C-SCRIP:
Collaborative Security Pattern Integration Process

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ABSTRACT

Collaboration is the act of working together, towards a common goal. Collaboration is essential to the success of construction project. In software engineering projects, understanding and supporting collaboration gives the broad impact on product quality. There appears that it is difficult to effectively interact and achieve a common project goals within the bounds of cost, quality and time. The purpose of the paper is to propose a collaborative engineering process, called Collaborative SeCurity patteRn Integration Process (C-SCRIP), and a tool that supports the full life-cycle of the development of a secure system from modeling to code.

Keywords: CMSPEM, Component Based Systems, Collaborative Process, Security Patterns

INTRODUCTION

Security pattern are considered as a good solution proposed by security experts to solve a recurrent problem in a given context. However, along with increasing popularity of patterns for security engineering, there is a need for directives and guidelines helping system designers – who are generally not security experts – to implement secure software systems based on set of security patterns. So far there is no clear, well-documented and accepted process dealing with the full integration of security patterns from the earliest phases of software development until the generation of the application code (Devanbu & Stubblebine, 2000).

Our work investigates how non-security experts can take profits from security patterns to easily implement secure component-based applications. In previous work (Bouaziz, Kallel, & Coulette, 2013) (Bouaziz & Coulette, 2012), we proposed an engineering process, called SCRIP (SeCurity patteRn Integration Process), which provides guidelines for integrating security patterns

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into component-based models. SCRIP defines activities and products to integrate security patterns in the whole development process, from UML component modeling until aspect code generation.

In this paper, we put the emphasis on the collaborative aspect of the proposed process. We use an extension of the SPEM standard – called CMSPEM – that was introduced in (Kedji, Coulette, Nassar, & Racaru, 2014). We aim to present how software engineers can collaborate to model and implement secure distributed applications.

We propose MDA-based approach whose main interest is to design applications by separating concerns and placing the concepts of models, meta-models and model transformations at the very center of the development process. Our approach combines model-to-model transformation and aspect-oriented programming. In the modeling phase, the designer model his application using UML 2 and take advantages of UML profiles and ATL as model-to-model transformation language to automatically integrate the security patterns in component-based applications. The use of aspect-oriented programming in the implementation phase guarantees the application of the security patterns independently of any application domain.

We build upon an integration process to help designers apply security pattern’s solutions in practical situations and to work with patterns throughout a component based software lifecycle (Bouaziz & Coulette, 2012). This process is highly collaborative, since it involves several types of participants who must work together in a coordinated manner. In order to provide a clearer comprehension of the phases of the method, a CMSPEM specification of the proposed process has been produced.

The paper is structured as follows. In the next section we present a background of the work. In Section 2, we present motivations. In Section 3, a collaborative SPEM process for security pattern integration is presented. Section 4 shows detailed description of the proposed collaborative process. A tool prototype SCR-Tool is presented in Section 5. In Section 6, we detail the related work and we conclude the paper in last section.

BACKGROUND

New technologies have emerged during the last decade, such as patterns, model driven engineering and component-based approach. All these technologies have the same common objective that is to facilitate the construction and understanding of software systems. They operate at different levels of abstraction from the general architecture of the system until its implementation. We give below a brief overview of these three technologies.

Component Based Software Engineering

CBSE (Szyperski, 2002) allows building large systems by assembling reusable components. It is a good solution to optimize the time and cost of software design while still guaranteeing the quality of the software (Brown & Wallnau, 1998). Usually, a component is seen as a black box that provides and requires services through its interfaces. Modeling component-based applications consists in describing components, their required and offered services and then describes component instances and finally how these instances are connected to form the final system. At the specification level a system is described as a static interconnection of software components. At runtime a component assembly is an instantiation of an architecture composed of linked component instances.
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