A Product Line Architecture for Evolving Intelligent Component Services in Tourism Information Systems

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Abstract

The challenge facing developers of Tourism Information Systems (TIS) is the need to evolve more intelligent and dependable tourism support services. However, these kinds of information systems have largely identical functionalities and delivers almost similar services. The systems differ mostly in the customized information contents they deliver and the scope of the tourism interest that is being promoted. The peculiarity of the e-Tourism domain makes it ideal for product line development. In this paper, a reference Tourism Product Line Architecture (TPLA) as a platform for evolving intelligent component services is proposed. The TPLA is a layered architecture of core reusable components that can be leveraged for the development of a TIS product family. The architecture is extensible and its components are formally specified as possessing intrinsic intelligent attributes and the semantic awareness that are desirable for the next generation of Tourism Information Systems.

Keywords: Product line, e-Tourism, Formal Specification, Intelligent Component

1 Introduction

Tourism Information Systems (TIS) are software applications that are deployable on the web and on small hand-held devices and dedicated to the provision of tourism business support services. TIS share many attributes in common and generally perform similar functions such as providing useful information to prospective tourists and helping in travel planning and management. They mainly differ in the nature of local information content they deliver and the scope of tourism interest that is being promoted. They can be variously engaged in the promotion of tourism at the national, continental, regional, state, local and enterprise levels. This degree of observable similarity in TIS makes them good candidates for a product line development initiative, which seem yet to be a prevalent practice in the e-Tourism domain. However, the fact that Tiscover AG (http://www.Tiscover.com [June 6, 2007]) renders tourism support services for eight different countries around the world is a clear indication of the viability of Software Product Line Engineering (SPLE) in the tourism domain. SPLE is a software development paradigm that enables the strategic and systematic reuse of core assets in the development of a family of software

products that share some features in common. It leverages the existence of certain core reusable components in order to realise a significant order of magnitude improvement in the cost and time of development.

A Software Product Line (SPL) is a set of software intensive systems that share a common, managed set of features satisfying the specific needs of a particular market segment or mission and that are developed from a set of core asset in a prescribed way (Bass and Kazman, 2003). A Product Line (PL) possesses variability features that define the specificity of each product in the PL. A product within the PL is formed by combining relevant components from the common asset base and customizing them as required through carefully planed variation mechanism such as parameterization, inheritance or extensibility according to the configuration of the common reference architecture that is central to every product in the PL.

A critical challenge being faced by software developers of TIS is the dynamic nature of user requirements in the e-Tourism domain (Staab et al, 2002). More users are becoming more dependent on the services of TIS for the planning and organization of travel tours in preference to the use of human travel agents (Staab et al, 2002). This has consequently imposed a high demand for more advanced intelligent behaviour in TIS supporting features like context-awareness, personalization and semantic web capabilities among the mostly desired. These features, if and when present in TIS are expected to affect the delivery of a specific number of services namely: Information Services (i.e. location-based information services based on history, events, facts, news), Transaction Services (i.e. decision support services such as travel recommendation, route advisory support, map guide, accommodation search, booking, query processing), Third Party Services (i.e. all other external e-commerce services like bookstore, car rental, online shop that are available in the TIS). These categories of services constitute the core functionality of many TIS.

Interestingly, this scenario makes SPLE very viable and promising in this domain, because it will not only engender the development of adaptable core reusable components that will deliver many of these desirable services but also provide a way to effectively manage future user requirements variations. This is because SPL enables the definition of system instances dictated by marketing and product plan specifications from prospective users and make dynamic software evolution a part of its core practice.

In this paper, we present a TPLA for the development of TIS product family. The TPLA is presented as a c2-style layered architecture (Buschmann et al., 1996) that offers a platform for evolving intelligent component services. The components are formally specified using an Architecture Description Language (ADL) as possessing the intrinsic intelligent attributes that make them suitable for development of next generation TIS.