

# Service Provisioning Framework for Self-Organized Networks

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**Abstract.** Mobile ad hoc networking, as a typical example of self-organized networks, is an emerging and promising communication paradigm. Not only the variety of devices but also the diversity of services is continuously increasing. Such services must be provisioned in a flexible and distributed way without central infrastructure. Thus, service deployment and management for such mobile devices are extremely difficult since a provisioning framework must cope with the high level of heterogeneity, degree of mobility, and take limited device resources into account. In this talk, we introduce SIRAMON, a generic, decentralized service provisioning framework for self-organized networks. SIRAMON integrates the required functions to deal with the full life-cycle of services. SIRAMON offers sufficient capabilities to specify, deploy, instantiate and manage not only trivial but also complex services like mobile ad hoc group applications.

**Keywords:** Service Provisioning, Self-Organization, SIRAMON

Ad hoc networks have been receiving much attention recently due to their immense field of application. A mobile ad hoc network is built of a collection of diverse wireless nodes (users). These nodes form a multi-hop network communicating spontaneously without relying on any pre-existing infrastructure or central administration. In order to make an ad hoc network functional, the nodes must organize themselves. They not only provide terminal but also relaying functionality for distant nodes. In this mobile ad hoc environment, efficient service provisioning requires flexible and distributed mechanisms. While the different applications and the great number of mobile devices make ad hoc networking interesting, the lack of central infrastructure, the high level of heterogeneity, the degree of mobility and the resource constraints of devices make it hard to provide ad hoc services.

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**Fig. 1.** Distributed Group Game in a Mobil Ad Hoc Network

So far, applications of Mobile Ad hoc NETWORKS (MANETs) [1] have been envisioned mainly in the field of emergency and military situations. However, MANETs offer many more possibilities. We assume that mobile ad hoc services will be introduced in the future into everyday life, and not just supporting work or daily activities but also giving pleasure in spare time. Hence, complex Mobile Ad hoc Group (MAG) services<sup>1</sup> (such as distributed group games, cf. Fig. 1) will appear in MANETs soon. This assumption is supported by the lately published report on mobile entertainment<sup>2</sup> and by the recently announced cooperation between SUN and NOKIA on new online multiplayer gaming solution using Java technology<sup>3</sup>.

While new applications in MANETs will provide powerful environments for group services, the complexity of service deployment and management in mobile ad hoc networks demand for the support of a service provisioning framework. Traditional techniques for service provisioning used in communication and data networks (Jini [2], UPnP [3], SDP [4], Chameleon [5], etc.) are not well suited for MANETs. First, they focus on a subset of service provisioning functionality (e.g.,

<sup>1</sup> We use the term MAG or ‘Mobile Ad hoc Group’ services referring to complex, mobile, device independent, distributed, software-based services (e.g., to support collaboration or to provide mobile, online group games).

<sup>2</sup> <http://www.mgain.org/MGAIN-wp3-d311-revised-final.pdf>

<sup>3</sup> The latest game console of NOKIA, called N-Gage, is now furnished with a networking middleware and mobile Java technologies making available Java-based, cross-platform approach to mobile multiplayer gaming.

resource discovery) only. And second, they are often based on the client-server model using a central, fixed infrastructure which is not available in a mobile ad hoc network.

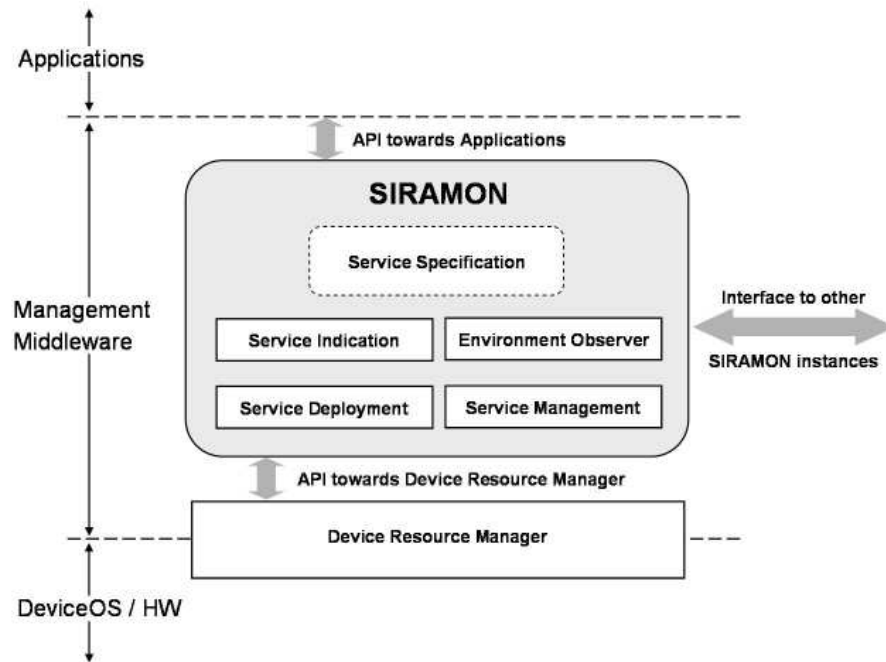


Fig. 2. Ad-Hoc Node Model with SIRAMON

The lack of a solution motivated us to propose a new service provisioning framework for self-organized environments, called SIRAMON (Service provisioning fRAMework for self-Organized Networks) which is appropriate even for mobile ad hoc networks. SIRAMON, see Fig. 2, is based on a modular and distributed design. Its components can be replaced according to current demands. The proposed modules are the following: (i) *Service Specification*; (ii) *Service Indication*; (iii) *Service Deployment*; (iv) *Service Management*; (v) *Environment Observer*. Service Specification contains the used Service Model which describes the role of the node in the service, the functions and connections of service elements to build the service. Service Indication is responsible for service announcement if the node hosts a service, or service lookup if the node intends to use a service. By the Service Deployment module, creation, installation and configuration of services are carried out. The Service Management component controls the service maintenance, reconfiguration and termination functions. And the Environment Observer module deals with the monitoring of the node resources and

the service context. We argue that this flexibility of our framework provides a powerful solution for service provisioning as required for MANETs.

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