House Mate System Architecture

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Introduction

This document provides the System Architecture for the House Mate System.

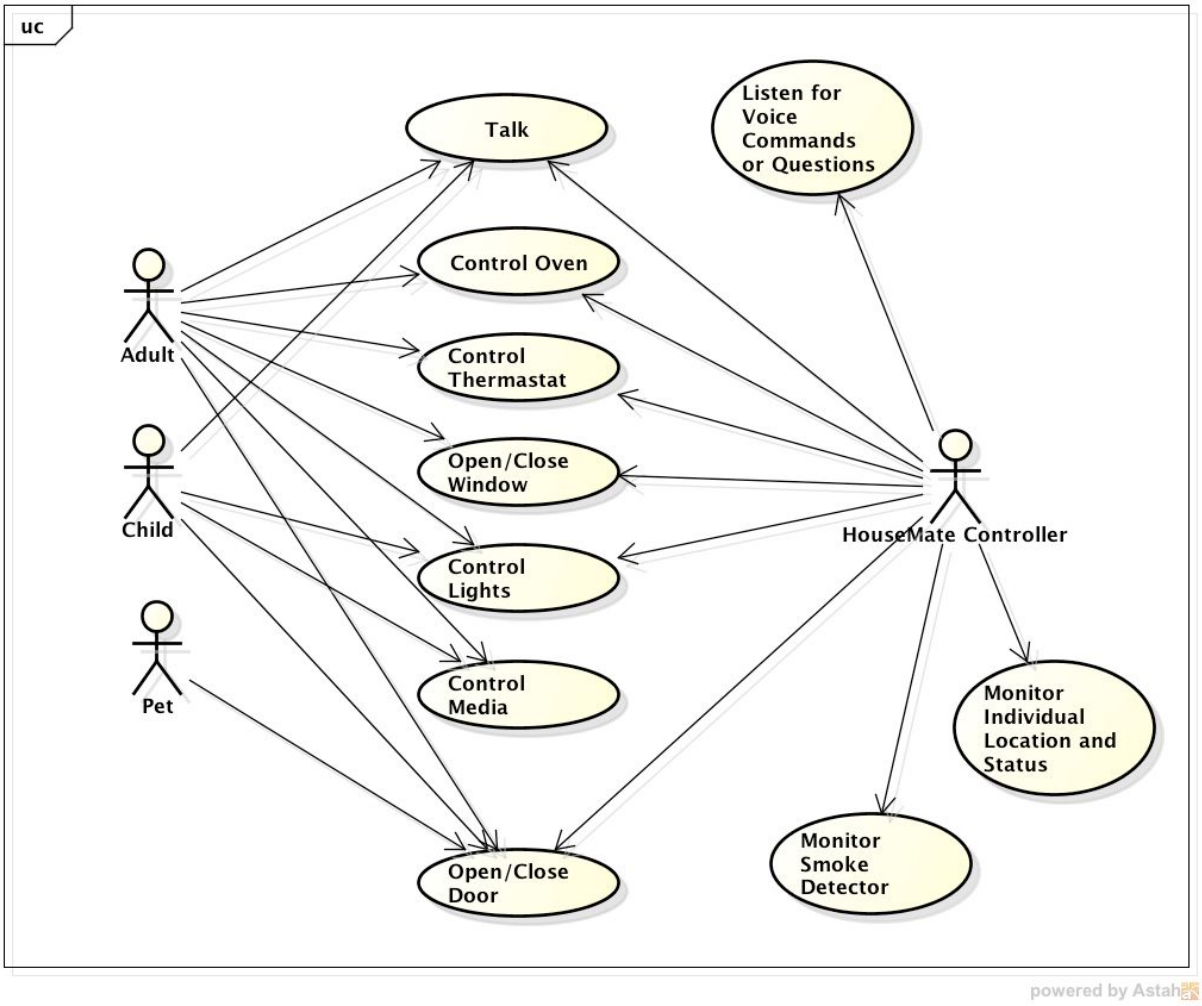
Overview

The House Mate System is designed to fully automate the home. The House Mate Service allows residents to control their home environment through voice commands. Sensors monitor the location of individuals within the home. Smart lights, doors, windows, thermostats, and other appliances are controlled through the House Mate system. Some of these appliances are controlled automatically based on the location of the residents, while voice command can be used to activate or override others.

Caption: Fully automated home with HouseMate system.

Supported Use Cases

The following use case diagram documents the high level use cases supported by the House Mate System.



Caption: UML Use case diagram with House Mate actors and use cases.

There are 4 types of actors:

- Adult
- Child
- Pet
- House Mate Controller

Adults, Children and Pets are residents of the house that are known by the House Mate System.

Each of these actors can be configured with different levels of control over the house hold appliances, including doors, windows, lights, thermostats, media, oven, etc. Adults generally have full control, children have less control, and then Pets have the least control.

