

E-commerce 2014

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Chapter 3

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

e Commerce Course :

Parts of Chapters

1.1 & 1.2,

5.1

8.1, 8.2 & 8.3

10.1

Complete Chapters

2, 3, 4, 6, 7 and 9



Agenda

- Internet: Technology Background
- Internet Today
- Future Internet Infrastructure
- Internet and Web: Features and Services
- Mobile Apps



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

- **Internet 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**



Packet Switching

I want to communicate with you.

Original text message

0010110110001001101110001101

Text message digitized into bits

01100010 10101100 11000011

Digital bits broken into packets

0011001 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

Figure 3.3, Page 117



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

■ Four TCP/IP layers

- ❖ Network interface layer
- ❖ Internet layer
- ❖ Transport layer
- ❖ Application layer

The TCP/IP Architecture and Protocol Suite

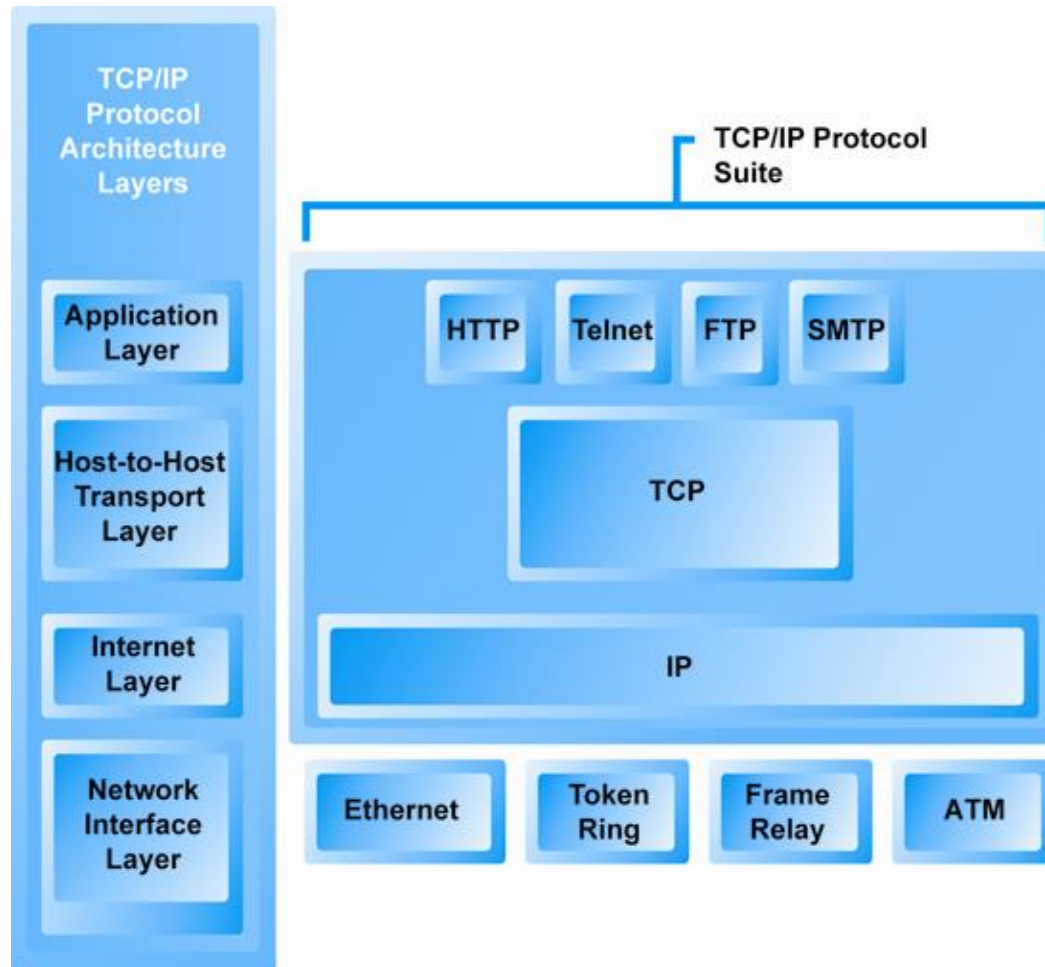


Figure 3.4, Page 119



Internet (IP) Addresses

■ IPv4

- ❖ 32-bit number
- ❖ Four sets of numbers marked off by periods:
201.61.186.227
 - Class C address: Network identified by first three sets, computer identified by last set

