CSE3241: Operating System and System Programming

Lecture-8

Sangeeta Biswas, Ph.D.
Assistant Professor
Dept. of Computer Science and Engineering (CSE)
Faculty of Engineering
University of Rajshahi (RU)
Rajshahi-6205, Bangladesh
E-mail: sangeeta.cse@ru.ac.bd / sangeeta.cse.ru@gmail.com

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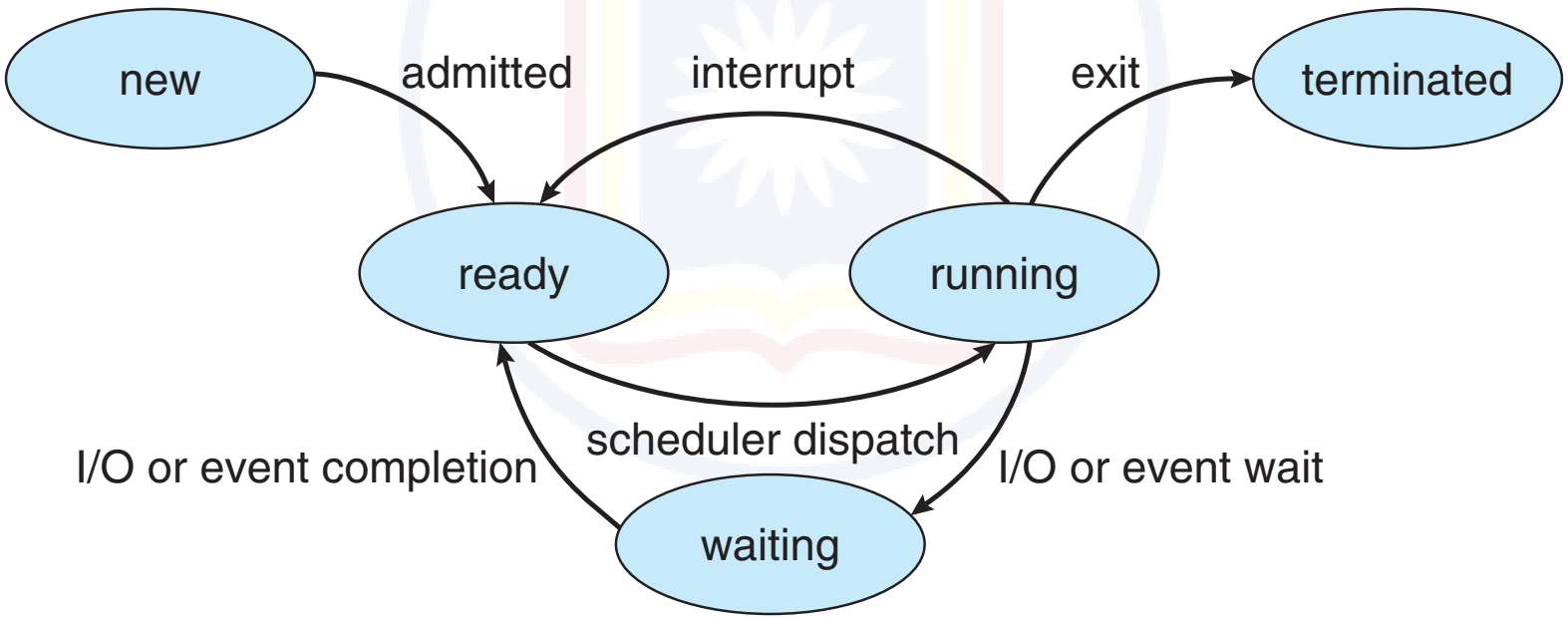
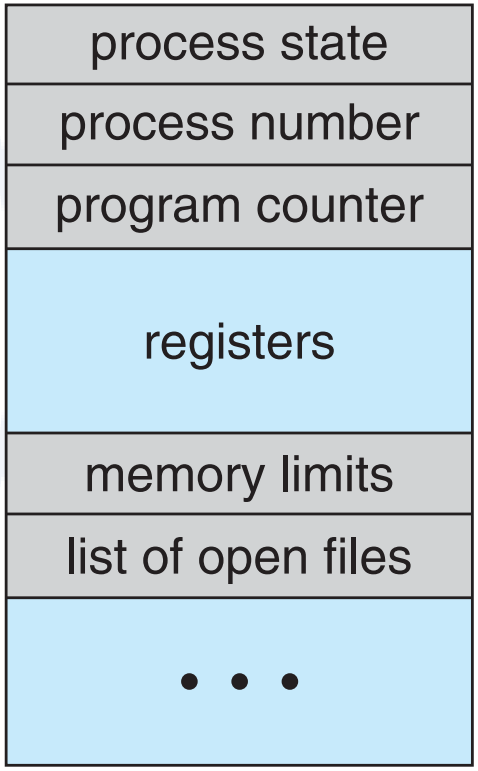
States of Process [1]

- As a process executes, it changes its state.
- In the ready and waiting states, processes build queues.
- Queues keep Process control block (PCB)s of processes.



