Introduction to Internet Technology

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Internet

- The **Internet** is the global system of interconnected computer networks that use the Internet protocol suite (TCP/IP) to link devices worldwide.

- It is a *network of networks* that consists of private, public, academic, business, and government networks of local to global scope, linked by a broad array of electronic, wireless, and optical networking technologies.

Internet cont..

- The Internet carries an extensive range of information resources and services, such as the inter-linked hypertext documents and applications of the World Wide Web (WWW), electronic mail, telephony, and file sharing.

Why is the internet useful?

- **The Internet is useful for facilitating communication, distributing information, and sharing knowledge.**

- Some of the ways this can be achieved through the use of the Internet is by fostering conversation or debates with other kinds of people, providing geographical information, and general knowledge sharing.

What is the purpose of the Internet?

- **The main purpose of the Internet is offering effective information sharing and communication globally using computers.**

- Notably, the Internet is the biggest player in the realization of the concept of globalization today.

- With the Internet, the world has become a global village.

- A person can now communicate comfortably with anyone in corner of the world

Why is the Internet good?

- **The Internet is good because it provides access to information on a 24-hour basis, allows for communication between people all across the world and allows for the information provided to be updated quickly.**

How does the Internet function?

- **The Internet is a network of autonomous computers linked together by wireless, cable or fiber links; devices exchange information over the network through data packets.**

- It is governed by a set of protocols called TCP/IP.

What is Internet technology?

- **Internet technology is the ability of the Internet to transmit information and data through different servers and systems.**

- Internet technology is important in many different industries because it allows people to communicate with each other through means that were not necessarily available

IT cont..

☐ The Internet is essentially a large database where all different types of information can be passed and transmitted.

☐ It can be passively passed along in the form of non interactive websites and blogs; it can also be actively passed along in the form of file sharing and document loading.

☐ Internet technology has lead to a wealth of information available to anyone who is able to access the Internet.

IT Cont..

- It has allowed people who were accustomed to textbooks and libraries to learn anything they could want from the comfort of a computer.

- Internet technology is constantly improving and is able to speed up the information highway that it has created.

- With the technologies powering the Internet, speeds are faster, more information is available and different processes are done that were not possible in the past. Internet technology has changed, and will continue to change, the way that the world does business and how people interact in daily life.

Internet history

- 1957 - the US creates the Advanced Research Projects Agency
- 1958 - the integrated circuit is invented
- 1959 - computers using transistors rather than vacuum tubes are smaller, faster, and less expensive
- 1962*- Paul Baran of RAND suggests a packet switching network
- 1965 - Ted Nelson coins the term "hypertext"
- 1967 - IBM builds the first floppy disk
- 1968 - Intel is founded
- 1969*- ARPANET is formed

Internet history

- 1969 - Number of hosts: 4
- 1971 - Number of hosts: 23
- 1971*- Ray Tomlinson invents an email program
- 1974 - Number of hosts: 62
- 1984 - Number of hosts: 1024
- 1986 - NSFNET (high-speed backbone) is created
- 1988 - Number of hosts: 56,000
- 1990 - ARPANET pulls the plug

World Wide Web

- ☐ 1992*- CERN and Tim Berners-Lee demonstrate the World Wide Web (WWW)

- ☐ 1993*- Mosaic hits the net

- ☐ 1994 - the Point-to-Point Protocol (PPP) allows TCP/IP over phone lines

- ☐ 1995 - Microsoft jumps into the Internet market and thus begin the "browser wars"

Internet protocols

- The way that someone who wants to use a service talks with that service
- Internet protocols consist of a suite of communication protocols
  - Transmission Control Protocol (TCP)
  - Internet Protocol (IP)
- Also specifies common applications such as electronic mail, terminal emulation, and file transfer

TCP/IP

- First developed in the mid-1970s, by Defense Advanced Research Projects Agency (DARPA)
  - establishing a packet-switched network that would facilitate communication between dissimilar computer systems at research institutions
- The foundation on which the Internet and the World Wide Web (WWW) are based.

Internet Protocol (IP)

- The Internet Protocol (IP) is a network-layer (Layer 3) protocol that contains addressing information and some control information that enables packets to be routed

- IP represents the heart of the Internet protocols.

