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SERVICE DESIGN AND SERVICE MANAGEMENT WITH THE SERVICE BLUEPRINTING METHODOLOGY

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Abstract. *A new application of software technology is the application area of smart living or sustainable living. Within this area application platforms are designed and realized with the goal to support value added services. In this context value added services integrates microelectronics, home automation and services to enhance the attractiveness of flats, homes and buildings. Especially real estate companies or service providers dealing with home services are interested in an effective design and management of their services. Service Engineering is the approved approach for designing customer oriented service processes. Service engineering consists of several phases; from situation analysis to service creation and service design to service management. This article will describe how the method service blueprint can be used to design service processes. Smart living includes all actions to enlarge a flat to a smart home for living. One special requirement of this application domain is the use of local components (actuators, sensors) within service processes. This article will show how this extended method supports service providers to improve the quality of customer oriented service processes and the derivation of needed interfaces of involved actors. For the civil engineering process it will be possible to derive needed information from a buit in home automation system.*

1 INTRODUCTION

In the context of smart living or sustainable living value added services integrates microelectronics, home automation and services to enhance the attractiveness of flats and buildings. Especially real estate companies are interested in an effective design and management of their offered services. Value added services focused on inhabitants are grouped to consulting and information, care and supervision, leisure time activities, repairs, mobility and delivery, safety and security, supply and disposal [1]. (see Figure 1).

On the one hand basic requirements of installation of local components within the flat, building or campus are needed. On the other hand the integration of external service providers is necessary to provide it-supported value added services (for example emergency sensors for elder people or facility control systems for companies).

Local components are for example outlet systems, light installation, location systems, mobile sensors, cameras as well as white goods (refrigerators, washing machines, etc.) or consumer electronics or devices for energy supply (heating systems, etc.). The networking of the local components is organized by different techniques (EIB, LON, IR, Bluetooth, LAN/WLAN [2][3]). Various mobile devices (cell phone, smart phone, PDA, Tablet-PC) are used to control local components via a service gateway. If needed, because different network technologies are used, the service gateway transforms queries to different protocols.

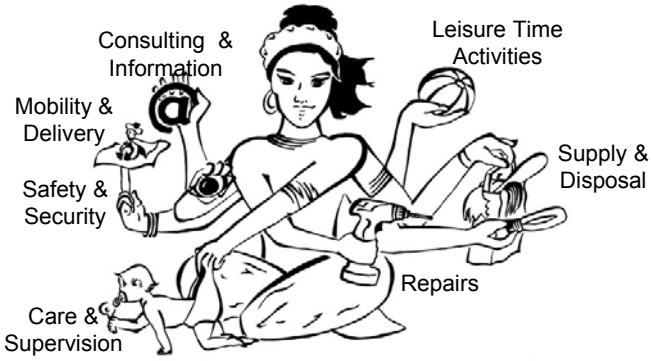

Figure 1. Value added services for smart living

External service providers are companies selling services (e.g. security services, delivery, caregivers). Due to providing it-supported value added services real estate companies expand their offer to a service provider (one face to the customer/ inhabitant – from one source) to compete within the future market of smart living [4]. New services will be developed by different process models of service engineering. A typical service engineering model has different numbers of phases. Basically it has four different phases: situation analysis, service creation, service design and service management. The whole life cycle of a service will be supported by these phases. To provide the service engineering process within smart living the method of service blueprinting can be adopted within the phase of service design. As a part of service design the blueprinting is used to model the overall service process integrating smart local components. Within the blueprint the different action parts of customers and providers will be shown. Therefore, the explicite intelligence of a smart home is unaccounted. For this, the blueprint will be extended with further action of a smart home.

2 STATE OF THE ART

The using of local components and their networking is proved since several years in national and international projects. The projects are accompanied by universities or various research institutes [3][5][6]:

"inHaus", Duisburg, Germany

"Das intelligente Haus", Gifhorn, Germany

"Haus der Gegenwart", München, Germany

"Trunifed Haus", Ahaus, Germany

"Vision Wohnen", München, Germany

"FutureLife", Hüneberg, Switzerland

"HomeLab", Eindhoven, Netherlands

"IT Neighborhood", Stockholm, Sweden

"AwareHome", Atlanta, USA

"Smart Home", Edingburgh, Great Britain

All projects have a same focus; they are focusing on different technology aspects for home automation. A house or flat was build to focus on specific usage of local components and to prove different networking concepts and technologies (EIB, KNX, Powerline, TCP/IP, etc.). Focusing on diffente aspects like home automation control in combination with mulitmedia and entertainmant devices or technology integration are the main aims of the listed projects. Some projects although take different target groups into account (e.g. families or elderly people). Figure 2 shows exemplary local sensors and actuators used inside a house or flat.

