

计算机科学引论

(2005 影印版)

Computing Essentials

● Timothy J. O'Leary

● Linda I. O'Leary

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Graw
Hill

Education



高等教育出版社

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江苏工业学院图书馆
藏书章



高等教育出版社

图字: 01-2004-3244 号

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Computing Essentials 2005, Complete Edition

原版 ISBN: 0-07-283607-5

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<http://www.mheducation.com>

图书在版编目(CIP)数据

计算机科学引论: 2005=Computing Essentials 2005, Complete Edition/
(美)奥利里(O'Leary,T.J.), (美)奥利里(O'Leary,L.I.). —影印本. —北京:
高等教育出版社, 2004.7

ISBN 7-04-014598-7

I. 计... II. ①奥... ②奥... III. 计算机科学—英文 IV. TP3

中国版本图书馆 CIP 数据核字 (2004) 第 056244 号

出版发行 高等教育出版社
社 址 北京市西城区德外大街 4 号
邮政编码 100011
总 机 010-82028899

购书热线 010-64054588
免费咨询 800-810-0598
网 址 <http://www.hep.edu.cn>
<http://www.hep.com.cn>

经 销 新华书店北京发行所
印 刷 北京民族印刷厂

开 本 850×1168 1/16
印 张 33.75
字 数 645 000

版 次 2004 年 7 月第 1 版
印 次 2004 年 7 月第 1 次印刷
定 价 38.00 元(含光盘)

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出版说明

本书是美国麦格劳-希尔 (McGraw-Hill) 出版公司出版的《Computing Essentials 2005, Complete Edition》一书的影印版。原书自 1989 年以来每年都出一次新版, 主要用作英语国家的计算机导论性教材。我社曾经影印过该书 2000 版, 并作为《计算机科学引论》推荐给各高等学校使用, 采用的学校普遍反映较好。本书是今年 5 月出版的新版, 内容做了全面更新, 突出知识的先进性、系统性和教学的实践性, 并提供更为丰富的习题、思考题和在线学习功能。

本书概括地介绍了计算机科学与技术的主要领域、各种应用及其对社会的影响。全书由 15 章和一些附录组成, 主要内容包括: 信息技术概述; 因特网、万维网与电子商务; 基本应用软件 (包括字处理、表处理、数据库管理系统、文字和图形演示、集成化软件包等); 专用软件 (包括图形图像处理、音频与视频、多媒体、Web 创作以及虚拟现实和专家系统等新兴应用); 操作系统等系统软件; 计算机系统组成部件; 输入/输出及相关外部设备; 外部存储设备; 通信与网络技术; 信息系统 (包括事务处理系统、管理信息系统、决策支持系统、管理支持系统等); 数据库与应用; 系统分析与设计; 程序设计与程序语言; 与信息技术有关的社会、组织、职业、道德、法律、安全和环境等问题; 计算机发展简介; 个人计算机购机与升级指南等。书中大量的图示、精心的版式设计, 使各种概念、技术、设备等一目了然。每章之后附有综合性的图示小结、重要词汇和术语列表、丰富的复习题、思考题和网上实习等。

本书内容丰富, 体裁新颖, 叙述简练清楚, 英语语言规范流畅。书中比较全面地覆盖了计算机科学与技术领域中基本的名词和术语, 尤其是目前十分流行和最新的一些概念和词汇。因此, 本书在使学生了解和掌握计算机及信息技术专业基础知识的同时, 也有助于他们掌握相应的英文词汇, 提高专业英语的阅读能力。本书既可作为计算机、信息管理及相关专业计算机导论课程的教材, 也可作为相应专业的计算机英语教材。

随书附原版多媒体光盘一张, 内容丰富, 图文声并茂。包括各种形式的教学辅助内容、网上资源链接、案例学习与实践、在线复习与自测练习等, 可辅助教师教学和学生自学。

Preface



INTRODUCTION

The 20th century not only brought us the dawn of the Information Age, but continued to bring us rapid changes in information technology. There is no indication that this rapid rate of change will be slowing—it may even be increasing. As we begin the 21st century, computer literacy will undoubtedly become prerequisite in whatever career a student chooses. The goal of *Computing Essentials* is to provide students with the basis for understanding the concepts necessary for success in the Information Age. *Computing Essentials* also endeavors to instill in students an appreciation for the effect of information technology on people and our environment and to give students a basis for building the necessary skill set to succeed in this new, 21st century.

ABOUT THE AUTHORS

Tim and Linda O'Leary live in the American Southwest and spend much of their time engaging instructors and students in conversation about learning. In fact, they have been talking about learning for over 25 years. Something in those early conversations convinced them to write a book, to bring their interest in the learning process to the printed page. Today,

they are as concerned as ever about learning, about technology, and about the challenges of presenting material in new ways, both in terms of content and the method of delivery.

A powerful and creative team, Tim combines his years of classroom teaching experience with Linda's background as a consultant and corporate trainer. Tim has taught courses at Stark Technical College in Canton, Ohio, and at Rochester Institute of Technology in upstate New York, and is currently a professor at Arizona State University in Tempe, Arizona. Tim and Linda have talked to and taught students from 8 to 80, all of them with a desire to learn something about computers and the applications that make their lives easier, more interesting, and more productive.

Each new edition of an O'Leary text, supplement, or learning aid has benefited from these students and their instructors who daily stand in front of them (or over their shoulders). *Computing Essentials* is no exception.

