

REAL TIME OPERATING SYSTEMS

Lesson-22: Other Scheduling Methods

1. Common scheduling models

Common scheduling models

- Cooperative Scheduling of ready tasks in a circular queue. It closely relates to function queue scheduling.
- Cooperative Scheduling with Precedence Constraints
- Cyclic scheduling of periodic tasks and Round Robin Time Slicing Scheduling of equal priority tasks
- Preemptive Scheduling
- Scheduling using 'Earliest Deadline First' (EDF) precedence.

Common scheduling models

- Rate Monotonic Scheduling using 'higher rate of events occurrence First' precedence
- Fixed Times Scheduling
- Scheduling of Periodic, sporadic and aperiodic Tasks
- Advanced scheduling algorithms using the probabilistic Timed Petri nets (Stochastic) or Multi Thread Graph for the multiprocessors and complex distributed systems.

2. Earliest Deadline First' (EDF) precedence

EDF

- When a task becomes ready, its will be considered at a scheduling point.
- The scheduler does not assign any priority.
- It computes the deadline left at a scheduling point.
- Scheduling point is an instance at which the scheduler blocks the running task and re-computes the deadlines and runs the EDF algorithm and finds the task which is to be run

EDF

- An EDF algorithm can also maintain a priority queue based on the computation when the new task inserts

3. Rate Monotonic Scheduler

Rate Monotonic Scheduler

- Rate monotonic scheduler computes the priorities, p , from the rate of occurrence of the tasks.
- The i -th task priority, p_i is proportional to ($1/t_i$) where t_i is the period of the occurrence of the task event.

Rate Monotonic Scheduler

- RMA gives an advantage over EDF because most RTOSes have provisions for priority assignment. Higher priority tasks always get executed

4. Precedence Assignment in the Scheduling Algorithms

Precedence Assignment in the Scheduling Algorithms

- Best strategy is one, which is based on EDF (Earliest Deadline First) precedence.
- Precedence is made the highest for a task that corresponds to an interrupt source, which occurs at the earliest a succeeding times. and which deadline will finish earliest at the earliest

Precedence Assignment in the Scheduling Algorithms

- We assign precedence by appropriate strategy in the case of the variable CPU loads for the different tasks and variable EDFs .

Dynamic Precedence Assignment

- Firstly, there is deterministic or static assignment of the precedence
- It means firstly there is rate monotonic scheduling (RMS).
- Later on the scheduler dynamically assigns and fixes the timeout delays afresh, and assigns the precedence as per EDF.
- The need for of the dynamic assignment arises due to the sporadic tasks and the distributed or multiprocessor indeterminate environment.

5. Fixed (Static) Real Time Scheduling of the Tasks

Fixed (Static) Real Time Scheduling of the Tasks

- A scheduler is said to be using a fixed time scheduling method when the schedule is static and deterministic

Methods for Fixed (Static) Real Time Scheduling

- (i) *Simulated annealing* method— different schedules fixed and the performance is simulated. Now, schedules for the tasks are gradually incremented by changing the interrupt timer settings (using a corresponding OS function) till the simulation result shows that none is missing its deadline.

Methods for Fixed (Static) Real Time Scheduling

- (ii) *Heuristic* method. Here, the reasoning or past experience lets us helps to define and fixing the fixed schedules.

Methods for Fixed (Static) Real Time Scheduling

- (iii) *Dynamic programming* model. This is as follows: Certain specific running program first determines the schedules for each task and then the timer interrupt *s* loads the timer settings from the outputs from that program

Summary

We learnt

- EDF
- Rate Monotonic Scheduling using 'higher rate of events occurrence First' precedence
- Fixed Times Scheduling: Simulated annealing, Heuristic and Dynamic programming

End of Lesson 22 of Chapter 8