CS343: Operating System

Memory Management

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Outline

- Motivations for Memory management
- Memory Management

Motivation for Memory Management

Motivation

- Memory size (RAM Size)
  - Server, Desktop, Mobile, my Old laptop, Smart Watch , smart atm card, RF ID
  - Upto 16TB, 32GB, 8GB, 2GB, 4MB, 1KB, Byte
- Page Mapping (Algorithmic)
  - Example 4GB RAM, page size 4KB
  - Number of Pages: 10^6 pages
    - O(n) or O (nlgn) Algorithm is OK
    - **O(n^2) is dangerous**
  - If Number of pages in Server is 10^9,
    - Linear algorithm have issues

Memory Management

Process Concept

- **Process** – a program in execution; process execution must progress in sequential fashion
- Multiple parts
  - The program code, also called **text section**
  - Current activity including **PC**, processor registers
  - **Stack** containing temporary data
    - Function parameters, return addresses, local variables
  - **Data section** containing global variables
  - **Heap** containing memory dynamically allocated during run time

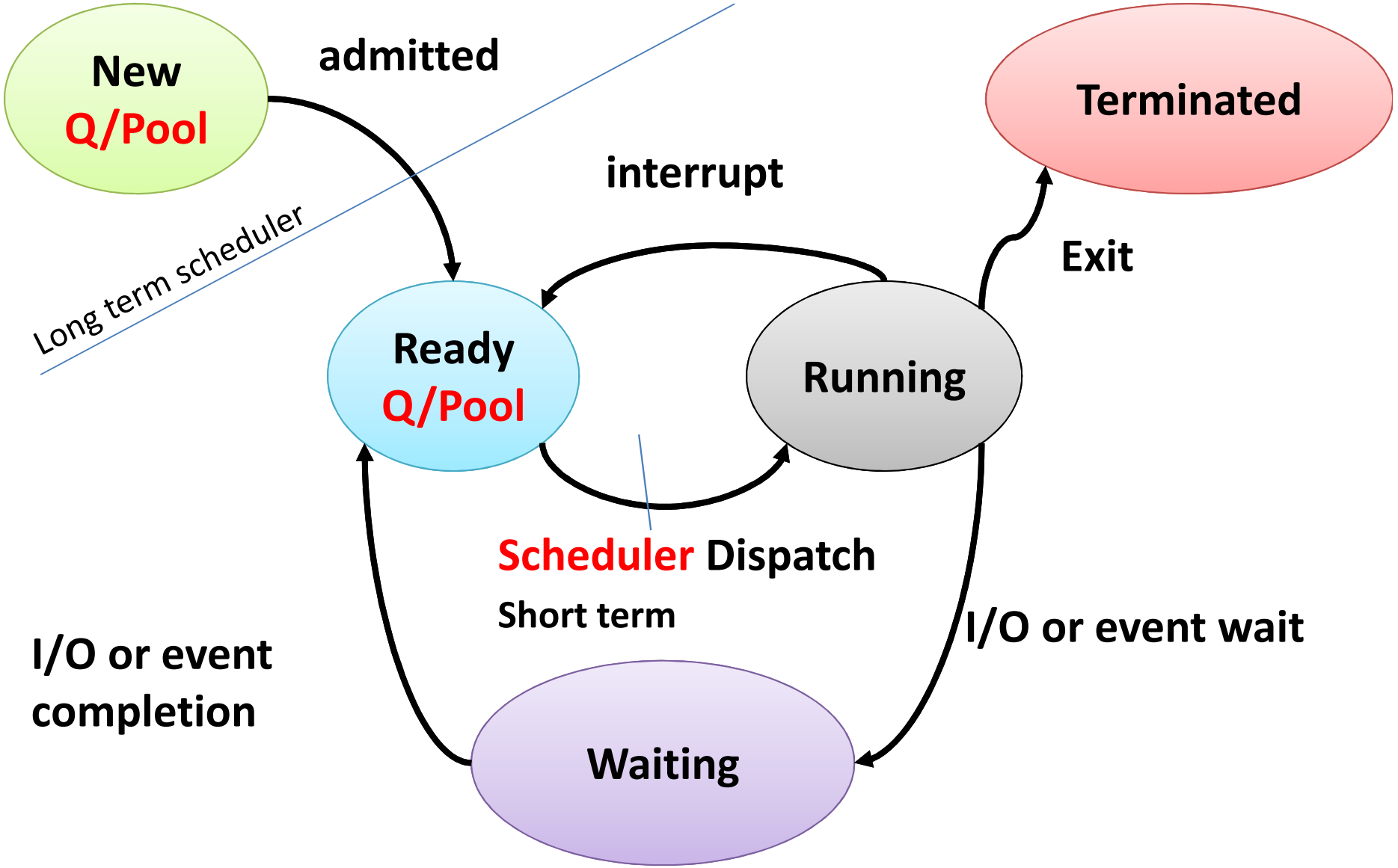
Process to be run..

- Program must be brought (from disk) into memory and placed within a process for it to be run
- CPU can access directly : Main memory and registers
- Memory unit only sees
  - A stream of addresses + read requests, or address + data and write requests

Process to be run..

- Register access in one CPU clock (or less)
- Main memory can take many cycles, causing a **stall**
- **Cache** sits between main memory and CPU registers
- Protection of memory required to ensure correct operation

Process State: State Diagram



Thanks