IoT Elderly Care Solution

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Client: Optical Solutions
Advisor: Daji Qiao
Team Website: http://sddec19-18.sd.ece.iastate.edu/

Outline

- Focus and Goal
- Research
- Plan and Progress

Focus & Goal

Problem Statement

- How can senior citizens stay in their homes longer?

[1]

Previous Groups

Autonomous Animals

- Built the initial system prototype for collecting kitchen usage data
- Ran into a number of issues reliably collecting kitchen data

Guardians of the Grandparents

- Created an Android application consuming stored data
- Installed flow meter and smart outlet

[21]

Functional Requirements

- Sensors generate data matching our expected model
- Display sensor event data through a web application
- The sensor solution is wireless with a battery life of 1-2 years
- Logic detects if a resident has a health anomaly

[8]

Non-functional Requirements

[22]

Reuse

[23]

Non-Invasive

[20]

Timely

[19]

Loss of Power

Constraints & Considerations

Cost [2]

Sensor limitations [3]

Inherited components [4]

Research

Market Survey

[5]

Potential Risks & Mitigation

Connection to the Cloud Environment [6]

Remote Test Environment [7]

Resource/Cost Estimate

- AWS Cloud Resources
  - EC2 Server: $0.0208/hr [11]
  - RDS Database: $0.017/hr [12]
  - S3 Bucket: $0.0237/GB [13]
- Sensors:
  - $29 per TI Sensor Tag
  - $35.64 per Raspberry Pi 3

Plan & Progress

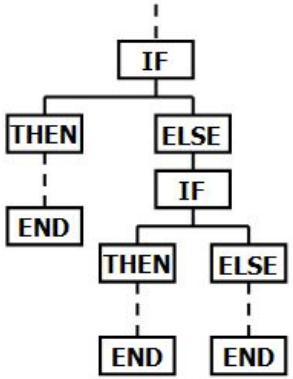
Member Roles & Responsibilities

- Jared Griffin
  - Web Application Engineer, Project Website Maintainer, GitLab Administrator
- Nidhi Dalvi
  - Hardware Engineer, Meeting Facilitator
- Tyler Borchert
  - Hardware Engineer
- Siyuan Zeng
  - Behavioral Logic Server Engineer
- Robert Guetzlaff
  - Behavioral Logic Server Engineer and Database Management

Functional Decomposition

[8]

