Process Management

December 7, 2016

Course: Operating System
Instructor: Dr. Sanjay Chaudhary
Mentor: Mrs. Purnima Shah

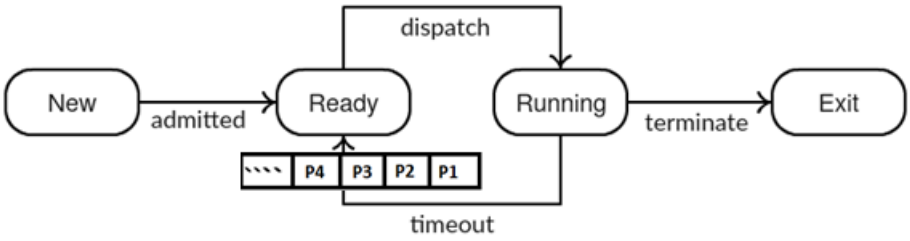
Group Members

Madhav Chavda - 1401006
Nisarg Tike - 1401070
Yash Kotadia - 1401114
Akshat Doshi - 1401119

- **Brief Description:**

  The computer system has N number of processes that are to be run on the processor in order to complete many tasks. As all the processes cannot run simultaneously on the processor, we need a mechanism through which we can manage all the processes effectively.

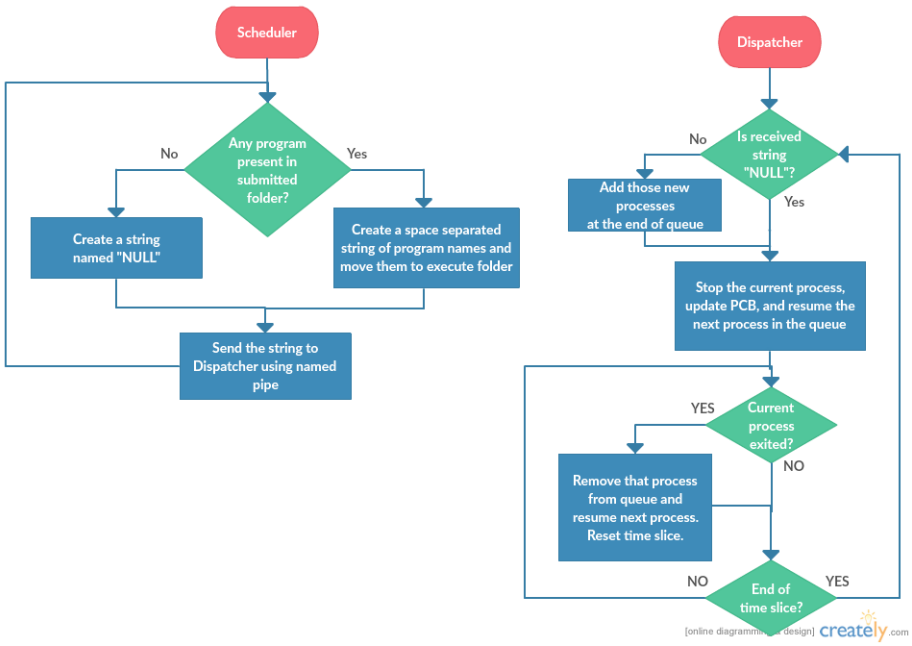
- **State Diagram:**



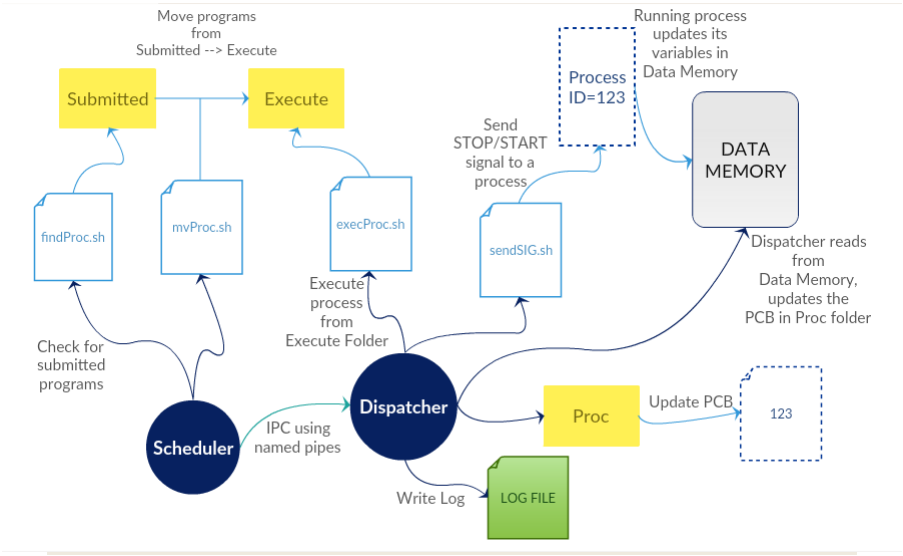
- **Technical Specification:**

  - IPC between Scheduler and Dispatcher using named pipes.
  - Dynamic submission of processes - Variable number of processes can be submitted for execution at any time.
  - Dynamic Data Memory - Dispatcher finds empty patches and memory is allocated to new processes accordingly.
  - Signal Handling - Signal immunity for scheduler and dispatcher
  - History of processes - Time taken by process is saved in history file along with timestamp
  - Log file generation - A log file is continuously updated which contains time stamp, PID, process name, Number of active processes, CPU efficiency
  - CPU efficiency - CPU efficiency is computed after every time slice
  - Proc folder - PCB or the process image is maintained for every process in separate files inside proc folder
  - Turnaround time, response time and actual execution time of a process

