

Project Plan

# demos.io

Utilising Increased Data Sharing



Royal Holloway  
Cisco University Challenge 2016

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## 1. EXECUTIVE SUMMARY

### 1.1 PROJECT DEFINITION

We began by discussing a IoT traffic solutions in New York, where sensors in the road determine traffic light changes. From this we developed a concept of public access to government-held data sets and tying those to a location to create a more data-rich location information application than Google Maps. Something that does not just compare locations, but makes semantic comparisons. The experience should be customisable and deliver exactly what the user is looking for with minimal input from the user.

### 1.2 PROJECT PROBLEM STATEMENT

Existing map applications do not currently utilise local government data sets to give more than basic location and name relationships to queries. We would like to produce a solution that makes this information more easily available and can be used to map all kinds of data onto an area, including sensor information.

### 1.3 PROJECT VISION

- To produce an application which provides immediate and easy access to data sets
- Applies these data sets to relevant locations
- Allows addition of data from users and third-party applications
- Allows sensors to be added to automatically send data straight to the database

### 1.4 TEAM STRUCTURE

Chloe, Kiat, Matt and Claude are software engineers. Matt will work on the UI as he has the most web development experience. Claude will be working with Java and WebGL as he has the most experience with these. Kiat will be assisting with the document standardisation and back-end algorithm. Chloe will be acting as project manager and assist when needed with Java. Emil is our business analyst and will be conducting market research and assisting with the presentation and project report.

### 1.5 KEY OBJECTIVES AND TARGETS

- Produce a simple and easy to understand interface for the web application
- Make data sets quickly available and visualised
- Implement document standardisation
- Allow sensor and other device connectivity for data collection

### 1.6 SCOPE OF PROJECT

We will produce the database, web interface, file standardisation and data mapping. We will not produce real sensors, but will instead simulate sensors using results generators that submit data to the server. We are not producing real sensors as these will be added by third parties.

### 1.7 SOLUTION AND DELIVERABLES OF THE PROJECT

The product should provide a GUI for users to search and contribute to a database of data sets via a server. Any data submitted must be standardised before deposited in the database. The user should be able to layer query results on top of an interactive map.

## 2. METHODOLOGY

We have chosen to use agile development. We are using this due to the short time period and volatility of our environment. Agile gives us the most flexibility and allows us to use methods such as SCRUM and Crystal. Our business analyst and project manager took the role of the user to regularly review the prototypes.

### 3. PROJECT ROADMAP

#### 3.1 PROJECT CHART

Task Name	Duration	Start	Finish	Oct 17						
				M	T	W	T	F	S	S
				⚙	🔍	📅				
Brainstorming and idea definition	11:00-12:00	10/20/16	10/20/16				■			
Task allocation and research	12:00-13:00	10/20/16	10/20/16				■			
Began UI building and document standardisation	14:00-16:00	10/20/16	10/20/16				■			
Design refinement & conflict resolution	16:00-17:00	10/20/16	10/20/16				■			
Functionality test of demo product	17:00-19:00	10/20/16	10/20/16				■			
Progress update meeting	19:00-20:00	10/20/16	10/20/16				■			
Bug fixing, code refactoring, report editing	20:00-00:00	10/20/16	10/21/16				■	■		
Progress meeting	00:00-01:00	10/21/16	10/21/16					■		
Continued development	01:00-03:00	10/21/16	10/21/16					■		
Final progress update meeting & presentation preparation	03:00-04:00	10/21/16	10/21/16					■		
Demo, presentation and report refinement, materials submission	04:00-08:00	10/21/16	10/21/16					■		

