

EUROPEAN MIDDLEWARE INITIATIVE

SOFTWARE MAINTENANCE 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 regression tests for the supported EMI components, the test unit availability and coverage and various static and dynamic metrics on released components.

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1. INTRODUCTION

1.1. PURPOSE

The Quality Control (QC) verifies the application of Quality Assurance (QA) processes and procedures and, through the execution of period reviews, reports the status and performance of the SA1 work. Quality Control report is meant to provide an aggregated view of quality inspection results and performance measurements and outline which changes, to correct anomaly or nonconformity discovered during the review, are submitted to PEB.

1.2. DOCUMENT ORGANIZATION

The document is organized as follows:

- Chapter 1 and 2 are the introduction and the executive summary respectively;
- Chapter 3 presents the organization of the Quality Control activity and which the interaction with the external entities are;
- Chapter 4 reports the Quality Review expected for PM6 as the defined review schedule;
- Chapter 5 describes the status of the regression tests;
- Chapter 6 reports the conclusions of the work.

1.3. REFERENCES

- [R1] **Quality Assurance Plan**, <https://twiki.cern.ch/twiki/bin/view/EMI/DeliverableDSA21>
- [R2] **Quality Assurance Metrics**, <https://twiki.cern.ch/twiki/bin/view/EMI/TSA23>
- [R3] **Quality Assurance Wiki Page**, <https://twiki.cern.ch/twiki/bin/view/EMI/SQAP>
- [R4] **Software Release Plan**, <https://twiki.cern.ch/twiki/bin/view/EMI/DeliverableDSA12>
- [R5] **Software Maintenance and Support Plan**,
<https://twiki.cern.ch/twiki/bin/view/EMI/DeliverableDSA11>
- [R6] **Technical Development Plan**,
<https://twiki.cern.ch/twiki/bin/view/EMI/DeliverableDNA131>
- [R7] **Release Management Wiki Page**, <https://twiki.cern.ch/twiki/bin/view/EMI/TSA13>
- [R8] **Configuration and Integration guidelines**,
<https://twiki.cern.ch/twiki/bin/view/EMI/EmiSa2ConfigurationIntegrationGuidelines>
- [R9] **Certification and testing guidelines**,
<https://twiki.cern.ch/twiki/bin/view/EMI/EmiSa2CertTestGuidelines>
- [R10] **Change management guidelines**,
<https://twiki.cern.ch/twiki/bin/view/EMI/EmiSa2ChangeManagementGuidelines>
- [R11] **DSA2.2.1 - QA Tools Documentation**, <https://twiki.cern.ch/twiki/bin/edit/EMI/DeliverableDSA221?topicparent=EMI.EmiDeliverables;nowysiwyg=1>
- [R12] **Certification report Template**, <https://twiki.cern.ch/twiki/bin/edit/EMI/EMICertification-ReportTemplate>
- [R13] **Software Verification and Validation Template**,
<https://twiki.cern.ch/twiki/bin/view/EMI/SoftwareVerAndValTemplate>
- [R14] **Quality Control Report PM6**, <https://twiki.cern.ch/twiki/bin/view/EMI/SA1QCPM6>
- [R15] **Software Quality Assurance Plan Documentation**,
https://twiki.cern.ch/twiki/bin/view/EMI/SQAP#SQAP_Documentation

DOCUMENT AMENDMENT PROCEDURE

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. The document shall be maintained in the CERN CDS repository and be made accessible through the OpenAIRE portal.

1.4. TERMINOLOGY

ABI	Application Binary Interface
API	Application Programming Interface
CDS	CERN Document Server
DCI	Distributed Computing Infrastructure
DMSU	Deployed Middleware Support Unit
EGI	European Grid Infrastructure
EMT	Engineering Management Team
ETICS	eInfrastructure for Testing, Integration and Configuration of Software
GGUS	Global Grid User Support
ITIL	IT Infrastructure Library
KPI	Key Performance Indicator
kSLOC	Kilo Source Lines Of Code
MCB	Middleware Coordination Board
NGI	National Grid Initiative
PEB	Project Executive Board
PTB	Project Technical Board
QA	Quality Assurance
QC	Quality Control
RfC	Request for Change
SLA	Service Level Agreement
SQAP	Software Quality Assurance Plan
SU	Support Unit

