SOEN 343:
SOFTWARE ARCHITECTURE AND DESIGN

Phase I

Instructor: Dr. Rodrigo Morales Alvarado

Project Name: The Ben SmartHome System

Team Members:
Ben Hitterman 40174961 - Leader
Dimitri Karagiannakis 40097824
Alexander Santelli 40164629
Francesco Ferrato 26642152
Alvaro Gonzalez 40153040

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1.1 Problem definition

1.1.1 Problem Statement

The problem of	*Integrating and managing diverse smart home technologies such as automated lighting, climate control, and security systems into a cohesive system. Creating a realistic simulation is done to test their interactions, streamline home automation, and enhance user experience.*
Affects	*Homeowner, researcher, student, practitioner*
The impact of which is	*Difficulties in achieving seamless integration and control of these smart home technologies in the system. This could lead to potential inefficiencies in energy use, compromised home security, and a steep learning curve for users.*
A successful solution would be	*An intuitive, flexible smart home simulation that simplifies task automation, promotes energy efficiency, enhances home security, and provides an educational tool for smart home technology experimentation and development.*

1.1.2 Product Position Statement

For	*Homeowner, researcher, student, practitioner*
Who	*Require an integrated approach to smart home management and wish to explore smart home technology.*
The Smart Home Simulator	*Smart home simulation software.*
That	*Provides a realistic and interactive representation of a smart home environment.*
Unlike	*Complex or non-interactive smart home management systems.*
Our product	*Offers a user-friendly interface, comprehensive control over smart home modules, and an educational platform for smart home technology development.*

1.2 Product Overview

1.2.1 Product Perspective

The Smart Home Simulator (SHS) is designed as a comprehensive, independent system that facilitates the simulation of a home environment with the integration of various smart home technologies. It operates as a standalone product, but with the capability to integrate external smart home modules, such as Smart Home Core Functionality (SHC), Smart Home Security (SHP) and Smart Heating (SHH) through defined APIs. The simulation feature is crucial for users who aim to test and optimize smart home setups in a virtual environment before applying these configurations in real-world settings.

1.2.2 Assumptions and Dependencies

Assumptions	Dependencies
The UX and UI of the SHS will be intuitive and user-friendly.	Continuous user feedback and testing are necessary to ensure it meets user expectations.
Smart home devices and technologies will continue to use network-based communication protocols like Wi-Fi.	The SHS's simulation accuracy depends on its ability to support and emulate these communication protocols.
The market for smart home devices will continue to grow, increasing the demand for simulation tools like the SHS.	The continued investment in SHS development relies on market growth.
Users have a basic understanding of smart home concepts and simulation software.	Users have a basic understanding of smart home concepts and simulation software.
The SHS is accessible through current mainstream web browsers such as Chrome, Firefox, Safari, and Edge.	The SHS development must ensure compatibility with these web browsers.

Users will regularly update their SHS software to the latest version.	The SHS's security, performance, and new feature implementation are dependent on users completing software updates.
The software used to develop SHS remains free and accessible.	The development and enhancement of SHS rely on the availability of these free software tools.

1.3 Technology Used

1.3.1 **Control Version System:** We have chosen Git and GitHub as the cornerstones of our version control strategy. These platforms will not only facilitate code sharing and version tracking but also serve as our primary tools for issue tracking and feature integration through the use of issues and pull requests within our repository. This setup will enable our team to meticulously manage our codebase, ensuring that every change is documented and every contribution is acknowledged.

1.3.2 **Team Collaboration:** As for team collaboration, we will use the labs as our weekly meetings and communicate through a Discord server for continuous communication.