Process Control Block (PCB) [1]

- Process Control Block:
  - is known as a task control block.
  - contains many pieces of information associated with a specific process.
  - is handled by the OS.



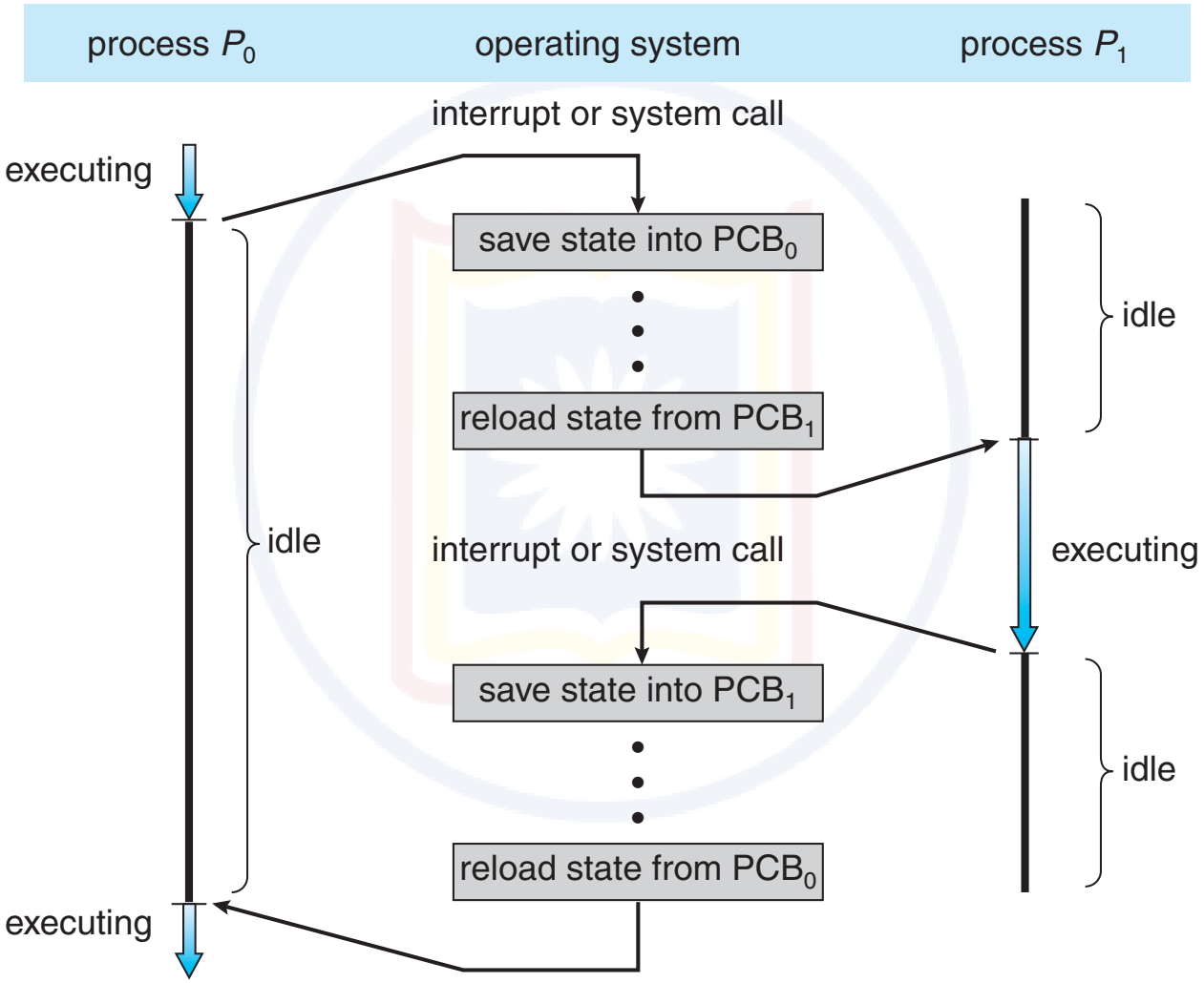
Some Fields of a PCB (I)

