Real-Time Systems
Scheduling Algorithms

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Types of Real-Time Systems

- Soft Real-Time Systems – failure to meet a specified deadline reduces the utility of the result, but does not lead to a significant financial loss.

- Hard Real-Time Systems – failure to meet a specified deadline can lead to catastrophic consequences.


Types of Scheduling Algorithms

- Static
  - Static priority

- Dynamic
  - Dynamic priority

Timeline

- 1970: Preemptive scheduling
- 1980: Bus scheduling
- 1990: Distributed scheduling
- 2000: EDV, VED

Scheduling Algorithms

- Static
  - Stability algorithm (Gantt charts)
- Dynamic
  - Best fit
  - RMS, EDF
  - IS, PE, DS, EPE

RT Round Robin

Classic Paper: Liu & Layland

Scheduling Algorithms for Multiprogramming in a Hard-Real-Time Environment
- Pro Forma Abstract: Radical Solution
- Question: Development Method
- Result: Technique
- Validation: Analysis

Algorithms (1)
- Rate Monotonic Scheduling (RMS) – task with shortest period has highest priority
- Earliest Deadline First (EDF) – task with earliest deadline has highest priority
- Priority Exchange (PE) – aperiodic task slot is swapped with periodic task slot
- Deferred Server (DS) – aperiodic task slot is kept until time expires
- Extended Priority Exchange (EPE) – uses unused time of periodic tasks to service aperiodic tasks

Algorithms (2)
- Noncooperative (NC) – task is rejected if it can’t be scheduled locally
- Random Scheduling (RS) – task is sent to a randomly selected node
- Focused Addressing (FA) – task is sent to a node that is estimated to have enough surplus
- Bidding – task is sent to a node based on best bid received from nodes in the system
- Flexible – task is sent to a node based on a combination of focused addressing and bidding

Algorithms (3)
- Immediate Server (IS) – similar to PE but aperiodic server has highest priority
- Critical Task Indicating (CTI) – tasks are deferred until their critical deadline point
- Earliest Deadline first with larger Value (EDV) – tasks with same deadline but higher importance have higher priority
- Value first with Earliest Deadline (VED) – tasks with same importance but earlier deadline have higher priority
Modern Paper: Wang, et. al.

Design and Evaluation of Priority Table Based Real-Time Scheduling Algorithms

- Pro Forma Abstract: Enhanced Solution
- Question: Development Method
- Result: Technique
- Validation: Analysis

Bibliography (1)


Bibliography (2)