REAL TIME OPERATING SYSTEMS

Lesson-23:
Performance Metrics

1. Models for Performance Measures

Three types of tasks for finding performance

- Scheduler must take into account (aperiodic, periodic and sporadic) separately.
- (i) An aperiodic task needs to be run only once.
- (ii) A periodic task needs to run after the fixed periods and it that must be executed before its next preemption is needed.
- (iii) A sporadic task needs to be checked for run after a minimum time period of its occurrence.

Predictably response to the event and minimum interrupt latency as Performance Measures

- An RTOS should quickly and predictably respond to the event.
- It should minimum interrupt latency and fast context switching latency.

Three Models for Performance Measures

- (i) Ratio of the sum of latencies of the tasks and Interrupt with respect to the sum of the execution times.
- (ii) CPU load for how much time CPU not idle
- (iii) Worst-Case Execution time with respect to mean execution time.

Interrupt latencies as Performance Metric

- Interrupt and task execution latencies with respect to the sum of the execution times must be very small
- There must be fast context switching .

CPU Load as Performance Metric

- Each task gives a load to the CPU that equals the task execution time divided by the task period
- CPU load or ***system load*** estimation in the case of multitasking is as follows. Suppose there are *m* tasks. For the multiple tasks, the *sum* of the CPU loads for all the tasks and ISRs should be less than 1

CPU Load

- CPU load equal to 0.1 (10%)─ means the CPU is underutilized and spends its 90% time in a waiting mode.
- Since the executions times can vary or and the task periods vary, the CPU loads can also vary

Sporadic Task Model Performance Metric

- T_{total} = Total length of periods for which sporadic tasks occur
- e = Total Task Execution Time
- T_{av} = Mean periods between the sporadic occurrences
- T_{min} = Minimum Period between the sporadic occurrences

Sporadic Task Model Performance Metric

- Worst-Case Execution-time performance metric, *p* is measured calculated as follows for a tasks worst case of a task in a model. model.
- $p = p_{worst} = (e * T_{total} / T_{av}) / (e * T_{total} / T_{min})$.
- Because average rate of occurrence of sporadic task = (T_{total} / T_{av}) and maximum rate of sporadic task burst = T_{total} / T_{min}.

Summary

We learnt

- Various models to define a performance metric.
- Three performance metrics for schedule management by the RTOS
- (i) interrupt latencies with respect to the execution times
- (ii) CPU load.
- (iii) Worst case execution time.

End of Lesson 23 of Chapter 8