Secure Door Opener Milestone 1

Team Members:

Name	Email
James Pabisz	jpabisz2020@my.fit.edu
Christopher Kiefer	ckiefer2019@my.fit.edu
Warren Smith	wsmith2019@my.fit.edu
Luke Bucher	lbucher2017@my.fit.edu

Faculty Advisor:

Dr. Marius Silaghi - msilaghi@fit.edu

Client:

Dr. Marius Silaghi - Graduate Professor at Florida Institute of Technology

Progress Matrix:

Task	% complete	James	Chris	Warren	Luke	To Do
Selection of Tech Stack	100%	40%	20%	20%	20%	
IOT Acceptance Criteria	100%	20%	20%	20%	40%	
Set up Proper Tasking and User Stories	100%	40%	20%	20%	20%	
Requirements Documentation	100%	20%	20%	20%	40%	
Subsystem Design Documentation	100%	20%	20%	20%	40%	
Integration Documentation	100%	20%	20%	20%	40%	
Lightweight Facial recognition Research	100%	20%	40%	20%	20%	
Infrastructure Research	100%	20%	40%	20%	20%	

Task Discussion:

Selection of Tech Stack:

Multiple technologies were examined during the selection of the tech stack. Research on the technology stack was split up by subsystems: App development, Network and Server interfacing, and hardware. We examined multiple application development technologies ranging from native Android app development tools to Cross platform tools to Hybrid tools. We have decided on native Android development because of the ease of creating a working application and the reduced complexity from having to work with less technologies. Java, Javascript, and Kotlin were considered for the app development. Kotlin was chosen for the massive reduction in boilerplate code over Java, the compatibility with Java and Javascript, the verbose compiler error explanations, and its speed. Android Studio will be used as the IDE for the development of the app as it has many great features for testing the app built in. Server and Network technologies investigated include the MEAN, MERN, LAMP, and MERN stacks. AWS was also investigated. A react stack with AWS will be implemented because it makes working with the mobile app easier and more intuitive while providing the necessary functionality. On the hardware side we will be working with a Raspberry Pi as it provides enough computational power whereas an arduino would not. A 2k resolution camera will be used in order to provide enough resolution to ensure satisfactory facial recognition while not picking up as much information as the other option which was 4k and would have made the system slower. Multiple project management softwares were examined and tested for ease of use and expressivity. ClickUp and Jira were the two project management tools that were determined to be the best.

Jira was chosen over ClickUp because of its ease of use and its agile development focused design. Additionally, most of the team has prior experience working with Jira so there is less of a learning curve attached.

IOT Acceptance Criteria:

Discussions with Dr. Silaghi about the requirements needed to ensure the performance of the IOT device. Our initial largest fear was that facial recognition was going to need to be completed by the Raspberry PI module itself. After further discussion with Dr. Silaghi we will be using the Raspberry PI as a network attached device that will push data upstream to an AWS instance. As well our secondary concern stemmed from power consumption of the Raspberry PI as we are operating on battery operations. Dr. Silaghi wants us to focus on the performance of the device and complete a second pass for optimizations.

Set up Proper Tasking and User Stories:

User stories were created for the Android application as well as the hardware. Jira was populated with the User stories. A gantt chart was created to organize the tasks, increase deadline visibility, and help keep people on track for deadlines. Goals and deadlines have been made for Milestones 2 and 3.

Requirements Documentation:

Requirements were generated from discussions with Dr. Silaghi. A copy was sent for review and with minor revisions was approved. Requirements are separated based on their subsystem that they are located within and design decisions are made with those separation in mind. Further readings about the requirements generated can be read directly from the SRS.

Subsystem Design Documentation:

The design document was generated from the approved requirements. Consideration was taken for the separation of the systems as well as ensuring that needed data is present in each sub system. We believe that a centralized IOT endpoint system will allow for seamless management of the devices as well as provide a simple direct communication between the mobile application and the Secure Door Lock device. Further reading into the design is located within the SDS.

Integration Documentation:

Integration of the systems and their breakdown are located within the SDS that has been generated.

