks allow handheld devices to receive news, Emails, and to send text.

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

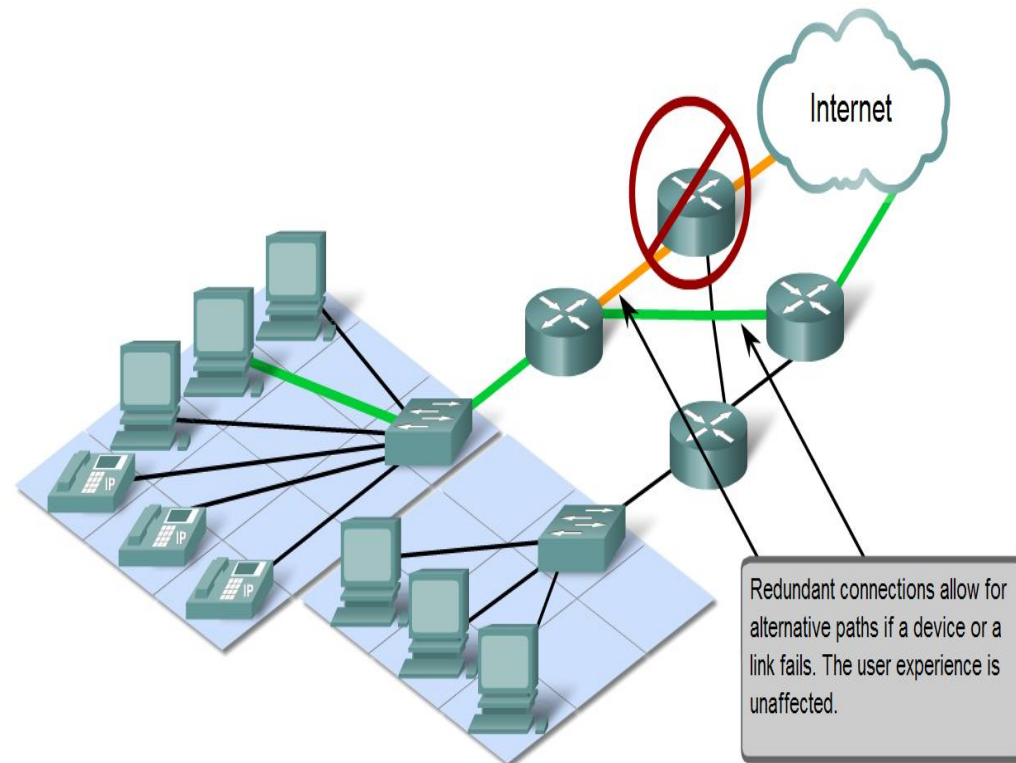Phones connect globally to share voice, text and images.
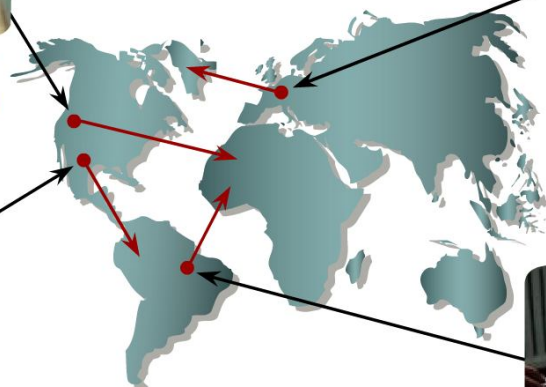
The Human Network is everywhere.

