

# GRID-GMS: An Architecture for Dynamic Resource Selection

*Cristiano C. Rocha, Denise Janson,  
Matheus A. Viera and M.A.R. Dantas  
Department of Informatics and Statistics (INE)  
Federal University of Santa Catarina (UFSC)*



UFSC

*Michael A. Bauer  
Department of Computer Science  
University of Western Ontario*



# Agenda

- Motivation
- Introduction
- Related Works
- Proposed Approach
- Conclusions
- Future Work

# Agenda

- Motivation
- Introduction
- Related Works
- Proposed Approach
- Conclusions
- Future Work

# Motivation

- **Resource management** in multi-cluster grid configurations is a challenging task which requires an **efficient scheduling** of distributed and parallel applications;
- **Advance reservations** are usually performed in a **static** form;
- A challenge to reach **transparency** is how to match efficiently applications and resource during the **execution time**.

# Motivation

- In this research work we propose an architecture to provide a support for a **dynamic selection** and **allocation** of resources to **workflow applications** in grid configurations;
- GRID-GMS (Grid Resource selection method - Grid Management System);
- Considers a **minimal reservation** of resources for a workflow and **future** requirements are **dynamically negotiated**.

# Agenda

- Motivation
- **Introduction**
- Related Works
- Proposed Approach
- Conclusions
- Future Work

# Introduction

- Multi-clusters, if well orchestrated as in a grid environment, can represent significant computational power for the execution of workflow applications;
- This meta-computing environment can be employed as a HPC facility inside a specific organization, or among different organizations, creating in both cases the concept of virtual organization (VO).

# Introduction

- Distributed grid configurations are usually **heterogeneous** in terms of resources and administrative police;
- GMS performs its functions as a **Meta-manager** component, i.e. a component that acts as **middleware server** for many different configurations.

# Agenda

- Motivation
- Introduction
- **Related Works**
- Proposed Approach
- Conclusions
- Future Work

# Related Works

- The use of **ontology** in a static fashion could help the typical **heterogeneity** resource **description** found between VOs;
- **Dynamic** mechanisms are used for **forecast** performance;
- **Load-balancing** and QoS are important aspects in a grid environment.

# Related Works

- Some works represent applications and resources using the **service approach**, based on Web Services;
- The use of **workflow** in grid allows execution of distributed applications considering diverse administrative domains;
- **Co-reservation/co-allocation** aids to enhance grid resource **usage**, but can represent a drawback without a dynamic mechanism.

