WEB DEVELOPMENT & DESIGN FOUNDATIONS WITH HTML5

8TH EDITION

TERRY FELKE-MORRIS

8th Edition

Web Development and Design Foundations with HTML5

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Preface

Web Development and Design Foundations with HTML5 is intended for use in a beginning web development course. This textbook introduces HTML and CSS topics such as text configuration, color configuration, and page layout, with an enhanced focus on the topics of design, accessibility, and Web standards. The text covers the basics that web developers need to build a foundation of skills:

- Internet concepts
- Creating web pages with HTML5
- Configuring text, color, and page layout with Cascading Style Sheets (CSS)
- Web design best practices
- Accessibility standards
- The web development process
- Using media and interactivity on web pages
- New CSS3 properties
- Website promotion and search engine optimization
- E-commerce and the Web
- JavaScript

A special feature of this text is the *Web Developer's Handbook*, which is a collection of appendixes that provide resources such as an HTML5 Reference, XHTML Reference, Comparison of XHTML and HTML5, Special Entity Character List, CSS Property Reference, WCAG 2.0 Quick Reference, FTP Tutorial, and web-safe color palette.

New to This Edition

Building on this textbook's successful seventh edition, new features for the eighth edition include the following:

- Updated coverage of HTML5 elements and attributes
- Expanded coverage of designing for mobile devices
- Expanded coverage of responsive web design techniques and CSS media queries
- Expanded coverage of responsive image techniques including the new HTML5 picture element
- Introduction of CSS coding techniques for dynamic menus
- Updated reference sections for HTML5 and CSS
- Additional Hands-On Practice exercises

- A new case study
- Updated code samples, case studies, and web resources

Student files are available for download from the companion website for this textbook at http://www.pearsonhighered.com/felke-morris. These files include solutions to the Hands-On Practice exercises, the Website Case Study starter files, and access to the book's companion VideoNotes. See the access card in the front of this textbook for further instructions.

Design for Today and Tomorrow

This textbook has a modern approach that prepares students to design web pages that work today, in addition to being ready to take advantage of the new HTML5 and CSS3 coding techniques of the future.

Organization of the Text

This textbook is designed to be used in a flexible manner; it can easily be adapted to suit a variety of course and student needs. Chapter 1 provides introductory material, which may be skipped or covered, depending on the background of the students. Chapters 2 through 4 introduce HTML and CSS coding. Chapter 5 discusses web design best practices and can be covered anytime after Chapter 3 (or even along with Chapter 3). Chapters 6 through 9 continue with HTML and CSS.

Any of the following chapters may be skipped or assigned as independent study, depending on time constraints and student needs: Chapter 7 (More on Links, Layout, and Mobile), Chapter 10 (Web Development), Chapter 11 (Web Multimedia and Interactivity), Chapter 12 (E-Commerce Overview), Chapter 13 (Web Promotion), and Chapter 14 (A Brief Look at JavaScript and jQuery). A chapter dependency chart is shown in Figure P.1.

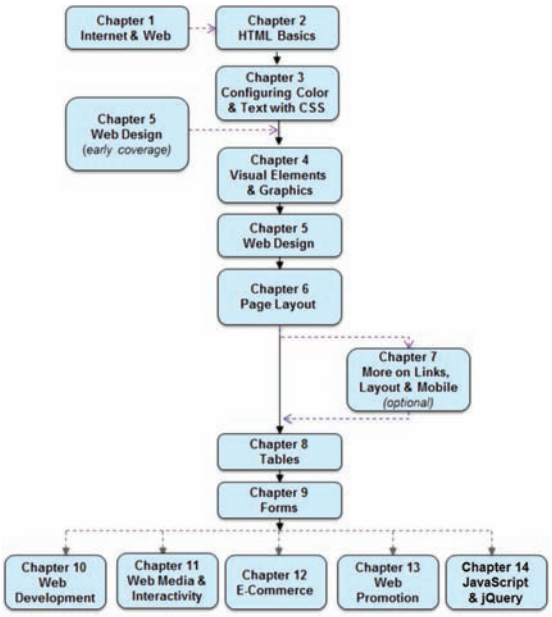

Figure P.1 This textbook is flexible and can be adapted to individual needs

Brief Overview of Each Chapter

Chapter 1: Introduction to the Internet and World Wide Web This brief introduction covers the terms and concepts related to the Internet and the Web with which Web developers need to be familiar. For many students, some of this will be a review. Chapter 1 provides the base of knowledge on which the rest of the textbook is built.

Chapter 2: HTML Basics As HTML5 is introduced, examples and exercises encourage students to create sample pages and gain useful experience. Solution pages for the Hands-On Practice are available in the student files.

Chapter 3: Configuring Color and Text with CSS The technique of using Cascading Style Sheets to configure the color and text on web pages is introduced. Students are encouraged to create sample pages as they read through the text. Solutions for the Hands-On Practice are available in the student files.

Chapter 4: Visual Elements and Graphics This chapter discusses the use of graphics and visual effects on web pages, including image optimization, CSS borders, CSS image backgrounds, new CSS3 visual effects, and new HTML5 elements. Students are encouraged to create web pages as they read through the text. Sample solutions for the Hands-On Practice are available in the student files.

Chapter 5: Web Design This chapter focuses on recommended web design practices and accessibility. Some of this is reinforcement because tips about recommended website design practices are incorporated into the other chapters.

Chapter 6: Page Layout This chapter continues the study of CSS begun earlier and introduces techniques for positioning and floating web page elements, including a two-column CSS page layout. New HTML5 semantic elements and techniques to provide HTML5 compatibility for older browsers are also introduced. Sample solutions for the Hands-On Practice are available in the student files.

Chapter 7: More on Links, Layout, and Mobile This chapter revisits earlier topics and introduces more advanced techniques related to hyperlinks, using CSS sprites, a three-column page layout, configuring CSS for print, designing pages for the mobile web, responsive web design with CSS media queries, responsive images, and the new CSS3 Flexible Box Layout Module. Students are encouraged to create pages as they read through the text. Sample solutions for the Hands-On Practice are available in the student files.

Chapter 8: Tables This chapter focuses on the HTML elements used to create tables. Methods for configuring a table with CSS are introduced. Students are encouraged to create pages as they read through the text. Sample solutions for the Hands-On Practice are available in the student files.

Chapter 9: Forms This chapter focuses on the HTML elements used to create forms. Methods for configuring the form with CSS are introduced. New HTML5 form control elements and attribute values are introduced. Students are encouraged to create sample pages as they read through the text. Sample solutions for the Hands-On Practice are available in the student files.

Chapter 10: Web Development This chapter focuses on the process of website development, including the job roles needed for a large-scale project, the web development process, and web hosting. A web host checklist is included in this chapter.

Chapter 11: Web Multimedia and Interactivity This chapter offers an overview of topics related to adding media and interactivity to web pages. These topics include new HTML5 video and audio, Flash®, Java™ applets, new CSS3 transform and transition properties, interactive CSS menu, interactive image gallery, JavaScript, jQuery, Ajax, and new HTML5 APIs. Students are encouraged to create pages as the topics are discussed. Sample solutions for the Hands-On Practice are available in the student files.

Chapter 12: E-Commerce Overview This chapter introduces e-commerce, security, and order processing on the Web.

Chapter 13: Web Promotion This chapter discusses site promotion from the web developer's point of view and introduces search engine optimization.

Chapter 14: A Brief Look at JavaScript and jQuery This chapter provides an introduction to client-side scripting using JavaScript and jQuery. Sample solutions for the Hands-On Practice are available in the student files.

***Web Developer's Handbook* Appendixes:** This handbook contains appendixes that include resources and tutorials that are useful for students, such as an HTML5 Quick Reference, an XHTML Quick Reference, Special Entity Characters, a Comparison of XHTML and HTML5, a CSS Property Reference, a WCAG 2.0 Quick Reference, an FTP Tutorial, and a web-safe color palette.

Features of the Text

Well-Rounded Selection of Topics This text includes both "hard" skills such as HTML5, CSS, and JavaScript (Chapters 2, 3, 4, 6, 7, 8, 9, and 14) and "soft" skills such as web design (Chapter 5), website promotion (Chapter 13), and e-commerce (Chapter 12). This well-rounded foundation will help students as they pursue careers as web professionals. Students and instructors will find classes more interesting because they can discuss, integrate, and apply both hard and soft skills as students create web pages and websites.

Hands-On Practice Web development is a skill and skills are best learned by hands-on practice. This text emphasizes hands-on practice through exercises within the chapters, end-of-chapter exercises, and the development of websites through ongoing real-world case studies. The variety of exercises provides instructors with a choice of assignments for a particular course or semester.

Website Case Studies There are four case studies that continue throughout most of the text (starting with Chapter 2). An additional case study starts in Chapter 5. The case studies serve to reinforce the skills discussed in each chapter. Instructors can cycle assignments from semester to semester or allow students to choose the case study that most interests them. Sample solutions to the case studies are available for download from the Instructor Resource Center at http://www.pearsonhighered.com/irc.

Web Research Each chapter offers web research activities that encourage students to further study the topics introduced in the chapter.

Focus on Web Design Most chapters offer additional activities that explore the web design topics related to the chapter. These activities can be used to reinforce, extend, and enhance the course topics.

FAQs In the author's web development courses, she is frequently asked similar questions by students. They are included in this textbook and are marked with the identifying FAQ logo.

Checkpoints Each chapter contains two or three Checkpoints, which are groups of questions to be used by students to self-assess their understanding of the material. A special Checkpoint icon appears with each group of questions.

Focus on Accessibility Developing accessible websites is more important than ever and this textbook is infused with accessibility techniques throughout. The special icon shown here makes accessibility information easy to find.

Focus on Ethics Ethics issues related to web development are highlighted throughout the textbook and are marked with the special ethics icon shown here.

Reference Materials The appendixes in the *Web Developer's Handbook* offer reference materials, including an HTML5 Quick Reference, an XHTML Quick Reference, Special Entity Characters, Comparison of XHTML and HTML5, a CSS Property Reference, a WCAG 2.0 Quick Reference, an FTP Tutorial, and a Web-Safe Color Palette.