Online gaming connects thousands of people seamlessly.
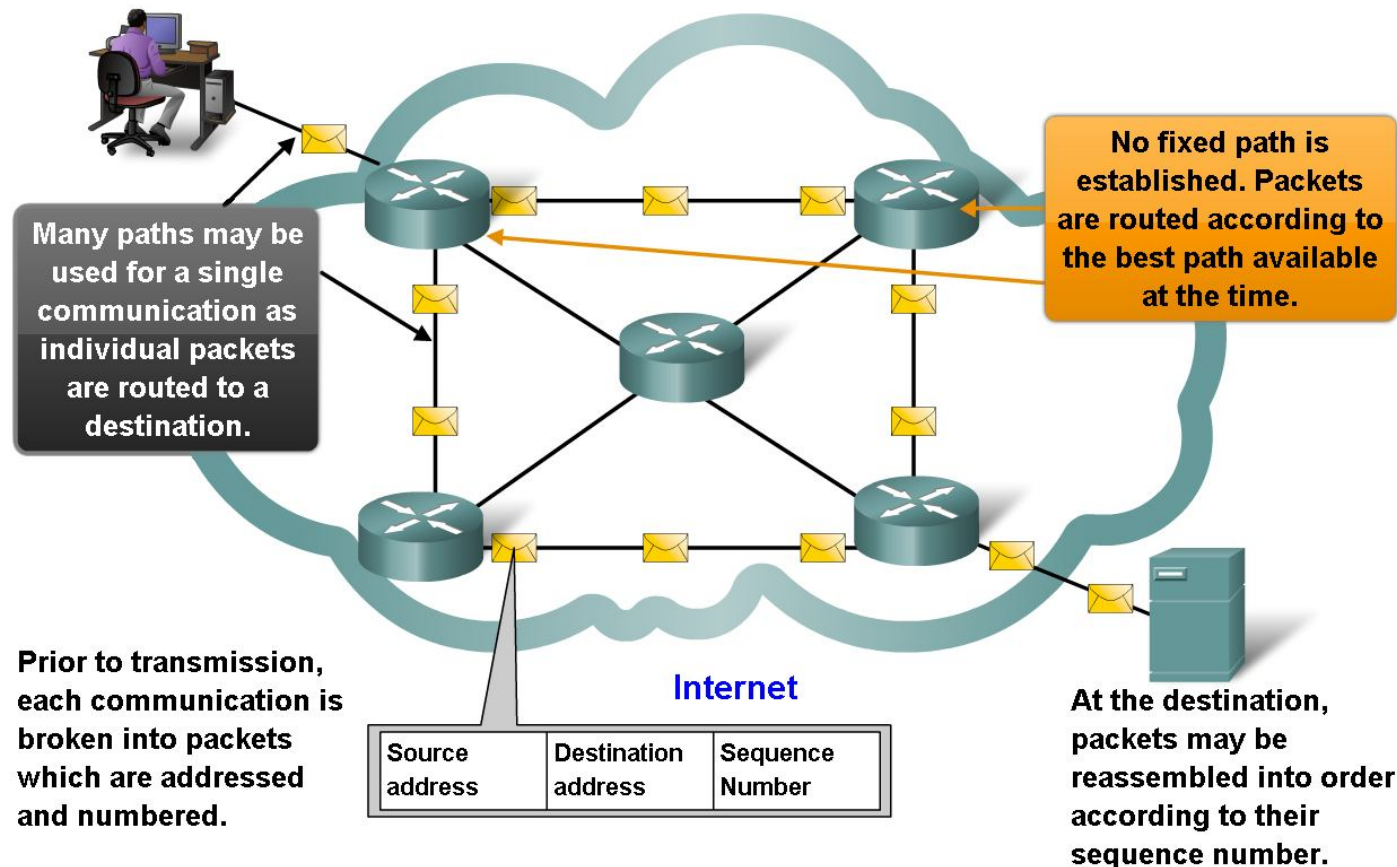
Network Architecture Characteristics

- Explain four characteristics that are addressed by network architecture design

  - Fault tolerance

  - Scalability

  - Quality of service

  - Security

Internet

Redundant connections allow for alternative paths if a device or a link fails. The user experience is unaffected.

Network Architecture Characteristics

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

Packet Switching in a Data Network

Many paths may be used for a single communication as individual packets are routed to a destination.

No fixed path is established. Packets are routed according to the best path available at the time.

Prior to transmission, each communication is broken into packets which are addressed and numbered.

Internet

Source address	Destination address	Sequence Number

At the destination, packets may be reassembled into order according to their sequence number.

