enCRUS Grid Middleware
Architecture

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Agenda

1. Definition of Grid Computing
2. What is enCRUS
3. enCRUS Architecture
4. enCRUS Features
5. Case Study
Definition of Grid Computing

- Infrastructure connecting distributed computers, storage devices, databases and applications
- Dynamic sharing of distributed computing resources
- Managed Virtual Platform
What is enCRUS

- enCRUS 1.0 is rooted on MoreDream KISTI developed
- enCRUS 2.0 is extension to Globus Toolkit 4.0 (GT4)
- Collection of high level grid services on top of GT4
- Support Unix, Linux, Windows
- Targeting computational and transactional grid
Why enCRUS

- Service Oriented enCRUS

Service Oriented

Stability

Agility

enCRUS Service Platform

Extensibility

ANC TECHNOLOGY
Service Oriented enCRUS

- Service Platform

Service Oriented Grid Platform

- enCRUS service Platform

- Standard Compliant
  - OGSA Compliant
  - Web Service compliant

- Seamless Grid Services
  - Virtualization
  - Resource Reservation
  - Grid Scheduling
  - Monitoring
  - Virtual Organization

- User Friendly Interface
  - Platform Interface
  - Service Interface
  - Web interface
  - CLI interface
  - API
enCRUS & Web Service

Applications

GT4 Container
enCRUS Core
Custom WSRF Web Services
GT4 WSRF Web Services
WS-Addressing, WSRF, WS-Notification
WSDL, SOAP, Ws-Security
Registry Administration
enCRUS Deployment

- Conceptual enCRUS Deployment

- Platform Container
- Scheduling
- Monitoring
- Workflow
- Provision
- Job Manager
- Impl/Handler
- Grid Protocol
- Database
- Storage
- System Interface
- Portal Interface
- Interface
enCRUS Platform Layers

- DRM
  - Grid Protocol
    - Grid Middleware
      - Grid Portal Service
        - User Interface Service
          - Platform

Service Portal
Platform Portal
Platform Container
Globus Toolkit
Resource Mgmt/Job Execute
enCRUS Service Map

Service Map (GT4 & Platform Container)

- **Applications**
  - Platform Web Services
  - Platform WSRF Web Services
  - GT4 WSRF Web Services
  - WS-Addressing, WSRF, WS-Notification

- **WSDL, SOAP, Ws-Security**

- **GT4/Platform Container**

- **Registry Administration**
Flow of enCRUS internal Flow
enCRUS Architecture
## enCRUS Components

### GT4 & enCRUS Components

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<tr>
<th>Group</th>
<th>Block 1</th>
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<td>Execution Controller</td>
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<td>Common Runtime</td>
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*ANC TECHNOLOGY*
## enCRUS Components

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<tr>
<th>Component</th>
<th>Core</th>
<th>Scheduler</th>
<th>Execution</th>
<th>Provision</th>
<th>Workflow</th>
<th>Monitor</th>
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<tr>
<td>Function</td>
<td>Platform Control</td>
<td>Job Schedule</td>
<td>Job Order</td>
<td>Server Provisioning</td>
<td>Workflow Modeling</td>
<td>Resource</td>
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<td>Function</td>
<td>Platform Configuration</td>
<td>Resource Reservation</td>
<td>Job Pause</td>
<td>Server Virtualization</td>
<td>Workflow deployment</td>
<td>Job</td>
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<td>Notification</td>
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<td>Job Exec Control</td>
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<td>Switch Provisioning</td>
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<td>Fault</td>
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**enCRUS Components**

- **Workflow Modeling**
- **Switch Provisioning**
- **Job Exec Control**
- **Notification**
- **Platform Config**
enCRUS Platform Container

- Components inter-relationship
enCRUS Platform

enCRUS Grid Service Platform

Platform Container

Globus Container (GT4)

DRM

Grid Monitor
Big Pic of enCRUS

Platform Container

Grid Service Portal

GLOBUS Container (GT4)

SGE

Condor

LSF

PBS

ETC, ...
enCRUS Features

- Stability

Solid enCRUS Grid Service Platform

- High Performance
- High Availability
- Checkpoint
- Fault Management
- System Monitoring
enCURS Features

- Extensibility

- Support Plug-in for Adapter
- Support Plug-in for Monitor
- Support Plug-in for Scheduler
- Support Plug-in for Executer
- Connection Other sub-cluster
enCRUS Features

- Agility

Agility

Virtualization

Extension (Public Grid Platform)

Easy to Deploy

Integrating existing Grid/Cluster
Case Study

• Company Info
  – Company: XXX Corporation. Hwasung, Korea
  – Industry: Manufacturing
  – Area of Focus: Analysis of complex tasks with time-consuming simulation

• Key Business Benefits
  – Increase efficiency of lab time, target the most productive areas
  – Improved productivity in CFD design cycle
  – Minimize a risk of user environment when applying computational grid
Case Study

• Key Business Challenges
  – Need innumerable time and energy for simulating the interaction of fluids and gases
  – One simulation failure affects predictability delay and business lines hold up
  – Budget restrictions lead R&D slow down
Case Study

• **Target Application Field**
  – CFD simulation: Commercial CFD code for metal extrusion and similar problems
  – OpenFOAM: a former commercial code that is now under GPL

![CFD Simulation](image1.png)

• **What is CFD?**
  – Computational Fluid Dynamics (CFD) is one of the branches of fluid mechanics that uses numerical methods and algorithms to solve and analyze problems that involve fluid flows. Computers are used to perform the millions of calculations required to simulate the interaction of fluids and gases with the complex surfaces used in engineering.

![OpenFOAM](image2.png)
Case Study

• Key Business Solutions
  – Build computational grid in order to obtain maximum benefit from operating CFD system
    • enCRUS service platform on 2-way x86 server
    • 20 x86 Job execution nodes
    • Linux Operating System
    • KVM Switch
    • Rack
    • Backup Drive
Case Study

- Computational Grid

GRID Middleware

Job

Job

Job

Job

Job

Job

Job

Job
Case Study

• Key Business Results
  – Maximize engineering productivity
  – Manage distributed resources with enCRUS
  – Maximize service efficiency through scheduling efficiently of rapid increasing data
  – Guarantee business stability without any failure
  – Gain flexible scalability simply adding a node when upgrade is needed
Question?