Chapter 3:
Operating Systems
（操作系统）

Chapter 3: Operating Systems(操作系统)

- 3.1 The History of Operating Systems
- 3.2 Operating System Architecture
- 3.3 Coordinating the Machine's Activities
- 3.4 Handling Competition Among Processes
- 3.5 Security

Functions of Operating Systems
(操作系统的功能)

- Oversee operation of computer(监督计算机的操作)
- Store and retrieve files(存储和检索文件)
- Schedule programs for execution(调度程序执行)
- Coordinate the execution of programs(协调程序的执行)

基于MS-DOS的:

Windows 1.0 (1985)

Windows 2.0

Windows 3.x

Windows 95

Windows 98

Windows ME

基于NT的:

Windows NT 3.x

Windows NT 4.0

Windows 2000

Windows XP

Windows Vista

Windows Server 2003

Windows 7

基于CE的:

Windows CE

Windows Phone 7

广泛用于PC机领域

- UNIX——1969 Bell Labs, Two branches
  - BSD（Berkeley Software Distribution）-1970s, University of California, Berkeley
  - AT&T UNIX
- Mac OS——Apple,Mac机, 核心是UNIX
- Linux——first released1991 by Linus Torvalds(芬兰人), free, small, stable, fast
  - Ubuntu
  - 红旗Linux
  - Red Hat

广泛用于较大的计算机系统和PC群

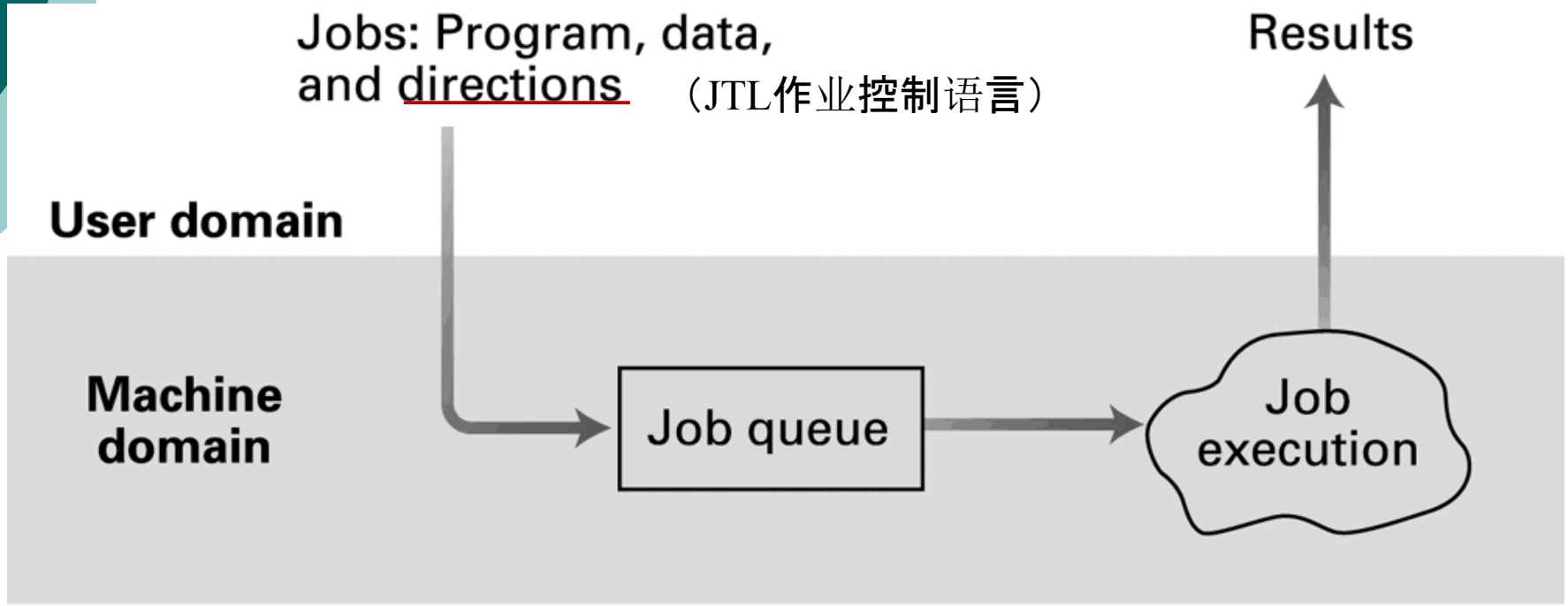
- Symbian——Nokia
- Android (google)——Motorala, HTC, Samsung, LG, Sony Ericsson,Linux, Open Source ,
- iPhoneOS——Apple
- Windows Phone——HTC,Nokia