VideoNotes VideoNotes are Pearson's new visual tool designed for teaching students key programming concepts and techniques. These short step-by-step videos demonstrate how to solve problems from design through coding. VideoNotes allow for self-placed instruction with easy navigation including the ability to select, play, rewind, fast-forward, and stop within each VideoNote exercise.

Margin icons in your textbook let you know when a VideoNote video is available for a particular concept or homework problem.

Supplemental Materials

Student Resources The student files for the web page exercises, Website Case Study assignments, and access to the book's VideoNotes are available to all readers of this textbook at its companion website http://www.pearsonhighered.com/felke-morris. A complimentary access code for the companion website is available with a new copy of this textbook. Subscriptions may also be purchased online.

Instructor Resources The following supplements are available to qualified instructors only. Visit the Pearson Instructor Resource Center (http://www.pearsonhighered.com/irc) or send an e-mail to computing@aw.com for information on how to access them:

- Solutions to the end-of-chapter exercises
- Solutions for the case study assignments

- Test questions
- PowerPoint® presentations
- Sample syllabi

Author's Website In addition to the publisher's companion website for this textbook, the author maintains a website at http://www.webdevfoundations.net. This website contains additional resources, including review activities and a page for each chapter with examples, links, and updates. This website is not supported by the publisher.

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About the Author

Terry Ann Felke-Morris is a Professor Emerita of Computer Information Systems at William Rainey Harper College in Palatine, Illinois. She holds a Doctor of Education degree, a Master of Science degree in information systems, and numerous certifications, including Adobe Certified Dreamweaver 8 Developer, WOW Certified Associate Webmaster, Microsoft Certified Professional, Master CIW Designer, and CIW Certified Instructor.

Dr. Felke-Morris has been honored with Harper College's Glenn A. Reich Memorial Award for Instructional Technology in recognition of her work in designing the college's Web Development program and courses. In 2006, she received the Blackboard Greenhouse Exemplary Online Course Award for use of Internet technology in the academic environment. Dr. Felke-Morris received two international awards in 2008: the Instructional Technology Council's Outstanding e-Learning Faculty Award for Excellence and the MERLOT Award for Exemplary Online Learning Resources—MERLOT Business Classics.

With more than 25 years of information technology experience in business and industry, Dr. Felke-Morris published her first website in 1996 and has been working with the Web ever since. A long-time promoter of Web standards, she was a member of the Web Standards Project Education Task Force. Dr. Felke-Morris was instrumental in developing the Web Development certificate and degree programs at William Rainey Harper College. For more information about Dr. Terry Ann Felke-Morris, visit http://terrymorris.net.

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1

Introduction to the Internet and World Wide Web

Chapter Objectives

In this chapter, you will learn how to . . .

- Describe the evolution of the Internet and the Web
- Explain the need for web standards
- Describe universal design
- Identify benefits of accessible web design
- Identify reliable resources of information on the Web
- Identify ethical use of the Web
- Describe the purpose of web browsers and web servers
- Identify networking protocols
- Define URIs and domain names
- Describe HTML, XHTML, and HTML5
- Describe popular trends in the use of the Web

The Internet and the Web are parts of our daily lives. How did they begin? What networking protocols and programming languages work behind the scenes to display a web page? This chapter provides an introduction to some of these topics and is a foundation for the information that web developers need to know. You'll be introduced to Hypertext Markup Language (HTML), the language used to create web pages.

1.1 The Internet and the Web

The Internet

The **Internet**, the interconnected network of computer networks that spans the globe, seems to be everywhere today. It has become part of our lives. You can't watch television or listen to the radio without being urged to visit a website. Even newspapers and magazines have their place on the Internet.

Birth of the Internet

The Internet began as a network to connect computers at research facilities and universities. Messages in this network would travel to their destination by multiple routes, or paths. This configuration allowed the network to function even if parts of it were broken or destroyed. In such an event, the message would be rerouted through a functioning portion of the network while traveling to its destination. This network was developed by the Advanced Research Projects Agency (ARPA)—and the ARPAnet was born. Four computers (located at UCLA, Stanford Research Institute, University of California Santa Barbara, and the University of Utah) were connected by the end of 1969.

Growth of the Internet

As time went on, other networks, such as the National Science Foundation's NSFnet, were created and connected with the ARPAnet. Use of this interconnected network, or Internet, was originally limited to government, research, and educational purposes. The number of individuals accessing the Internet continues to grow each year. According to Internet World Stats (http://www.internetworldstats.com/emarketing.htm), the percentage of the global population that used the Internet was 0.4% in 1995, 5.8% in 2000, 15.7% in 2005, 28.8% in 2010, and 45% in 2015. Visit http://www.internetworldstats.com to explore more statistics about the usage and growth of the Internet.

The lifting of the restriction on commercial use of the Internet in 1991 set the stage for future electronic commerce: Businesses were now welcome on the Internet. However, the Internet was still text based and not easy to use. The next set of developments solved this issue.

Birth of the Web

VideoNote
Evolution of the Web

While working at CERN, a research facility in Switzerland, **Tim Berners-Lee** envisioned a means of communication for scientists by which they could easily "hyperlink" to another research paper or article and immediately view it. Berners-Lee created the World Wide Web to fulfill this need. In 1991, Berners-Lee posted the code for the Web in a newsgroup and made it freely available. This version of the World Wide Web used **Hypertext Transfer Protocol (HTTP)** to communicate between the client computer and the web server, used **Hypertext Markup Language (HTML)** to format the documents, and was text based.

The First Graphical Browser

In 1993, Mosaic, the first graphical web browser became available. Marc Andreessen and graduate students working at the National Center for Supercomputing Applications (NCSA) at the University of Illinois Urbana–Champaign developed Mosaic. Some individuals in this

group later created another well-known web browser—Netscape Navigator—which is an ancestor of today's Mozilla Firefox browser.

Convergence of Technologies

By the early 1990s, personal computers with easy-to-use graphical operating systems (such as Microsoft's Windows, IBM's OS/2, and Apple's Macintosh OS) were increasingly available and affordable. Online service providers such as CompuServe, AOL, and Prodigy offered low-cost connections to the Internet. Figure 1.1 depicts this convergence of available computer hardware, easy-to-use operating systems, low-cost Internet connectivity, the HTTP protocol and HTML language, and a graphical browser that made information on the Internet much easier to access. The **World Wide Web**—the graphical user interface to information stored on computers running web servers connected to the Internet—had arrived!

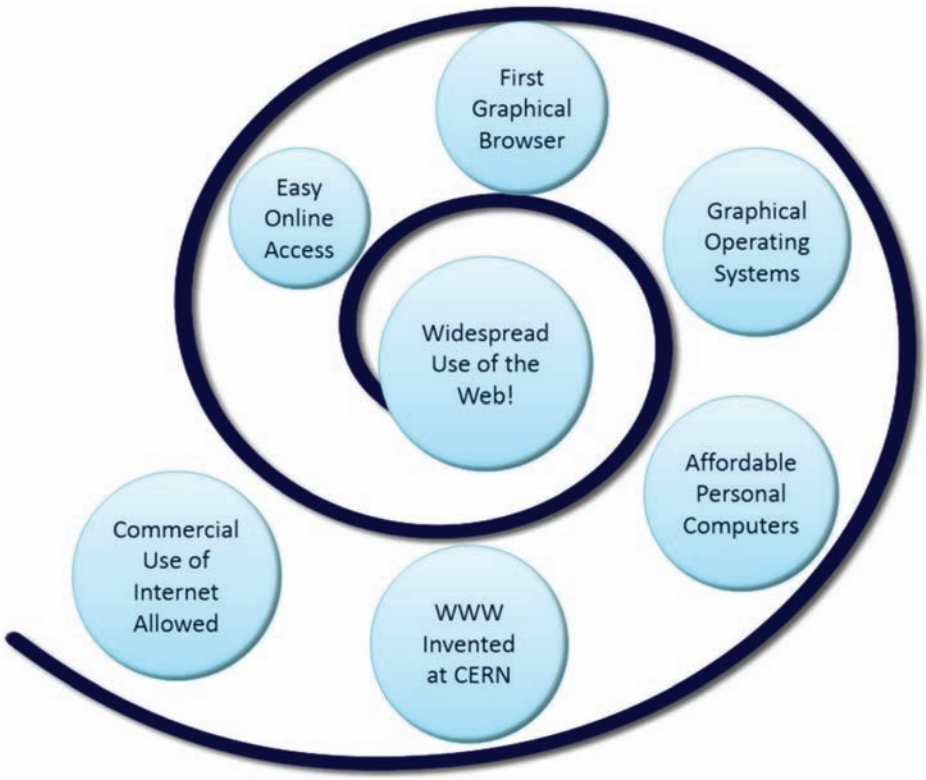

Figure 1.1 Convergence of Technologies. Used by permission of World Wide Web Consortium (W3C)

Who Runs the Internet?

You may be surprised that there is no single person "in charge" of the global interconnected network of computer networks known as the Internet. Instead, Internet infrastructure standards are overseen by groups such as the **Internet Engineering Task Force (IETF)** and the **Internet Architecture Board (IAB)**. The IETF is the principal body engaged in the development of new Internet protocol standard specifications. It is an open international community of network designers, operators, vendors, and researchers concerned with the evolution of Internet architecture and the smooth operation of the Internet. The actual technical work of the IETF is completed in its working groups. These working groups are organized into areas by topic, such as security and routing.

The IAB is a committee of the IETF and provides guidance and broad direction to the IETF. As a function of this purpose, the IAB is responsible for the publication of the **Request for Comments (RFC)** document series. An RFC is a formal document from the IETF that is drafted by a committee and subsequently reviewed by interested parties. RFCs are available for online review at http://www.ietf.org/rfc.html. Some RFCs are informational in nature, while others are meant to become Internet standards. In the latter case, the final version of the RFC becomes a new standard. Future changes to the standard must be made through subsequent RFCs.

