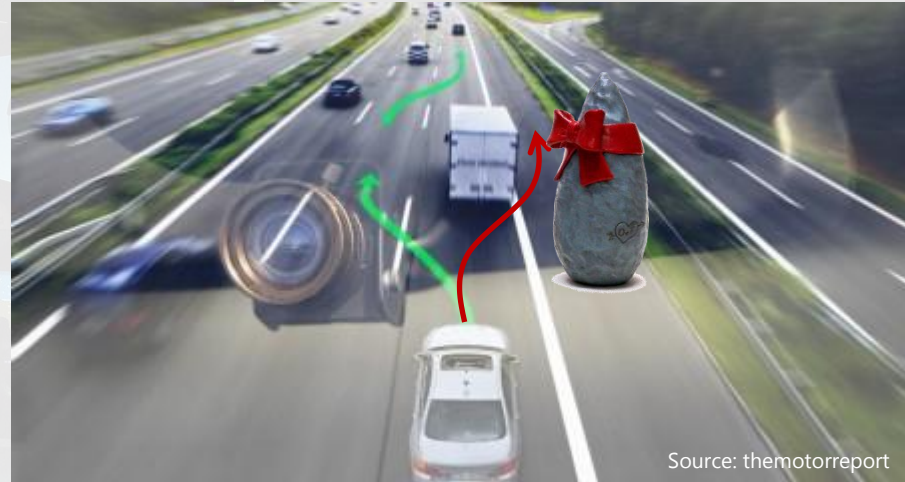


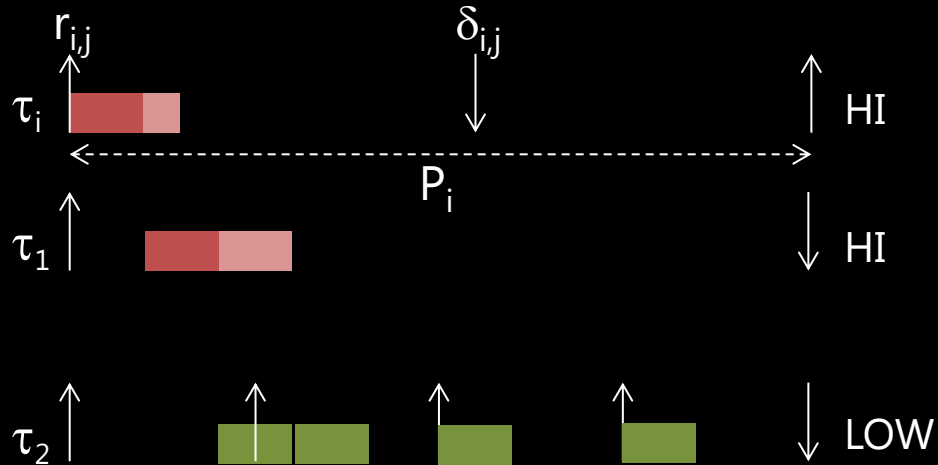
On the Expressiveness of Scheduling Contexts for Mixed-Criticality Scheduling