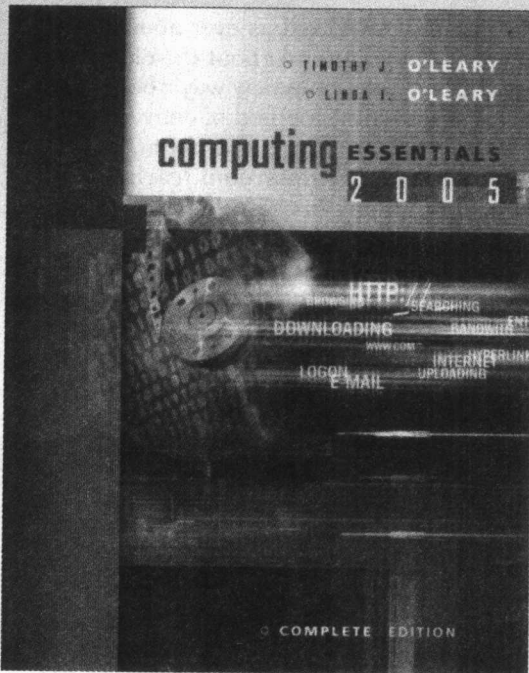
A WORD FROM THE AUTHORS

Times are changing, technology is changing, and this text is changing, too. Do you think the students of today are different from yesterday? Mine are and I'll wager that yours are as well. On the positive side, I am amazed how much effort students put toward things that interest them and things they are convinced are relevant to them. Their effort directed at learning application programs and exploring the Web seems at times limitless. On the other hand, it is difficult to engage them in other equally important topics such as personal privacy and technological advances.

I've changed the way I teach, and this book reflects that. I no longer lecture my students about how important certain concepts like microprocessors, input devices, and utility programs are. Rather, I begin by engaging their

interest by presenting practical tips related to the key concepts, by demonstrating interesting applications that are relevant to their lives, and by focusing on outputs rather than processes. Then, I discuss the concepts and processes.

Motivation and relevance are the keys. This text has several features specifically designed to engage students and to demonstrate the relevance of technology in their lives. These elements are combined with a thorough coverage of the concepts and sound pedagogical devices.



SELECTED FEATURES OF THIS BOOK

- **Visual Chapter Openers** Each chapter begins with a two-page Visual Chapter Opener with large graphics and brief text. The graphics present the structure and organization of the chapter. The text relates the graphics to topics that are covered in the chapter and discusses their importance. The objective of the visual chapter openers is to engage students and provide relevancy and motivation.
- **On the Web Explorations** Within many of the chapters, two or more On the Web Explorations are presented as marginal elements. These explorations encourage students to connect to carefully selected Web sites that provide additional information on

key topics. The objective of the Web Explorations is to encourage students to expand their knowledge by using Web resources.

On the Web Explorations

Dragon Soft is a leader in developing continuous-speech systems. To learn more about the company, visit our Web site at <http://www.mhhe.com/oleary/CE05> and select On the Web Explorations from Tim's Toolbox.

- **Tips** Within many of the chapters, Tips are provided that offer advice on a variety of chapter-related issues such as how to efficiently locate information on the Web, how to speed up computer operations, and how to protect against computer viruses. One objective of the Tips is to provide students with assistance on common technology-related problems or issues. The other objective is to motivate students by showing the relevance of concepts presented in the chapter to their everyday lives.

TIPS

Have you used the Internet? If so, then you probably already know how to use a browser. For those of you who do not, here are a few tips to get you started.

- 1 **Start browser.** Typically, all you need to do is double-click the browser's icon on the desktop.
- 2 **Enter URL.** In the browser's location box, type the URL (uniform resource locator, or address) of the Internet or Web location (site) that you want to visit.
- 3 **Press ENTER.** On your keyboard, press the ENTER key to connect to the site.
- 4 **Read and explore.** Once connected to the site, read the information displayed on your monitor. Using the mouse, move the pointer on the monitor.

- **Concept Checks** Every chapter contains strategically placed Concept Check boxes. Each box contains questions related to the material just presented. The objective of these Concept Checks is to provide students the opportunity to test their retention of key chapter concepts.

Concept Check

- ✓ What is an information system?
- ✓ What is required of a competent end user?

- **Making IT Work for You** Based on student surveys, 10 special interest topics have been identified. These topics include downloading music from the Internet, creating personal Web sites, and using the Internet to place free long-distance telephone calls. Each of these 10 special interest topics is presented in a two-page Making IT Work for You section within the relevant chapter. The objective is to engage students by presenting high-interest topics and to motivate them to learn about related concepts in the chapter.



- **Making IT Work Video Series** Based on student interest and chapter content, several Making IT Work for You special interest topics have been selected for special attention. Seven short videos bring these selected topics to life. These videos are available on the student Computing Essentials CD and at the course Web site. One objective of this feature is to motivate students by animating and extending the printed two-page Making IT Work for You presentation in the textbook. The other objective is to provide instructors with a presentation tool for classroom demonstrations that are integrated and further supported by the textbook.
- **Using IT at DVD Direct** Many students find information systems concepts to be very challenging. A series of four cases focused on DVD Direct, a factious Web-based movie rental company, have been created. The cases are referenced at the end of Chapters 11, 12, 13, and 14. Students can view the case from their Computing Essentials CD or from the text's Web site. The cases have been written to allow instructors to skip all or some of the cases without losing continuity. The objective of the cases is

to engage students in an interesting current application of technology and to demonstrate the relevance and importance of information systems, databases, systems analysis and design, and programming.

