Grid Operational Supports for Middleware Deployment and User Administration

International Symposium on Grids and Clouds 2010
March 23, 2011
Academia Sinica, Taipei, Taiwan

Eisaku Sakane\textsuperscript{1}, Kento Aida\textsuperscript{1,2},
Manabu Higashida\textsuperscript{3}, Taizo Kobayashi\textsuperscript{4}, Hirofumi Amano\textsuperscript{4},
Mutsumi Aoyagi\textsuperscript{4}

\textsuperscript{1}National Institute of Informatics
\textsuperscript{2}Tokyo Institute of Technology
\textsuperscript{3}Osaka University
\textsuperscript{4}Kyushu University
Table of Contents

• Background
• Inter-university Grid Infrastructure
• Grid Middleware Deployment
• User Administration
• Summary
Background

• Toward construction of a production level science grid, geographically distributed computational resources have to work in close cooperation with each other
• Organizations offering computational resources to the grid are independent of each other
• To do so, a grid middleware is needed
  – Grid middleware is a large software collection
  – It is hard to install and configure the middleware because administrators need much knowledge
  – There are several methods that make installation easier
  – Consistent configuration of middleware in multiple sites is still hard because administrators need to configure settings properly communicating with administrators in multiple site
• Each resource provider operates own computational resources under each operation policy
  – To use the resources, users must apply for an account at multiple site
  – Administrators must maintain mapping information between users’ client certificates and local account in sites if GSI is adopted as security infrastructure

• To enable users to access the grid infrastructure, a systematic user administration for the grid infrastructure is needed
Inter-university Grid Infrastructure

• In case of Japan...

• An inter-university grid infrastructure is organized by
  – supercomputer centers in 9 universities
  – an operation center in National Institute of Informatics (NII)

• NAREGI Middleware was adopted to operate the inter-university grid infrastructure
Resource Providers

- Research Institute for Information Technology, Kyushu University
- Information Initiative Center, Hokkaido University
- Information Technology Center, Nagoya University
- National Institute of Informatics
- Cyberscience Center, Tohoku University
- Center for Computational Sciences, University of Tsukuba
- Information Technology Center, University of Tokyo
- Global Scientific Information and Computing Center, Tokyo Institute of Technology
- Academic Center for Computing and Media Studies, Kyoto University
- Cybermedia Center, Osaka University

(resource provider)
(operation center)
# Computer Systems

<table>
<thead>
<tr>
<th>Site</th>
<th>Hardware</th>
<th>#cores*</th>
<th>Memory[GB]**</th>
<th>#nodes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hokkaido U.</td>
<td>DELL PowerEdge R200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hitachi HA8000/110W</td>
<td>2</td>
<td>2/4</td>
<td>27</td>
</tr>
<tr>
<td>Tohoku U.</td>
<td>NEC SX-9</td>
<td>16</td>
<td>1000</td>
<td>4</td>
</tr>
<tr>
<td>U. Tsukuba</td>
<td>Appro XtremeServer-X3</td>
<td>16</td>
<td>32</td>
<td>4</td>
</tr>
<tr>
<td>U. Tokyo</td>
<td>Hitachi HA8000-tc/RS425</td>
<td>16</td>
<td>32</td>
<td>4</td>
</tr>
<tr>
<td>Tokyo Tech.</td>
<td>HP ProLiant SL390s</td>
<td>12</td>
<td>54/96</td>
<td>375</td>
</tr>
<tr>
<td>Nagoya U.</td>
<td>Fujitsu PRIMERGY RX200</td>
<td>2</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Fujitsu HX600</td>
<td>16</td>
<td>64</td>
<td>16</td>
</tr>
<tr>
<td>Kyoto U.</td>
<td>Fujitsu HX600</td>
<td>16</td>
<td>32</td>
<td>4</td>
</tr>
<tr>
<td>Osaka U.</td>
<td>NEC SX-8R</td>
<td>8</td>
<td>64/256</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>NEC SX-9</td>
<td>16</td>
<td>1000</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>NEC Express5800/120Rg-1</td>
<td>4</td>
<td>16</td>
<td>12</td>
</tr>
<tr>
<td>Kyushu U.</td>
<td>Fujitsu PRIMERGY RX200S3</td>
<td>4</td>
<td>8</td>
<td>12</td>
</tr>
</tbody>
</table>

