CSCI315 – Operating Systems Design

Department of Computer Science
Bucknell University

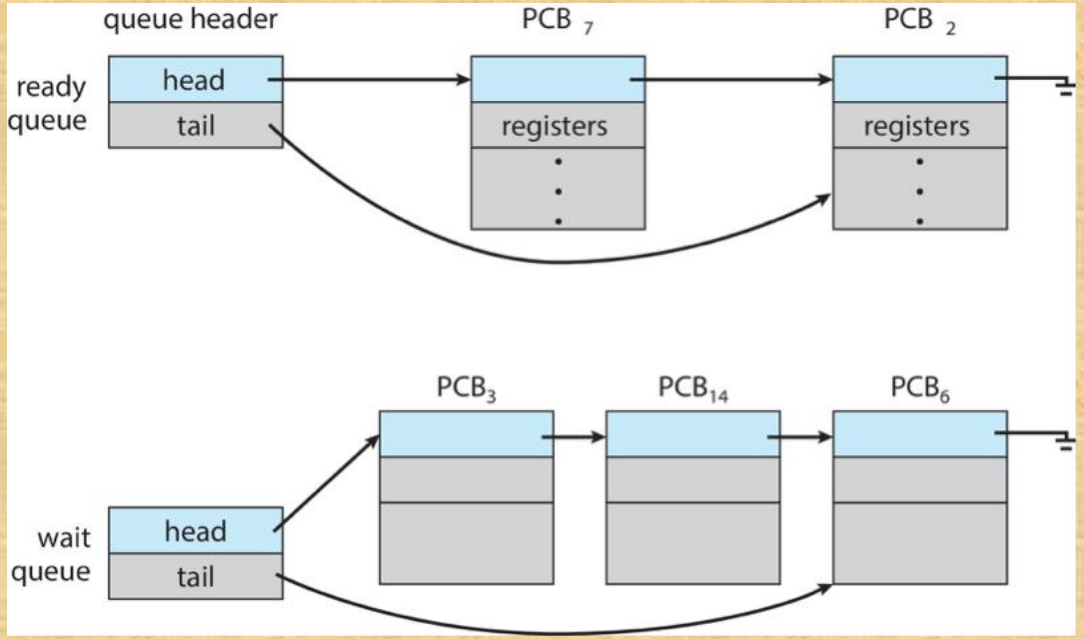
Processes Life Cycle

Ch 3

This set of notes is based on notes from the textbook authors, as well as L. Felipe Perrone, Joshua Stough, and other instructors.
Xiannong Meng, Fall 2021.

Processes and OS Queues

A process is represented by its PCB in the OS software.
The collection of processes are typically organized into a **doubly linked list**!

