Operating System

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Outlines

- Introduction to Process
- Program vs Process
- Process States
- Process Control Block(PCB)
- Process Creation
- Process Termination

Process Elements

- Two essential elements of a process are:

Program code

- which may be shared with other processes that are executing the same program

A set of data associated with that code

- when the processor begins to execute the program code, we refer to this executing entity as a *process*

Process

Definition:

A "Process " is a program at the time of execution. A process is more than the program code, it includes the programme counter, the process stack, and the contents of process register..etc.The purpose of process stack is to store temporary data, such as subroutine parameters, return address and temporary variables.
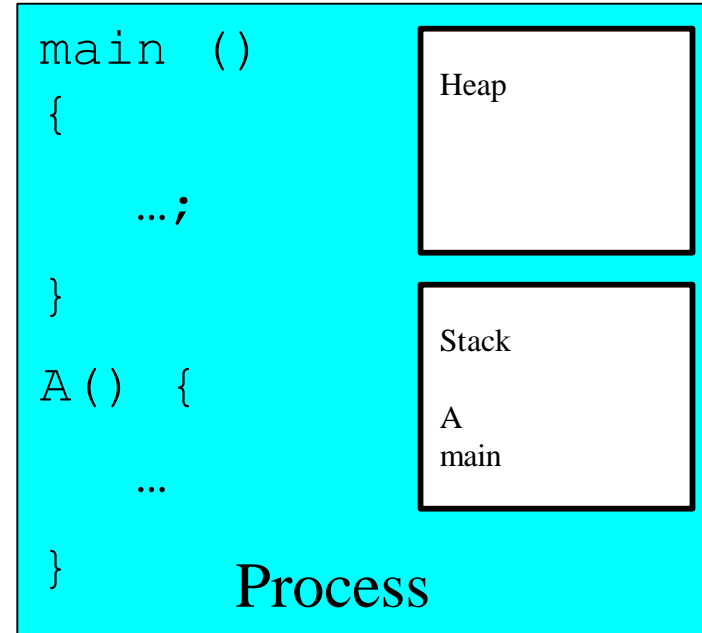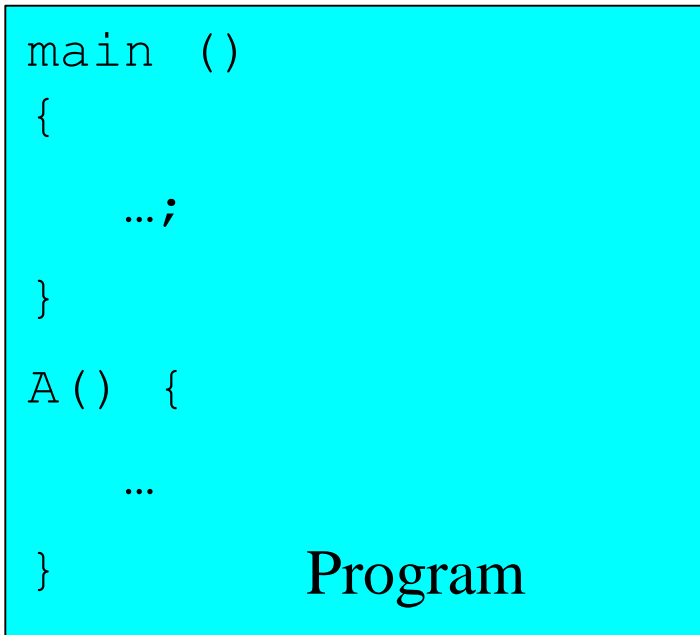
More about Process

The term process (Job) refers to program code that has been loaded into a computer's memory so that it can be executed by the central processing unit (CPU). A process can be described as an instance of a program running on a computer or as an entity that can be assigned to and executed on a processor. A program becomes a process when loaded into memory and thus is an active entity.

