Infrastructure Strategy Smart Airport Report

Introduction

Internet of Things (IoT) devices are used to connect with other products/networks using a wide range of different wireless protocols such as Bluetooth, Wi-Fi and 4G. These devices are designed to make the user's lives easier for them, providing an array of purposes, whether it's used in the physical world or human-centred environments.

With airport managing companies have a growing interest in IoT technologies and Mobile Crowdsensing to build a 'smart airport' to optimise the indoor lighting across the entire building, I will describe the functional requirements and architecture of the system. This report will provide diagrams that identify the various entities of the system and how they interconnect with each other.

Functional Requirements

To build the Smart Airport, the company will need to follow specific functional requirements which includes using a IPv6 addressing scheme and gather user data that has been collected from embedded light sensors. The data will also be stored in a database, processing the information to operate the automatic indoor lighting systems used around the airport.

The company should be able to incorporate Mobile Crowdsensing to the airport, letting users use their smartphone devices get free Wi-Fi privileges if they agree to the application's terms of service which involves giving consent for data collection.

The application should also be used to increase the volume of collected data, making the system perform more efficiently as well as saving energy. This will give the users the ability to provide feedback on the mobile crowdsensing which is extremely important because it makes sure that there is excellent customer satisfaction which helps the business improve their system more effectively.

With data being collected through mobile crowdsensing, it can be a sensitive issue for individuals as it could reveal information that they didn't want public such as home and work locations and routes they take when commuting. Ensuring that their privacy and security information is collected safely is therefore extremely important.

The system should be designed to have a back-end system which collects all the sensory data and other relevant meta-data. Furthermore, it will be used to produce a real-time luminance map of the airport based on operations of the indoor lighting systems. This will cause the company to save money because they will be using less energy to power the indoor lights throughout the airport.

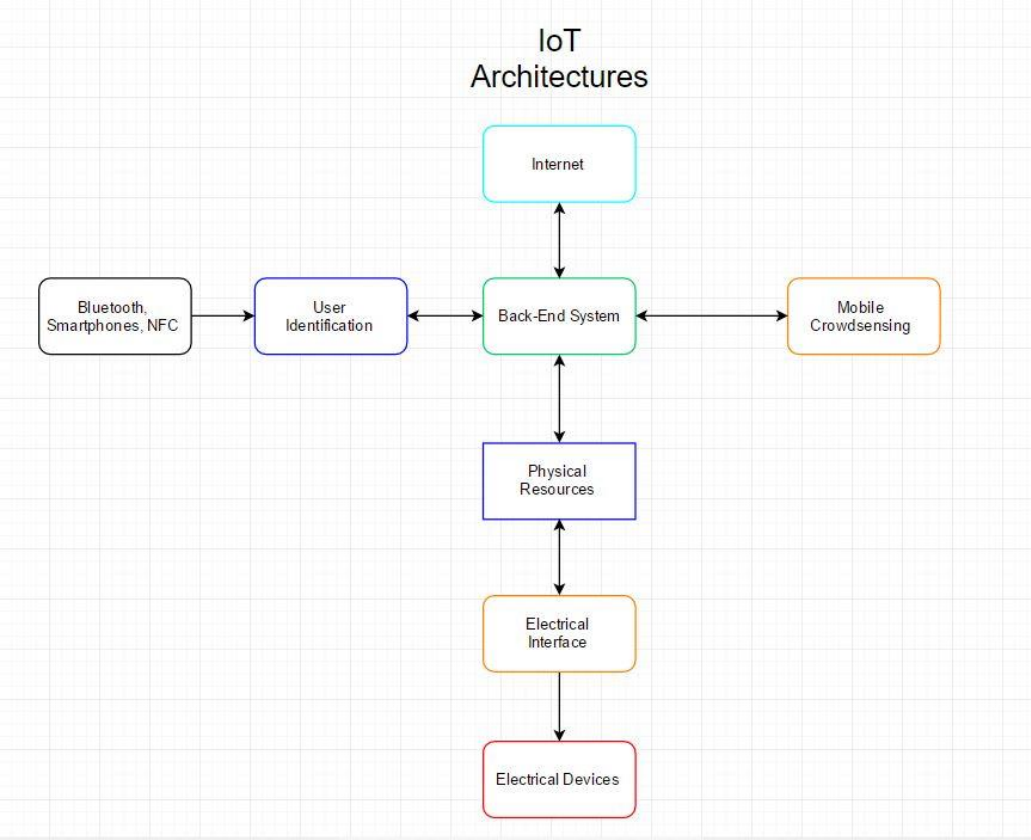
Cloud computing is a growing practice in the IT industry which we will use to get network of remote servers on the internet to store and manage data. There would have many benefits to managing the data received by consumers in remote servers. One reason would be that it's more flexible as it's better for businesses that have a growing or changing bandwidth demands. Another reason would be that it's able to

work anywhere, if the consumer has an internet connection and in regarding to this project, all consumers will have free Wi-Fi if they agree to the terms and conditions on the phone app.

