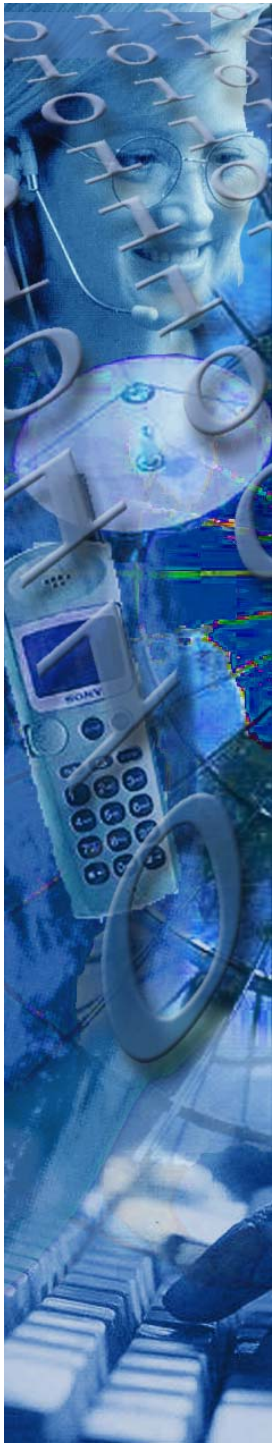

Adaptive Management Middleware for Grid Services and Applications Based on Policies

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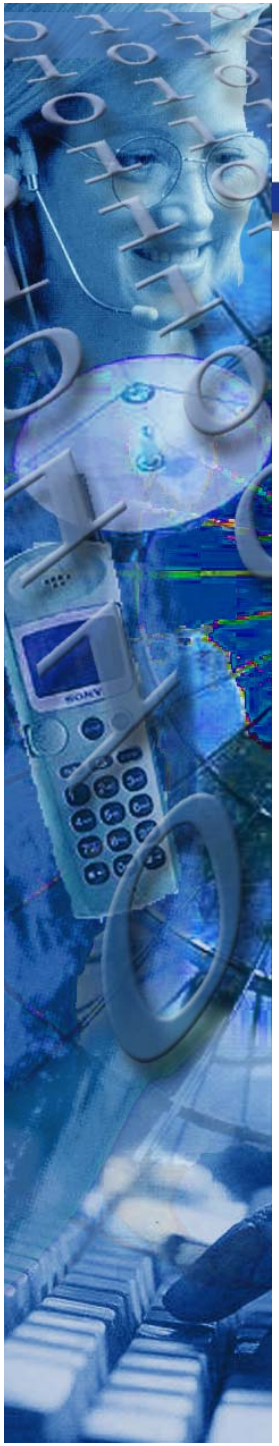
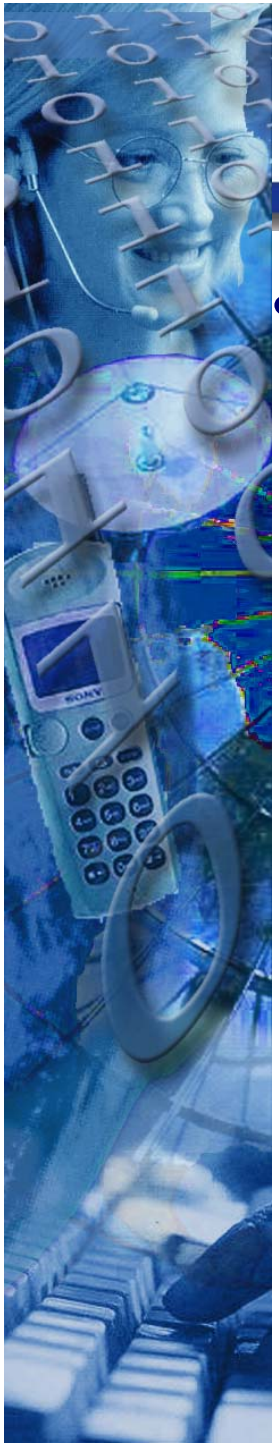