#### 3.2 PROJECT TASKS AND MILESTONES

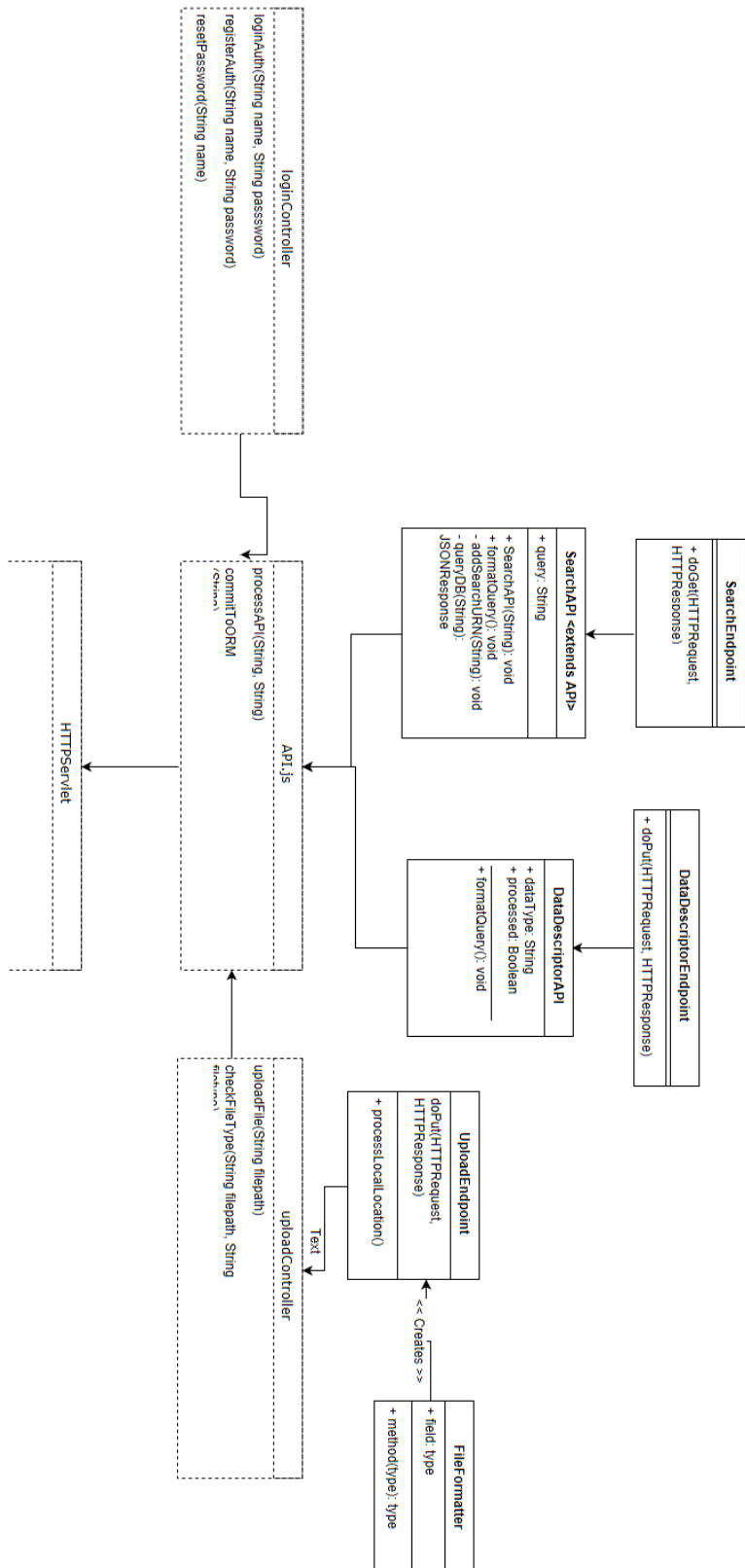
- Design user interface
- Build server API
- Build database
- File standardisation
- Build mobile applications
- Develop geoJSON mapping onto map

