

Enhanced Smart Home Management System

Group 8

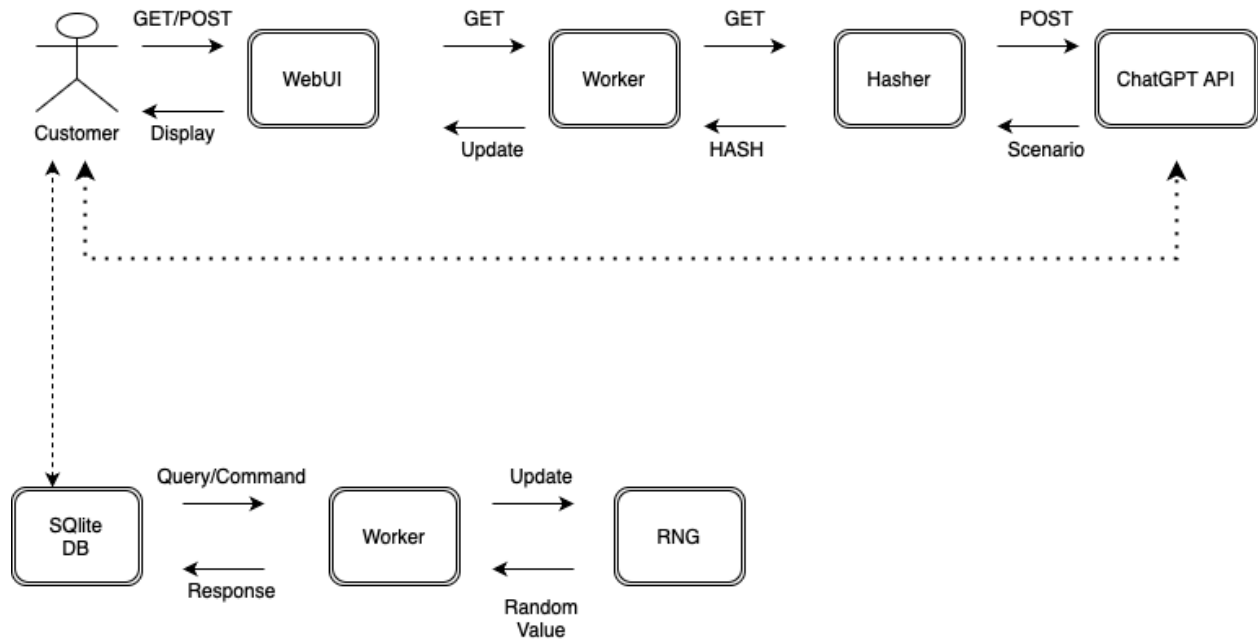
**Sean Welby**

**Tyler Hine**

**Zachary Holecz**

**Chrisma Ndlovu**

## Chapter 1



- The Customer interacts with the WebUI via GET/POST requests.
- The WebUI communicates with the Worker to process these requests.
- For device operations, the Worker interacts with the Hasher and RNG to perform actions like hashing and generating random numbers.
- The Worker also communicates with the SQLite DB to update or query device states.
- For scenario generation, the Worker sends a POST request to the ChatGPT API.
- The ChatGPT API returns a generated scenario that is passed back to the Customer through the WebUI.
- The SQLite DB serves as the central data storage and state management system, which the Worker queries or updates.

## Chapter 2

### Customer and WebUI Interaction:

- The Customer interacts with the system through the WebUI by sending GET requests to view the current status of smart home devices or POST requests to change settings or control devices.
- The WebUI is responsible for displaying information to the Customer, which includes real-time data and responses from the ChatGPT API for generated scenarios.

### WebUI to Worker Communication:

- The WebUI forwards these requests to the Worker, the system's backend processing unit.
- The Worker handles these requests by performing the required operations on the smart home devices or generating scenarios.

### Worker to Hasher and RNG:

- When encryption or security operations are needed, the Worker sends a GET request to the Hasher to encrypt data before storing it or using it in operations.
- For operations requiring randomness, such as session token generation, the Worker sends an update to the RNG and receives random values.

### Worker, SQLite DB, and RNG Integration:

- The Worker communicates with the SQLite DB, sending queries or commands to update the smart home devices' state or to retrieve information based on the Customer's actions.
- The SQLite DB responds with the necessary information or confirms the update.
- The RNG provides random values back to the Worker as needed for various operations.

