

THE IT-ARCHITECTURE PROFESSIONALS

Einführung in die technischen Konzepte

Model Driven Architecture

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Geschäftsführer



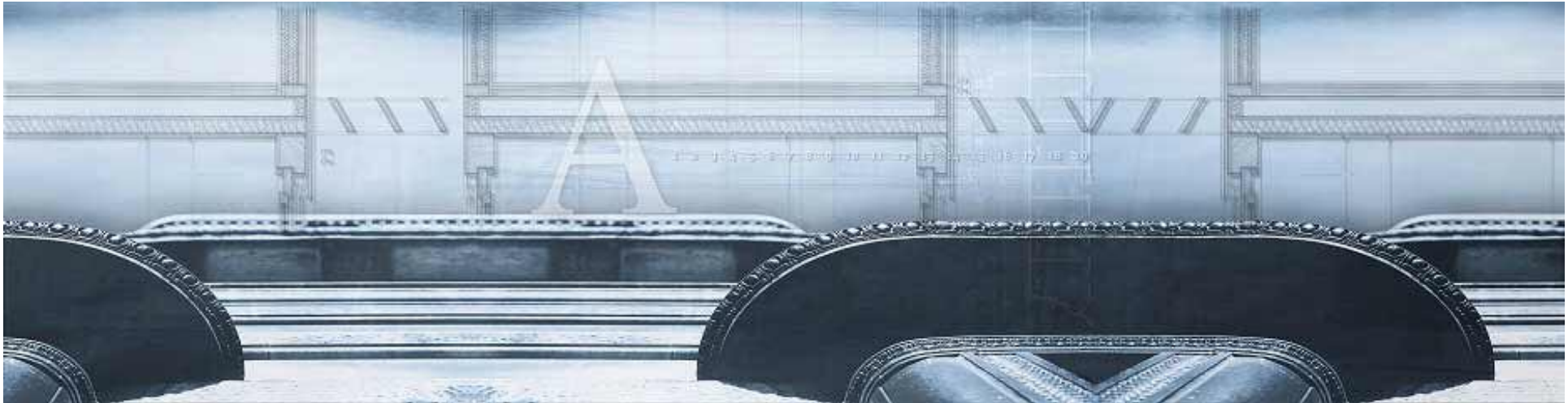
"Civilization advances by extending the number of important operations we can perform without thinking"

