

Pawpharos: Pet Tracking Utilizing Bluetooth Low Energy Tags



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Abstract

Bluetooth low energy tags are popular for their price, availability, and convenience. Utilizing this technology, a product was formulated to track the location of pets by pinging the bluetooth signal off of Raspberry Pi Zero “sniffers”, and being able to see it through an account on the Pawpharos web page. This allows for tracking from anywhere, which is not only convenient, but also helps pet safety and security, especially with owners that may not be home much of the time.

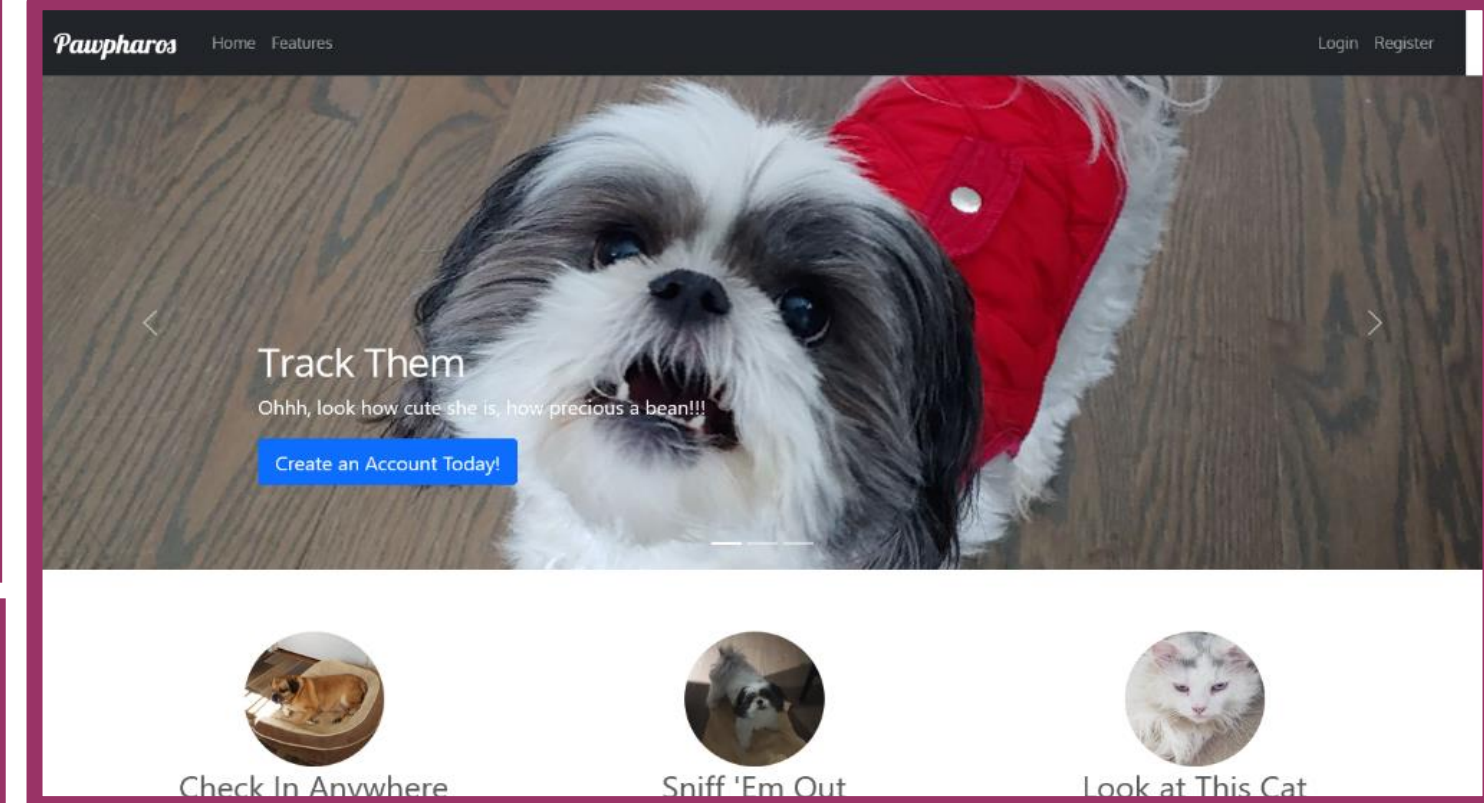


Figure 2: A look at the title page of the Pawpharos website, where owners are able to register, log in, and see the location of their pets.

