

# Author Rebuttal to Rocha et al. “Comments on Minimizing Buffer Requirements under Rate-Optimal Schedule in Regular Dataflow Networks”

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The claims made in our paper (Govindarajan, et al., JVL SI 2002) are indeed **correct**. For the example discussed in page 212 of our paper (reproduced here in Fig. 1) and the schedule given in page 211 (reproduced here in Table 1), the buffer requirements for all arcs are shown in Table 2.

It can be seen that the minimum buffer requirements for arcs  $(a, b)$ ,  $(b, a)$ ,  $(b, d)$ ,  $(d, b)$ ,  $(c, d)$ , and  $(d, c)$ , are respectively 2, 3, 2, 3, 6, and 6. And the total buffer requirement is indeed 22. It is possible to have other rate-optimal schedules which may have a buffer requirement which is more than the minimum requirement.

As stated in our paper, the buffer requirement is **ONLY** during the steady-state execution of a minimum buffer rate-optimal schedule. The reasons for following this approach, as stated in our paper, is that the steady-state kernel is what is executed repeatedly (significantly more number of times

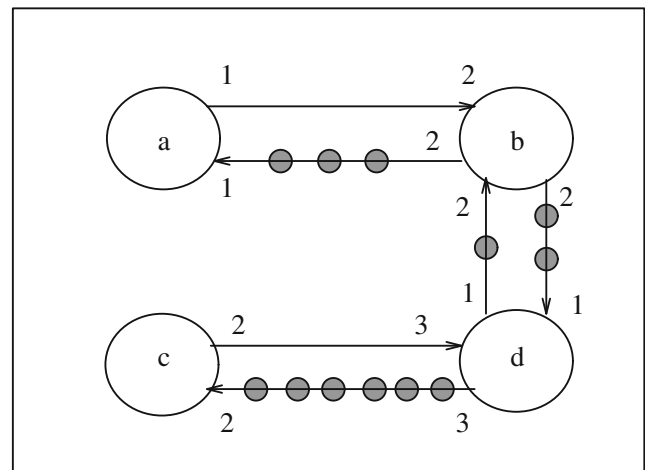


Figure 1 Example RSFG.

than the prologue or epilogue) and hence optimizing the kernel and its buffer requirement is beneficial, even if it requires additional resources (compile time).

With respect to the arguments in page 3 (of the submitted note by Rocha, et al.) and Equations (9)-(11), our comment is that the invariant calculation is possibly giving the maximum buffer requirement for the individual places and it is not clear how the maximum buffer requirement invariant for a group of places correspond to the minimum buffer requirement of a rate-optimal schedule.

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**Table 1** Schedule for the example RSFG.

	Time step												
	0	1	2	3	4	5	6	7	8	9	10	11	12
iteration = 0	c,a	c,-a	c,-a	d,a	d,-a	-a	b						
iteration = 1							c,a	c,-a	c,-a	d,a	d,-a	-a	b
iteration = 2													c,a

**Table 2** Buffer requirements for the schedule.

Time	Actor(s) Fired	Buffer requirements on arcs											
		(a,b)		(b,a)		(b,d)		(d,b)		(c,d)		(d,c)	
		Before	After	Before	After	Before	After	Before	A	Before	After	Before	After
0	c, a	0	0	3	3	2	2	1	1	0	2	6	4
1	c,-a	0	0	3	3	2	2	1	1	2	4	4	2
2	c,-a	0	1	3	2	2	2	1	1	4	6	2	0
3	d, a	1	1	2	2	2	1	1	2	6	3	0	3
4	d,-a	1	1	2	2	1	0	2	3	3	0	3	6
5	-a	1	2	2	1	0	0	3	3	0	0	6	6
	b												
6	c, a	2	0	1	3	0	2	3	1	0	2	6	4
7	c,-a	0	0	3	3	2	2	1	1	2	4	4	2
8	c,-a	0	1	3	2	2	2	1	1	4	6	2	0
9	d, a	1	1	2	2	2	1	1	2	6	3	0	3
10	d,-a	1	1	2	2	1	0	2	3	3	0	3	6
11	-a	1	2	2	1	0	0	3	3	0	0	6	6
	b												
12	c,-a	2	0	1	3	0	2	3	1	0	2	6	4