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THE IT-ARCHITECTURE PROFESSIONALS

Success Story: Siemens RailCom and Model Driven Architecture
Siemens builds Product Line with MDA

Siemens Transportation Systems

Siemens Transportation Systems is a division of Siemens AG, the world's largest manufacturer of electrical and electronic equipment. Siemens Transportation Systems has many years international experience in building large-scale transit systems.

RCM – RailCom Manager

Siemens RailCom Manager communication management system is a standard product, which provides access to all information, communication and monitoring systems via a single, integrated user interface. The product integrates public address (PA), customer infor-

mation screens (CIS), closed-circuit TV (CCTV) surveillance equipment, help-point intercom (HPI) emergency call stations, supervisory control and data acquisition (SCADA), and related facilities.

RailCom Manager offers:

• Real-time timetable information, continuously available to passengers

• Up-to-date information and entertainment in stations via electronic media

• Readily accessible emergency telephones and information terminals

• Surveillance cameras in stations which provide active protection of passengers and property

End Customers

The main customers of the RailCom Manager are global and regional mass transit operators, such as train and subway operators. The organization Siemens Transportation Systems Rail Communication supplies rail communication projects of diverse complexities all over the world, including success stories in Berlin, Hanover, the Netherlands, New York, Bangkok, Hong Kong and Malaysia. These projects include passenger information systems, public address, clock systems, video surveillance, emergency call, telephony solutions, communication networks and SCADA – leveraging the full bandwidth of the RailCom Manager functionality.

RCM is a Product Line Solution

Siemens RailCom was facing a huge challenge when moving from offering a service towards the development of a standard product. Traditional standard solutions, such as, for example, ERP Systems (Enterprise Resource Planning), offer a fixed set of functionality, which is usually customized through parameters in database tables, configuration files and rules capturing customer specific system behavior.

Interactive Objects **iO**
MODELS MADE FOR BUSINESS

RCM Product Line Approach

The RCM product line is a set of highly reusable components. For individual projects, these components can be tailored and combined with additional components to meet customer specific requirements. The project specific tailoring of product components can be done on different levels. Model Driven Architecture (MDA) allows for tailoring on different UML model levels, and efficient mapping to a customer specific implementation, without breaking the RCM product approach. Individual component instances will have a lifetime of up to 15 years and MDA helps ensuring that product components and tailored customer components will stay in synch over this time, ensuring cost efficient maintenance of many tailored component instances.

Component Based Development with MDA

The primary principle of RCM's component development is "Design by Contract", i.e. RCM components are loosely coupled, and interact only via well defined interfaces. No assumption can be made on the physical location of individual components. MDA supports the definition of well structured and technology independent component interfaces.

The RCM product needed to be much more flexible, for a number of reasons:

• RCM must seamlessly integrate into the existing, hugely diverse technical environments at different customer sites

• RCM must be flexible enough to support a wide variety of different functional requirements

• RCM must be open to include different best-of-breed modules and packages from 3rd parties, depending on the customer's specific situation

Consequently, Siemens RCM needed an approach which allowed openness and flexibility beyond traditional package customization approaches.

MDA – Model Driven Architecture

The Model Driven Architecture® (MDA®) of the Object Management Group™ (OMG™) allows for very efficient mapping between different UML models with different levels of abstraction. MDA also supports automatic mapping of detailed technical models to a concrete implementation, such as in Java or C#.

Tailorable Standard Solutions with MDA and ArcStyler

ArcStyler was chosen by Siemens because of its excellent support for MDA, as well as it's high level of openness, which was a prerequisite for building a tailorable standard solution. Siemens RCM makes use of many of ArcStyler's open framework features.