Functional Architecture

IoT Architecture

Designing the architecture for the smart airport project should be one of the early steps in this large task. The back-end system will be connected to multiple components such as the internet, the mobile crowdsensing section, the physical resources and showing the user identifications of each consumer that has the application on their smartphones. The electronical devices are referring to hardware components like sensor motes that can track the light emitting from consumer's phones and additional hardware that the company wishes to add in the future.



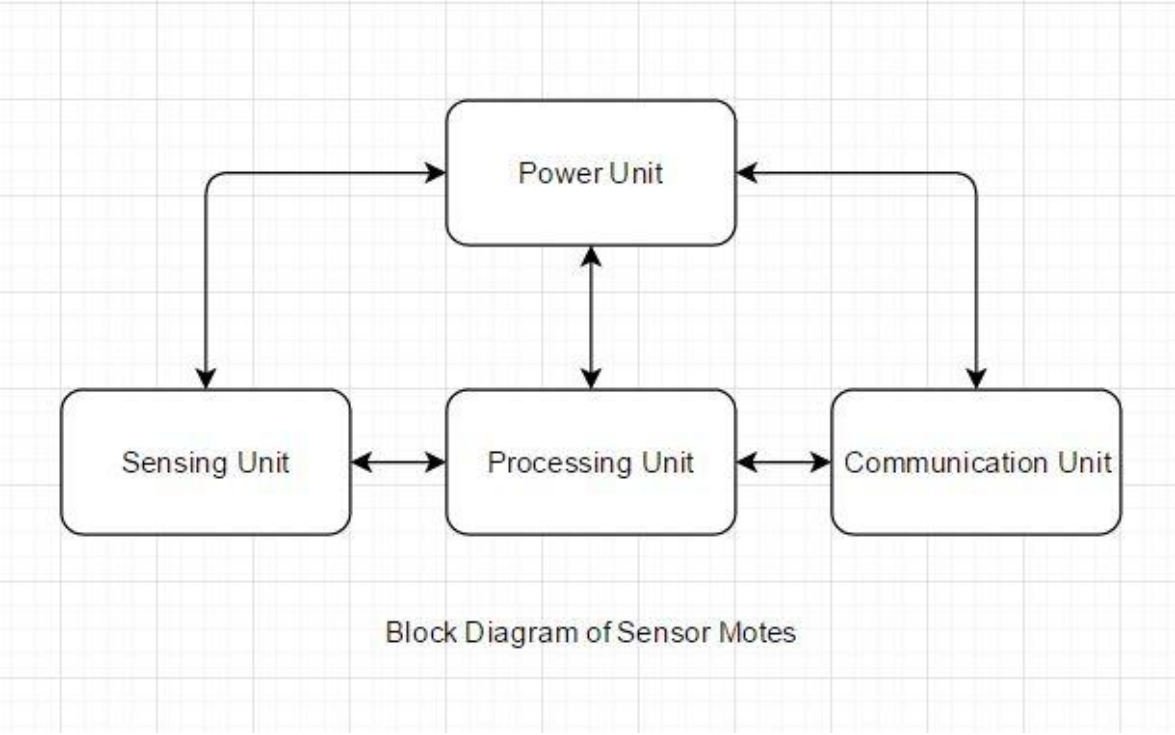
Sensor Motes

Sensor motes will be deployed in key parts of the airport, all equipping with embedded luminance sensors. These motes will be used to communicate wirelessly with peers, forming a wireless sensor network. This is important because it allows the network to collect sensory data and relay them to the airport back-end.

The board should have easy access to controls so fitting it with an LED touchscreen will allow users to view and monitor data being gathered in real time from the Wireless Sensor Network.

Across the entire airport, there will contain sensor motes distributed at key areas where there are a lot of pedestrians using their mobile devices. The sensors will have a low budget and contain embedded sensors to track motion, which will be highly constrained in computation resources and energy.

