RTES
Assignment 1 Report

By: Shashank Karkare

Futex: NPTL pthread mutex is implemented via futex. Futex is short for fast – mutex , which comes from the way futex works. Futex executes in user space if there is no contention and thus reducing the time need for locking or unlocking but if there is contention then the wait queue is used and then system call is made which adds overhead. Futex works on address of the variable that is shared between the process or threads. To check for the variable address mostly architecture specific assembly code is written to atomically check or change the value of the variable. Futex is in three states , locked , unlocked or in contention . System call is required for processes and threads sleeping on the variable to wake them up.

Real Time Scheduling in Linux: Linux supports real-time process scheduling. Process or thread priority should be in between 1(min) and 99 (max). Only on these priority can the real time scheduling policy be applied. Two policy is implemented namely SCHED_FIFO and SCHED_RR.
All realtime task is priority based and a high priority task runs before a low priority task no matter which scheduling policy is implemented. The difference is when two task have the same priority then in case of SCHED_FIFO , the task which arrived first is executed first and then the another (in First-In First-Out) fashion. In second case ,SCHED_RR, they are executed in round robin fashion with certain time quantum given to each task.
To ensure that a realtime task does not hogs the cpu time , scheduling decision was made by linus that for every 1 sec 0.95 sec will be given to realtime task and 0.05 sec will be given to the normal task so that system responsiveness does not degrade.

Ftrace: Ftrace is the tracer which is used to trace the internals of the kernel, but its usage has expanded just from kernel function trace to user-space and many different functionalities. It can be used for debugging nad analyzing latencies and performance issues inside the kernel. It can be used to trace many static points in the kernel like , context switches , interrupts disable time and many more. Ftrace uses the debugfs file system to hold the control files as well as the files to display output. Generally these debugfs is located /sys/kernel/debug directory. It contains the files used to display the output of the trace-cmd.
Trace-cmd is tool which interacts with the ftrace on the command line and can perform various function depending on which command is provided to it.