Software Engineering Project (2IP40)

Project Group 1

Software Quality Assurance Plan

version 0.1.3 (Internally Accepted), 14 June 2006

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Abstract

This is the Software Quality Assurance Plan (SQAP) for the SPINGRID project. This project is part of the Software Engineering Project (2IP40) and is one of the assignments at Eindhoven University of Technology. The document complies with the SQAP from the Software Engineering Standard, as set by the European Space Agency [ESA]. This document contains the guideline to maintain the quality of the project, with exception of the procedures for verification and validation, which are described in the Software Validation and Verification Plan ([SVVP]).

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Document Status Sheet

Document Title	Software Quality Assurance Plan
Document Identification	SPINGRID/Documents/Management/SQAP/0.1.3
Author(s)	I. van der Linden, S.C.H. Bego
Version	0.1.3
Document Status	draft / internally accepted / conditionally approved / approved

Version	**Date**	**Author(s)**	**Summary**
0.0.1	05-12-2005	I. van der Linden & S.C.H. Bego	Document creation
0.1.0	22-12-2005	I. van der Linden & S.C.H. Bego	Internally accepted (with changes)
0.1.1	20-02-2006	M. Leijten	Appendix D added
0.1.2	27-03-2006	I. van der Linden & S.C.H. Bego	SM's changes

Document Change Record

Document Title	Software Quality Assurance Plan
Document Identification	SPINGRID/Documents/Management/SQAP/0.1.1
Date of Changes	14-06-2006

Section Number	**Reason for Change**
Appendix D	This appendix wasn't defined yet
Appendices	Adding documents to the specific appendix

Chapter 1

Introduction

1.1 Purpose

This document describes the procedures and control methods to obtain the desired quality level of the end products and the process by which these end products are created. This document serves as a guide for the managers and developers of the SPINGRID project. All team members must read this document and apply the procedures stated in it. The document applies to all phases of software development as defined in the Project Management Plan [SPMP]. Detailed information about the software quality assurance activities for these phases will be added in appendices during the project.

1.2 Scope

In the SPINGRID project a system has to be designed to support grid-calculations. The software to be made consists of at least three applications, which must interact using the internet. *Dispatchers* gather jobs from various *Submitters* and dispatch them to so called *Agents*. The entire system has to be developed (in JAVA) in a way that it is easy to maintain and extend.

1.3 List of definitions

This section contains the definitions of all used terms, acronyms and abbreviations in this document.

2IP40	The Software Engineering Course ID at Eindhoven University of Technology
AD	Architectural Design
Agent	Application that retrieves and executes jobs
ATP	Acceptance Test Plan
CI	Configuration Item
Client	Monitor, Agent or Submitter
Customer	Dutch Space B.V.
CM	Configuration Manager
DD	Detailed Design
Dispatcher	Application that dispatches jobs to Agents
ESA	European Space Agency
Monitor	Application that either monitors dispatchers
PM	Project Manager
QAM	Quality Assurance Manager
SCMP	Software Configuration Management Plan
SM	Senior Management
SPMP	Software Project Management Plan
SQA	Software Quality Assurance
SR	Software Requirements
SRD	Sofware Requirements Document
Submitter	Application that submits jobs to dispatchers
SVVP	Software Verification and Validation Plan
SVVP/SR	SVVP/Software Requirements
SVVP/AD	SVVP/Architectural Design
SVVP/DD	SVVP/Detailed Design
TR	Transfer Phase
TU/e	Eindhoven University of Technology
UR	User Requirements
URD	User Requirements Document
XML	eXtensible Markup Language