#### 4. TEAM RESPONSIBILITIES

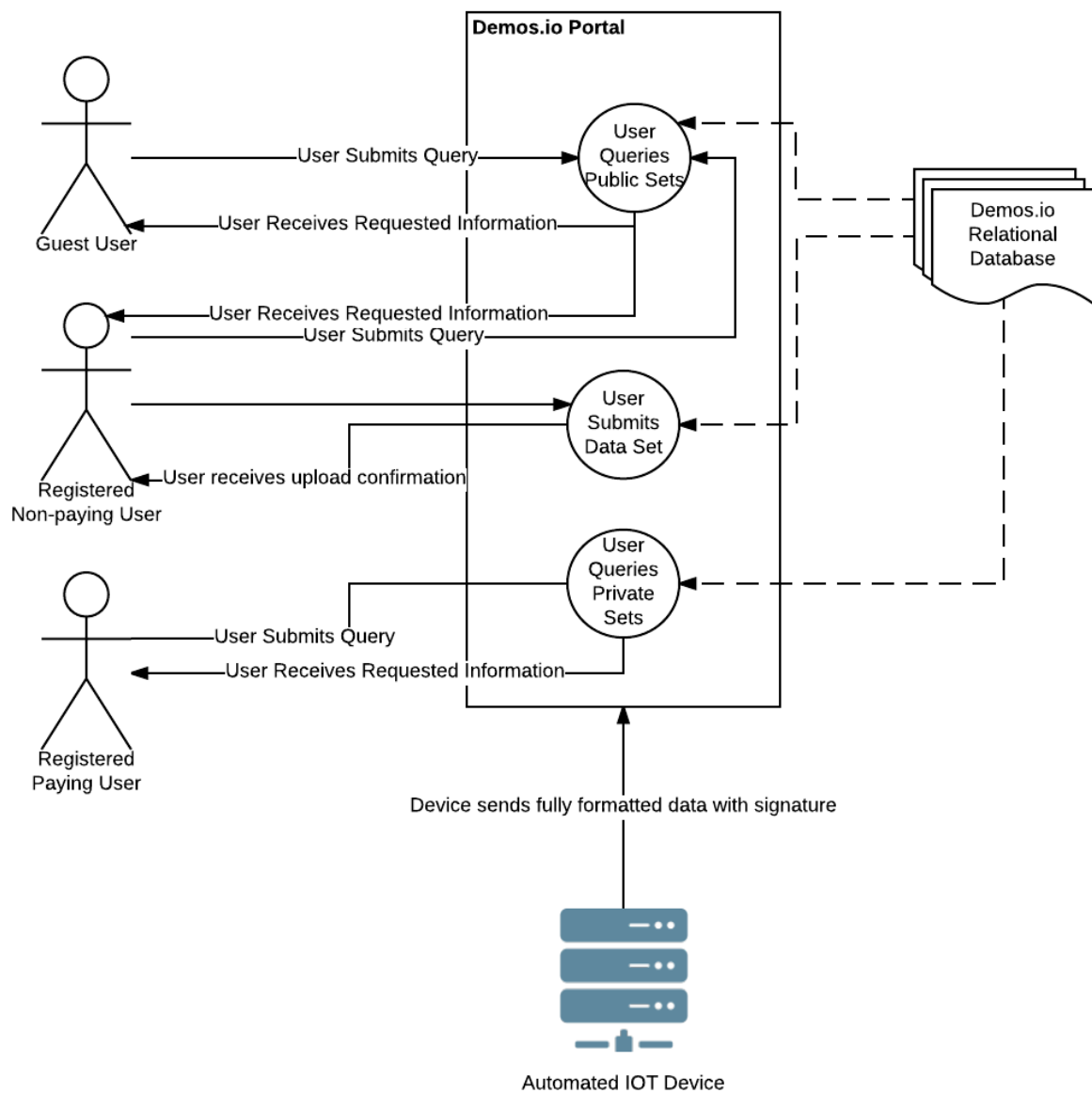
Royal Holloway University Team				
Team Members				
Chloe Houlihan	Emil	Claude Henry-Rochenoir	Matt Brown	Kiat
Team Role				
Project Manager	Business Analyst	Software Engineer	Software Engineer	Software Engineer
Responsibilities				
Divide project into modules and allocate based on strengths	Conduct market research for initial concept	Java programming	Interface	Product design
Host regular progress meetings	Develop the design with regard to marketing and UX	Data analytics and mapping	Web Development	Server development
Resolve conflicts and make final decisions on technology and methods used	Produce parts 6,7 and some of 8 of the report	Produced sensor synthesis	Head of Git management	System operations
Put together parts 1, 2, 3, 4 and 5 of the report	Assist in presenting the presentation			
Produce and deliver a presentation and demo				

## 5. UML DIAGRAMS

### 5.1 UML DIAGRAM



## 5.2 USER RELATIONSHIP DIAGRAM



## 6. MARKET RESEARCH

Due to the steady population growth over the last 20 years, traffic volumes have increased along all classes of UK roads (Road Traffic Estimates: Great Britain 2014 (R), 2014). This has resulted in an increase in traffic congestion and management problems. Traffic jams are far more common in this day, especially involving vans (Road Traffic Estimates: Great Britain 2014 (R), 2014). These types of problems are, present in the UK, are not just limited to motor vehicles.

### 6.1 DEMOGRAPHICS AND SEGMENTATION

Over time there has been a substantial change in the age groups that are involving themselves in vehicle transportation. More specifically, the number of young people with full driver licenses has decreased from 44 % in 1995/1997 to 31% in 2013 (Road Traffic Estimates: Great Britain 2014 (R), 2014).

The booming popularity of the geolocation based games like Pokemon Go has increased pedestrian traffic. As a result, we have increased pedestrian traffic in specific real-life locations related to the game. We can apply this concept to small business owners as a good way to attract crowds near-by, thus increasing their potential customer base.

#### 6.1.1 MARKET VALUE

Through time the definition of what is a “smart city” has changed to include many things, however one thing has remained the same – being part of “smart cities” means “utilizing information and communications technology (ICT) and the Internet to address urban challenges.” Cisco, (Mitchell et al., 2013). Currently it is estimated that the population in urban areas grows by nearly 60 million every year and as a result more than 60 % of the population will live in cities by 2050, which will be expressed in massive resource consumption Cisco, (Mitchell et al., 2013).

