Case study at Deutsche Bank AG – illustrating concepts, application and ROI of Convergent Architecture with MDA

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Outline

- Introduction
  - Deutsche Bank Bauspar and the b-online project

- MDA @ work
  - Convergent Architecture
  - Applied MDA
  - Software Development Process

- Conclusion
  - MDA Benefits
Deutsche Bank Bauspar

Industry: Financial

URL: www.deutsche-bank-bauspar.de

Company facts:

- Founded 1987
- Subsidiary of Deutsche Bank AG, the leading German bank
- Provides special savings plans within the framework of savings and loan associations, designed to help its customers build the capital to acquire real estate
- Approx. 800,000 customers
Project: b-online

- Internet-enabling and integrated support of core business processes of Customer Service

Concerns

- Increasing demands and requirements of the users
- New technologies emerge at an ever increasing rate
- No standard software solution available

Legacy Migration/Integration

- Reuse: Existing mainframe system
  - Based on CICS, COBOL, DB2
  - Implemented in 80’s and continuous development ever since
  - Business logic to be extended, technological basis essentially unmodified

- New: Web-based front ends
  - Large-scale Internet application
  - Several intranet and internet front ends to be integrated with mainframe system
System Users

- **Customers**
  - View contracts, download forms, apply via internet
  - Customer activities have to be verified by staff prior to any modification of data

- **Sales partners/field staff**
  - Comprehensive calculation and status information on contracts and customers
  - Customer service application used on-line and off-line

- **Back office staff**
  - Finalize processes without re-entering redundant data
Core Requirements

- Integration of existing system
- Openness to different presentation layers
Thorough evaluation showed MDA to be optimal solution:

- Evolutionary development
  - MDA explicitly supports diverse technologies and heterogeneous IT landscapes as found at Deutsche Bank
  - Future-oriented, step-by-step modifications

- Independence of implementation technologies
  - MDA and appropriate tools allow decoupling of business logic from technological detail
  - Flexibility to quickly respond to new and changing technologies
  - Flexibility to quickly respond to new and changing business requirements
Model Driven Architecture (MDA) (2)

- High development productivity and system quality
  - Focus on business logic
  - Integration of heterogeneous environments automated by infrastructure generation from common model, automated consistency and quality assurance

- Excellent communication and collaboration in dev process
  - MDA and appropriate tools improve collaboration between different roles (Business analysts, OO developers, COBOL developers)
  - Common UML model and well-defined modeling style as lingua franca and easy-to-understand documentation
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Convergent Architecture

- Holistic, model-centric approach to IT Architecture
- One single model for business experts and IT experts
  - Model/repository allows different views, revealing information on different levels of abstraction
    - Traceability, no information loss
    - Separation of concerns: Business and IT
  - Explains and applies OMG‘s MDA
    - Model-driven (vs. code-centric), generative approach
    - Non-invasive: Not a 4GL approach, not only for green field dev

www.ConvergentArchitecture.com
The Three Pillars of Holistic Architecture

Models the domain of IT-system development

Models the business for which the IT-system is being built.

Maps the respective business models “convergently” to available technology.
Architectural Style

„A style and method of design and construction. The art and science of designing and erecting [systems].“

An Architectural Style influences:

- Design of software architecture
- UML Modeling Style and MDA approach
- Selection of tools for automated Model-to-Infrastructure transformation
  - Infrastructure: Source code, config files, build environment, deployment, test harness, ...
- Software development organization and process
Applied MDA (1)

- Specification of business detail separated from specification of technology detail

1. Annotate model using stereotypes and profiles
2. Generate and compile code
Applied MDA (2)

- Enrichment of model according to well-defined modeling style (stereotypes, property sheets) supplies information necessary for transformation to infrastructure.
Technology projection implemented through pluggable MDA-Cartridges, which are based on a separate UML model.

