Implementing features to Pintos OS

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ABOUT Pintos OS

- Pintos is a simple operating system framework for the 80x86 architecture. It is written in C programming language.

- It has kernel threads, user programme loading and execution, and a file system, but it does it in a very simple way.

- We ran Pintos OS in QEMU. QEMU is a Machine Emulator which enables us to run a variety of guest OS.

PROBLEM STATEMENT

Pintos already implements a simple threading system, a basic program loader, a simple File system but they have certain limitations which are as follows:

- The Alarm Clock functionality is not efficient.

- No Priority Scheduler and suffers from Priority Inversion.

- Lack of efficient schedulers to organize processes.

- User processes crash immediately.

- System calls are not implemented.

OUTCOMES

In order to overcome the problems mentioned in the previous slide we implemented the following solutions.

- Changes in timer_sleep() function in order to save Processor time.
- We implement Priority Donation in order to prevent the situation of priority inversion.
- We also implemented the MLFQS Scheduler to help in scheduling the threads.
- We Implement argument passing to a program
- We also implement several System calls.

Results and Test cases

We tried to implement our code according to the given standard by Stanford University. We also tried to run our code on the test cases provided by them and we found that our implementation passed 105 out of 107 test cases.

```
SUMMARY BY TEST SET

Test Set                              Pts Max   % Ttl   % Max
-------------------------------       --- ---   ------  ------
tests/userprog/Rubric.functionality   102/108  33.1%/  35.0%
tests/userprog/Rubric.robustness       88/ 88  25.0%/  25.0%
tests/userprog/no-vm/Rubric             1/  1  10.0%/  10.0%
tests/filesys/base/Rubric              30/ 30  30.0%/  30.0%
-------------------------------       --- ---   ------  ------
Total                                          98.1%/100.0%
```

```
SUMMARY BY TEST SET

Test Set                       Pts Max   % Ttl   % Max
--------------------------     --- ---   ------  ------
tests/threads/Rubric.alarm     18/ 18  20.0%/  20.0%
tests/threads/Rubric.priority  38/ 38  40.0%/  40.0%
tests/threads/Rubric.mlfqs     37/ 37  40.0%/  40.0%
--------------------------     --- ---   ------  ------
Total                                 100.0%/100.0%
```

REFERENCES

- https://www.scs.stanford.edu/10wi-cs140/pintos/pintos.html

- https://www.ccs.neu.edu/home/skotthe/classes/cs5600/fall/2015/assignments.html

- https://github.com/WyldeCat/pintos-anon => Pintos Source Download

- https://www.youtube.com/watch?v=CI5FHJhXv38 => Pintos Installation Tutorial

THANK YOU!