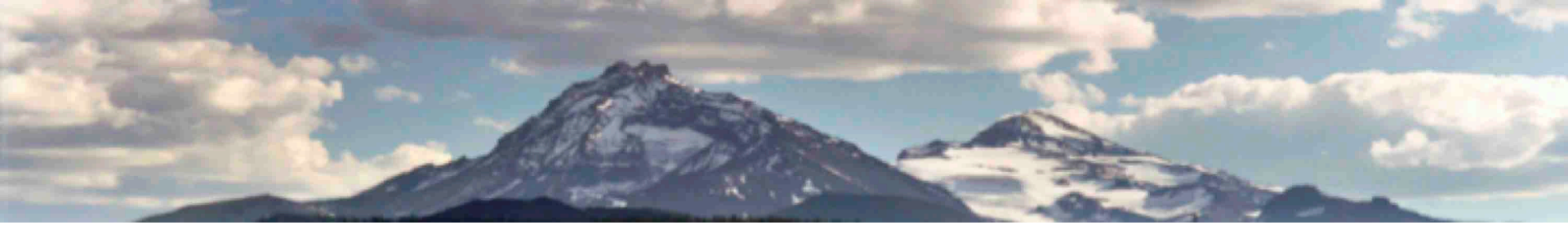


CIS 415
Operating Systems
Midterm Review

Prof. Allen D. Malony
Department of Computer and Information Science
Fall 2023

UNIVERSITY OF OREGON

Logistics

- Midterm next Tuesday, October 31
  - Closed book
  - 2 page of notes, front and back
  - No computers, phones, tablets, or electronic devices
  - No discussion with neighbors
  - 80 minutes (possibly extend to 90 minutes)
- Previous midterms
  - Posted on Canvas Friday by 5pm
- Monday office hours
  - Extended 12-2pm
- No programming will be required in any answer

What did we cover so far?

Topic	**Lecture**
❑ *Overview*	
❍ Chapter 1 – Introduction	1: Introduction
❍ Chapter 2 – Operating System Structures	2: OS architecture / System Calls
❑ *Process Management*	
❍ Chapter 3 – Processes and IPC	3: Processes 4: IPC
❍ Chapter 4 – Threads	5: Threads
❍ Chapter 5 – CPU Scheduling	6: Scheduling
❑ *Concurrency*	
❍ Chapter 6/7 – Process Synchronization	7: Synchronization

What do we need to know for the midterm?

- All OSC chapters covered thus far
- All lectures presented thus far
- Things learned in lab exercises
- Except:
  - Will not quiz you on the research papers

Study Advice

- Read book and then read it again
- Review lectures
  - Please DO NOT print lecture slides – save the forest!
- Think about concepts (important)
- You do not need to know specific details that pertain to specific operating systems, as described in the OSC book
- Come to office hours with questions

Let's try this again … what will you ask?

- Ah, that's a different question!
- Let's start first with what you might expect the midterm to look like
- Then maybe I will be more specific about what will be actually on the midterm … maybe

What to expect on the midterm?

- Structure
  - Three sections, ech on a topic we have covered
  - Each section has two parts
- Part 1: Concepts
  - Each question is intended to take limited time to answer
  - Includes true/false, multiple choice, short answer, …
- Part 2: Problems
  - Intended to involve a bit more thinking and more time
  - Include more “essay” answers (i.e., more writing)

What will be covered on the midterm?