In addition, Siemens gained the following benefits from ArcStyler:

• Significant increase in development productivity through high level of automation

• Efficient management of complex UML models

• Architectural consistency across all technical and functional tiers of the system

• Efficient and well structured MDA-based development process
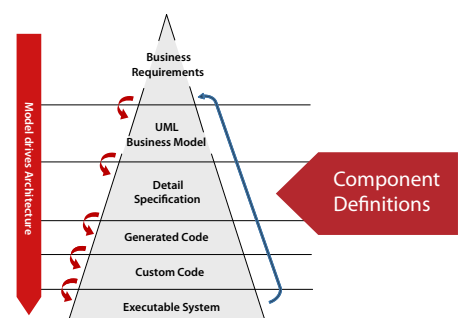
Model Driven Offshoring (MDO)

Siemens decided to conduct the entire application development at an offshore development center in Budapest. Only the business team and a small number of technical key staff is based at the head quarter in Germany. The MDO approach, which combines offshore development and MDA, was chosen to reduce the risks of offshore development, and ensure long-term control over the work results.

The figure above shows the MDA-based approach for Component Based Development. A key feature of MDA is the seamless transition of component models from a very high level of abstraction down to the concrete implementation.
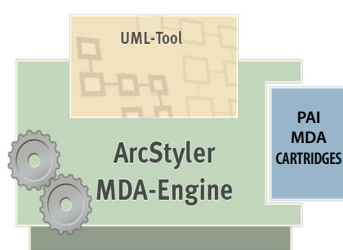
Component Types

RCM implements the following Component Types, leveraging MDA for automated component generation:

• Transportation Object Model: represents events and processes in the system

• Business Components, including rule engine, scheduler, message processing and audio processing.

• Device Control Components: displays, audio, video surveillance, help points, stairs and elevators, on-vehicle presentation, etc.

• Configuration Components, describing the structure and configuration of the system

• Technical Components, e.g. logging and monitoring

MDA Architecture Blueprints

ArcStyler offers a rich set of MDA cartridges, which automate the mapping from UML models to a concrete implementation, e.g. in Java, J2EE, or .Net/C#. Each cartridge typically supports a specific tier, e.g. GUI development, component development, persistence, etc. ArcStyler also allows for the efficient customization of existing cartridges to meet specific customer needs. An MDA Architecture Blueprint is a project specific combination of cartridges, which generates the code needed to implement the project specific architecture.

Component Tailoring
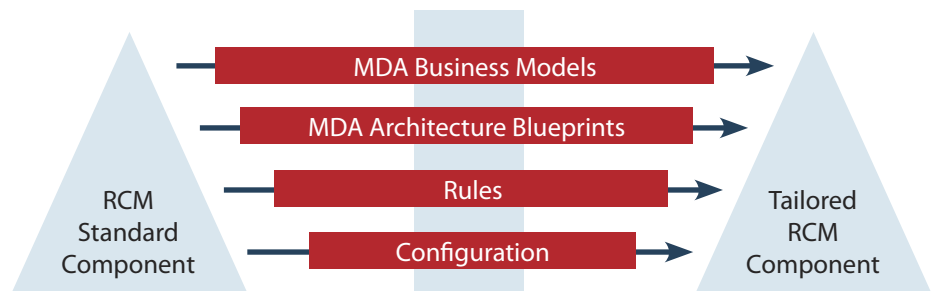
The benefit of an MDA Architecture Blueprint is that it helps ensure architectural consistency across all technical tiers as well as across all components.

The MDA Architecture Blueprints for RCM components support a variety of technologies, including Java 2, RMI, JMS, RTP (audio steaming), HTTP, XML, SOAP, CORBA/IIOP, SSL and O/R Mapping (Hibernate).

Platform-Specific Blueprints

A key benefit of MDA is that component design is done independently of the technology used to implement the component. Different MDA Architecture Blueprints can be used to seamlessly map a component to specific target platforms. This was important for Siemens RCM, because different customers require different operating environments. Currently, RCM is using two different Architecture Blueprints: one for BEA WebLogic, one for JBoss.

Component Tailoring with MDA

Components are explicitly designed for reuse, and solve project specific business functionality through tailoring on different levels:

• Configuration and Rules

• Adaptation or exchange of specific components, supported through Model Driven Architecture

The Result

• Highest possible level of reuse

• Efficient tailoring of existing functionality

• Efficient handling of different transportation information sources

• Efficient handling of different station hardware displays, audio systems, video systems, etc

• Flexibility to run on different hardware platforms, operating systems, and application servers.