

Chapter 17

Virtual Organisational Trust Requirements: Can Semiotics Help Fill the Trust Gap?

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ABSTRACT

It is suggested that the use of the semiotic ladder, together with a supportive trust agent can be used together to better explicate “soft” trust issues in the context of Grid services. The contribution offered here is intended to fill a gap in current understanding and modelling of such issues and to support Grid service designers to better conceptualise, hence manage trust issues. The semiotic paradigm is intended to offer an integrative viewpoint within which to explicate “soft” trust issues throughout the Grid life-cycle. A computationally lightweight trust agent is described that can be used to verify high level trust of a Virtual Organisation. The potential benefits of the approach that is advocated here include the reduction of risk and potential improvements in the quality and reliability of Grid service partnerships. For these benefits to accrue, explicit “soft” as well as “hard” trust management is essential as is an integrative viewpoint.

INTRODUCTION

Computational models of trust mechanisms based on explicating notion of trust in the context of Grid services have only recently emerged from the research literature (Eymonn, Konig, & Matros,

2008; Song, Hwang, & Kwok, 2005). One reason for this is that traditional security mechanisms are being increasingly challenged by open, large scale and decentralized environments. Specifically, the Grid is specifically characterized by *ad hoc* collaborations (sharing of computing resources)

as between geographically distributed Virtual Organisations (VO's). Explicit trust management should ideally aim to go well beyond "hard" tangible security aspects of Grid services (Matthews, Bicarregui, & Dimitrakos, 2003). Rather, at a higher level of organizational abstraction, wider trust dimensions inherent within Grid partnerships such as partner reputation and organizational culture, quality of service issues such as reliability, provenance, values and ethical concerns need to be examined. Emergent research work is only beginning to seek to address these "soft" trust issues and seeking to integrate these with more fine-grained Grid service security concerns (Wilson, Arenas, & Schubert, 2007).

Since Grid standards are grounded on Web-Services, it might at first appear to be reasonable to assume that various Web-Service standards that are still under development will together, create a suitably structured framework within which to address both "hard" and "soft" Grid trust and security concerns. Indeed, initiatives are now underway, having the aim of ensuring that emergent Grid computing paradigms are based on a fully articulated set of trust and security protocols and standards (Cahill et al., 2003). However, it is becoming increasingly apparent that there is a gap in our current understanding of "soft" trust aspects of Grid services. The remainder of this paper seeks to show the potential for filling the trust gap with respect to agent-to-agent Grid services through use of the semiotic paradigm.

GRID COMPUTING: A BRIEF OVERVIEW

Grid computing is a computational network of tools and protocols for coordinated resource sharing and problem solving among pooled assets. These pooled assets are known as Virtual Organizations (VO). They can be distributed across the globe and are heterogeneous in character. The Grid is a type of a parallel and distributed

system that enables the sharing, selection, and aggregation of resources distributed across multiple administrative domains based on their availability, capability, performance, cost, and users' quality of service requirements. Grid computing uses many computers connected via a network simultaneously to solve a single scientific or business related problem. Whereas current initiatives have focused on the needs of the scientific community, in the future the business community is expected to benefit too. Indeed, Grid computing is expected to become a mainstream business-enterprise topology during the rest of the current decade. In the most common case, the type of application most likely to benefit from the blurring of the binding as between application and host is one that usually require substantial amounts of computer power and/or produce or access large amounts of data. That is to say, execution of an application in parallel across multiple host machines distributed within or between enterprises can increase performance substantially and also make use of the spare capacity of existing nodes too.

Grid applications often typically involve large volumes of data produced by data-intensive simulations and experiments. The Grid can be conceived as a huge network of VO's which have coordinated their resource node sharing capabilities. The Global Grid Forum (GGF) has been formed to standardize the growth of the Grid. The GGF has embraced the Open Grid Services Architecture (OGSA) as the industry blueprint for standards-based grid computing. "Open" refers to both the process to develop standards and the standards themselves. It is "service-oriented" because it delivers functionality as loosely-coupled, interacting services aligned with industry-accepted Web service standards. The "architecture" defines the components, their organizations and interactions, and the design philosophy used. A basic premise of OGSA is that everything is represented by a service: a network enabled entity that provides some capability through the exchange of messages. Computational resources,

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