■ IPv6

- ❖ 128-bit addresses, able to handle up to 1 quadrillion addresses (IPv4 can handle only 4 billion)

Routing Internet Messages: TCP/IP and Packet Switching

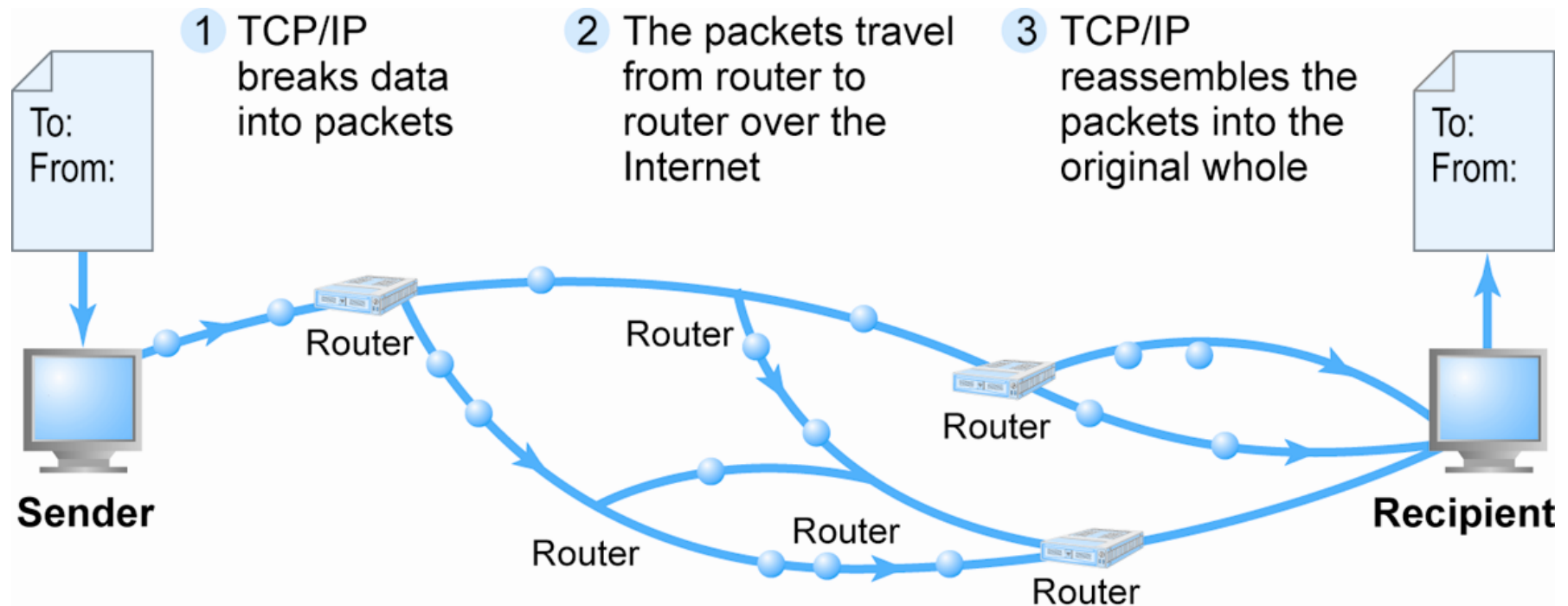


Figure 3.5, Page 120

**TABLE 2.4**

NAME	DESCRIPTION
COMPUTING SERVICES	
Elastic Compute Cloud (EC2)	Scalable cloud computing services
Elastic Load Balancing (ELB)	Distributes incoming application traffic among multiple EC2 instances
STORAGE SERVICES	
Simple Storage Service (S3)	Data storage infrastructure
Glacier	Low-cost archival and backup storage
DATABASE SERVICES	
DynamoDB	NoSQL database service
Redshift	Petabyte-scale data warehouse service
Relational Database Service (RDS)	Relational database service for MySQL, Oracle, SQL Server, and PostgreSQL databases
ElastiCache	In-memory cache in the cloud
SimpleDB	Non-relational data store