The **Internet Corporation for Assigned Numbers and Names (ICANN)**, http://www.icann.org, was created in 1998 and is a nonprofit organization. Its main function is to coordinate the assignment of Internet domain names, IP address numbers, protocol parameters, and protocol port numbers. Prior to 1998, the **Internet Assigned Numbers Authority (IANA)** coordinated these functions. IANA still performs certain functions under the guidance of ICANN and maintains a website at http://www.iana.org.

Intranets and Extranets

Recall that the Internet is an interconnected network of computer networks that is globally available. When an organization needs the communication capabilities of the Internet, but doesn't want its information to be available to everyone, either an intranet or extranet is appropriate.

An **intranet** is a private network that is contained within an organization or business. Its purpose is to share organizational information and resources among coworkers. When an intranet connects to the outside Internet, usually a gateway or firewall protects the intranet from unauthorized access.

An **extranet** is a private network that securely shares part of an organization's information or operations with external partners such as suppliers, vendors, and customers. Extranets can be used to exchange data, share information exclusively with business partners, and collaborate with other organizations. Privacy and security are important issues in extranet use. Digital certificates, encryption of messages, and virtual private networks (VPNs) are some technologies used to provide privacy and security for an extranet. Digital certificates and encryption used in e-commerce are discussed in Chapter 12.

1.2 Web Standards and Accessibility

Just as with the Internet, no single person or group runs the World Wide Web. However, the **World Wide Web Consortium** (http://www.w3.org), referred to as the **W3C,** takes a proactive role in developing recommendations and prototype technologies related to the Web. Topics that the W3C addresses include web architecture, standards for web design, and accessibility. In an effort to standardize web technologies, the W3C produces specifications called recommendations.

W3C Recommendations

The W3C Recommendations are created in working groups with input from many major corporations involved in building web technologies. These recommendations are not rules; they are guidelines. Major software companies that build web browsers, such as Microsoft, do not always follow the W3C Recommendations. This makes life challenging for web developers because not all browsers will display a web page in exactly the same way. The good news

is that there is a convergence toward the W3C Recommendations in new versions of major browsers. You'll follow W3C Recommendations as you code web pages in this book. Following the W3C Recommendations is the first step toward creating a website that is accessible.

Web Standards and Accessibility

The **Web Accessibility Initiative (WAI)** (http://www.w3.org/WAI), is a major area of work by the W3C. Since the Web has become an integral part of daily life, there is a need for all individuals to be able to access it.

The Web can present barriers to individuals with visual, auditory, physical, and neurological disabilities. An **accessible** website provides accommodations that help individuals overcome these barriers. The WAI has developed recommendations for web content developers, web authoring tool developers, web browser developers, and developers of other user agents to facilitate use of the Web by those with special needs. See the WAI's **Web Content Accessibility Guidelines (WCAG)** at http://www.w3.org/WAI/WCAG20/glance/WCAG2-at-a-Glance.pdf for a quick overview.

Accessibility and the Law

The **Americans with Disabilities Act (ADA)** of 1990 is a federal civil rights law that prohibits discrimination against people with disabilities. The ADA requires that business, federal, and state services are accessible to individuals with disabilities. A 1996 Department of Justice ruling (http://www.justice.gov/crt/foia/readingroom/frequent_requests/ada_coreletter/cltr204.txt) indicated that ADA accessibility requirements apply to Internet resources.

Section 508 of the Federal Rehabilitation Act was amended in 1998 to require that U.S. government agencies give individuals with disabilities access to information technology that is comparable to the access available to others. This law requires developers creating information technology (including web pages) for use by the federal government to provide for accessibility. The **Federal IT Accessibility Initiative** (http://www.section508.gov) provides accessibility requirement resources for information technology developers. As the Web and Internet technologies developed, it became necessary to review the original Section 508 requirements. New proposed Section 508 requirements were aligned to WCAG 2.0 guidelines and released for comment in 2015. This textbook focuses on WCAG 2.0 guidelines to provide for accessibility.

In recent years, state governments have also begun to encourage and promote web accessibility. The Illinois Information Technology Accessibility Act (IITAA) guidelines (see http://www.dhs.state.il.us/IITAA/IITAAWebImplementationGuidelines.html) are an example of this trend.

Universal Design for the Web

The Center for Universal Design defines universal design as "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design." Examples of universal design are all around us. The cutouts on curbs that make it possible for people in wheelchairs to access the street also benefit a person pushing a stroller or riding a Segway Personal Transporter (Figure 1.2). Doors that

Figure 1.2 A smooth ride is a benefit of universal design. Definition from The Principles of Universal Design by The Center for Universal Design. Published by by NC State University, ©1997

open automatically for people with mobility challenges also benefit people carrying packages. A ramp is useful for a person in a wheelchair, a person dragging a rolling backpack or carry-on bag, and so on.

Awareness of universal design by web developers has been steadily increasing. Forward-thinking web developers design with accessibility in mind because it is the right thing to do. Providing access for visitors with visual, auditory, and other challenges should be an integral part of web design rather than an afterthought.

A person with visual difficulties may not be able to use graphical navigation buttons and may use a screen reader device to provide an audible description of the web page. By making a few simple changes, such as providing text descriptions for the images and perhaps providing a text navigation area at the bottom of the page, web developers can make the page accessible. Often, providing for accessibility increases the usability of the website for all visitors.

Accessible websites, with alternative text for images, headings used in an organized manner, and captions or transcriptions for multimedia features, are more easily used not only by visitors with disabilities, but also by visitors using a browser on a mobile device such as a phone or tablet. Finally, accessible websites may be more thoroughly indexed by search engines, which can be helpful in bringing new visitors to a site. As this text introduces web development and design techniques, corresponding web accessibility and usability issues are discussed.

1.3 Information on the Web

These days anyone can publish just about anything on the Web. In this section we'll explore how you can tell if the information you've found is reliable and how you can use that information.

Reliability and Information on the Web

There are many websites—but which ones are reliable sources of information? When visiting websites to find information, it is important not to take everything at face value (Figure 1.3).

Questions to ask about web resources are listed as follows;

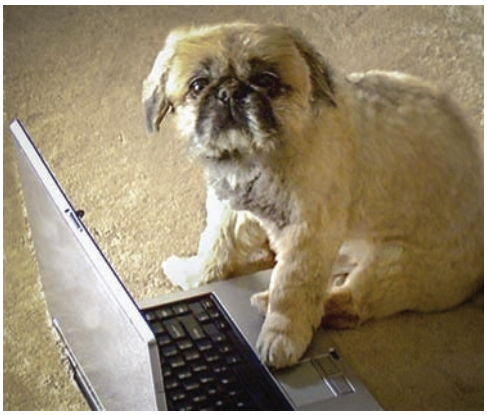

Figure 1.3 Who really updated that web page you are viewing?

- **Is the organization credible?**

Anyone can post anything on the Web! Choose your information sources wisely. First, evaluate the credibility of the website itself. Does it have its own domain name, such as http://mywebsite.com, or is it a free website consisting of just a folder of files hosted on a free web hosting site (such as weebly.com, awardspace.com, or 000webhost.com)? The URL of a free website usually includes part of the free web host's domain name. Information obtained from a website that has its own domain name will usually (but not always) be more reliable than information obtained from a free website.

Evaluate the type of domain name: Is it for a nonprofit organization (.org), a business (.com or .biz), or an educational institution (.edu)? Businesses may provide information in a biased manner, so be careful. Nonprofit organizations and schools will sometimes treat a subject more objectively.

- **How recent is the information?**

  Another item to look at is the date the web page was created or last updated. Although some information is timeless, very often a web page that has not been updated for several years is outdated and may not be the best source of information.

- **Are there links to additional resources?**

  Hyperlinks indicate websites with supporting or additional information that can be helpful to you in your research as you explore a topic. Look for these types of hyperlinks to aid your studies.

- **Is it Wikipedia?**

  Wikipedia (http://wikipedia.org) is a good place to begin research, but don't accept what you read there for fact, and avoid using Wikipedia as a resource for academic assignments. Why? Well, except for a few protected topics, anyone can update Wikipedia with anything! Usually it all gets sorted out eventually—but be aware that the information you read may not be valid.

  Feel free to use Wikipedia to begin exploring a topic, but then scroll down to the bottom of the Wikipedia web page and look for "References"—and then explore those websites and others that you may find. As you gather information on these sites, also consider the other criteria: credibility, domain name, timeliness, and links to additional resources.

Ethical Use of Information on the Web

This wonderful technology called the World Wide Web provides us with information, graphics, and music—all virtually free (after you pay your Internet service provider, of course). Let's consider the following issues relating to the ethical use of this information:

- Is it acceptable to copy someone's graphic to use on your own website?
- Is it acceptable to copy someone's website design to use on your own site or on a client's site?
- Is it acceptable to copy an essay that appears on a web page and use it, or parts of it, as your own writing?
- Is it acceptable to insult someone on your website or link to that person's site in a derogatory manner?

The answer to all these questions is no. Using someone's graphic without permission is the same as stealing it. In fact, if you link to it, you are actually using up some of the site's bandwidth and may be costing the owner money. Instead, ask the owner of the website for permission to use the graphic. If permission is granted, store the graphic on your own website and be sure to indicate the source of the graphic when you display it on your web page. The key is to request permission before using someone else's resources. Copying the website design of another person or company is also a form of stealing. Any text or graphic on a website is automatically copyrighted in the United States, regardless of whether a copyright symbol appears on the site or not. Insulting a person or company on your website or linking to the person's or company's website in a derogatory manner could be considered a form of defamation.

Issues like these, related to intellectual property, copyright, and freedom of speech, are regularly discussed and decided in courts of law. Good Web etiquette requires that you ask permission before using others' work, give credit for what you use ("fair use" in the U.S.

copyright law), and exercise your freedom of speech in a manner that is not harmful to others. The **World Intellectual Property Organization (WIPO)**, http://wipo.int, is dedicated to protecting intellectual property rights internationally.