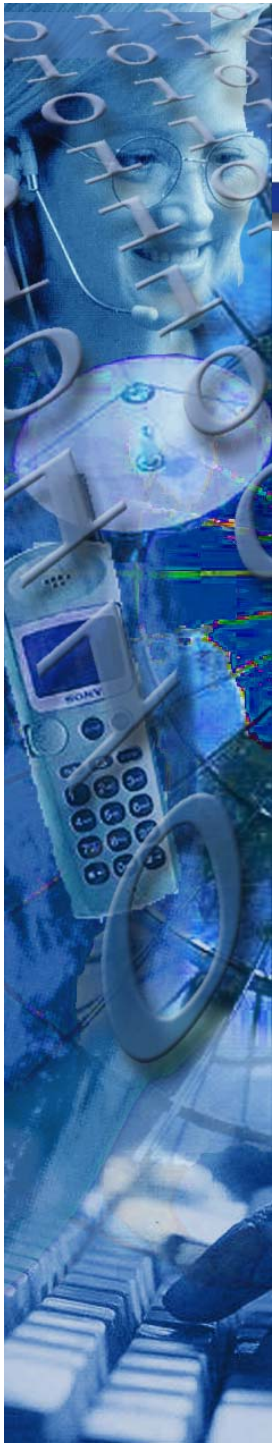
Agenda

- Introduction
- Management Middleware Requirements
- Functional Requirements for Grid Connectivity Services Management
- Policy-Based Management Proposal - Overview
- Initial Trials
- Conclusions
- Ongoing and Future Work



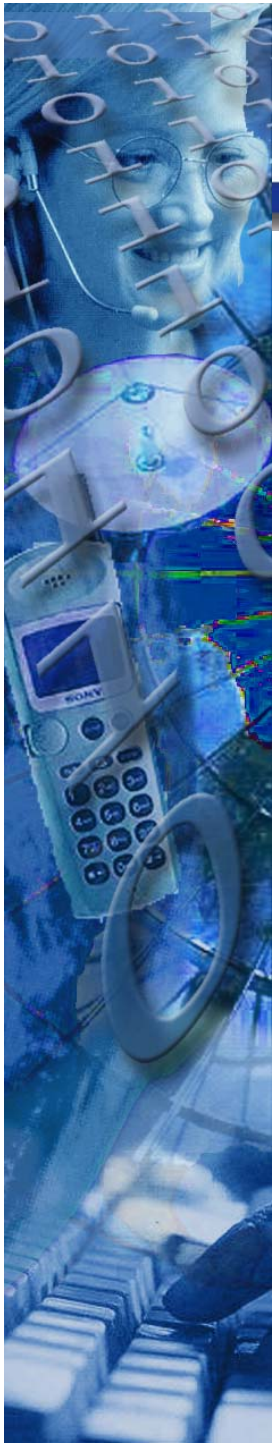
Introduction (I)

- **Next Generation Grid Computing Tendencies:**
  - Services should be provided to users regardless of network technology, administrative domain or operative platform.
  - Effective access to large amount of computing, network and storage resources, reducing procurement, deployment, maintenance and operational cost.
  - Network Performance: Fault-tolerance, Reliability, Scalability, Flexibility and Persistence.
  - OGSA Compatibility



Introduction (II)

- **Main Problems:**
  - Swift and dynamic reservation and allocation of computational resources
  - Allocation of network resources per service
  - Configuration of resources on fly
  - Deployment of distributed services in heterogeneous and multi-domain networks



Management Middleware Requirements

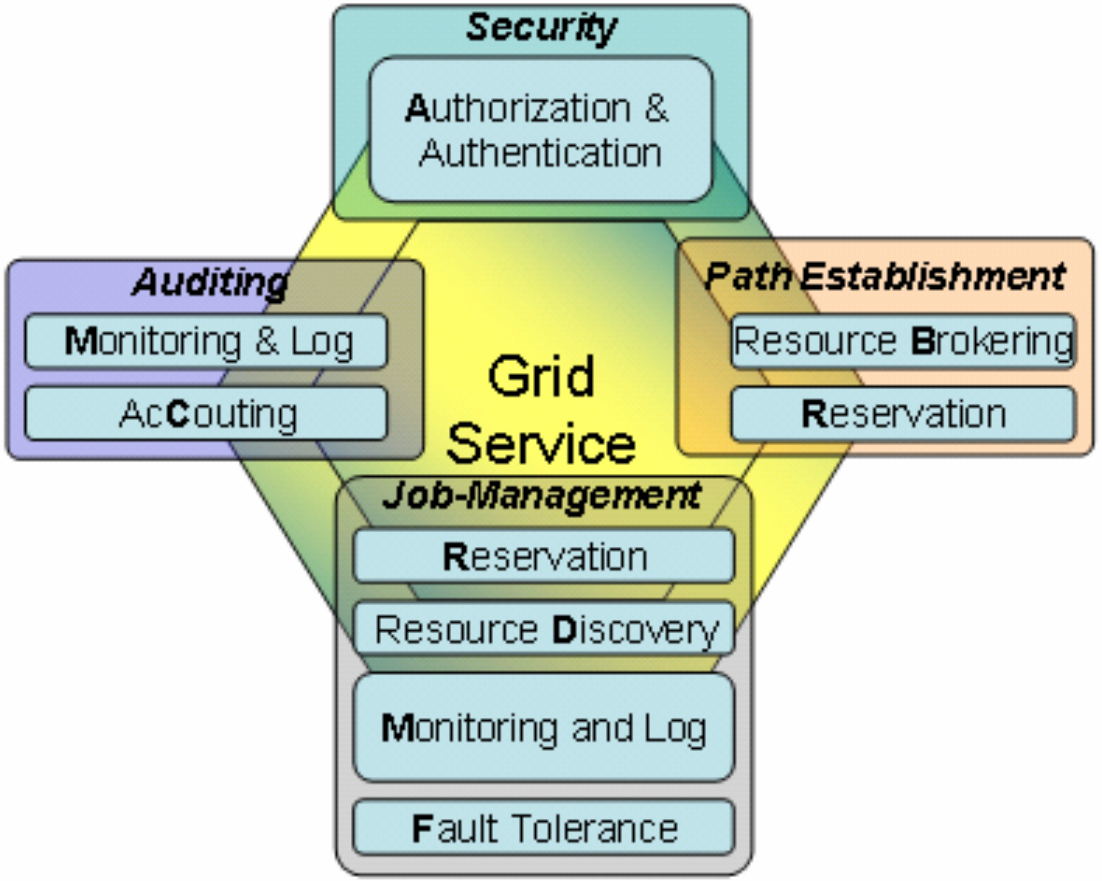
Grid computing is affected by continuous innovations