2. EXECUTIVE SUMMARY

Performing Quality Control is specifically concerned with monitoring work results to see whether they comply with the standards set out in the SQAP defined in SA2. Operating throughout the project, it aims to identify and remove the causes of unacceptable results from a product and a release schedule perspective. Basically, all the releases of EMI components need to satisfy well-defined certification and validation criteria before being included in a stable EMI distribution, sufficient to guarantee to a high degree of confidence that all EMI products meet the requirements set by our direct customers and that no regression are introduced. This activity also deals with security assessments of selected EMI components under the coordination of CSIC (add reference).

More precisely, the QC is responsible to carry out the following two major activities:

- **perform periodic reviews**, on the base of predefined control tools, to constantly control the performance of the team and collect measurements for evaluating quality metrics. Further information about the scheduled quality reviews can be accessed at [R14];
- **elaborate project deliverables** to summarize and further elaborate the results of the execution of periodic reviews in order to point out any nonconformity or negative trends that might became defects in the future.

At the time of writing (PM6) there is no official EMI release available and no real measurements can be effectively collected or analysed. Nevertheless, the change requests present in the following paragraphs are intended to be effective and for each of them a response is expected according to the review procedures established in the SQAP. The change requests, namely corrective and preventive, can contribute to the improvement of the project quality and should be noted in the project 's documentation for ensuring their traceability.

3. THE ORGANIZATION OF THE QUALITY CONTROL

The diagram below describes how the QA (part of the SA2) and the QC (SA1) interacts and in which way the information flows between them.

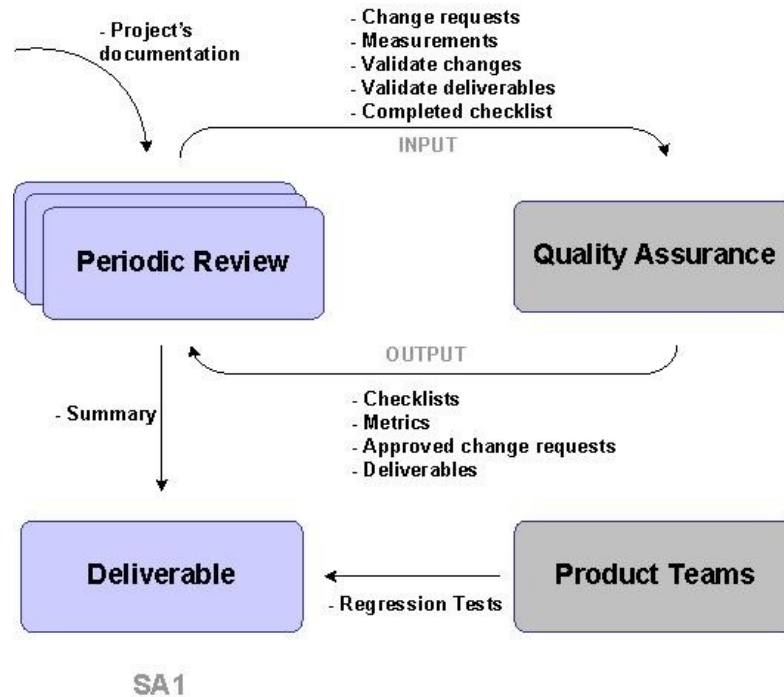


Figure 1: Quality Control Information flow

3.1. INPUTS

This paragraph presents the list of the information items that the QC receives as input and that are fundamental for the execution of reviews.

Quality Assurance Plan

The SQAP [R1] specifies the procedures, the metrics and the manner in which the EMI project is to achieve its quality goals in terms of software development.

Quality Checklists

A checklist is a structured tool used to verify whether the required steps in a process have been met. As each step is completed, it is checked off the list. In accordance to the SQAP, the input checklists for the QC in SA1 are:

- Review of the Software Release Plan
- Review the Software Release Schedule
- Review the Software Maintenance and Support Plan
- Security Assessments
 - *this review has been postponed*

Quality Metrics

A quality metric is an operational definition that describes, in very specific terms, a project or product attribute and how the QC process will measure it.