# Agenda

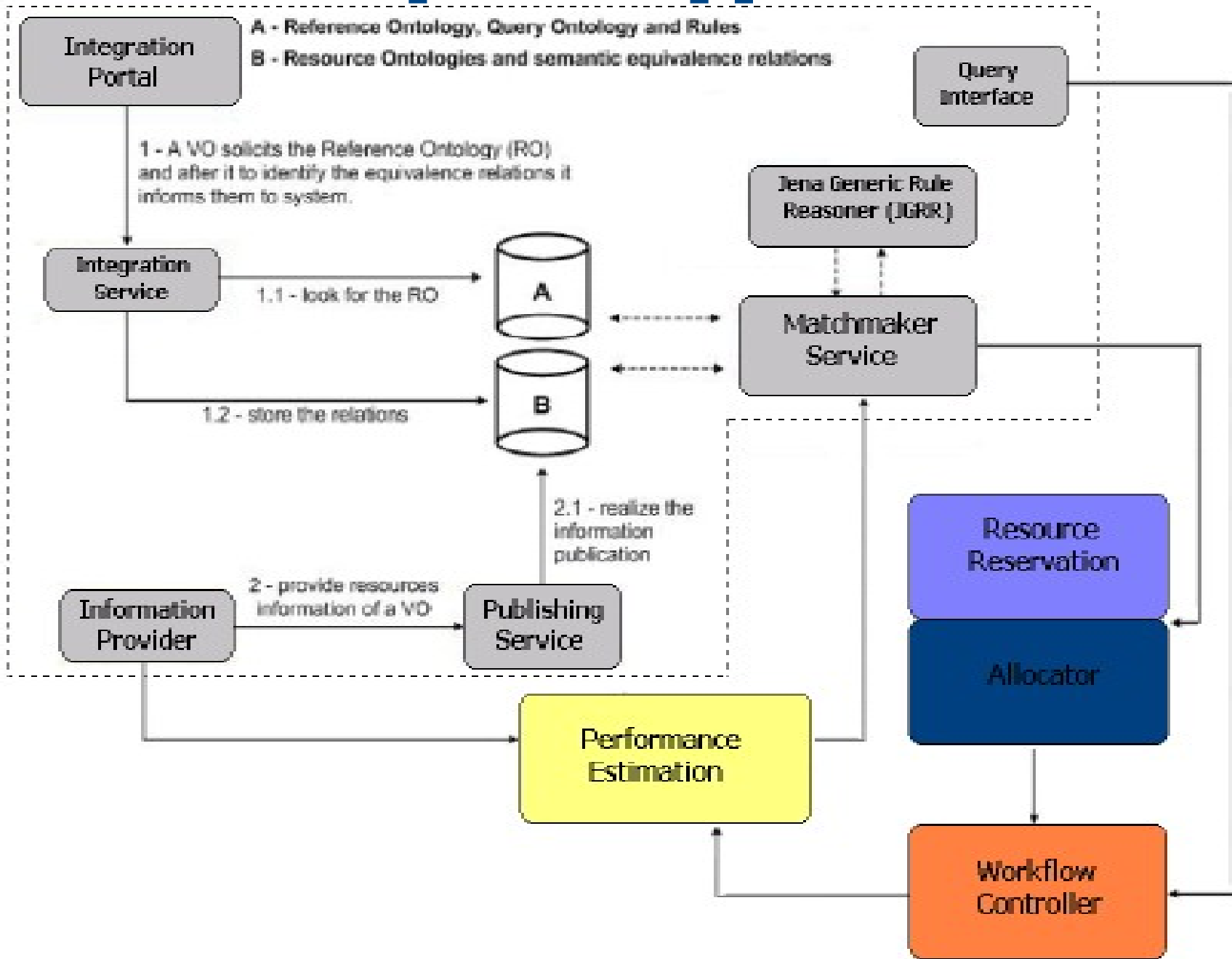
- Motivation
- Introduction
- Related Works
- **Proposed Approach**
- Conclusions
- Future Work

# Proposed Approach

- The **ontology** paradigm is applied to **formal description** of grid resources. Furthermore, it offers a base for the **semantic matching**, considering multiple ontologies;
- Initial **requirements** are accepted, if it is possible. However, requests for **future utilization** could be dynamically analyzed in a **future moment**;
- This mechanism could be utilized for a **workflow** application to gather more **up-to-date** resource information.



# Proposed Approach



# Proposed Approach

- Reservations are **based upon calculus** from the Performance Estimation proposed component.
- If a process could not be completed, because of resource constrain, this module is responsible for the **context saving** and later for the **checkpoint**.
- A **ticket approach** is adopted for each query

# Agenda

- Motivation
- Introduction
- Related Works
- Proposed Approach
- **Conclusions**
- Future Work

# Conclusions

- In this paper, we described the design of an architecture called as GRID -GMS (*Grid Resource selectIon methoD - Grid Management System*). The goal of the proposal targets to perform a dynamic selection and allocation of resources to workflow applications in grid configurations.
- A dynamic approach was considered to execute workflow in grid environments, representing a differential for a previous resource matching environment developed in our research group.
- This new approach allows dynamic reservation in heterogeneous grid environments, offering transparency of allocation and reservation for ordinary users.



# Agenda



- Motivation
- Introduction
- Related Works
- Proposed Approach
- Conclusions
- **Future Work**

# Future Work

- The conceptual model of this new approach and integration with the previous environment was the first stage of our work;
- Next steps are implementation and case studies experiments in multi-cluster grid configurations.



Thank you !

Questions ?