- All areas covered are fair game
  - Especially for concept questions
- But I can not reasonably expect to ask you about everything … or can I?
- Will have concept questions and/or problems on:
  - Section 1: Processes and Threads
  - Section 2: Scheduling
  - Section 3: Concurrency/Synchronization
- My job is to make sure you have enough time
- Ok, now for a quick review

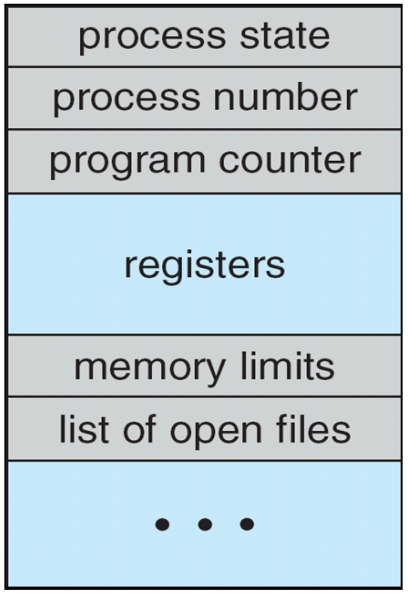
Processes and Threads

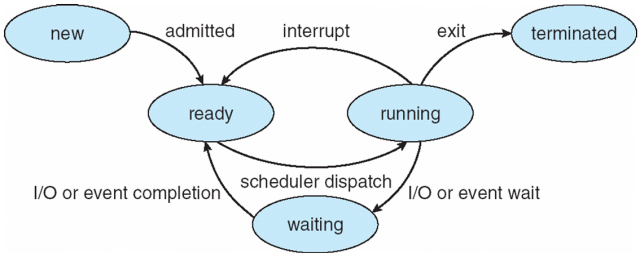
- What are they?
- How are they different?
- How does the OS represent and manage them?
- How do they operate with respect to each other?
- How do they execute with respect to the OS?
  - System calls
  - Interrupts
- How do they interact?
- What are the threading models?

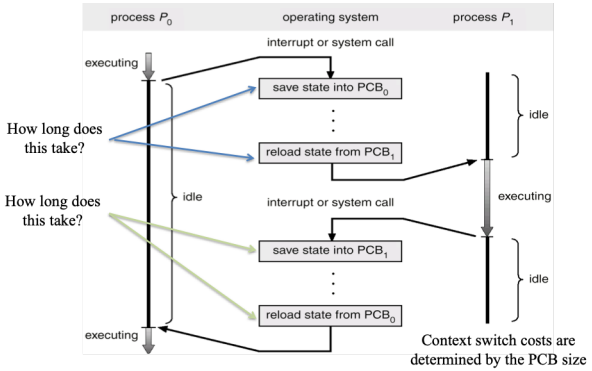
What makes up a process?

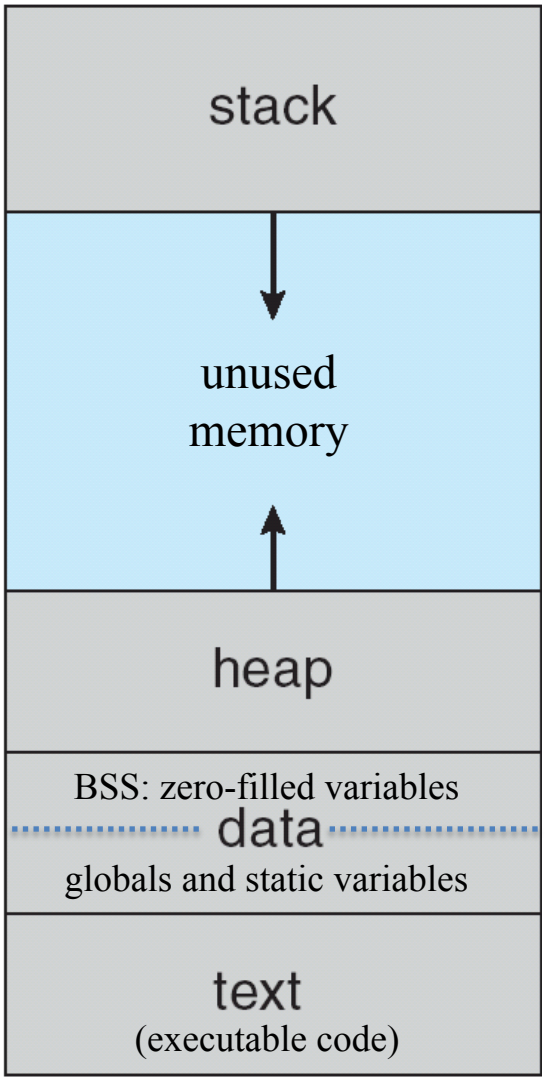
- Process address space
- Process control block
- How is a process created?
- Process state transitions
- What happens on context switch?

