BITS, PILANI – K. K. BIRLA GOA CAMPUS

Operating Systems

by

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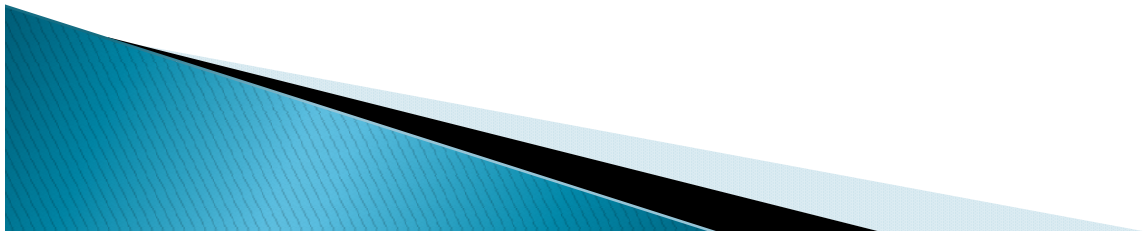
Process Concept

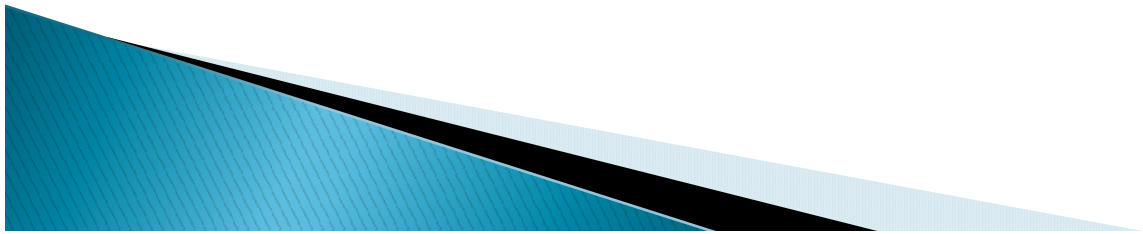
- Process – a program in execution
- A process includes:
  - Text section
  - program counter
  - stack
  - data section
  - heap



Process states

- In multi programming / multitasking environment number of processes can reside in the system

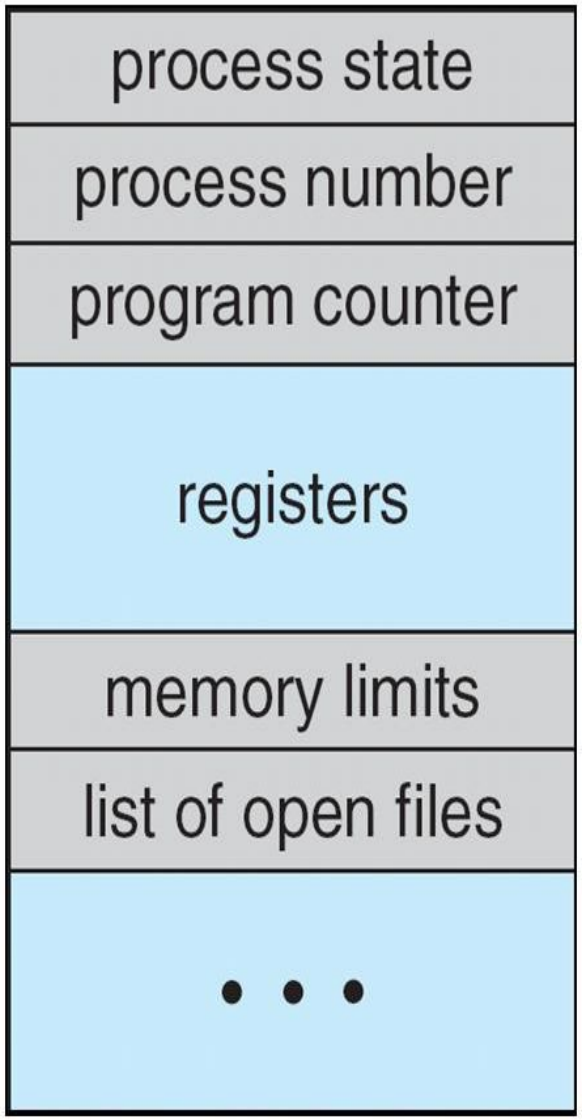
- At any instance of time processes can be in different state such as Ready, Blocked, Running etc. and processes move from one state to another state depending upon certain conditions.



