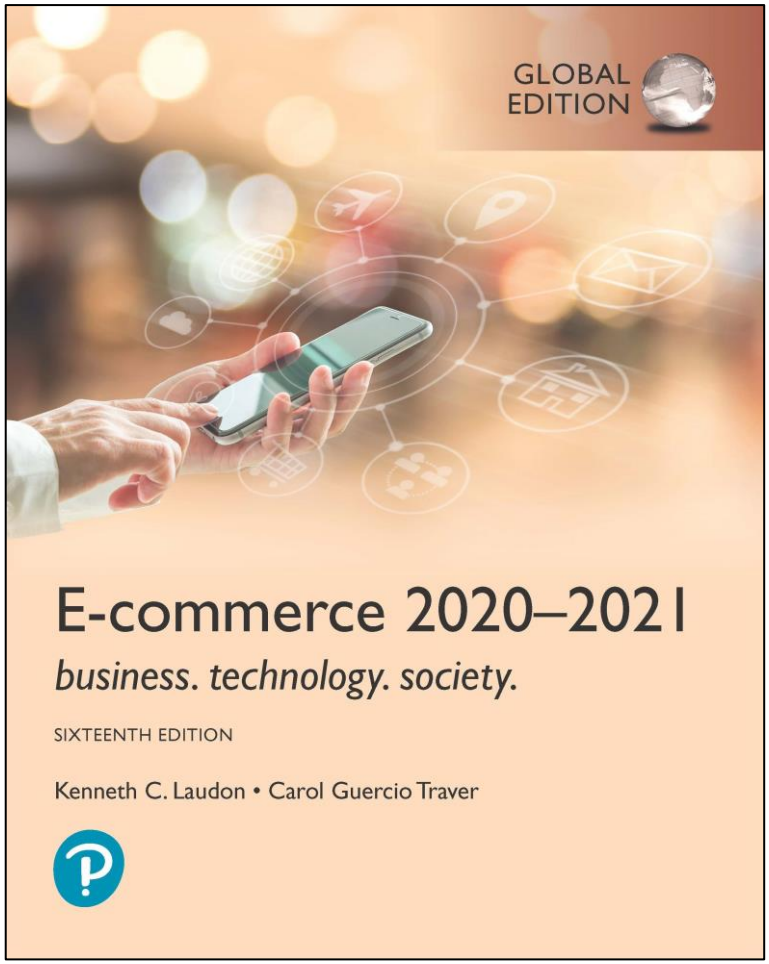
E-commerce 2020-2021: Business. Technology. Society.

Sixteenth Edition, Global Edition



Chapter 2

E-commerce
Infrastructure

Pearson

Learning Objectives

2.1 Discuss the origins of, and the key technology concepts behind, the Internet.

2.2 Explain the current structure of the Internet.

2.3 Understand how the Web works.

2.4 Describe how Internet and web features and services support e-commerce.

2.5 Understand the impact of mobile applications.

Tech Titans Target a Prize: Bringing Internet Access to Rural India

- Class Discussion
  - How can the business opportunities of rural India be assessed?
  - What is rural India's biggest potential?
  - Which of the various methods described for bringing the Internet to rural India do you feel might be most successful?

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, 1961–1974
  - 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