Difference between Program and Process

SL No.	Program	Process
1	Program contains a set of instructions designed to complete a specific task.	A Process is a sequence of instruction in execution.
2	Program is a passive entity as it resides in the secondary memory.	Process is an active entity as it is created during execution and loaded in to the main memory.
3	Program is a static entity.	Process is a dynamic entity.
4	Time span of a program is unlimited	Time span of process is limited
5	Program is always passive	Process is always active
6	Program does not have any resource requirement, it only requires memory space for storing the instructions.	Process has a high resource requirement, it needs resources like CPU, Memory address, I/O during its lifetime.
7	Program does not have any control block.	Process has its own control block called Process Control Block(PCB).

Process =? Program

```
main ()
{

    …;

}

A() {

    …

}           Program
```

```
main ()
{                    Heap

    …;

}

A() {                Stack

    …              A
                     main
}           Process
```
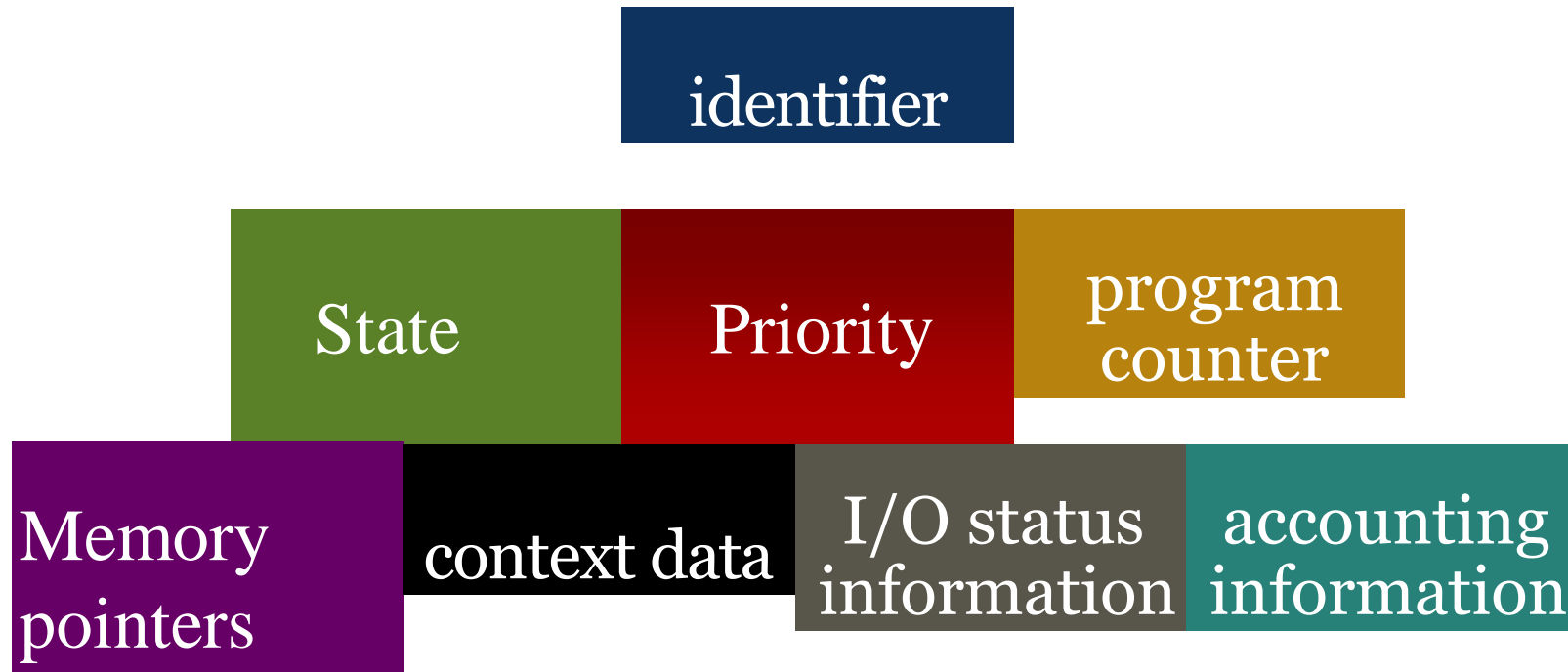
- **More to a process than just a program:**
  - Program is just part of the process state
  - I run Vim or Notepad on lectures.txt, you run it on homework.java – Same program, different processes
- **Less to a process than a program:**
  - A program can invoke more than one process
  - A web browser launches multiple processes, e.g., one per tab