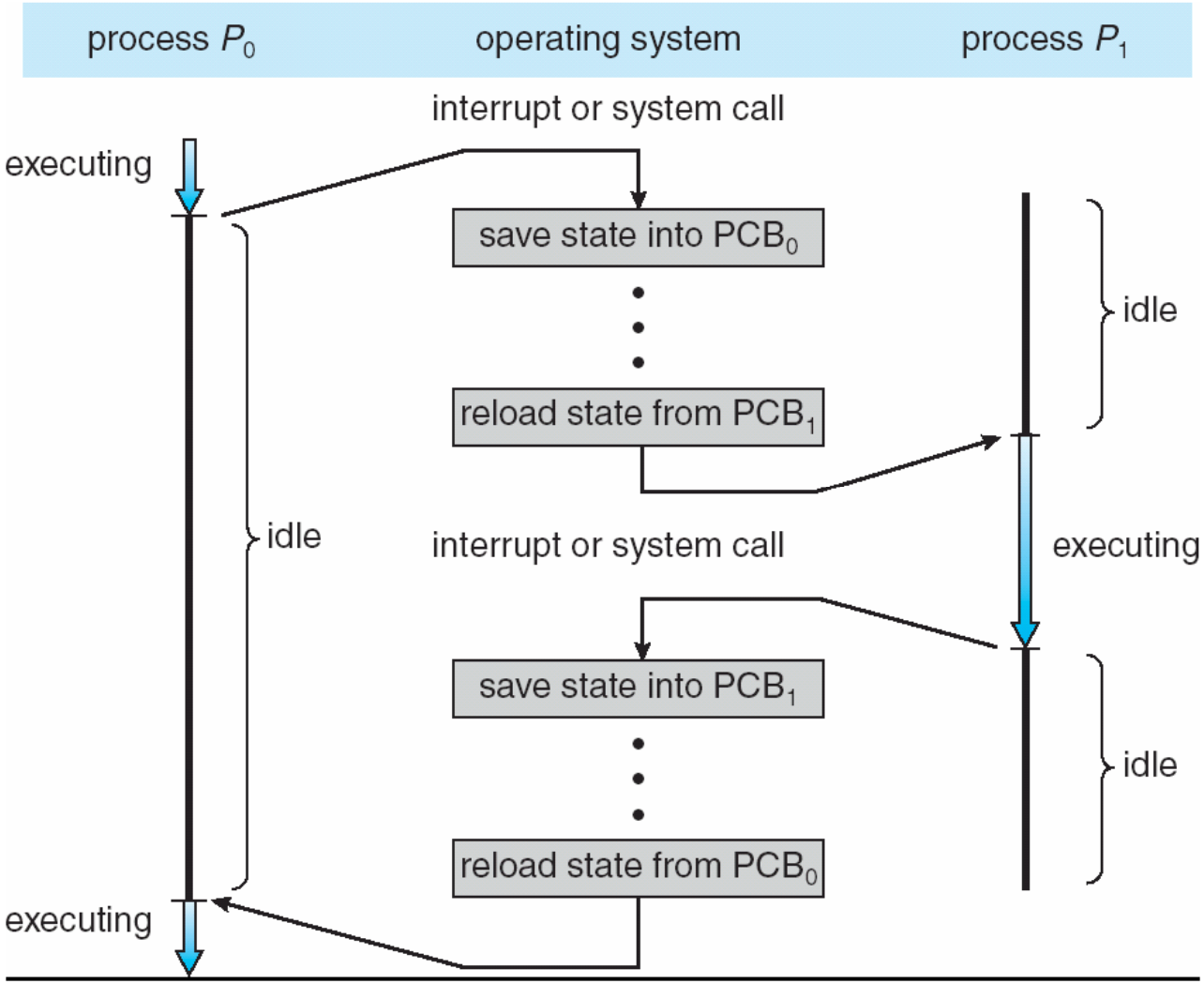
Process Control Block (PCB)

Information associated with each process

- Process state
- Program counter
- CPU registers
- CPU scheduling information
- Memory-management information
- Accounting information
- I/O status information

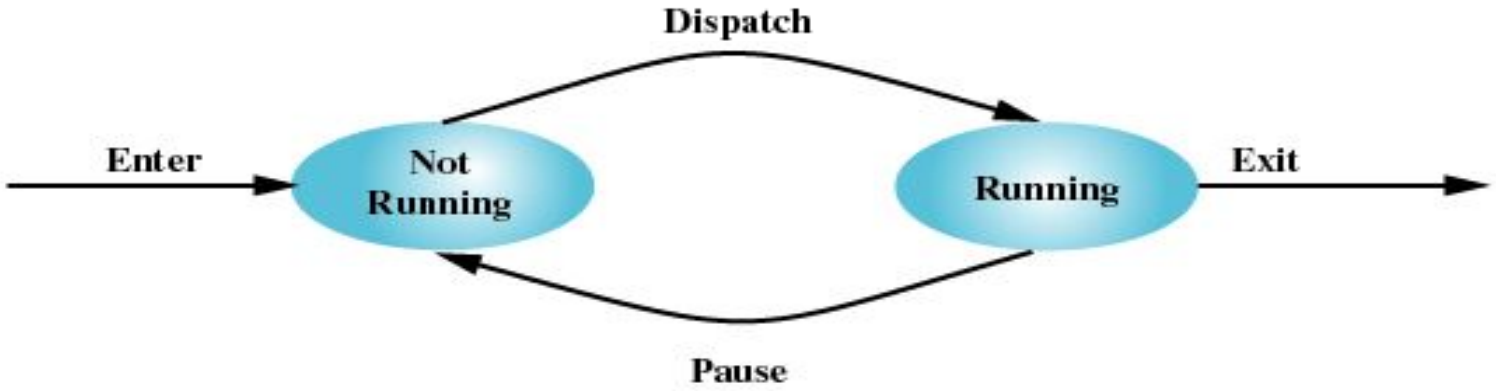


CPU Switch From Process to Process



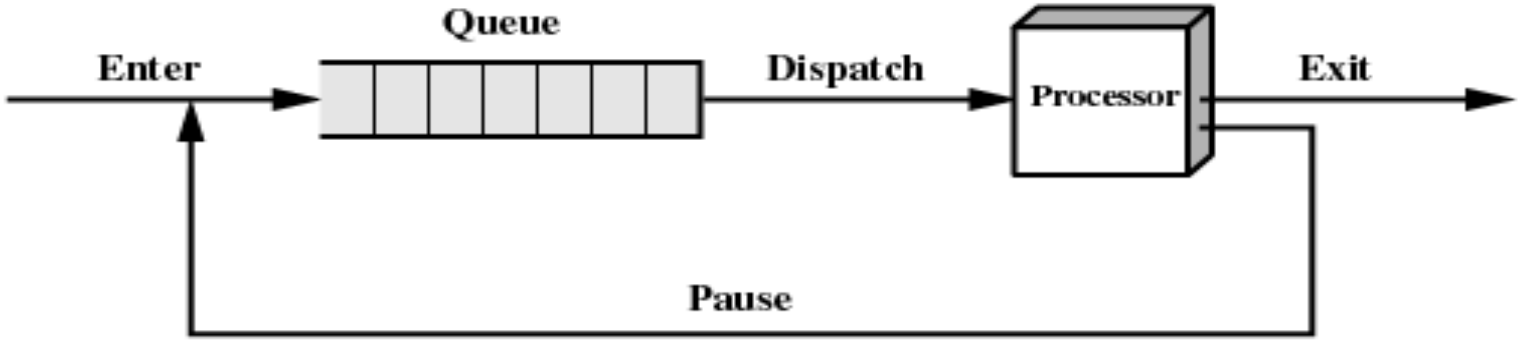
A simple scenario: Two-State Process Model

