Project Proposal - Management and Visualization of Traffic Data

1. Introduction

Conveqs Oy is a company that develops software for traffic management and control in cooperation with the City of Helsinki and Aalto University. In 2022 a group in software project course developed a visualization of the real-time radar data from the test area in Jätkäsaari. This visualization shows the real-time vehicle positions and traffic signal states on a map through a web-page.

The next plausible step would be to visualize the numeric data of the traffic performance. There is special interest in visualizing time series of the traffic data and in comparing different traffic scenarios. In order to store different scenarios for visualization a data management system like database is also needed.

2. Project goals

The goal of the project is to build a data management system with web based visualization for traffic data. The traffic data may involve real-time data from sensors or artificial data from a simulator.

There are four basic categories of data:

- Traffic performance indicators: queue lengths, delays, travel times,
- Traffic demand: Incoming traffic flows, speed levels, routes, vehicle types
- Traffic control: parameters of signal controllers
- Simulation settings: Time of the day, duration, simulation parameters

The goal is to develop a database model for traffic scenarios. Each scenario combines a certain traffic demand and control with the related performance indicators e.g. the results of a simulation run. A typical use case is to have certain traffic demand and several alternative control options. It should be possible to fetch these scenarios and visualize the traffic performance indicator so that it would be easy to see the best option. Another example is to show traffic indicators of one control option with different traffic demands.

The results should be shown visually in a web-based dashboard. The user should be able to choose different resolutions for time series.

3. Technologies

The suitable technologies and development tools for the project should be discussed and decided at the beginning of the project. The data will most likely be provided in JSON-format in file or through an API.

The database and visualization framework should be flexible, so that new data types can be added when necessary. NonSQL database solutions should be considered like MongoDB. The framework should be built and documented so that it can be further extended by the client.

In visualization Javascript or similar can be used. Use of so called low code tools is also an option given that they provide the necessary functionality.

4. Requirements for the students

Understanding of web and database technologies is needed (Javascript, REST, Websockets, HTML, Server/Client model) in addition to basic programming skills.

Expertise on traffic engineering aspects is provided by the customer.

The difficulty of the topic is likely to be moderate, however, it can be modified to become harder (or easier) by tuning the requirements/functionality.

5. Legal Issues

Intellectual Property Rights (IPR): The client gets all IPRs to the results.

Confidentiality: The client will not share any confidential information with the students.

6. Client

Conveqs Oy is a startup founded in 2019 focusing in traffic modeling and management. The company has deep connections with Aalto university and its founding team has a combined 50+ years of expertise in traffic engineering and software development.

The work will be part of the high priority "Jätkäsaari Smart Junction" research initiative and Conveqs has prepared to provide support needed for a successful completion of this

project. In addition, cloud servers, software licenses and other tools needed will be provided by the company.

Contact person/product owner will be Kari Koskinen who has successfully led several similar projects and has a long academic and industry experience in relevant fields. Contact details are:

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7. Additional information

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