Real Time Embedded System
Assignment – 1

Real-time Tasks Models in Linux

Team - 12
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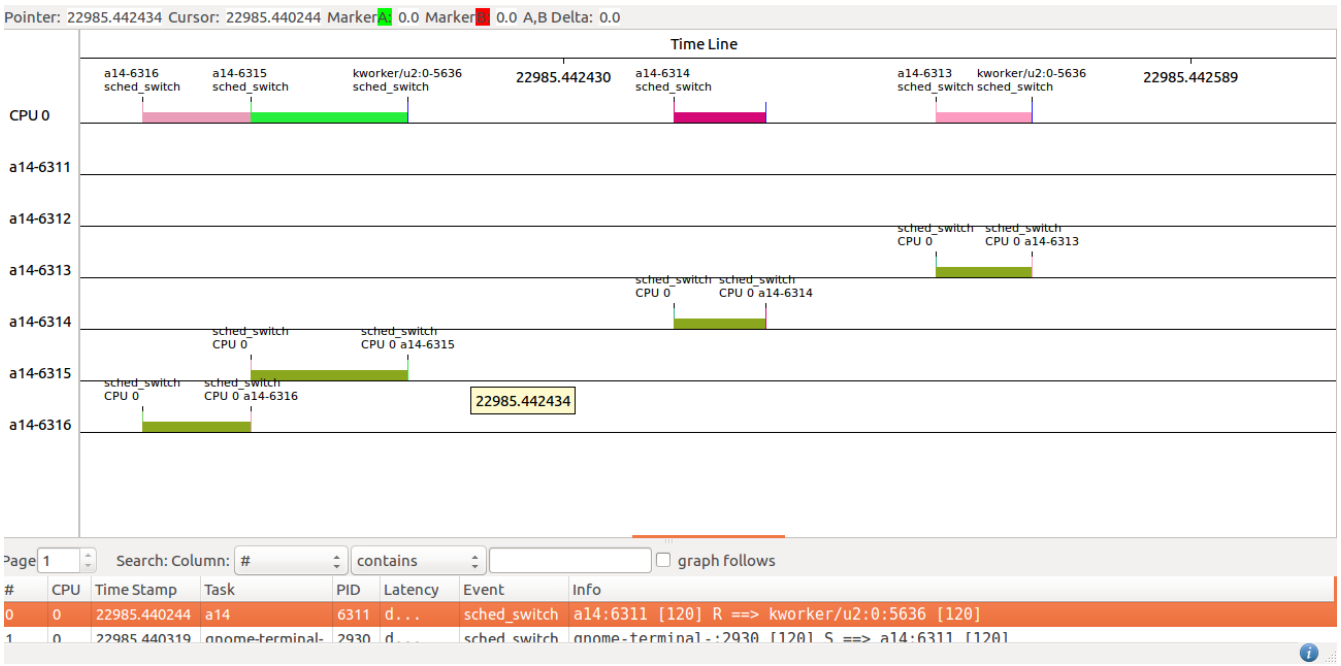
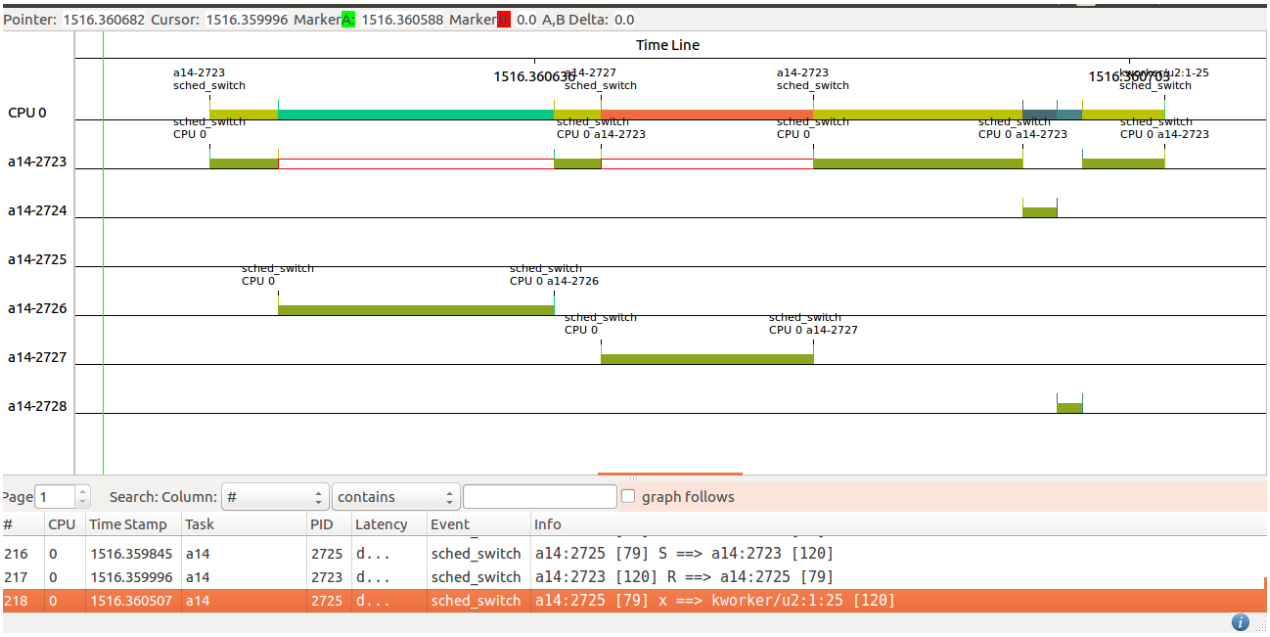
The Input file used is as follows:
4 1000
P 20 20 10 L1 1995000 U1 300
P 80 25 40 L1 200000 U1 100
P 40 30 20 L2 400000 U2 100
A 10 0 500