Sensors/hardware



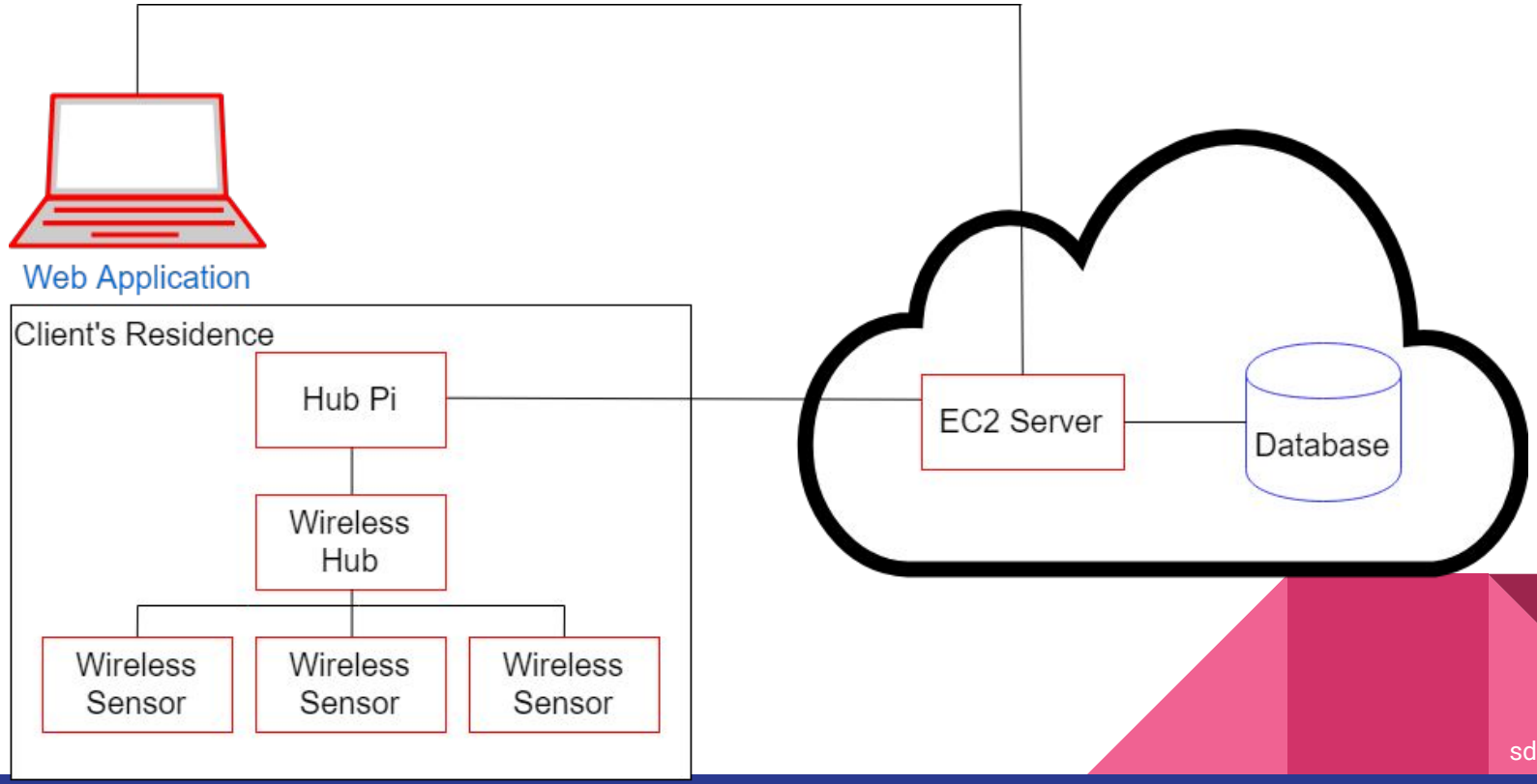
[9]