PCB









stack segment

data segment

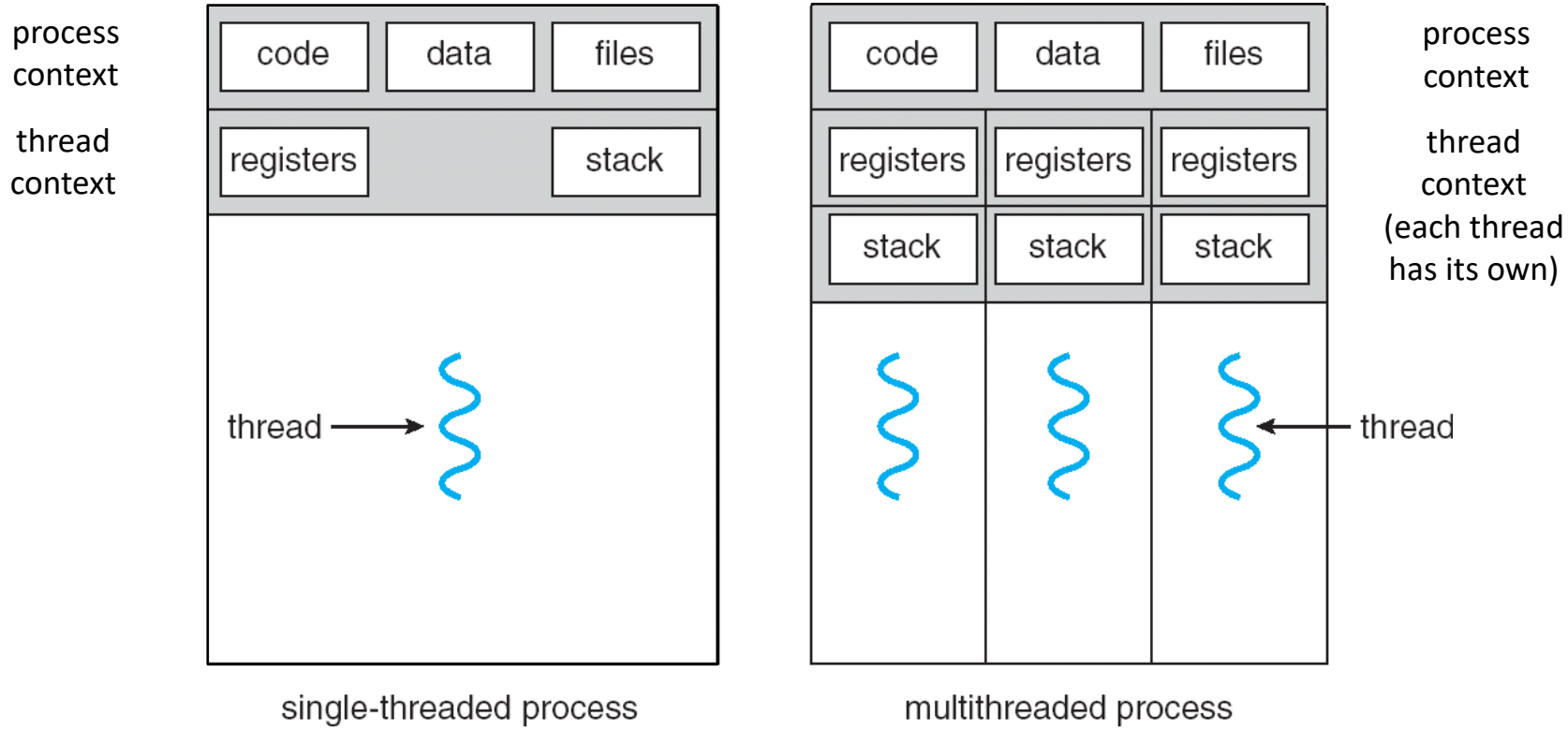
text segment

What is a thread?

