

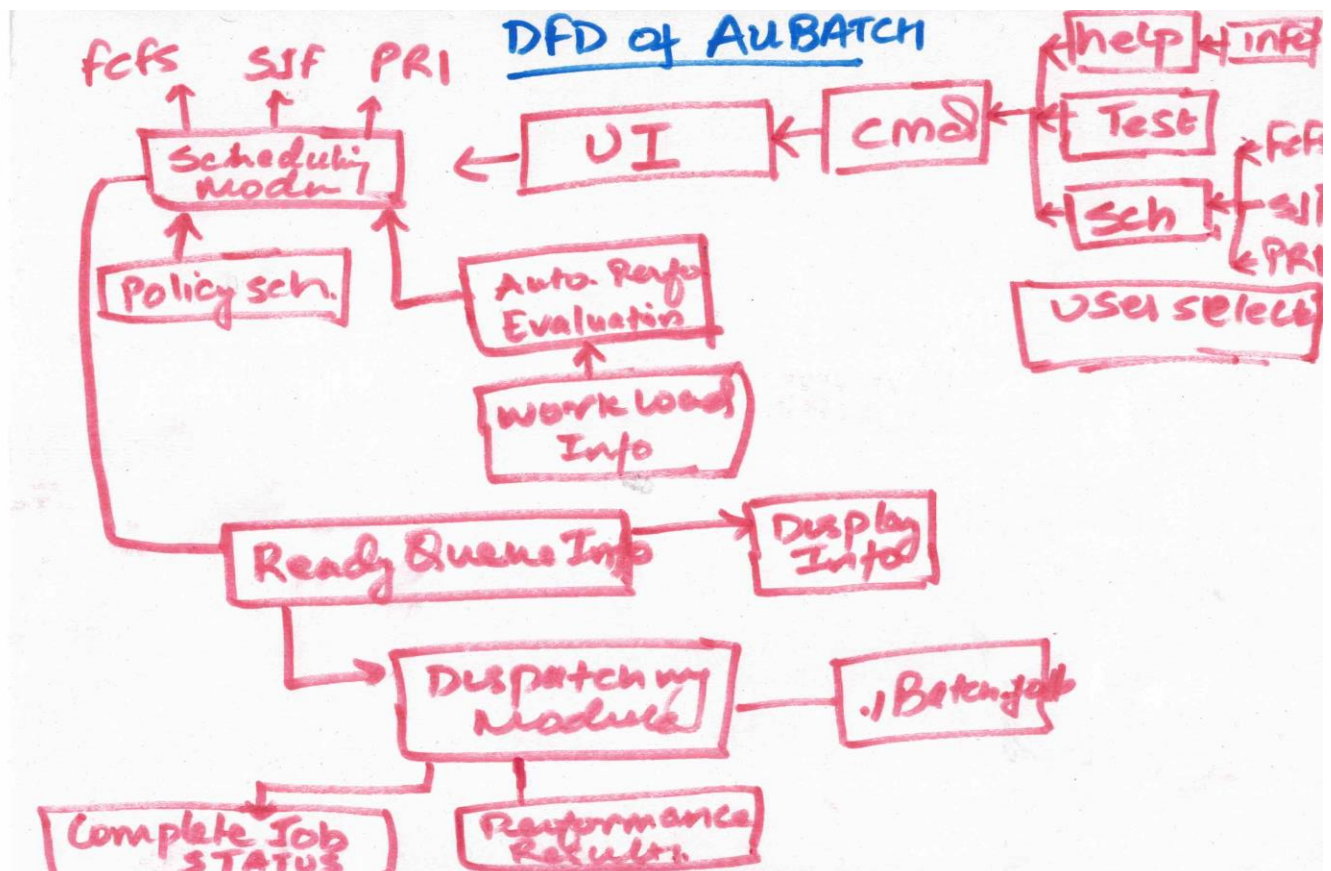
COMP 7500 ADVANCED OPERATING SYSTEM

PROJECT-3 AUBatch SCHEDULER

BY: YASH MAHAJAN

Note: How to run AUBatch? Follow README file.

1. Design, Implementation and DFD for AUBatch:



Above the Data Flow Diagram (DFD) which highlight the structure of the project.

