IOT Homecare

Tender

May

2017

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Albert Prime

Table of Contents

Project Overview

As an elderly or just sickly person, it is common for those who can afford it to hire a 24 hour caregiver to monitor the patient and give them attention when needed. This becomes a problem when you cannot afford the service or you're just uncomfortable with introducing this strange person into your life. The Internet Of Things HomeCare System is a system designed to reduce costs of being a sick person such that you do not need a 24 hour caregiver with you checking your blood sugar levels, heart-rate and what not every 2 hours.

The name we have chosen for the system is Nightingale. We chose this name because the name Nightingale is synonymous with healthcare, thanks to Florence Nightingale, who was a pioneer in the field in the 1800s.

A few ideas for how the system can be implemented and used:

- An automated medicine dispenser that can be set to dispense medicine according to time and dosage of the person it is meant to take care of. The dispenser can also have a reminder each time it is time to take the medicine. All the tablets can be dispensed into one small bowl so that the patient doesn't have to keep track themselves.
- The system can automatically turn the sprinklers on and off depending on time and weather such that if it's going to rain, water won't be wasted. This can be applied to household items like curtains, windows, lights etc such that if there is no movement in a room for a certain period of time the lights turn off and on again if there is motion.
- The system can include room sensors that can notify the caregivers when there is an unusual pattern of movement. If the patient hasn't moved in an unreasonable amount of time, taking sleeping and "when out" into consideration.
- We can include a smart bracelet that monitors the user's heart rate. The bracelet can include a panic button that the user can press should anything need immediate attention, signaling the caregiver. The heart rate monitor can send data periodically or on request.
- A feature that can create an alert if the stove has been on and empty, the tap running or the lights on for an unreasonable amount of time let the user know incase they've forgotten to prevent harm and save resources.
- The system will include an application that can be used by the caregiver to monitor the user and if need be, control the devices and sensors. The patient can also use the mobile application to control

the devices and sensors but certain functions like changing medical dosages and switching sensors off will require administrative authorization. This can be used to control devices around the house such as the TV, lights, dishwasher etc.

- The application will also include a login for the family of the patient where they can check up on the user and communicate with the caregiver for updates.
  This system is one that has no boundaries. The innovative possibilities are endless. The implementation will have to be modular because we need to be able to add features over time and make very few to no changes to the system itself.

