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Software Engineering 2: "myTaxiService"
**D**esign **D**ocument

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# Contents

# 1 Introduction

## 1.1 Purpose

The purpose of the Design Document is to provide documentation in order to aid the development of myTaxiService's system by providing a description of how it should be built and how its components are expected to interact with each other.

## 1.2 Scope

This Design Document is intended to explain the design and architecture of myTaxiService, a new application that will provide an easy way to access the taxi service in a city. It describes the system both from a software and hardware point of view, in order to clarify the system's structure and how it accomplishes its functionalities.

## 1.3 Definitions, Acronyms, Abbreviations

#### 1.3.0.1 Definitions

- *End users:* this category comprises all those who use the application[1]: administrators, taxi drivers, logged in users and guests.

#### 1.3.0.2 Acronyms

- *UI:* user interface through which the end users can interact with the application.
- *DB:* Database.
- *DBMS:* Database Management System.

## 1.4 Reference Documents

- Document with the assignment for the project
- RASD for myTaxiService
- Template for the Design Document
- IEEE standard for Software Design Document
- The IEEE standard for architecture descriptions

[1] For their definition we refer to the RASD's section 1.6

## 1.5 Document Structure

The following parts of this document are structured in 3 sections: architectural design, user interface design and requirements traceability. The architectural design section describes the software and hardware components of the system and their interactions. The user interface design section which refers to the "User Interfaces" subsection of the RASD. The requirements traceability section that explains how the proposed design meets the requirements that have been defined in the RASD.

