

# EUROPEAN MIDDLEWARE INITIATIVE

## SOFTWARE DEVELOPMENT QUALITY CONTROL REPORT

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#### **Abstract:**

This document describes the status and performance of the quality control task with details on the availability and execution of unit, functional and compliance tests for the EMI components. This report focuses on the quality control review activities for EMI 1 release.

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### Document Log

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4	01/06/11	Integrated comments from Florida Estrella, Maria Alandes Pradillo and Francesco Giacomini	Andrea / INFN
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## 1. INTRODUCTION

### 1.1. PURPOSE

The main purpose of the periodic JRA1 Quality Control reports, as mandated by the Software Quality Assurance Plan [R 2], is to summarize the status and performance of quality control pertaining the EMI software development activities. In particular, the reports should sum up the results of the EMI software components reviews and provide details about the availability and execution of unit, functional and compliance tests for the EMI components. This report focuses on the status of the QC activity during the first year of the project and the EMI 1 release QC review.

### 1.2. DOCUMENT ORGANISATION

The rest of this document is organized as follows. Section 2 is the executive summary. Section 3 presents the QC activities in the first year of the project. Section 4 discusses the EMI 1 QC review. Results are summarized and recommendations on how to improve the current situation are given. Finally, Section 5 concludes the report.

### 1.3. REFERENCES

**Table 1: Table of References**

<b>R 1</b>	DJRA1.7.1 EMI Software Development Quality Control Report <a href="http://cdsweb.cern.ch/record/1277533">http://cdsweb.cern.ch/record/1277533</a>
<b>R 2</b>	DSA2.1 EMI Software Quality Assurance Plan <a href="https://twiki.cern.ch/twiki/pub/EMI/DeliverableDSA21/EMI-DSA2.1-1277599-QA_Plan-v1.2.pdf">https://twiki.cern.ch/twiki/pub/EMI/DeliverableDSA21/EMI-DSA2.1-1277599-QA_Plan-v1.2.pdf</a>
<b>R 3</b>	DSA2.3 – KPI and metrics definition document <a href="https://twiki.cern.ch/twiki/bin/view/EMI/EmiSa2MetricsGuidelines">https://twiki.cern.ch/twiki/bin/view/EMI/EmiSa2MetricsGuidelines</a>
<b>R 4</b>	DSA2.2.1 - QA Tools Documentation <a href="https://twiki.cern.ch/twiki/bin/edit/EMI/DeliverableDSA221">https://twiki.cern.ch/twiki/bin/edit/EMI/DeliverableDSA221</a>
<b>R 5</b>	DSA2.4 – Continuous integration and certification testbeds <a href="https://twiki.cern.ch/twiki/bin/view/EMI/DeliverableDSA24">https://twiki.cern.ch/twiki/bin/view/EMI/DeliverableDSA24</a>
<b>R 6</b>	DSA2.3.1 – Periodic QA report <a href="https://twiki.cern.ch/twiki/bin/view/EMI/DeliverableDSA231">https://twiki.cern.ch/twiki/bin/view/EMI/DeliverableDSA231</a>
<b>R 7</b>	DJRA1.5 - Standardization Work Plan and Status Report <a href="https://twiki.cern.ch/twiki/bin/view/EMI/DeliverableDJRA151">https://twiki.cern.ch/twiki/bin/view/EMI/DeliverableDJRA151</a>
<b>R 8</b>	DJRA1.6 – Integration Work Plan and Status Report <a href="https://twiki.cern.ch/twiki/bin/view/EMI/DeliverableDJRA161">https://twiki.cern.ch/twiki/bin/view/EMI/DeliverableDJRA161</a>
<b>R 9</b>	DNA1.3.1 – Technical Development Plan <a href="https://twiki.cern.ch/twiki/bin/view/EMI/DeliverableDNA131">https://twiki.cern.ch/twiki/bin/view/EMI/DeliverableDNA131</a>
<b>R 10</b>	EMI Description of Work <a href="https://twiki.cern.ch/twiki/pub/EMI/EmiDocuments/EMI-Part_B_20100624-PUBLIC.pdf">https://twiki.cern.ch/twiki/pub/EMI/EmiDocuments/EMI-Part_B_20100624-PUBLIC.pdf</a>
<b>R 11</b>	EMI JRA1 Development and test plans <a href="https://twiki.cern.ch/twiki/bin/view/EMI/EmiJra1T1Coord">https://twiki.cern.ch/twiki/bin/view/EMI/EmiJra1T1Coord</a>
<b>R 12</b>	EGEE III SA3 Testing <a href="https://twiki.cern.ch/twiki/bin/view/EGEE/SA3Testing">https://twiki.cern.ch/twiki/bin/view/EGEE/SA3Testing</a>
<b>R 13</b>	EMI Test availability survey <a href="https://twiki.cern.ch/twiki/bin/view/EMI/EmiTestAvailabilitySurvey">https://twiki.cern.ch/twiki/bin/view/EMI/EmiTestAvailabilitySurvey</a>
	S2 SRMv2 Compliance Test Suite