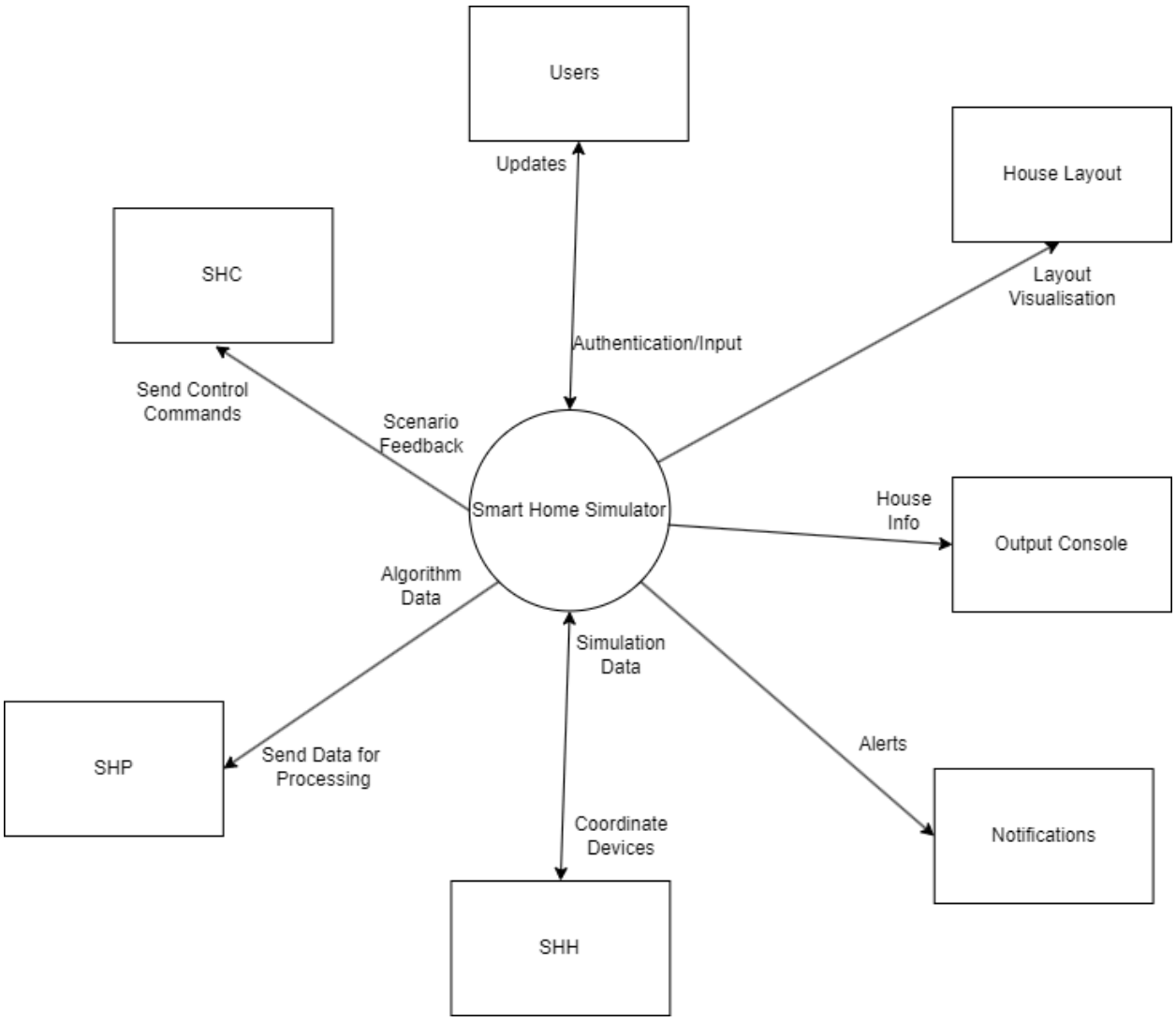
1.3.3 **Monitoring and Verification:** In the context diagram of our Smart Home Simulator (SHS) project, the SHS serves as the central hub that interconnects various components of a smart home ecosystem. The diagram illustrates the system's architecture, where the SHS is responsible for processing input from users, such as authentication and scenario feedback, and managing the flow of data between subsystems like the Smart Home Control (SHC), Smart Home Security (SHP), and Smart Home Heating (SHH). It also interfaces with the house layout for visualization and simulation data to ensure accurate representation and coordination of devices within the virtual environment. The outcome of the SHS's processes is observed through alerts and notifications on an output console, creating a dynamic and interactive model for users to simulate and assess smart home behaviors and policies effectively.

