HUBWARE

SMART HOME FACTORY

SARAH

White paper

The future belongs to Smart Home Assistants

A smart home is a complex structure and needs an intelligent assistant to make it pleasant and liveable for the residents.

Complex houses are not worth living in

A smart home consists of many devices from different manufacturers and technologies. Residents want an easy-to-use, functional and elegant system - an assistant that is always available and easy to use. Today›s market offers many complex, technically demanding solutions that require extensive expertise. In addition, a wide variety of technologies and manufacturers are combined in-house to create installations that often do not work together directly. If a problem occurs, troubleshooting is time-consuming and requires an expensive expert.

The needs of residents for safety, energy efficiency, comfort and expandability of the smart home are hard to combine in an easy-to-use product today.

Linking isolated solutions with software

The Swiss Gottlieb Duttweiler Institute GDI published the «Smart Home 2030» Report in 2015 [2]. The theses «Instead of hardware, software determines» and «networking is the key to success» were presented as challenges. This postulated trend has been confirmed in recent years and is now one of the core issues in the highly fragmented smart home market.

Other publications also describe the shift of the smart home market away from isolated solutions to platform solutions ([1], [3], [4], [5], [6]). The core issue - the fragmentation of the market for devices by manufacturer, communication technologies and data exchange protocols - will not disappear in the future. Existing stand-alone solutions are integrated into platform solutions and thus made smart.

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Requirements for a contemporary Smart Home platform solution

The fragmented market for components and user needs, lead to the development of a central, higher-level system - a so-called platform solution.

Integrating the whole house

A platform solution integrates products from different manufacturers and technologies - e.g. based on radio or wired systems, via IP or via cloud interface. Typically, permanently installed home automation systems are also combined with flexible consumer devices.

Devices of various trades such as lighting, shading, multimedia, weather, climate, household and security are integrated and controlled by this central system. Producers and consumers of electricity, heating, cooling, ventilation and water installed in the house can also be used. The integration of multimedia devices and cameras for monitoring and intercom allows interesting extensions and assistance. In case of an emergency, a trusted person can open the door remotely.

Needs of residents and integrators

Integrators and residents have different tasks and needs. The integrator is responsible for the technical functionality of the house, to integrate devices and configure them into a functioning overall system. When the finished "Smart Home" is handed over to the occupant, his work is usually completed.

Since the "Smart Home" is a living system, there are ongoing adjustments in the life cycle. If the needs of the resident(s) change, the sequences and settings of the programmed devices must be adjusted. A floor lamp for the living room or Wi-Fi loudspeaker is purchased and should be integrated into the "relaxing" mood. Residents want to make such small adjustments themselves quickly and easily, without having to rely on an integrator.

Smart Services enable simple operation

The individual systems and devices in the Smart Home are not "smart" and intelligent in themselves, but at best linked and connected by the platform-based control system. Special algorithms and programs are created to connect them in a meaningful way. Extending these functions, but also maintaining the Smart Home software, requires an expert and regularly costs money.

A modern smart home system offers the resident simple user interfaces and settings. The actual control and orchestration of the devices is done by the system in the background.

One possible application is the shading control: Current data from the weather station installed on the roof and forecast data obtained online are used to control the shades of the house according to comfort and energy efficiency.

Another example is the optimization of the own energy consumption . On a sunny day, energy produced by the photovoltaic system is used for connected consumer appliances such as heat pumps, boilers, battery accumulators, electric vehicles and household appliances such as washing machines, dryers or dishwashers. The occupant only has to choose in which prioritization this should take place. The system takes over the execution depending on further factors such as the prediction of solar radiation, the estimated energy consumption and the expected running time of the consumers.

Sensors installed in the building, such as motion and presence detectors, are used for the automatic control of lights and other automations in the presence of residents. In the absence of the occupants, they serve as sensors for the built-in safety system.

The system can also monitor selected actions of the residents and use these for a self-learning presence simulation in order to simulate an occupied house according to realistic patterns when absent.

Smart Home Systems work autonomously and locally

The Smart Home System is permanently installed in the house. If an active Internet connection is required for normal operation, e.g. due to algorithms or data transferred to the cloud, this is problematic and can lead to failure of basic functions for heating or the time-controlled export of actions ([7], [8]).

All data of the house is stored locally. This ensures that residents' sensitive usage data does not fall into the wrong hands and is sold on to third parties unnoticed by the data producer and owner.