- IP has two primary responsibilities:
  - providing connectionless, best-effort delivery of datagrams through an internetwork
  - providing fragmentation and reassembly of datagrams to support data links with different maximum-transmission unit (MTU) sizes

Transmission Control Protocol (TCP)

- Provides reliable transmission of data in an IP environment.
- Services TCP provides
  - Stream data transfer
    - TCP delivers an unstructured stream of bytes identified by sequence numbers
    - TCP groups bytes into segments and passes them to IP for delivery.
  - Reliability
    - Providing connection-oriented, end-to-end reliable packet delivery

Transmission Control Protocol (TCP)

- **Efficient flow control**
  - When sending acknowledgments back to the source, the receiving TCP process indicates the highest sequence number it can receive without overflowing its internal buffers

- **Full-duplex operation**
  - TCP processes can both send and receive at the same time

- **Multiplexing**
  - Simultaneous upper-layer conversations can be multiplexed over a single connection
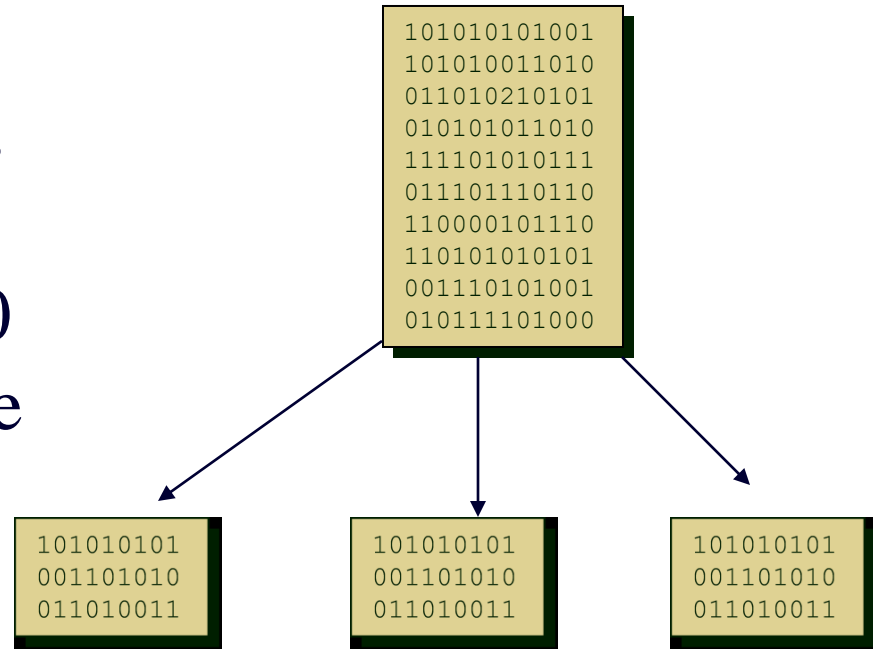
Internet Protocols Application-Layer Protocols

- The Internet protocol suite includes many application-layer protocols that represent a wide variety of applications, including the following:

    - File Transfer Protocol (FTP)-Moves files between devices
    - Simple Network-Management Protocol (SNMP)-Primarily reports anomalous network conditions and sets network threshold values
    - Telnet-Serves as a terminal emulation protocol
    - X Windows-Serves as a distributed windowing and graphics system used for communication between X terminals and UNIX workstations
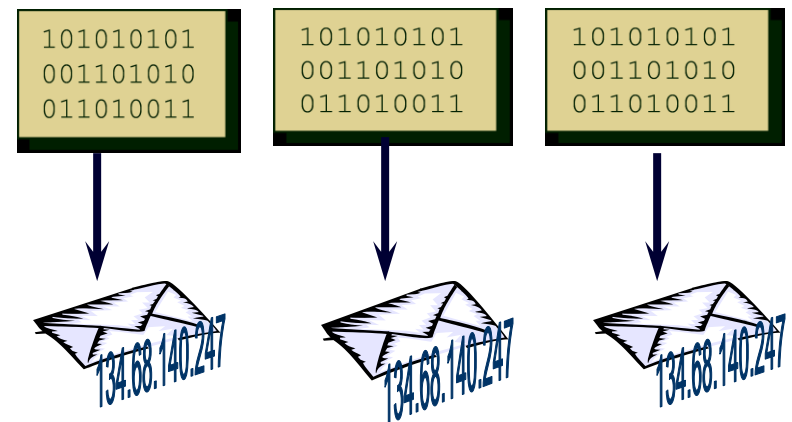
How TCP/IP Works