- **Flow Diagram**



- **Connection Diagram**



- **Listing of source code:**

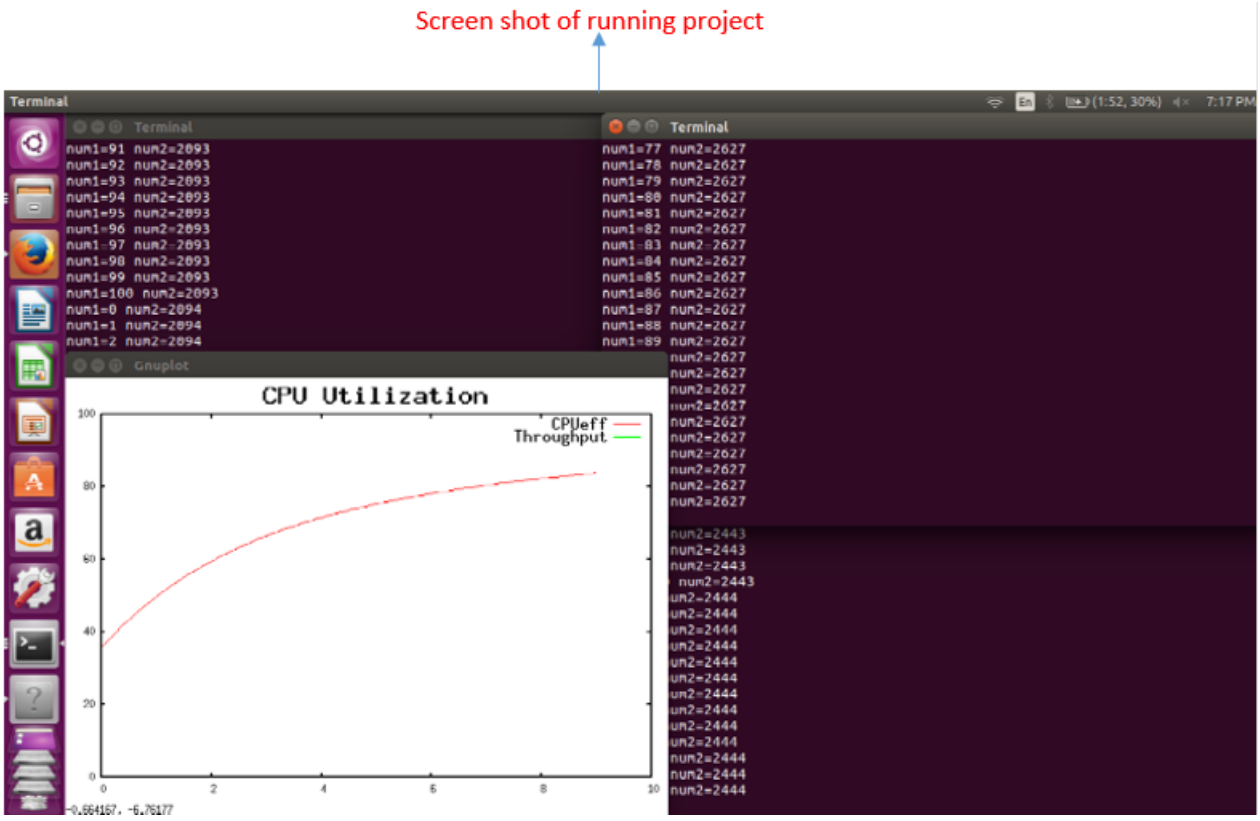
  Dispatcher.c
  Scheduler.c

  findProc.sh
  execProc.sh
  getPname.sh
  getProcID.sh
  mvProc.sh
  sendSIG.sh

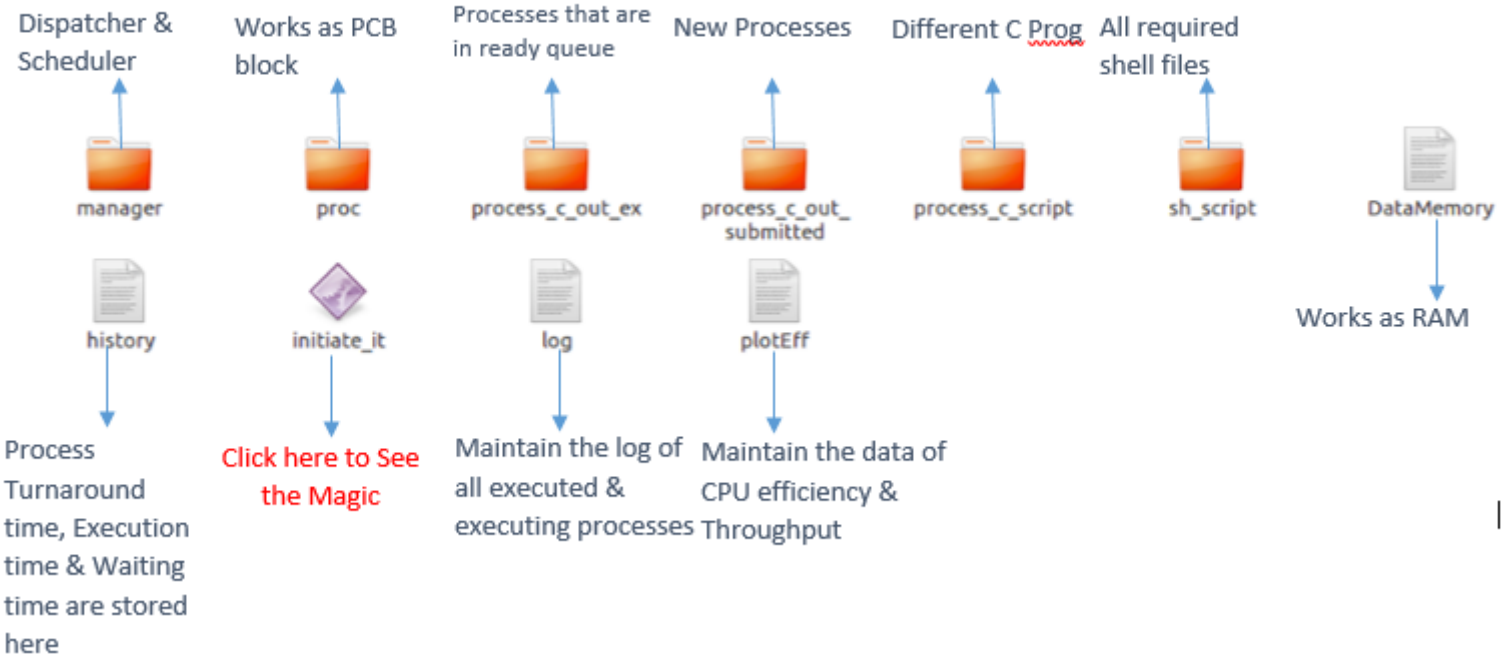
- **Output Files:**
  history
  log file
  plotEff
  GNUPLOT
  proc Folder