- **Value Object**
  - Cobol
    - Module, Copies
  - Java
    - Value Objects
    - SAX Handler
    - DAOs
    - Junit Classes
  - XML
    - Test Documents
  - DBMS
    - DDL
Essential artifacts are modeled and generated for every layer

- **BL**
  - EJBs, Deployment-Descriptors
  - Stub-Classes (remote Client)

- **LL**
  - Standard Access

- **PL**
  - DAO
  - DDL

- **Common**
  - Value Objects, SAX Handler
  - Junit Tests
  - XML Samples
  - DBMS DDL

- **Struts**
  - Form Classes
  - Action Classes

- **UI Control Flow**
  - Configuration

- **WFMS**
  - Process Def.

- **Mainframe**
  - Moduls (COBOL)
  - Copies
  - Bind Members
  - XML Parser/Builder
  - Stub-Classes Server

*Planned for next iteration*
High efficiency of model driven approach:

- High proportion of generated code
- Development of working cartridge prototypes in a few weeks
- Parallel development of business model and cartridges
- Low maintenance for cartridges: 5-10% of overall effort

<table>
<thead>
<tr>
<th>Architectural Layer</th>
<th>Percentage of generated LOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>XML-Interface</td>
<td>100 %</td>
</tr>
<tr>
<td>Frontend-Layer</td>
<td>40 % *</td>
</tr>
<tr>
<td>Business-Layer Server</td>
<td>60 %</td>
</tr>
<tr>
<td>Business-Layer Host</td>
<td>70 %</td>
</tr>
<tr>
<td>Logical-Layer Server</td>
<td>70 %</td>
</tr>
<tr>
<td>Logical-Layer Host</td>
<td>60 %</td>
</tr>
<tr>
<td>Physical-Layer Server</td>
<td>90 %</td>
</tr>
<tr>
<td>Physical-Layer Host</td>
<td>90 %</td>
</tr>
</tbody>
</table>

* Project started before ArcStyler Accessors were available, thus lower % here currently (more hand coding than necessary).
ArcStyler

- Comprehensive, end-to-end solution for Model Driven Architecture
- Assistance for developers with important architectural tasks
- Leverages existing, but isolated tools and technologies by automating transformation of information
- Simplifies and expedites entire development life cycle, from PIM to code

ArcStyler Core Modules

- UML-Tool
- ArcStyler MDA-Engine
- ArcStyler MDA Cartridge
- UML Model Repository
Software Development Process

- Iterative approach based on Rational Unified Process
- Version Management
  - CVS for UML model and Java sources
  - Proprietary system on mainframe for COBOL code
- ArcStyler integrates with FTP client to send generated COBOL files automatically to mainframe
- Nightly builds by generated build environment
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**b-online Project Facts**

- **Large-scale Internet application**
  - Runs on 30,000+ workstations in all 1,250 branches of Deutsche Bank
  - Large number of web users (field sales rep, customers, prospects)

- **Developed by 35 persons in 5 teams**
  - Pilot running in 3 months
  - System in production < year.

- **Production use since Dec 2002**

- **Winner of OMG Award 2002 „Best MDA Application“**

- **ROI quote from the Deutsche Bank**
  - “Immediate savings in the development process due to the MDA-compliant approach and usage of the Architectural IDE for MDA amounted to approx. 40% compared to the estimated figures for development without this approach.”
Core MDA Benefits identified by Deutsche Bank

- Integration
  - Integration of heterogeneous system environments (Internet, EJB, COBOL,...) through infrastructure generation from a common model

- Future-proof, open system
  - Flexibility by keeping the core model devoid of technical detail
  - Technical detail is maintained in the MDA-Cartridges and annotations to the model

- Final quote
  - “Our architectural style with the Model Driven Architecture is an important step in the further development of our mission-critical IT systems.”

Published in ObjektSpektrum, OS 03/2002, http://www.objektspektrum.de
"Modellgetriebene Architektur in einem J2EE- und Cobol-Großrechner-Umfeld" (Model Driven Architecture in a J2EE and Cobol Mainframe Environment)
Model Driven Architecture for the Enterprise

http://www.ArcStyler.com/

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