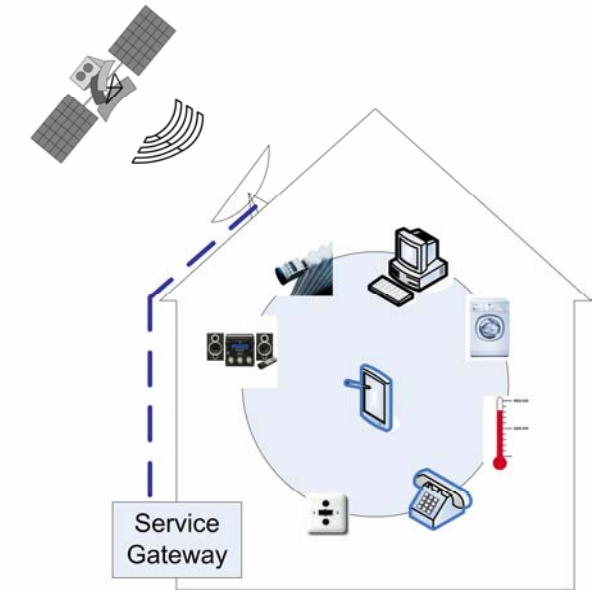

Figure 2. Aktuators and Sensors within an automatic home

The "InternetHome" proves different local components of one manufacture (Honeywell) to control the house and proves the benefit to integrate network components from another manufacture (Cisco). Primary aim of "Das intelligente Haus" is the network of local

compontents to raise the passive security for intrusion, fire and leakage detection of the home. The secondary aim is focusing on optimal association with resources (gas, water, power) supported by energy control components. “Smart Home” verifies useful local components for assisted care living to get optimal usability to the elderly people. To raise social responsibility and competence of inhabitants within a district is checked in project “IT Neighborhood” by using a local communication network based on TCP/IP. During startup of the “IT Neighborhood” project especial erldery people are trained on using the computer and the internet. Developing an intelligent surrounding to prove assisted living especially for elder people is subject of project “AwareHome”. Within the project “AwareHome”, local components should identify personal circumstances to alert, to help, to assist elder people in their everyday life. If integration with local components is necessary (messages to read out and confirm, make attitudes) this interaction is made by gestures, which are recognized by visual assistance systems installed inside the home.

Focus of these entire projects is raising the comfort and the easy handling by using local components inside a smart home. The realization of services, provided directly inside a customer’s home, was not viewed by projects, except “FutureLife”, where products could be ordered online and will be placed in the “SkyBox”. The developing of the delivery service, as one example of a value added service, was prototyping. But how about developing services for a mass market using a service platform and it-supported value added services? For developing services the usage must be standardised. Service blueprinting visualisation interaction of the involved actors for documentation, service optimization and interface development.

3 SMART LIVING

The main part of research project “SmarterWohnenNRW” [7] is to develop new concepts of it-supported value added services. The new services will be provided to inhabitants by their real estate company. The services will be provided by professional service providers in cooperation with the real estate company as a new distribution chanal. Another objective within the project is to identifiy local networked components for various it-supported value added services focusing on mass market suitability. Partner of this research project is Fraunhofer-IMS, Fraunhofer-ISST and Hattinger Wohnstätten e.G. (HWG). 200 flats and houses will be renovated and upgraded by the HWG to prepare the service platform for testing and proving all it-supported value added services. On the one hand the project should validate the concepts and on the other hand it should prove the scalability and portability of the developed concepts and techniques for a mass market. Within the scope of the project the houses will be equipped with local components and ip-network. This will provide an infrastructure to settle different it-supported value added services.

The service gateway realizes the integration and the communication of the local components. The service platform performs the integration of external service providers and their communication (see Figure 3). One very important thing is to address local components, which can be on a campus or outside the home, to provide local information (for example: weather forecast). The unique address and security connection will be handled by the service platform and service gateway. Another relevant thing is to provide the adequate services to inhabitants.

