# Synchronizations with Mobility for Graph Transformations *

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Our work is aimed at developing high-level models for complex global computing systems. At the high level of abstraction, the primitives made available by the underlying middleware are used to coordinate the behaviours of different computational entities. Important features of such a kind of model are: (i) expressiveness, since complex forms of interaction have to be modelled; (ii) compositionality, which is required to allow a bottom-up development of systems.

We propose an approach based on graph transformations, which extends Synchronized Hyperedge Replacement (SHR) [2]. The main advantage of SHR is that it can be easily implemented in a distributed setting. In fact, transformations are specified by defining the behaviour of single hyperedges via productions with local effects. Productions interact via synchronizations on common nodes and exchange data via name mobility in the Fusion Calculus style.

We extend standard SHR by parameterizing the inference rules that are used to compose productions using a generalization of synchronization algebras that allows to specify the underlying synchronization model [4]. Thus by changing the synchronization algebra one can model systems based on different middlewares. The proposed extension adds structures suitable to deal with mobility and local resources, which are two main features of global computing systems.

We formalize the model using a Labelled Transition System (LTS) where labels contain synchronizations and names of nodes. We prove that the resulting bisimilarity is a congruence w.r.t. the operators of a suitable algebra of graphs by showing that the LTS can be specified in De Simone format [1]. As an example, we study the equivalence of different implementations of dynamic routers.

As a larger example, we show how to map Fusion Calculus into our model [3] and that this mapping provides a concurrent compositional semantics for it.

## References

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