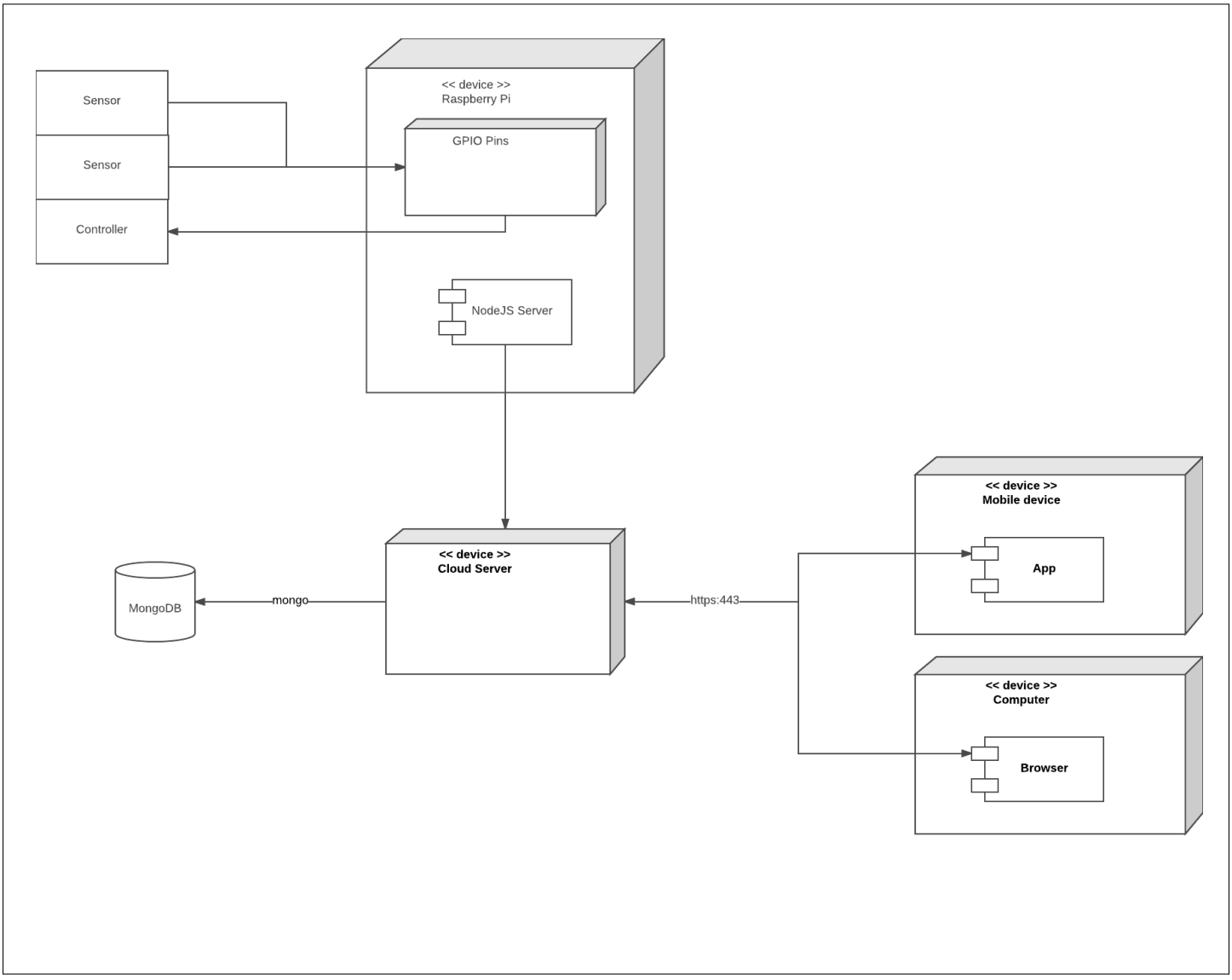


Figure 1: Deployment Diagram

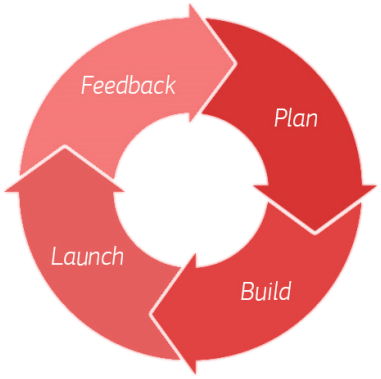
Proposed Methodology

We value the relationship formed between the client and our team and the importance of having a good relationship. So much so that we want to include you throughout the whole process of building your project by presenting demos and working with your feedback; as well as keeping you up-to-date on our progress.

Our Methodology
This all forms just one part of the methodology we've chosen to development your project. The agile method. Specifically, feature driven development. One of the biggest advantages about this is that we can quickly and easily incorporate feedback into the system.

Procedure
We will begin by developing an overall model of the system. The model will represent our solution and how we intend to develop it. Once we have agreed upon the system model we can begin working on the feature list. This list will contain all the features you wish your project to have. We will ranks each as either a major or minor feature and begin working through such accordingly. For each feature we intend to develop a plan to construct the feature.

Development
Lastly, develop the features. As we go through we'll go through each feature on the feature list we'll create the plan, develop the feature and move to the next feature. We believe this will provide the best experience for communication and producing the product.



