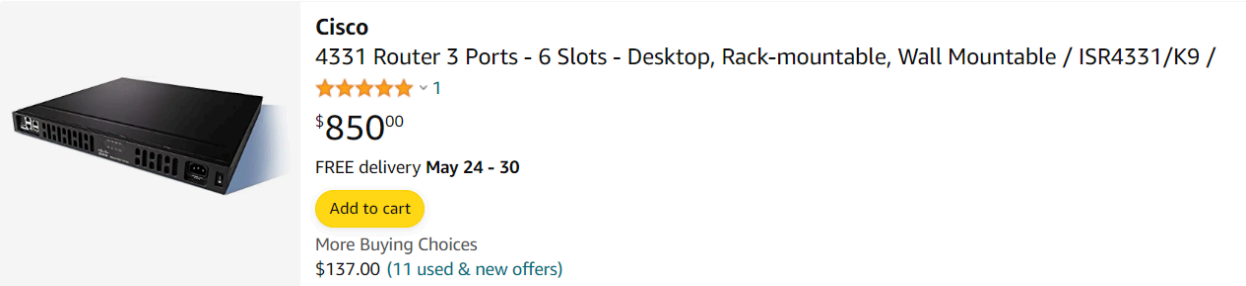
Introduction

The prototype system uses Internet of Things (IoT) technologies to improve security alarm systems through effective management and monitoring. Machine-to-machine (M2M) operations that are connected and normalized, device administration, database utilization for device data, processing and action management, a visualized dashboard, programming approaches and constructions, and Internet of Things analytics are some of the key characteristics. This thorough methodology guarantees a reliable and well-optimized system that satisfies contemporary security requirements.

To guarantee functionality and optimisation, I will start by methodically focusing on each component as I construct the prototype:

Cisco router



Location:I will place this router in a central location within my house which is a living room.This ensures optimal coverage and connectivity for all devices within the network including my alarm system components.

Price:I will buy this router for $850

Its specifications: Cisco router 433, 3ports, 6 slots, desktop, rack-mountable,wall mountable, ISR4331, k9

Raspberry pi

Sponsored

Raspberry Pi 5, Single Board Computer, 4GB RAM, 2.4GHz 64-bit Quad-core Arm Cortex-A76 Processor, Bluetooth 5.0, BLE Wireless

★★★★☆ 8

100+ bought in past month

$72.99

Delivery **Tue, May 28**

Ships to Kenya

Add to cart

Location:I will install the Raspberry Pi near the cisco router within the same room.This allows for easy network connectivity and communication with other devices in the smart alarm system.

Price:I will buy this raspberry pi for $72 .

Its specifications: Raspberry Pi 5, Single board computer, 4GB RAM, 2.4GHZ 64-bit Quad-core Arm cortex-A76 processor, Bluetooth 5.0, BLE wireless

PIR sensor

Sponsored

HiLetgo 3pcs AM312 Mini Pyroelectric PIR Human Sensor Module PIR Infrared IR Sensor Body Manual Motion Infrared IR Detector

★★★★½ 205

100+ bought in past month

$8.69

Delivery **Fri, May 31**

Ships to Kenya

Add to cart

Location:I will position the PIR sensors strategically in the entryways,hallways and the rooms of the house to ensure that they have a clear line of sight to detect motion effectively.

Price:I will buy these PIR sensors for $8

Its specifications: Hiltego 3pcs AM312 Mini pyroelectric PIR human sensor Module PIR infrared IR sensor body manual motion infrared IR detector

Alarm bell buzzer

AC110V, 120dB Red Mini Electric Motor Siren, Motor Alarm, Horn Sound Buzzer, Alarm Bell for Home, Residential Areas, Industries, Stores and Control Systems

★★★☆☆ 11

$16.39

Delivery **Wed, May 29**

Ships to Kenya

Add to cart

Strobe light

Sponsored

Alarm Siren Strobe Light 120dB Industrial Sound Light Alarm Outdoor Waterproof Siren Strobe Alarmfor Home Security AC110V Tone Volume Adjustable

★★★½☆ 5

$129.99

Save 10% with coupon

Delivery **Thu, May 30**

Ships to Kenya

Only 11 left in stock - order soon.

Add to cart

Location:I will install the electric sirens and strobe lights in visible and audible locations like outside the house, near entrances and exterior walls of the house.This placement helps alert occupants and deter intruders effectively.

Price for buzzer: $ 16

Price for strobe lights: $ 129

Specifications for the buzzer: Ac110v, 120db Red Mini Electric Motor siren,Horn sound Buzzer, Alarm Bell for home

Specifications for strobe light: Alarm siren strobe light 120db, industrial sound light alarm outdoor waterproof siren strobe alarm for home security Ac110v tone volume adjustable

Actuators

Sponsored

12 Inch Linear Actuator, 1000N High Speed 10mm/s Heavy Duty 12V Linear Actuator, Instantaneous Waterproof Switch with Mounting Bracket, for Automotive (300mm)

$46.99

Save 9% with coupon

Delivery **Fri, May 31**

Ships to Kenya

Only 9 left in stock - order soon.

Location:I will install the linear actuators on the windows and doors of the house that require automated opening or closing based on alarm triggers.I will ensure it is installed securely so that it can operate smoothly without obstruction.

Price: I will buy it for $46 .

Its specifications: 12 inch linear actuator, 1000N high speed 10mm/s heavy duty linear actuator, instantaneous waterproof switch with mounting bracket,for automotive (300mm)

Laptop

HP Notebook Laptop, 15.6" HD Touchscreen, Intel Core i3-1115G4 Processor, 32GB RAM, 1TB PCIe SSD, Webcam, Type-C, HDMI, SD Card Reader, Wi-Fi, Windows 11 Home, Silver