- Process may be in one of two states
  - Running
  - Not-running



(a) State transition diagram

Not-Running Process in a Queue



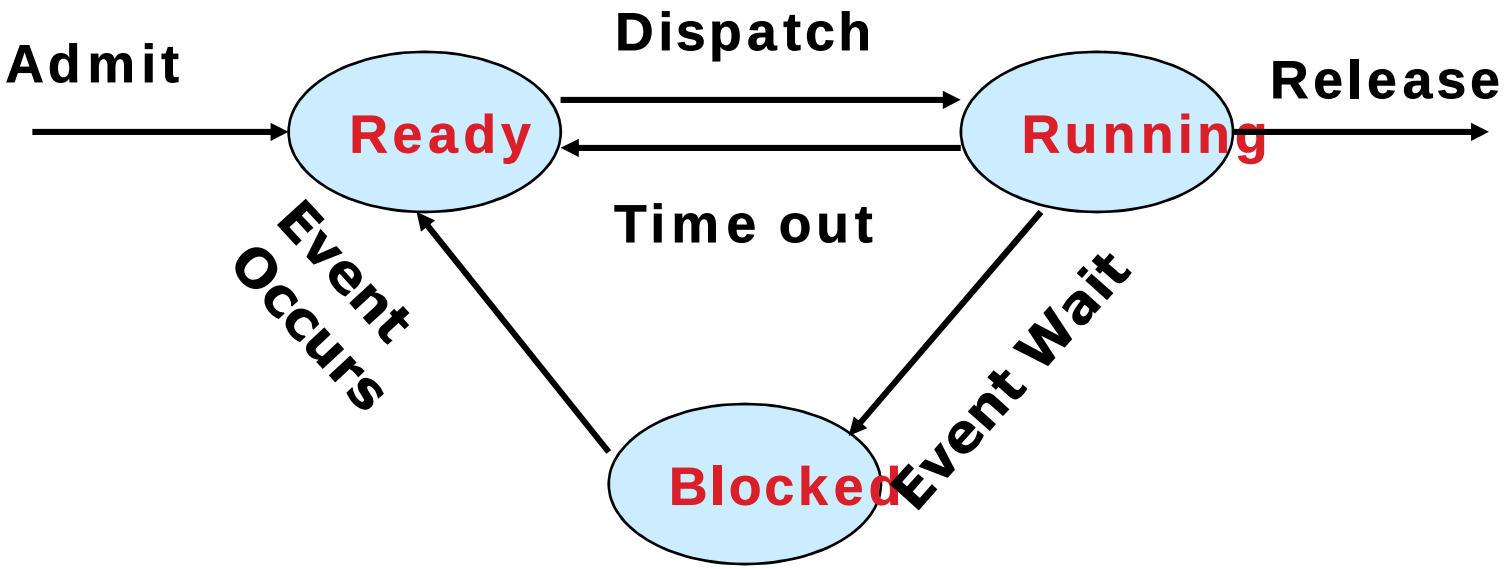
(b) Queuing diagram

What processes are in queue?

