Mobile Components as Topological Action Systems*

(Work in progress)

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Traditional formalisms for distributed computing are no more adequate in the context of recent technological developments like wide area networks or mobile devices since they are based on the location transparency principle. The acknowledgement of the network has given rise to several formalisms like Ambient Calculus [1], Mobile UNITY [5], or Mobis [3]. Recently, a topological approach to distributed computing [4], topological action systems, was developed which showed that the mobility aspects in both wide and local area networks fit well within the action systems framework.

Here, we continue our study of mobility by formally defining a *mobile component* as a topological distributed action system that has an identity. This component can, in certain conditions, be composed with other mobile components or be decomposed into subcomponents. The (de)composition property allows us to model highly reconfigurable systems that also present features like replication and mobility of the components in the distributed system. Using the notion of mobile component we can in a unitary way model diverse types of mobile resources, like data stores, code resources or active entities. The mobile components have similar characteristics as the ambients in Ambient Calculus. However, topological action systems are described with program like constructs and have a semantics based on the weakest precondition predicate transformer [2] making our formalism more intuitive to work with than Ambient Calculus, which is a process oriented calculus.

References

[1] L. Cardelli and A. D. Gordon. Mobile Ambients. In Maurice Nivat (Ed.), *Foundations of Software Science and Computational Structures*, Lecture Notes in Computer Science 1378, pages 140-155, Springer-Verlag, 1998.

[2] E. W. Dijkstra. *A Discipline of Programming.* Prentice-Hall International, 1976.

[3] C. Mascolo. Mobis: A Specification Language for Mobile Systems. In P. Ciancarini and A. Wolf (Eds.), *Proceedings of Coordination Languages and Models, Coordination'99*, Lecture Notes in Computer Science 1594, pages 37-52, Springer-Verlag, 1999.

[4] L. Petre, K. Sere and M. Waldén. A Topological Approach to Distributed Computing. In Proceedings of WDS'99 - Workshop on Distributed Systems, Iasi, Romania, September 1999. Electronic Notes in Theoretical Computer Science, Vol. 28 (to appear).

[5] G.-C. Roman, P. J. McCann, and J. Y. Plun. Mobile UNITY: Reasoning and Specification in Mobile Computing. *ACM TOSEM*, Vol. 6, No. 3, pages 250-282, 1997.

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