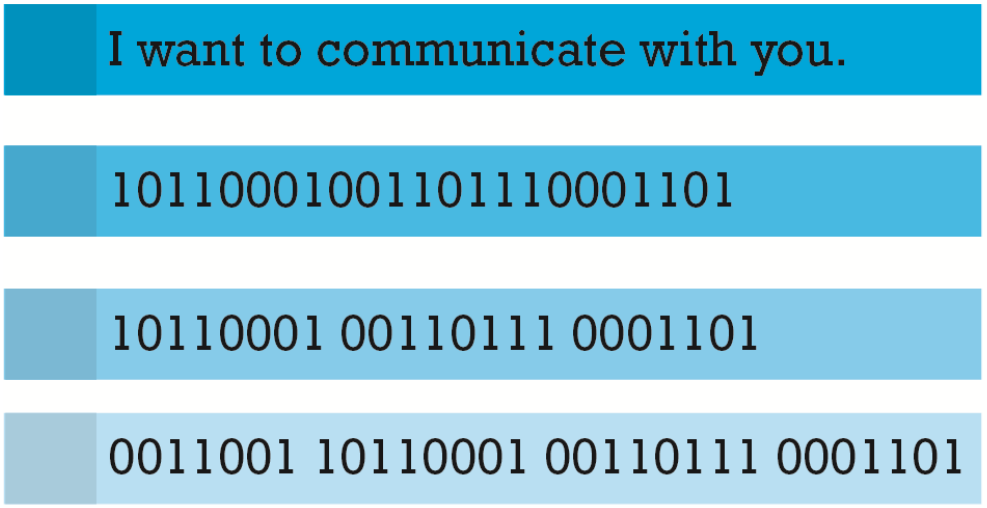
The Internet: Key Technology Concepts

- 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
- Less expensive, wasteful than circuit-switching