The metrics defined for the QC in SA1:

- Review of the Software Release Plan
 - *No metric defined for this review*
- Review the Software Release Schedule
 - *Delay on the release schedule (ID: DELAYONTHERELEASE)*
- Review the Software Maintenance and Support Plan
 - *Total user incidents per user month (ID: TOTALUSERINCIDENTS)*
 - *Training and support incident per user month. (ID: TRAININGSUPPORTINCIDENTS)*
 - *Average time to deal with an incident at the 3rd level of user support (ID: AVERAGETIMEFORUSERINCIDENTS)*
- Security Assessments
 - *No metric defined for this review*

Approved change requests

The list of approved change requests is provided as input to verify that their implementation is correct and satisfies the quality standards. Approved change requests can include modifications to the work methods or to the schedule and come as a result of the change management process led by the PEB.

Currently, there are no previous approved changes that need to be verified.

Deliverables

This is the list of deliverables (documents of products) that the QC verifies.

3.2. OUTPUTS

This paragraph presents the list of the information items that the QC returns to the QA for further elaboration.

Change Requests

This is the list of recommended corrective or preventive actions to consider for preventing future defects in procedures or products.

Measurements

Quality control measurements are the documented results for the associated metrics.

Validated changes

Validated changes are the results of changes, defect repairs, or variances that have been inspected and corrected. Any changed or repaired procedures or products are once again verified and will be either accepted or rejected before the final decision is provided.

Validated deliverable



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Main goal of QC is to determine the correctness of project's deliverables. The results of quality controls are validated deliverables.

Completed checklists

Completed checklists are output of the QC activity to become part of the project's documentation.

3.2.1 Quality Baseline

The quality baseline is not a listed output of this process. Almost everything that is done throughout the quality process culminates in the quality baseline.

4. QUALITY CONTROL REVIEW

According to the schedule defined in the SQAP, this QC review refers to PM6 and it is the first performed for the SA1 activity.

4.1. REVIEW OF THE SOFTWARE RELEASE PLAN

The aim of the Review of the Software Release Plan is to check that the release plan is up to date and that describes the actual release process.

The Software Release plan is accessible at [R4].

4.1.1 Input

Quality Checklists

- Checklist for the Review of the Software Release Plan ([add reference to wiki](#))

Quality Metrics

- *No metrics defined for this review*

Approved change requests

- *No previous approved changes defined for this review*

Deliverables

- Software Release Plan [R4]

4.1.2 Output

Completed Checklist

Check Number	Question	Response
1	Does the list of supported platforms correspond to the actual set of platforms on which software components are released?	N.A.
	see [R4], chap. 5	
	see [R8]	
	see [R7]	
2	Is the installation of external dependencies well documented?	N
	see http://eticsoft.web.cern.ch/eticsoft/internal/public/VMWareImages/EMI_SL5_x86_64_EPEL_rpmlist.txt	
	see [R8]	
3	Are instructions to build the software up to date?	Y

	see [R8]	
4	Is the list of supported delivery software formats up to date (source and binary packages, tarball, package lists, etc)?	N.A.
	see [R4], par. 4.5.5	
5	Is the description of the process on how to handle changes up to date?	N.A.
	see [R4], par. 4.2	
	see [R10]	
6	Are the communication channels published with updated information?	N.A.
	see [R4], par. 4.5.5	
7	Is the process on how to deliver software to the Production Infrastructures up to date and it's aligned to what the Production Infrastructures are expecting?	N.A.
	see [R4], chap. 4.5.5	

Table 1: Review of the Software Release Plan (N.A. = Not Available)

Measurements

There are no measurements for this review.

Comments

The table below (Table 2) reports specific comments for the checks that have returned a non-satisfactory response (i.e. N.A. or N). Although this review is only meant to give an overview of the current degree of compliance for the quality procedures, and will not have any effective impact on the prosecution of the work, it strongly recommended to take the comments reported below in strict consideration and to take corrective actions in response to the change requests defined for this review.