Process Elements

■ While the program is executing, this process can be uniquely characterized by a number of elements, including:

identifier

State

Priority

program counter

Memory pointers

context data

I/O status information

accounting information

Process States

When a process executes, it changes the state, generally the state of process is determined by the current activity of the process. Each process may be in one of the following states

- **New** - The process is being created.
- **Running** - Instructions are being executed.
- **Waiting** - Waiting for some event to occur.
- **Ready** - Waiting to be assigned to a processor.
- **Terminated** - Process has finished execution.

A Five-state Process Model
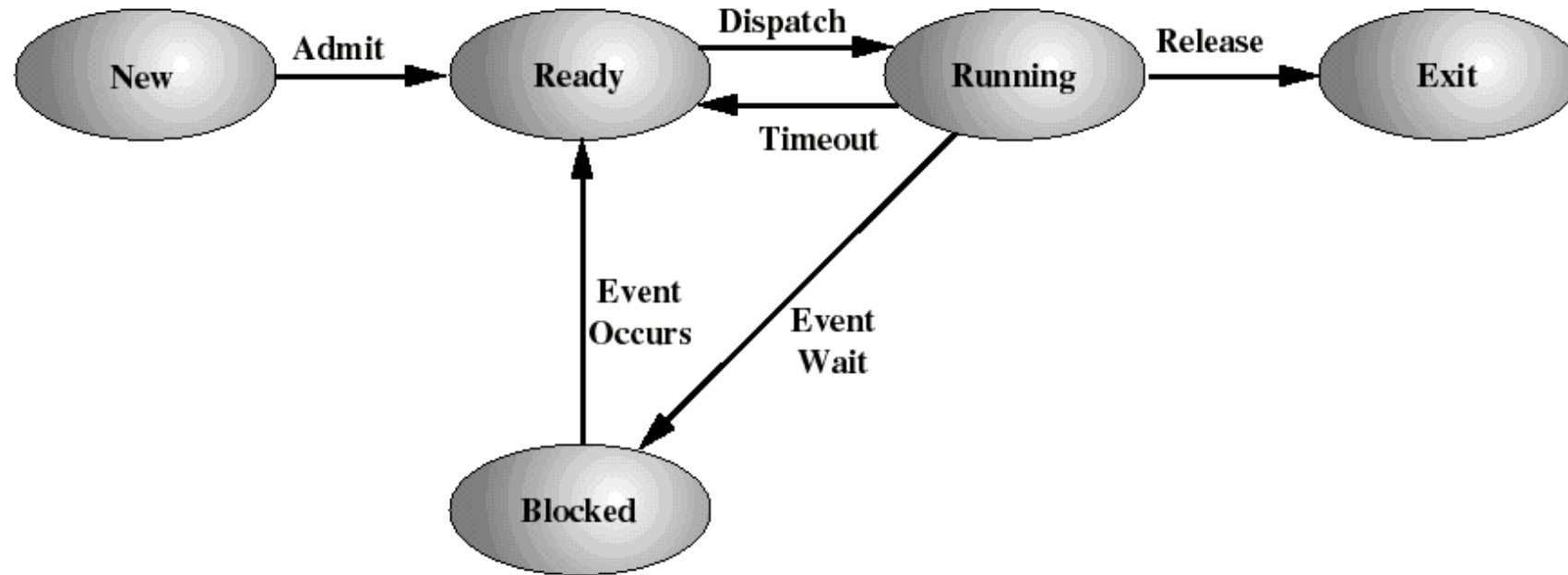
Ready to exit: A parent may terminate a child process