Department of Computer Science and Engineering
The University of Texas at Arlington

Team B: Door Keepers

Project: Wi-Fi Garage Door Opener

Team Members:
Anup Patel
Santosh Shrestha
Wasyhun Tesfaye
Adrian Echavarria

Last Updated: Sunday, August 3, 2014, 11:05 PM
# Table of Contents

Document Revision History .................................................................6

1 General Organization .........................................................................8
   1.1 Project Manager .................................................................8
   1.2 Project Oversight ..............................................................8
   1.3 Roles and Responsibilities .................................................. 9
   1.4 Project Constraints ............................................................ 10
   1.5 Project Assumptions ........................................................... 10
   1.6 Preliminary Schedule and Costs Estimates ...............................10

2 Scope Statement ..............................................................................11
   2.1 Purpose ...............................................................................11
   2.2 Product Definition ..............................................................11
   2.3 Intended Audience ..............................................................12

3 Cost Management Plan .....................................................................13
   3.1 Purpose ...............................................................................13
   3.2 Financial Management .........................................................13
   3.3 Labor Management ..............................................................13

4 Earned Value Management ...............................................................14
   4.1 Introduction .........................................................................14
   4.2 Components of Microsoft Project Plan ...................................14
   4.3 Performance Analysis .........................................................14
   4.4 Earned Value Analysis .........................................................15

5 Scope Management Plan .................................................................16
   5.1 Purpose ...............................................................................16
   5.2 Staged Plan ..........................................................................16

6 Work Breakdown Structure ..............................................................17
   6.1 Purpose ...............................................................................17
   6.2 Microsoft Project File ..........................................................17

7 Quality Management Plan ...............................................................19
   7.1 Purpose ...............................................................................19
   7.2 Documentation Management ...............................................19
   7.3 Software Management .......................................................19
   7.4 Testing Management ...........................................................19
8 Communications Plan ..........................................................................................................................20
  8.1 Internal Communication ................................................................................................................20
  8.2 External Communication ..............................................................................................................21
9 Change Management Plan ..................................................................................................................22
  9.1 Purpose of Integrated Change Management Plan .......................................................................22
  9.2 Roles and Responsibilities ..........................................................................................................22
  9.3 Review and Approval Process ......................................................................................................23
  9.4 Change Identification, Documentation, Implementation, and Reporting ....................................23
  9.5 Change Proposal Form .................................................................................................................24
10 Risk Management Plan ......................................................................................................................26
  10.1 Purpose of Risk Management Plan ............................................................................................26
  10.2 Roles and Responsibilities .........................................................................................................26
  10.3 Risk Identification .......................................................................................................................27
  10.4 Risk Triggers ...............................................................................................................................27
  10.5 Risk Analysis ..............................................................................................................................27
  10.6 Risk Severity ................................................................................................................................27
  10.7 Risk Response Planning ............................................................................................................29
  10.8 Risk Documentation and Reporting ...........................................................................................29
  10.9 Risk Control ................................................................................................................................29
11 Procurement Management Plan .........................................................................................................30
  11.1 Purpose of the Procurement Management Plan .......................................................................30
  11.2 Roles and Responsibilities .........................................................................................................30
  11.3 Required Project Procurements and Timing .............................................................................30
  11.4 Description of Items/ Services to be acquired ........................................................................30
12 Project Closeout Report ......................................................................................................................32
  12.1 Purpose of Closeout Report ........................................................................................................32
  12.2 Administrative Closure ..............................................................................................................32
## Document Revision History

<table>
<thead>
<tr>
<th>Revision Number</th>
<th>Revision Date</th>
<th>Description</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>3/3/2014</td>
<td>First Draft</td>
<td>Compiling of incomplete sections</td>
</tr>
<tr>
<td>0.2</td>
<td>3/4/2014</td>
<td>First Corrections</td>
<td>Added in some missing sections</td>
</tr>
<tr>
<td>0.3</td>
<td>3/5/2014</td>
<td>Completed First Draft</td>
<td>All sections assembled and integrated.</td>
</tr>
<tr>
<td>1.0</td>
<td>3/6/2014</td>
<td>Touches</td>
<td>Last touches before turn in.</td>
</tr>
<tr>
<td>1.1</td>
<td>4/30/2014</td>
<td>Updates before Baseline</td>
<td>A number of updates</td>
</tr>
<tr>
<td>2.0</td>
<td>5/1/2014</td>
<td>Final Baseline Updates</td>
<td>List minute changes</td>
</tr>
<tr>
<td>2.1</td>
<td>8/3/2014</td>
<td>Baseline Updates</td>
<td>Changes from DDS</td>
</tr>
</tbody>
</table>
List of Figures

Figure 1: Product Scope.................................................................................................................. 11

List of Tables

Table 1: Roles and Responsibilities................................................................. 9
Table 2: Schedule.............................................................................................. 10
Table 3: Cost Breakdown.................................................................................. 13
Table 4: Work Time Estimation .................................................................... 13
Table 5: Work Schedule................................................................................. 18
Table 6: Risk Analysis................................................................................. 27
Table 7: Risk Severity....................................................................................... 28
Table 8: Risk Response Planning ................................................................. 29
1 General Organization

1.1 Project Manager
The project manager for the team will be Anup Patel. Anup Patel will be in charge of making sure each member is reaching deadlines for required document submission and will make sure the team is staying on track with the Microsoft Project Plan. Anup will also be in charge of taking meeting minutes for each team meeting that we have and reporting them back to the team as a refresher. Anup has had much experience working on various teams through his school career and he will bring those skills and help the team stay on task.

