# Motivation

   Middleware holds a critical role in service-oriented architectures enabling ambient intelligence applications. Communication relationships amongst application components involve the use of protocols, making application-related services tightly coupled to middleware. Additionally, to overcome resource constraints like network-related limited bandwidth, and support the various relevant applications, several communication models have arisen. Thus, as there exist many styles of communication and consequently many styles of middleware, we have to deal with middleware heterogeneity. Significantly, a service implemented upon a specific middleware cannot interoperate with services developed upon another. Similarly, we cannot predict at design time the execution environment of services deployed in the network, in particular due to the network's openness. However, no matter which underlying communication protocols are present, services deployed on the various networked devices must both discover and interact with the services available in their vicinity. More precisely, Service Discovery Protocols (SDP) enable finding and using networked services without any previous knowledge of their specific location. And, with the advent of both mobility and wireless networking, SDPs are taking on a major role in networked environments, and are the source of a major heterogeneity issue across middleware. Furthermore, once services are discovered, applications need to use the same interaction protocol to allow unanticipated connections and interactions with them. Consequently, a second heterogeneity issue appears among middleware. Summarizing, middleware for ambient intelligence applications must overcome two heterogeneity issues to provide interoperability, i.e.: (i) heterogeneity of service discovery protocols, and (ii) heterogeneity of interaction protocols between services.

Research

   As outlined above, interoperability among networked entities, which in particular integrates mobile devices that randomly join the network for possibly short periods of time, is becoming a real issue to overcome. Networked devices must be aware of their dynamic environment that evolves over time, and further adapt their communication paradigms according to the environment. Thus, distributed systems for the dynamic networked environment must provide efficient mechanisms to detect and interpret protocols currently used, which are not known in advance. Furthermore, detection and interpretation must be achieved without increasing consumption of resources on the resource-constrained devices. In this context, we have developed systems for achieving interoperability among services based on heterogeneous middleware platforms, in a way transparent to application services. We reuse concepts from software architecture enriched with event-based parsing techniques to drastically improve middleware interoperability, enabling applications to be efficiently aware of their environment. The originality of our approach comes from the trade-offs achieved among efficiency, interoperability and flexibility. Our solution may further be applied to any existing middleware platform.
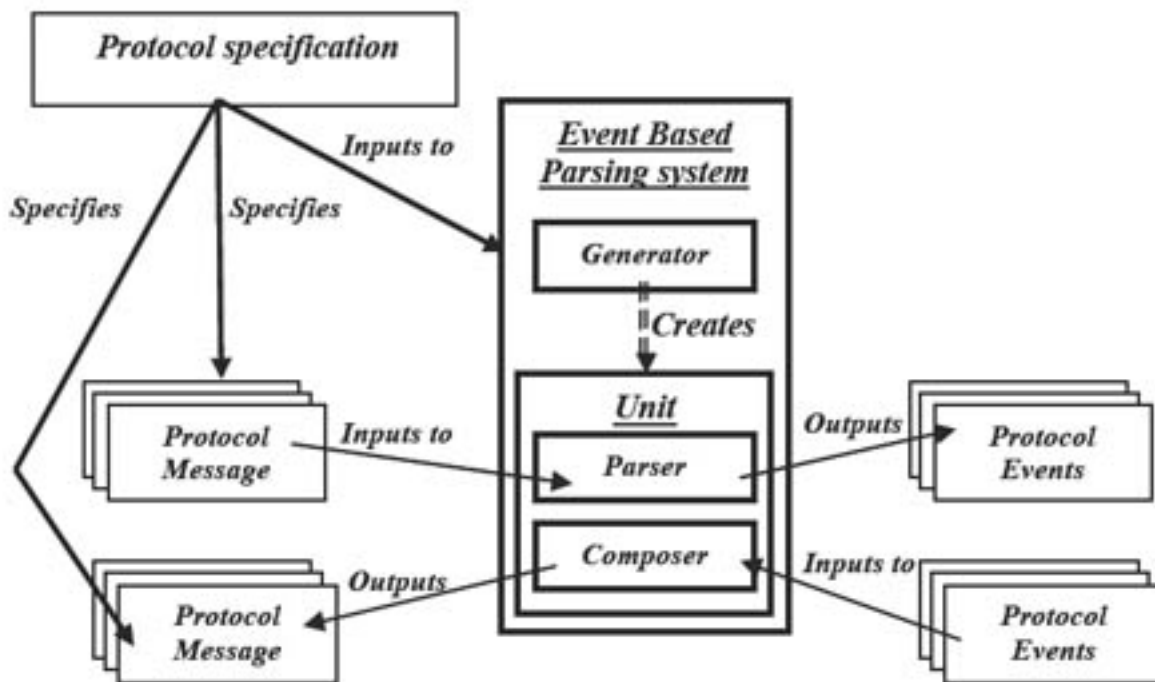
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Supporting Grant

- [Amigo](#) -- IST FP6 IP - Ambient Intelligence for the networked home environment

Related Software

- [INMIDIO](#) interoperable middleware

Follow-up

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[Dynamic synthesis of connectors](#)

Publications

Titre [Protocole de découverte de services interopérable en réseau ad hoc](#) AuteursSailhan
Françoise; Bromberg David; Issarny Valérie Détail
Ingénierie des systèmes d'information
14,1 (02/02/2009) 39 Titre
[INDISS: Interoperable Discovery System for Networked Services](#)
AuteursBromberg David; Issarny Valérie DétailIn
6th International Middleware Conference ACM/IFIP/USENIX
Volume 3790 (2005) 164-183 Accès au texte intégral
Titre [Service Discovery Protocol Interoperability in the Mobile Environment](#) AuteursBromberg
David; Issarny Valérie DétailIn
4th International Workshop, SEM 2004, Linz, Austria, September 20-21, 2004
Volume 3437 (20/09/2004) 64 Accès au texte intégral