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Software Engineering 2

Assignment 4: Integration Test Plan

Version 1.0

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Contents

1 Introduction

1.1 Revision History

This is the first version of the document. There are no previous versions.

Revision	Last Edited	Changes
1.0	21/01/2016	Document redaction

1.2 Purpose and Scope

The Integrated Test Planning Document (ITPD) describes the plan to accomplish the integration test. This document is supposed to be written before the integration test really happens and takes the architectural description of the software system as a starting point, for this reason it is often redacted in parallel with the Design Document. It explains to the development team what to test, in which sequence, which tools are needed for testing (if any), which stubs/drivers/oracles need to be developed.
The purpose of integration testing is to verify functional, performance, and reliability requirements of individual software modules of the product when they are combined and tested as a group; i.e., units (or groups of units) are exercised through their interfaces. The aim is to test the modules interactions incrementally, with success and error cases being simulated via appropriate parameter and data inputs. Simulated usage of shared data areas and inter-process communication is tested and individual subsystems are exercised through their input interface. Test cases are constructed to test whether all the components interact correctly, for example across procedure calls or process activations.
This is done after testing individual modules, i.e., unit testing; the overall idea is a "building block" approach, in which verified assemblages are added to a verified base which is then used to support the integration testing of further assemblages up to the complete final system (the testing on the complete system is not part of this integration testing phase).

1.3 List of Definitions and Abbreviations

The following acronyms are used in this document:

- RASD: Requirements Analysis and Specification Document
- DD: Design Document
- DB: DataBase. It is a test Database filled with test data. See section 5.3.

The following definitions are used in this document:

- Driver: are considered dummy modules which are always distinguished as "calling programs that are handled in bottom up integration testing; they are only used when main programs are under construction.
- Stub: in computer science, test stubs are programs that simulate the behaviors of software components (or modules) that a module undergoing tests depends on. Test stubs are mainly used in incremental testing's top-down approach.
- Oracle: in computing, software testers and software engineers can use an oracle as a mechanism for determining whether a test has passed or failed. The use of oracles involves comparing the output(s) of the system under test, for a given test-case input, to the output(s) that the oracle determines that product should have.

1.4 List of Reference Documents

- Specification document: myTaxiService project
- Requirements Analysis and Specification Document (RASD) for myTaxiService
- Design Document (DD) for myTaxiService

2 Integration Strategy

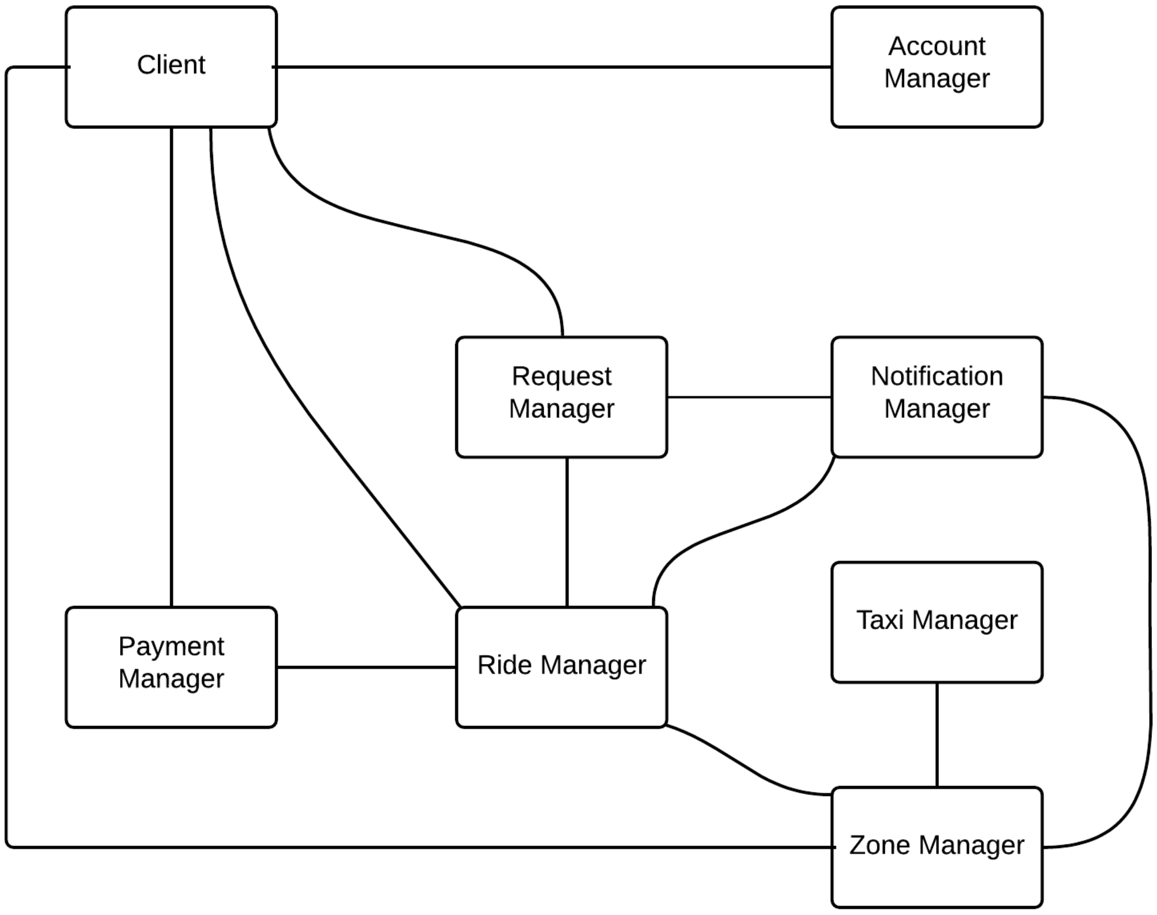
2.1 Entry Criteria

It is supposed that the unit testing phase has already been completed successfully.
In particular the following components are considered already tested and thus trusted as working:

- Payment Manager
- Notification Manager
- Taxi Manager
- DB
- Google Maps APIs

2.2 Elements to be Integrated

The scheme below show the main high level components of the system.



From test I1 up to test I7 the integration is related to sub-systems.
Starting from I8 tests will be focused on integration of higher level components.

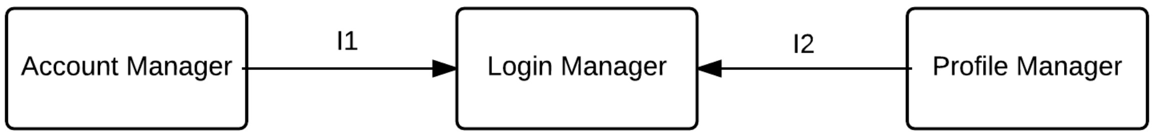
ID	Integration Test	Paragraphs		
I1	Login Manager →Account Factory	2.4.1	3.1.1	3.2.1
I2	Profile Manager →Login Manager	2.4.1	3.1.1	3.2.1
I3	Zone Engine →Queue Manager	2.4.2	3.1.2	3.2.4
I4	Ride Handler →Ride Worker	2.4.3	3.1.3	3.2.3
I5	Ride Worker →Ride Engine	2.4.3	3.1.3	3.2.3
I6	Request Handler →Request Worker	2.4.4	3.1.4	3.2.2
I7	Request Worker →Request Engine	2.4.4	3.1.4	3.2.2
I8	Client →Account Manager	2.4.5	3.1.5	
I9	Client →Payment Manager	2.4.5	3.1.6	
I10	Client →Request Manager	2.4.5	3.1.7	
I11	Client →Ride Manager	2.4.5	3.1.8	
I12	Client →Zone Manager	2.4.5	3.1.9	
I13	Request Manager →Ride Manager	2.4.6	3.1.10	
I14	Request Manager →Notification Manager	2.4.6	3.1.11	
I15	Ride Manager →Zone Manager	2.4.7	3.1.12	
I16	Ride Manager →Payment Manager	2.4.7	3.1.13	
I17	Ride Manager →Notification Manager	2.4.7	3.1.14	
I18	Zone Manager →Taxi Manager	2.4.8	3.1.15	
I19	Zone Manager →Notification Manager	2.4.8	3.1.16	

2.3 Integration Testing Strategy

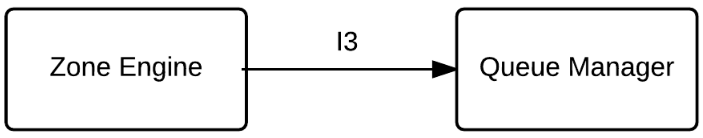
An hybrid approach will be used to accomplish the analysis. At the beginning the integration inside the sub-systems of the high level components will be taken into account and consequently the integration between the high level components themselves.

