AudoLOK

Presented by eLOK Systems
For ENSC 305w/440
December 16 2015

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Outline

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- Introduction
- Market Analysis
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- System Overview
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Motivation: Short Video

https://www.youtube.com/watch?v=WpTSBhOVP08

Introduction

- eLOK Systems Goal
  - To eliminate challenges faced by physically challenged individuals

- Team
  - Lexi Chor – CEO Electronics Engineer
  - Ellson Dai – CTO Electronics Engineer
  - Chi Zhang – CFO Electronics Engineer
  - Christy Tao – CIO Computer Engineer

Market Analysis

Product Name	Lockitron	August	Goji	Audolok
Send eKeys	✓	✓	✓	✓
Remote Locking and Unlocking	✓	✗	✗	✓
No Need to Replace Current Lock	✓	✓	✗	✓
Automatically Open/Close	✗	✗	✗	✓
Mobile Application	✓	✓	✓	✓
Power Outage Functionality	✓	✓	✓	✓

Market Analysis

Automatic Swing Door

Automatic Sliding Door

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- New Technologies and Innovations
  - Lock/Unlock using mobile application
  - Automatically open/close door
  - Electronic shareable keys

- Target Group
  - People with physical limitations
  - Remote access

System Overview

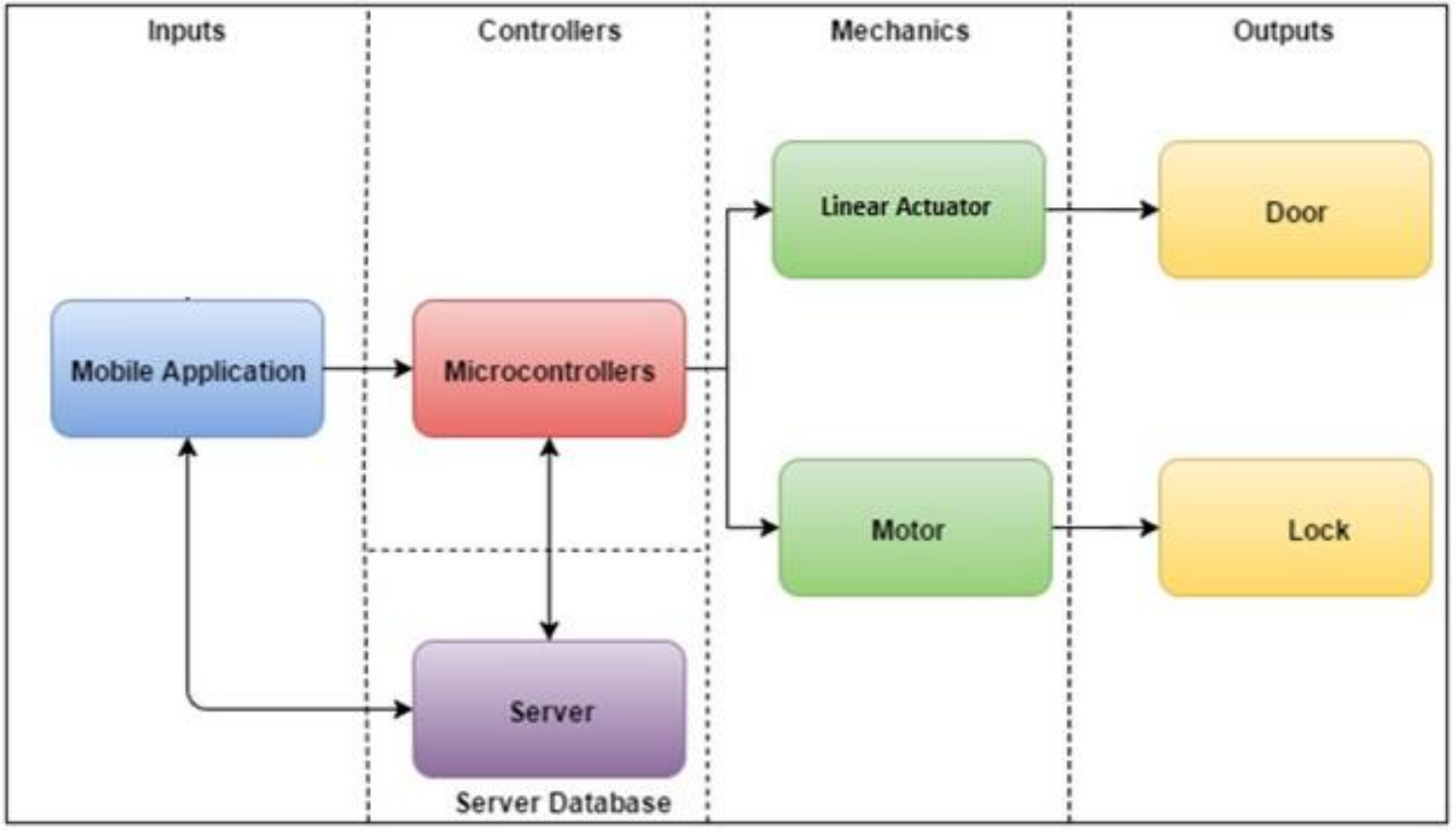
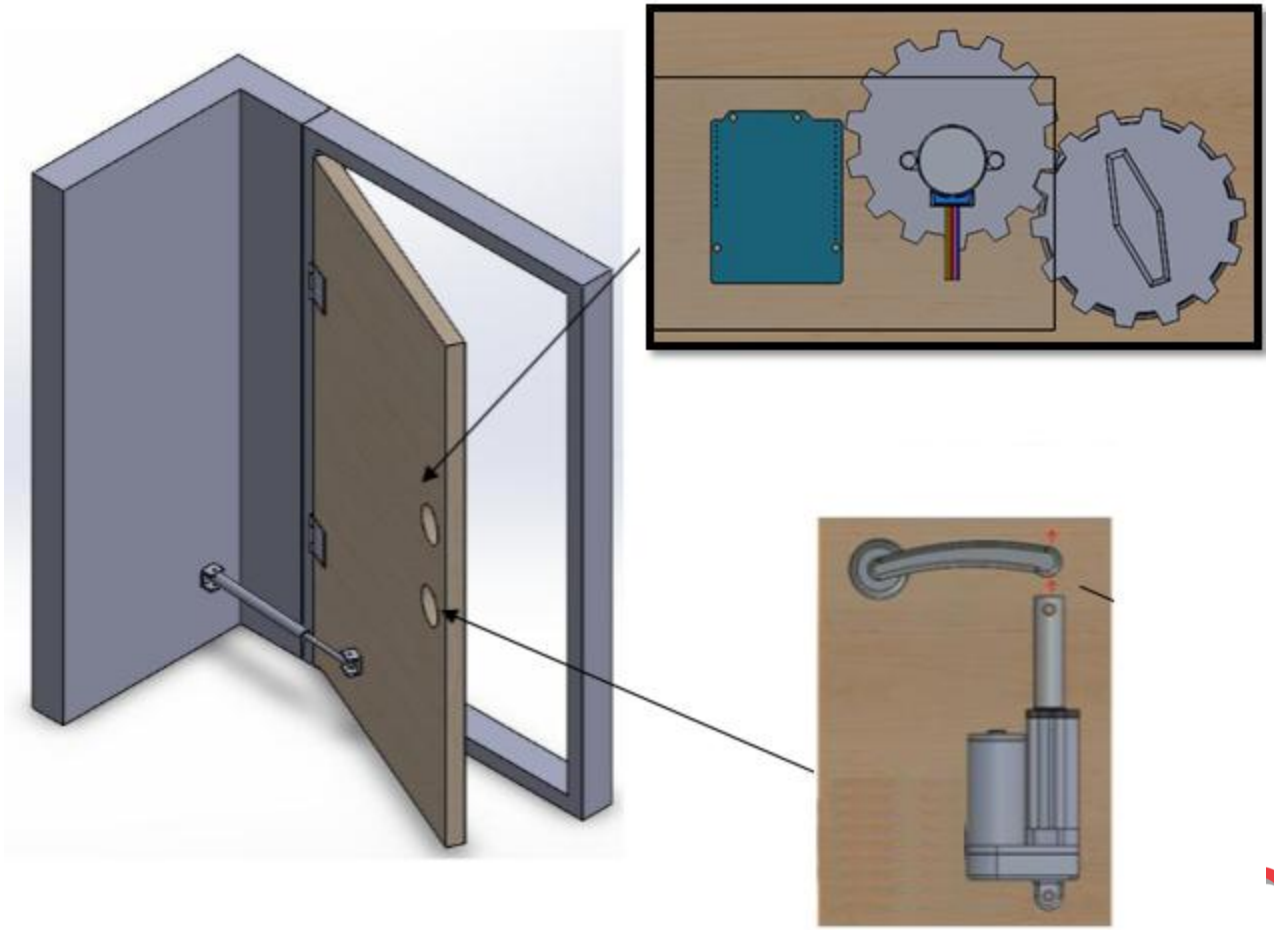