- Process ID: a unique identification number given by the OS.
- Parent ID: parent's unique ID.
- Process State: new / ready / running / waiting / halted.
- Values of CPU Registers: information stored in program counter, accumulator, index register, stack pointer, etc.
- CPU Scheduling Information: process priority, pointers to scheduling queues and so on.
- Memory-Management Information: values of base and limit registers, page table, segment table, memory limits, etc.

Some Fields of a PCB (II)

- Process Privileges: allowed/disallowed access to system resources.
- Interprocess Communication Information: various flags, signals and messages associated with the communication among independent processes.
- Process Structuring Information: process's children id's, or the id's of other processes related to the current one.
- Accounting Information: time CPU spent for the process execution, time limits.
- I/O Status Information: lists of allocated I/O devices, lists of opened files, etc.

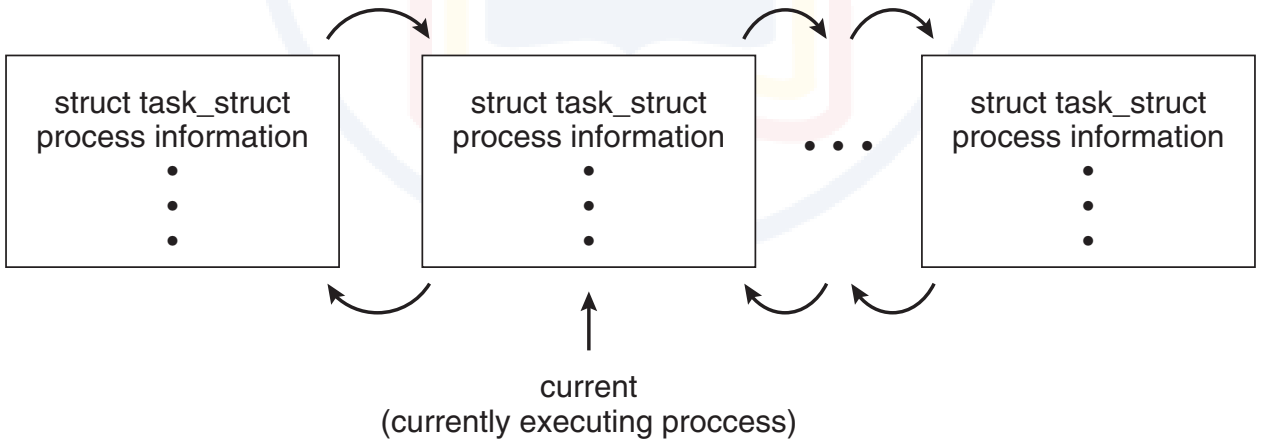
CPU Switch from Process to Process [1]