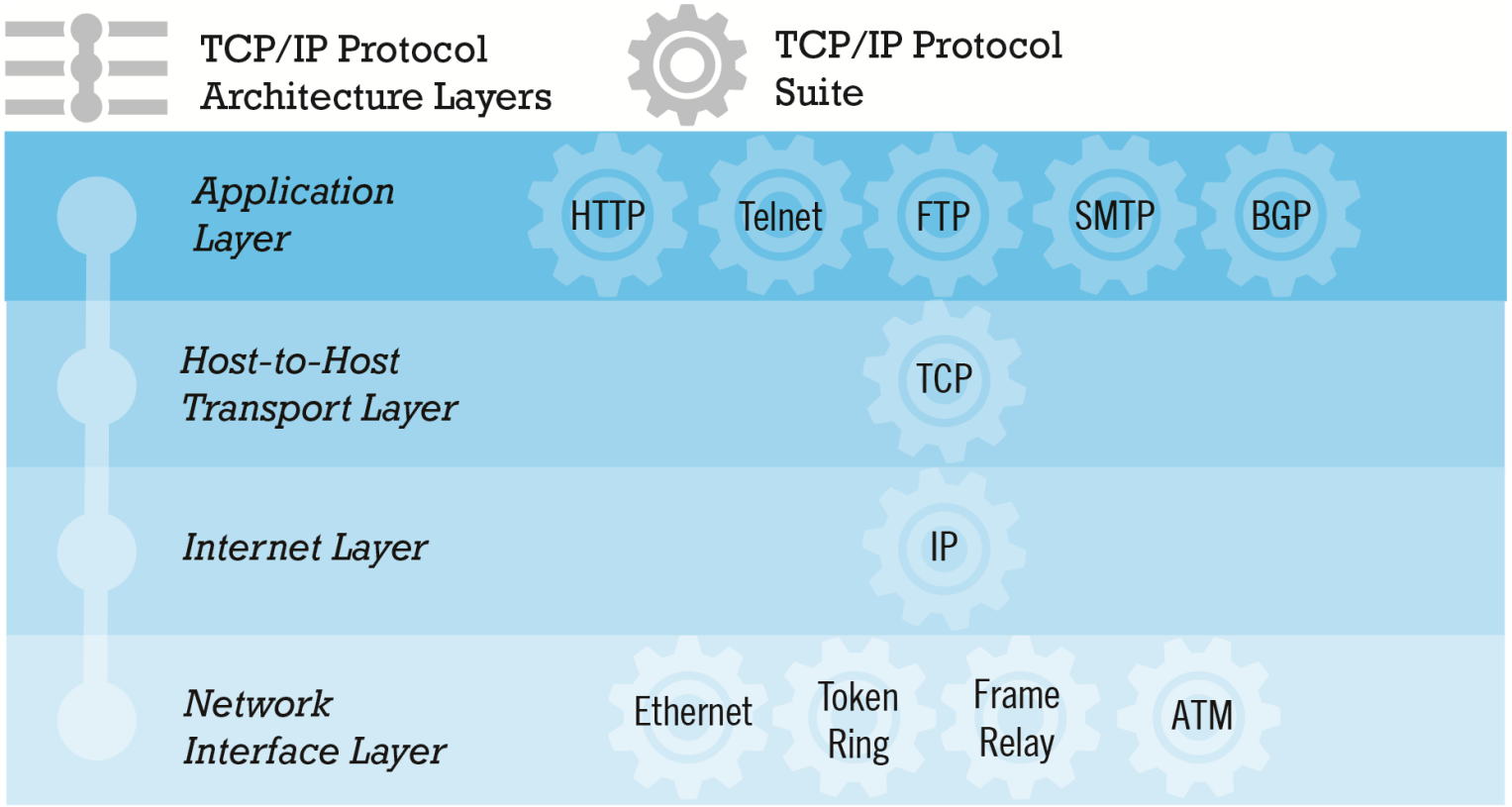
Figure 2.3 Packet Switching



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)
- Four TCP/IP layers
  - Network interface layer
  - Internet layer
  - Transport layer
  - Application layer

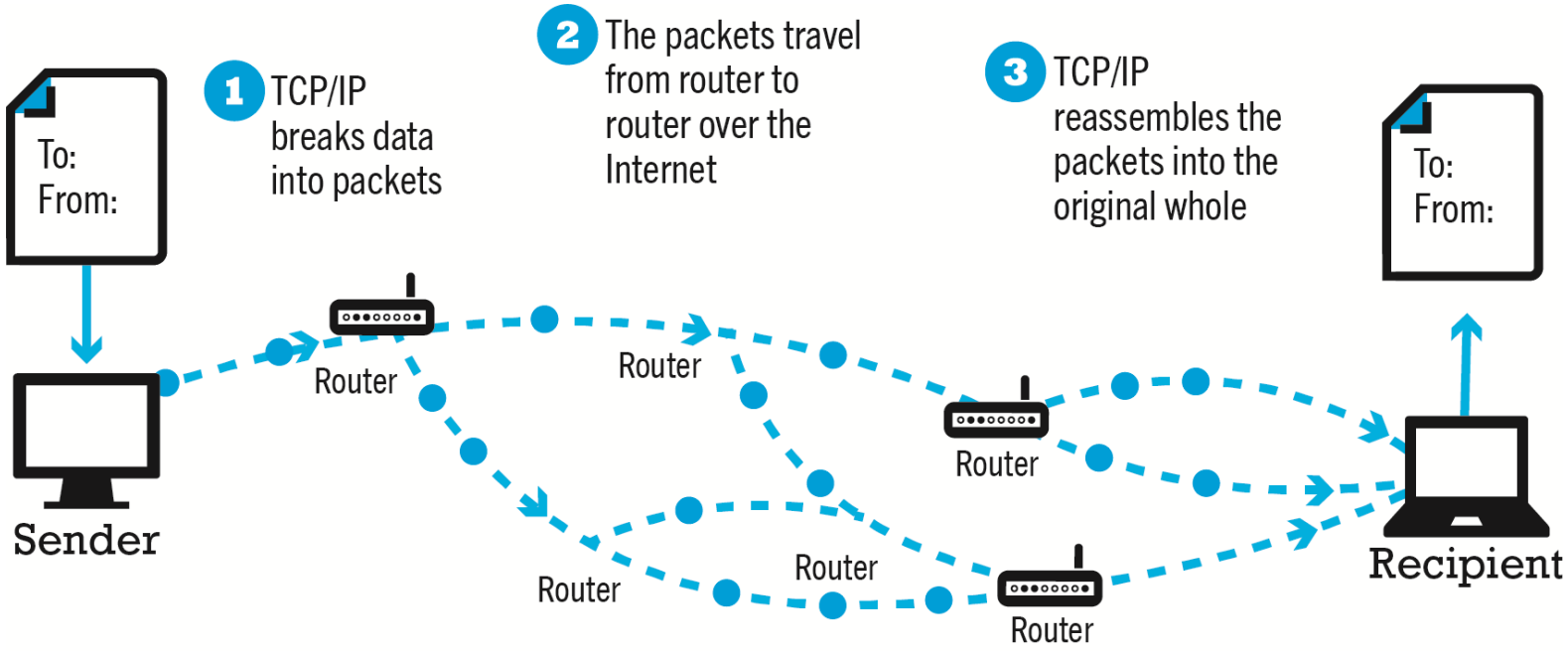
Figure 2.4 The TCP/IP Architecture and Protocol Suite