Network Architecture Characteristics

- Describe characteristics of the Internet that help it scale to meet user demand

    - Hierarchical

    - Common standards

    - Common protocols

Internet Structure - A Network of Networks
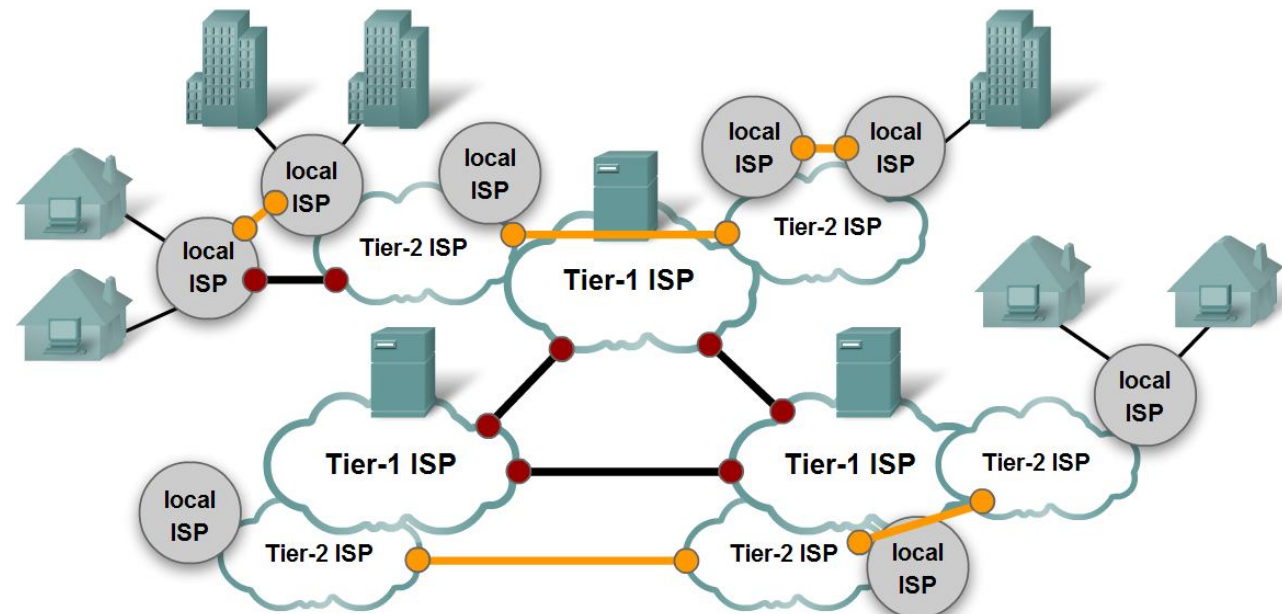
Network Architecture Characteristics

