Operating System

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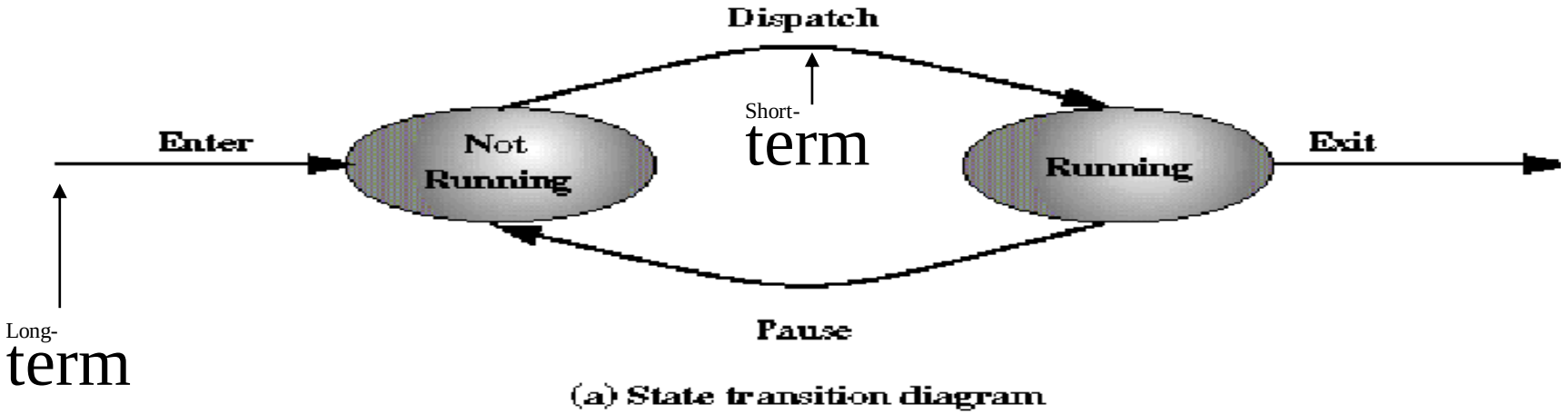
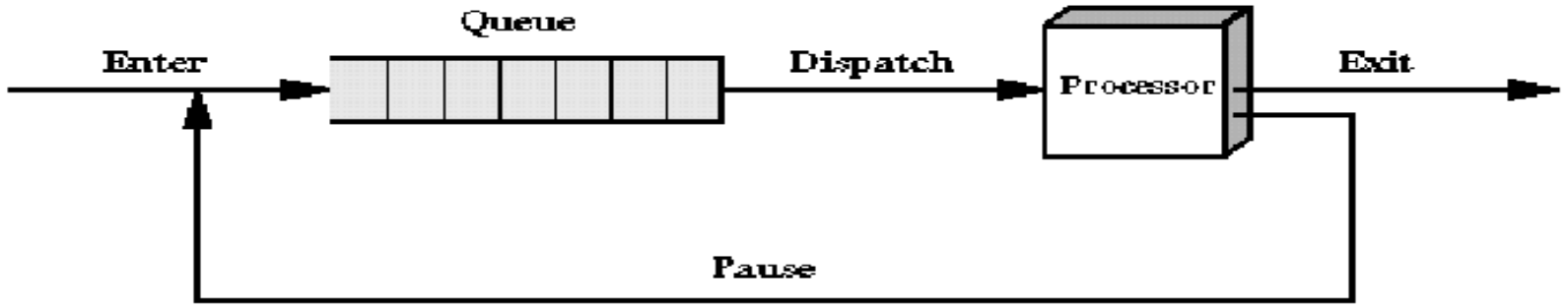
Long/Short-Term Scheduling