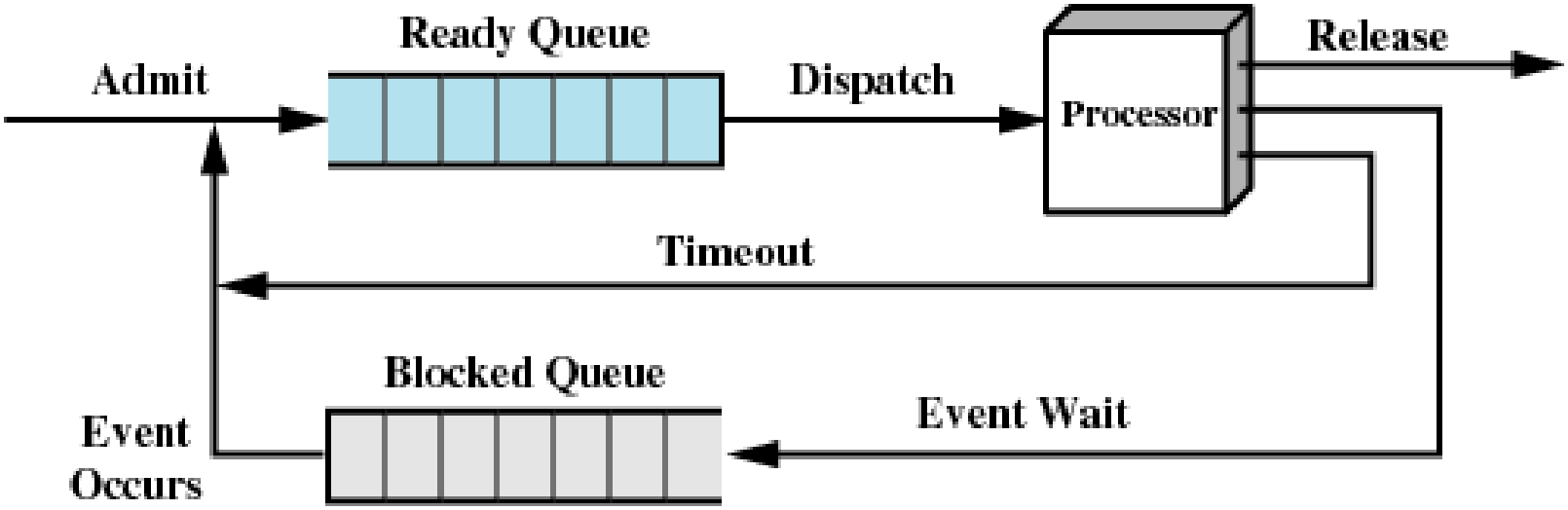
Process timed out
Process gone for I/O

Both are 2 different scenarios

Three state model

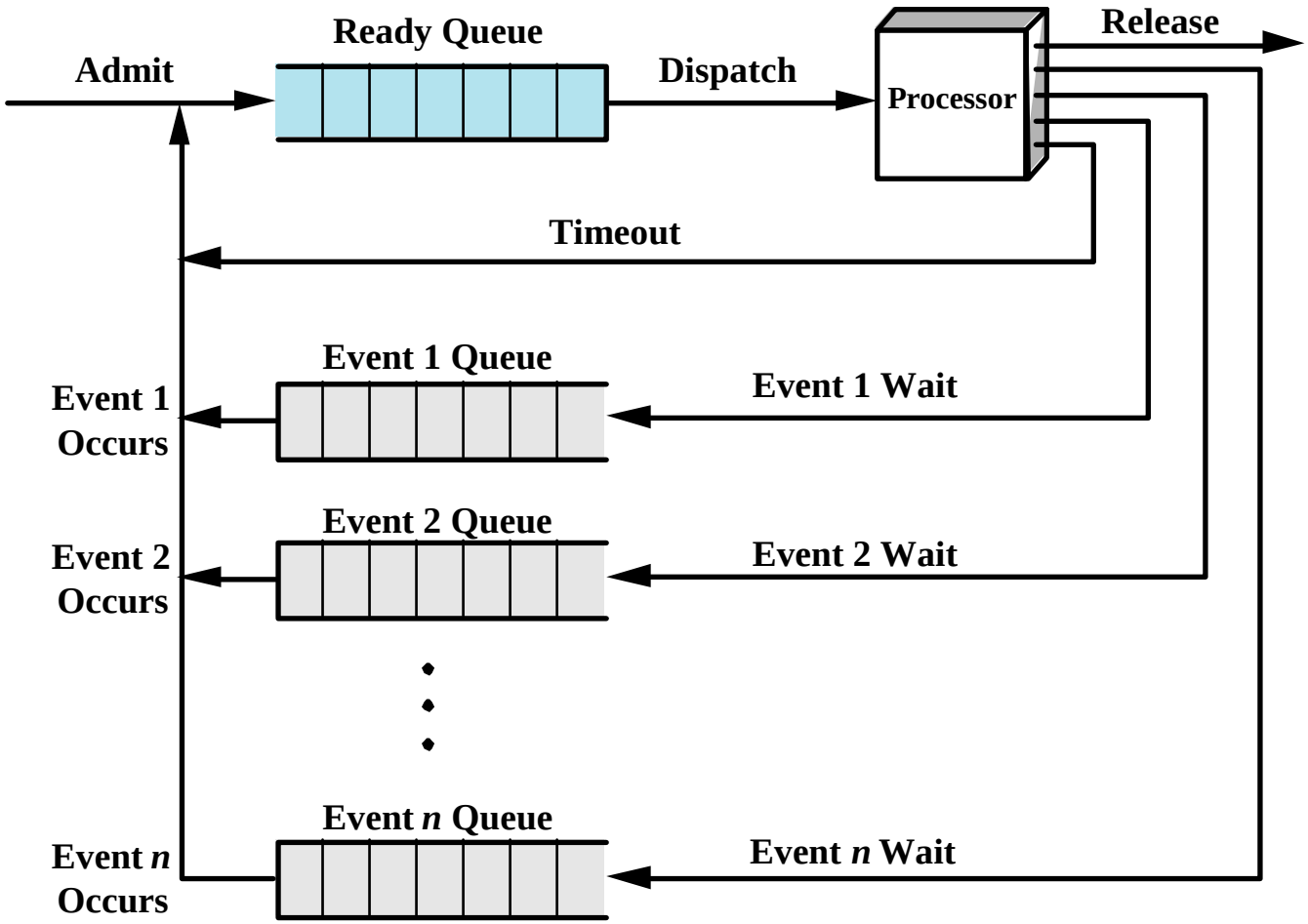


Three state model: Queuing Diagram



(a) Single blocked queue

Multiple Blocked Queues



(b) Multiple blocked queues

Four state model

- Need to create process
  - Process control block
  - Verify availability of resources