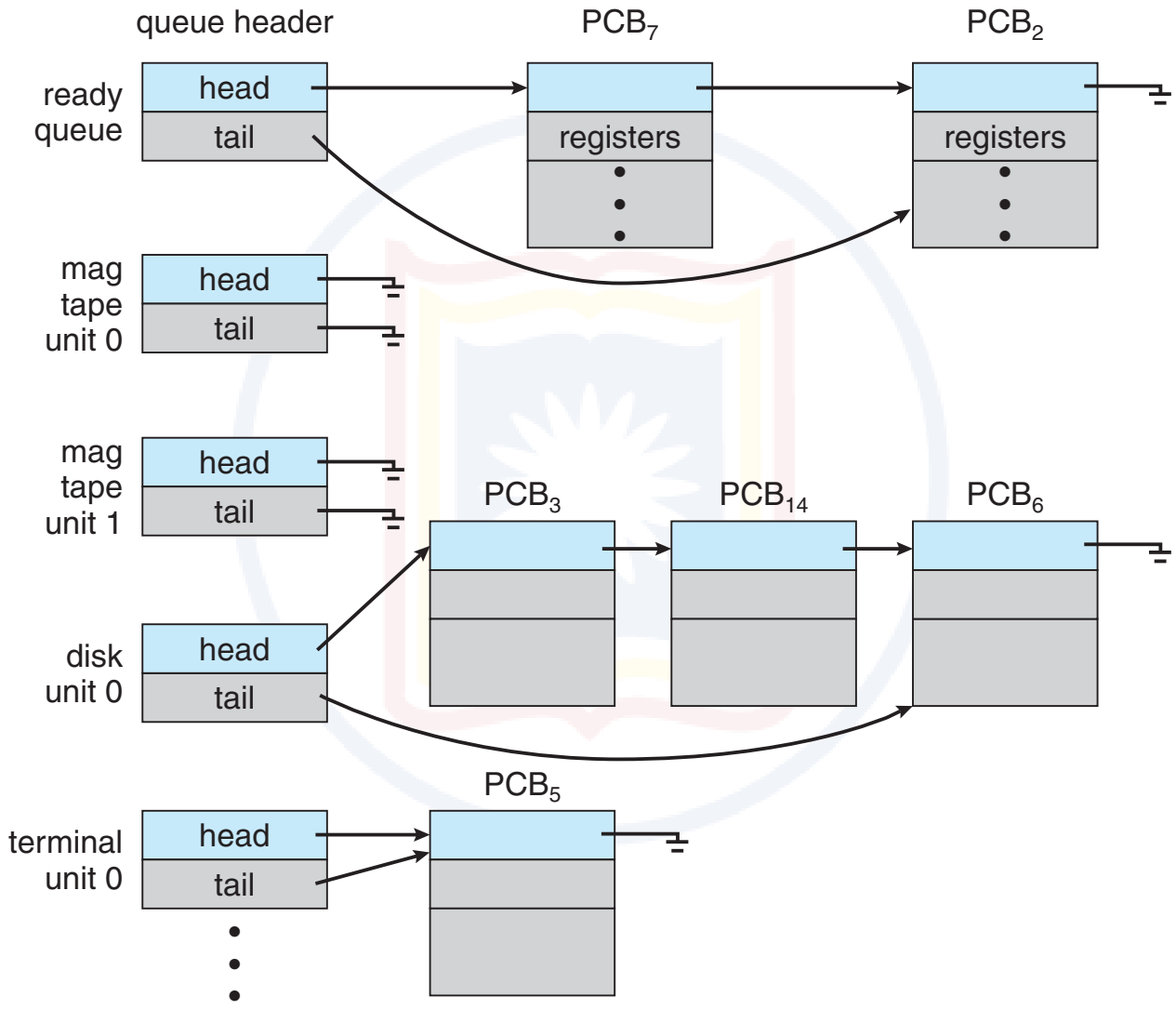
Process Reprsentation in Linux [1]

- Linux uses C structure task_struct to hold PCB. Some fields are:
  - pid_t pid; [process identifier]
  - long state; [state of the process]
  - unsigned int time_slice; [scheduling information]
  - struct task_struct *parent; [this process's parent]
  - struct list_head children; [this process's children]

