

# Software Quality Assurance Plan

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SQAP-2.0.1561



Where innovation starts

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### **Abstract**

This document is the Software Quality Assurance Plan of the GROUP QISproject.

This project is part of the Software Engineering Project (2IP35) 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 (see [1]).

This document contains information on how the quality of the project is maintained.

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# Document Status Sheet

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# 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 GROUP QISproject. 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 SPMP[4]. Detailed information about the software quality assurance activities for these phases will be added in appendices during the project.

### 1.2 Scope

QIS is an application designed and developed by GROUP QISfor the Departement of Mathematics and Computer Science at Eindhoven University of Technology. The purpose of the application is to optimize communication between various parties within the department regarding the management of working hours, holidays, courses and employees.

### 1.3 List of definitions

AD	Architectural Design
ADD	Architectural Design Document
AT	Acceptance Test
ATP	Acceptance Test Plan
CI	Configuration Item
CM	Configuration Manager
DD	Detailed Design
DDD	Detailed Design Document
ESA	European Space Agency
IT	Integration Test
PM	Project Manager
QM	Quality Assurance Manager
SCMP	Software Configuration Management Plan
SEP	Software Engineering Project
SPMP	Software Project Management Plan
SQA	Software Quality Assurance
SQA Team	The QM or vice-QM optionally assisted by specific team members
SQAP	Software Quality Assurance Plan
SR	Software Requirements
SRD	Software Requirements Document
ST	System Test
STD	Software Transfer Document
SUM	Software User Manual
SVVP	Software Verification and Validation Plan
SVVR	Software Verification and Validation Report
TR	Transfer
UR	User Requirements
URD	User Requirements Document
UT	Unit Test

### 1.4 List of references

- [1] ESA Board for Software Standardization and Control (BSSC). European space agency software engineering standards. February 1991. (ESA PSS-05-0 Issue 2).
- [2] GROUP QIS. Architectural design document. Technical report, Eindhoven University of Technology, Computer Science, ? 2009.
- [3] GROUP QIS. Software configuration management plan. Technical report, Eindhoven University of Technology, Computer Science, September 2009.
- [4] GROUP QIS. Software project management plan. Technical report, Eindhoven University of Technology, Computer Science and Engineering, sep 2009.
- [5] GROUP QIS. Software quality assurance plan. Technical report, Eindhoven University of Technology, Computer Science, September 2009.

- [6] GROUP QIS. Software requirements document. Technical report, Eindhoven University of Technology, Computer Science, ? 2009.
- [7] GROUP QIS. Software verification and validation plan. Technical report, Eindhoven University of Technology, Computer Science, September 2009.
- [8] GROUP QIS. Svvp - acceptance test plan. Technical report, Eindhoven University of Technology, Computer Science, ? 2009.
- [9] GROUP QIS. User requirements document. Technical report, Eindhoven University of Technology, Computer Science, September 2009.

# Chapter 2

## Management

### 2.1 Organization

For a survey of the organizational structure within the project, and the responsibilities of the individual members of the team see the SPMP[4]. The Quality Assurance Manager (QM) is responsible for the SQA. In this he is assisted by the vice QM. When the software quality is endangered the QM contacts the PM. They will decide whether or not one or more of the following parties have to be informed:

- Customer
- Senior management

### 2.2 Tasks

The main task of the QM is to check whether the procedures are followed properly and that the standards are handled correctly as defined in the SQAP [5], SVVP [7] and the SCMP [3]. Additionally the QM inspects whether all group members fulfill their tasks as defined in the SPMP [4] according to the parts of the SQAP[5] applying to their specific tasks. If a problem is detected, the appropriate procedure as defined in chapter 7 will be followed. The QM has, besides his main task, the following additional tasks:

- Checking the consistency and the coherence between documents.
- Organize internal reviews (initiative lies with the QM).
- Organize external reviews (initiative lies with the QM).
- Attend both internal and external reviews.

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 QM. The QM can delegate tasks to the vice QM. Every significant quality affecting problem found by a team member has to be reported to the QM. In case the QM is unavailable for a certain period of time, the vice QM will take over his tasks.

## Chapter 3

# Documentation

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

## Chapter 4

# Standards, practices, conventions and metrics

### 4.1 Documentation standards

Various documents will be produced during this project. The QM checks that the documents adhere to the ESA Software Engineering Standard guidelines[1], this will be done during checks held by the QM.

Every document has to be approved by:

- The author(s)
- The leader of the responsible team
- The QM

In case these three turn out to be all the same person, the vice QM has to give his approval as well.

The documents have to adhere to the following documentation standards:

- All documents must adhere to the ESA Software Engineering Standard guidelines[1].
- All documents must adhere to the corporate identity as described in the SCMP[3].
- All documents must be written in English.
- Requirements on review and approval as described in chapter 5.
- Requirements on document identification as described in the SCMP.
- Procedures involving the change of documents (as described in the SCMP).

