sw707e14 - Bicycles and the Internet of Things

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Frame titel

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Introduction

Bicycle Sharing System

Our Goal For the Project

Suggested Solutions

Implementation Details

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SECTION TITLE

Introduction 2

Bicycle Sharing System

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Introduction

Who Are We?

- Erik
- Lasse
- Søren
- Lars
- Dennis
- Mathias

What Will be in This Presentation?

- What are we dealing with?
- What problems are there to address? and why?
- How does the solution fit with the Internet of Things? (lasse ret lige til her)
- How did we manage to solve the problems?
- A demonstration of the outcome.
- What can be concluded from our work?

Bicycle Sharing System

What Is a Bicycle Sharing System?

"Short term bicycle rental available at unattended stations" - Paul DeMaio, MetroBike LCC

The idea is that: "bikes provide a new paradigm in short distance transport that is a realistic alternative to the bus, tram, taxi, or private car [...]".

Pick your bicycle at A and place it at B.

source of definition: http://www.bicyclesharingsystems.com/whatis.php

The Current System

- CIVITAS ARCHIMEDES.
- 2009: 135 bicycles and 19 stations.
- Today: +2 stations and +102 bicycles.
- Open system, free to use.
- Each bicycles is used minimum 1.4 times during a day.
- AFA JCDecaux.

Problems With the Current System

- You do not know beforehand if there are bicycles available for you and how many.
- You cannot make sure that there will be a bicycle for you.
- There is no way for Aalborg Kommune to monitor the use of the bicycles.

How Can We Solve These Problems?

Does other bicycle sharing systems address these problems?

- Status: All of the examined systems provides a website for getting the current amount of bicycles at each station.
- Booking: Of the examined systems it is done either by creating a special subscription, paying by week, month or quarter, or by creating a booking for a bicycle online in advance asking for a confirmation half an hour before reservation.
- Monitoring: Of the examined systems it is either done through registering bicycles in docks at the stations or by tracking their position with GPS.

Our Goal For the Project

Problem Definition

It is possible to develop a system for Aalborg Bycykel that is user friendly and manageable, within the context of the Internet of Things.

- What are the requirements for a city bicycle booking and positioning system?
- How can the booking and positioning system be designed and implemented within the context of the Internet of Things?
- Why should the developed system be used over the currently used system?

Requirements

We want a system that is able to:

- Provide status of availability of bicycles.
- Give an option to book a bicycle.
- Track the position of each bicycle.
- Collect data for analysis of the usage for Aalborg Kommune.
- Predicting when a bicycle will be available for use.

Criteria

What values did we want the system to have?

- As little change as possible, rather an extension the current system.
- Easy to use and accessible by everyone.

Suggested Solutions

Availability of Bicycles - Camera

source of image: http://www.mantratec.com/Weatherproof-cameras/weatherproof-camera-1.jpg

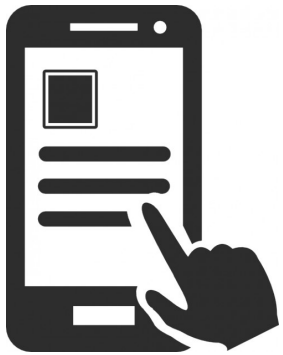
Availability of Bicycles - Chip

source of image: https://pbs.twimg.com/profile_images/1280492977/RFID-Chip.jpg

Availability of Bicycles - Dock

source of image: http://www.tuvie.com/wp-content/uploads/public-bike-system1.jpg

Booking Software - Mobile App

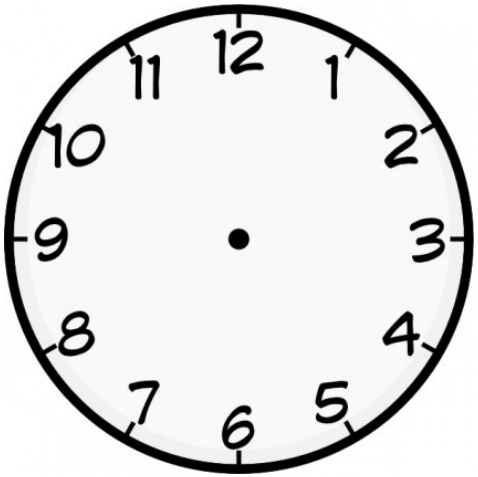


source of image: http://cdns2.freepik.com/free-photo/smartphone_318-23380.jpg

Booking Software - Website

source of image: http://www.eventmanagerblog.com/uploads/2014/03/creating-perfect-event-websites.png