# 2 Architectural Design

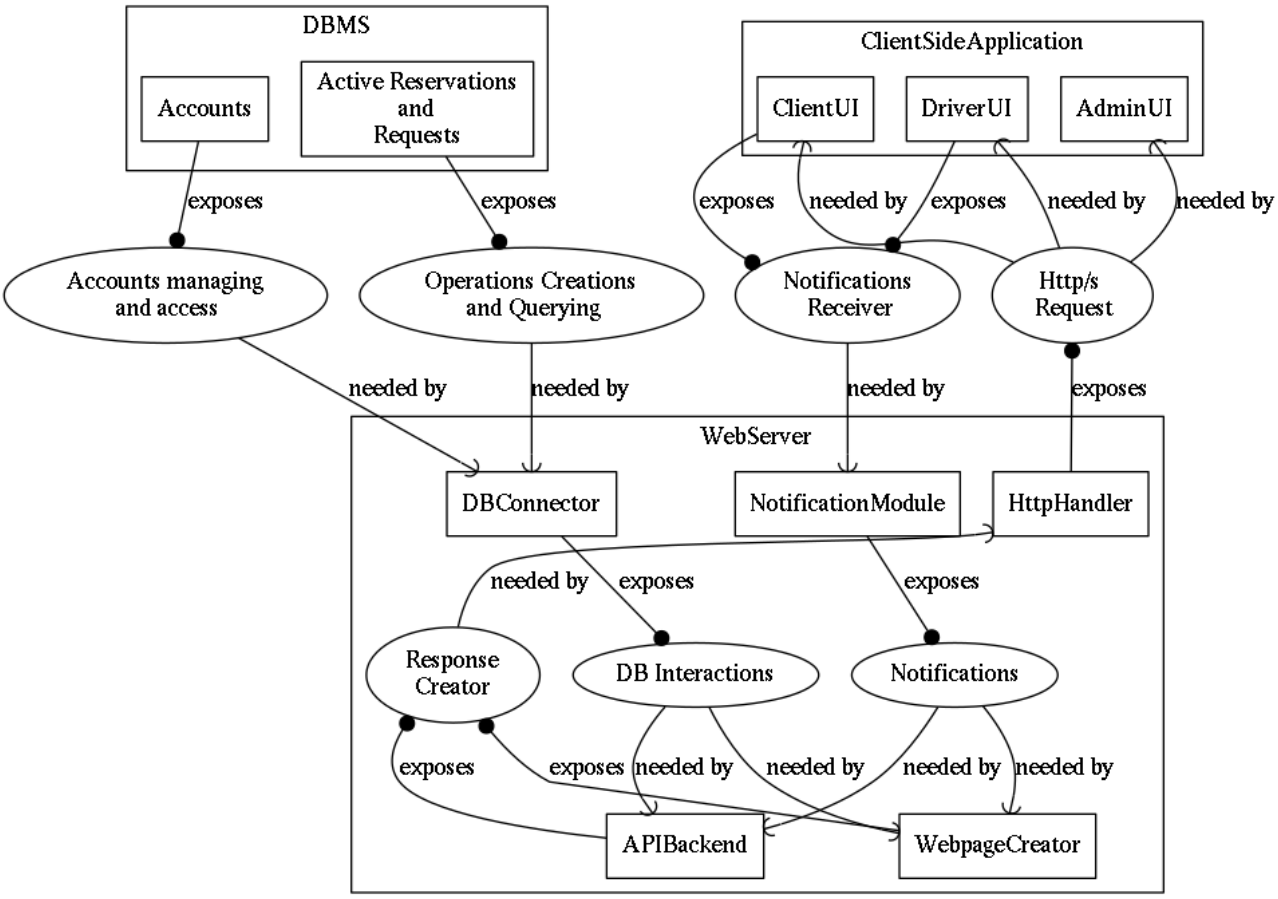
## 2.1 Overview

The system to be developed, as mentioned before, will be used to provide an easy access to a taxi service. Therefore, its main functionalities, that will have to be supported by the design and architecture, are: the storage of the taxi drivers' and clients' accounts, the computation of the taxi queue of each zone and the handling of requests and reservations. Furthermore, the system will have to comply to quality of service attributes as specified in the RASD.

## 2.2 High Level Components and Their Interaction

myTaxiService's system is composed by three main components: DBMS, Web Server and client application. The client application provides the UI through which end users can access the application's services. These requests are forwarded to the Web Server which is in charge of providing a response, eventually querying the Database in the DBMS for information. The Web Server is also responsible for answering to the API calls coming from external applications and notifying the end users for particular events, like when a request is accepted by a taxi driver. The DBMS stores all the information of the end users's accounts, the active requests and reservations.

