Chapter 3
The Internet and World Wide Web: E-commerce Infrastructure

Brief Chapter Outline
3.1 The Internet: Technology Background
3.2 The Internet Today
3.3 Internet II: The Future Infrastructure
3.4 The World Wide Web
3.5 The Internet and the Web: Features
3.6 Case Study: Akamai Technologies: Speeding Internet Performance with Math
3.7 Review

Web 2.0: Mashups Propel New Web Services
Class Discussion
• What are Web mashups and what technology makes them possible?
• Why would Google and others allow their software to be combined with other software?
• What is the potential benefit to consumers?
• If mashups ultimately make money, how will the revenues be divided?
• Why would mashups be supportive of “context” advertising?
The Internet: Technology Background

- The Evolution of the Internet 1961-2003
- The Internet: Key Technology Concepts
- Other Internet Protocols and Utility Programs
- Insight on Business: Peer-to-Peer Computing Goes to Work

Internet II: The Future Infrastructure

- Limitations of Internet I
- The Internet2® Project
- The Larger Internet II Technology Environment: The First Mile and the Last Mile
- Benefits of Internet II Technologies

The World Wide Web

- Development of the Web
- Hypertext
- Markup Languages
- Web Servers and Clients
- Web Browsers

The Internet and the Web: Features

- E-mail
- Instant Messaging
- Search Engines
- Intelligent Agents (Bots)
- Insight on Technology: Chatterbots at Work
- Chat
- Music, Video and Other Standard Files
- Streaming Media
- Cookies
- Internet II and E-commerce: Emerging Features and Services

Web Services Propel Next Wave in E-commerce

- **Web services**: general term that refers to an emerging set of applications, services and standards that make it possible for software programs to communicate with each other over the Web and share documents and information automatically based on standards
- **Simplest-Shop.com** an example of use of Web services to create a complex Web site at relatively low cost

The Internet: Technology Background

- **Internet**: A interconnected network of thousands of networks and millions of computers, linking businesses, educational institutions, government agencies and individuals
- **World Wide Web (Web)**: One of the Internet’s most popular services, providing access to over 8 billion Web pages
The Evolution of the Internet 1961-2003

- History of Internet can be segmented into 3 phases:
  - **Innovation Phase** – fundamental building blocks conceptualized and realized
  - **Institutional Phase** – providing funding and legitimization for Internet
  - **Commercialization Phase** – private corporations take over and expand Internet backbone and services

**Stages in the Development of the Internet**

- **Innovation Phase** (1961 - 1974):
  - ARPANET was created by the Advanced Research Projects Agency (ARPA) of the United States Department of Defense (DoD) to research and develop internetworking technology.

- **Institutional Phase** (1975 - 1995):
  - Internet Protocol (IP) was standardized, leading to the growth of the Internet.

- **Commercialization Phase** (1995 - present):
  - Private corporations take over and expand the Internet backbone and services.

**Figure 3.2** Development of the Internet Timeline

<table>
<thead>
<tr>
<th>YEAR</th>
<th>EVENT</th>
<th>SIGNIFICANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1962</td>
<td>J. C. R. Licklider proposes a “Galactic Network” of computers.</td>
<td></td>
</tr>
<tr>
<td>1963</td>
<td>Lawrence Robert Holmes proposes ARPA’s fund development for ARPANET, using packet switching.</td>
<td></td>
</tr>
<tr>
<td>1967</td>
<td>The concept of packet switching is born.</td>
<td></td>
</tr>
<tr>
<td>1968</td>
<td>DARPA sponsors projects that form the Internet backbone.</td>
<td></td>
</tr>
<tr>
<td>1972</td>
<td>The first Internet message is sent from UCSD to UCLA.</td>
<td></td>
</tr>
<tr>
<td>1983</td>
<td>The ARPANET is completely replaced by the Internet backbone.</td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td>The Internet is commercially accessible.</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 3.2** Development of the Internet Timeline (continued)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>EVENT</th>
<th>SIGNIFICANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>NSF announces the development of an Internet superhighway supporting researchers, educators, and students.</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>NSF sponsors the Accelerated Learning Environment (ALEX) project.</td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>Internet is transformed into a commercial service.</td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>The U.S. federal government encourages the founding of regional Internet service providers.</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>NSC, Department of Commerce, funds its first contract with the Internet.</td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>E-commerce (e-business) begins.</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 3.3** Stages in the Development of the Internet

- **Innovation Phase**:
  - The first Internet message is sent from UCSD to UCLA.