### ChatGPT API for Scenario Generation:

- For scenario generation, the Worker sends a POST request to the ChatGPT API with relevant prompts.
- The ChatGPT API processes these prompts and returns a scenario that is relayed back to the Customer through the WebUI.

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## System Workflow

- The workflow starts with the Customer initiating a request through the WebUI.
- The Worker acts as a central coordinator, handling these requests, communicating with the database, and performing necessary operations with other services.
- The Hasher ensures that any data that needs to be secured is encrypted, enhancing the security of the system.
- The RNG generates the required random values to ensure non-repetitive and unpredictable outcomes for operations that require randomness.
- The SQLite DB acts as the persistence layer, storing and providing data as needed.
- The ChatGPT API adds a layer of interactivity and user engagement, providing users with an understanding of smart home scenarios through natural language processing and AI.

## Zachary Holecz - Resume

Computer Science Major seeking to obtain a challenging seasonal full-time internship.

### **PROJECTS:**

- Python Object Creation: Created a simulated library organization system
- Designed, Specified, Procured, & Assembled my own Personal Computer
- Front-End development of web-based applications

### **SKILLS:**

Proficient with Java, Python, Basic C, Haskell, HTML, Java Script coding languages  
Proficient with Microsoft Office Applications  
Mathematical Skills: Problem-solving, Calculus, Statistics

### **EDUCATION:**

**West Chester University**, B.S. Computer Science - (2021- present)

CumGPA 3.63 - College of Sciences & Mathematics, Computer Science Department

Courses: Statistics 1, Technical Writing, Computer Systems, Computer Science I, II, and III

**George Mason University**, B.S. Computer Science - (2019 - 2021)

GPA 2.9 - *Volgenau* School of Engineering, Department of *Computer Science*

Courses: Introduction to Computer Science, Introduction to Python, Calculus 1

**Owen J Roberts High School**, Academic Honors Curriculum (2016 - 2019)

GPA 3.6 (2019), Honor Roll (2016-2019)

Courses: AP Computer Science (2019), honors English, Honors Sciences, and Honors Mathematics (2016-2019)

### **HONORS/AWARDS:**

**George Mason University** - Mason Freedom Scholarship, Mason Impact Award (2019 - 2020)

**Owen J Roberts HS Academics** - Barry Irwin Memorial Scholarship for Computer Science (2019)

**Owen J Roberts HS Robotics** - State Tournament Qualifier, Team Co-Captain, (2019)

**Owen J Roberts HS Orchestra** - Menchy Music Award (2019), Violin (2012 - 2019)

### **ACTIVITIES:**

**West Chester Rugby Club** - National Finalist Team 2021

**George Mason University Rugby Football Club** - Varsity Team Starter (2019)

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**Coventry Wildcats Rugby Football Club** - Co-Captain (2019), Undefeated Season (2019), HS State Finalist Team (2019), U15 - 3<sup>rd</sup> Place State Championships (2016), Team Member (2013 - 2019)

### **WORK EXPERIENCE:**

#### **Enterprise – Seasonal Automotive Detailer (Summer 2021 & Summer 2022):**

- Worked as an automotive detailer at the Pottstown location
- Cleaned and sanitized vehicles
- Transported vehicles to other Enterprise locations
- Pick up customers and take them to the location

## Sean Welby - Resume

Well-grounded and solution-oriented Computer Scientist with a wide variety of programming experience. Experienced in C, HTML, Python and particularly skilled in Java and Linux. Works well on team-based projects, motivating myself and others to be productive. Seeking to use my backend and security experience in an entry level position.

### EDUCATION

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West Chester University, West Chester, Pennsylvania

**Bachelor of Science: Computer Science**

*Expected May 2024*

**Computer Security Certificate**

*Expected May 2024*

**CompTIA Security+**

*Expected March 2024*

**Relevant Courses:** CSC I/II/III, Computer Systems, Data Structures & Algorithms, Computer Security & Ethics I/II, Foundations of Computer Science, Data Com/Networking, Digital Image Processing, Software Security, Software Engineering, Modern Malware Analysis, Intro to Cloud Computing

### **COMPUTER SKILLS:**

Programming Languages: Java, Python, C, SQL, Haskell, R

Operating Systems: Windows, Linux

Applications: MatLab, MS Office, GitHub, Oracle Virtual Box, Hack The Box, TryHackMe, Cisco Packet Tracer, VS Code, Wireshark

Security: Pen Testing, Decryption/Encryption, Firewalls, nmap

**Activities/Clubs:** Computer Science Club, Cyber Security Club, Judo Club, Intramural Soccer

### EMPLOYMENT

## Enhanced Smart Home Management System

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**Turtle Back Zoo Employee, Essex County Parks Department:** May 2020- Present

560 Northfield Avenue

West Orange, NJ 07052

Duties: Cashier, Chauffeur, Customer Service, Answering Phones, Crowd Control, Carousel/Train Conductor, Paddle Boat Worker, Parking Director, Expo, Party/Event assistant.

