CSGE602055 Operating Systems CSF2600505 Sistem Operasi Week 08: Scheduling

Rahmat M. Samik-Ibrahim (ed.)

University of Indonesia

https://os.vlsm.org/
Always check for the latest revision!

REV214 24-Jan-2020

Operating Systems 2020-1

 $\hbox{A [08-10, Rm 3113, Mo/We]} - \hbox{B/M [10-12, Rm 3113, Mo/We]} - \hbox{C [13-15, Rm 3113, Mo/We]}$

D [10-12, Rm 2307(Mo), Rm 3113(We)] — E [08-10, Rm 2307(Mo), Rm 3113(We)]

Week	Schedule	Topic	OSC10
Week 00	27 Jan - 02 Feb 2020	Overview 1, Virtualization & Scripting	Ch. 1, 2, 18.
Week 01	03 Feb - 09 Feb 2020	Overview 2, Virtualization & Scripting	Ch. 1, 2, 18.
Week 02	10 Feb - 16 Feb 2020	Security, Protection, Privacy,	Ch. 16, 17
		& C-language	
Week 03	17 Feb - 23 Feb 2020	File System & FUSE	Ch. 13, 14, 15
Week 04	24 Feb - 01 Mar 2020	Addressing, Shared Lib, & Pointer	Ch. 9
Week 05	02 Mar - 08 Mar 2020	Virtual Memory	Ch. 10
Reserved	09 Mar - 13 Mar 2020	Q & E	
MidTerm	14-21 Mar 2020 (TBA)	MidTerm (UTS)	Subject to change.
Week 06	23 Mar - 31 Mar 2020	Concurrency: Processes & Threads	Ch. 3, 4
Week 07	01 Apr - 07 Apr 2020	Synchronization & Deadlock	Ch. 6, 7, 8
Week 08	08 Apr - 14 Apr 2020	Scheduling + W06/W07	Ch. 5
Week 09a	15 Apr - 19 Apr 2020	Storage, Firmware, Bootldr, & Systemd	Ch. 11
OCL	20 Apr - 26 Apr 2020	OnLine & CoLearnIng	
Week 09b	27 Apr - 28 Apr 2020	Storage, Firmware, Bootldr, & Systemd	Ch. 11
Week 10	29 Apr - 05 May 2020	I/O & Programming	Ch. 12
Reserved	06 May - 10 May 2020	Q & A	
Final	11-18 May 2020 (TBA)	Final (UAS)	This schedule is
Extra	25 Jun 2020	Extra assignment confirmation	subject to change.

STARTING POINT — https://os.vlsm.org/

Agenda

- Start
- 2 Schedule
- 3 Agenda
- 4 Week 08
- Scheduling
- 6 CPU Burst: How Long (When)?
- MultiProcessor Schedulling
- The Two State Model
- The End

Week 08 Scheduling: Topics¹

- Preemptive and non-preemptive scheduling
- Schedulers and policies
- Processes and threads
- Deadlines and real-time issues

¹Source: ACM IEEE CS Curricula 2013

Week 08 Scheduling: Learning Outcomes¹

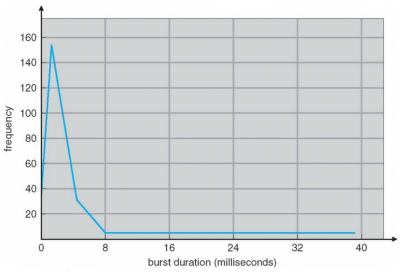
- Compare and contrast the common algorithms used for both preemptive and non-preemptive scheduling of tasks in operating systems, such as priority, performance comparison, and fair-share schemes. [Usage]
- Describe relationships between scheduling algorithms and application domains. [Familiarity]
- Discuss the types of processor scheduling such as short-term, medium-term, long-term, and I/O. [Familiarity]
- Describe the difference between processes and threads. [Usage]
- Compare and contrast static and dynamic approaches to real-time scheduling. [Usage]
- Discuss the need for preemption and deadline scheduling. [Familiarity]
- Identify ways that the logic embodied in scheduling algorithms are applicable to other domains, such as disk I/O, network scheduling, project scheduling, and problems beyond computing. [Usage]

¹Source: ACM IEEE CS Curricula 2013

Week 08: Scheduling

- Reference: (OSC10-ch05 demo-w08)
- Scheduling
 - Basic Concepts
 - WARNING: It's just a BURST
 - IO Burst
 - CPU Burst
 - CPU Burst vs. Freq (See next slide)
 - Criteria: Utilization, throughput, {turnaround, waiting, response} time.
 - (Burst) Algorithm
 - FCFS, SJF, RR, Priority, Multilevel Queue.
 - Preemptive / Non-preemptive (Cooperative) Scheduling
 - I/O Bound / CPU Bound Processes
- Thread Scheduling
 - User-level \rightarrow Process-Contention Scope (PCS): many to many/one.
 - $\bullet \ \, \mathsf{Kernel\text{-}level} \to \mathsf{System\text{-}Contention} \ \, \mathsf{Scope} \ (\mathsf{SCS}) \text{: one to one}.$
- Standard Linux Scheduling
 - Completely Fair Scheduler (CFS).
 - Real Time Scheduling.

CPU Burst: How Long (When)?



©2013 Silberschatz, Galvin and Gagne Operating System Concepts – 9th Edition

MultiProcessor Schedulling

- Asymmetric Multiprocessing vs. Symmetric Multiprocessing (SMP).
- Processor Affinity: soft vs. hard.
- NUMA: Non-Uniform Memory Access.
- Load Balancing
- Multicore Processors
- Real Time Schedulling: Soft vs. Hard.
- Big O Notation
 - O(1)
 - O(log N)
 - O(N)

The Two State Model

- CPU State I/O State CPU State . . .
 - n: processes in memory.
 - p: I/O time fraction.
 - p^n : probability n processes waiting for I/O.
 - $1 p^n$: CPU utilization of n processes.
 - $\left[\frac{(1-p^n)}{n}\right]$: CPU utilization of ONE processes.
- Example: $p = 60\% \Rightarrow \text{CPU Utilization Per Process}$: $\left\lfloor \frac{1 (60\%)^n}{n} \right\rfloor$

CPU Utilization	Multiprogramming (%)				
N	1	2	3	4	5
Per Process	40	32	26	21	18

For 5 concurrent processes:
 If total time is 100 seconds; for each processs, the CPU time will be 18 seconds.

The End

- ☐ This is the end of the presentation.
- extstyle ext
- This is the end of the presentation.