Abstract

In the Future Internet, billions of devices will be connected to the Internet. Devices at any levels of hierarchy provide services leading to a huge amount of services (i.e., the Internet of Services). From the software developer perspectives, new services can be created by utilizing these pre-made services. One of the important issues of the creation of such service-based applications is the interoperability problem. The devices might have implemented their services differently; using different programming languages, protocols and concepts. Another important issue is regarding the deployment method of service-based applications on personalized and embedded devices with different capabilities and configurations. For each device with different capability and configuration, different tailored code is required.

This thesis proposes PMG-pro (Present, Model, Generate and provide), a language-independent, bottom-up and model-driven method for service creation. With this method, a service is created by providing the new functionality of a service-based application as a service. By using existing service frameworks and APIs, from a service description, PMG-pro generates an abstract graphical service representation (service model) and source code implementing for service invocations. Depending on the target modeling languages, different graphical notations can be used to represent services. Similarly, different programming languages can also be used to implement the service invocations. We call these pairs (i.e., the service model and the source code) platform-specific models. With these platform models, service composers use the graphical service representation to model new service-based applications, while the machine (i.e., computer system) uses the source code to generate code from the service-based application model.

This thesis contributes to the service engineering method that applies a model-driven development approach. Three main contributions are a model-driven method for service creation, an automatic service presentation of pre-made services, and a new method of handling device capability and configuration. With these, service creation in the Internet of Services can be done in a rapid and automatic manner. Service designers can create a new service by defining a model of service-based applications using pre-made service models, while code for a specific device can be generated automatically from the model.

The PMG-pro method has been partly prototyped and validated on various case studies in the domain of smart homes that have produced encouraging results. The method promotes a rapid, language-independent, and unified process of software service development.