1.2 Project Oversight
This section will demonstrate how the Door Keepers plan to stay on task and keep the progress flowing the development of the Smart Garage product with our internal and external controls.

1.2.1 Internal Control
- **Google Docs**
  Google Docs has been a crucial part of our project to date. It is an online server which hosts all of our document files for individual sections as required for the deliverables. Each member can go into the shared folder and make edits live, and that will not affect anyone else. This saves the hassle of a single person only being able to edit a document at one time.

- **Team Meetings**
  For senior design one, team meetings for the Door Keepers are currently at 10:30am in the Senior Design Lab right after the class lab session. Most members are able to stick around for 2-3 where we can address any issues we are having with the project, discuss requirements, discuss deadlines or even just hang out. For the intersession between spring and summer, we will be conducting virtual team meetings via Google Hangout. Lastly, for senior design two, we plan on meeting two to three times a week based on member availability.

- **Communication**
  GroupMe is an essential tool that the Door Keepers use as a form of communication. Instead of a plain group text, all members have downloaded the GroupMe app on their smartphone devices and we are all able to stay in touch with each other directly and see what each other is talking about. GroupMe can also be accessed from the web incase access via smartphone is unable at the time.
1.2.2 External Control

- **Individual Status Reports**
  Individual status reports allows Mr. O’Dell to evaluate the progress that each team member is making on required deliverables for the current time period.

- **Team Status Reports**
  Team status reports allows Mr. O’Dell to evaluate the progress that a team is making as a whole on required deliverables for the current time period. While presenting our team status reports, this allows for other groups to ask questions and we receive feedback.

- **Gate Review**
  Formal Gate reviews exist for our team to present major deliverables to the teacher and class within a 40 minute time period and receive feedback during the last 10 minutes of class.

1.3 Roles and Responsibilities

<table>
<thead>
<tr>
<th>Project Member</th>
<th>Role(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mike O’Dell</td>
<td>Team Supervisor</td>
<td>Oversees project as a whole.</td>
</tr>
<tr>
<td>Protection Security</td>
<td>Team Sponsor</td>
<td>Provides team with feedback on deliverables.</td>
</tr>
<tr>
<td>Anup Patel</td>
<td>Team Leader / Graphics / Web Development</td>
<td>Assigns tasks, manages MS Project File, and takes notes. Will design website.</td>
</tr>
<tr>
<td>Adrian Echavarria</td>
<td>Document Master / Web / Software / Hardware / Android</td>
<td>Reviews and compiles all deliverables. Hardware Research, Android lead.</td>
</tr>
<tr>
<td>Santosh Shrestha</td>
<td>Hardware / Android</td>
<td>Hardware Lead</td>
</tr>
<tr>
<td>Wasyhun Tesfaye</td>
<td>Packaging / Android</td>
<td>Risk Management and Packaging lead.</td>
</tr>
</tbody>
</table>

Table 1: Roles and Responsibilities
1.4 Project Constraints
Because the second half of the course is in the summer, we will have a few constraints:

- The project is to be completed in 7 months.
- Our team consists of 4 members to split the work.
- No hardware or android experience between the members

1.5 Project Assumptions
All team members will learn MS Project Plan and basic android development by the end of summer intersession in June.

1.6 Preliminary Schedule and Costs Estimates

<table>
<thead>
<tr>
<th>Task</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRS Initial Draft</td>
<td>02-27-2014</td>
</tr>
<tr>
<td>Project Charter Initial Draft</td>
<td>03-06-2014</td>
</tr>
<tr>
<td>MS Project Plan Initial Draft</td>
<td>03-06-2014</td>
</tr>
<tr>
<td>Architecture Design Draft</td>
<td>04-23-2014</td>
</tr>
<tr>
<td>SRS Due</td>
<td>03-27-2014</td>
</tr>
<tr>
<td>MS Project Plan Due</td>
<td>05-02-2014</td>
</tr>
<tr>
<td>Project Charter Due</td>
<td>05-02-2014</td>
</tr>
<tr>
<td>Architecture Design Due</td>
<td>06-04-2014</td>
</tr>
<tr>
<td>Detailed Design Due</td>
<td>07-04-2014</td>
</tr>
<tr>
<td>System Test Plan Due</td>
<td>07-11-2014</td>
</tr>
<tr>
<td>Prototype Due</td>
<td>07-24-2014</td>
</tr>
</tbody>
</table>

Table 2: Schedule
2 Scope Statement

2.1 Purpose
The goal of this accessory is to give a homeowner remote control over their garage door, utilizing their existing garage door opener, home internet connection, and smart phone. This will allow the homeowner to monitor their garage, raise and lower the door, and check door activity via sensors and live video.

2.2 Product Definition
The microcontroller is the brains of the Smart Garage. Microcontroller will have input/output pins to fire signals to the garage door opener hardware, slots for internal storage and camera, ports for wired and wireless access, and an online community with a lot of sample code, instructions, and documentation on features.