<b>R 14</b>	<a href="http://s-2.sourceforge.net/">http://s-2.sourceforge.net/</a>
<b>R 15</b>	EMI 1 Production release Criteria <a href="https://twiki.cern.ch/twiki/bin/view/EMI/ProductionReleaseCriteria">https://twiki.cern.ch/twiki/bin/view/EMI/ProductionReleaseCriteria</a>
<b>R 16</b>	EMI Release tracker <a href="https://savannah.cern.ch/task/?group=emi-releases">https://savannah.cern.ch/task/?group=emi-releases</a>
<b>R 17</b>	EMI SA 2 Release management policy <a href="https://twiki.cern.ch/twiki/bin/view/EMI/EmiSa2ReleaseManagementPolicy">https://twiki.cern.ch/twiki/bin/view/EMI/EmiSa2ReleaseManagementPolicy</a>
<b>R 18</b>	EMI SA2 Component Release checklist <a href="https://twiki.cern.ch/twiki/bin/view/EMI/EMIReleaseChecklist">https://twiki.cern.ch/twiki/bin/view/EMI/EMIReleaseChecklist</a>
<b>R 19</b>	EMI SA 2 Change management policy <a href="https://twiki.cern.ch/twiki/bin/view/EMI/EmiSa2ChangePolicy">https://twiki.cern.ch/twiki/bin/view/EMI/EmiSa2ChangePolicy</a>
<b>R 20</b>	EMI SA 2 Configuration and Integration policy <a href="https://twiki.cern.ch/twiki/bin/view/EMI/EmiSa2ConfigurationIntegrationPolicy">https://twiki.cern.ch/twiki/bin/view/EMI/EmiSa2ConfigurationIntegrationPolicy</a>
<b>R 21</b>	EMI SA 2 Packaging policy <a href="https://twiki.cern.ch/twiki/bin/view/EMI/EmiSa2PackagingPolicy">https://twiki.cern.ch/twiki/bin/view/EMI/EmiSa2PackagingPolicy</a>
<b>R 22</b>	EMI SA 2 Testing policy <a href="https://twiki.cern.ch/twiki/bin/view/EMI/EmiSa2TestPolicy">https://twiki.cern.ch/twiki/bin/view/EMI/EmiSa2TestPolicy</a>
<b>R 23</b>	EMI SA 2 Documentation policy <a href="https://twiki.cern.ch/twiki/bin/view/EMI/EMISa2DocumentationPolicy">https://twiki.cern.ch/twiki/bin/view/EMI/EMISa2DocumentationPolicy</a>
<b>R 24</b>	EMI SA 2 Certification policy <a href="https://twiki.cern.ch/twiki/bin/view/EMI/EmiSa2CertPolicy">https://twiki.cern.ch/twiki/bin/view/EMI/EmiSa2CertPolicy</a>
<b>R 25</b>	The Linux Filesystem Hierarchy Standard <a href="http://www.linuxfoundation.org/en/FHS">http://www.linuxfoundation.org/en/FHS</a>
<b>R 26</b>	MSA1.2.1 EMI Referece Releases <a href="http://cdsweb.cern.ch/record/1277546/files/EMI_MS18_v1.0.pdf">http://cdsweb.cern.ch/record/1277546/files/EMI_MS18_v1.0.pdf</a>

#### 1.4. DOCUMENT AMENDMENT PROCEDURE

Amendments, comments and suggestions should be sent to the author and/or to the [emi-jra1-quality@eu-emi.eu](mailto:emi-jra1-quality@eu-emi.eu) mailing list.

This document can be amended by the authors further to any feedback from other teams or people. Minor changes, such as spelling corrections, content formatting or minor text re-organisation not affecting the content and meaning of the document can be applied by the authors without peer review. Other changes must be submitted to peer review and to the EMI PEB for approval.

When the document is modified for any reason, its version number shall be incremented accordingly. The document version number shall follow the standard EMI conventions for document versioning.

## 1.5. TERMINOLOGY

**Table 2: Table of Acronyms**

<b>APEL</b>	Accounting Processor for Event Logs component
<b>ARC</b>	Advanced Resource Connector
<b>Argus</b>	The Argus Authorization service
<b>BDII</b>	Berkeley Database Information Index
<b>BES</b>	Basic Execution Service
<b>CREAM</b>	The Computing Resource Execution and Management Cream Service
<b>JSDL</b>	Job Submission and Description Language
<b>PT</b>	Product Team
<b>QA</b>	Quality Assurance
<b>QC</b>	Quality Control
<b>RfC</b>	A Request for Change (RfC) is a formal request to change one or more software components.
<b>SQAP</b>	Software Quality Assurance Process
<b>StoRM</b>	Storage Resource Manager
<b>VOMS</b>	Virtual Organization Membership Service
<b>VOMS Admin</b>	Virtual Organization Membership Administration Service
<b>WMS</b>	Workload Management System

## 2. EXECUTIVE SUMMARY

This document is the second report on the status of the Quality Control (QC) activity in the context of the EMI JRA1 work package. This report focuses on the description of the QC activities during the first year of the project and software components review for the EMI 1 release.

Much work has been done to adopt and implement the quality process defined by SA2, in particular by porting the building of the middleware to ETICS, repackaging the software, reorganize documentation and adopting the test and certification process as request by SA2 policies.

Porting the building of the software to ETICS was particularly challenging for the PTs that had no significant experience with the tools but also for PTs with solid ETICS background due to the new ETICS features put in place to comply with SA2 policies. The changes in the packaging for most software imposed an update of the configuration code and the adaptation of the documentation. The implementation of the testing, certification, and documentation policies also required effort to adapt existing practices to the new requirements and release processes.

The results of these efforts have been measured by the EMI components QC review, whose results are summarized and discussed in section 4 of this report. 57 components were verified by 5 people from the JRA1, SA1 and SA2 activities. A significant improvement was measured in the availability of test plans, passing from 52% (October, 2010) to 84% (May, 2011) of successfully reviewed components. Nearly all components provided packages compliant with FHS [R 25] and 86% also provided buildable source RPMs. This is a remarkable achievement in the harmonization of the package structure across the middlewares and towards the adoption of EMI packages in Linux distributions.