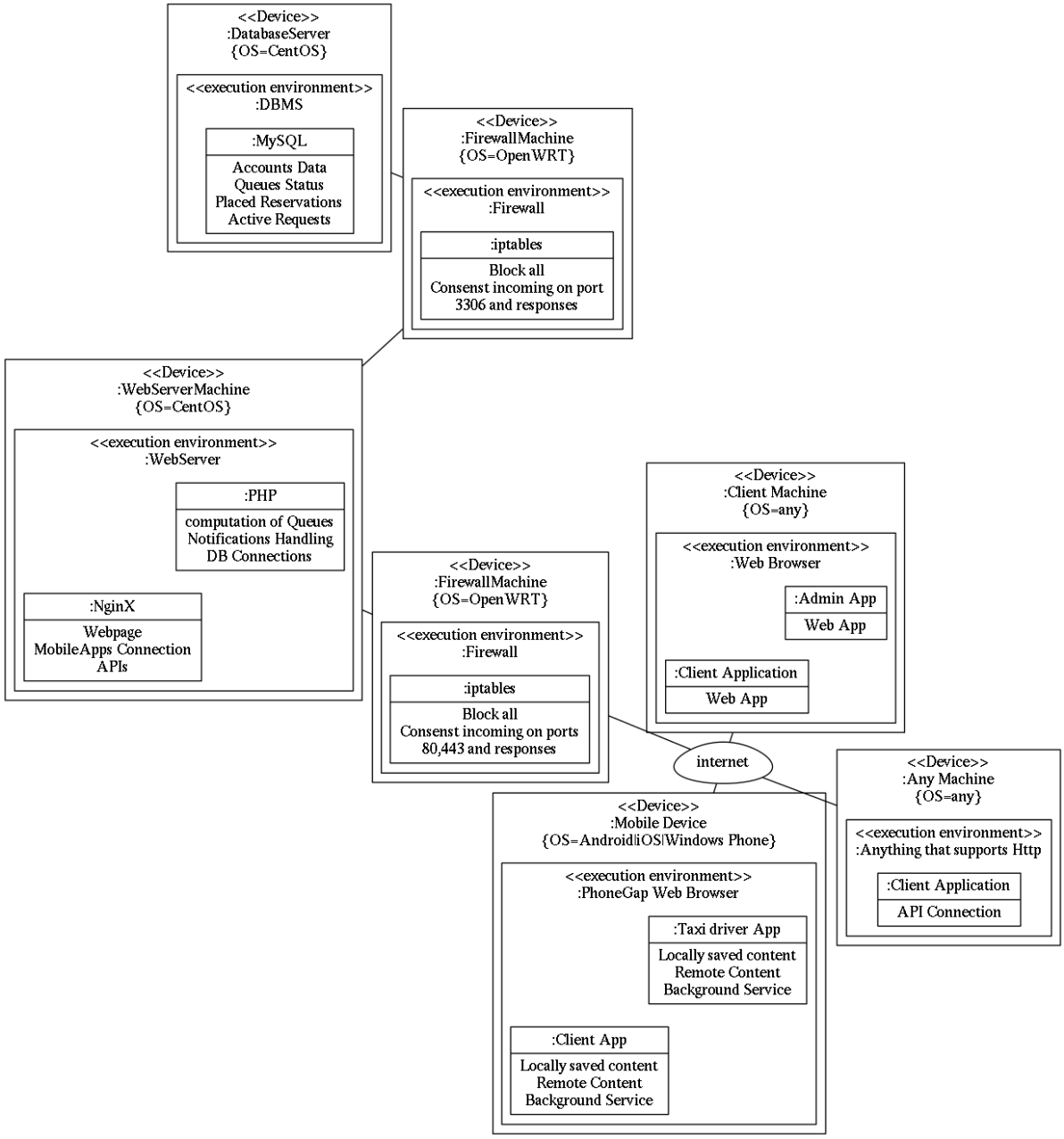
## 2.3 Component View




Meanwhile the DBMS and the ClientSide application are pretty much self explanatory the WebServer part requires some details:

- The Webpage Creator is the responsible for both the Mobile App and Web App responses. The httpHandler will recognise the request by the parameters and ask the Webpage Creator to either create the full Html page (in the case of the Web App) or just send a partially created page that only contains the dynamic data that the Mobile App will then include in its interface.
- The API Backend will be called by the httpHandler and will respond with Only the data requested in a JSON format

## 2.4 Deployment View




This is just a pretty standard configuration with DMZ, Internal network, double firewall and untrusted network, see more in section 2.8

## 2.5 Runtime View

Some details:

- Https negotiations are omitted in order to preserve readability, but they would all be between the apps (Web or Mobile) and the httpHandler
- Queues are not represented in the database, but they are all re-computed with a query that selects the taxis that are active, are in the desired area and returns them sorted by the time they were marked as active.

## 2.6 Component Interfaces

**2.6.0.1 DBInteractions** This interface encapsulates and exposes all the operations the Web Server needs to interact with the DB. The operations are divided in 2 categories based on the DB's part they manage:

- *Accounts managing and access:* this interface exposes methods to manage the stored end users accounts.

| Method | Parameters required | Notes |
|---|---|---|
| addAccount | account type and credentials | adds an account to the DB of the specified type |
| updateAccount | user ID, attribute to modify, and value | updates the attribute specified to the new value |
| deleteAccount | user ID | deletes the account specified by the ID |
| getAccount | user ID | returns the account corresponding to the ID with all its attributes |
| getAllAccounts | type of the accounts | returns all the accounts of the specified type |
| getFirstInQueue | location | returns the first taxi (by activation time) that is in the given location |

- *Operations creations and querying:* this interface exposes methods to manage and retrieve requests and reservations.