The controller will be packaged in a hard enclosure which will prevent dust from entering. The case will be also able to withstand high and low temperatures from weather. Smart Garage will be mountable on ceiling with the brackets which will be included in it.
While the hardware will not need much change, the software underneath must accommodate for the microcontroller and its hardware. There are many distributions of GNU/Linux available for use on the microcontroller, along with additional code to use its special hardware features (the I/O pins and accessory slots/ports). We will however, need to setup a webserver in the controller’s software to serve as a gateway for controlling the device and storing/serving data/images/etc. This server will be accessible through the web and smartphone app.

App development must take into account how the microcontroller accepts inputs and deal with the underlying software. Homeowner must be able to setup the Smart Garage and use it through the android app or web browsers GUI based environment. Homeowner must not have any circumstances on which they have to modify lines of code, deal with a terminal/command prompt, or otherwise touch the underlying software. A simplified interface and setup will be implemented.

2.3 Intended Audience

Our intended audience are smartphone-owning homeowners with garages who wants to monitor and control their garage remotely. Some technical experience will be required to ease setup, as there will be door-switches to place and ports on the garage door opener to hardwire. Our product will be a small package that can be installed and executed on same day.
3 Cost Management Plan

3.1 Purpose

The primary purpose of the team Door Keepers, cost management wise is to keep the material cost within the budget of $800 and divide the labor time equally between the team members. Since our target audience are homeowners; our goal is to make an affordable accessory. To achieve our goal we have decided to split Cost Management Plan into Financial Management and Labor Management.

3.2 Financial Management

To keep the project under budget, team Door Keepers has researched the price of all the components that will be required to build Smart Garage. These are hardware so far identified as: a Garage Door Opener unit, Microcontroller Kit (includes, Wi-Fi adaptor, SD card, case, power adaptor, etc), Camera, Sensors, and wires. This may change depending on requirements changes during detail design, but this is baseline.

Since, during our implementation and test some product may break down. So, Door Keepers has decided to get some of the equipment more than one depending on the risk and warranty the equipment will have. According to the price of the components that has been provided at Amazon.com we have estimated that this project will cost from $400.00 to $600.00. The breakdown of the estimated price is shown in table below:

<table>
<thead>
<tr>
<th>Item Name</th>
<th>Lowest Cost Estimated</th>
<th>Highest Cost Estimated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Garage Door Opener</td>
<td>$150.00</td>
<td>$300.00</td>
</tr>
<tr>
<td>2. Microcontroller x 2</td>
<td>$120.00</td>
<td>$160.00</td>
</tr>
<tr>
<td>3. Camera x 2</td>
<td>$60.00</td>
<td>$60.00</td>
</tr>
<tr>
<td>4. Door Sensors x 4</td>
<td>$60.00</td>
<td>$60.00</td>
</tr>
<tr>
<td>5. Wires (for sensor/hook ups) x 2</td>
<td>$10.00</td>
<td>$20.00</td>
</tr>
<tr>
<td><strong>Total Cost</strong></td>
<td><strong>$400.00</strong></td>
<td><strong>$600.00</strong></td>
</tr>
</tbody>
</table>

Table 3: Cost Breakdown

3.3 Labor Management

The total hours the team have to work to finish the project that we have obtained is around 1800 hours. Our total time period for the project is for 33 weeks. So, each member will have to work for 13 hours per week. We have also estimated Source Line of Code (SLOC) to be around 1500 to 2000, according to COCOMO II. To obtain the best result each team member of The Door Keepers must work effectively for:

<table>
<thead>
<tr>
<th>Estimate Technique (in months)</th>
<th>Best in Class</th>
<th>Average</th>
<th>Worst In Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jones’ First Order Estimation Practice</td>
<td>6.65</td>
<td>7.26</td>
<td>8.29</td>
</tr>
<tr>
<td>COCOMO II</td>
<td></td>
<td>7.9</td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Work Time Estimation
4 Earned Value Management

4.1 Introduction
Earned Value Management will be used by the Door Keepers to measure the productivity relating to developing the Smart Garage. This measure is given by certain components in the Microsoft Project Plan where we estimate the amount of hours (person-hours) that a task should take then taking the actual (person-hours) for each of the tasks. Each member is responsible for tracking their hours worked on anything relating to the product and documenting it in their engineering lab book. On Friday during our weekly team meeting, these values are all requested by one team member and updated into our Microsoft Project Plan.

4.2 Components of Microsoft Project Plan
Each task in our Microsoft Project Plan has the following items associated with it:

- **Budgeted Cost Of Work Scheduled (BCWS) - Planned Value**
  Amount of work do we estimate a task will take. This value is assigned when the task was created during our project planning phase.

- **Actual Cost of Work Performed (ACWP) - Actual Cost**
  Amount of work does a task actually take. This value will be updated after the task is completed.

- **Budgeted Cost of Work Performed (BCWP) - Earned Value**
  The earned value for each individual task.

Along with the above, each task for our project is given a planned start and finish date to help estimate and keep the team on track with development.

4.3 Performance Analysis
The Door Keepers will use CPI and SPI as performance indices to track individual and team performance levels. Each task in our Microsoft Project Plan will be given a CPI and SPI to analyze if we are on good performance, or bad with the task. The following are formulas on how to calculate these values:

**Cost Performance Index (CPI)**
\[ CPI = \frac{BCWP}{ACWP} = \frac{Earned Value}{Actual Cost} \]

**Schedule Performance Index (SPI)**
\[ SPI = \frac{BCWP}{BCWS} = \frac{Earned Value}{Planned Value} \]
4.4 Earned Value Analysis

In order to make sure the development of our Wi-Fi garage door opener stays on progress, we must make sure our performance analysis values states at the following levels:

CPI or SPI > 1.0 = Good Performance
CPI or SPI < 1.0 = Bad Performance
5 Scope Management Plan

5.1 Purpose

The Scope Management Plan details how the Door Keepers will keep the project under our specified scope and not deviate from its intended purpose. Given the nature of our current microcontroller and associated off-the-web software, its vast online communities, and its abilities as a general computing device, maintaining this scope is extremely important.