Introduction

Pets are valued members of families across the globe. Most of the time, they stay inside the houses of their owners. Many times, there is no one at home to watch the pet, like during the day on weekdays when people are at work or school, or extended periods of time, such as vacations or work trips.

This brings about an interesting problem, how does the owner know what the pet is doing, or that the pet is in a room or place that they are not supposed to be? These could be rooms with valuable items, or places that could be hazardous for the pet. This question is important, and one we decided to tackle with our project.

Product Expectations

When designing the product, we had a few simple goals:

Inexpensive: As a novelty product, an inexpensive design allows for a more competitive product. The product should be effective, and inexpensive.

Simple: The product should be easy to set up, and consumer friendly. Documentation should be easy to understand, and the product easy to use.

Scalable: The product should be able to account for houses of any size or layout and should have the ability to be shifted and adjusted around from room to room without issues on the hardware or software side.

Proposed System

To achieve these expectations, we decided to utilize Bluetooth Low Energy (BLE) technology in the form of a beacon, to ping off Raspberry Pi Zero's. The sniffers use a master-slave relationship, where secondary sniffers send information received from the tag to the master sniffer, when the tag passes through the zones defined by the sniffers. When the signal is received, the sniffers relay information to the web server through the master sniffer.

The updates are viewable through the web app, which updates in real time based on the login and connections from the devices to the account that was created for those devices. All updates will be automated after the initial setup, making usage of this product simple, with the ability to add more pi's for scalability purposes without hassle.

Theory

Our project utilizes several services on the back end to ensure that everything is running smoothly, and securely. Our front end web server is primarily built off of Django, which handles the routing of requests, combined with Javascript and HTML scripting to view the data associated with the account, initially created with the purchase of the product, on our website.

As for the sniffers, they communicate with the webserver by utilizing HTTP requests. Using python functions through Django, responses are generated based on the requests made by the pi, once the signal has been picked up from the sniffers and beacon.

From beginning to end, the process begins with the BLE tag constantly sending signal at a specific frequency at a low range, until it is picked up by one of the pi's. This pi sends a signal to the master sniffer, which then sends a signal to the web server via the HTTP requests, through the Django framework. This updates the web server with the information of where the pet's location has pinged. This is viewable in the person's account, once they login through the website and access their linked devices.

Marketability

Along with the webs server, our group also carried out its own market research in order to justify our product's viability on the market. There are several products on the market, from repurposing lost item tags, to dedicated pet tracking tags.

For our device to be competitive, the cost needs to be in the low \$100 range, as other devices in the market have initial costs around this price, but come in with a monthly subscription, which we do not intend on adding, for added competitiveness.

By buying the pi's in bulk, and making our own Pawpharos 3D printed branded case, it would allow us to drive cost down to around \$125. This would allow a target price of \$134.99 for a base kit, which includes room for an 8% profit margin per unit.

	Tile BLE	Whistle Go GPS	Tractive BLE/GPS	Pawpharos BLE
Pet Tracking	X	✓	✓	✓
Mobile App	✓	✓	✓	X
Battery life 1+ year	✓	X	X	✓
Distance Over 1 kilometer	X	✓	✓	X
Cost Less than \$100	✓	X	X	✓
Subscription	X	✓	✓	X

Figure 1: This table shows the current comparison of Pawpharos to other tracking tag products on the market.

Conclusion and Future Work

This project has a lot of potential for future modules and abilities. Examples of this include live video updates, while remaining secure, as well as active deterrents that work in coordination with Pawpharos and the sniffers, to actively prevent pets from going to dangerous areas and stay out of annoyances, such as the garbage. Development of a future mobile app will also add to the appeal of the product.

