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Thematic Priority: **Communication network development**

# D:SA2.1 First Annual Activity Report of SA2 Quality Assurance Activity

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## Document Control Sheet

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# Executive Summary

This document is the First Annual report on the SA2 Quality Assurance activity. It is an interim report describing the whole of the SA2 activity's work performed over the first twelve months of the project. This report is intended to be read by the Project Reviewers representing the Commission.

This document makes reference to other reports produced by the activity: D:SA2.0, M:SA2.1, M:SA2.2, M:SA2.3, M:SA2.4, and M:SA2.5, all of which are cited in the References section.

The SA2 Quality Assurance Activity has five interacting tasks: QA Processes, Test and Review, Packaging, Compliance Testing, Build and Test Facility.

The first three tasks produce documents and procedures that determine the required testing process and packaging criteria for software components contributed to the OMII-Europe repository. The second task also produces feedback to software developers, requests for corrections, and improved test cases.

The third task produces suites of compliance tests which check that software components comply with the emerging international standards applicable to OMII-Europe. Currently the effort in this task is targeting OGSA-BES, HPCP. Later on we will address security and data access standards.

The fourth task will deliver a functioning automated build and test service for use by project partners and future contributors to the repository. This will be a supported production service.

In the first year of the project, SA2 has achieved the following:

- Installation of an automated ETICS /Metronome build and test facility at partner sites.
- Demonstration of the build and test facility and the compliance test suite at conferences.
- Implementation of Compliance Tests to verify the behaviour of Job Submission services.
- Publication of a series of policies, procedures, and packaging guidelines for use by service implementers.
- Use of the policies to aid in the review cycle of the compliance tests

In the second year, SA2's objectives are:

- Improve and extend the QA policies to cover interaction between other tasks.
- Integrate engineering and benchmarking (code and test suites) into the ETICS repository
- Run regular build and test cycles on submitted components. Review test suite effectiveness.
- Improve and extend the Compliance Test suites and create new tests as standards mature

The four main tasks are all proceeding to plan. However the packaging task has slipped slightly in that the milestone M:SA2.5 is not fully complete. This will only affect the first build and test cycles of software components that are contributed to the repository. We now plan to complete the document by PM15 (July 2007).

# Table of Contents

# 1 Introduction

This document summarises the achievements of the SA2 Quality Assurance (QA) Activity for the first twelve months of the project and shows the plan for year two.

The objective of the SA2 activity is to provide the means to ensure – through compliance with relevant standards – that software contributed to and available from the OMII-Europe repository, provided by the SA1 activity, meets consistent quality standards of functional stability, portability, ease of deployment, performance, and interoperability.

The activity can be described as *software production*, and is broken down into five interacting tasks:

- **Quality Assurance Process** – Definition and publication of a common set of policies and practices to be applied to all components that are contributed to the OMII-Europe Repository. Regular reviews to ensure that these policies and practices are being followed
- **Test and Review** – procedures for reviewing and improving the test suites of software components that are contributed to the OMII-Europe Repository.
- **Compliance Testing** – where software components in the Repository claim to implement OGSA[1] standards, tests to show compliance with these standards will either be collected from the community or written by the SA2 team. Examples of such standards are OGSA-BES (the Basic Execution Service job submission and control standard from the OGF), JSDL (the Job Submission Description Language, an OGF recommended standard), and HPCP (the High Performance Computing Profile – a profile of BES and JSDL produced by OGF to support simple job submission).
- **Build and Test Facility** – The functional and compliance test suites of the previous two tasks will be executed in an automated environment. This will consist of deployments of the Metronome framework (formerly the NMI[2] build and test facility) supporting the ETICS[3] infrastructure.
- **Packaging** – a documented set of required packaging formats will be produced that will ensure easy of deployment of software components across supported platforms.

The key outcome of the activity as a whole will be a recognised OMII-Europe brand that gives potential users confidence in the quality and support of components in the OMII-Europe Repository.

[1] OGSA is the Open Grid Services Architecture, a web service based architecture of Grid services being defined within the Open Grid Forum (referred to as OGF throughout).
[2] NMI is the NSF Middleware Institute, a US research institute whose goals are similar to OMII. NSF is the National Science Foundation and is a US Federal Government funded body.
[3] ETICS is the e-Infrastructure for Testing Integration and Configuration of Software, an EU project led by CERN.

# 2 Partners and effort

This activity is led by the University of Southampton (SOTON) who contribute expertise in software production and QA processes gained through the OMII-UK programme. SOTON has also created a Metronome/ETICS environment for the project. SOTON has also created the initial compliance test suites.