The market for IoT and IoE based solutions can be generally divided into 5 smaller subsections:

1. Smart Energy Management
2. Smart Water Management
3. Smart Transport Management
4. Smart Waste Management
5. Assisted Living

#### ***Smart Energy Management***

This subsection is one that demonstrates a very wide range of technology, services and products which leads to specific specialized domains for customers to choose from based on their needs. It is estimated to grow to a value of \$ 500 billion by 2030 (Department for Business, Innovation and Skills, 2013).

#### Trends

1. Smart metering/AMI – the meters of today can provide “real time energy use data, power outage detection, dynamic pricing, switching between suppliers, and a Home Area Network interface.”
2. Smart appliances – growth in this market provides continued opportunity. Sales are projected to exceed 24 million by 2017. Manufacturers have yet to capitalize on this market in part to the results of a survey which showed that “consumers have shown no willingness to buy smart



appliance outside their 10-year average replacement cycle, unless they are available at the right price and deliver tangible energy savings.”

*Information adapted from Department for Business, Innovation and Skills, 2013 page 26 – 27.*

### **Smart Water Management**

A market of considerable size with an estimated growth of 20% annually by 2020 and with an excess of \$22.2 billion by 2020 (excess includes needed innovation and implementation of smart technologies) (Department for Business, Innovation and Skills, 2013).

#### Trends

The market is generally classified as conservative and risk averse due to strict regulations hindering innovation. The adoption of smart technologies in this market has been led by countries like Australia, Israel and Singapore while the UK is lagging in the adoption process. While the opportunities for investment are on an increase investors are not confident in this market due to the long development cycles and heavy capital requirements that may not pay off.

*Information adapted from Department for Business, Innovation and Skills, 2013 page 52 – 56.*

### **Smart Transport Management**

This market has presented huge increase with an estimate of a 20+% increase per annum and an excess of \$100 billion by 2018 (excess includes needed innovation and implementation of smart technologies) (Department for Business, Innovation and Skills, 2013).

#### Trends

The market focuses heavily on Transport Information Application in order to reduce congestions and emissions, improve quality of life, safety and optimize the flow of traffic. Some implementations include:

1. GIS/traffic management service application model integration and convergence;
  - GIS based mass traffic information management engine
  - GIS/traffic management service application model integration and convergence
  - Traffic comprehensive information resources integration
  - Traffic data centre and traffic flow data survey and analysis
  - Traffic data collection, statistical analysis and presentation
2. Intelligent traffic features (to reduce congestion, improve quality of life, reduce emission from traffic, improve safety and optimize traffic flow)
  - Dynamic traffic information acquisition, integration, processing, forecast and distribution
  - Electronic toll collection
  - Intelligent parking guidance system
  - Vehicle licence plate automatic identification
  - Traffic event automatic detection
  - GPS monitoring/dispatching and information service

*Information adapted from Department for Business, Innovation and Skills, 2013 page 83 – 84.*

## ***Smart Waste Management***

On a global scale, it was estimated that the market is worth a total of \$ 475 billion in 2015, however a concrete value could not be estimated due to the nascent nature of the sector (Department for Business, Innovation and Skills, 2013).

### Trends

The main focus of this sub-market is efficiency, enhancement of waste collection and separation, cost reduction and improved recycling. These act as the main drivers of change with some of the deployed technologies reflecting that:

1. Smart Public Realm Bins – self-contained, solar powered trash compactors
2. Refuse Collection Vehicle GPS Tracking – information gathered is used to increase operational efficiency of refuse collection vehicles.

*Information adapted from Department for Business, Innovation and Skills, 2013 page 107 – 108.*

### *Assisted Living*

The market growth is on a continuous increase, in large part dictated by the willingness of households to adopt smart technology. Of particular note is the rate of acceptance in community centres and private households. Smart technology in community centres was valued at \$ 115.5 million in 2009 with an annual growth of 20.2% until 2015 and private household services at \$ 39.4 million in 2009 and with a 28.5% increase until 2015 (Department for Business, Innovation and Skills, 2013).

### Trends

The primary drivers in this market are demographics, with the largest problem being the aging population, economic and social, the demand for care technology for an aging population increases (Department for Business, Innovation and Skills, 2013).

- Market Driven Growth - Increased private participation will lead to higher competition, and private sector investment will drive the growth instead of government-funded projects.
- Private funding - Will rapidly increase and overtake the government funds.
- Diversification - Strong market participants will expand into other lucrative regions, and there will be large-scale plans under execution.
- Interoperability - Equipment is likely to become globally interoperable and will use open platform software to enhance connectivity.
- Shift in Demands - There will be a vast expansion in product portfolio and the aged population are likely to change their demands. There will be specific suppliers for the variety of equipment.