2.4 Sequence of Component/Function Integration

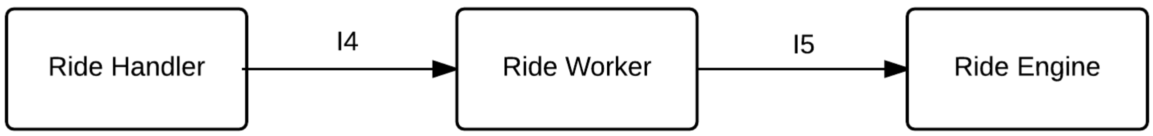
2.4.1 Sequence of integration for Account Manager sub-system



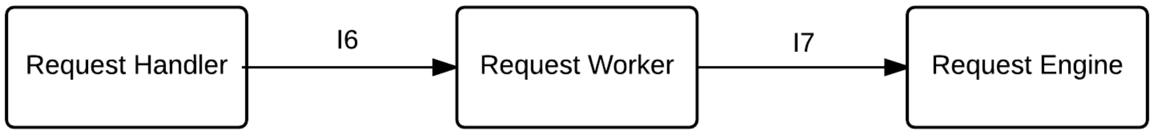
2.4.2 Sequence of integration for Zone Manager sub-system



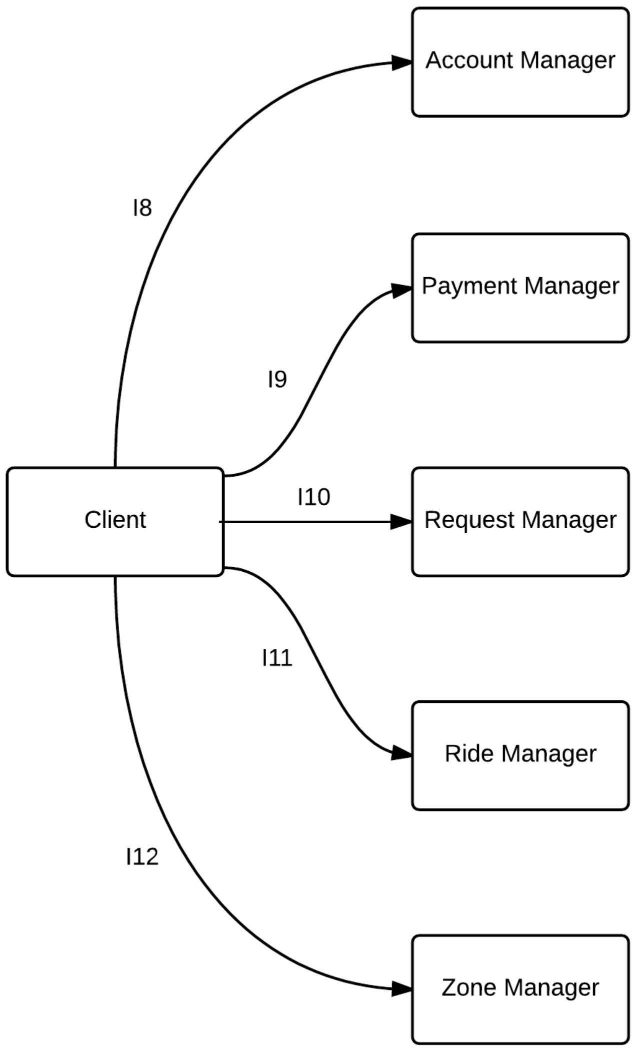
2.4.3 Sequence of integration for Ride Manager sub-system



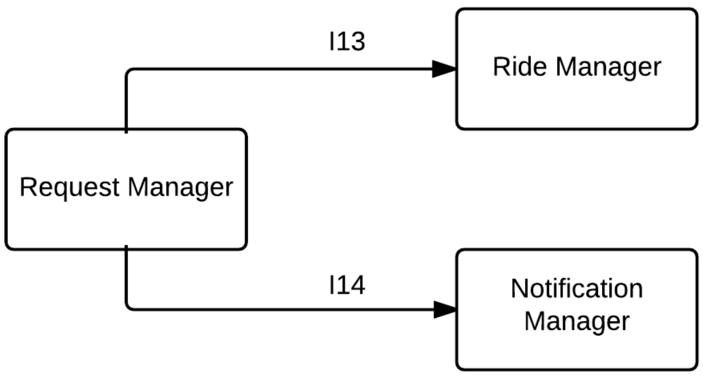
2.4.4 Sequence of integration for Request Manager sub-system



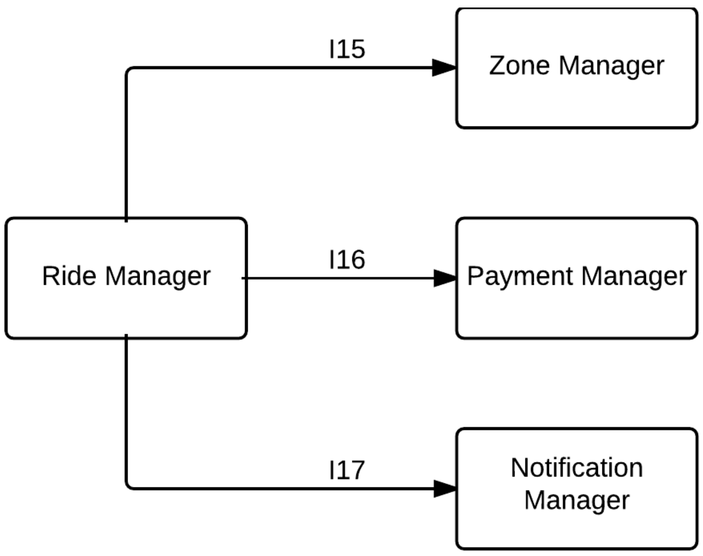
2.4.5 Sequence of integration for Client



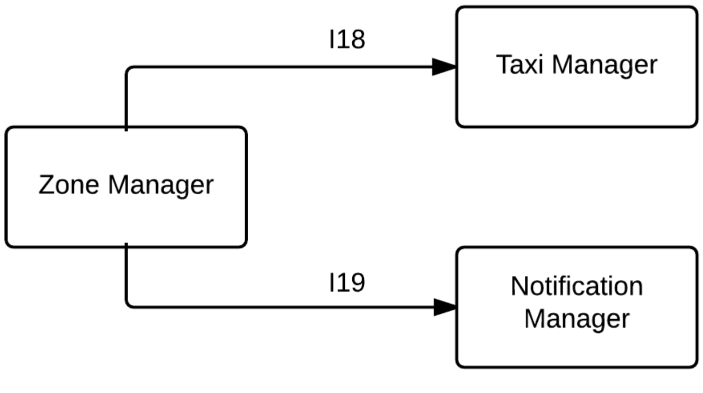
2.4.6 Sequence of integration for Request Manager