Amazon Web Services

NETWORKING AND CONTENT DELIVERY SERVICES

Route 53	DNS service in the cloud, enabling business to direct Internet traffic to web applications
Virtual Private Cloud (VPC)	Creates a VPN between the Amazon cloud and a company's existing IT infrastructure
CloudFront	Content delivery services
Direct Connect	Provides alternative to using the Internet to access AWS cloud services

ANALYTICS

Elastic MapReduce (EMR)	Web service that enables users to perform data-intensive tasks
Kinesis	Big Data service for real-time data streaming ingestion and processing



Search service that can be integrated by developers into applications

Queue for storing messages as they travel between computers



Amazon Web Services

DEPLOYMENT AND MANAGEMENT SERVICES

Identity and Access Management (IAM)

Enables securely controlled access to AWS services

CloudWatch

Monitoring service

Elastic Beanstalk

Service for deploying and scaling web applications and services developed with Java, .Net, PHP, Python, Ruby, and Node.js

CloudFormation

Service that allows developers an easy way to create a collection of related AWS resources

MOBILE

Cognito

Allows developers to securely manage and synchronize app data for users across mobile devices

Mobile Analytics

Can collect and process billions of events from millions of users a day



Amazon Web Services

PAYMENT SERVICES

Flexible Payment Service (FPS)

Payment services for developers

DevPay

Online billing and account management service for developers who create an Amazon cloud application

MISCELLANEOUS

Amazon Mechanical Turk

Marketplace for work that requires human intelligence

Alexa Web Information Service

Provides web traffic data and information for developers



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
- ❖ For example: `http://www.azimuth-interactive.com/flash_test`



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, and so on



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:
 - ❖ Shift in processors, operating systems
- 33% of all cell phones



Cloud Computing

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



Cloud Computing Models Compared

TABLE 2.5

CLOUD COMPUTING MODELS COMPARED

TYPE OF CLOUD	DESCRIPTION	MANAGED BY	USES
Public cloud	Third-party service offering computing, storage, and software services to multiple customers	Third-party service providers (CSPs)	Companies without major privacy concerns Companies seeking pay-as-you-go IT services Companies lacking IT resources and expertise
Private cloud	Cloud infrastructure operated solely for a single organization and hosted either internally or externally	In-house IT or private third-party host	Companies with stringent privacy and security requirements Companies that must have control over data sovereignty
Hybrid cloud	Combination of private and public cloud services that remain separate entities	In-house IT, private host, third-party providers	Companies requiring some in-house control of IT that are also willing to assign part of their IT infrastructures to a public cloud partition on their IT infrastructures