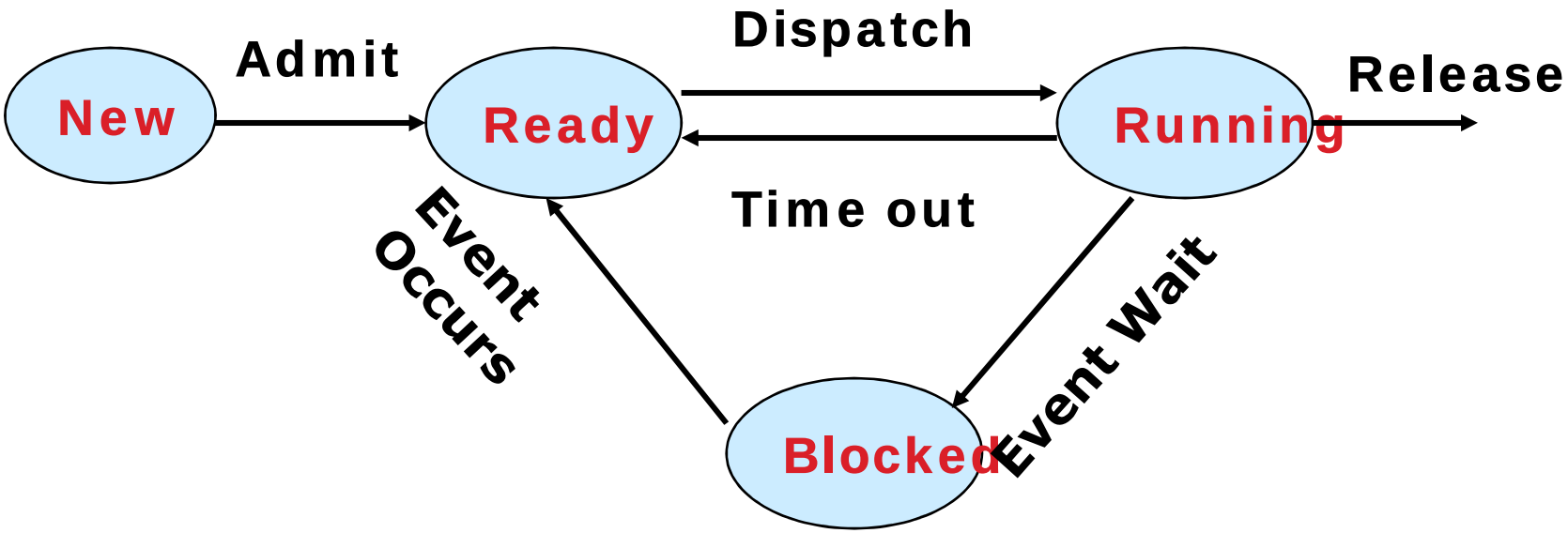
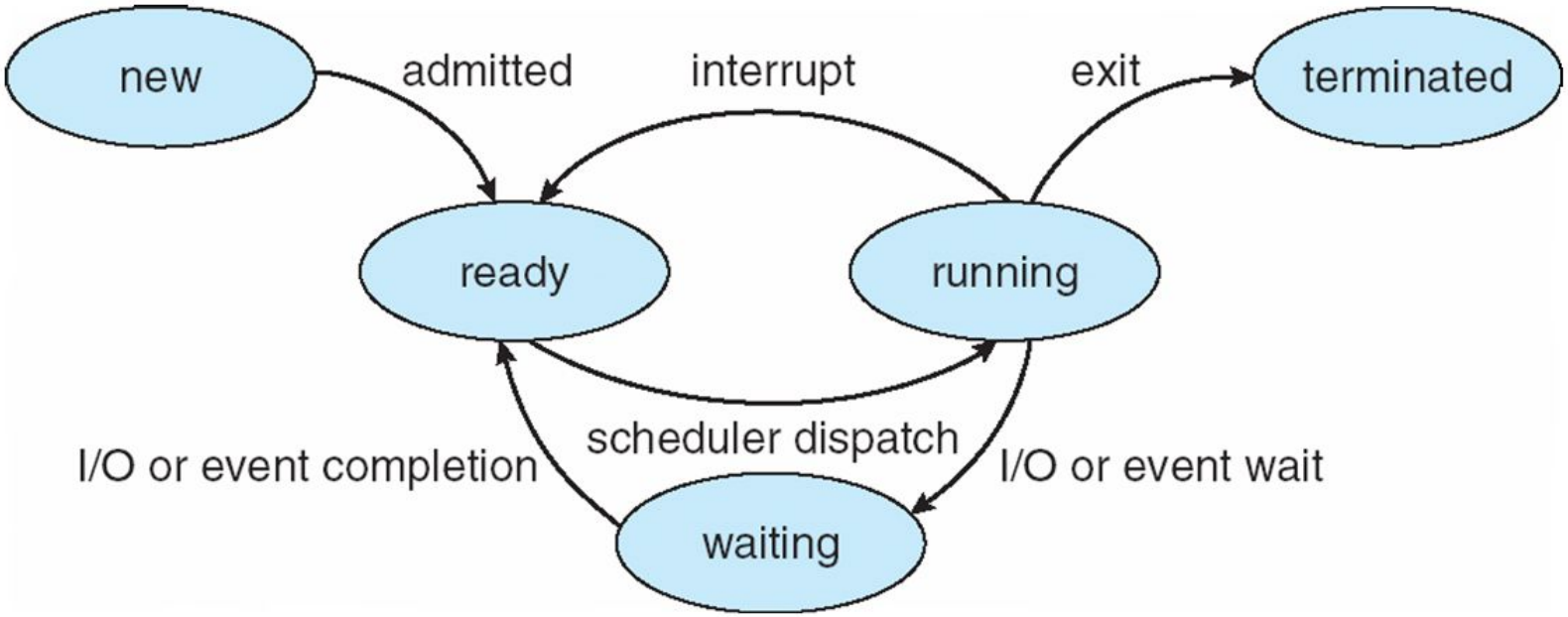


