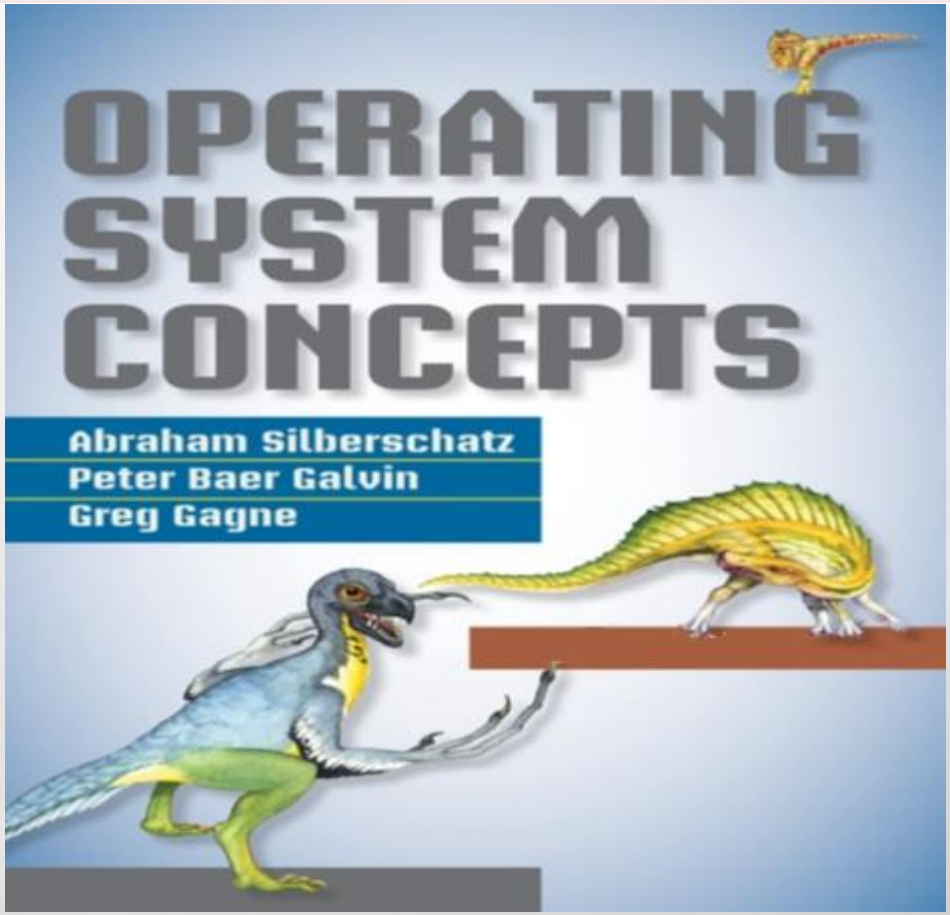
Mustansiriayah University
Collage of Education
Computers Science Department

Chapter Three
Processes
Part I



Fourth Class

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Process Concepts & Management

- A process is a program in execution; process execution must progress in sequential fashion. ال Process هو برنامج في التنفيذ .يجب أن يكون تقدم تنفيذ ال Process بطريقة متتابعة.

- A process need certain resources such as CPU time, memory, files, and I/O devices to accomplish its task. These resources are allocated to the process either when it is created or while it is executing.

تحتاج ال Process إلى موارد معينة مثل CPU time, memory, files, and I/O devices لإنجاز مهمتها .يتم تخصيص هذه الموارد لل Process إما عند إنشائها أو أثناء تنفيذها .

- Early C/S allowed only one program to be executed at a time. This program had complete control of the system and had access to all of the system resources.
- Today C/S allows multiple programs to be executed concurrently, therefore consists of a collection of processes.

انظمة الحاسبات الاولى كانت تسمح بتنفيذ برنامج واحد فقط في وقت واحد .وكان هذا البرنامج يسيطر بصورة كاملة على النظام ويستطيع الوصول إلى جميع موارد النظام .

