Designing Service-Oriented Applications in the Presence of Non-Functional Properties: A Mapping Study

Plácido A. Souza Neto[a], Genoveva Vargas-Solar[b], Umberto Souza da Costa[c], Martin A. Musicante[c], Javier Alfonso Espinosa-Oviedo[b], José Luis Zechinelli-Martini[d], Regina Motz[e], Alberto Pardo[e], Agustín Mullin[e]

[a]*Instituto Federal do Rio Grande do Norte – Natal, Brazil*
[b]*CNRS, LIG-LAFMIA, Saint Martin d'Hères, France*
[c]*Universidade Federal do Rio Grande do Norte – Natal, Brazil*
[d]*Universidad de las Américas-Puebla, LAFMIA – Cholula, Mexico*
[e]*Universidad de la Reública, Montevideo, Uruguay*

Abstract

This paper discusses the results of a systematic mapping (SM) [?]...

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1. Introduction

This paper presents a Systematic Mapping (SM) [?] about the design of service-oriented applications in the presence of non-functional requirements. SM is a method for analyzing a field of interest (e.g., service oriented applications and NFR). The analysis can focus on periodicity of publications organized by categories called facets combined to answer specific research questions [?] that a scientist wishes to answer with quantitative data generated through the SM steps.

In systems engineering, a non-functional requirement (NFR), also called qualities of a system, refer to the behaviour of a system. These criteria are not necessarily related to the output of the system or its application logic, but to the conditions of its execution, its performance, and other properties (e.g., security, fault tolerance). NFR are also referred as "constraints", "quality attributes", "quality goals", "quality of service requirements" or "non-behavioural requirements". In the case of service-based applications, non-functional requirements concern the conditions in which the application is executed and also constraints imposed by the services.

Associating non-functional requirements to services based applications can help to ensure that the resulting application is compliant to the user requirements and also with the characteristics of the services it uses.

The variability of terms about NFR comes from vocabularies of different domains, like software engineering, distributed systems, service oriented programming, etc. Therefore, the systematic mapping presented in this paper aims to identify the evolution of the area between 1998-2014 and the relationship between concepts used for defining NFR and associating them to service oriented applications.

The remainder of this paper is organized as follows. Section 2 gives the background about NFR and service oriented applications. Section 3 describes the systematic mapping process and our research protocol, including the search strategy and selection of papers. Section 4 presents and interpretes the analytics results. Section 5 concludes the paper and discusses research perspectives.

2. Mapping process

3. Outcomes

4. Concluding remarks

The mapping results presented can be the starting point to motivate new studies, support the investigation of specific problems not sufficiently explored yet. The quantitative analysis provides an idea of the trends in service-based software development with NFR, including methodologies, languages and tools. The distribution of the papers that deal with NFR shows that they are addressed in different domains but the vocabulary changes a lot and that there is a need of consensus, despite the existence of specifications like ISO/IEC 9126. When NFR are addressed at the level of the services they are related to QoS measures like economy or economic cost, availability, authentication requirements for contacting a service. NFR as defined by ISO/IEC 9126 are vast and papers address one or two at a time, particularly those related to the software engineering domain. Middleware solutions provide frameworks that consider different types of NFR but this concerns only the implementation stage of the software development process. This implies that the compliance between the design and the implementation might not be ensured.

With respect to the systematic mapping, we think that it requires a qualitative perspective that can be added by explicitly adding filtering and clustering criteria related to the provenance of the papers, the impact factor of the conference/journal where they appear, the reputation of the authors (given for example by their H factor), the institution and country of the authors. Without discarding the quantitative

analysis, adding these criteria could increase the quality and value of the analysis. Similarly, we feel that choosing key words in the second phase of the methodology can be empirical, using vocabularies of the knowledge domain, could help to have a more representative choice. We are currently working in providing tools that can help to add quality to the systematic mapping method.