Customer Success

Nokia: Mobile Terminals

If a picture is worth a thousand words, an executable model is worth a thousand pictures

PROBLEM STATEMENT:

The common practice in platform architecture development is quite informal and heavily relies on system architects' experience. This is often done with spreadsheets that forecast results based on results observed on previous designs. This is feasible when changes in successive generations of the architecture are relatively small. The informal approach becomes problematic when dealing with truly novel architectural concepts that call for systematic exploration of widely different alternatives. Furthermore, platform requirements are typically expressed in technical terms that are not properly connected to end-user needs.

Nokia Research Center

Nokia (www.nokia.com) is the world leader in mobility, driving the transformation and growth of the converging internet and communications industries. Nokia creates a wide range of mobile devices and provides people with experiences in music, navigation, video, television, imaging, games, and business mobility through these devices. Nokia also provides equipment, solutions, and services for communication networks.

Nokia Research Center (NRC), a separate unit within Nokia, is not attached to any specific product development business unit. NRC has more than 1,100 researchers, engineers, and scientists working in the Nokia Research Centers and Lablets that Nokia maintains around the globe. They come from a variety of technical backgrounds, but are all working on research issues relating to mobility of voice and data, management, and communications.

NoTA Mobile Terminal Architectures

For the ITEA MARTES (Model-based Approach to Real-Time Embedded Systems) European research project (www.martes-itea.org), NRC worked on a mobile terminal case study focused on communication-centric mobile terminal architectures that are designed for the digital convergence era. In this context, NRC has adopted Intel® CoFluent™ Design's MCSE method for architectural modeling and used Intel® CoFluent™ Studio as mobile device platform modeling toolset.

NRC performs significant research activity in the area of mobile terminal architectures, where it has developed a service-oriented architecture concept called Network on-Terminal Architecture (NoTA, www.notaworld. org). NoTA is an interconnect-centric modular service-oriented architecture for current and future mobile device platforms. NoTA provides superior performance and effective horizontalization possible via eased integration. The work of Nokia in the MARTES project is closely connected to NoTA.

Using Intel® CoFluent™ Studio for Platform Architecture Development

The NoTA platform architecture development method aims at overcoming these pitfalls of informal practices. NoTA-based systems are engineered in a systematic requirements–driven manner. The NoTA goals include:

- **Separation of concerns:** The ability to develop different aspects of the system independently from each other facilitates reuse and improves the ability to manage complexity.
- **Model-based engineering:** Nokia requires the availability of analysis, verification, transformation, code generation, and synthesis tools that operate on models.
- **Reuse of models:** Nokia believes that the ability to effectively reuse models in different contexts greatly improves design productivity compared to conventional methodologies.

BUSINESS BENEFITS

- Provides a systematic, requirements-driven design methodology
- Allows the use of novel technologies and open innovation
- Promotes reuse of models for future configurations
- Creates well-documented models to remove ambiguities in communication to supply chain
- Shortens the R&D cycle

DESIGN ACCOMPLISHMENTS

- Utilized Intel® CoFluent™ Studio as mobile device platform modeling toolset
- Adopted architectural modeling methodology for ITEA MARTES case study
- Eliminated the pitfalls associated with informal method, utilizing spreadsheet analysis for architecture development
- Created an efficient way to store and retrieve models from repositories
- Developed method to ensure designs are stepwise verifiable against end-user requirements
- Provided a flexible and scalable methodology, enabling reuse on different levels

- **Early validation and verification:** The validation and verification in the NoTA method are not limited to logical correctness, but also cover non-functional aspects, such as real-time performance and energy consumption.

Meta-Model-Based Integration of Telelogic's Tau G2

As part of their tool enhancement work in MARTES, Telelogic and Intel® CoFluent™ Design implemented a meta-model-based integration of their tools using Eclipse Modeling Framework (EMF) and its Ecore format. This is the same technology that has been used to implement other MARTES meta-model-based tool integrations in the project.

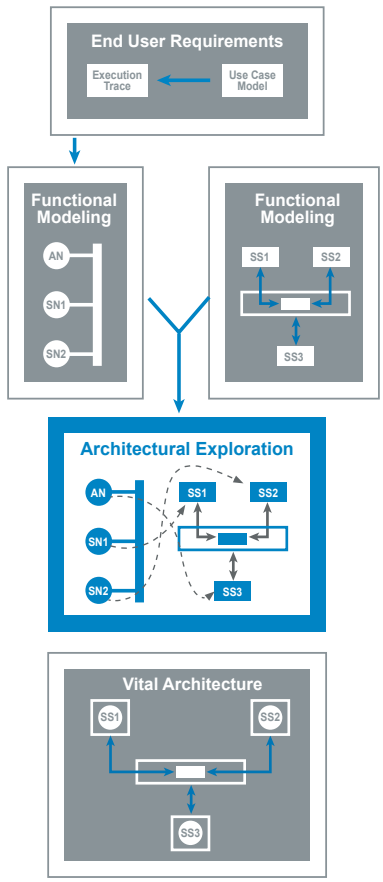
This tool integration provides an alternative way to transfer use-case behavior between the tools. Tau is used purely for application models. Real-time performance attributes can be added to the Tau model as tagged values of the UML profile that is specific for this purpose, but can be regarded as adaptation of the MARTES application model. One important benefit of transferring the whole model is that users can now deal with feedback from the platform architecture model that potentially affects the use-case behavior.

NoTA Methodology for Architectural Modeling

NRC has adopted Intel® CoFluent™ Design's method for architectural modeling in NoTA. With this method, an architectural model is developed by building the functional architecture (timed-behavioral model, e.g., functional model of the system with timing information) and the platform architecture (executive structure) and mapping the functional blocks onto the executive structure. The Intel® CoFluent™ Studio toolset includes tools that support model creation and mapping.

Network traffic analysis is a key output in verifying the designed architecture. Each designed architecture needs to be simulated against all the use cases. After exploration of different architectures within the Intel® CoFluent™ Studio is complete and the optimal case is selected, the architecture solution consists of the following:

- A set of subsystems connected together with a certain interconnect topology
- Mapping of the decomposed use-case originated services into the above subsystems
- Verified and refined performance parameters for the services
- All of the above verified against the original end-user use cases



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