**Summer Custodian, Florham Park School District:** Summer 2018, Summer 2019

151 Briarwood Rd

Florham Park, NJ 07932

Duties: Custodial Assistant (cleaning, painting, landscaping, construction)



## **Tyler Hine**

**434 W High Street – Phoenixville, PA 19460**

**Hinetyler0@gmail.com – 484-680-1653**

### **EDUCATION**

**West Chester University, West Chester, PA**

**Bachelor of Science in Computer Science, May 2024**

### **RELEVANT COURSEWORK**

**Discrete Mathematics: Mathematical concepts used in computer science**

**Management of Information Systems: Data Communications and Networking**

**Computer Science: Software Engineering; Front-End Development, Back-End Development**

**Computer Science: File and Data Structures**

### **WORK EXPERIENCE**

**Vecchia Pizzeria**

**Pizza Maker, May 2022 – Present**

- **Manage the inventory of ingredients for each week of business**
- **Prepare the dough for each week of business**
- **Shape, dress, and cook the food for customers' orders**

**Bella Napoli**

**Delivery driver, May 2018 – April 2022**

- **Delivered customer food and drink orders in a timely manner**
- **Managed the inventory of food storage for each week of business**
- **Collaborated with coworkers to keep the restaurant up to and above health standards**
- **Completed trips to Philadelphia to pick up weekly food inventory**

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## **Giant**

**Cashier, March 2016 – August 2016**

- **Handled the transaction process of customers that purchased groceries**
- **Maintained the organization of outdoor store property**
- **Generated weekly performance reports for peers**

## **SKILLS**

**Proficient in Word, PowerPoint, Excel, Java, C, HTML, Angular, CSS, JavaScript**

# Enhanced Smart Home Management System

Chrisma Ndlovu

P: (267) 382-6879

E:chrismandlv@icloud.com

VB .NET | JavaScript | Data Modeling | SQL | Python | Analysis Skills | Information Security | Database Programming | Troubleshooting

## Summary:

- Computer Science student pursuing software engineering seeking internship opportunity to gain hands-on experience. Offering creativity, critical thinking, and active listening. Highly organized, proactive, and punctual with strong motivation for success.
- Skilled and detail-oriented Computer science student with a keen interest in Software Development, Software engineering, Artificial intelligence, Mobile Application Development, and User Interface Designer
- Learned how to set up version control, bug reports, and continuous integration tools.
- Studied the Incorporated data collection for automated testing of IBM firmware using Python and SQL Developed internal web tools for data visualization and manipulation that became used across teams of 100+ developers, testers, and managers.
- Knowledge of Defined standards and constraints of projects using wireframes, feedback, and docs Worked with multiple MySQL databases.
- Wrote code, fix bugs, developed software using version control Website Management: Help maintain the website.
- Ability to Carry out Analysis, Requirement understanding, and feasibility, System designing, Implementation, and Testing.
- Ability to work with customers to understand project requirements and set up the development timeline.

## Education:

### Montgomery County Community College, Blue Bell PA

May 2022

- Associates of Applied Science in Computer Science

GPA: 3.2

### Technical Skills:

- Programming Language: Java, HTML/CSS, C++, SQL, Python, JavaScript, swiftUI, Visual Basic, MIPS
- Programming Tools: Eclipse, PyCharm, Code Runner, JGrasp, Xcode
- Tools and Frameworks: Word, Access, Excel, PowerPoint, Visio
- Cloud & Databases: MySQL
- Graphic Design: Maya, Unity
- Work Experince: Proficient in Proxmox, Tenable, Qualys, Hyper-V, IT Support, Help Desk Management, Access Control Systems, Emergency Communication Systems.
- Soft Skills: Strong leadership, problem-solving, communication, project management, and team management skills.
- Interpersonal Skills: Strong Internet Research, Excellent Verbal, Written and Quantitative Skills, Time Management and Prioritization Abilities, Effective Presentation and Negotiation Skills
- Others: Honesty, Active Listening, Empathy, Collaboration, Multitasking
- Interests: Creative Writing, Arts and Culture, Traveling, Education, New Media, Advancing of Technology

# Enhanced Smart Home Management System

## Project Experience

### College Project Team Project

Oct 2021 – Dec 2021

- Creating a website for a tourism company using HTML
- Utilizing Annotation-Based Configuration, design and build the different modules for user registration/login, products information editing, and cart items editing.
- Use of location-based ads and use hyperlinks to provide data for specific tourist attractions.

