

CPU6001 Major Project - Terms of Reference

Student Name: XXXXXXXX

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Student number:

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Project title:

An investigation into the graphical representation of smart cities data

Date of production: 29/10/16

Version: 1:2

Background and overview:

The introduction of Internet Protocol Version 6 (IPV6), the transition from using the Binary numbering system to the Hexadecimal numbering system for the allocation of Internet Protocol (IP) addresses has massively increased the availability of these IP addresses. This allows an enormous array and number of devices to become internet connected, from your smartphone to your refrigerator, your car or even your car parking space.

The term 'Internet of things' stems from this innovation, and as part of this connectivity explosion, the Smart City has started to emerge. A smart City is a city that uses internet connectivity to monitor services, utilities and transportation systems to enable intelligent or 'smart' solutions be developed.

A network of bus or tram stops displaying accurate arrival information, or car parks that can direct the driver to empty car parking spaces are simple examples of the smart city, as are connected and monitored motorways that open and close extra running space to improve traffic flow.

The project sponsor is Biodata Ltd, a Manchester-based technology company specialising in Smart Cities technology, specifically people counting technologies.

Their work is centred around a CCTV people counting system, Video Turnstile, and the multitude of possible applications that stem from this technology.

Video Turnstile monitors 'counting zones' and counts people as they pass through these zones. This is a very accurate system and returns counts with an accuracy of up to 98%.

Biodata has developed a system that counts passengers stepping on and off buses utilising Video Turnstile and a Raspberry Pi data logger to monitor passenger counts, along with time, latitude and longitude coordinates and vehicle identification data. This data is published to an MQTT broker (Message Queuing Telemetry Transport Protocol) , a specialist low overhead server that receives data from the device when a connection is available and then publishes this to subscribers, in this case, a MongoDB non-relational database.

MongoDB is used rather than a more conventional relational database due to the vast amount of data this system will produce – a single data logger will produce 1440 documents – the MongoDB equivalent of a record – in each twenty-four hour period. If you take into consideration the data produced by a 200 bus operation, 288,000 documents will be produced each twenty-four hour period.

MongoDB is a very quick and scalable technology, particularly suitable for big data such as this.

The company requires that a cross-platform web application compatible with both desktop and mobile devices, be developed to analyse the data captured by bus mounted data loggers. It is the aim of the company to market this as a revenue protection tool in Asia and South America

Objectives:

- To investigate the area of Business Intelligence and identify the most useful format to present processed data.
- To understand and accurately interrogate the non-relational Mongo database utilised by Biodata
- To investigate alternative technologies to evaluate the most appropriate graphical representation tools
- To investigate suitable techniques and technologies to access the database and present the information in a visual format on various web-based platforms.
- To develop and test a proof of concept prototype system to present to the company
- To provide a final report and on-going work log

Constraints:

Biodata Ltd works almost exclusively with JavaScript in its various incarnations. The client has requested the functionality of the web app be based on JavaScript, using D3.js

(Data-Driven Documents) to visualise data, and that the app can interrogate a non-relational database (MongoDB), rather than a conventional SQL database.

D3.js utilises Scalable Vector Graphics (SVG) to render its visualisations and the client has acknowledged the lack of backwards compatibility this presents – SVG is not supported by older Internet Explorer browsers, and is satisfied that the risk of incompatibility is acceptable.

Resources:

There are no hardware/software costs associated with this project as the intention is to use open-source software and the author's personal computers.

A small cloud server has been sourced to host an internet connected MongoDB Database should this be required.

There will be some travel expenses associated with travelling to Manchester to meet with the company: it is expected that this will be no greater than £50.

Reporting:

- Regular weekly meetings will be conducted with the project supervisor Martin Stanhope to report progress on the project. Additionally, a blog will be published online charting progress of the project and recording supervisor meetings. This blog will be securely accessed by invited subscribers issued with a username and password.
- Project Sponsor: ???
- Project Supervisor: ???
- Project Tutors:?????

Bibliography:

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