In addition, contrary to what happened for this first review, the information needed to perform the review's checks will be exclusively collected from Software Release Plan and no other information sources, or external documents, will be considered.

Check Number	Comment
1	Since no EMI components have been release yet, the check cannot be performed. The information that is necessary to make the comparison is not available. The list of supported platforms will be defined in the Installation Guide of the EMI components. The Installation Guide is one of the required documents as defined in the SQAP.
2	Whether the check is referring to the installation of external dependencies in ETICS or to the installation of external dependencies for the deploy of the EMI components, no documentation is available in both cases.
4	No list available.
5	No information on how to handle changes to the Software Release Plan is available
6	No communication channels are defined in any of the available documents.
7	The current release of the Software Release Plan [R4] does not mention any information regarding the delivery process of EMI components, either it does not contain which the Production Infrastructure requirements are and how EMI plans to address them.

Table 2: Review of the Software Release Plan – Comments

According to the SQAP, the documents governing the development, verification and validation, use and maintenance of the software processes should be made available on this page [R15] (*Software Quality Assurance Plan Documentation*) but at the moment of writing no items are currently listed there.

Validated changes

There are no previous change requests that require to be verified for this review.

Validated Deliverables

None

Variations from previous report

There are no variations from the previous review to report. Variations analysis will be performed starting from the next review when more information will be available.

4.1.3 Change requests

The list of the changes suggested/requested for this report follows:

- to make the review more effective, **define** the tolerance range of positive checks for considering the associated EMI deliverables accepted. If the results fall within the range, the deliverables are accepted. Alternatively, the deliverables might be rejected because they do not meet the quality standards set for the project.

The possibility of submitting change requests to the checklist structure (e.g. question text, number of questions) will be considered later on during the project when more information on the effectiveness of the review checks will be available.

4.2. REVIEW THE SOFTWARE RELEASE SCHEDULE

The Review of the Software Release Schedule should check that the priorities of the project are taken into account and reflected in the scheduled releases.

The Software Release Schedule is accessible at [R4].

4.2.1 Preamble on the EMI-0 release

According to the DoW, the first EMI release (EMI-1) will be delivered in March 2011. The product teams are currently working on an 'exercise' release designed to understand how to apply the agreed procedures, find any problem about tools and processes and in general fine tune the EMI software engineering process before the EMI-1 release. The outcome of this exercise release, called EMI-0, is not expected to be made available to external users. Its goal is to prepare a consistent, coherent repository of non-conflicting packages by the end of October 2010 without any specific commitment on functionality. For further information about the status of the EMI-0 release, please refer to [R7].

4.2.2 Input

Quality Checklists

- Checklist for the Review of the Software Release Schedule ([add reference to wiki](#))

Quality Metrics

- *Delay on the release schedule (ID: DELAYONTHERELEASE)*

Approved change requests

- *No previous approved changes defined for this review*

Deliverables

- Software Release Schedule [R15], [R4].

4.2.3 Output

4.2.4 Checklist

Check Number	Question	Response
1	<i>Has the previous schedule been kept?</i>	N.A.
	<i>see [R4], par. 4.6</i>	
	<i>see [R7]</i>	
2	<i>Does the new schedule take into account what wasn't accomplished in the previous schedule?</i>	N.A.
	<i>see [R7]</i>	
3	<i>Is the new schedule aligned to the Software Development Plan and the priorities of the project?</i>	N.A.
	<i>see [R6]</i>	
	<i>see https://twiki.cern.ch/twiki/bin/view/EMI/DeliverableDJRA111</i>	
	<i>see https://twiki.cern.ch/twiki/bin/view/EMI/DeliverableDJRA121</i>	
	<i>see https://twiki.cern.ch/twiki/bin/view/EMI/DeliverableDJRA131</i>	
	<i>see https://twiki.cern.ch/twiki/bin/view/EMI/DeliverableDJRA141</i>	
	<i>see https://twiki.cern.ch/twiki/bin/view/EMI/DeliverableDJRA151</i>	
<i>see https://twiki.cern.ch/twiki/bin/view/EMI/DeliverableDJRA161</i>		

Table 3: Review the Software Release Schedule

Measurements

In the following, the metrics list defined for this review is reported.