### Building an SQL Database

Sept 2021 – Dec 2021

- Created a full database for a company selling Antiques.
- Created several queries using the SQL to display in Excel based on the information needed by the company

### Data Management Internationale

June 2022 - June 2023

- Managed IT support and help desk operations, ensuring timely resolution of internal and customer technical issues.
- Led the installation and configuration of a Proxmox environment, transitioning from Hyper-V to enhance system efficiency and reliability.
- Implemented and configured Tenable and Qualys for comprehensive vulnerability scanning, significantly improving security posture.
- Spearheaded vulnerability remediation efforts, reducing potential security risks and ensuring compliance with industry best practices.
- Oversaw the addition and configuration of an access control system to manage employee access to restricted areas, enhancing security and compliance.
- Developed and implemented an emergency communication system, enabling rapid text messaging to workers in case of emergencies, thereby improving response times and safety protocols.

## Accomplishments

- Dean's List in Montgomery County Community College
- Phi Theta Kappa Honor Society

## Technical Report: Enhanced Smart Home Management System

### Executive Summary:

This technical report documents the development process and outcomes of the Enhanced Smart Home Management System demo. The project aimed to create a proof of concept that demonstrates the monitoring and control of smart home devices, with an innovative integration of ChatGPT for dynamic scenario generation. This integration aims to showcase the system's capabilities in simulating real-world smart home interactions, enhancing user engagement and understanding.

### 1. Introduction

The Enhanced Smart Home Management System is designed as a scalable, secure platform that facilitates real-time interaction with smart home devices. The addition of ChatGPT for scenario generation represents a leap towards interactive demonstrations, providing users with a clear vision of practical applications and benefits.

### 2. Project Scope and Objectives

The project focuses on demonstrating core functionalities such as temperature monitoring and lighting control, complemented by the innovative use of AI to generate dynamic smart home scenarios. The objectives include:

- Showcasing real-time device control and monitoring.
- Integrating ChatGPT to enhance the demo with dynamic scenario generation.
- Developing a user-friendly interface for system interaction.

### 3. Technology Stack and Selection

- **Backend:** Node.js with Express for RESTful API services.
- **Frontend:** React for dynamic and responsive web interfaces.
- **Database:** SQLite for lightweight data storage needs.
- **Security:** Basic authentication mechanism for demo purposes.
- **Deployment:** Docker for containerization and simplified deployment.
- **AI Integration:** ChatGPT API for generating smart home scenarios.

### 4. System Design and Architecture

The system employs a microservices architecture, simplifying scalability and maintenance. It includes:

- A RESTful API backend for handling requests and managing device states.
- A SQLite database for storing device information and user settings.

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- A frontend application providing a graphical user interface.
- Integration with ChatGPT API for scenario generation.

### 5. Development Process

#### **Backend Development:**

Developed RESTful endpoints for device interaction and integrated SQLite for data persistence.

#### **Frontend Development:**

Created a React-based web interface enabling users to monitor and control smart devices and interact with the ChatGPT-generated scenarios.

#### **Security and Authentication:**

Implemented a simple yet effective authentication system for user access control.

#### **Dockerization and Local Deployment:**

Containerized the application components for easy deployment and testing.

#### **Integration of ChatGPT API:**

Enhanced the system with a module to communicate with the ChatGPT API, generating realistic smart home scenarios based on user inputs or predefined prompts.

### 6. Testing and Final Adjustments

Conducted thorough testing of all system components, focusing on functionality, user experience, and scenario realism. Adjustments were made based on feedback and test outcomes.

### 7. Demonstration Preparation

Prepared a comprehensive demonstration, including a live system walkthrough and examples of ChatGPT-generated scenarios, to showcase the system's capabilities and innovative features.

### 8. Conclusion

The Enhanced Smart Home Management System demo successfully demonstrates the integration of smart home device control with advanced AI capabilities. This proof of concept highlights the potential for creating intuitive and interactive smart home environments that cater to user needs and preferences.