Fixed Priorities or EDF for Distributed Real-Time Systems?

Juan M. Rivas, J. Javier Gutiérrez and Michael González Harbour

Computers and Real-Time Group, Universidad de Cantabria, 39005-Santander, SPAIN
{rivasjm, gutierjj, mgh}@unican.es

GOAL: to compare how FP and EDF can influence the schedulability of a distributed real-time system under a variety of conditions: different system sizes, deadline/period ratios, different lengths of end-to-end flows, ...; inspired by [1]

Example specification:
- 20 E2E flows
- Up to 8 steps per E2E flow
- 10 single step E2E flows
- 5 processors
- Maximum periods ratio= 1000
- D=Num. of steps in E2E flow*T
- FP, local and global EDF
- PD and HOSPA

Evolution rules:
- 50 seed models
- Initial and last utilizations: 40%-99%
- Utilization step: 1%
- Uniform utilization distribution

24000 tests executed
- Analysis, optimization and calculation of slacks

Computation times:
- Almost 4 months of CPU time
- Less than 15 hours of supercomputer usage

**Results for an Example**

- Maximum utilizations reached for scheduling optimization techniques
- Slacks when applying schedulability analysis techniques
- Computation times for tests

**GEN4MAST (Results Processing)**

- Database (HDF5)
- MAST Results Description

**Other MAST Tools**

- Model Builders
  - (Graphical editor, UML profile, Ada components, etc.)
- Results Viewer
- Simulator

**GEN4MAST (Generator)**

- MAST System Description
- Supercomputer scripts
- GEN4MAST (Results Processing)

**MAST Analysis Tool**

- Sensitivity Analysis
  - Slacks:
    - System
    - Processing Resource
    - End-to-end Flow
    - Operation
- E2E Flow Model

- Scheduling Parameters Assignment Techniques
- Schedulability Analysis Techniques
- Distributed Systems
  - HOSPA [9]
  - Simulated Annealing
  - PD [4]
  - NPD [4]
- Distributed Systems:
  - Offset-Based [6][7]
  - Local EDF [8]
  - Global EDF [10]
  - Heterogeneous [9]

**Evolution Rules**

- Number of seed models with the same specification
- Initial and last utilization values (%)
- Utilization step (%)
- Utilization distribution (uniform/non-uniform)

**System Specification**

- Number of end-to-end (E2E) flows
- Maximum number of steps per E2E
- Number of E2Es with a single step
- Number of processors and networks
- Deadline and period ranges and ratios
- Type of schedulers: FP, local or global EDF

**GEN4MAST (Generator)**

- Application Profiles
- MAST home page: http://mast.unican.es/

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- Less than 15 hours of supercomputer
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