Options: 7 capacities

4.4 967

2K+ bought in past month

$453.99

Delivery **Fri, May 31**

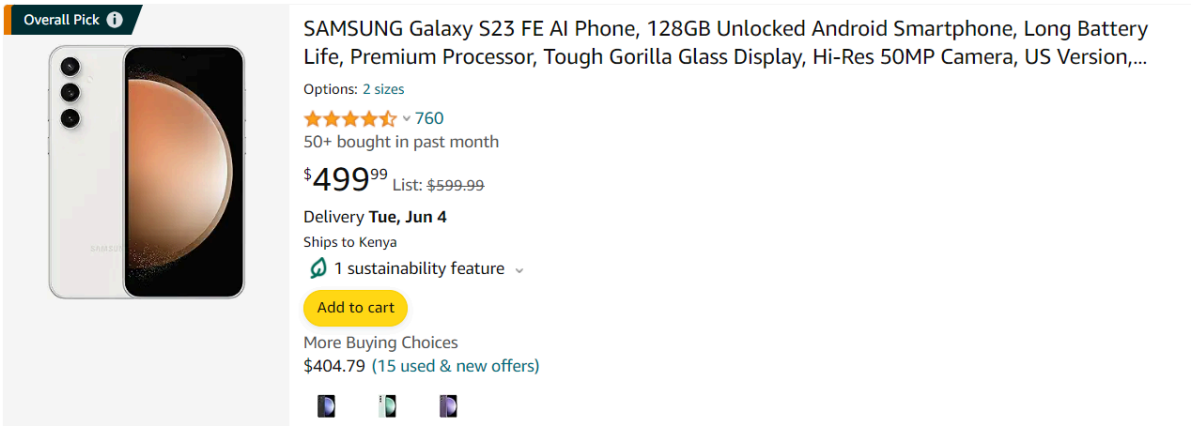
Ships to Kenya

Location: The laptop can be safely stored in the home office, which also doubles as the main location for monitoring and managing the whole alarm system. Easy access to logs, configuration choices, system settings, and status updates from a single device is guaranteed via centralized control.

Its specifications: Hp notebook laptop, 15.6” HD touch screen,Intel core i31115G4 processor,32GB RAM,1TB PCIe SSD, webcam, Type-C, HDMI, SD card reader, wifi, windows 11 Home,silver.

Price:I will buy this laptop for $ 453 .

Mobile phone



Specifications: Samsung Galaxy S23 FE AI phone, 128GB unlocked smartphone, Long Battery Life, Premium processor, Tough Gorilla Glass Display, Hi-res 50mp camera, US version, 2023, cream.

Price:I will buy this phone for $500

Server

CimFAX A5 Paperless Fax Machine Send Fax from PC/Mobile Phone via Fax Line 24/7 Anytime Anywhere Fax Remotely Fax Server 5 Users Fax2email

★★★★☆ 178

$295.00

Save $20.00 with coupon

Delivery **Wed, May 29**

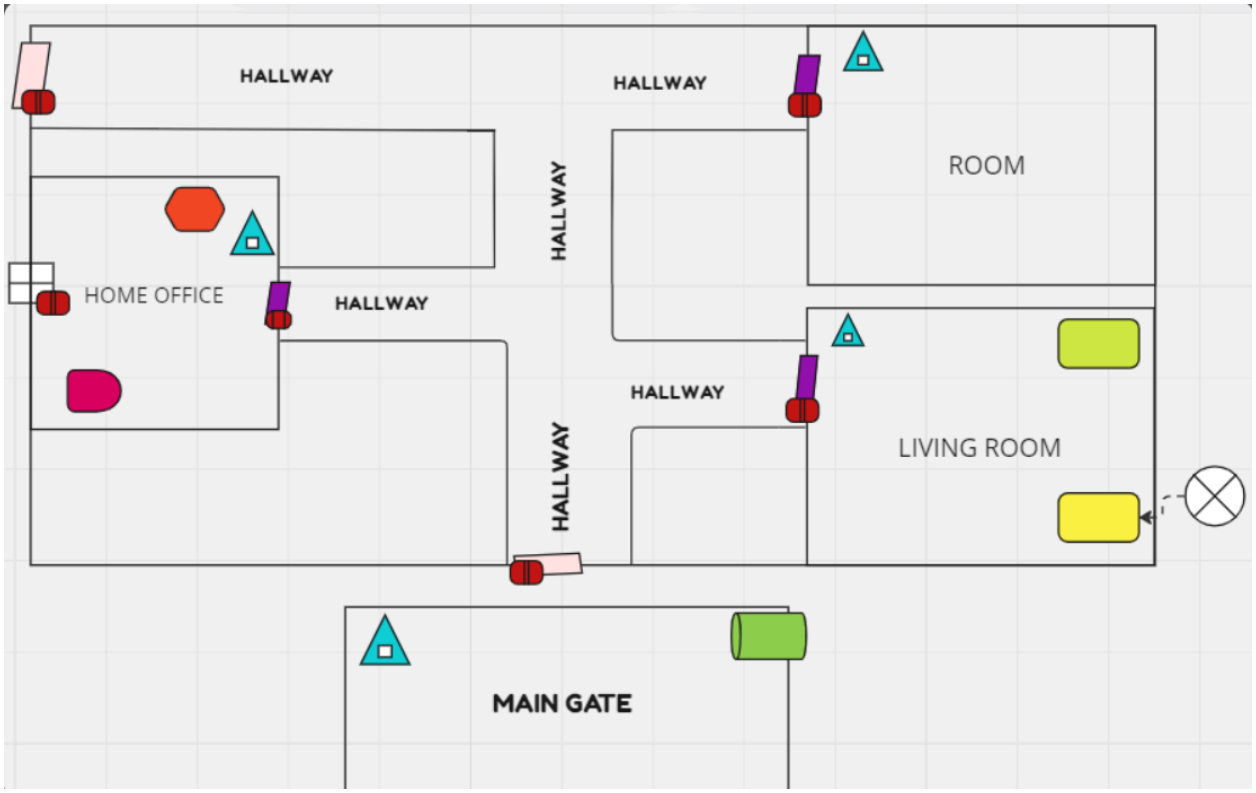
Ships to Kenya

Location:I will place the cimFax A5 in a secure and accessible location, which is the living room.This allows for convenient remote faxing capabilities as part of the alarm system.

Price:I will buy this server for $295 .

Its specifications: CimFAX A5 paperless Fax Machine Send Fax from PC/mobile phone via Fax line 24/7 Anytime Anywhere Fax remotely server 5 users Fax2email

Architecture of these devices in a house



As you can see above on my system installation, the symbols that are on the house architecture are explained on the key area. The symbols represent the devices that I used to install the alarm system in the house.
The burglar alarm includes the sensor, the bell and the strobe lights.

Connected and normalized M2M operations

Every device has a network connection and is able to communicate with every other device. To create a dependable network infrastructure, this entailed setting up network settings on devices like the switch, Cisco router, Raspberry Pi, and CCTV.

