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The Internet &
World Wide Web

"The Internet.
All the piracy
and none of the scurvy."
-- Anonymous
Content

• Topics:
  ◦ Internet and WWW Overview
    • History
    • Technologies
    • Connecting to the Internet
    • Internet Software Tools
    • The World Wide Web

• Resources:
  ◦ Meyers, CompTia A+ Certification
Networks

- When computers talk to each other, this is called a network.
  - The network can have different kinds of computers and peripherals attached to it.
  - Networks in which computers are physically connected to each other in the close geographical proximity are called local area networks (LANs)
  - Other networks are called wide area networks (WANs)
- The Internet is a wide area network.
- The Internet is an open system = “a system whose architecture is not a secret”
What is the Internet?

- The internet is a WAN.
- History
  - Motivated by military desire for secure, reliable, efficient communications in the result of nuclear war.
  - ARPAnet (circa 1971): used “NCP”
  - Open internet was standardized in September 1981
- Fundamental ideas:
  - Uses "data packets" to move information (packet switching).
  - Relies (mostly) on insulated cables.
  - Allows communication without a "dedicated connection".
Internet Providers

- The Internet is divided into groups called tiers.
- Tier 1, consists of 9 companies (AT&T) providing high-speed fiber-optic networks (backbones) to the major cities of the earth.
- Tier 1 backbones interconnect at special network access points (NAPs). Tier 1 providers do not charge each other.
- Tier 2 providers (Time Warner) own smaller, regional networks and pay the Tier 1 providers.
- Tier 3 providers are even more regional and connect to Tier 2 providers.
- Backbone routers connect to more than one other backbone router, creating a big, interwoven framework for communication.
A total of nine companies provide Tier 1 Internet connectivity to the U.S. and the World.
If any one cable is cut/damaged communication between cities is still possible.
Packet vs. Circuit Switching

- In any conversation (or exchange of information) there is going to be a lot of time when nothing is being said or exchanged.
- Packet switching allows multiple conversations to share one wire, by breaking up large pieces of data into small packets and then "sharing" a cable among all clients who want to use a cable.
Packet Switching... cont

- In packet switching, large messages (emails, web-pages, even sections of speech in a phone conversation) are broken up into multiple addressed packets.
- These packets are sent separately across the Internet (they may take separate routes) and reassembled when they reach their destination.
Internet Service Provider (ISP)

- Every Tier 1 and Tier 2 provider leases connections to the Internet to companies called Internet service providers (ISPs).
- ISPs essentially sit along the edges of the Tier 1 and Tier 2 Internet and tap into the flow.
- You can, in turn, lease some of the connections from the ISP and thus get on the Internet.
- ISP's provide a number of different ways to connect to the Internet (different combinations of hardware and software may be required).
Protocols

- Protocol = set of rules for how computers communicate with each other.

- **Lower Level Protocols** (device to device)
  - IP: internet protocol (the address of a machine)
  - TCP: transmission control protocol (proof of delivery, rules or reassembling partitioned messages)

- **Higher Level Protocols** (program to program)
  - FTP: file transfer protocol
  - SMTP: simple mail transfer protocol
  - HTTP: hypertext transfer protocol

• For more information:
  http://en.wikipedia.org/wiki/Internet_protocol_suite
Protocols...

- Internet packets rely on multiple layers of protocols.
- This is comparable to how a traditional letter might be delivered using a range of physical mediums.
- Stop... give examples.
Internet Software

- FTP (file transfer protocol)
  - download
  - upload
- Email (SMTP)
- Bitorrent (File Sharing)
- Newsgroups
  - posting
  - thread
- VoIP (Digital phone)
- Streaming Digital Content (movies)
- Botnets
  - Spam
  - DOS attacks
Clients and Servers

- **Server**: computer on a network which carries out some service for another computer.
- **Client**: the other computer for whom the server is carrying out the service
- **Types of servers**:
  - file server
  - database server
  - web server
  - groupware server (Lotus Notes, BitTorrent)
  - mail server
  - application server (provides access to particular applications e.g., game servers of a web site)
Client-Server Architecture

- **Advantages:**
  - Isolates data storage technology.
    - Places more burden on server (instead of client)
    - Allows for distributing tasks amongst server(s)
  - Follows object-oriented and modular programming paradigms
    - Example: HTML documents, CSS files, images, video clips, etc.

- **Disadvantages:**
  - Multiple points of failure.
  - Multiple points of attack.
Client-Server Architecture Types

- **Two-tier**
  - Presentation / Interface layer
  - Data layer

- **Three-tier**
  - Presentation / Interface layer
  - Processing layer
  - Data layer

  - Web browser == client
  - Internet
  - Application server, web server
  - Internet or LAN
  - File server, database server, web server
What is the World Wide Web?

- The world-wide web (WWW) is NOT the internet!
- History:
  - The idea of the world-wide web was conceived by Sir Tim Berners-Lee
  - Developed and discussed at CERN in Switzerland from about 1989
  - Made public in 1994
- Fundamentals:
  - The WWW uses the Internet, but is not the Internet itself.
  - The WWW is a way of organizing and viewing data that is accessible through the Internet.
World Wide Web... cont

- The Web provides a graphical interface to digital content stored on the Internet.

- Server Side:
  - Web servers are computers running specialized software programs (Apache, IIS).
  - Web servers provide access to collections of digital documents (mostly .html files) called websites.
  - Web sites are accessed by using the HTTP protocol on port 80.
The Web provides a graphical interface to digital content stored on the Internet.

Client Side:

- Web-browser software, such as Internet Explorer or Mozilla Firefox, can make requests for web-pages.
- These requests are in HTTP, and use DNS (Domain Name Resolution).
- DNS allows us to use "web addresses" (www.google.com) instead of IP addresses (72.14.204.103:80)
Web Programming Languages

- **Client Side:**
  - Programs are run by the client's browser/application.
  - Example: Javascript
    - scripting language based on Java
    - write programs using a text editor,
    - programs are embedded/stored with HTML.

- **Server Side:**
  - Programs are run by a web server program.
  - Example: PHP
    - scripting language (HyperText PreProcessor)
    - write programs using a text editor,
    - programs are embedded/stored with HTML.
The End