ETICS
The Grid Quality Process

An Application of ETICS Co-Scheduling Mechanism to Interoperability and Compliance Validation of Grid Services

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ETICS Vision

- *'Harness the power of the Grid infrastructure to help addressing the software development and maintenance challenges of large-scale, open source European projects'*

- **Mainly, three areas of interest:**
  - management support: infrastructure and metadata
  - quality certification assessment: best practices and standard guidelines
  - promotion and dissemination of results: central repository with artifacts, documentation and dissemination tools for latter analysis

The ETICS testbed

- **Automated facility to reproduce real scenarios under fully controlled environment**
  - General purpose: to run functional and conformance tests on production-like scenarios
- **Goals:**
  - Leverage of the project information about structure, relationships and operations already known by the system
  - Ability to perform complex tests over a distributed environment:
    - Deploying services completely and automatically
    - Synchronizing the execution of tasks using messaging mechanisms
    - Collecting all the results generated (and std or err outputs)
  - Integration in the ETICS repository for further consult and analysis (e.g. trends)

OMII-Europe Vision

- *'To bring together the best technologies from Europe and elsewhere and make them available in a usable and supported form to scientists across the ERA'*, **what means:**
  - Deliver production quality middleware relevant to large-scale and smaller collaborative Grids by federating development activities across Europe
  - Exploit already existent developments from FP5 and FP6 and maximize benefits of global collaborations with USA and China.
- **Specific actions performed covers: take advantage of a well-defined QA process, re-engineer key components adapting them to standards and provide a central repository for software, documentation and training**
- **Contribute to OGF in the definition of OGSA**

OGSA-BES

- **OGF proposal for interoperability across job submission engines**
  - Based on JSDL
  - Defined as a composition of three models:
    - State model: allowed states and allowed trigger events
    - Information model: general information interface to abstract the underlying LRMS
    - Resource model: specific information to extend the general behavior (based on profiles)
  - Accessible through three WS port-types:
    - BES-Factory: creation, monitoring and operation over bunches of activities
    - BES-Management: management of the service itself
    - BES-Activity: monitoring and operation over single activities

Tasks to perform I

- **Main objective: to check interoperability between job submission engines by validating their conformance to the OGSA-BES recommendation**
- **Two implications:**
  - Develop the test suite that interprets and parses the recommendation into specific service calls
  - Use or develop the independent client which will perform the test
- **Additional objective: to perform this test automatically as part of the QA practices provided by ETICS**
  - Ability to use the source tree to build the components, deploy the service, execute the test and harvest the results

Tasks to perform II

- **Specific actions to cover:**
  - To study the OGSA-BES specification (requirements, optional features, outputs) and according to the RFC2119, implement the suite of conformance tests
  - To select the framework to perform the test (programming language and tools) that is intended to provide the best ratio integration*performance/complexity
  - To develop the deployment modules for the services under test
  - To develop the virtual scenario reproducible on demand where to perform the test (formally testbed)
  - To integrate such environment into the current ETICS facility

The OGSA-BES testsuite I

- **Based on the draft version of the recommendation (v33) released in Mar ’07**
- **Test the implementation of the data model:**
  - Using a generic client which wraps the normative WSDL document published in the recommendation
  - Accessing the WS using different security profiles (HTTPS, WS-S, GSI)
  - Performing the defined operations under different conditions (range tests, exception tests, state tests and management tests)
  - JSDL agnostic (not covered in the recommendation)
- **Using a JSDL variant: HPC Profile Application (no Posix compliant)**

The OGSA-BES testsuite II

- **Mainly, two options for the implementation:**
  - Based on the ETSI TTCN notation
  - Based on common unit testing frameworks (xUnit)
- **Usage of WS technologies and the wider support make the xUnit a simpler and easier choice.**
- **Finally, implemented in Java using:**
  - Axis as the SOAP implementation
  - gLite Trustmanager for the security delegation and management
  - JUnit for the unit testing and reports generation
  - Ant for using from the CLI

The services

- **Re-engineering tasks of OMII-EU for BES support:**
  - CREAM-BES extensions for CREAM
  - Ogsabes extensions for UNICORE
- **CREAM currently part of gLite**
  - CREAM is built in ETICS by EGEE/JRA1
  - CREAM-BES built in ETICS by OMII-Europe
- **UNICORE 6 released in August**
  - Ogsabes built in ETICS by OMII-Europe

The ETICS virtual testbed I

- **ETICS build activity based on modular design and versioning system (like CVS)**
- **ETICS test activity aims to reach the same modularity and reusability by defining:**
  - Deployments: composition of nodes or other deployments
  - Nodes: provide services and tests
  - Services: ETICS configuration
  - Tests: ETICS configuration
- **Desired features:**
  - Co-scheduling the deployment of the mentioned scenario
  - Root-enabled access and private usage of resources
  - Collection of the reports and integration into the ETICS repository

