Providing reliable distributed Grid services in mobile environments

www.Akogrimo.org

Outline

- **The Akogrimo Project**
- **Mobility**
- **Reliability**
- **Architecture**
- **Current Developments**
- **Issues**
- **Future Plans**

Akogrimo

Motivation

- Mobility is rapidly becoming part of our lives.
- Technologies include 802.11 – UMTS -GPS
- Applications – mobile internet, vehicle tracking / navigation.
- Influencing creation of location specific services and increased levels of semantic computing.
- Fits in well with web services and application integration technologies, great potential for the application of Grid Technology.

Akogrimo

The Project

- Akogrimo: Access to knowledge through the Grid in a mobile world.
- Aim to design a grid middleware prototype capable of supporting mobility.
- European Research Project.
- 3 year duration.

Akogrimo

Approach

- Akogrimo's focus is on the development on technologies above and below the Grid infrastructure layer.
- The project is using mobile technology which like Mobile Ipv6 exists at hardware level.
- The project aims to present a series of application test beds running on Akogrimo Grid Middleware that demonstrate technologies like Mobile IpV6 being utilised in the Grid.
- Akogrimo also will be OGSI and WSRF compliant.

Akogrimo

CCLRC Focus

- Work on the Akogrimo application layer has been the focus of CCLRC in the past few months.
- We have worked with the following areas:
  - VO management
  - Workflow Management
  - SLA
- During this process we have created Architecture documents and also started work on first test applications.
- At the moment, concept is that Akogrimo services are ran on a base architecture that calls in mobile services.

Mobility

Key Akogrimo Technologies

Mobile Ipv6

- Allow roaming of terminal by keeping home address.
- Aim to build on existing MIPv6 projects that have influenced and helped establish MipV6 support in Grid middleware GT4.
- WSRF.net not yet support

Positioning technologies

- GPS
- RFID

Mobility

Challenges

We focus on two main areas:

Connection

- Loss in connection - train through tunnel
- Physical address change

Context

- Change in resource location – data movement from EU to China
- Change in environment – UMTS – GPRS handover

Mobile Hell

Mobility + Reliability

Approach

- Akogrimo aims to cater for mobility by linking the higher architecture to the lower level technology
- This will hopefully solve reliability issues that can not be solved by lower levels.
- Solutions to issues like loss of physical connection or change in context, it is aimed will be built into this higher level architecture.
- This will improve the reliable execution of applications that run over the Akogrimo Grid Architecture.

Reliability

Issues

Reliability can be defined in many ways, but we are concerned with how it is

- Measured
- Presented
- Selected
- Provided

- Often reliability is defined by agreements between parties.
- Reliable for me is not reliable for somebody else.

Reliability

Providing a reliable architecture

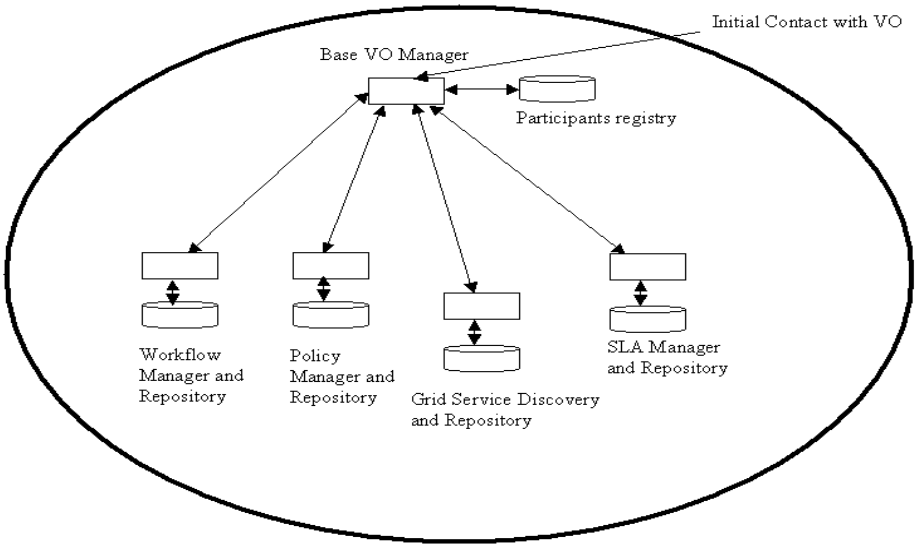
- Within Akogrimo services are either provided by the owner of the Akogrimo Grid or by a separate third party supplier.
- Thus reliability can be seen as based around the Akogrimo base services working well with the external services which make up the Akogrimo Architecture.
- These external services are also designed to add mobility into the model (ER).
- We will look at the core Akogrimo base Architecture which aims to provide reliable execution of mobile Grid Services first.