(a) State transition diagram

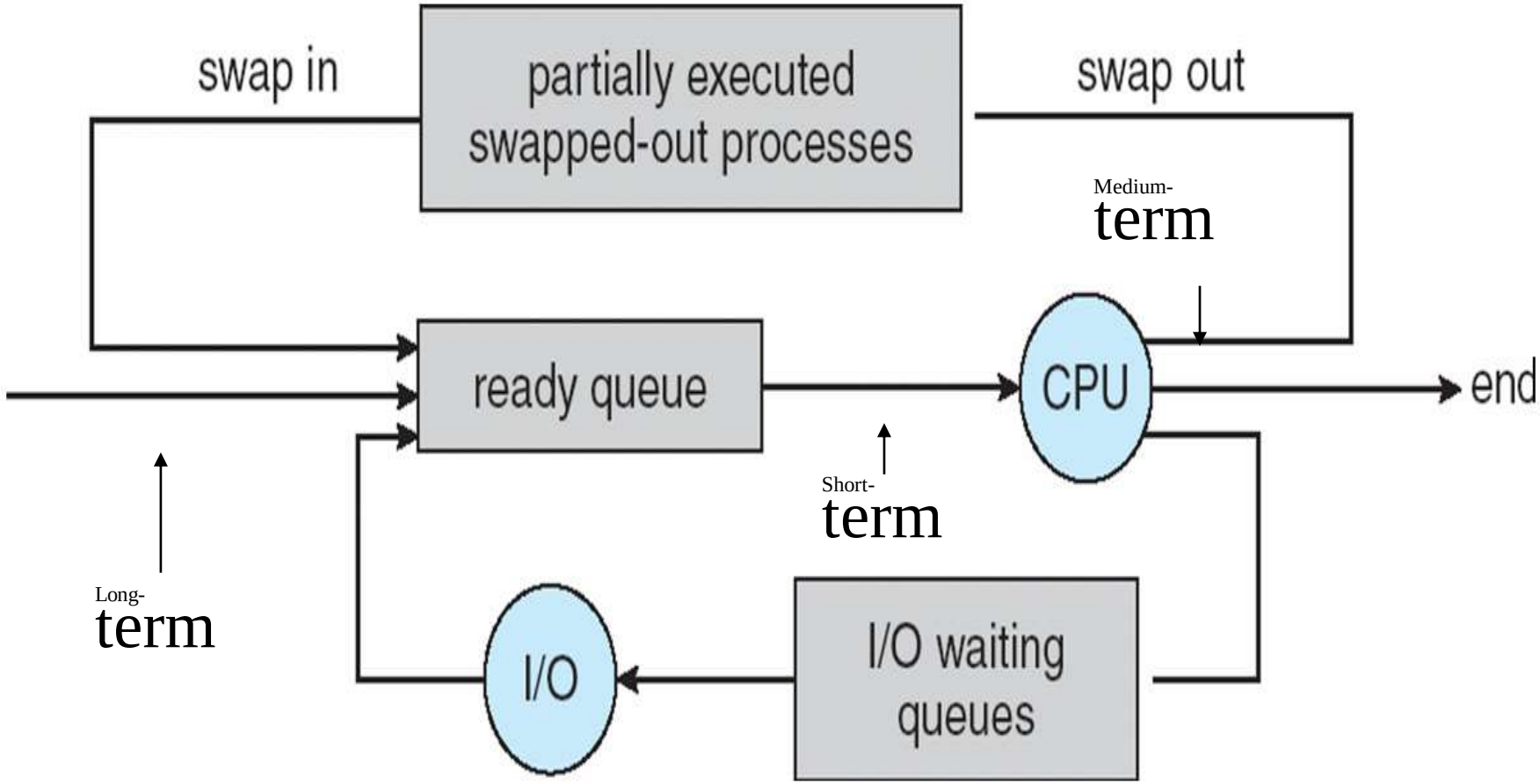


(b) Queuing diagram

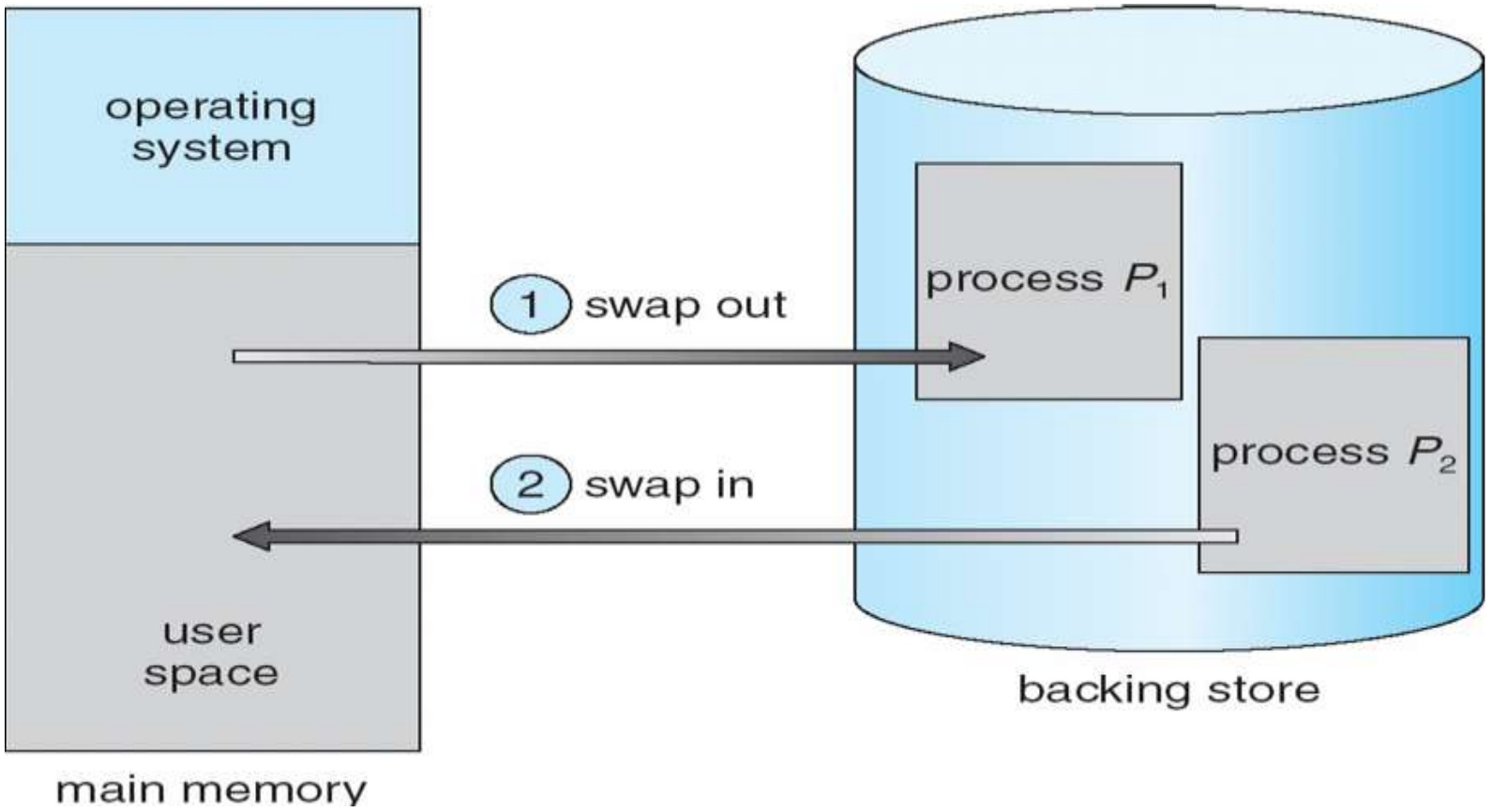
Aspects of Schedulers

- Long-term scheduler is invoked very infrequently (seconds, minutes) $\Rightarrow$ (may be slow).
- The long-term scheduler controls the degree of multiprogramming.
- Short-term scheduler is invoked very frequently (milliseconds) $\Rightarrow$ (must be fast).
- Processes can be described as either:
  - **I/O-bound process** – spends more time doing I/O than computations, many short CPU bursts.
  - **CPU-bound process** – spends more time doing computations; few very long CPU bursts.

