

Software Engineering Project (2IP40)

Project Group 1

Integration Test Plan

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| | | |
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Abstract

This document describes the Integration Test Plan (ITP) for the SPINGRID project and was made according to the software engineering standard provided by the European Space Agency described in [ESA]. This document contains the description of the integration tests for the project. This project is one of seven assignments for the course 2IP40 at Eindhoven University of Technology.

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Chapter 1

Introduction

1.1 Purpose

This document describes the plans for testing the integration of the created components. The
15 purpose of this document is to test the interfaces between the components as described in
[ADD, chapter 5]. Every team member who cooperates in the integration tests should read
this document.

1.2 Scope

The software implements a computational grid. This grid is able to execute jobs when it
20 receives an application accompanied by a set of data files. By hiding the complexity of grid
technology the system will be easy to use. Usability is also increased by offering a web-based
front-end for users to access the system.

1.3 List of definitions and abbreviations

1.3.1 Definitions

| | |
|-----------------------|---|
| Agent | Application that is used by a resource provider to retrieve and execute jobs. |
| Application | A non-interactive data processing application consisting of executables, scripts and/or auxiliary data files that reads one or more input data files and writes one or more output files. |
| Application Provider | An application provider can offer a set of applications to the SPINGRID system. They can restrict access for projects and for resource providers to their applications. |
| Client | Application that is used by all the users except the resource provider who uses the agent application. |
| Computational Grid | A hardware and software infrastructure that enables coordinated resource sharing within dynamic organizations consisting of individuals, institutions and resources. |
| Customer | Dutch Space B.V. |
| Data Provider | A data provider can offer a set of datafiles to the SPINGRID system. They can restrict access for projects and for resource providers to their datafiles. |
| Dispatcher | A dispatcher acts like a server and manages the distribution of jobs over the computational grid. |
| Job | Specification of application, configuration data, input and/or output data files and scheduler specific data (priority, preferred resource, etc). |
| Job Provider | Job providers are users that offer a job to a project. They have to be a member of that particular project. |
| Project | A collection of jobs with specified access rights to which users (project members) can be assigned. |
| Project Administrator | The project administrators administrate projects and can assign and remove job providers, configure a project and restrict access for resource providers. |
| Resource Provider | Resource providers are users that offer time on their computers to the SPINGRID system. They can restrict access to their computer for application providers and projects. |
| Role | The actions and activities assigned to a person. |
| SPINGRID | A computational grid using SPINGRID software. |
| SPINGRID Software | Software developed by Dutch Space and TU/e to build computational grids for distributed data processing. |
| SPINGRID System | The full name of the entire system. |
| System Administrator | The system administrator oversees the entire SPINGRID system and has the right to configure the system, to create and remove projects and assign and remove project administrators. |

1.3.2 Abbreviations

| | |
|-----|----------------------------|
| DDD | Detailed Design Document |
| ESA | European Space Agency |
| ITP | Integration Test Plan |
| URD | User Requirements Document |

1.4 Documents

1.4.1 Reference Documents

| | |
|--------|--|
| [ESA] | <i>ESA Software Engineering Standards (ESA PSS-05-0 Issue 2)</i> , ESA Board for Software Standardization and Control (BSSC), 1991 |
| [SVVP] | <i>Software Verification and Validation Plan</i> , SPINGRID team, TU/e, Version 0.1.2, March 2006 |

30 1.4.2 Applicable Documents

| | |
|-------|--|
| [ADD] | <i>Architectural Design Document</i> , SPINGRID team, TU/e, version 1.0.0., April 2006 |
| [DDD] | <i>Detailed Design Document</i> , SPINGRID team, TU/e, version 0.0.1, April 2006 |
| [URD] | <i>User Requirements Document</i> , SPINGRID team, TU/e, version 1.0.0, February 2006 |
| [SRD] | <i>Software Requirements Document</i> , SPINGRID team, TU/e, version 1.0.1, March 2006 |

1.5 Overview

In the second chapter the items to be tested are mentioned. A specification for each test case is given in the third chapter. The fourth chapter specifies the procedures for these test cases. In the fifth chapter the reports for all test cases are presented.

Chapter 2

Test plan

2.1 Test items

The items to be tested consist of the integration of the code modules developed, for the SPINGRID project. For testing we choose the bottom-up approach. This means that integration testing starts at the bottom level. This way the project will be built up from the bottom level. The integration tests described in this documents are at the component level. The integration tests of lower level code modules are described in the corresponding components unit test. Unit tests are described in the [UTP].

2.2 Features to be tested

Figures 2.1, 2.2 and 2.3 shows the components that form the SPINGRID system. (these figures are derived from figures 4.1, 4.2 and 4.3 in the [ADD, chapter 4]). The arrows represent the order of integration, i.e. integration testing.

