

# Software Quality Assurance Plan

Group Fingerprint

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## **Abstract**

- 5 This is the Software Quality Assurance Plan for the Software Engineering Project. This document is based on the ESA standard for software development and the work of many previous SEP groups.

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

### 80 1.2 Scope

Fingerprint is an application designed and developed by group Fingerprint for prof. dr. ir. P.D. Anderson. The application provides a cross-platform tool to visualise uid mixing. Users can define the initial concentration distribution, as well as manipulate the mixing protocol. The resulting uid distribution can be stored and analysed by the user for comparison purposes.

### 1.3 List of definitions

2IP35	The Software Engineering Course
AD	Architectural Design
ADD	Architectural Design Document
AT	Acceptance Test
ATP	Acceptance Test Plan
Client	prof. dr. ir. P.D. Anderson
CM	Configuration Manager
DD	Detailed Design
DDD	Detailed Design Document
ESA	European Space Agency
TU/e	Eindhoven University of Technology
OM	Operations and Maintenance Plan
PM	Project Manager
QM	Quality Manager
SCMP	Software Configuration Management Plan
SEP	Software Engineering Project
SL	Software Librarian
SPMP	Software Project Management Plan
SQAP	Software Quality Assurance Plan
SR	Software Requirements
SRD	Software Requirements Document
STD	Software Transfer Document
SUM	Software User Manual
SVVP	Software Verification and Validation Plan
SVVR	Software Verification and Validation Report
TR	Transfer phase
UR	User Requirements
URD	User Requirements Document
VPM	Vice Project Manager

### 1.4 List of references

- [1] Fingerprint. Advanced design document. *SEP*, 2013.
- [2] Fingerprint. Detailed design document. *SEP*, 2013.
- 90 [3] Fingerprint. Software configuration management plan. *SEP*, 2013.
- [4] Fingerprint. Software project management plan. *SEP*, 2013.
- [5] Fingerprint. Software quality assurance plan. *SEP*, 2013.
- [6] Fingerprint. Software validation and verification plan. *SEP*, 2013.
- [7] Fingerprint. User requirements document. *SEP*, 2013.
- 95 [8] ESA. *ESA Software Engineering Standards*. ESA, March 1995.



# 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. The Quality Assurance Manager (QAM) is responsible for the SQA. In this he is assisted by the vice QAM. When the software quality is endangered the QAM 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

Quality assurance tasks that will be carried out in this phase.

The main task of the QAM is to check whether the procedures are followed properly and that the standards are handled correctly as defined in the SQAP [5], SVVP [6] and the SCMP [3]. Additionally the QAM inspects whether all group members fulfil their tasks as defined in the SPMP [4] according to the parts of this document applying to their specific tasks. If a problem is detected, the appropriate procedure as defined in Chapter 7 will be followed. The QAM has, besides his main task, the following additional tasks:

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

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

## 120 **2.3 Responsibilities**

The main responsibility for the SQA tasks, as described in Section 2.2, lies with the QAM. The QAM can delegate tasks to the vice QAM. Every problem found by a team member has to be reported to the QAM. In case the QAM is unavailable for a certain period of time, the vice QAM will assume his tasks.

## 125 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

# 130 Standards, practices, conventions and metrics

### 4.1 Documentation standards

Various documents will be produced during this project. The QAM checks that the documents adhere to the ESA Software Engineering Standard guidelines [8], this will be done  
135 during checks held by the QAM.

Every document has to be approved by:

- The author(s)
- The leader of the responsible team
- 140 • The QAM

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

The documentation standards the documents need to adhere to are the following:

- All documents must adhere to the ESA Software Engineering Standard guidelines [8].
- 145 • All documents must adhere to the house style as described in the SCMP [3].
- All documents must be written in British, academic 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).

150 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

The design standards are defined in the ADD[1] and DDD[2].

### 4.3 Coding standards

155 The coding standards are defined in the DDD[2].

### 4.4 Comment standards

The comment standards are defined in the DDD[2].

### 4.5 Testing standards

The testing standards are defined in the SVVP[6].

### 160 4.6 Metrics

- Length of procedures (should not be more than 100 lines).
- 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).
- 165 • Maximum depth of loops (should be less than 3).

### 4.7 Compliance monitoring

The QAM will monitor compliance to the proposed conventions by way of taking samples at random, during which references to other documents are checked. Problems discovered during the review are reported by the QAM.

## 170 Chapter 5

# Review

Standards and procedures for Reviews and Audits are described in SVVP [6]. 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 [8] and if their layout and style adheres to the house style defined in 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].

## Chapter 6

# Test

Methods and procedures for testing are detailed in the SVVP [6]. 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.

## Chapter 7

# Problem reporting and corrective action

195 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 [8].
- 200 • Non compliance with the house style (SCMP [3]).
- Incompleteness.
- Errors.

### Code problems:

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

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

- 210 • 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.



- 215
- 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
- 220

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:

- 225
- 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 [3].

## 7.1 Change in requirements of the customer

- 230
- 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

235 The SQA team has to make sure that appropriate tools, techniques and methods are used. These are described in SCMP [3], SPMP [4], SVVP [6] and ADD [1]. 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?).
- 240 • 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  
245 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  
250 to the standards described in SCMP [3]. 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.
- 255 • Name conventions are consequentially used.

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

# 260 Media control

The QAM 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

# 265 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 [8]. 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 QAM.

## 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

# 280 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 QAM 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

<sup>290</sup> 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 QAM will assist him in this task.



# Appendix A

## User Requirements phase

295 For the first phase of the project (User Requirements), 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:

- 300
- 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 require-  
305 ments defined in SVVP [6].

### 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:

- 310
- 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

315 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.
- 320 • CI status indication.

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

### A.4 SQAP

325 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

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

- Reviewing and audits.
- Testing.
- Tracing.

335 During internal reviews (SVVP [6]) 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

## Sprints phase

340 During the sprints, 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 [6]) 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. Please note that the documents are updated iteratively each  
345 sprint, so multiple reviews will be held.

### B.1 SPMP

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).
- 350 • External problems (e.g. external software/code).

### B.2 SQAP

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

- The tasks of the SQA team during the current sprint
- 355 • Coding and commentary standards

### B.3 SVVP

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).
- 360 • The System Test Plan (can be a document on its own).
- The Integration Test Plan (can be a document on its own).

## B.4 SCMP

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

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

## B.5 SRD

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

- 370 • Contains requirements on the software to be developed, these requirements must be based on the software requirements stated in the URD [7]
- Contains constraints on the software to be developed, these constraints must be based on the software constraints stated in the URD [7]
- Contains a logical model
- Contains a priority list of the requirements
- 375 • Contains a traceability table (see SVVP [6])

## B.6 ADD

The SQA team checks before internal reviews whether the ADD:

- 380 • 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)

## B.7 DDD

385 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)

## 390 **B.8 ATP**

The SQA team checks before internal reviews whether the ATP:

- contains all user requirements described in URD

## **B.9 STP**

The SQA team checks before internal reviews whether the STP:

- 395
- contains sufficient tests to test the system

## **B.10 ITP**

The SQA team checks before internal reviews whether the ITP:

- contains sufficient tests to test the integration of all components

## **B.11 UTP**

400 The SQA team checks before internal reviews whether the UTP:

- contains sufficient tests to test all units of the system

# Appendix C

## Transition Phase

405 For the last phase of the project (Transition Phase), 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 STD

The SQA team checks before internal reviews whether the STD:

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

### C.2 SUM

The SQA team checks before internal reviews whether the SUM:

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