CSGE602055 Operating Systems
CSF2600505 Sistem Operasi
Week 07: Scheduling

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

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Operating Systems 2018-2 (Room 3114)
R/M (Tu/Th 13-15) | I (Tu/Th 15-17) | E (Th 19-22)

Week	Schedule	Topic	OSC10
Week 00	04 Sep - 12 Sep 2018	Overview 1	Ch. 1, 18
Week 01	13 Sep - 19 Sep 2018	Overview 2 & Scripting	Ch. 1, 2
Week 02	20 Sep - 26 Sep 2018	Security, Protection, Privacy, & C-language	Ch. 16, 17
Week 03	27 Sep - 03 Oct 2018	File System & FUSE	Ch. 13, 14, 15
Week 04	04 Oct - 10 Oct 2018	Addressing, Shared Lib, & Pointer	Ch. 9
Week 05	11 Oct - 17 Oct 2018	Virtual Memory	Ch. 10
Reserved	18 Oct - 23 Oct 2018		
Mid-Term	24 Okt - 01 Nov 2018	MidTerm (UTS): TBA	
Week 06	06 Nov - 12 Nov 2018	Concurency: Processes & Threads	Ch. 3, 4
Week 07	13 Nov - 21 Nov 2018	Synchronization & Deadlock	Ch. 6, 7, 8
Week 08	22 Nov - 28 Nov 2018	Scheduling	Ch. 5
Week 09	29 Nov - 05 Dec 2018	Disks, BIOS, Loader, & Systemd	Ch. 11
Week 10	06 Dec - 12 Dec 2018	I/O & Programming	Ch. 12
Reserved	13 Dec - 25 Dec 2018		
Final	26 Dec - 04 Jan 2018	Final (UAS): TBA	This schedule is subject to change.
Extra	12 Jan 2019	Extra assignment	

The Weekly Check List

- **Resources**: `https://os.vlsm.org/`
  - **(THIS) Slides** — `https://github.com/UI-FASILKOM-OS/SistemOperasi/tree/master/pdf/`
  - **Demos** — `https://github.com/UI-FASILKOM-OS/SistemOperasi/tree/master/demos/`
  - **Extra** — `BADAK.cs.ui.ac.id:///extra/`
  - **Problems** — `rms46.vlsm.org/2/195.pdf`, `196.pdf`, ..., `205.pdf`
- **Text Book**: any recent/decent OS book. Eg. (**OSC10**) Silberschatz et. al.: **Operating System Concepts**, 10^{th} Edition, 2018.
- Encode your **QRC** with image size of approximately 250x250 pixels:
  "OS182 CLASS ID SSO-ACCOUNT Your-Full-Name"
  Special for **Week 00**, mail your **embedded** QRC to:
  `operatingsystems@vlsm.org`
  With Subject: `OS182 CLASS ID SSO-ACCOUNT Your-Full-Name`
- Write your Memo (with QRC) **every week**.
- Login to `badak.cs.ui.ac.id` via `kawung.cs.ui.ac.id` for at least **10 minutes** every week. Copy the weekly demo files to your own home directory.
  Eg. (Week00): `cp -r /extra/Week00/W00-demos/ W00-demos/`

Agenda

Week 07 Synchronization & Deadlock: Topics[1]

- Shared Memory and Critical Section
- Consistency, and its role in programming language guarantees for data-race-free programs
- Message passing: PtPo vs Multicast, Blocking vs non-blocking, buffering.

[1] Source: ACM IEEE CS Curricula 2013

Week 07 Synchronization & Deadlock: Learning Outcomes[1]