Though a novelty product, the ability to expand on a project using small, modern, and non-intrusive methods to create a powerful and secure pet surveillance system, could also have broader implications in the security or surveillance fields.

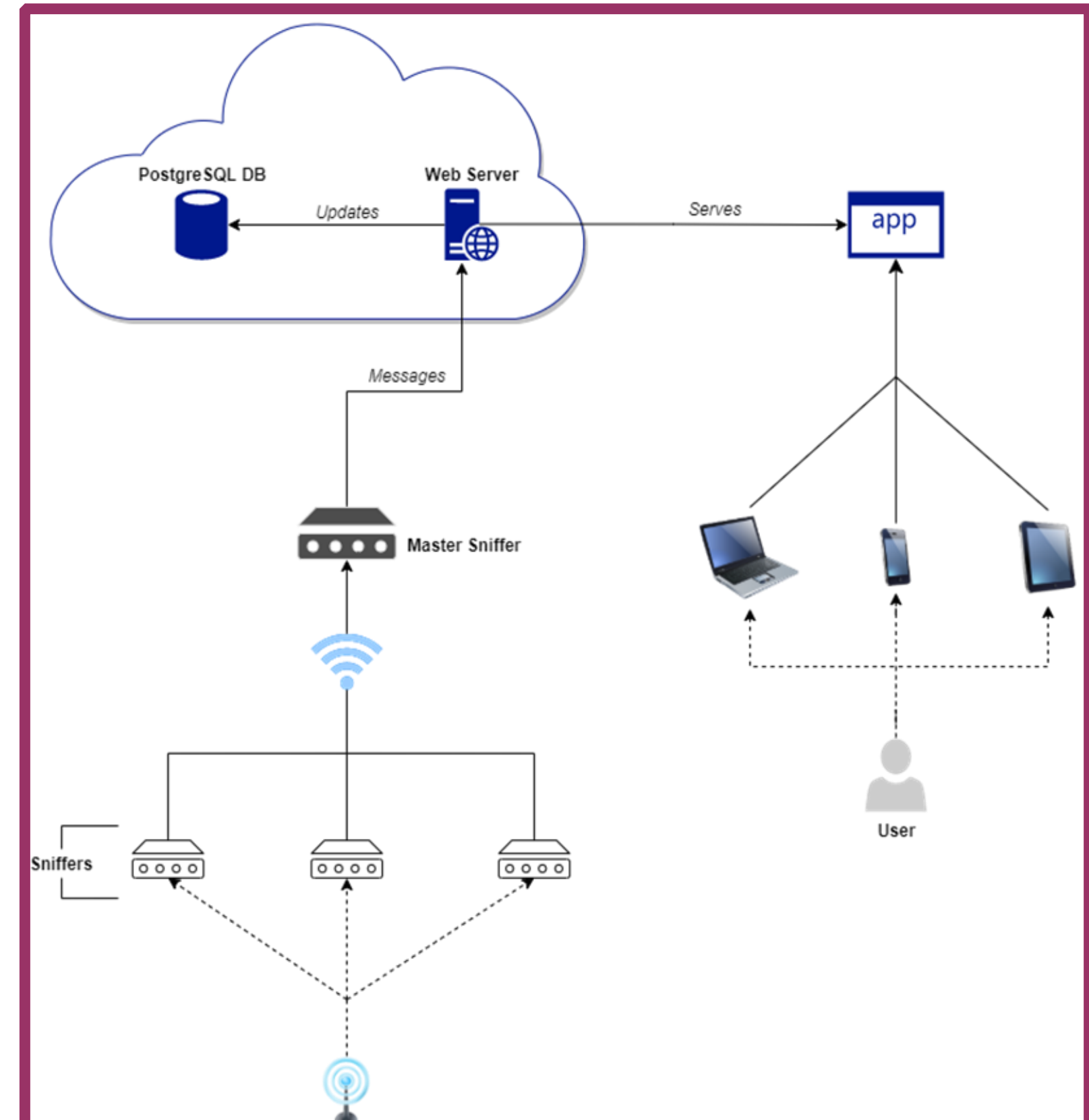


Figure 3. Network Diagram of the our product

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