1.4 List of references

[ADD]	*Architectural Design Document*, SPINGRID team, TU/e, Version 1.0.0, April 2006
[ATP]	*Acceptance Test Plan*, SPINGRID team, TU/e, Version 0.1.0, June 2006
[DDD]	*Detailed Design Document*, SPINGRID team, TU/e, not yet available
[ESA]	*ESA Software Engineering Standards (ESA PSS-05-0 Issue 2)*, ESA Board for Software Standardization and Control (BSSC), 1991
[ITP]	*Integration Test Plan*, SPINGRID team, TU/e, 0.1.0, May 2006
[SCMP]	*Software Configuration Management Plan*, SPINGRID team, TU/e, 0.1.2, June 2006
[SE1]	Software Engineering Website: Requirements for user requirements http://wwwis.win.tue.nl/2R690/ur_req.html, T. Verhoeff, TU/e, 2002
[SE2]	Software Engineering Website: Reviews http://wwwpa.win.tue.nl/wstomv/edu/sep/checklists/reviews.html, T. Verhoeff, TU/e, 2002
[SPMP]	*Software Project Management Plan*, SPINGRID team, TU/e, Version 0.1.1, January 2006
[SVVP]	*Software Verification and Validation Plan*, SPINGRID team, TU/e, Version 0.1.3, June 2006
[SQAP]	*Software Quality Assurance Plan*, SPINGRID team, TU/e, 0.1.3, June 2006
[SRD]	*Software Requirements Document*, SPINGRID team, TU/e, 1.0.1, March 2006
[STP]	*System Test Plan*, SPINGRID team, TU/e, 0.1.0, June 2006
[URD]	*User Requirements Document*, SPINGRID team, TU/e, 1.0.0, February 2006
[UTP]	*Unit Test Plan*, SPINGRID team, TU/e, 0.1.0, May 2006

Chapter 2

Management

This chapter details the structure and tasks of the Software Quality Assurance (SQA) team.

2.1 Organization

For a survey of the organization within the project and the responsibilities of the individual members of the teams see [SPMP]. The Quality Assurance Manager (QAM) leads the SQA team. He is assisted by the vice-QAM. Furthermore the QAM is responsible for the SQA and the performance of the SQA team. When the software quality is endangered the QAM will contact the PM. They will also decide whether or not one or more of the following parties have to be informed:

- The customer
- Senior Management

2.2 Tasks

The main task of the SQA team is to check whether the procedures are followed properly and that standards are handled correctly as defined in the [SQAP], [SVVP] and [SCMP]. Additionally the SQA team inspects whether all group members fulfill their tasks as defined in [SPMP] according to the parts of the [SQAP] applying to their specific tasks. If a problem is detected, the appropriate procedure as defined in chapter 7 will be followed. Besides the described main task, the SQA team has the following additional tasks:

- The SQA team has to check the consistency and coherence between documents.
- Organize internal reviews (chapter 5).
- Attend the internal reviews.

- Check whether all group members take their responsibilities as defined in [SPMP] by talking to the team members.

Specific tasks arising during the different phases of the project will be added in the corresponding appendices.

2.3 Responsibilities

The main responsibility for the SQA tasks, as described in section 2.2, lies with the QAM. The QAM can delegate the tasks within the SQA team. Minor problems can be solved by each member of the SQA team, whereas major problems are matter of the QAM and are also reported to the PM. Every problem found by a team member has to be reported to the QAM (chapter 7). Reporting to project members outside the SQA team is done by the QAM. In case the QAM will be unavailable for a short period of time, the vice-QAM will assume his tasks. If the QAM will be unavailable for a longer period of time, the SQA team must be expanded and the tasks reorganized. The PM will be responsible for this.

Chapter 3

Documentation

The documents to be delivered in the specific phases of the project are listed and outlined in [SPMP]. Document standards are described in chapter 4.

Chapter 4

Standards, practices, conventions and metrics

4.1 Documentation standards

During this project many different documents will be made. The SQA team checks that the documents adhere to the house style (defined in [SCMP]) and that the documents are made following the ESA standard guidelines [ESA], this is done during the random checks (chapter 5) held by the SQA team. Every document has to be approved by:

- The author(s)
- The leader of the responsible team
- A member of the SQA team

In case that these three people happen to be one and the same, a second member of the responsible team has to give his approval as well. Only approved documents affect the project. The documentation standards involve the following:

- All documents must adhere to the ESA standard [ESA].
- All documents must adhere to the house style as described in [SCMP].
- All documents use the template provided by the CM.
- All documents must be written in English.
- Requirements on review and approval as described in chapter 5.
- Requirements on document identification as described in [SCMP].
- Procedures involving the change of documents.

These standards apply to all documents, to electronic versions as well as printed ones. However the layout requirements do not apply to documents other than the project and product documents. All documents are made available through the document repository, as described in [SCMP]. In case of unavailability of the document repository, the CM sees to it that there are three copies available of every document (latest version with the highest status of approval) in the groups workspace. The three copies consist of one copy on paper and two digital copies on two different geographical locations.