2.4.7 Sequence of integration for Ride Manager



2.4.8 Sequence of integration for Zone Manager



3 Individual Steps and Test Description

3.1 Test Case Specifications

3.1.1 Integration tests for Account Manager

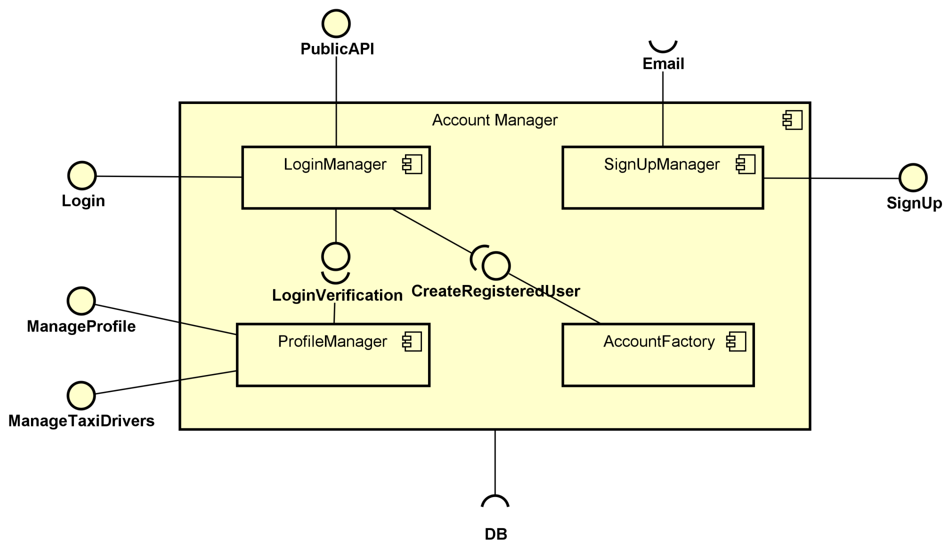


Figure taken from paragraph 2.3.1 of the DD

Test case identifier	I1
Test item(s)	Login Manager →Account Factory
Input specification	Create typical Login Manager input
Output specification	Check if the correct methods are called in the Account Factory
Environmental needs	Client driver and the DB

Test case identifier	I2
Test item(s)	Profile Manager →Login Manager
Input specification	Create typical Profile Manager input
Output specification	Check if the correct functions are called in the Login Manager
Environmental needs	Client driver and the DB

3.1.2 Integration tests for Zone Manager

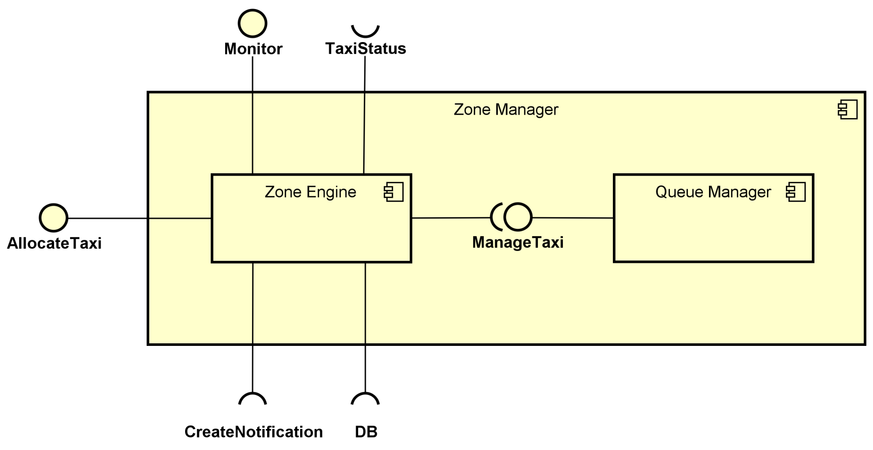


Figure taken from paragraph 2.3.6 of the DD

Test case identifier	I3
Test item(s)	Zone Engine →Queue Manager
Input specification	Create typical Zone Engine input
Output specification	Check if the correct functions are called in the Queue Manager
Environmental needs	Ride Manager driver

3.1.3 Integration tests for Ride Manager

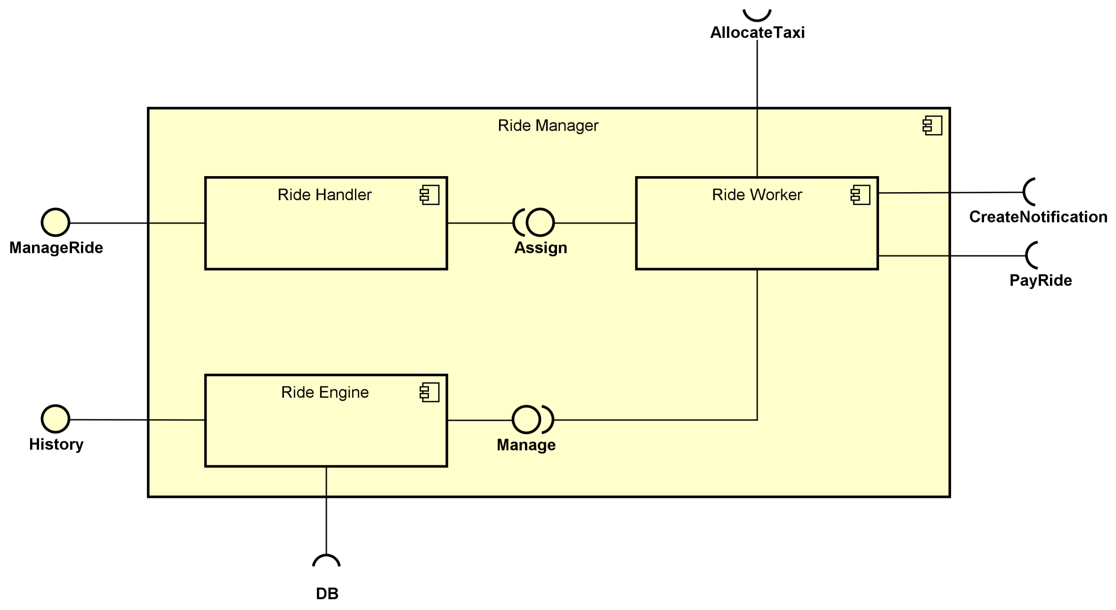


Figure taken from paragraph 2.3.3 of the DD

Test case identifier	I4
Test item(s)	Ride Handler →Ride Worker
Input specification	Create typical Ride Handler input
Output specification	Check if the correct functions are called in the Ride Worker
Environmental needs	Request Manager driver to simulate a typical communication input (creation or modification of ride), the stubs for Payment Manager, Zone Manager and Notification Manager to satisfy the components interdependencies

Test case identifier	I5
Test item(s)	Ride Worker →Ride Engine
Input specification	Create typical Ride Worker input
Output specification	Check if the correct functions are called in the Ride Engine
Environmental needs	I4 succeeded, the DB

3.1.4 Integration tests for Request Manager

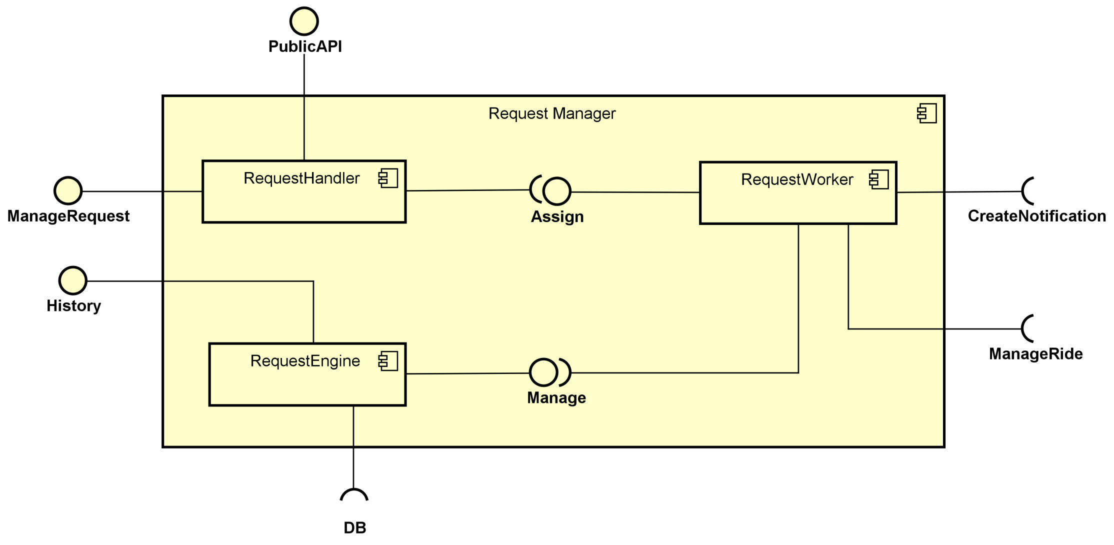
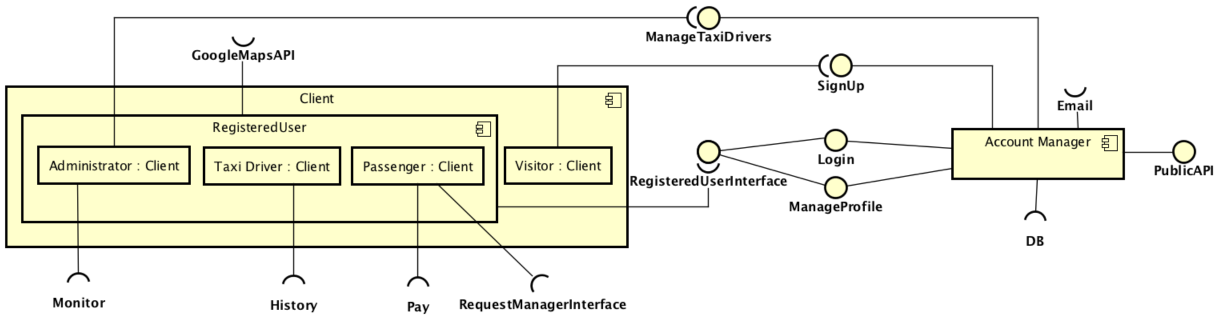


