Enhanced Smart Home Management System

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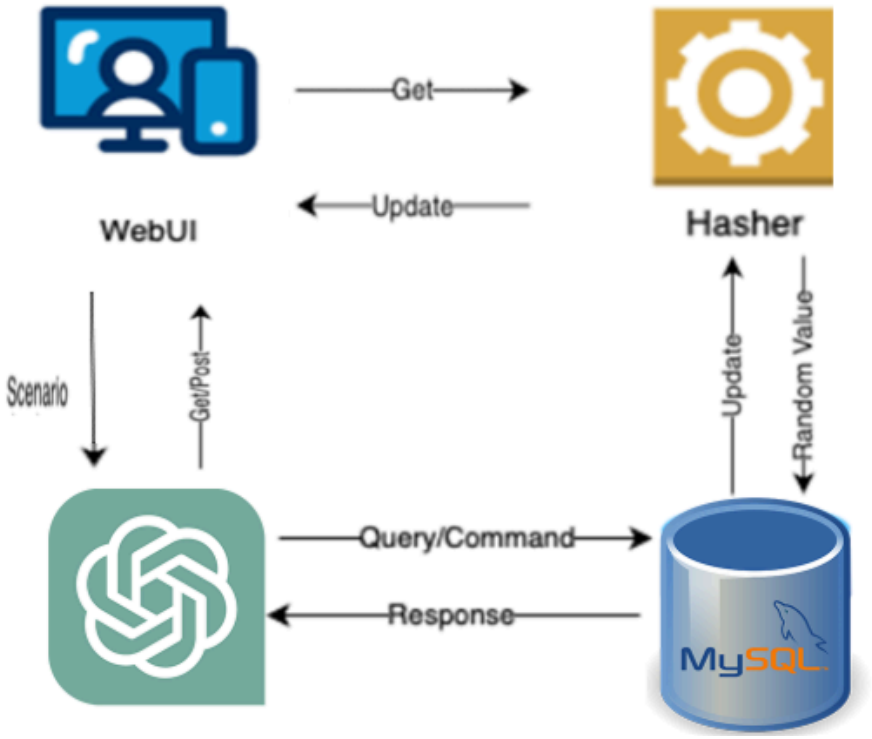
Introduction

We are excited to announce the upcoming Smart Home Management System (SHMS), a platform that will transform user engagement with home environments. This technical preview is designed to give you a glimpse into the future of home automation, emphasizing safety, energy efficiency, and simplicity. Our goal is to make the SHMS intuitive for everyone, regardless of technical background.



System Description

The SHMS will be a comprehensive solution that provides real-time monitoring and control of smart home devices. It will also introduce an innovative scenario generation feature powered by the ChatGPT API, offering users a narrative of smart home responses to various situations.

How It Will Work

User Interaction

Users will be able to interact with the SHMS through a web-based interface, designed to offer control over smart devices and to request illustrative scenarios showcasing the system's capabilities.

System Components

- WebUI: The front-end portal for user interaction with the smart home environment.
- Hasher & RNG: This security component will encrypt sensitive data to ensure privacy and protection. A random number generator that will provide additional security layers for operations requiring randomness.
- MySQL DB: The database that will store device states and user configurations.
- OpenAI & IFTTT API: The AI-powered service that will generate descriptive scenarios for user education and engagement. The back-end service that will process requests and issue commands to smart devices.

Anticipated Features and Benefits

- Emergency Response: The SHMS will detect emergencies, such as gas leaks, and will respond by executing safety protocols like gas supply shut off and alerting emergency services.
- Energy Optimization: The system will analyze energy consumption patterns to suggest efficient usage, aiming to conserve energy and reduce costs.
- User-Friendly Interface: The SHMS will feature an easy-to-navigate web interface, simplifying smart home management for users.
- Interactive Scenarios: Utilizing the ChatGPT API, SHMS will generate scenarios educating users about the system's functionality and event responses.

Value Proposition

For the technical community, the SHMS promises a modular, scalable, and secure architecture that integrates cutting-edge technologies into a seamless user experience, powered by AI.

For our non-technical audience, SHMS will act as your home's guardian angel – watching over you, ensuring your comfort, and managing your home's efficiency, all while educating you about the wonders of smart technology.

Docker Images and Containerization

Our system will implement four containers to accomplish our goals. We will first have a container for the OpenAI & IFTTT API that will handle the generation of scenarios for the SHMS. This container will communicate directly with the Web UI container to handle the backend routing for the requests made by the user. The third container will be for the MySQL database and will communicate with the hasher and random number generator as well as the Api-Service. The hasher and random number generator will be handling the encryption of the data from the database that is sent to the Web UI and the random number generator will be used to generate tokens for security purposes. All of these containers will require an image and dockerfile for each of them.