Marcus Völöp, Adam Lackorzynski, Hermann Härtig

Mixed Criticality Systems

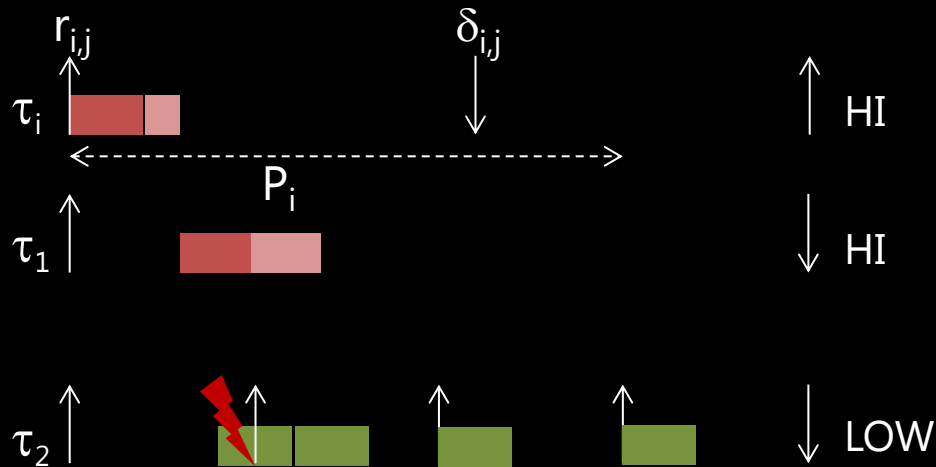


Mixed Criticality Scheduling



Criticality Monotonic – RM

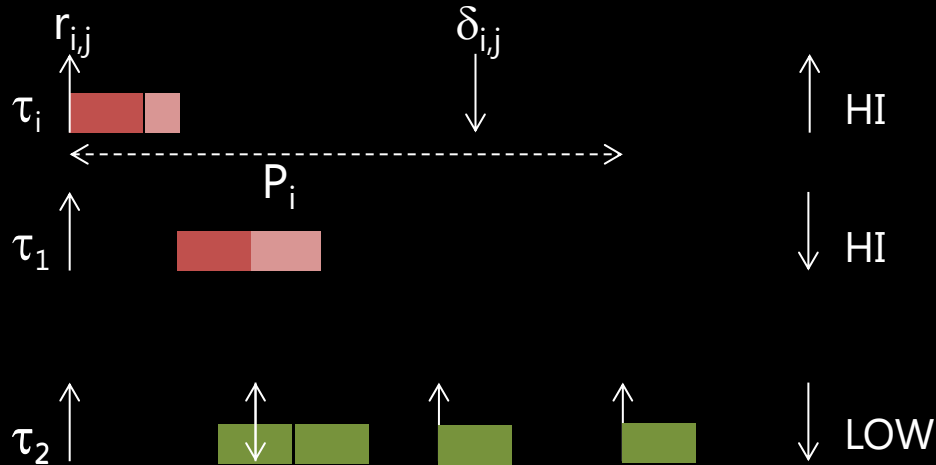
[S. Vestal '07; H. Li, S. Baruah '10]



Mixed Criticality Scheduling

Own Criticality Based Priority Assignment (OCBP)

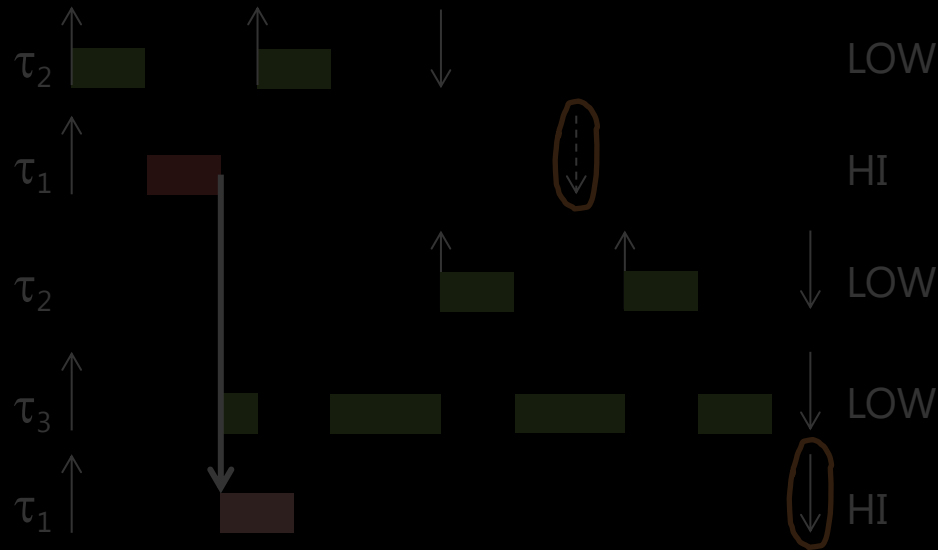
[S. Vestal '07; H. Li, S. Baruah '10]



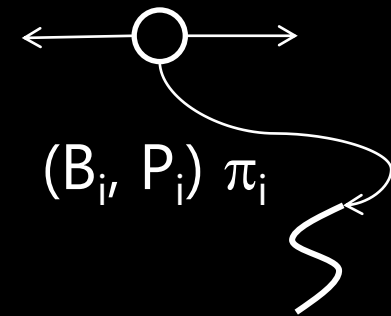
Mixed Criticality Scheduling

EDF – Virtual Deadlines

[S. Baruah, V. Bonifaci, G. D'Angelo, A. Marchetti-Spaccamela, S. van der Ster, L. Stougie '12]