Any major changes to the product will need to be scrutinized by the team: finding new requirements, importance, impact, and the time required to perform these tasks. A general description follows:

5.2 Staged Plan

5.2.1 New Requirements

We must find the root requirements of the desired change. The customer may say one thing but mean something very different, and the hardware may or may not have ways to accommodate. We will identify what specifically is desired (clarify all new changes requested), and find the resulting new requirements.

The first question of these new requirements: are they in-line with the current product feature set? Are we stepping into different territory, using or requiring a new interface or item, and do we want to take this step? If so, we proceed to the next step, determining importance and priority.

5.2.2 Importance

We must determine how important the desired change is. This will require feedback from the customer and developer to decide on a priority. This will help us prioritize changes, so the most desired changes are done earliest, based on impact to the current project.

5.2.3 Impact

Based on those priorities, we must determine how feasible the requested change will be. This feasibility will be weighted with the priority of the change, helping us determine an overall impact on development for the desired change.

The team will then update the System Requirements Specification and Project Plan documents accordingly. More on how we plan to deal with the resulting changes is detailed in Section 9, Change Management Plan.
6 Work Breakdown Structure

6.1 Purpose

Our Work Breakdown Structure is split up into three phases which include our two classes Senior Design 1 and Senior Design 2 and the summer intersession. Senior Design 1 is the primary planning phase of our project to identify what the Smart Garage will entail. Summer Intersession is when the team will be remote from each other, but still continue to work on project requirements such as learning android development. Lastly, Senior Design 2 is when the team will start to actually work on finalizing specifications for our product and begin the primary development phase.

6.2 Microsoft Project File

The following is an export from our Microsoft Project Plan which shows when we planned on starting certain elements for our product. The information for Senior Design 2 will be updated when an updated calendar is created for the course.

<table>
<thead>
<tr>
<th>Task Number</th>
<th>Task Name</th>
<th>Planned Start</th>
<th>Planned Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Senior Design 1</td>
<td>Fri 1/24/14</td>
<td>Tue 5/6/14</td>
</tr>
<tr>
<td>1.1</td>
<td>Documents</td>
<td>Fri 2/7/14</td>
<td>Tue 5/6/14</td>
</tr>
<tr>
<td>1.1.1</td>
<td>System Requirements</td>
<td>Fri 2/7/14</td>
<td>Thu 3/27/14</td>
</tr>
<tr>
<td>1.1.2</td>
<td>Project Charter</td>
<td>Fri 2/21/14</td>
<td>Fri 5/2/14</td>
</tr>
<tr>
<td>1.1.3</td>
<td>Architecture Design</td>
<td>Thu 4/3/14</td>
<td>Tue 5/6/14</td>
</tr>
<tr>
<td>1.1.4</td>
<td>Microsoft Project Plan</td>
<td>Tue 1/28/14</td>
<td>Fri 5/2/14</td>
</tr>
<tr>
<td>1.2</td>
<td>Team Meetings</td>
<td>Fri 1/24/14</td>
<td>Fri 5/2/14</td>
</tr>
<tr>
<td>1.3</td>
<td>Presentations</td>
<td>Thu 1/30/14</td>
<td>Tue 5/6/14</td>
</tr>
<tr>
<td>1.3.1</td>
<td>Team Status Reports</td>
<td>Thu 1/30/14</td>
<td>Fri 2/28/14</td>
</tr>
<tr>
<td>1.3.2</td>
<td>Charter and Project Plan Review</td>
<td>Sun 3/16/14</td>
<td>Fri 3/21/14</td>
</tr>
<tr>
<td>1.3.3</td>
<td>SRS Gate Review Presentation</td>
<td>Fri 3/21/14</td>
<td>Fri 3/28/14</td>
</tr>
<tr>
<td>1.3.4</td>
<td>Architecture Gate Reviews</td>
<td>Fri 5/2/14</td>
<td>Thu 5/8/14</td>
</tr>
<tr>
<td>1.4</td>
<td>Research</td>
<td>Mon 1/27/14</td>
<td>Fri 3/28/14</td>
</tr>
<tr>
<td>1.5</td>
<td>Sponsor Meetings</td>
<td>Mon 2/10/14</td>
<td>Wed 4/30/14</td>
</tr>
<tr>
<td>1.6</td>
<td>Project LOGO</td>
<td>Mon 3/17/14</td>
<td>Sun 3/23/14</td>
</tr>
<tr>
<td>2</td>
<td>Summer Intersession</td>
<td>Mon 5/12/14</td>
<td>Fri 6/6/14</td>
</tr>
<tr>
<td></td>
<td>Task Description</td>
<td>Start Date</td>
<td>End Date</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------</td>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>2.1</td>
<td>Team Logo Design</td>
<td>Mon 5/12/14</td>
<td>Fri 5/23/14</td>
</tr>
<tr>
<td>2.2</td>
<td>Android Programming Training</td>
<td>Mon 5/12/14</td>
<td>Fri 6/6/14</td>
</tr>
<tr>
<td>2.3</td>
<td>Team Virtual Meetings (Google Hangouts)</td>
<td>Mon 5/12/14</td>
<td>Mon 6/2/14</td>
</tr>
<tr>
<td>3</td>
<td><strong>Senior Design 2</strong></td>
<td>Mon 5/26/14</td>
<td>Fri 8/8/14</td>
</tr>
<tr>
<td>3.1</td>
<td>Architecture Design</td>
<td>Mon 5/26/14</td>
<td>Tue 6/3/14</td>
</tr>
<tr>
<td>3.2</td>
<td>Detailed Design Specification</td>
<td>Thu 6/5/14</td>
<td>Fri 7/4/14</td>
</tr>
<tr>
<td>3.3</td>
<td>System Test Plan</td>
<td>Sat 6/28/14</td>
<td>Fri 7/11/14</td>
</tr>
<tr>
<td>3.4</td>
<td>Prototype</td>
<td>Tue 6/10/14</td>
<td>Thu 7/24/14</td>
</tr>
<tr>
<td>3.5</td>
<td>Presentations</td>
<td>Mon 6/2/14</td>
<td>Fri 7/11/14</td>
</tr>
<tr>
<td>3.6</td>
<td>Team Meetings</td>
<td>Mon 6/2/14</td>
<td>Mon 8/11/14</td>
</tr>
<tr>
<td>3.7</td>
<td>Research</td>
<td>Mon 6/2/14</td>
<td>Fri 8/8/14</td>
</tr>
</tbody>
</table>