Timeline

We would like to meet our clients as soon as possible to begin discussing your vision for the project and to clarify as much as possible before we begin work. Currently there are 3 demos assigned for this project:

- Demo 1: 26th May
- Demo 2: 28th July
- Demo 3: 1st September

During these demos we will show you the progress we have made and get feedback from you about what you like and what you would want changed. Our current plan for the demo meetings are as follows:

- Demo 1: Discuss requirement documentation that we have produced, as well as demo a mock front-end that we have produced to demonstrate how these requirements can be met.
- Demo 2: Discuss design documentation that we have produced, as well as demo the progress we have made with the various subsystems of the project.
- Demo 3: Demo the various subsystems of the project, and potentially have a working, integrated prototype of the full system, as well as present some user documentation.

During each of these demo sessions, we would appreciate any feedback that you may have. Any criticisms or advice that you may have for us will be greatly appreciated, as we greatly value your input and believe that it is important in order to deliver the product that you require. During the final evaluation phase, which begins on the 13th October, our client will receive all of documentation as well as a fully integrated system.

Please note that, as the client, you are more than welcome to adjust this timetable as you see fit. Additionally if you would like to have any additional meetings to check our progress, or make an adjustment to the specification, we would be more than happy to arrange it. We believe the more input we get from you as a client, then more refined the final product will be.

The Team

Dimpho Mahoko

Software Developer

I am an aspiring software developer looking to gain new skills and develop those I already have. Notable skills include web development, Java, C++, JavaScript, PHP, HTML.
Below are my accomplishments worth mentioning in no particular order.

- Second place in the Standard Bank IT challenge finals in 2016.
- Webmaster at Tuks FM from September 2016 till present. Responsibilities include maintaining the website and keeping it up to date.
- Mentor at The University of Pretoria EBIT Week for EBIT Marketing.
  Responsibilities include database administration, website maintenance and all other admin related responsibilities like communication with parents whose children wish to attend EBIT Week.
- 2016 Retro Rabbit Rabbiteer program attendee
  The program was focused mainly on giving programming students an idea of how work in the industry is actually done. Notable technologies learnt include GitHub integration with team work and cloud computing and hosting.

Jason van Hattum

Team Leader | Android Developer

I am a motivated developer and student with a passion for application and web-app development, currently studying a BSc(Computer Science). Technologies that I am fluent in include full-stack MEAN and LAMP development, Java, C++, Android, Python and Django. I have experience in project management, web-app development and Android application development.

I enjoy experimenting in my free time, especially working on side projects on my Raspberry Pi and building Android applications. I also enjoy making graphical programs in WebGL. My hobbies also include reading, playing games, and fishing.

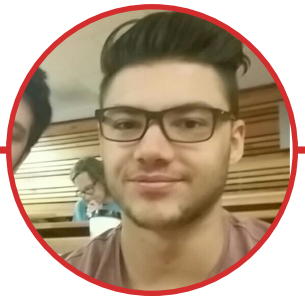
Projects that I have worked on include:

- A web application for the University of Pretoria used for peer-review and team evaluation within major projects (Can be found here.). Skills that I developed here include front-end languages such as HTML, CSS, and Javascript; Python and Django.
- A variety of Android applications as a freelancing developer, both front-end and back-end. Skills developed here include Android development, Google Firebase, interface design and NodeJS.

Accomplishments and work experience:

- A member of the Golden Key International Honours Society.
- A teaching assistant and tutor for multiple subjects since January 2016.
- Participated in the Standard Bank IT Challenge in 2016 and 2017; and ACM in 2016.

Kyle Erwin



UX Designer | Software Developer

Currently studying a BSc Computer science. I'm a well rounded programmer with many skills in many languages. My passion lies in artificial intelligence and creating applications with an intuitive design. I'm a harder worker that is known to be "on top of things" by my peers.

I've worked in many leader positions and understand the importance of synergy in a team. Most noteworthy, I was apart of the TukVillage residence committee and the graphic designer for all of the events (2015 - 2016). I launched a web development company, unhinged.co.za, with team member Keegan Ferrett. My work has also extended to app development and partnerships with small start-up companies.

In my free time I often find myself programming on personal projects, coming up with new concepts and focusing my time on perfecting my artificial intelligence skills.
More about me and my skills:

- Up-to-date with all the latest design trends.
- Used applications such as Google Analytics, webmaster and Google Trends.
- Written many C++ tutorials for beginner programmers.
- Business skills and working with clients.
- An understanding of scala, a programming language great for AI.