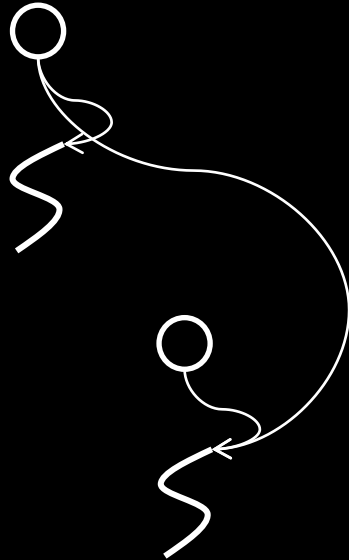


Scheduling Context

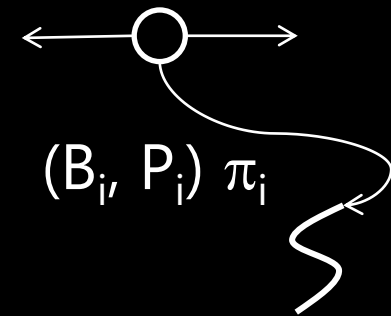


Timeslice Donation

[U. Steinberg, J. Wolter, H. Härtig '05]



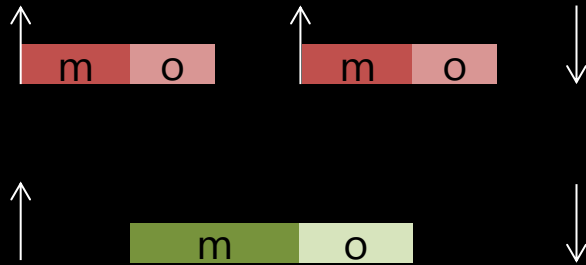
Scheduling Context



Scheduling Contexts (SC)

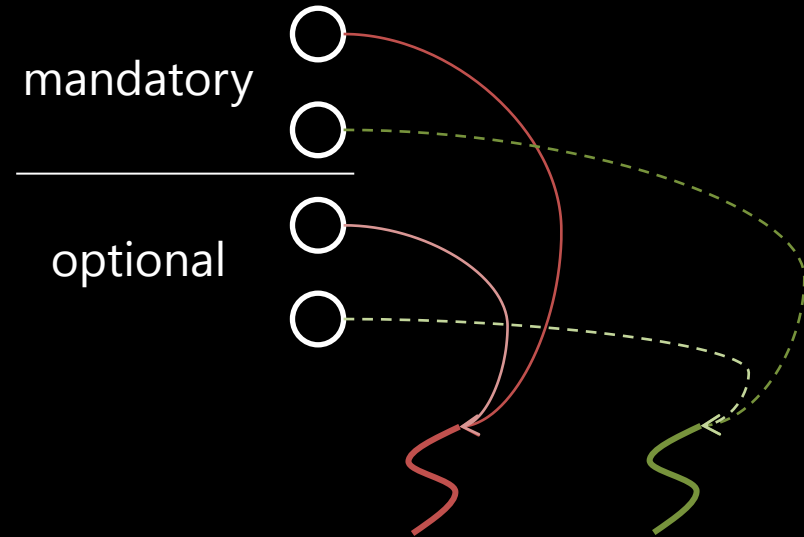
Imprecise Computation

[J.-Y. Chung, J. Liu, K.-J. Lin '90]