Table 5: Work Schedule
7 Quality Management Plan

7.1 Purpose
The Quality Management Plan will make sure that the final product meets all the requirements from the System Requirements Specification document. By abiding to these management plans, The Door Keepers hopes to achieve quality control over the various parts of the documentation, software, and testing, as the project continues forward.

7.2 Documentation Management
Each member is responsible for documenting the amount of time they have spent on the work assigned to them. Before the documented works are brought together, reviews are done to make sure that major points would not be left out. If any changes would have to be made then the responsible person for that document would be notified to change it. After the documented works are brought together, their formatting, grammar, and punctuation will be reviewed and altered by our document-master, so that the entire finished document will be consistent. This draft is then up for scrutiny by the team, sponsors, peer review group and Mr. O’Dell, before finalization.

7.3 Software Management
The software portion will use many off-the-web components/software made specifically for the micro-controller and certain common tasks (web server, file storage, etc), shortening actual development. All off-the-web components/code used will be in-line documented, with sources, source URLs, access dates, compile dates, and author citation, along with original, unaltered sources provided for review.

The custom parts, our look and feel, the phone app, and customized web page and controls, will be stored and updated on the team’s online repository as updates occur. GitHub may be utilized for our coding parts to help maintain version control, depending on our current online repository strategy.

7.4 Testing Management
Testing will verify that the resulting product fully abides by our System Requirements Specifications. The SRS will be on hand during all tests to ensure everything is as planned. Once primary tests are concluded, it will be open for testing and feedback by our sponsor, potential customers, and Mr. O’Dell.
8 Communications Plan

8.1 Internal Communication

To communicate within the team, Door Keepers has decided to hold meetings and use Emails, GroupMe, Google+ Hangout, Google Drive and our phones. The time period of this project is for two semester so, the time and place for meetings will be managed as it will be easier during that time. Door Keepers has also decided to meet virtually during the intersession of first and second phase of the project.

8.1.1 Meetings

The Door Keepers has decided to meet every Friday after 10:30 am till 12:00 pm in the Senior Design Lab for first phase. For the second phase since we will have to build the Smart Garage so, team has decided to have meeting two times a week. Team will meet in the Senior Design Lab on Wednesday and Friday. During this period, major decisions and project planning will be done. Each team member status will be discussed and next task will be assigned according to skills and time available.

In addition to weekly meeting, the team has decided to meet one hour before each senior design class to keep each member updated on any changes or plans during the first phase of the project. This would help to bring more efficiency on the work and work load on each member where we would be able identify the risk. Since class will start early during second phase so no plan has been made yet.

8.1.2 Emails

Email will be used for longer communication, agendas, task questions, or anything too large for a simple chat box between the team members.

8.1.3 GroupMe

GroupMe helps us cut phone-texting down and maintains a log of all our communication for review by the team. This allows us to quickly share information and updates with the group all at one time. GroupMe can also be used through web. This has become very helpful when one of our member had lost the smartphone.

8.1.4 Google+ Hangout

Google+ Hangout will be used when some of us would not be able to attend the meetings. Since most of our team members live far away from the School. So by using Google+ Hangout it will save time which we would have spent by travelling to School. During the intersession phase some of us may travel but since we would be still working for our project so we have expected to use Google+ Hangout for all of our meetings. During this meeting we would discuss about the
Android app training and some pre planning for the Smart Garage design. Dates and time for this meetings has not been decided yet.

8.1.5 **Google Drive**

The team has decided to share all the documents through Google Drive. Each document would be sub-divided into subsections. After updating one of the subsections that has been assigned, version number needs to be increased to keep track of the updates that would be done according to time period. After the completion of the subsection, it would be examined by each team member to identify if there would be any mistakes. All of these subsections would be arranged, combined and formatted together by one team member and examined by the others after completion.