*Information adapted from Department for Business, Innovation and Skills, 2013 page 106.*

## **6.2 TARGET MARKET**

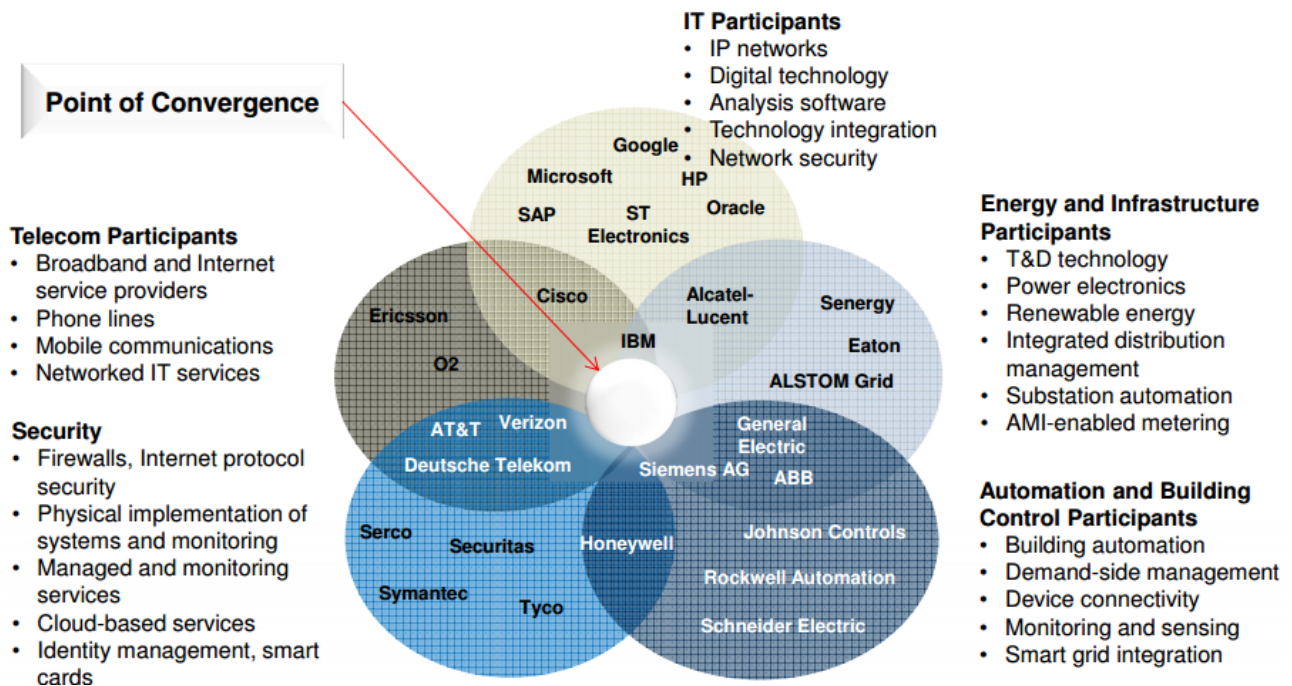
The primary, income contributing customers will be data analysis companies and local business owners. Value to these customers will be provided through the sale of licenses for visualisation of useful data sets to small businesses, and sales of raw user contributed data to analysis companies.

## **6.3 MARKET NEED**

A customisable interface which is pseudo-bespoke for use by small businesses. A central hub of public, but not currently easily accessible, data sets. A platform where users can not just compare locations, nor query specific data and search through APIs for data that applied to them. It should allow them to make semantic queries and should return mapped information that is applicable to their chosen location.

## 6.4 COMPETITION

### Smart City Market: Convergence of Competition, Global, 2012–2025



Source: Frost and Sullivan 'Strategic Opportunity Analysis of the Global Smart City Market'

The competitive advantage provided by our product is the merging datasets from public and private domains in order to provide layered information to assist with decision making for corporate endeavours, by providing niche data relevant to business goals, and individual users by providing specific data to create a bespoke map based on location.

## 7. UNIQUE SELLING POINT

Businesses want bespoke software, however for small businesses this is not always feasible. Our solution is pseudo-bespoke, as it is customisable by the user. Due to the large data set cardinality, they will be able to find the data relevant to them. The user can combine their data with external resources within our easy-to-visualise application, meaning all their data is in one place, allowing them to compare visually.