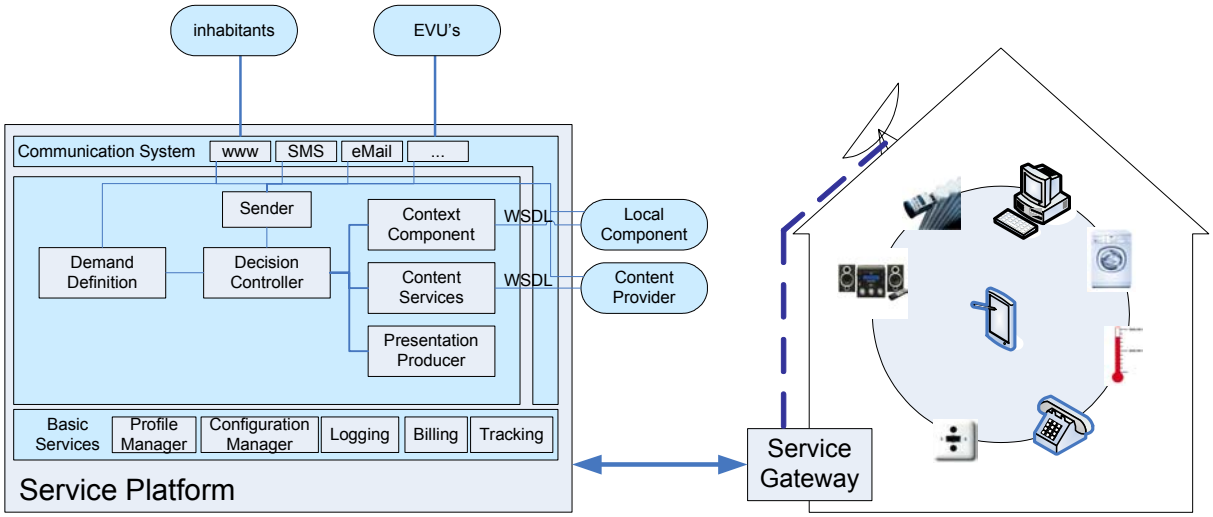

Figure 3. Service platform for it-supported value added services

General service engineering process models does not guarantee the success of an offered service [8][9], but it helps to feed customers expectations. Value added services in general should be customer orientated. The capturing of customers expectations and experiences need to be proved by methods for a successful service developing. The gained expectations and experiences must be transferred into a blueprint of the new service and take part of the service design and service management decision.

4 SERVICE DESIGN

Special task within these service processes is the use of local components to offer it-supported value added services. Service Engineering knows different process modells. All models are structured into different phases. One important phase is the service design phase. During service design the methodology of service blueprint describes the whole service process. The customer will initiate activities or will participate in the service process. In smart living szenarios local components will take a part of customers' activities. Therefore the local components have to be installed inside a building or flat. The local components produce information and additionally information will be sent to local components. How can the method service blueprint be extended to enable it to model these facts? To answer this question is necessary to raise the quality of service processes in the application domain smart living. Another question will be the advantage for the civil engineering using to describe services, offered to the inhabitants. Needed home automation will be resulting from offered services, designed with service blueprint. The aim is to provide the full functionality of a smart house to fit offered it-supported value added services.

Service blueprint is a process analysis method, based on flow chart to systemize the description, documentation and analysis of service processes [8][10][11]. The blueprint structures the process activities on either side – customer and provider. Shostack [10] defined the service blueprint with three activity levels divided by the "line of visibility" and the "line of interaction". The first increment, amplified by Kingman-Brundage, contains more activity levels. It differs between customer activities, onstage activities, backstage activities, support activities and management activities [12]. These different kinds of activities show the organised process of a service blueprint from customer to service provider including support and management. The second increment, processed by Kleinaltenkamp and Fließ, includes the

"line of order penetration". It divides the management activity into preparation and facility activities [13][14]. The main part, the "line of visibility", didn't change through the increments of the service blueprinting. Figure 4 shows the different structures of increments in service blueprint.

Till now the service blueprint specific options allows integrating and visualisation different kind of information such like time, costs and resources into the model. An analysis reflects the important communication points to customers and shows the potential fail points. But there is no possibility to integrate automatic raised information from home automation components which are installed inside the building. This information are unaccounted during the service process and have to be bring into the it-supported value added service process afterwards. Modelling the service process will support the civil engineers to integrate needed local components into the building.