What if you'd like to retain ownership, but make it easy for others to use or adapt your work? **Creative Commons**, http://creativecommons.org, is a nonprofit organization that provides free services that allow authors and artists to register a type of a copyright license called a Creative Commons license. There are several licenses to choose from, depending on the rights you wish to grant. The Creative Commons license informs others as to exactly what they can and cannot do with your creative work. See http://meyerweb.com/eric/tools/color-blend to view a web page licensed under a Creative Commons Attribution-ShareAlike 1.0 License.

Checkpoint 1.1

1. Describe the difference between the Internet and the Web.
2. Explain three events that contributed to the commercialization and exponential growth of the Internet.
3. Is the concept of universal design important to web developers? Explain your answer.

1.4 Network Overview

A **network** consists of two or more computers connected for the purpose of communicating and sharing resources. Common components of a network are shown in Figure 1.4 and include the following:

- Server computer(s)
- Client workstation computer(s)
- Shared devices such as printers
- Networking devices (routers, hubs, and switches) and the media that connect them

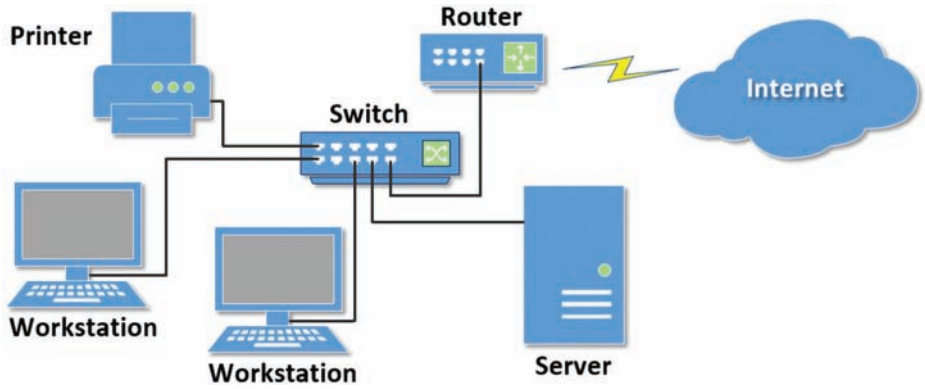

Figure 1.4 Common components of a network

The **clients** are the computer workstations used by individuals, such as a personal computer (PC) on a desk. The **server** receives requests from client computers for resources such as files. Computers used as servers are usually kept in a protected, secure area and are accessed only by network administrators. Networking devices such as hubs and switches provide network connections for computers, and routers direct information from one network to another. The **media** connecting the clients, servers, peripherals, and networking devices may consist of copper cables, fiber optic cables, or wireless technologies.

Networks vary in scale. A **local area network (LAN)** is usually confined to a single building or group of connected buildings. Your school computer lab may use a LAN. If you work in an office, you probably use a computer connected to a LAN. A **wide area network (WAN)** is geographically dispersed and usually uses some form of public or commercial communications network. For example, an organization with offices on both the East and West Coasts of the United States probably uses a WAN to provide a link between the LANs at each of the offices.

A **backbone** is a high-capacity communication link that carries data gathered from smaller links that interconnect with it. On the Internet, a backbone is a set of paths that local or regional networks connect to for long-distance interconnection. The Internet is a group of interconnected networks with very high-speed connectivity provided by the Internet backbones.

1.5 The Client/Server Model

The term **client/server** dates from the 1980s and refers to personal computers joined by a network. "Client/server" can also describe a relationship between two computer programs—the client and the server. The client requests some type of service (such as a file or database access) from the server. The server fulfills the request and transmits the results to the client over a network. While both the client and the server programs can reside on the same computer, typically they run on different computers (Figure 1.5). It is common for a server to handle requests from multiple clients.

The Internet is a great example of client/server architecture at work. Consider the following scenario: An individual is at a computer using a web browser client to access the Internet. The individual uses the web browser to visit a website, let's say http://www.yahoo.com. The server is the web server program running on the computer with an IP address that corresponds to yahoo.com. It is contacted, locates the web page and related resources that were requested, and responds by sending them to the individual.

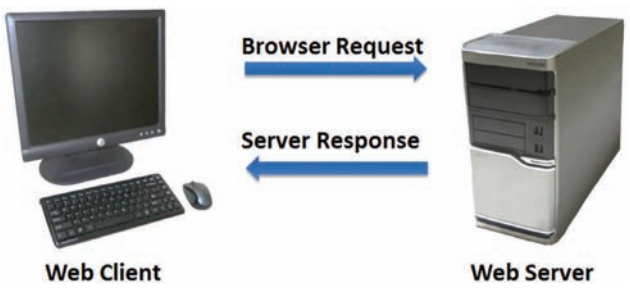

Figure 1.5 Web client and web server

Here's how to distinguish between web clients and web servers:

Web Client

- Connected to the Internet when needed
- Usually runs web browser (client) software such as Internet Explorer or Firefox
- Uses HTTP
- Requests web pages from a server
- Receives web pages and files from a server

Web Server

- Continually connected to the Internet
- Runs web server software (such as Apache or Internet Information Server)
- Uses HTTP
- Receives a request for the web page
- Responds to the request and transmits the status code, web page, and associated files

When clients and servers exchange files, they often need to indicate the type of file that is being transferred; this is done through the use of a MIME type. **Multipurpose Internet Mail Extensions (MIME)** are rules that allow multimedia documents to be exchanged among many different computer systems. MIME was initially intended to extend the original Internet e-mail protocol, but it is also used by HTTP. MIME provides for the exchange of seven different media types on the Internet: audio, video, image, application, message, multipart, and text. MIME also uses subtypes to further describe the data. The MIME type of a web page is text/html. MIME types of GIF and JPEG images are image/gif and image/jpeg, respectively.

A web server determines the MIME type of a file before the file is transmitted to the web browser. The MIME type is sent along with the document. The web browser uses the MIME type to determine how to display the document.

How does information get transferred from the web server to the web browser? Clients (such as web browsers) and servers (such as a web server) exchange information through the use of communication protocols such as HTTP, TCP, and IP, which are introduced in the next section.

1.6 Internet Protocols

Protocols are rules that describe how clients and servers communicate with each other over a network. There is no single protocol that makes the Internet and Web work; a number of protocols with specific functions are needed.

File Transfer Protocol (FTP)

File Transfer Protocol (FTP) is a set of rules that allow files to be exchanged between computers on the Internet. Unlike HTTP, which is used by web browsers to request web pages and their associated files in order to display a web page, FTP is used simply to move files

from one computer to another. Web developers commonly use FTP to transfer web page files from their computers to web servers. FTP is also commonly used to download programs and files from other servers to individual computers.

E-mail Protocols

Most of us take e-mail for granted, but there are two servers involved in its smooth functioning: an incoming mail server and an outgoing mail server. When you send e-mail to others, **Simple Mail Transfer Protocol (SMTP)** is used. When you receive e-mail, **Post Office Protocol** (POP; currently **POP3**) and **Internet Message Access Protocol (IMAP)** can be used.

Hypertext Transfer Protocol (HTTP)

HTTP is a set of rules for exchanging files such as text, images, audio, video, and other multimedia on the Web. Web browsers and web servers usually use this protocol. When the user of a web browser requests a file by typing a website address or clicking on a hyperlink, the browser builds an HTTP request and sends it to the server. The web server in the destination machine receives the request, does any necessary processing, and responds with the requested file and any associated files (such as image files, media files, and other related files).

Transmission Control Protocol/Internet Protocol (TCP/IP)

Transmission Control Protocol/Internet Protocol (TCP/IP) has been adopted as the official communication protocol of the Internet. TCP and IP have different functions that work together to ensure reliable communication over the Internet.

TCP

The purpose of **TCP** is to ensure the integrity of network communication. TCP starts by breaking files and messages into individual units called **packets**. These packets (see Figure 1.6) contain information such as the destination, source, sequence number, and checksum values used to verify the integrity of the data.

Figure 1.6 TCP packet

TCP is used together with IP to transmit files efficiently over the Internet. IP takes over after TCP creates the packets, using IP addressing to send each packet over the Internet via the best path at the particular time. When the destination address is reached, TCP verifies the integrity of each packet by using the checksum, requests a resend if a packet is damaged, and reassembles the file or message from the multiple packets.

IP

Working in harmony with TCP, **IP** is a set of rules that controls how data is sent between computers on the Internet. IP routes a packet to the correct destination address. Once sent, the packet gets successively forwarded to the next closest router (a hardware device designed to move network traffic) until it reaches its destination.

Each device connected to the Internet has a unique numeric **IP address**. These addresses consist of a set of four groups of numbers, called octets. The current version of IP, **Internet Protocol Version 4 (IPv4)**, uses 32-bit (binary digit) addressing. This results in a decimal number in the format of xxx.xxx.xxx.xxx, where each xxx is a value from 0 to 255. Theoretically, this system allows for at most 4 billion possible IP addresses (although many potential addresses are reserved for special uses). However, even this many addresses will not be enough to meet the needs of all of the devices expected to be connected to the Internet in upcoming years.

IP Version 6 (IPv6) will be the next standard IP protocol and will provide a huge increase in the number of possible addresses and many technological advances. IPv6 was designed as an evolutionary set of improvements to the current IPv4 and is backwardly compatible with it. Service providers and Internet users can update to IPv6 independently without having to coordinate with each other. IPv6 provides for more Internet addresses because the IP address is lengthened from 32 bits to 128 bits. This means that there are potentially 2^{128} unique IP addresses possible, or 340,282,366,920,938,463,463,347,607,431,768,211,456 addresses. (Now there will be enough IP addresses for everyone's PC, notebook, cell phone, tablet, toaster, and so on!)

The IP address of a device may correspond to a domain name. The **Domain Name System (DNS)** associates these IP addresses with the text-based URLs and domain names you type into a web browser address box. For example, at the time this book was written, one of Google's IP addresses was 173.194.116.72. You can enter this number in the address text box in a web browser (as shown in Figure 1.7), press Enter, and the Google home page will display. Of course, it's much easier to type "google.com," which is why domain names such as google.com were created in the first place! Since long strings of numbers are difficult for humans to remember, the Domain Name System was introduced as a way to associate text-based names with numeric IP addresses.