Behavioral Logic

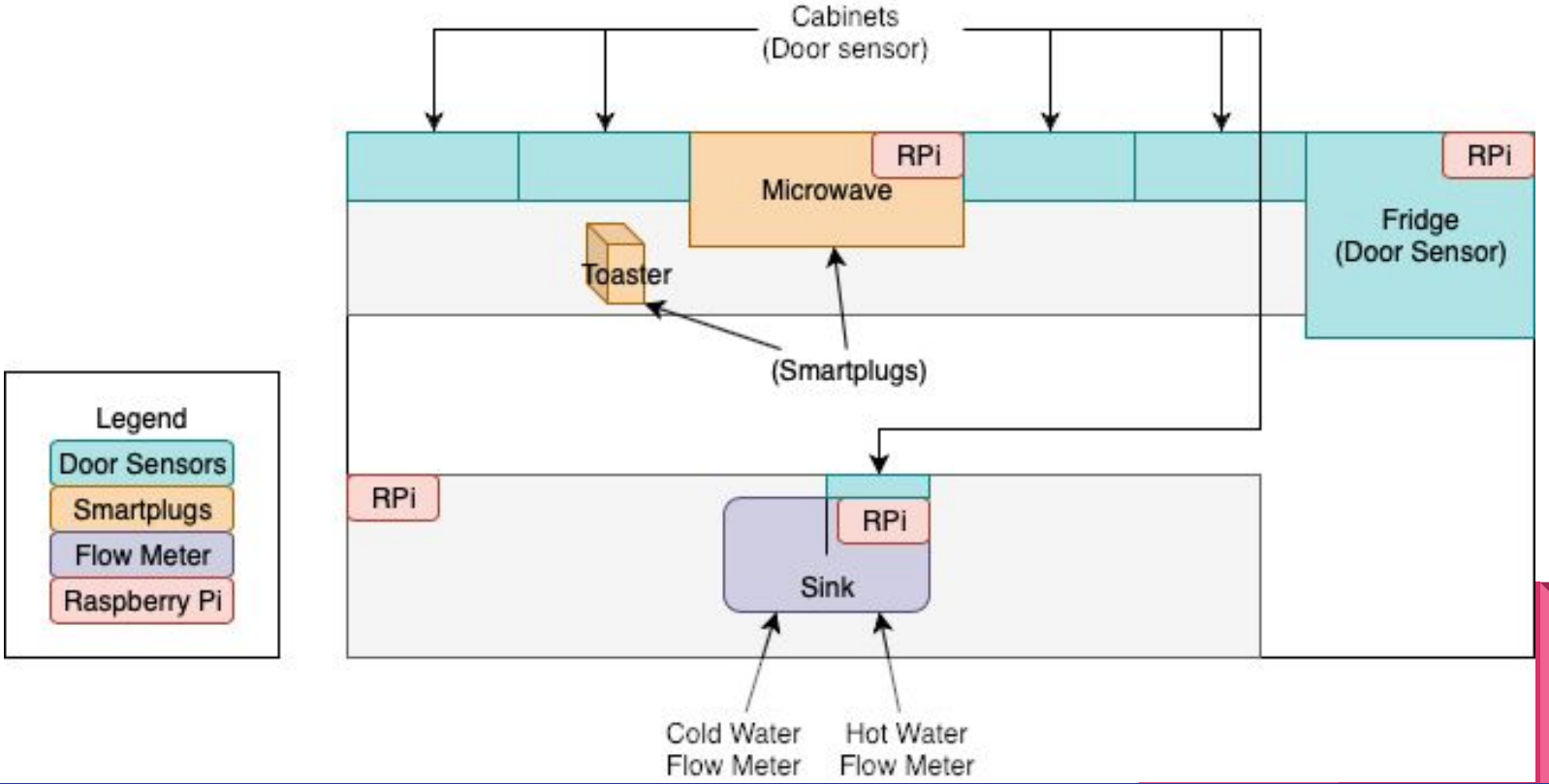
[10]

