SJNPRIO Scheduler Implementation

SJNPRIO Algorithm:

The algorithm implement for the project 2.2 is SJNPRIO. For this implementation, I have combined the concepts of shortest job first (SJF) and priority based scheduling. In this case, if SJNPRIO scheduler is enabled, it will schedule the process with least runtime first unless the runtimes are same for different processes. In that case, it takes priority into consideration and the process with the highest priority is scheduled first. For example, let us consider the following case.

There are three processes with runtimes as 50ms, 50ms and 20ms. Third process is scheduled first as it has the least runtime among all the processes. Now since the other two processes have the same runtimes, it considers priority. If the priority of process 1 is greater than the priority of process 2, then process 1 is scheduled before process 2 or vice versa. In this implementation, it is considered that lower the '*prio*' attribute value higher the priority of the process similar to nice priority.

Test Case used:

To test this scheduler, 16 processes are considered with decreasing runtimes for the first 8 processes from 2seconds to 1.3seconds. The last 8 processes have the same runtime of 300ms which is less than the first 8 processes. Hence they run before any of the first 8 processes. Among the last 8 processes, prio attribute is given value in ascending order which indicates the descending order of priority. So, when SJNPRIO scheduler is used the order of process execution is Process 8, Process 9, ……., Process 15, Process 7, Process 6, …….., Process 1. The program output along with the dmesg output is attached for reference. In the dmesg output, the finishing of processes can be tracked using cid number. Following are the screenshots of this test case output.

```
Child 8 finished
Child 9 finished
Child 10 finished
Child 11 finished
Child 12 finished
Child 13 finished
Child 14 finished
Child 15 finished
Child 7 finished
Child 6 finished
Child 5 finished
Child 4 finished
Child 3 finished
Child 2 finished
Child 1 finished
Child 0 finished
```

Figure 1: Test Program Output

```
[ 2408.283263] sjnprio_event: DEQ(cid8:pid1482:dl0.000000008)
[ 2408.284298] sjnprio_event: ENQ(cid8:pid1482:dl0.000000008)
[ 2408.285365] sjnprio: task_tick cid8, pid1482
[ 2408.286446] sjnprio_event: DEQ(cid8:pid1482:dl0.000000008)
[ 2408.287448] sjnprio: pick_next_task: picked cid9, pid1483
[ 2408.288448] sjnprio_event: prev->(cid8:pid1482),next->(cid9:pid1483)
[ 2408.289543] sjnprio: task_tick cid9, pid1483
[ 2408.290705] sjnprio_event: DEQ(cid9:pid1483:dl0.000000009)
[ 2408.291804] sjnprio_event: ENQ(cid9:pid1483:dl0.000000009)
[ 2408.292829] sjnprio: task_tick cid9, pid1483
[ 2408.293873] sjnprio_event: DEQ(cid9:pid1483:dl0.000000009)
[ 2408.294851] sjnprio: pick_next_task: picked cid10, pid1484
[ 2408.295846] sjnprio_event: prev->(cid9:pid1483),next->(cid10:pid1484)
[ 2408.296871] sjnprio: task_tick cid10, pid1484
[ 2408.298099] sjnprio_event: DEQ(cid10:pid1484:dl0.000000010)
[ 2408.299113] sjnprio_event: ENQ(cid10:pid1484:dl0.000000010)
[ 2408.300081] sjnprio_event: DEQ(cid10:pid1484:dl0.000000010)
[ 2408.301029] sjnprio: pick_next_task: picked cid11, pid1485
[ 2408.301989] sjnprio_event: prev->(cid10:pid1484),next->(cid11:pid1485)
[ 2408.302984] sjnprio: task_tick cid11, pid1485
[ 2408.304149] sjnprio_event: DEQ(cid11:pid1485:dl0.000000011)
[ 2408.305112] sjnprio_event: ENQ(cid11:pid1485:dl0.000000011)
[ 2408.306080] sjnprio: task_tick cid11, pid1485
[ 2408.307058] sjnprio_event: DEQ(cid11:pid1485:dl0.000000011)
[ 2408.307985] sjnprio: pick_next_task: picked cid12, pid1486
[ 2408.308932] sjnprio_event: prev->(cid11:pid1485),next->(cid12:pid1486)
[ 2408.309926] sjnprio: task_tick cid12, pid1486
[ 2408.311116] sjnprio_event: DEQ(cid12:pid1486:dl0.000000012)
[ 2408.312057] sjnprio_event: ENQ(cid12:pid1486:dl0.000000012)
[ 2408.313011] sjnprio: task_tick cid12, pid1486
[ 2408.313983] sjnprio_event: DEQ(cid12:pid1486:dl0.000000012)
[ 2408.314892] sjnprio: pick_next_task: picked cid13, pid1487
[ 2408.315801] sjnprio_event: prev->(cid12:pid1486),next->(cid13:pid1487)
[ 2408.316778] sjnprio: task_tick cid13, pid1487
[ 2408.317930] sjnprio_event: DEQ(cid13:pid1487:dl0.000000013)
[ 2408.318877] sjnprio_event: ENQ(cid13:pid1487:dl0.000000013)
[ 2408.319777] sjnprio_event: DEQ(cid13:pid1487:dl0.000000013)
[ 2408.320652] sjnprio: pick_next_task: picked cid14, pid1488
[ 2408.321557] sjnprio_event: prev->(cid13:pid1487),next->(cid14:pid1488)
[ 2408.322520] sjnprio: task_tick cid14, pid1488
[ 2408.323608] sjnprio_event: DEQ(cid14:pid1488:dl0.000000014)
[ 2408.324561] sjnprio_event: ENQ(cid14:pid1488:dl0.000000014)
[ 2408.325491] sjnprio: task_tick cid14, pid1488
[ 2408.326394] sjnprio_event: DEQ(cid14:pid1488:dl0.000000014)
[ 2408.327273] sjnprio: pick_next_task: picked cid15, pid1489
[ 2408.328173] sjnprio_event: prev->(cid14:pid1488),next->(cid15:pid1489)
[ 2408.329145] sjnprio: task_tick cid15, pid1489
[ 2408.330255] sjnprio_event: DEQ(cid15:pid1489:dl0.000000015)
[ 2408.331175] sjnprio_event: ENQ(cid15:pid1489:dl0.000000015)
[ 2408.332067] sjnprio_event: DEQ(cid15:pid1489:dl0.000000015)
[ 2408.332949] sjnprio: pick_next_task: picked cid7, pid1481
[ 2408.333810] sjnprio_event: prev->(cid15:pid1489),next->(cid7:pid1481)
[ 2408.334740] sjnprio: task_tick cid7, pid1481
[ 2408.335847] sjnprio_event: DEQ(cid7:pid1481:dl1.000000001)
[ 2408.336771] sjnprio_event: ENQ(cid7:pid1481:dl1.000000001)
[ 2408.337689] sjnprio: task_tick cid7, pid1481
[ 2408.338587] sjnprio_event: DEQ(cid7:pid1481:dl1.000000001)
[ 2408.339478] sjnprio: pick_next_task: picked cid6, pid1480
[ 2408.340375] sjnprio_event: prev->(cid7:pid1481),next->(cid6:pid1480)
```

