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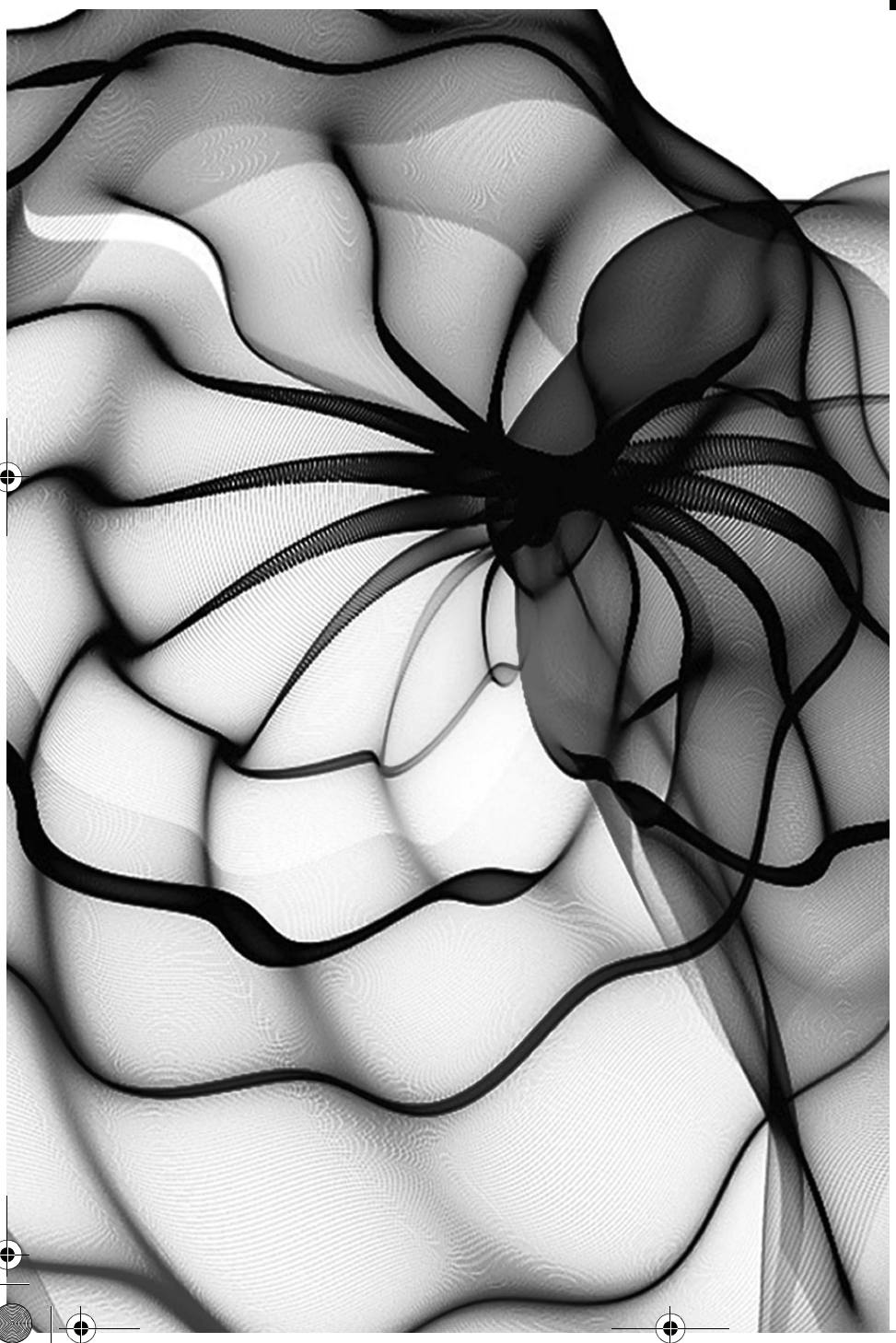
Introduction to Computers and the Internet



People are using the web to build things they have not built or written or drawn or communicated anywhere else.
—Tim Berners-Lee

How wonderful it is that nobody need wait a single moment before starting to improve the world.
—Anne Frank

Man is still the most extraordinary computer of all.
—John F. Kennedy

Objectives

In this chapter you'll learn:

- Computer hardware, software and Internet basics.
- The evolution of the Internet and the World Wide Web.
- How HTML5, CSS3 and JavaScript are improving web-application development.
- The data hierarchy.
- The different types of programming languages.
- Object-technology concepts.
- And you'll see demos of interesting and fun Internet applications you can build with the technologies you'll learn in this book.

