Chapter 12

Home Service Engineering for Sensor Networks

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ABSTRACT

This Chapter deals with the important process related to smart environments engineering, with a specific emphasis on the software infrastructure. In particular, the Chapter focuses on the whole process, from the initial definition of functional requirements to the identification of possible implementation strategies. On the basis of this analysis, a context model as well as the possible choice of relevant sensor types is carried out.

MOTIVATION FOR IT-BASED HOME SERVICES

Demographic factors, including age, income level, marital status, birth and death rate and the average family size, influence the development of populations and available human resources. Taking these factors into account, there will be less human resources to provide home and care services to people. This leads to a demographic distribution that is ill-equipped to provide home and care services since there is a smaller workforce providing for the elderly. The percentage of single households among all ages is rising, leading to a higher demand for services. Single households still require the same quantity of home services as all other households. Finally, there is and will continue to be a higher demand of individual home services across all ages. One possibility to fulfill the higher demand is to use IT as an active part of home services.

“Smart home”, “intelligent home”, “automated home” and “smart living” are popular terms used to describe home process automation. Of interest
is how to integrate this automation into a service process realized by a local service provider. To define such integrated services, different aspects thereof must be discussed. These aspects are:

- Focusing service engineering for IT-based services
- Defining and modeling IT-based home services
- Exhibiting context model

In order to model and (automatically) execute IT-based home services, they must be given special treatment, with sensors and actuators taking active roles within the service package as agents supporting or triggering human actions. Sensors and actuators are local components inside the home and can be bundled under the term domotic. For example, an emergency detected by a system leads to a phone call from an assistant or a detected device failure is followed by a technical inspection. The infrastructure to enable such interaction is based upon information and communication technology (ICT). To set up and facilitate such IT-based home services, a methodology and notation for modeling the service process and information pool is needed. Work is currently underway in the research community of service engineering to deliver such a solution. Service engineering, however, does not currently consider local components as an active part of an IT-based home service. The focus lies instead on human tasks done by employers or customers. Till now such details of IT-based home services are not defined and classified - they do not exist. Therefore standard process models for service engineering are examined, assessed and extended to support IT-based home services. In other words, existing methodologies and notations are verified for practice. If they are not sufficient, they must be extended.

**HOME SERVICES ENGINEERING IN FOCUS**

For modeling IT-based home services, a service blueprint is used to structure service tasks on different levels according to their distance from the customer. It structures process activities on two sides - customer and service provider. The analysis reveals important communication points to customers and shows potential failure points. Data can be presented visually with different notations such as flow charts, extended Event-Driven Process Chain (eEPC) or Business Process Modeling Notation (BPMN). There are much more notations existing, but none of them are capable of modeling IT-based home services without extension. For the purposes, BPMN is used to model the IT-based home service within the service blueprint structure. BPMN is extended by special features to address the entire range of IT-based home services provided within a smart home environment.

**Service and Home Service Definition**

Currently, there is no concrete scientific definition for service. Through its usage, we are able to extrapolate the following aspects of a service (for more details see Meffert and Bruhn, 2000):

- Activity-oriented
- Process-oriented
- Result-oriented
- Potential-oriented

These four characteristics of services involve different approaches. As a consequence, services are rendered directly to activities within a process to fulfill individual needs or market-oriented results or rather are viewed by human or system realized potentials. A combined view of the three characteristics (potential-oriented, process-oriented, and result-oriented) can be organized within a phase-oriented model. Hilke combined