Access to the Smart Home - whether in-house or remotely - is only possible for authorized users. The occupant decides who is allowed to access which functions and when. Communication is encrypted and cannot be viewed or manipulated by outsiders.

SARAH, the Smart Home Assistant

SARAH is designed to meet the needs of the next generation of smart homes. It is a state-of-the-art platform solution that focuses on the requirements and needs of the residents.

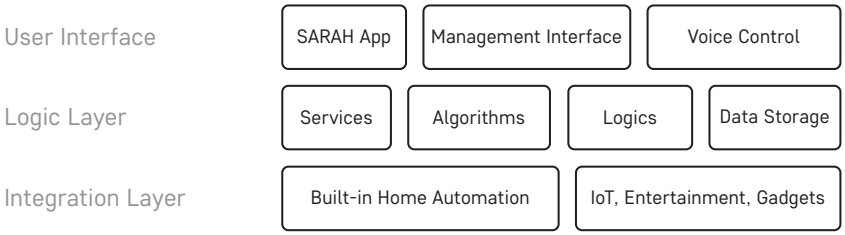

Figure 1 Architecture SARAH Smart Home System

Matching user interfaces

The residents use the user-friendly and award-winning [9] SARAH App. This is optimized for daily use by the residents. Personal user accounts and authorizations also allow children, visitors or external persons to use the system.

A web-based management interface allows integrators and technically experienced users to configure the various technologies and devices. This can also be temporarily enabled for remote access by external persons such as the integrator.

Further interaction options such as voice control or other user interfaces can be easily added in the future.

Services simplify the complexity

Various controls are combined in the logic layer. Devices are controlled in it in a technology-neutral manner. Users access it via the various user interfaces.

For example, the climate control system is structured so that residents can adjust the desired target values in the app. The complex physical configuration of the climate zones with valves, sensors and other components is done in the management interface. The service's algorithms then control the devices based on service configuration and user preferences to optimize power consumption and convenience.

Interoperability through gateways

SARAH integrates the devices and technologies into the integration layer using specific adapters ("gateways") in such a way that they look the same for the system and can be operated. It does not matter whether the device is accessible via bus cable, via a power cable with powerline technology, wirelessly via radio or Wi-Fi, or via the Internet via cloud interface. Within SARAH, devices are addressed in the neutral "SARAH device language", which are translated into technology-specific commands and values by the gateways.

> „ The resident is not interested in how the device works - it has to work. "

Local data storage

The SARAH server is installed in the house and locally connected to all installed components (if supported by the manufacturer). All data and algorithms are executed on the server. No private data is stored externally.

The communication of the SARAH App with the SARAH server is always encrypted. Each communication partner generates its own key pair (private & public key) during initial connection establishment and can thus always be uniquely identified.