- **Test Results:**

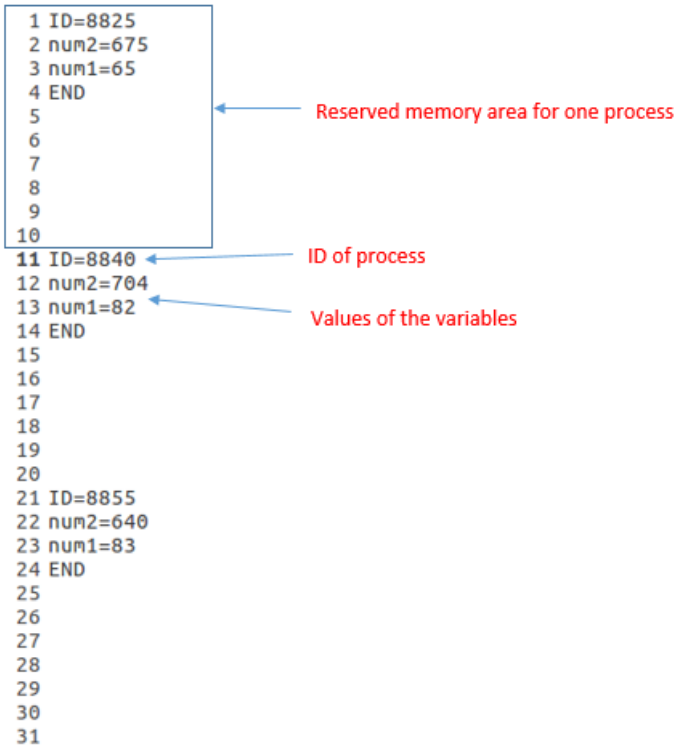
Terminal and GNUPLOT



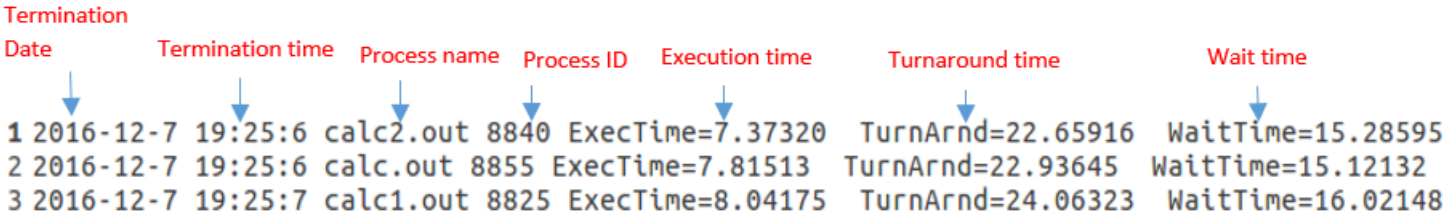
General Overview



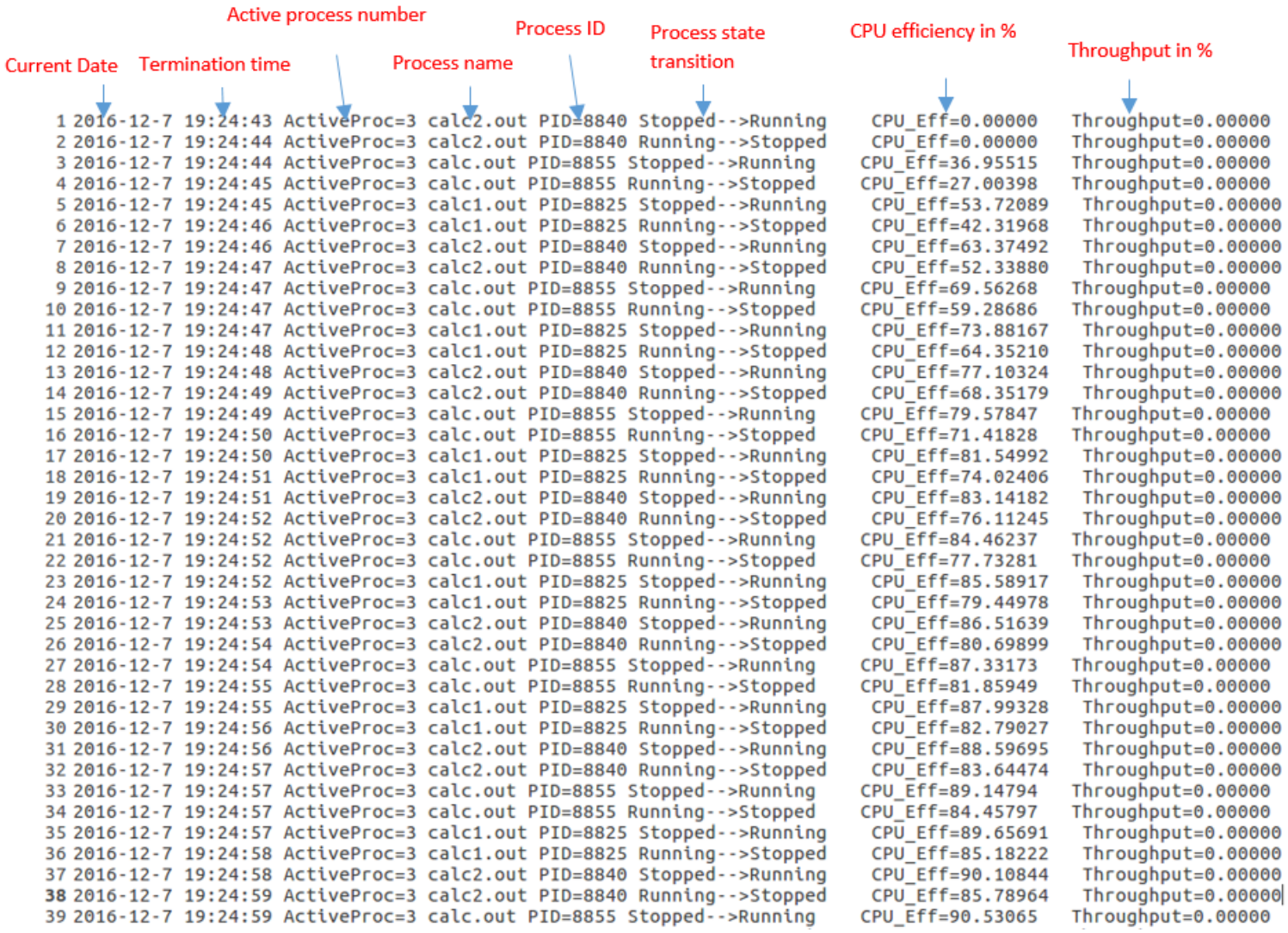
File as a Data Memory



History file



Log file

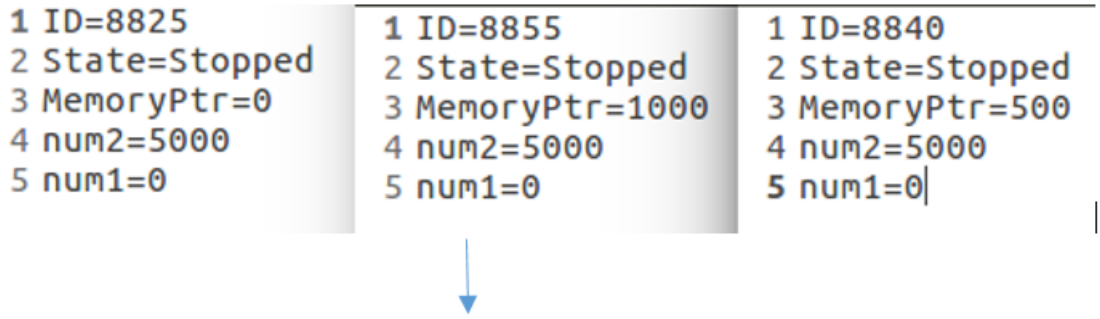

Active process number
Process ID
Process state transition
CPU efficiency in %
Throughput in %
Current Date
Termination time
Process name
1 2016-12-7 19:24:43 ActiveProc=3 calc2.out PID=8840 Stopped-->Running CPU_Eff=0.00000 Throughput=0.00000
2 2016-12-7 19:24:44 ActiveProc=3 calc2.out PID=8840 Running-->Stopped CPU_Eff=0.00000 Throughput=0.00000
3 2016-12-7 19:24:44 ActiveProc=3 calc.out PID=8855 Stopped-->Running CPU_Eff=36.95515 Throughput=0.00000
4 2016-12-7 19:24:45 ActiveProc=3 calc.out PID=8855 Running-->Stopped CPU_Eff=27.00398 Throughput=0.00000
5 2016-12-7 19:24:45 ActiveProc=3 calc1.out PID=8825 Stopped-->Running CPU_Eff=53.72089 Throughput=0.00000
6 2016-12-7 19:24:46 ActiveProc=3 calc1.out PID=8825 Running-->Stopped CPU_Eff=42.31968 Throughput=0.00000
7 2016-12-7 19:24:46 ActiveProc=3 calc2.out PID=8840 Stopped-->Running CPU_Eff=63.37492 Throughput=0.00000
8 2016-12-7 19:24:47 ActiveProc=3 calc2.out PID=8840 Running-->Stopped CPU_Eff=52.33880 Throughput=0.00000
9 2016-12-7 19:24:47 ActiveProc=3 calc.out PID=8855 Stopped-->Running CPU_Eff=69.56268 Throughput=0.00000
10 2016-12-7 19:24:47 ActiveProc=3 calc.out PID=8855 Running-->Stopped CPU_Eff=59.28686 Throughput=0.00000
