

DAIMLERCHRYSLER



# MDA Success Story

## ePEP successful with Model Driven Architecture

DaimlerChrysler TSS GmbH

■ TECHNOLOGIES ■ SERVICES ■ SOLUTIONS

### The Customer

DaimlerChrysler's Large Truck Business Unit for Europe / Latin America had its most successful year so far in 2004, selling more than 137.000 Mercedes-Benz trucks world wide. A large amount was contributed by the Actros model, which was voted "Truck of the Year". Other models in the product portfolio include the Axor, Atego, Econic, Unimog, as well as the Accelo (Brazil) and 1938S (Brazil).

### The Project

The ePEP project (Electronic Production Planning) supports all processes within production plants starting from construction clearance up to production clearance. ePEP supports approx. 220 uses cases, and is based on the following core modules:

1. GTTA (Global Parts/Schedule Alignment): ensures timely availability of new or changed parts, which are used across different production sites.
2. KOAEND (Construction Plan Change Management): distributes incoming construction plan change information to all stakeholders, leveraging customizable rules engine.
3. ESKOORD (Production Coordination): supports the entire production process chain, including work order management, master data management, automatic distribution of supplier queries, quotation management, purchase order management and delivery schedule management.

### Customer Benefits

Thanks to the successful rollout of ePEP in March 2005 in Wörth (Germany), Aksaray (Turkey) and Sao Bernardo (Brazil), DaimlerChrysler achieved the following goals:

- Optimized coordination of delivery and deployment of new and conversion parts for Truck manufacturing
- Improved schedule coordination with suppliers
- Reduced production risks

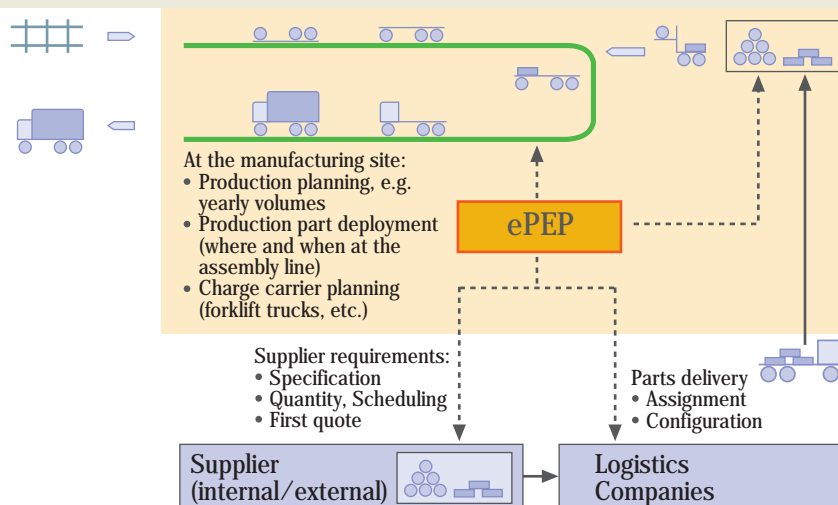
### Project Partners

DaimlerChrysler TSS GmbH is a wholly owned subsidiary of DaimlerChrysler AG, founded in 1998. TSS specializes in J2EE- and .NET based applications, Lotus Notes, and Data Warehousing solutions, as well as Consulting and Test Services exclusively for DaimlerChrysler AG worldwide.