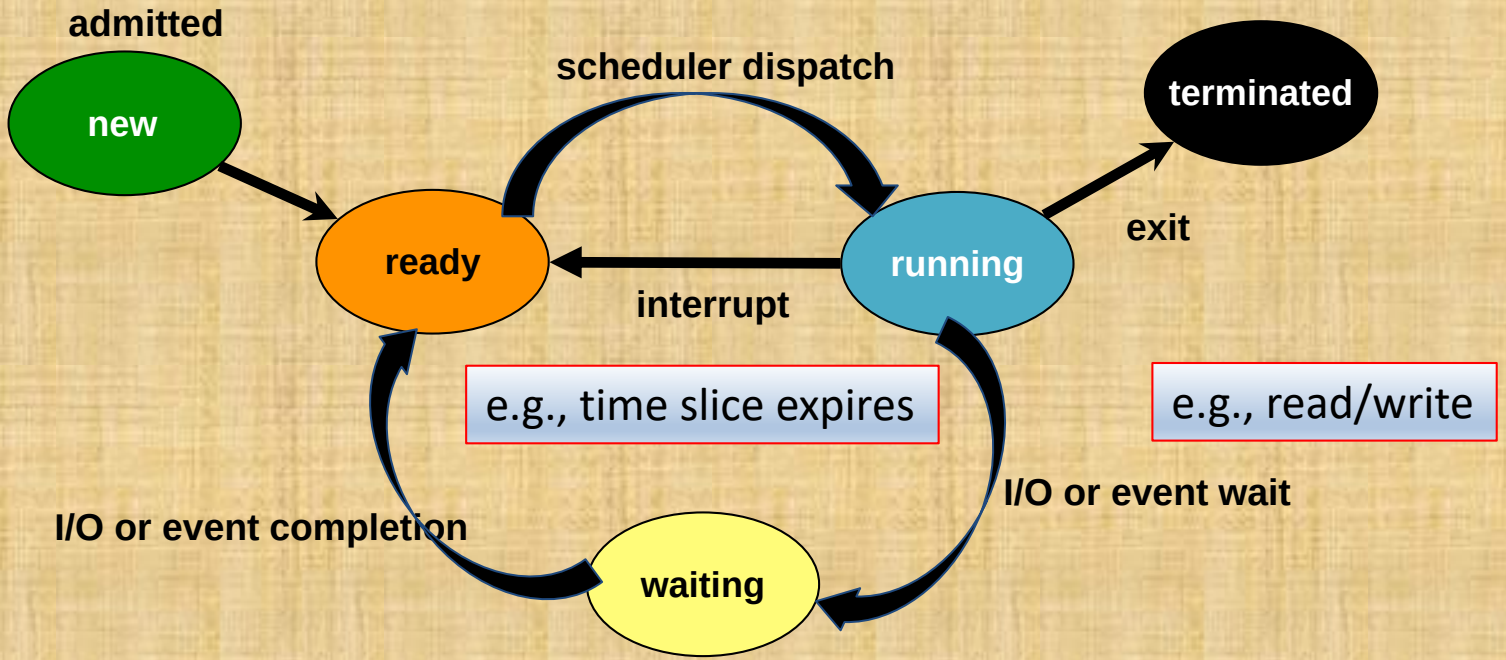


Process State

As a process executes, it changes its ***state***:

- **new**: The process is being created.
- **running**: Instructions are being executed.
- **waiting**: The process is waiting for some event to occur.
- **ready**: The process is waiting to be assigned to a processor.
- **terminated**: The process has finished execution.