ID	DELAYONTHERELEASE
Name	Delay on the release schedule
Description	This metric could be provided as a histogram showing the delay time (in days) for each release, weighted using the release time
Unit	$(\text{release delay})/(\text{release time}) * 100$
Measurement	N.A.
Thresholds/target value	Ideally the release deadlines should be always met, leading to 0 delays for each release. Proper thresholds have to be defined. The trend of the delays over time could provide useful hints for process optimization.
Comment	The first EMI release, internal-release, will be made available at the end of October 2010 and thus no measurements for this metric can be collected and the metric be analysed.

Table 4: Delay on the release schedule – Metric

Comments

The table below reports specific comments on the check results.

Check Number	Question
1	Since no EMI components have been release yet, the check cannot be performed. The information that is necessary to make the comparison is not available. However it is not clear where the official release schedule is maintained and how it can be accessed.
2	As mentioned for the check n.1, it is not clear where the official release schedule is maintained and how it can be accessed. Furthermore, it is not clear how changes or modifications across different releases will be tracked and analyzed. The adoption of a change management system is encouraged.
3	In the Technical Development Plan [R6] and in the various detailed sub plans, there is no evidence of the development road-map. GANTT charts of progress tables will certainly help the quality control activity in being more accurate in the verification of the work. At the moment only sparse pieces of information, scattered among various paragraphs, are available. In some cases the reported information is too vague (i.e. expression like "during the first year") making the execution of check difficult to perform. Moreover, even when dates are mentioned, there is no reference to any official document or product that might consent the quality control to verify that the deadline has been met or not.

Table 5: Review the Software Release Schedule - Comment

Validated changes

There are no previous change requests that require to be validated for this review.

Validated Deliverables

None.

Variations from previous review

There are no variations to report from the previous review.

Change requests

The list of the changes suggested/requested for this report follows:

- to make the review more effective, **define** the tolerance range of positive checks for considering the associated EMI deliverables accepted. If the results fall within the range, the deliverable is accepted. Alternatively, the deliverable might be rejected because it does not met the quality standards set for the project;
- to facilitate the tracking of changes across different releases, it is strongly encouraged the adoption of a change management system to track the change requests life-cycle.

4.3. REVIEW THE SOFTWARE MAINTENANCE AND SUPPORT PLAN

The Review of the Software Maintenance and Support Plan should check that the plan is up to date and describes the actual maintenance and support processes and that the SLAs are respected.

4.3.1 Checklist

Check Number	Question	Re-sponse
1	<i>Is the process on how to handle incidents reported by EMI users using GGUS up to date?</i>	Y
	<i>see [R11]</i>	
	<i>see [R10]</i>	
	<i>see [R5]</i>	
2	<i>Is the process on how to handle requests coming from EMI users or other PTs up to date?</i>	Y
	<i>see [R5]</i>	
	<i>see [R10]</i>	
3	<i>Is the process on how to handle problems up to date?</i>	Y
	<i>see [R5]</i>	
	<i>see [R8]</i>	

Table 6: Review the Software Maintenance and Support Plan

4.3.2 Quality Control Measurements

ID	TOTALUSERINCIDENTS
Name	Total user incidents per user month
Description	This metric covers defects not only in the software but also in the documentation, training and user support processes, per user month. User month means the number of users (in our case, deployed services?) Per month.
Unit	GGUS tickets per user per month
Measurement	N.A.
Thresholds/target value	It is difficult to state a threshold valid for all the product teams, in general a decreasing trend would show positive results.
Comment	The first EMI release, internal-release, will be made available only at the end of October 2010 and thus no measurements for this metric can be collected. However if we were to start measurements collection tomorrow, we will be able to collect measurements for gLite and dCache only.