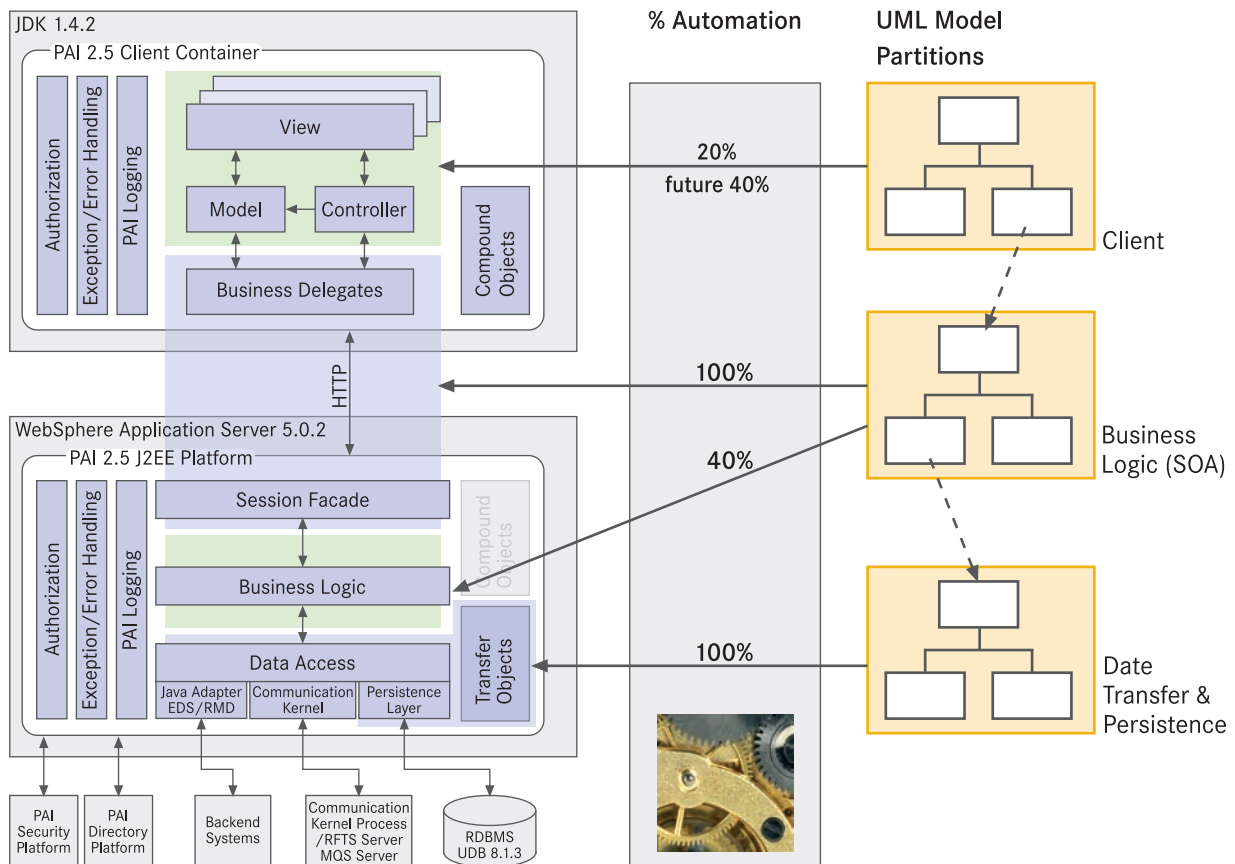
Interactive Objects GmbH is a leading provider of solutions for model-driven software engineering. Backed by over a decade of successful project work, Interactive Objects is a competent partner in IT projects from analysis to implementation and the practical use of Model Driven Architecture® (MDA®).

### Benefits of MDA Approach for TSS

- Model Driven Architecture optimizes multi-site software development process
- MDA helps to ensure architectural consistency of complex IT system.
- 15% increase in development productivity in first year
- ROI in less than 12 months
- Expected total productivity increase of 30% in second year, compared to a non-MDA approach



# TSS is convinced that development productivity will increase an additional 15% by next year.



## ePEP Project Highlights

ePEP is based on DaimlerChrysler's own PAI Framework, an elaborate J2EE architecture and a standardized operation platform. ePEP was designed to replace more than 10 heterogeneous legacy systems. The ePEP system is based on a state-of-the-art, layered Java J2EE architecture. Integration with approximately 12 external systems is done via XML, Messages Queues, and Batch Files.

## IT Challenges

- Very complex business and process logic
- Integration into existing, complex system landscape
- Planned 10% improvement of development productivity to achieve cost saving targets
- Multi-site development ("mix-shoring") in Germany and Malaysia

TSS selected an approach based on Model Driven Architecture (MDA) to address these challenges.