- **A Look to the Future** Each chapter concludes with a brief discussion of a specific recent technological advance related to material presented in the chapter. The objective of this feature is to remind students that technology is always changing and to reinforce the importance of staying informed of recent changes.



- **Visual Chapter Summaries** Each chapter ends with a multipage visual chapter summary. Like the chapter openers, the summaries use graphics to present the structure of the chapter and text to provide specifics. Using a columnar arrangement, major concepts are represented by graphics followed by detailed text summaries. The objective of the visual chapter summaries is to provide a detailed summary of key concepts and terms in an engaging and meaningful way.
- **Using Technology** Every chapter has Web-related end-of-chapter exercises that direct students to explore current popular uses of technology. In most cases, the first question requires the student to view one of the Making IT Work for You Web-delivered demonstrations and to respond to a series of related questions. Other questions require Web research. The objective of the Using Technology feature is to provide a powerful tool to engage and motivate students by providing assignments related to technology that directly relates to them.



- **Expanding Your Knowledge** Every chapter has end-of-chapter exercises directing students to enhance their depth of knowledge on specific technologies introduced in the chapter. In most cases, those questions require the students to use either their free Computing Essentials CD and/or the O'Leary Web site to respond to a series of related questions. One objective of the Expanding Your Knowledge feature is to provide support for instructors who want their students to effectively use the free interactive CD. The other objective is to support instructors who want their students to obtain greater in-depth understanding of key technologies.



- **Building Your Portfolio** Every chapter has end-of-chapter exercises directing students to prepare and to write a one- or two-page paper on critical technology-related issues. One question requires students to summarize and analyze select emerging technologies addressed in the chapter. Another question focuses on a critical chapter-related privacy, security, and/or ethical issue. Students are required to consider, evaluate, and formulate a position. One objective of the Building Your Portfolio feature is to support instructors who want their students to develop critical thinking and writing skills. Another objective is to provide support for instructors who want their students to create written document(s) recording their technology knowledge. A third objective is to provide support for instructors who want their students to recognize, understand, and analyze key privacy, security, and ethical issues relating to technology.



- **Free Integrated and Interactive CD** The Computing Essentials CD contains a variety of materials custom designed to support the text. These materials include animations, videos, expansion text, descriptions of select IT careers, and much more. The CD content is also available from the text's Web site. Every chapter includes direct and specific references to the CD. The objective of the CD is to support instructors with materials to customize or focus their courses in a variety of different ways. It also provides students with a free, fast, and rich resource of materials that is not dependent upon a fast Internet connection.
- **Tim's Toolbox** Throughout the pages of the text you will see specific references to Tim's Toolbox. It is a metaphor representing the complete collection of student resources available from the student's Computing Essentials CD and from the text's Web site at www.mhhe.com/oleary/CE05. The objective of Tim's Toolbox is to provide a simple, consistent, and intuitive interface and menu structure to resources provided at both locations.
- **Engaging Students** Having all these features is one thing. Making the students aware of them is another. Like in almost all textbooks, Chapter 1 of this textbook provides an overview and framework for the following chapters. Unlike other textbooks, our Chapter 1 also provides a discussion and overview of each of the above engaging features. One objective of this approach is to support instructors who want to focus their students' attention on any one or on a combination of features. The other objective is to motivate students by highlighting features that are visually interesting and relevant to their lives.

Instructor's Guide

RESOURCES FOR INSTRUCTORS

We understand that in today's teaching environment offering a textbook alone is not sufficient to meet the needs of the many different instructors who use our books. To teach effectively, instructors must have a full complement of supplemental resources to assist them in every facet of teaching from preparing for class, to presenting lectures, to assessing students' comprehension. *Computing Essentials* offers a complete, fully integrated supplements package, as described below.

Instructor's Resource Kit

The Instructor's Resource Kit contains an updated CD containing the Instructor's Manual in both MS Word and PDF formats, PowerPoint slides, and Brownstone's Diploma test generation software with accompanying test item files for each chapter. The distinctive features of each component of the Instructor's Resource Kit are described below.

- **Instructor's Manual** The Instructor's Manual contains a schedule showing how much time is required to cover the material in the chapter; a list of the chapter competencies; tips for covering difficult material; and answers to the Concept Checks. Also included are answers to all the exercises in the Chapter Review section and answers to the Web Exercises. The manual also includes a helpful introduction that explains the features, benefits, and suggested uses of the IM and an index of concepts and corresponding competencies.
- **PowerPoint Presentation** The PowerPoint presentation is designed to provide instructors with a comprehensive resource for use during lecture. It includes a review of key terms and definitions, figures from

the text, along with several new illustrations, anticipated student questions with answers, and additional resources that can be accessed in Internet-enabled classrooms. Also included with the presentation are comprehensive speaker's notes.

- **Testbank** The *Computing Essentials* edition testbank contains over 3,000 questions categorized by level of learning (definition, concept, and application). This is the same learning scheme that is introduced in the text to provide a valuable testing and reinforcement tool. The test questions are identified by text page number to assist you in planning your exams, and rationales for each answer are also included. Additional test questions, which can be used as pretests and posttests in class, can be found on the Online Learning Center, accessible through our Information Technology Supersite (www.mhhe.com/it).

