Project 4: Home Security System Proposal

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Contents

Chapter 1

Description of Project

1.1 Project Idea

This proposal is for a home security system that is a hardware and software solution. Our company will offer installation services for the system, which is a base station and various POE IP cameras. The storage for the system will be through AWS and there will be a web interface to access the recorded feeds. The monetization will be through a hardware and install fee, and a monthly subscription fee for the AWS storage and web interface.

The hardware will be based of a Raspberry Pie 5, with a Corral Accelerator, and a POE switch. It will all be contained within a custom case that will be mounted to the wall. The cameras will be POE IP cameras that will be connected to the switch and powered by it. The customer will be able to pick various numbers and variations of indoor and outdoor cameras.

The Pie will be running the default version of Raspbian. The open source software Frigate will be used to manage the cameras, feeds, recordings, and detection. The storage will be through AWS S3 mounted locally using Rclone. Frigate will handle the web interface, but there will be a tunnel to the AWS instance so the customer can access the recordings on the web.

The install service will be done by in house contractors. They will visit the customer's home, advise them on number of cameras and camera placement. They will then install the hardware, connect it to the internet, and show the customer how to use the system.

Chapter 2

Likely Marketing Efforts

2.1 Target Audience

Our primary target market is homeowners, small business owners, and property managers who seek an affordable, high-tech security solution. Families who wish to enhance safety and businesses that require high-level surveillance will all be catered to by this system. By selling to homeowners, businesses, and security-conscious consumers, our AI-powered security system fills a sizable niche in the market.

2.2 Cost Expectations

Testing Testing Testing

Chapter 3

Technical Details / Technical Research

A three-tier surveillance security system package specifically designed for family homes. The packages offer different levels of security, from essential home monitoring to advanced surveillance with AI-based detection. Each package includes necessary hardware, software, and storage solutions for easy installation and use. The Coral USB Accelerator is included in all packages to enhance AI-based motion detection and object recognition. Real pricing for PoE switches has also been incorporated. Camera specifications have been adjusted so that the first tier supports either indoor or outdoor use, and the second tier includes both indoor and outdoor cameras.

Tier 1: Essential Home Package The Essential Home Package is designed for families looking for an entry-level yet effective surveillance system. This package includes two cameras that can be used either indoors or outdoors, providing flexibility for home security. Components:

- 2 Indoor/Outdoor PoE Cameras (Reolink 5MP, 2560×1920 resolution, 30 fps) - $70 each

- 1 Raspberry Pi 5 (4GB RAM) pre-installed with surveillance software - $60

- 1 Coral USB Accelerator for AI-powered motion detection - $25.99

- 1 PoE Switch (4-port TP-Link TL-SF1005P) - $40

Features:

- Local storage on Raspberry Pi 5 (up to 128GB via microSD)

- Mobile app access for live viewing

- AI-based motion detection and object recognition using Coral USB Accelerator

Estimated Total Cost: $266

Tier 2: Smart Home Package

This package offers additional security coverage and smart features for homeowners seeking more control over their surveillance system. It includes a combination of indoor and outdoor cameras, ensuring comprehensive security coverage.

Components:

- 2 Indoor PoE Cameras + 2 Outdoor PoE Cameras (Reolink 5MP, 2560×1920 resolution, 30 fps) - $70 each

- 1 Raspberry Pi 5 (4GB RAM) pre-installed with surveillance software - $60

- 1 Coral USB Accelerator for AI-powered motion detection - $25.99

- 1 PoE Switch (8-port NETGEAR GS308PP) - $100

Features:

- Local storage on Raspberry Pi 5 (up to 256GB via external SSD)

- Mobile app access for live viewing and playback

- AI-based human and vehicle recognition for smarter motion detection

Estimated Total Cost: $506

Tier 3: Advanced Family Package

The Advanced Family Package is ideal for families wanting full security coverage with AI-based surveillance features and cloud storage options. This package includes six cameras that can be used in any combination of indoor or outdoor settings.

Components:

- 6 Indoor/Outdoor PoE Cameras (Reolink 5MP, 2560×1920 resolution, 30 fps) - $70 each

- 1 Raspberry Pi 5 (8GB RAM) pre-installed with surveillance software - $80

- 1 Coral USB Accelerator for AI-powered motion detection - $25.99

- 1 PoE Switch (16-port TP-Link TL-SG1016PE) - $180

Features:

- Local storage on Raspberry Pi 5 (up to 512GB via external SSD)

- Mobile app access for live viewing, playback, and two-way audio

- AI-powered motion detection and object recognition using Coral USB Accelerator

- Optional cloud storage integration with AWS

Estimated Total Cost: $826

3.1   Staffing and Salaries

Department Director: $180k/yr
    Software Team:

- **Business Analyst/Scrum Master:** $120k/yr

- **Software Dev Lead**

    - **Team 1:**
        * **Senior Dev:** $120k/yr
        * **Junior Dev:** $80k/yr
        * **Junior Dev:** $80k/yr
    - **Team 2:**
        * **Senior Dev:** $120k/yr
        * **Junior Dev:** $80k/yr
        * **Junior Dev:** $80k/yr

Systems Team:

- **Systems Administrator:** $80k/yr

- **Network and Security Lead:** $120k/yr

    - **Network and Security Specialist:** $100k/yr

- **Helpdesk Lead/External Liaison:** $50k/yr

    - **Helpdesk Specialist:** $30k/yr
    - **Helpdesk Specialist:** $30k/yr
    - **Helpdesk Specialist:** $30k/yr

Chapter 4

Defined Goals / MVP

The end product is a home security system and hardware solution that we offer install services for. The package to the user will be home base station that has a POE switch, and varying IP cameras to connect to it. The storage for the system will be through AWS and the there will be a web interface to access the recorded feeds. The monetization is through a hardware and install fee, and a monthly subscription fee for the AWS storage and web interface.