Our product offers semantic comparisons. This means a user can type with natural language and receive the data they are looking for without scrolling through endless APIs. They can find more than just a location- they find specified data tied to that location.

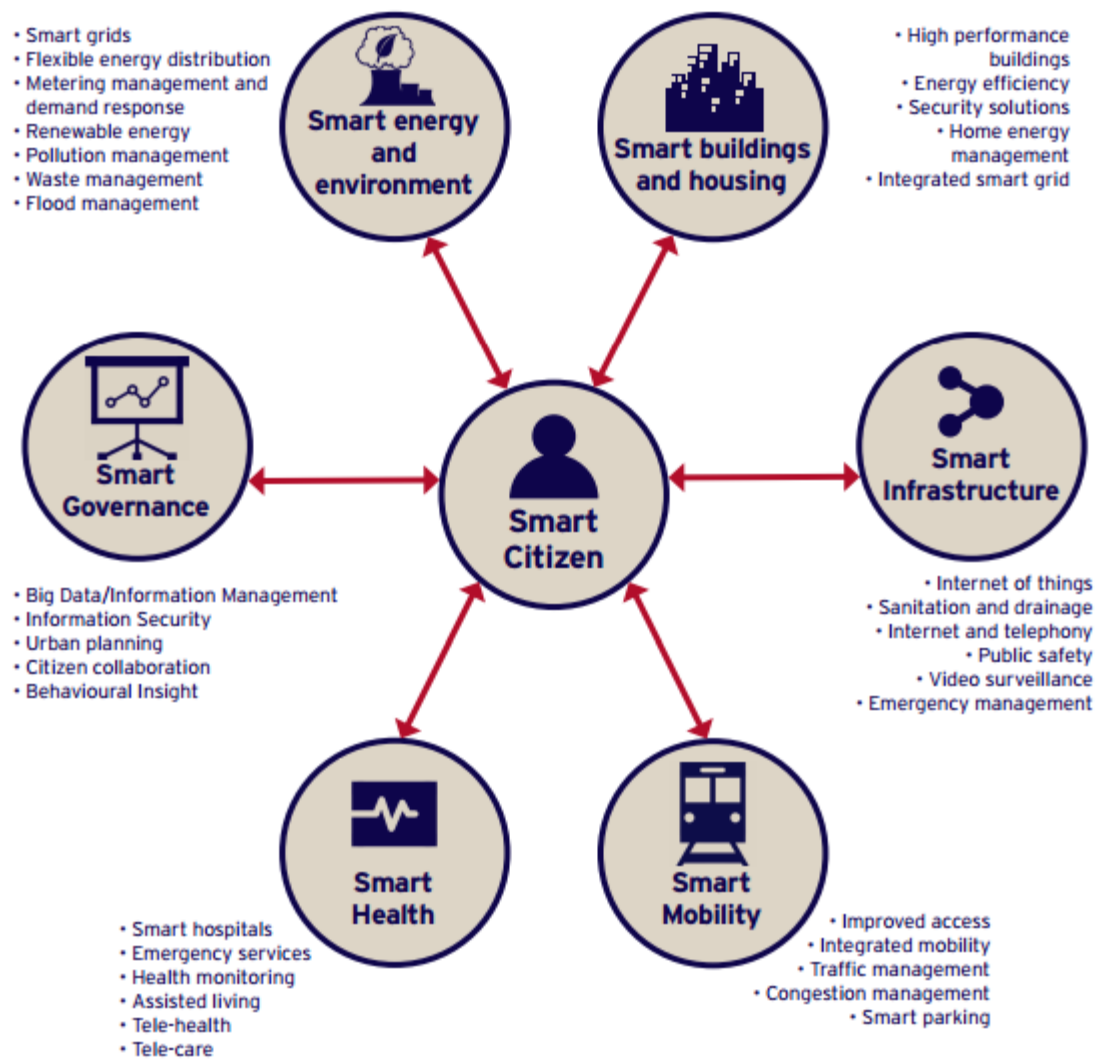
Using document standardisation, users can contribute data without the compatibility issues that arise with Big Data. This expands our database, and thus we reward contributors with otherwise restricted access to certain data sets. This gives everyday individuals incentive to use the application as an everyday tool, not just for business. We allow these users free access in return for data, which we can then sell to analytics companies, and may be utilised by business owners for their own market research.

## 8. PRESENTATION & MARKETING MATERIALS



The inspiration behind our design stems from the smart technology used to map real-time traffic data in “smart cities”. Our goal is to assist business owners to achieve their objectives. Our logo reflects this idea, by combining imagery of a modern city and a geo-marker.

In the diagram below are listed all of the advances offered by “smart cities”.