Figure taken from paragraph 2.3.2 of the DD

Test case identifier	I6
Test item(s)	Request Handler →Request Worker
Input specification	Create typical Request Handler input
Output specification	Check if the correct functions are called in the Request Worker
Environmental needs	Client (Passenger) driver to simulate a typical communication input (creation or modification of request/reservation), the stubs for Ride Manager and Notification Manager to satisfy the components interdependencies

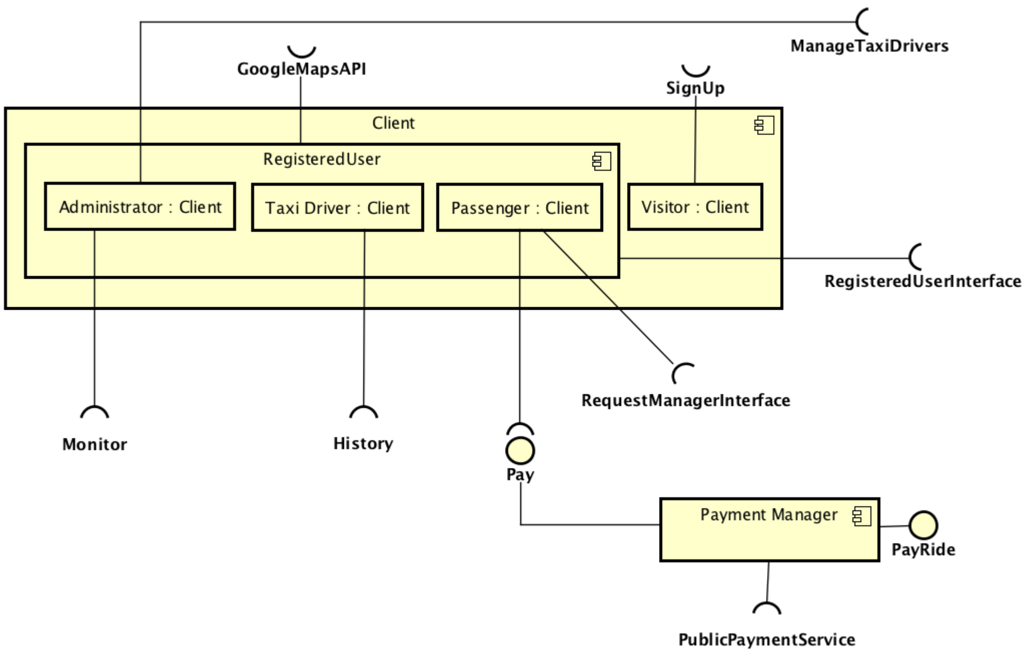
Test case identifier	I7
Test item(s)	Request Worker →Request Engine
Input specification	Create typical Request Worker input
Output specification	Check if the correct functions are called in the Request Engine
Environmental needs	I6 succeeded, the DB

3.1.5 Integration tests for Client and Account Manager



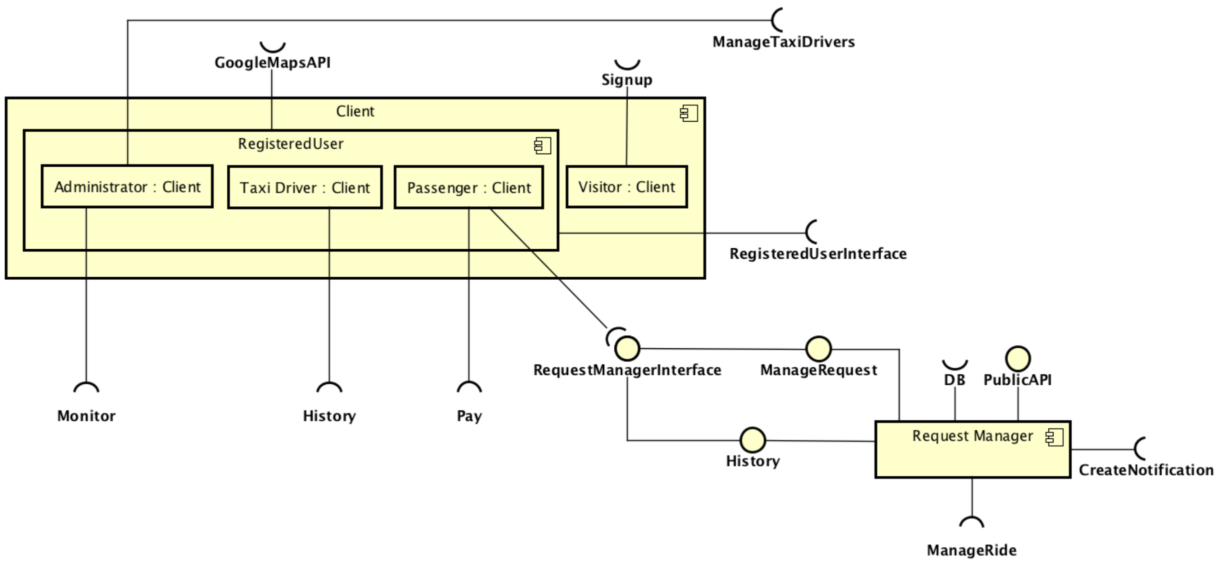
Test case identifier	I8
Test item(s)	Client →Account Manager
Input specification	Create typical Client input
Output specification	Check if the correct functions are called in the Account Manager
Environmental needs	I1, I2 succeeded, the DB, the stub for Notification Manager to satisfy the components inter-dependencies

