REAL TIME OPERATING SYSTEMS

Lesson-17:

Task Cyclic Scheduling of Periodic Tasks

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. Cyclic Scheduling Periodic tasks

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Time Periodic Scheduling in the cyclic order

- Assume periodically occurring three tasks

- Let in time-frames allotted to the first task, the task executes at t1, t1 + T_{cycle}, t1+ 2 × T_{cycle}, .., second task frames at t2, t2 + T_{cycle}, t2+ 2 × T_{cycle} and third task at t3, t3 + T_{cycle}, t3+ 2 × T_{cycle}, … .

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Time Period Scheduling in the Periodic tasks

- Start of a time frame is the scheduling point for the next task in the cycle.

- T_{cycle} is the cycle for repeating cycle of execution of tasks in order 1, 2 and 3 and equals start of task 1 time frame to end of task 3 frame.

- T_{cycle} is period after which each task time frame allotted to that repeats

Case : $t_{cycle} = N \times$ Sum of the maximum times for each task

- Then each task is executed once and finishes in one cycle itself.

- When a task finishes the execution before the maximum time it can takes, there is a waiting period in-between period between two cycles.

- The worst-case latency for any task is then $N \times$ Sum of the maximum times for each task. A task may periodically need execution. A task period for the its need of required repeat execution of a task is an integral multiple of t_{cycle}.

Tasks C1 to C5 Cyclic Scheduling

Task C1 Check Message at Port A Successive 20 mS	Task C2 Read Port A and Place it At Queue	Task C3 Decrypt Queue Messages	Task C4 Encode Queue Messages	Task C5 Transmit by Writing at Port B

Task C1 to Task C5

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Example of Video and audio signals

- Signals reaching at the ports in a multimedia system and processed

- The video frames reach at the rate of 25 in one second.

- The cyclic scheduler is used in this case to process video and audio with Tcycle = 40 ms or in multiples of 40 ms.

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Orchestra Playing Robots

- First the director robot sends the musical notes. Then, the playing robots receive and acknowledge to the director.

- In next cycle, the master robot again sends the musical notes.

- The cyclic scheduler is used in this case to send and receive signals by each robot after the cycle period

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Summary

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We learnt

- A cyclic scheduling is very efficient for handling periodic tasks and when the number of tasks is small

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End of Lesson 17 of Chapter 8