TechTV—New Video Series from McGraw-Hill Technology Education



McGraw-Hill Technology Education is pleased to announce a new relationship with TechTV. Through this partnership, we are able to offer instructors and students new video content directly related to computing that enhances the classroom or lab experience with technology programming from business and society. Video selections from Tech TV programs such as "Cybercrime," "The Screen Savers" and "TechLive" are sometimes edgy and always informative. Use of these videos will help students understand how computing interacts with and contributes to business and society—and will also offer an advance look at emerging technology and devices. These new videos have been selected with the guidance of Professor Donald L. Amoroso of San Diego State

University. Professor Amoroso is an active teacher of large sections and has selected video segments from Tech TV that he knows will work in the classroom. He has prepared written guidance on how to best use these videos to facilitate learning. This new series gives instructors and students more power for teaching and learning in the computing classroom!

Making IT Work Video Series

Available on CD or the Web site, these videos provide cutting-edge context to help students learn the concepts presented in the text. This series of brief video presentations features the author and corresponds to specific Making IT Work for You topics from the text, making it a flexible tool for in-class and Web-delivered demonstrations while engaging students by presenting high-interest topics directly related to the concepts presented in the text. The series includes videos on:

- CD-R Drivers and Music from the Internet
- Creating a Personal Web Site
- Instant Messaging
- Locating Jobs Online
- Using TV Tuner Cards and Video Clips
- Virus Protection
- Web-based Applications

SimNet Concepts

The optional CD provides computer-based training and assessment for Computer Concepts. SimNet Concepts includes interactive "labs" for 77 different computer concepts in the Learning Component, and 160 corresponding assessment questions in the Assessment Component. In the Learning Component the content menus parallel the contents of the McGraw-Hill Technology Education text being used for the class, so students can cover topics for each chapter of the text you are using. Students also have access to a **Progress Report** that readily displays which topics have not yet been completed. If you assign custom lessons via PageOut, completion information is also tracked in the grade book.

SimNet Concepts offers a unique graphic-intensive environment for assessing student

understanding of computer concepts. Many are **mini-simulations**! There are 60 questions in the Practice question pool, and 120 in the Assessment question pool.

SimNet Concepts also offers the only truly integrated learning and assessment program available today. When a student completes any SimNet assessment, by simply clicking one button (the Make Custom Lesson button), he or she can have SimNet assemble a custom menu of topics on the learning side that the student either answered incorrectly or did not answer on that exam. These custom lessons can be saved to disk, and can be loaded by the student at any time to study those topics. SimNet Concepts also includes **Student Remediation**. This feature records what the student did when answering an assessment question incorrectly.

Computing Essentials CD

The Computing Essentials CD was developed by the O'Leary's specifically for this text. It contains animations of key concepts, videos relating to select Making IT Work for You applications, and in-depth coverage of select topics. Computing Essentials CD icons are located in the margins throughout the book to alert students that expanded coverage of the material in the text can be found on their Computing Essentials CD.

Digital Solutions to Help You Manage Your Course

PageOut—PageOut is our Course Web Site Development Center that offers a syllabus page, URL, McGraw-Hill Online Learning Center content, online exercises and quizzes, gradebook, discussion board, and an area for student Web pages. For more information, visit the PageOut Web site (www.pageout.net).

Online Learning Centers—The Online Learning Center that accompanies *Computing Essentials* is accessible through our Information Technology Supersite (www.mhhe.com/it). This site provides additional learning and instructional tools developed using the same three-level approach found in the text and supplements. This offers a consistent method for students to enhance their comprehension of the concepts presented in the text.

Online Courses Available—OLCs are your perfect solutions for Internet-based content. Simply put, these Centers are “digital cartridges” that contain a book’s pedagogy and supplements. As students read the book, they can go online and take self-grading quizzes or work through interactive exercises. These also provide students appropriate access to lecture materials and other key supplements.

Blackboard.com

WebCT (a product of Universal Learning Technology)

O’Leary Series Applications Lab Manuals

The O’Leary Series computer applications lab manuals for Microsoft Office are available separately, or packaged with *Computing Essentials*. The O’Leary Series offers a step-by-step approach to developing computer applications skills and is available in both brief and introductory levels. The introductory level manuals are Microsoft Office Specialist Certified and prepare students for the Microsoft Office Specialist Certification Exam.

Student's Guide

STUDENT'S GUIDE TO THE O'LEARY LEARNING SYSTEM

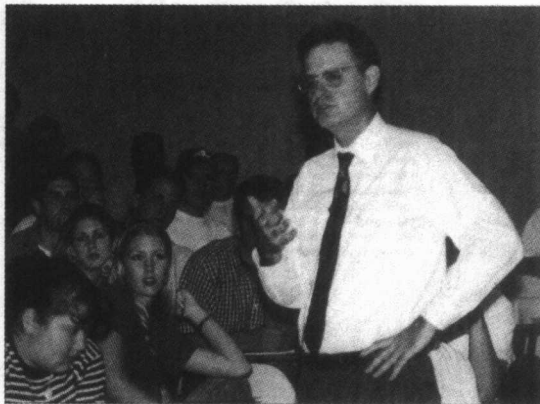
Recently, at the end of the semester, some of my students stopped by my office to say they enjoyed the class and that they "learned something that they could actually use." High praise indeed for a professor! Actually, I had mixed feelings. Of course, it felt good to learn that my students had enjoyed the course. However, it hurt a bit that they were surprised that they learned something useful.