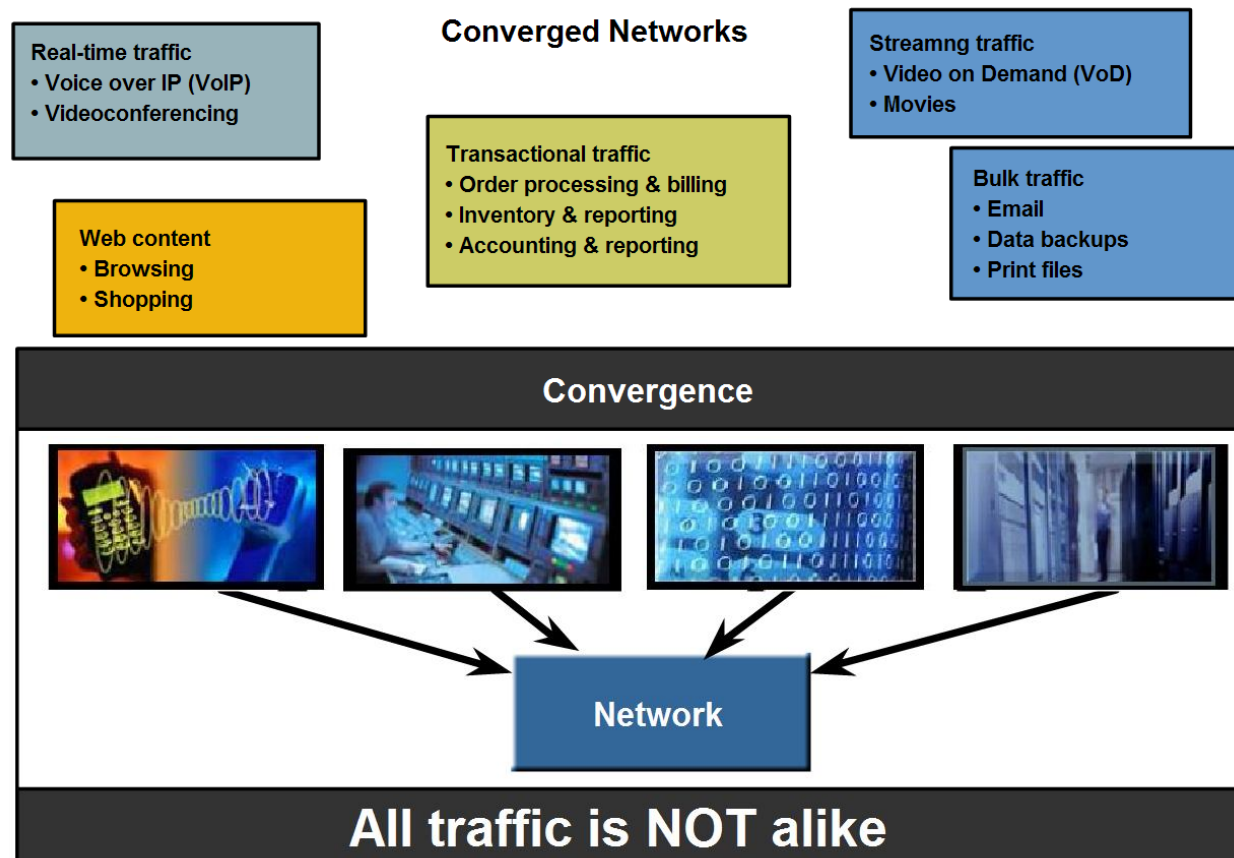- Explain the factors that necessitate Quality of Service and the mechanisms necessary to ensure it

Using Queues to Prioritize Communication

Voice Over IP

Financial Transaction

Web Page

High Priority Queue

Medium Priority Queue

Low Priority Queue

All communication has some access to the media, but higher priority communication has a greater percentage of the packets.

Link to Network
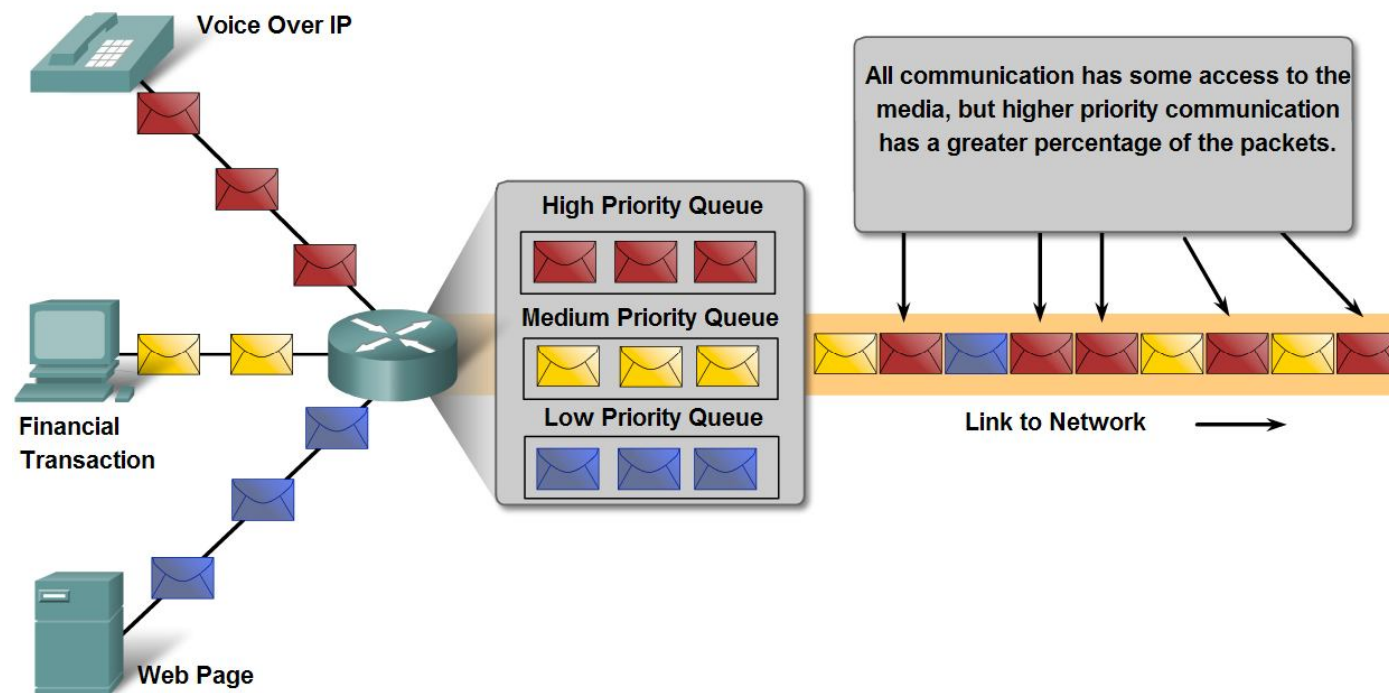
Queuing according to data type enables voice data to have priority over transaction data, which has priority over web data.
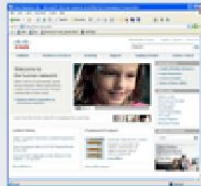
Network Architecture Characteristics

