Software Engineering and Architecture Group

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Architecture Patterns Design Handbook

Architectural patterns are widely accepted as recurring solutions that solve problems at the architectural design level. Regrettably, describing, finding, and applying architectural patterns in practice remains largely ad-hoc and idiosyncratic. One main reason behind these problems is that each pattern offers a whole solution space comprised of infinite solution variants of the same pattern, which are difficult to express in a systematic way.

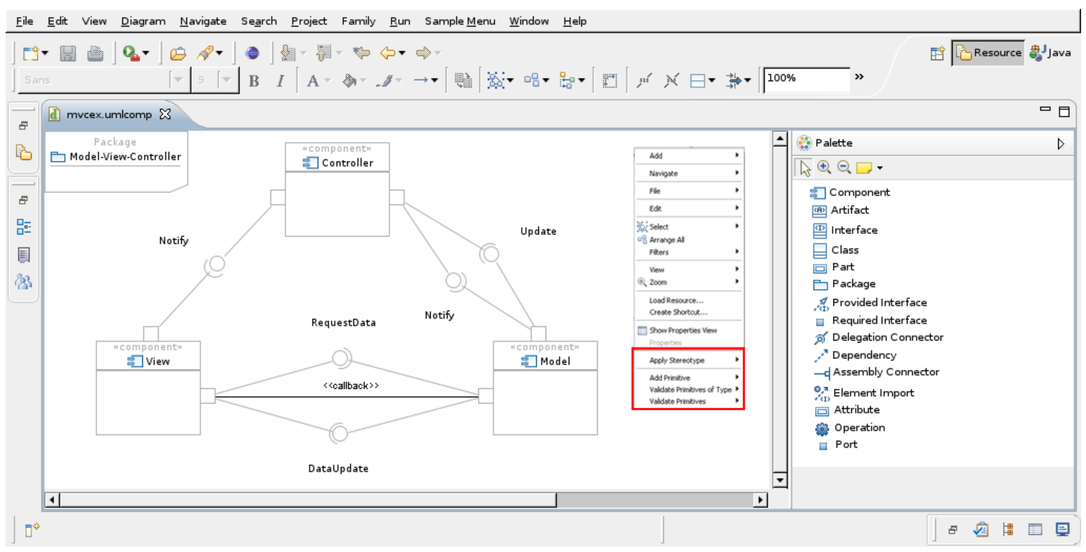

Figure 1: *Primus: a pattern-based system design tool.*

This project is funded by the University of Groningen and will deliver a Pattern Design Handbook to support architects and designers by providing rich pattern modeling resources, helping to reason about the quality attributes of the system, facilitating inexpensive architectural documentation, enforcing traceability of architectural decisions to requirements, and performing model checking for the architectural correctness and completeness.

DARWIN - Architecture-centric Evolution

This project (System Evolvability) is funded by the SenterNovem Bsik Programme. System evolvability is a system's ability to withstand changes to its requirements, environment and implementation technologies. The objective of this project is to investigate architectures, methods, and tools that improve the evolvability of complex and large software intensive systems. The project takes place in the context of the evolvability of Philip's MRI scanners.

Figure 2: *Extraction of execution architecture views to support architecture-centric evolution of large software-intensive systems.*

Suitable architectural views are important assets to facilitate system evolution. Such views help practitioners to understand an existing system, to plan and evaluate intended changes, and to communicate them to other stakeholders. In this research, we are exploring forward and reverse engineering processes to construct and maintain architectural views, in particular execution architecture views, of large software-intensive systems.

GRIFFIN - Architectural Knowledge

This project (a GRid for inFormatIoN about architectural knowledge) is funded by the NWO JACQUARD Programme. The GRIFFIN project develops notations, tools and associated methods to extract, represent and (re)use architectural knowledge (AK) that currently is not documented or represented in the system. The project emphasizes sharing AK in a distributed context. Consequently, the project also devises tools and infrastructure (the knowledge grid) to do so in an integrated way.