Analyzing the collected information and placing them within the service processes to raise the quality of service to customers is the main focus of blueprinting [10]. Different service process modelling methods can be used for analyzing customer expectations and designing customer services [8]. The "flow chart" for service design and management by Ramaswamy [11] adopts different modelling constructions such as decision branch and process owner. It models the steps of functions to deliver services to customers. The service process can although be modelled with the "Event-driven Process Chains" (EPC), which is an important aspect of the Architecture of Integrated Information Systems (Aris) [15].

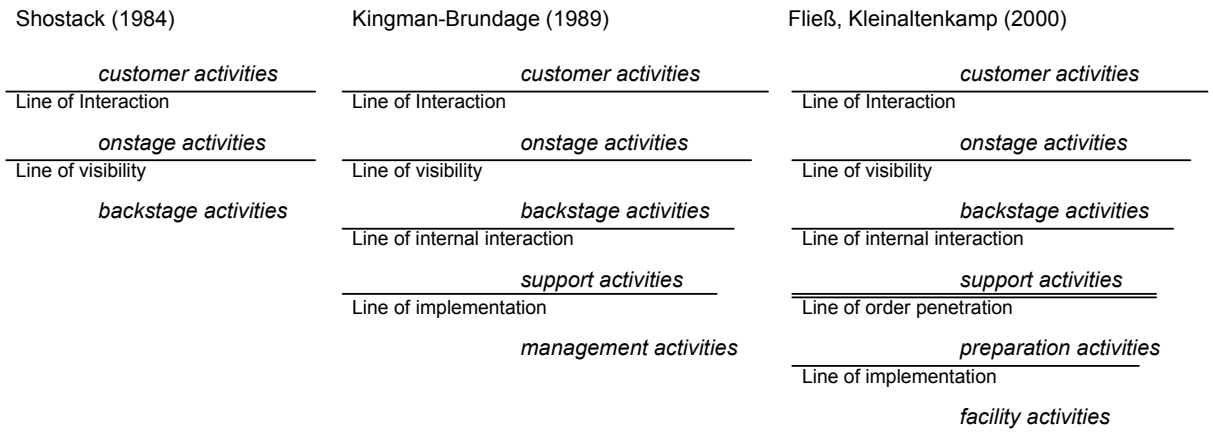

Figure 4. Increment overview of Service Blueprinting

The amount of information, available at customer service interactions, is one major part of the service delivery quality. Further information, collected from customer profiles and additional local components (e.g. thermostat, heating systems, and entry access), should be integrated in the service design and service management process. Situations and activities triggered from a customer and identified by home automation (e.g. leaving home, leakage, consumption) assists services like relocation service, security service, delivery service etc. Figure 5 shows the usage of service blueprint as an abstract example. With little modifications and extensions it allows dealing with automatically collected information from local sensors and actuators. Customers' activities can be swayed by local components and their individual profile.

Dealing with local components, directly or indirectly influenced by customers, a new line will be added to the structure of service blueprint (see Figure 5). The "line of crossbench

interaction" separates the activities done directly by inhabitants from activities enforced indirectly by inhabitants (e.g. specific conduct at smart homes).

In smart homes inhabitants will interact more and more with smart local components. In preparation for value added services acting independent the need to distinguish between direct and indirect customer activities increases. Two objectives can be developed from the new structure of this blueprint. First it will identify local components needed for the value added service, because they are modelled as self-acting customer activities. Second it will obviously point out the potential of a service within a smart home. The potential of new innovative services in the environment of the product "living" will include a large quantity of providing a better service, a higher quality, lower prices or a combination of them assisted by local components.