أنظمة الحاسبات اليوم تسمح بتنفيذ عدة برامج في نفس الوقت ، وبالتالي يحتوي النظام على مجموعة من ال processes

Process State

- As a process executes, it changes state. The state of a process is defined in part by the current activity of that process. Each process may be in one of the following states:

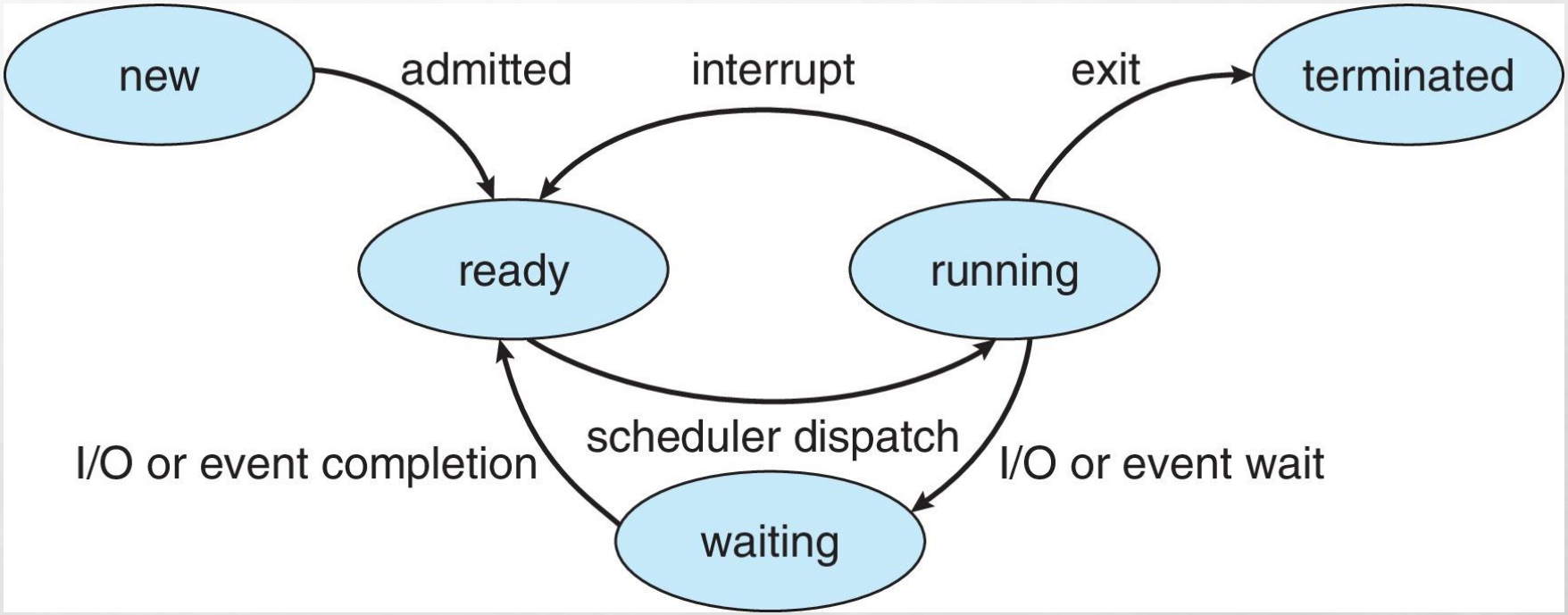
أثناء تنفيذ ال Process ، حالتها تتغير . يتم تعريف حالة ال Process جزئيًا من خلال النشاط الحالي لتلك ال Process.

  - **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

- It is important to realize that only one process can be running on any processor at any instant. .

من المهم أن ندرك أن Process واحد فقط يمكن تشغيلها على أي معالج في أي لحظة.

Diagram of Process State

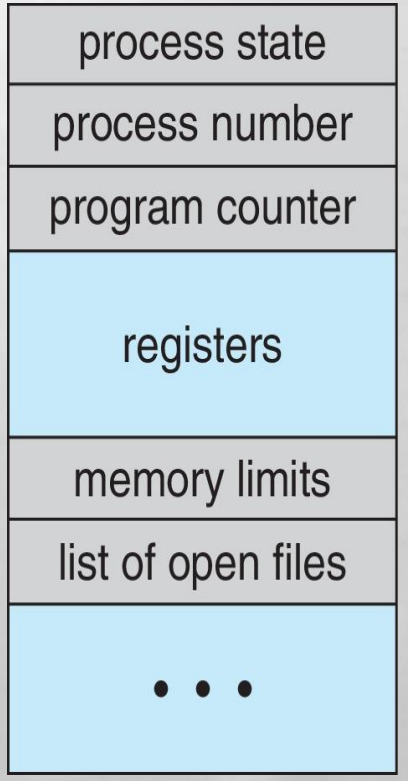


Process Control Block (PCB)

❖ Each process is represented in the operating system by a **Process Control Block** (**PCB**), also called a **Task Control Block**.