2. Performance Metric and Workload Conditions

2.1 MakeFile

```
[yzm0034@localhost Project-3]$ make
gcc -std=c99 -pthread -lm -o aubatch aubatch.c
gcc -std=c99 -pthread -lm -o batch_job batch_job.c
[yzm0034@localhost Project-3]$ script AuBatch_Script
Script started, file is AuBatch_Script
[yzm0034@localhost Project-3]$
```

2.2 Initiation

```
[yzm0034@localhost Project-3]$
[yzm0034@localhost Project-3]$ ./aubatch
Welcome to Yash Mahajan's batch job scheduler Version 1.0
Type 'help' to find more about AUBatch commands.
>
```

2.3 First job

```
>run job1 5 1
Dispatcher only supports the ./batch_job program
job1 replaced with ./batch_job program

>run job2 7 2
Dispatcher only supports the ./batch_job program
job2 replaced with ./batch_job program

>run job 10 1
Dispatcher only supports the ./batch_job program
job replaced with ./batch_job program

>list
Total number of jobs in the queue: 0
Scheduling Policy: FCFS.
Running Job:


| Name | CPU_Time | Pri | Progress |
|------|----------|-----|----------|
| job  | 10       | 1   | run      |


Completed Jobs:


| Name | CPU_Time | Pri | Arrival_time | Progress |
|------|----------|-----|--------------|----------|
| job  | 10       | 1   | 21:13:29     | complete |
| job1 | 5        | 1   | 21:15:21     | complete |
| job2 | 7        | 2   | 21:15:28     | complete |


>
```

2.4 FCFS

```
>run job1 10 1
Dispatcher only supports the ./batch_job program
job1 replaced with ./batch_job program

>run job2 5 1
Dispatcher only supports the ./batch_job program
job2 replaced with ./batch_job program

>run job3 2 1
Dispatcher only supports the ./batch_job program
job3 replaced with ./batch_job program

>list
Total number of jobs in the queue: 1
Scheduling Policy: FCFS.
Running Job:
Name          CPU_Time    Pri    Progress
job2           5           1      run

Ready Queue:
Name          CPU_Time    Pri    Arrival_time    Progress
job3           2           1      21:20:38         wait

Completed Jobs:
Name          CPU_Time    Pri    Arrival_time    Progress
job1          10           1      21:20:26         complete

>list
Total number of jobs in the queue: 0
Scheduling Policy: FCFS.
Completed Jobs:
Name          CPU_Time    Pri    Arrival_time    Progress
job1          10           1      21:20:26         complete
job2           5           1      21:20:32         complete
job3           2           1      21:20:38         complete

>
```

2.5 SJF

```
>sjf

>run job1 10 1
Dispatcher only supports the ./batch_job program
job1 replaced with ./batch_job program

>run job 5 1
Dispatcher only supports the ./batch_job program
job replaced with ./batch_job program

>run job 2 1
Dispatcher only supports the ./batch_job program
job replaced with ./batch_job program

>list
Total number of jobs in the queue: 1
Scheduling Policy: SJF.
Running Job:
Name          CPU_Time    Pri    Progress
job            5           1      run

Ready Queue:
Name          CPU_Time    Pri    Arrival_time    Progress
job            2           1      21:21:59         wait

Completed Jobs:
Name          CPU_Time    Pri    Arrival_time    Progress
job1          10           1      21:20:26         complete
job2           5           1      21:20:32         complete
job3           2           1      21:20:38         complete
job1          10           1      21:21:48         complete

>
```

2.6 PRIORITY

```
>pri
>run job4 10 1
Dispatcher only supports the ./batch_job program
job4 replaced with ./batch_job program

>run job4 5 2
Dispatcher only supports the ./batch_job program
job4 replaced with ./batch_job program

>run job6 15 1
Dispatcher only supports the ./batch_job program
job6 replaced with ./batch_job program

>list
Total number of jobs in the queue: 0
Scheduling Policy: PRI.
Running Job:
Name      CPU_Time  Pri  Progress
job6      15        1    run

Completed Jobs:
Name      CPU_Time  Pri  Arrival_time  Progress
job1      10        1    21:20:26      complete
job2      5         1    21:20:32      complete
job3      2         1    21:20:38      complete
job1      10        1    21:21:48      complete
job       5         1    21:21:54      complete
job       2         1    21:21:59      complete
job4      10        1    21:22:40      complete
job4      5         2    21:22:46      complete

>list
Total number of jobs in the queue: 0
Scheduling Policy: PRI.
Completed Jobs:
Name      CPU_Time  Pri  Arrival_time  Progress
job1      10        1    21:20:26      complete
job2      5         1    21:20:32      complete
job3      2         1    21:20:38      complete
job1      10        1    21:21:48      complete
job       5         1    21:21:54      complete
job       2         1    21:21:59      complete
job4      10        1    21:22:40      complete
job4      5         2    21:22:46      complete
job6      15        1    21:22:58      complete

>
```