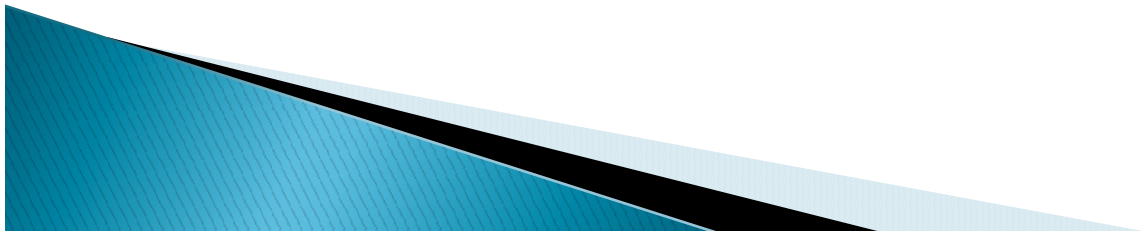
Diagram of Process State



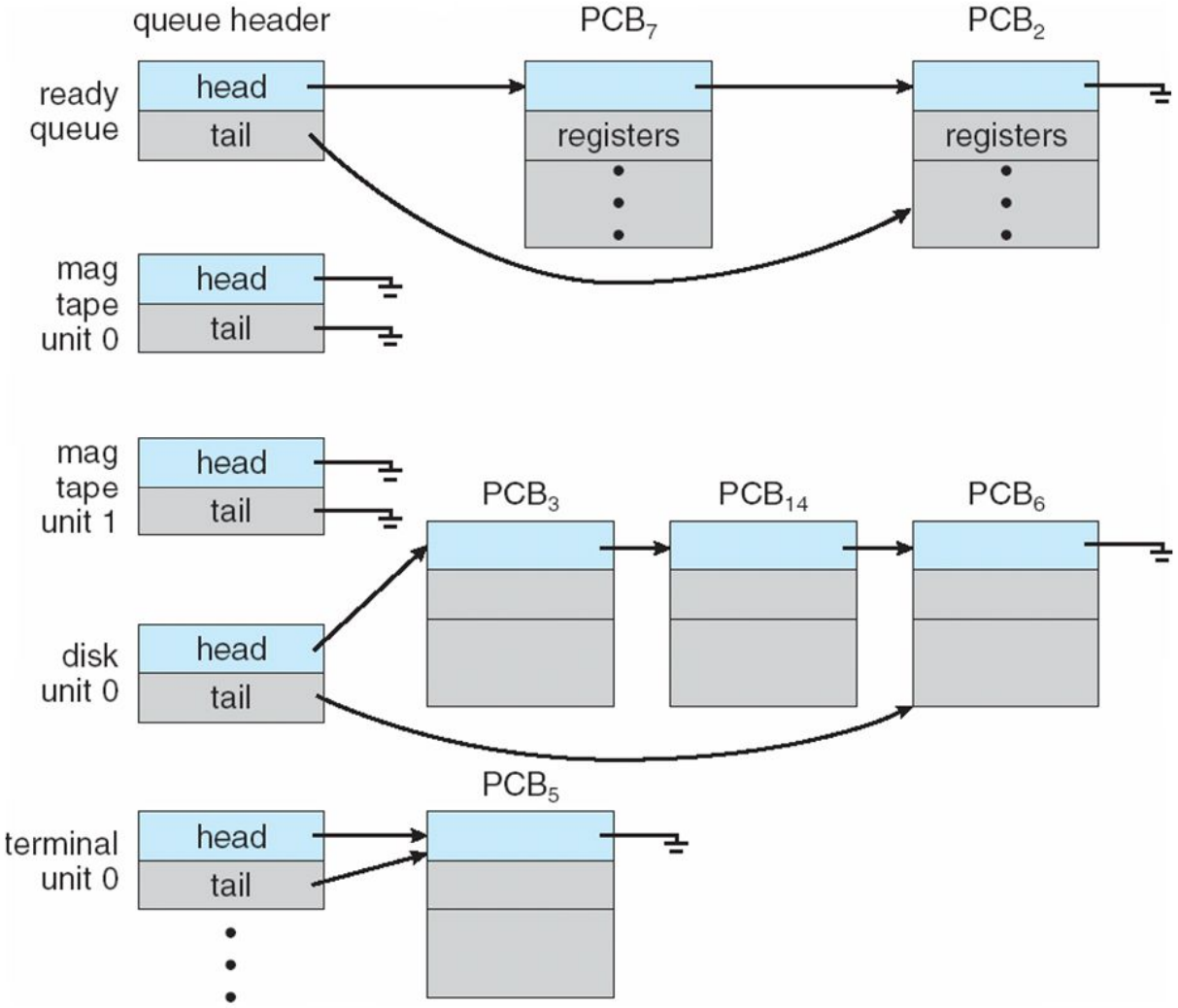
Process Scheduling Queues

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

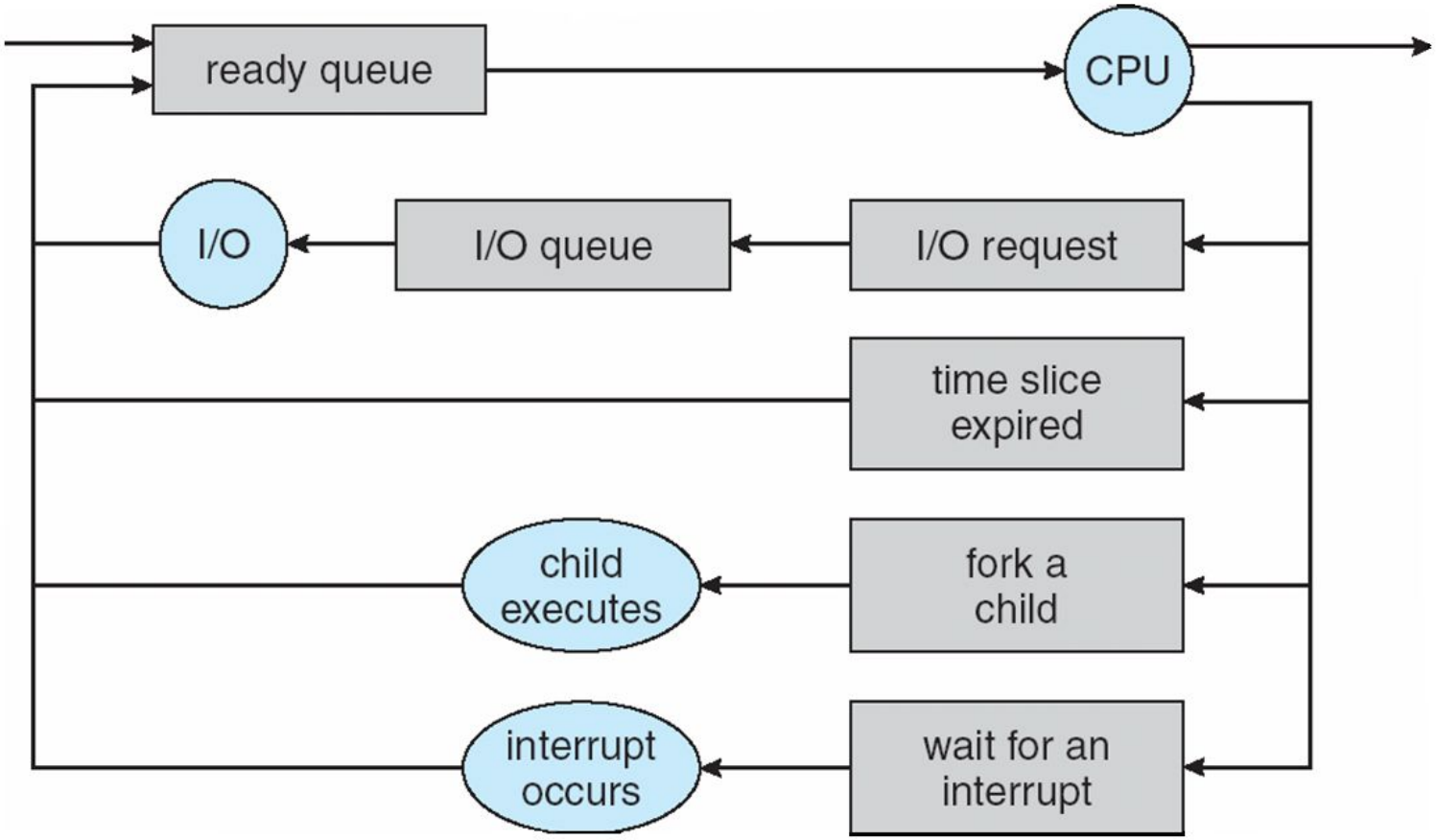
Processes migrate among the various queues