Self-Review Exercises

1.1 Fill in the blanks in each of the following:

a) The company that popularized personal computing was _____.

ANS: Apple.

b) Computers process data under the control of sets of instructions called computer _____.

ANS: programs.

c) _____ is a type of computer language that uses Englishlike abbreviations for machine-language instructions.

ANS: Assembly language.

d) _____ languages are most convenient to the programmer for writing programs quickly and easily.

ANS: High-level.

e) The only language a computer can directly understand is that computer's _____.

ANS: machine language.

f) The programs that translate high-level language programs into machine language are called _____.

ANS: compilers.

g) _____, or labeling content, is another key part of the collaborative theme of Web 2.0.

ANS: Tagging.

h) With _____ development, individuals and companies contribute their efforts in developing, maintaining and evolving software in exchange for the right to use that software for their own purposes, typically at no charge.

ANS: open-source.

i) The _____ was the predecessor to the Internet.

ANS: ARPANET.

j) The information-carrying capacity of a communications medium like the Internet is called _____.

ANS: bandwidth.

k) The acronym TCP/IP stands for _____.

ANS: Transmission Control Protocol/Internet Protocol.

1.2 Fill in the blanks in each of the following statements.

a) The _____ allows computer users to locate and view multimedia-based documents on almost any subject over the Internet.

ANS: World Wide Web.

b) _____ founded an organization—called the World Wide Web Consortium (W3C)—devoted to developing nonproprietary, interoperable technologies for the World Wide Web.

ANS: Tim Berners-Lee.

c) _____ are reusable software components that model items in the real world.

ANS: Objects.

d) _____ is a smartphone operating system based on the Linux kernel and Java.

ANS: Android.

1.3 Fill in the blanks in each of the following statements (based on Section 1.14):

a) Objects have the property of _____—although objects may know how to communicate with one another across well-defined interfaces, they normally are not allowed to know how other objects are implemented.

ANS: information hiding.

b) In object-oriented programming languages, we create _____ to house the set of methods that perform tasks.

ANS: classes.

c) The process of analyzing and designing a system from an object-oriented point of view is called _____.

ANS: object-oriented analysis and design (OOAD).

d) With _____, new classes of objects are derived by absorbing characteristics of existing classes, then adding unique characteristics of their own.

ANS: inheritance.

e) The size, shape, color and weight of an object are considered _____ of the object's class.

ANS: attributes.

1.4 State whether each of the following is *true* or *false*. If the statement is *false*, explain why.

a) HTML5 (HyperText Markup Language 5) is a high-level language designed to specify the content and structure of web pages in a portable manner.

ANS: False. HTML is a markup language.

b) Keeping page styling together with the page content and structure enables you to easily change the look and feel of the pages on an entire website, or a portion of a website.

ANS: False. By separating page styling from page content and structure, you can change the look and feel of the pages on an entire website, or a portion of a website, simply by swapping out one style sheet for another.

c) A web server maintains a database of hostnames and their corresponding IP addresses, and performs the translations automatically.

ANS: False. A Domain Name System (DNS) server maintains a database of hostnames and their corresponding IP addresses, and performs the translations automatically.

1.5 Fill in the blanks in each of the following statements:

a) _____ is a JavaScript library that simplifies JavaScript programming by making it easier to manipulate a web page's elements and interact with servers in a portable manner across various web browsers.

ANS: jQuery.

b) _____ is the standard for transferring encrypted data on the web.

ANS: Hypertext Transfer Protocol Secure (HTTPS).

c) _____ identify resources on the Internet.

ANS: URIs (Uniform Resource Identifiers).

d) An _____ is a numerical value that uniquely identifies the server on the Internet.

ANS: IP (Internet Protocol) address.

e) Browsers often _____ web pages for quick reloading.

ANS: cache.

f) The _____ operating system is used in the iPhone, iPad and iPod Touch devices.

ANS: iOS.

Solutions

1.6 Fill in the blanks in each of the following statements:

a) The process of instructing the computer to solve a problem is called _____.

ANS: computer programming.

b) What type of computer language uses Englishlike abbreviations for machine-language instructions? _____.

ANS: assembly language.

c) The level of computer language at which it's most convenient for you to write programs quickly and easily is _____.

ANS: high-level language.

d) The only language that a computer directly understands is called that computer's _____.

ANS: machine language.

e) Web 2.0 embraces an _____—a design that encourages user interaction and community contributions.

ANS: architecture of participation.

f) _____ is the concept that a large, diverse group of people will create smart ideas.

ANS: collective intelligence.