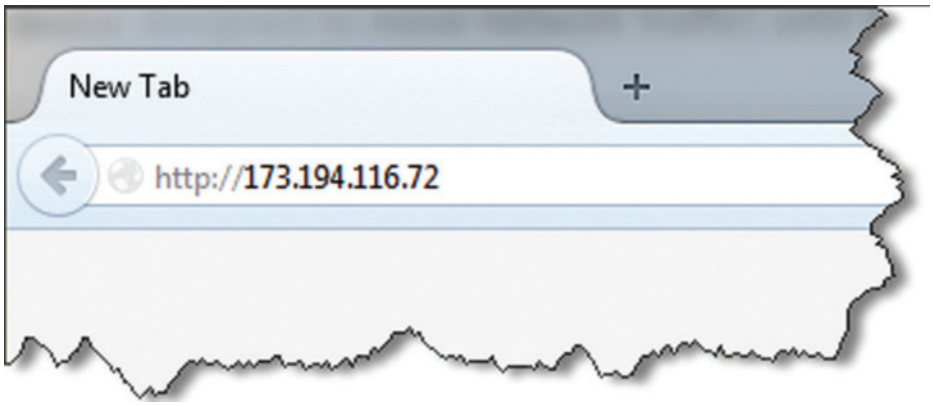

Figure 1.7 Entering an IP address in a web browser

FAQ **What is HTTP/2?**

HTTP/2 will be the first major update to HTTP, which was first developed in 1999. As websites have become more image and media intensive, the number of requests needed to display a web page and its related files have increased. A major benefit of HTTP/2 will be quicker loading of web pages by processing multiple concurrent HTTP requests. Visit the following resources for more information about HTTP/2:

- https://tools.ietf.org/html/draft-ietf-httpbis-http2-17
- http://readwrite.com/2015/02/18/http-update-http2-what-you-need-to-know
- https://http2.github.io

1.7 Uniform Resource Identifiers and Domain Names

URIs and URLs

A **Uniform Resource Identifier (URI)** identifies a resource on the Internet. A **Uniform Resource Locator (URL)** is a type of URI which represents the network location of a resource such as a web page, a graphic file, or an MP3 file. The URL consists of the protocol, the domain name, and the hierarchical location of the file on the web server.

The URL http://www.webdevfoundations.net, shown in Figure 1.8, denotes the use of HTTP protocol and the web server named www at the domain name of webdevfoundations.net. In this case, the root file (usually index.html or index.htm) of the chapter 1 directory will be displayed.

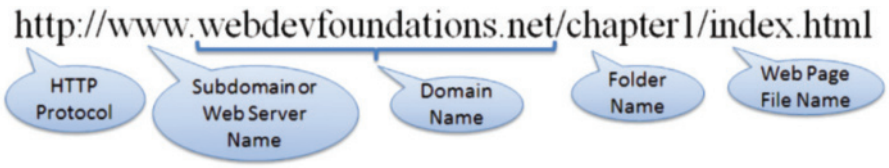

Figure 1.8 URL Describing a file within a folder

Domain Names

A **domain name** locates an organization or other entity on the Internet. The purpose of the Domain Name System (DNS) is to divide the Internet into logical groups and understandable names by identifying the exact address and type of the organization. The DNS associates the text-based domain names with the unique numeric IP address assigned to a device.

Let's consider the domain name www.google.com. The portion "google.com" is the domain name that is registered to Google. The ".com" is the top-level domain name. The "google" is considered a second-level domain name. The "www" is the name of the web sever (sometimes called the **host**) at the google.com domain.

A **subdomain** can be configured to house a separate website located at the same domain. For example, Google's Gmail can be accessed by using the subdomain "gmail" in the domain name (gmail.google.com). Google Maps can be accessed at maps.google.com, and Google News Search is available at news.google.com. See http://www.labnol.org/internet/popular-google-subdomains/5888/ for a list of the top 40 Google subdomains. The combination of a host/subdomain, second-level domain, and top-level domain name (such as www.google.com or mail.google.com) is called a **fully qualified domain name (FQDN)**.

Top-Level Domain Names

A **top-level domain (TLD)** identifies the rightmost part of the domain name, starting with the final period. A TLD is either a **generic top-level domain (gTLD)**, such as .com for commercial, or a **country-code top-level domain**, such as .fr for France. The **Internet Assigned Numbers Authority (IANA)** website has a complete list of TLDs (http://www.iana.org/domains/root/db).

Generic Top-Level Domain Names (gTLDs)

The Internet Corporation for Assigned Names and Numbers (ICANN) administers gTLDs (http://www.icann.org). Table 1.1 shows several common gTLDs and their intended use.

Table 1.1 Top-level domains

Generic TLD	Used By
.aero	Air-transport industry
.asia	Pan-Asia and Asia Pacific community
.biz	Businesses
.cat	Catalan linguistic and cultural community
.com	Commercial entities
.coop	Cooperative
.edu	Restricted to accredited degree-granting institutions of higher education
.gov	Restricted to government use
.info	Unrestricted use
.int	International organization (rarely used)
.jobs	Human resources management community
.mil	Restricted to military use
.mobi	Corresponds to a .com website—the .mobi site is designed for easy access by mobile devices
.museum	Museums
.name	Individuals
.net	Entities associated with network support of the Internet, usually Internet service providers or telecommunication companies
.org	Nonprofit entities
.post	Universal Postal Union, an agency of the United Nations
.pro	Professionals such as accountants, physicians, and lawyers
.tel	Contact information for individuals and businesses
.travel	Travel industry

The .com, .org, and .net TLD designations are currently used on the honor system, which means that, for example an individual who owns a shoe store (not related to networking) can register shoes.net.

Expect the number and variety of gTLDs to increase. ICANN accepted proposals for almost 2000 new gTLDs in 2012. A wide variety of new gTLDs were proposed including place names (.quebec, .vegas, and .moscow), retail terms (.blackfriday), financial terms (.cash, .trade, and .loans), technology terms (.systems, .technology, and .app), and whimsical, fun terms (.ninja, .buzz, and .cool). Some of the first new gTLDs to become available included .bike, .guru, .holdings, .clothing, .singles, .ventures, and .plumbing. ICANN has set a schedule to periodically launch new gTLDs. Visit http://newgtlds.icann.org/en/program-status/delegated-strings for a list of new gTLDs.

Country-Code Top-Level Domain Names

Two-character country codes have also been assigned as TLD names. These codes were originally intended to be meaningful by designating the geographical location of the individual or organization that registered the name. Table 1.2 lists some popular country codes used on the Web.

Table 1.2 Country codes

Country Code TLD	Country
.au	Australia
.de	Germany
.es	Spain
.eu	European Union (a group of countries rather than a single country)
.in	India
.jp	Japan
.ly	Libya
.nl	The Netherlands
.us	United States
.ws	Samoa

The IANA website at http://www.iana.org/domains/root/db has a complete list of country-code TLDs. Domain names with country codes are often used for municipalities, schools, and community colleges in the United States. For example, the domain name www.harper.cc.il.us denotes, from right to left, the United States, Illinois, community college, Harper, and the web server named "www" as the site for Harper College in Illinois.

Although country-code TLD names were intended to designate geographical location, it is fairly easy to obtain a domain name with a country-code TLD that is not local to the registrant. Examples of non-geographical use of country-code TLDs include domain names such as mediaqueri.es, webteacher.ws, and bit.ly. Visit http://register.com, http://godaddy.com, and many other domain name registration companies for examples of readily available country-code TLDs.

Domain Name System (DNS)

The DNS associates domain names with IP addresses. The following happens each time a new URL is typed into a web browser:

1. The DNS is accessed.
2. The corresponding IP address is obtained and returned to the web browser.

3. The web browser sends an HTTP request to the destination computer with the corresponding IP address.
4. The HTTP request is received by the web server.
5. The necessary files are located and sent by HTTP responses to the web browser.
6. The web browser renders and displays the web page and associated files.

We all get impatient sometimes when we need to view a web page. The next time you wonder why it is taking so long to display a web page, think about all of the processing that goes on behind the scenes before the browser receives the files needed to display the web page (Figure 1.9).

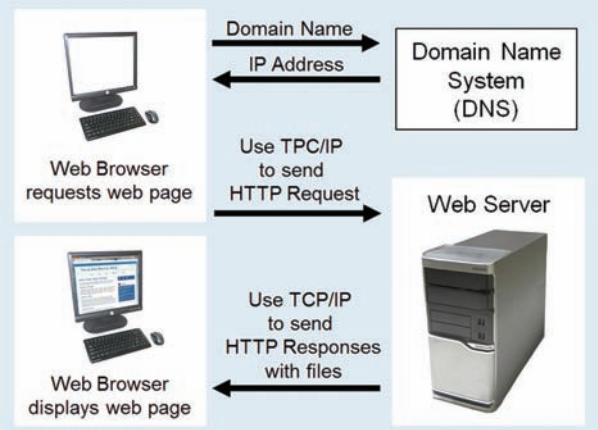

Figure 1.9 Accessing a web page

1.8 Markup Languages

Markup languages consist of sets of directions that tell the browser software (and other user agents such as mobile phones) how to display and manage a web document. These directions are usually called tags and perform functions such as displaying graphics, formatting text, and referencing hyperlinks.

Standard Generalized Markup Language (SGML)

SGML is a standard for specifying a markup language or tag set. SGML in itself is not a document language, but a description of how to specify one and create a document type definition (DTD). When Tim Berners-Lee created HTML, he used SGML to create the specification.

Hypertext Markup Language (HTML)

HTML is the set of markup symbols or codes placed in a file intended for display on a web browser. The web browser renders the code in the HTML file and displays the web page document and associated files. The W3C (http://www.w3.org) sets the standards for HTML.

Extensible Markup Language (XML)

XML was developed by the W3C as a flexible method to create common information formats and share the format and the information on the Web. It is a text-based syntax designed to describe, deliver, and exchange structured information. It is not intended

to replace HTML, but to extend the power of HTML by separating data from presentation. Using XML, developers can create whatever tags they need to describe their information.

