Advanced Coordination Models for Information Technology (IT) and Embedded Integrated Systems

Mots clés :
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● Domaine scientifique principal: Divers

Résumé du projet de recherche (Langue 1)
We are targeting the evolution from today’s separate worlds of embedded applications (e.g., net-centric assemblies of heterogeneous lightweight sensors and actuators) and Information Technology (IT) services to the future world of seamlessly integrated services, thus enabling IT and Embedded Integrated Systems (ITEmIS systems). Service Oriented Architecture (SOA) is a significant enabler towards ITEmIS systems. SOA supports the needed run-time composition of autonomous and heterogeneous networked systems, by introducing the service abstraction for networked entities and associated runtime protocols for service discovery, access and composition. Still, addressing the challenge of ITEmIS systems development requires major evolution of state of the art SOA. More specifically, we are addressing integration of the IT and embedded domains at the level of business workflows. ITEmIS systems are realized as workflows composing services from the two domains. ITEmIS workflows should support and integrate various coordination schemes applying to the IT and embedded domains. IT services are commonly designed based on message-oriented or data-oriented coordination schemes, while embedded services employ event-oriented or data-oriented schemes, where the latter may differ considerably in terms of complexity and quantity levels from the respective IT ones. Examples of employed paradigms include synchronous and asynchronous procedure calls, publish-subscribe schemes, data sharing schemes and so on. With regard to workflow schemes, both orchestration of a set of services by a central coordinator, and choreography among peer services may be envisaged. Orchestration seems to be the more investigated and easier to realize, however, choreography may be the choice for certain systems. Finally, for tiny embedded systems such as sensors and actuators, both individual and group communication should be supported for flexibly managing entities in a fine-grained or coarse-grained (sensor networks) manner. Research challenges rising in the above context will be addressed as part of the ANR ARPEGE ITEmIS (IT and Embedded Integrated Systems) research project. Building on existing research efforts together with related experiment, the aim of the proposed PhD thesis is to investigate the diverse coordination paradigms applying to the IT and embedded domains, and propose, formalize and validate an advanced workflow model able to integrate such heterogeneous paradigms. The thesis work will decompose in the following steps: * State of the art analysis and assessment of coordination paradigms applying to the IT and embedded domains; * State of the art analysis of description/formalization models for such paradigms; * Modelling of ITEmIS workflows integrating such paradigms; * Validation through the implementation of an advanced workflow engine for the execution of ITEmIS workflows and related experimentation.

Résumé du projet de recherche (Langue 2)
Effective integration of embedded systems in the service oriented architecture paradigm, spanning from the elaboration of supporting architectural style regarding in particular interaction protocols, to the modeling of enabled heterogeneous composite service and supporting middleware.

Informations complémentaires (Langue 1)
Multiples collaborations au niveau international au sein de l'EPI ARLES.

Informations complémentaires (Langue 2)
Sujet de thèse d'Hamid Ameziani, inscrit en 1ere année à compter du 1/12/2009.