Process State Transition Diagram

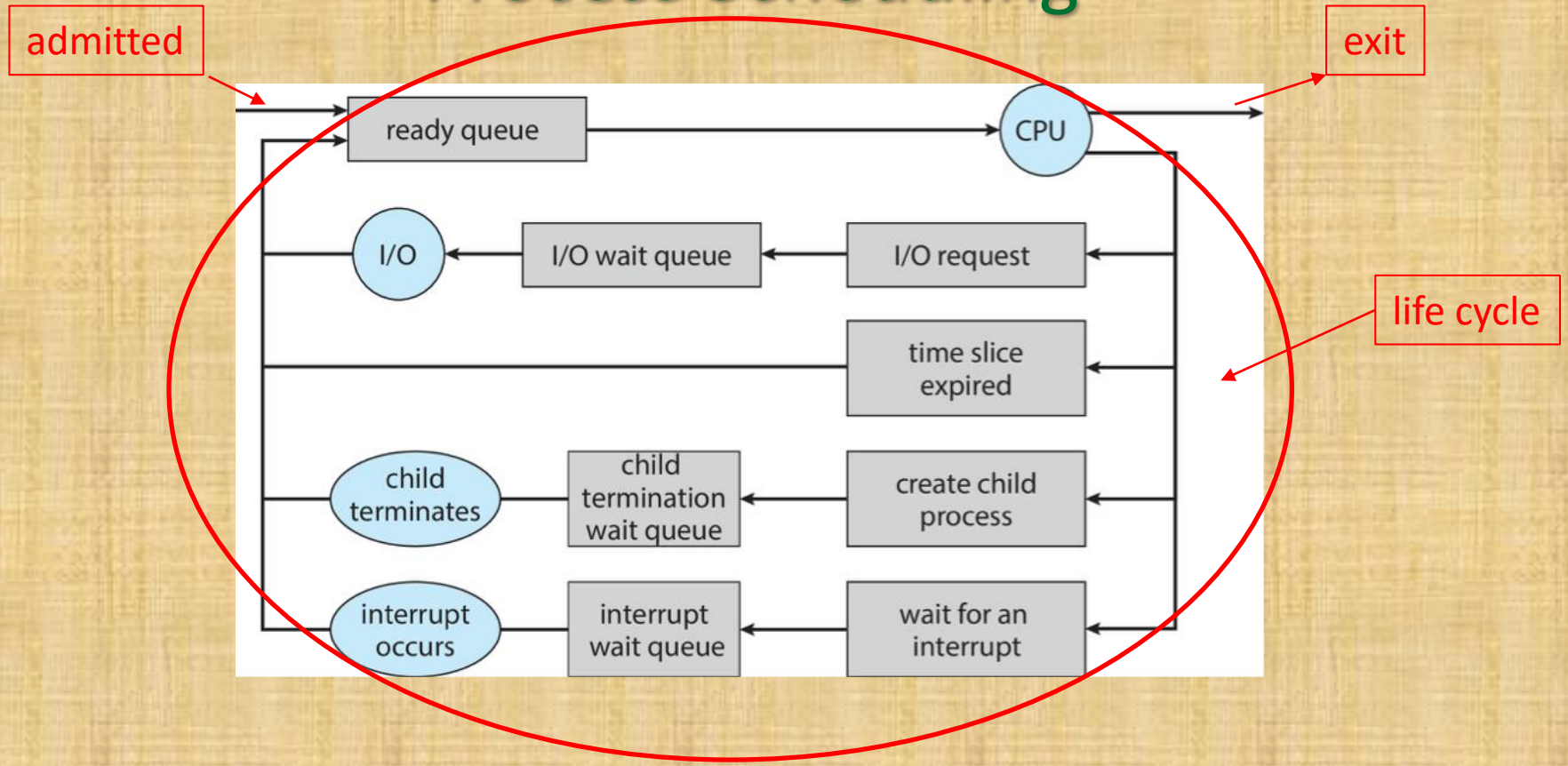


Process Scheduling Queues

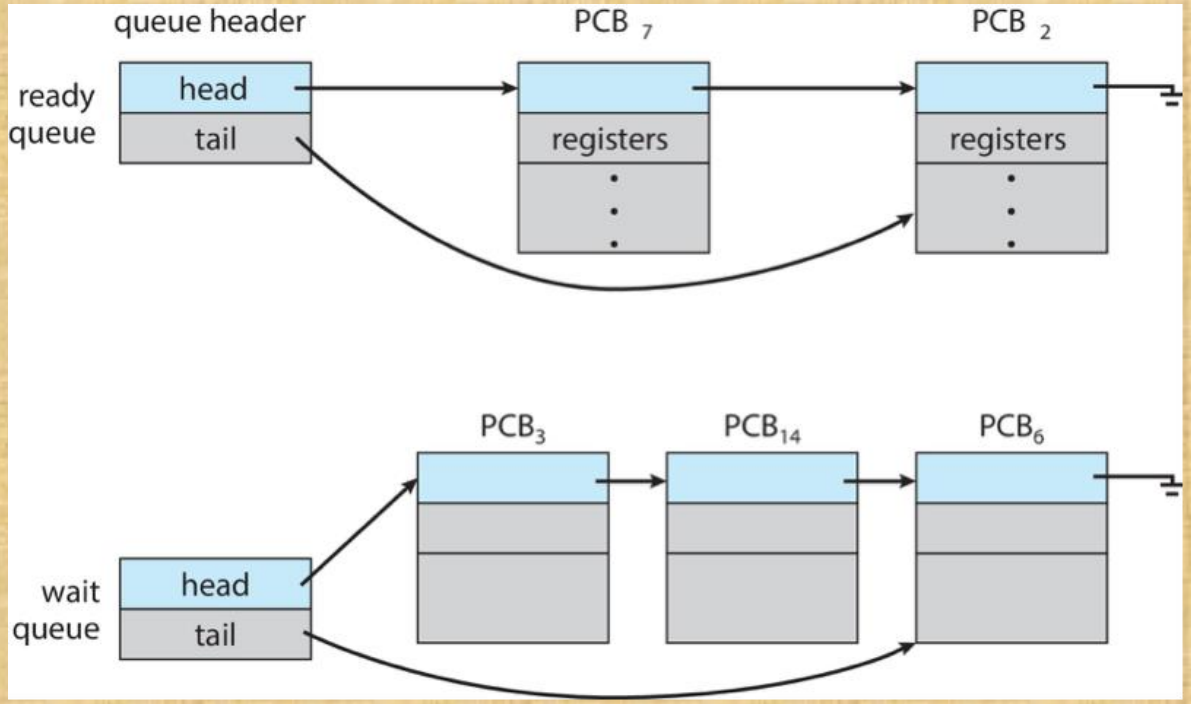
- ***Waiting queue*** – set of processes waiting for service from an I/O device. Waiting queues may contain processes that are **sleeping**, waiting for their turns to be brought into main memory from secondary memory. Waiting queues sometimes are also called ***device queues***.
- ***Ready queue*** – set of all processes residing in main memory, ready to execute.

Processes migrate between various queues.

Process Scheduling



Processes and OS Queues



Scheduling

- **Long-term scheduler** is invoked very infrequently (seconds, minutes) ⇒ (may be slow; controls the *degree of multiprogramming*)
- **Short-term scheduler** is invoked very frequently (milliseconds) ⇒ (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
- Operating system may schedule to have a good mix of processes running concurrently.
- We will discuss various CPU scheduling policies in a later chapter.

Context Switch

- When CPU switches to another process to run, the system must save the state (**context**) of the current process and load the saved state for the new process.
  - The state of a process is described by the values in its PCB, e.g., the register values, the program counter, the opened files…
- Context-switch time is **overhead**; the system does no useful work while switching.
  - The “context” is the state of the process.
- Time needed depends on hardware support.

CPU Switching Among Processes