8.1.6 **Phone**

Phone calls are reserved for urgent problems or questions since we are busy throughout the day. However, GroupMe has smartphone apps, keeping us notified anywhere.

8.2 **External Communication**

To communicate with sponsor or Mr. O’Dell, the team utilizes Text Messages, Emails and Meetings.

8.2.1 **Text Messages**

The primary way of communicating with the sponsors would be through text messages. Sponsors would be updated about the status of Door Keepers, project, schedule meeting and any other additional actions that would be taken such as: email sent to sponsor regarding project question or documentation through text messages.

8.2.2 **Emails**

Primary means of communication with Mr. O’Dell, and secondary with our sponsor.

Emails will be used to submit documentation/deliverables and to communicate about any difficulties that would arise in the project.

8.2.3 **Meetings**

Meetings with the sponsors would be held according to our combined availability. Since Mr. O’Dell holds our classes, our primary meeting time is during class for short inquiry or his office hours for longer sessions.
9 Change Management Plan

9.1 Purpose of Integrated Change Management Plan

The need for changes in key features of a product during development processes in large-scale projects is unavoidable. Such need of changes became the most significant factor due to the fast growing technological achievements, the uncontrolled market variations, and the schedules required for developing our product. Hence, preparing a thought-out change management plan is one of the most important responsibilities that must be performed by any successful development team. A well-documented change management plan will be used as a guideline when dealing with changes that may occur during any product development phase.

9.2 Roles and Responsibilities

- **Project Sponsor**
  
  The sponsor needs to present the details about the change to the attention of the team via email or face-to-face meeting to the manager depending on the significance of the change on the project. The team manager then will send the proposal, including his concerns on the impact of the proposed change against the overall project schedule, via email to the change manager. The change manager then will present the proposal to the team for decision. If it is a minor change, the team members will discuss during the team’s regular meeting. If it is a major change, the team will decide to make a face-to-face discussion with the sponsor. Upon acceptance, the sponsor will need to fill out the ‘Change Proposal Form’ for the team records, and the change will be documented in further paperwork rehearsals.

  When the proposed change comes from a team member, the team will discuss and evaluate the proposal. If the proposed change is moderate, the sponsor will be notified during the nearest next meeting. If the proposed change is major, the sponsor will be notified immediately. The sponsor will need to give approval of any change, regardless of the rating of the proposed change. If the sponsor accepted the proposed change, the team will fill out a Change Proposal Form, and document the change.

- **Project Manager**
  
  The project manager is responsible to arrange meeting schedules with sponsors and stakeholders whenever there will be a major change to be made. He will discuss the qualities of a change proposed by either the sponsor or any stakeholder. Any changes or modifications from any source shall first reach the project manager before it goes into further actions.
- **Project Team**
  Any team member is allowed to suggest a change throughout the project's life. The team will then evaluate the pros and cons of performing the change, make a decision either by consensus or by vote, before passing the proposal to the sponsor and stakeholders.

- **Change Manager**
  The change manager is responsible for arranging team meeting schedules whenever there will be a major change to be made. He is responsible for making further researches regarding the impact of proposed changes before bringing the change to the stage for decision.

- **Other Stakeholders**
  The project supervisor, Prof. O'Dell, is the only stakeholder of the project. The project supervisor shall be alerted whenever there is any major change on the project. Moderate and minor changes will be reported on the team and individual status reports. The project supervisor can propose changes. The proposed changes will be processed in the same manner as the project sponsor is going through.

### 9.3 Review and Approval Process
The details of proposed changes should be filled out onto Change Proposal Form. Any proposed change shall go through the project manager before passed into further steps. The project manager then sends the proposed change and his concerns, if any, via email to the change manager. The change manager, after making some researches, then shall bring the proposed changes to the team for discussions and evaluations. The team then shall make decisions on whether the proposal is accepted or declined via consensus or vote. The team will also decide on whether the proposed change will be passed to the project sponsor on both cases of accepting and rejecting.

### 9.4 Change Identification, Documentation, Implementation, and Reporting
This section describes detailed information regarding the suggested change. The informations on the ‘Change Proposal Form’ that will be required to be filled at the time of proposing a change include: change description, the need of proposed change (Why?), effects of proposed change, handling other effects due to the proposed change, rating of the proposed change (Major, moderate, minor), and any other comments. It will also provide blank line spaces to fill the name of the requester, the date, the signatures of; the person requesting the change, the project manager and all other team members, as well as for the project sponsor and project supervisor as needed. The form presented on the next pages, Change Proposal Form, will be used to record about any proposed change in the project.
9.5 Change Proposal Form

Change Proposal Form

Requester’s Name: ______________________

Description of Change:

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

Importance of Change:

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

Effects of Change:

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

Handling Effects of Change:

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

Rating of Change:

☐ Minor  ☐ Moderate  ☐ Major
Other Comments (if any):

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

Signatures

<table>
<thead>
<tr>
<th>Name</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Project Manager


Project Sponsor


Project Supervisor


10 Risk Management Plan

10.1 Purpose of Risk Management Plan

This section contains the risk assessment and management plan of our project. Any complication and difficulty that could probably be faced by the team and could potentially obstructs or blocks the advancement of the project is considered to be a risk. The risk management plan considered the most probable risks that may be encountered during project development processes and established ways and procedures to deal with it whenever occurred. The risk management plan is a fundamental reference to systematically recognize, sort, highlight, and control any potential risk in the project.