Indeed, the results of the reviews also show that only 4% of the verified components were found to be fully compliant with the SA2 production release criteria[R 15] (33% were highly compliant and 63% were poorly compliant). The failures were caused by incorrect application of the certification process, missing information for the QC review, missing test reports or reports not formatted following the proposed templates. These results show that much works needs to be done in order to improve the measured performance of the quality process. Some recommendations on how the situation can be improved in the year 2 are given in section 4.3. In particular:

1. Better communication between the quality assurance and development teams is recommended in order to increase, on one side, the awareness of the quality process and to provide, on the other, a continuous review and fine tuning of the process and policies.
2. The central importance of the quality process must be restated at the project level, excluding from EMI releases and updates the components which fail to be compliant with the expected criteria.
3. Clear quality objectives and thresholds must be defined for the future EMI release as soon as possible, so that appropriate plans can be done and PTs have enough time to work towards compliance.
4. The QC review process accuracy must be improved and fine tuned so that the measured quality reflects the real quality of the delivered components.
5. Better tools should be provided to monitor the evolution of quality metrics and make the QC review work more timely and effective in order to better support PTs in the implementation of the quality process.



### 3. STATUS OF THE JRA1 QUALITY CONTROL ACTIVITY

As introduced in the DJRA1.7.1 [R 1], JRA1 QC's main responsibility is to assess that PTs are following the SQAP process defined by SA2. A significant fraction of the EMI JRA1 work during the first year of the project was focused on the implementation of the quality process defined by SA2, in particular

- porting the building of the software on the ETICS build system following the rules defined in the EMI configuration and integration policy [R 20]
- repackage software according to EMI packaging policy [R 21]
- test software components following the EMI testing policy [R 22]
- certify software components following the EMI certification policy [R 24]
- reorganize and harmonize documentation to be compliant with the EMI documentation policy [R 23]

All the above activities fall under the QC activity and are described briefly in the remainder of this section.

#### 3.1. BUILDING AND INTEGRATION

Porting the building of software to ETICS was one of the biggest challenges in the first year of the EMI project. The EMI 0 release was the first step in that direction with the clear objective of obtaining a single integrated build which would produce source and binary packages as well as quality metrics out of the middleware source code. ARC, gLite, UNICORE and dCache components were integrated in the common EMI ETICS project following the first incarnation of the configuration and integration guidelines. PTs who had no previous significant experience with ETICS had to learn it and adapt the building of their software to it. A significant effort was shared among all PTs to harmonize the set of external dependencies across the components and adapt the the build to the guidelines.

While many components (84% according to the final EMI 0 build report) were already successfully building on ETICS for the EMI 0 integration exercise release [R 26], the updated requirements in the EMI configuration and integration policy [R 20] for the EMI 1 release and the introduction of the new dependency resolution and packaging mechanisms in the 1.5 version of the ETICS client (released on February, 21<sup>st</sup> 2011) required significant updates in components' ETICS configurations.

The changes in the 1.5 version of the ETICS client provided a cleaner management of external dependencies coming from the OS and the integration of the mock RPM packaging tool which was necessary for the automated generation of source RPMs in the build.

A full successful build of all EMI components (producing only binary packages) was first achieved on February, 14<sup>th</sup> on the EMI-1 release candidate 1 nightly build.

#### 3.2. PACKAGING

The large majority of EMI components (92%, i.e. all except ARC components) required radical changes in the way their packages were structured in order to comply with the EMI packaging policy [R 21]. In particular,

- Packages had to be restructured in order to follow Fedora packaging guidelines and be compliant with the Filesystem Hierarchy Standard [R 25]
- Buildable source RPMs had to be produced for the supported platforms (Scientific Linux 5 X86\_64 for EMI 1) besides tarballs and binary RPMs.

The restructuring of the packages required significant changes in the configuration and startup code for the affected components. These changes were reflected in the documentation, which had to be adapted accordingly.

In the end, most components released in EMI 1 are compliant with FHS (the exceptions will be detailed later in this document) and 86% of the packages provide buildable source RPMs. It must be noted that at the beginning of the project only ARC components provided buildable source RPMs, so this a big achievement for the first year of the EMI project.

### 3.3. TESTING

EMI software components have been tested following the EMI SA2 Testing [R 22] policy. The following subsections describe the activities performance during the preparation of the EMI 1.

#### 3.3.1 Test plan availability

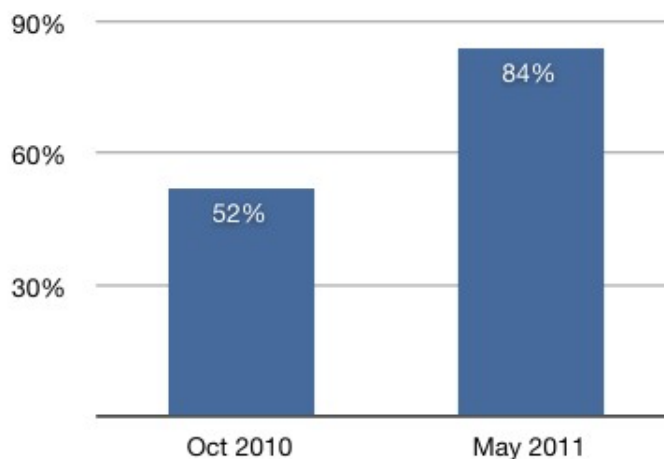


Figure 1: Test plan availability improvement in the first year of the project

As verified in the EMI 1 QC review, 84% of the PTs provided a test plan describing the test strategy used to assess their components' expected behavior. This is a significant improvement over the situation at the beginning of the project when only around 50% components provided a test plan [R 1]. It must be noted, however, that not all the PTs succeeded in providing a test plan compliant with the template defined in the SA testing policy [R 22].

#### 3.3.2 Static code analysis and testing

The ETICS build system provides plugins to statically analyze the source code of the EMI components at build time. No thresholds however have been defined by SA2 for code quality metrics. Indeed, static analysis tools were typically ignored by PTs during the preparation of the EMI 1 release, so no improvement is measured over the situation at the beginning of the project.