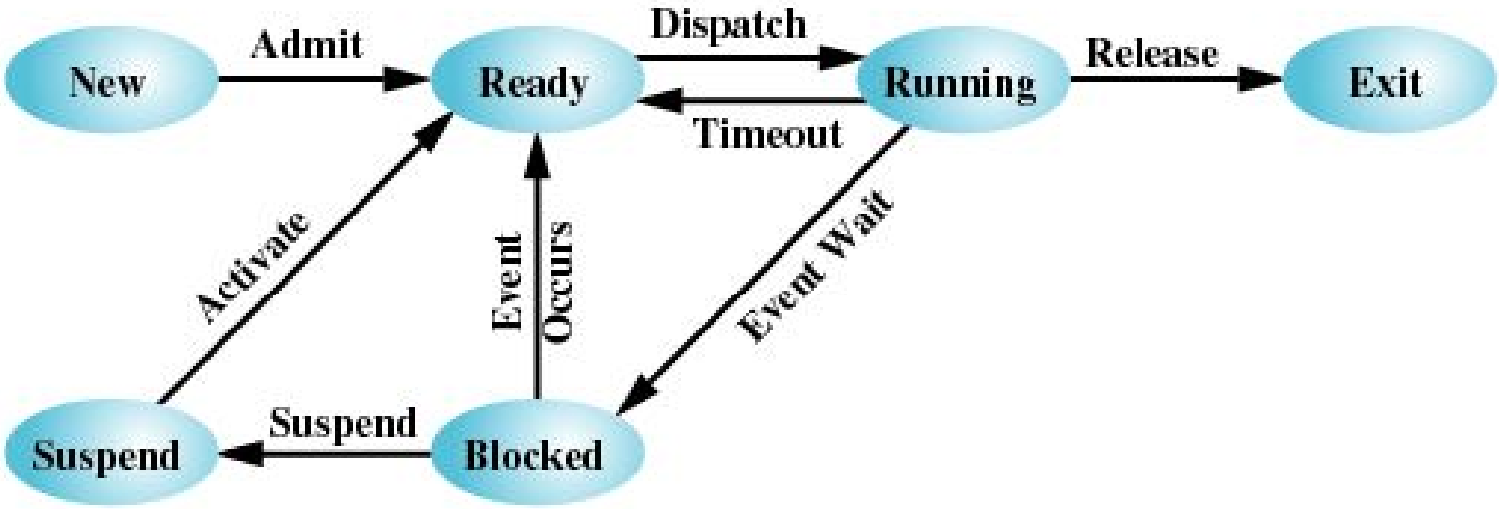
Ready Queue And Various I/O Device Queues