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

The Hourglass Model of the Internet

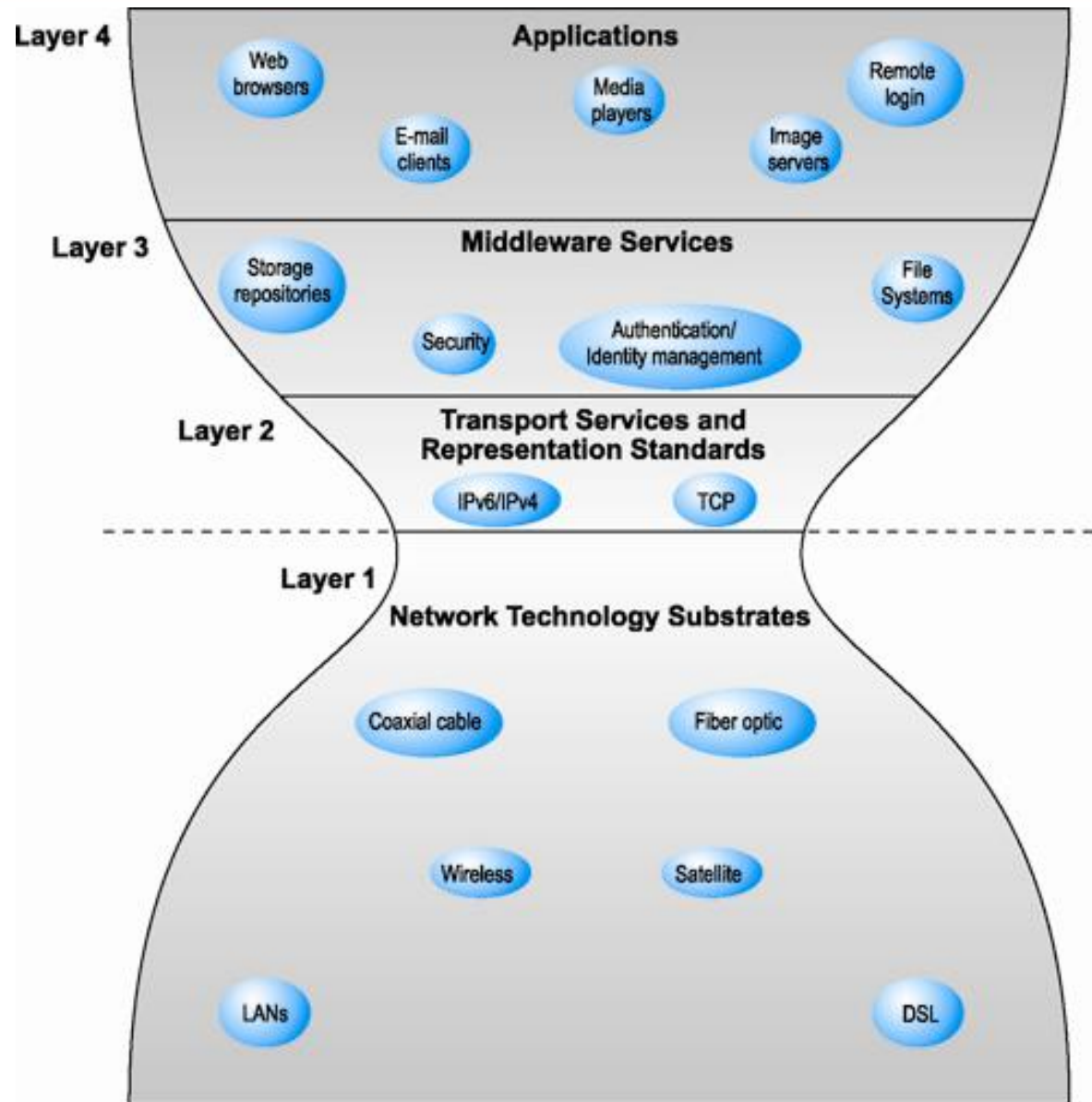


Figure 3.11, Page 128



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 – Internet Exchange Points

- ❖ Hubs where backbones intersect with regional and local networks, and backbone owners connect with one another

■ CANs – Campus Area Networks

- ❖ LANs operating within a single organization that leases Internet access directly from regional or national carrier