#cores* = #cores/node, Memory[GB]** = Memory[GB]/node
Grid Middleware

- developed by the Centre for Grid Resource and Development, NII

  - uses GSI and VOMS

- computing services

- control nodes (operated in OC)
  - grid service (security, job brokering, information service, portal, ...)

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Target Problems

• Deployment of grid middleware
  – installation
    • must be done easily
  – configuration
    • must be done correctly and effectively

• User administration
  – applying for accounts at multiple sites
  – obtaining grid user certificate
  – creating grid-mapfile at each site
Deployment of Grid Middleware

• We need to deploy suitable components of the NAREGI middleware to both resource providers and the operation center

• We developed installation tools to deploy the NAREGI middleware
  – The installation tools enable administrators of both resource providers and the operation center to install suitable components in their sites
Configuration Procedure

• In deployment using our tools, a configuration procedure will be done as follows

(1) Application to add/delete computing nodes

(2) Configures to add/delete computing nodes

(3) Generates a configuration file for the resource provider

(4) Configures computing nodes using the configuration file

(5) Start operation

(6) Start operation
Remarkable Points in Deployment

• The installation tools make configuration procedures easier by concentrating necessary information on single configuration file

• What administrators in resource provider have to know is
  – simple information of grid component configuration
    • This node is a GridVM component, ...
  – basic information about computing nodes that administrators manage daily

• No deep knowledge of grid middleware is needed
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Grid-Pack

• We established an application system, called “Grid-Pack”, solving the problems

• Concept of Grid-Pack
  – User applies for account at only one resource provider (Grid-Pack application)
  – Grid-Pack application = account & certificate requests
  – Proxy application procedure to create an account on another resource provider
  – RA operation on each resource provider (LRA) following the Authentication Profile for Classic X.509 PKI
  – semi-automatic generation mechanism of grid-mapfile at each site
Registration of User Account

User

grid-pack application

Computer Center A

LRA operator

account request + GPID

Computer Center B ...

admin.

user account

User admin.

Computer Center A

User admin.

LRA operator

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User account

User admin.
Problem in Grid-Pack

- The operation center notifies users of LicenseID.
  - sends users an email attached an encrypted archive including UMS account, password and LicenseID.
  - notifies users of the password of the encrypted archive by telephone.

- User identification with F2F interview
- With drastic increase of the number of user at be bottle-neck of the procedure.

- How do we ease heavy duties in the operation?
Federated Authentication System with Shibboleth

LicenseID

– Grid Portal: Service Provider
  • operations on UMS
    – storing user certificate

LicenseID

– Grid Portal: Service Provider
  • operations on UMS
    – creating user account
    – storing user certificate
Shibboleth

Operation center

CA system

Repository

VOMS

UMS

Shib-DS

Resource provider

Portal

(myproxy-server)

Shib-SP

Shib-IdP

DB
Summary

• We mentioned our experience of grid operational supports in the inter-university grid infrastructure focusing on the grid middleware deployment and the user administration

• The grid middleware installation tools enable administrators in resource provider to install and configure grid middleware without detailed knowledge of the middleware

• The user administration tools offer users to apply accounts to use the grid infrastructure in easy way and help administrators to register user accounts and maintain grid-mapfiles in multiple resource providers
Future Plan

• We plan to extend the testbed for the authentication system using GSI and Shibboleth in order to start operation among 9 resource providers.

• The goal is to start the production level operation of the user administration in FY2011.