Scheduling of tasks are shown in kernelshark:



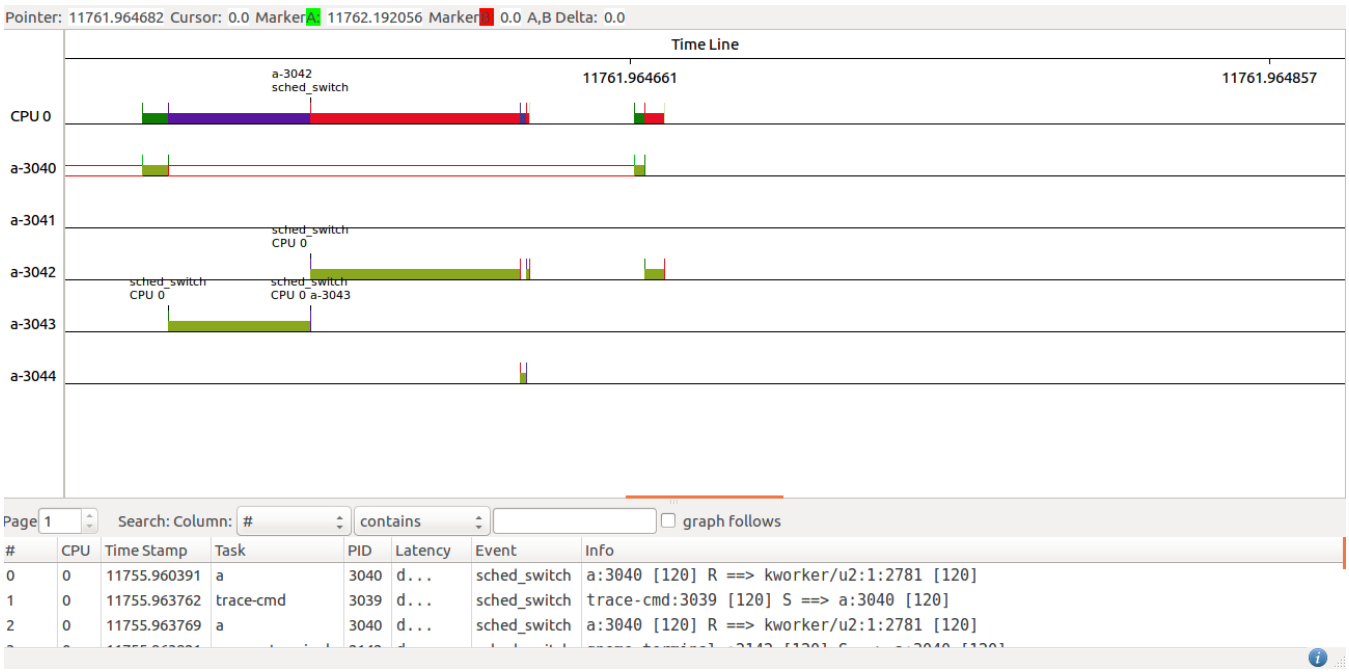
From the above image, pid-6316 with a priority of 80 has the highest priority out of the 4 processes. Hence it is scheduled immediately and is then followed by pid-6315 with priority as 40. Then comes pid-6314 with priority 20. With the least priority of 10 among the 4 processes pid-6313 is scheduled after all other higher priority processes.

Task Over-run condition:
Following image shows Over-run condition where pid-2723 is requested to start but has not finished its previous execution yet. It is over-running due to pre-emption by pid-2726 and pid-2727.



