CS 170 Week 5

Winter 2026

https://sites.cs.ucsb.edu/~rich/class/cs170/

Agenda

1. Mid-quarter TA Evaluation
2. Lab1 Rubric
3. Lab2 Overview
4. Questions

Mid-quarter TA Evaluation

Please fill out the survey before February 12th.

https://forms.gle/UN3qeXsc1ouxgwoa9

Lab 1 Rubric

- General Design: 60 points
  - 10 pts for successful build
  - 10 pts for creating/jumping to process
  - 10 pts for handling arguments correctly
  - 10 pts for scheduler
  - 5 pts for SYS_exit
  - 5 pts for SYS_halt
  - 5 pts for exception handling
  - 5 pts fort interrupt handling
- Read system call: 60 points
- Write system call: 40 points
- Durability: 40 points

Lab 1 Rubric

- General Design: 60 points
- Read system call: 60 points
  - 25 pts for incorrect reading implementation
  - 11 pts for EOF handling
  - 8 points for error checking, per argument (exact errno is not required for full points)
- Write system call: 40 points
  - 25 pts for incorrect writing implementation
  - 5 points for error checking, per argument (exact errno is not required for full points)
- Durability: 40 points
  - 19 pts - No crashes / faults / deadlocks (excluding EOF hang)
  - 3 pts per autograder read/write test (7)

Lab 2: Multiple Processes

Lab2 Overview

Goal: *Multiprogramming* - Support multiple (8) processes concurrently

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  - The main memory will be split in 8 equal sections. Each process gets one.
- More system calls

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  - User_Base: offset in main_memory for that particular process
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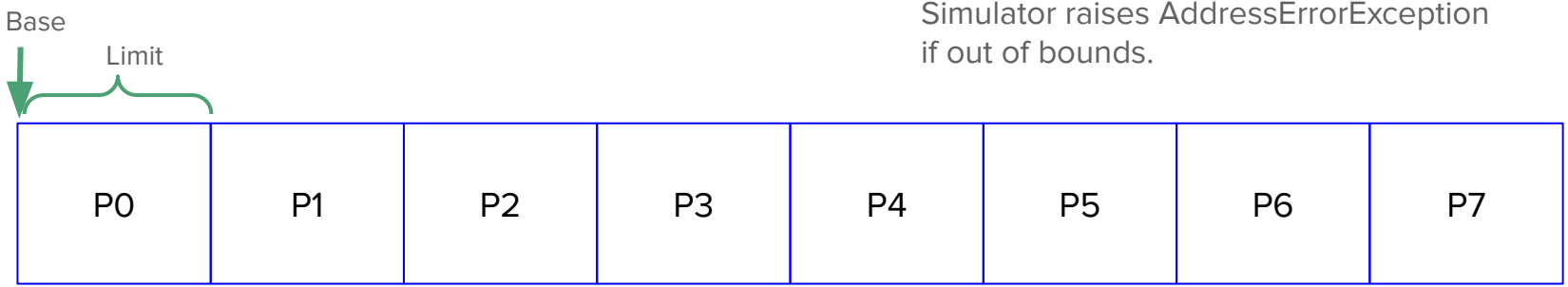
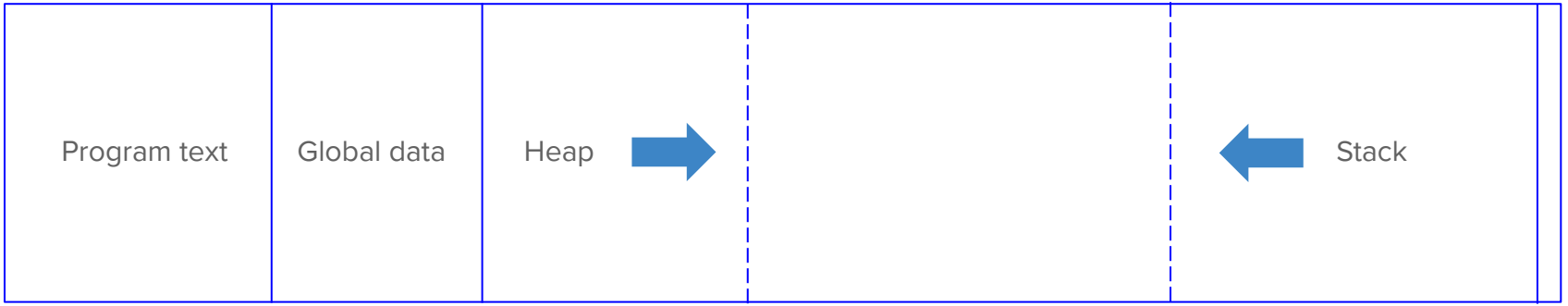


*NOTE: The process numbers (P#) are *not* the pid of the process. It is only used to highlight the memory partitions.