Unlocking of Bicycles - On time



source of image: http://images.all-free-download.com/images/graphiclarge/purzen_clock_face_clip_art_24896.jpg

Unlocking of Bicycles - GPS

source of image: https://cdn3.iconfinder.com/data/icons/wireless/512/16-512.png

Unlocking of Bicycles - QR Code

source of image: http://www.qrstuff.com/images/sample.png

Unlocking of Bicycles - SMS

source of image: http://www.fusionindia365.com/images/templatemo_logo.png

Unlocking of Bicycles - Password

source of image: http://i.bnet.com/blogs/272104_b9383b0487-300x225.jpg

Tracking of Bicycles - GPS

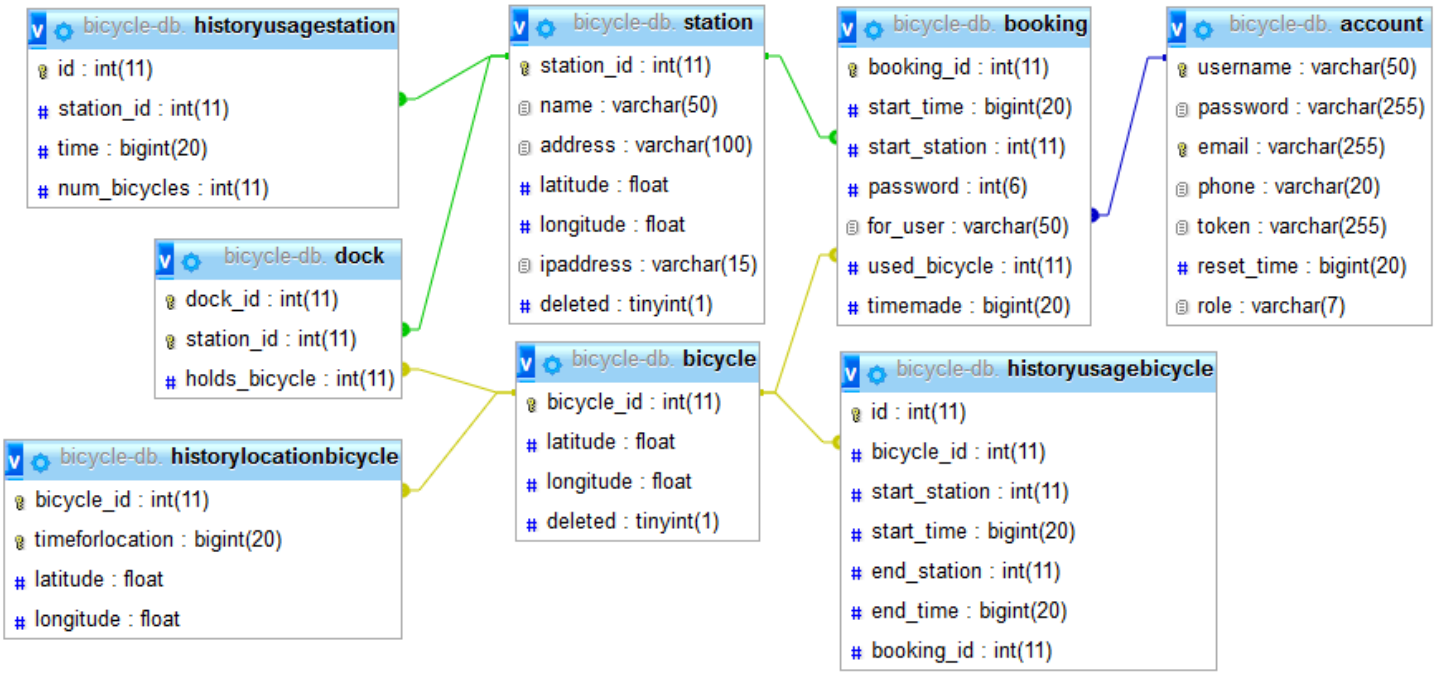
source of image: http://cdns2.freepik.com/free-photo/receiving-gps-signal_318-10003.jpg