Representation of Process Scheduling

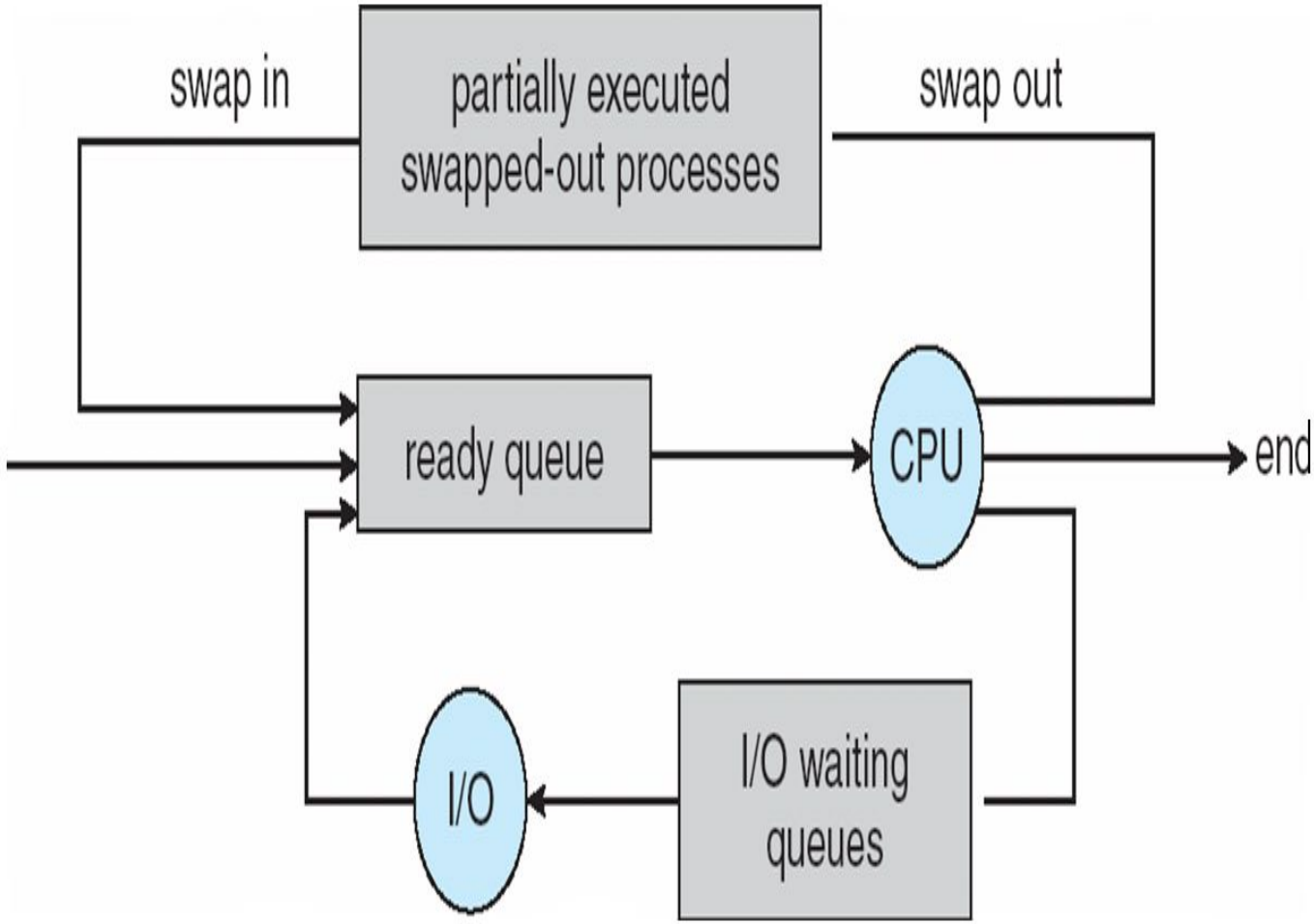


Six state model: one suspend state

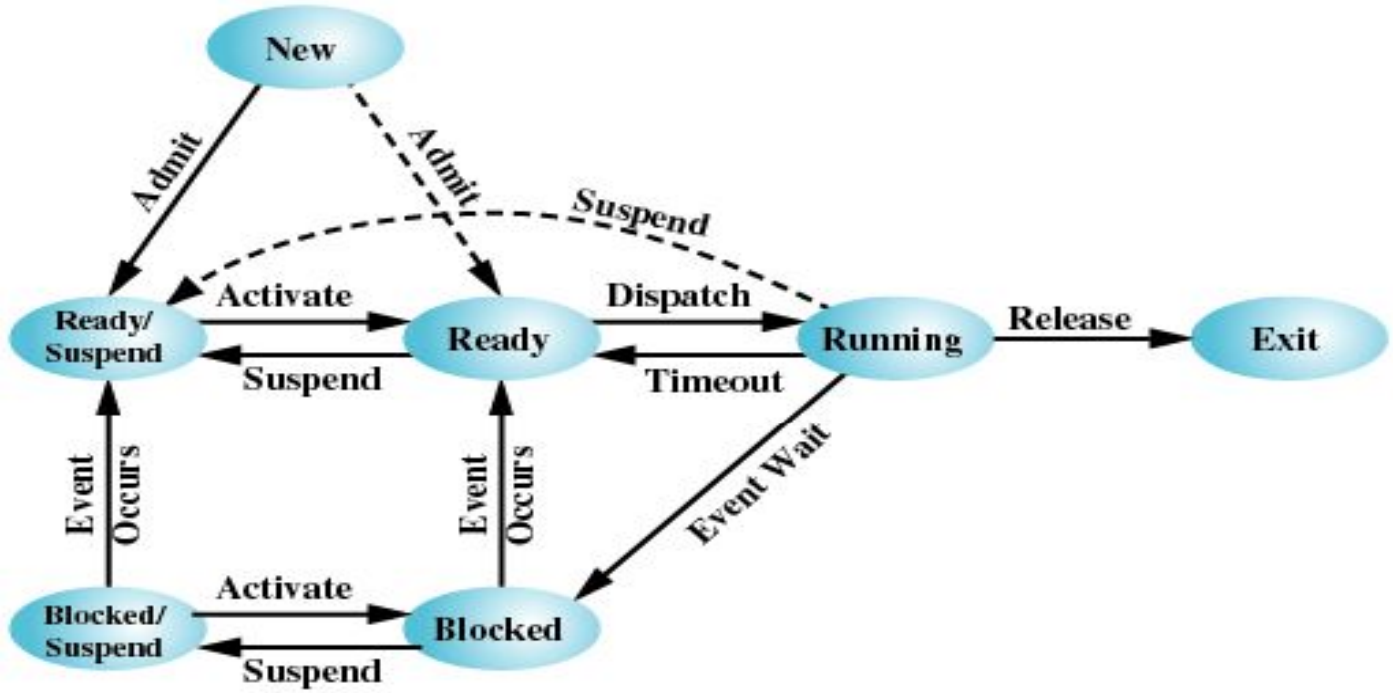


(a) With One Suspend State

Swapping out the process



Seven state model : two suspend states



(b) With Two Suspend States

Figure 3.9 Process State Transition Diagram with Suspend States

Reasons for Process Suspension

Swapping	The operating system needs to release sufficient main memory to bring in a process that is ready to execute.
Other OS reason	The operating system may suspend a background or utility process or a process that is suspected of causing a problem.
Interactive user request	A user may wish to suspend execution of a program for purposes of debugging or in connection with the use of a resource.
Timing	A process may be executed periodically (e.g., an accounting or system monitoring process) and may be suspended while waiting for the next time interval.
Parent process request	A parent process may wish to suspend execution of a descendent to examine or modify the suspended process, or to coordinate the activity of various descendents.