CERN is the supplier of the ETICS framework. They provide the software plus support, training, and assistance in installing and configuring the framework. CERN also provide a production ETICS service for public use.

The University of Wisconsin-Madison (UWM) is the supplier of Condor and the Metronome build and test suite (formerly known as the NMI testbed). They support and maintain the software and they also permit partners to use their Condor pool at Madison for build and test.

Beihang University (BU) is the supplier of the CROWN grid middleware used widely in Chinese universities and institutes. BU has undertaken to install and run a Metronome / ETICS environment for Chinese users. BU was assisted by the Computer Network Information Centre, Chinese Academy Sciences (CNIC) until their withdrawal from the activity in October 2006.

The University of Chicago have expertise with the GLOBUS Toolkit and are partners in other US Grid initiatives. They have not formally reported unfunded effort to this activity but their contribution has been advisory and consultative through attending teleconferences and face-to-face meetings.

Table 1 shows the reported actual funded and unfunded efforts from each partner for the first year of the project.

| *Partner short name* | *Budgeted **funded** effort (months) for Year 1* | *Actual **funded** effort (months) for Year 1* | *Budgeted **unfunded** effort (months) for Year 1* | *Actual **unfunded** effort (months) for Year 1* |
|---|---|---|---|---|
| *SOTON* | 18.0 | 15.5 | 33.0 | 24.0 |
| *CERN* | 6.0 | 6.8 | 0.0 | 1.3 |
| *UCHIC* | | | 6.0 | 0.0 |
| *UWM* | | | 3.0 | 3.0 |
| *BU* | | | 6.0 | 16.0 |
| *CNIC* | | | 6.0 | 1.5 |
| ***Total*** | **24.0** | **22.3** | **54.0** | **45.8** |

**Table 1 - Reported Actual Effort by SA2 Partners**

SOTON's effort has been below budget due to slow recruitment at the start of the project.
CERN's effort is slightly over budget. They too had difficulty recruiting at the start but allocated extra effort in the second six months, especially supporting SOTON in the installation of ETICS and the preparation of the GridSAM demonstration for the OGF20 training course.
UWM continue to provide support for the Metronome system to SOTON and CERN.
BU provided extra unfunded effort to install the Metronome system.
CNIC withdrew from this activity in October 2006. The main impact of this withdrawal was the loss of their hardware from the Condor Pool supporting the Metronome installation at Beihang (BU), but later BU contributed their own cluster to restore the Condor Pool environment. This change has not impacted the work of this activity and other activities and does not require re-planning.

# 3 Progress

This section reports the progress of this activity broken down by the five tasks.

## *3.1 QA Processes*

### 3.1.1 Progress in Year 1

We have defined processes and practices to ensure high software quality, efficient software production, and timely delivery – see D:SA2.0, M:SA2.1 and M:SA2.2. Some examples are:

- Test Engineer Task List (from M:SA2.1)
- Compliance Test Suite execution (from M:SA2.3)

We have gained experience in operating these practices by integrating the initial implementations of the compliance test suites into the Build and Test Facility, then executing the test suites, then reviewing the effectiveness of those tests

### 3.1.2 Plan for Year 2

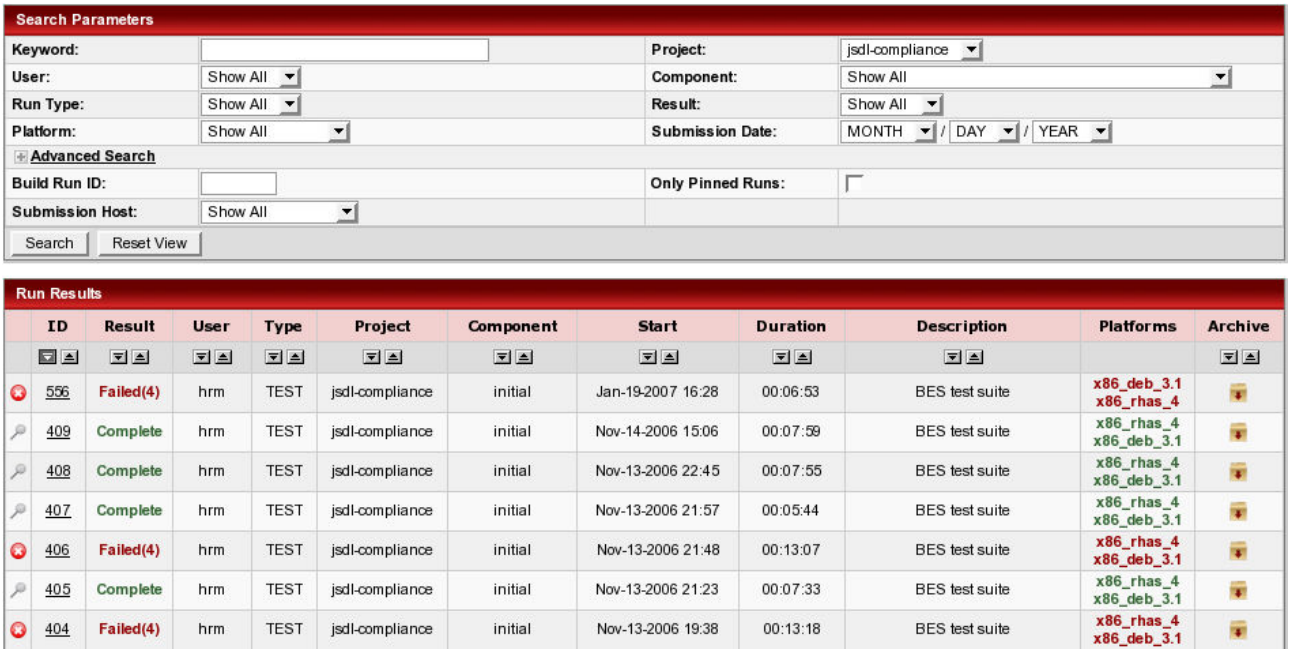
We will review processes and procedures after the initial submissions of software to the repository have taken place and they have passed through the first cycle of test and review.
Subsequently we will review the processes at monthly meetings with a formal process review every three months if deemed appropriate.

