An OGSA Framework for Load-balancing European DataGrid Resource Broker

William Lee

London e-Science Centre
Department of Computing, Imperial College London

European DataGrid

Enabling access to geographically distributed computing and storage facilities.

Work Package 1 - Workload Management

• Define and Implement an Architecture for distributed scheduling and resource management
  • Resource Broker
  • Compute Elements
  • Replica Catalog
  • Job Submission Service

Resource Broker Architecture

• Client/Server model
• Providing Job Submission / Management Client API
• Java, C++, Python Applications can interact using the Resource Broker Client API
• Scalability of the Client/Server model…

An Open Grid Services Framework

• Transform Resource Broker to an interoperable service oriented architecture
  – JobSubmissionFactory
  – JobManager
• Resource Brokers dynamically participate in a Resource Pool
• Symmetric Services running on multiple OGSA Grid Containers
Load-balancing Framework - The Abstract View

Information

Strategy

Load-balancing Framework - The Technical View

1. Query UDDI
2. Submit Job
3. Put request tuple into space and wait
4. Job submitted to the associated RB, and put response tuple into space
5. Deploy JobManager and set GSH of the Response tuple
6. GSH of the JobManager service is returned
7. Manage job through JobManager instance

Implementation

• Tuplespace -
  • Default Javaspace Implementation
  • Transaction and Persistence
• OGSA Container
  • Globus Toolkit 3.0.1
  • Extended Factory Provider to allow instances to be created on co-operating containers
  • Message-level security

Discussions

• Interoperability
• Decentralised
• Transparency
• Separating Information and Decision

Future Works

• Notification to inform user of job status change
• Security in Javaspace
• Generic Load-balancing framework and Job Submission Port Type
• Performance Analysis

Research Funding

• EPSRC/DTI Core e-Science Programme
  – The London e-Science Centre (THIBB/C/008/00023)
• Engineering Physical Science Research Council
  – RealityGrid (GR/R67699/01)
  – Discovery Net (GR/R67750/01)
  – Effective Multi-user Multi-job Resource Utilisation (GR/R74505/01)
  – High Performance Software Components (GR/N13571)
• Wellcome
  – BAIR/866786/A/02/Z
• Biotechnology & Biological Sciences Research Council
  – Proteome Grid (28/BEPI7014)
• Natural & Environmental Research Council
  – GENIE
Acknowledgements

• Director: Professor John Darlington
• Technical Director: Dr Steven Newhouse
• Research Staff:
  – Anthony Mayer, Nathalie Furmento
  – Stephen McGough, James Stanton
  – Yong Xie, William Lee
  – Marko Krznaric, Murtaza Gulamali
  – Asif Saleem, Laurie Young, Gary Kong
• Contact:
  – http://www.lesc.ic.ac.uk/
  – e-mail: lesc@ic.ac.uk

Equipment Funding

• Strategic Research Investment Fund (SRIF)
  – £3M to IC HPC (May 2001)
  • £1.9M Computing & Storage Resources
  • £750K Networking Infrastructure
  • £350K Refurbishment
• HEFCE Joint Research Equipment Initiative
  – An Open Multi-disciplinary Parallel Computing Resource
    for Imperial College (2001 – GR/R62083/01)
  – IC Informatics Grid (2000 – GR/R04034/01)
  – CFD Server for IC (1999 – GR/M92355)
  – A High Performance Parallel Server for multi-disciplinary
    activities at Imperial College (1996 – GR/L26100)

Collaborators

• Imperial College
  – High Energy Physics
  – Space and Atmospheric Physics
  – Computational Science (Aeronautics & Mech. Engineering)
  – Data Mining
• External
  – Manchester Centre for Novel Computing
  – QMW Centre for Computational Science
  – Condor Team, University of Wisconsin
• Industrial
  – Sun Centre of Excellence in e-Science
  – Intel Virtual European Centre of Excellence
  – Compusys