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)

Figure 2.5 Routing Internet Messages: TCP/IP and Packet Switching



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/

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 Mobile Platform

- Primary Internet access is now through tablets and smartphones
- Tablets supplement PCs for mobile situations
  - Over 160 million people in U.S. use Internet with tablets
- Smartphones are a disruptive technology
  - New processors and operating systems
  - Over 3.3 billion worldwide access Internet with smartphones

The Internet "Cloud Computing" Model (1 of 2)

- Firms and individuals obtain computing power and software over Internet
- Three types of services
  - Infrastructure as a service (IaaS)
  - Software as a service (SaaS)
  - Platform as a service (PaaS)
- Public, private, and hybrid clouds

The Internet "Cloud Computing" Model (2 of 2)

- Drawbacks
  - Security risks
  - Shifts responsibility for storage and control to providers
- Radically reduces costs of:
  - Building and operating websites
  - Infrastructure, IT support
  - Hardware, software

Other Internet Protocols and Utility Programs

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

Internet Infrastructure

- 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

Figure 2.10 The Hourglass Model of the Internet

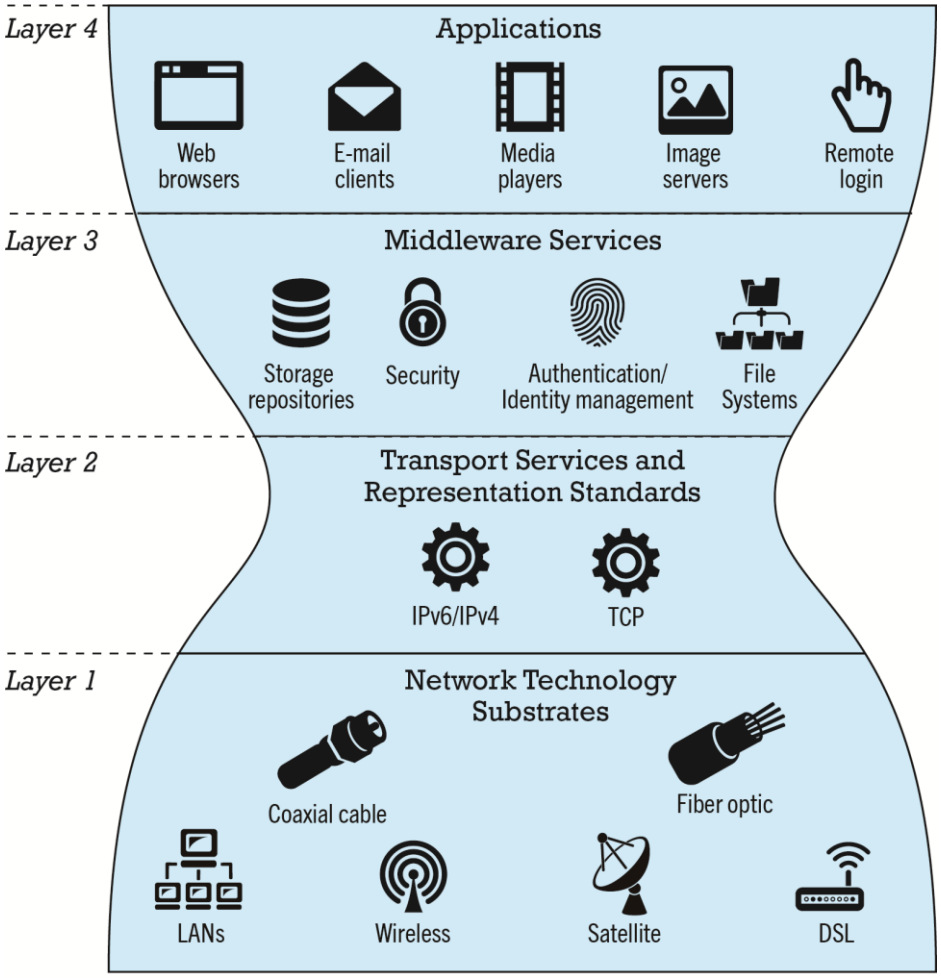
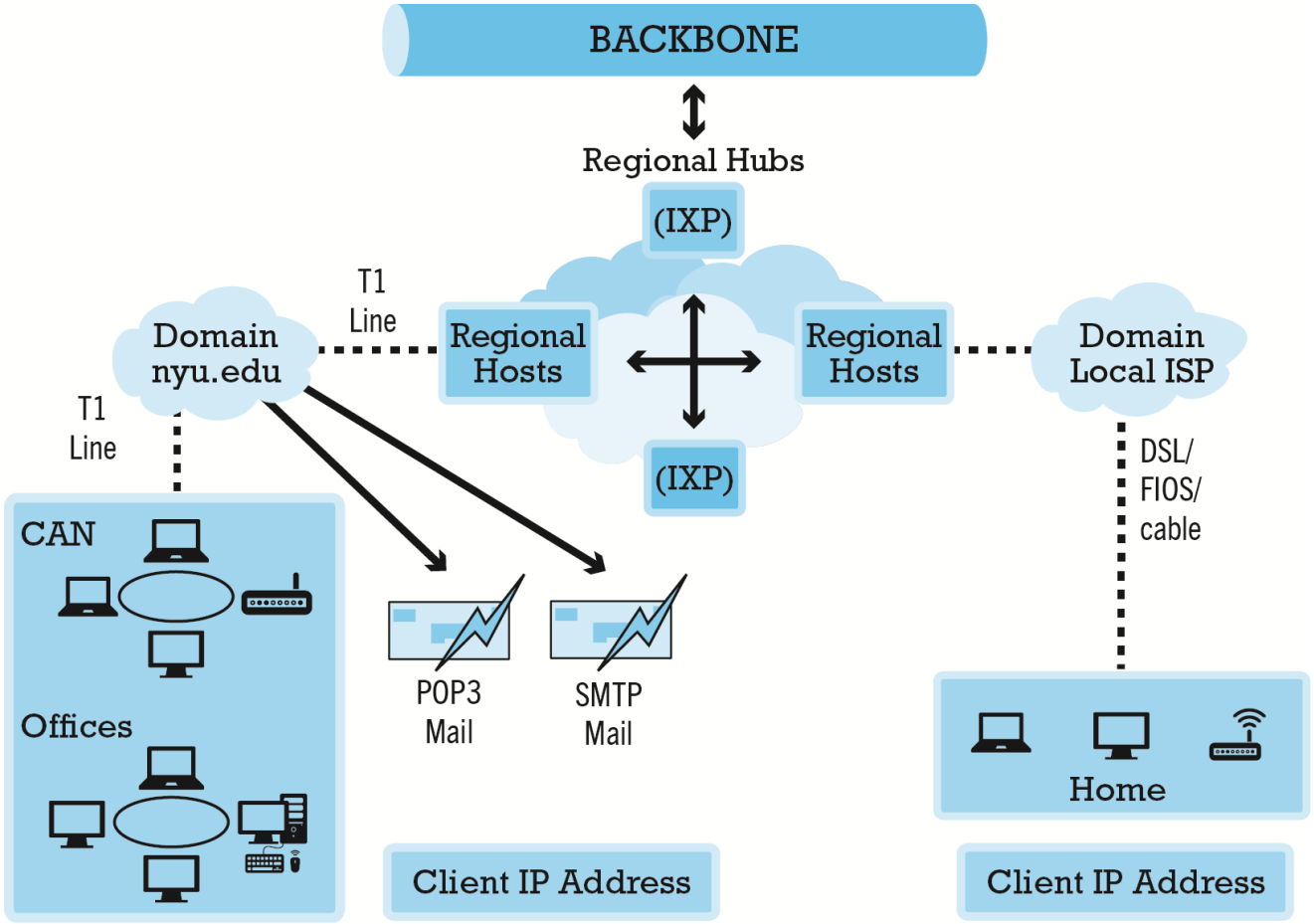


