第13讲 进程调度的目标与类型

内　　容　（2.2 - 2.5）

1. Types of scheduling
2. Scheduling Criteria （准则）
3. Scheduling Algorithms
4. Real-Time Scheduling

Learning objectives（2.2 - 2.5）

By the end of this lecture you should be able to:

- **Explain what's *Response Time* *（响应时间）*, *Turnaround time* *（周转时间）*, *Deadlines* *（截止时间）*, *Throughput* *（吞吐量）***
- **理解进程调度的目标、类型、原则**
- **理解 Decision Mode: *Nonpreemptive* *（非剥夺）* &*Preemptive* *（剥夺）***
- **Scheduling， Rate Monotonic Scheduling（速度单调）**

Learning objectives (2.2 - 2.5) （ continue ）

By the end of this lecture you should be able to:

- 研究经典进程调度算法： *FCFS*, Round Robin （轮转）， Shortest Process Next， Shortest Remaining Time， Highest Response Ratio Next， Feedback
- 理解 Real-Time Systems 及类型
- 理解掌握： Real-Time Scheduling， Deadline

§2.2 Types of scheduling

Aim of Scheduling

- Response time （响应时间）
- Throughput （系统吞吐量）
- Processor efficiency （处理机效率）
- Fairness (公平性，防止进程饥饿)

Types of Scheduling

- 按 OS 的类型划分：
  - 批处理调度、分时调度、实时调度、多处理机调度
- 按调度的层次划分：
  - Long-term scheduling （长程调度）
  - Medium-term scheduling （中程调度）
  - Short-term scheduling （短程调度）