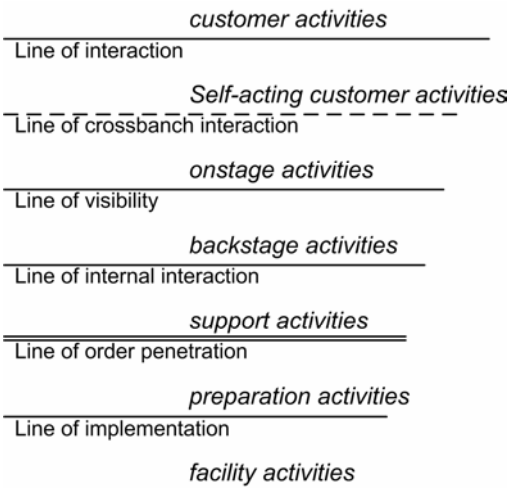

Figure 5. Extended service blueprint

As an example for it-supported value added service the vitalcheck will be described afterwards. An outpatient care caregiver is involved to look after their patient. The service platform instantiate the value added service and coordinates the need of an inhabitant. The infrastructure for smart local components is established by the real estate company. Personalized information about the vital values and personal data of an inhabitant will be provided by the service platform. Inside the home different local components or smart wear will be used to collect various information like vitality (e.g. heartbeat or blood preasure) or behaviour (e.g. moving or lavatory use) of the inhabitant.

Smart wear products are vests or shirts with sensors or sensor controlled mattress. Especially sensor controlled mattresses are qualified to prevent cod death. Finally the responsible caregiver determined different critical values for the inhabitant - his patient - and insert them into the service platform. The collected values determine specific situations. The needed information from an automatic home defined in advanced, so afterwards the responsible actuators and sensors can be installed within the house. Therefore it is important to define offered services and their needed information content.

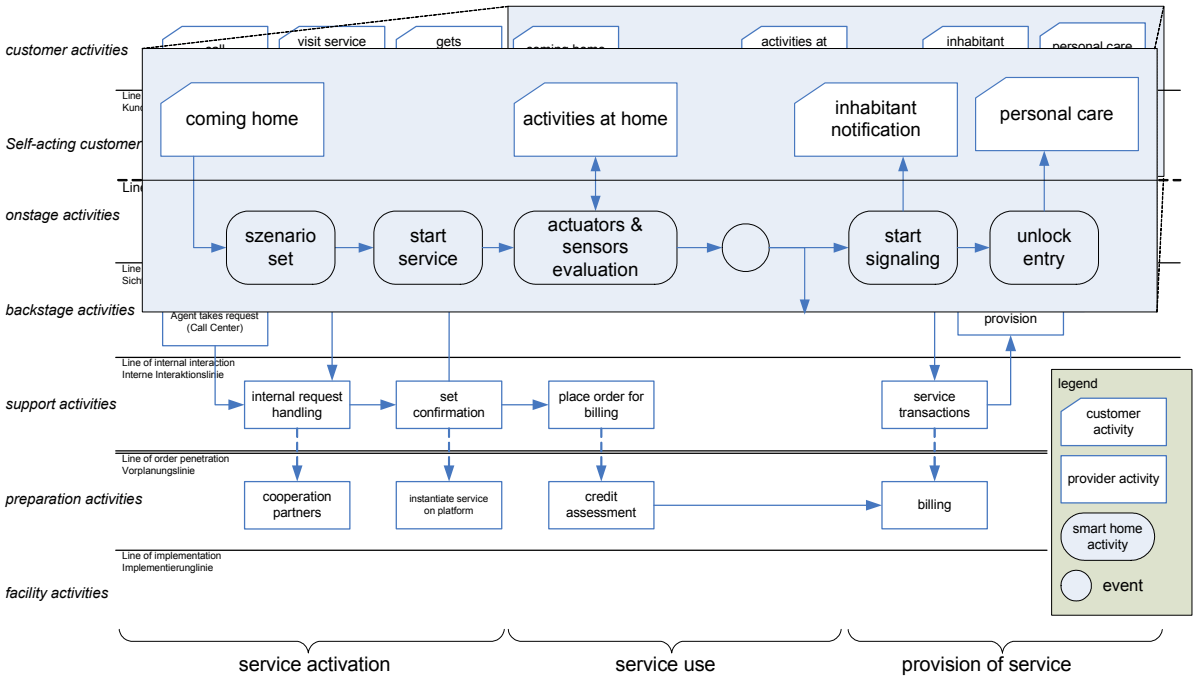

Figure 6. Service blueprinting with home automation based on care service example "VitalCheck"

If a critical value is reached, the service platform will inform, depending of escalation breakpoints, the relatives, neighbors, friend, personal responsible or caregiver. The caregiver will get the notification from the service platform and afterwards he can check, whether he should contact, visit the person or alert the emergency. His decision will depend on the information he has. The service platform provides him actual and prior vital values, to confirm his decision (see Figure 6). In addition to the vital values it is possible to provide more information about the person. Maybe he was outside and the alarm activates or the last action (like moving, oven using …) of the inhabitant. The emergency will correctly know where the person is, because the service platform locates the end device of the person.