#### 3.3.3 Unit tests

Unit tests were declared mandatory for all the EMI software components, but no code coverage threshold has been set by SA2. One of the reason behind this decision is that most EMI components do not provide a unit test suite. Moreover, the tools to measure the coverage for code developed in different programming languages were not integrated in the ETICS build system when the testing policy was being defined by SA2.

It is also questionable why unit test were declared “mandatory” for all the PTs. As verified by the first test availability survey [R 1], a few middleware components (e.g., UNICORE) were developed with a comprehensive unit test suite that shows good coverage , while the majority of other components (e.g., gLite and ARC components) pursued other strategies (no unit testing and mainly functional test suites) to check the components' functionality. Should now unit tests be developed for all EMI components so that a minimum coverage threshold is reached for all the code? Should only new functionality whose development is funded by EMI be properly unit tested? How can this be verified by QC? No clear recommendation has been given yet on this subject from SA2.

For the above reasons no significant improvement is measured over the situation at the beginning of the project as presented in DJRA1.7.1 [R 1]. Detailed figures on unit test availability are given in section 4.2.3.

#### 3.3.4 Regression tests

Regression tests, in this context, are defined as tests that make sure that bugs fixed in the past are not reintroduced in future releases as a result of changes in the code. The status of regression testing for EMI components is monitored by SA1 QC activity and will not be discussed in detail in this report.

Indeed, the EMI 1 QC review results presented in section 4.2.3 show that 47% of the verified components proved to run regression tests on their code.

### **3.3.5 Deployment tests**

Most PTs (detailed figures and discussion can be found in section 4.2.3) included deployment and configuration reports for their components in their testing reports for EMI 1 as requested by the testing policy. Deployment and configuration test results are required to prove that components can be installed and configured properly on EMI supported platforms.

### **3.3.6 Certification**

Significant effort has been put in the certification of EMI components as the final step for PTs in the EMI 1 release preparation. Certification is defined in the EMI Certification policy as “the action done by a PT on a component release in order to certify that the PT has followed and applied the SA2 policies during the component release development, documentation and testing phases” [R 24].

The only components that were not included in the EMI 1 release were excluded due to certification problems, which was not considered appropriate for production.

Detailed figures on certification reports availability and completeness are given in section 4.2.2.

## **3.4. SOFTWARE DOCUMENTATION**

The documentation has been reorganized following the rules of the EMI documentation policy [R 23] by most PTs. Some PTs did not convert the documentation to PDF as requested by the policy but provided all the requested information in other formats (e.g., wiki pages).

The status of the documentation is reviewed in SA2 periodic QA reports and will not be discussed here.

## **3.5. SOFTWARE COMPONENTS REVIEW**

### **3.5.1 SA2 Production Release Criteria**

SA2 Production Release criteria [R 15] define the minimum set of criteria considered to be mandatory in a component release scheduled for production. These criteria are verified by QC before a component can be released in production. The output of the verification is a report informing about the compliance with the criteria. The criteria to be verified have been organized by SA2 as follows:

Category	Checked Criteria
Change management	<p>Every component release must be tracked in a component release task created by the release manager in the EMI release tracker [R 16].</p> <p>All the changes included in the component release must be tracked in an RfC in the PT tracking tool. All the RfCs must be attached to the component release task.</p>
Integration and configuration	<p>Every component release must have a corresponding ETICS component (and subsystem) configuration in ETICS.</p> <p>The component configuration must contain a tag of the code.</p> <p>The configuration must build without errors in the nightly build of the release candidate project configuration.</p>
Packaging	<p>Every component release must include a link to all the new packages in all supported packaging formats.</p>
Testing	<p>Every component release task must include a link to the test plan of the component.</p> <p>The minimum set of tests that are mandatory at this stage of the project are: Unit tests, Deployment tests, Basic functionality tests, Any existing automatic regression test.</p> <p>Every component release task must attach the test report for the component including the test results of the mentioned set of tests.</p>
Documentation	<p>The following documents must be provided by PTs: Release notes, Functional description, User guide, Client installation and configuration guide, System administrator guide, Service reference card.</p>
Certification	<p>Every component release must include a link to the certification report.</p>

*Table 3: Production release criteria*

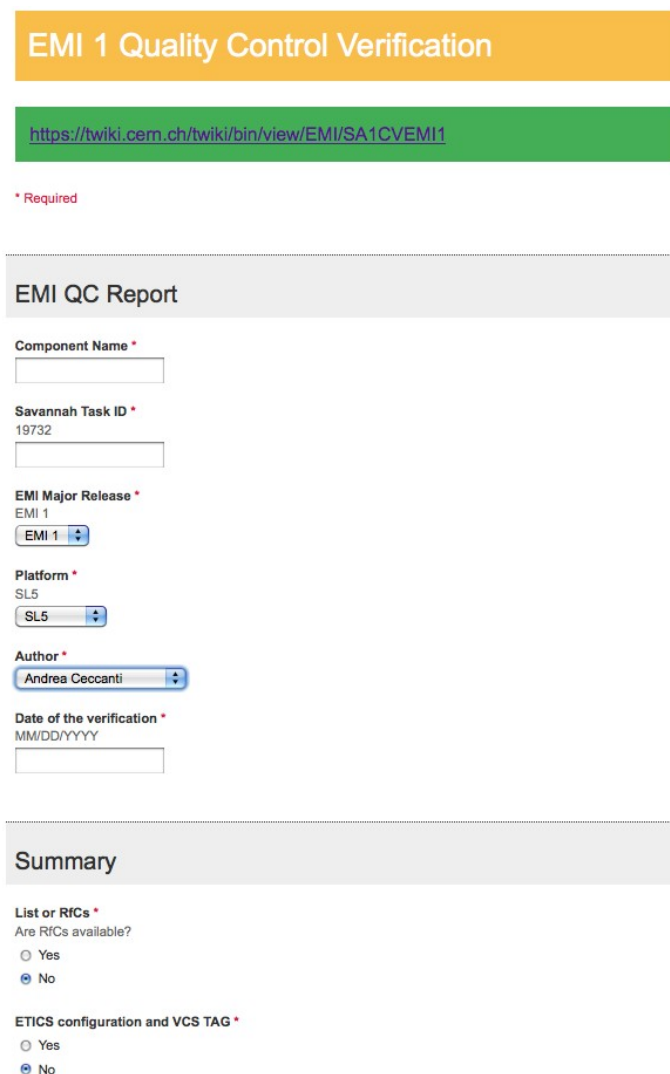
The above criteria have been checked for all EMI 1 components. The results of the review are presented in the next section.

