

CS343 - Operating Systems

Module-2A

Introduction to Process Concept & Process States



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Session Outline

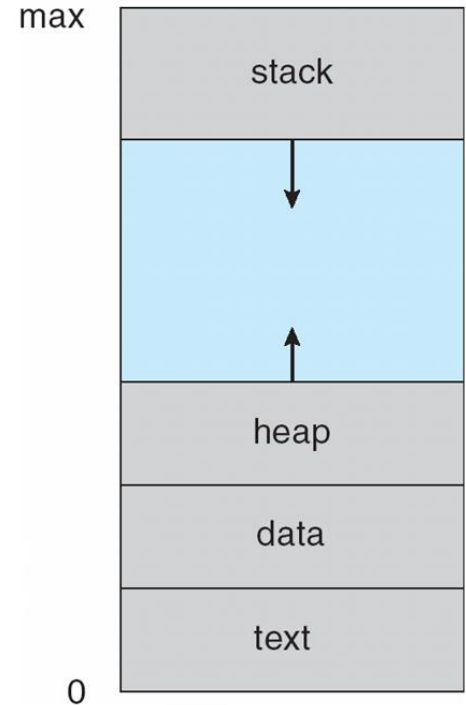
- ❖ **Process Concept**
- ❖ **Process State Diagram**
- ❖ **Process Control Block**
- ❖ **Context Switching between Processes**
- ❖ **Process Scheduling**
- ❖ **Long Term Vs Short Term Scheduler**

Process Concept

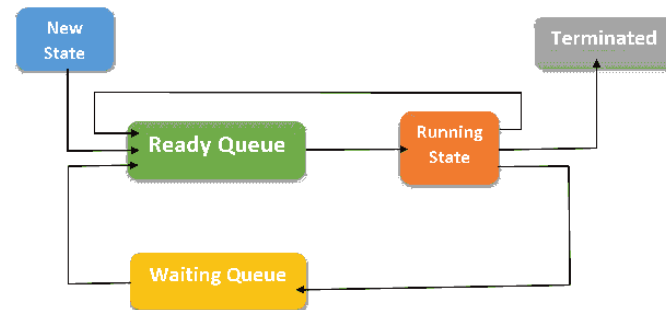
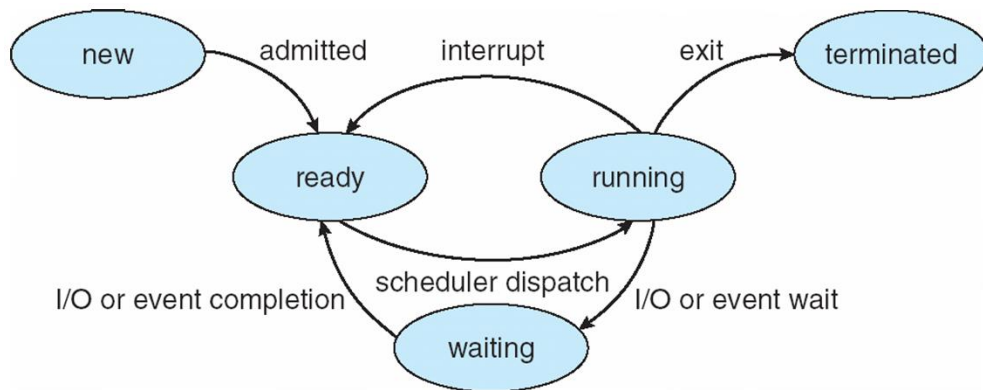
- ❖ A process is a **program in execution**
- ❖ It is a unit of work within the system
- ❖ Program is a **passive entity**, process is an **active entity**
- ❖ Process needs resources to accomplish its task
- ❖ These resources include **CPU, memory, I/O, files**, etc.
- ❖ Program becomes process when executable file loaded into memory
- ❖ Program execution is initiated by GUI mouse clicks / command line entry