The client's need for connected devices and normalized machine-to-machine (M2M) operations is efficiently met by the smart alarm system due to a well-integrated network architecture and standardized communication protocols. It guarantees constant connectivity between all installed devices, enabling effective data exchange and communication between the switch, CCTV, Cisco router, Raspberry Pi, sensors, sirens, and other components.

Data formats and protocols are standardized by data normalization procedures, allowing for consistent and compatible communication between devices. Alarm triggering systems automate activities in reaction to detected incursions, while sensor connection with the Raspberry Pi or CCTV enables real-time monitoring and response to security incidents. Centralized control and coordination for a unified and responsive smart alarm system are made possible by the system's powerful security standards, video surveillance capabilities, and remote monitoring through the Ring app.

Remote management

Problems can be quickly identified and resolved without the need for physical intervention due to remote diagnostic tools and continuous monitoring of device status and performance parameters. By keeping the devices' software up to date with the newest security patches and feature additions, managing patches and updates will help to minimize downtime.

I will use Device configuration management to optimize settings for compatibility, security, and performance, while security features like encryption and access controls shield devices from hackers and unwanted access. Lifecycle management guarantees that devices are used effectively and replaced when necessary, while automation technologies make regular activities like patching, configuration updates, and monitoring easier.

Process and action management

The procedure and action management for dealing with security events, such incursions, are smoothly integrated into my smart alarm system. Hiltego PIR Sensors are positioned strategically to detect motion in key parts of your home during the detection phase. This starts the Raspberry Pi 5's analysis phase, which evaluates the kind and extent of the breach that was found. The system automatically initiates relevant steps, such as turning on electric sirens and strobe lights outside the home for loud and visible notifications, based on the analysis results.

By shutting windows or doors, the Linear Actuator can simultaneously secure entry points. In parallel, the CimFAX A5 Paperless Fax Machine generates an email report that is sent via the Ring App to specific recipients, offering up-to-date, comprehensive details on the intrusion occurrence. This all-inclusive procedure guarantees prompt identification, accurate evaluation, prompt action, and educational alert, improving the security and responsiveness of the smart alarm system.

Cloud storage to save data

A smart alarm system's cloud storage is a flexible part that fulfills several important functions. Sensor readings, alarm logs, video recordings, and system configurations are just a few of the data types that are centrally stored in it. Remote monitoring and control of the alarm system are made possible by this data's safe storage and easy accessibility from any location with an internet connection. In addition, cloud storage is essential for disaster recovery and backup, guaranteeing that important data is securely saved and recoverable in case of system outages or data loss.

Programming techniques and constructs

When creating and deploying a smart alarm system similar to yours, integrating hardware components, and utilizing a mobile app such as the Ring App, programming approaches and constructions are essential. These components come together as follows:

Hardware Device Setup: The initial phase involves configuring the hardware, such as the CimFAX A5 Paperless Fax Machine, Hiltego PIR Sensors, Electric Sirens and Strobe Lights, Raspberry Pi 5, Cisco Router 433, and linear actuator. For smooth integration and operation within the system, every device needs to be correctly connected, set up, and tested.

Visual programming constructs: The development process can be made simpler by using visual programming constructs like graphical programming tools or drag-and-drop interfaces. For example, without requiring deep coding knowledge, processes and logic for processing sensor inputs, triggering actions, and producing email reports can be visually designed using tools like Node-RED or Blockly.

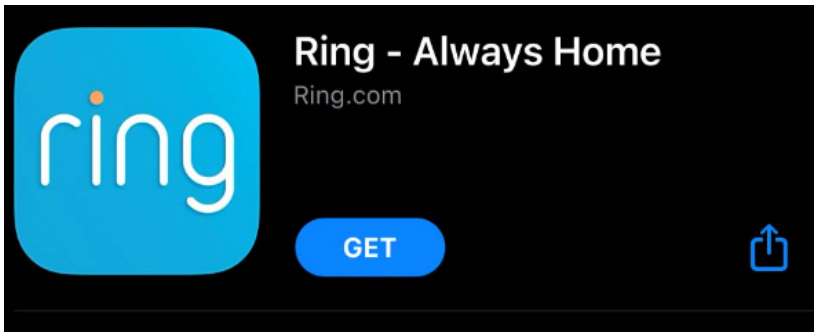
Non-Visual Programming constructions: In contrast, non-visual programming constructions need the use of programming languages such as JavaScript, Python, or Java. More complex control over data processing, communication protocols, and device behavior is possible at this level of programming. For instance, Raspberry Pi Python programmes can interpret sensor data, manage actuators, and communicate with cloud services to enable email notifications.

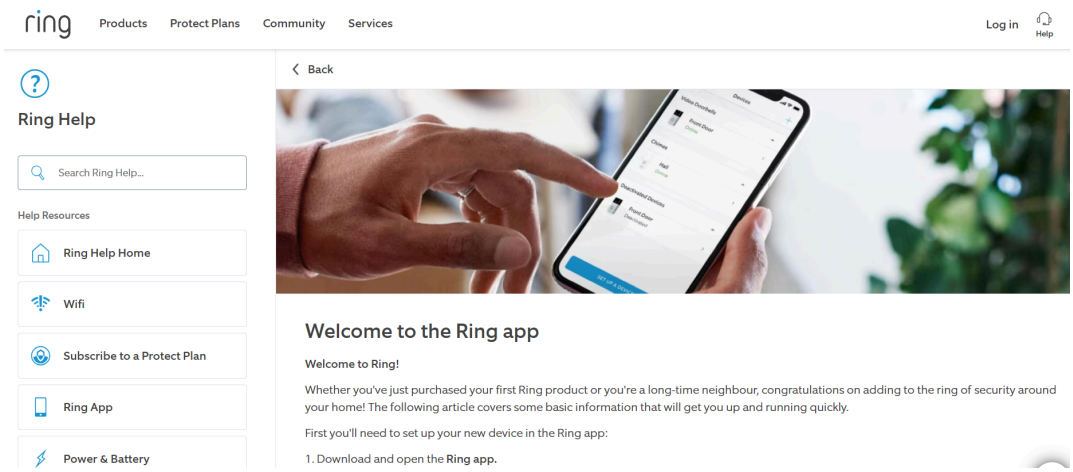
Mobile App Integration (Ring App): Users may monitor and control their smart alarm system remotely thanks to the Ring App, which acts as a vital interface. Developing mobile app features like real-time alerts, status updates, and interactive controls for arming/disarming the system or seeing surveillance footage is a necessary step in integrating the Ring App. Programming expertise in mobile app development frameworks such as React Native, Flutter, or native iOS/Android development is needed for this integration.