10.2 Roles and Responsibilities

- **Project Sponsor**
  
  The Project Sponsor, Protection1, is a home security company with extensive experiences in home security concerns in general and garage doors controls in particular. They are willing to share real world experiences and knowledge in project development processes and the potential risks to occur, provide available hardware devices as possible, advise project ideas, comment and help to set up system requirement specifications, follow up project developments and progresses throughout the lives of the project.

- **Project Manager**
  
  The major responsibility of the project team leader is overseeing the whole project and making sure the successful accomplishment of the system requirement specifications according to the schedule. He need to make sure any progress in the project goes according to the scheduled time frame. He, as any other team member, is also responsible to get done his other specific project task assignments as needed.

- **Project Team**
  
  The team is responsible to strictly follow the predetermined risk plans and task schedules. The team shall evaluate project work progresses at least ones in a week to make sure the development is going according to the plan and to retain risk impacts on the growth of the project to a minimum.

- **Project Stakeholders**
  
  We designed the project to develop a system that is targeted to be used in both business and residential facilities. The potential risk here is, if our product will not satisfy the need of our targeted stakeholders. Hence we focused and considered businesses and individuals needs in relation to our product while setting up risk plans and system specification requirements. We also considered potential change requests that may arise from the stakeholders in terms of the need, technology, and demands of our product.
• **Risk Manager**

The major responsibility of the risk manager is overseeing the project risks prevention or minimization approaches. He is also responsible for collaborating any risks related management concerns of the project within the rest of the team. He is also responsible to develop risk management plans of the project.

10.3 **Risk Identification**

Although managing the risk minimization task is the major responsibility of the project risk manager, identifying any potential risks of the project is the responsibility of each team member. The risk manager is then responsible to document the risks and develop risk management plans, though the final plan will be set by the team through discussions in a meeting. Discussing the plan will also help other team members know how to deal with any risk that may occur during development processes. The discussion, in turn, will make the team diminish the effect of risks and retain the project development schedule accordingly.

10.4 **Risk Triggers**

Risk triggers are events or performance characteristics that warn of the occurrence of risk events. The following risk triggers have been recognized by the team:

1. Missing individual deliverable deadlines/schedule
2. Emotional indicators of stress or non-school related issues
3. Requirements changes
4. Inability to construct hardware correctly/low hardware knowledge.
5. Low real world product development experiences
6. Members sickness

10.5 **Risk Analysis**

The following table shows the qualitative risk analysis table of risks that have been identified by the team. It shows the ranks and probability of the risk occurring, and also its estimated cost to the production schedule by days.

<table>
<thead>
<tr>
<th>Risks</th>
<th>Priority (Ranks*)</th>
<th>Probability (%)</th>
<th>Cost (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Missing individual deliverable deadlines/schedule</td>
<td>3</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>2. Non-school related issues</td>
<td>3</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>3. Low hardware knowledge</td>
<td>2</td>
<td>50</td>
<td>7</td>
</tr>
<tr>
<td>4. Low real world product development experiences</td>
<td>1</td>
<td>100</td>
<td>7</td>
</tr>
<tr>
<td>5. Members sickness</td>
<td>3</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>6. Requirements changes</td>
<td>3</td>
<td>5</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 6: Risk Analysis  
*Ranks: Critical-1, High-2, Low-3*
10.6 Risk Severity

The following table shows the severity of the identified risks. The table shows the priority/severity, the resolution as well as the trigger for each risk.

<table>
<thead>
<tr>
<th>Risks</th>
<th>Priority/Severity</th>
<th>Resolution</th>
<th>Trigger</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Missing individual deliverable deadlines/schedule</td>
<td>Low</td>
<td>Make sure the team focus on the schedule</td>
<td>Unable to move forward as scheduled</td>
</tr>
<tr>
<td>2. Non-school related issues</td>
<td>Low</td>
<td>Try help to each other and insure the problem is solved as possible.</td>
<td>Problem to move as scheduled</td>
</tr>
<tr>
<td>3. low hardware knowledge</td>
<td>Medium</td>
<td>Make sure each member researched on all necessary hardware devises</td>
<td>Results to schedule overlapping and crowd</td>
</tr>
<tr>
<td>4. Low real world product development experiences</td>
<td>High/Sever</td>
<td>Try to identify the real world risks by requesting experience sharing from seniors</td>
<td>Uncertain about what will happen next for sure</td>
</tr>
<tr>
<td>5. Members sickness</td>
<td>Low</td>
<td>Make ready everyone to cover up to each other next time</td>
<td>Work load on individuals may occur</td>
</tr>
<tr>
<td>6. Requirements changes</td>
<td>Medium</td>
<td>Make ready for any possible requirement changes to come and to allocate time for it</td>
<td>Work load on individuals may occur</td>
</tr>
</tbody>
</table>