## 4. EMI 1 QUALITY CONTROL REVIEW

The EMI 1 Kebnekaise release was officially released to the public on May 12<sup>th</sup>, 2011. All the components included in the release have been verified by the QC team.

The QC review activity was coordinated by Giuseppe Fiameni (SA1 QC task leader) and shared among five persons (Maria Alandes Pradillo, Claudio Cacciari, Andrea Ceccanti, Jozef Cernak and Giuseppe Fiameni) from the SA2, JRA1 and SA1 work packages. The clear objective was to speed up the verification process as much as possible and be compliant with the EMI 1 release schedule. Tasks were assigned to members coming from different middlewares (e.g., UNICORE components assigned to reviewers with a gLite background) to reduce the possibility of biased reviews.

An online verification form (see Figure 2) was created by Giuseppe Fiameni leveraging Google Documents. The advantage of this approach is that all verification reports would be maintained in a single shared online spreadsheet. Verification reports were periodically generated from the spreadsheet data using scripts and attached to the tasks in the release tracker. The data from the spreadsheet was finally imported in a relational database for easier querying and analysis.



**EMI 1 Quality Control Verification**

<https://twiki.cern.ch/twiki/bin/view/EMI/SA1CVEM1>

\* Required

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### EMI QC Report

Component Name \*

Savannah Task ID \*

19732

EMI Major Release \*

EMI 1

EMI 1

Platform \*

SL5

SL5

Author \*

Andrea Ceccanti

Date of the verification \*

MM/DD/YYYY

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### Summary

List or RFCs \*

Are RFCs available?

Yes

No

ETICS configuration and VCS TAG \*

Yes

No

The QC review, for each component, was triggered by the corresponding task in the EMI release tracker [R 16] being moved to the “Certified” state by PTs. The review was split in two parts:

1. Documentation review, coordinated by Maria Alandes Pradillo, and documented in SA2 QA periodic reports. This review checks, for each component, that the documentation is appropriate and up-to-date.

2. Certification review: this review focuses on checking that all the other production release criteria are met. Details on the structure of this review are given in the next section.

#### 4.1. REVIEW STRUCTURE

The QC review focused on the verification of the following 12 quality aspects:

1. The list of addressed RfCs are listed in the task
2. ETICS configuration and VCS tag are correctly listed in the task and certification report
3. The certification report is available
4. The certification report is complete in all sections
5. Binary packages are correctly listed in the task and available in the repository
6. Binary tarballs are correctly listed in the task and available in the repository
7. Source packages are correctly listed in the task and available in the repository
8. Source tarballs are correctly listed in the task and available in the repository
9. The test report contains information about unit test execution
10. The test report contains information about deployment test execution
11. The test report contains information about basic functionality test execution
12. The test report contains information about regression test execution

All these aspects had equal weight for the review and were mandatory.

#### 4.2. RESULTS

57 unique components were verified (some of them were verified multiple times) in the period from April 15<sup>th</sup>, 2011 to May 10<sup>th</sup>, 2011. Figure 3 presents the overall components' compliance with the quality aspects. Only 2 components (4% of the total) were found to be fully compliant; 19 components (33%) were compliant with at least 9 checks, while 36 components (63%) satisfied less than 9 checks.

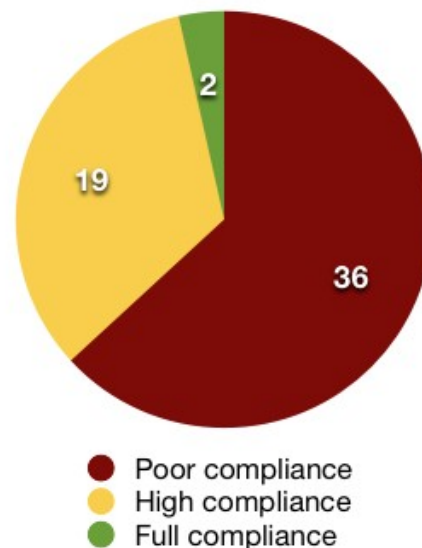


Figure 3: Components compliance with EMI production quality criteria as verified by QC. Only 4% of the components were found to be fully compliant, while 63% satisfied less than 9 checks out of 12.

Figure 4 presents a summary of components' compliance with the main quality aspects. Note that in this chart some related quality aspects have been grouped (e.g., certification report availability and completeness).