❖ It contains many pieces of Information associated (مرتبطة) with each process, including these:

- **Process state:** running, waiting, etc.
- **Program counter:** the address of the next instruction to execute
- **CPU registers:** like, accumulators, index registers, stack pointers
- **CPU scheduling information**: priorities, scheduling queue pointers
- **Memory-management information:** the value of the base and limit registers, the page tables
- **Accounting information** : CPU used, clock time, start, time limits
- **I/O status information**: list of I/O devices allocated to process, list of open files



Process Scheduling

- The objective of multiprogramming is to have some process running at all times, to maximize CPU utilization

الهدف من البرمجة المتعددة هو أن يكون بعض الProcess قيد التنفيذ في جميع الأوقات ، لتحقيق أقصى قدر من استخدام الـ CPU.

- The objective of time sharing is to switch the CPU among processes so frequently that users can interact with each program while it is running.

الهدف من ال time sharing هو تبديل CPU بين الProcesses بشكل متكرر بحيث يمكن للمستخدمين التفاعل مع كل برنامج أثناء تشغيله.

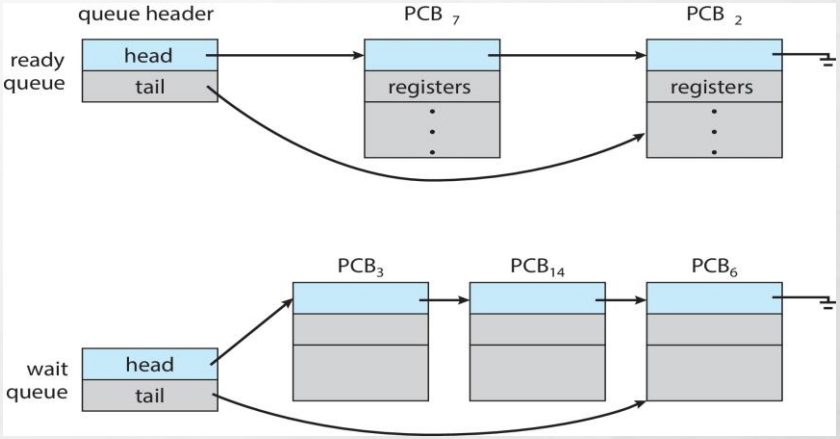
- **The process scheduler** selects an available process (possibly from a set of several available processes) for program execution on the CPU.

ال **process scheduler** يختار Process متوفر ربما من مجموعة من ال Processes المتوفرة لتنفيذ البرنامج في الـ CPU

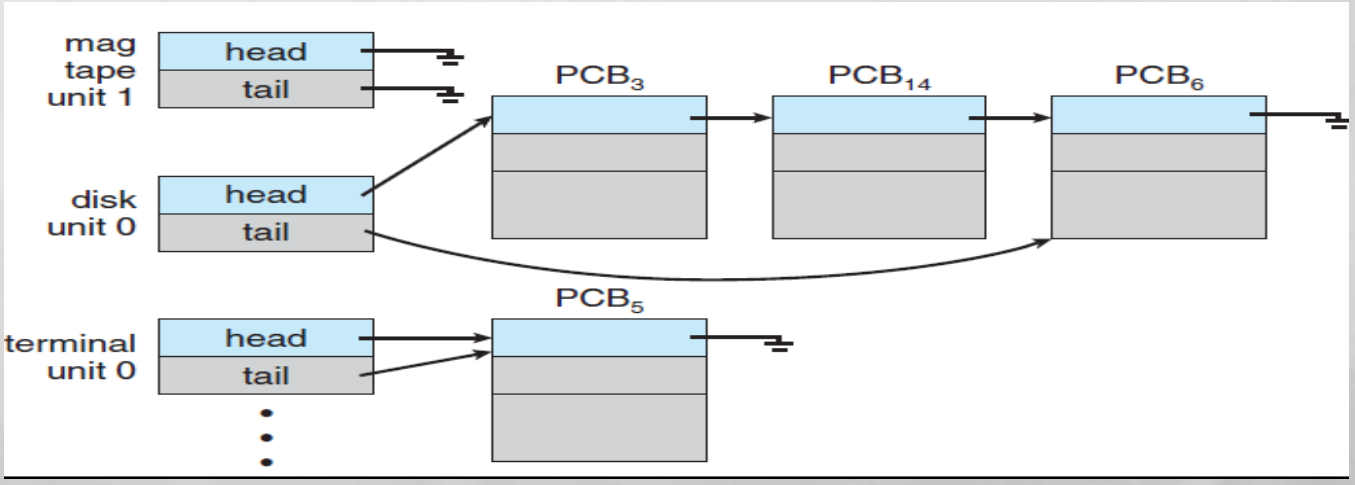
- For a single-processor system, there will never be more than one running process. If there are more processes, the rest will have to wait until the CPU is free and can be rescheduled.