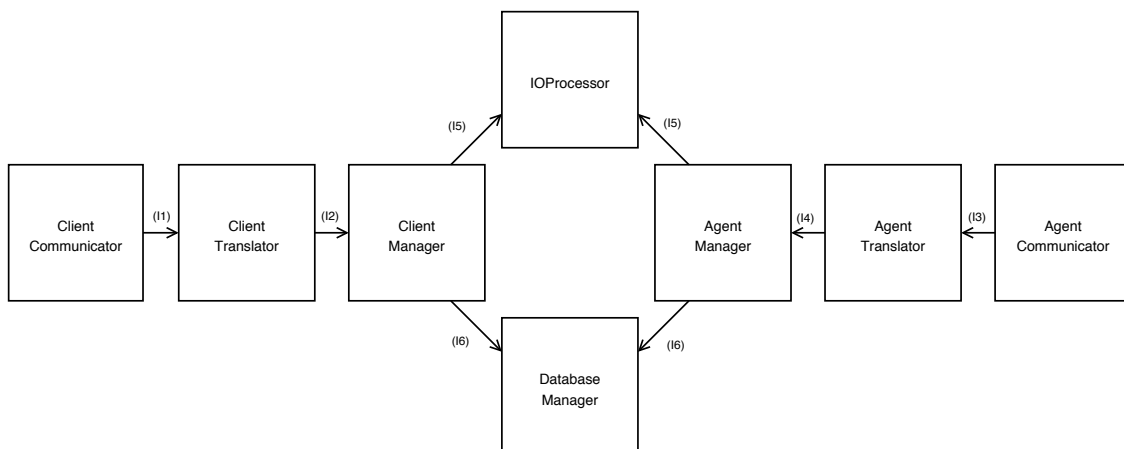


Figure 2.1: Components of the Dispatcher-software

50

Integration Tests of the dispatcher-software:

| ID | Integration Test | Paragraphs | | |
|----|--|------------|-----|-----|
| I1 | Client Communicator → Client Translator | 3.1 | 4.1 | 5.1 |
| I2 | Client Translator → Client Manager | 3.2 | 4.1 | 5.1 |
| I3 | Agent Communicator → Agent Translator | 3.3 | 4.1 | 5.1 |
| I4 | Agent Translator → Agent Manager | 3.4 | 4.1 | 5.1 |
| I5 | Agent Manager, Client Manager → Database Manager | 3.5 | 4.1 | 5.1 |
| I6 | Agent Manager, Client Manager → IOProcessor | 3.6 | 4.1 | 5.1 |

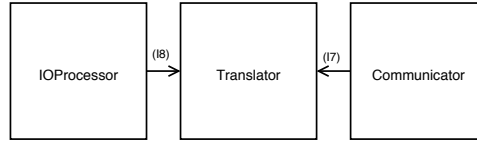


Figure 2.2: Components of the Client-software

55

Integration Tests of the client-software:

| ID | Integration Test | Paragraphs | | |
|----|---------------------------|------------|-----|-----|
| I7 | Communicator → Translator | 3.7 | 4.2 | 5.2 |
| I8 | IOProcessor → Translator | 3.8 | 4.2 | 5.2 |

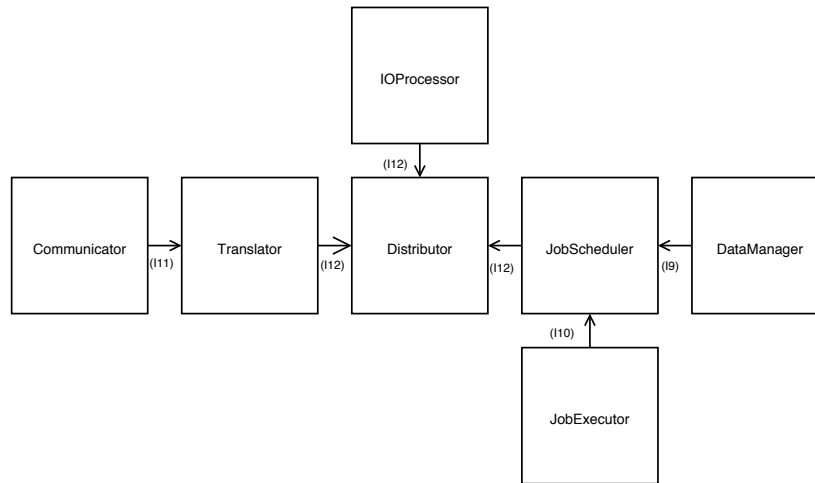


Figure 2.3: Components of the Agent-software

60

Integration Tests of the agent-software:

| ID | Integration Test | Paragraphs | | |
|-----------|---|-------------------|-----|-----|
| I9 | DataManager → JobScheduler | 3.9 | 4.3 | 5.3 |
| I10 | JobExecutor → JobScheduler | 3.10 | 4.3 | 5.3 |
| I11 | Communicator → Translator | 3.11 | 4.3 | 5.3 |
| I12 | JobScheduler, IOProcessor, Translator → Distributor | 3.12 | 4.3 | 5.3 |

