Capstone Project

Specialized Parking Oriented Technology

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Introduction

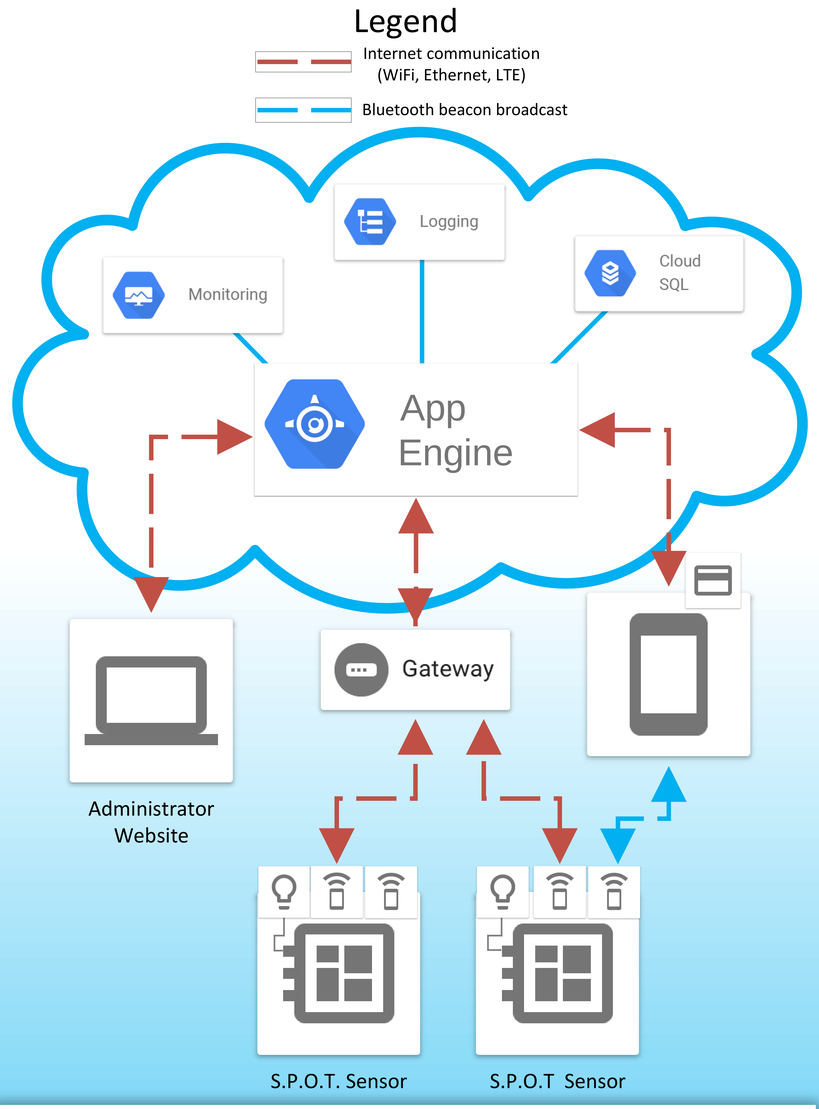
The purpose of this project is to design a power efficient parking management system that will make parking easier to manage for parking services as well as give users an easier time with finding and paying for parking. Users are able to track the number of available spaces in parking lots and automatically verify their parking through their smart phones. Parking services can track parking spot status and manage user account information through a secure website.

Gateway

The gateway is a low power device that handles status information between S.P.O.T sensors and the cloud. We are using a Raspberry Pi 3B as our gateway. The gateway forwards spot statuses to the Google Cloud's App Engine while forwarding verification messages from the App Engine to S.P.O.T sensors.

Power

Administrator Website



App Engine

The Google Cloud App Engine is used as a framework for hosting web applications, facilitating communication to the Gateway, Mobile App, SQL Database, and Administrator Website through the use of the HTTP messages. The App Engine serves multiple functions:

- Updates sensor statuses from Gateways to the SQL Database
- Verifies a user's permit with the parking spot type
- Handles payments and deductions from a user's balance
- Delivers availability of the parking spots to Mobile App users
- Executes user account changes and parking lot status lookup from an Administrator Website

Mobile App

The mobile app is user's primary interaction with our service. The app allows users to preform multiple tasks:

- Allow users to verify their parking permit simply by opening the app
- Enables users to check their account balance, permit type, and the current spot they are using.

S.P.O.T Sensor

- S.P.O.T sensor units initiate communication between the user and the app using Bluetooth iBeacons
- Units update the App Engine with spot statuses through a gateway using TCP over a 802.11n 2.4 GHz WiFi connection
- Each units serve multiple functions:
  - Detects cars entering and leaving spots
  - Communicates spot status with the user through LEDs
  - Control a Bluetooth iBeacon used by the mobile app to identify the spot a user enters

Conclusion