Figure 1: Block Diagram of Audolok Systems

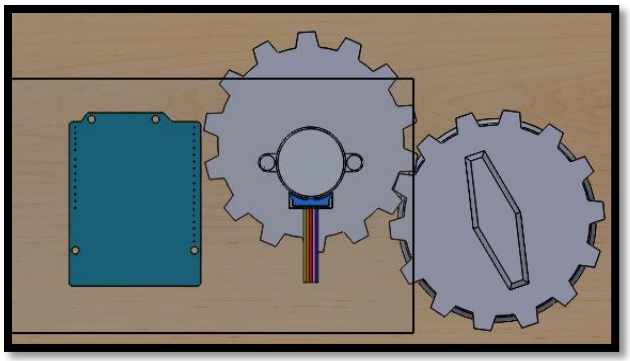
Overall System Design



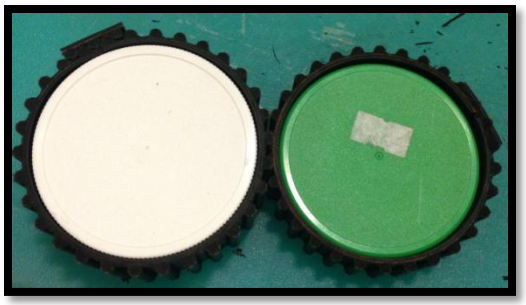
Design Systems

- Mechanical System
- Hardware System
- Software System

Mechanical Design



- Lock System
  - Used to rotate the deadbolt lock



- Components
  - Gears
    - Container lids and timing belts
  - Motor
    - Continuous Servo Motor (LS-3600)
      - 6 Kg.cm Torque

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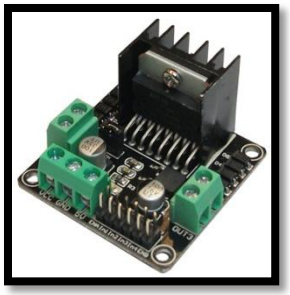
Mechanical Design

- Handle System
  - Linear Actuator – 4 Inch Stroke

- Open/Close System
  - Linear Actuator – 6 Inch Stroke

Fully Extended Length: 4.13 + Stroke + Stroke
Fully Retracted Length: 4.13 + Stroke