As you read the text, notice the "Tips" scattered throughout the book. These tips offer suggestions on a variety of topics from the basics of cleaning a monitor to how to make your computer run faster and smoother. Also, notice the "Making IT Work for You" sections that demonstrate some specific computer applications you might find interesting. For example, one demonstrates how to capture and use television video clips for electronic presen-

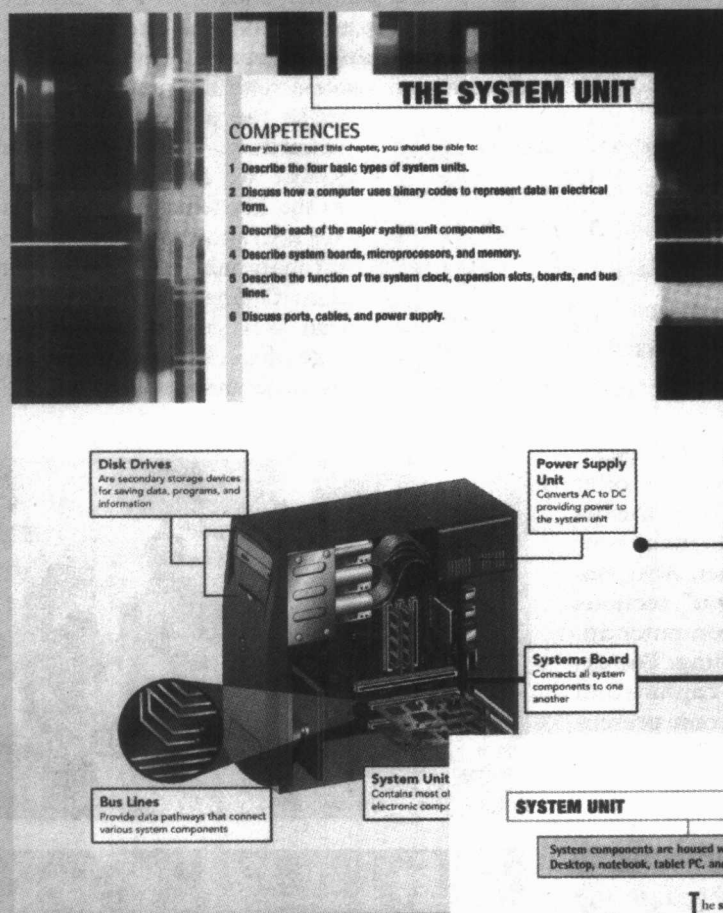
tations and another shows how to capture, save, and play music from the Internet.

Many learning aids are built into the text to ensure your success with the material and to make the process of learning rewarding. In the pages that follow, we call your attention to the key features in the text. We also show you supplemental materials, such as the student Online Learning Center, that you should take advantage of to ensure your success in this course.

*Here's my promise to you:
In the following pages you
will find things that you can
actually use now as well as
that provide a foundation for
understanding future
technological advances.*



What makes Computing Essentials such a powerful tool?



Visual Chapter Openers

Each chapter begins with a two-page opening spread that provides the Chapter Competencies and a brief introduction to the chapter. Graphics present the structure and organization of the chapter visually, while text discusses the topics that will be covered and their importance.

Key Terms

Throughout the text, the most important terms are presented in bold type and are defined within the text. You will also find a list of key terms at the end of each chapter and in the glossary at the end of the book.

The **system unit**, also known as the **system cabinet** or **chassis**, is a container that houses most of the electronic components that make up a computer system. For microcomputers, there are four basic types (see Figure 6-1):

- **Desktop system units** typically contain the system's electronic components and selected secondary storage devices. Input and output devices, such as a mouse, keyboard, and monitor, are located outside the system unit. This type of system unit is designed to be placed either horizontally or vertically. Vertical units are often called **tower models**.
- **Notebook system units** are portable and much smaller. These system units contain the electronic components, selected secondary storage devices, and input devices (keyboard and pointing device). Located outside the system unit, the monitor is attached by hinges. Notebook system units are often called **laptops**.

Figure 6-1 Basic types of system units

How does Computing Essentials use the Web and provide practical real world tips?

- **Control unit:** The control unit tells the rest of the computer system how to carry out a program's instructions. It directs the movement of electronic signals between memory—which temporarily holds data, instructions, and processed information—and the arithmetic-logic unit. It also directs these control signals between the CPU and input and output devices.
- **Arithmetic-logic unit:** The arithmetic-logic unit, usually called the ALU, performs two types of operations—arithmetic and logical. **Arithmetic operations** are, as you might expect, the fundamental math operations: addition, subtraction, multiplication, and division. **Logical operations** consist of comparisons. That is, two pieces of data are compared to see whether one is equal to (=), less than (<), or greater than (>) the other.

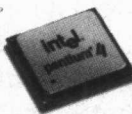


Figure 6-7 Carrier package

MICROPROCESSOR CHIPS

Chip capacities are often expressed in **word sizes**. A **word** is the number of bits (such as 16, 32, or 64) that can be accessed at one time by the CPU. The more bits in a word, the more powerful—and the faster—the computer is. As mentioned previously, eight bits group together to form a byte. A 32-bit word computer can access 4 bytes at a time. A 64-bit word computer can access 8 bytes at a time. Therefore, the computer designed to process 64-bit words is faster.