Joshua Cilliers

Graphic Design | Software Developer

I am currently in my final year of studying a BSc Computer Science and hoping to continue on to Honours. I'm an aspiring programmer with a broad set of skills that go beyond programming. I hope to move further into the development of complex systems, on both the front and back end of development. I enjoy broadening my experiences as much as possible and am always eager to attempt new projects and to learn more while doing so.

My programming experience includes being fully fluent in C++, Java, LAMP and MEAN stack development, and Python. I have also worked on projects for iOS and Android and have experience with tools and frameworks such as Ionic.

I offer freelance web development and social media marketing services in my free time when I'm not pursuing my own hobbies and interests.

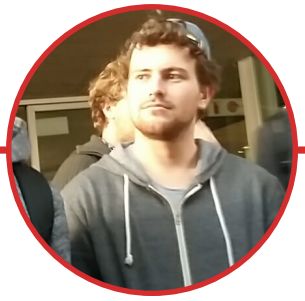
My current personal hobby is attempting to learn about the development process in Unreal Engine 4 so that I can contribute to the open-source Unreal Tournament project.

My other hobbies include photography, photo-editing and film-editing, tinkering with hardware, game development (specifically level and systems design), and reading and writing.

My skill-set and interests include:

- A focus on developing well rounded systems.
- Experience in designing the front-end of websites and a handful of systems.
- Experience in developing for the back-end of systems.
- A willingness to learn new languages and technologies.

Keegan Ferrett



Project Manager | Physical Computing

Currently in my final year of studying BSc Computer Science. I am an aspiring software developer with a love for mathematics and problem solving. I am a passionate programmer who is excited to develop my skills and knowledge. I enjoy taking on leadership roles and pushing myself with exciting and large projects.

I have launched a website designed and development business, unhinged.co.za, with another team mate Kyle Erwin. My role in the business is mostly backend development and running the business's accounting, however our vision is to one day extend into larger, and more complex projects, which we hope with this give up the experience to do.

During my free time I enjoy working on my Android app development skills, experimenting with physical computing (skilled with using Raspberry Pis and Arduinos), as well as competing in various programming and problem solving contests. Some contests that I have completed are: Standard Bank IT Challenge 2016 and 2017, ACM 2016, and HackFu challenge 2016.

Below are some of my passions and interests:

- Android App Development
- Mathematics
- Compiler Design and Construction
- Physical Computing and Electronic Engineering
- Computer Networks and Security

Why Albert Prime?

Our team consists of a set of people with enough skills to complete this project sufficiently and then some. We are all sufficiently competent in MEAN stack.

Keegan is our resident Raspberry Pi expert. He has a passion for Raspberry Pi and works with them on a regular basis. This will aid the development of this system as one of the requirements is to program a Raspberry Pi to gather the data from the devices around the house.

As third year Computer Science Students, we know a number of programming languages. It is worth mentioning that Jason is very fluent in Python amongst other languages. It will be an asset to your system to have someone with his expertise working on it.

Application development is one of our strong points. The mobile application needed for the caretaker communication and control of devices will make use of our skills. Joshua and Keegan's experience with iOS and Android development and his passion for mobile application development amongst others will be put to great use with this system.

This system will require creativity and and a good understanding of cloud servers. The Rabbiteer program Dimpho attended in 2016 focused a lot on this. This project will be an opportunity to develop these skills and her success in the Standard bank IT challenge shows her creative capability and competence.

Kyle is very passionate about Artificial Intelligence which is always a useful skill in today's age. This system could use his passion and skill for the monitoring and learning the user's patterns such that if anything seems out of place, the caregivers can notified.

All 5 group members are talented developers. Above are a few of the skills we have to offer but our skills are not limited to what is mentioned above. We are all hardworking fast learners and willing to learn any new technologies and skills needed to make this system a successful one.