2.7 Quit

```
Ti
>quit
Total number of job submitted: 4
Total number of job completed: 4
Average turnaround time: 8.000000 seconds
Average CPU time: 8.000000 seconds
Average waiting time: 0.000000 seconds
Throughput: 0.500000 No./second
[yzm0034@localhost Project-3]$
```

3. The Performance Evaluation of the three Scheduling algo.

3.1 FCFS Test:

```
>help -test
Test Command:
test <benchmark> <policy> <num_of_jobs> <priority_levels>
    <min_CPU_time> <max_CPU_time>
>test benchmark fcfs 5 3 10 20
>
>list
Total number of jobs in the queue: 3
Scheduling Policy: FCFS.
Running Job:
Name      CPU_Time      Pri      Progress
batch_job 17              3        run

Ready Queue:
Name      CPU_Time      Pri      Arrival_time      Progress
batch_job 15              2        21:24:41           wait
Ready Queue:
Name      CPU_Time      Pri      Arrival_time      Progress
batch_job 11              2        21:24:41           wait
Ready Queue:
Name      CPU_Time      Pri      Arrival_time      Progress
batch_job 17              1        21:24:41           wait
Completed Jobs:
Name      CPU_Time      Pri      Arrival_time      Progress
batch_job 13              2        21:24:41           complete

>Benchmark Test Done Running
Please Press Enter for Statistics
>
Total number of job submitted: 5
Total number of job completed: 5
Average turnaround time: 44.400002 seconds
Average CPU time:14.600000 seconds
Average waiting time:29.600000 seconds
Throughput: 0.112613 No./second

>list
Total number of jobs in the queue: 0
Scheduling Policy: FCFS.
Completed Jobs:
Name      CPU_Time      Pri      Arrival_time      Progress
batch_job 13              2        21:24:41           complete
batch_job 17              3        21:24:41           complete
batch_job 15              2        21:24:41           complete
batch_job 11              2        21:24:41           complete
batch_job 17              1        21:24:41           complete
>
```

3.2 SJF Test:

```
>help sjf
Scheduling policy:
    sjf: change the scheduling policy to SJF.

>test benchmark sjf 5 3 10 20

>list
Total number of jobs in the queue: 4
Scheduling Policy: SJF.
Running Job:
Name      CPU_Time      Pri      Progress
batch_job 10              3        run

Ready Queue:
Name      CPU_Time      Pri      Arrival_time      Progress      wait
batch_job 10              3        21:27:45           wait
Ready Queue:
Name      CPU_Time      Pri      Arrival_time      Progress      wait
batch_job 13              2        21:27:45           wait
Ready Queue:
Name      CPU_Time      Pri      Arrival_time      Progress      wait
batch_job 13              1        21:27:45           wait
Ready Queue:
Name      CPU_Time      Pri      Arrival_time      Progress      wait
batch_job 15              2        21:27:45           wait

>Benchmark Test Done Running
Please Press Enter for Statistics

>
Total number of job submitted: 5
Total number of job completed: 5
Average turnaround time: 34.000000 seconds
Average CPU time: 12.200000 seconds
Average waiting time: 21.799999 seconds
Throughput: 0.147059 No./second

>
```

3.3 PRIORITY Test:

```
>test benchmark pri 5 3 10 20

>list
Total number of jobs in the queue: 4
Scheduling Policy: PRI.
Running Job:
Name      CPU_Time      Pri      Progress
batch_job 16              1        run

Ready Queue:
Name      CPU_Time      Pri      Arrival_time      Progress      wait
batch_job 17              2        21:30:19           wait
Ready Queue:
Name      CPU_Time      Pri      Arrival_time      Progress      wait
batch_job 14              2        21:30:19           wait
Ready Queue:
Name      CPU_Time      Pri      Arrival_time      Progress      wait
batch_job 12              3        21:30:19           wait
Ready Queue:
Name      CPU_Time      Pri      Arrival_time      Progress      wait
batch_job 13              3        21:30:19           wait

>Benchmark Test Done Running
Please Press Enter for Statistics

>
Total number of job submitted: 5
Total number of job completed: 5
Average turnaround time: 45.400002 seconds
Average CPU time: 14.400000 seconds
Average waiting time: 31.000000 seconds
Throughput: 0.110132 No./second

>
```

4. Learned Lesson

1. How the scheduling algorithms works.
2. How to use Pthreads.
3. How to implement multi-threading.
4. How to use command parser and handle user inputs.
5. How to use `exec()` function.
6. How to compare different scheduling algorithms and how critical is to select the correct algorithm for a particular task.