

BUS 168 - Chapter 3

E-commerce Infrastructure: The Internet, Web, and Mobile Platform

The Internet: Technology Background

- Internet
 - Interconnected network of thousands of networks and millions of computers
 - Links businesses, educational institutions, government agencies, and individuals
- World Wide Web (Web)
 - One of the Internet's most popular services
- Provides access to billions, possibly trillions, of Web pages

The Evolution of the Internet: 1961–Present

- Innovation Phase, 1964–1974
 - Creation of fundamental building blocks
- Institutionalization Phase, 1975–1995
 - Large institutions provide funding and legitimization
- Commercialization Phase, 1995–present
 - Private corporations take over, expand Internet backbone and local service

The Internet: Key Technology Concepts

- Defined as network that:
 - Uses IP addressing
 - Supports TCP/IP
 - Provides services to users, in manner similar to telephone system
- Three important concepts:
 - Packet switching
 - TCP/IP communications protocol
 - Client/server computing

Packet Switching

- Slices digital messages into packets
- Sends packets along different communication paths as they become available
- Reassembles packets once they arrive at destination
- Uses routers
 - Special purpose computers that interconnect the computer networks that make up the Internet and route packets
 - Routing algorithms ensure packets take the best available path toward their destination
- Less expensive, wasteful than circuit-switching

TCP/IP

- Transmission Control Protocol (TCP)
 - Establishes connections among sending and receiving Web computers
 - Handles assembly of packets at point of transmission, and reassembly at receiving end

- Internet Protocol (IP)
 - Provides the Internet's addressing scheme

Internet (IP) Addresses

- IPv4
 - 32-bit number
 - Four sets of numbers marked off by periods: 201.61.186.227
- IPv6 - 128-bit addresses, able to handle up to 1 quadrillion addresses (IPv4 can only handle 4 billion)

Domain Names, DNS, and URLs

- Domain name
 - IP address expressed in natural language
- Domain name system (DNS)
 - Allows numeric IP addresses to be expressed in natural language
- Uniform resource locator (URL)
 - Address used by Web browser to identify location of content on the Web

Client/Server Computing

- Powerful personal computers (clients) connected in network with one or more servers
- Servers perform common functions for the clients
 - Storing files
 - Software applications
 - Access to printers, etc.

The New Client: The Mobile Platform

- In a few years, primary Internet access will be through:
 - Tablets
 - Supplementing PCs for mobile situations
 - Smartphones
 - Disruptive technology

Cloud Computing

- Firms and individuals obtain computing power and software over Internet
 - e.g.: Google Apps
- Fastest growing form of computing
- Radically reduces costs of:
 - Building and operating Web sites
 - Infrastructure, IT support
- Hardware, software

Other Internet Protocols and Utility Programs

- Internet protocols -
 - HTTP
 - E-mail: SMTP, POP3, IMAP
 - FTP, Telnet, SSL/TLS

The Internet Today

- Internet growth has boomed without disruption because of:
 - Client/server computing model
 - Hourglass, layered architecture
 - Network Technology Substrate
 - Transport Services and Representation Standards
 - Middleware Services
 - Applications

Internet Network Architecture

- Backbone
 - High-bandwidth fiber-optic cable networks
 - Private networks owned by a variety of NSPs
 - Bandwidth: 155 Mbps–2.5 Gbps
 - Built-in redundancy
- IXPs
 - Hubs where backbones intersect with regional and local networks, and backbone owners connect with one another
- CANs
- LANs operating within a single organization that leases Internet access directly from regional or national carrier

Internet Service Providers (ISPs)

- Provide lowest level of service to individuals, small businesses, some institutions
- Types of service
 - Narrowband (dial-up)
 - Broadband
 - Digital Subscriber Line (DSL)
 - Cable modem
 - T1 and T3
 - Satellite

Intranets and Extranets

- Intranet
 - TCP/IP network located within a single organization for communications and processing
- Extranet
 - Formed when firms permit outsiders to access their internal TCP/IP networks

Who Governs the Internet?