3.1.6 Integration tests for Client and Payment Manager



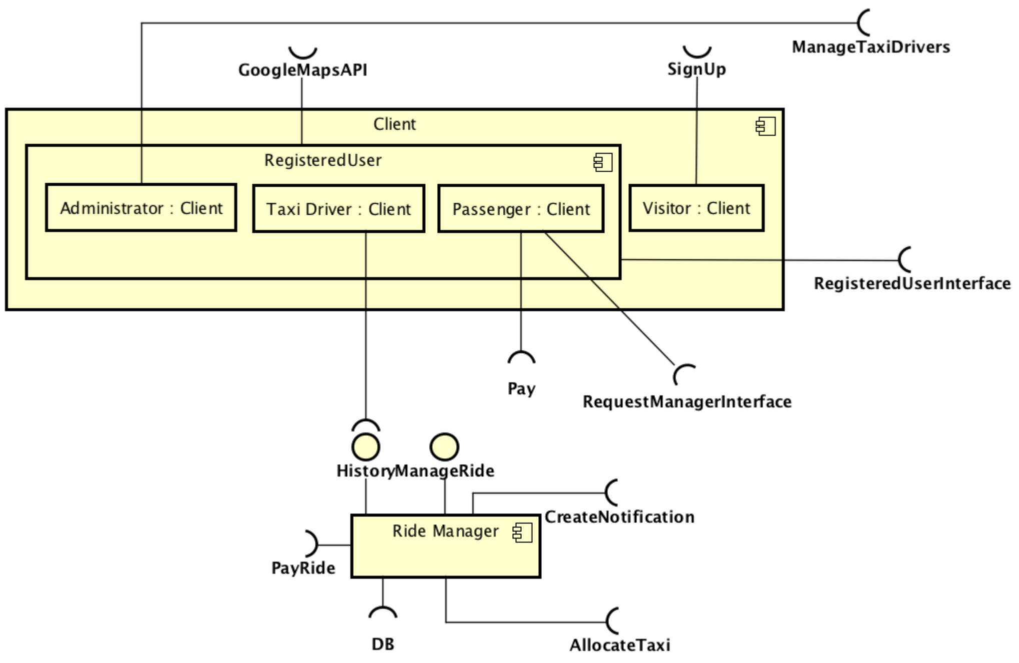
Test case identifier	I9
Test item(s)	Client →Payment Manager
Input specification	Create typical Client input
Output specification	Check if the correct functions are called in the Payment Manager
Environmental needs	The stub for Public Payment Service to satisfy the components inter-dependencies

3.1.7 Integration tests for Client and Request Manager



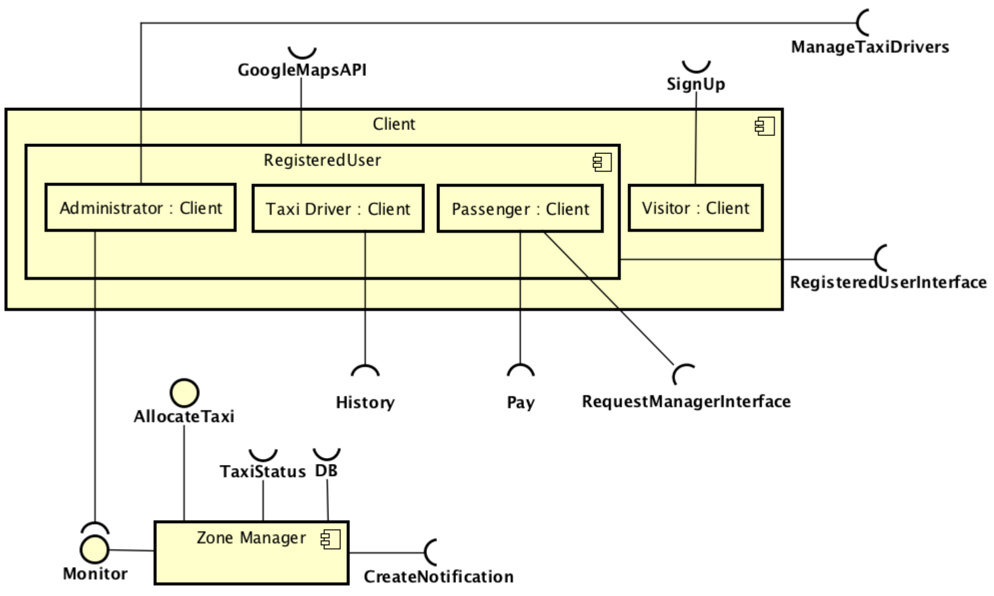
Test case identifier	I10
Test item(s)	Client →Request Manager
Input specification	Create typical Client input
Output specification	Check if the correct functions are called in the Request Manager
Environmental needs	I6, I7 succeeded, the DB and the stubs for Ride Manager, Notification Manager to satisfy the components inter-dependencies

3.1.8 Integration tests for Client and Ride Manager



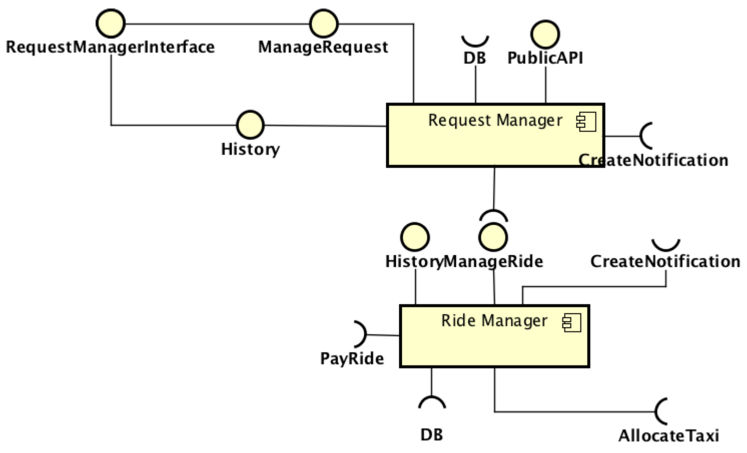
Test case identifier	I11
Test item(s)	Client →Ride Manager
Input specification	Create typical Client input
Output specification	Check if the correct functions are called in the Ride Manager
Environmental needs	I4, I5 succeeded, the DB and the stubs for Payment Manager, Zone Manager, Notification Manager to satisfy the components inter-dependencies

3.1.9 Integration tests for Client and Zone Manager



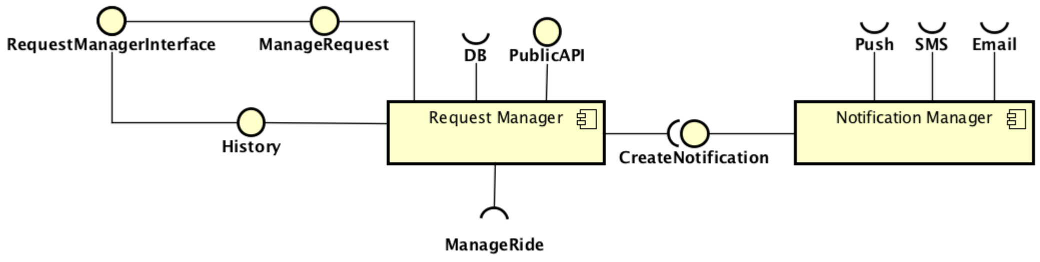
Test case identifier	I12
Test item(s)	Client →Zone Manager
Input specification	Create typical Client input
Output specification	Check if the correct functions are called in the Zone Manager
Environmental needs	I3 succeeded, the DB and the stubs for Taxi Manager, Notification Manager to satisfy the components inter-dependencies

3.1.10 Integration tests for Request Manager and Ride Manager



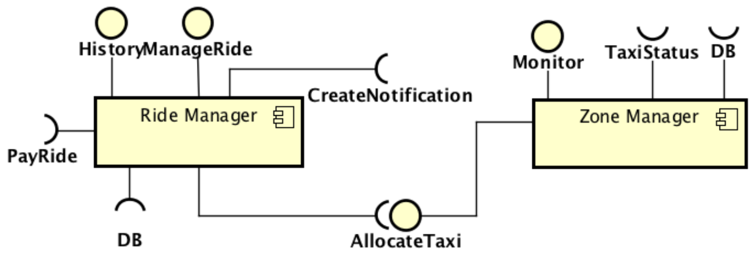
Test case identifier	I13
Test item(s)	Request Manager →Ride Manager
Input specification	Create typical Request Manager input
Output specification	Check if the correct functions are called in the Ride Manager
Environmental needs	I4, I5, I6, I7 succeeded, the DB, the stubs for Notification Manager, Zone Manager, Payment Manager to satisfy the components inter-dependencies