Internet Network Architecture

MAEs – Metropolitan Area
Exchange

NAPs – Network Access Points

POP – Post Office Protocol

SMTP– Simple Mail Transfer
Protocol

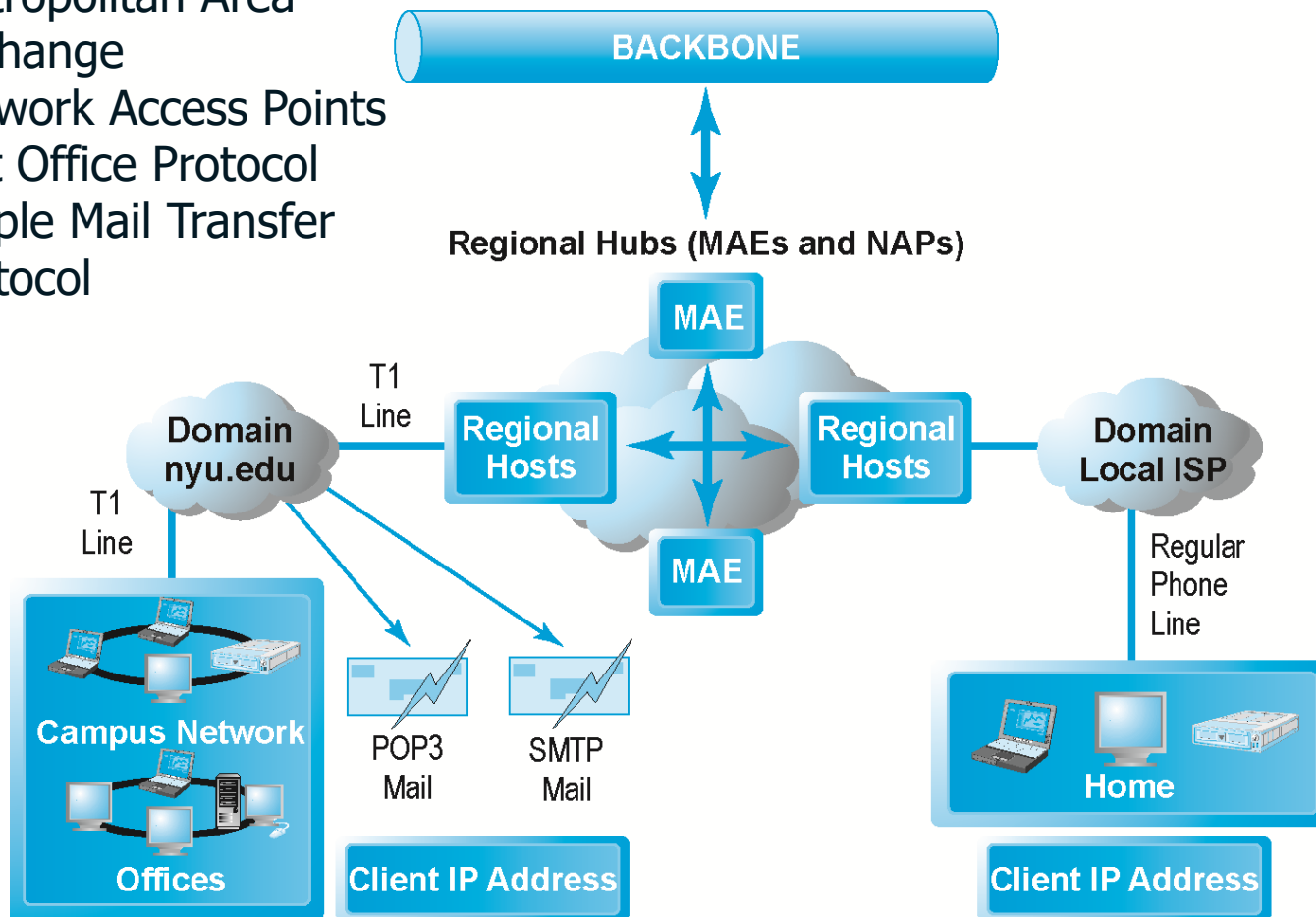


Figure 3.12, Page 129



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

■ Intranet

- ❖ TCP/IP network located within a single organization for communications and processing
- ❖ Used by private and government organizations for internal networks
- ❖ All Internet applications can be used in private intranets



Who Governs the Internet?

■ Organizations that influence the Internet and monitor its operations include:

- ❖ Internet Corporation for Assigned Names and Numbers (ICANN)
- ❖ Internet Assigned Numbers Authority (IANA)
- ❖ Internet Engineering Task Force (IETF)
- ❖ Internet Research Task Force (IRTF)
- ❖ Internet Engineering Steering Group (IESG)
- ❖ Internet Architecture Board (IAB)
- ❖ Internet Society (ISOC)
- ❖ Internet Governance Forum (IGF)
- ❖ World Wide Web Consortium (W3C)
- ❖ Internet Network Operators Groups (NOGs)



Insight on Society: Class Discussion

Government Regulation and Surveillance of the Internet

- How is it possible for any government to “control” or censor the Web?
- Does the Chinese government, or the U.S. government, have the right to censor content on the Web?
- How should U.S. companies deal with governments that want to censor content?
- What would happen to e-commerce if the existing Web split into a different Web for each country?



