REAL TIME OPERATING SYSTEMS

Lesson-13:

Hard and Soft Real Time Design Considerations

1. Hard Real Time Design Considerations

Hard real time

- Hard real time means strict about adherence to each task deadline. When an event occurs, it should be serviced within the predictable time at all times in a given hard real time system.
- The preemption period for the hard real time task in worst case should be less than a few μs.

Hard real time

- A hard RT RTOS is one, which has predictable performance with no deadline miss, even in case of sporadic tasks (sudden bursts of occurrence of events requiring attention).
- Automobile engine control system and anti lock brake are the examples of hard real time systems

Hard real time system design

- Disabling of all other interrupts of lower priority when running the hard real time tasks
- Preemption of higher priority task by lower priority tasks
- Some critical code in assembly to meet the real time constraint (deadline) fast
- Task running in kernel space, [This saves the time required to first check whether access is outside the memory space allocated to the kernel functions.]

Hard real time system design

- Provision of asynchronous IOs
- Provision of locks or spin locks
- Predictions of interrupt latencies and context switching latencies of the tasks
- Predictability is achieved by writing all functions which execute always take the same predefined time intervals in case of varying rates of occurrences of the events.

Hard real time system design

- Response in all the time slots for the given events in the system and thus providing the guaranteed task deadlines even in case of sporadic and aperiodic tasks.
- Sporadic tasks means tasks executed on the sudden-bursts of the corresponding events at high rates, and
- Aperiodic tasks mean task having no definite period of event occurrence.

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Example of hard real time system

- video transmission, each picture frame and audio must be transferred at fixed rate

2. Soft Real Time Design Considerations

Soft real time system

- One in which deadlines are mostly met.
- Soft real time means that only the precedence and sequence for the task-operations are defined, interrupt latencies and context switching latencies are small but there can be few deviations between expected latencies of the tasks and observed time constraints and a few deadline misses are accepted

Soft real time task

- The preemption period for the soft real time task in worst case may be about a few ms.
- Mobile phone, digital cameras and orchestra playing robots are examples of soft real time systems.

Summary

We learnt

- Soft real time systems can accept few deadline misses and
- Hard real time systems adhere to the predicted latencies, deadlines and time constraints of the processes

End of Lesson 13 of Chapter 8