Peer-to-Peer Grids: scalability, dependability and discovery of resources and services for global Grid markets

Final report of COREGRID REP 14 stay from UPC (CR38) – SICS (CR19) and KTH (CR15)
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Introduction

This report summarizes the activities and achievements that have resulted from the COREGRID REP 14 stay on peer-to-peer grids. During the three weeks of the stay Leandro Navarro (UPC) has collaborated mainly with Per Brand, Joel Höglund, Konstantin Popov (SICS) and Vladimir Vlassov (KTH).

The objective of the stay was to work and exchange ideas on several issues that appear when designing the mechanisms to support Grid markets over a key based routing overlay or DHT such as DKS and the required discovery and selection mechanisms.

Work done

The work was organized as follows: an initial joint meeting with SICS and KTH was used to do individual presentations of interests and the current work by each participant. A list of specific topics of common interest was drafted. The work in the remaining days in SICS and KTH was divided into group discussion meetings, bilateral working meetings, and individual work.

One part of the work resulted in a more deep understanding of recent work by each group, particularly a market based approach for resource allocation, the Currency Management System, the Market Information Service (UPC); Niche DHT, including the self-* support, flexible binding models (SICS), discovery mechanisms and authorization models for Grids (KTH).

The main part of the work at SICS was focused on the discussion and initial design of a prototypical decentralized Grid application named "Our Simple Storage Service" (OSSS) that while being deliberately simple in the functional aspects (simple storage service), it is sophisticated in the non-functional aspects, supporting self-* properties (self-configuring, self-optimization, self-healing and self-protection). This service runs inside a virtual-organization (VO) using resources contributed by the participants of the VO. In a second step we consider also having additional services running within the same VO and therefore competing for the common resources. On a third step we can consider that there is a resource market where additional resources can be acquired when required by the services via the virtual organization management system. This work has continued after the visit.

The main part of the work at KTH was related to discovery mechanisms (KTH) applied to resource markets (UPC), and an authorization module for Grids being developed at KTH that is being incorporated into applications and services being developed at UPC. The discussion on the first topic was on the comparison between the discovery and resources, services and market instances (open auctions). The discussion on the second topic was related to learning about the flexibility of the language to describe authorization policies and establishing the policy enforcement points in the applications. This work has continued after the visit.

Conclusions

The work performed during the stay has been following the goals described in the proposal, focusing on increasing the mutual awareness of the related work, and focusing on some specific aspects for UPC-SICS (self-* services) and other aspects for UPC-KTH (discovery and authorization) that were discussed during the stay and developed partially during the stay and later.

The work planned and performed is related to the following CoreGRID topics in order of more to less importance: (1) Architectural Issues: Scalability, Dependability, Adaptability; (2) Resource Management and Scheduling; (3) Grid Systems, Tools and Environments.

The research work initiated during the stay continues later at distance by the participants of the stay and involving local PhD students in follow-up topics.

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