11 2016-12-7 19:24:47 ActiveProc=3 calc1.out PID=8825 Stopped-->Running CPU_Eff=73.88167 Throughput=0.00000
12 2016-12-7 19:24:48 ActiveProc=3 calc1.out PID=8825 Running-->Stopped CPU_Eff=64.35210 Throughput=0.00000
13 2016-12-7 19:24:48 ActiveProc=3 calc2.out PID=8840 Stopped-->Running CPU_Eff=77.10324 Throughput=0.00000
14 2016-12-7 19:24:49 ActiveProc=3 calc2.out PID=8840 Running-->Stopped CPU_Eff=68.35179 Throughput=0.00000
15 2016-12-7 19:24:49 ActiveProc=3 calc.out PID=8855 Stopped-->Running CPU_Eff=79.57847 Throughput=0.00000
16 2016-12-7 19:24:50 ActiveProc=3 calc.out PID=8855 Running-->Stopped CPU_Eff=71.41828 Throughput=0.00000
17 2016-12-7 19:24:50 ActiveProc=3 calc1.out PID=8825 Stopped-->Running CPU_Eff=81.54992 Throughput=0.00000
18 2016-12-7 19:24:51 ActiveProc=3 calc1.out PID=8825 Running-->Stopped CPU_Eff=74.02406 Throughput=0.00000
19 2016-12-7 19:24:51 ActiveProc=3 calc2.out PID=8840 Stopped-->Running CPU_Eff=83.14182 Throughput=0.00000
20 2016-12-7 19:24:52 ActiveProc=3 calc2.out PID=8840 Running-->Stopped CPU_Eff=76.11245 Throughput=0.00000
21 2016-12-7 19:24:52 ActiveProc=3 calc.out PID=8855 Stopped-->Running CPU_Eff=84.46237 Throughput=0.00000
22 2016-12-7 19:24:52 ActiveProc=3 calc.out PID=8855 Running-->Stopped CPU_Eff=77.73281 Throughput=0.00000
23 2016-12-7 19:24:52 ActiveProc=3 calc1.out PID=8825 Stopped-->Running CPU_Eff=85.58917 Throughput=0.00000
24 2016-12-7 19:24:53 ActiveProc=3 calc1.out PID=8825 Running-->Stopped CPU_Eff=79.44978 Throughput=0.00000
25 2016-12-7 19:24:53 ActiveProc=3 calc2.out PID=8840 Stopped-->Running CPU_Eff=86.51639 Throughput=0.00000
