The CASAS smart home project is dedicated to providing monitoring services to homes of the elderly and their caregivers. Sensors are placed throughout the monitored home to record the activity of the monitored individuals. This allows caregivers to remotely check-in and monitor the status of individuals they care for. The interface that caregivers interact with to query the status of the monitored individuals are voice assistants like the Google Home. A panel provides access controls which allow monitored individuals to allow caregivers access to their home’s sensor data.

Project Requirements
- Smart Home Device Interface
  - Utilize a natural language processing device like the Google Home that users can query to receive answers to questions about a specific person living in a monitored home.
- User & Smart Device Registration, Authentication and Authorization
  - A tool to manage access rights to various smart homes following proper user authorization/authentications practices in accordance with HIPAA policies and other data governance acts.

Solution Approach
Our solution approach includes breaking the problem into multiple microservices which each have their own responsibilities. By composing these services, we are able to achieve the functionality required. Our services include an HTTP backend for handling user requests for information. A time series database for logging events in a smart home throughout the day, and a web panel where residents can log in and control the level of access to home data visible to their caregivers.

Solution Architecture

Subsystems
- Handler
  - Web backend which fulfills requests for information about residents.
- DialogFlow
  - Natural language processing service.
- Engine
  - Sensor data translation and forwarding daemon.
- Permissions Portal (WebUI)
  - Permissions panel for residents to control observability.

Solution Results
- Developed a Vue.js web application which handles authentication and access control permissions for residents and caregivers.
- Created intents for caregivers to ask questions in natural language about residents. (Ex. Did mom eat today?)
- Built deployment system which will autodeploy new containers on the docker instance running on the CASAS VM without any manual work.

Future Work
- Add more relationship/context links to give other pertinent information when a single question can relate to other events the caregiver might want to know about the resident.
- Deploy a production version of the service.

Glossary
- NLP: Natural Language Processing
- Assistant: Any device which is capable of passing off queries to DialogFlow [3]. Includes Google Home & Amazon Alexa.
- DialogFlow: The renamed(formerly api.ai) natural language processing backend which the assistant devices will pass queries and receive responses from.
- InfluxDB: Open source time-series database
- RabbitMQ: implements the Advanced Message Queuing Protocol and is built on the Open Telecom Platform framework for clustering and failover

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