65 2.3 Test deliverables

The following items must be delivered before integration testing can begin:

- The Architectural Design Document [ADD]
- Chapters 1 and 2 of the Detailed Design Document [DDD]
- The Unit Test Plan [UTP]
- 70 • Chapters 1, 2, 3 and 4 of this document

The following items must be delivered before a specific integration test can begin:

- The paragraphs in [DDD, chapter 3] concerning the components involved in the test
- The unit testing test reports concerning the components involved (i.e. these components have been unit tested). These reports can be found in [UTP, chapter 4]
- 75 • The components involved
- Drivers for this specific integration test (this is described below)
- Input data for this specific integration test.

A driver is a main program that accepts test data and passes this test to the component to be tested and prints relevant results. Drivers must be kept for future integration tests.

80 The storage of these files is described in the appendix for the DD phase of the [SCMP]. Because the two components involved in a specific integration test are already unit tested, the drivers that are made for them can be used in the integration test. This way testing can be performed more efficient. The following items must be delivered when a specific integration test is finished:

- 85 • Integration test report, which will be listed in the integration tests paragraph in chapter 5 of this document
- Integration test output data

- Problem reports (if necessary)

The following items must be delivered when testing on all code modules has finished:

- 90 • All integration test reports, which comprises chapter 5 of this document.

2.4 Testing tasks

The following tasks are necessary for performing a specific integration test:

- Designing the integration test
- Designing a driver (if it was not made at the unit test)

95 • Designing input test data (if it was not made at the unit test)

- Setting up a system, the components involved, the driver and the input test data
- Performing the integration test

2.5 Environmental needs

The environmental needs are described in [ATP, chapter 2.5].

100 **2.6 Test case pass/fail criteria**

Every test case must describe what the criteria are to pass that specific test.

Chapter 3

Test case specifications

3.1 Integration test case I1

| | |
|----------------------|--|
| Test Case Identifier | I1T1 |
| Test Item(s) | Client Communicator → Client Translator |
| Input Specification | Create typical Client Communicator input |
| Output Specification | Check if the correct functions are called in the Client Translator |
| Environmental Needs | Client driver |

3.2 Integration test case I2

| | |
|----------------------|---|
| Test Case Identifier | I2T1 |
| Test Item(s) | Client Translator → Client Manager |
| Input Specification | Create typical Client Translator input |
| Output Specification | Check if the correct methods are called in the Client Manager |
| Environmental Needs | I1 succeeded |

3.3 Integration test case I3

| | |
|----------------------|---|
| Test Case Identifier | I3T1 |
| Test Item(s) | Agent Communicator → Agent Translator |
| Input Specification | Create typical Agent Communicator input |
| Output Specification | Check if the correct methods are called in the Agent Translator |
| Environmental Needs | Agent Driver |

3.4 Integration test case I4

| | |
|----------------------|--|
| Test Case Identifier | I4T1 |
| Test Item(s) | Agent Translator → Agent Manager |
| Input Specification | Create typical Agent Translator input |
| Output Specification | Check if the correct methods are called in the Agent Manager |
| Environmental Needs | I3 succeeded |

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3.5 Integration test case I5

| | |
|----------------------|---|
| Test Case Identifier | I5T1 |
| Test Item(s) | Client Manager → Database Manager |
| Input Specification | Create typical Client Manager input |
| Output Specification | Check if the correct methods are called in the Database Manager |
| Environmental Needs | I2 succeeded |

| | |
|----------------------|---|
| Test Case Identifier | I5T2 |
| Test Item(s) | Agent Manager → Database Manager |
| Input Specification | Create typical Agent Manager input |
| Output Specification | Check if the correct methods are called in the Database Manager |
| Environmental Needs | I4 succeeded |

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3.6 Integration test case I6

| | |
|----------------------|--|
| Test Case Identifier | I6T1 |
| Test Item(s) | Client Manager → IOProcessor |
| Input Specification | Create typical Client Manager input |
| Output Specification | Check if the correct methods are called in the IOProcessor |
| Environmental Needs | I2 succeeded |