- Schemas conversion technologies
- Common meta-models and ontologies
- Allow data to move between different systems technologies
- Intercommunication between different network domains

Key challenges are “Co-ordination” and “Orchestration”

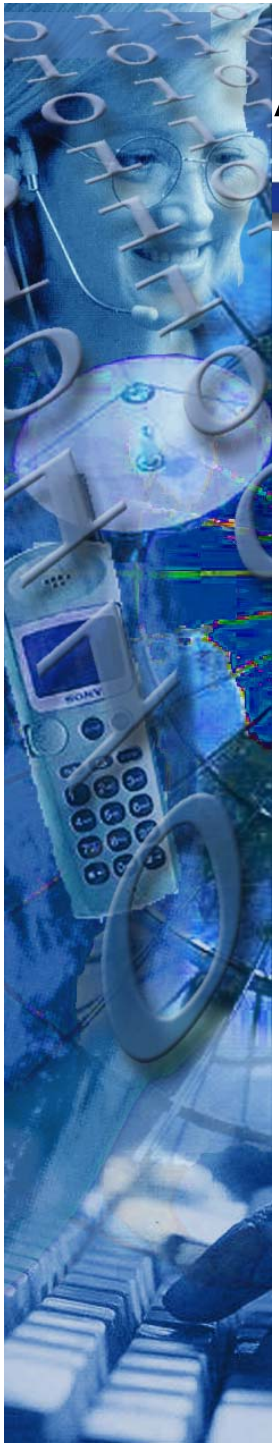
- Services on the net need specific resources requirements
- Usually these requirements are hard coded using low-level primitives
- Grid need to handle resources in more dynamic way
- Grid applications will require to co-ordination and orchestration of grid elements at run time

Functional Requirements for Next Generation Grid Services Management



Virtual Grid Path (VGP)