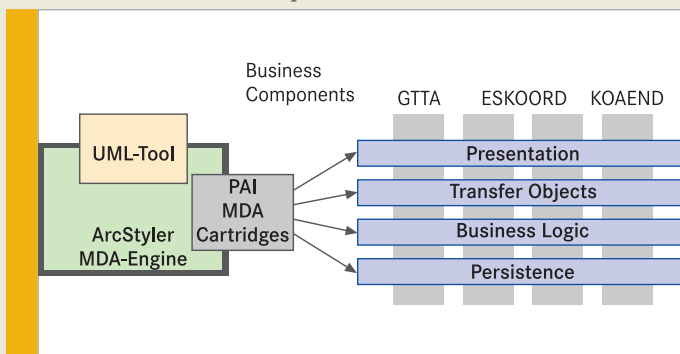
## ePEP and Model Driven Architecture

ePEP leverages the full potential of Model Driven Architecture (MDA). MDA is an open standard, defined by the Object Management Group™ (OMG™). MDA allows for the efficient mapping between different levels of abstraction in UML® models, e.g. from UML business models to UML architectural models. MDA Cartridges automate the mapping from technical UML models to an implementation, e.g. in Java.

The TSS ePEP team has built a number of customized cartridges, which now provide a DaimlerChrysler specific MDA Architecture Blueprint for the PAI Framework.

MDA shifts the emphasis of development projects up to the UML level, and away from low-level coding tasks. In ePEP, the level of automation that could be reached in different areas of the systems ranges from 20% up to 100%.

## MDA Architecture Blueprints



Achieving architectural consistency in the complex ePEP system was a key goal for TSS, in order to ensure stability and long-term maintainability. Another important requirement was to incorporate DaimlerChrysler's own Application Framework and Infrastructure (PAI), a unified, J2EE compliant operating environment, supporting Security, Logging, Fail Over, Directory Services, and Application Distribution.

TSS developed an MDA Architecture Blueprint which was specifically customized to support DaimlerChrysler's PAI Framework:

- Architectural consistency and PAI compliance across all technical and functional layers of the system
- Reduced complexity for developers
- Optimized efficiency and productivity of the PAI-specific J2EE development process
- Integration with the strategic IBM WSAD development tool

TSS builds Architecture Blueprint with ArcStyler

- Interactive Object's ArcStyler provides a number of standard MDA Cartridges, which generate code for different application layers (presentation, application, persistence, etc) on different target platforms (BEA, JBoss, SAP NetWeaver, Microsoft .Net)
- ArcStyler's open Cartridge architecture (CARAT) allows for easy customization of Cartridges
- TSS combined standard and custom cartridges to develop the PAI-specific MDA Architecture Blueprint

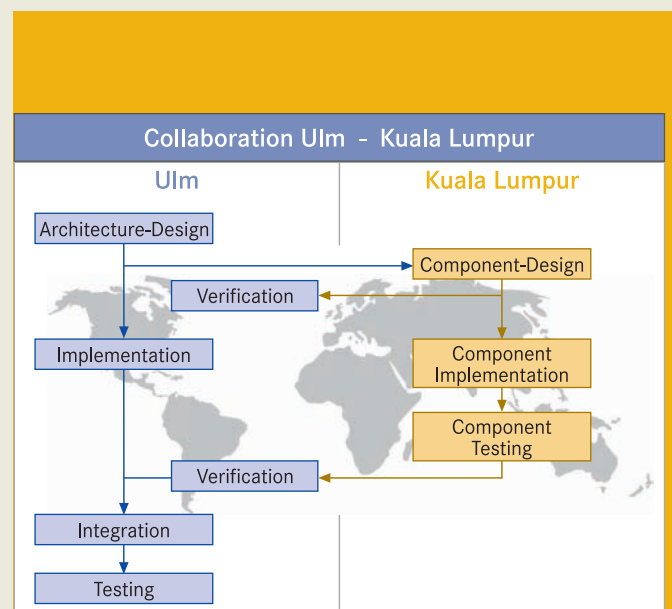
## Model Driven Offshoring (MDO)

TSS's strategic decision to use offshore resources in Malaysia for the project added another level of complexity. TSS was looking at Model Driven Offshoring (MDO) to reduce the typical risks found in offshoring projects.

Wolfgang Käfer, TSS Technology Lead: "The Model Driven Offshoring approach has a number of benefits, including improved cooperation and simplified coordination, increased transparency, dramatically improved quality, and on the long term control over intellectual property and investment security."