Older microprocessors typically process data and instructions in milliseconds of a second, or **microseconds**. Newer microprocessors are much faster and process data and instructions in billions of a second, or **nanoseconds**. Supercomputers, by contrast, operate at speeds measured in **picoseconds**—1,000 times as fast as microprocessors. (See Figure 6-9.)

There are two types of microprocessor chips.

- **CISC chips:** The most common type of microprocessor is the **complex instruction set computer (CISC) chip**. This design was popularized by Intel and is the basis for their line of microprocessors. It is the most widely used chip design with thousands of programs written specifically for it. Intel's Pentium microprocessors are CISC chips. While Intel is the leading manufacturer of microprocessors, other manufacturers produce microprocessors using a nearly identical design. These chips, referred to as **Intel-compatible processors**, are able to process programs originally written specifically for Intel chips. For example, AMD Corporation produces Intel-compatible chips known as Athlon and Blamner.
- **RISC chips:** **Reduced instruction set computer (RISC) chips** use fewer instructions. This design is simpler and less costly than CISC chips. The PowerPC is a RISC chip produced by Motorola. SPARC is a RISC chip produced by Sun. These chips are used in many of today's most powerful microcomputers known as **workstations**.

See Figure 6-10 for a table of popular microprocessors.

SPECIALTY PROCESSORS

In addition to microprocessor chips, a variety of more specialized processing chips have been developed. These specialty chips include:

- **Graphics coprocessors** are specifically designed to handle the pricing requirements related to displaying and manipulating 2-D and 3-D graphics images.



Figure 6-8 Cartridge

Unit	Second
Microsecond	Millionth of a second
Nanosecond	Billionth of a second
Picosecond	Tenth of a second

Figure 6-9 Processing speed

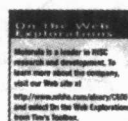


Figure 6-10 A table of popular microprocessors

Tips

Tips appear within nearly every chapter and are provided to offer advice on a variety of chapter-related issues, such as how to efficiently locate information on the Web, how to speed up computer operations, and how to protect against computer viruses. Tips assist you with common technology-related problems or issues, and motivate you by showing the relevance of concepts presented in the chapter to everyday life.

TIPS

1. **Having problems or need to upgrade your system and need help?** Here are a few suggestions:
 - a. Select a reputable computer store. Consider local as well as national chain stores. Check them out with the Better Business Bureau.
 - b. Visit the store with your computer, study, have a knowledgeable friend accompany you. Describe the problem and get a written estimate. Ask about the company's warranty.
2. **Tag your system.** If you leave the system, attach a tag with your name, address, and telephone number.
3. **Pay by credit card.** If a dispute arises, many credit card companies will intervene on your side.

units, and expansion boards, as well as other devices that are able to configure themselves. Ideally, to install a new expansion board all you have to do is insert the board and turn on the computer. As the computer starts up, it will search for these Plug and Play devices and automatically configure the devices and the computer system. Unfortunately, not all computer systems and expansion cards have this capability. For those devices that do not, reconfiguration involves installing device drivers as discussed in Chapter 3.

Concept Check

1. What is a system clock? How is it like a lasso drum? What is clock speed? How is it measured?
2. What does open vendor stand architecture mean?
3. What are expansion slots and cards? Name five expansion cards.

BUS LINES

Bus lines provide data pathways that connect various system components.

A **bus line**—also known simply as a **bus**—connects the parts of the CPU to each other. Buses also link the CPU to various other components on the system board. (See Figure 6-17.) A bus is a pathway for bits representing data and instructions. The number of bits that can travel simultaneously down a bus is known as the **bus width**.

A bus is similar to a multi-lane highway that moves bits rather than cars from one location to another. The number of traffic lanes determines the bus width. A highway (bus line) with more traffic lanes (bus width) can move traffic (data and instructions) faster. For example, a 64-bit bus is twice as fast as a 32-bit bus. Why should you even have to care about what a bus line is? The answer is that, as microprocessor chips have changed, so have bus lines. This design or bus architecture is an important factor relating to the speed and power for a particular computer. Additionally, many devices, such as expansion boards, will work with only one type of bus.

EXPANSION BUSES

Every computer system has two basic categories of buses. One category, called **system buses**, connects the CPU to memory on the system board. The other category, called **expansion buses**, connects the CPU to slots on the system board.

Computer systems typically have a combination of different types of expansion buses. The principal types are EISA, PCI, AGP, USB, and FireWire.

- **Industry standard architecture (ISA)** was developed for the first IBM Personal Computer. Originally, it had an 8-bit bus width. Later, it was expanded to 16 bits. Although too slow for many of today's applications, the ISA bus is still widely used.