Process Concept

- ❖ One program can have several processes
- ❖ **Process** has multiple parts
 - ❖ The program code, also called **text section**
 - ❖ Current activity - **program counter**, registers
 - ❖ **Stack** containing temporary data like function parameters, return addresses, local variables
 - ❖ **Data section** containing global variables
 - ❖ **Heap** -dynamically allocated memory during run time



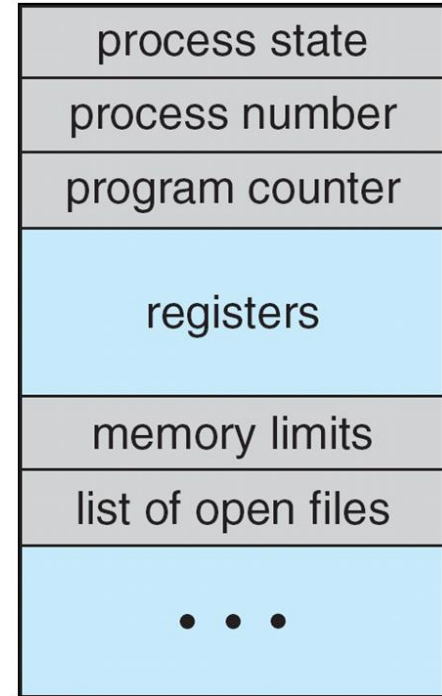
Process State Diagram



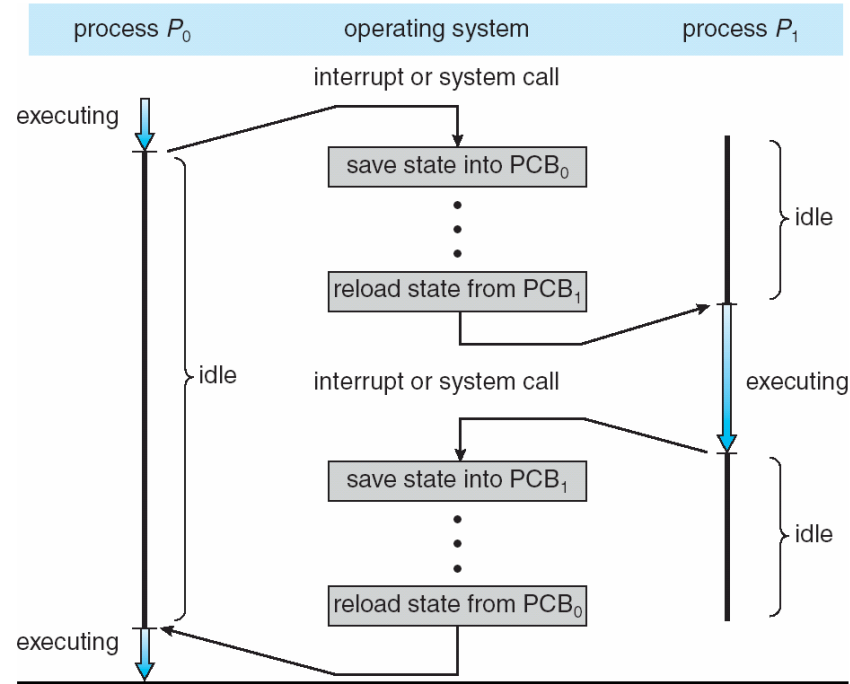
- ❖ **new**: The process is being created
- ❖ **running**: Instructions are being executed
- ❖ **waiting**: The process is waiting for some event to occur
- ❖ **ready**: The process is waiting to processor assignment.
- ❖ **terminated**: The process has finished execution

Process Control Block (PCB)

- ❖ Process state – running, waiting, etc
- ❖ Program counter – location of instruction to next execute
- ❖ CPU registers – contents of all process-centric registers
- ❖ CPU scheduling information- priorities, scheduling queue pointers
- ❖ Memory-management information – memory allocated to the process
- ❖ Accounting information – CPU used, clock time elapsed since start, time limits
- ❖ I/O status information – I/O devices allocated to process, list of open files