4.2 Design standards

The design standards in the Architectural Design (AD) and Detailed Design (DD) phase will be defined or referenced in the Architectural Design Document [ADD] respectively Detailed Design Document [DDD]. The software design paradigm that will be used for the actual SPINGRID-applications is Object Oriented Programming. UML will be used as modeling technique for object oriented designs.

4.3 Coding standards

Coding standards are described in the appendix that will be written at the start of the AD phase as an appendix to the SQAP. Also, the customer might supply some Coding standards.

4.4 Comment standards

The Comment standards form a part of the Coding standards and will thus be described in the appendix about the Coding standards.

4.5 Testing standards

The testing standards to be used are described in [SVVP].

4.6 Metrics

Members of the SQA team will measure the quality of the delivered software, during random checks, by means of metrics. Some examples of metrics are:

- Length of procedures (should not be more than 100 lines).
- Total length of (useful) commentary divided by the total length of code (should exceed 1/5).

- Number of parameters divided by number of procedures (should not exceed 5. Procedures should have no more than 7 parameters).
- Maximum depth of nested if-statements (should be less than 4).
- Maximum depth of loops (should be less than 3).

Further metrics will be defined in Appendix D, DD phase. The SQA team makes a small report containing the results of the described tests in its log and delivers the report to the author(s) of the checked document. If a violation of these metrics is detected, it has to be resolved, unless the PM and QAM grant a permit.

4.7 Compliance monitoring

The SQA team will monitor compliance to the proposed conventions by way of random checking of Configuration Items (CIs) during which references to other documents are checked. During the reviews the SQA team member present checks with the authors of the reviewed CI whether it has references in it. He will also check whether the authors checked the referenced CIs. Discovered problems are reported to the PM.

Chapter 5

Review

Standards and procedures for Reviews and Audits are described in [SVVP]. In addition to Reviews, the SQA team carries out random checks as described below.

Random checks
The SQA team randomly checks all project and product documents to ensure that all products adhere to the document standards and that all group members do their job properly. Management and product documents are tested for adherence to the ESA Software Engineering standards [ESA] and if their layout and style adheres to the house style defined in [SCMP]. Furthermore the references and tracing to other documents are investigated. It is observed that program code adheres to the coding standards. Random checks are an addition to the reviews. Every document undergoes a random check at least once. To save time, the SQA team does not have to write a report. It just reports the results to the author and his team leader (possibly during a progress meeting). If problems are discovered a date is set when the problem must be solved and then the document is checked again. The SQA team also does random checks on tools as described in the [SCMP].

Chapter 6

Test

Methods and procedures for testing are detailed in the [SVVP]. In random tests (chapter 5) and in weekly interviews of team leaders, the SQA team observes that these procedures are followed and that the team that had their CI tested undertakes possible necessary actions. When it is detected that the testing procedures are not followed, the SQA team informs the PM.

Chapter 7

Problem reporting and corrective actions

When a problem in an approved CI is detected, it has to be solved. There are several kinds of problems:

Document problems:

- Non compliance with other project documents.
- Non compliance with the ESA standard [ESA].
- Non compliance with the house style ([SCMP]).
- Incompleteness.
- Errors.

Code problems:

- Lack of functionality.
- Wrong functionality.
- Non compliance with coding or commentary standards.

These are the procedures to be followed when a problem is detected:

Problem reporting procedure:

- When a problem is detected, the person who discovered the error is responsible for reporting it to the PM and QAM. When a problem is discovered during a review, the member of the SQA team present is responsible.

Problem solving procedure:

- The SQA team appoints the team leader of the corresponding CI team to solve the reported error. He is then responsible for solving the problem.
- When the problem is solved the SQA team is notified to check whether the made changes solve the problem.
- When the problem cannot be solved, or cannot be solved within a reasonable amount of time a meeting is set up with the PM, the QAM and the team leader of the responsible team. During this meeting a decision will be made about further dealing with the problem.

If the problem to be solved was discovered after internal or external acceptance, the PM first decides whether the problem is important enough to solve, if so, a Change Request (CR) has to be filled out. This CR has to be approved by:

- In case of previous internal acceptance: the PM, the author(s) of the document and the QAM.
- In case of previous external acceptance: the PM, the author(s) of the document, the QAM, Senior Management (and in case of the URD, SRD and ATP the client).

The procedures for changing CIs are described in the [SCMP].