Conclusion

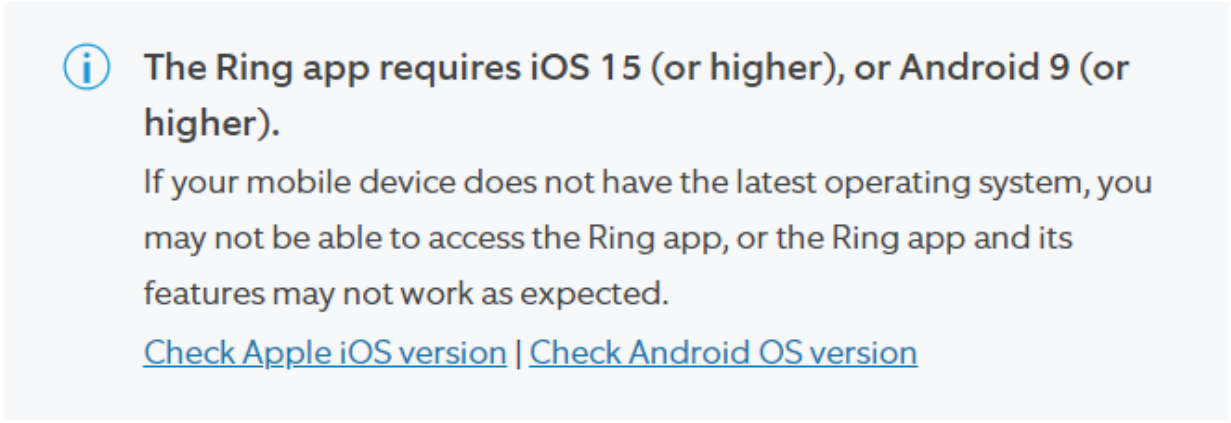
With the help of mobile app integration and visual and non-visual programming constructs, you can build a comprehensive and easy-to-use smart alarm system that seamlessly integrates hardware, processes data, initiates actions, and offers a user interface for monitoring and control.

Ring app



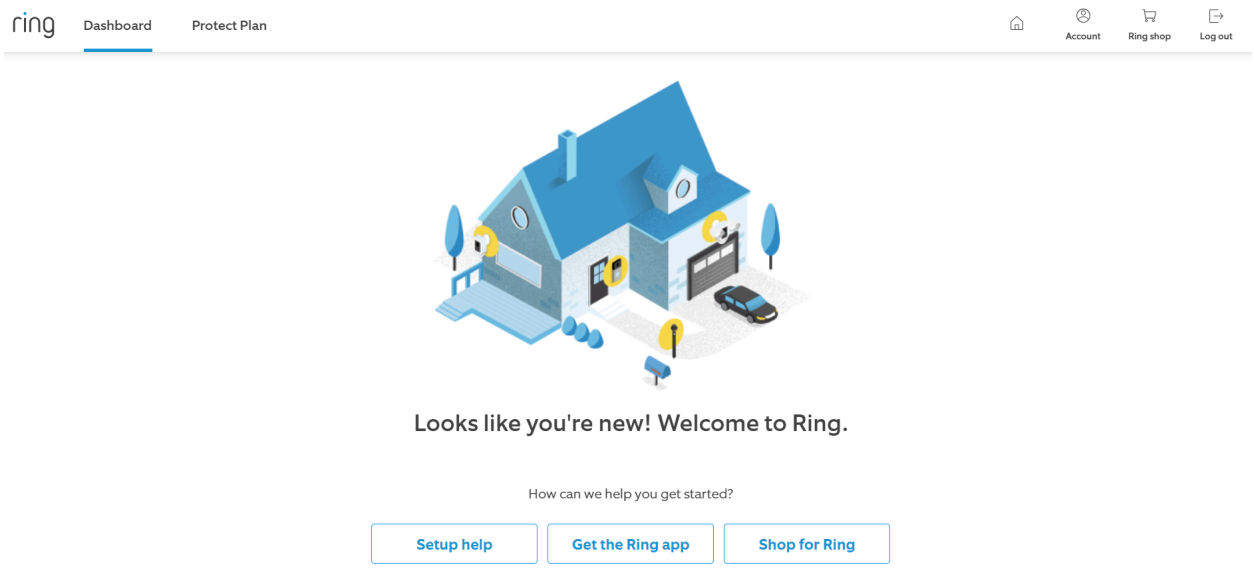


I installed the ring app on my phone and a laptop for remote monitoring, control, and alerts. I will ensure I have access to this app from anywhere, allowing me to manage the smart alarm system remotely.



Both android and apple users can use this app as shown above.

Visual dashboard



Here is the dashboard of the ring app after the user has logged in.

Wifi


Checking your Ring device's wifi signal strength


Reconnecting your Ring devices to wifi


Fixing inaccessible recordings by adjusting your router

Solving connection issues with your Ring device

Finding your wifi password

Improving your Ring device connectivity

Ring app not showing video or connecting to my Ring device

Rebooting your Ring Video Doorbell or Security Camera

The ring app functionality

1.End-users

Monitoring: Using the app, end users may keep an eye on their house or other assets from a distance. They have access to recorded film, can watch live camera feeds, and can get notifications when motion or events are detected.

Alerts and Notifications: When an alarm goes off or when sensors or cameras spot questionable activity, the app instantly notifies end users through alerts and notifications.

Control: Using the app, end users can activate or disable the alarm system, change the sensitivity of the sensor, and control other users' access rights.

History: A history of past alerts, motion detections, and user interactions with the system are all available through the app.

2.Administrators

System configuration: Through the app, administrators can adjust the alarm system's complex settings and presets. They have the ability to integrate third-party devices or services, set up and manage several devices, and alter alarm modes and regulations.

User management: Within the app, administrators can control user accounts and rights. Users can be added or removed, access and control levels can be assigned, and activity records for each user can be viewed

Troubleshooting: In order to help administrators resolve any problems with the alarm system, such as connectivity problems, malfunctioning sensors, or software updates, the app may offer diagnostic tools and troubleshooting manuals.

Reporting: The app's reporting and analytics features enable administrators to examine security incidents, assess system performance, and create reports for compliance or monitoring needs.