26 2016-12-7 19:24:54 ActiveProc=3 calc2.out PID=8840 Running-->Stopped CPU_Eff=80.69899 Throughput=0.00000
27 2016-12-7 19:24:54 ActiveProc=3 calc.out PID=8855 Stopped-->Running CPU_Eff=87.33173 Throughput=0.00000
28 2016-12-7 19:24:55 ActiveProc=3 calc.out PID=8855 Running-->Stopped CPU_Eff=81.85949 Throughput=0.00000
29 2016-12-7 19:24:55 ActiveProc=3 calc1.out PID=8825 Stopped-->Running CPU_Eff=87.99328 Throughput=0.00000
30 2016-12-7 19:24:56 ActiveProc=3 calc1.out PID=8825 Running-->Stopped CPU_Eff=82.79027 Throughput=0.00000
31 2016-12-7 19:24:56 ActiveProc=3 calc2.out PID=8840 Stopped-->Running CPU_Eff=88.59695 Throughput=0.00000
32 2016-12-7 19:24:57 ActiveProc=3 calc2.out PID=8840 Running-->Stopped CPU_Eff=83.64474 Throughput=0.00000
33 2016-12-7 19:24:57 ActiveProc=3 calc.out PID=8855 Stopped-->Running CPU_Eff=89.14794 Throughput=0.00000
34 2016-12-7 19:24:57 ActiveProc=3 calc.out PID=8855 Running-->Stopped CPU_Eff=84.45797 Throughput=0.00000
35 2016-12-7 19:24:57 ActiveProc=3 calc1.out PID=8825 Stopped-->Running CPU_Eff=89.65691 Throughput=0.00000
36 2016-12-7 19:24:58 ActiveProc=3 calc1.out PID=8825 Running-->Stopped CPU_Eff=85.18222 Throughput=0.00000
37 2016-12-7 19:24:58 ActiveProc=3 calc2.out PID=8840 Stopped-->Running CPU_Eff=90.10844 Throughput=0.00000
38 2016-12-7 19:24:59 ActiveProc=3 calc2.out PID=8840 Running-->Stopped CPU_Eff=85.78964 Throughput=0.00000
39 2016-12-7 19:24:59 ActiveProc=3 calc.out PID=8855 Stopped-->Running CPU_Eff=90.53065 Throughput=0.00000