Scheduling Queues

- As processes enter the system, They are put into a **job queue**, which consists of all processes in the system كل الموجودة في النظام
- **Ready queue:** set of all processes residing in main memory, ready and waiting to execute. الباقية في الذاكرة الرئيسية جاهزة وتنتظر التنفيذ
- **Wait queues:** set of processes waiting for an event (i.e. I/O) التي تنتظر لحدث



- The system also other queues in the system. Such as list of processes, waiting for a particular I/O device is called a **device queue**.



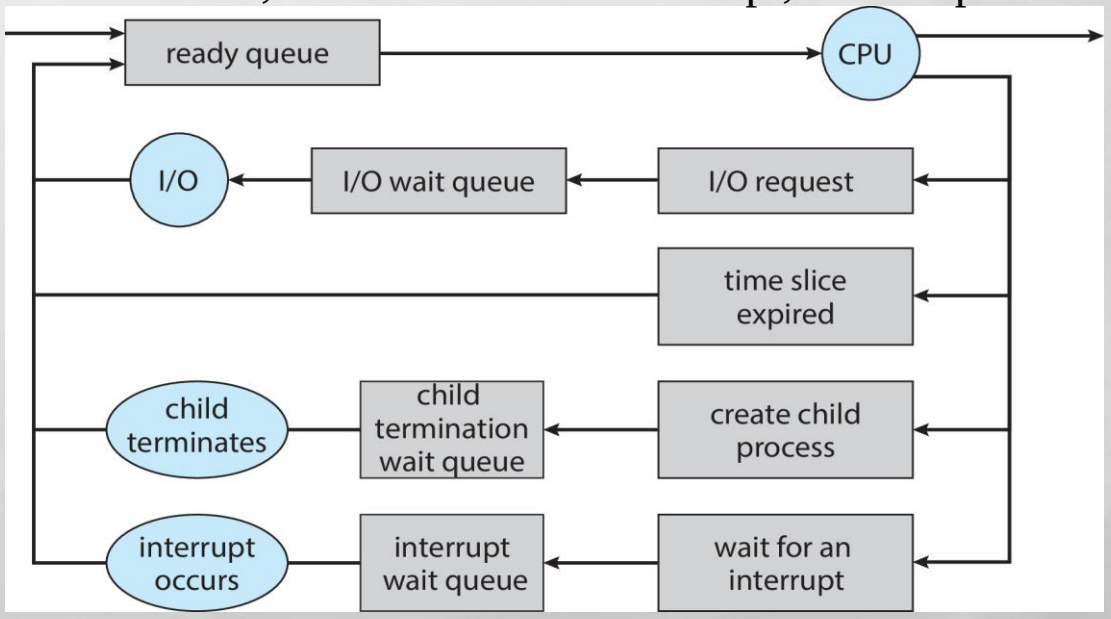
Scheduling Queues Cont.

- A new process is initially put in the **ready queue**. It waits there until it is selected for execution, or is **dispatched (يرسل)**.
- Once the process is allocated the CPU start execute it, one of several events could occur:

a. The process could issue an **I/O request** and then be placed in an **I/O queue**.

b. The process could create a new sub-process and wait for the sub-process's termination.

c. The process could be removed from the CPU, as a result of an interrupt, and be put back in the ready queue.



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