A Multi-Sensory Approach to acquire and process health and lifestlye information

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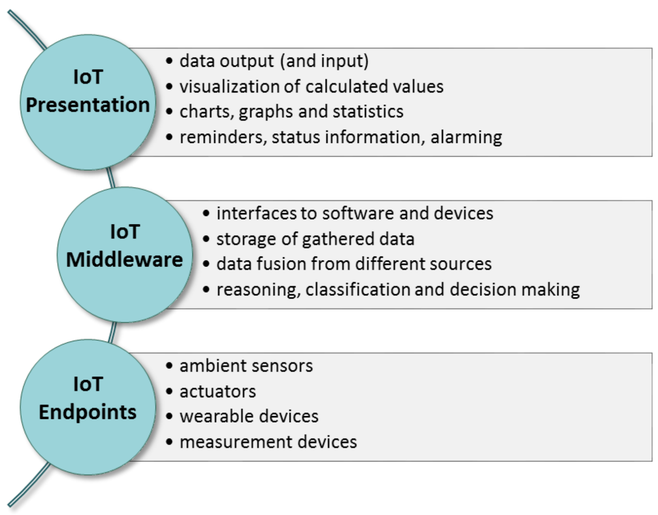
ABSTRACT

Starting around 2010, the Internet of Things has grown rapidly and now also embraces the field of healthcare. Subsequently, sensor-based technologies and infrastructure to support specific aspects of health and quality of life gain significant social acceptance and are ready to be put into practice. To address this process, a modular and reusable multi-sensor monitoring system to acquire and process health and lifestyle related sensor data was designed and implemented. The proposed system consists of a set of wireless ambient sensors and a collection unit which are all placed in the monitoring environment. The sensor components of the monitoring unit can be arranged and selected individually and were designed as a plug-and-play module to ensure a straightforward integration in the environment. The collected raw data is securely transmitted to the backend server which consists of a data storage and a data processing unit. In the data processing unit, the collected raw data is linked with individual context information and is then processed in consecutive algorithmic levels, depending on the criteria of the respective use case. The processed data of each evaluation step is separately stored and can either be forwarded to a third party (e.g. for providing results to the users) or be re-used in further evaluation. Through the implementation of interfaces, it is also possible to integrate data from external sources (e.g. wearables, health monitoring devices, etc.) at each level of data processing. The implemented and adapted system, including five non-invasive sensors which allow the monitoring of 10 different actions related to an active lifestyle, was installed and tested in 100 households in the framework of the Smart VitAALity project. First results show that the integrated sensor system was well accepted by the participants and worked in a stable and reliable manner over the test duration of one year.

