Project Proposal - Truck Rest Stop Parking System

1. Introduction

Every day hundreds of trucks travel the roads of Finland delivering cargo as an essential part of infrastructure. In southern Finland the majority of these trucks enter and leave Finland through the ports of Helsinki. However, currently there is simply not enough parking and rest stop space available for the needs of the delivery industry. To bring relief to the problem there is a recently started project aiming to open a new overnight parking and rest area for truckers near the Helsinki airport. We, YO-bitti Oy, will be developing the parking permit management system for this area. Such a system is needed to avoid long-term parking and other misuse of the parking area. Additionally the system should provide and could visualize analytics about the use of the area.

In this project a parking permit management system with access control and monitoring will be constructed. This includes a mobile application where end users (truckers) register themselves and their vehicles to the system in order to gain access to the parking area and its services. The application will then communicate with a backend to open gates and doors for the vehicles and their drivers. If there is enough time, the system will also visualize the collected parking data to give the managers some insight in things like parking space utilization, most congested times and days of week etc.

2. Project goals

As described above, in this project you will develop a mobile application where truck drivers register information about themselves and their vehicles. In addition to the app, a backend handling all data and connecting the app to the physical devices, such as the gates on site, will also be established. If you have interest in electronics you can also participate in the development of the IoT devices that will interface with the gates and vehicle detection sensors, but this is not a mandatory part of the project. Additionally there is an opportunity to do network engineering as an internal network for the system will be installed as part of the project.

As an optional extra software development task, a browser based administration interface for visualizing the current and historical data about the parking area can be developed. This tool would expose information such as parking space utilization over time and the busiest times of day etc.

3. Technologies

- The final application will use microservice architecture and all components will be packaged as Docker containers.
- The mobile web application must be a single page app written in JS using a client side rendering framework such as React.js or Vue.js.
- The backend should run on Node.js and use MySQL (or equivalent) as its database.
- Communication between the frontend and backend should use REST APIs.
- Interaction with the IoT hardware is performed using MQTT.

4. Requirements for the students

Mobile web development and good programming skills as well as some experience in client-server architectures helps to get started easily. The web application to be created is pretty limited in scope, and studying different potential technologies is encouraged. The students will need to co-operate to author the high-level design of the architecture between the mobile application clients, the backend and the physical IoT devices (gates etc.). Knowledge of version control (git) is required, and version control best practices (branches, pull requests) should be followed. Additionally basic knowledge about databases is required. Basic knowledge about containers, Docker and CI are preferred.

We will naturally mentor and support you throughout the project. If the task turns out to be too broad, we are ready to narrow the scope. Similarly if the project develops quickly, we're open for you to bring new ideas and features to the table.

5. Legal issues

Intellectual Property Rights (IPR):
- The client gets all IPRs to the results.
- The required access to technical documentation and source code will be provided to the course staff and other essential parties.

Confidentiality:
- The client will share some confidential information with the students. There is no need for an additional NDA apart from the details agreed upon in the Aalto's "AGREEMENT ON STUDY PROJECT" document chapter 8.

6. Client

We will provide all needed parts and software licences as well as server resources for developing and testing the project. A private source control system will be provided by us. The students are required to have their own computers. Working remotely is possible, but at least some of the research, testing and installation of the system will be done on site.

Client representative

Product Owner
Aleksi Markkanen
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Preselected Student Team Members

The following students have informed us about this opportunity, and we have selected them to work on this project based on their interests and suitable skillset:

- Dennis Marttinen (dennis.marttinen@aalto.fi)
- Erika Marttinen (erika.marttinen@aalto.fi)
- Benjamin Pettinen (benjamin.pettinen@aalto.fi) (our employee)
- Petteri Pulkkinen (petteri.k.pulkkinen@aalto.fi)
- Jasu Vehtari (jasu.vehtari@aalto.fi)

7. Additional information

The documentation language for the project is English.