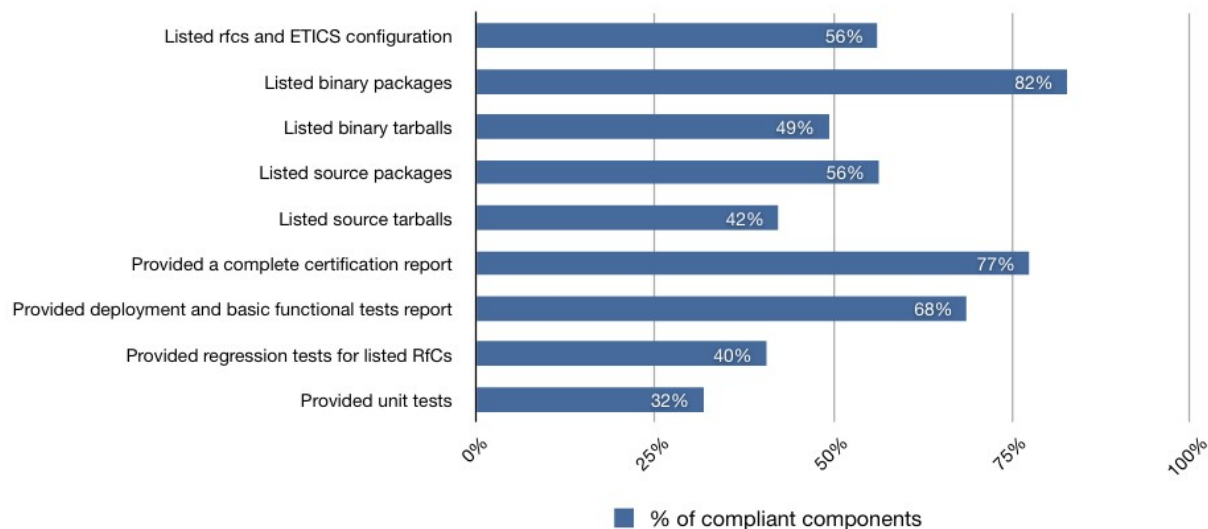


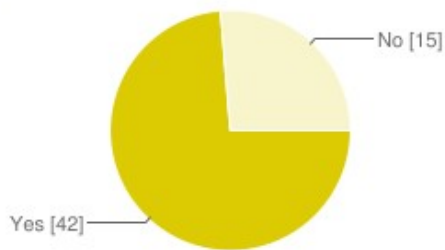
Table 4 shows the relation between components names, as tracked in the release tracker, and number of satisfied quality checks.

# of satisfied quality checks	Component name
12	Trustmanager, UNICORE HiLA
11	APEL parsers v.1.0.0, APEL Publisher v.3.2.7, dCache v.1.9.12, glite-gsoap/gss, UNICORE Gateway, VOMS v.2.0.0
10	ARC gridftp server v.1.0.0, ARC InfoSys v.1.0.0, CREAM v.1.13, gridsite v.1.7.13 L_B v.3.0.10, UNICORE XUADB v.1.3.2, WMS v.3.3.0
9	ARGUS v.1.3.0, glite-proxyrenewal v.1.3.19, lcas, TORQUE server config UVOS v.1.4.1, VOMS-Admin 2.6.1
8	AMGA v.2.1.2, ARC CE v.1.0.0, ARC core, BLAH v.1.16, CEMon v.1.13, gLite CLUSTER CREAM LSF module, CREAM TORQUE module, DPM, emi-wn, gLite-MPI v.1.0.0 TORQUE WN config, Unicore clients
7	ARC clients, DGAS-sensors v.4.0.1, UNICORE AIP v.2.0.0, UNICORE Registry v.6.4.0 UNICORE WS v.6.4.0, UNICORE XACML PDP v.2.0.0
6	ARGUS-EES v.0.0.10, emi-ui, gLExec v.0.8.10, glite-yaim-core LCMAPS-plugins-c-pep v.1.1.3, LFC, RAL-SAGA-SD v.1.0.0, StoRM SE v.1.7.0, UNICORE sec libs v.2.0.0, UNICORE XNJS v.1.4.0
5	LCMAPS v.1.4.29, UNICORE Services Environment v.6.4.0, UNICORE TSI v.6.4.0
2	GFAL/lcg_util v.1.11.18, site BDII, top BDII
1	core BDII

Table 4: Number of satisfied quality checks per component.

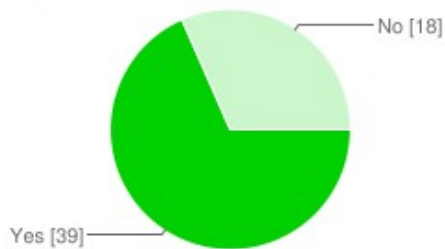
## 4.2.1 Basic task integrity checks

### List or RfCs



Yes	<b>42</b>	74%
No	<b>15</b>	26%

### ETICS configuration and VCS TAG



Yes	<b>39</b>	68%
No	<b>18</b>	32%

RfCs and ETICS configuration and VCS tag were correctly listed in the task for the majority of components (74% and 68% respectively).

Components that did not introduce new functionality or bug fixes were not required to list any RfCs in their task, however due to the review structure, these components were considered failing the check. In the future the review will take this scenario into account.

