

Dynamic Resource Management on the Grid

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1. INTRODUCTION

In this paper, we discuss the conceptual architectural design of a dynamic resource management framework which leverages the open-source Globus Toolkit[2] and commercially available HP OpenView Configuration Management Solutions software (Radia)[1]. Our approach provides adaptive and scalable middleware for static and dynamic resource provisioning, resource monitoring, virtual organization-wide authorization, and business policy management. In what follows, we provide a brief overview about Radia software¹.

2. RADIA

Radia[1] implements an automated, policy-driven change and configuration management system for dynamically adjusting the size, configuration and allocation of physical system and data resources. It provides a highly adaptable, flexible, and automated approach to resource provisioning for an infrastructure by adopting an object-oriented technology for transforming software and content from file-based media into self-aware, platform-independent, intelligent objects that can automatically assess the environment into which they are deployed, and have the capability to install, update and repair themselves accordingly.

3. GRRMS

The Globus-Radia Resource Management System (GRRMS) provides an automated, scalable, highly configurable and adaptable solution to dynamic resource management for a grid environment. The GRRMS architecture, shown in Figure 1, implements a set of WSRF-compliant[3] services to provide various functionalities for authorization, resource discovery, job monitoring and management, SLA management, and resource provisioning as part of the Globus-Radia Broker (GRB). One of the key features of this framework is the ability to automatically provision (and de-provision)

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¹We assume that the reader is familiar with the open-source Globus toolkit[2].

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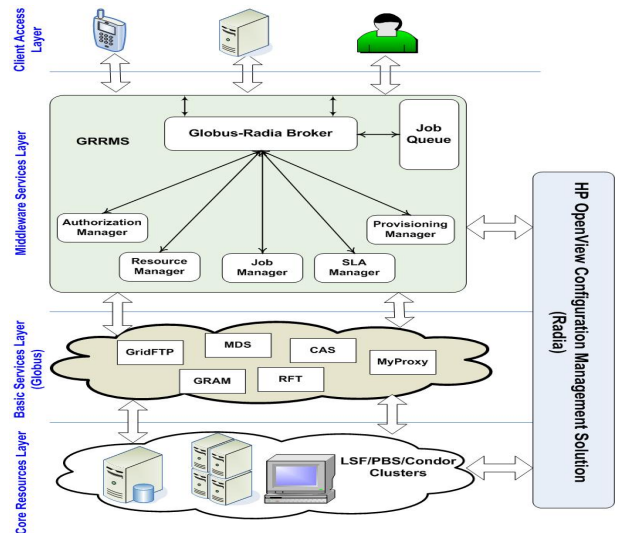


Figure 1: GRRMS Architecture

resources for execution of applications based on the changing load characteristics of the environment, thereby ensuring appropriate resource usage. This feature is enabled by the Provisioning Manager, which is responsible for allocation and deployment of resources needed to execute a client application. In our framework, we use Radia as a tool for provisioning of hardware and software resources. Radia provides a Web services API for basic management of resources and their deployment, based on a *distribution model*. These models are created dynamically by the Radia Configuration Server (based on situation-specific data) and are specified (by the Radia administrator) using XML-based ‘policies’, which broadly defines *what* application needs to be installed/deployed *where*, *when* and *how*. They also specify software dependency, i.e., the deployment relationship with other software components, operating systems and hardware. The policies are stored in the Radia Database, and queried by the Configuration Server at run-time. Similar policies can also be defined for resource de-allocation, wherein applications are terminated and/or uninstalled.

4. REFERENCES

- [1] HP OpenView Configuration Management Solutions Software, <http://managementsoftware.hp.com>.
- [2] The Globus Toolkit, <http://www.globus.org>.
- [3] S. Graham, I. Robinson, and et al. Web Services Resource Framework Primer, Draft 5. In <http://www.oasis-open.org/committees/wsrp>, 2005.