Log file

```
40 2016-12-7 19:25:0 ActiveProc=3 calc.out PID=8855 Running-->Stopped    CPU_Eff=86.42258   Throughput=0.00000
41 2016-12-7 19:25:0 ActiveProc=3 calc1.out PID=8825 Stopped-->Running    CPU_Eff=90.90638   Throughput=0.00000
42 2016-12-7 19:25:1 ActiveProc=3 calc1.out PID=8825 Running-->Stopped    CPU_Eff=86.97126   Throughput=0.00000
43 2016-12-7 19:25:1 ActiveProc=3 calc2.out PID=8840 Stopped-->Running    CPU_Eff=91.24596   Throughput=0.00000
44 2016-12-7 19:25:2 ActiveProc=3 calc2.out PID=8840 Running-->Stopped    CPU_Eff=87.46560   Throughput=0.00000
45 2016-12-7 19:25:2 ActiveProc=3 calc.out PID=8855 Stopped-->Running    CPU_Eff=91.56041   Throughput=0.00000
46 2016-12-7 19:25:2 ActiveProc=3 calc.out PID=8855 Running-->Stopped    CPU_Eff=87.88123   Throughput=0.00000
47 2016-12-7 19:25:2 ActiveProc=3 calc1.out PID=8825 Stopped-->Running    CPU_Eff=91.83392   Throughput=0.00000
48 2016-12-7 19:25:3 ActiveProc=3 calc1.out PID=8825 Running-->Stopped    CPU_Eff=88.31996   Throughput=0.00000
49 2016-12-7 19:25:3 ActiveProc=3 calc2.out PID=8840 Stopped-->Running    CPU_Eff=92.10035   Throughput=0.00000
50 2016-12-7 19:25:4 ActiveProc=3 calc2.out PID=8840 Running-->Stopped    CPU_Eff=88.72394   Throughput=0.00000
51 2016-12-7 19:25:4 ActiveProc=3 calc.out PID=8855 Stopped-->Running    CPU_Eff=92.34676   Throughput=0.00000
52 2016-12-7 19:25:5 ActiveProc=3 calc.out PID=8855 Running-->Stopped    CPU_Eff=89.07497   Throughput=0.00000
53 2016-12-7 19:25:5 ActiveProc=3 calc1.out PID=8825 Stopped-->Running    CPU_Eff=92.56980   Throughput=0.00000
54 2016-12-7 19:25:6 ActiveProc=3 calc1.out PID=8825 Running-->Stopped    CPU_Eff=89.41274   Throughput=0.00000
55 2016-12-7 19:25:6 ActiveProc=3 calc2.out PID=8840 Stopped-->Running    CPU_Eff=92.77921   Throughput=0.00000
56 2016-12-7 19:25:6 ActiveProc=3 calc2.out PID=8840 Running-->Exited    CPU_Eff=92.72738   Throughput=4.19540
57 2016-12-7 19:25:6 ActiveProc=2 calc.out PID=8855 Stopped-->Running    CPU_Eff=92.62404   Throughput=4.19048
58 2016-12-7 19:25:6 ActiveProc=2 calc.out PID=8855 Running-->Exited    CPU_Eff=92.70402   Throughput=8.22741
59 2016-12-7 19:25:6 ActiveProc=1 calc1.out PID=8825 Stopped-->Running    CPU_Eff=92.60625   Throughput=8.21953
60 2016-12-7 19:25:7 ActiveProc=1 calc1.out PID=8825 Running-->Exited    CPU_Eff=92.76457   Throughput=11.98478
```