Lightweight Facial Recognition Research:

There were multiple different approaches that were looked into including making our own lightweight form of machine learning.We ultimately decided that using a pre existing tool would be better. After much thought we decided that developing our own form of facial recognition would just simply be too much effort for a very minor gain, if any gain at all. This also works in tandem with our choice of infrastructure because the tools will have an easier time communicating with each other. The choice to use AWS was partly due to the research that was

done in regards to choosing the tool for this part. The main reason that we decided to make this choice was due to how easily accessible Amazon Rekognition is and the fact that it is partly free. The majority of what we need facial recognition to do would fall under the free part of this tool. The main feature that led us to choose this tool was the ability to upload a picture and manipulate it from there. It is important that we are easily able to upload a picture because the hardware will not be able to process the image on the door handle, so the tool we use must be able to accept images as input parameters. There were a few other different facial recognition tools that were considered but were either locked behind a paywall or were too complex for what we needed.

Infrastructure Research:

The infrastructure research was done side by side with facial recognition research. Again we had multiple different ideas on how to proceed with this. There were talks of using a private server that Dr.Silaghi had but that was determined to be an unfeasible option. Ultimately we decided to just host the infrastructure on AWS. This turned out to be a boon as we decided to go with Amazon's facial recognition software. The fact that we decided to use AWS and Amazon facial recognition means that we will be able to integrate everything much easier.

Member Contributions:

James Pabisz:
Completion of User Stories
Setup of Project Management Tool and Tasks
Comparison and Selection of Tech Stack

Christopher Kiefer:
Completion of Test Plan document
Discussion/Completion of Infrastructure Research
Discussion/Completion of Lightweight Facial Recognition Research

Warren Smith:
Completion of Test Plan document

Luke Bucher:
Completion of SRS document
Completion of SDS document
Discussions on infrastructure
Completion of IOT Acceptance Criteria
Completion of Integration Design
Discussions of selected Tech Stack
Creation of Jira Board and attached User Stories

Milestone 2 Task Matrix:

Task	James	Christopher	Warren	Luke
Camera	20%	20%	40%	20%
Raspberry Pi	20%	40%	20%	20%
.apk Creation	40%	20%	20%	20%
Begin backend endpoints	20%	20%	20%	40%

Milestone 2 Task Discussion:

Camera:
This task is mainly dealing with the physical camera itself. This task will include selecting a camera to use on the Pi and finding a way to integrate it. Included in this will be finding or creating a suitable set of drivers that can be used on the Pi.

Raspberry Pi:
This task will include selecting the model of Raspberry Pi we will use for this project. The task will also include finding a way to set up the Pi to connect to the server as well as making sure the camera is connected and working

.apk Creation:
This task is mainly about the creation of the .apk package we will be using throughout the rest of the project. This .apk package should be able to communicate with the server by the end of the Milestone.

Backend endpoints:
Setup the server so that it can send and receive data from both the app and the door opener. The main focus of this milestone is to make sure that communication between each link, from the app to the server and from the server to the hardware, is in place. The app does not necessarily need to be able to communicate with the door opener.

Meeting Dates:

Date	Topic
August 29,2022	Initial kick off meeting/ preliminary requirements gathering
September 14, 2022	Discussed requirements in depth, examined the hardware that will be used

Faculty Advisor Feedback below:

Task 1:

Task 2:

Task 3:

Task 4:

Task 5:

Task 6:

Task 7:

Task 8:

Approval from Faculty Advisor

"I have discussed the milestone with the team. I have evaluated the progress and will assign a grade for this milestone."

Signature: _____   Date: _____

Evaluation by Faculty Advisor:

Score (0-10)

James	0	1	2	3	4	5	6	7	7.5	8	8.5	9	9.5	10
Chris	0	1	2	3	4	5	6	7	7.5	8	8.5	9	9.5	10
Luke	0	1	2	3	4	5	6	7	7.5	8	8.5	9	9.5	10
Warren	0	1	2	3	4	5	6	7	7.5	8	8.5	9	9.5	10