Chapter XXVI
Semantic Discovery of Services in Democratized Grids

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ABSTRACT

This chapter aims at discussing issues concerning the advertisement and semantic discovery of Web services in a democratized Grid environment: an environment in which users are agnostic of the low-level details for managing the services offered and requested. This type of environment poses new requirements, and thus, it affects the functionality of a service advertisement/discovery system. In the context of this aim, the chapter presents the motivation and the technologies developed towards a semantic information system in the Grid4All environment. The chapter emphasizes on bridging the gap between Semantic Web and conventional Web service technologies, supporting developers and ordinary users to perform resources’ and services’ manipulation tasks, towards a democratized Grid.

INTRODUCTION

Web services, as a distributed computation paradigm, raise a number of issues in order for their benefits to reach their potential. Semantic descriptions of Web services have emerged due to their prospective to support the automation of service discovery, invocation, composition and moni-
toring tasks by providing machine-exploitable meaningful declarative descriptions of service characteristics. Despite the benefits of semantic Web services, there is a gap between Semantic Web and conventional Web service technologies, which impedes the semantic manipulation of services’ registries, providing limitations for the adequate, flexible and seamless treatment of services. Ordinary Web users, software developers and service providers, as well as users of service registries must be supported to perform their tasks more effectively in such a machine-oriented (semantic) environment. This is particularly true for services or domains that change frequently: Stakeholders must be supported to perform their tasks in effective and adequate ways.

This chapter aims at presenting issues and solutions proposed for dealing with the problems of semantic web service advertisement, discovery and selection in a democratized grid environment: An environment that provides opportunities for (a) users that are agnostic of the low-level details required for managing services offered and requested, and for (b) service providers that need to make the best of their offered services. This type of environment poses new requirements, and thus, affects the functionality of a service advertisement/discovery system. In the context of these issues, the chapter presents specific technologies developed for realizing a Semantic Information System of a grid environment. The developed system supports the Grid4All approach for service discovery and selection in a democratized grid, in the context of the Grid4All European IST project.

The Grid4All project aims at developing a self-managed, autonomous, fault tolerant, and easy to use infrastructure that will enable ordinary users and small organizations such as schools and small/medium enterprises to share their computing resources. In this way, a ‘democratized’ grid is envisaged, which is accessible to organizations that lack the human and computation resources so as to participate in existing grids. In this context, Grid4All resources (traded in markets realized as specific types of services) and application-specific services are being advertised in the Grid4All Semantic Information System (G4A-SIS). The G4A-SIS provides a portal where semantically described grid services are advertised and discovered by (software and human) peers. Peers may pose to the G4A-SIS orders (i.e. requests and offers) concerning (a) specific resources that are being traded in markets, satisfying specific criteria/preferences/constraints concerning resources’ configuration, market and order-related properties, or (b) application-specific services’ profile specifications. These are further detailed in the sections that follow.

This chapter presents the technologies developed for the G4A-SIS to provide semantically-enriched functionalities for the resources/services’ advertisement and discovery tasks, towards a democratized grid environment. Special emphasis is given to the semantic specification of services’ profiles, supporting the effective discovery of advertised services.

The structure of the chapter is the following: in the next section, an overview of grid environments and web services is presented. Next, the Grid4All framework is presented, together with the need for an information system which promotes democratization. Next, the features of the Grid4All SIS are discussed, followed by a review of the state of the art in relevant approaches. The chapter ends with some conclusions.

GRID ENVIRONMENTS AND WEB SERVICES

Grid Environments

A grid provides the infrastructure for sharing and reusing entities by multiple users. These entities are referred to as ‘resources’. A grid is a collection of interconnected machines, sometimes referred to as “nodes,” “resources”, “members”,
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