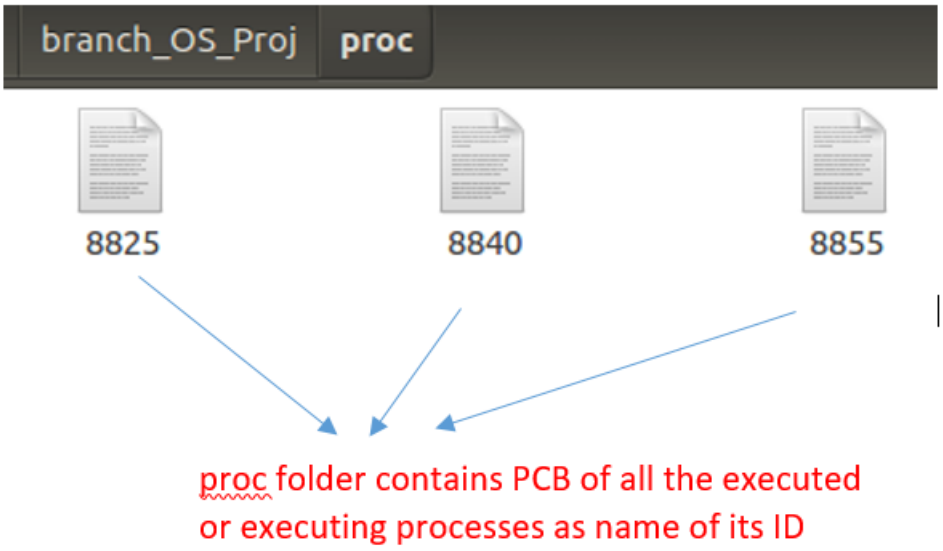
No. of Running Process is decreased when a process is terminated or completes its execution

File as a PCB

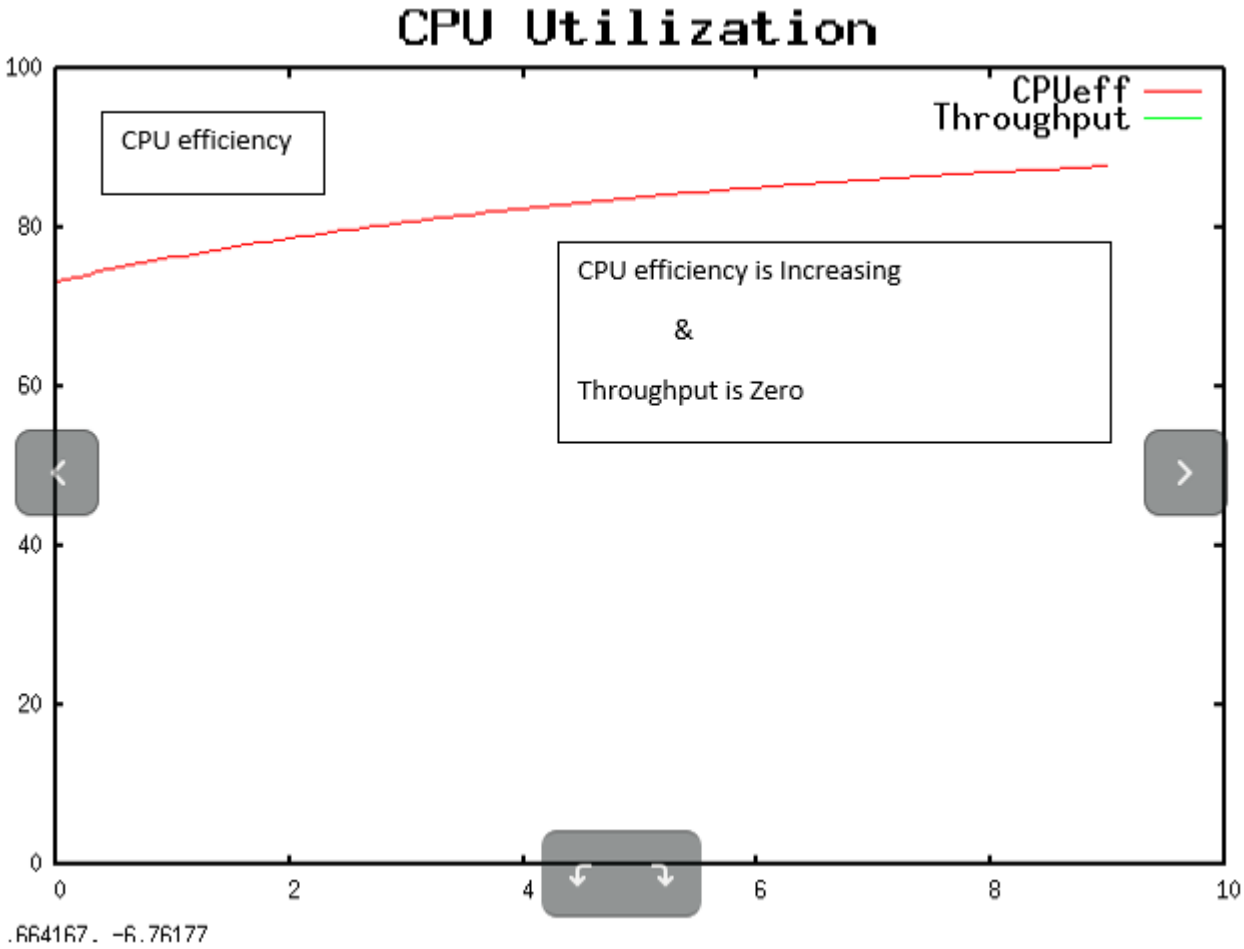


Above image is the process image of individual 3 processes. Our process image contains the process ID, process state and its variable values. As we have taken a screen shot of process image at run time so as from above image you can see that 2 of them processes are in stopped state and 1 of them process is in running state.

