UniversitÃă degli Studi di Padova
Dipartimento di Matematica
Corso di Laurea Magistrale in Informatica

Multiprocessor Resource Sharing Protocol
Implementazione e valutazione

September 26, 2014

Multiprocessor resource sharing Protocol

- Model
- MrsP
- Proposed solution
- LITMUS^{RT}
- Implementation
- Experiment
- Conclusion and future works

MrsP

Multiprocessor resource sharing Protocol

- for partitioned algorithms
- spinning-based protocol
- generalizes uniprocessor RTA: $R_i = C_i + B_i + I_i$
  - $I_i = \sum_{\tau_j \in hp(i)} \lceil \frac{R_i}{T_j} \rceil C_j$
  - $B_i = max\{\hat{c}, \hat{b}\}$
  - $C_i = WCET_i + \sum_{r^j \in F(\tau_i)} n_i c^j$
- helping mechanism

Overheads

Resource lock:

- change priority, add job to the queue, set ceiling - 800k ns (O(m))
- wake up the queued lock holder - 6k ns (migration)
- busy wait - 400 ns

Resource release:

- restore priority, pop job from the queue, restore ceiling - 500 ns
- wake up the queued lock holder - 6k ns (migration)
- Running job migration - 800k ns

Overheads

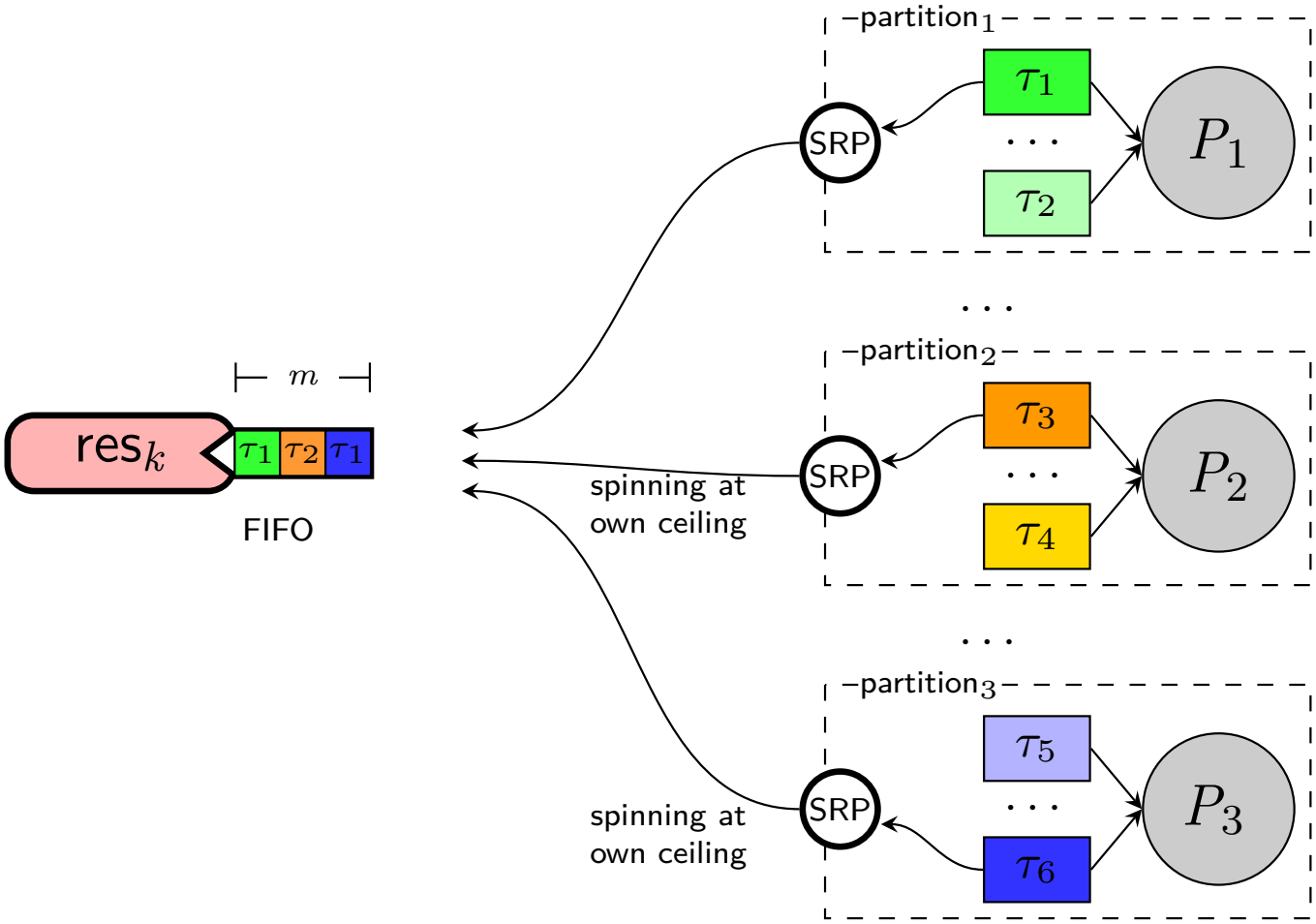
Post context switch 1:

- find a new cpu for the preempted lock holder and set up the - migration 24k ns (lock cpu + lock resource)
- perform the migration of the preempted job - 37k ns

Post context switch 2:

- a cpu is again available for a migration - 3k ns
- performs the migration of the queued job - 6k ns

MrsP


partition$_1$
τ_1
τ_2
P_1
SRP
partition$_2$
τ_3
τ_4
P_2
SRP
partition$_3$
τ_5
τ_6
P_3
SRP
spinning at own ceiling
spinning at own ceiling
m
res$_k$
τ_1 τ_2 τ_1
FIFO

Response time - 1

Task	Partition	Priority	Critical section	WCET
τ_1	P_1	20	1	1
τ_2	P_2	20	1	1

Task	MrsP	Ceiling	Non preemption
τ_1	1.123.127	1.045.957	1.181.310
τ_2	2.231.823	2.029.249	2.446.051

Response time - 2

Task	Partition	Priority	Critical section	WCET
τ_1	P_1	20	3	3
τ_2	P_2	20	3	3

Task	MrsP	Ceiling	Non preemption
τ_1	3.050.809	3.145.418	3.057.504
τ_2	5.994.789	6.211.880	6.067.983

Response time - 3

Task	Partition	Priority	Critical section	WCET
τ_1	P_1	20	1	1
τ_2	P_1	10	0	1
τ_3	P_2	20	1	1

Task	MrsP	Ceiling	Non preemption
τ_1	1.206.362	2.194.042	1.111.517
τ_2	1.098.587	1.068.602	1.977.039
τ_3	2.351.562	3.168.240	1.911.890

Response time - 4

Task	Partition	Priority	Critical section	WCET
τ_1	P_1	20	3	3
τ_2	P_1	10	0	1
τ_3	P_2	20	3	3

Task	MrsP	Ceiling	Non preemption
τ_1	3.066.828	4.242.092	3.177.307
τ_2	1.035.721	1.141.324	3.956.506
τ_3	6.099.752	7.209.873	6.024.691

Response time - 5

Task	Partition	Priority	Critical section	WCET
τ_1	P_1	20	1	1
τ_2	P_1	10	0	3
τ_3	P_2	20	1	1

Task	MrsP	Ceiling	Non preemption
τ_1	1.053.232	4.215.599	1.113.397
τ_2	3.018.344	3.071.190	4.006.309
τ_3	2.042.122	5.169.139	2.068.905

Response time - 6

Task	Partition	Priority	Critical section	WCET
τ_1	P_1	20	1	1
τ_2	P_1	10	0	3
τ_3	P_2	20	1	1
τ_4	P_2	10	0	3
τ_5	P_3	20	1	1

Task	MrsP	Ceiling	Non preemption
τ_1	1.111.410	4.312.490	1.173.600
τ_2	3.029.214	3.131.630	4.205.578
τ_3	2.062.770	5.301.240	2.211.347
τ_4	3.022.036	3.099.090	5.078.436
τ_5	3.030.634	6.309.370	3.184.333