Quality Assuring Scheduling

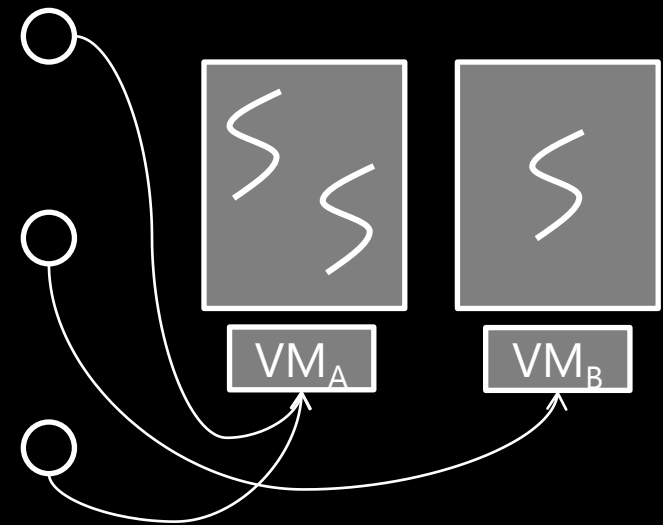
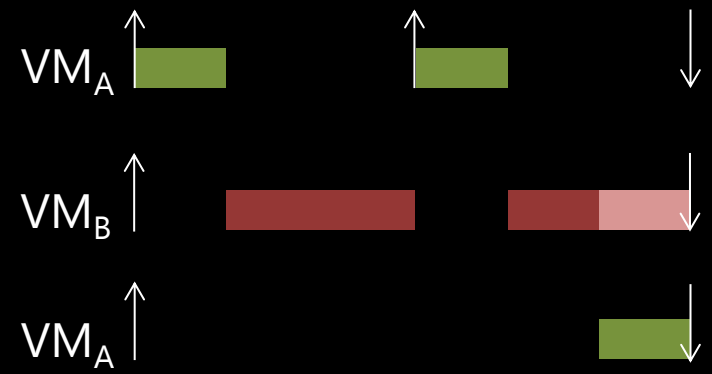
[C.-J. Hamann, J. Löser, L. Reuther, S. Schönberg, J. Wolter, H. Härtig '01]



Scheduling Contexts (SC)

Flattening Mixed Criticality Schedules

[A. Lackorzynski, A. Warg, M. Völz, H. Härtig '12]



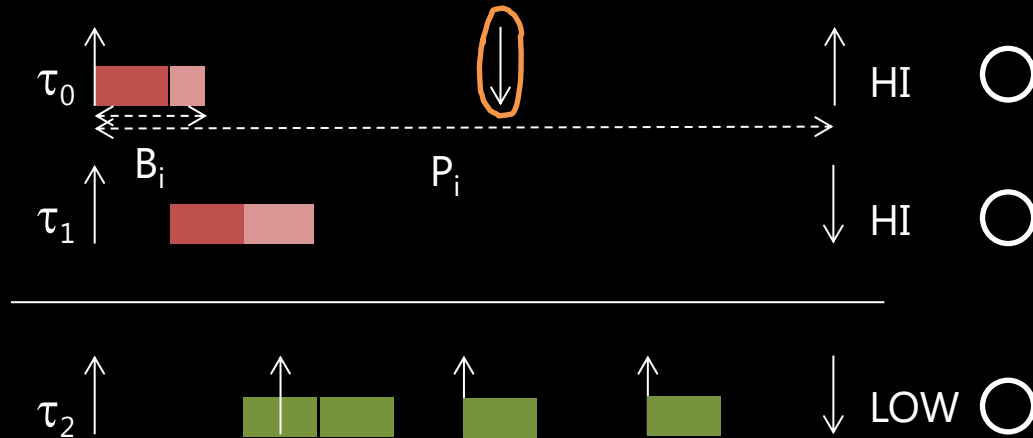
Criticality Monotonic – RM

Scheduling Context

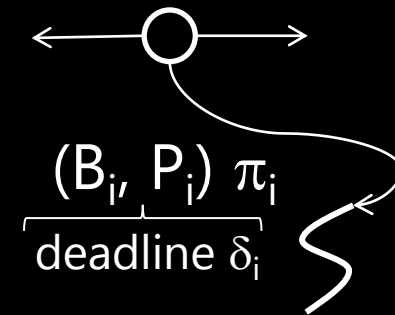
▪ How can we express mixed-criticality schedulers in terms of scheduling contexts?

▪ How can we extend scheduling contexts to become more expressive?

