# Erratum to *Compositionality of Projection Inheritance*

W.M.P. van der Aalst and K.M. van Hee and R.A. van der Toorn

Eindhoven University of Technology, Faculty of Technology and Management, Department of
Information and Technology, P.O. Box 513, NL-5600 MB, Eindhoven, The Netherlands.
w.m.p.v.d.aalst@tm.tue.nl

Theorem 40 (Compositionality of Projection Inheritance) is one of the central theorems
in the paper "Component-Based Software Architectures: A Framework Based on In-
heritance of Behavior" (cf. [1], pages 157–158). This theorem states that, given certain
requirements, a component can be replaced by another component which is subclass
without changing the overall behavior of the system. This is indeed the case. However,
Theorem 40 also states that the resulting system is sound (i.e., proper termination, ab-
sence of deadlocks, etc.). Note that a strong notion of soundness is used. This notion
of soundness does not allow for dead transitions (transitions which can never be ac-
tivated). Unfortunately, the requirements of Theorem 40 do not imply the absence of
dead transitions in the newly added component. A counter example for the theorem as
it is formulated in [1] is shown in the figure below:
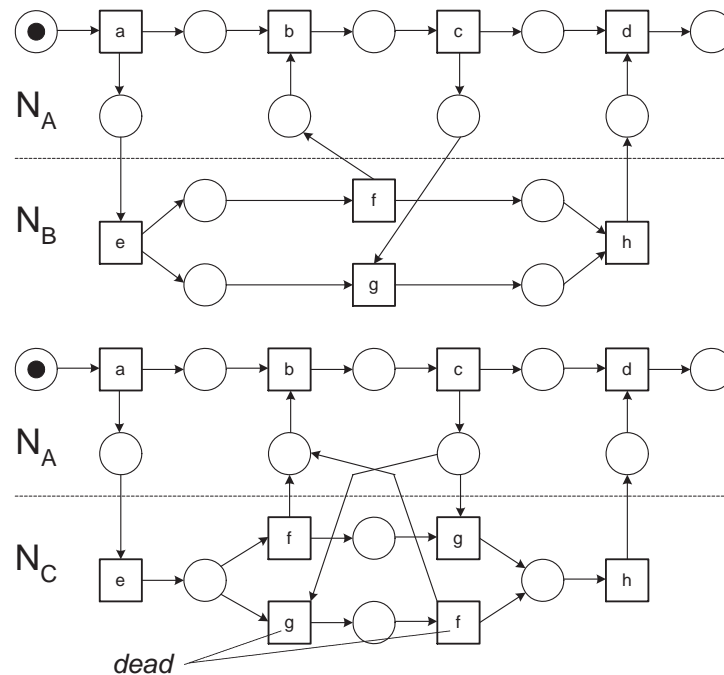
The C-net composed of N_A and N_B is a sound C-net in the spirit of Theorem 40. More-
over, both N_B and N_C correspond to sound C-nets and N_C is a subclass of N_B under
projection inheritance [2]. (In fact N_B and N_C are branching bisimilar.) If N_B is re-

placed by N_C, then, according to Theorem 40, the resulting C-net should be sound and a subclass of the original C-net composed of N_A and N_B. The resulting C-net is indeed a subclass of the original C-net and the first three requirements stated in Definition 16 (Soundness) hold. Unfortunately, the resulting net is (formally) not sound since the bottom two transitions f and g are dead and the fourth requirement stated in Definition 16 excludes dead transitions. Note that this is a surprising, but not essential, problem which can be repaired easily. First of all, it is possible to use weak soundness (i.e., without the fourth requirement) rather than soundness. Second, it is possible to remove dead transitions whenever C-nets are composed from other C-nets. Note that it is easy to see that these modifications do not compromise the validity of the other proofs since dead transitions do neither enable new behavior nor disable existing behavior.

References

1. W.M.P. van der Aalst, K.M. van Hee, and R.A. van der Toorn. Component-Based Software Architectures: A Framework Based on Inheritance of Behavior. *Science of Computer Programming*, 42(2-3):129–171, 2002.
2. T. Basten and W.M.P. van der Aalst. Inheritance of Behavior. *Journal of Logic and Algebraic Programming*, 47(2):47–145, 2001.