- **Institutional Phase**:
  - The ARPANET is completely replaced by the Internet backbone.

- **Commercialization Phase**:
  - The Internet is commercially accessible.

**Figure 3.3** Stages in the Development of the Internet (continued)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>EVENT</th>
<th>SIGNIFICANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>NSF sponsors the Accelerated Learning Environment (ALEX) project.</td>
<td></td>
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</tr>
<tr>
<td>2003</td>
<td>E-commerce (e-business) begins.</td>
<td></td>
</tr>
</tbody>
</table>
The Internet: Key Technology Concepts

- Federal Networking Council definition of Internet highlights three important concepts that are basis for understanding the Internet:
  - Packet switching
  - TCP/IP communications protocol
  - Client/server computing

Packet Switching

- A method of slicing digital messages into packets, sending the packets along different communication paths as they become available, and then reassembling the packets once they arrive at their destination
- Uses routers: special purpose computers that interconnect the computer networks that make up the Internet and route packets to their ultimate destination
- Routers use computer programs called routing algorithms to ensure packets take the best available path toward their destination

TCP/IP (Transmission Control Protocol/Internet Protocol)

- Protocol: a set of rules for formatting, ordering, compressing and error-checking messages
- TCP: Establishes the connections among sending and receiving Web computers, handles the assembly of packets at the point of transmission, and their reassembly at the receiving end
- IP: Provides the Internet’s addressing scheme
- TCP/IP is divided into 4 separate layers:
  - Network Interface Layer
  - Internet Layer
  - Transport Layer
  - Application Layer

Resolution of the Federal Networking Council

"The Federal Networking Council (FNC) agrees that the following language reflects our definition of the term Internet:"

Internet refers to the global information system that—

(i) is logically linked together by a globally unique address space based on the Internet Protocol (IP) or its subsequent extensions/evolutions;

(ii) is able to support communications using the Transmission Control Protocol/Internet Protocol (TCP/IP) suite or its subsequent extensions/evolutions, as well as other IP-compatible protocols; and

(iii) provides, in the manner of accessibility, either publicly or privately, high-level services layered on the communications and related infrastructure described herein.

Last modified on October 30, 1995.

Packet Switching

Original text message

00101100100110100101110001101

Text message digitized into bits

01100010 10101100 11000011

Digital bits broken into packets

00111011 10101100 11000011

Header information added to each packet indicating destination, and other control information, such as how many bits are in the total message, and how many packets.

The TCP/IP Architecture and Protocol Suite

TCP/IP Protocol Architecture Layers

TCP/IP Protocol Stack

HTTP

FTP

SMTP

Ethernet

Token Ring

Fiber Optics

ATM
IP Addresses

- Internet address (also called IP address): a 32-bit number expressed as a series of four separate numbers marked off by periods, such as 201.61.186.227
- IPv4: the current version of IP. Can handle up to 4 billion addresses
- IPv6: the next generation of IP. Will use 128-bit addresses and be able to handle up to 1 quadrillion addresses

Routing Internet Messages: TCP/IP and Packet Switching

Domain Names and URLs

- Domain name: IP address expressed in natural language
- Domain name system (DNS): allows numeric IP addresses to be expressed in natural language
  - Example: cnet.com = 216.200.247.134
- Uniform resource locator (URL): addresses used by Web browsers to identify location of content on the Web

Client/Server Computing

- Model of computing in which very powerful personal computers (clients) are connected in a network with one or more server computers that perform common functions for the clients, such as storing files, software applications, etc.
Insight on Business: Peer-to-Peer Computing Goes to Work