| Method | Parameters required | Notes |
|---|---|---|
| addRequest | starting location, destination | adds a new "not accepted" request to the DB and returns its ID to the caller |
| deleteRequest | request ID | deletes an existing request from the DB |
| activateRequest | request ID, taxi ID | changes the state of the request from "not accepted" to "accepted" and the taxi to unavailable. |
| getRequest | request ID | returns the request and all its attributes |
| getUserRequests | user ID | returns all the active requests of the specified user |
| addReservation | starting locations, destination, meeting time | adds a new reservation to the DB and return its ID |
| deleteReservation | reservation ID | deletes an existing reservation from the DB |
| activateReservation | reservation ID, taxi ID | changes the state of the reservation from "not accepted" to "accepted" and the taxi to unavailable |
| getReservation | reservation ID | returns the reservation specified by its ID with all its attributes |
| getUserReservations | user ID | returns all the active reservations of the specified user |

user ID is always a parameter, but not always specified to keep the table readable
also, the "activate" methods mark a row in the DB as not removable by the user

**2.6.0.2 Http/s Request** This interface exposes

**2.6.0.3 Response creator** This interface exposes all the functionalities end users require to access the services offered by myTaxiService. In the following list the methods are divided by type of end user that needs them.

- *Functionalities exploited by guests:*

| Method | Parameters required | Notes |
|---|---|---|
| searchForETA | starting location | returns the ETA[2] of the CAT[3] |

- *Functionalities exploited by logged in user:* logged in user can access the searchForETA method exposed for guests along the following methods:

| Method | Parameters required | Notes |
|---|---|---|
| requestTaxi | | |
| cancelRequest | | |
| showRequestDetails | | |
| reserveTaxi | | |
| cancelReservation | | |
| showReservationDetails | | |
| register | | |
| login | | |
| logout | | |

- *Driver:*

[3]text
[3]text

| Method | Parameters required | Notes |
|---|---|---|
| answerRequest<br>answerReservation<br>toggleState | | |

**2.6.0.4 Notifications** This interface exposes methods to notify end users (except for administrators) of particular events.

### 2.7 Selected Architectural Styles and Patterns

The most important part of the application is based on a classical Client-Server pattern: the service is completely provided by the centralized core, to which the clients connect in order to perform any operation.
More in details the pattern involves a very minimal client with almost no functionalities except for connecting to the server and displaying the information received.
For the Server it was decided to adopt a 3-tier subdivision: the untrusted internet, the DMZ and the internal network.

### 2.8 Other Design Decisions

In order to provide an easier maintenance and to allow the project to scale easily two main points were stated:

- A cross-platform web-based framework should be chosen to develop the mobile version of the application
- A cloud based approach should be chosen instead of buying the hardware to host the service

## 3 User Interface Design

This section has been explored in RASD's section 2.1.1 "User Interfaces" so we refer to that one.

## 4 Requirements Traceability

Functional requirements:

- Data accessibility, modifiability and creation for the 4 kinds of users[4] is granted thanks to the http interface exposed on the Internet.

- Notification delivery is granted through the interface exposed by the mobile applications and web applications.

Non functional requirements:

- Secure channels will be established using SSL
- Autentication will always be checked before accessing sensible data.
- Stability, scalability and availability of resources will be granted by using a cloud-based system. The deployment will not be made on phisical machines but virtual machines rented on reliable providers.

# 5 References

[4]Guest, Administrator, Regeistered User and Taxi Driver (RASD section 1.6)

# 6 Appendix

Appendix for Roberto Clapis
Work hours: 20

Software Used:

| Task | Software |
|---|---|
| Edit LaTeX Source | Vim |
| Edit Graphs Sources | Vim |
| Edit sources for Sequence Diagrams | Vim |
| Convert Sequence Diagrams to images | Quick SequenceDiagramEditor |
| Generate and Raster directed graphs | Dot |
| Generate and Raster undirected graphs | Fdp |
| General images mangling and cropping | ImageMagick & Shotwell |
| Convert LaTeX source to PDF | LaTeXMK |
| Spell Check | Aspell |
| LaTeX Check | LaCheck |