Motor Driver – L298 Dual H-Bridge



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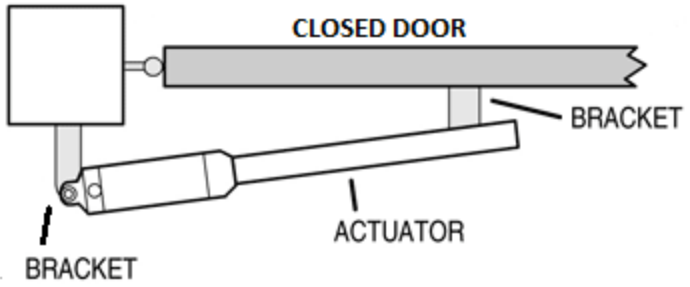
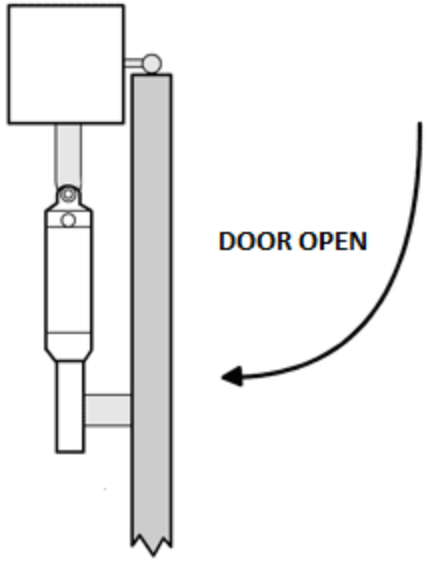
Mechanical Design



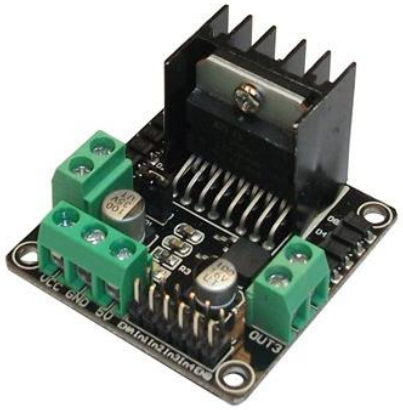
- Closed Door
- Linear Actuator Fully Extended

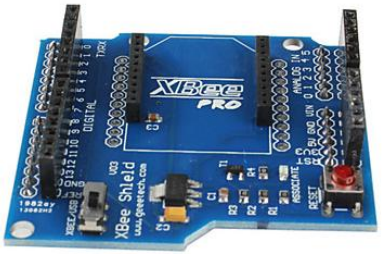


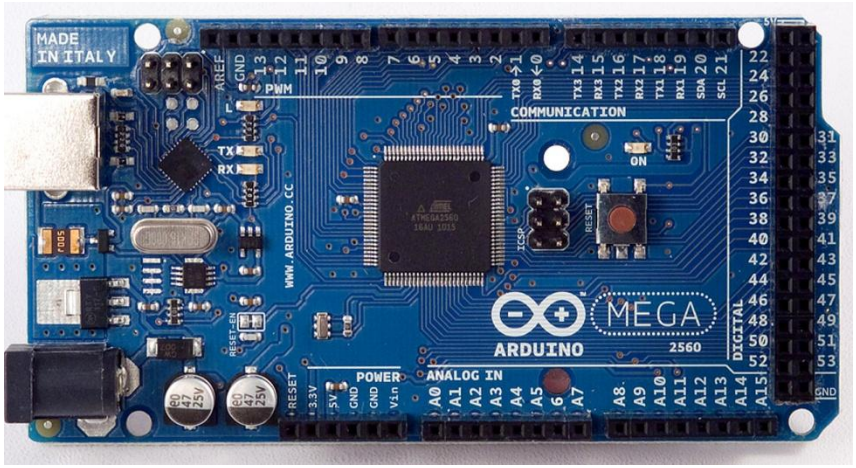
- Opened Door
- Linear Actuator Fully Retracted

Hardware Design

- Arduino Mega 2560
- Wee ESP8266 Xbee Compatible Module
- Xbee Shield-Pin Interface and Logic Shifter
- Motor Driver Module