Overview

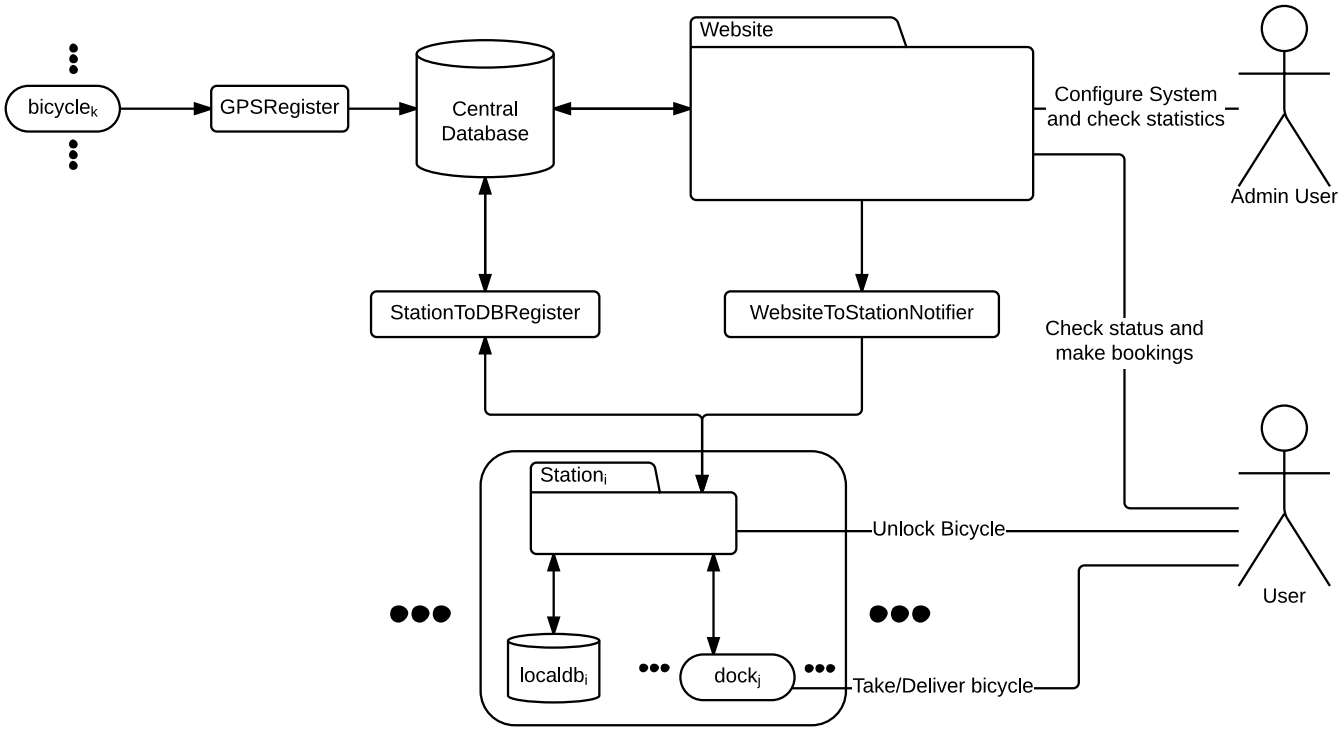
- Database
- Architecture
- Synchronisation