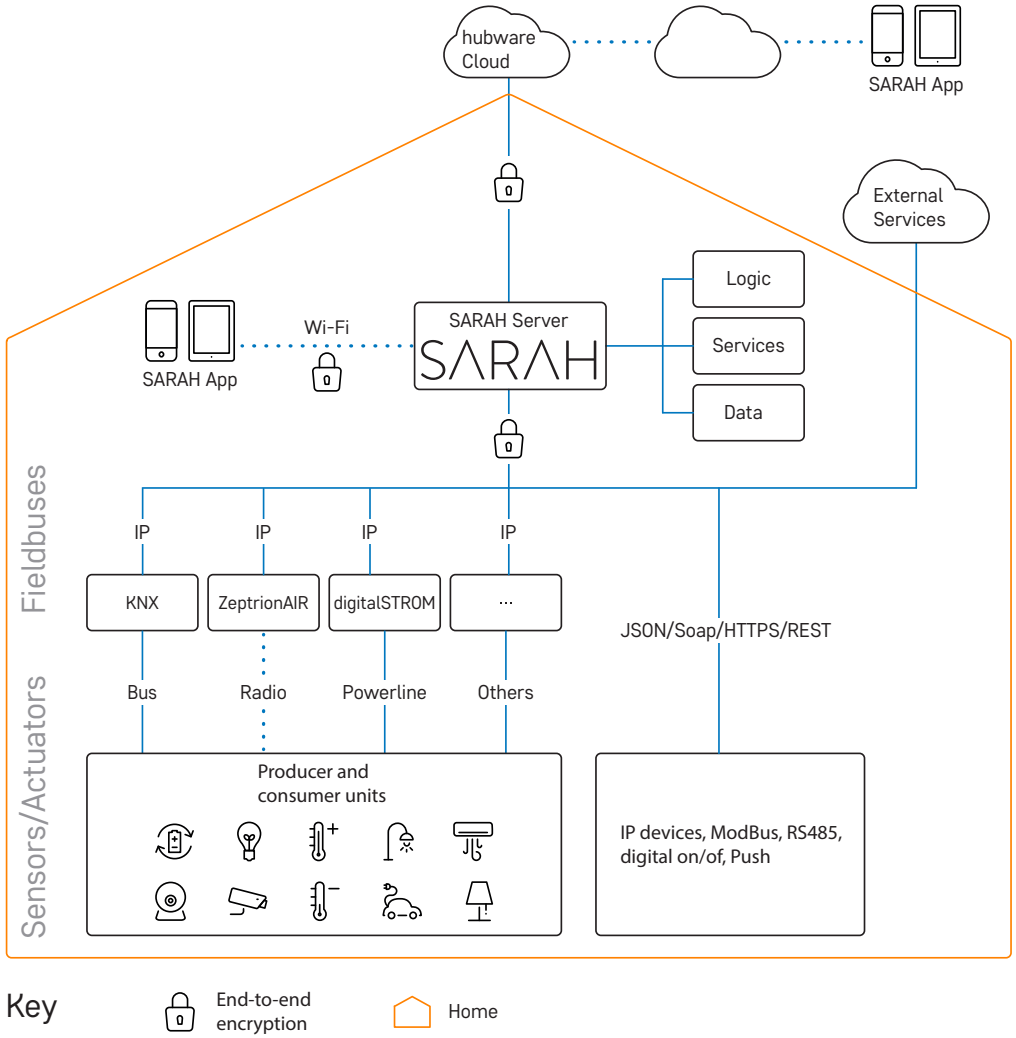

Figure 2 *Interaction of SARAH and Gateways*

To access the app from the Internet to the home SARAH server, a secure connection is established via the hubware cloud. Thanks to the unique, cryptographically secured device certificate and additional end-to-end data encryption, the data flow over the cloud cannot be decrypted and read by hubware or third parties. The cloud infrastructure is located on its own servers in a Swiss data center.

Alternative Solutions

SARAH is not the only smart home central and platform solution on the market. This can be roughly divided into three segments.

Proprietary platform solutions such as IP *Symcon, iBricks or Gira* offer similar functions as SARAH. Most of these solutions are very technically oriented, are programmed in a project-oriented way and are "hard-wired". The user interface usually does not meet the expectations of the "smart phone generation".

Trained, experienced integrators are needed to set up and maintain these systems. The installation of a smart home is a customer-specific project that cannot be automatically supplemented with new functions. Updates to be carried out during the life cycle, adjustments to the logic or the integration of new devices require detailed knowledge and therefore usually an expensive expert.

Simple, often cloud-based solutions such as *Homematic IP, Somfy Tahoma or Qivicon* from the German Telekom offer basic functions with good user guidance and support. However, due to the dependency on the cloud and a focus on the entry-level market, the systems are functionally quickly exhausted. *HomeKit* from Apple and Google Home also belong to this category. Often the collected data is also aggregated, shared with partner companies and resold.

Open source solutions available on the market such as *OpenHAB or FHEM* offer a very wide range of supported interfaces and technologies. The further development of the software is driven by volunteers. These systems are ideal for technically talented and interested users - the dream of having your own smart home can be realized very individually.

However, the smart home then, becomes a hobby: software updates and adjustments due to new devices in the smart home are often time-consuming. In addition, there is the risk that components or even the entire system will not be further developed by the voluntary developers. If the property is to be sold at a later date, such a system reduces the value and must be replaced.

Meet SARAH, your personal smart home assistant

Residents' needs for a high-quality, comfortable and easy-to-use smart home are met with the SARAH Smart Home Assistant.

Specific user interfaces for residents and technicians make it easy to use with the award-winning app, and to manage the system. New devices can be easily integrated and used in the various services.

SARAH is a product with regular, stable updates, not a project-based solution. The system is integrated in the house and keeps all data, algorithms and logics locally. The focus is on data protection, security and technology neutrality.

SARAH is a smart home platform for the future that is geared to meet the needs of residents.

Learn more about SARAH

hubware.house/SARAH

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