Figure 2.11 Internet Network Architecture



The Internet Backbone

- Comprised of 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
- Tier 1 Internet Service Providers (Tier 1 ISPs) or transit ISPs
- Numerous private networks physically connected to each other
- Undersea fiber optics, satellite links

Internet Exchange Points (IXPs)

- Regional hubs where Tier 1 ISPs physically connect with one another and with regional Tier 2 ISPs.
- Tier 2 ISPs provide Tier 3 ISPs with Internet access.
- Originally called Network Access Points (NAPs) or Metropolitan Area Exchanges (MAEs).

Tier 3 Internet Service Providers

- Retail providers
  - Lease Internet access to home owners, small businesses
  - Large providers: Comcast, Charter Spectrum, AT&T, Verizon, Altice (Optimum)
  - Smaller local providers
- Services
  - Narrowband
  - Broadband
  - Digital subscriber line (DSL)
  - Cable Internet
  - Satellite Internet

Campus/Corporate Area Networks

- Local area networks operating within single organization, such as NYU or Microsoft Corporation
- Lease Internet access directly from regional and national carriers

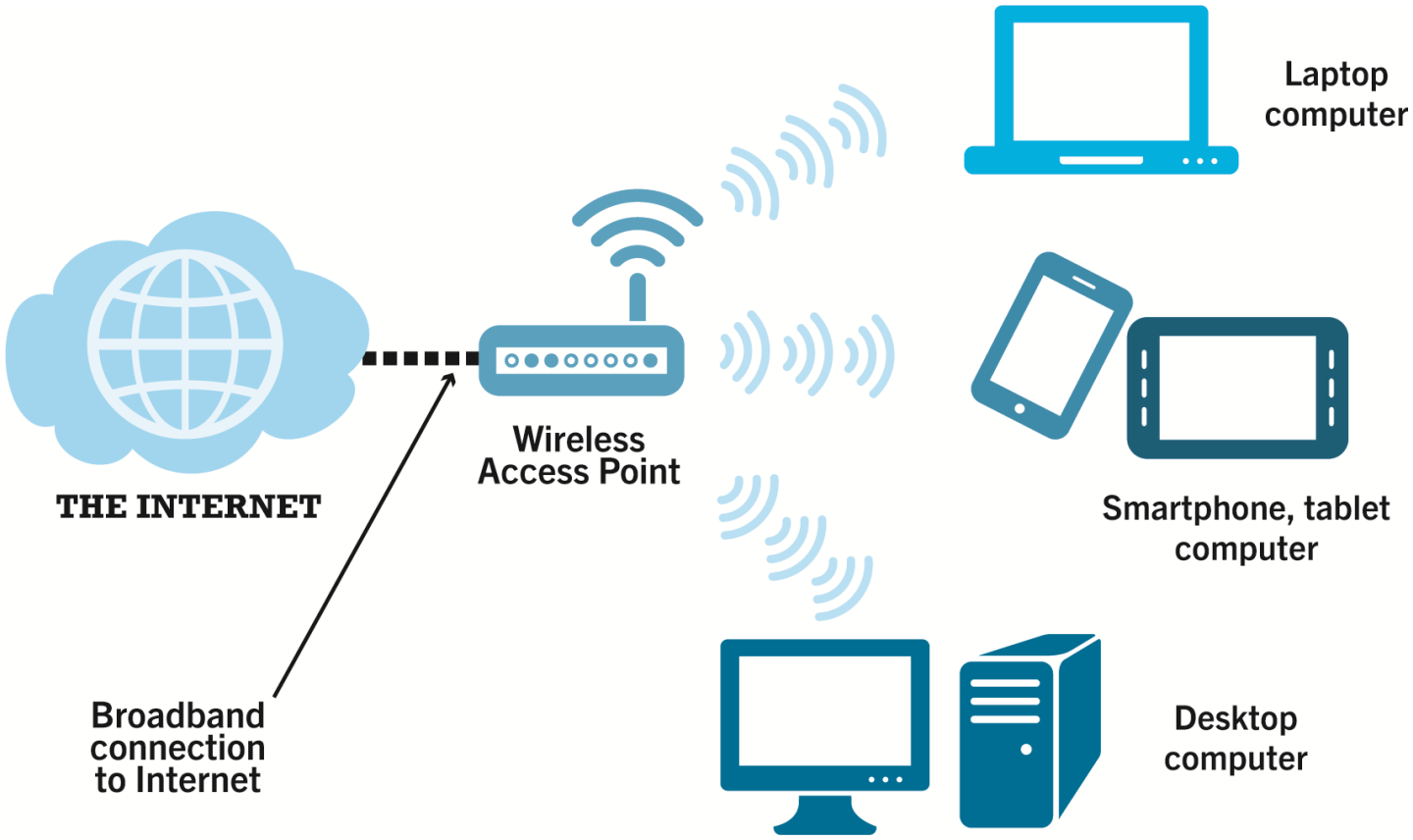
Mobile Internet Access

- Two basic types of wireless Internet access:
  - Telephone-based (mobile phones, smartphones)
  - Computer network-based (wireless local area network-based)
- Telephone-based wireless Internet access
  - Currently based on 3G and 4G technologies
  - 5G will provide higher bandwidth with speeds reaching 10 Gbps or more

Wireless Local Area Network (WLAN) - Based Internet Access

- Wi-Fi (various 802.11 standards)
  - High-speed, fixed broadband wireless LAN (WLAN)
  - Wireless access point (“hot spots”)
  - Limited range but inexpensive
- WiMax
- Bluetooth

Figure 2.13 Wi-Fi Networks



Other Innovative Internet Access Technologies: Drones, Balloons, and White Space

- Google: Project Loon
- Facebook: Facebook Connectivity Lab/Acquila drone
- Microsoft: Airband Initiative (white spaces)

The Internet of Things (IOT)

- Objects connected via sensors/RFID to the Internet
- “Smart things”
- Interoperability issues and standards
- Security and privacy concerns