The ETICS virtual testbed II

- **Co-scheduling provided by Condor inside ETICS**
  - Dedicated scheduler for test activities
  - ETICS synchronization APIs to control the full process
- **Root-enabled access => important security risk**
  - Usage of virtualization
    - To minimize this leak
    - To provide more accurate resources on demand
    - Xen (using the vGrid portal) and VMware
  - Usage of Condor matchmaking mechanism
    - By location, platforms, owners, etc.
- **The ETICS repository:**
  - All the outputs of the deployment
  - Merged in a single report

The service deployment I

- **Interoperability test modeled in ETICS**
  - Deployment represented as a “Distributed Test”
    - Setup the session and launch the nodes (as individual jobs)
  - Machines represented as “Nodes”
    - Containing the general deployment modules to launch the services
    - Passing common information to the specific deployment modules
  - Services represented as components
    - Linked to the nodes using the dependency mechanism (configurations)
    - Deploy the services by calling specific deployment modules
  - Tests represented as components
    - The same behavior than services

The service deployment II

- **Consisting of four nodes (machines) automatically deployed by ETICS as part of the distributed test:**
  - Package repository
    - Metapackages to harvest the full set of packages required
    - APT/YUM format (for SLC3/4 support)
  - Worker Node
    - PBS-MOM node attached to the CE
  - Computing Element (target BES endpoint)
    - PBS-Server (Maui), CE-CREAM and CE-Monitor services, VOMS-enabled PDP and local BDII service
  - BES client
    - Java-based BES compliance tester

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Module Summary

Project name:	gridtestbed
Module name:	eu.omii.compliance
Description:	OGSA-BES compliance testing for gLite
Version:	0.1.0
Release:	0
Vendor:	OMII-Europe
License:	

Execution Summary

Result:	**Success**
Success rate:	100% (1/1)
Start time:	24/09/2007 17:36:21
End time:	24/09/2007 18:07:50
Duration:	00:31:29
Configuration:	eu.omii.compliance.glite
Tag:	HEAD
VCS Root:	:pserver:anonymous@isscvs.cern.ch:/local/reps/gridtestbed
Platform:	slc4_ia32_gcc346

ETICS Commands

Get project:	etics-get-project gridtestbed
Checkout:	etics-checkout -c eu.omii.compliance.glite eu.omii.compliance
Build:	
Test:	etics-test -c eu.omii.compliance.glite eu.omii.compliance

Environment Properties

eTICS Build System

Project name: gridtestbed
Module name: eu.omii.compliance.ce
Module config: eu.omii.compliance.ce.glite
Build status: Success
Description: OGSA-BES CE
Dependencies

Page generated at 24/09/2007 18:07:11
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Artefacts

Checkout / download log

```
09/24/07 17:41:06.170 INFO main [write] - Checking out configuration 'eu.omii.compliance.ce.glite'
09/24/07 17:41:06.171 INFO main [write] -
09/24/07 17:41:06.173 INFO main [write] - [checkout]: cvs -d :pserver:anonymous@isscvs.cern.ch:/local/reps/gridtestbed co -A eu.omii.compliance.ce
09/24/07 17:41:06.175 INFO main [write] -
09/24/07 17:41:06.176 INFO main [_systemCall] - Calling system command: cvs -d :pserver:anonymous@isscvs.cern.ch:/local/reps/gridtestbed co -A
eu.omii.compliance.ce
09/24/07 17:41:06.780 ERROR main [write] - cvs checkout: Updating eu.omii.compliance.ce
09/24/07 17:41:07.013 INFO main [write] - U eu.omii.compliance.ce/deployCE.sh
```

Build log

No log available

Test report

```
09/24/07 17:43:15.896 INFO main [write] - Executing test: eu.omii.compliance.ce.glite
09/24/07 17:43:15.898 INFO main [write] -
09/24/07 17:43:15.932 INFO main [write] - Cannot found sloccount. Plugin is disabled
09/24/07 17:43:15.951 INFO main [write] -
09/24/07 17:43:15.959 INFO main [write] - [init]: echo "Launching deployment of gLite CE"
09/24/07 17:43:15.962 INFO main [write] -
09/24/07 17:43:15.964 INFO main [_systemCall] - Calling system command: echo "Launching deployment of gLite CE"
09/24/07 17:43:16.014 INFO main [write] - Launching deployment of gLite CE
09/24/07 17:43:16.106 INFO main [write] - [test]: sh deployCE.sh -l "/root/wsetics/eu.omii.compliance.glite.ce" -d "--start" -r "--stop" -v
09/24/07 17:43:16.107 INFO main [write] -
09/24/07 17:43:16.109 INFO main [_systemCall] - Calling system command: sh deployCE.sh -l "/root/wsetics/eu.omii.compliance.glite.ce" -d "--start" -r "--stop" -v
09/24/07 17:43:16.162 INFO main [write] - Waiting for the repository...
09/24/07 17:45:15.980 INFO main [write] - found at lxb1107v2.cern.ch:8090
09/24/07 17:45:16.073 INFO main [write] - Publishing CE proposal for the WN (lxb1107v1.cern.ch)...
09/24/07 17:45:19.680 INFO main [write] - Done!
09/24/07 17:45:19.780 INFO main [write] - Waiting for the Worker Node...
09/24/07 17:45:33.687 INFO main [write] - found at lxb1303v2.cern.ch
Deploying CE (using lxb1107v2.cern.ch:8090 as repo and lxb1303v2.cern.ch as wn)...
09/24/07 17:45:33.778 INFO main [write] - Downloading certificates...
```

Unit Test Results

Designed for use with JUnit and Ant.