- Peer-to-peer computing an outgrowth of client/server computing model
- Allows client computers to share resources without intervention of a central server
- Most often used for sharing music and other file over the Internet, in violation of copyright laws
- However, some new legitimate uses such as Groove Workspace, a P2P platform developed by Groove Networks

Other Internet Protocols and Utility Programs

- HTTP: Protocol used to transfer Web pages
- SMTP, POP and IMAP: Protocols used to send and receive e-mail
- FTP: Protocol that permits users to transfer files from server to client and vice versa
- SSL: Protocol that provides secure communications between client and server
- Telnet: Program that enables a client to emulate a mainframe computer terminal
- Finger: Utility program that lets you check who is logged on, for how long and user name
- Ping: Utility program that allows you to check connection between client and server
- Tracert: Utility program that allows you to follow path of a message sent from a client to a remote computer

Sample FTP Session

The Result of a Ping
Tracing the Route a Message Takes on the Internet

**The Internet Today**

- Client/server computing model, coupled with hourglass, layered architecture of Internet has allowed Internet to handle explosive growth without disruption
- **Hourglass/layered architecture** – 4 layers:
  - Network Technology Substrate
  - Transport Services and Representation Standards
  - Middleware Services
  - Applications

**The Hourglass Model of the Internet**

![Hourglass Model](image)

**Internet Network Architecture**

![Architecture Diagram](image)

**The Internet Backbone**

- Consists of high-bandwidth fiber-optic cable owned by a variety of Network Service Providers (NSPs)
- Term bandwidth refers to how much data can be transferred over the communications media within a fixed period of time
- May be expressed bits per second (bps), kilobits per second (Kbps), megabits per second (Mbps) or gigabits per second (Gbps)

**Major U.S. Internet Backbone Owners**

<table>
<thead>
<tr>
<th>TABLE 3.2</th>
<th>MAJOR U.S INTERNET BACKBONE OWNERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT&amp;T</td>
<td>Qwest</td>
</tr>
<tr>
<td>Cable &amp; Wireless</td>
<td>Level 3</td>
</tr>
<tr>
<td>Genuity</td>
<td>Williams</td>
</tr>
<tr>
<td>MCI</td>
<td>Verizon</td>
</tr>
<tr>
<td>Sprint</td>
<td>Bellingrin</td>
</tr>
<tr>
<td>Juniper</td>
<td>Alcatel</td>
</tr>
</tbody>
</table>

![Backbone Owners](image)
NAPs, MAEs and CANs

- Hubs where backbones intersect with regional and local networks, and where backbone owners connect with one another called Network Access Points (NAPs) or Metropolitan Access Exchanges (MAEs).
- Campus area network (CAN): Local area network operating within a single organization that leases Internet access directly from regional or national carrier.

Internet NAPs and MAEs

Map of Internet NAPs and MAEs

Internet Service Providers (ISPs)

- Leases Internet access to home owners, small businesses and some large institutions
- Retail providers that deal with “last mile of service”
- Major national ISPs include AOL, MSN, and AT&T Worldwide.
- Offer both narrowband (traditional telephone modem connection at 56.6 Kbps) and broadband (service based on DSL, cable modem, T1 or T3 telephone lines, and satellite)

ISP Service Levels Bandwidth Choices

<table>
<thead>
<tr>
<th>SERVICE</th>
<th>COST/MONTH</th>
<th>SPEED TO DESKTOP (KBPS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telephone Modem</td>
<td>$10-$25</td>
<td>30-56 Kbps</td>
</tr>
<tr>
<td>DSL</td>
<td>$40-$50</td>
<td>384 Kbps-1.5 Mbps</td>
</tr>
<tr>
<td>Cable Modem</td>
<td>$40-$50</td>
<td>512 Kbps-2 Mbps</td>
</tr>
<tr>
<td>Satellite Dish</td>
<td>$150-$175</td>
<td>250 Mbps-1 Mbps</td>
</tr>
<tr>
<td>T1</td>
<td>$1000-$2000</td>
<td>1.54 Mbps</td>
</tr>
</tbody>
</table>