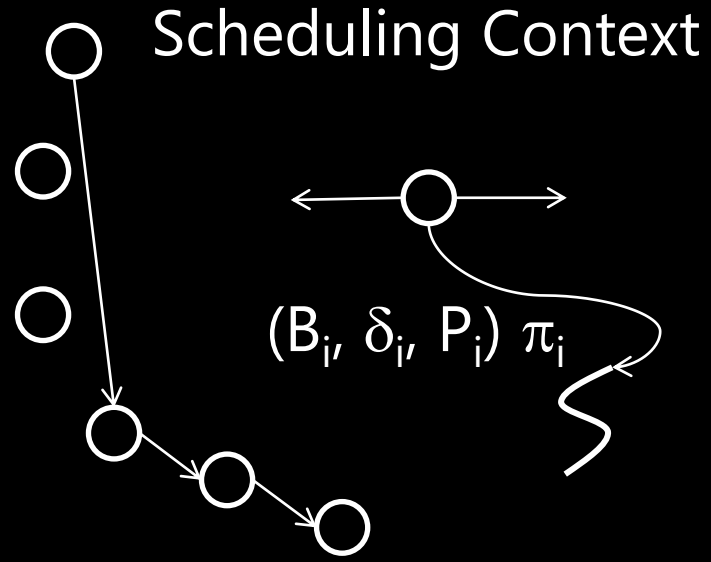
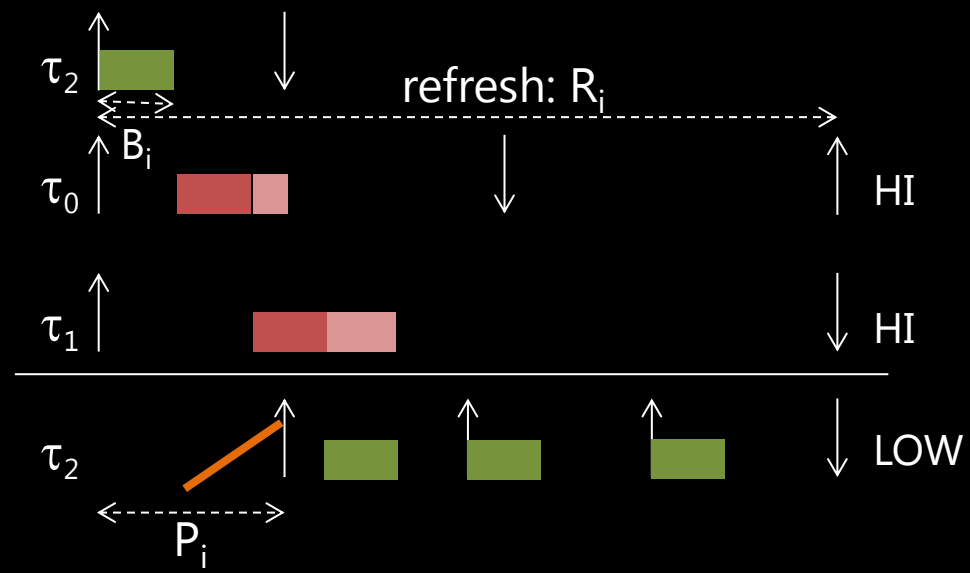
Criticality Monotonic – RM