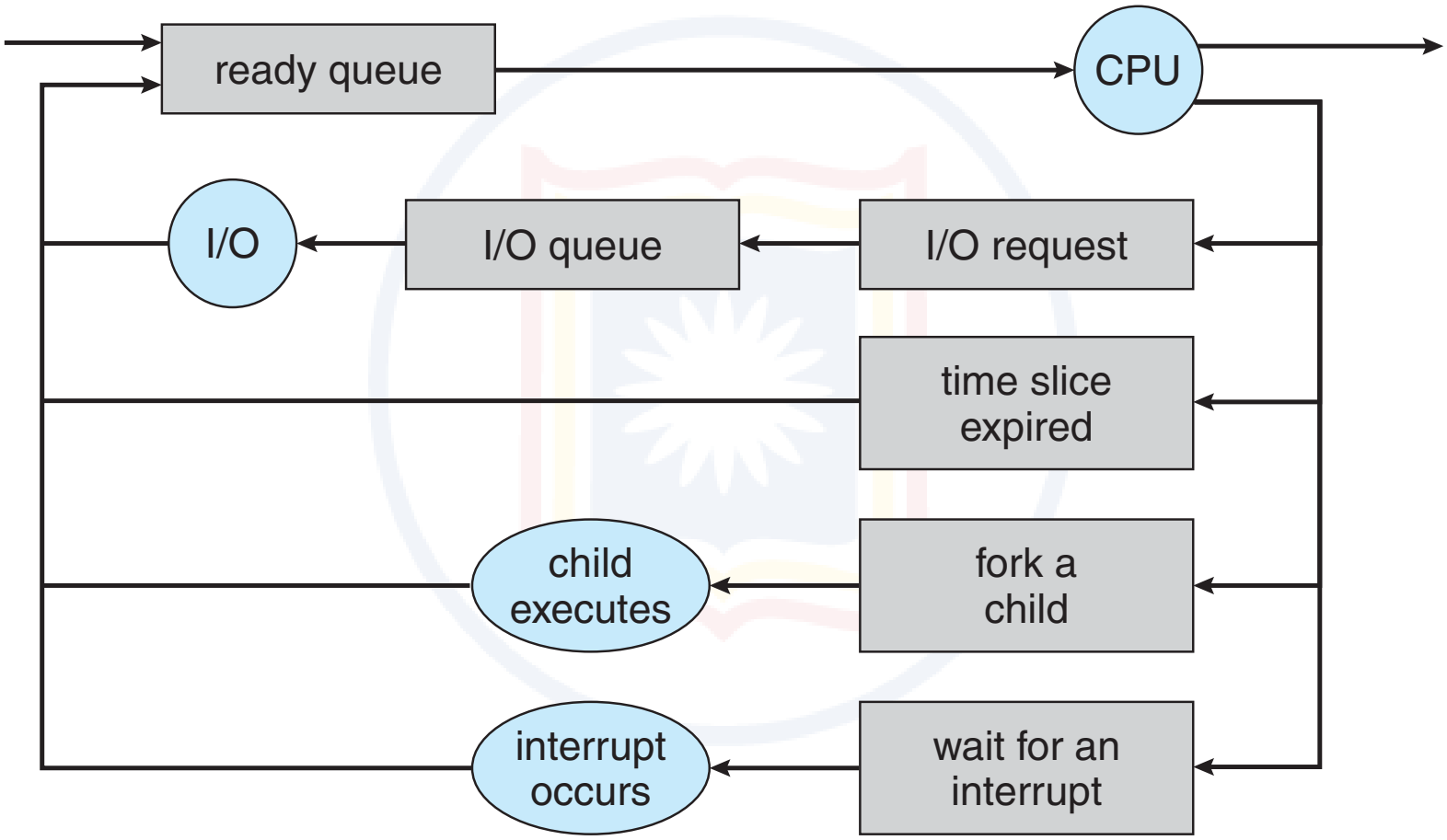
Figure: Doubly linked list of task_struct holding active processes in Linux



Various Queues [1]