Extensible Hypertext Markup Language (XHTML)

XHTML was developed by the W3C to reformulate HTML 4.01 as an application of XML. It combines the formatting strengths of HTML 4.01 and the data structure and extensibility strengths of XML. XHTML has been used on the Web for over a decade and you'll find many web pages coded with this markup language. At one point the W3C was working on a new version of XHTML, called XHTML 2.0. However, the W3C stopped development of XHTML 2.0 because it was not backward compatible with HTML4. Instead, the W3C decided to move forward with HTML5.

HTML5—the Newest Version of HTML

HTML5 is intended to be the successor to HTML4 and will replace XHTML. HTML5 incorporates features of both HTML and XHTML, adds new elements, provides new features such as form edits and native video, and is intended to be backward compatible. The W3C approved HTML5 for Candidate Recommendation status in late 2012. HTML5 reached final Recommendation status in late 2014. The W3C continues its development of HTML and is adding more new elements, attributes, and features in HTML5.1 which is currently in draft form.

Checkpoint 1.2

1. Describe the components of the client/server model as applied to the Internet.
2. Identify two protocols used on the Internet to convey information that use the Internet, but do not use the Web.
3. Explain the similarities and differences between a URL and a domain name.

1.9 Popular Uses of the Web

E-Commerce

Continued growth is expected for **e-commerce**, which is the buying and selling of goods and services on the Internet. Forrester Research projects that by 2018, over $414 billion will be spent on online retail sales (https://www.forrester.com/US+eCommerce+Forecast+2013+To+2018/fulltext/-/E-RES115513). With over 3 billion people online worldwide, as reported by Internet World Stats (http://www.internetworldstats.com/emarketing.htm), that's quite a few potential shoppers! As mobile web access becomes more commonplace, e-commerce will be regularly done not only from stationary computers, but also from portable devices—tablets, netbooks, smartphones, and technology we haven't even imagined yet.

Mobile Access

Accessing the Web with devices other than the standard desktop, notebook, and netbook computers is a growing trend. Bloomberg Businessweek reported that electronics manufacturers expect a huge demand for **tablet** devices (such as the Apple iPad, Amazon Kindle Fire, and Microsoft Surface) and anticipated $49 billion in sales by 2015 (http://buswk.co/fK2Q9e). A study (http://stateofthemedia.org/2012/mobile-devices-and-news-consumption-some-good-signs-for-journalism/) by the PEW Research Center determined that many people own more than one mobile Internet-enabled device: over half of people who own a laptop computer also own a smartphone, 23% of owners of laptops also own a tablet, 13% own all three devices. Web designers must consider how their pages will display and function not only on personal computers, but also on smartphones, tablets, and other mobile devices.

Blogs

The trend of keeping a web log, or blog, has been driven by individuals as a forum for personal expression. A **blog** is a journal that is available on the Web; it is a frequently updated page with a chronological list of ideas and links. Blog topics range from politics to technical information to personal diaries. Blogs can focus on one subject or range across a diverse group of topics—it's up to the person, called a blogger, who has created and maintains the blog. Bloggers usually update their blogs daily with easy-to-use software designed to allow people with little or no technical background to update and maintain a blog. Many blogs are hosted at blog communities such as http://www.wordpress.com. Others are hosted at individual websites, such as the blog kept by the web designer Eric Meyer at http://meyerweb.com. Businesses have noted the value of blogs as communication and customer relationship tools. Companies such as Microsoft (http://blogs.msdn.com) and IBM (https://www.ibm.com/developerworks/mydeveloperworks/blogs) utilize blogs in this manner.

Wikis

A **wiki** is a website that can be updated immediately at any time by visitors, using a simple form on a web page. Some wikis are intended for a small group of people, such as the members of an organization. The most powerful wiki is Wikipedia (http://wikipedia.org), an online encyclopedia, which can be updated by anyone at any time. Wikis are a form of social software in action—visitors sharing their collective knowledge to create a resource freely used by all. While there have been isolated incidents of practical jokes, and inaccurate information has occasionally been posted at Wikipedia, the given information and linked resources are a good starting point when exploring a topic.

Social Networking

Blogs and wikis provide web visitors with new methods for interacting with websites and other people—a use referred to as **social computing**, or **social networking**. A trendy activity these days is participating in a social networking site such as Facebook (http://www.facebook.com) or LinkedIn (http://www.linkedin.com). Research firm eMarketer predicts that in 2017, 78% of Internet users will access "a social network at least once per month" (http://www.emarketer.com/Article/Social-Networking-Reaches-Nearly-One-Four-Around-World/1009976). If it seems to you as if most of your friends are on Facebook, that may

be the case: As of 2015, Facebook had over 1.49 billion monthly active users (http://newsroom.fb.com/company-info). While LinkedIn was created with professional and business networking in mind, businesses have also found it useful to create Facebook sites to promote their products and services.

Twitter (http://www.twitter.com) is a social networking site for **microblogging**, or frequently communicating with a brief message (140 characters or less) called a **tweet**. Twitter users (called twitterers) tweet to update a network of friends and followers about their daily activities and observations. Twitter is not limited to personal use. The business world has also discovered the marketing reach that Twitter can provide. Visit https://business.twitter.com/basics for insights on how to use Twitter to promote your business and communicate with customers.

Cloud Computing

Document collaboration sites like Google Drive and Microsoft OneDrive, blogs, wikis, and social networking sites are all accessed via the Internet (the "cloud") and are examples of **cloud computing**. The National Institute of Standards and Technology (NIST) defines cloud computing as the on-demand use of software and other computing resources hosted at a remote data center (including servers, storage, services, and applications) over the Internet. Expect to see more public and private use of cloud computing in the future.

RSS

Really Simple Syndication, or **Rich Site Summary (RSS)** is used to create newsfeeds from blog postings and other websites. The RSS feeds contain a summary of new items posted to the site. The URL to the RSS feed is usually indicated by the letters XML or RSS in white text within an orange rectangle. A **newsreader** is needed to access the information. Some browsers, such as Firefox, Safari, and Internet Explorer, can display RSS feeds. Commercial and shareware newsreader applications are also available. The newsreader polls the feed URL at intervals and displays the new headlines when requested. RSS provides web developers with a method to push new content to interested parties and (hopefully) generate return visits to the site.

Podcasts

Podcasts are audio files on the web that take the format of an audio blog, radio show, or interview. Podcasts are typically delivered by an RSS feed, but can also be made available by providing the link to a recorded MP3 file on a web page. These files can be saved to your computer or to an MP3 player (such as an iPod) for later listening.

Web 2.0

Flickr (http://www.flickr.com) and Pinterest (http://pinterest.com) are two social software sites that provide information-sharing opportunities. Flickr, a photo-sharing site, calls itself the "best way to store, search, sort, and share your photos." Pinterest describes itself as "a place to discover ideas for all your projects and interests, handpicked by people like you." Pinterest users "pin" photos from websites they have found useful or intriguing on "boards" that are organized by categories. Users can search for pins, follow other users, and follow boards. Pins of interest are displayed. Websites such as Wikipedia, Flickr, Twitter, and Pinterest are examples of what is called **Web 2.0**. While a consensus on the

definition of Web 2.0 has yet to be reached, think of it as the next step in the transition of the Web from isolated static websites to a platform that utilizes technology to provide rich interfaces and social networking opportunities. Visit http://www.go2web20.net and use the search engine to find Web 2.0 sites. You may also read Tim O'Reilly's informative Web 2.0 essay at http://www.oreilly.com/pub/a/web2/archive/what-is-web-20.html for more information on this developing topic.

The single trend that you can expect to remain the same for the foreseeable future is the trend of constant change. Internet and web-related technologies are in a constant state of development and improvement. If constant change and the opportunity to learn something new excite you, web development is a fascinating field. The skills and knowledge you gain in this book should provide a solid foundation for your future learning.

FAQ **What is the next big thing on the Web?**

The Web is changing by the minute. Check the textbook's companion website at http://www.webdevfoundations.net for a blog that will help you stay current about web trends.

Chapter Summary

This chapter has provided a brief overview of Internet, Web, and introductory networking concepts. Much of this information may already be familiar to you.

Visit the textbook's website at http://www.webdevfoundations.net for links to the URLs listed in this chapter and to view updated information.

Key Terms

Accessible
Americans with Disabilities Act (ADA)
backbone
blog
client/server
clients
cloud computing
country-code top-level domain
Creative Commons
domain name
Domain Name System (DNS)
e-commerce
extranet
Federal IT Accessibility Initiative
File Transfer Protocol (FTP)
fully qualified domain name (FQDN)
generic top-level domain (gTLD)
hashtag
host
HTML5
Hypertext Markup Language (HTML)
Hypertext Transfer Protocol (HTTP)
Internet
Internet Architecture Board (IAB)
Internet Assigned Numbers Authority (IANA)
Internet Corporation for Assigned Numbers and Names (ICANN)
Internet Engineering Task Force (IETF)
Internet Message Access Protocol (IMAP)
intranet
IP
IP address
IP Version 4 (IPv4)
IP Version 6 (IPv6)
local area network (LAN)
markup languages
media
microblogging
Multipurpose Internet Mail Extensions (MIME)
network
newsreader
packets
podcasts
Post Office Protocol (POP3)
protocols
Really Simple Syndication or Rich Site Summary (RSS)
Request for Comments (RFC)
Section 508 of the Federal Rehabilitation Act
server
Simple Mail Transfer Protocol (SMTP)
social computing
social networking
Standard Generalized Markup Language (SGML)
subdomain
tablet
TCP
Tim Berners-Lee
top-level domain (TLD)
Transmission Control Protocol/Internet Protocol (TCP/IP)
tweet
Uniform Resource Indicator (URI)
Uniform Resource Locator (URL)
Web 2.0
Web Accessibility Initiative (WAI)
Web Content Accessibility Guidelines (WCAG)
web host server
wide area network (WAN)
wiki
World Intellectual Property Organization (WIPO)
World Wide Web
World Wide Web Consortium (W3C)
XHTML
XML

Review Questions

Multiple Choice

1. What is a unique text-based Internet address corresponding to a computer's unique numeric IP address called?
   a. IP address
   b. domain name
   c. URL
   d. user name

2. Select the item below that indicates the top-level domain name for the URL http://www.mozilla.com.
   a. mozilla
   b. com
   c. http
   d. www

3. Of the following organizations, which one coordinates applications for new TLDs?
   a. Internet Assigned Numbers Authority (IANA)
   b. Internet Engineering Task Force (IETF)
   c. Internet Corporation for Assigned Numbers and Names (ICANN)
   d. World Wide Web Consortium (W3C)
4. Which of the following is a network that covers a small area, such as a group of buildings or campus?
   a. LAN
   b. WAN
   c. Internet
   d. WWW
5. Which of the following organizations takes a proactive role in developing recommendations and prototype technologies related to the Web?
   a. World Wide Web Consortium (W3C)
   b. Web Professional Standards Organization (WPO)
   c. Internet Engineering Task Force (IETF)
   d. Internet Corporation for Assigned Numbers and Names (ICANN)

True or False

6. _____ A URL is one type of URI.
7. _____ Markup languages contain sets of directions that tell the browser software how to display and manage a web document.
8. _____ The World Wide Web was developed to allow companies to conduct e-commerce over the Internet.
9. _____ A domain name that ends in .net indicates that the website is for a networking company.