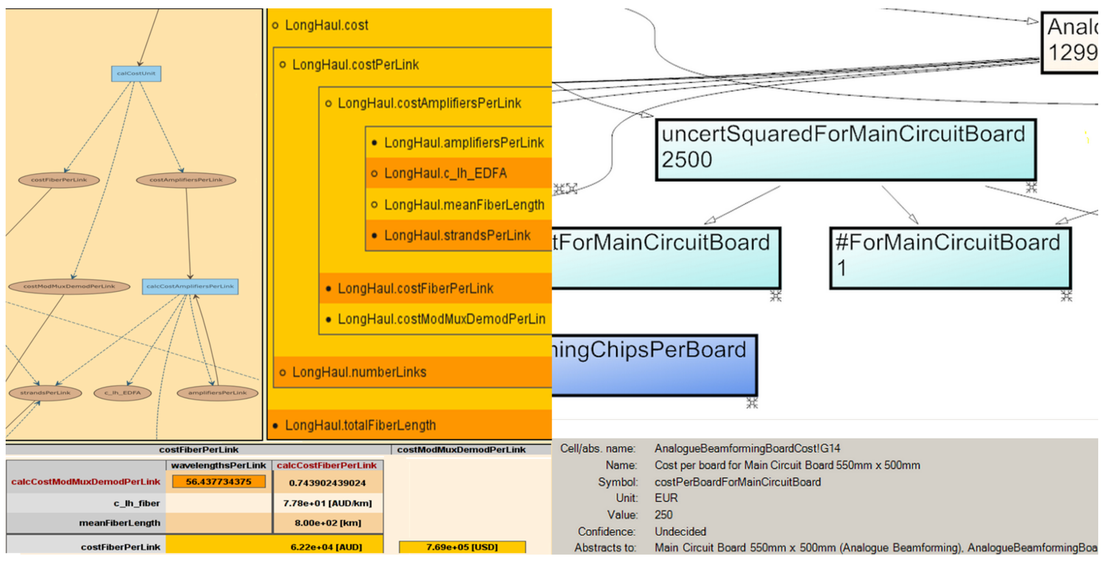

Figure 3: *Snapshots from the Knowledge Architect tool suite.*

Existing notational and documentation approaches to software architecture typically focus on the components and connectors and fail to document the design decisions that resulted in the architecture as well as the organizational, process and business rationale underlying the design decisions. This results in high maintenance cost, high degrees of design erosion and lack of information and documentation of relevant AK. AK is defined as the integrated representation of the software architecture of a software-intensive system (or a family of systems), the architectural design decisions, and the external context/environment. This research focuses on how to capture, share, (re)use and manage AK in the architecting process.

SAS-LEG - Service Oriented Architectures in e-Government

This project (Software As Service for the varying needs of Local E-Governments) is funded by the NWO JACQUARD Programme, and is a collaboration between the University of Groningen, Cordys and various municipalities of the Netherlands. The aim is to produce a software engineering platform implementing a Software as Service (SaS) approach for the varying needs of Local E-Governments. The expected benefit is reduced implementation and evolution costs when customizing national laws in local context.

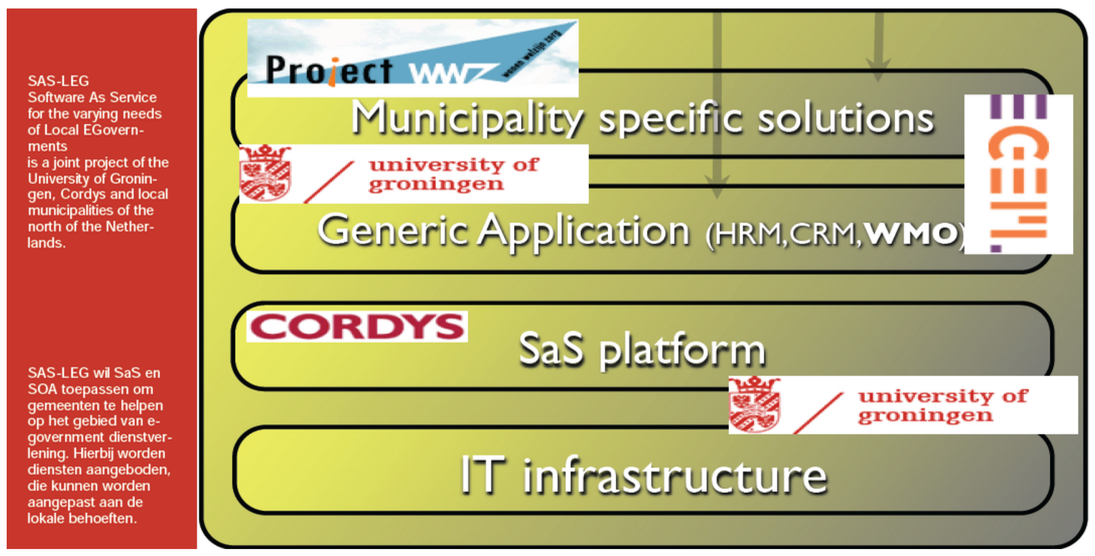

Figure 4: *The general structure of SAS-LEG project.*

Service Oriented Architectures are considered to be the new paradigm for developing flexible and dynamic software solutions by using loose coupling of services and other components of various platforms. The integration of these interoperable services around a business process allows systems development in environments that have continuously changing requirements. In order to achieve this kind of adaptability and customization to almost every situation and the ever-changing needs of the customers/users (a characteristic which is highly requested in the e-Government field) we concentrate on discovering new ways and constructing new sets of tenets to abide by for developing software systems that will be compatible with the open world assumption and thus able to perform even in the most competitive real-life environments.

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