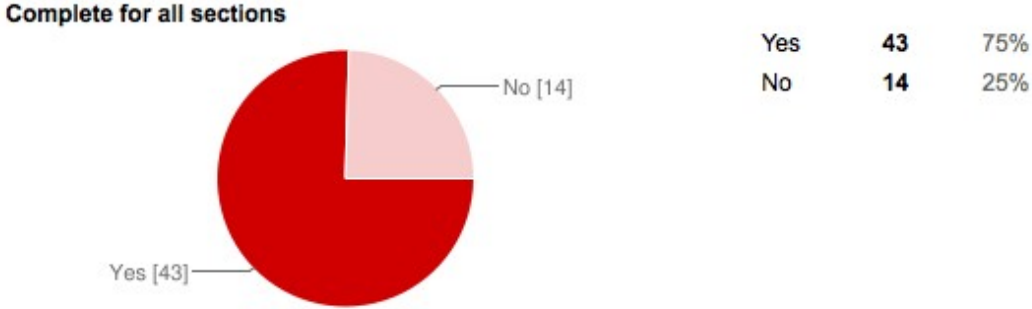
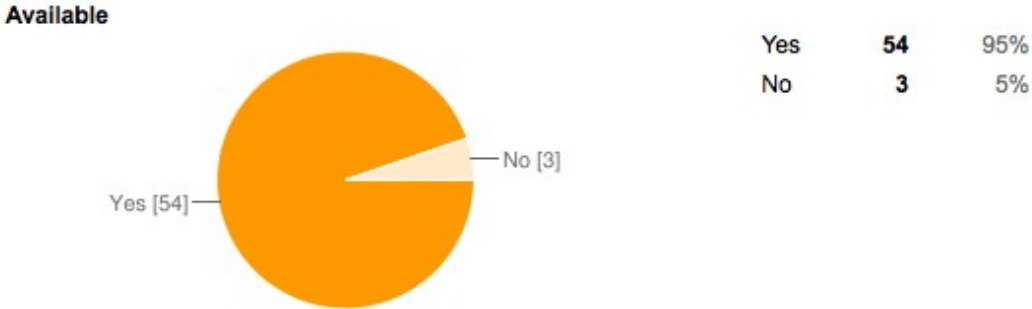
Other failures are caused by

- PTs not listing RfCs at all or failing to do so in the requested way
- VCS tag not included in the certification report
- the ETICS configuration not being locked when the task was moved to the “Certified” state.

In the future the review will be modified to take this scenarios into account.

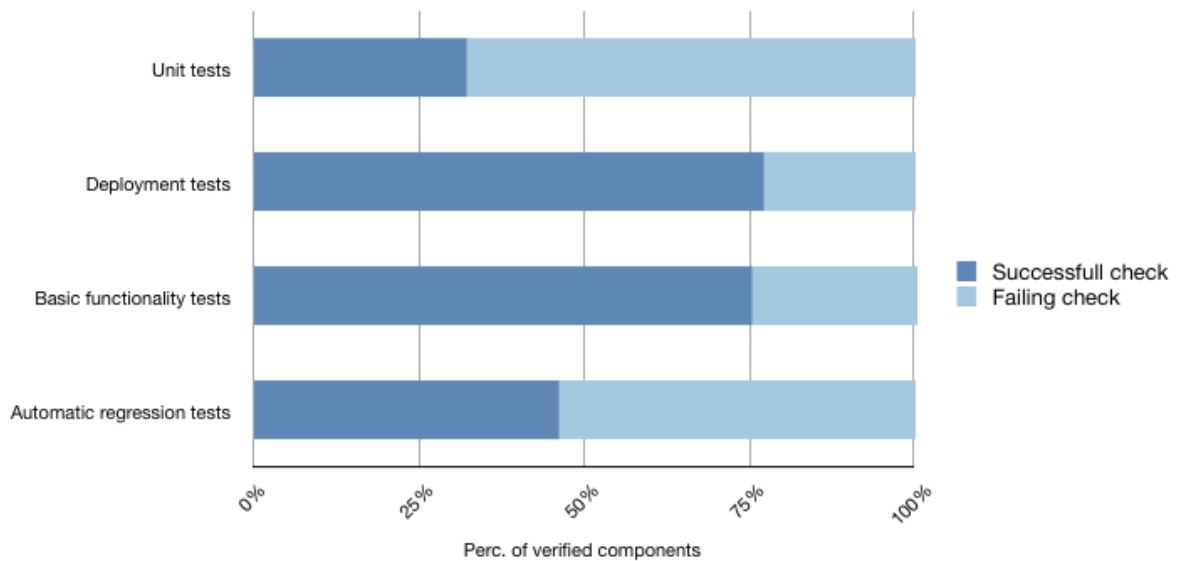


**4.2.2 Certification report availability and completeness checks**



The pie charts in Figure 6 summarize the results of the certification report availability and completeness checks. All PTs correctly attached a certification report to their task, with the exception of the core, top and site BDII components. The certification report was complete in all sections for 75% of the verified components.

### 4.2.3 Test reports checks

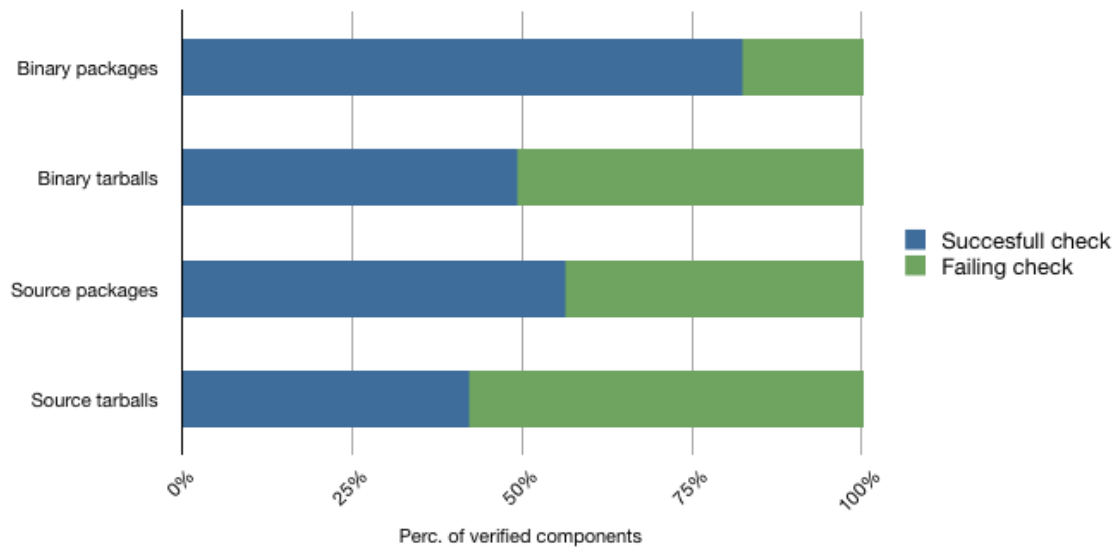


*Figure 7: Test availability checks results. The check verified that results of the tests were correctly included in the test report for the verified components.*