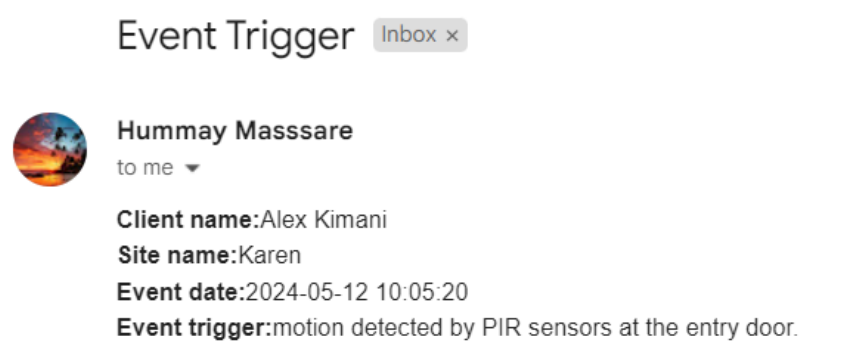
Iot analytics

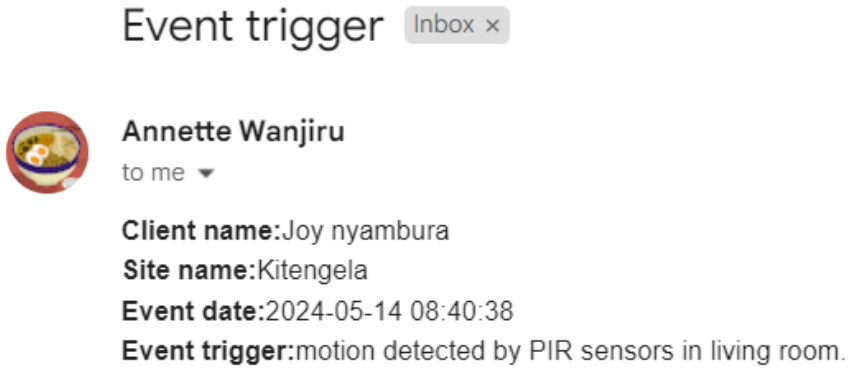
Extrapolation and prediction: Through the analysis of past sensor data, including motion and door sensors, the system is able to forecast activity patterns and possible security threats. It can, for instance, predict when people are typically home or identify unusual trends that would point to a break-in.

Activation of actuators: Actuators in a smart security alarm system are pivotal for responding to detected threats for example: activating alarms, lights, sirens when authorized entry is detected; Controlling accessing points like door locks or gates based on authentication authorization protocols.

Analysis

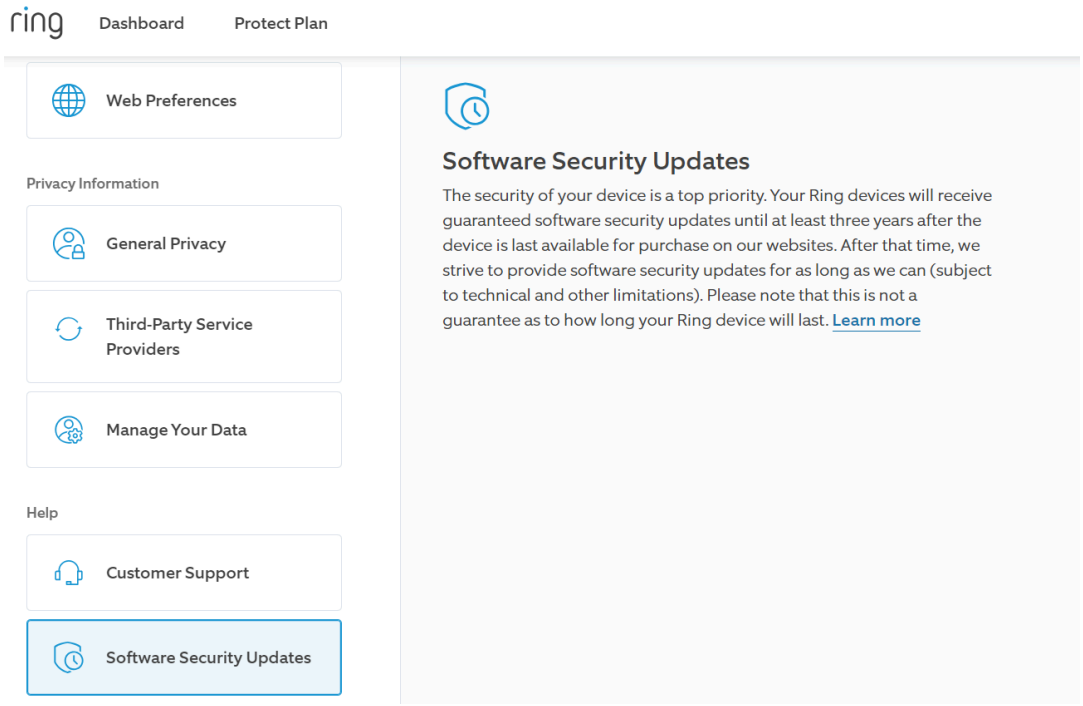
Alarm event triggers





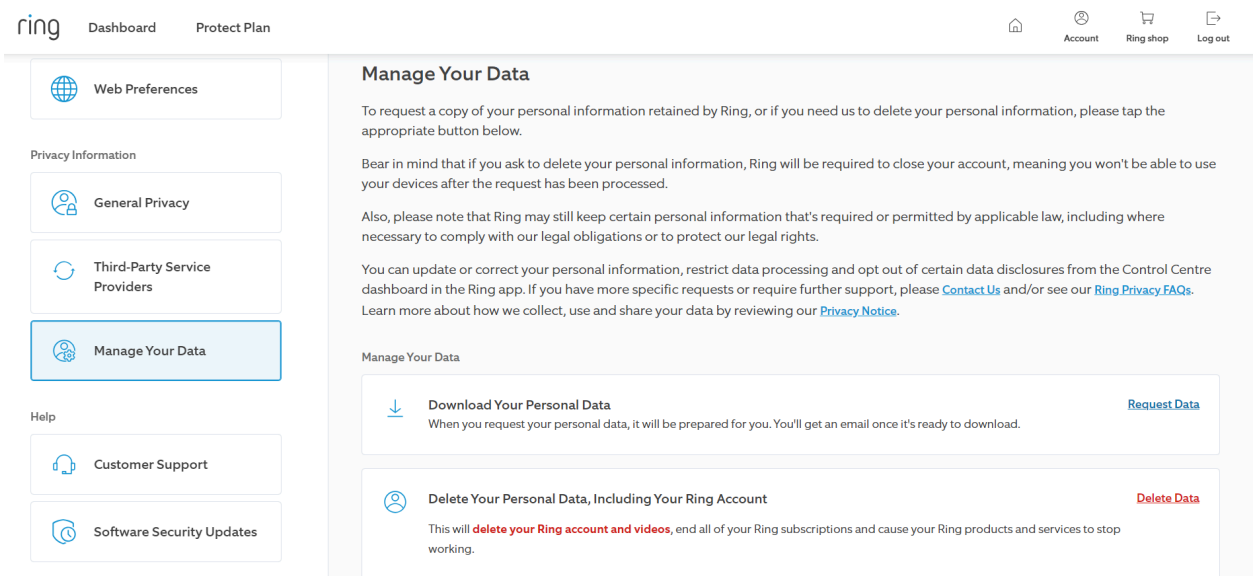
Here I was testing and It worked as I got the notifications of different intrusions from my system.