Insight on Business: The Apple Watch: Bringing the Internet of Things to Your Wrist

- Class Discussion
  - Are you or anyone you know using the Apple Watch? If not, why not? If so, what apps do you use most?
  - What are the potential benefits of wearable technology? Are there any disadvantages?
  - What effects will features like the Apple Pay button and Taptic Engine have?
  - Are there any privacy issues raised by wearable technology?

Who Governs the Internet?

- Organizations that influence the Internet and monitor its operations include:
  - Internet Corporation for Assigned Names and Numbers (ICANN)
  - 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: Government Regulation and Surveillance of the Internet

- Class discussion:
  - 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 online content?
  - 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?

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
- 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
  - Used in conjunction with Cascading Style Sheets (CSS)
  - 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
  - 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 is to display web page, but may include added features
  - Google's Chrome: more than 67% and 64% of the desktop and mobile markets, respectively
    - Open source
  - Internet Explorer: 8% of desktop, >1% mobile
  - Microsoft Edge: 5% of desktop
  - Mozilla Firefox: 9% desktop, >1% mobile
    - Open source
  - Apple's Safari: 4% desktop, 27% mobile

The Internet and Web: Features

- Features on which the foundations of e-commerce are built:
  - Communication tools
  - Search engines
  - Downloadable and streaming media
  - Web 2.0 applications and services
  - Virtual reality and augmented reality
  - Intelligent digital assistants

Communication Tools

- E-mail
  - Most used application of the Internet
- Messaging Applications
  - Instant messaging
- Online message boards
- Internet telephony
  - VOIP
- Video conferencing, video chatting, telepresence

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
- Top three providers: Google, Bing, Yahoo (Oath)