1.7 Fill in the blanks in each of the following statements:

a) _____ is now used to develop large-scale enterprise applications, to enhance the functionality of web servers, to provide applications for consumer devices and for many other purposes.

ANS: Java.

b) _____ initially became widely known as the development language of the UNIX operating system.

ANS: C.

c) The Web 2.0 company _____ is the fastest growing company ever.

ANS: Groupon.

d) The _____ programming language was developed by Bjarne Stroustrup in the early 1980s at Bell Laboratories.

ANS: C++.

1.8 State whether each of the following is *true* or *false*. If the statement is *false*, explain why.

a) Cascading Style Sheets™ 3 (CSS3) is used to specify the presentation, or styling, of elements on a web page (e.g., fonts, spacing, sizes, colors, positioning).

ANS: True.

b) Ensuring a consistent look and feel on client-side browsers is one of the great challenges of developing web-based applications.

ANS: True.

c) An `HTTP` request typically posts (or sends) data to a server.

ANS: False. A `post` request typically posts data to a server. An `HTTP` request often posts data to a server-side form handler that processes the data.

d) Client-side scripts often can access the server's file-directory structure.

ANS: False. Server-side scripts often can access the server's file directory structure.

1.9 Fill in the blanks in each of the following statements:

a) _____ is the next-generation Internet Protocol that features built-in security and a new addressing scheme, significantly expanding the number of addresses available.

ANS: IPv6.

b) HTML documents normally contain _____, which, when clicked, load a specified web document.

ANS: hyperlinks.

c) A _____ contains information that directs a browser to the resource that the user wishes to access; _____ make such resources available to web clients.

ANS: URL, web servers.

d) The two most common HTTP request types are _____ and _____.

ANS: `get` and `post`.

e) Web-based applications are multitier applications. The _____ (also called the data tier or the information tier) maintains the application's data and typically stores data in a relational database management system. The _____ implements business logic, controller logic and presentation logic to control interactions between the application's clients and its data. The _____, or client tier, is the application's user interface, which gathers input and displays output.

ANS: bottom tier, middle tier, top tier.

f) _____, the fastest growing mobile and smartphone operating system, ss based on the Linux kernel and Java.

ANS: Android

1.10 What is the relationship between JavaScript and ECMAScript?

ANS: JavaScript is a scripting language created by Netscape. Netscape and Microsoft have been instrumental in the standardization of JavaScript by ECMA International (formerly the European Computer Manufacturers Association) as ECMAScript.

1.11 Describe the difference between *client-side programming* and *server-side programming*.

ANS: Client-side programming technologies are used to build web pages and applications that are run in the browser on the user's device. Server-side programming technologies are used to create applications that respond to requests from client-side web browsers.

1.12 ***(Internet in Industry and Research)*** Figures 1.1–1.4 provide examples of how computers and the Internet are being used in industry and research. Find three additional examples and describe how each is using the Internet and the web.

ANS: Answers will vary.

1.13 ***(Cloud Computing)*** Describe three benefits of the cloud computing model.

ANS: Answers will vary. Information is accessed via the Internet and available on demand—rather than having it stored on your personal computer. Cloud storage or processing services are generally more cost effective, allowing you to increase or decrease resources to meet your needs at any given time, rather than purchasing expensive hardware to ensure that you have enough storage and processing power to meet your needs at their peak levels. Software offered as a service in the cloud allows businesses to easily manage customer information and access it from their computers or mobiles devices. These applications are often less expensive and shift the burden of managing the applications from the business to the service provider, saving businesses additional money. Another benefit of using software in the cloud is that it ensures everyone within the business is working on the same version of the software at all times.

1.14 ***(Web Services)*** In Fig. 1.11 we listed several web services that can be used to create your own web applications. Using two different web services—either from the table or that you find online—describe a type of web application that you would like to create. How does it use the content provided by each of the web services?

ANS: Answers will vary.

1.15 ***(Internet Negatives)*** Besides their numerous benefits, the Internet and the web have several downsides, such as privacy issues, identity theft, SPAM and malware. Research some of the negative aspects of the Internet. List five problems and describe what could possibly be done to help solve each.

ANS: Answers will vary.

1.16 *(Web 2.0)* In this chapter, we discussed a few popular Web 2.0 businesses, including Facebook, Twitter, Groupon, Foursquare, Skype and YouTube. Identify another Web 2.0 business and describe why it fits the Web 2.0 business model.

ANS: Answers will vary.

1.17 *(Watch as an Object)* You're probably wearing on your wrist one of the world's most common types of objects—a watch. Discuss how each of the following terms and concepts applies to the notion of a watch: object, attributes, behaviors, class, inheritance (consider, for example, an alarm clock), abstraction, modeling, messages, encapsulation, interface and information hiding.