智能手机

Evolution of Shared Computing

- Batch processing（批处理）
- Interactive processing （交互式处理）
  - Requires real-time processing
- Time-sharing/Multitasking （分时/多任务）
  - Implemented by Multiprogramming
- Multiprocessor machines （多处理器计算机）

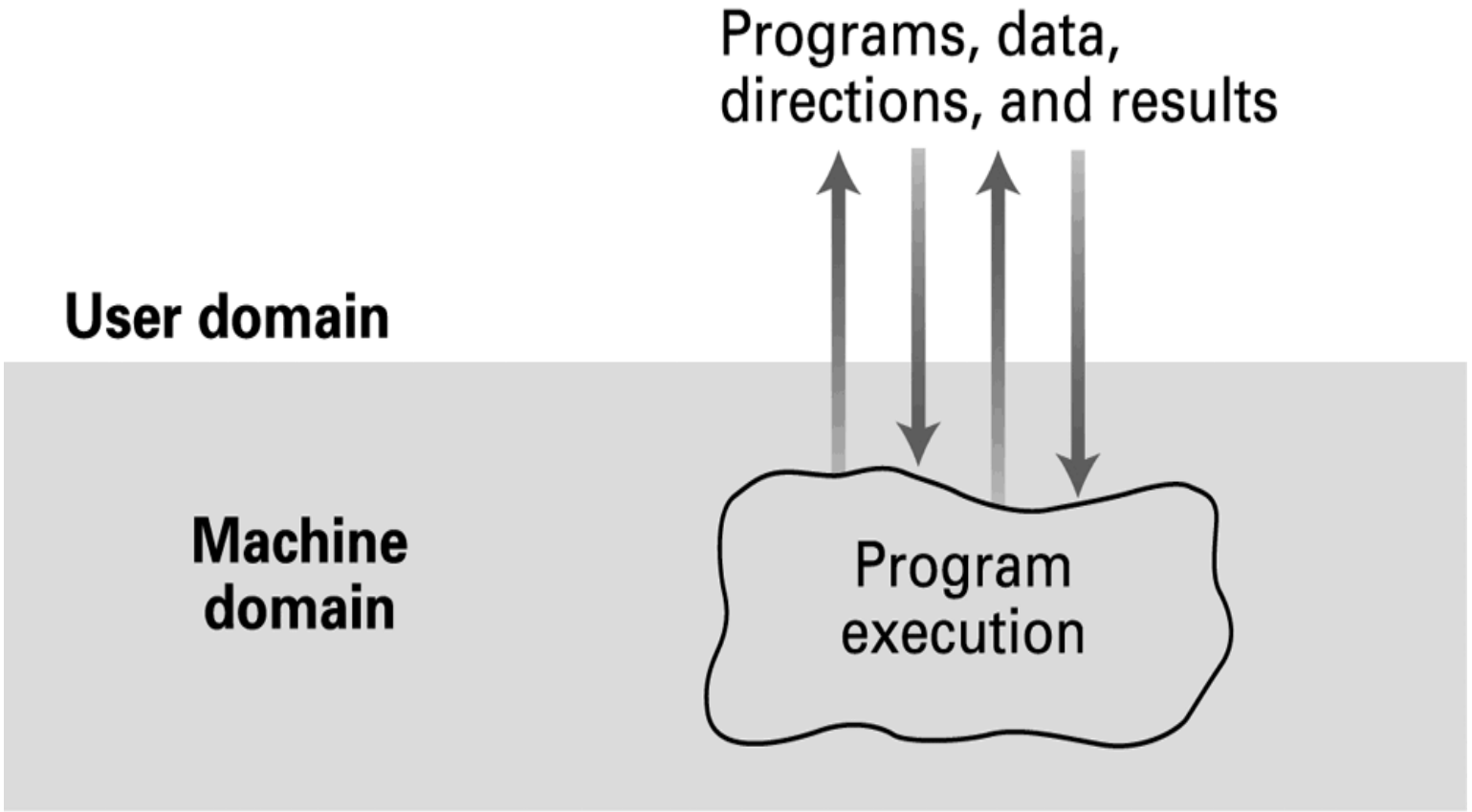
Figure 3.1 Batch processing(批处理)