1.3.4 **Design and Modeling Work:** Our approach to Design and Modeling Work is structured around the Model View Controller (MVC) design pattern. This architectural framework is pivotal in segregating the frontend and backend components of our project, promoting a clean separation of concerns. By adopting MVC, we not only streamline the development process but also enhance the maintainability and scalability of our application. This methodical separation allows frontend developers to focus on user interface design, while backend developers can concentrate on the business logic and data handling, ensuring that each aspect of the project is separated.

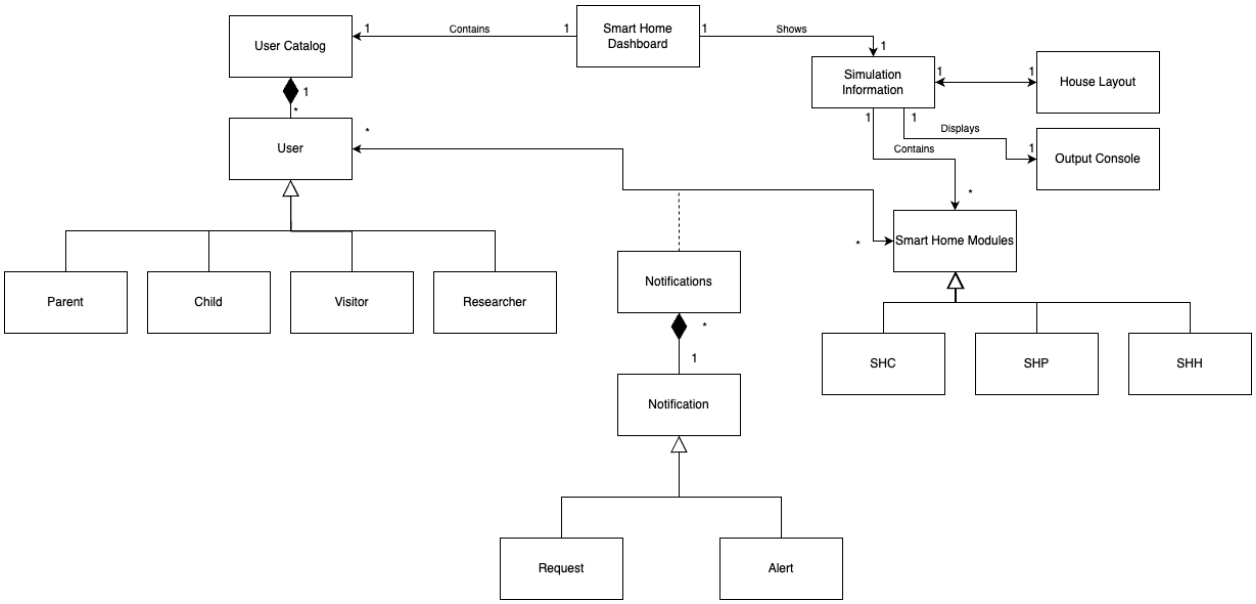
1.3.5 **Development Framework**: For frontend frameworks, we will be using React and Tailwind, and for backend, we will be using Springboot alongside Java.

1.3.6 **Coding**: For the frontend, we will be using TypeScript/JavaScript and for the backend, we will be using Java. For our hosting Digital Ocean, we will be using MySQL for database management.

1.4 Context diagram



1.5 Domain model



1.6 References

[1] https://www.modernanalyst.com/Careers/InterviewQuestions/tabid/128/ID/1433/What-is-a-Context-Diagram-and-what-are-the-benefits-of-creating-one.aspx

[2] https://en.wikipedia.org/wiki/Domain_model