Broadband Service Choices

- Digital Subscriber Line (DSL): Telephone technology delivers high-speed access through ordinary telephone lines; speeds from about 385 Kbps to 1.5 Mbps
- Cable modem: Cable television technology piggybacks digital access to Internet on top of analog video cable line; speeds from about 500 Kbps to 2 Mbps
- T1 and T3: International telephone standards for digital communication that offer guaranteed delivery rates
  - T1: 1.54 Mbps
  - T3: 43 Mbps
- Satellite: high-speed downloads (256 Kbps to 1 Mbps), but no upload available
Intranets and Extranets

- **Intranet**: TCP/IP network located within a single organization for purposes of communication and information processing.
- **Extranet**: Formed when firms permit outsiders to access their internal TCP/IP networks.

Who Governs the Internet?

- A number of different organizations that influence Internet and monitor its operations including:
  - Internet Architecture Board (IAB)
  - Internet Corporation for Assigned Names and Numbers (ICANN)
  - Internet Engineering Steering Group (IESG)
  - Internet Engineering Task Force (IETF)
  - Internet Society (ISOC)
  - World Wide Web Consortium (W3C)

Insight on Society: Government Regulation of the Internet Class Discussion

- Why should the government of France be permitted to censor the Web in France (or elsewhere)?
- Does the Chinese government, or the U.S. government, have the right to censor content on the Web?
- How is it possible for any government to "control" or censor the Web?
- What would happen to e-commerce if the existing Web split into a different Web for each country?

Internet II: The Future Infrastructure

- **Internet II**: The second era of the Internet that is being built today by private corporations, universities and government agencies.

Limitations of Internet I

- To appreciate potential benefits of Internet II, must understand the limitations of Internet’s current infrastructure:
  - Bandwidth limitations
  - Quality of service limitations
  - Network architecture limitations
  - Language development limitations
  - Wired Internet limitations

### Table 3.4: Time to Download a 10 Megabyte File by Type of Internet Service

<table>
<thead>
<tr>
<th>Type of Internet Service</th>
<th>Time to Download</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narrowband Services</td>
<td></td>
</tr>
<tr>
<td>Telephone modem</td>
<td>25 minutes</td>
</tr>
<tr>
<td>Broadband Services</td>
<td></td>
</tr>
<tr>
<td>DSL</td>
<td>3.5 minutes</td>
</tr>
<tr>
<td>Cable modem</td>
<td>3.5 minutes</td>
</tr>
<tr>
<td>T-1</td>
<td>51 seconds</td>
</tr>
<tr>
<td>T-3</td>
<td>2 seconds</td>
</tr>
</tbody>
</table>
The Internet2® Project

- Internet2: Consortium of more than 200 universities, government agencies and private businesses that are collaborating to find ways to make the Internet more efficient
- Primary goals:
  - Create a leading edge very-high speed network for national research community
  - Enable revolutionary Internet applications
  - Ensure the rapid transfer of new network services and applications to the broader Internet community

Areas of Focus of Internet2

- Advanced network infrastructure: New backbone networks that interconnect GigaPoPs used by Internet2 members to access network
- New networking capabilities: Projects include
  - Deploying IPv6
  - Developing and implementing new QoS technologies
  - Developing more effective routing practices
  - Coordinating the interconnection of different components of the Internet2 infrastructure
  - Creating an infrastructure to handle multicasting
- Middleware: incorporating identification, authentication, authorization, directory and security services into standardized middleware
- Advanced applications: distributed computation, virtual labs, digital libraries, distributed learning, tele-immersion

The Larger Internet II Technology Environment: The First Mile and the Last Mile

- GENI Initiative: Proposed by NSF to develop new core functionality for Internet
- Private initiatives in fiber optics and wireless Internet services