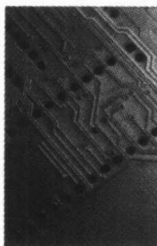


Figure 6-17 A bus is a pathway for bits

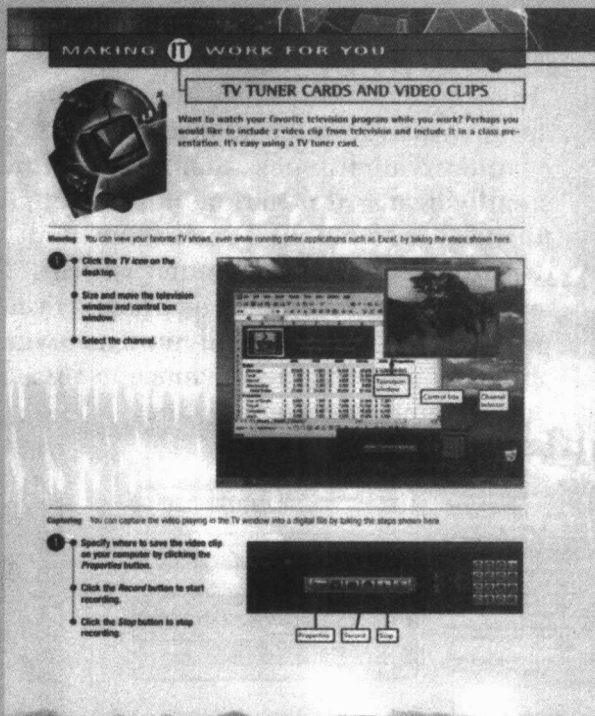
On the Web Explorations

Two or more On the Web Explorations appear within nearly every chapter and are presented as marginal elements. These explorations ask you to connect to carefully selected Web sites that provide additional information on key topics, encouraging you to expand your knowledge by using Web resources.

Computing Essentials Web site

Throughout the text, the Computing Essentials Web site at <http://www.mhhe.com/oleary/CE05> is referenced. The text directs you to this Web site for additional material, Web links, and exercises to boost interest and enhance your comprehension of the material.

How does Computing Essentials get you involved in current technologies?

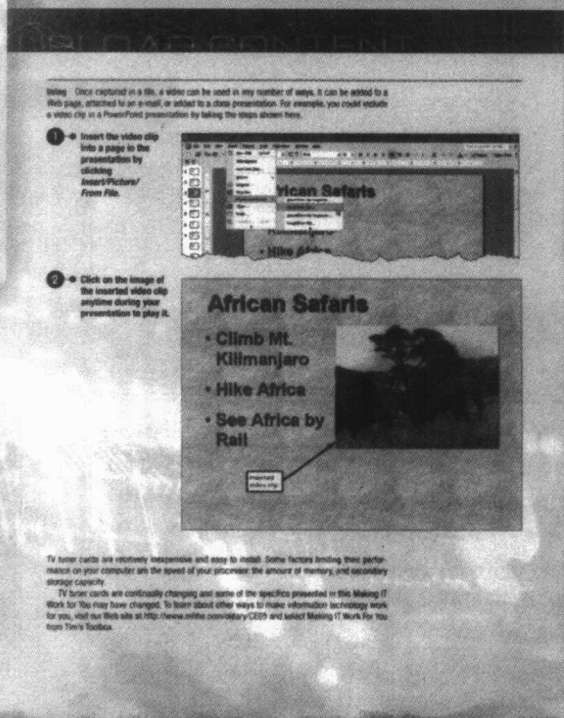


Making IT Work Video Series

Seven of the Making IT Work for You features have been expanded into video presentations available on the Web and from the Computing Essentials CD. These videos expand and animate the material in the book.

Making IT Work for You

Special interest topics are presented in a two-page Making IT Work for You section within the chapter relating to that topic. These topics include protecting against computer viruses, downloading music from the Internet, and using the Internet to place free long-distance telephone calls.



How does Computing Essentials teach you about the future in information technology?

A Look to the Future

Xybernaut Corporation Makes Wearable Computers a Reality

Wouldn't it be nice if you could conveniently access the Internet wirelessly at any time during the day? What if you could send and receive e-mail from your waist-mounted computer? What if you could maintain your personal schedule book, making new appointments with others on the fly? What if you could play interactive games, and surf the Web from anywhere?

Of course you can do all this and more using wireless technology and PDAs. Many people currently use this technology when they are away from their home or office. What if these users could accomplish these tasks with an even smaller, more portable and less intrusive system? Will people be wearing computers rather than carrying them? What if your computer featured a head-mounted display?

Xybernaut Corporation is currently marketing a personal wearable computer called POMAP. The device is described as a personal multimedia appliance. It is composed of a processor that runs Windows CE, a wireless pointing device, and a head-mounted display. The display allows you to see the equivalent of a desktop monitor via a small screen that is worn in front of one eye. This screen is only one inch square and weighs a mere 3 ounces. The device includes an MP3 player that plays songs and displays videos, and abridged versions of Windows Office programs.

Devices made by Xybernaut® are currently being evaluated for use in airports by security personnel. These devices are currently being used by the U.S. Department of Defense for military applications and by the Toronto Blue Jays to end long lines at ticket windows.

When coupled with face recognition technology Xybernaut's Mobile Assistant V allows security personnel the advantage of portability and instant communication with the command center. Police and security officers may someday use this technology to check IDs and verify your identity. Experts say that wearable computers will be used by surgeons in operating rooms to "view" their patients.

Will we be wearing computers soon? Some of us already are. And some experts predict the majority of us will employ a wearable computer before the end of the decade. Many computer manufacturers are currently working on wearable computers, and there is even a wearable computer fashion show that showcases the latest designs. Many people are already "wearing" their computers, and making use of this mobile technology to read e-mail while waiting in lines or even studying their notes for the next exam. What do you think? Will Americans someday grab their keys and their computers before they leave the house? Will your computer one day be housed in your jacket?



