

# **A Parametric Design Approach to Scalability Management of Semantic Middleware**

Reto Krummenacher

*reto.krummenacher@sti-innsbruck.at*

Forschungsinstitut STI, Universität Innsbruck

The World Wide Web is one of the ground-breaking achievements of modern computer science. The core technology, so simple to use, allows billions of users to publish, share and consume information from all over the world. With the emergence of the Web2.0 paradigm, Web services and the Semantic Web, the World Wide Web has transformed to an open interactive market place. Heterogeneous and distributed producers and consumers – or rather, in the current context of the Web, so-called prosumers – have to integrate data and to coordinate their activities. Bringing this all together and lifting it to the level of large-scale Web computing triggers increased scalability, heterogeneity and dynamism challenges. In response, recent work in the field of middleware technology proposes semantics-aware tuplespaces that enable the integration, communication and coordination of billions of autonomous, distributed and heterogeneous data and service prosumers. Sources are no longer addressed directly by their endpoint locator, but are abstracted by the semantic space middleware that provides a unified and virtually global view of the data published in diverse databases. Such middleware is the fundamental building block for the realization of distributed application in the true Web sense: scalable, open and very simple to use.

In this work we discuss in-depth the requirements and challenges arising in the context of large-scale Web computing. As main contribution, we elaborate on scalability implications, and present a parametric design-based user requirements analysis tool that supports architects during the design phase of semantic space realizations. The tool aims at facilitating the configuration of scalable and dependable space installations that match the application needs in terms of functional and non-functional properties. As proof of concept, we present a Web-scale semantic space implementation that ensures scalability and decentralization by means of established P2P technology.