Fiber Optics and the Bandwidth Explosion in the First Mile

- Fiber optics concerned with the “first mile” or backbone Internet services that carry bulk traffic over long distances
- Older transmission lines being replaced with fiber-optic cable: over $700 billion invested worldwide by telecommunications companies
- Right now, much of fiber-optic cable laid in United States is “dark”, but represents a vast digital highway that can be utilized in the future

Worldwide Fiber-Optical Market Growth

- Figure 3.16, Page 151

Photonics Technologies

- Photonics: Study of communicating with light waves
- Technologies that will have impact on achieving Internet II include
  - Dense Wavelength Division Multiplexing (DWDM)
  - Optical and fiber switches, and switching components
  - Optical integrated circuits
  - Optical networks
- Big Band: Next step in Internet access; will provide bandwidth of 10 Gbps +
Wireless Internet Access: The Last Mile 3G Telephone and Wi-Fi LAN Technologies

- **Wireless Internet access** concerned with the “last mile” – from Internet backbone to user’s computer, cell phone, PDA, etc.
- Two different basic types of wireless Internet access:
  - Telephone-based
  - Computer network-based

### Telephone-based Wireless Internet Access

- **Different standards**
  - Global System for Mobile Communications (GSM): used primarily in Europe
  - Code Division Multiple Access (CDMA): used primarily in U.S.
  - Third generation (3G) cellular networks
  - Use General Packet Radio Services (GPRS) – digital packet-switched technology
  - Wireless Web protocols include:
    - Wireless Access Protocol (WAP)
    - iMode
Example Hybrid Cellular Wireless Devices

Table 3.7, Page 157

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>PROVIDER/NETWORK</th>
<th>SPEED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handspring Treo 680</td>
<td>Sprint/CODA/2000/1X network</td>
<td>(60–144 Kbps)</td>
</tr>
<tr>
<td>Palm Treo200</td>
<td>AT&amp;T GSM/GPRS network</td>
<td>(60–144 Kbps)</td>
</tr>
<tr>
<td>Kyocera 7035</td>
<td>Verizon GSM/GPRS network</td>
<td>(60–144 Kbps)</td>
</tr>
<tr>
<td>Blackberry™ 6210</td>
<td>AT&amp;T Wireless and T-Mobile GSM/GPRS networks</td>
<td>(60–144 Kbps)</td>
</tr>
<tr>
<td>Blackberry™ 6290</td>
<td>Verizon Wireless CDMA100/1X network</td>
<td>(60–144 Kbps)</td>
</tr>
</tbody>
</table>

Wireless Local Area Networks (WLANs)

- Wi-Fi: High-speed, fixed broadband wireless local area network. Different versions for home and business market. Limited range
- WiMax: High-speed, medium range broadband wireless metropolitan area network
- Bluetooth: Low-speed, short range connection of digital devices
- Ultra-Wideband (UWB): Low power, short-range high bandwidth network
- Zigbee: Short-range, low-power wireless network technology useful for remotely controlling digital devices

Wireless Local Area Network Hotspots

Figure 3.18, Page 158

Potential Wireless Internet E-commerce Services

Table 3.8, Page 160

<table>
<thead>
<tr>
<th>SERVICE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal Market Services</td>
<td>Services that apply across industries and firms.</td>
</tr>
<tr>
<td>Personalization</td>
<td>Shrink value, time, space based on user profiles and work.</td>
</tr>
<tr>
<td>Localized content</td>
<td>Maps, fixed locations, nearby locations, real estate services.</td>
</tr>
<tr>
<td>Convenience services</td>
<td>Photos, chat rooms, copy-to-use reverse.</td>
</tr>
<tr>
<td>Retailing services</td>
<td>Shopping charts, money transfer, gift payment, after sales service.</td>
</tr>
<tr>
<td>Financial services</td>
<td>Trading, stock, interest rates, based on account information.</td>
</tr>
<tr>
<td>Vertical Market Services</td>
<td>Services that apply within a firm or industry.</td>
</tr>
<tr>
<td>Sales support</td>
<td>Shrink, adoption of containers, remote order, calendar and planning information.</td>
</tr>
<tr>
<td>Reservation systems</td>
<td>Coordination of sales and inventory.</td>
</tr>
<tr>
<td>Dispatching</td>
<td>Communication of job detail, parts information, repair orders.</td>
</tr>
<tr>
<td>Aircraft management</td>
<td>Control of fleet delivery or service staff, monitoring locations, and work schedules.</td>
</tr>
<tr>
<td>Kiosk delivery</td>
<td>Tracking of packages, queues, and performance monitoring.</td>
</tr>
</tbody>
</table>

