

A Rendezvous of Content Adaptable Service and Product Line Modeling*

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Abstract. Content adaptable applications are often used in ubiquitous computing environment, and it aims to service the adaptable contents to users. In this environment, the services are dynamically selected and provided, the contexts are changed frequently. Then, the application services are to be modeled to derive the adaptable service effectively and to reuse the model. Modeling with software features and product line concepts may support for making service decision strategy. In this paper, we propose a service decision modeling technique for content adaptable applications in ubiquitous environment. It consists of defining variation points and their variants, finding out the dependencies between them, and then building the variant selection strategies. These can accomplish to define the decision model based on content adaptable service, and the definition templates help the reuse more effective.

1 Introduction

In the age of ubiquitous computing, computing devices and information are everywhere and user has multiple ways of accessing and exploiting them. So, the developers must consider relevant features which are for context awareness, location awareness, self adaptation and decision capability.

In such environments, a device can vary from a workstation, to a mobile phone, a PDA or any other limited terminal. Moreover these devices are likely to be heterogeneous, requiring special considerations in terms of their physical resources and computing power. The problem in these environments is to deliver a content understandable service by the end user.

To respond efficiently to the heterogeneity of the environment, multimedia systems must dispose of advantage mechanisms that allow adapting services according to users' interests and capabilities. These mechanisms must be capable to negotiate the best document variant if it exists but also to negotiate the best adaptation to apply on the original document in order to meet the client requirements. In this context, a good

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description of: the user (its preferences and the used device capabilities), the server (its content and adaptation capabilities) and the network play a major role to make the final delivered service well adapted to the end user.

The content adaptability is another important issue for this environment. This can serve an adaptable content on the fly so that the application has to the strategies to decide the appropriate service. These services have to be predefined and modeled. If well defined and modeled, they can be reused for another application which has same objective or same concern. And to support the reuse issue, it has to be modeled more systematic. The reuse of service means the reuse of service decision strategy. As a result, the service decision model is needed. The issue of how to specify the service is becoming interesting theme recently.

Michalis Anastasopoulos took his effort to illustrate how pervasive computing applications can benefit from a software product line approach and especially from the PuLSETM (Product Line Software Engineering) method, which was developed at the Fraunhofer Institute for Experimental Software Engineering (IESE) [1].

Besides, by adopting an architecture-based approach, [2] provides reusable infrastructure together with mechanisms for specializing that infrastructure to the needs of specific systems. Some researchers suggest frameworks that facilitate the development and deployment of web services aware, respectively [3] [4]. So far, the attention of web service is now being directed as how to resolve the context awareness not how to define the strategy and reuse. They suggest reasonable concepts or architecture even though the modeling techniques or processes are not embodied yet.

The product line engineering concept is introduced to practice a dependable low-risk high-payoff practice that combines the necessary business and technical approaches to achieve success [5]. Variation point and variant are the core concept of product line. In [6], the authors took their effort for describing the taxonomy of variability dependencies and the types of variability dependencies. This concept can be useful for establish the decision process of web based application.

In this research, we suggest the process model of service decision for content adaptable application. This model is using product line concept such as variation points, variants and dependency.

Section 2 describes the related works, section 3 introduces our suggestion, section 4 shows the framework to support proposed model and section 5 assesses our challenges and contributions.

2 Related Works

2.1 Variability of Pervasive Computing with PuLSE

IESE(Institut Experimentelles Software Engineering) illustrates how pervasive computing applications can benefit from a software product line approach and especially from PuLSE (Product Line Software Engineering) method. It discusses the variability in pervasive computing [1].

This is based on that Human-centric character of pervasive software development requires dealing with ever-increasing variability at different stages of the software life