ANS: The entire watch is an object that is composed of many other objects (such as the moving parts, the band, the face, etc.) Watch attributes are time, color, band, style (digital or analog), etc. The behaviors of the watch include setting the time and getting the time. A watch can be considered a specific type of clock (as can an alarm clock). With that in mind, it is possible that a class called `Clock` could exist from which other classes such as watch and alarm clock could inherit the basic features in the clock. The watch is an abstraction of the mechanics needed to keep track of the time. The user of the watch does not need to know the mechanics of the watch in order to use it; the user only needs to know that the watch keeps the proper time. In this sense, the mechanics of the watch are encapsulated (hidden) inside the watch. The interface to the watch (its face and controls for setting the time) allows the user to set and get the time. The user is not allowed to directly touch the internal mechanics of the watch. All interaction with the internal mechanics is controlled by the interface to the watch. The data members stored in the watch are hidden inside the watch and the member functions (looking at the face to get the time and setting the time) provide the interface to the data.

1.18 *(Privacy)* Some online e-mail services save all e-mail correspondence for some period of time. Suppose a disgruntled employee were to post all of the e-mail correspondences for millions of people, including yours, on the Internet. Discuss the issues.

1.19 *(Programmer Responsibility and Liability)* As a programmer in industry, you may develop software that could affect people's health or even their lives. Suppose a software bug in one of your programs caused a cancer patient to receive an excessive dose during radiation therapy and that the person was severely injured or died. Discuss the issues.

1.20 *(2010 "Flash Crash")* An example of the consequences of our excessive dependence on computers was the so-called "flash crash" which occurred on May 6, 2010, when the U.S. stock market fell precipitously in a matter of minutes, wiping out trillions of dollars of investments, and then recovered within minutes. Research online the causes of this crash and discuss the issues it raises.

1.21 *(Making a Difference Projects)* The following is a list of just a few worldwide organizations that are working to make a difference. Visit these sites and our Making a Difference Resource Center at `www.deitel.com/makingadifference`. Prepare a top 10 list of programming projects that you think could indeed "make a difference."

- `www.imaginecup.com/`
  The *Microsoft Image Cup* is a global competition in which students use technology to try to solve some of the world's most difficult problems, such as environmental sustainability, ending hunger, emergency response, literacy and combating HIV/AIDS. Visit `www.imaginecup.com/about` for more information about the competition and to learn about the projects developed by previous winners. You can also find several project ideas submitted by worldwide charitable organizations at `www.imaginecup.com/students/imagine-cup-solve-this`. For additional ideas for programming projects that can make a difference, search the web for "making a difference" and visit the following websites:

- `www.un.org/millenniumgoals`
  The United Nations Millennium Project seeks solutions to major worldwide issues such as environmental sustainability, gender equality, child and maternal health, universal education and more.
- `www.ibm.com/smarterplanet/`
  The IBM® Smarter Planet website discusses how IBM is using technology to solve issues related to business, cloud computing, education, sustainability and more.
- `www.gatesfoundation.org/Pages/home.aspx`
  The Bill and Melinda Gates Foundation provides grants to organizations that work to alleviate hunger, poverty and disease in developing countries. In the United States, the foundation focusses on improving public education, particularly for people with few resources.
- `www.nethope.org/`
  NetHope is a collaboration of humanitarian organizations worldwide working to solve technology problems such as connectivity, emergency response and more.
- `www.rainforestfoundation.org/home`
  The Rainforest Foundation works to preserve rainforests and to protect the rights of the indigenous people who call the rainforests home. The site includes a list of things you can do to help.
- `www.undp.org/`
  The United Nations Development Programme (UNDP) seeks solutions to global challenges such as crisis prevention and recovery, energy and the environment and democratic governance.
- `www.unido.org`
  The United Nations Industrial Development Organization (UNIDO) seeks to reduce poverty, give developing countries the opportunity to participate in global trade, and promote energy efficiency and sustainability.
- `www.usaid.gov/`
  USAID promotes global democracy, health, economic growth, conflict prevention, humanitarian aid and more.
- `www.toyota.com/ideas-for-good/`
  Toyota's Ideas for Good website describes several Toyota technologies that are making a difference—including their Advanced Parking Guidance System, Hybrid Synergy Drive®, Solar Powered Ventilation System, T.H.U.M.S. (Total Human Model for Safety) and Touch Tracer Display. You can participate in the Ideas for Good challenge by submitting a short essay or video describing how these technologies can be used for other good purposes.

  ANS: Answers will vary.