Engineering Software Services for Pervasive Environments

[ESSPE '07 Workshop Summary]

Alexander L. Wolf

Organizing and Program Committee Chair

Department of Computing
Imperial College London
United Kingdom

http://www.doc.ic.ac.uk/~alw/

ABSTRACT

The International Workshop on the Engineering of Software Services for Pervasive Environments (ESSPE) brings together researchers interested in the software engineering challenges found at the convergence of software services and pervasive environments. This summary presents the motivation for the workshop and a brief review of the papers appearing in the proceedings.

Categories and Subject Descriptors

D.2 [**Software Engineering**]: General

General Terms

Design

Keywords

software services, pervasive computing, ESSPE

Motivation

Two emerging trends in information and communication technologies will begin to converge over the next ten years. These are *software services* and *pervasive environments*.

Software services represent a particular method to structure, deploy, assemble, and execute component-based distributed systems. Various specifications have been put forth in an effort to standardize these processes. Certainly the best known is Web Services, which is applying the method in the context of web-based software systems.

Pervasive environments represent a particular application domain for software systems, one that encompasses such characteristics as mobility (i.e., location dependence), ubiquity (software running in "all" things), and universal connectivity (software, and the things that use the software, always in communication, albeit at different qualities of service).

Both software services and pervasive environments have received considerable individual attention from researchers, but the challenges of understanding the complexities of their interaction and integration have yet to be faced. The focus of the International Workshop on the Engineering of Software

Services for Pervasive Environments (ESSPE) is specifically the *software engineering* issues underlying the convergence of software services and pervasive environments.

- How do we design and develop services that can operate within a pervasive, ubiquitous, and highly dynamic computing environment, one that may involve activities spanning home, work, and nomadic movement?

- How do we provide guarantees of correctness, robustness, resilience, trust, and security when the number of devices, contexts, and users grows to encompass large portions of society and life?

- How do we maintain software systems whose component services may be developed by a variety of different organizations, and deployed and operated for many years?

These are difficult questions, requiring expertise in many different domains.

Scope and Accepted Papers

The call for papers listed the following topics of interest within the scope of the workshop:

- techniques and tools for requirements, design, implementation, testing, and maintenance;

- specific designs and architectures;

- performance analysis, experimentation, and simulation;

- robustness, resilience, trust, and security;

- quality of service;

- adaptability and self-management;

- networking and middleware;

- mobility and nomadic services; and

- applications and usability.

The community responded to the call with a very strong and diverse set of papers covering many of the topics. Listed below are brief summaries of the papers appearing in the proceedings.

Drew Stovall and Christine Julien. *Resource Discovery with Evolving Tuples.* Proposes extensions to tuple space mechanisms to permit tuples to "self evolve" and shows how this feature can be used in pervasive computing environments to support context-dependent resource discovery.

Luciano Baresi, Sam Guinea and Liliana Pasquale. *Self-Healing BPEL Processes with Dynamo and the JBoss Rule Engine.* Presents an approach to self healing based on a rule-based system embedded within a web services infrastructure.

Holger Klus, Dirk Niebuhr and Andreas Rausch. *A Component Model for Dynamic Adaptive Systems.* Presents a framework for component-based development of dynamic adaptive applications that includes a run-time support environment supporting dynamic reconfiguration of components.

Paola Inverardi and Massimo Tivoli. *A Reuse-Based Approach to the Correct and Automatic Composition of Web Services.* Shows how the constraints of two substrate services can be used to complete a partially specified composed service.

Ulrich Scholz and Romain Rouvoy. *Divide and Conquer— Scalability and Variability for Adaptive Middleware.* Proposes an approach to enable adaptation of large clusters of middleware and applications.

Letian Rong, Manel Fredj, Valerie Issarny and Nikolaos Georgantas. *Mobility Management in B3G Networks: a Middleware-Based Approach.* Presents a middleware design for mobility management in B3G networks that combines four different types of mobility handling mechanisms.

Nenad Medvidovic and Sam Malek. *Software Deployment Architecture and Quality-of-Service in Pervasive Environments.* Discusses deployment decisions for distributed architectures, proposing techniques for specifying and analyzing QoS properties as the basis for deployment decisions.

Heinz-Josef Eikerling, Matthias Benesch and Frank Berger. *Using Proximity Relations for the Adaptation of Mobile Field Services.* Presents the design of a context engine for reasoning over proximity relations to provide services to nomadic field workers.

Gunnar Brataas, Jacqueline Floch, Romain Rouvoy, Pyrros Bratskas and George Papadopoulos. *A Basis for Performance Property Prediction of Ubiquitous Self-Adapting Systems.* Describes an approach to self-adapting applications in mobile environments based on run-time architecture models and utility (goal) policies, focusing on performance properties and their prediction.

Antonia Bertolino, Guglielmo De Angelis, Sebastian Elbaum and Antonino Sabetta. *Scaling up SLA Monitoring in Pervasive Environments.* Proposes an approach to performing checks on service-level agreements that is intended to deal with scalability and diversity challenges.

Vincenzo Grassi and Andrea Sindico. *Towards Model Driven Design of Service-Based Context-Aware Applications.* Introduces a conceptual model and an example instantiation that support the development of context-aware aspects of a pervasive application.

Pietro Mazzoleni and Stefan Tai. *Engineering Mobile Field Worker Applications.* Argues for a set of service-oriented facilities that must be provided to field workers in B3G environments.

Closing Thoughts

The community is currently in a period of broad exploration. This can be seen in the large number of workshops and conferences on the topics of either software services or pervasive environments. On the positive side, this is drawing people to interesting and important new challenges and problems. But on the negative side, the community has yet to come together on a clear research agenda. It is hoped that ESSPE will enable at least some portion of the community to examine software services in the context of pervasive environments in a coherent and focused way.

Acknowledgments