First-in,first-out, FIFO

Job priorities

Figure 3.2 Interactive processing
(交互式处理)



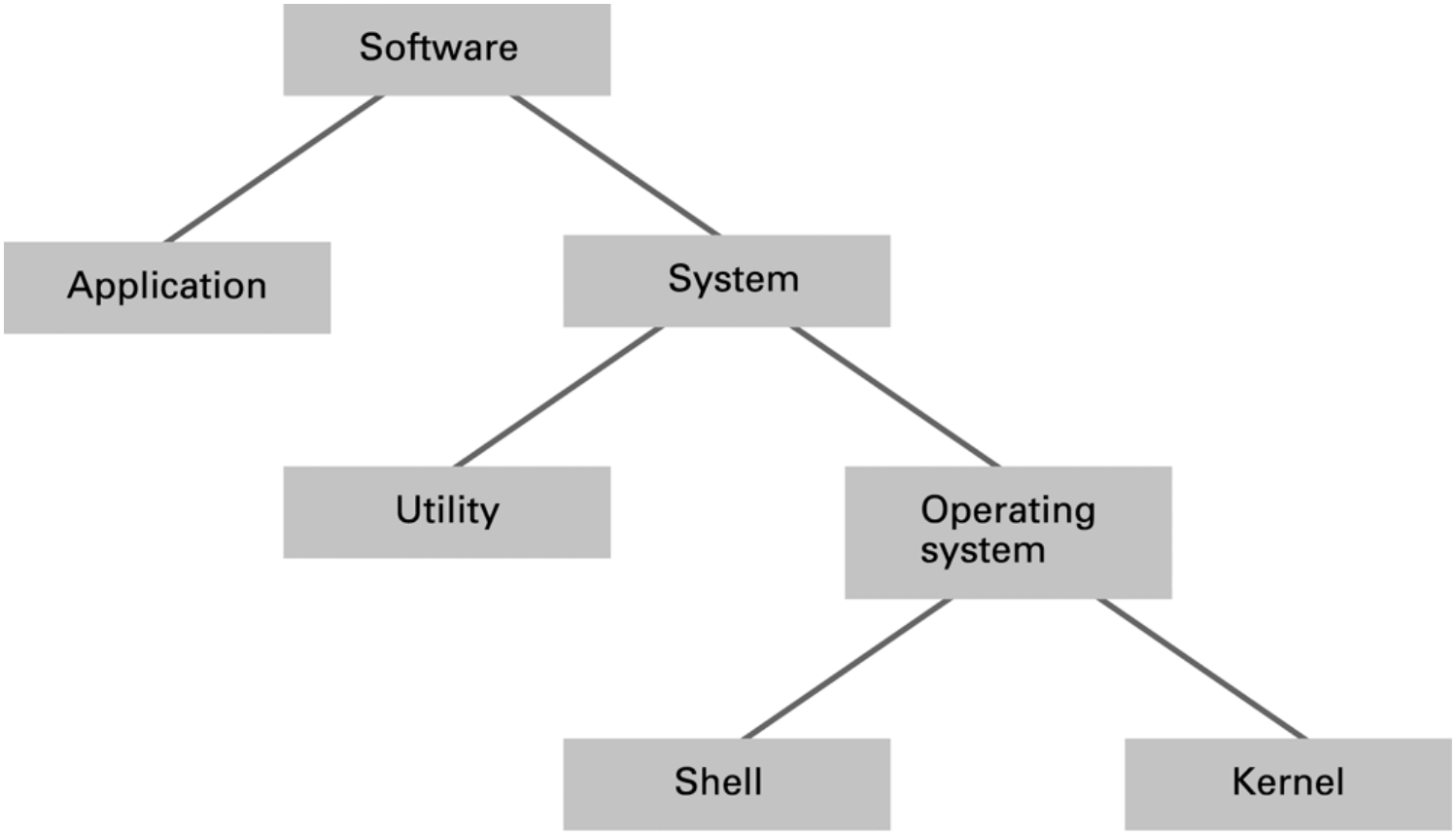
- Load balancing(负载平衡): dynamically allocating tasks to the various processors so that all processors are used efficiently
- Scaling(均分): breaking tasks into a number of subtasks compatible with the number of processors available