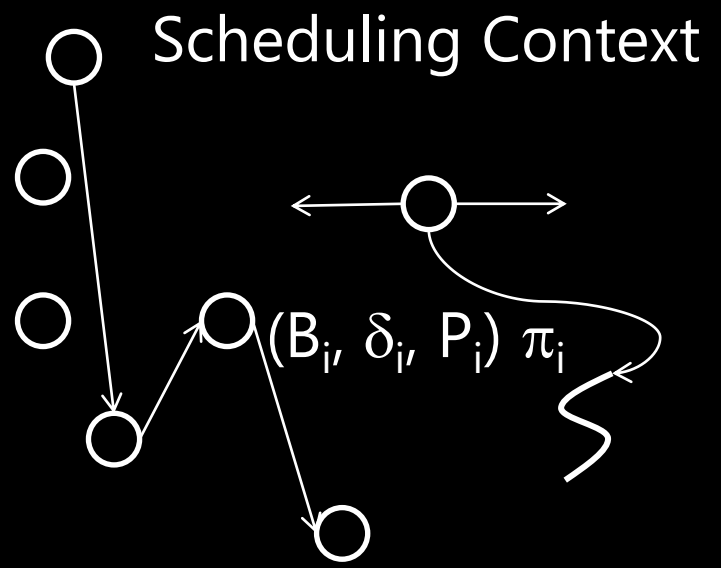
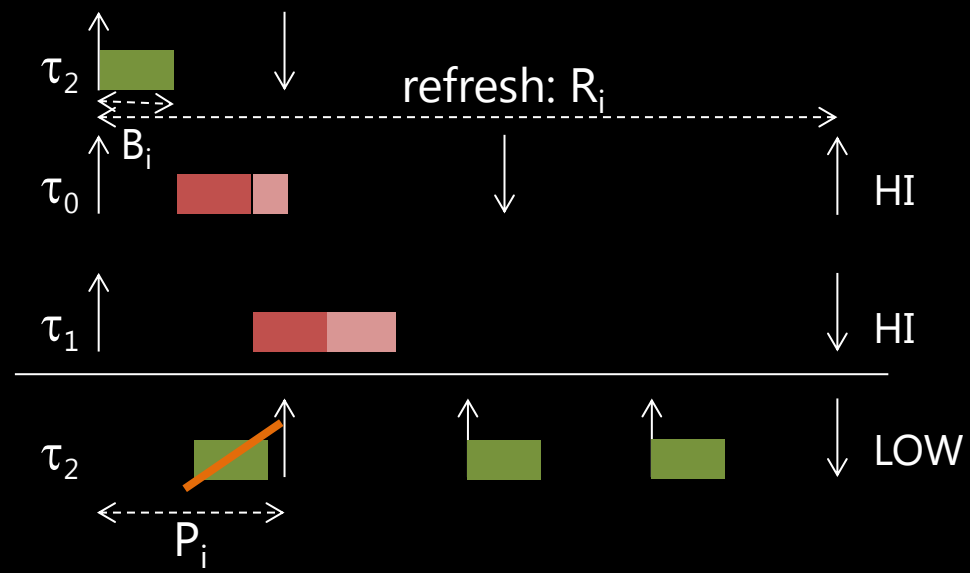
Scheduling Context