Architecture

Key Elements

- We will now look at four main Akogrimo application level components which have the main influence on the management and therefore reliable execution of mobile services.
- These are:
  - VO Manager
  - Workflow Manager
  - Policy (security) Manager
  - SLA Manager

Akogrimo Base Architecture

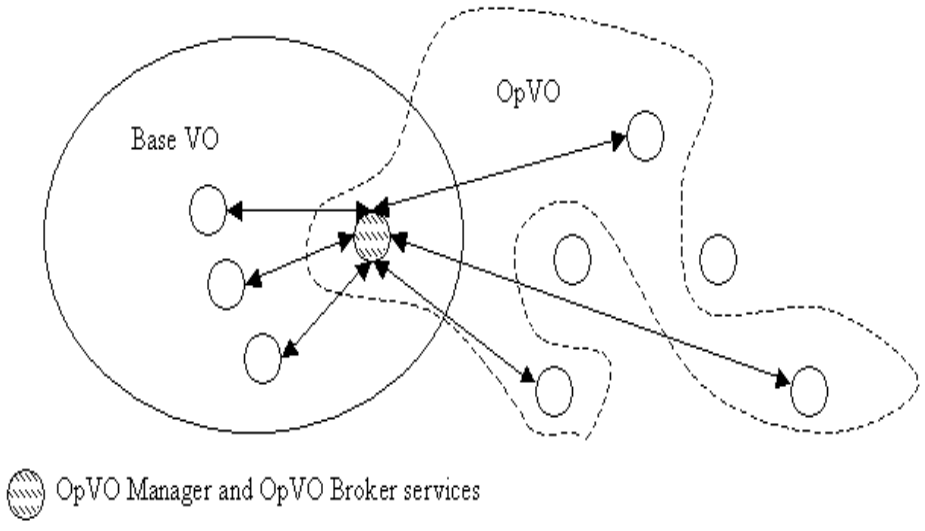


Architecture

VO Management

- At the top of the Akogrimo Architecture is the Base VO Manager.
- Key Point of workflow and initialises the execution of an Akogrimo Service.
- Mobile services are already joined to the Base VO but become live when the application is being executed.
- In order to secure and also manage this execution effectively the execution of these services are managed by a sub VO Manager created by the Base VO Manager.
- This sub management is done by the Operative VO Manager and the execution can be visualised in the context of and Operative VO.

VO Architecture

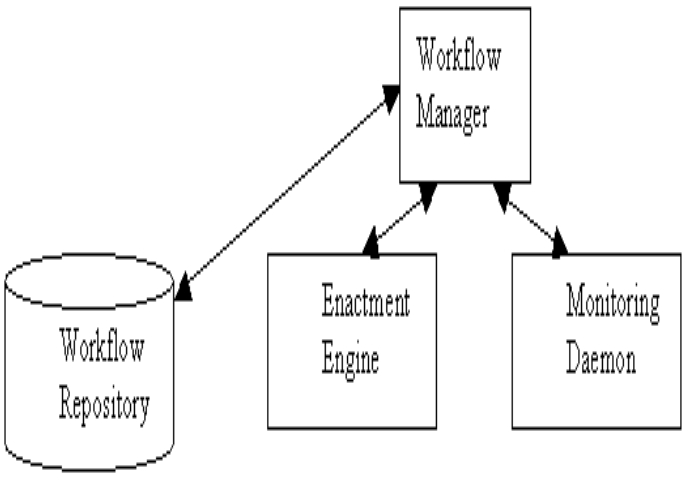


Architecture

Workflow Management

- Managing the orchestration of service execution is the workflow manager (WFM).
- The WFM components ensure that this execution is done effectively.
- Loss of service in mid execution can be factored into the workflow and the WFM to ensure that backup provision is in place.