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| | |
|----------------------|--|
| Test Case Identifier | I6T2 |
| Test Item(s) | Agent Manager → IOProcessor |
| Input Specification | Create typical Client Manager input |
| Output Specification | Check if the correct methods are called in the IOProcessor |
| Environmental Needs | I4 succeeded |

3.7 Integration test case I7

| | |
|----------------------|---|
| Test Case Identifier | I7T1 |
| Test Item(s) | Communicator → Translator |
| Input Specification | Create typical Communicator input |
| Output Specification | Check if the correct methods are called in the Translator |
| Environmental Needs | Dispatcher driver |

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3.8 Integration test case I8

| | |
|----------------------|---|
| Test Case Identifier | I8T1 |
| Test Item(s) | IOProcessor → Translator |
| Input Specification | Create typical IOProcessor input |
| Output Specification | Check if the correct methods are called in the Translator |
| Environmental Needs | N/A |

3.9 Integration test case I9

| | |
|----------------------|---|
| Test Case Identifier | I9T1 |
| Test Item(s) | DataManager → JobScheduler |
| Input Specification | Create typical Datamanager input |
| Output Specification | Check if the correct methods are called in the JobScheduler |
| Environmental Needs | N/A |

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3.10 Integration test case I10

| | |
|----------------------|---|
| Test Case Identifier | I10T1 |
| Test Item(s) | JobExecutor → JobScheduler |
| Input Specification | Create typical JobExecutor input |
| Output Specification | Check if the correct methods are called in the JobScheduler |
| Environmental Needs | N/A |

3.11 Integration test case I11

| | |
|----------------------|---|
| Test Case Identifier | I11T1 |
| Test Item(s) | Communicator → Translator |
| Input Specification | Create typical Communicator input |
| Output Specification | Check if the correct methods are called in the Translator |
| Environmental Needs | Dispatcher driver |

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3.12 Integration test case I12

| | |
|-----------------------------|--|
| Test Case Identifier | I12T1 |
| Test Item(s) | JobScheduler → Distributor |
| Input Specification | Create typical JobScheduler input |
| Output Specification | Check if the correct methods are called in the Distributor |
| Environmental Needs | I9-I10 succeeded |

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| | |
|-----------------------------|--|
| Test Case Identifier | I12T2 |
| Test Item(s) | IOProcessor → Distributor |
| Input Specification | Create typical IOProcessor input |
| Output Specification | Check if the correct methods are called in the Distributor |
| Environmental Needs | I8 succeeded |

| | |
|-----------------------------|--|
| Test Case Identifier | I12T3 |
| Test Item(s) | Translator → Distributor |
| Input Specification | Create typical Translator input |
| Output Specification | Check if the correct methods are called in the Distributor |
| Environmental Needs | I11 succeeded |

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Chapter 4

Test procedures

4.1 Integration test procedure TP1

| | |
|----------------------------------|---|
| Test Procedure Identifier | TP1 |
| Purpose | This test procedure verifies wether the dispatcher software: <ul style="list-style-type: none">• can handle command-line input• can handle client input• can handle agent input• can output requested information to a client• can output requested information to an agent |
| Procedure Steps | Execute I5-I6 after I1-I4 |

| | |
|----------------------------------|--|
| Test Procedure Identifier | TP2 |
| Purpose | This test procedure verifies wether the client software: <ul style="list-style-type: none">• can handle command-line input• can handle dispatcher input• can output requested information to the client• can output information to the dispatcher |
| Procedure Steps | Execute I7-I8 |

| | |
|----------------------------------|--|
| Test Procedure Identifier | TP3 |
| Purpose | This test procedure verifies wether the agent software: <ul style="list-style-type: none">• can handle command-line input• can handle dispatcher input• can output information to the dispatcher |
| Procedure Steps | Execute I12 after I9-I11 |

Chapter 5

Test report

165 5.1 TP1 Test Report

I1 has successfully been executed by Robert Leeuwestein on May 29th, 2006.
I2 has successfully been executed by Robert Leeuwestein on May 29th, 2006.
I3 has successfully been executed by Joery Mens on May 29th, 2006.
I4 has successfully been executed by Joery Mens on May 29th, 2006.
170 I5 has successfully been executed by Joery Mens on May 29th, 2006.
I6 has successfully been executed by Joery Mens on May 29th, 2006.

5.2 TP2 Test Report

I7 has successfully been executed by Sven Bego on May 29th, 2006.
175 I8 has successfully been executed by Sven Bego on May 29th, 2006.

5.3 TP3 Test Report

I9 has successfully been executed by Roel Coset on May 29th, 2006.
I10 has successfully been executed by Roel Coset on May 29th, 2006.
180 I11 has successfully been executed by Roel Coset on May 29th, 2006.
I12 has successfully been executed by Roel Coset on May 29th, 2006.