3.1.11 Integration tests for Request Manager and Notification Manager



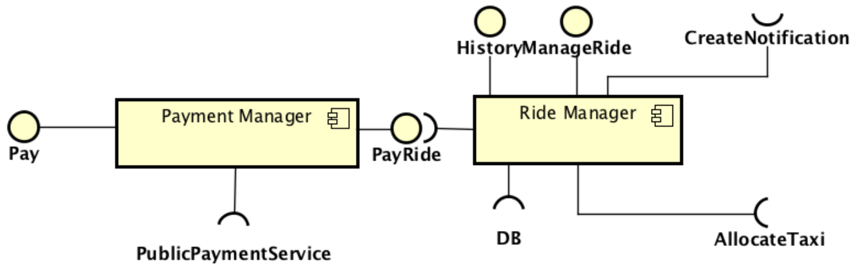
Test case identifier	I14
Test item(s)	Request Manager →Notification Manager
Input specification	Create typical Request Manager input
Output specification	Check if the correct functions are called in the Notification Manager
Environmental needs	I6, I7 succeeded, the stubs for SMS, Email, Push notification to satisfy the components inter-dependencies

3.1.12 Integration tests for Ride Manager and Zone Manager



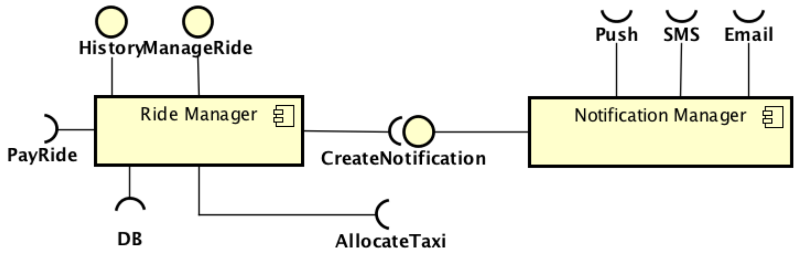
Test case identifier	I15
Test item(s)	Ride Manager →Zone Manager
Input specification	Create typical Ride Manager input
Output specification	Check if the correct functions are called in the Zone Manager
Environmental needs	I3, I4, I5 succeeded, the DB, the stub Taxi Manager to satisfy the components inter-dependencies

3.1.13 Integration tests for Ride Manager and Payment Manager



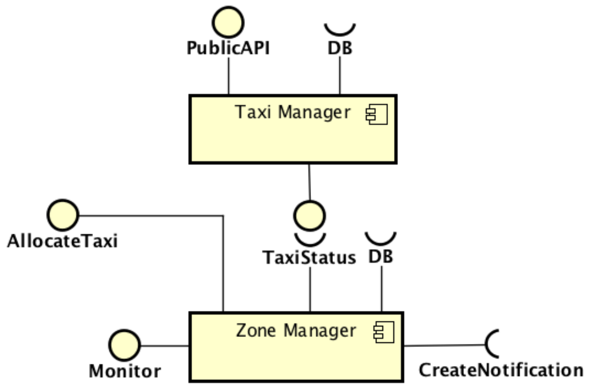
Test case identifier	I16
Test item(s)	Ride Manager →Payment Manager
Input specification	Create typical Ride Manager input
Output specification	Check if the correct functions are called in the Payment Manager
Environmental needs	I4, I5 succeeded, the stub for Public Payment Service to satisfy the components inter-dependencies

3.1.14 Integration tests for Ride Manager and Notification Manager



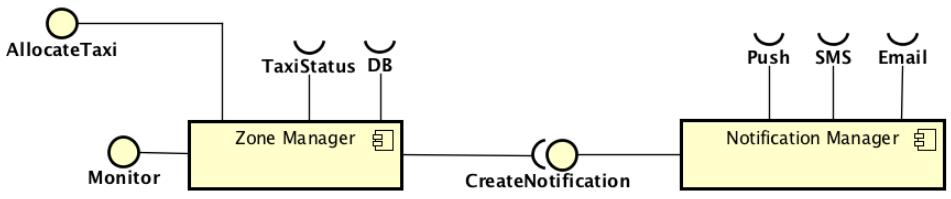
Test case identifier	I17
Test item(s)	Ride Manager →Notification Manager
Input specification	Create typical Ride Manager input
Output specification	Check if the correct functions are called in the Notification Manager
Environmental needs	I4, I5 succeeded, the stubs for SMS, Email, Push notification to satisfy the components inter-dependencies

3.1.15 Integration tests for Zone Manager and Taxi Manager



Test case identifier	I18
Test item(s)	Zone Manager →Taxi Manager
Input specification	Create typical Zone Manager input
Output specification	Check if the correct functions are called in the Taxi Manager
Environmental needs	I3 succeeded, the DB

3.1.16 Integration tests for Zone Manager and Notification Manager



Test case identifier	I19
Test item(s)	Zone Manager →Notification Manager
Input specification	Create typical Zone Manager input
Output specification	Check if the correct functions are called in the Notification Manager
Environmental needs	I3 succeeded, the stubs for SMS, Email, Push notification to satisfy the components inter-dependencies

3.2 Test procedures

3.2.1 Test procedure for Account Manager sub-system

Test procedure identifier	TP1
Purpose	This test verifies that the Account Manager component: • Can handle the Visitor input • Can handle the Registered User input • Can output the requested information to a Visitor • Can output the requested information to a Registered User • Can retrieve the correct information about a user
Procedure steps	Execute I2 after I1

3.2.2 Test procedure for Request Manager sub-system

Test procedure identifier	TP2
Purpose	This test verifies that the Request Manager component: • Can handle the Passenger input (creation/modification of requests/reservations and user's history) • Can handle the Passenger input from an external service through the APIs • Can output the requested information to a Passenger • Can start a thread for every user's request • Can modify and delete requests, thus it can retrieve information about the requests from the DB • Can retrieve the correct information about a user
Procedure steps	Execute I7 after I6

3.2.3 Test procedure for Ride Manager sub-system

Test procedure identifier	TP3
Purpose	This test verifies that the Ride Manager component: • Can handle the creation, modification and cancellation of rides • Can start a thread for every user's ride • Can handle the Taxi driver's input • Can output the requested information to a Taxi driver • Can retrieve information about the rides from the DB • Can retrieve the correct information about a user • Can launch a payment process
Procedure steps	Execute I5 after I4

3.2.4 Test procedure for Zone Manager sub-system

Test procedure identifier	TP4
Purpose	This test verifies that the Zone Manager component: • Can handle the Administrator input • Can output the requested information to the Administrator • Can manage the queues of taxis in the zones • Can forward a request to the correct queue • Can retrieve information about the queues from the DB • Can retrieve the correct information about a specific Taxi driver • Can send job proposals to taxi drivers
Procedure steps	Execute I3

