

Software Engineering for IOT

Smart Wine Basement Project

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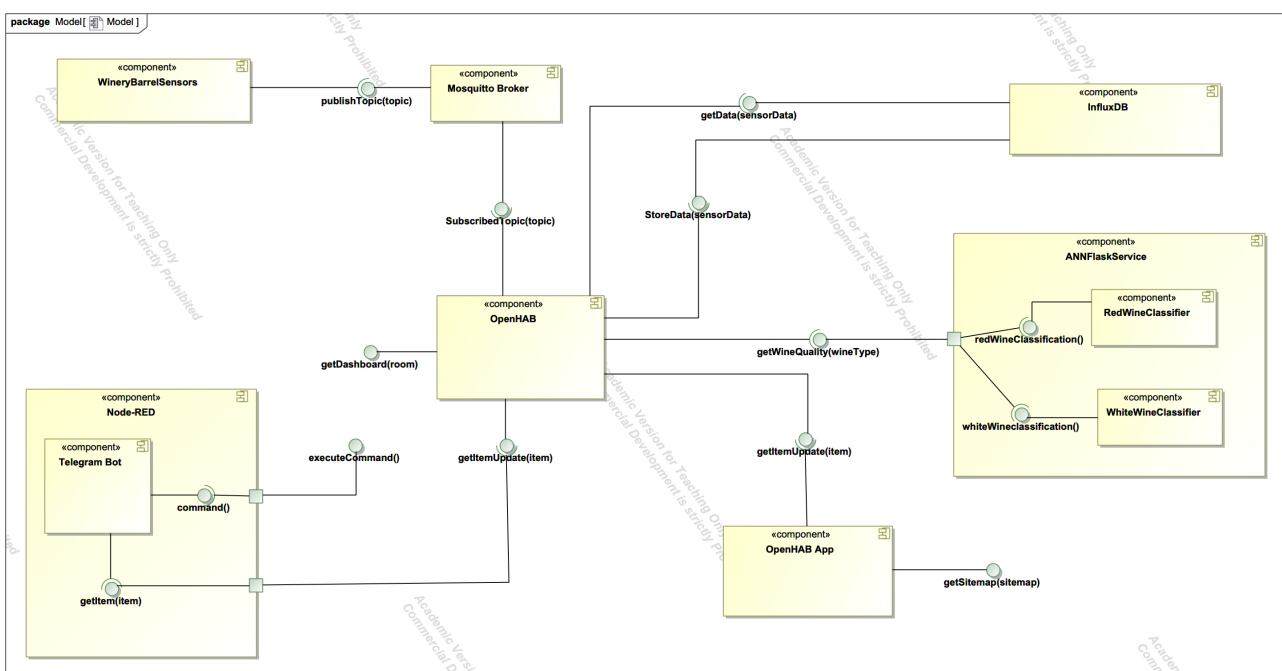
Intro

The Smart-Winery-Basement is a monitoring system for the wine barrels in a basement. The first goal of it is to monitor a set of attributes that the wine have. This is possible thanks to the sensors that are installed inside the barrels. The data generated by the sensors are saved inside the database.

The second goal of the system is to analyse the data, so, the data generated by the sensors are exploited to discover the quality of the wine.

The third goal is to show all the data to the user, for this reason the system integrates several dashboards.

Component Diagram:



WineryBarrelSensors

The WineryBarrelSensors component is an application written in Java which its task is to generate fake data for the sensors inside the barrels.

The generated data are: Fixed Acidity, Volatile Acidity, Cetric Acid, Residual Sugar, Chlorides, Free Sulfure Dioxide, Total Sulfure Dioxide, Ph, Sulphates and Alcohol.

For each sensor it generates a random number between a minimum and maximum value (the minimum and maximum values change according to the type of wine, whether white or red).

The data are updated randomly since the behaviour of the barrels is simulated by the Threads, In a specific way the data is added or decreased with a random number.

Finally, this data is sent from time to time to the Broker Mosquitto.

Mosquitto:

The system uses the publish-subscribe as architectural pattern for asynchronous communication Between WineryBarrelsSensor and OpenHAB.

For this reason Mosquitto has been used as broker in order to allow the exchange of data between publishers and subscribers via topic using the MQTT protocol.

OpenHab:

OpenHAB3 (from now on only OH) is the gateway of the system.

The data received by it are saved inside the NOSQL database InfluxDB and shown to the user via dashboards.

Moreover, every ten seconds it makes for each wine barrels a request to ANNFlaskService sending it the sensors' data. Therefore, ANNFlaskService processes this data and returns the quality of the wine. Even this value (the quality of wine) is shown via Dashboard.

The requests to ANNFlaskService are made through rules written on OH, in particular a rule was written for each wine barrel using the programming language Jython.

The instance of OpenHAB thanks to the service OpenHAB Cloud is exposed outside the localhost. In fact it is possible to connect to the instance of OpenHAB by connecting to myopenhab.org. OHCloud is mandatory to let the user to interact with the system via Telegram.

ANNFlaskService:

ANNFlaskService was made in python using the micro-web framework Flask and it has been deployed via docker container.

It allows to expose two machine learning classifiers, respectively one for white wine and one for the red wine.

The two classifiers was trained on two datasets with equal attributes but different samples with the random forest algorithm.

The random forest algorithm has shown better results than other algorithms (about 80% of accuracy).

Nodered-Telegram:

A telegram bot has been deployed on the node red platform. The telegram bot gives the possibility to interact with the system in a simple way using the commands (simple strings that starts with the slash "/").

These commands make API requests to OH in order to watch the data on the telegram app.

OpenHAB-app:

This project include some dashboards ("sitemaps") made for the mobile application of openHAB.