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

Converged Networks

Real-time traffic
- Voice over IP (VoIP)
- Videoconferencing

Streamng traffic
- Video on Demand (VoD)
- Movies

Transactional traffic
- Order processing & billing
- Inventory & reporting
- Accounting & reporting

Bulk traffic
- Email
- Data backups
- Print files

Web content
- Browsing
- Shopping

Convergence

Network

All traffic is NOT alike

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 02:14:05 $1.54 Just one second earlier...	Time : Price 02:14:04 $1.52 The price may be better.
Downloading web pages (often lower priority)	Web pages arrive a bit later...	But the end result is identical.

Network Architecture Characteristics

- Describe why networks must be secure

Unauthorized Transactions

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
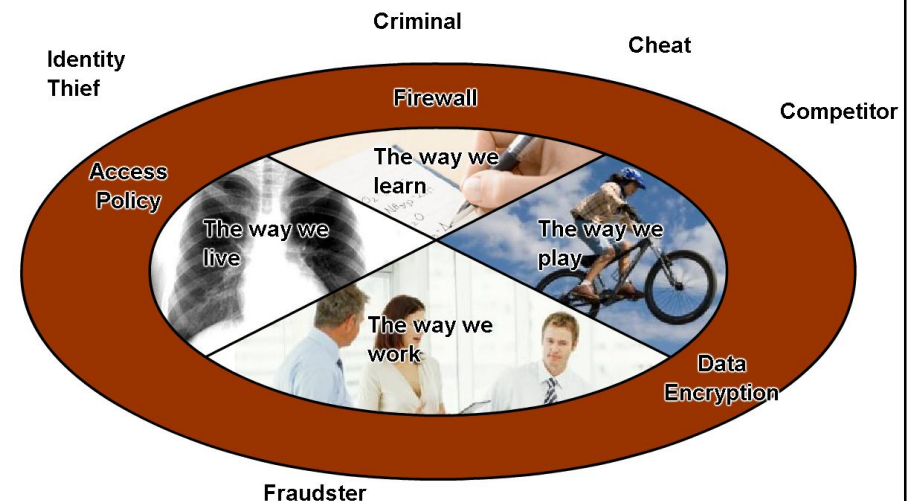
IRC Clients and Wiki Server

- Install and use IRC clients and a Wiki server

Summary

In this chapter, you learned to:

- Describe how networks impact our daily lives.
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- 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.
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