Types of Software(软件类型)

- Application software(应用软件)
  - Performs specific tasks for users (执行用户的特定任务)
- System software (系统软件)
  - Provides infrastructure for application software(为应用软件提供基础架构)
  - Consists of operating system and utility software(包括操作系统和实用软件)

Figure 3.3 Software classification

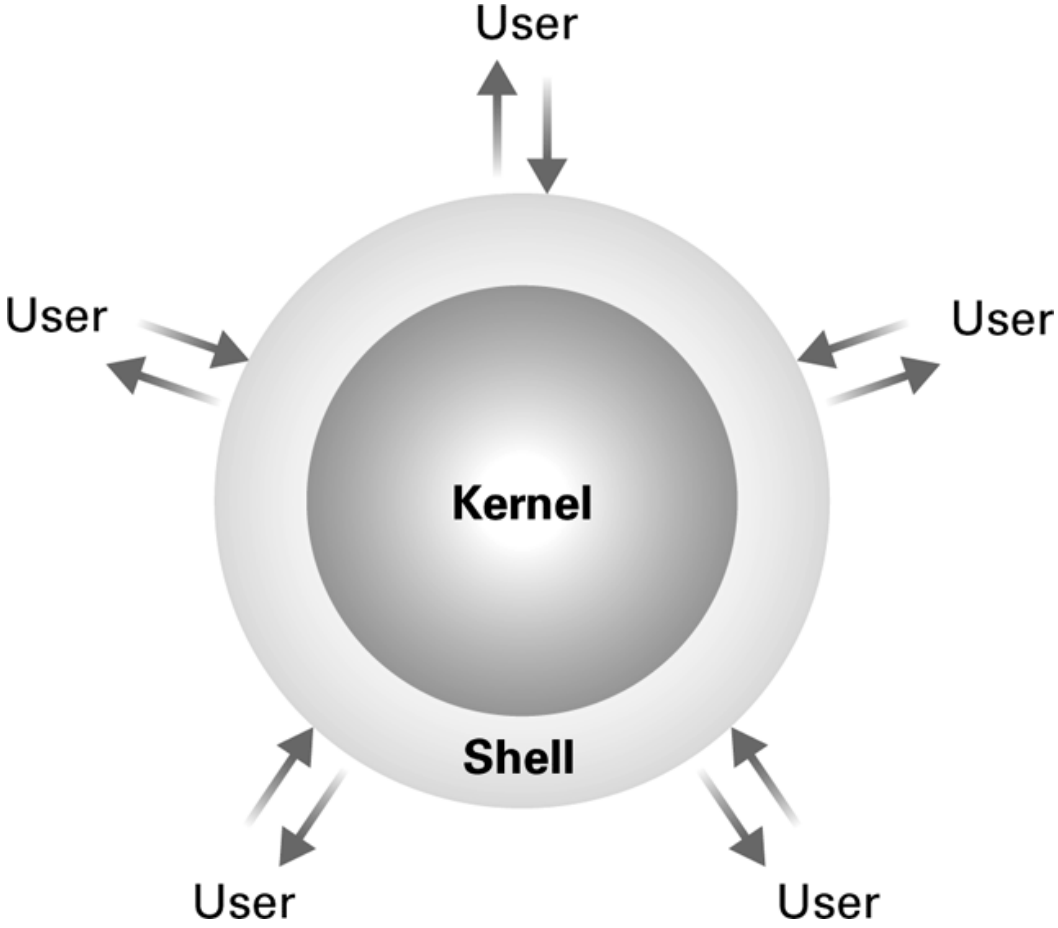
(软件分类)