Class eu.omii.bes.compliance.BESComplianceTestSuite

Name	Tests	Errors	Failures	Time(s)	Time Stamp	Host
BESComplianceTestSuite	27	27	0	77.162	2007-09-24T16:04:51	lxb1303v1.cern.ch

Tests

Name	Status	Type	Time(s)
BadFormattedJSDLActivityDocument	Error	Unexpected exception, expected<org.ogf.bes.factory.UnsupportedFeatureFaultType> but was<eu.omii.bes.exception.ServiceInvocationException> java.lang.Exception: Unexpected exception, expected but was Caused by: eu.omii.bes.exception.ServiceInvocationException: ; nested exception is: java.io.IOException: java.io.IOException: java.io.IOException: Non nillable element 'jobDefinition' is null. at eu.omii.bes.clients.FactoryClient.CreateActivity(Unknown Source) at eu.omii.bes.compliance.factory.CreateActivityTest.BadFormattedJSDLActivityDocument(Unknown Source)	0.506
UnsupportedJSDLActivityDocument	Error	Unexpected exception, expected<org.ogf.bes.factory.UnsupportedFeatureFaultType> but was<java.lang.NullPointerException> java.lang.Exception: Unexpected exception, expected but was Caused by: java.lang.NullPointerException at org.ogf.jsdl.posix.POSIXApplication_Type.setArgument(Unknown Source) at eu.omii.bes.compliance.factory.CreateActivityTest.UnsupportedJSDLActivityDocument(Unknown Source)	0.107
UnsupportedFeatureActivityDocument	Error	Unexpected exception, expected<org.ogf.bes.factory.UnsupportedFeatureFaultType> but was<java.lang.NullPointerException> java.lang.Exception: Unexpected exception, expected but was Caused by: java.lang.NullPointerException at eu.omii.bes.utils.FormatConverter.getMessageElement(Unknown Source) at eu.omii.bes.compliance.factory.CreateActivityTest.UnsupportedFeatureActivityDocument(Unknown Source)	0.112
PrivilegedActivity	Error	Unexpected exception, expected<org.ogf.bes.factory.NotAuthorizedFaultType> but was<eu.omii.bes.exception.ServiceInvocationException> java.lang.Exception: Unexpected exception, expected but was Caused by: eu.omii.bes.exception.ServiceInvocationException at eu.omii.bes.clients.FactoryClient.CreateActivity(Unknown Source) at eu.omii.bes.compliance.factory.CreateActivityTest.PrivilegedActivity(Unknown Source)	48.333
StoppedService	Error	Unexpected exception, expected<org.ogf.bes.factory.NotAcceptingNewActivitiesFaultType> but was<eu.omii.bes.exception.ServiceInvocationException> java.lang.Exception: Unexpected exception, expected but was Caused by: eu.omii.bes.exception.ServiceInvocationException: No such operation 'StopAcceptingNewActivities' at eu.omii.bes.clients.ManagementClient.StopAcceptingNewActivities(Unknown Source) at eu.omii.bes.compliance.factory.CreateActivityTest.StoppedService(Unknown Source)	0.855
InvalidRequest	Error	Unexpected exception, expected<org.ogf.bes.factory.InvalidRequestMessageFaultType> but was<eu.omii.bes.exception.ServiceInvocationException> java.lang.Exception: Unexpected exception, expected but was Caused by: eu.omii.bes.exception.ServiceInvocationException at eu.omii.bes.clients.FactoryClient.CreateActivity(Unknown Source) at eu.omii.bes.compliance.factory.CreateActivityTest.InvalidRequest(Unknown Source)	0.605

Results

- Ability to launch automatically the deployment of the CREAM-BES CE
- Ability to test the latest release of a Grid service against an international agreed recommendation for Grid interoperability
- Ability to integrate end-to-end conformance tests in the QA process out of the box

Issues

- **Instability of this cutting-edge technologies:**
  - Axis2 and Rampart module
  - ETICS co-scheduling still under development
  - BES specification under public comment phase
  - CREAM-BES under development

- **Coordination with different efforts:**
  - Migration from SLC3 to SLC4 as supported platform in gLite
  - Usage of ETICS as the build system (essential in terms of repository of packages)
  - Integration of virtualization in the current ETICS pool of machines

What's next?

- **Using this proof of concept, integrate data model and virtualization in the current ETICS release (ETICS v2.0)**
- **Extend the automatic deployment to UNICORE and other Grid implementations in order to test their conformance**
  - Perform cross-site submissions between different job submission engines using this interface
- **Extend the testbed to other recommendations**
  - Grid certification automatically accomplished by the Grid itself

Thanks

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