Table 7: Risk Severity
10.7 Risk Response Planning

<table>
<thead>
<tr>
<th>Risks</th>
<th>Response Type</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Missing individual deliverable deadlines/schedule</td>
<td>Management</td>
<td>Make sure the team members focus on the schedule</td>
</tr>
<tr>
<td>2. Non-school related issues</td>
<td>Management</td>
<td>Try help to each other and insure the problem is solved as possible.</td>
</tr>
<tr>
<td>3. low hardware knowledge</td>
<td>Management</td>
<td>Make sure each member researched on all necessary hardware devises</td>
</tr>
<tr>
<td>4. Low real world product development experiences</td>
<td>Management</td>
<td>Try to identify the real world risks by requesting experience sharing from seniors / experienced personnel</td>
</tr>
<tr>
<td>5. Members sickness</td>
<td>Management</td>
<td>Make ready everyone to cover up to each other next time</td>
</tr>
<tr>
<td>6. Requirements changes</td>
<td>Management</td>
<td>Make ready for any possible requirement changes to come and to allocate time for it</td>
</tr>
</tbody>
</table>

Table 8: Risk Response Planning

10.8 Risk Documentation and Reporting

The risk manager will prepare a spread sheet to keep detailed information about the identified risks and the risk management plans. The spread sheet will be uploaded in the team’s google drive made available to be viewed by any member. The risk manager will be responsible to update the spread sheet whenever new risk is identified. All other members shall be responsible to discuss with the Risk Manager about the spread sheet to make sure no missed information in the spread sheet.

10.9 Risk Control

The identified risks and risk management plans shall be discussed in team meetings whenever identified. Risk management plans shall be discussed by the team and carefully documented by the Risk Manager. The plans shall be made available in the team’s Google drive to be viewed by all team members so that all team members can follow the plan and be on the same page with the team. The responsibility of identifying, researching, mitigating any identified risk shall be of all members including the risk manager.
11 Procurement Management Plan

11.1 Purpose of the Procurement Management Plan

The purpose of the procurement management plan is to explain the process that must be followed in order to acquire items that will be necessary to build out product. This process will help make sure that only items that are necessary for our product are to be purchased and nothing is wasted.

11.2 Roles and Responsibilities

- **Project Manager**
  Mike O’Dell will have the final say in purchasing items for our product.

- **Project Sponsor**
  The Project Sponsor, Protection 1 Security, will provide insight into what may be needed to build and design our product to specification.

- **Project Team**
  The Door Keepers will be in charge of compiling a list of items that will be needed based on team member domains.
  - Anup Patel – Web / Software
  - Adrian Echavarria – Web / Software / Hardware / Android
  - Santosh Shrestha – Hardware / Android
  - Wasyhun Tesfaye – Packaging / Android

  The team members will do research in their own domains and bring back options to the team of what exactly is needed to develop and make our product function.

11.3 Required Project Procurements and Timing

Items needed for our product should be procured before the implementation phase of our project. Because of the design concepts of our product, we should be able to purchase everything needed at the start and not need to purchase much in the future. We plan on purchasing all items at least two weeks before our implementation phase to ensure all items arrive on time due to shipping.

11.4 Description of Items/ Services to be acquired

List of items the project needs to fully function:

- Microcontroller
- Web-Camera
- SD Card
- Form-fitting Case
- Mounting Screws
- Mounting Bracket
• Power Adapter
• Speakers
• Garage Door Sensors

Extra/future features to make our product better:
• LCD Screen
• Microphone
• External Light
12 Project Closeout Report

12.1 Purpose of Closeout Report
This report is conducted to assess how the project succeeded or failed upon completion. Lessons learned, best practices, and shortcomings will be captured by this report. This will also resolve personal, contract, administrative, and financial issues.

12.2 Administrative Closure

12.2.1 Were the objective of the project met?
Our product will be analyzed against our System Requirements Specifications documentation and a prototype will be subject for inspection by our sponsor, any potential customers, and Mr. O’Dell. Any requirements not met or deviations from the SRS will be documented in the closeout report with explanations.

12.2.2 Archiving Project Artifacts
All documents, images, and sources will be kept as soft copies in the team’s Google Docs online file repository, along with hard copies of the documents kept in the senior design lab for reference. Receipts and other outside-source documents/printables will maintain originals and scanned-copies.

The following are what will be archived and available for review:

- System Requirements Specification (SRS)
- Project Plan
- Project Charter
- Architectural Design Specifications (ADS)
- Detailed Design Specifications (DDS)
- System Test Plan (STP)
- Financial Records
- Purchase Receipts
- Team Status Report Presentations
- Source code with each major revision
- Build and Use Instructions
- General Status Reports

12.2.3 Lessons Learned
As we continue with this project, we will be recording everything in Engineering Notebooks, and occasionally review each other’s notebook to help identify key points when problems and successes occur. We will also occasionally ask each other at meetings about problems we faced and successes we uncovered. These will be recorded/noted in our repository for future reference.
12.2.4 Plans for Post Implementation Review (PIR)

Upon our prototype passing acceptance criteria and inspection, we will conduct the Post Implementation Review (PIR). This feedback will help us as we go toward the final product.

12.2.5 Final Customer Acceptance

Upon finalizing the prototype, the team will conduct hands-on demonstrations of the product with any potential customers, the sponsor, and Mr. O’Dell. They will be given the opportunity to verify the compliance with the requirements and provide feedback on their expectations.

12.2.6 Financial Records

All purchases will be documented and all receipts digitized and maintained by our team on our repository (archival) with the hardcopies in the lab. These will be incorporated into our final closeout report.

12.2.7 Final Project Performance Report

This report will review the performance of the project based on a few certain areas:

- **Scope:** Did the project maintain its desired area of specialization?
- **Schedule:** How was the team on their scheduled tasks?
- **Quality:** How well was the prototype/product accepted?
- **Risk:** Was the Risk Management Plan effective?