3.2.5 Test procedure for components involved in User login

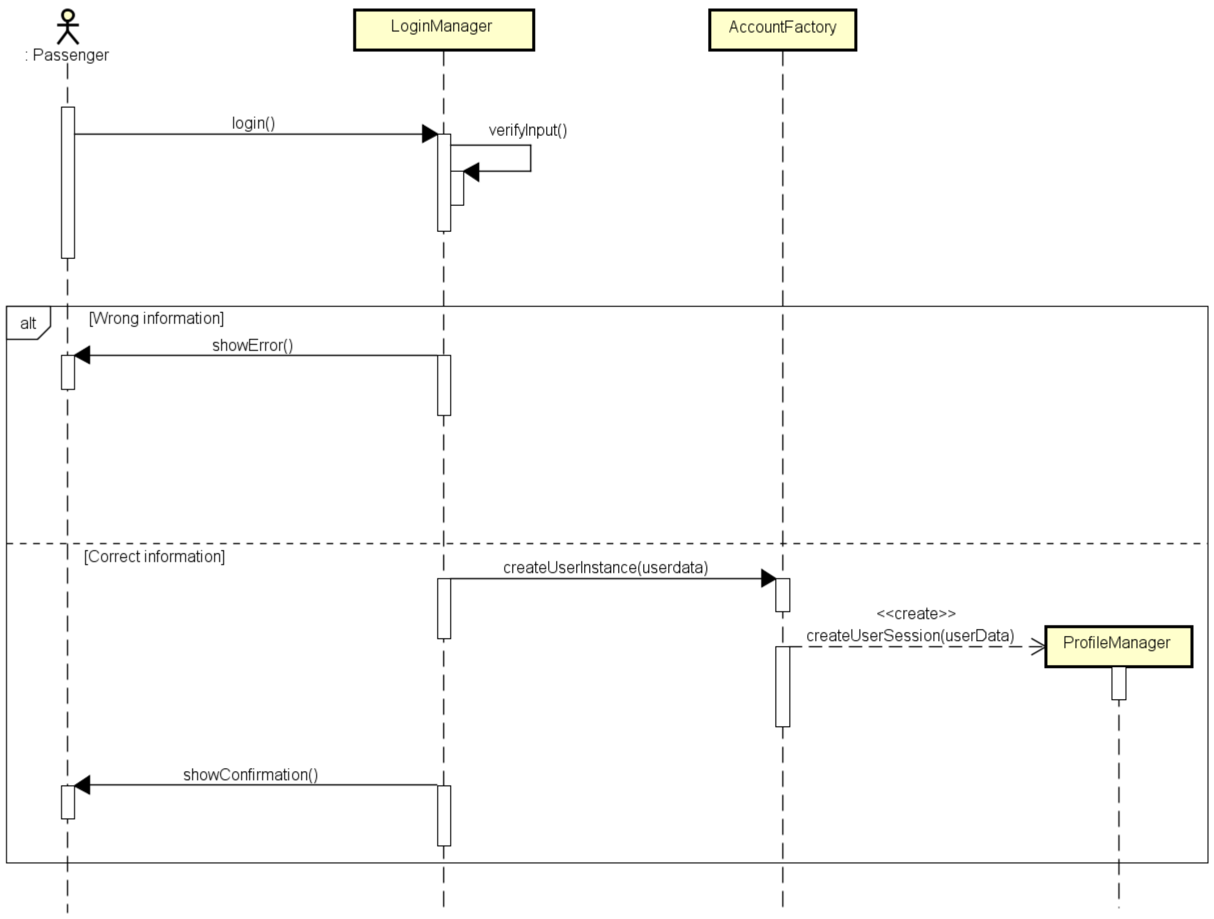


Figure taken from paragraph 2.5.2.1 of the DD

Test procedure identifier	TP5
Purpose	This test verifies the login procedure in order to check the correct integration of all the involved components.
Procedure steps	Execute in order I1 and I2

3.2.6 Test procedure for components involved in Passenger request

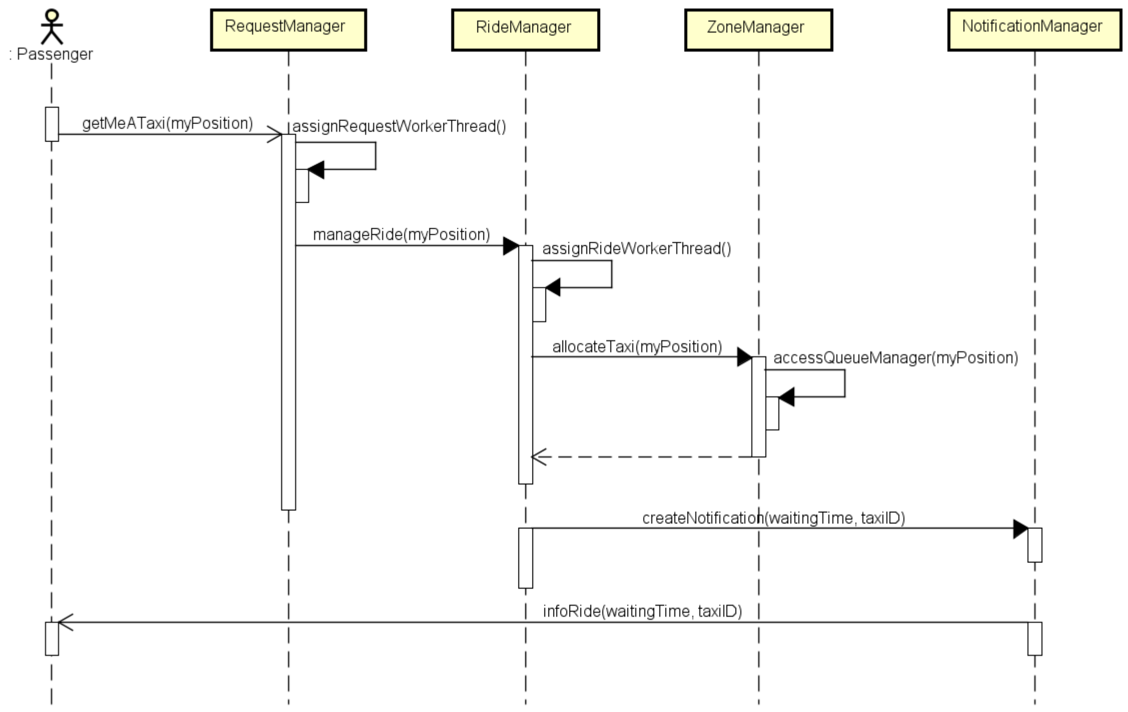


Figure taken from paragraph 2.5.2.2 of the DD

Test procedure identifier	TP6
Purpose	This test verifies the procedure activated when a passenger asks for a taxi in order to check the correct integration of all the involved components.
Procedure steps	Execute in order I10, I13, I15 and I17

3.2.7 Test procedure for components involved in Request cancellation

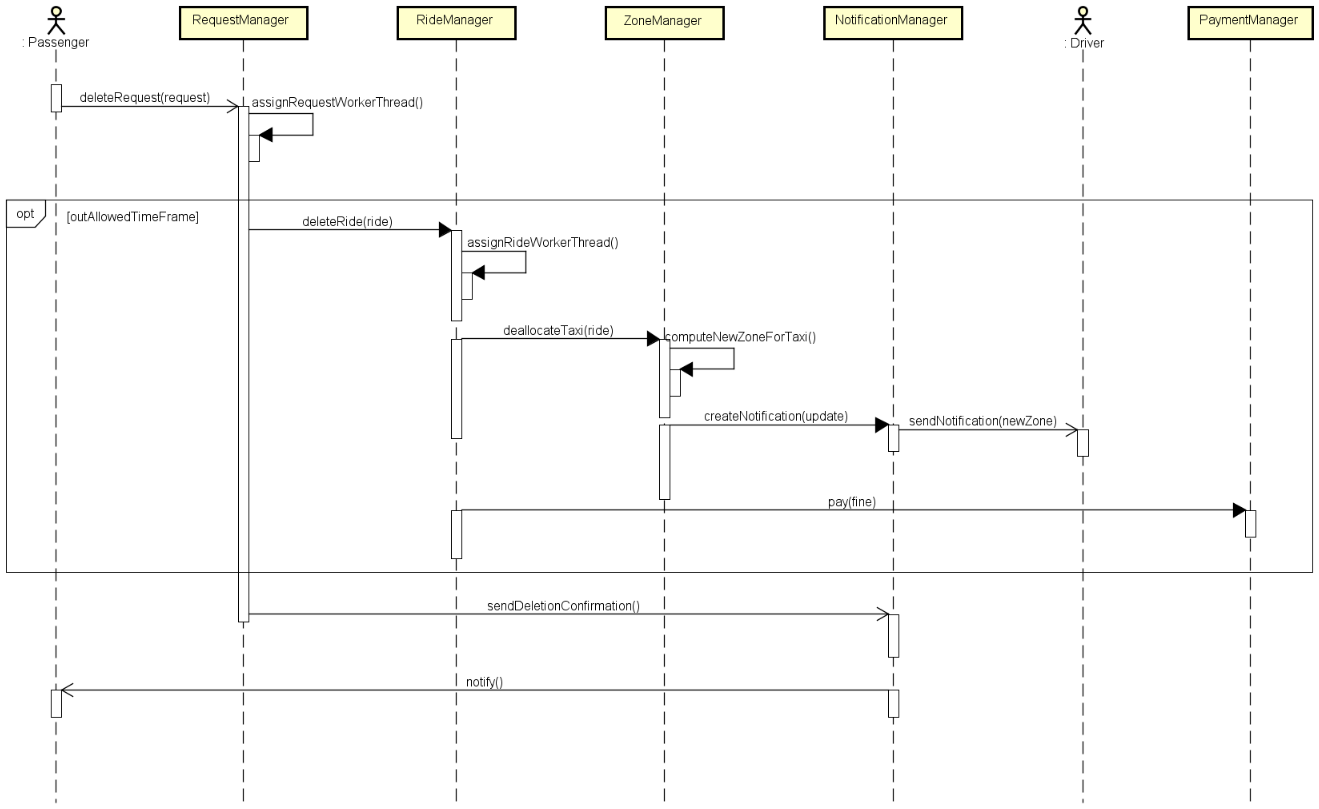


Figure taken from paragraph 2.5.2.3 of the DD

Test procedure identifier	TP7
Purpose	This test verifies the procedure activated when a passenger deletes a request or reservation for a taxi (when the [outAllowedTimeFrame] condition is not satisfied) in order to check the correct integration of all the involved components.
Procedure steps	Execute in order I10 and I14