MDO allows for a number of different ways of integrating the teams in different development centers. A key question is how much exposure the offshore team should have to the MDA process.

Peter Schneider, CTO TSS: "We deliberately chose an approach where our offshore team is fully integrated into the MDA development process. The alternative would have been to do MDA only in Germany, and then pass the generated code to the team in Malaysia to fill in the gaps. However, we think that the up-front investment in training the Offshore team to perform more highly qualified MDA-tasks will start paying off in the medium term."



# PAI Cartridges speed up the deployment of the PAI Platform

## MDA: Key Benefits for TSS

The application of MDA provided the following benefits for TSS:

### Development Cost Reduction

- Increase in development productivity through high level of automation (code generation, UML documentation)
- MDA improves project communication and coordination through tighter alignment of specification and code, reducing friction losses normally caused by multi-site development.
- MDA reduced the cost for individual software development cycles, and increases project transparency. This allows to identify problems and deviations much earlier.
- MDA supports division of labor, allowing for further optimizations.
- MDA-skilled offshore resources can execute much higher value tasks

### Project Risk Mitigation

- Better quality code through automation reduces short- and long-term risks
- Streamlining of the development process, fewer misinterpretations of requirements through close alignment of model and code
- Continuous evolution of prototypes provide immediate feedback

### Efficient Architecture Governance

- Reduce architectural complexity
- Automatically ensures architectural compliance across all application tiers and functional “slices” of the system
- Consequent use of design patterns throughout the project, pattern automation with MDA, e.g. „Delegate Pattern“: implemented once in a custom MDA cartridge (generates delegate artifacts for business objects), used in a consistent way in many places throughout the entire system

### Long-Term Maintainability

- MDA provides well documented business domain model, system architecture and development process, helps ensuring long-term maintainability with changing staff
- Well structure component architecture supported by MDA ensures flexibility and maintainability

## Conclusion

TSS had to deal with a number of initial issues, caused by the adoption of MDA:

- Training and coaching of developers was required to raise the ability to work on a high level of abstraction and fully leverage the benefits of MDA.
- The MDA development process model is not intuitive. Also, customizations were required to fit the needs of TSS. MDA experts from Interactive Objects helped to kick-start the process and architecture development.
- TSS invested into developing their own guidelines, e.g. common rules for modeling (how to model a specific pattern and it's application within the system).

However, TSS found that the benefits of MDA by far outweigh these issues.

Martin Heinemann, ePEP Project Manager: "After the initial MDA ramp-up phase, we experienced an increase in development productivity of approximately 15%. This allowed us to over-achieve the initial target of 10%, which was the basis of the original project calculation."

Wolfgang Kaefer, ePEP Technology Lead: "We were able to achieve an MDA-specific ROI within the first 12 months, and we are convinced that the overall increase in development productivity will reach 30% next year."

Consequently, TSS has developed a roadmap which will leverage MDA even more in the future:

- Standardized, MDA-based architecture and development processes to further improve quality and productivity
- Functional extension of MDA Architecture Blueprints
- Provision of more optimized PAI Cartridges
- Leverage MDA approach within the CMMI process framework

## Contact

### DaimlerChrysler TSS GmbH

Lise-Meitner-Straße 15

89081 Ulm

Telefon +49 (0)7 31/50 96-0

Fax +49 (0)7 31/50 96-599

[www.dctss.de](http://www.dctss.de)

Management, CTO

Peter Schneider

[peter.m.schneider@daimlerchrysler.com](mailto:peter.m.schneider@daimlerchrysler.com)

Project Responsibility ePEP

Martin Heimann

[martin.heimann@daimlerchrysler.com](mailto:martin.heimann@daimlerchrysler.com)

Technology Responsibility TSS

Wolfgang Käfer

[wolfgang.kaefer@daimlerchrysler.com](mailto:wolfgang.kaefer@daimlerchrysler.com)

### Interactive Objects Software GmbH

Basler Straße 61

79100 Freiburg

Telefon +49 (0)7 61/400 73-0

Fax +49 (0)7 61/400 73-73

[www.interactive-objects.com](http://www.interactive-objects.com)

Oliver Kraus

[oliver.kraus@interactive-objects.com](mailto:oliver.kraus@interactive-objects.com)