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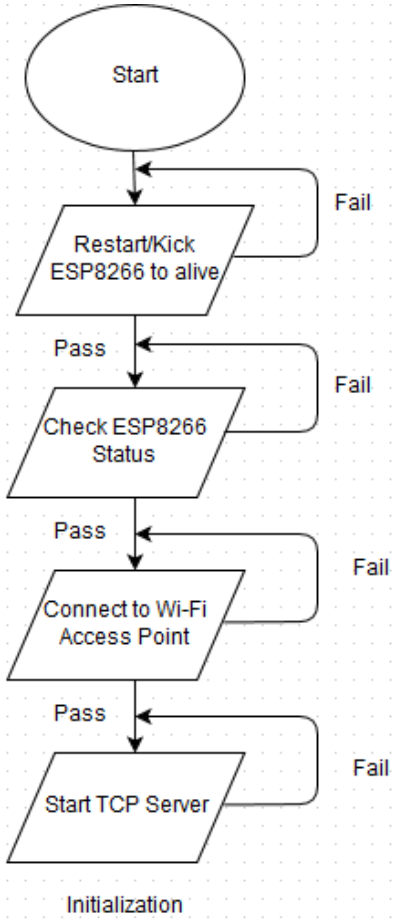
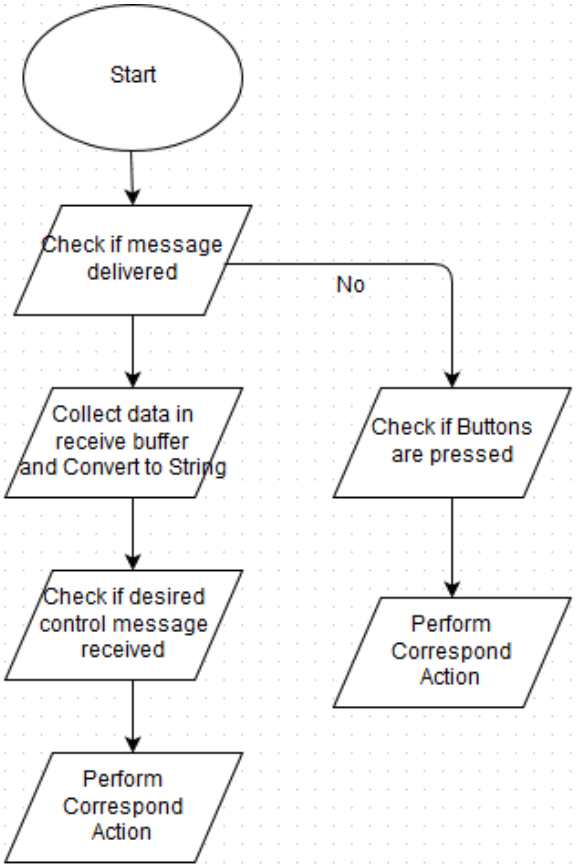
Communication System Overview