7.0.1 Change in requirements of the customer

It is also possible that the requirements of the customer change. In this case, the requested change is matched to the URD. If the change conforms to the URD it is accepted. If it does not conform to the URD, the team decides wether it will discard the changes or not.

Chapter 8

Tools, techniques and methods

The SQA team has to make sure that appropriate tools, techniques and methods are used. These are described in [SCMP], [SPMP], [SVVP] and [ADD]. The SQA team checks their use by means of random checks.

With respect to the tool used during this project special interest is paid to:

- Availability of the tools. (Has every group member access to the tools?).
- Knowledge. The group members working with the tools must have the necessary skills to work with the tools (see also chapter 13, Training).
- The tools must work properly. (Are there errors or malfunctions in tools? Enough capacity?).

Every used tool will be checked at least once before use and once during use. When problems appear the SQA decides together with the PM and CM if the problem can be solved, or if the tool must be replaced by an alternative.

Chapter 9

Code control

It is the CMs responsibility to assure the correct handling of the code and all other CIs due to the standards described in [SCMP].

The following has to be valid:

- Documents are available to all people who are authorized to access them and to no one else.
- All versions of a document are available.
- No file is unnecessarily locked.
- Name conventions are consequentially used.

The SQA team checks if the procedures and standards as described in [SCMP] are handled properly. This is done by reviews and random checks (chapter 5). Problems are reported to the CM and PM.

Chapter 10

Media control

The SQA team checks if the procedures and standards as described in [SCMP] are handled properly. This is done in reviews and random checks (chapter 5). Problems are reported to the CM and PM.

Chapter 11

Supplier control

All external software components in the program code, that have an unreliable source, will be tested according to the [ESA] standards. Software components that have reliable sources will undergo some quick tests. These tests will be focused on the parts of this software that are of importance to the project. Whether an external software component is reliable or not is to be decided by the programmer that wants to use the specific component and at least one other member of the SPINGRID project team that is not part the team that wants to use the component.

The software tools that will be used for development of the program code (such as GUI builders etc.) are available to all project members.

Chapter 12

Records collection, maintenance and retention

Minutes of meetings and notes of external reviews are added to the project library as described in [SCMP]. Minutes of meetings are added after the members of the meeting have approved them. Minutes are delivered 3 workdays after the meeting at the latest. These documents will be kept throughout the duration of this project. Notes of reviews are reworked into a new version of the document.

Chapter 13

Training

During the project there will arise tasks that require special skills. Due to the fact that all group members reached an acceptable level of knowledge in the area of computer science, special training in this area will probably be unnecessary. However, each member of the SPINGRID should make sure he has sufficient skill in JAVA-development. If tasks arise that require special skills, the PM and the QAM will assess the level of knowledge for the task in the group and then they decide if special actions have to be taken. In that case, detailed information will be added in the appendices of this document.

Chapter 14

Risk management

In the [SPMP], the risks of the project are described. During progress meetings the occurrence of any of the risks described must be discussed and the PM must see to it that the necessary course of action is taken. The QAM will assist him in this task.

Appendix A

UR Phase

For the first phase of the project (UR), the SQA team must see to it that the following documents are properly reviewed internally before they are submitted for an external review.

A.1 URD

The SQA team checks before the internal review whether the URD:

- Contains a general description of the software that has to be developed.
- Contains requirements on the software to be developed as stated by the customer.
- Contains constraints on the software to be developed.
- Contains a priority list of the requirements

Furthermore it has to be checked that every user requirement complies with the requirements defined in [SVVP].

A.2 SPMP

The SQA team must check whether the goals of the project are clearly described. A life cycle approach for the project must be defined. The SQA team must ensure that the SPMP is realistic by checking:

- The assumptions made during the planning of the project (by comparing the actual time spent with the reserved time in the planning).
- Restrictions with respect to planning (e.g. availability of members).
- External problems (e.g. room availability).

A.3 SCMP

With respect to the SCMP, the SQA team checks before the internal review whether the document provides procedures concerning:

- CI identification.
- CI storage.
- CI change control.
- CI status indication.

All documents must have a unique identifier and backups must be made at least twice every week.

A.4 SQAP

With respect to the SQAP, the SQA team checks before the internal review whether the SQAP contains:

- Project standards.
- Problem reporting procedures.
- Responsibilities of the project members with respect to quality assurance.

A.5 SVVP

With respect to the SVVP, the SQA team checks before the internal review whether the SVVP contains:

- Reviewing and audits.
- Testing.
- Tracing.