The important part within the blueprint, especialy for the civil engineering, will be the usage of smarthome activities and situation detection. In Figure 7 different properties are listed for home activities used as indirect customer interaction within a service blueprint. The definied properties derive to the needed hardware plugged into the house. If the need for a system to enter the house by dynamic access for an it-supported value added service is defined, it has directly an effect to the requirements for the infrastructure and the entry system. Part of the properties for a home activity are:

- moving
- behavior
- actuator
- status
- event
- time
- place
- duration
- dependence
- ...

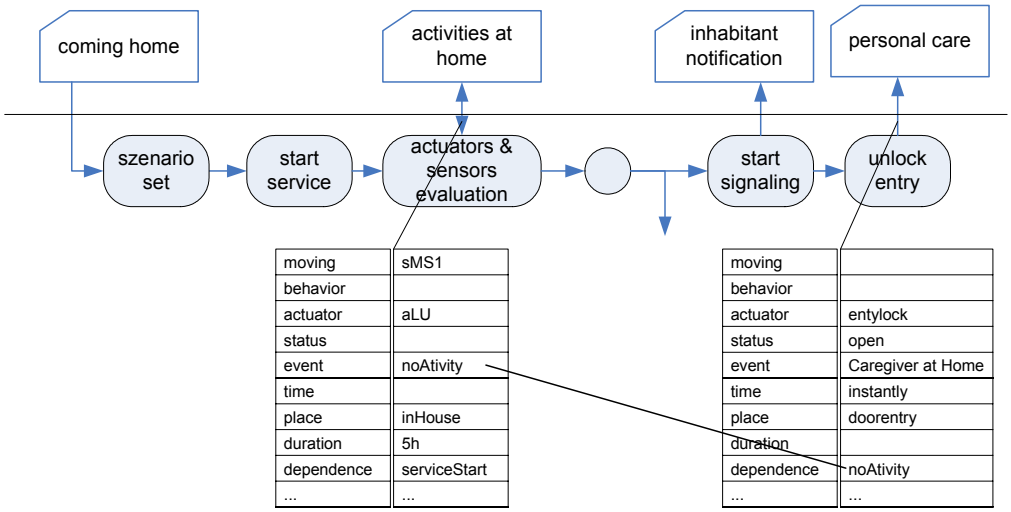

Figure 7. Propertydescription for home activities

The dependencies between the home activities will be defined by using the property "*dependence*". The property describes the need of an event – trigged by another home activity – before the home activity starts. The property description will be transferred to a service process compatible XML-structure. Standardised XML-structure carries over to an automative instanciated and interpreted home automation system based for example on OSGI [16].

5 CONCLUSION

All additional techniques for modelling service processes are useless, if they are not customer orientated. The service model does not guarantee the success of an offered service [8][9], but it helps to unterstand the customer actions and to prevent failure points in advance. The capturing of customers expectations and experiences need to be proved by methods for a successful service developing. The gained expectations and experiences must be transfered into the service blueprinting and take part of the service design and service management decision. Simple houses are extended by a service platform and smart local components for the realization of it-supported value added services to smart house. The smart local components are used to supply additional information for external service providers. Especially the multiple usages of smart components to deliver information to different service providers are very important. Driven by changing demands of inhabitants, real estate companies extend their offers with additional services. To manage a significant number of services a strongly flexible architecture and an easy entry for service providers is needed. The flexible architecture increases the offer of it-supported value added services for the service platform.

Service blueprinting as a part of the service engineering process clarified the usage to design service processes. The extension of service blueprinting showed the impact of developing new services especially in the application domain smart living. Further research will be focus on developing an adequate notation including different local components according to new value added services from different domains.

Furthermore the interfaces between local componentes, service gateway, service platform and service providers has to be defined for a whole service chain. The home automation

provides a standardisation for example settled by the Digital Living Network Alliance [17]. For provider interaction the service process can be descripted and automaticaly supported for example by eFlow [18] or openXchange [19]. The bridge from home automation to service provider will a main focus for further research and although the automative interpretaion of the XML-structure.

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