Web Application

Detailed Design

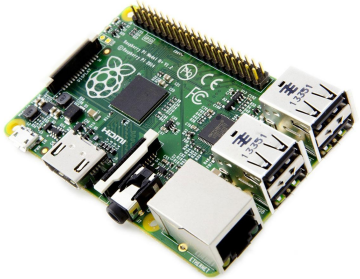


Test Environment

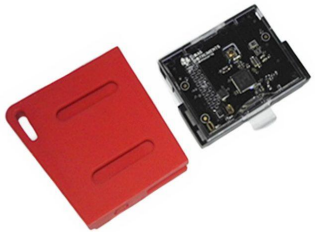


Technology Used

- Technology Platforms
  - AWS
    - EC2
    - RDS
    - S3
- Hardware
  - Raspberry Pi



TI sensor tag



- Software
  - Web Application
    - React
    - Jest
  - Logic Server
    - Spring Server
    - Eclipse
  - Hardware
    - VNC
    - Python

Prototype Implementations

- Sensor hardware
- Logic Server
  - Kitchen activities monitor.
- Web Application

John

Food Consumption

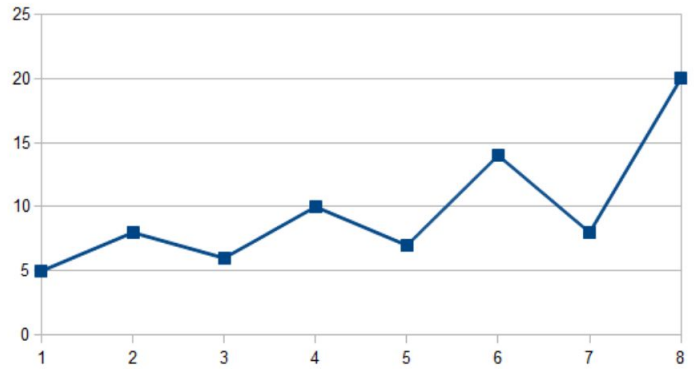
- Overview
- Breakfast
- Lunch
- Supper

Water Usage

Bathroom

Overview

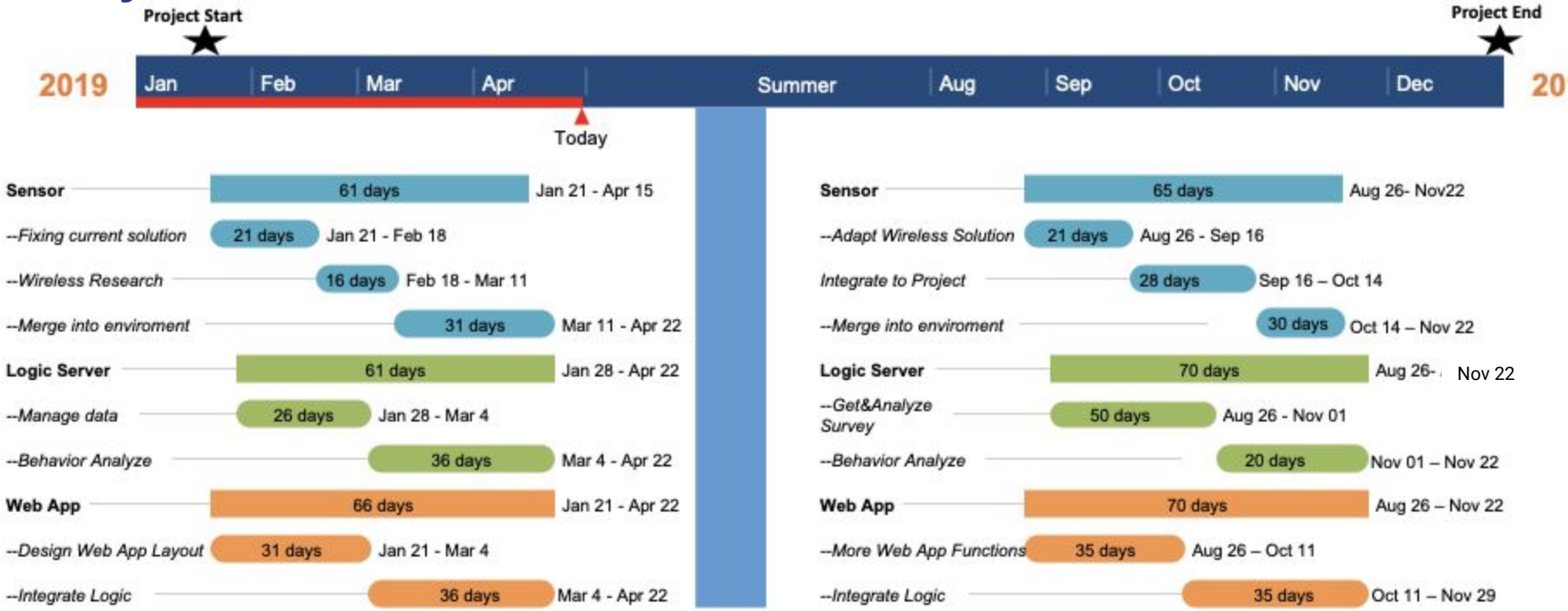
✓ **Breakfast** ✗ Lunch ☐ Supper



Project Milestones

- Sensor
  - Fixing current solution and test
  - Research and implement a new wireless solution
  - Implement it into testing environment
- Logic
  - View raw in a human readable format
  - Prediction for breakfast, lunch and dinner
- Web Application
  - Displaying raw data
  - Graphing data to make it more understandable
  - Integrate logic assumptions

Project Milestones & Schedule



Test Plan

- Sensor
  - Unit testing with unittest
  - Testing the code using the prototype
- Logic Server
  - JUnit Test (For Unit tests.)
  - Mockito Test (For Integration Tests.)
- Web Application
  - Unit Testing
  - Acceptance & Integration Tests

Project Status

- Sensor Hardware
  - Fixed previous solution
  - Researched a wireless solution for next semester
- Logic Server
  - Kitchen activities monitor
  - Meal prediction logic.
- Web Application
  - Project bootstrapping
  - Continuous integration workflow
  - UX mockups being developed for next semester

Plan for next semester

- Sensor hardware
  - Implement wireless solution into prototype
  - Replace old solution with wireless
- Logic Server
  - Make more survey to get detailed information for implementing logic.
  - Better logic algorithm.
- Web Application
  - Implement the UX mockups created this semester
  - Integrate behavioral logic

