Domain-specific Software Architecture Based on a Building Block Method

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Abstract

This paper discusses a method for designing domain-specific architectures for a family of telecommunication systems. This method has evolved to support reusability, configurability, testability, and conceptual integrity.

Keywords: Reuse, Building Block Method, Software Architecture

Workshop Goals: Networking

Working Groups: Reuse process models, Design guidelines for reuse, Domain analysis, Reuse and OO methods.

1 Background

Philips Kommunication Industry (PKI) has developed a method to describe the architectural needs for the telecommunication applications. We, in research, took their initial working level ideas and tailored to meet their architectural and reuse requirements. This method supports reuse in large scale in terms of subsystems. After tailoring the concepts, criteria and guidelines, PKI is able to achieve more than 60% reuse across the family.

2 Position

After tailoring the method and concepts, the new method has a support for:

1. Architectural reuse
2. Reuse guidelines for design reuse
3. Conceptual integrity
4. Design for test, which has been ignored by the reuse community
5. Reuse by a large collection of construction set (group of objects and architecture that relate to the conceptual integrity of a family) and architectures.

2.1 Building Blocks

Understanding the concepts behind a method is important when considering testing of reusable software. Basically focus your test principles based on the development concepts of a family of reusable systems. A Building Block (BB) is a collection of reusable object classes that represent a unit of system functionality. It is also a basic unit of a system architecture. Each BB's separates specification (its interfaces) and implementation. Furthermore there are two kinds of building blocks such as an application BB and a generic BB. Application BB's are created from existing generic BB's to achieve high granularity of reuse. Each units of reusable components developed to achieve high granularity of reuse as well as configurability and conceptual integrity of the system. Configurability and conceptual integrity are the main attributes for achieving reuse in this application family.

Our notion of quality attributes are high granularity of reuse (subsystems, architectures and product family), configura bility and conceptual integrity, testing, and documentation.

The Building Block Development Method is a development methodology adopted for this project. It is based on the principles of architecture-oriented decomposition and incremental layering, in addition to object-oriented con cepts such as object class (building block), generics, information hiding, and run-time binding. This makes this method superior and rich in offering advanced concepts to support reuse.

This method has improved PKI productivity by more than 60% increase in reuse across the family product line.

3 Comparison

When we compare to existing work on architectural reuse such as SEI's work with DSSA and Loral Federal Systems, etc, we have achieved reuse and quality by various concepts of the method [1, 2, 3].

Our guidelines on reuse and design for test are comprehensive to Booch's notion of a reusable component.

References

[1] W. Tracz, "DSSA Frequently Asked Questions," in *ACM SIGSOFT, SE Notes*, 1994.

[2] E. Mettala and M. Graham, "The domain specific software architecture program, CMU/SEI-92-SR-9," tech. rep., June 1992.

[3] R. Hayes-Roth and W. Tracz, "DSSA tool requirements for key process functions, version 1.0," tech. rep., October 1993.

Biography

Dr Muthu Ramachandran is currently a senior research scientist at Philips Research Labs, researching into reuse method for DSSA, testing, OO reuse. Previously he was a senior lecturer at Liverpool John Moores University teaching specialist courses on reuse and has published more than 30 articles on reuse. He did his doctoral thesis on development for reuse at Lancaster University.