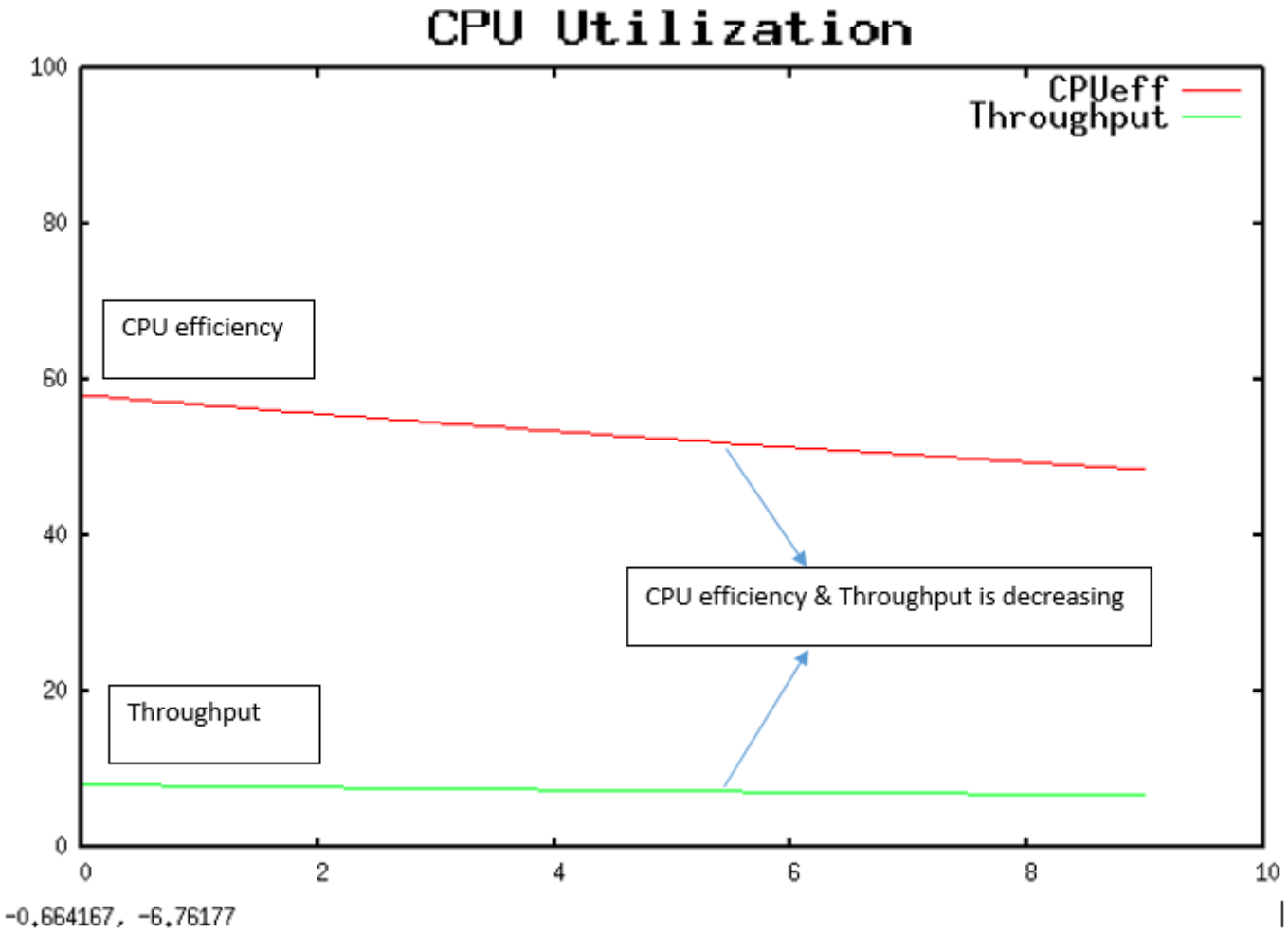
Overview of proc folder



CPU Efficiency plot

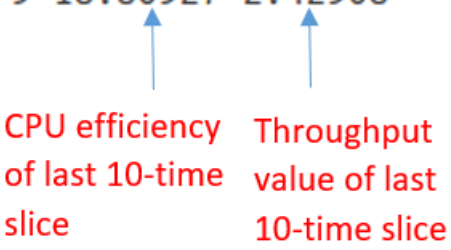


CPU Efficiency plot



PlotEff file

```
 1 Time CPUeff Throughput
 2 0 19.97424 2.57953
 3 1 19.83773 2.56190
 4 2 19.70307 2.54451
 5 3 19.57022 2.52735
 6 4 19.43914 2.51043
 7 5 19.30978 2.49372
 8 6 19.18216 2.47724
 9 7 19.05622 2.46098
10 8 18.93194 2.44492
11 9 18.80927 2.42908
```



References:

http://unix.stackexchange.com/questions/16738/when-a-process-will-go-to-d-state
http://unix.stackexchange.com/questions/2879/how-to-get-a-program-running-with-root-privilege
http://unix.stackexchange.com/questions/5642/what-if-kill-9-does-not-work
http://www.unix.com/programming/173333-how-sleep-wake-thread.html