Test procedure identifier	TP8
Purpose	This test verifies the procedure activated when a passenger deletes a request or reservation for a taxi (when the [outAllowedTimeFrame] condition is satisfied) in order to check the correct integration of all the involved components.
Procedure steps	Execute in order I10, I13, I15, I19, I16 and I14

3.2.8 Test procedure for components involved in Driver's job assignation

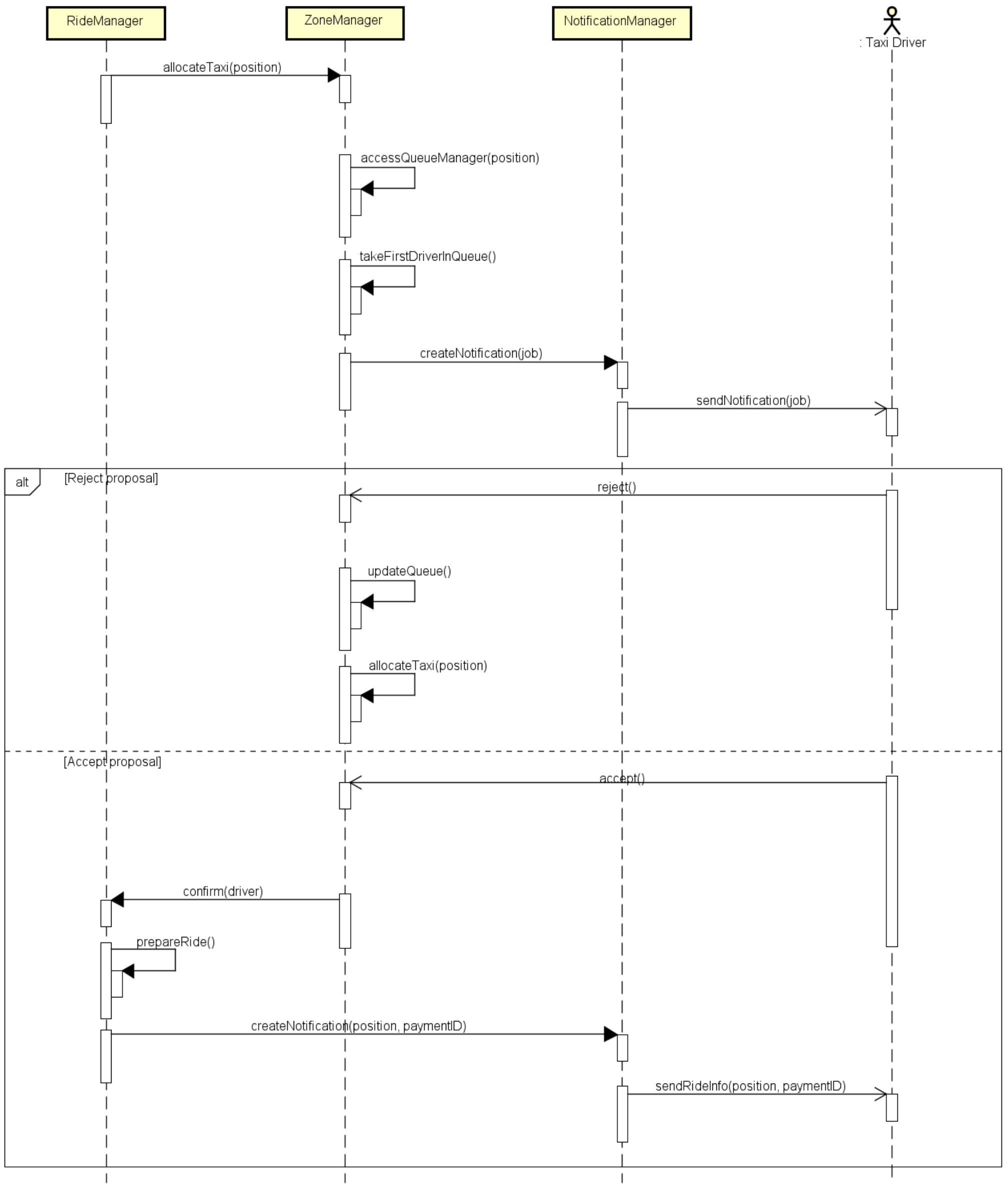


Figure taken from paragraph 2.5.2.4 of the DD

Test procedure identifier	TP9
Purpose	This test verifies the procedure activated when the system assigns a job to a driver (when the [Reject proposal] branch is taken) in order to check the correct integration of all the involved components.
Procedure steps	Execute in order I15 and I19

Test procedure identifier	TP10
Purpose	This test verifies the procedure activated when the system assigns a job to a driver (when the [Accept proposal] branch is taken) in order to check the correct integration of all the involved components.
Procedure steps	Execute in order I15, I19 and I17

4 Tools and Test Equipment Required

To perform in a reliable way the integration testing, the following tools and testing environments are needed. In order to accomplish the integration testing at sub-component level (e.g. integration of the components in the Account Manager) we are going to use the integration framework of Mockito's library. We made this choice because this tool offers the possibility to implement the stubs and the drivers needed for the testing. We are going to use Mockito also in the integration testing of mobile clients.
To perform the integration testing at component level (e.g. integration of Zone Manager with Ride Manager) we are going to use the Arquillan framework. This is due to the fact that we have several runtime units that are going to run in different software containers inside the same virtual machine and this framework provides the tools to test software containers integration. We take in consideration manual testing to test the integration between the web client and the other components of the system.
The testing environment consists in a virtual machine for the application logic and another one for the DBMS running both Ubuntu Server 14.04 LTS. Concerning the client side we need a mobile terminal running Android 6.0.1, another mobile terminal running iOS 9.2 and a desktop PC running Google Chrome.

5 Program Stubs and Test Data Required

5.1 Stubs

- Payment Manager
- Zone Manager
- Notification Manager
- Ride Manager
- Public Payment Service
- Taxi Manager
- SMS service
- Mail service
- Push service

5.2 Drivers

- Client (Administrator, Taxi Driver, Passenger)
- Ride Manager
- Request Manager

5.3 Data required

To perform a correct integration testing it is necessary to implement a dummy DB populated with the following data:

- Some user data for each user type (Administrator, Taxi Driver, Passenger)
- A set of requests for shared and non-shared trips
- A set of rides
- A set of city zones
- A set of taxis to populate each zones taxi queue

All this data elements must match together to perform correctly the integration testing. In order for a request and its associated ride to be correct, at least a taxi driver and one or more passengers should appear. The taxi driver should match with his taxi and the taxi should be in the starting zone of the ride.

6 References

Material from Wikipedia

- Integration testing: https://en.wikipedia.org/wiki/Integration_testing
- Oracles: https://en.wikipedia.org/wiki/Oracle_(software_testing)

7 Appendix

7.1 Software and tools used

- TeXstudio 2.10.6 (http://www.texstudio.org/) to redact and format this document.
- Astah Professional 7.0 (http://astah.net/editions/professional)

7.2 Hours of work

The time spent to redact this document:

- Baldassari Alessandro: 20 hours.
- Bendin Alberto: 20 hours.
- Giarola Francesco: 20 hours.