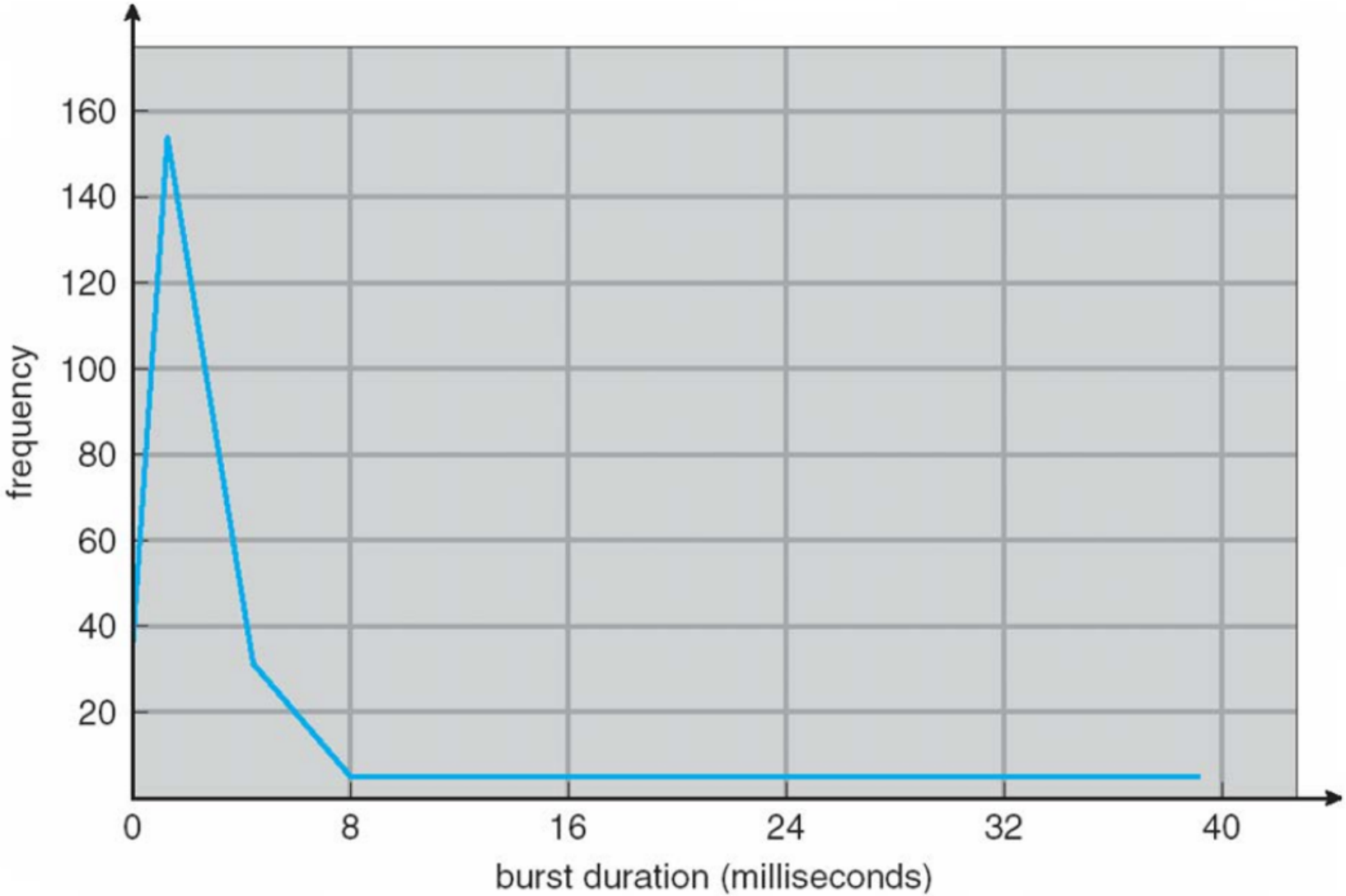
- Use mutual exclusion to avoid a given race condition. [Usage]
- Give an example of an ordering of accesses among concurrent activities (e.g., program with a data race) that is not sequentially consistent. [Familiarity]
- Use semaphores to block threads [Usage]

[1] Source: ACM IEEE CS Curricula 2013

Week 08: Scheduling

- Reference: (OSC9-ch06 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.
  - Kernel-level $\rightarrow$ System-Contention Scope (SCS): one to one.
- Standard Linux Scheduling
  - Completely Fair Scheduler (CFS).
  - Real Time Scheduling.

CPU Burst: How Long (When)?



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: $p = 60\% \Rightarrow$ **CPU Utilization Per Process**: $\left[\frac{1-(60\%)^n}{n}\right]$

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

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