- Organizations that influence the Internet and monitor its operations include:
 - 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)
- International Telecommunications Union (ITU)

The Internet2 Project

- Consortium of 350+ institutions collaborating to facilitate revolutionary Internet technologies
- Primary goals:
 - Create leading-edge very-high speed network for national research community
 - Enable revolutionary Internet applications
- Distributed and collaborative computing environments for sciences, health, arts and humanities initiatives

Fiber Optics and the Bandwidth - Explosion in the First Mile

- “First mile”: Backbone Internet services that carry bulk traffic over long distances
- Older transmission lines being replaced with fiber-optic cable
- Much of fiber-optic cable laid in United States is “dark,” but represents a vast digital highway that can be utilized in the future
- Technology improvement has also expanded capacity of existing fiber lines

The Last Mile: Mobile Wireless Internet Access

- “Last mile”: From Internet backbone to user’s computer, smartphone, etc.
- Two different basic types of wireless Internet access:
 - Telephone-based (mobile phones, smartphones)
- Computer network-based

Telephone-based Wireless Internet Access

- Evolution:
 - 3G cellular networks: next generation, packet-switched
 - 3.5G (3G+)

- 4G (WiMax, LTE)

Wireless Internet Access Network Technologies

- Wi-Fi
 - High-speed, fixed broadband wireless LAN (WLAN). 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

The Future Internet

- Latency solutions
- Guaranteed service levels and lower error rates
- Declining costs
- The Internet of Things (IoT)
 - Objects connected via sensors/RFID to the Internet
 - Spearheaded by EU and China
- IBM's Smarter Planet initiative

The Web

- 1989–1991: Web invented
 - Tim Berners-Lee at CERN
 - HTML, HTTP, Web server, Web browser
- 1993: Mosaic Web browser with GUI
 - Marc Andreessen and others at NCSA
 - Runs on Windows, Macintosh, or Unix
- 1994: Netscape Navigator, first commercial Web browser
 - Andreessen, Jim Clark
- 1995: Microsoft Internet Explorer

Hypertext

- Text formatted with embedded links
 - Links connect documents to one another, and to other objects such as sound, video, or animation files
- Uses Hypertext Transfer Protocol (HTTP) and URLs to locate resources on the Web

Markup Languages

- Hypertext Markup Language (HTML)
 - Fixed set of pre-defined markup “tags” used to format text
 - Controls look and feel of Web pages

- HTML5 the newest version
- eXtensible Markup Language (XML)
 - Designed to describe data and information
- Tags used are defined by user

Web Servers and Web Clients

- Web server software
 - Enables a computer to deliver Web pages to clients on a network that request this service by sending an HTTP request
 - Apache, Microsoft IIS
 - Basic capabilities: Security services, FTP, search engine, data capture
- Web server
 - Web server software or physical server
 - Specialized servers: Database servers, ad servers, etc.
- 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 Microsoft Explorer and Edge, Mozilla Firefox, Google Chrome, Apple Safari

The Internet and Web: Features

- Features on which the foundations of e-commerce are built:
 - E-mail
 - Instant messaging
 - Search engines
 - Online forums and chat
 - Streaming media
- Cookies

E-mail

- Most used application of the Internet
- Uses series of protocols for transferring messages with text and attachments from one Internet user to another

Instant Messaging

- Displays words typed on a computer almost instantly, and recipients can respond immediately in the same way

Search Engines

- Identify Web pages that match queries based on one or more techniques
 - Keyword indexes, page ranking
- Also serve as:
 - Shopping tools
 - Advertising vehicles (search engine marketing)
 - Tool within e-commerce sites
- Outside of e-mail, most commonly used Internet activity

Online Forums and Chat

- Online forum
 - Also known as a message board, bulletin board, discussion board, discussion group, board or forum
 - Web application that enables Internet users to communicate with each other, although not in real time
 - Members visit online forum to check for new posts
- Online chat
 - Similar to IM, but for multiple users
- Typically, users log into chat room

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
- Allows users to begin playing media files before file is fully downloaded

Cookies

- Small text files deposited by Web site on user's computer to store information about user, accessed when user next visits Web site
- Can help personalize Web site experience
- Can pose privacy threat

Web 2.0 Features and Services

- Online Social Networks
 - Services that support communication among networks of friends, peers
- Blogs
 - Personal Web page of chronological entries
- Really Simple Syndication (RSS) -Program that allows users to have digital content automatically sent to their computers over the Internet
- Podcasting
 - Audio presentation stored as an audio file and available for download from Web

- Wikis
 - Allows user to easily add and edit content on Web page
- Music and video services
 - Online video viewing
- Digital video on demand

Web 2.0 Features and Services

- Internet telephony (VOIP)
 - Voice over Internet Protocol (VOIP) uses Internet to transmit voice communication
- Intelligent Personal Assistants
 - Software that interacts with the user through voice commands
 - Natural language, situational awareness, interactivity with various Web services

Mobile Apps

- Use of mobile apps continues to explode in 2012
 - 70% of mobile phone owners research products and services, 35% have made purchase
- Increased use/purchasing from tablets
- Platforms:
 - iPhone/iPad, Android, Blackberry
- App marketplaces:
- Google Play, Apple's App Store, RIM's App World, Windows Phone Marketplace