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A Look to the Future

Each chapter concludes with a brief discussion of a recent technological advance related to chapter material, reinforcing the importance of staying informed.

How does Computing Essentials reinforce key concepts?

Visual Chapter Summaries

These summaries appear in at least two pages at the end of each chapter. Using a columnar arrangement, major concepts are presented by graphics followed by detailed text summaries, providing a summary of key concepts and terms in an engaging and meaningful way.

USING IT AT DVD DIRECT—A CASE STUDY

INTRODUCTION

DVD Direct is an entirely Web-oriented movie rental business. Unlike traditional movie rental businesses like Blockbuster, DVD Direct conducts all business over the Web at its Web storefront. For a monthly fee, their customers are able to order up to three movies at a time from a listing posted at the company Web site. The movies the customers select are delivered to them on DVD disks in mail within three working days. After viewing, customers return one or more disks by mail. They are allowed to keep the disk as long as they wish but can never have more than three disks in their possession at one time.

Although in operation for only three years, DVD Direct has experienced rapid growth. To help manage and to accelerate this growth, the company has just hired Alice, a recent college graduate. Let's follow Alice on her first day at DVD Direct which begins with a meeting with Bob, the vice president of Marketing.

ALICE'S FIRST ASSIGNMENT

Bob: Oh, hi Alice... come on in! I know that we were scheduled for an orientation meeting this morning, but I'm afraid that will have to wait. There is an important fire to put out today. Let me introduce you to one of your coworkers. This is Janet.

Alice and Janet exchange hellos and Bob motions Alice to take one of the chairs across from his desk as he speaks.

Bob: I just came back from a meeting with Carol, our CEO. While we were discussing the Monthly Membership Report, she said she was concerned about how our members were connecting to our Web site. (See Figure C12-1.) This really caught our attention! Our membership growth has exceeded projections and I had assumed that our meeting was to discuss how to handle all the new members. She suggested that her Marketing Report be modified to include the percentage of our customers who use high bandwidth, and she wants us to analyze the changes in low bandwidth customers versus high bandwidth customers over the past year.

Alice: Janet, here is the Monthly Membership Report. I'd like you to review it and then create two profiles. One profile will describe our members who use low bandwidth. The other profile will be for our members who use high bandwidth. I'm interested in any differences or unique characteristics you can uncover.

Bob removes the cover page, hands the rest of the report to Janet, and hands the cover page to Alice.

Bob: Alice, I want you to focus on these three values. (See Figure C12-2.) Start by locating their source. Then obtain data for low and high bandwidth members for the past twelve months and prepare a graph comparing the two. Start by talking with Dennis. He is the southwest marketing manager and has been developing the Monthly Membership Report.



Figure C12-1 "The user site was concerned about how our members were connecting to our Web site."

1. Identify how a knowledge-based system can be used to solve a problem and get a written solution. Ask about the system's outputs.

2. Tag your system. If you have the system, attach a tag with your name, address, and telephone number.

3. Pay by credit card. If a deposit account, your credit card company will bill you on your bill.

Concept Check

- What is a system clock? How is it like a bus driver? What is clock speed? How is it measured?
- What does open versus closed architecture mean?
- What are expansion slots and cards? Name five expansion cards.

VISUAL SUMMARY

THE SYSTEM UNIT

SYSTEM UNIT



System unit (system cabinet or chassis) contains most electronic components. Four basic types are:

- **Desktop**—placed horizontally or vertically; vertical units called **tower models**.
- **Notebook**—portable, often called **laptops**.
- **Table PC**—highly portable; support stylus or pen input.
- **Handheld**—smaller, also known as **personal digital assistant (PDA)**.

Electronic Representation

Our senses create continuous **sensing signals**. A conversion to digital signals is necessary before processing. Data and instructions can be represented electronically with a **two-state** or **binary** system of numbers 0 and 1. Each 0 or 1 is called a **bit**. A byte consists of eight bits and represents one character.

Binary Coding Schemes

Binary coding schemes convert binary data into characters. These schemes are:

- **ASCII**—the most widely used for microcomputers.
- **EBCDIC**—developed by IBM; used primarily by large computers.
- **Unicode**—16-bit code; designed to support international languages like Chinese and Japanese.

SYSTEM BOARD



The system board (main board or motherboard) contains all system components and allows input and output devices to communicate with the system unit. It is a flat circuit board covered with electronic components.

- **Bus slots** provide connection points for chips (microchips, semiconductors, integrated circuits). Chips mounted on carrier packages.
- **Slots** provide connection points for specialized cards or circuit boards.
- **Bus lines** provide pathways to support communications.



Using IT at DVD Direct—A Case Study

Beginning in Chapter 11 and continuing through Chapter 14, Using IT at DVD-Direct—A Case Study is an up-close look at what you might expect to find on the job in the real world. Available from the Computing Essentials CD and from the Web, you will follow Alice, a recent college graduate hired as a marketing analyst, as she navigates her way through Accounting, Marketing, Production, Human Resources, and Research, gathering and processing data to help manage and accelerate the growth of the three-year-old company. This case study is supported with end of chapter exercises

Concept Check

Located at points throughout each chapter, the Concept Check cues you to note which topics have been covered and to self-test your understanding of the material