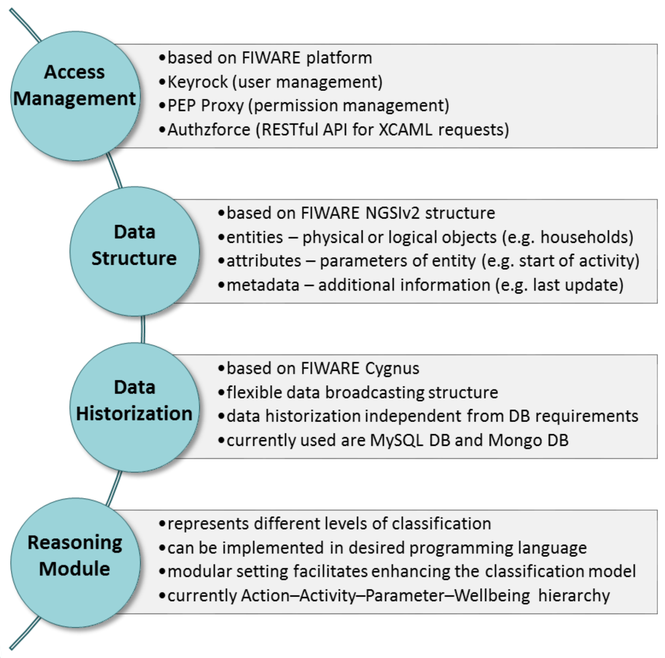
Introduction

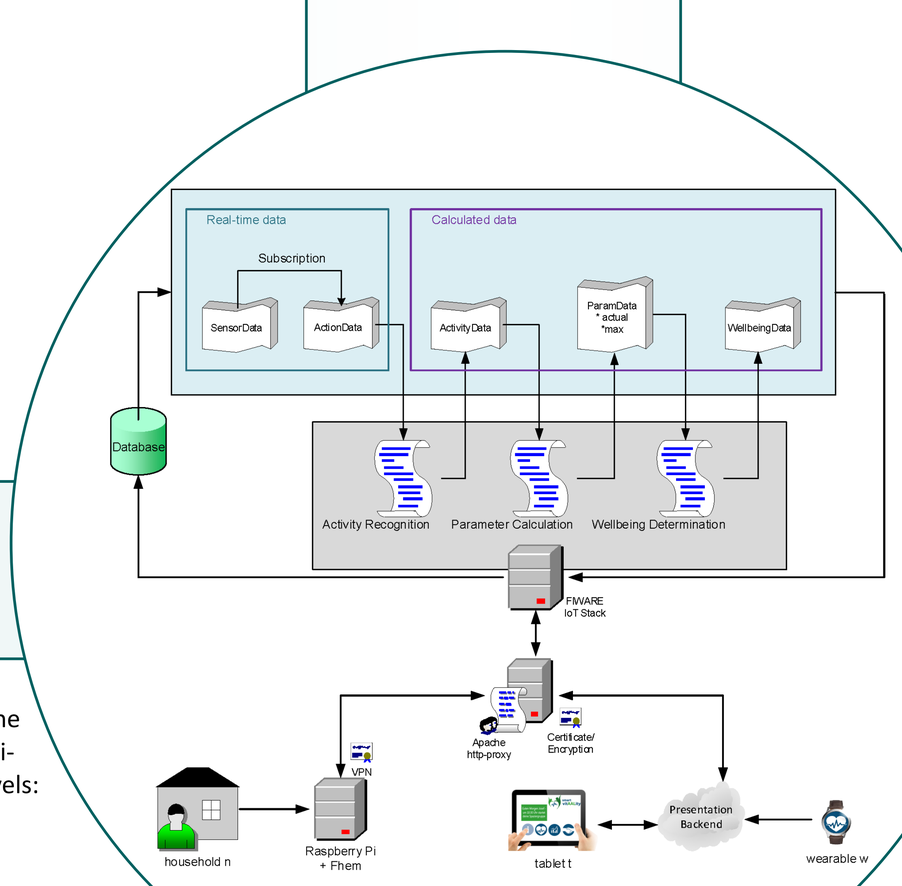
The concept of Internet of Things (IoT) describes the Internet as an interaction platform for Things to share information. Such Things are objects, able to interact with each other e.g. sensors, actuators, tags etc. The basis definition of an IoT application describes it as a set of three different layers:



Techincal implementation

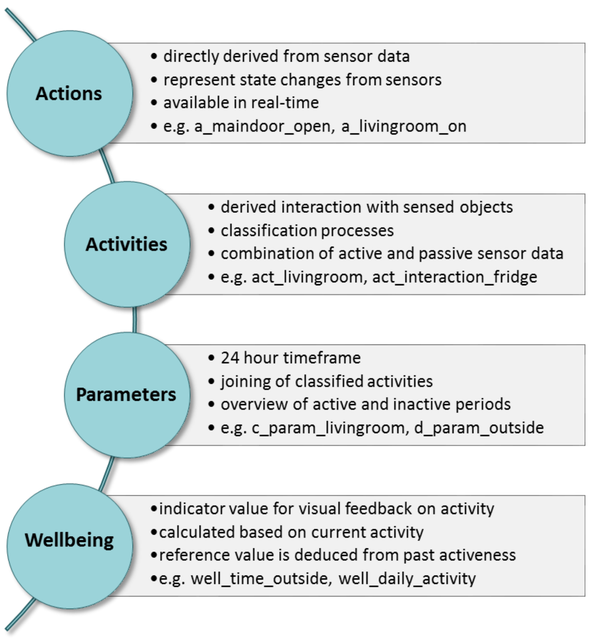
Listed are the main technical components, which were used to build the IoT middleware architecture. The main components are based on modules of the FIWARE platform.





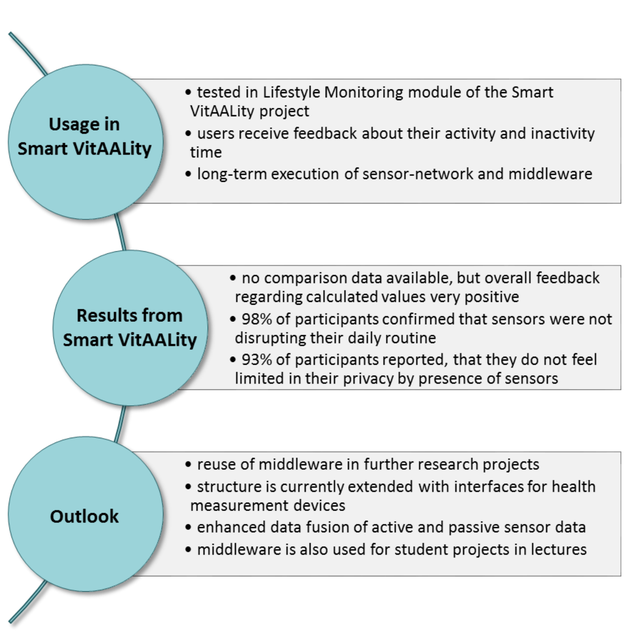
Classification Approach

The persisted raw data are used in the reasoning module where different levels of classification can be implemented. The module can be written in any language. In case of the Smart VitAALity project, the reasoning module has four abstraction levels:



Results and Outlook

In course of the Smart VitAALity project, an ambient sensor set of five energy-harvesting sensors was placed in the living environment of more than 100 participants. All described reasoning levels were implemented for research purposes.



[1]Smart VitAALity—www.smart-vitaality.at

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