# Motivation

With the drastic evolution of wireless technologies, software services can become truly ubiquitous, being not solely accessed but also hosted by wirelessly networked portable devices. As a result, legacy applications can become available anytime, anywhere, but also revisited to take full advantage of ubiquitous networking. Further, new application services may emerge, in particular based on the nomadic feature and ad hoc connectivity of wireless portable devices. This is for instance exemplified by emergency rescue scenarios, where mobile portable hosts serve sensing the environment and coordinating rescue actions. Still, enabling ubiquitous service provisioning on mobile hosts requires special care, as resources are far more constrained than resource-rich Internet servers originally targeted by service oriented computing and its Web Service instantiation. Further, the mobility of wireless hosts requires special attention. Indeed, early solutions introduced towards nomadic computing targeted service hosts with which connectivity can eventually be restored, while this cannot be assumed in general when services are hosted by mobile devices that connect in an ad hoc way. However, today's networking environments are far more powerful and rich, in terms of available technologies, and can be easily exploited towards enabling for seamless mobility.

# Research

As part of our research in pervasive service-oriented systems, we have developed the ubiSOAP communication middleware, which underlies SOAP-based middleware and strives to provide ubiquitous networking to services. Specifically, ubiSOAP defines a two-layer architecture composed of a multi-radio networking layer and a WS-oriented communication layer, which respectively provide network-agnostic connectivity and SOAP point-to-point and group communication in ubiquitous networking environments.

By offering network-agnostic connectivity, the ubiSOAP communication middleware effectively exploits the diverse network technologies at once in order to create an integrated multi-radio networking environment, hence offering network-agnostic connectivity to services. This requires addressing a number of critical issues such as network availability, user and application QoS requirements and vertical handover. The latter issue is particularly important with respect to the service continuity requirement.Multi-radio connectivity further allows for effectively realizing a multi-network overlay. Specifically, resource-rich nodes (e.g., laptops or even reachable stationary nodes) that embed multiple radio interfaces may act as bridges that route messages across heterogeneous networks. Such a feature is beneficial for ubiquitous services, enabling to overcome the resource limitation and mobility of nodes and contributing to achieve ubiquitous service connectivity. Indeed, this allows energy-limited devices to use the least consuming interface while being able to reach all the devices of the overlay. Further, a networked service that changes physical network following host mobility may still be reachable in the overlay.

Another key fetaure of ubiSOAP is to support legacy Web services and thus to transparently

bring the added value of today's ubiquitous networking environments to existing services. This has in particular led us to layer ubiSOAP as a specific Point-to-Point transport for SOAP engines and to leverage WS-addressing to integrate multi-radio, multi-network connectivity in SOAP headers. Still, another SOAP transport that is of much interest for ubiquitous networking environments is group transport. Indeed, group-based interactions are central in a number of ubiquitous computing scenarios, due to the user-centric nature of ubiquitous computing and the innate group interaction skills of people. ubiSOAP thus features a base SOAP transport for group communication.

## Contributors

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## Supporting Grant

- IST PLASTIC -- Providing dependabLe and Adaptive Service Technology for pervasive Information and Communication

## Related Software

- ubiSOAP service-oriented middleware

## Publications

Titre ubiSOAP: A Service Oriented Middleware for Ubiquitous Networking AuteursCaporuscio Mauro; Raverdy Pierre-Guillaume; Issarny Valérie Détail *IEEE Transactions on Services Computing* (2010) Accès au texte intégral

Titre ubiSOAP: A Service Oriented Middleware for Seamless Networking AuteursCaporuscio Mauro; Raverdy Pierre-Guillaume; Moungla Hassine; Issarny Valérie DétailIn *6th International Conference on Service Oriented Computing : ICSOC 2008* (2008) 195-209 Accès au texte intégral

Titre A Reference Model for Service Oriented Middleware AuteursAutili Marco; Caporuscio Mauro; Issarny Valérie DétailN° (2008) Accès au texte intégral

Titre A Perspective on the Future of Middleware-based Software Engineering AuteursIssarny Valérie; Caporuscio Mauro; Georgantas Nikolaos DétailIn *Workshop on the Future of Software Engineering : FOSE 2007* (2007) 244-258 Accès au texte intégral

Titre Energetic Performance of Service-oriented Multi-radio Networks: Issues and Perspectives AuteursCaporuscio Mauro; Charlet Damien; Issarny Valérie; Navarra Alfredo DétailN° (2006) Accès au texte intégral

Titre A UML 2.0 Profile for Architecting B3G Applications AuteursCaporuscio Mauro; Issarny Valérie DétailIn *3rd International Workshop on Rapid Integration of Software Engineering techniques : RISE 2006*

(2006) 18-34 Accès au texte intégral