Software updates



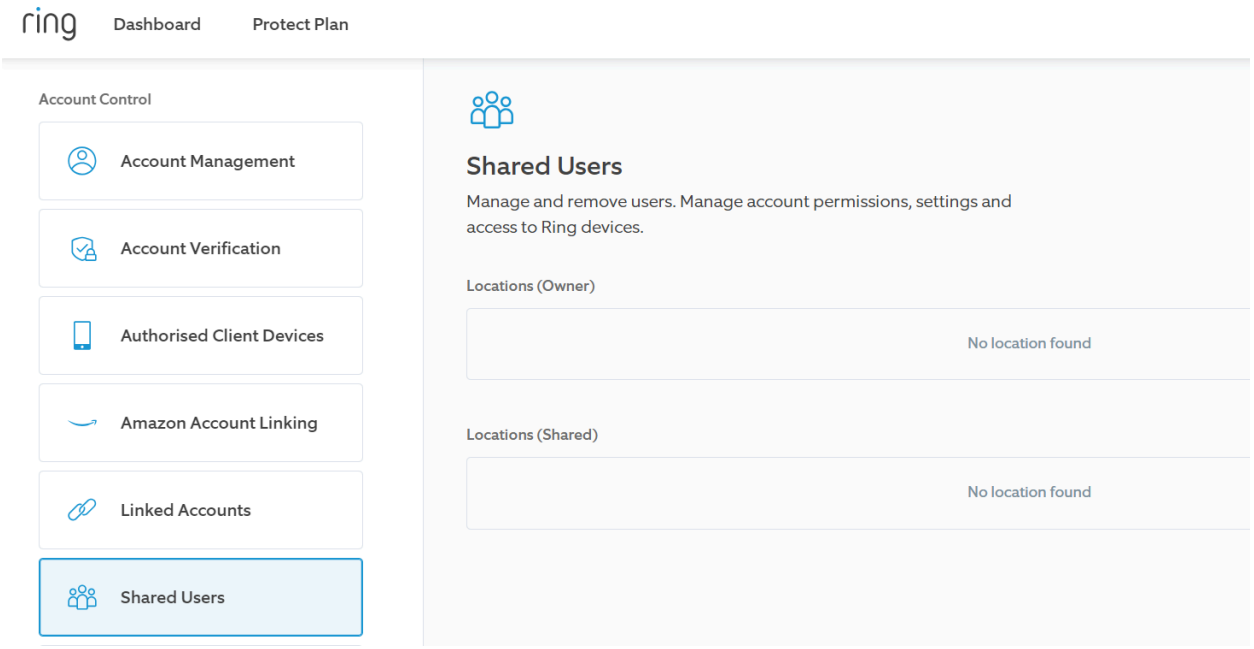
The user can update the software when necessary.

Data management



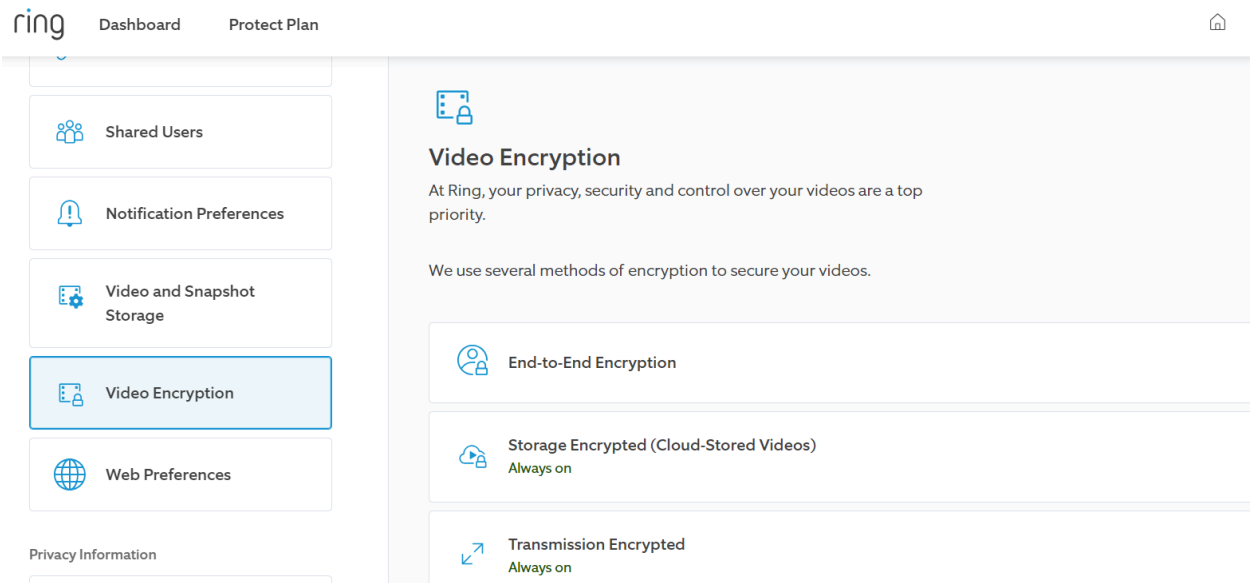
The user can manage their data including downloading their personal data or deleting their personal data.