Priority inversion:

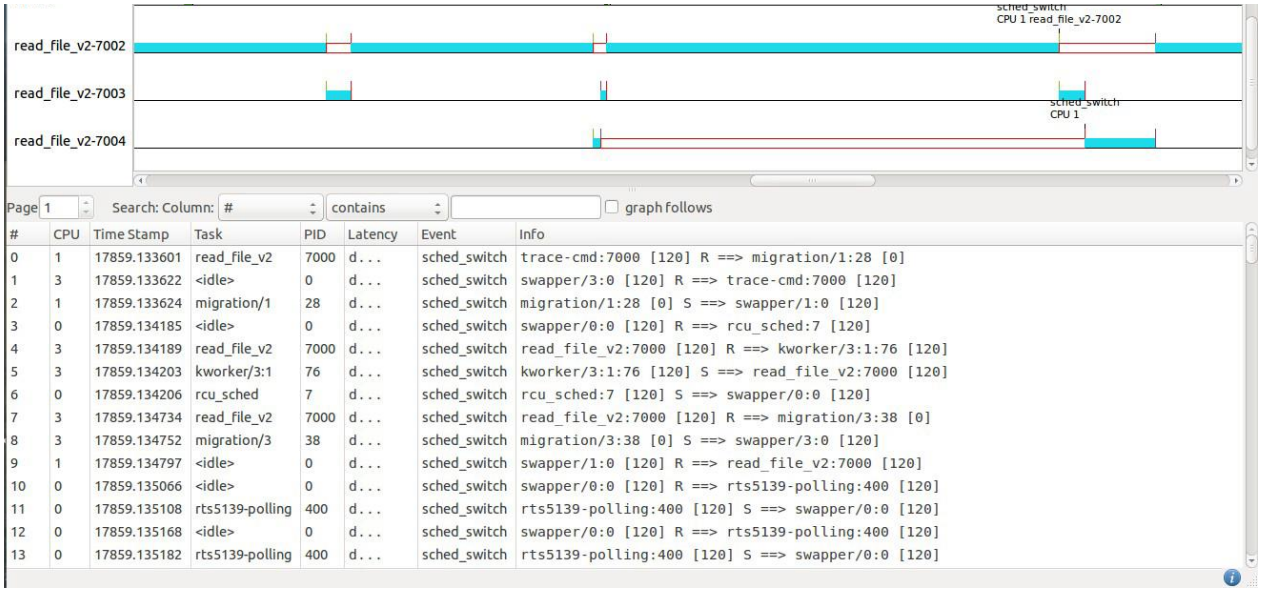
Priority inversion scenario in scheduling can be seen in this image where a high priority task (pid-3040) is indirectly pre-empted by a lower priority task (pid-3043) effectively "inverting" the relative priorities of the two tasks.



Priority Inheritance:

Priority Inheritance is shown in this image where pid-7002 is holding L1. Pid-7003 tries to acquire the resource but cannot because of the lock. Thus, it gets blocked.

Pid-7004 with priority 40 tries to run but is pre-empted by pid-7002 which is at a temporary priority of 80. Here we see the priority getting inherited.



Page 1 Search: Column: # contains graph follows

#	CPU	Time Stamp	Task	PID	Latency	Event	Info
0	1	17859.133601	read_file_v2	7000	d...	sched_switch	trace-cmd:7000 [120] R ==> migration/1:28 [0]
1	3	17859.133622	<idle>	0	d...	sched_switch	swapper/3:0 [120] R ==> trace-cmd:7000 [120]
2	1	17859.133624	migration/1	28	d...	sched_switch	migration/1:28 [0] S ==> swapper/1:0 [120]
3	0	17859.134185	<idle>	0	d...	sched_switch	swapper/0:0 [120] R ==> rcu_sched:7 [120]
4	3	17859.134189	read_file_v2	7000	d...	sched_switch	read_file_v2:7000 [120] R ==> kworker/3:1:76 [120]
5	3	17859.134203	kworker/3:1	76	d...	sched_switch	kworker/3:1:76 [120] S ==> read_file_v2:7000 [120]
6	0	17859.134206	rcu_sched	7	d...	sched_switch	rcu_sched:7 [120] S ==> swapper/0:0 [120]
7	3	17859.134734	read_file_v2	7000	d...	sched_switch	read_file_v2:7000 [120] R ==> migration/3:38 [0]
8	3	17859.134752	migration/3	38	d...	sched_switch	migration/3:38 [0] S ==> swapper/3:0 [120]
9	1	17859.134797	<idle>	0	d...	sched_switch	swapper/1:0 [120] R ==> read_file_v2:7000 [120]
10	0	17859.135066	<idle>	0	d...	sched_switch	swapper/0:0 [120] R ==> rts5139-polling:400 [120]
11	0	17859.135108	rts5139-polling	400	d...	sched_switch	rts5139-polling:400 [120] S ==> swapper/0:0 [120]
12	0	17859.135168	<idle>	0	d...	sched_switch	swapper/0:0 [120] R ==> rts5139-polling:400 [120]
13	0	17859.135182	rts5139-polling	400	d...	sched_switch	rts5139-polling:400 [120] S ==> swapper/0:0 [120]