The remaining actor is the House Mate Controller. The House Mate Controller is an autonomous agent that monitors the sensors and controls all appliances within the house. The House Mate Controller monitors the location and status of all house residents and manages the appliances around them either proactively or in response to voice commands. For example, when a person walks into a room, the House Mate Controller will automatically turn on the lights and adjust the thermostat.

Individuals can interact with the House Mate System using voice commands to control the appliances. For example, “open the door” or “dim the lights”. Individuals can also ask questions of the House Mate System. For example, the House Mate Controller may respond to the question “Where is Martha?” with the answer “Martha is sleeping in the living room”.

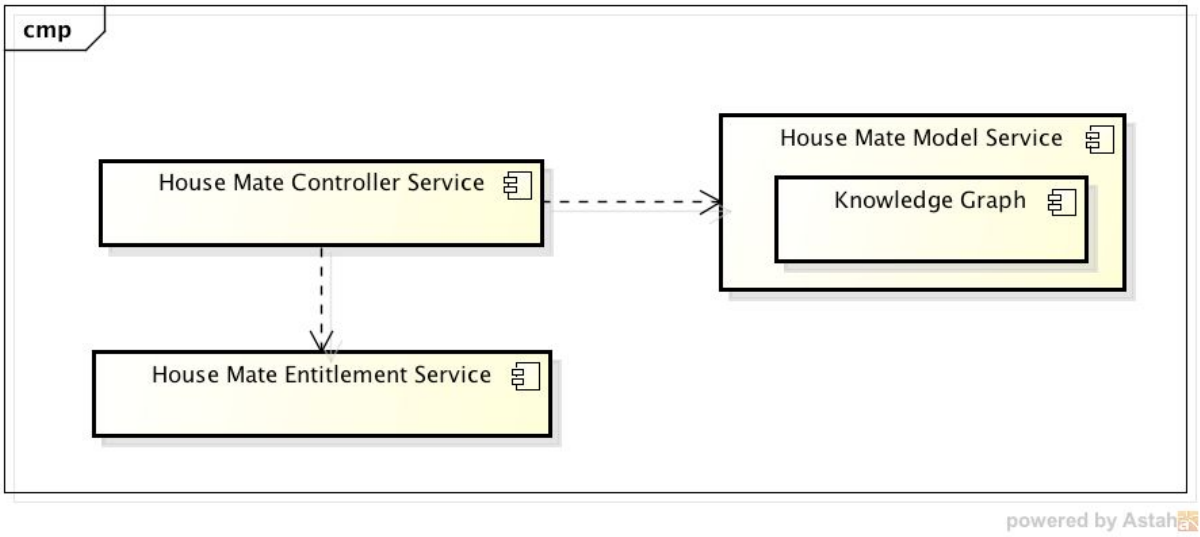
Caption: The House Mate System knows where all the residents of the house are including the pets.

System Architecture

This section defines the System Architecture for the House Mate System.

The following component diagram shows the high level system components of the for the House

Mate System.



Caption: UML Component diagram describing the high level services for the House Mate System.

House Mate Model Service

The House Mate Model Service is responsible for managing the domain entities of the House Mate System. Domain entities include People and Pets, Rooms, Appliances, Sensors, The Model Service provides an API for interacting with those objects. The API supports querying the state of the entities, as well as updating the state.

The Model Service maintains the state of all sensors and appliances in the Knowledge Base. See the Knowledge Graph Design document from Assignment 1 for details.

Reference the House Mate Model Service Design Document for design details (TBD in assignment 2).

House Mate Controller Service

The House Mate Controller Service monitors the sensors and controls all of the appliances in the house. The Controller Service is responsible for monitoring the events received from the sensors located in the house and responding by appropriately controlling the appliances. In addition, the Controller Service is responsible for listing for voice commands and responding by controlling the appropriate appliance. The Controller Service can also respond to general questions about the state of the house.

Reference the Collection Service Design Document for design details (TBD in assignment 3).

House Mate Entitlement Service

The House Mate Entitlement Service manages authentication of users and controls access to appliances. The Entitlement Service first identifies the user through voice recognition. Once identified, the Entitlement Service is used to gate access to control appliances.

Reference the House Mate Entitlement Service design document for design details (TBD in assignment 4).

Technology

This section specifies the technology choices for the House Mate System.

The system will be implemented entirely in Java using the JDK 1.8.

The System Architecture follows a micro service architecture. Each of the 3 system components will be implemented as a micro service.

Each service will:

- Define a Java Interface that provides a list of all public methods supported by the Service
- Provide an implementation in Java of the service interface
- Provide a factory method for accessing a Singleton Instance of the service
- Fully encapsulate the service implementation details; anything external to the service may only access the public service interface

To simplify the implementation, each of the services will be collocated within the same Java Virtual Machine (JVM). This will allow direct java level method access to the Service interfaces by the peer services and client applications.

Assume that there is a single user of the system to avoid concurrency issues.