Discussions with other activities have concluded that the initial set of policies and practices should be expanded to include interactions with the other SA activities and with the JRA activities, particularly JRA1, JRA4 (Benchmarking) and JRA3 (Security). By PM16 we will produce updated procedures to show how these other activities are formally expected to interact.

## *3.2 Test and Review*

### 3.2.1 Progress in Year 1

We have gained experience in the Test and Review process by executing the initial Compliance Test Suites as described in M:SA2.4 and reviewing the outcomes. The Metronome environment produces metrics such as ‘percentage pass’ and the failures can be examined by drilling down as shown in Figure 1 (taken from M:SA2.4)



Search Parameters

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|---|---|---|---|
| Keyword: | | Project: | jsdl-compliance |
| User: | Show All | Component: | Show All |
| Run Type: | Show All | Result: | Show All |
| Platform: | Show All | Submission Date: | MONTH / DAY / YEAR |
| Advanced Search | | | |
| Build Run ID: | | Only Pinned Runs: | |
| Submission Host: | Show All | | |

Search | Reset View

Run Results

| ID | Result | User | Type | Project | Component | Start | Duration | Description | Platforms | Archive |
|---|---|---|---|---|---|---|---|---|---|---|
| 556 | Failed(4) | hrm | TEST | jsdl-compliance | initial | Jan-19-2007 16:28 | 00:06:53 | BES test suite | x86_deb_3.1 x86_rhas_4 | |
| 409 | Complete | hrm | TEST | jsdl-compliance | initial | Nov-14-2006 15:06 | 00:07:59 | BES test suite | x86_rhas_4 x86_deb_3.1 | |
| 408 | Complete | hrm | TEST | jsdl-compliance | initial | Nov-13-2006 22:45 | 00:07:55 | BES test suite | x86_rhas_4 x86_deb_3.1 | |
| 407 | Complete | hrm | TEST | jsdl-compliance | initial | Nov-13-2006 21:57 | 00:05:44 | BES test suite | x86_rhas_4 x86_deb_3.1 | |
| 406 | Failed(4) | hrm | TEST | jsdl-compliance | initial | Nov-13-2006 21:48 | 00:13:07 | BES test suite | x86_rhas_4 x86_deb_3.1 | |
| 405 | Complete | hrm | TEST | jsdl-compliance | initial | Nov-13-2006 21:23 | 00:07:33 | BES test suite | x86_rhas_4 x86_deb_3.1 | |
| 404 | Failed(4) | hrm | TEST | jsdl-compliance | initial | Nov-13-2006 19:38 | 00:13:18 | BES test suite | x86_rhas_4 x86_deb_3.1 | |

**Figure 1 Metronome run history**

### 3.2.2 Plan for Year 2

As software from the JRA activities starts to be delivered we will assist them with the integration of their test suites into the repository (referred to in D:SA2.0 Section 2, Phase 3) and we will execute those tests across all supported platforms to determine functional stability, ease of deployment, and portability. We will report defects back to the authors for corrective action.

We will carry out the integration of Benchmarking tests from JRA4 (D:SA2.0, Section 2 Phase 4) to allow performance metrics to be published through the repository interface.