Figure 2.17 How Google Works

Downloadable and Streaming Media

- Downloads:
  - Growth in broadband connections enables large media file downloads
- Streaming technologies
  - Enables music, video, and other large files to be sent to users in chunks so that the file can play uninterrupted
- Podcasting
- Explosion in online video viewing

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
  - Enables web page publishing with no knowledge of HTML
- Wikis
  - Enables documents to be written collectively and collaboratively
  - E.g. Wikipedia

Virtual Reality and Augmented Reality

- Virtual reality (VR)
  - Immersing users within virtual world
  - Typically uses head-mounted display (HMD)
  - Oculus Rift, Vive, PlayStation VR
- Augmented reality (AR)
  - Overlaying virtual objects over the real world, via mobile devices or HMDs
  - Pokémon GO

Insight on Technology: Leaping into the Future with AR and VR

- Class Discussion
  - What are some of the challenges to the widespread adoption of AR and VR?
  - Why are major players such as Facebook, Google, Apple, Amazon, and telecommunications companies so interested in AR and VR applications?
  - Have you used any e-commerce-related AR or VR applications? If you have, did you find them to be useful? What did you like about them? What didn't you like?

Intelligent Digital Assistants

- Computer search engine using:
  - Natural language
  - Conversational interface, verbal commands
  - Situational awareness
- Can handle requests for appointments, flights, routes, event scheduling, and more.
  - Examples:
    - Apple’s Siri
    - Google Now
    - Google Assistant

Mobile Apps

- Use of mobile apps has exploded
  - Most popular entertainment media, over TV
  - Always present shopping tool
  - Almost all top 100 brands have an app
- Platforms
  - iPhone/iPad (iOS), Android
- App marketplaces
  - Google Play, Apple's App Store, Amazon's Appstore

Careers in E-commerce

- Position: E-commerce Specialist
- Qualification/Skills
- Preparing for the Interview
- Possible Interview Questions

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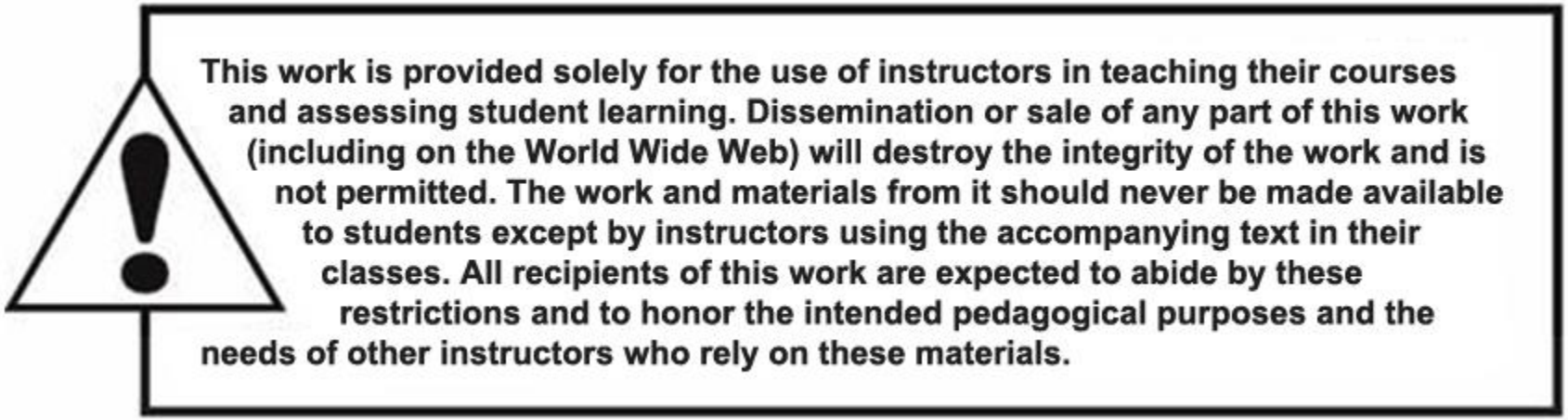

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