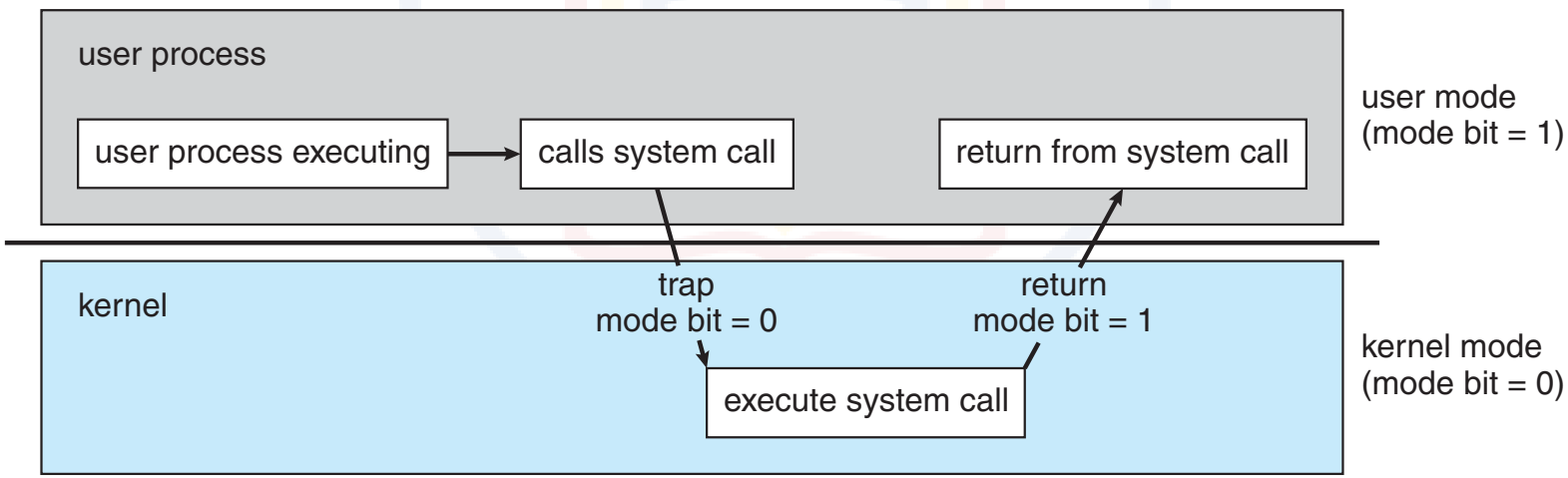


Queueing Diagram of Process Scheduling [1]

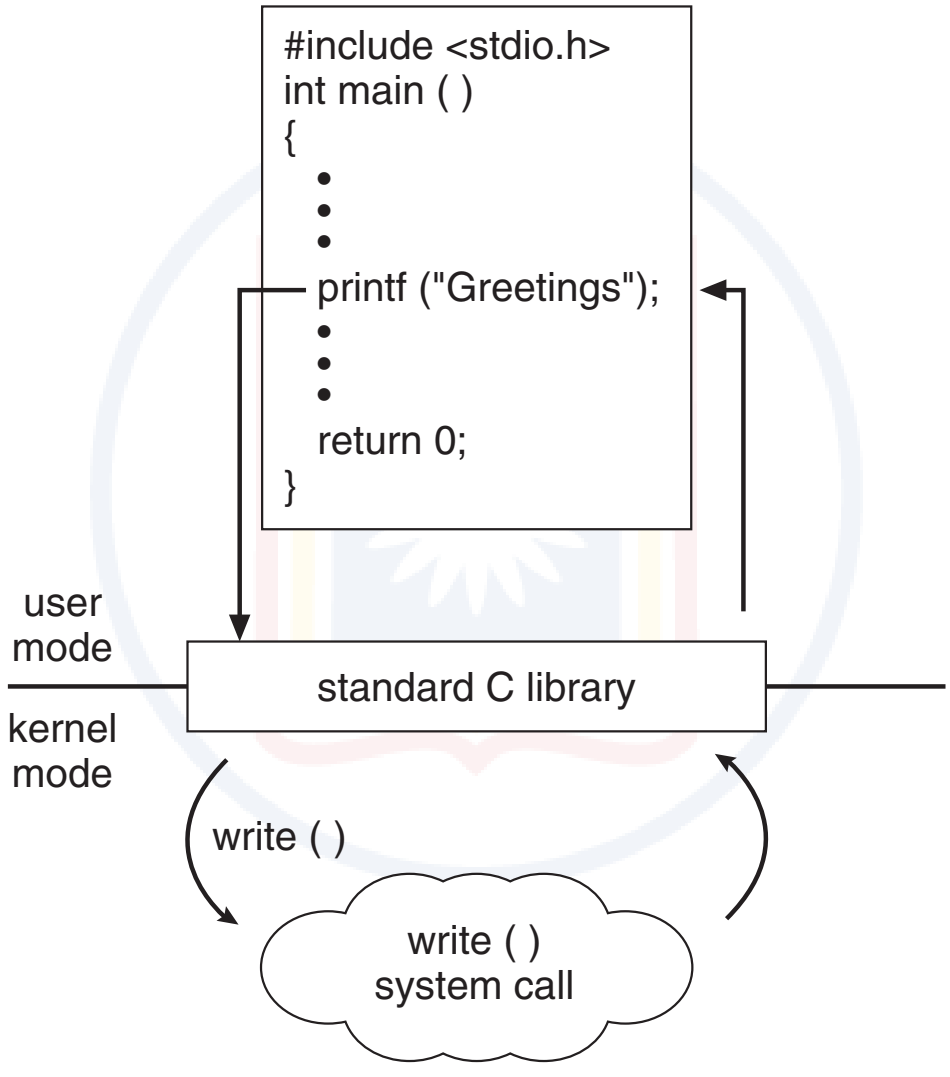


What is System Call?

- System Call is an instruction that:
  - provides an interface between restricted processes (e.g., user process) and unrestricted processes (e.g., kernel process).
  - generates a software interrupt to get services from the kernel process.
  - is also called Kernel call.



Standard C Library Handling of write()



References

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Operating System Concepts.
John Wiley & Sons, 9 edition, 2012.