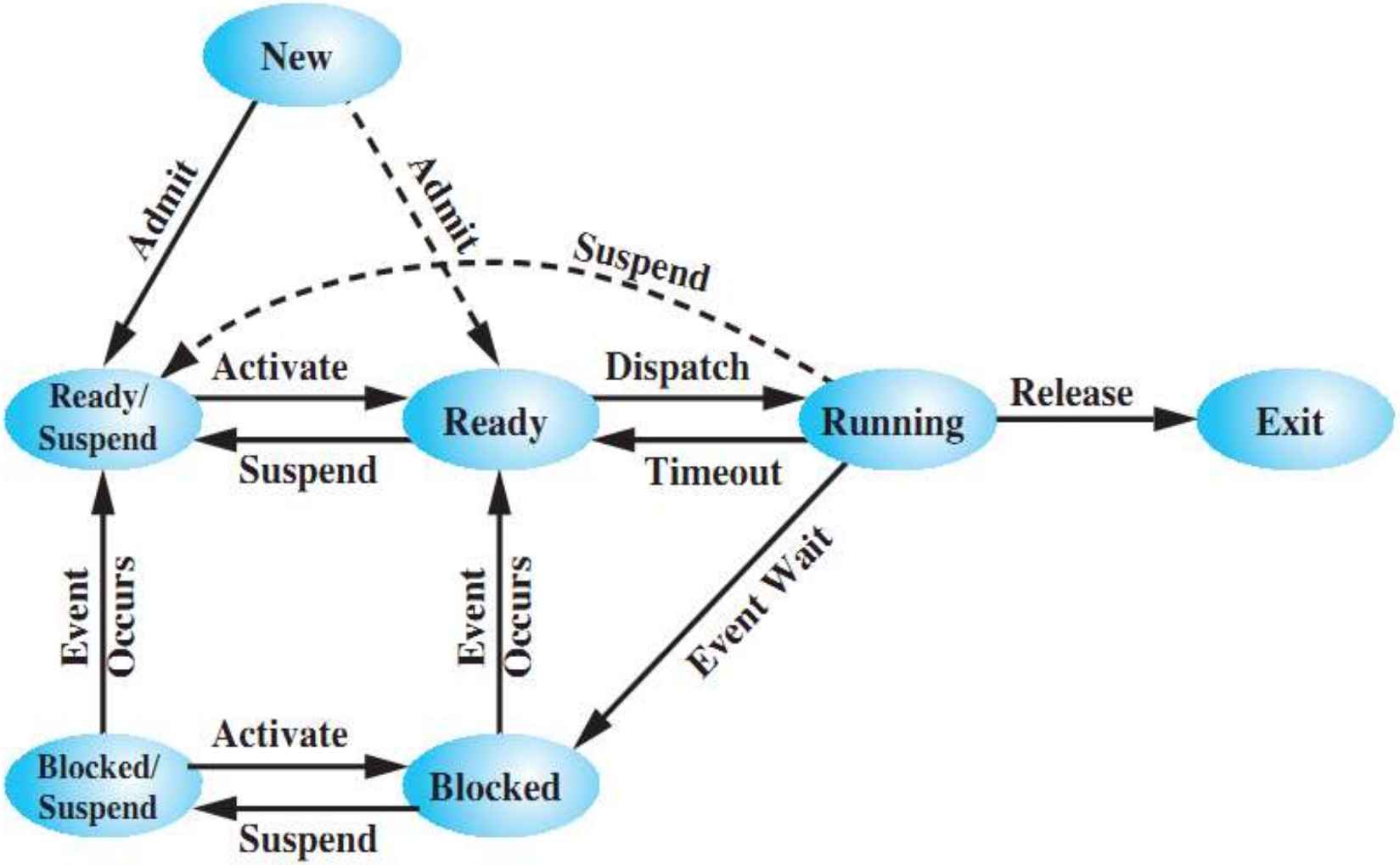
Medium Term Scheduling



Schematic View of Swapping



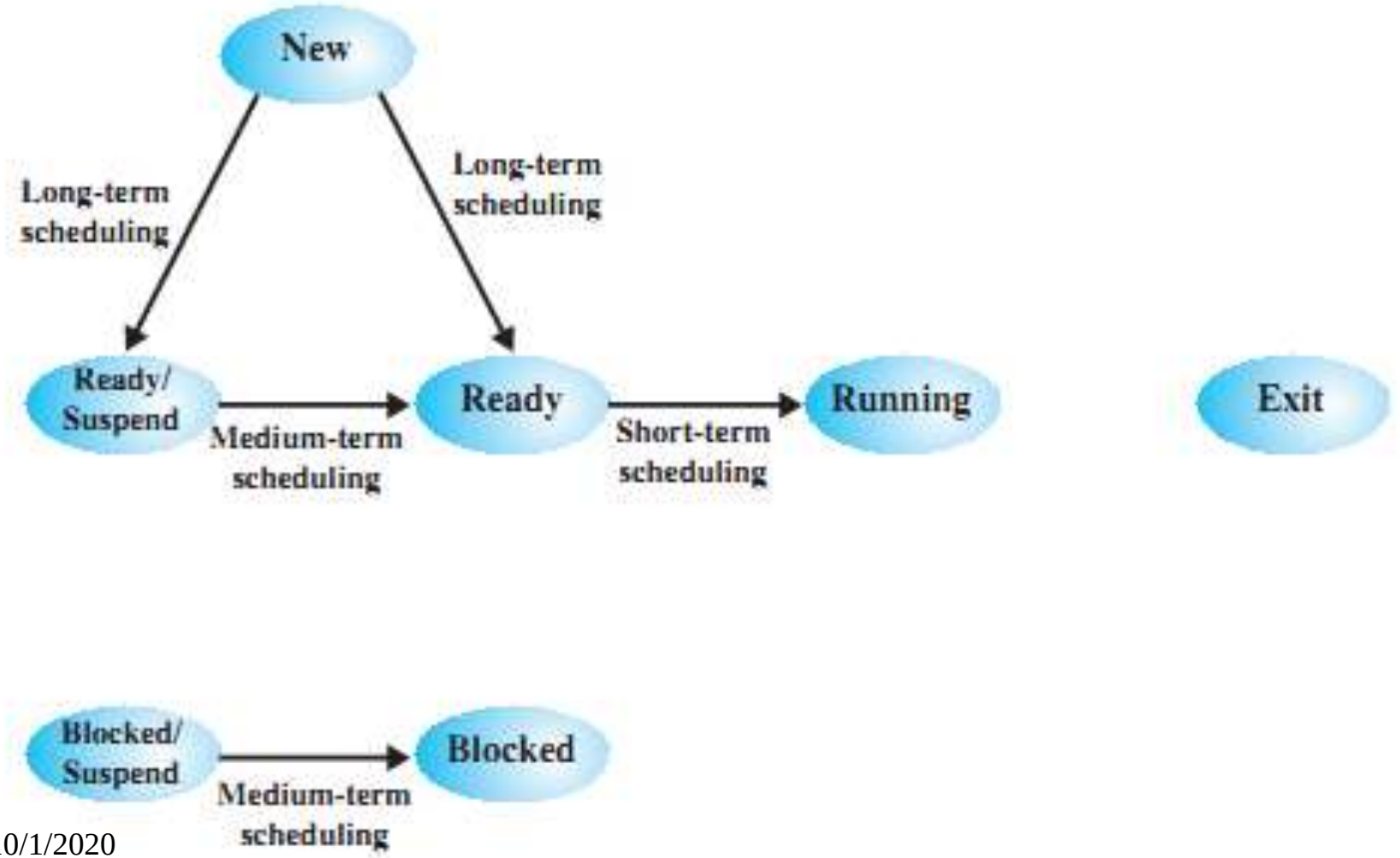
A Seven-state Process Model



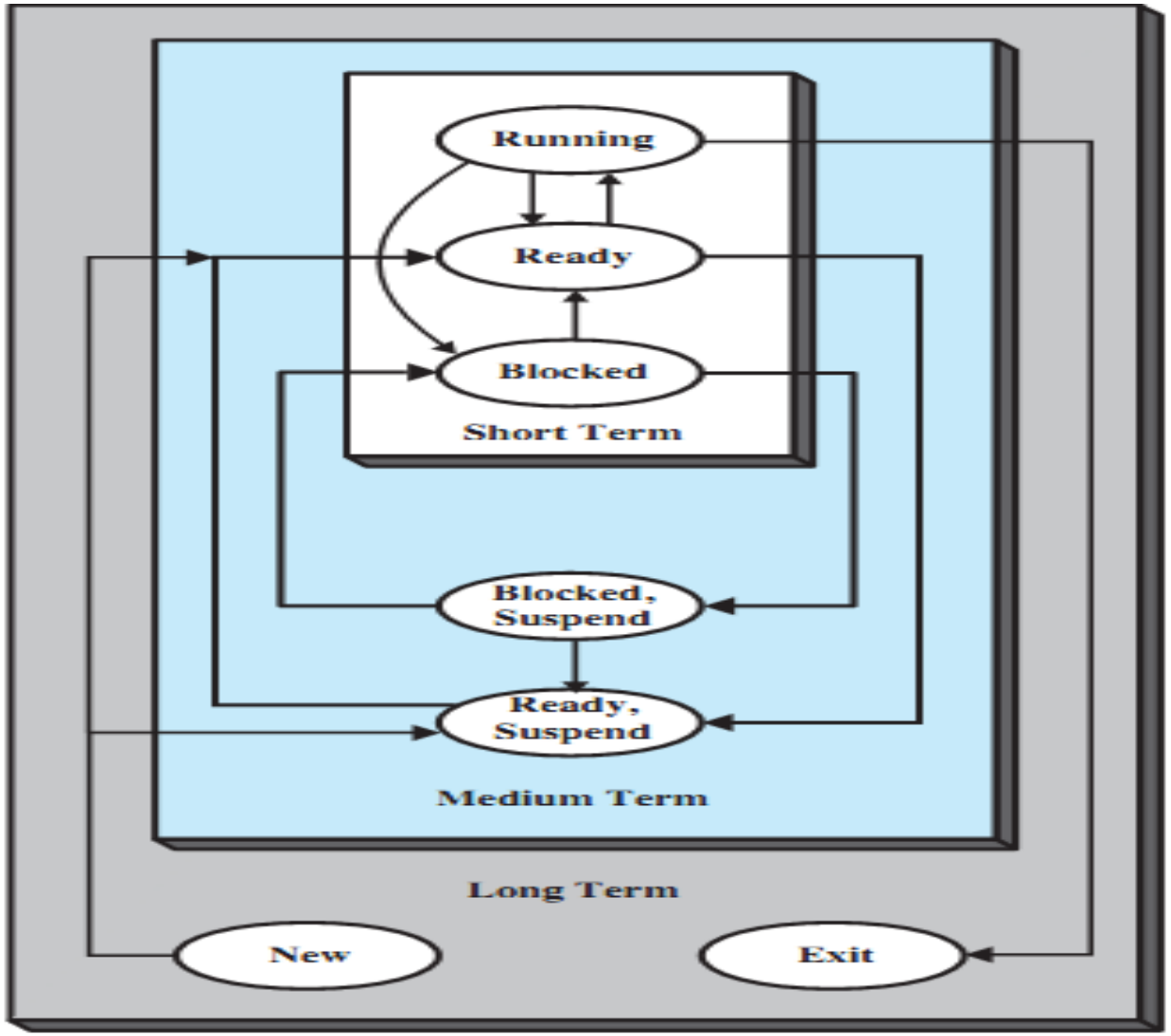
New state transitions

- Blocked —> Blocked Suspend
  - When all processes are blocked, the OS will make room to bring a ready process in memory.
- Blocked Suspend —> Ready Suspend
  - When the event for which it has been waiting occurs (state info is available to OS).
- Ready Suspend —> Ready
  - when no more ready processes in main memory.
- Ready —> Ready Suspend (unlikely)
  - When there are no blocked processes and must free memory for adequate performance.

