GardeNet

TEAM 16

JOHN CONNELL, ANTHONY JIN, CHARLES KINGSTON, AND KEVIN KREDIT
Overview

- The Project
- Design Decisions
- Project Highlights
- Reflections
The Project

The Problem
- Watering is a labor intensive venture
- Community gardens often have difficulties to get consistent volunteer help

Our Solution
- Automate the watering process via
  - 3G cellular network
  - Internet-of-Things (IoT)

Target Market
- Urban farms to community and home gardens
- Our main client is Caledonia Community Garden
Design Norms

- Integrity
- Trust
- Humility
- Stewardship

5/17/2016
Our Design

Simplified GardeNet System Architecture
Website

- Platform: Apache web server on Raspberry Pi
- Features
  - Dynamic scheduling
  - Set weather sensitivity per zone
  - “Public” and password protected “Admin” views
  - View historical data
  - Modify alert and account settings
Server

- **Platform**: Python server on Raspberry Pi
- **Communication**: Internet sockets
- **Controls**
  - Communication between the website and the gateway
  - Historical data
- **Monitors**
  - Weather
  - Garden status, sends alerts

_GardeNet Server Architecture_
Gateway

- Platform: Arduino Leonardo / MEGA 2560
- Communication
  - 3G Modem
  - RF24 radio
- Controls
  - Nodes
  - Alerts
- Monitors
  - System feedback data
Node

- **Platform**: Arduino Nano
- **Communication**: RF24 radio
- **Controls**
  - 4 valves
  - 1 flow rate meter
- **Monitors**
  - Input voltage level
  - Flow states
  - Communication link
- **Modular**
  - Up to 16 nodes
  - All programmed with same code
Closed demo socket.
Sending: DEM01
Successfully sent!
Got a connection from the demo
Closed demo socket
Sending: DEM01
Successfully sent!
Got a connection from the demo
Closed demo socket
Sending: DEM01
Successfully sent!
Got a connection from the demo
Closed demo socket
Sending: DEM01
Successfully sent!
Got a connection from the demo
Closed demo socket
Sending: DEM01
Successfully sent!
Got a connection from the demo

14:13:36
Friday, 5/6/2016
Demo 1 mode
Time Awake : 100.00% : good
Mesh status : 1/1 : good
Mesh uptime : 100.00% : good
3G status : connected (1) : good
3G uptime : 100.00% : good
Node status : no issues : good

[Send of type T to node 1 success]

14:13:41
Friday, 5/6/2016
Demo 1 mode
Time Awake : 100.00% : good
Mesh status : 1/1 : good
Mesh uptime : 100.00% : good
3G status : connected (1) : good
3G uptime : 100.00% : good
Node status : no issues : good
Project Highlights

Challenges
- Seven programming languages
- Exosite vs. GardeNet server
- Reliability
- Budget and time constraints

Opportunities
- Advice from experts
- Learning curve
Assessment

What We Learned
- Systems design
- Web development
- Networking

Future Work
- Better onsite control
- Onsite weather monitoring
- Control lights, outlets
- Dedicated mobile app
- Support multiple customers

The Complete System
Thanks

**Engineering Advisors**
- Professor Mark Michmerhuizen
- Mentor Kurt Dykema
- Consultant Eric Walstra

**Networking Advisors**
- Professor Victor Norman
- Lab Administrator Chris Wieringa

**Garden Managers**
- David Benjamin of CCG
- Kyle Van Eerden of EDF

**Engineering Support**
- Bob DeKraker
- Phil Jasperse
Questions