Users location



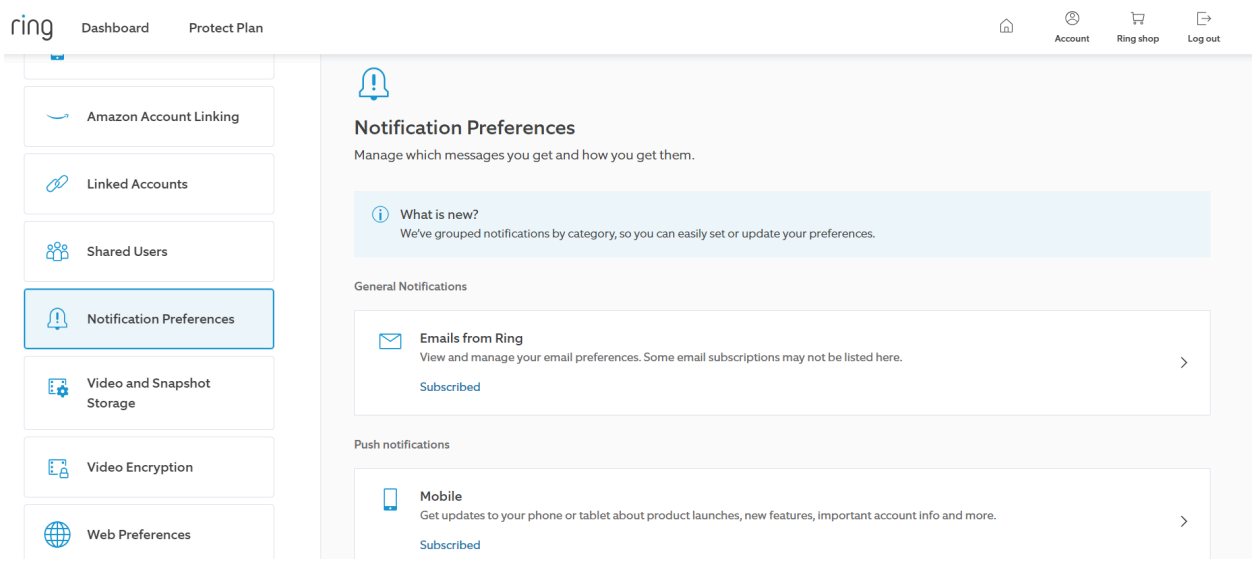
For the shared users they can be able to see each other location allowing the owner to remove users or manage them. The owner can manage account permissions settings and access to ring devices.

Encryption



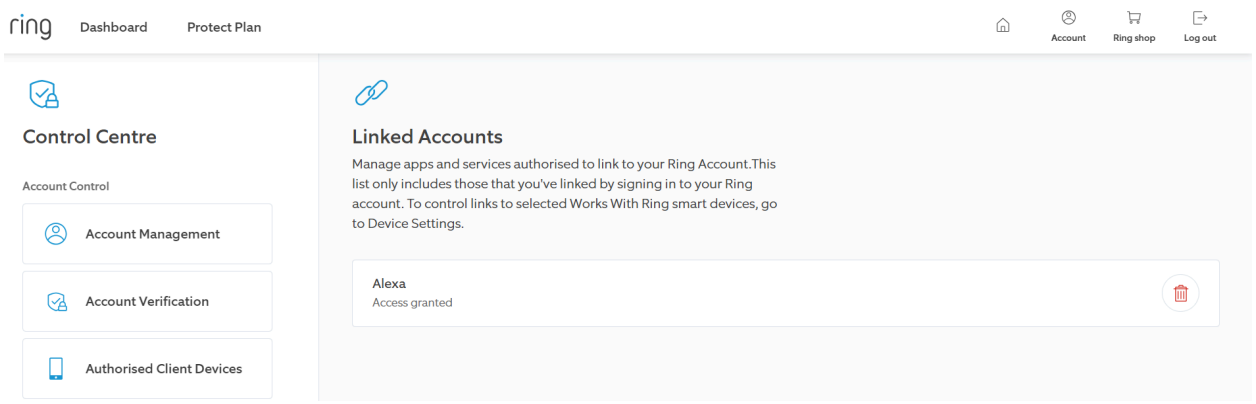
This app offers end to end encryption, storage encryption for example cloud-storage videos which makes the data of this app secured perfectly as the cloud storage is nicely encrypted. It also offers transmission encryption.

Notifications preference



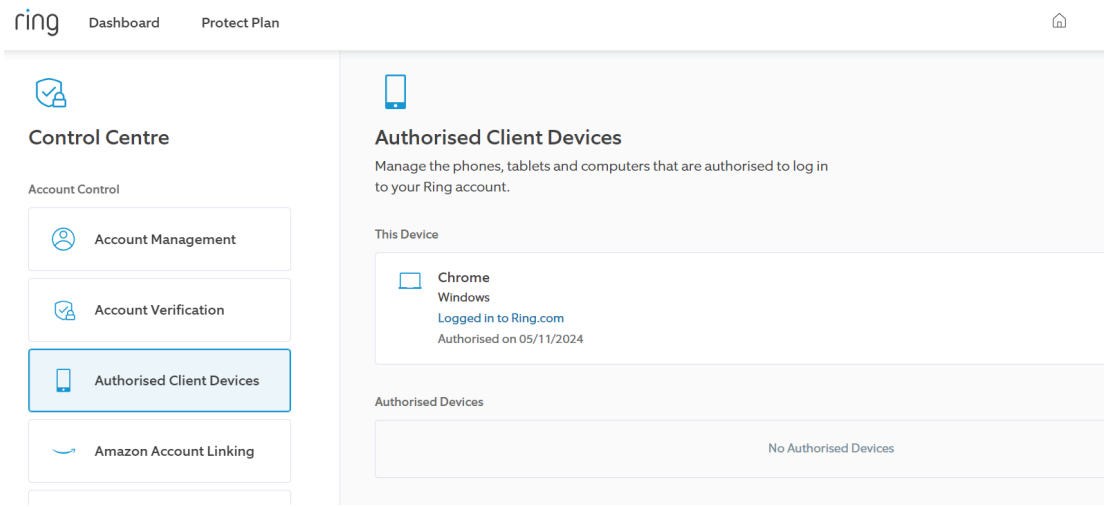
The user can manage their emails through this option of notification preference.

Linked accounts



The user can link their account and control links to selected works with this app device through device settings.

Authorized client devices



Users can manage their devices by deciding on the devices that should stay logged in. They can be able to remove the devices that they don't want to stay logged in through this option.