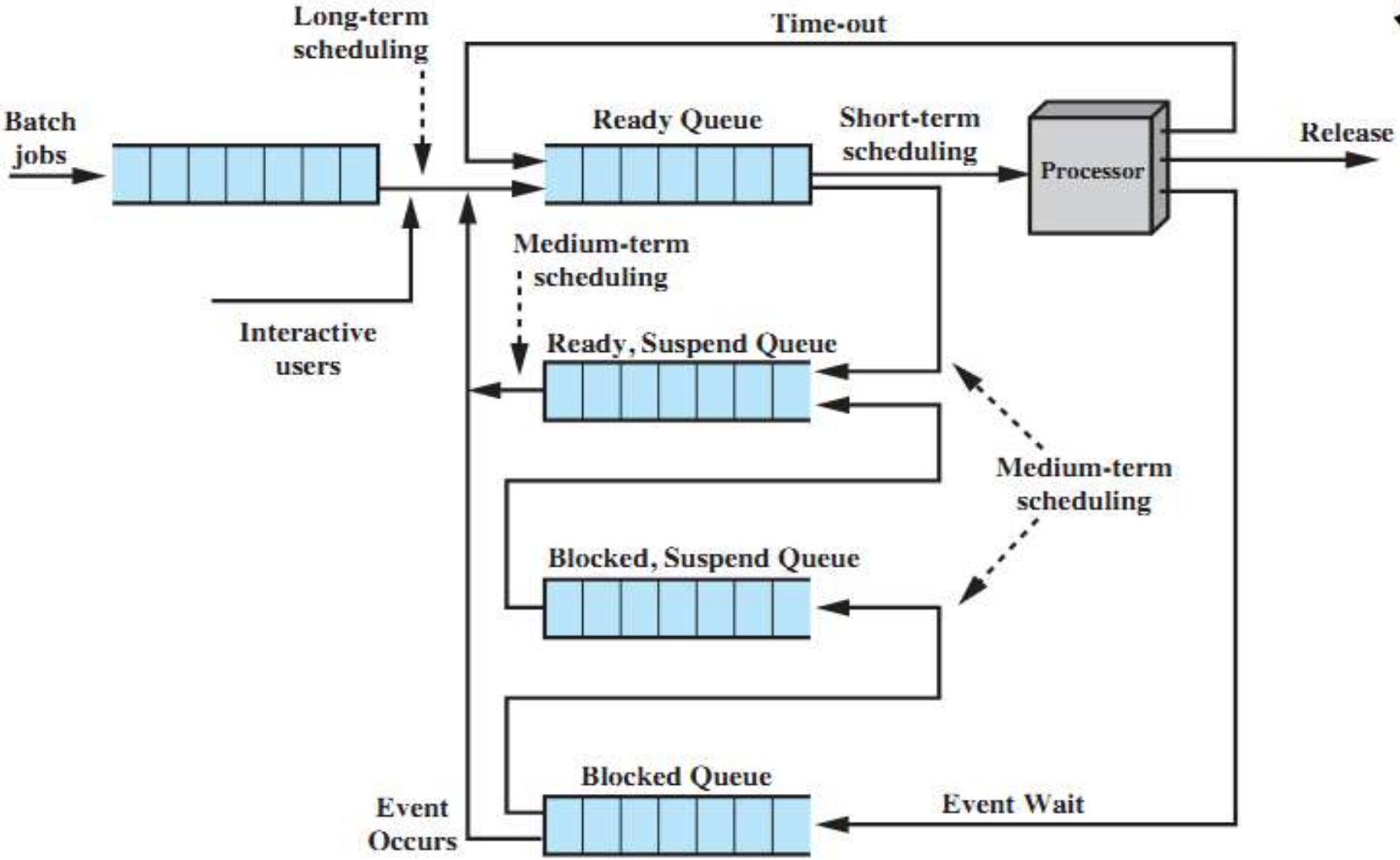
Classification of Scheduling Activity



Another view of the 3 levels of scheduling



Queuing Diagram for Scheduling



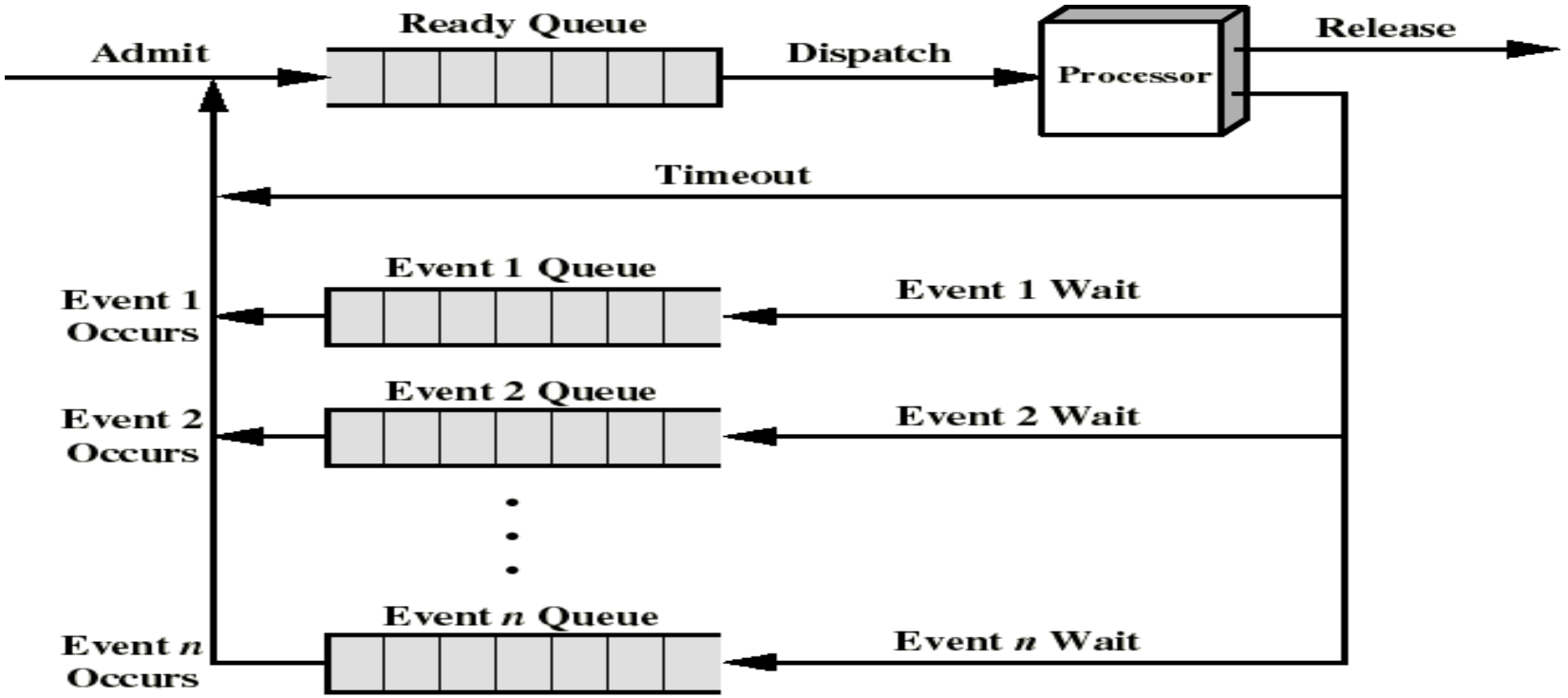
Dispatcher (short-term scheduler)

- Is an OS program that moves the processor from one process to another.
- It prevents a single process from monopolizing processor time.
- It decides who goes next according to a scheduling algorithm.
- The CPU will always execute instructions from the dispatcher while switching from process A to process B.

Process Scheduling Queues

- Process queue – set of *all* processes in the system.
- Ready queue – set of processes residing in main memory, ready and waiting to execute.
- Device queues – set of processes waiting for an I/O device.
- Processes migrate among the various queues.

A Queuing Discipline



- **When event n occurs, the corresponding process is moved into the ready queue**

Ready Queue and various I/O Device Queues