Operating System Components
(操作系统组件)

- **Shell**(外壳)**:** Communicates with users
  - Text based
  - Graphical user interface (GUI)
- **Kernel**(内核)**:** Performs basic required functions
  - File manage(文件管理)
  - Device drivers(设备驱动)
  - Memory manager(内存管理)
  - Scheduler and dispatcher(调度程序和分派程序)

Figure 3.4 The shell as an interface between users and the operating system(作为用户和操作系统内核之间接口的外壳)



File Manager(文件管理器)

- **Directory** (or **Folder**): A user-created bundle of files and other directories (subdirectories)
- **Directory Path:** A sequence of directories within directories

Memory Manager(內存管理器)

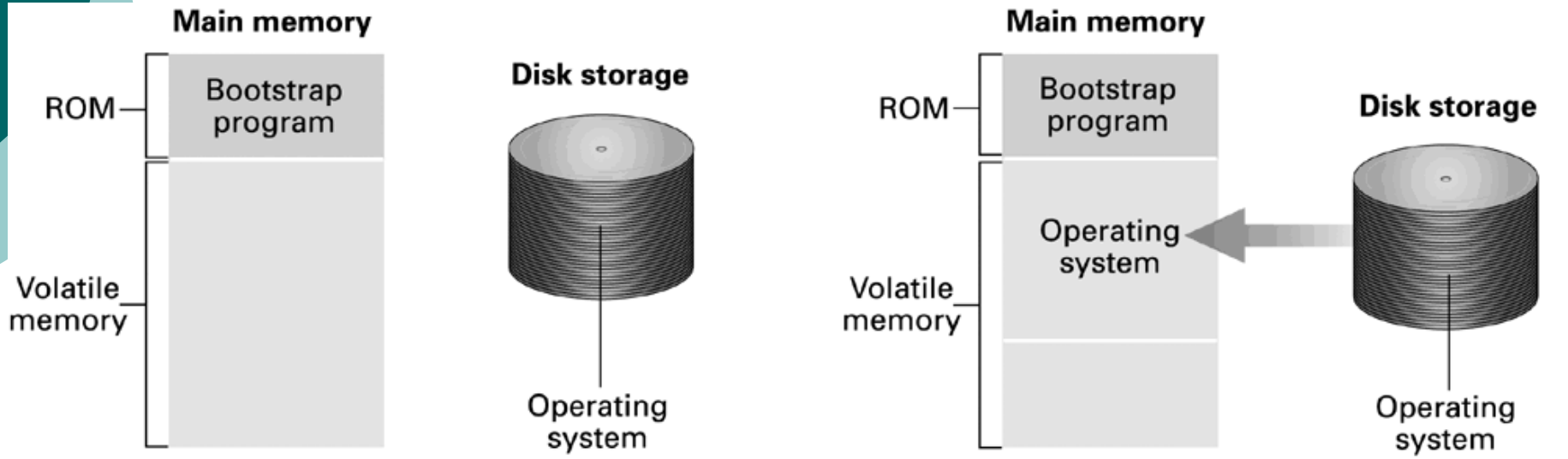
- Allocates space in main memory
- May create the illusion that the machine has more memory than it actually does (**virtual memory**) by playing a “shell game” in which blocks of data (**pages**) are shifted back and forth between main memory and mass storage

Getting it Started (Bootstrapping)(引导)

- **Bootstrap(引导程序):** Program in ROM (example of firmware)(固件的例子)
  - Run by the CPU when power is turned on
  - Transfers operating system from mass storage to main memory
  - Executes jump to operating system

Figure 3.5 The booting process

(引导过程)



Step 1: Machine starts by executing the bootstrap program already in memory. Operating system is stored in mass storage.