Benefits of Internet II Technologies

- IP Multicasting – set of technologies that enables efficient delivery of data to many locations on a network
- Latency solutions – differentiate (differentiated quality of service) will be able to assign different levels of priority to packets depending on type of data being transmitted
- Guaranteed service levels – ability to purchase right to move data through network at guaranteed speed in return for higher fee
- Lower error rates
- Declining costs

IP Multicasting

Figure 3.19, Page 161
Development of the Web

- 1989-1991: Web invented by Tim Berners-Lee at European Particle Physics Laboratory (CERN)
- 1993: Marc Andreessen and others at NCSA create Mosaic, a Web browser with a graphical user interface that could run on Windows, Macintosh, or Unix computer
- 1994: Andreessen and Jim Clark found Netscape, and create first commercial Web browser, Netscape Navigator
- August 1995: Microsoft introduces its version of Web browser, Internet Explorer

Hypertext

- A way of formatting pages with embedded links that connect documents to one another, and that also link pages to other objects such as sound, video, or animation files
- Uses Hypertext Transfer Protocol (HTTP) and URLs to locate resources on the Web

Top-Level Domains

<table>
<thead>
<tr>
<th>Domain</th>
<th>Introduced</th>
<th>Purpose</th>
<th>Sponsor</th>
</tr>
</thead>
<tbody>
<tr>
<td>com</td>
<td>1984</td>
<td>Internet service</td>
<td>Internet</td>
</tr>
<tr>
<td>edu</td>
<td>1985</td>
<td>Educational</td>
<td>US govern</td>
</tr>
<tr>
<td>gov</td>
<td>1985</td>
<td>US government</td>
<td>US General Service Administration</td>
</tr>
<tr>
<td>mil</td>
<td>1985</td>
<td>Military</td>
<td>US Department of Defense</td>
</tr>
<tr>
<td>net</td>
<td>1985</td>
<td>Network</td>
<td>National Network Information Center</td>
</tr>
<tr>
<td>org</td>
<td>1985</td>
<td>Organization</td>
<td>US Patent and Trademark Office</td>
</tr>
<tr>
<td>biz</td>
<td>1998</td>
<td>Business</td>
<td>US Department of Commerce</td>
</tr>
<tr>
<td>info</td>
<td>1998</td>
<td>Information</td>
<td>US Department of Commerce</td>
</tr>
<tr>
<td>prof</td>
<td>1998</td>
<td>Professional</td>
<td>Self-governing</td>
</tr>
<tr>
<td>mil</td>
<td>1998</td>
<td>Military</td>
<td>US Department of Defense</td>
</tr>
<tr>
<td>int</td>
<td>2001</td>
<td>International</td>
<td>National Science Foundation</td>
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<tr>
<td>coop</td>
<td>2001</td>
<td>Cooperation</td>
<td>US Department of Commerce</td>
</tr>
<tr>
<td>pro</td>
<td>2001</td>
<td>Professional</td>
<td>Self-governing</td>
</tr>
<tr>
<td>name</td>
<td>2001</td>
<td>Name</td>
<td>US Department of Commerce</td>
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<tr>
<td>org</td>
<td>2002</td>
<td>Organization</td>
<td>Self-governing</td>
</tr>
</tbody>
</table>

Markup Languages

- Generalized Markup Languages (GMLs) include:
- Standard Generalized Markup Language (SGML) – an early GML
- Hypertext Markup Language (HTML) – a GML that is relatively easy to use; provides fixed set of markup “tags” used to format a Web page
- eXtensible Markup Language (XML) – new markup language specification developed by W3C that is designed to describe data and information; tags used are defined by user