## *3.3 Compliance Testing*

### 3.3.1 Progress in Year 1

We have implemented a series of compliance tests for job submission and job monitoring and we have executed them against various pre-defined implementation endpoints. The test suites verify the correct behaviour of an endpoint that claims to implement the OGSA-BES standard. At present the tests are run using the Metronome build and test facility. These tests also show compliance with part of the proposed High Performance Computing Profile specification that is now in the process of being finalised by OGF.

Our HPCP test suite was showcased in the interoperability demonstration at the SuperComputing 2006 conference. The test suite was run against ten different HPC Profile implementations from a variety of academic and commercial developers including Globus, Unicore, and Microsoft. The test suite highlighted a non-compliance in one particular implementation.

### 3.3.2 Plan for Year 2

Improve existing compliance tests –
Use of ETICS: We will integrate the existing compliance tests into the ETICS framework.
Improvement of existing tests: We will track the evolution of OGSA-BES and HPCP through the standards process. We will refine and extend the set of tests performed.

New test suites –

We will develop new compliance test suites as standards mature and implementations become available. We have identified areas of interest in the Virtual Organisation Management area; Grid Accounting (Usage Records and Resource Usage Specification); and Database Access (WS-DAI).

## *3.4 Build and Test Facility*

The majority of effort this year has been expended in deploying the Metronome and ETICS tools at the partners' sites.

### 3.4.1 Progress in Year 1

Instances of the Metronome Framework (formerly called the NMI Build and Test Facility) have been installed at SOTON, CERN, and BU. UWM has contributed technical assistance where necessary. Each of these sites has a heterogeneous Condor pool of test machines supporting their installation. Mutual access to each other's Condor pools is being arranged by pairwise agreement.

The ETICS framework has been deployed successfully at SOTON with assistance from CERN. CERN has migrated its own installation to an updated release on a production server and work has begun to mirror that installation at SOTON.

### 3.4.2 Plan for Year 2

In PM 14, CERN staff will visit SOTON to assist with their upgrade.
By PM14, it will be possible to register a project with the OMII-Europe repository and automatically link it to the build and test facility.
As components from the JRA activities start to be delivered, they will be integrated into the build and test facility. The focus of this task will then become the support and improvement of the build and test facility in production use.

## *3.5 Packaging*

The goal of this task is to publish and maintain a document that lists the packaging formats that must be supported by components that are contributed to the repository.

### 3.5.1 Progress for Year 1

Discussion with other activities on this subject has been infrequent and inconclusive. However a first draft of M:SA2.5 –"Specification of the OMII-Europe packaging model" – has been published which includes minimum packaging criteria. We have not made this task a high priority this year and as a result, the document is incomplete.

### 3.5.2 Plan for Year 2

By PM15 we will have finalised the list of supported packaging formats through consultation with the JRA 1 activities and we will update M:SA2.5 accordingly. This document will become the reference point by which the Test and Review task to determines whether or not a component supports the correct packaging models.

# 4 Conclusion

At the end of PM12 the SA2 task has achieved the following:

- Installation of an automated ETICS /Metronome build and test facility at partner sites.
- Demonstration of the build and test facility at AHM2006[4] and SuperComputing 2006 conferences.
- Implementation of Compliance Tests to verify the behaviour of Job Submission services.
- Demonstration of Compliance Tests at SuperComputing 2006
- Publication of a series of policies, procedures, and packaging guidelines for use by service implementers.
- Use of the policies to aid in the review cycle of the compliance tests

In the second year, SA2's objectives are:

- Improve and extend the QA policies to cover interaction between other tasks.
- Integrate JRA1 engineering outputs (code and test suites) into the ETICS repository
- Integrate JRA4 Performance test metrics into the ETICS repository
- Run regular build and test cycles on submitted components to demonstrate stability, ease of deployment, portability, and performance. Review test suite effectiveness.
- Improve and extend the Compliance Test suites.
- Create new Compliance Tests as standards mature

This activity will produce criteria that will be used to assess software that has been contributed to the OMII-Europe repository. The technical committee will only recommend software for use if meets these criteria.

[4] AHM is the UK e-Science All Hands Meeting conference held annually and organised by the UK Research Councils

# 5 References


1) D:SA2.0v2 - Initial Specification of OMII-Europe QA procedure, tools, policies and practices
2) M:SA2.1 – Initial OMII-Europe Quality Assurance procedure
3) M:SA2.2 – Initial Set of OMII-Europe Quality Assurance Tools, Policies, and Practices
4) M:SA2.3 – Initial Compliance Test Suite
5) M:SA2.4 – Initial Integration of test suites into the NMI Build and Test Facility
6) M:SA2.5 – Specification of Packaging Model