

FROM RESEARCH TO INDUSTRY

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Optimizing Real-Time Systems

(OVSTR)



DigiCosme Research Days

April 12th, 2016

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leti & list

- Presentation of the OVSTR working group
- Subject and outcomes of first meeting
- Next meetings and outlook

- Subject: optimization of real time systems
 - Currently performed at a single level of design only
 - Instead focus on **cross-layer optimizations**:
From high-level models down to the hardware level
 - Keywords: real-time task scheduling, WCET analysis, probabilistic analysis, high-level modeling, compilers, (predictable) computer architecture, multi-core, network-on-chips, applications

- Goal: identify scientific problems for collaboration
 - Foster discussion at the end of meetings (reserve 1 hour per meeting)
 - Community involved to find next meeting topics

- Website: <https://digicosme.lri.fr/gt+ovstr>

■ One-day meetings focusing on a specific subject

- 2-3 meetings per year
- Open to everyone interested

■ Morning Session:

- Invited talks focusing on the state-of-the-art
- Complementary topics
- Coordinated presentations

■ Afternoon Session:

- Presentations focusing on a given contribution
- Proposed by community



- **First OVSTR meeting** (October 15, 2015)
 - Subject: **cache issues** in WCET analysis and scheduling of real-time tasks
 - 33 participants (France, Germany, Luxembourg)

- **Morning sessions (invited):**
 - **Jan Reneike** (Saarland University, Germany):
« Bounding the Cache-Related Preemption Delays »
 - **Pascal Richard** (University of Poitiers):
« Hard Real-Time Scheduling with Cache-Related Preemptions delays »

- **Afternoon session:**
 - 4 talks (LTCI/Telecom ParisTech, Inria, University of Brest, University of Luxembourg)

- 3 talks of outstanding/best papers of RTNS 2015
 - Slides of all tasks available on website

Slides extracted from invited talks ... (thanks to them!)

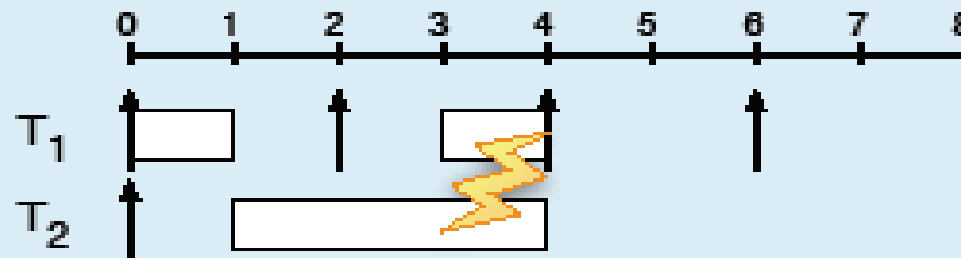
Why use preemptive scheduling?



- Preemption often increases schedulability of task sets.
- Tasks with short deadlines are often unschedulable non-preemptively.

Example

Given: Two periodic tasks T_1 and T_2 , with periods $P_1 = 2$, $P_2 = 8$, deadlines $D_1 = P_1$, $D_2 = P_2$, and execution times $C_1 = 1$, $C_2 = 3$.



■ Synthesis of the discussions

- Should scheduler be aware of more information coming directly from the application level?
- Should the notion of tasks be refined, e.g., by in execution phases having possibly different properties?
 - Capture more semantics from higher levels of design
 - Extend current task models or even redefine them

■ Submission of an ANR proposal: SWORTS

- Enhance real-time system design flow:

Optimize timing properties based on high-level models (CPAL), covering code generation, WCET analysis, and task scheduling.

- May 23rd at LTCI/Telecom ParisTech
 - Subject: parallelization of real-time tasks
 - Registration available here: <https://digicosme.lri.fr/gt+ovstr>
 - Afternoon: slots for shorter talks are still available!

- Morning session:
 - Laurent George (ESIEE):
 - « Real-time multiprocessor scheduling of parallel tasks »
 - Christine Rochange (University of Toulouse):
 - « Timing analysis of parallel tasks running on parallel architectures »

- List of potential upcoming subjects:

Network-on-chips (traversal times and task mapping), design of time-predictable hardware platforms, reproducibility, code generation