Example HTML Code and Web Page

HTML Tools

<table>
<thead>
<tr>
<th>Software Tool</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text editor, such as Notepad or Wordpad</td>
<td>Suitable for creating simple Web pages, text.</td>
</tr>
<tr>
<td>Frontpage</td>
<td>Strong candidate for Web page creation, design, and site management tools. Good at creating and integrating graphics and other objects.</td>
</tr>
<tr>
<td>Dreamweaver</td>
<td>Professional Web page and site development tool. Good at creating graphics, animations, and other special effects.</td>
</tr>
</tbody>
</table>
Web Servers and Web Clients
- **Web server software**: Enables a computer to deliver Web pages written in HTML or XML to clients on network that request this service by sending an HTTP request.
- **Leading brands**: Apache and Microsoft.
- **Basic capabilities**: Security services, FTP, search engine, data capture.
- **Term Web server also used to refer to physical computer that runs Web server software**.
- **Specialized types** include database servers, ad servers, mail servers, video servers.
- **Web client**: Any computing device attached to the Internet that is capable of making HTTP requests and displaying HTML pages.

Web Browsers
- **Primary purpose** to display Web pages.
- **Internet Explorer (88%)** and Firefox (9%) dominate the market.
- **Other browsers** include:
  - Netscape
  - Opera
  - Safari (for Apple Macintosh)

The Internet and Web: Features
- Internet and Web features on which the foundations of e-commerce are built include:
  - E-mail
  - Instant messaging
  - Search engines
  - Intelligent agents (bots)
  - Chat
  - Music, video and other standard files
  - Streaming media
  - Cookies

E-mail
- Most used application of the Internet.
- Uses a series of protocols to enable messages containing text, images, sound, video clips, etc. to be transferred from one Internet user to another.
- Also allows attachments (files attached to the e-mail message).
- Can be an effective marketing tool.
- Spam: unsolicited e-mail. A worsening problem.
Instant Messaging
- Fastest growing form of online human communication
- Displays words type on a computer almost instantly, and recipients can then respond immediately in the same way
- Different proprietary systems offered by AOL, MSN, Yahoo and Google

Search Engines
- Identifies Web pages that appear to match keywords (queries) entered by a user, and provides list of best matches based on one or more of a variety of techniques
- No longer simply search engines, but also shopping tools and advertising vehicles (search engine marketing)

Top Ten Search Engines

<table>
<thead>
<tr>
<th>Search Engine</th>
<th>Percentage of Searches</th>
<th>Percentage of Searches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google</td>
<td>46.2%</td>
<td>75 million</td>
</tr>
<tr>
<td>Yahoo</td>
<td>23.4%</td>
<td>95 million</td>
</tr>
<tr>
<td>MSN</td>
<td>11.4%</td>
<td>50 million</td>
</tr>
<tr>
<td>AOL</td>
<td>6.9%</td>
<td>44 million</td>
</tr>
<tr>
<td>Ask Jeeves</td>
<td>4.8%</td>
<td>35 million</td>
</tr>
</tbody>
</table>

Intelligent Agents (Bots)
- Software programs that gather and/or filter information on a specific topic and then provide a list of results
- Types include search bot, shopping bot, Web monitoring bot, news bot, chatterbot

How Google Works
1. A user enters a search query.
2. Google's Web servers retrieve the relevant pages. Google uses a complex algorithm to rank the pages. Each page is assigned a rank, which is based on the number of links pointing to it and the importance of those pages.
3. The user is presented with a list of relevant pages, ordered by rank.