During internal reviews ([SVVP]) the SQA team checks these documents and in case of problems, the author(s) and the team leader are informed. After the corrective action has been taken, the SQA team reviews the document again.

Appendix B

SR Phase

For the second phase of the project (SR), the SQA team must see to it that the following documents are properly reviewed internally before they are submitted for an external review.

During internal reviews ([SVVP]) the SQA team checks these documents and in case of problems, the author(s) and the team leader are informed. After the corrective action has been taken, the SQA team reviews the document again.

B.1 SRD

The SQA team must check before internal reviews whether the SRD:

- Contains requirements on the software to be developed, these requirements must be based on the software requirements stated in the [URD]
- Contains constraints on the software to be developed, these constraints must be based on the software constraints stated in the [URD]
- Contains a logical model.
- Contains a priority list of the requirements.
- Contains a traceability table (see [SVVP]).

B.2 SPMP/SR

The SQA team checks before internal reviews whether the SPMP is realistic what concerns:

- The assumptions made during the planning.
- Restrictions with respect to the planning (e.g. availability of members).
- External problems (e.g. external software/code).

B.3 SQAP/SR

With respect to the SQAP, the SQA team checks before internal reviews whether the SQAP contains:

- The tasks of the SQA team during the SR phase.

B.4 SVVP/SR

With respect to the SVVP, the SQA team checks before internal reviews whether the SVVP contains:

- The Acceptance Test Plan (can be a document on its own).
- The System Test Plan (can be a document on its own).

Appendix C

AD Phase

For the third phase of the project (AD), the SQA team must see to it that the following documents are properly reviewed internally before they are submitted for an external review.

C.1 The ADD

The SQA team checks before internal reviews whether the ADD:

- contains an architectural design of the software to be developed, this design must describe a physical model and the interfaces between the different classes contains pre and post conditions for the methods defined in the physical model
- contains an architectural design of the software to be developed, this design must describe a physical model and the interfaces between the different classes
- contains a traceability table (see [SVVP, section 4.3])

C.2 SPMP/AD

The SQA team checks before internal reviews whether the SPMP is realistic what concerns:

- the assumptions made during the planning
- restrictions with respect to the planning (e.g. availability of members)
- external problems (e.g. external software/code)

C.3 SQAP/AD

With respect to the SQAP, the SQA team checks before internal reviews whether the SQAP contains:

- coding and commentary standards

C.4 SVVP/AD

With respect to the SVVP, the SQA team checks before internal reviews whether the SVVP contains:

- the Integration Test (IT) plan

C.5 SCMP/AD

With respect to the SCMP, the SQA team checks before internal reviews whether the SCMP contains:

- a description of the tools used in support of version control, code creation, compilation and debugging

During internal reviews [SVVP, Chapter 4] the SQA team checks these documents and in case of problems, the author(s) and the team leader are informed. After the corrective action has been taken, the SQA team reviews the document again.

Appendix D

DD Phase

For the fourth phase of the project (DD), the SQA team must see to it that the following documents are properly reviewed internally before they are submitted for an external review.

D.1 DDD

The SQA team checks before internal reviews whether the ADD:

- contains the detailed design of the software to be developed, this design must describe the components and their interfaces to other components.
- contains a detailed design of the software to be developed.
- contains a traceability table (see [SVVP, section 4.3])

D.2 ATP

The SQA team checks before internal reviews whether the ATP:

- contains all user requirements described in [URD].

D.3 STP

The SQA team checks before internal reviews whether the STP:

- contains sufficient tests to test the system.

D.4 ITP

The SQA team checks before internal reviews whether the ITP:

- contains sufficient tests to test the integration of all components.

D.5 UTP

The SQA team checks before internal reviews whether the UTP:

- contains sufficient tests to test all units of the system.

The Coding and Commentary standards are described in the [SCMP, Appendix D].

Appendix E

TR Phase

For the fifth phase of the project (TR), the SQA team must see to it that the following documents are properly reviewed internally before they are submitted for an external review.

E.1 STD

The SQA team checks before internal reviews whether the STD:

- contains a list of all deliverables to be transferred.
- contains a procedure to build the software.
- contains a procedure to install the software.

E.2 SUM

The SQA team checks before internal reviews whether the SUM:

- contains a tutorial on how to use the software.
- contains references to all options possible in the software.