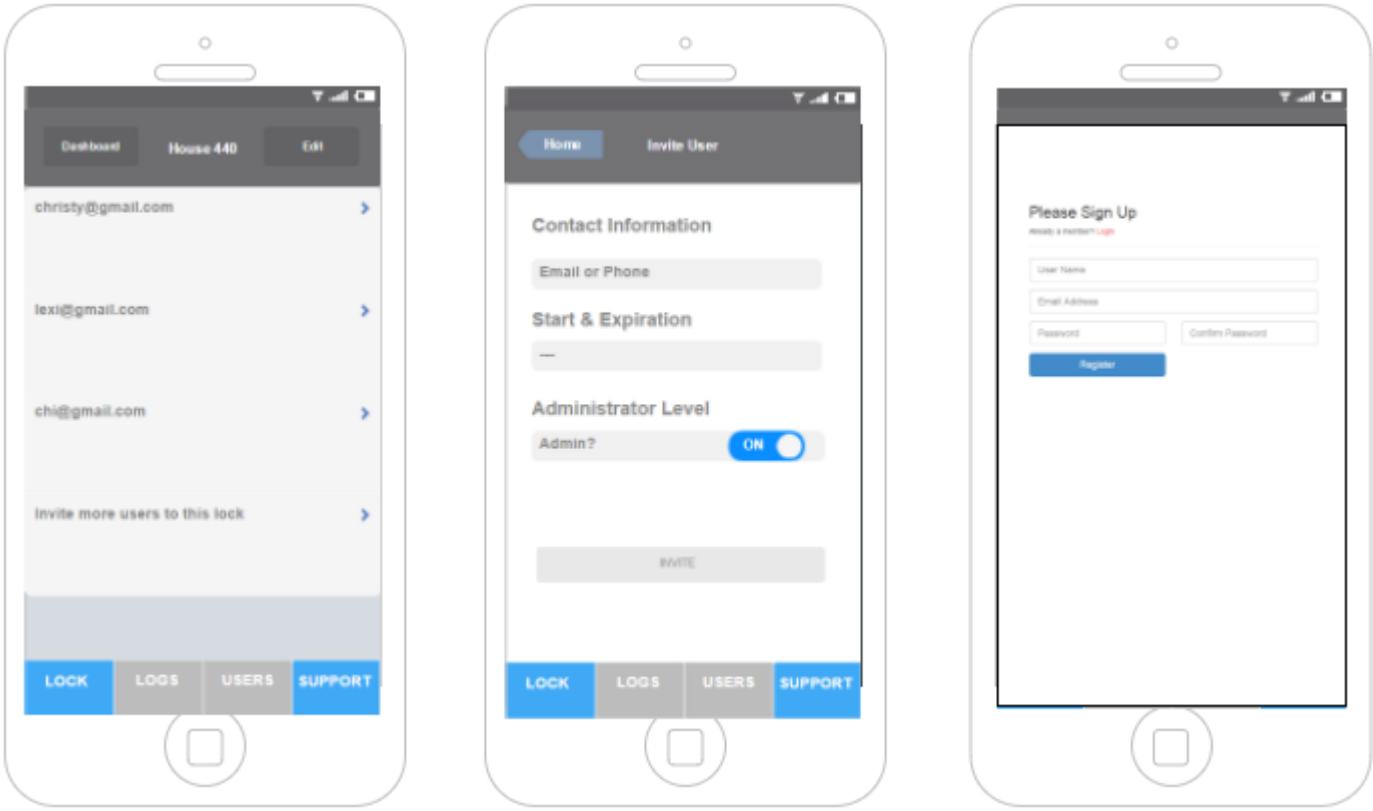
- ESP8266 in to-station mode
- ESP8266 will support physical layers for TCP server
- The message delivery is achieved by HTTP GET by support of TCP server

Firmware Architecture





Software Structural (Plan A)



Software Design

- Units
  - Database, register/login system, lock state page, invitation through Gmail API, UI/UX
- Challenges
  - Unit testing and integration testing
  - Bugs after integration
  - Internal conflicts
  - Storyboard xib

