Erratum to
"Suspension-Aware Analysis for Hard Real-Time Multiprocessor Scheduling"

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Abstract

In [3], we derived hard real-time multiprocessor schedulability analysis for self-suspending task systems, under both global fixed-priority and global EDF scheduling. For global fixed-priority scheduling, we derived an upper bound on the workload for a task that does not have a carry-in job. It has come to our attention that this derivation suffers from an error. In this note, we point out the error and offer a correction.

I. Counterexample

Lemma 1 in [3] shows that the workload bound for any task τ_i in an interval of length L that does not have a carry-in job is at most:

$$\left(\left\lfloor \frac{L-e_i}{p_i} \right\rfloor + 1\right) \cdot e_i. \tag{1}$$

Consider a task τ_i with $e_i = p_i = 4$ and an interval $[0, 10)$ with $L = 10$. Suppose τ_i does not have a carry-in job in this interval and releases three jobs in this interval at time one, five, and nine, respectively. For this example, Eq. (1) computes a workload bound of τ_i of eight time units. However, the actual workload of τ_i is nine time units, as its first two jobs contribute four time units each and its third job contributes one time unit to the workload.

II. Correction

We now state the corrected Lemma 1.

Lemma 1.

$$\omega^{nc}(\tau_i, L) = \left\lfloor \frac{L}{p_i} \right\rfloor \cdot e_i + min(e_i, L \ mod \ p_i). \tag{2}$$

Proof: The proof is similar to reasoning in [1], [2], as illustrated in Fig. 1. Since τ_i does not have a carry-in job, only jobs that are released within $[t_o, t_f)$ can contribute to $\omega^{nc}(\tau_i, L)$. Note that suspensions do not contribute to the workload. According to our task model, suspensions of $\tau_{i,k}$, which is the last job of τ_i that is released before t_f, may be of length 0 within $[r_{i,k}, t_f)$. ■

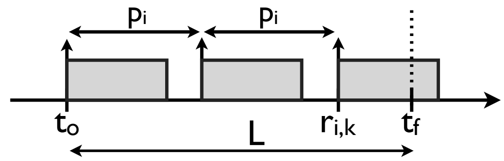

Fig. 1: Computing $\omega^{nc}(\tau_i, L)$.

We also note that Sec. 3 as well as the rest of the paper [3] remain correct if the above corrected Lemma 1 is used in later derivations.

References

[1] S. Baruah. Techniques for multiprocessor global schedulability analysis. In *Proc. of the 28th Real Time Systems Symposium*, pp. 119-128, 2007.
[2] N. Guan, M. Stigge, W. Yi, and G. Yu. New response time bounds for fixed priority multiprocessor scheduling. In *Proc. of the 30th RTSS*, pp. 387-397, 2009.
[3] Cong Liu and James H Anderson. Suspension-aware analysis for hard real-time multiprocessor scheduling. In *Proc. of the 25th Euromicro Conf. on Real-Time Systems*, pages 271–281. IEEE, 2013.

Acknowledgment. We would like to thank Andrea Parri and Geoffrey Nelissen for pointing out this error.