Management Activities

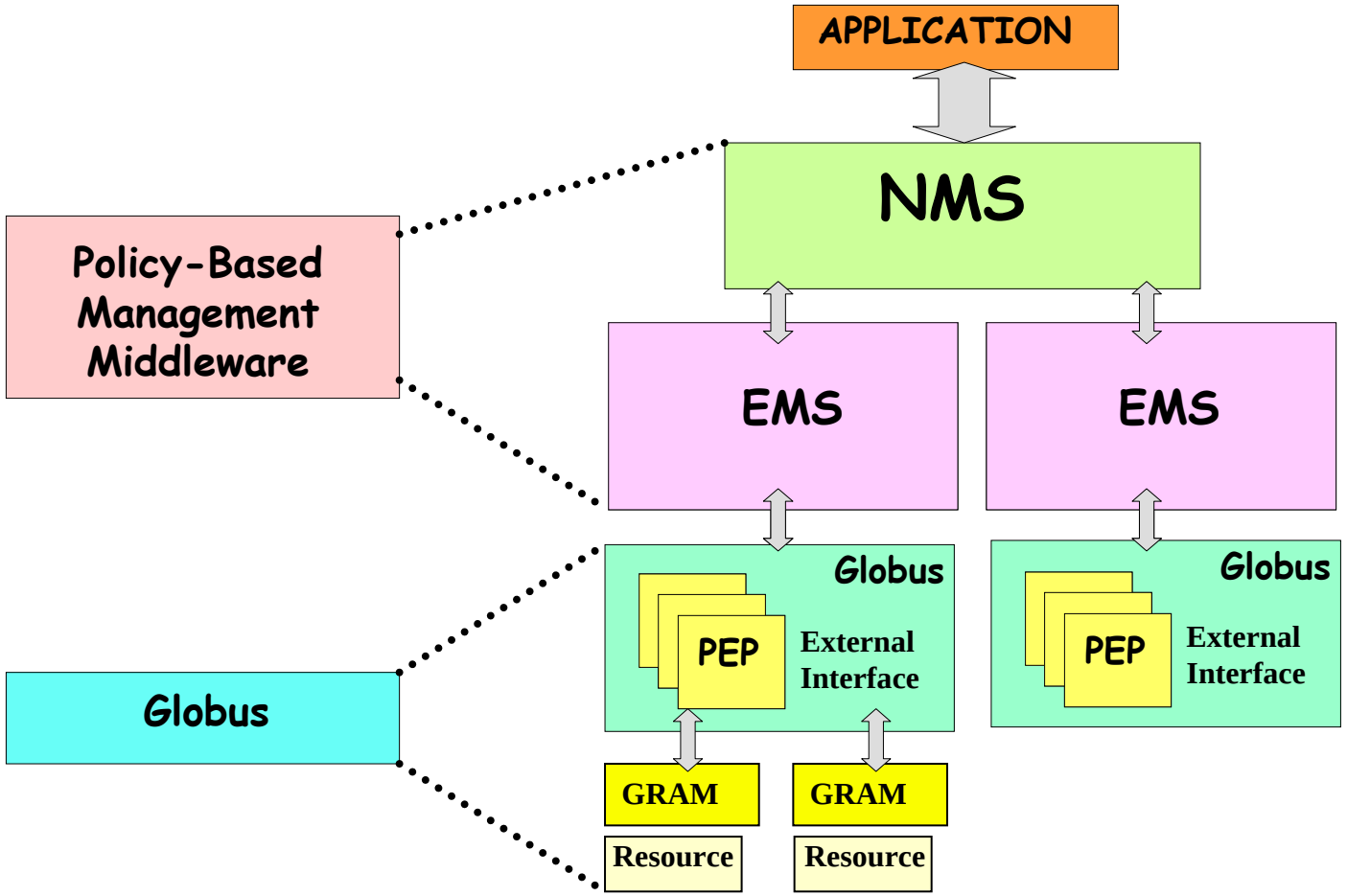


Adaptive Management Policy-Based System

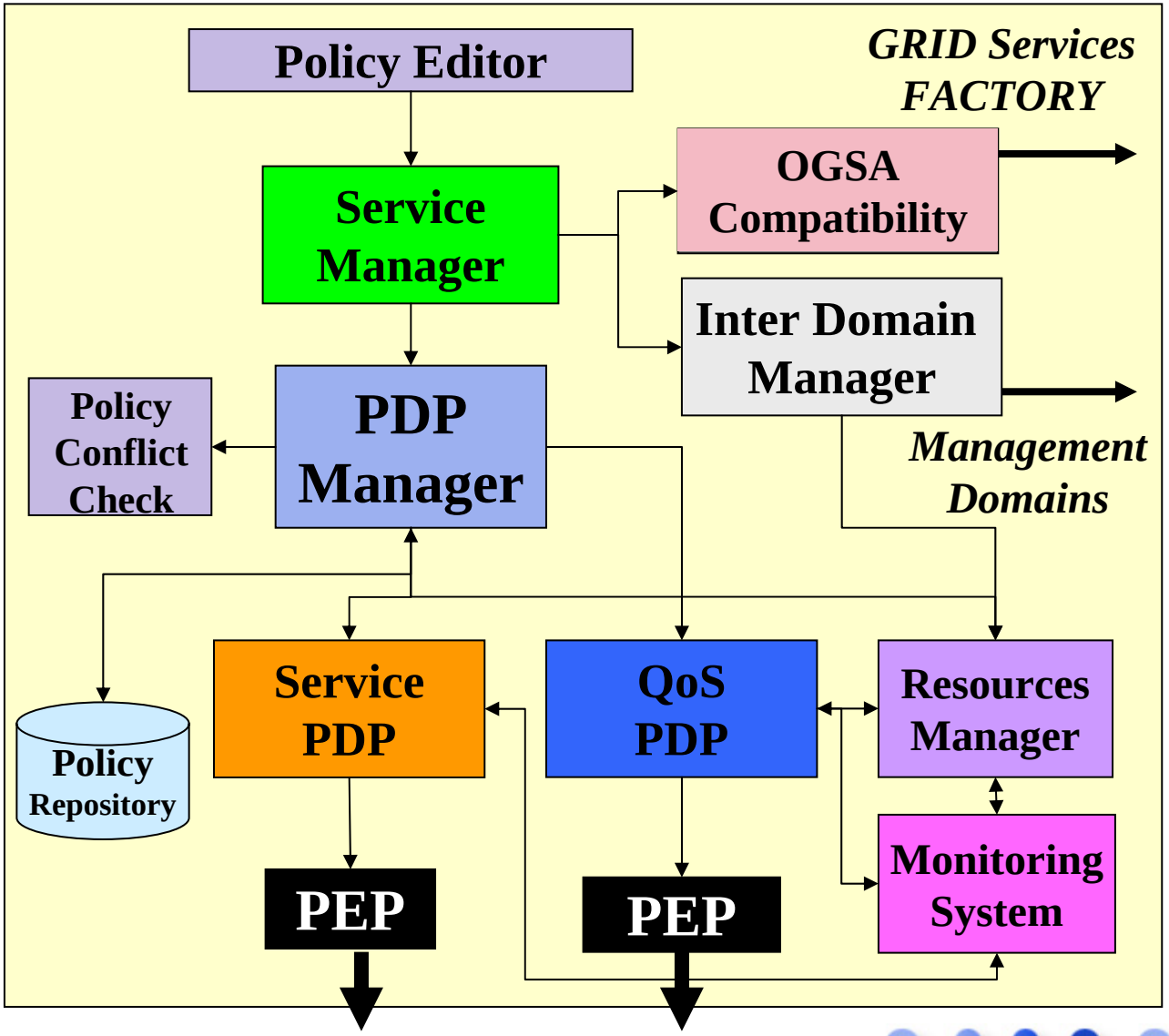
- **Main Goal**
  - Design and implement components for a policy-based management middleware in order to manage grid services on heterogeneous networks.