Database

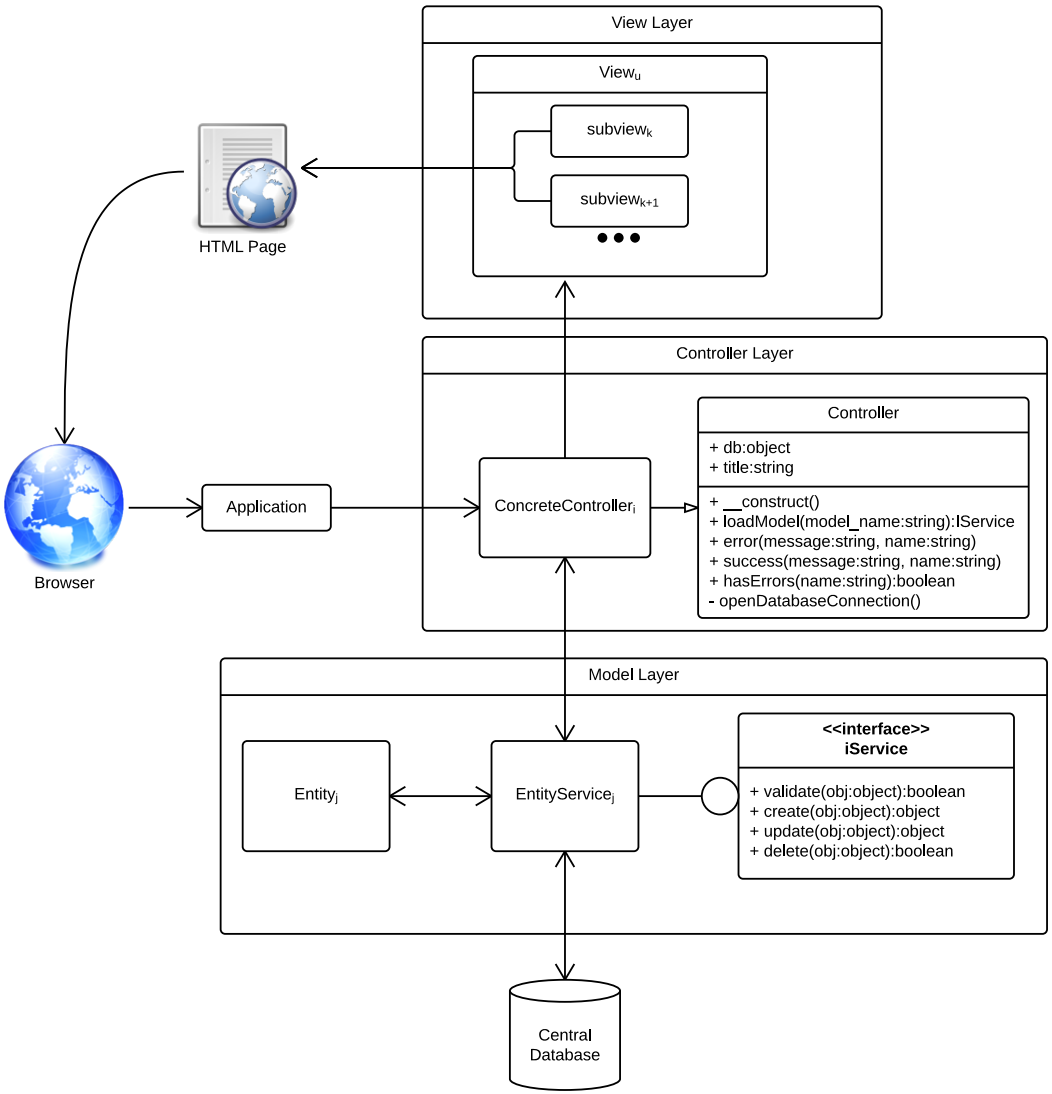
- MySQL
- ER-Diagram → MySql Schema



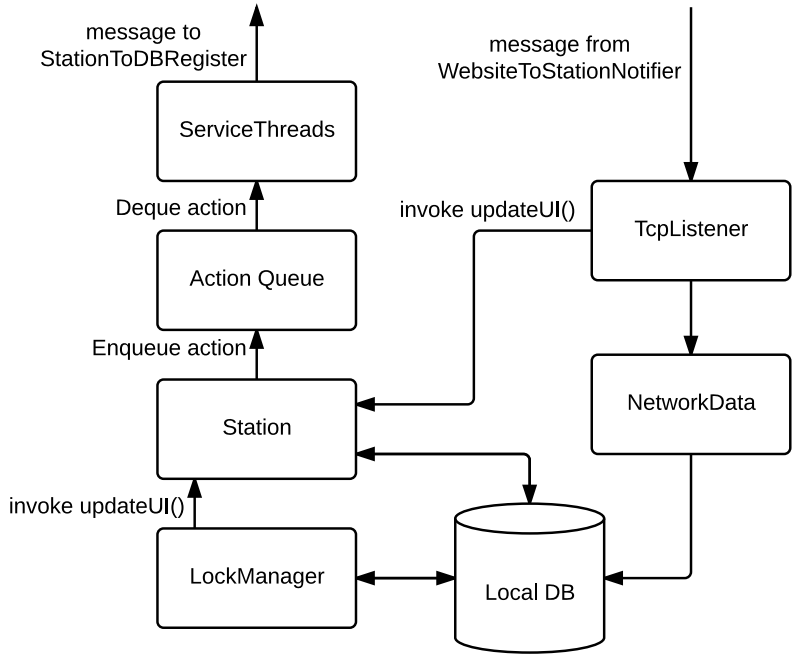
Overall Architecture and Interaction



Webpage Architecture



Station Simulation Architecture



Synchronisation

Watch out for:

- Inconsistent state
- Connection failures

Synchronisation

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Issues:

- Bicycle locking/unlocking
- Removal/Insertion of bicycles
- Booking/Unbooking
- Station boot/reboot
- Dock insertion/removal