1 CPP Benchmark

In the communicating parallel processes benchmark [1] models a ring of several processes (n units) which communicate with its neighbours via synchronisation actions. Figure 1 shows a CPP-system with 4 processes and 4 actions.

We check two different properties:

(1) $\mathsf{EF}^{[0,\infty[}\ (\wedge_{i=1}^{n} l_4^i)$ which verifies if in all processes the location l_0^i may be reached. This property is can be verified by simple reachability analysis.

(2) $\phi^{TL} = \mathsf{AG}^{[0,\infty[}\ (\mathsf{EF}^{[1,1]}\ \mathit{true})$ tests for divergence of time and requires full TCTL model checking. If this property holds, it is assured that at any moment, in any location, time is allowed to pass for at least one time unit, and thus the system is timelock free. This benchmark has a timelock because in $process_i$ location l_4^i can only be left for $x_i \leq 4$. However, according to the location invariant, time is allowed to pass in this location until x_i reaches a value of 5. Modifying the guards on the transition leaving l_4^i to $x_i \leq 5$ can solve this problem.

In the incomplete version, only the two first processes remain known (white box), all the remaining parts may be put into the black box. The structure of the incomplete CPP is depicted in Figure 2

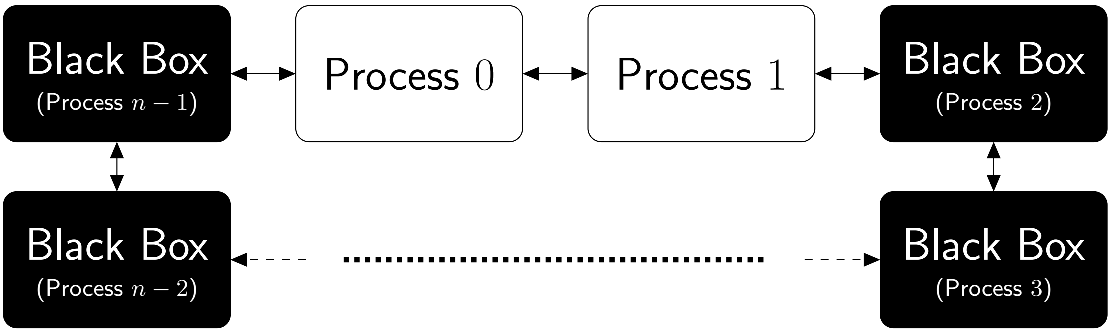

Figure 2: Benchmark: Incomplete CPP

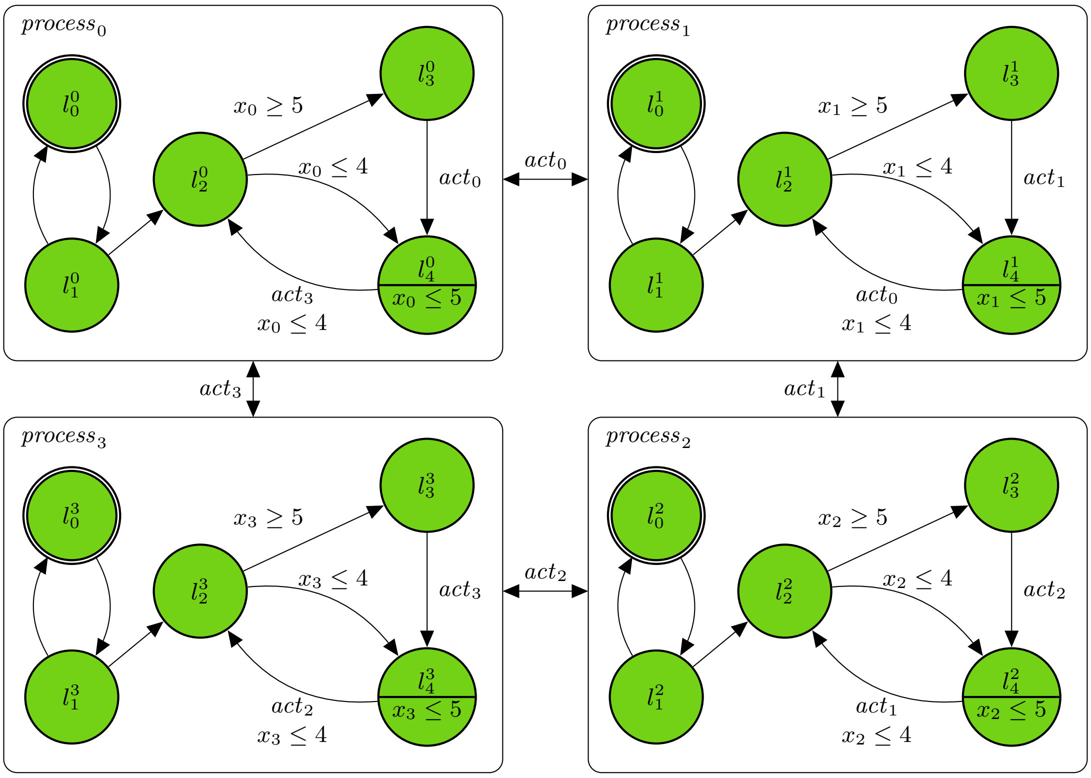

Figure 1: Benchmark: CPP

References

[1] G. Morbé and C. Scholl. Fully symbolic tctl model checking for incomplete timed systems. In H. Treharne and S. Schneider, editors, *Automated Verification of Critical Systems 2013 (AVoCS)*, volume 66, Guildford, Surrey, United Kingdom, 2013. EASST.