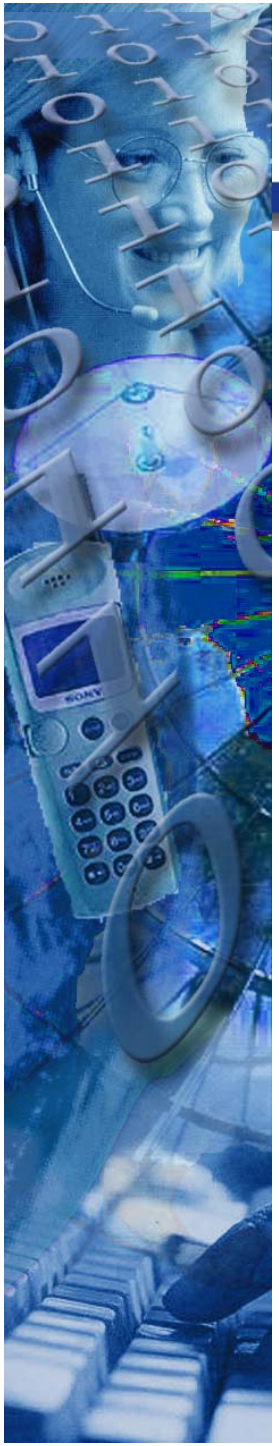
- **Individual Objective**
  - The architecture should ease to deploy and activate of grid services for all kind of allowed users
  - Dynamic extensibility of management functionality to cope with new grid services
  - Allocation, modification, removal of isolated forwarding and computational resources with QoS and security to privileged users
  - Cope with heterogeneous programmable and passive networks
  - The framework should be capable of detecting its position within the management infrastructure and extended by itself

PBMS Architecture



PBMS Architecture





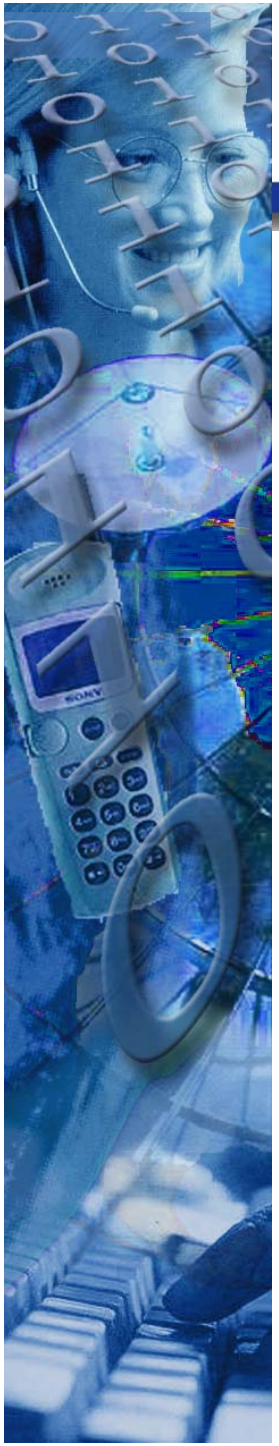
PBMS - High Level Functionality

Virtual-Grid Path Configuration

- The provision of end-to-end IP paths over heterogeneous networks
- Support QoS parameters by policies resources reservation will be applied in the path-provisioning request

Resources Reservation and Activation

- Network fault-tolerance management
- Network trouble isolation
- Restoration for grid services
- Real-time management for service network providers



PBMS - High Level Functionality

Grid Services Deployment

- Acknowledge of the grid services
- Reservation of resources based on QoS requirements
- Deployment and activation of resources as well as services
- Service management by monitoring tools and re-configuration of both resources and services.