OCBP

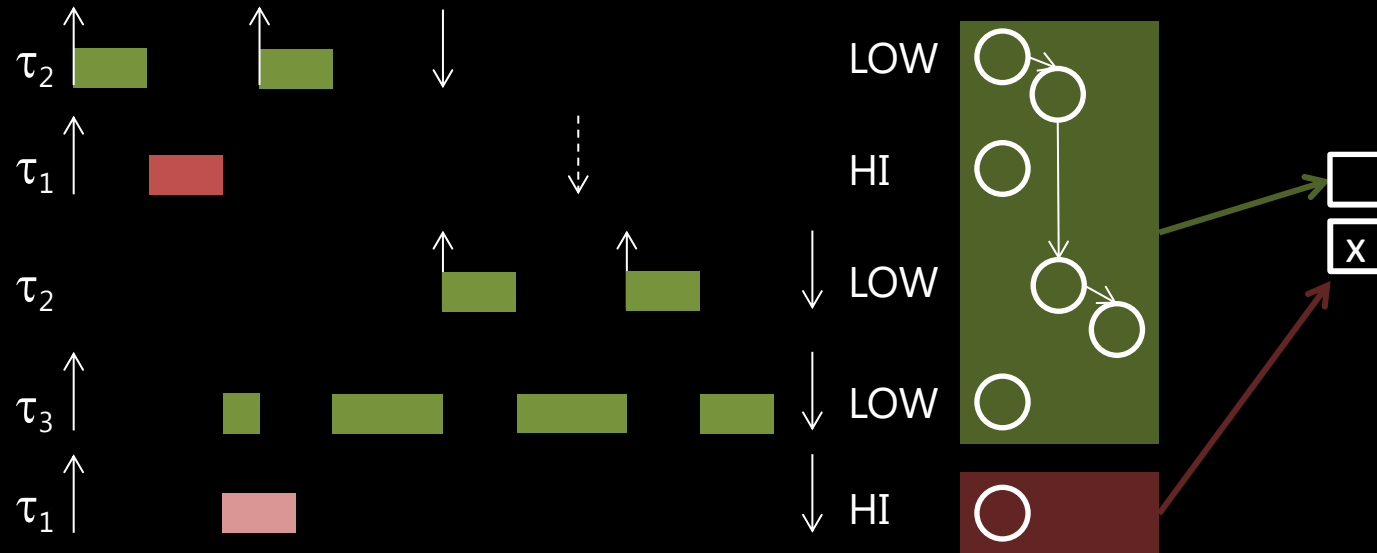


OCBP



EDF – Virtual Deadlines

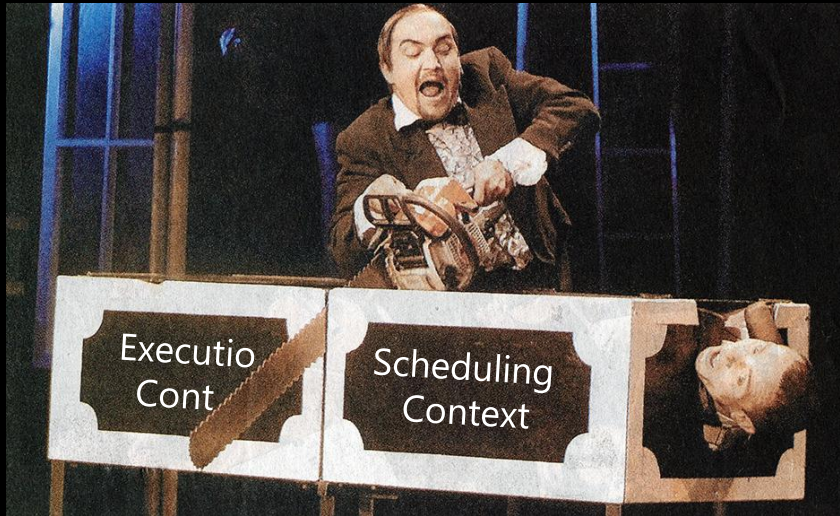
[S. Baruah, V. Bonifaci, G. D'Angelo, A. Marchetti-Spaccamela, S. van der Ster, L. Stougie '12]



This talk in one slide

Go ahead, split threads:
you won't hurt them!

- Expressive
(CM / OCBP / EDF-VD)
- Flexible
(priority inheritance /
imprecise computation /
flattening /
mixed criticality scheduling)
- Easy to implement
(queue SCs not Threads)



Wintergarten Varieté: Collins Brothers

One more thing.

HLS: A Framework for Composing Soft Real-Time Schedulers

[J. Regehr '01]

Scheduler(s)	Guarantee conversion(s)
fixed priority	any \mapsto (any, NULL ⁺)
join	<i>see below</i>
limit	RESBS \mapsto RESBH
proportional share	PS \mapsto PS ⁺ , PSBE \mapsto PSBE ⁺ , RESU \mapsto PSBE ⁺
CPU reservation	ALL \mapsto RESBH ⁺ , RESU \mapsto RESBH ⁺
time sharing	NULL \mapsto NULL ⁺
BSS-I, PShED	ALL \mapsto RESU ⁺ , RESU \mapsto RESU ⁺
CBS	ALL \mapsto RESBH ⁺ , RESU \mapsto RESBH ⁺
EEVDF	ALL \mapsto PSBE ⁺ , RESU \mapsto PSBE ⁺
Linux, Win 2000	NULL \mapsto NULL ⁺
Lottery, Stride	PS \mapsto PS ⁺ , RESU \mapsto PS ⁺
Resource Kernel	ALL \mapsto (RESBS ⁺ , RESBH ⁺), RESU \mapsto (RESBS ⁺ , RESBH ⁺)
Rialto, Rialto/NT	ALL \mapsto RESCS ⁺ , RESU \mapsto RESCS ⁺
SFQ	PS \mapsto PS ⁺ , PSBE \mapsto PSBE ⁺ , RESU \mapsto PSBE ⁺
SFS	PS⁺ \mapsto PS⁺, RESU⁺ \mapsto PS⁺
Spring	ALL \mapsto RESBH ⁺ , RESU \mapsto RESBH ⁺
TBS	ALL \mapsto RESBS ⁺ , RESU \mapsto RESBS ⁺

