Introducing Office IoT for iPhone and iPad

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Introduction

Welcome to Office IoT, relayr's unique Smart Office prototype for connecting your surroundings to the internet. Office IoT allows users to monitor a multitude of systems in one place, from which windows are open in a given building to how many people are inside and the ambient temperature. Given the relayr login credentials, you can view live data from relayr's office in Berlin. Otherwise, select the demo to see a simulation of what relayr's cloud solution can do for you. With Office IoT, relayr is making daily life easier and increasing efficiency, providing an accessible platform to facilitate infrastructure maintenance.

Functionality

Office IoT is a prototype that can be extended well beyond the office, anywhere from private homes to commercial enterprises. On a basic level, the iphone app displays a global office map with live information from the cloud. Open windows are shown in red and the current ambient

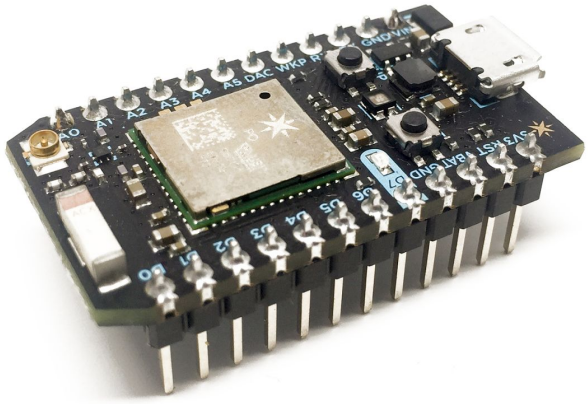
temperature of the office can be seen in the display footer. Furthermore, the footer gives an estimated count of how many people are in the office, changing throughout the day with the in and outflow of individuals. If your device loses connection to the cloud, Office IoT provides you with a user friendly way of reconnecting with the mere click of a button.

Of course, displaying data from relayr's office in Berlin could potentially pose security issues, so you'll have to provide password credentials to access the live feed. In the interest of showing the prototype to the world, we've also created a "demo mode" which simulates the data that Office IoT can provide.

Awesome! So we've seen what it can do - but how does it work?

The hardware

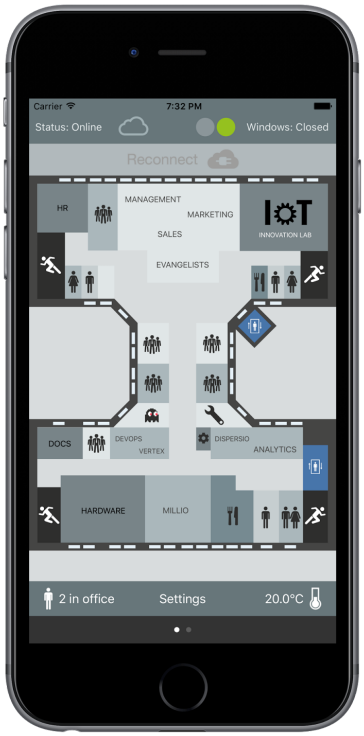
To monitor the windows, we've installed Particle Photon microcontrollers throughout the office, attached to simple magnetic switches for detecting whether windows are open or closed. Each Photon sends the data to the relayr cloud as a JSON, using the MQTT protocol and our office wifi connection. For the temperature, we used the relayr whitebox to collect and send data to the cloud, which can then be accessed in the same way as with the window data.



As for the number of people in the office, we developed a solution that can work for any office or building, regardless of how people enter or leave the structure. Initially, we set up infrared sensors to detect the coming and going of people in the office, which proved impractical and often inaccurate. Instead, we took advantage of our CISCO Meraki routers to calculate how many devices are connected to the internet. Our five routers in the office then send this data to the cloud, which is immediately accessed by the Office IoT app. Finally, we correlate this data to the number of people in the office (and subtract the number of devices that are always connected to the internet) to formulate an estimate of how many people are in the building at any one time. Since most people have a phone and a laptop that they connect to the internet, we've found that our estimated count is consistently within a couple people of the actual count.

The app

Office IoT, for iPhone and iPad, retrieves all the sensor data from the cloud and analyzes it to provide users with an overview of the office's current status. Coded in Swift, apple's own programming language, it uses the CocoaMQTT framework to communicate with the relayr cloud. The app takes advantage of relayr's channels API to subscribe to all the sensor devices, without creating an individual MQTT pipe for each one to improve performance. Office IoT also saves a user's relayr credentials once he or she has entered them, to avoid having to repeat the login procedure each time.



The global office map image was originally a Scalable Vector Graphic (SVG), but had to be converted to core graphics swift code (using PaintCode) because apple only natively supports PNG and JPEG asset formats. While drawing the entire image using core graphics leads to longer compilation times, it is ultimately much more efficient than using the natively supported formats and facilitates changing the map to show live data, such as with the windows.

Below you can find a github repository with the entire code for the app. We've taken out our relayr credentials, but you can put in your own to use the prototype for your home or other building.

Where next?

The Office IoT prototype has nearly endless potential - from helping to monitor if potted plants have to be watered using humidity sensors to checking the vacancy of bathrooms in the building. One can easily receive new data with the app, simply subscribe to new topics and start displaying data from the cloud! We plan to start collecting temperatures from around the office to generate a heat map, which will be displayed on the app to see if the server room is too hot. We also want to install weight sensors underneath our water bottle crates to monitor if our beverage supplies are running low, which will result in the app automatically placing a new order of supplies.

With Office IoT, users can increase their efficiency, improve their daily lives, and further connect themselves to their environment. Although the app focuses on relayr's office in Berlin, it can be optimized to serve any home or commercial enterprise, all with the help of relayr's unique cloud technology. To start, simply download Office IoT to see what the Internet of Things can do for you!