OGSA Compatibility

- Parse of SOAP files into OGSA compatibility component
- Extraction of grid service deployment and configuration parameters
- Communication by XML schemas

Example Scenario

Re-Configuration: The NMS will re-configurate the services by deploying new EL policies modifying the Network Resources Reserved.

Reservation and Allocation: The QoS PEPs apply the policies to reserve the corresponding network

Monitoring: The MS sends an alarm which indicates that the resources will not anymore available.

Management Policies

NMS

147.83.106.64/26

EMS

EMS

Video Decoding

Linux Debian Globus 2.4

Linux- Fe Globus 2

Service Continues Runing.

10.0.4.192/28

ideo aw"

Client

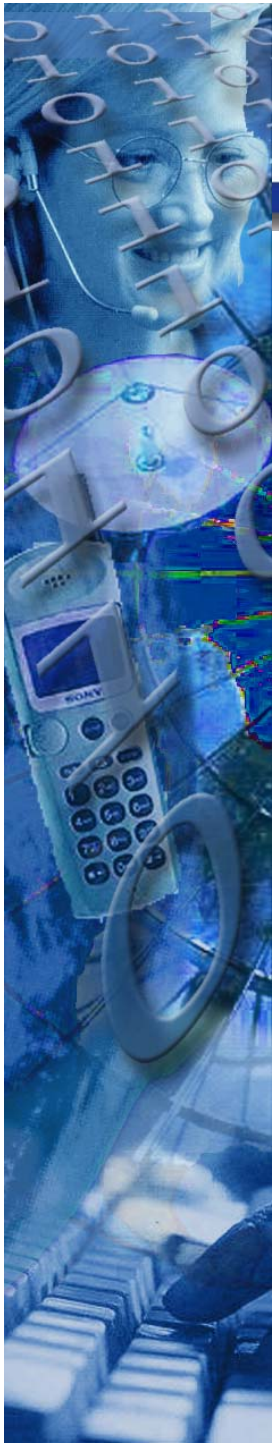
Linux - Debian Globus 2.4

10.0.4.176/28

EMS

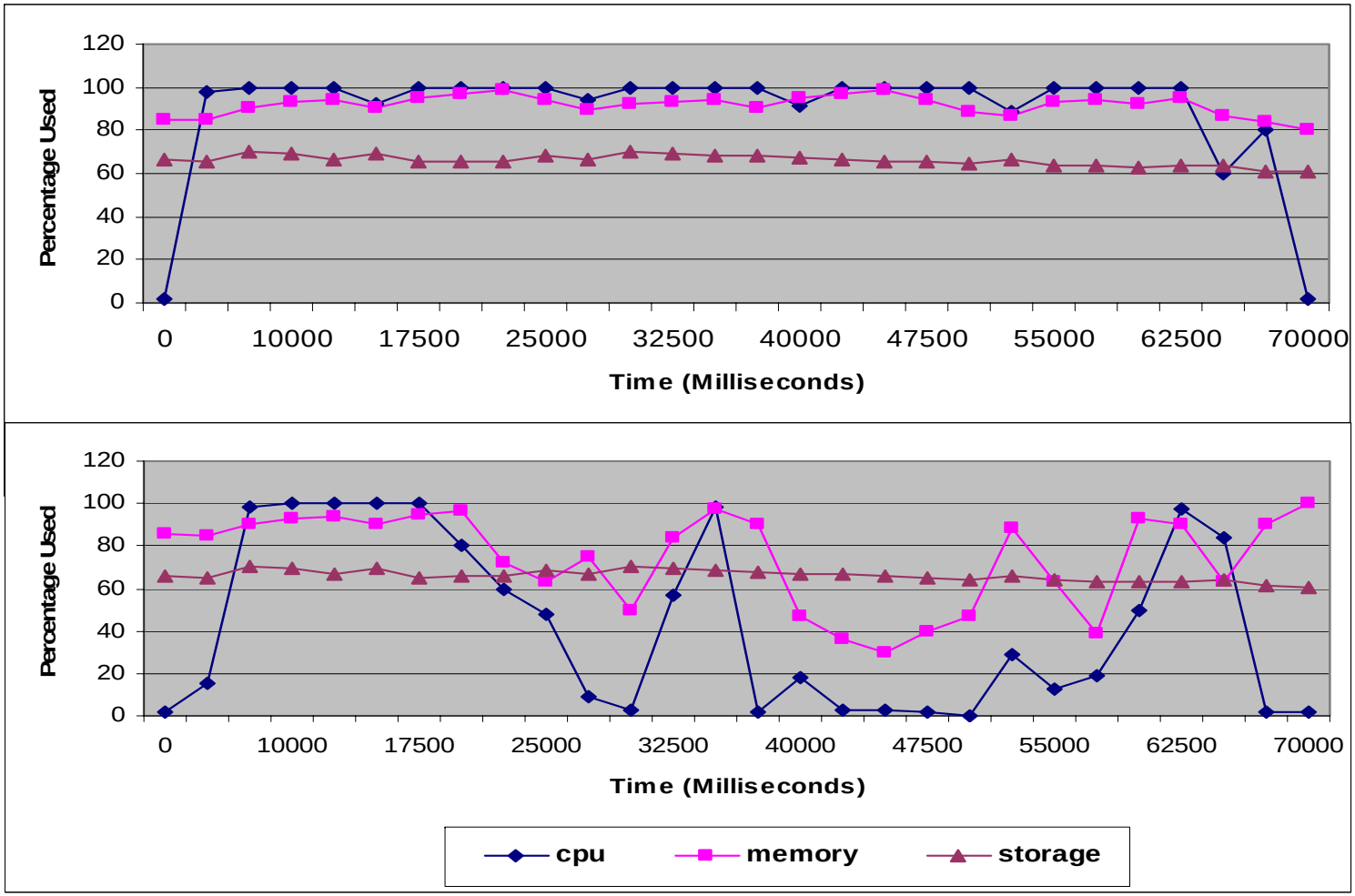
NMS

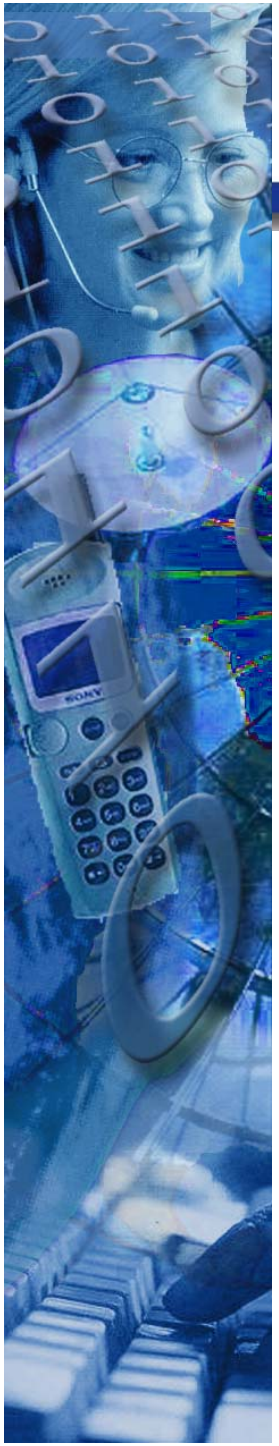
VIDEO SERVER



PBMS – Initial Trials (I)

Resources Monitoring on UPC - Test bed

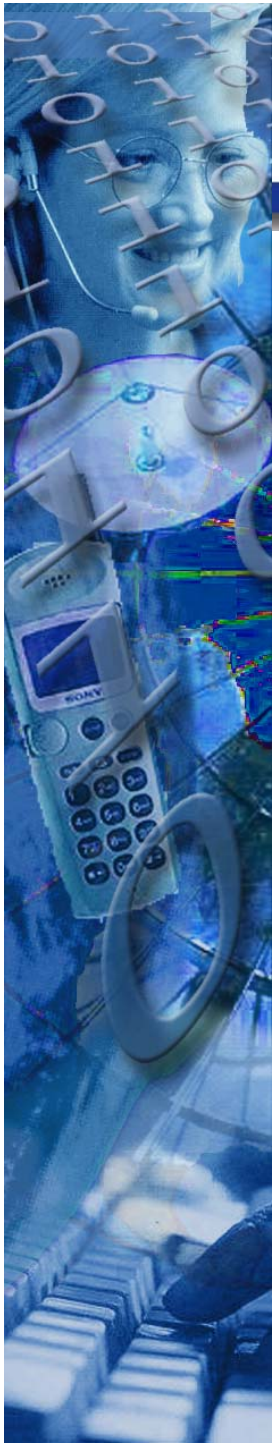




PBMS – Initial Trials (II)