Types of Web Bots

<table>
<thead>
<tr>
<th>Table 3.11, Page 175</th>
<th>Table 3.11, Page 175</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE</td>
<td>EXAMPLES</td>
</tr>
<tr>
<td>Search Bot</td>
<td>AskSmarts.com, WebWurks.com</td>
</tr>
<tr>
<td>Shopping Bot</td>
<td>MyBargains.com, OnlineStore.com</td>
</tr>
<tr>
<td>Web Monitoring Bot</td>
<td>WebWatch, WebMonitor.com</td>
</tr>
<tr>
<td>News Bot</td>
<td>NewsAlerts.com, SportAlerts.com</td>
</tr>
<tr>
<td>Chat Bot</td>
<td>Live (WorldLifeline.com), Live (WorldTalk.com), Mobile (WorldTalkWeb.com)</td>
</tr>
</tbody>
</table>
Insight on Technology: Chatterbots Get a Job: Virtual Reps

Class Discussion

"What are chatterbots? Why would any firm use them?"

Have you experienced a chatterbot on the Web or telephone? Was this a useful or helpful experience?

What are vReps? Why would a business use vReps?

Verity is now owned by Autonomy Corporation (autonomy.com)

Chatterbots are intelligent agents that can "converse" with a user over the Web

In workplace, commonly called "virtual representatives" and are viewed as one possible answer to customer service issues on Web

NativeMinds a leading provider of online virtual customer relations solutions, with a product called vReps

vReps are being used by Coca-Cola, Ragu, Ford, etc.

Other Internet and Web Features Relevant to E-commerce

Chat: Enables users to communicate via computer in real time (simultaneously); used in e-commerce to help develop community

Music, video, and other standard files: routinely used for marketing and advertising purposes

Streaming media: enables music, video and other large files to be sent to users in chunks so that when received and played, file comes through uninterrupted

Cookies: small text file stored on user's computer with information about the user that can be accessed by Web site the next time user returns to the site

Internet II and E-commerce: Emerging Features and Services

Weblogs (blogs): Personal Web page that typically contains a series of chronological entries by its author, and links to related Web pages

Really Simple Syndication (RSS): Program that allows users to have digital content automatically sent to them; typically used for news

Podcasting: Audio presentation stored as an audio file and available for download from Web

Internet II and E-commerce: Emerging Features and Services (cont'd)

Wiki: Web application that allows a user to easily add and edit content on a Web page

New music and Video services: Videocasts; digital video on demand; videocasts

Internet Telephony: Technologies that use Voice Over Internet Protocol (VOIP) and Internet’s packet-switched network to transmit voice and other forms of audio communication over the Internet

Internet II and E-commerce: Emerging Features and Services (cont'd)

Video conferencing

Online software and services: digital software libraries, distributed storage

M-commerce applications
The Growth of Internet Telephony

Figure 3.24, Page 180

Key IP Telephony Players

Table 3.12, Page 181

<table>
<thead>
<tr>
<th>COMPANY</th>
<th>SPECIALTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>NBDPhone</td>
<td>Network and equipment</td>
</tr>
<tr>
<td>Lucent</td>
<td>Equipment</td>
</tr>
<tr>
<td>Cisco</td>
<td>Equipment</td>
</tr>
<tr>
<td>Alcatel</td>
<td>Network and equipment</td>
</tr>
<tr>
<td>Allworx</td>
<td>Equipment</td>
</tr>
<tr>
<td>Avaya</td>
<td>Equipment</td>
</tr>
<tr>
<td>VoiceBac</td>
<td>Equipment</td>
</tr>
<tr>
<td>3Cares</td>
<td>Equipment</td>
</tr>
<tr>
<td>ABB</td>
<td>Equipment</td>
</tr>
<tr>
<td>North</td>
<td>Equipment</td>
</tr>
<tr>
<td>ITTIC</td>
<td>Service provider</td>
</tr>
<tr>
<td>Comvest</td>
<td>Network</td>
</tr>
<tr>
<td>AT&amp;T</td>
<td>Network</td>
</tr>
<tr>
<td>iBasis</td>
<td>Service provider</td>
</tr>
</tbody>
</table>

Internet II and E-commerce: Other Emerging Features and Services

- Digital libraries
- Distributed storage:
- Distance learning
- Digital video
- Video teleconferencing
- Tele-immersion
- M-commerce applications