Chapter 5

Testing to be Performed

Requirements	Test Case	Test Result	Defect/Error
Hardware Setup			
Gather all required components	Verify all components are present		
Insert the microSD card into the Raspberry Pi	Verify microSD card is inserted		
Connect the Raspberry Pi to a monitor, keyboard, and mouse	Verify connections		
Power on the Raspberry Pi	Complete initial setup wizard		
Raspberry Pi OS Configuration			
Download Raspberry Pi Imager	Verify download		
Flash Raspberry Pi OS to the microSD card	Verify flashing process		
Enable SSH access via raspi-config	Verify SSH access		
Connect the Raspberry Pi to Wi-Fi or Ethernet	Verify network connection		
Update the Raspberry Pi OS	Verify OS update		
Frigate Installation			

Install Docker on the Raspberry Pi	Verify Docker installation		
Pull the Frigate Docker image	Verify Docker image pull		
Create a directory for Frigate configuration files	Verify directory creation		
Create and configure the config.yml file	Verify config.yml file		
Add camera details to the config.yml file	Verify camera details		
Run the Frigate Docker container	Verify Docker container running		
Camera Setup			
Physically connect 4 cameras to the Raspberry Pi	Verify camera connections		
Verify each camera is recognized by the Raspberry Pi	Verify camera recognition		
Testing and Optimization			
Access the Frigate web interface	Verify web interface access		
Verify live feeds from all 4 cameras	Verify live feeds		
Test motion detection and recording	Verify motion detection		
Adjust Frigate settings for optimal performance	Verify settings adjustment		
Restart the Frigate Docker container	Verify container restart		
Verify system performance after optimization	Verify system performance		
Security and Documentation			
Change default passwords	Verify password change		

Enable a firewall and restrict SSH access	Verify firewall and SSH settings		
Test SSH access with the new password	Verify SSH access		
Document the setup process	Verify documentation		
Review the documentation for accuracy	Verify documentation accuracy		
Perform a final system test	Verify final system test		
Create a backup of the microSD card	Verify backup creation		
Install preconfigured OS using flashdrive	Insert flashdrive into Pi		
	Boot Raspberry Pi		
	Verify OS installation		
Check that Frigate is running	Verify Frigate service is active		
Check that Rclone is running	Verify Rclone service is active		
	Verify Rclone configuration		
Check that the bucket is mounted and viewable	Verify AWS S3 bucket is mounted		
	Access files in the mounted bucket		
Check that the web interface is viewable	Access the web interface URL		
	Verify live camera feeds are displayed		

Chapter 6

Summary of Proposal

Many homeowners would love to have security for their house. Our product does not only allow for this security but is also more advanced than competitors. Using these cameras and hard wiring them to a PI will add an extra layer of security to make it harder hackers to breach. Using AWS the cost of installation would be lower and more income will come from a month subscription.

Chapter 7

Timeline and Budget

7.1   Timeline

7.2   Budget Estimates

Cost estimates are divided into hardware, storage/software, licensing, human resources, developer labor, installer labor, employee benefits, vehicle cost, and damage allowance.

Hardware consists of the Pi 5, costing $150 dollars (including shipping). Cameras, the average customer will buy 4 1200p cameras valued at 100 dollars each. The Coral TPU and the M2 accelerator key cost $100 together. The POE switch will cost 50 dollars, and another 50 dollars for cabling, mounting equipment, etc. Calculating into 2,000 units come to 1.5 million.

Damage Allowance is an alloted amount for recovery of damaged product that arrives, that usually equates to 10% or total hardware cost.

Storage cost refers to the AWS storage cost for 4 cameras in 1200p, with the predetermined storage. This is estimated to be $96,000 a year. Software is $0 outside of storage costs.

Licensing includes electrical contractor licenses for 3 installers, $600. Business license, $100. Home Improvement Contractor license. $1095.

Human Resources requires one person, making 60k annually.

Developer labor cost is determined by the teams total salaries combined, including scrum master, and head of department.

Installer labor is determined by the installers salaries times amount of installers, with a salary of $62,000 in VA.

Systems team labor includes the system team's total salaries Help desk labor covers help desk personnel for the year. Benefits are calculated by $15,000 per year per employee. Vehicle costs are sorted into upfront (cost of vehicle purchase), and annual, including gas, 60 cents a mile, maintenance 40 cents a mile, and $6,000 a year for full insurance for 3 vans.

Item	Cost
Hardware	$1,500,000
Damage Allowance	$150,000
Storage/software	$96,000
Licensing	$1795
Human Resources	$60,000 for the year.
Developer Labor	$860,000 for the project.
Installer Labor	$186,000 for the project
Systems team	$350,000 for the year
Help Desk Labor	$90,000 for the year
Benefits	$270,000 for employees.
Vehicle cost	$165,900 upfront, $15,900 annually after year 1.
General insurance cost	$3,000
Total	$3,732,695

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