Fill in the Blank

10. _____ is the set of markup symbols or codes placed in a file intended for display on a web browser.
11. _____ combines the formatting strengths of HTML 4.0 and the data structure and extensibility strengths of XML.
12. A standard language used for specifying a markup language or tag set is _____.
13. The newest version of HTML is called _____.
14. Frequently communicating by posting brief messages at a social networking site is called _____.
15. The purpose of _____ is to ensure the integrity of network communication.

Hands-On Exercise

1. Twitter (http://www.twitter.com) is a social networking website for microblogging, or frequently communicating with a brief message (140 characters of less) called a tweet. Twitter users (referred to as twitterers) tweet to update a network of friends and followers about their daily activities, observations, and information related to topics of interest. A **hashtag** (the #symbol) can be placed in front of a word or term within a tweet to categorize the topic, such as typing the hashtag #SXSWi in all tweets about the SXSW Interactive Conference for the web design industry. The use of a hashtag makes it easy to search for tweets about a category or event in Twitter.

   If you don't already use Twitter, sign up for free account at http://www.twitter.com. Use your Twitter account to share information about websites that you find useful or interesting. Post at least three tweets. You might tweet about websites that contain useful web design resources. You might describe sites that have interesting features, such

as compelling graphics or easy-to-use navigation. After you begin to develop your own websites, you could tweet about them, too!

Your instructor may direct you to include a distinctive hashtag (for example, something like #CIS110) in your tweets that are related to your web design studies. Searching Twitter for the specified hashtag will make it easy to collect all the tweets posted by the students in your class.

2. Create a blog to document your learning experiences as you study web development. Visit one of the many sites that offer free blogs, such as http://www.blogger.com, http://www.wordpress.com, or http://www.tumblr.com. Follow the site's instructions to establish your own blog. Your blog could be a place to note websites that you find useful or interesting. You might report on sites that contain useful web design resources. You might describe sites that have interesting features, such as compelling graphics or easy-to-use navigation. Write a few sentences about each site that you find intriguing. After you begin to develop your own sites, you could include the URLs and reasons for your design decisions. Share this blog with your fellow students and friends. Display your page in a browser, and print the page. Hand in the printout to your instructor.

Web Research

1. The World Wide Web Consortium creates standards for the Web. Visit its site at http://www.w3c.org and then answer the following questions:
   a. How did the W3C get started?
   b. Who can join the W3C? What does it cost to join?
   c. The W3C home page lists a number of technologies. Choose one that interests you, click on its link, and read the associated pages. List three facts or issues you discover.
2. The Internet Society takes an active leadership role in issues related to the Internet. Visit its site at http://www.isoc.org and then answer the following questions:
   a. Why was the Internet Society created?
   b. Determine which local chapter is closest to you. Visit its website. List the website's URL and an activity or service that the chapter provides.
   c. How can you join the Internet Society? What does it cost to join? Would you recommend that a beginning Web developer join the Internet Society? Why or why not?
3. The WebProfessionals.org is a professional association dedicated to the support of individuals and organizations that create and manage websites. Visit its site at http://www.webprofessionals.org and then answer the following questions:
   a. How can you join WebProfessionals.org? What does it cost to join?
   b. List one of the events in which WebProfessionals.org participates. Would you like to attend this event? Why or why not?
   c. List three ways that WebProfessionals.org can help you in your future career as a web developer.

Focus on Web Design

1. Visit a website that interests you. Print the home page or one other pertinent page from the site. Write a one-page summary of the site that addresses the following topics:
   a. What is the URL of the site?
   b. What is the purpose of the site?
   c. Who is the intended audience?
   d. Do you think that the site reaches its intended audience? Why or why not?
   e. Is the site useful to you? Why or why not?
   f. Does this site appeal to you? Why or why not? Consider the use of color, images, multimedia, organization, and ease of navigation.
   g. Would you encourage others to visit this site? Why or why not?
   h. How could this site be improved?

2

HTML Basics

Chapter Objectives

In this chapter, you will learn how to . . .

- Describe HTML, XHTML, and HTML5
- Identify the markup language in a web page document
- Use the html, head, body, title, and meta elements to code a template for a web page
- Configure the body of a web page with headings, paragraphs, line breaks, divs, lists, and blockquotes
- Configure text with phrase elements
- Configure special characters
- Use the new HTML5 header, nav, main, and footer elements
- Use the anchor element to link from page to page
- Create absolute, relative, and e-mail hyperlinks
- Code, save, and display a web page document
- Test a web page document for valid syntax

This chapter gets you started on your very first web page. You'll be introduced to Hypertext Markup Language (HTML), the language used to create web pages; eXtensible Hypertext Markup Language (XHTML), the most recent standardized version of HTML; and HTML5, the newest version of HTML. The chapter begins with an introduction to the syntax of HTML5; continues with sample web pages; and introduces HTML structural, phrase, and hyperlink elements as more example web pages are created. You will learn more if you work along with the sample pages in the text. Coding HTML is a skill, and every skill improves with practice.

2.1 HTML Overview

Markup languages consist of sets of directions that tell the browser software (and other user agents such as mobile phones) how to display and manage a web document. These directions are usually called tags and perform functions such as displaying graphics, formatting text, and referencing hyperlinks.

The World Wide Web is composed of files containing **Hypertext Markup Language (HTML)** and other markup languages that describe web pages. Tim Berners-Lee developed HTML using Standard Generalized Markup Language (SGML). SGML prescribes a standard format for embedding descriptive markup within a document and for describing the structure of a document. SGML is not in itself a document language, but rather a description of how to specify one and create a document type definition (DTD). The W3C (http://www.w3c.org) sets the standards for HTML and its related languages. Like the Web itself, HTML is in a constant state of change.

HTML

HTML is the set of markup symbols or codes placed in a file that is intended for display on a web page. These markup symbols and codes identify structural elements such as paragraphs, headings, and lists. HTML can also be used to place media (such as graphics, video, and audio) on a web page and describe fill-in forms. The browser interprets the markup code and renders the page. HTML permits the platform-independent display of information across a network. No matter what type of computer a web page was created on, any browser running on any operating system can display the page.

Each individual markup code is referred to as an **element** or **tag**. Each tag has a purpose. Tags are enclosed in angle brackets, the < and > symbols. Most tags come in pairs: an opening tag and a closing tag. These tags act as containers and are sometimes referred to as container tags. For example, the text that is between the `<title>` and `</title>` tags on a web page would display in the title bar on the browser window. Some tags are used alone and are not part of a pair. For example, a `<br>` tag that configures a line break on a web page is a stand-alone, or self-contained, tag and does not have a closing tag. Most tags can be modified with **attributes** that further describe their purpose.

XML

XML (eXtensible Markup Language) was developed by the W3C to create common information formats and share the format and the information on the Web. It is a text-based syntax designed to describe, deliver, and exchange structured information, such as RSS feeds. XML is not intended to replace HTML, but to extend the power of HTML by separating data from presentation. Using XML, developers can create any tags they need to describe their information.

XHTML

The most recent standardized version of HTML used today is **eXtensible HyperText Markup Language (XHTML)**. XHTML uses the tags and attributes of HTML4 along with the syntax of XML. XHTML has been used on the Web for over a decade and you'll find many web pages coded with this markup language. At one point the W3C was working on a new version of XHTML, called XHTML 2.0. However, the W3C stopped development of XHTML 2.0 because it was not backward compatible with HTML4. Instead, the W3C decided to move forward with HTML5.

HTML5

HTML5 is intended to be the successor to HTML4 and will replace XHTML. HTML5 incorporates features of both HTML and XHTML, adds new elements of its own, provides new features such as form edits and native video, and is intended to be backward compatible.

The W3C approved HTML5 for Candidate Recommendation status in late 2012. HTML5 reached final Recommendation status in late 2014. The W3C continues its development of HTML and is adding more new elements, attributes, and features in HTML 5.1, which is currently in draft form.

Recent versions of popular browsers, such as Internet Explorer, Microsoft Edge, Firefox, Safari, Google Chrome, and Opera, already support most features of HTML5. When new versions of each browser are released, you can expect increased support of HTML5. You'll learn to use HTML5 syntax as you work through this textbook. W3C HTML5 documentation is available at http://www.w3.org/TR/html5/.

FAQ What software do I need?

No special software is needed to create a web page document; all you need is a text editor. The Notepad text editor is included with Microsoft Windows. TextEdit is distributed with the Mac OS X operating system. (See http://support.apple.com/kb/TA20406 for configuration information.) An alternative to the operating system's basic text editor is one of the many free or shareware editors that are available, such as Notepad++ for Windows (http://notepad-plus-plus.org/download) and TextWrangler for Macs (http://www.barebones.com/products/textwrangler/download.html). Another commonly used alternative is a commercial web-authoring tool, such as Adobe Dreamweaver. Regardless of the software or program you use, having a solid foundation in HTML will be useful.