Memory from a user process perspective

Per user process memory (only relevant segments are shown):

P0:



Note: May be demonstrated on the board for better understanding.

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  - Major system calls
  - “Housekeeping” system calls

Lab2 Overview – System calls

- **Major system calls**
  - **fork()**
  - **execve()**
  - **wait()**
- Housekeeping system calls
  - sbrk()
  - ioctl()
  - fstat()
  - getpagesize()
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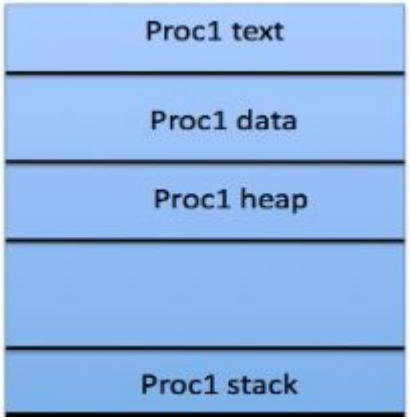
  - close()

Creating new processes: fork (part 1)

Parent



Register Values
(and more)

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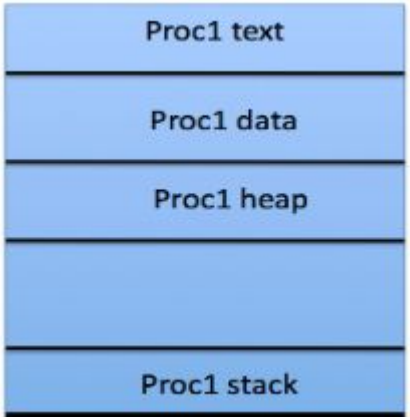

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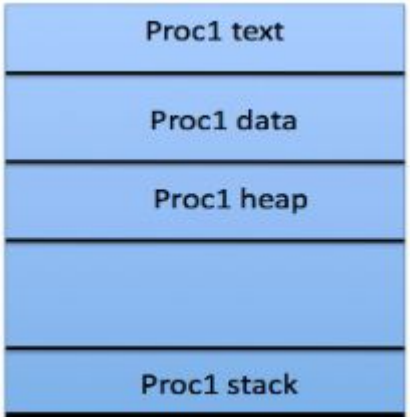

Register Values (and more)

"Clones"/copy almost everything (except PID).

Child

Register Values (and more)

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Creating new processes: exec (optional part 2)

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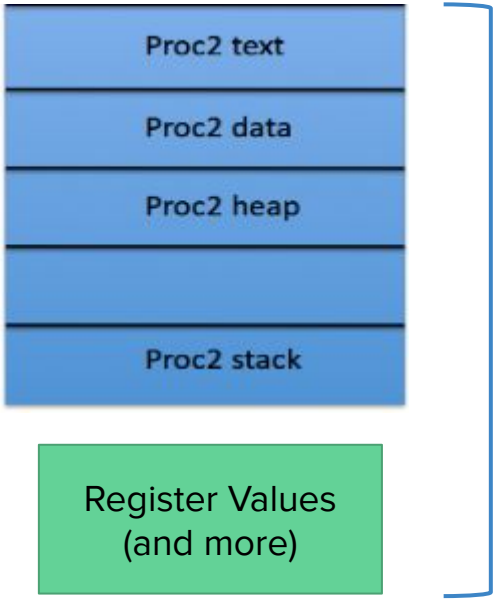

“Everything” is cleared and the program text is replaced by the new program. PID is preserved.

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Creating new processes: exec (optional part 2)

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Register Values
(and more)

exec does not require forking to work. You can call exec by itself!

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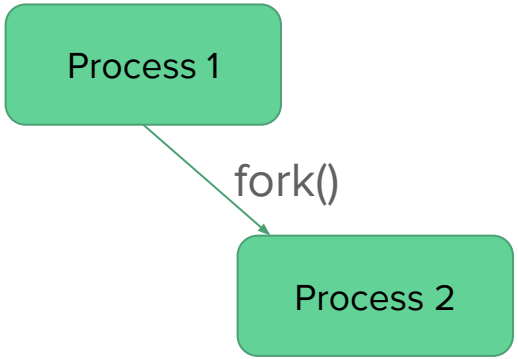
Question: If the only way a process is created is by a fork (and execve), where does the first process come from? 🤔

Answer: The first process (typically PID 1) is spawned by the OS kernel. In KOS, the first process is determined by the “-a” flag.

Wait syscall

The wait() syscall

Basic terms: wait for a child process to finish



If process 1 calls wait(), it will block until process 2 completes.

Wait, a zombie apocalypse?