Deploy Management Policies - Times

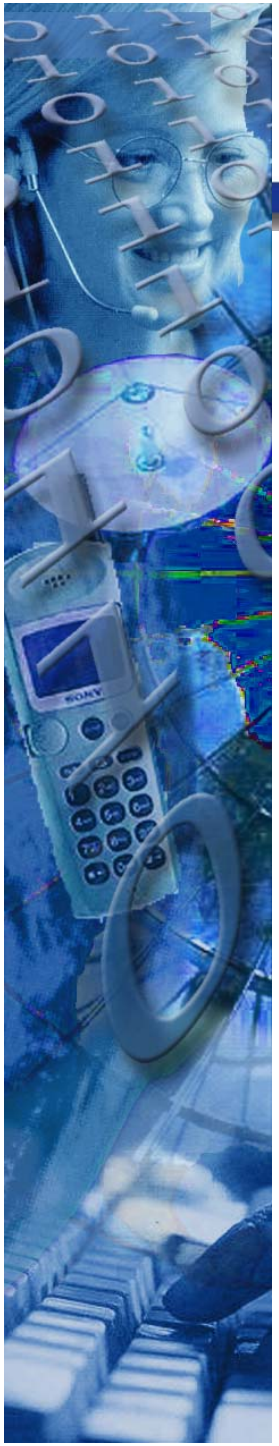
ACTIVITY	TIME
NL Policy Creation (QoS parameters)	634 ms
Resources Monitoring	1145 ms
Resources Selection and Reservation	2386 ms



Conclusions (I)

A Full-featured Adaptive Management Middleware

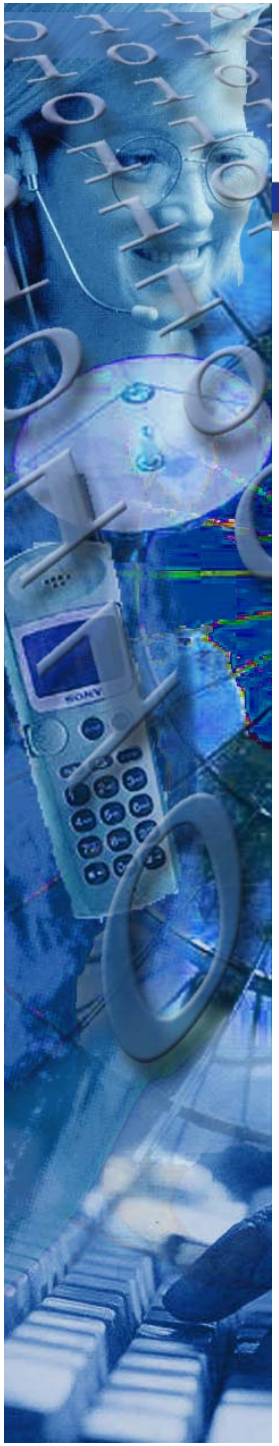
- An architecture taking advantage of the synergy obtained by coupling Policy-based technology and Globus Toolkit
- Simplifies grid services deployment and management
- Optimal manage of the network resources
- Scalable architecture as well as automate
- Deployment and Activation of Grid services in all planes



Conclusions (II)

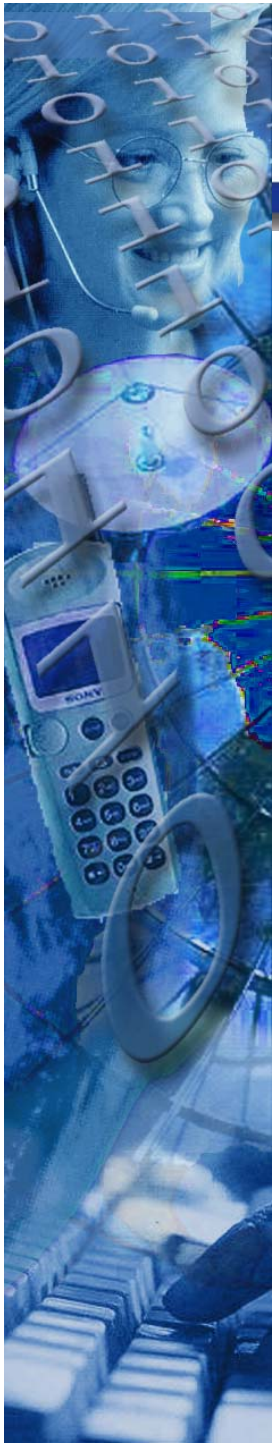
Integrated Approach to Grid Service Management

- Open architecture for final users
- Intercommunication between different domains
- Support for dynamic, reconfigurable on demand, secure and highly customizable computing storage and networking environments
- Dynamic extensibility and flexibility of the architecture



Ongoing and Future Work

- The development of further Grid Applications
- Implement the policy-based architecture
- Analyze the functionality of the architecture
- To carry out the appropriate performance tests:
  - **Scalability**
  - **Flexibility**
  - **Fault Tolerance**
  - **Management Times vs. Deployment times**
  - **Interoperability**



Thank You!!!
Any Questions ??

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http://nmg.upc.es/~emagana/
For more information on Management Grid Computing!!!!