- User-level threads / kernel-level threads
- What is the thread state? What is in it?
- How is a thread created?
- Pthreads
- You need to make sure that you are clear on the differences between processes and threads
- Take a look at the program examples

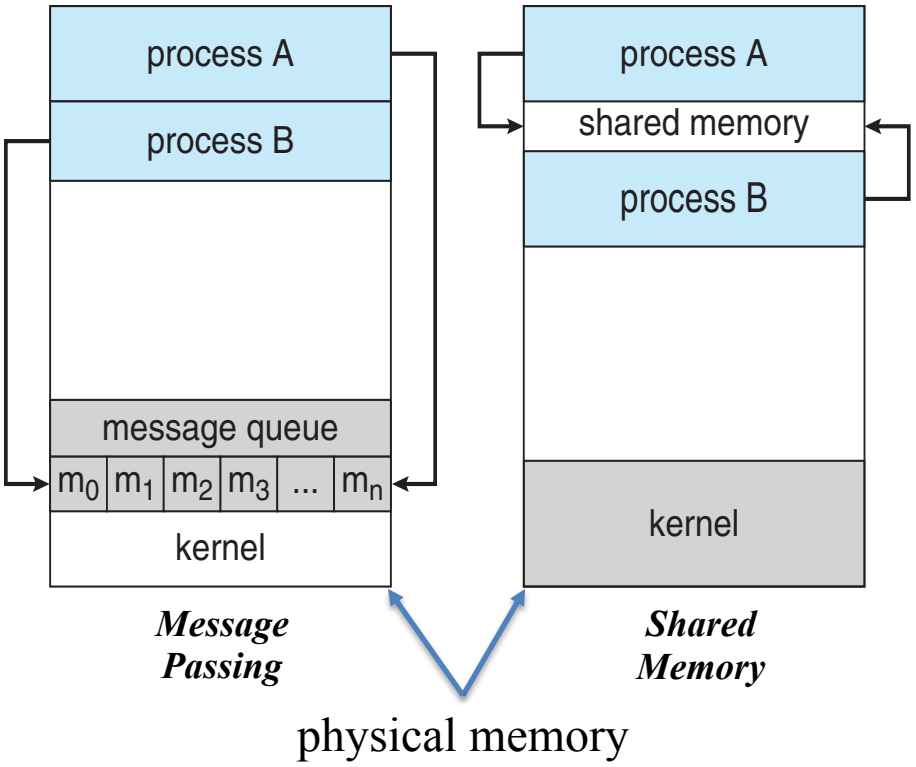
Single-Threaded (Process) vs. Multithreaded

- Regular UNIX process can be thought of as a special case of a multithreaded process
  - A process that contains just one thread!
- Multithreaded process has multiple threads



Interprocess Communication (IPC)

- What is IPC?
- What are different types of IPC?
  - Shared memory: shared segment, pipe
  - Message passing: mailboxes, sockets
- Why do we care?
- Processes need to interact with other
  - Need support from the OS to do so
  - Why?



Scheduling

- Know your scheduling algorithms
- Easy topic to write a problem for this
- Think about non-preemptive versus preemptive

Concurrency and Synchronization

- What is a critical section?
- What is the critical section problem?
- What are solutions to the critical section problem?
- Know about synchronization constructs …
  - Mutex
  - Semaphore
  - Condition variables (not so much)
  - … and how they are used
- Look at the classic synchronization problems
  - Bounded buffer
  - Dining philosopher

Sample Midterms

- To be posted on Canvas tomorrow (Friday)
  - Midterm from Fall 2015
  - Midterm from Spring 2019
- Just the questions will be posted
- At least 1 problem question from the sample midterms will be on the real midterm!

Next Class

- Midterm