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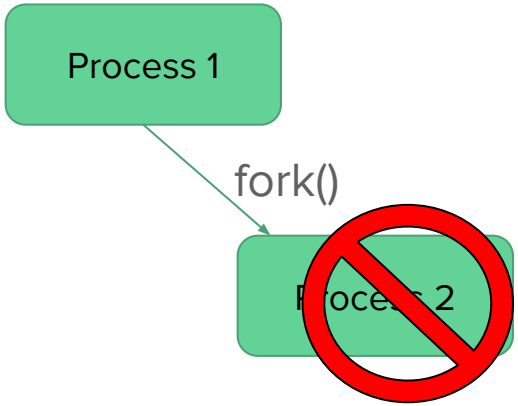
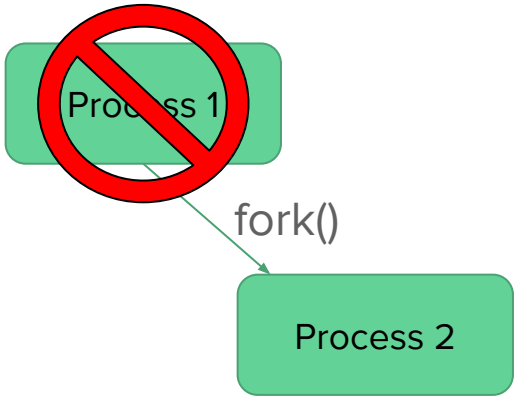


What if process 1 never calls wait?
And, process 2 exits?

Process 2 is now a “zombie”, as the OS must still remember the PCB. *Why???*

Wait, orphans?

The wait() syscall



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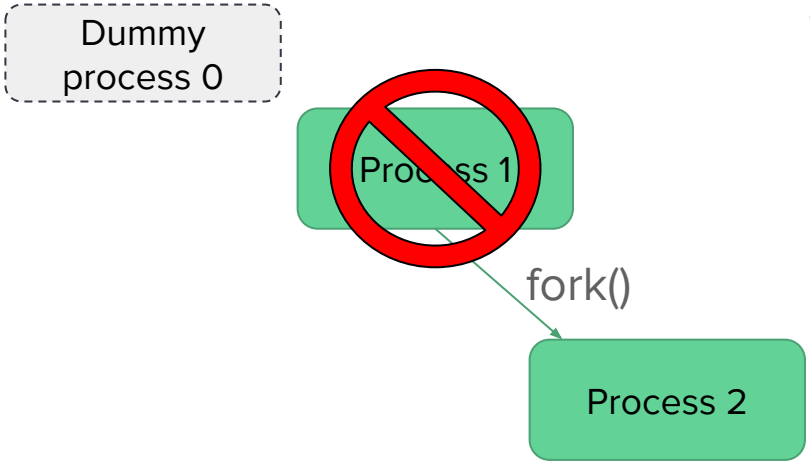

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Ah, we could just say P2 has a parent of a dummy PCB with a dummy process ID (like 0)

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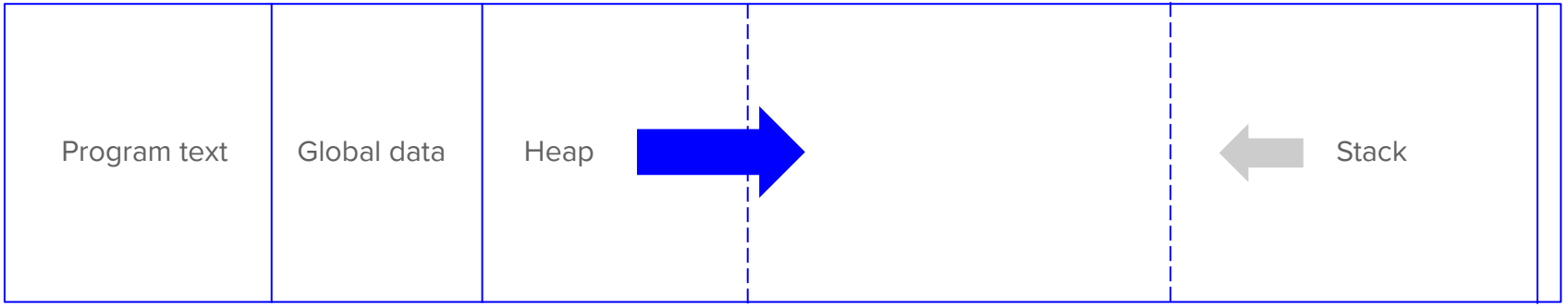
sbrk()

Increment (or decrement) heap size.

P0:



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See website: https://sites.cs.ucsb.edu/~rich/class/cs170/labs/kos_mp_v2/index.html

Time sharing

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5. Repeat step 2-4

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ksh and background tasks

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Demo ksh background task:

Questions