Work-in-Progress: Preference-Oriented Scheduling in Multiprocessor Real-Time Systems

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Beyond Timeliness: Execution Preferences!

- Classical RT schedulers treat tasks the same
  - EDF/RMS: execute all tasks at their earliest times
  - EDL/DP: execute all tasks at their latest times

- Tasks may prefer to be executed early or late
  - Fault-tolerant systems w. primary/backup model

An example of two tasks $T_1 (2, 5)$, $T_2 (3, 10)$ with their backups $B_1$ and $B_2$
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PO Scheduler!
Models and Prior Work

- Real-time tasks with execution preferences
  - Set $\Psi$ of periodic task $T_i (c_i, p_i)$: WCET, period
  - Each task has a preference: $\Psi = \Psi_S \cup \Psi_L$
    - Early tasks: as soon as possible (ASAP)
    - Late tasks: as late as possible (ALAP)
  - Preference value (PV)
    - For each task instance
    - Early/late tasks: finish/start times

Prior work: Preference-Oriented Schedulers

- POED: deadline based PO scheduler [Guo’15]
- POFP: fixed-priority based PO schedule [Begam’16]
PO Scheduling: Multiprocessor Systems

- Several observations for PO partitioning
  - Each processor: mixture of early/late tasks
  - Early/late tasks w. harmonic periods $\Rightarrow$ same P

- POPA (period-aware) partitioning
  - Tasks w. harmonic periods $\Rightarrow$ pairs (or groups)
    - Task pair: one early and one late tasks w. same period
    - Task group: balanced early/late task utilizations
  - Sort task pairs (groups) w. aggregated utilization
  - Map task pairs (groups) $\Rightarrow$ processors
    - WFD or other heuristics
    - Map remaining individual tasks at the end