

Management Information Systems

Basics of the Internet

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(Adapted from Introduction to IS, Rainer and Turban)

Internet Basics Outline

Internet History
Internet Structure
Switching Methods
TCP/IP in the Internet
Internet addressing

The Internet

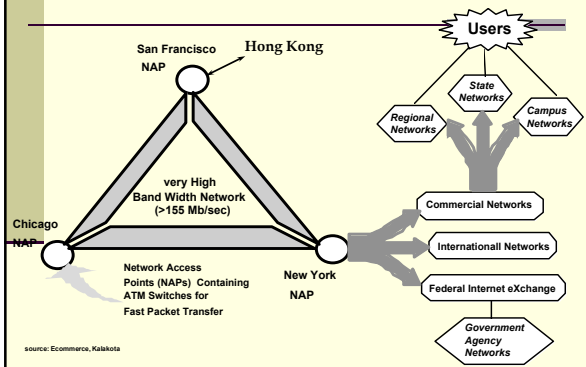
- The **Internet** is a global WAN that connects approximately one million organizational computer networks in more than 200 countries.
 - Intranet
 - a network designed to serve the internal informational needs of a single organization.
 - Extranet
 - a network that connects parts of the intranets of different organizations and allows secure communications among business partners over the Internet using virtual private networks.
 - Darknet
 - a private network that runs on the Internet but is only open to users who belong to the network.

Internet History

- Evolved from ARPANet (Defense Department's Advanced Research Projects Agency Network)
- ARPANet was developed in 1969, and was the first packet-switching network
- Initially, included only four nodes: UCLA, UCSB, Utah, and SRI
- Early Applications
 - Telnet/FTP (1972/73)
 - Distributed Email (1972)
 - TCP/IP (1982-83)
 - DNS (1984)
- In the 1980s, NSFNet extended packet-switched networking to non-ARPA organization; eventually replaced ARPANet
- Instituted Acceptable Use Policies to control use
- CIX (Commercial Internet eXchange) was developed to provide commercial internetworking

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Internet Architecture (1995)



Simplified structure of the Internet

Hierarchy of privately-owned networks

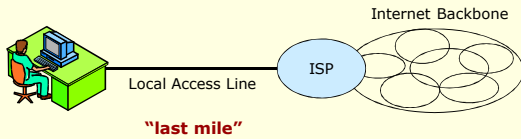
- Backbone network: High speed, city-to-city, with network access points, owned by large service providers (AT&T, MCI, Level3)
- ISP networks: Connect from backbone to local areas
- Local access networks: Access to individual computers (local telephone network, cable TV network, building networks)



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Accessing the Internet

- Connecting via an online service
- Internet kiosks
- Dial-up
- ISDN
- DSL
- Cable Modem
- Satellite
- Wireless
- Fiber to the home

Switching Methods

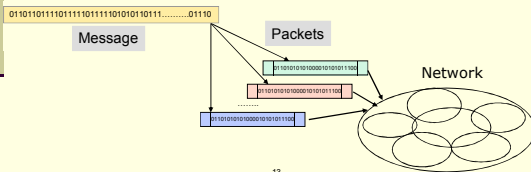
- Circuit Switching
 - Requires a dedicated communication path for duration of transmission
 - wastes bandwidth, but minimizes delays
- Message Switching
 - Entire path is not dedicated, each link is seized, used and released
 - long delays result from intermediate storage and repetition of message
- Packet Switching
 - Specialized message switching, with very little delay

Packet-switched networks

Data is sent as a sequence of 'packets'

- It isn't cost effective to have telephone-like connections between different communicating computers
- This is primarily because data transmission is 'bursty'

Packetize, transmit, reassemble



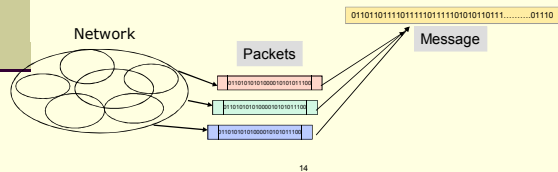
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Protocols and TCP/IP

Effective communication requires rules

- Protocol: A set of rules for transmitting data between computers
- Example: TCP/IP

The 'rules' in a protocol answer questions like:

- What's the address of the computer I want to send this to?
- Where do I send the next packet I get, based on its address?
- How do I detect the beginning of a new packet?
- How do I figure out an error in transmission?

IP address

- 32-bit number given to each device connected to the Internet

TCP/IP Protocol Communication Layers

- Internet is based on TCP/IP protocol
- Transmission control Protocol (TCP) / Internet Protocol (IP)
- Multiple Layers
 - Application or process layer
 - specifies how application communicates with network, separate module for each application, e.g. e-mail,
 - Transport layer
 - ensure reliable communication – TCP, Packetizing, assembling, error control
 - Internetworking
 - data exchange across networks, IP for addressing and routing, fragmenting
 - Network
 - data exchange across nodes on a shared network, software depends on type of network
 - Physical (media dependent)

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Analogy -- IP Traffic and Postcards

- Packets are Postcards = IP
 - To/From Addresses
 - Content
- Sending a Novel on Postcards
 - Page numbering (ordering, duplicate detection)
 - Positive Acknowledgment
 - Retransmission on Timeout

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Internet Characteristics

The Internet is not an 'intelligent' network

- It treats all data packets equally, irrespective of source/content
- It's role is simply to get them from one computer to another.

The intelligence of the Internet is at the 'edges'

- Edges: the devices (like computers) connected to the Internet
- Any application on any connected computer can use the Internet's data transmission features
- Anyone with a computer connected to the Internet can run applications that use the Internet

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Why is this important?

It is easy to run new Internet-based applications

- No changes to the Internet itself are needed; the application simply has to know how to interface with TCP/IP
- The user(s) of the new application simply run it on their Internet clients and servers
- In a way, the Internet is the ultimate networking 'platform'

Innovation in application development is encouraged

- Applications not originally planned (or even imagined) by the Internet's designers can flourish
- World-Wide Web, Kazaa, IM, VOIP

The Internet cannot discriminate between applications

- New applications do not need the 'permission' of the network
- Existing application owners cannot prevent new ones from emerging by preventing access to the Internet

IP Addressing

- IP Addresses
- unique 32 bit numbers assigned by Internet Network Information Center (InterNIC)
- 148.186.146.20
- four groups (0 -255)
- left bits for network class & address (A, B, C);
- right bits for machines address on the network
- Domain Name Service (DNS)
 - map IP addresses to names (www.rutgers.edu)

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Addresses on the Internet

- **Domain names** consist of multiple parts, separated by dots, which are read from right to left.
 - Top-level domain
 - the rightmost part of an Internet name; common top-level domains are .com, .edu, .gov
 - Name of the organization
 - Name of the specific computer

Internet Address example

www.camden.rutgers.edu

Name of the specific
computer: sub unit

Name of the organization:
Auburn University

Top level domain:
edu

Emerging Trends

- Fiber distributed data interface (FDDI)
- Asynchronous Transfer Mode (ATM)
- Asymmetric Digital Subscriber Line (ADSL)
- Synchronous optical Network (SONET)
- BlueTooth
- Frame Relay
- Virtual Private Networks (VPNs)
- Gigabit Networks
- Internet next generation and Internet II
- IPv6 (IPng)
- Internet 2

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