The chart in Figure 7 summarizes the results of test availability checks. Most components correctly reported about deployment and basic functionality tests. It is worth noting that *all* components included in the EMI 1 release could be successfully deployed but some didn't report correctly in their test report. Regression tests were present only in about half of the reports while unit tests only in one third of the verified components. Some failures were caused by missing test reports (ARGUS-EES, BDII, glite-yaim-core) or test reports not compliant with the required format (DPM, GFAL/lcg\_util, LFC, gLexec, lcas, lcms).

Only 20% of the components proved to report correctly for all the types of tests, i.e.: ARC InfoSys, Argus, dCache, gLite-MPI, Trustmanager, UNICORE clients, UNICORE Gateway, UNICORE HILA, UNICORE Registry, UNICORE WS, UNICORE XUADB, VOMS.

#### 4.2.4 Package availability checks



*Figure 8: Package availability check. The check verified that packages were correctly listed in the component tracker task and available in the release candidate repository*

QC verified that packages were correctly listed in the component tracker task and available in the EMI release candidate repository. The chart above summarizes the results of these checks.

Most components (82%) correctly listed the binary packages in their task on the tracker, while less than half of the components (on average) succeeded in listing correctly binary tarballs and source packages. Only 30% of the components correctly listed all the packages in their task as requested. Among the failing components, notable exceptions are some UNICORE libraries that do not build their packages in ETICS and are installed as part of other UNICORE components. The UNICORE libraries are: UNICORE AIP, UNICORE security libraries, UNICORE services environment, UNICORE XACML PDP and UNICORE XNJS.

In the future it is recommended that these components are not tracked in the release tracker.

### 4.3. RECOMMENDATIONS

The results of the review show that much work needs to be done in order to improve the measured performance of the quality process. Here is a list of general recommendations aimed at improving the current situation:

- PT awareness of the quality process should be improved. SA2 Policies are considered unnecessary bureaucracy by many PTs who fail to see the advantage in having a clearly defined quality process. The evidence of this is that only 2 of the reviewed components correctly followed the procedures as requested by SA2 during the EMI 1 release. SA2 and JRA1 QC should work so that policies and procedures are better understood and applied by the PTs.
- A policy review should be organized taking into account the lessons learned during the EMI 1 preparation and the feedback from the PTs.
- In the future, components failing to be compliant with expected quality criteria should not be included in EMI releases. The SA1 release manager and PEB should enforce this rule in order to foster PTs to be compliant with the policies and the quality process.
- SA2 should define target thresholds for key code quality metrics to be achieved for the EMI 2 and EMI 3 releases as soon as possible, so that PTs have enough time to work towards compliance.
- SA2 should provide better tools to SA1 and JRA1 QC to monitor the evolution of quality metrics: in particular, as mentioned in the SQAP [R 2], a dashboard should be provided that “will automatically collect and publish the relevant metrics and measurements associated to the software components so that alarms and notification on deviations can be monitored by QC.”
- Build and integration tools documentation, stability and performance should be improved. The official user guide and online documentation for ETICS does not cover many new features used by EMI (parentless locking, new dependency resolution mechanism, mock packaging, scriptlets for customizing specfile generation etc.) so developers typically have to contact ETICS support to get information that should be provided in the user guide. Moreover, during the preparation of EMI 1, ETICS showed performance (e.g., nightly builds taking days to complete) and stability issues (e.g., bugs in the etics client that led to orphaned builds, shortage of worker nodes for the target platforms) that should be addressed to ease integration and building of future EMI releases.
- The accuracy of the QC review process must be improved and adapted to the nature of the middleware. Different weights should be assigned to different checks taking into account the real impact on the quality of the delivered software components. For instance, having good documentation should be more important than correctly listing the produced packages in the release task tracker. JRA1 QC, SA1 QC and SA2 should work together in the definition of these weights. The possibility of providing automated tools for creating certification reports that are integrated with the release tracker should also be considered, in order to limit the number of editing mistakes and have more control on the information needed to perform QC activities.

## 5. CONCLUSIONS

This report presented the JRA1 QC activities during the first year of the project. Much work have been done to adopt and implement the quality process defined by SA2, in particular by porting the building of the middleware to ETICS, repackaging the software according to SA2 policies, reorganize documentation as requested and comply with the test and certification policies defined by SA2.

The measured performance of the quality process is however not optimal at this point in time. The QC review for the EMI 1 release show that only 4% of the verified components were found to be fully compliant with the SA2 production release criteria [R 15]. One of the main reasons for this is that Quality is not perceived by PTs as a crucial aspect of their development work.

To improve the situation, better communication between the quality assurance and development teams is recommended in order to increase, on one side, the awareness of the quality process and to provide, on the other, a continuous review and fine tuning of the process and policies.

The definition of target quality objectives for the next EMI release must be timely addressed, so that development plans can take the effort to be compliant with the metrics into account and work can start as soon as possible.

Finally, better tools must be provided to monitor the evolution of quality aspects in the developed software components. The clear objective should be to make QC review work more timely and effective in order to provide prompter feedback and support to PTs in the implementation of the quality process defined by SA2.