❑ Transfer Control Protocol (TCP) breaks data into small pieces of no bigger than 1500 characters each. These "pieces" are called packets.

```
101010101001
101010011010
011010210101
010101011010
111101010111
011101110110
110000101110
110101010101
001110101001
010111101000
```

```
101010101
001101010
011010011
```

```
101010101
001101010
011010011
```

```
101010101
001101010
011010011
```
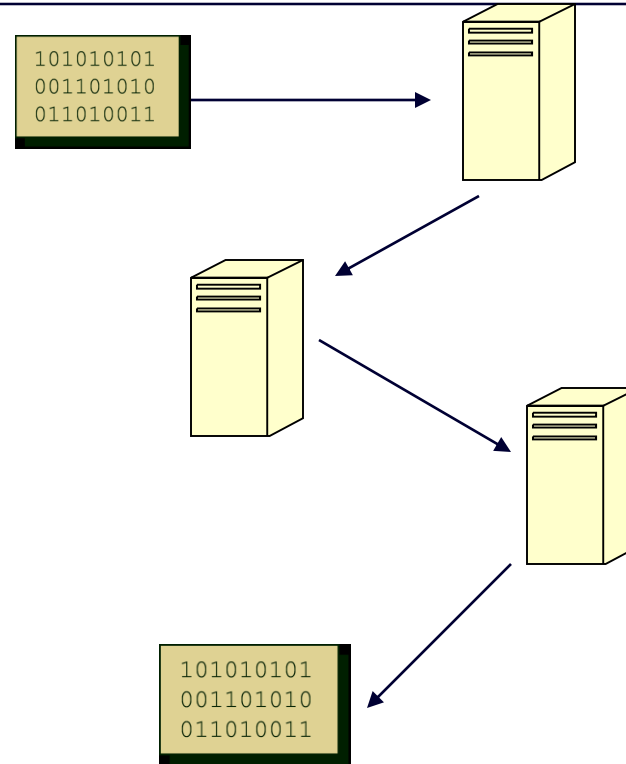
How TCP/IP Works

☐ Each packet is inserted into different Internet Protocol (IP) "envelopes." Each contains the address of the intended recipient and has the exact same header as all other envelopes.

```
101010101        101010101        101010101
001101010        001101010        001101010
011010011        011010011        011010011
```

134.68.140.247   134.68.140.247   134.68.140.247

How TCP/IP Works

- A router receives the packets and then determines the most efficient way to send the packets to the recipient.

- After traveling along a series of routers, the packets arrive at their destination.

```
101010101
001101010
011010011
```

```
101010101
001101010
011010011
```

How TCP/IP Works

□ Upon arrival at their destination, TCP checks the data for corruption against the header included in each packet. If TCP finds a bad packet, it sends a request that the packet be re-transmitted.

101010101
001101010
011010011
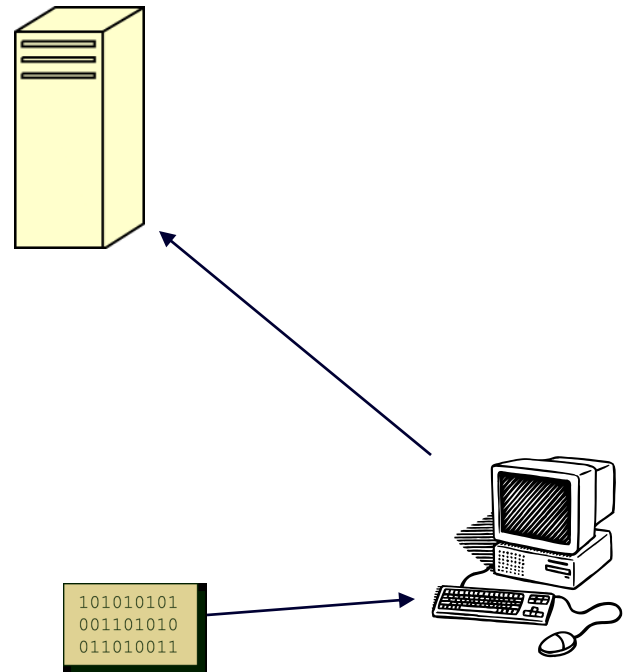
Internet Protocols Application-Layer Protocols

- Network File System (NFS), External Data Representation (XDR), and Remote Procedure Call (RPC)-Work together to enable transparent access to remote network resources

- Simple Mail Transfer Protocol (SMTP)-Provides electronic mail services

- Domain Name System (DNS)-Translates the names of network nodes into network addresses

Internet addresses

- **IP numbers**
  - An IP number has four 'digits', with each digit represented by a number from 0 to 255
    - 0.0.0.0 to 255.255.255.255
  - Like a zip code to help a packet of information find its way to the proper destination
- **Domain Names**
  - Verbal equivalents to IP numbers
  - Paired with the IP numbers in a large database that is distributed throughout the Internet
  - Computers you access through a web browser have a domain name
  - Only need to know about IP numbers when you encounter a computer which does not have a name assigned.

Internet addresses

☐ DNS system is organized in a tree - like structure based loosely on the organization of the ARPANet

☐ All the computers in the Internet are thought of as belonging to a specific wide domain

- ■ .com .net .org .biz .us .tv .ws .name .cc .de .jp .be .at .uk .nz .cn .tw .jobs .eu .fm .ms .nu .tc .tk .vg .mobi

☐ Each domain might have a number of subdomains

- ■ .iu .iupui .cs

IP Addresses

☐ Example of an IP Address:

http://134.68.140.1/

The IP Address of the Computer Science Department's Web Server

Anatomy of a URL
– Uniform Resource Locator

http://www.cs.iupui.edu/index.html

protocol

machine name

sub-sub domain

sub domain

domain name

file name

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