API Service For IFTTT & OpenAI

1. *Python Flask Application and Dockerfile:*
   - Developed a Flask application (`app.py`) with endpoints for user authentication and scenario triggering, connected to a MySQL database using environment variables.
   - Integrated IFTTT and OpenAI : The application uses IFTTT (If This Then That) webhooks to communicate with smart home devices, allowing for actions like turning on/off lights and starting/stopping a vacuum cleaner. OpenAI is utilized for additional functionalities such as communication with the user and making a voice announcement.
   - Created a Dockerfile (`dockerfile.api`) using the official Python image, set the working directory, copied application files, installed dependencies, exposed port 5000, and configured the container to run the Flask application automatically.
2. *Requirements and Docker Image:*
   - Prepared a `requirements.txt` file listing Python dependencies such as Flask and mysql-connector-python.
   - Built and pushed the Docker image to Docker Hub using `docker build` and `docker push` commands with the tag `ighost007/smart–home-api:latest`.
3. *Kubernetes Deployment and Service:*
   - Created a Kubernetes Deployment and Service (`deployment-api.yaml`) to define the API service, specifying the Docker image, environment variables for database connectivity, and exposing the service for communication with other components.
4. *Deployment and Testing:*
   - Deployed the API service to Kubernetes using `kubectl apply -f deployment-api.yaml`.
   - Pending tasks include testing communication with the MySQL database container, verifying endpoint functionality, and ensuring proper interaction with other SHMS components especially allowing announcements through browsers from mp3 generated from OpenAI api.

Hasher and Random Number Generator

1. *Security with Hasher*

- Password storage will be configured so that there are no plain-text passwords and will be .stored as the hashed version instead
- Utilizing comparison of data hashes at different points in time will ensure that the hasher will be able to verify the integrity of the stored data

2. *Dockerfile*

- The dockerfile will be done with a base image that will have the necessary runtime for the hasher and will be written from a Python base image
- The environment variables will be set to include the MySQL database host name, username, and password information including all information that is to be encrypted / hashed
- The hasher will be using port 3306:3306
- The 'requirements.txt' file will include the hashing library 'bcrypt' as well as Flask for the web framework

Building WebUi Image

The WebUi will be built using the React app and will utilize its component libraries. In order to deploy this in Kubernetes, React will be containerized within a dockerfile and be built into an image. A react application will be made locally and a dockerfile will be made in the project's root directory. Using Docker Desktop in the background, the image will be built, run, and pushed to our repository. The React image will then be pushed into the Kubernetes and the deployment and service YAML files will be created and applied. The WebUI will need to be able to input information using the text box and send that data to the OpenAI container and get updates from the hasher.

An issue I had earlier with the WebUI is currently building the react image itself into the kubernetes. It seems to run into errors while Installing the dependencies into the kubernetes while doing the command 'npm install' and it seems it cannot utilize the package.json file even though it is in the same directory.

Building the Database:

For the MySQL database we wanted to make it so that its main functions consisted of storing and retrieving data such as device states, user configurations, and schedules, which will help assist in the overall process of the smart home system. The process of creating the database container went like this:

1. First I used docker desktop to create and run the mysql-container image
2. Created ‘dockerfile’ and began building the ‘schema.sq’l file which creates and populates the 6 tables. These files were updated inside our teams GitHub repository.
    a. The tables inside the database consist of:
        i. Users: Stores user account information.
        ii. Devices: Contains details about each smart home device(id, status, type)
        iii. Device Logs: Logs devices activities and changes in status
        iv. Schedules: Holds the scheduled data for automated tasks
        v. Scenarios: Predefined or custom user scenarios(like Magic Morning)
        vi. UserPreferences: Customizable settings for users(like preferred brightness of lighting)
3. After cloning the repository branch I began building a docker image running the container using the following commands in the ‘MySql’ directory. Then I tagged and pushed the image to docker hub for later use of the container
4. Next, after we finally got the instance running I created a namespace called ‘mysql-space’ and ran and built the mysql-container. Then I created a yaml, ‘db.yaml’ file to deploy the database container.

Data Collection/Creation and Management:

- *Data Collection*: Data such as user information, scenarios, and device statuses are collected through the WebUI and API service. Users can input their information, select scenarios, and control devices via the WebUI.

- *Preliminary Results*: For initial testing, we were successfully able to communicate with smart home devices, including turning on and off lights and starting and stopping a vacuum cleaner. We are currently configuring the use of speech commands for enhanced user interaction. Additionally, we are working on ensuring that all containers communicate effectively, especially the WebUI, where user data is collected and scenarios are triggered. This integration is crucial for providing a seamless user experience and full functionality of the Smart Home Management System (SHMS)

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)
Coventry Wildcats Rugby Football Club - Co-Captain (2019), Undefeated Season (2019), HS State Finalist Team (2019), U15 - 3rd 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

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

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

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**

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

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

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