

A User Centered Model Driven Service Oriented Ubiquitous Government Design Approach

Idoughi Djilali, Computer Science Department, Faculty of Exact Sciences, University of Bejaia, Béjaïa, Algeria

Djeddi Abdelhakim, Computer Science Department, Faculty of Exact Sciences, University of Bejaia, Béjaïa, Algeria

ABSTRACT

Delivering government services using information and communication technologies has gained great success, and raised citizens' need to access the presented services in ubiquitous ways. Leading governments and institutes in this field have already started to invest in this field and dispute that it has been over twenty years since the presentation of the concept of ubiquity there are no adaptable and reusable frameworks for creating large ubiquitous systems, since the developed ones were small and destined to create specific systems. In this article, the authors present a development approach that combines XP fast development, MDA's automated development and ease of modifying and updating, and the domain-oriented development that allows for the creation of a virtual image of governments agencies with a focus on active involvement of future system's users.

KEYWORDS

Domain-Oriented Design SOA, MDA, Ubiquitous Government Service, User Centred

1. INTRODUCTION

Providing government services using ICTs proved to be very effective, projects in this course as e-governments were exceptionally promising. After the emergence of ubiquitous computing presented by Weiser (1991) in the early nineties world leading governments in the field of e-government (The United Nations E-Government Survey 2018) have started initiatives toward ubiquitous governments, to solve noticed issues and challenges (Idoughi & Abdelhakim, 2018), though until now there were no presented frameworks to serve this shift. What we address in this paper's work, where we make use of Model Driven Development the major trend in software development in this decade because of its automated development process, rapidity, simplicity to update modify or even redesign from the ground as well as the reduced costs what we think suitable in developing such projects destined to large public hardly satisfied in dynamic environments.

We define ubiquitous government as the use of ubiquitous technologies to convey governments' services in their interactions any time anywhere with the use of any available device. The variety of stakeholders makes it hard to present a whole design solution, though the use of domain-oriented design can lead to simplifying the process since all concerned stakeholders will be mapped and

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outlined giving a clear view of the whole system. The presented approach will be making use of model driven architecture (Mellor, 2004) and user centered design methods to achieve the highest satisfaction degrees since the target's approval is the main issue.

Model-driven architecture presented by the *object management group* (OMG) defines any system in forms of models to simplify transformation process the very top one is called CIM (computation independent model) that describes how a system should be in terms of a language that is appropriate for the users. CIM in computational terms is mapped to a *platform independent model* (PIM), MDA have multiple levels of PIMS independent of any particular platform, in top PIMs business models are expressed at a high level of abstraction where PIMs at next levels include some aspects of technology even though they are not platform specific (Dey & Abowd, 2000). In the presses of MDA, PIM is transformed into one or more selected platform-specific models (PSMs) (Figure 1), what gives the ability for a model to not run entirely in single platform but multiple ones which is one of the advantages MDA offers to ubiquitous systems development. In the code files layer, the codes suitable to run in the selected platforms are generated. MDA adapted agile concept by making models complete enough that they can be executed standing alone based on the notion that code and executable models are operationally the same racing down the chain from analysis to implementation in short cycles by treating all defined models in the same time (El-Sheikh & Omran, 2004; Mellor, 2004). MDA also provide a version that is services based, its models adapt services concepts as its CIMs that became CSIMs (common services information model) (Radhakrishnan & Wookey, 2004).

What makes MDA the best choice to develop ubiquitous government services is that it holds a set of standards for modelling contextual data of ubiquitous computing and services, (Ou, Georgalas, Azmoodeh, Yangand, & Sun, 2006) used MDA in context aware applications development as they used ontology to describe applications' context awareness aspects (Jang & Woo, 2005). Also used MDA by proposing a model for developing context aware web applications.

According to the OMG there are mainly four perspectives from which meta-data and meta-models of MDA add value to services:

- Allow grouping, interlinking and coupling services (brokered services).

This can be achieved through the use of solutions as service brokering; the solutions can be applied on environments with common as well as well as heterogynous architectures what solves the heterogeneity problem in ubiquitous systems. The grouped services can be more context aware and provide vaster data to users.

- Integrating services implemented with multiple underlying technologies.

Figure 1. Modeling concepts in MDA



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