You will need to test your web pages in the most popular browsers, which are listed as follows, along with the URLs where you can download them for free:

- Internet Explorer (http://windows.microsoft.com/en-US/internet-explorer/download-ie)
- Mozilla Firefox (http://www.mozilla.com/en-US/products/download.html)
- Apple Safari (http://www.apple.com/safari/download/)
- Google Chrome (http://www.google.com/chrome)

You will also find the Web Developer Extension for Firefox (https://addons.mozilla.org/en-us/firefox/addon/web-developer) to be useful.

2.2 Document Type Definition

Because multiple versions and types of HTML and XHTML exist, the W3C recommends identifying the type of markup language used in a web page document with a **Document Type Definition (DTD)**. The DTD identifies the version of HTML contained in your document. Browsers and HTML code validators can use the information in the DTD when processing the web page. The DTD statement, commonly called a **doctype** statement, is the first line of a web page document. The DTD for HTML5 is:

```
<!DOCTYPE html>
```

2.3 Web Page Template

You already know that the HTML markup language tells browsers how to display information on a web page. Let's take a closer look at what's "under the hood" of every web page you create. Every single web page you create will include the DTD and the html, head, title, meta, and body elements. We will follow the coding style to use lowercase letters and place quotes around attribute values. A basic HTML5 web page template (found in the student files at chapter2/template.html) is as follows:

```
<!DOCTYPE html>
<html lang="en">
<head>
<title>Page Title Goes Here</title>
<meta charset="utf-8">
</head>
<body>
... body text and more HTML tags go here ...
</body>
</html>
```

With the exception of the specific page title, the first seven lines will usually be the same on every web page that you create. Review the code above and notice that the document type definition statement has its own formatting and that the HTML tags all use lowercase letters. Next, let's explore the purpose of the html, head, title, meta, and body elements.

2.4 HTML Element

The purpose of the html element is to indicate that the document is HTML formatted. The html element tells the browser how to interpret the document. The opening **<html>** tag is placed on a line below the DTD. The closing `</html>` tag indicates the end of the web page and is placed after all other HTML elements in the document.

The html element also needs to indicate the spoken language, such as English, of the text in the document. This additional information is added to the `<html>` tag in the form of an attribute, which modifies or further describes the function of an element. The **lang attribute** specifies the spoken language of the document. For example, `lang="en"` indicates the English language. Search engines and screen readers may access this attribute.

2.5 Head, Title, Meta, and Body Elements

There are two sections on a web page: the head and the body. The **head section** contains information that describes the web page document. The **body section** contains the actual tags, text, images, and other objects that are displayed by the browser as a web page.

The Head Section

Elements that are located in the head section include the title of the web page, meta tags that describe the document (such as the character encoding used and information that may be accessed by search engines), and references to scripts and styles. Many of these features do not show directly on the web page.

The **head element** contains the head section, which begins with the **<head>** tag and ends with the **</head>** tag. You will always code at least two other elements in the head section: a title element and a meta element.

The first element in the head section, the **title element**, configures the text that will appear in the title bar of the browser window. The text between the **<title>** and **</title>** tags is called the title of the web page and is accessed when web pages are bookmarked and printed. Popular search engines, such as Google, use the title text to help determine keyword relevance and even display the title text on the results page of a search. A descriptive title that includes the website or organization name is a crucial component for establishing a brand or presence on the Web.

The **meta element** describes a characteristic of a web page, such as the character encoding. **Character encoding** is the internal representation of letters, numbers, and symbols in a file such as a web page or other file that is stored on a computer and may be transmitted over the Internet. There are many different character-encoding sets. However, it is common practice to use a character-encoding set that is widely supported, such as utf-8, which is a form of Unicode (http://www.unicode.org). The meta tag is not used as a pair of opening and closing tags. It is considered to be a stand-alone, or **self-contained**, tag (referred to as a **void element** in HTML5). The meta tag uses the **charset attribute** to indicate the character encoding. An example meta tag is as follows:

```
<meta charset="utf-8">
```

The Body Section

The body section contains text and elements that display directly on the web page in the browser window, also referred to as the browser viewport. The purpose of the body section is to configure the contents of the web page.

The **body element** contains the body section, which begins with the **<body>** tag and ends with the **</body>** tag. You will spend most of your time writing code in the body of a web page. Text and elements typed between the opening and closing body tags will display on the web page in the browser viewport.

2.6 Your First Web Page

Hands-On Practice 2.1

VideoNote
Your First
Web Page

Now that you're familiar with basic elements used on every web page, it's your turn to create your first web page, shown in Figure 2.1.

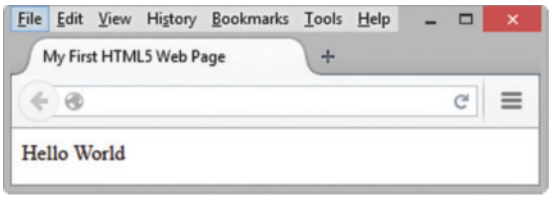

Figure 2.1 Your first webpage

Create a Folder

You'll find it helpful to create folders to organize your files as you develop the web pages in this book and create your own websites. Use your operating system to create a new folder named mychapter2 on your hard drive or a portable flash drive.

To create a new folder on a Mac:

1. Launch Finder, and select the location where you would like to create the new folder.
2. Choose File > New Folder to create an untitled folder.
3. To rename the folder, select the folder and click on the current name. Type a name for the folder, and press the Return key.

To create a new folder with Windows (version 7 and below):

1. Launch Windows Explorer (either press the Windows key or select Start > All Programs > Accessories > Windows Explorer).
2. Navigate to the location where you would like to create the new folder, such as My Documents or your C: drive.
3. Select New Folder.
4. To rename the New Folder, right-click on it, select Rename from the context-sensitive menu, type in the new name, and press the Enter key.

To create a new folder with Windows (version 8 and above):

1. Launch File Explorer (formerly called Windows Explorer):
   a. Display the Desktop.
   b. Right-click on the Start button and select File Explorer.
2. Navigate to the location where you would like to create the new folder, such as Documents, your C: drive, or an external USB drive.
3. Select the Home tab. Select New Folder.
4. To rename the New Folder, right-click on it, select Rename from the context-sensitive menu, type in the new name, and press the Enter key.

FAQ **Why should I create a folder, why not just use the desktop?**

Folders will help you to organize your work. If you just use the desktop, it would quickly become cluttered and disorganized. It's also important to know that web-sites are organized on web servers within folders. By starting to use folders right away to organize related web pages, you are on your way to becoming a suc-cessful web designer.

Your First Web Page

Now you are ready to create your first HTML5 web page. Launch Notepad or another text editor. Type in the following code:

```
<!DOCTYPE html>
<html lang="en">
<head>
<title>My First HTML5 Web Page</title>
<meta charset="utf-8">
</head>
<body>
Hello World
</body>
</html>
```

Notice that the first line in the file contains the doctype. The HTML code begins with an opening `<html>` tag and ends with a closing `</html>` tag. The purpose of these tags is to indicate that the content between them makes up a web page. The head section is delimited by `<head>` and `</head>` tags and contains a pair of title tags with the words "My First HTML5 Web Page" in between, along with a **`<meta>`** tag to indicate the character encoding.

The body section is delimited by `<body>` and `</body>` tags. The words "Hello World" are typed on a line between the body tags. See Figure 2.2 for a screenshot of the code as it would appear in Notepad. You have just created the source code for a web page document.

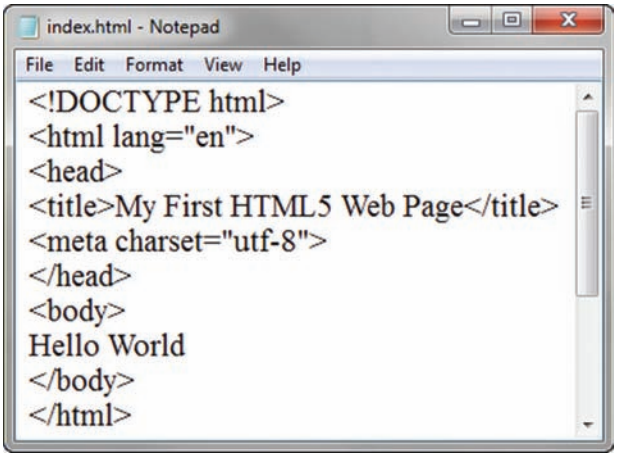

Figure 2.2 Code displayed in Notepad. Screenshot from Microsoft® Notepad®. Used by permission of Microsoft Corporation

FAQ **Do I have to start each tag on its own line?**

No, you are not required to start each tag on a separate line. A browser can display a page even if all the tags follow each other on one line with no spaces. Humans, however, find it easier to write and read web page code if line breaks and indentation are used.

Save Your File

You will save your file with the name of index.html. A common file name for the home page of a website is index.html or index.htm. Web pages use either a .htm or a .html file extension. The web pages in this book use the .html file extension. Display your file in Notepad or another text editor. Select File from the menu bar, and then select Save As. The Save As dialog box will appear. Navigate to your mychapter2 folder. Using Figure 2.3 as an example, type the file name. Click the Save button after you type the file name. Sample solutions for the exercises are available in the student files. If you like, you can compare your work with the solution in the student files at chapter2/index.html before you test your page.

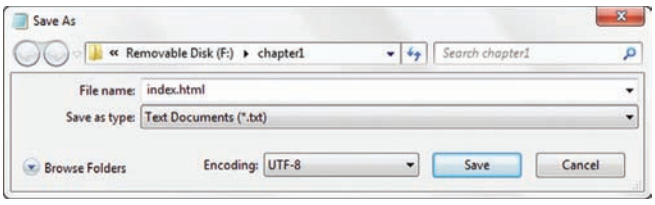

Figure 2.3 The Save As dialog box. Screenshot from Microsoft® Notepad®. Used by permission of Microsoft Corporation