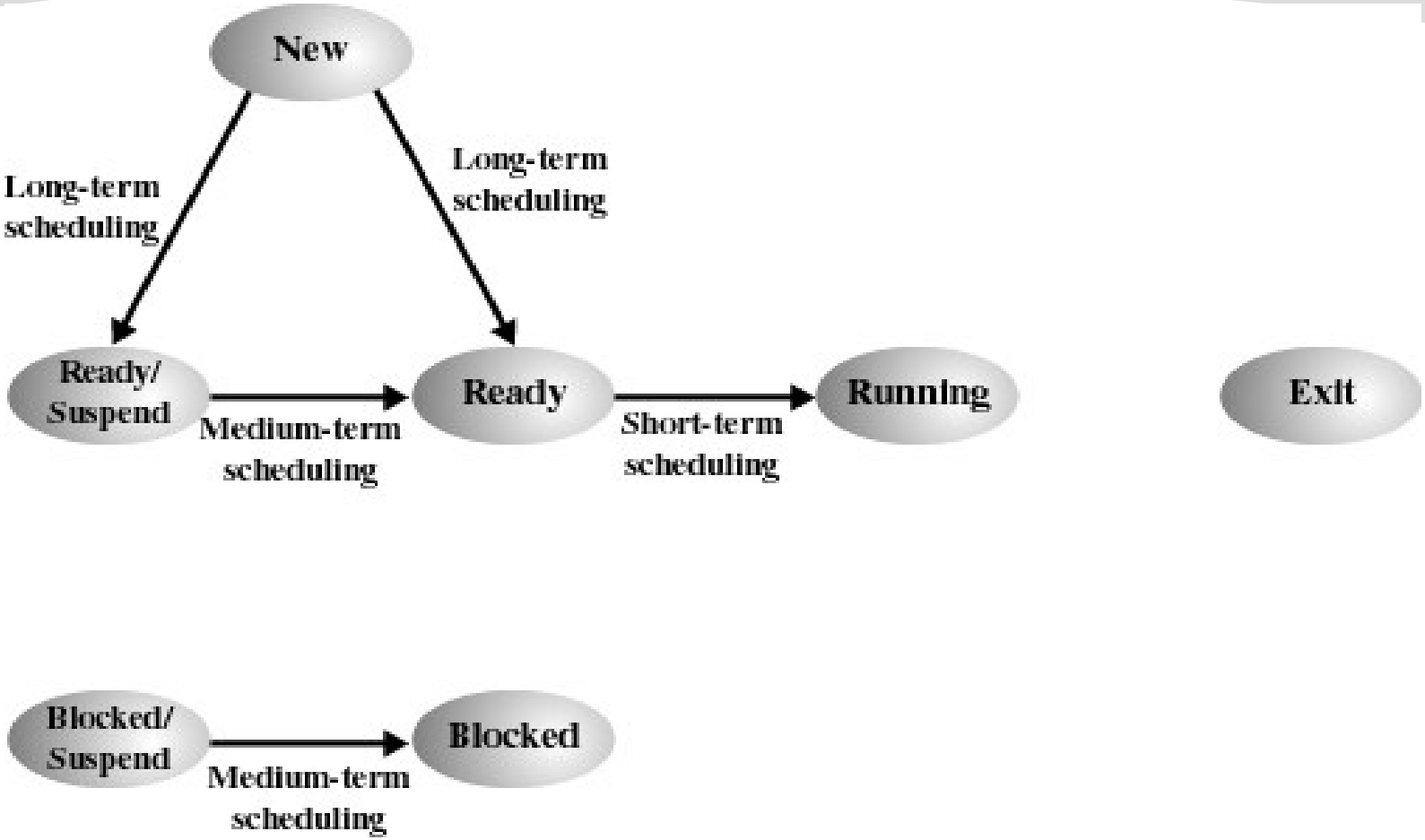

Figure 9.1 Scheduling and Process State Transitions

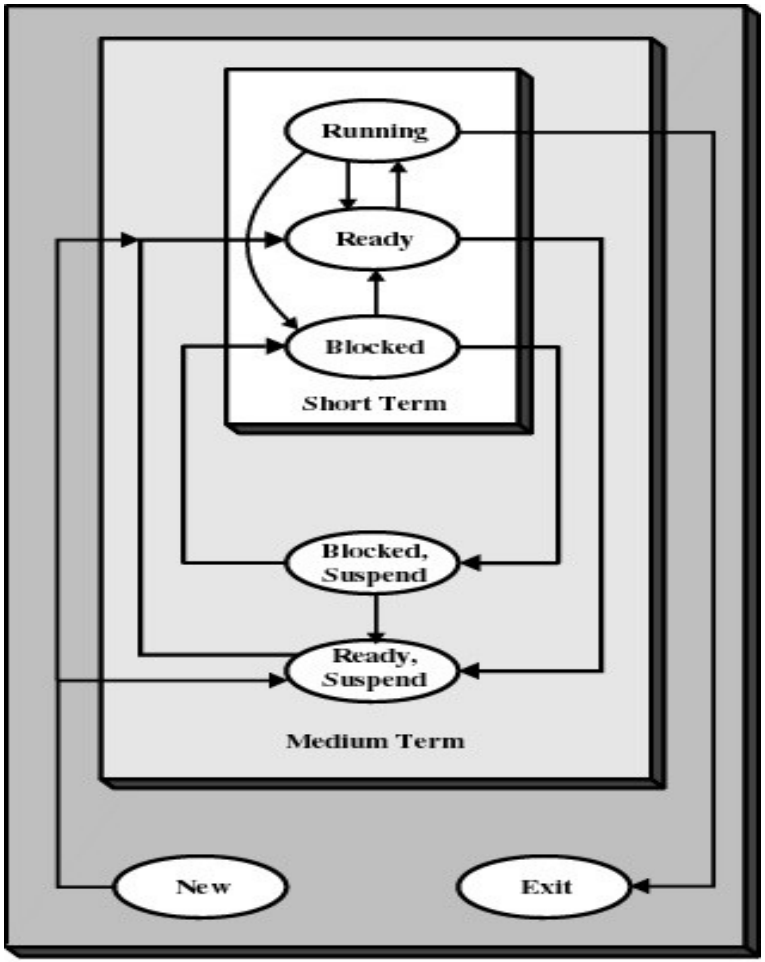

Figure 9.2 Levels of Scheduling

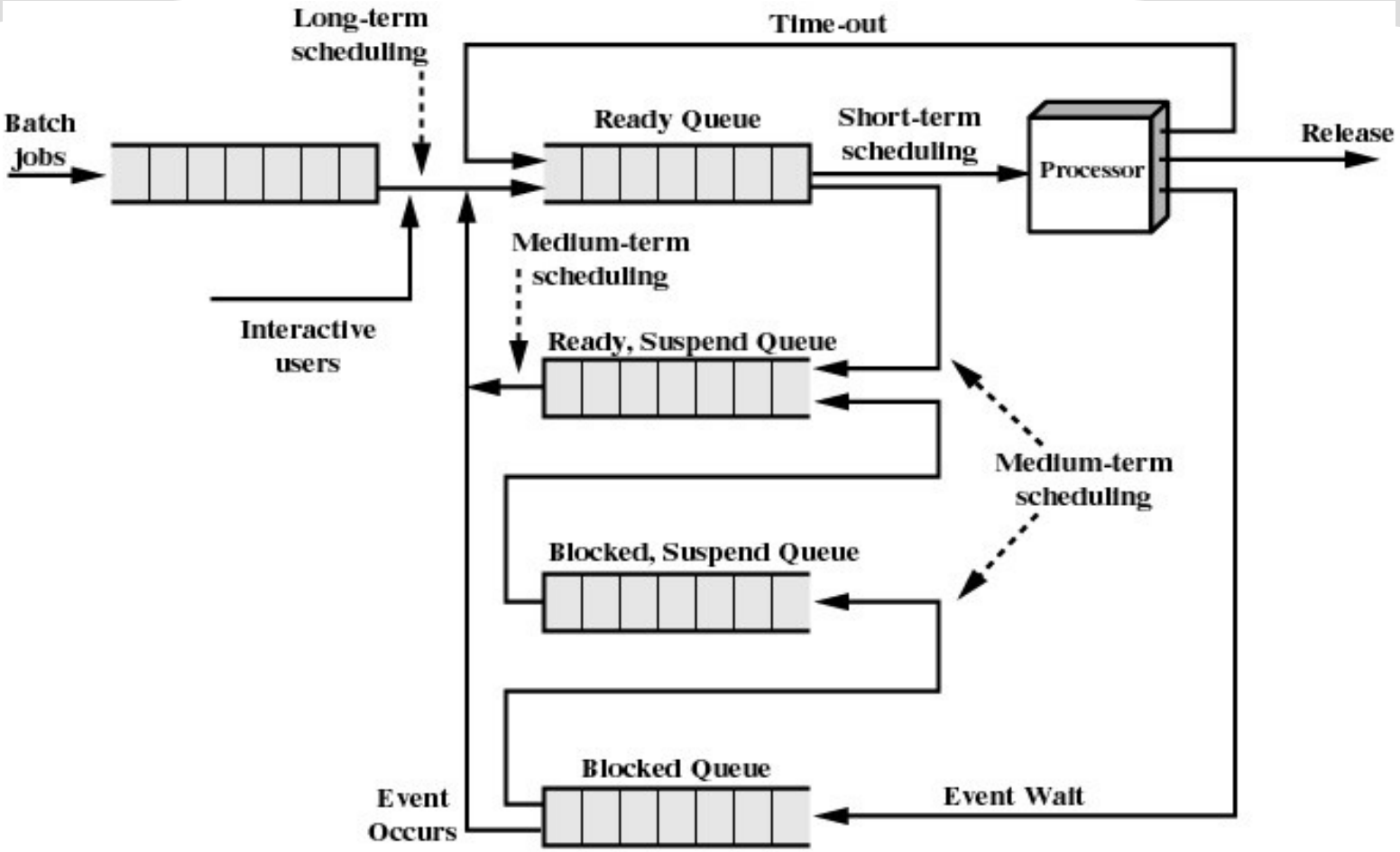

Figure 9.3 Queuing Diagram for Scheduling

Long-term scheduling

- 又称为高级调度、作业调度，它为被调度作业或用户程序创建进程、分配必要的系统资源，并将新创建的进程插入就绪队列，等待 Short-term scheduling

---

- 采用交换技术的系统将新创建的进程插入（就绪，挂起）队列，等待 Medium-term scheduling 。
- 批处理系统中，作业进入系统后，先驻留在磁盘上（批处理队列中）。长程调度从该队列中选择作业，为之创建进程

Long-term scheduling

- Determines *which* programs are admitted to the system for processing

  - 这取决于调度算法，如 FCFS 、短作业优先、基于优先权、响应比高者优先等调度算法

- *How many* programs are admitted to the system ?

  - Controls the degree of multiprogramming

- *When* does the scheduler be invoked?

  - Each time a job terminates

  - Processor is idle exceeds a certain threshold

Medium-term scheduling

- ***又称为中级调度***，它调度换出到磁盘的进程进入内存，准备执行

- 中级调度配合对换技术使用。
- 其目的是为了提高内存的利用率和系统吞吐量。
- 在多道程序度允许的情况下，从外存选择一个挂起状态的进程调度到内存（换入）

Short-term scheduling

- *又称为进程调度、低级调度，*调度内存中的就绪进程执行。
- Known as the dispatcher: 决定就绪队列 *Which* 进程将获得处理机
- Executes most frequently
- Invoked when an event occurs
  - Clock interrupts
  - I/O interrupts
  - Operating system calls
  - Signals(信号)