Limitations of the Current Internet

■ Bandwidth limitations

- ❖ Slow peak-hour service

■ Quality of service limitations

- ❖ Latency

■ Network architecture limitations

- ❖ Identical requests are processed individually

■ Wired Internet

- ❖ Copper and expensive fiber-optic cables



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



The First Mile and the Last Mile

■ GENI – (Global Environment for Network Innovations) Initiative

- ❖ Proposed by NSF (National Science Foundation) to develop new core functionality for Internet

■ Most significant private initiatives

- ❖ Fiber optic trunk-line bandwidth - First mile
- ❖ Wireless Internet services - Last mile



Fiber Optics and the Bandwidth Explosion in the First Mile

- **“First mile”**: Backbone Internet services that carry bulk traffic over long distances
- **Fiber-optic cable**: hundreds of glass strands that use light to transmit data
 - ❖ Faster speeds and greater bandwidth
 - ❖ Thinner, lighter cables
 - ❖ Less interference
 - ❖ Better data security
- **Substantial investments in fiber optic by telecommunications firms in last decade**
 - ❖ Enable integrated phone, broadband access, video services



The Last Mile: Mobile Internet Access

- **“Last mile” : From Internet backbone to user’ s computer, smartphone, and so on**
- **Two different basic types of wireless Internet access:**
 - ❖ Telephone-based (mobile phones, smartphones)
 - ❖ Wireless local area network (WLAN)-based



Wireless Internet Access Network Technologies

■ Wi-Fi

- ❖ High-speed, fixed broadband wireless LAN (WLAN)
- ❖ Wireless access point (“hot spots”)
- ❖ Limited range but inexpensive
- ❖ For-profit Wi-Fi networks: Boingo, AT&T Wi-Fi Services

■ WiMax

- ❖ High-speed, medium range broadband wireless metropolitan area network

■ Bluetooth

- ❖ Personal connectivity between devices and to Internet
- ❖ Low-speed, short range connection