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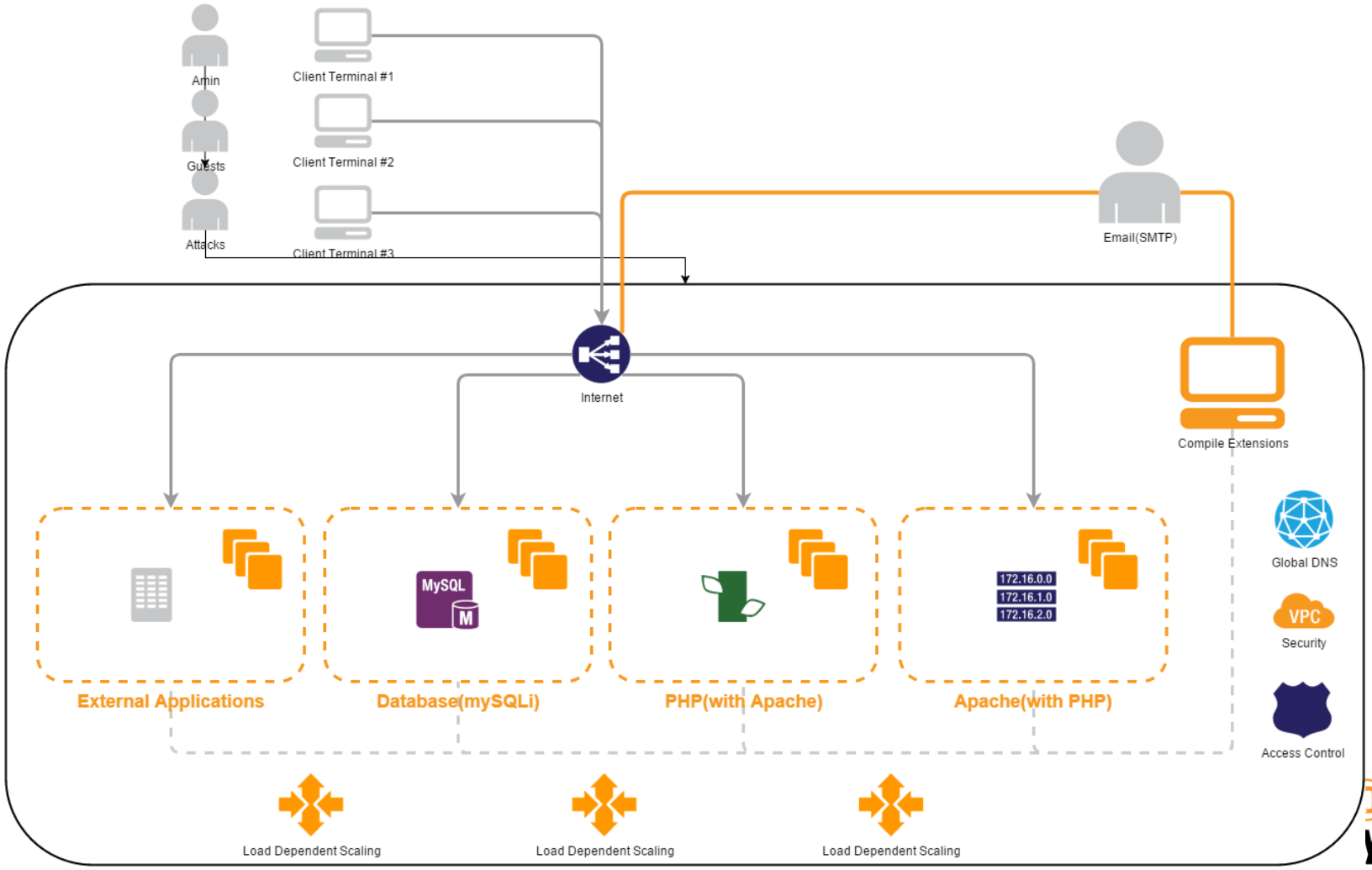
Software Structural (Plan B)



Software Design

- Units
  - PHP+Apache+mySQL, server/client setup, SMTP, TCP connection, Ajax and jQuery, UI, CSS, etc.
- Challenges
  - TCP connection between two ports under the same LAN
  - Communication and integration
  - Limited time

Finance

Component Name	Estimated Cost ($)	Actual Cost ($)	Difference ($)
Arduino Uno R3	35	30	+5
Arduino Mega 2560	50	40	+10
ESP8266 Wi-Fi Module	60	40	+20
Xbee Shield	38	20	+18
Motor	20	16	+4
Dead Bolt Lock	15	10	+5
Door Structure	50	25	+25
3D print and PCB print	50	N/A	+50
Basic Components	30	50	-20
Tax and Mailing Fee	30	80	-50
Contingencies	100	140 (2xLinear Actuator) 100 (miscellaneous)	-40 -100
Subtotal	478	551	-73