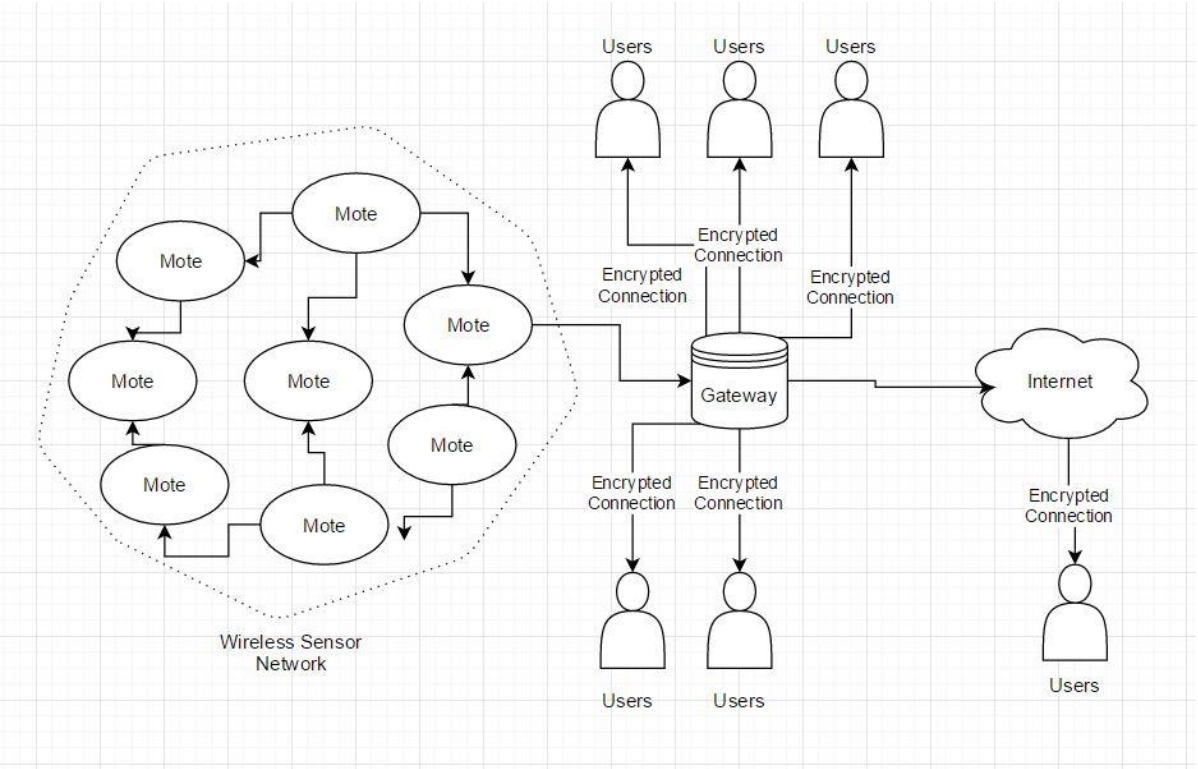
An example of wireless sensor nodes that we could use in this project are the Bosch SensorTec ASSN sensor hubs as it's also very low powered and flexible which will benefit our project in case of Scope Creep occurring.



Block Diagram of Sensor Motes

Above is a block diagram shows the general arrangements of the components that the sensor motes will have. The power unit needs to always have adequate energy available to power the sensors. This is because the sensor motes will be placed in hard-to-reach locations around the airport and would take too much time and effort to change the batteries. The batteries will be rechargeable and the main source of power for the sensor motes.

The sensors are used to capture light emitted by mobile phones throughout the airport, an active sensor acting depending on the environment. If there are more users in a specific location, then the light sources will be brighter as a result. The sensors will be self-powered, meaning that their batteries will be the only thing required to amplify their analogue signals.



In the next diagram, it contains the overview of our Wireless Sensor Network Infrastructure containing the Sensor Motes, the user's smartphone devices and the Network Gateway.

Regarding the Network Gateway, it will be built to run on a Linux kernel and contain the standard hardware connectors like Ethernet, USB ports and SD card readers. An example of a network gateway that would be perfect for this such as this would be the existing NGW100 kit from Atmel due to its low power and high speed connectivity.

Above contains a basic overview of the Internet of Things Architecture that could be used during the development of the project. The architecture will be using a Constrained Application Protocol which enables constrained devices to communicate with the wider internet using very similar protocols. All the connections between different mediums will be encrypted for added security measures.

An application layer protocol that could be used for this project is Constrained Application Protocol, which is designed specifically for resource-constrained devices such as Wireless Sensor Network nodes. It will be used between devices and notes on the network and can translate to HTTP for a simplified integration with the internet, while at the same time meeting the correct requirements that includes simplicity and multicast support.

Safety and Security

To protect the infrastructure, especially in a critical department such as an airport, we will need to invest in a system that will limit the vulnerability for it to be sabotaged accidently or purposely at any time. It's best to budget the security infrastructure depending confidentiality, the integrity and the availability of the system. One way to

ensure protection is to provide the users with anonymity, removing their identifying information before sent to the third party.

It is recommended to do participatory crowdsensing instead or opportunistic crowdsensing. This is because we want the users to have the option to take part in the technique or not, forcing the users to download and install the application on their smartphones wouldn't work because it's very anti-consumer and some people that will use the airports may not have a smartphone.

Conclusion

In conclusion to this report, it's a realistic and beneficial project that will save the company energy and money in the process as well as providing good customer satisfaction if the data gathered from customers has been secured and kept safely and professionally.

There could have specific improvements such as gathering the location settings from the users in the airport instead of using embedded light sensors. This method will give a more accurate and precise reading on how many people are in specific areas throughout the airport. However, some users might be disinterested if the company can track the user's movements throughout the airport

Working on the functional requirements and architecture described in this report however, will provide a scalable and financially viable way to extend the IoT infrastructure of the local airport and should build a good foundation if the business wants to create additional projects in this area of IT.