*Source: HM Government (2016) 'Smart cities Pitchbook'*

Cities are real-time systems, and a “smart city” is made up of several smart systems. An intelligent city will have smart physical, social, institutional and economic infrastructure in a sustainable environment, with its citizens at the centre of these systems.

In order to fulfil our mission we have focused on Smart Governance, Smart Infrastructure and Smart Mobility by merging and layering data from private and public domains.

All of this data can be utilized by prospective clients in order to discover areas and markets in which they can position themselves. Through the use of geolocation and population density measurements clients can make a predictive model of trends on how their potential consumers move and behave in a given vicinity. This can help to determine what type of advertisements are most effective, what products to offer and if they need to reposition or refocus themselves in the market in order to achieve the highest level of consumer satisfaction, reputation boost and revenue increase.

## 9. REFERENCES

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DEMOS.IO

DATA DEMOCRATISATION

# EXISTING TECHNOLOGY

- GOOGLE MAPS
  - NEAREST COFFEE SHOP
  - SHOW LOCATION RELATIONSHIPS
- SOCRATA
  - DATA SETS COLLECTED FROM LOCAL SERVICES, BUSINESSES AND SURVEYS
  - LIMITED TO GOVERNMENTS
  - OPEN DATA NETWORK AND CITY OF OAKLAND





## OPEN DATA NETWORK

Publish data and share. Find data and build. Answer questions.

What is the annual change in gdp of Washington Metro Area (DC-V





# WHAT IF WE COMBINED THESE TECHNOLOGIES?

- MAKE IT PUBLIC
- REWARD CONTRIBUTING USERS WITH INCREASED DATA ACCESS
- A PLATFORM TO MAKE ACCESS TO THESE PUBLIC DATA SETS EASY AND IMMEDIATE
- SIMPLE INTERFACE, INSTANT RESULTS

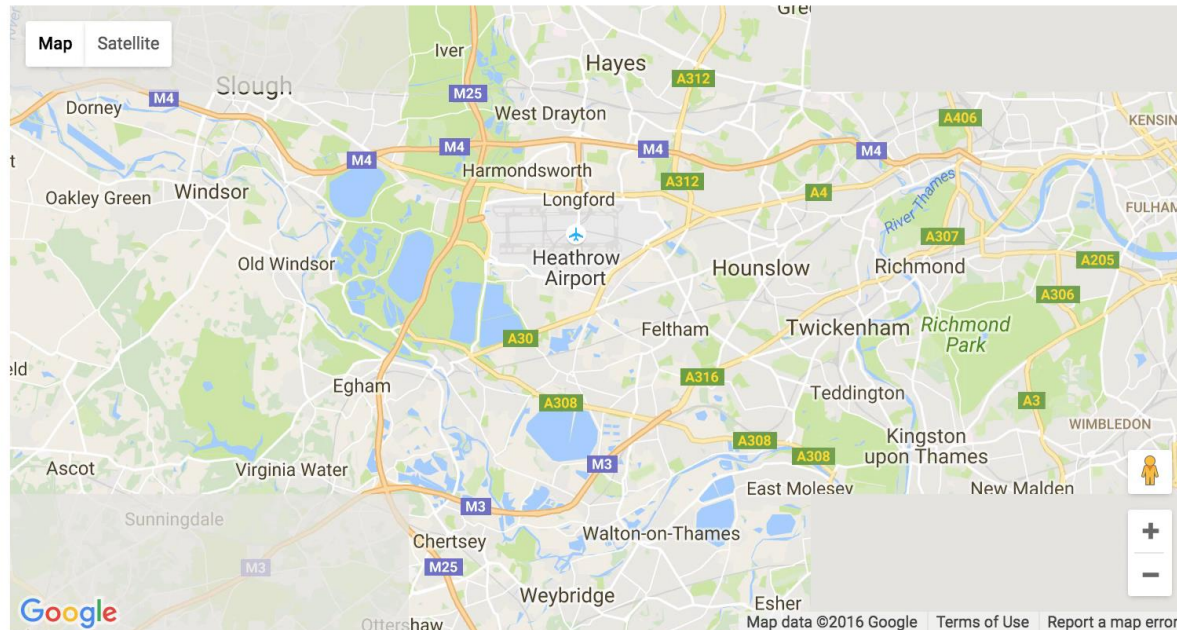


# DEMOS.IO – PHARMACIST EXAMPLE

Demos.io Contribute

Login Register

Search the City



Locations

No locations have been added.

Data Sets

No sets have been added.

