German University in Cairo
Faculty of Media Engineering and Technology
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CSEN 602 Operating Systems, Spring 2021
Milestone 2
Due Date: 27/5/2022 at 11:59pm

Milestone 2

In this milestone, you are required to extend your milestone 1 code by implementing a memory.

Memory Management

In milestone 1, your system stored all the created variables in a single data structure and there was no protection offered for each process's data. In this milestone, you are expected to augment your memory system by making the OS manage it and assign a space for each process. The memory is of a fixed size. It is made up of 40 memory words. The memory is large enough to hold the un-parsed lines of code, variables and PCB for any of the processes. The memory is divided into memory words, each word can store 1 variable and it's corresponding data. For simplicity, feel free to specify a naming convention for the variable names associated with the lines of code and elements of the PCB. Processes should not access any data outside their allocated memory block. A process should only be created at it's arrival time. A process is considered created when it's program file is read into lines and it gets assigned a part of the memory for instructions, variables and it's PCB. Assume that each process needs enough space for 3 variables.

Feel free to separate the lines of code, variables and PCB within the memory if needed as long as they fall within the same data structure meant to represent the memory.

Your code needs to be able to handle the case where the memory is not large enough to run all the processes. When a new process is created, the system checks if there is enough space, if not the system will unload one of the existing processes and store it's data on the disk. Feel free to assume the format for the memory when stored on the disk. However while unloaded, the process remains in the scheduler, thus when it is time for the unloaded process to run again, the process memory is swapped back into the memory from the disk. As a result, you need to program a way to read and write an existing processes memory from the disk as well manage the memory swapping process and protect each processes memory.

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Process Control Block

A process control block is a data structure used by computer operating systems to store all the information about a process.In order to schedule your processes, you will need to keep a PCB for every process. The PCB should contain the following information:

1. Process ID (The process is given an ID when is being created)

2. Process State

3. Program Counter

4. Memory Boundaries

Output

For this Milestone, your Simulated OS should be able to manage the memory based on the arrival times and execution times of the program files in milestone 1. You should make sure to have the following outputs ready to show for the evaluation:

- The memory shown every clock cycle in a human readable format.

- The ID of any process whenever it is swapped in or out of disk.

- The format of the memory stored on Disk.

Project Deliverable and Submission

The project should be submitted as ONE zip folder containing the java files. Please make sure to name your folder as follows, Team_number (ex. Team_00). Late submissions will not be accepted. Submission will be through the following link: `https://forms.gle/VSPFvr7qet92NxRD7`.