Table 7: Total user incidents per user month

ID	TRAININGSUPPORTINCIDENTS
Name	Training and support incident per user month.
Description	This metric covers defects in the training and user support processes, per user month. User month means the number of users (deployed services?) per month. The training and support defects can be derived by subtracting the tickets in status unsolved (ticket that generated a bug) from the total number of opened tickets. It relies on proper bug opening from GGUS tickets, especially for what concerns ambiguous or missing documentation.
Unit	Incident per user month
Measurement	N/A
Thresholds/target value	Decreasing trend.
Comment	The first EMI release, internal-release, will be made available at the end of October 2010 and thus no measurements for this metric can be collected. However if we were to start measurements collection tomorrow, we will be able to collect measurements for gLite and dCache only.

Table 8: Training and support incident per user month - Metric


ID	AVERAGETIMEFORUSERINCIDENTS
Name	Average time to deal with an incident at the 3rd level of user support
Description	This metric wants to measure the effectiveness of a product team to provide 3rd level user support. The time is measured from the time the ticket reaches a PT's 3rd level support and the time the ticket is moved to the status solved or unsolved
Unit	Days
Measurement	
Thresholds/target value	Need project wide agreement.
Comment	The first EMI release, internal-release, will be made available at the end of October and thus no measurements for this metric can be collected. However if we were to start measurements collection tomorrow, we will be able to collect measurements for gLite and dCache only.

Table 9: Average time to deal with an incident at the 3rd level of user support - Metric

4.3.3 General comments

This report partly complies with the quality standards expected for the Software Maintenance and Support plan. The part concerning the metrics evaluation has not been completed due to the unavailability of real measurements. For this reason, a complete response cannot be produced. Some minor adjustments to the GGUS interface are still under development but they will not affect the review results and not influence the way users currently interact with the system. GGUS only supports gLite and dCache components (Supported Unit) for the generation of quality measurements (i.e. number of incidents, problems, etc.) and this might generate non-complete results in the future.

The metrics defined for this report and the KPIs [R5] defined in the DoW might generate the same results leading to overlaps or crossings. The definition of the two groups of indicators should be revised according to the objectives of the project.

4.3.4 Change requests

The list of changes suggested/requested for this review follows:

- to avoid overlaps in performance evaluation, **consider** to aggregate the quality metrics defined for this review with the project level KPIs.

4.3.5 Validated changes

There are no previous change requests that require to be verified for this review.

4.3.6 Validated Deliverables

There are no deliverables defined for this review.



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4.3.7 Variations from the previous review

There are no variations to report from the previous review.

4.4. SECURITY ASSESSMENTS

Contribution from Elisa Heymann (UAB) is mandatory here. At the moment, no plan is available or expected during the next weeks.

5. REGRESSION TEST

The Quality Control activity for the SA1 is specifically concerned with monitoring work results for software maintenance and release activities to see whether they comply with the standards set out in the QA plan. In addition, the quality control should contain details on availability and execution of regression tests for the supported EMI components and various metrics on released components. As outlined in [R9], regression tests are tests that are meant to verify specific bug fixes. A regression tests can be associated to a bug reported in the bug (defect) tracker. A Product Team should aim at providing regression tests whenever the bug fix can be automatically (i.e. with a script) verified. When regression tests are distinguished, their execution should be highlighted in [R12]. Regression tests should be performed always on a release candidate; exceptions can be done for the release of urgent bug fixes and special occasions agreed within the EMT.

5.1.1 General comments

Although no regression tests have been performed yet, it might be asserted that the instructions on how to implement, execute and document new regression tests are well documented and the procedure looks consolidate. At the moment no causes that may lead to unacceptable results are envisaged, but it is strongly encouraged to better clarify how the details of the regression tests execution should be made available. The availability of a centralized place where to collect information from, would really facilitate the Quality Control work and reduce the possibility of errors. Also consider to extend the Software Verification and Validation Template [R13] with the addition of a specific section where details on regression tests can be reported.

6. CONCLUSIONS

This document reports the organization of the QC activity in SA1 and includes the results of the quality review expected for the PM6. The part concerning the evaluation of SA1 performance contains some inconsistency mainly due to the unavailability of necessary information. Despite the lack of information, the review reports remarkable and valuable results that, in the form of change requests, will be submitted to PEB for further elaboration.

Finally, what results evident in reviewing the SA1 activity, and in general the applicability of QA procedures, is the lack of a centralized point of access where relevant information is kept and made available to project's stakeholders also in a better structured format.