Review of the system to meeting the client requirements

1.Connected and normalized operations

The system incorporates machine to machine(M2M) operations for communication between devices, ensuring seamless connectivity and interaction

Extent of meeting requirements: Fully meets the client's requirement for connected and normalized M2M operations.

2.Device management

The system includes device management capabilities, allowing configuration, monitoring, and control of devices such as sensors, actuators, and the raspberry pi.

Extent of meeting requirements: Fully meets the client's requirement for device management

3.Use of database for device data

The system can utilize a database such as cloud storage for storing device data, intrusion logs, system status and other relevant information.

Extent of meeting requirements: Fully meets the client's requirement for using a database for device data.

4.Process and action management

The system efficiently processes sensor data, triggers appropriate actions such as emails alerts, activation of alarms and manages responses to detect intrusions.

Extent of meeting requirements: Fully meets the client's requirement for processing and action management.

5.Visualized dashboard

The system provides a visualized dashboard, potentially through the ring app or another interface, for users to monitor system status, view intrusion alerts, and manage settings

Extent of meeting requirements: Fully meets the client's requirements for a visualized dashboard.

6.Programming techniques and constructs

The implementation involves programming techniques and constructs, including software development, hardware device setup(Raspberry pi, sensors, actuators), and visual and non-visual programming constructs for system logic

Extent of meeting requirements: Fully meets the client’s requirement for programming techniques and constructs.

7.Use of Iot analytics

The system processes sensor data to detect intrusions and trigger alerts.The system activates actuators in response to detected intrusions.

Extent of meeting requirement: fully meets the client’s requirement for Iot analytics.

The advantages of my system

Enhanced security: The integration of advanced sensors, such as motion detectors, together with cameras permits all-encompassing property surveillance. Rapid reaction to security incidents is ensured by automation features like automated arming/disarming and real-time warnings, which raise overall security levels.

Remote monitoring: Users can view live camera feeds, receive fast warnings on their smartphones or tablets, and remotely check the status of their smart alarm system by utilizing cloud connectivity and a mobile app interface. For instance, when a motion sensor is set off, the user gets a push notice on their smartphone app that includes a picture taken with the camera that demonstrates the activity that was identified. Even when they are away from home, customers may keep informed and take prompt action due to our remote monitoring option.

Customizable alerts: User-customizable alert notifications are provided by the smart alarm system. Custom alert triggers can be set up by users, such as system status changes, low battery warnings, or specific sensor activations. For example, users can set up the system to deliver distinct alert messages or tones for different types of alerts (such as low battery, incursion, and fire alarms). Furthermore, escalation protocols can be established, so an alarm automatically escalates to selected contacts or emergency services if it is not acknowledged within a predetermined amount of time.

User-friendly Interface: Simplicity and intuitiveness were prioritized in the layout of the mobile application and user interface. This makes the alarm system user-friendly and accessible for all users, with features including easy-to-understand controls for managing the system, visual representations of system status (e.g., green for armed, red for activated), and straightforward navigation.

The disadvantages of the system

Cybersecurity risks: Your smart alarm system is vulnerable to cybersecurity risks like hacking, illegal access, data breaches, and malware assaults, just like any other connected device. To reduce these dangers, it is essential to put strong security measures and frequent updates into place.

Dependency on connectivity: Network failures, internet connectivity problems, or other disturbances may damage the system's performance and interfere with cloud-based functions, mobile device communication, and remote monitoring.

Complexity of setup and maintenance: It may take technical know-how and continuing maintenance to set up and configure a smart alarm system with several components, integrations, and automation rules in order to guarantee optimal operation, updates, and troubleshooting.

Compatibility issues: When integrating the alarm system with non-affiliated devices, platforms, or services, compatibility problems, interoperability difficulties, or functional constraints may arise. System dependability depends on ensuring interoperability and smooth integration with suitable devices.

Conclusion

In short , my smart alarm system has many benefits when it comes to security, remote monitoring, customisation, scalability, and user experience, but it also has drawbacks that need to be carefully planned, implemented, and managed. These include internet dependency, cybersecurity, cost, complexity, privacy, and compatibility. My smart alarm system's advantages and efficacy can be maximized by successfully resolving these issues.

Suggestions for the system

Voice control integration: Include voice control features (such as Google Assistant and Amazon Alexa) so that customers may monitor and operate the alarm system using voice commands, increasing accessibility and convenience.

Geofencing and location-based automation: Create virtual boundaries around your property with geofencing technology, and use it to automate tasks like arming and deactivating your alarm system, changing settings based on where you are, and sending alerts when you enter or leave specific zones.

Integration with emergency services: Examine your possibilities for integration with emergency response services (such as the fire department, police, or medical services) to enable the automatic dispatch of emergency professionals in the event of an emergency or documented security incident.

Scalability and Expansion: Create a smart alarm system prototype that is easily expandable to accommodate future additions of sensors, devices, and functionality. To facilitate future expansions and interoperability with third-party devices/services, take into account compatibility with industry standards and protocols.

Self-management and individual responsibility

Adherence to Time Schedule: I showed outstanding time management abilities by sticking to the scheduled time for each task and allotting enough time for the different stages of the project. This guaranteed that all phases of the system's development, testing, and deployment were finished on schedule.

Handling challenges:I addressed the problem well by adding these required components into the system when faced with difficulties like the necessity to add other devices like a switch and a phone. This proactive strategy demonstrates my capacity to quickly overcome unforeseen challenges and adjust to changing requirements.

Budget management: Despite the fact that the addition of more devices caused unanticipated expenses to raise the budget, my ability to make the necessary adjustments shows careful financial leadership. This illustrates my understanding of the project's expenses and my readiness to make the required changes to guarantee the project's success.

Quality standards: Fulfilling the alarm system's quality standards and requirements demonstrates a high level of attention to detail and dedication to producing a dependable and useful product. This illustrates how committed I am to producing work of the highest quality.

Documentation: Upholding full documentation of the design and development procedure, encompassing plans, tasks, schedules, and finances, is essential for project honesty, accountability, and subsequent analysis. My documentation procedures demonstrate my attention to detail and analytical abilities, both of which are critical for efficient self-management.

Conclusion

Overall, my strong self-management abilities and individual responsibility in the design and development of the alarm system are highlighted by my ability to manage time effectively, handle challenges, manage budgets, maintain quality standards, and record the project process. These characteristics are necessary for the effective delivery and execution of projects.