Step 2: Bootstrap program directs the transfer of the operating system into main memory and then transfers control to it.

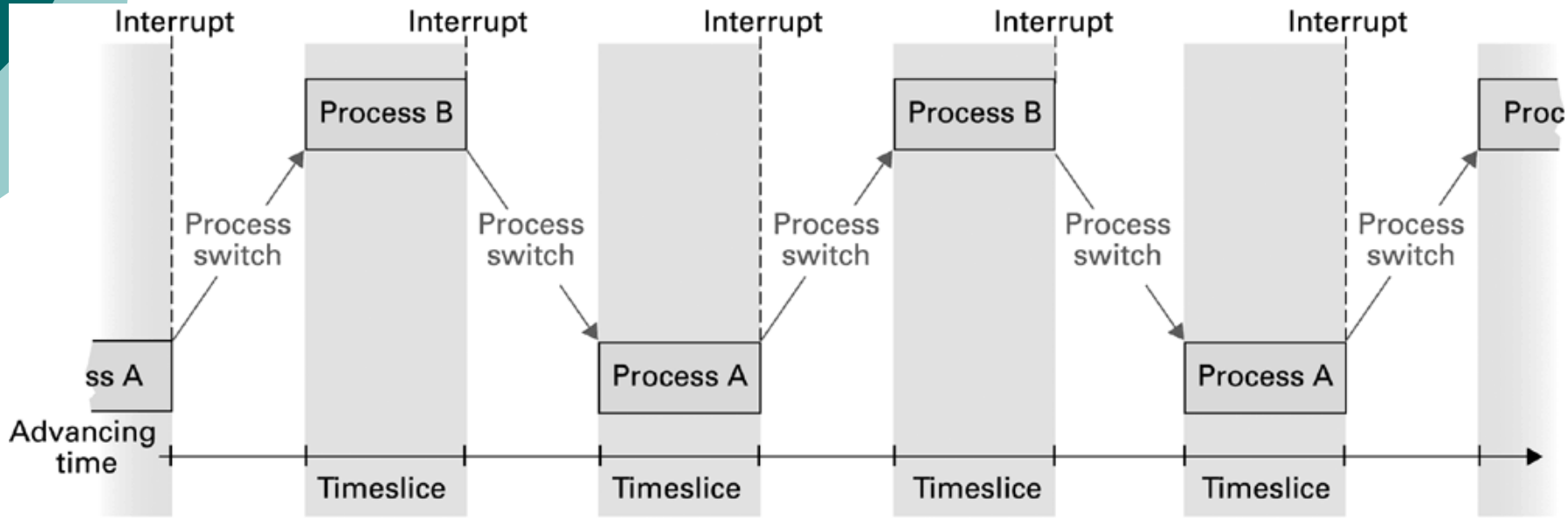
Processes(进程)

- **Process**(进程)**:** The activity of executing a program
- **Process State**(进程状态)**:** Current status of the activity
  - Program counter(程序计数器)
  - General purpose registers(通用寄存器)
  - Related portion of main memory(主存中的相关部分)

Process Administration(进程管理)

- **Scheduler** (调度程序) **:** Adds new processes to the process table and removes completed processes from the process table
- **Dispatcher** (分派程序) **:** Controls the allocation of time slices to the processes in the process table
  - The end of a time slice is signaled by an interrupt.

Figure 3.6 Time-sharing between process A and process B(进程A与进程B之间的分时)



Security(安全性)

- Attacks from outside(来自机器外部的攻击)
  - Problems
    - Insecure passwords(不安全的密码)
    - Sniffing software(嗅探软件)
  - Counter measures (对策)
    - Auditing software(审计软件)

Security (continued)

- Attacks from within (来自机器内部的攻击)
  - Problem: Unruly processes
  - Counter measures(防范对策): Control process activities via privileged modes(特权模式) and privileged instructions