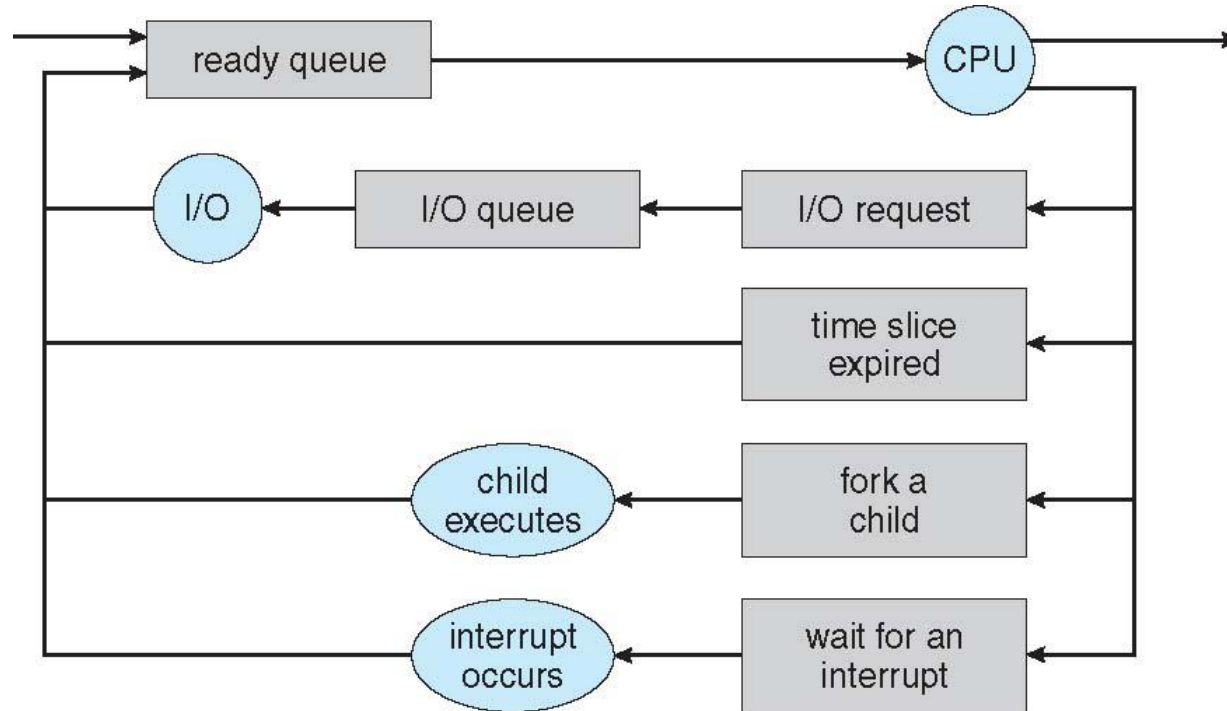
Context Switch From One Process to Another



Process Scheduling

- ❖ Maximize CPU use, quickly switch processes onto CPU for time sharing
- ❖ **Process scheduler** selects among available processes for next execution on CPU
- ❖ Maintains **scheduling queues** of processes
 - ❖ **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

Representation of Process Scheduling



Schedulers

- ❖ **Short-term scheduler (CPU scheduler)** – selects which process should be assigned to CPU for execution
 - ❖ Short-term scheduler is invoked frequently
- ❖ **Long-term scheduler (Job scheduler)** – selects which processes should be brought into the ready queue (RAM)
 - ❖ Long-term scheduler is invoked less frequently
 - ❖ It controls the **degree of multiprogramming**
 - ❖ **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
 - ❖ Long-term scheduler strives for good ***process mix***

Thank you

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