Page 1:

■ A computer system can be divided roughly into four components: the hardware, the operating system, the application programs, and the users (Figure 1.1). The hardware—the central processing unit (CPU), the memory, and the input/output (I/O) devices—provides the basic computing resources for the system

■ The application programs—such as word processors, spreadsheets, compilers, and Web browsers—de■ne the ways in which these resources are used to solve users' computing problems

■ The operating system controls the hardware and coordinates its use among the various application programs for the various users. We can also view a computer system as consisting of hardware, software, and data

■ The operating system provides the means for proper use of these resources in the operation of the computer system

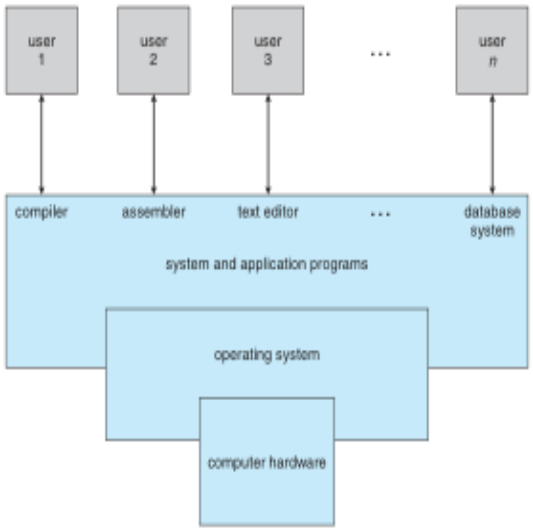

Figure 1.1 Abstract view of the components of a computer system.

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■ The goal is to maximize the work (or play) that the user is performing

■ A computer system has many resources that may be required to solve a problem: CPU time, memory space, ■le-storage space, I/O devices, and so on

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■ They are the basis for game machines, music players, cable TV tuners, and industrial control systems

■ Computers gained in functionality and shrunk in size, leading to a vast number of uses and a vast number and variety of operating systems

■ (See Chapter 20 for more details on the history of operating systems.) How, then, can we de■ne what an operating system is? In general, we have no completely adequate de■nition of an operating system

■ These programs require certain common operations, such as those controlling the I/O devices. The common functions of controlling and allocating resources are then brought together into one piece of software: the operating system. In addition, we have no universally accepted de■nition of what is part of the operating system

■ (Along with the kernel, there are two other types of programs: system programs, which are associated with the operating system but are not necessarily part of the kernel, and application programs, which include all programs not associated with the operation of the system.) The matter of what constitutes an operating system became increasingly important as personal computers became more widespread and operating systems grew increasingly sophisticated

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■ Mobile operating systems often include not only a core kernel but also middleware—a set of software frameworks that provide additional services to application developers

1.2 Computer-System Organization

■ For example, each of the two most promi- nent mobile operating systems—Apple’s iOS and Google’s Android—features a core kernel along with middleware that supports databases, multimedia, and graphics (to name a only few). Before we can explore the details of how computer systems operate, we need general knowledge of the structure of a computer system

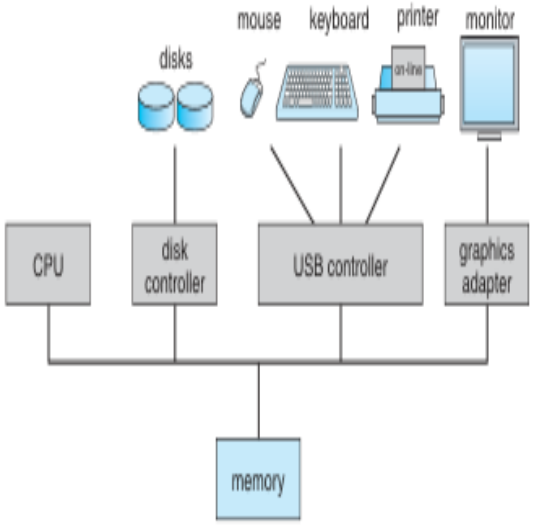

Figure 1.2 A modern computer system.

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