Figure 2: dmesg output 1 (Process 8 -> 15)

```
[ 2408.341328] sjnprio: task_tick cid6, pid1480
[ 2408.342448] sjnprio_event: DEQ(cid6:pid1480:dl1.000000001)
[ 2408.343367] sjnprio_event: ENQ(cid6:pid1480:dl1.000000001)
[ 2408.344255] sjnprio_event: DEQ(cid6:pid1480:dl1.000000001)
[ 2408.345132] sjnprio: pick_next_task: picked cid5, pid1479
[ 2408.345990] sjnprio_event: prev->(cid6:pid1480),next->(cid5:pid1479)
[ 2408.346918] sjnprio: task_tick cid5, pid1479
[ 2408.347974] sjnprio_event: DEQ(cid5:pid1479:dl1.000000001)
[ 2408.348905] sjnprio_event: ENQ(cid5:pid1479:dl1.000000001)
[ 2408.349812] sjnprio: task_tick cid5, pid1479
[ 2408.350696] sjnprio_event: DEQ(cid5:pid1479:dl1.000000001)
[ 2408.351550] sjnprio: pick_next_task: picked cid4, pid1478
[ 2408.352404] sjnprio_event: prev->(cid5:pid1479),next->(cid4:pid1478)
[ 2408.353336] sjnprio: task_tick cid4, pid1478
[ 2408.354414] sjnprio_event: DEQ(cid4:pid1478:dl1.000000001)
[ 2408.355328] sjnprio_event: ENQ(cid4:pid1478:dl1.000000001)
[ 2408.356289] sjnprio_event: DEQ(cid4:pid1478:dl1.000000001)
[ 2408.357180] sjnprio: pick_next_task: picked cid3, pid1477
[ 2408.358036] sjnprio_event: prev->(cid4:pid1478),next->(cid3:pid1477)
[ 2408.358975] sjnprio: task_tick cid3, pid1477
[ 2408.360081] sjnprio_event: DEQ(cid3:pid1477:dl1.000000001)
[ 2408.360982] sjnprio_event: ENQ(cid3:pid1477:dl1.000000001)
[ 2408.361884] sjnprio: task_tick cid3, pid1477
[ 2408.362798] sjnprio_event: DEQ(cid3:pid1477:dl1.000000001)
[ 2408.363649] sjnprio: pick_next_task: picked cid2, pid1476
[ 2408.364504] sjnprio_event: prev->(cid3:pid1477),next->(cid2:pid1476)
[ 2408.365452] sjnprio: task_tick cid2, pid1476
[ 2408.366551] sjnprio_event: DEQ(cid2:pid1476:dl1.000000001)
[ 2408.367495] sjnprio_event: ENQ(cid2:pid1476:dl1.000000001)
[ 2408.368377] sjnprio_event: DEQ(cid2:pid1476:dl1.000000001)
[ 2408.369252] sjnprio: pick_next_task: picked cid1, pid1475
[ 2408.370105] sjnprio_event: prev->(cid2:pid1476),next->(cid1:pid1475)
[ 2408.371029] sjnprio: task_tick cid1, pid1475
[ 2408.372151] sjnprio_event: DEQ(cid1:pid1475:dl1.000000001)
[ 2408.373052] sjnprio_event: ENQ(cid1:pid1475:dl1.000000001)
[ 2408.373954] sjnprio: task_tick cid1, pid1475
[ 2408.374870] sjnprio_event: DEQ(cid1:pid1475:dl1.000000001)
[ 2408.375721] sjnprio: pick_next_task: picked cid0, pid1474
[ 2408.376574] sjnprio_event: prev->(cid1:pid1475),next->(cid0:pid1474)
[ 2408.377504] sjnprio: task_tick cid0, pid1474
[ 2408.378650] sjnprio_event: DEQ(cid0:pid1474:dl2.000000001)
[ 2408.379561] sjnprio_event: ENQ(cid0:pid1474:dl2.000000001)
[ 2408.380444] sjnprio_event: DEQ(cid0:pid1474:dl2.000000001)
[ 2408.381306] sjnprio_event: prev->(cid0:pid1474),next->(cid-1:pid13)
```

Figure 3: dmesg output 2 (Process 7 -> 0)