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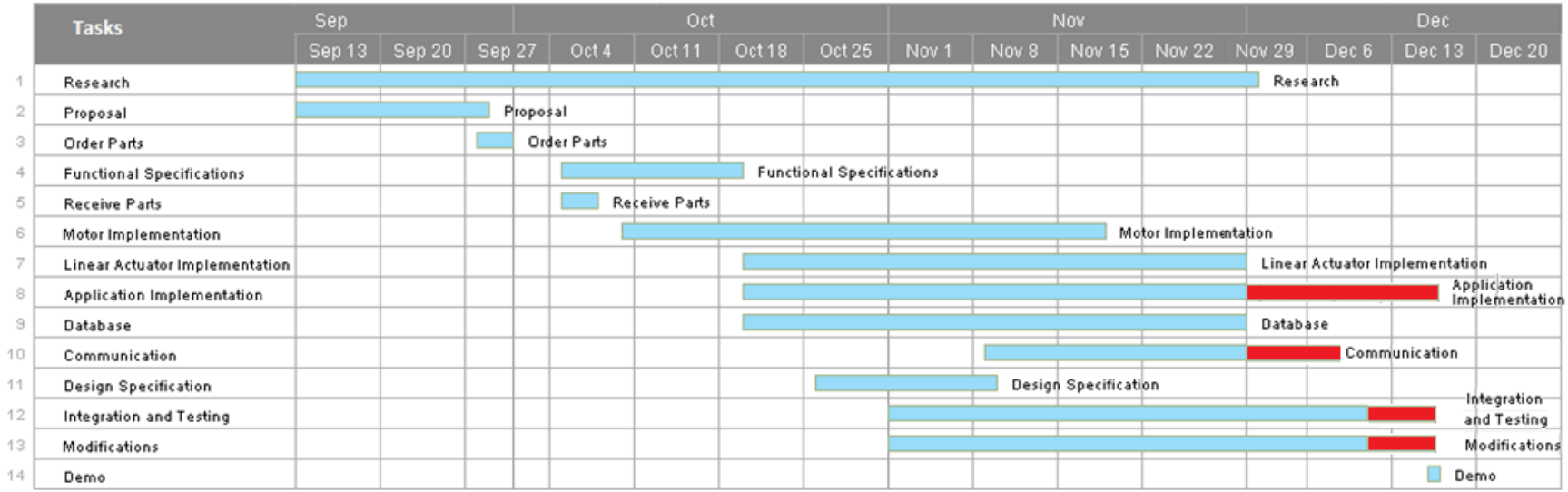
Schedule


Tasks
Sep
Oct
Nov
Dec
Sep 13
Sep 20
Sep 27
Oct 4
Oct 11
Oct 18
Oct 25
Nov 1
Nov 8
Nov 15
Nov 22
Nov 29
Dec 6
Dec 13
Dec 20
1 Research
2 Proposal
3 Order Parts
4 Functional Specifications
5 Receive Parts
6 Motor Implementation
7 Linear Actuator Implementation
8 Application Implementation
9 Database
10 Communication
11 Design Specification
12 Integration and Testing
13 Modifications
14 Demo

Technical Skills

- MCU programming
- Soldering
- Components Selection
- Mechanical Structures
- Hand tools

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Challenges

- Self-learning
- Trouble shooting and Debugging
- Communication between MCU and App
- Software Application
- Mechanical Integration
- Structural Design and Building

Future Plan

- Better enclosure box
- Implement of mobile application
- Solve the problem of linear actuator when power is off
- Fixed the problem on firmware integration on both button and Wi-Fi control
- Better mechanical organization

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Conclusion

- Idea to proof-of-concept and prototype
- Possible future development
- We learned and gained a lot of experience during this project, both technical and non-technical

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- Professors: Steve Whitmore, Andrew Rawicz
- Lab Technician: Gary Shum
- Structural Help: Greg Chor

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References

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Questions

- Questions?