Wi-Fi Networks

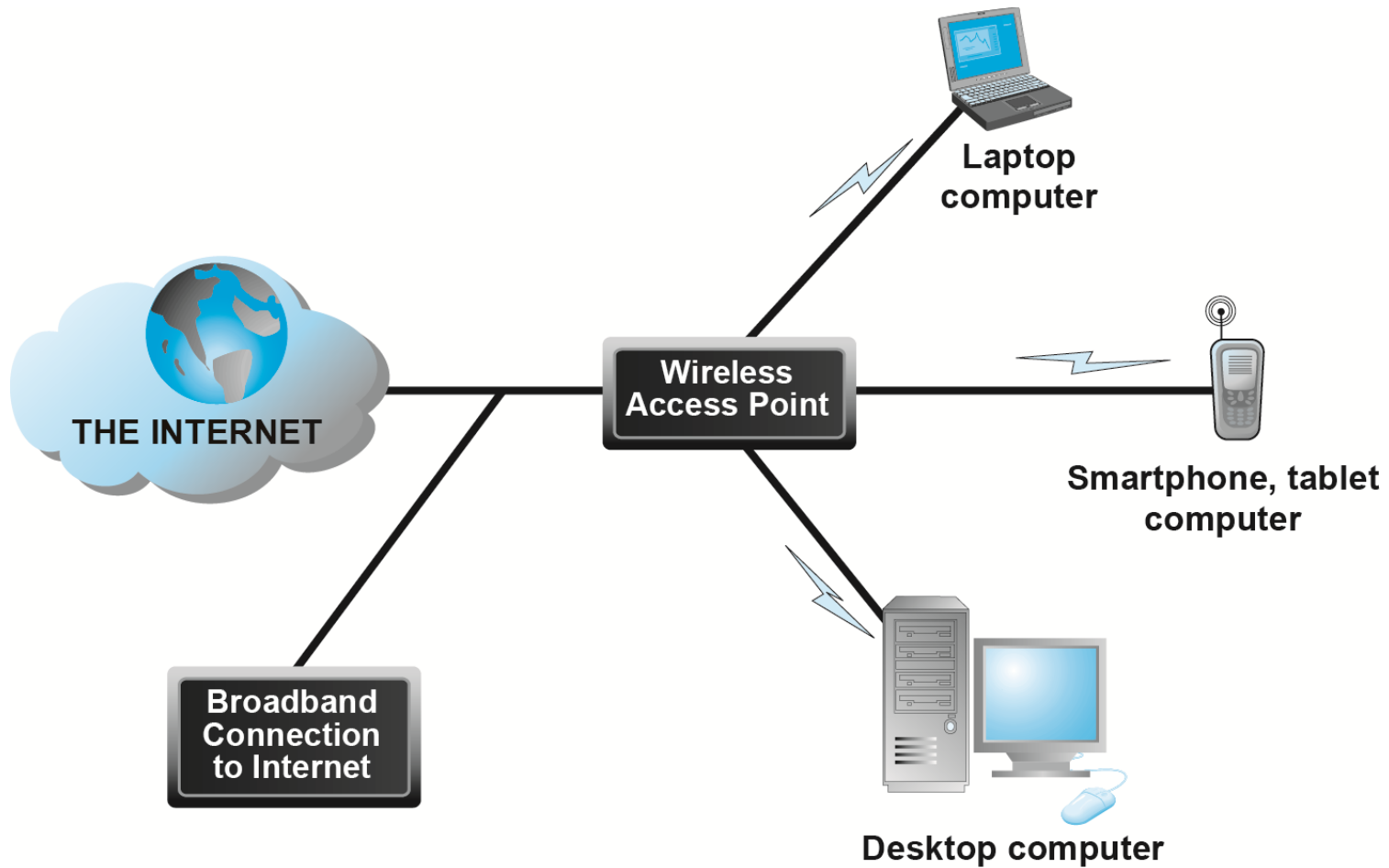


Figure 3.15, Page 145



The Future Internet

- **Latency solutions** (delay in service)
 - ❖ diffserv (differentiated quality of service)
- **Guaranteed service levels and lower error rates**
 - ❖ Ability to purchase the right to move data through network at guaranteed speed in return for higher fee
- **Declining costs**
- **The Internet of Things (IoT)**
 - ❖ Objects connected via sensors/RFID to the Internet
 - ❖ Spearheaded by EU and China



The Web

- **1989–1991: Web invented**
 - ❖ Tim Berners-Lee at CERN
 - ❖ HTML, HTTP, Web server, Web browser
- **1993: Mosaic Web browser w/GUI**
 - ❖ 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**
 - ❖ Example URL:
`http://megacorp.com/content/features/082602.html`



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

- ❖ May refer to either Web server software or physical server
- ❖ Specialized servers: Database servers, ad servers, and so on

■ 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—54% of market**
- **Mozilla Firefox—20%**
 - ❖ Open source
- **Other browsers**
 - ❖ Google Chrome—19%
 - ❖ Apple's Safari—5%