These standards apply to all artefacts, both written as well as electronic versions. The documents are made available through the project repository, as described in the SCMP.

## 4.2 Design standards

There are no strict design rules and/or standards used during design. But the design has to meet the following criteria:

- Naming in the design should be consistent;
- Every designed element has to be consistent with the rest of the system;
- Every designed element has to be extendable (eg. everything that is designed should be open for improvements and other changes);

Furthermore it is encouraged to make the design as simple as possible. All these criteria's are checked during reviews.

## 4.3 Coding standards

The project follows the Django coding style <sup>1</sup>, which itself is based on the Style Guide for Python Code <sup>2</sup>.

Note that our project is not going to be internationalized, thus the following standard does not have to be adhered to: *Mark all strings for internationalization; see the i18n documentation for details.*

## 4.4 Comment standards

The coding standards already describe how comments should be placed. Comments that are meant to be used for documenting the API should be readable for pydoc <sup>3</sup>

## 4.5 Testing standards

The testing standards that are used during the entire project are described in the Software Verification and Validation Plan.

## 4.6 Metrics

Members of the SQA team will measure the quality of the implementation of the product by means of random checks. The quality of the implementation of the product is measured by means of metrics. These metrics include:

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<sup>1</sup>see <http://docs.djangoproject.com/en/dev/internals/contributing/#coding-style>, section Coding style

<sup>2</sup>see <http://www.python.org/dev/peps/pep-0008/>

<sup>3</sup>see <http://docs.python.org/library/pydoc>

- The length of procedures.
- The length of useful comment.
- The number of parameters each procedure contains.
- The maximum depth of nested structures.

Furthermore the subjective metric readability is used, which describes the general impression and understandability of random pieces of code. The readability can be partially based on compliance with the coding and comment standards.

## **4.7 Compliance monitoring**

The QM will monitor compliance to the proposed conventions as specified in chapter 5.

## Chapter 5

# Review

Standards and procedures for Reviews and Audits are described in the SVVP[7]. In addition to Reviews, the SQA team carries out random checks as described below.

### 5.1 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 (see [1]) and if their layout and style adheres to the corporate identity defined in the SCMP[3]. 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, however, it does keep a log of all random checks. It also 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[3].

#### 5.1.1 Log of random checks

The QM maintains a log of all performed random checks and tests. Each check and tests is described in a single log entry. The following information can be found in the log:

1. The CI that is checked (including versioning information),
2. The date and time for the check.
3. Short description of the outcome of the check.
4. When problems are found: actions to be taken, and when the problems should be fixed.

## Chapter 6

# Test

Methods and procedures for testing are detailed in the SVVP[7]. In random tests 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.

### 6.1 Log of random tests

The QM maintains a log of all performed random checks and tests, see [5.1.1] for details for the contents of the log.

## Chapter 7

# Problem reporting and corrective action

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 (see ESA[1]).
- Non compliance with the corporate identity (SCMP[3]).
- Incompleteness.
- Errors.

### Code problems:

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

### Problem reporting procedure:

- When a problem is detected, the person who discovered the error is responsible for reporting it to the PM and QM. 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 QM 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 QM.
- In case of previous external acceptance: the PM, the author(s) of the document, the QM, Senior Management (and in case of the URD[9], SRD[6] and ATP[8] the client).

The procedures for changing CIs are described in the SCMP[3].

## 7.1 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 whether 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[3], SPMP[4], SVVP[7] and ADD[2]. 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. (Does every member have access to the tools?).
- Knowledge. The group members working with the tools must have the necessary skills to work with the tools (see 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

The CM is responsible for the correct handling of the CIs, see SCMP[3] for what the requirements are on these CIs.

The SQA team checks if the procedures and standards as described in SCMP[3] are handled properly. This is done by reviews and random checks. Problems are reported to the CM and PM.

## Chapter 10

# Media control

The QM checks if the procedures and standards as described in the SCMP are handled properly. This is done in reviews and random checks (chapter 5). Problems are reported to the librarian 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 Software Engineering Standard guidelines [1]. 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 QM.

## 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 delivered 3 workdays after the meeting, so that everyone can approve them at the next meeting. 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 may 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, should the need arise for people with specialized knowledge into a certain area for some task, the PM and the QM will assess the level of knowledge for the task in the group and then they decide whether special action needs to be taken. In that case, detailed information can be found in the appendices of this document.

## Chapter 14

# Risk management

In the SPMP[4], 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 QM 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 the SVVP[7].

### 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 (see the SVVP[7]) 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 (see the SVVP[7]) 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[6]:

- Contains requirements on the software to be developed, these requirements must be based on the software requirements stated in the URD[9].
- Contains constraints on the software to be developed, these constraints must be based on the software constraints stated in the URD[9].
- Contains a logical model.
- Contains a priority list of the requirements.
- Contains a traceability table (see the SVVP[7]).

### 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 the SVVP)

### 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 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 the SVVP)

### 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 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.

In SR section: overview of quality assurance activities in AD, DD and TR phases.