Workflow Architecture

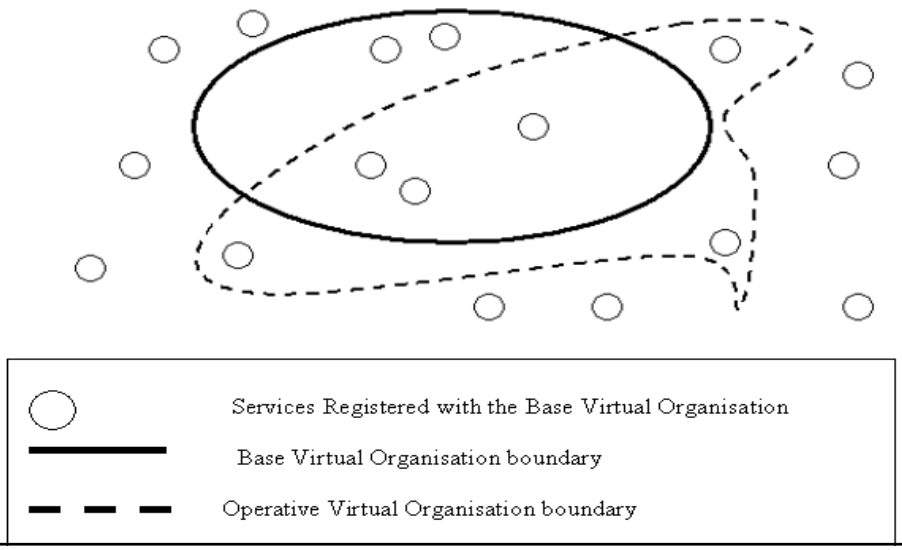


Architecture

Service Management

- Many mobile services are owned and provided by organisations outside our control.
- The use of the WFM and also VO Management in the architecture adds resilience to the use of these external services in case a service fails or acts in an unreliable manner.
- However Akogrimo also aims to influence that reliability provision is also a key aim of the external service providers.
- We improve reliability by managing:
  - Service Discovery
  - Service Selection
  - Service Execution

Service Management Architecture



Architecture

SLA

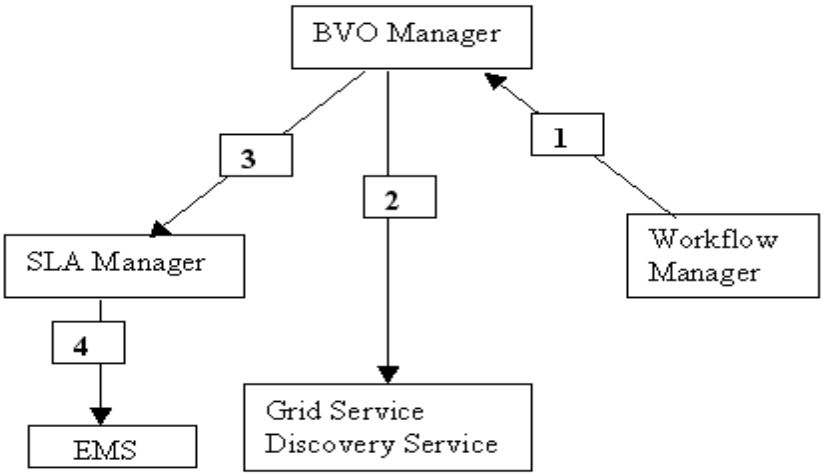
- In many computing relationships Service Level Agreements form a bond that helps guarantee reliable service provision.
- Akogrimo relies on SLA contracts too.
- SLA contracts in Akogrimo are base upon SLA templates completed by the Akogrimo customer and service provider.
- Done when either publishing a service to be used or when selecting an application service to be executed
- Emergency Response is a bad example, but …

Architecture

SLA Service Selection

- In respect to SLA services can be discovered and selected based on criteria signed up for.
- Akogrimo provides a brokering service to enable this correct service selection based on workflow and SLA needs.
- This is part of the VO management section.

Execution Architecture



Current Developments

- We are on the verge of presenting our first Emergency response application.
- We aim to build on this during the next few weeks.
- Once completed we will begin the Disaster Management and E-Health test beds.

Issues

- A main issue that is confronting us at the moment is the handling of context in workflow.
- As illustrated out workflow manager consists of four main components.
- Here the workflow is written in BPEL and executed via and enactment engine. This engine has to be able to deal with context.
- Want context to be factored in as seamless as possible with no rollbacks in Workflow.
- Defining context is proving to be hard enough …

Future Plans

- Continued development of prototype's.
- This is to expand to a E-learning Prototype and also Disaster Management Prototype.
- Finalise approach for context management.
- Currently using RFID as our positioning technology, looking to also run application with GPS data.

Any Questions?

Thanks for listening

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