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**

How Google Works

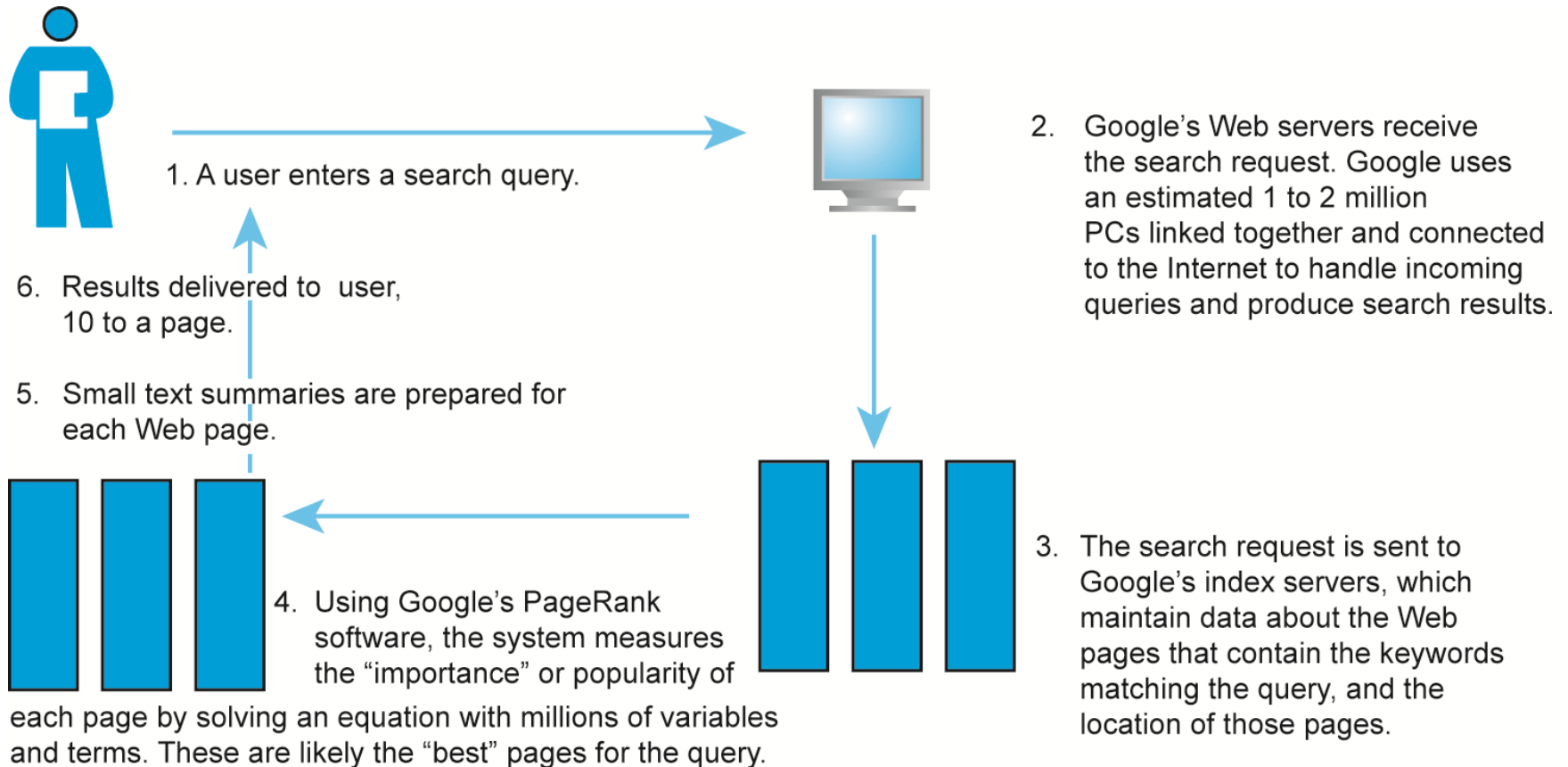


Figure 3.20, Page 161



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 one another, 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



Web 2.0 Features and Services

■ 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

■ Video conferencing, video chatting, and telepresence

■ Online software and Web services

- ❖ Web apps, widgets, and gadgets



Intelligent Personal Assistants

- **Software that interacts with the user through voice commands**
- **Features**
 - ❖ Natural language; conversational interface
 - ❖ Situational awareness
 - ❖ Interpret voice commands to interact with various Web services
- **Examples: Siri, Google Now**



Mobile Apps

■ Use of mobile apps has exploded

- ❖ More than 60% of online shoppers are mobile shoppers as well

■ Increased use/purchasing from tablets

■ Platforms

- ❖ iPhone/iPad (iOS), Android, Blackberry

■ App marketplaces

- ❖ Google Play, Apple's App Store, RIM's App World, Windows Phone Marketplace





Class Discussion

Google Glass: Augment My Reality

- **Have you used any augmented reality applications? If so, has it been useful; if not, is it a service that seems interesting? Why or why not?**
- **Are there any privacy issues raised by augmented reality applications?**
- **What are the potential benefits of augmented reality applications? Are there any disadvantages?**
- **What revenue models could work for providers of augmented services?**



Insight on Technology: Class Discussion

Is HTML5 Ready for Primetime?

- **What features of HTML5 are changing the way Web sites are built?**
- **Is HTML5 a disruptive technology, and if so, for whom?**
- **Are there any disadvantages in Web sites and mobile apps moving to an HTML5 platform?**



Insight on Technology: Class Discussion

Apps for Everything: The App Ecosystem

- **What are apps and why are they so popular?**
- **Do you use any apps regularly? Which ones, and what are their functions?**
- **What are the benefits of apps? The disadvantages?**
- **Are there any benefits/disadvantages to the proprietary nature of the Apple platform?**



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