

A UML 2.0 Profile for Architecting B3G Applications

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Abstract. B3G is an emerging network technology which conceives the convergence of telecommunication and IP-based networks for providing enhanced services able to transfer both voice and non-voice data through wired and wireless networks. Moreover, B3G networks can be no longer considered as “*passive*” entities which only transport data between endpoints, but they must be considered as “*active*” parties that have their own behavior and provide services. This creates a completely new application domain where applying current software engineering design tools, such as software architectures, fails. In fact, dealing with B3G networks requires to explicit low-level details usually abstracted by the architectural descriptions.

To this extent, we present an ongoing work on investigating B3G-oriented application modeling. In particular, we propose an enhanced UML profile to define and analyze software architectures that explicitly exploit the B3G domain properties.

1 Introduction

Beyond Third-Generation (B3G) [30] network is an emerging technology which conceives the convergence of telecommunication networks with IP based networks. Services associated with B3G provide the ability to transfer both voice data (i.e., a telephone call) and non-voice data (i.e., downloading information, exchanging email, and instant messaging) through different types of network, either wired or wireless. This opens to a new world where distributed applications can not only interact with each other over plenty of different networks, but they can also interact with non-software entities (i.e., humans), by exploiting services offered by telecommunication networks.

Such a vision breaks some assumptions posed so far by the software engineering community and requires for adapting/revising the software life-cycle, and the related tools, since the early activities. In particular, the *software design* is the first process activity to be affected by the B3G application domain. The *software design* aims to build the first description, both behavioral and structural, of the entire system under development. Consequently, since the *architectural design* is described by means of Software Architecture (SA) modeling [5][25], also this one should be adapted/revised accordingly.

SA has been largely accepted as a well suited tool to achieve a better software quality while reducing the time-to-market. This results in a proliferation of different Architectural Description Languages (ADLs), defined by both the academia and the industry [20].

The use of SA descriptions allows software engineers to model large, complex applications by using suitable abstractions of the system components and their interactions. This forces the separation of architectural concerns from other design ones, thus abstracting away many details. On the other hand, SA descriptions allow for analysis and verification of architectural choices, both qualitative and quantitative, since the early stages of the software life-cycle [6].

However, the use of SA fails when specifying B3G-oriented applications. In fact, dealing with B3G networks requires to explicit those low-level details usually abstracted by SA specifications. To this extent, we argue networks involved in B3G scenarios can be no longer considered as “*passive*” entities which only transport data between end-points, but they must be considered as “*active*” parties that have their own behavior and provide services. Hence, since they actively affect the overall system’s performance and behavior, they cannot be taken apart but must be considered, along with all their characteristics, within the design process. According to this and due to the high degree of network heterogeneity inherent to the B3G application domain, it is important to raise up some characteristics such as *network type*, *quality of service*, *security*, *network services*, etc.

This paper presents an ongoing work on investigating B3G-oriented application modeling. In particular, we show how, starting from a small survey of the networks involved in B3G scenarios, it has been elicited a set of properties that characterizes B3G-oriented applications and, then we present an enhanced UML profile [24] for explicitly defining and analyzing SAs that take into account these properties of interest.

The paper is organized as follows: Section 2 first describes the different networks available in the B3G application domain and then presents the sets of properties elicited. Section 3 presents the B3G-oriented UML profile we designed while Section 4 discusses the analysis aspects related to the B3G application domain. Finally, Section 5 concludes and discuss future work.

2 B3G Network Properties Elicitation

B3G network technology indicates the convergence of telecommunication networks with IP based networks. Services associated with B3G provide the ability to transfer both voice data and non-voice data through different types of network, either wired or wireless. In this setting, wireless networks are categorized into three groups based on their coverage range: (i) Wireless Wide Area Networks (WWAN) that includes wide coverage area technologies such as 3G cellular (UMTS), Global System for Mobile Communications (GSM), General Packet Radio Service (GPRS), i-Mode, etc. . . , (ii) Wireless Local Area Networks (WLAN) that includes 802.11, HiperLAN, and several others, and (iii) Wireless