Update Map

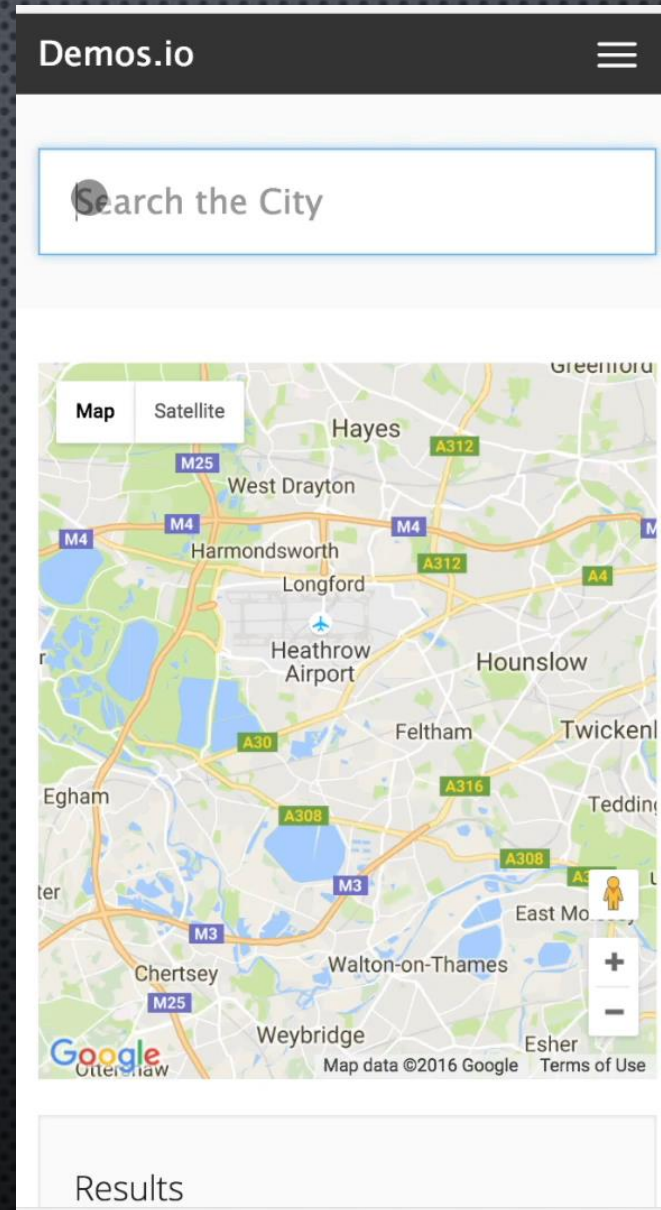
Results

Waiting for maps.googleapis.com...





# MOBILE APPLICATION



# CUSTOM QUERIES

- OUR PLATFORM ALLOWS DATA ORGANISATION AND CORRELATION
- THIS ALLOWS USERS AND APPLICATIONS TO MAKE CUSTOM QUERIES
- GOOGLE ONLY ALLOWS LOCATION COMPARISONS, WE ALLOW SEMANTIC COMPARISONS
- COMPARE VICINITIES, PRICES, TRAFFIC, AIR QUALITY, THE COMBINATIONS ARE ENDLESS





# DOCUMENT STANDARDISATION

- TO AVOID BIG DATA ISSUES WITH USER CONTRIBUTIONS, WE HAVE CREATED A DOCUMENT STANDARDISATION
- NOT BIG DATA BUT STRUCTURED DATA
- THIS MEANS EVERYONE CAN CONTRIBUTE TO THE DATA WITHOUT FORMAT ISSUES





# BACKEND PROCESSING

- IoT DEVICE INTEGRATION
- DEVICE SEND DATA WITH HASH OF VALUES APPENDED TO PACKAGE
- HASH IS THEN ENCRYPTED WITH PUBLIC KEY
- OUR PRODUCTS MAINTAINS EXCLUSIVE CONTROL OVER THE DEVICE
- WE HAVE MODELLED SENSORS WITH LIVE UPDATING

# POSSIBILITIES ARE ENDLESS

- USER CONTRIBUTION ALLOWS ANYONE TO ADD SENSOR DATA
- INCREASES SPAN AND TYPES OF DATA SETS
- ALLOWS THIRD PARTY APPLICATIONS TO QUERY
  - TRAFFIC APPS
  - POKEMONGO THIRD-PARTY APPS
  - AIR POLLUTION MAPPING





# WHO ELSE WILL USE IT?

- ANY SMALL BUSINESS OWNER
- LARGE COMPANIES CAN PURCHASE OUR USER-CONTRIBUTED DATA SETS
- USERS CONTRIBUTE IN RETURN FOR FREE DATA USE



ANY QUESTIONS?