Summary

- Helping monitor the health of senior citizens
- System addresses this by:
  - Collecting data from the seniors' homes
  - Analyzing their behavior
  - Displaying health information in a web application

[14]

References

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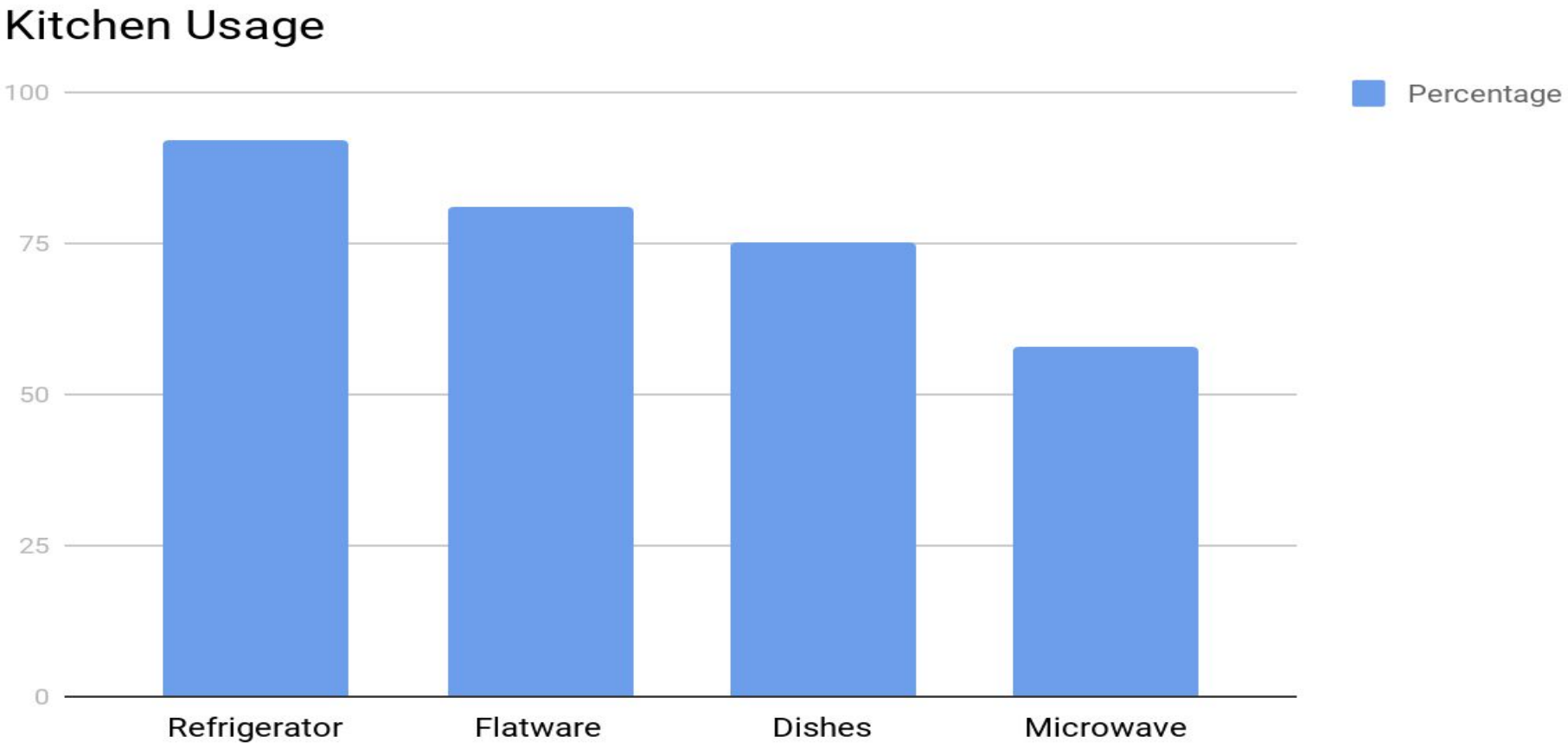
Appendix A


Kitchen Usage
100
75
50
25
0
Refrigerator
Flatware
Dishes
Microwave
Percentage