- Alfred North Whitehead, Philosopher

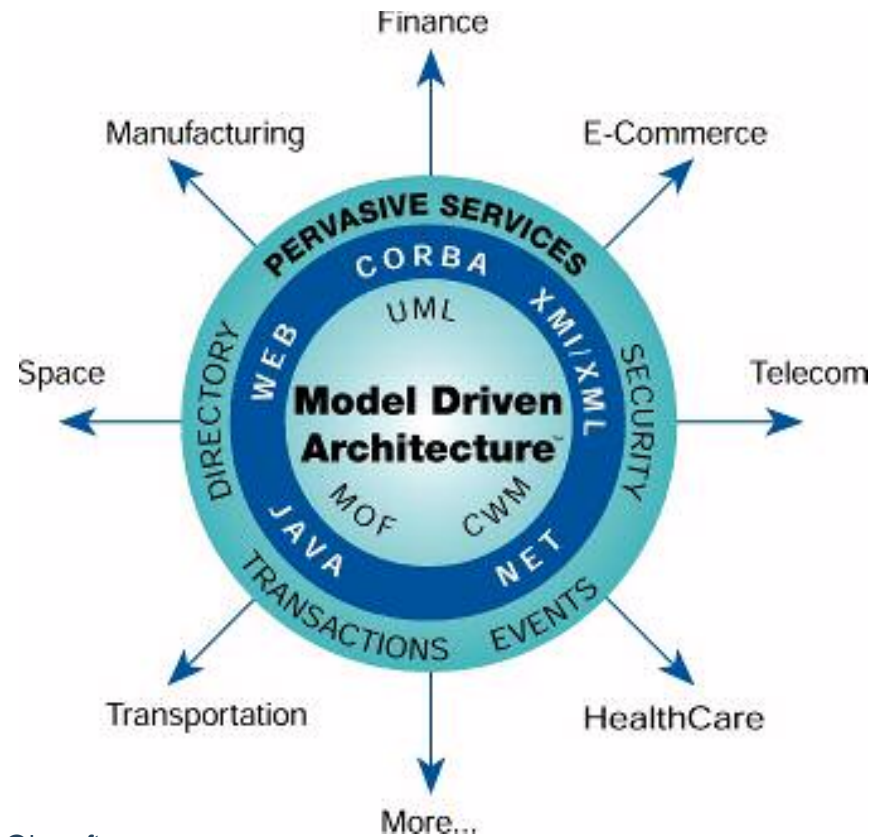
The company behind ArcStyler

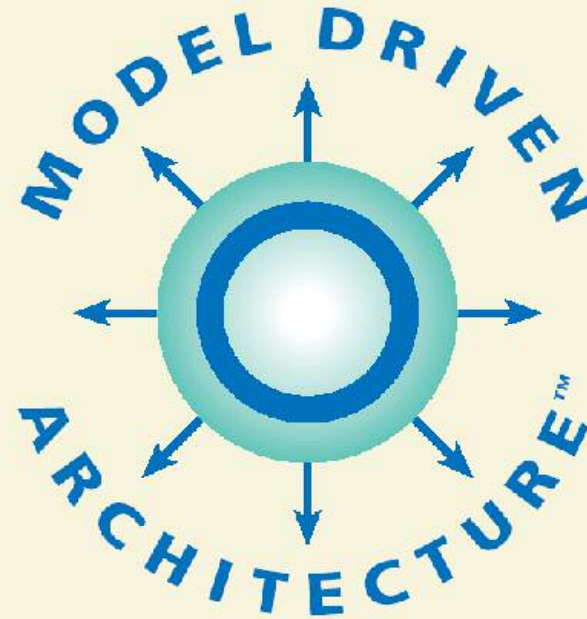
3

- ◆ Interactive Objects was founded 1990
 - Headquarters in Germany, offices in UK, and USA.
- ◆ Successful in applied Architectural Consulting
 - “Chief Architect” positions in many Fortune 500 companies
- ◆ Profitable
 - Significant R&D investments (> 20%)
- ◆ Launched ArcStyler/MDA Product Line in 2000
 - Based on a decade of reality-scale consulting
 - Is proven ROI-effective in production environments
 - Defines/substantiates a new class: the **Architectural IDE**
- ◆ Contributor to OMG MDA Standard



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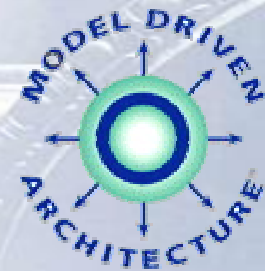
"MDA™ goes beyond middleware to provide a comprehensive, structured solution for future-safe and interoperable application development. ArcStyler™ provides an excellent example of the OMG's MDA approach."

*Dr. Richard Soley, Chairman
and CEO of the OMG*

The OMG's Model Driven Architecture

MDA addresses the challenges of today's highly networked, constantly changing systems environment, providing an architecture that assures:

- ▶ Portability
- ▶ Increased application re-use
- ▶ Reduced cost and complexity of application development and management
- ▶ Cross-platform Interoperability
- ▶ Platform Independence
- ▶ Productivity



Source: www.omg.org/mda/executive_overview.htm

Heterogeneity is Permanent

◆ Programming languages

- ▶ ~3 million COBOL programmers
- ▶ ~1.6 million VB programmers
- ▶ ~1.1 million C/C++ programmers

◆ Operating systems

- ▶ Unix, Linux, MVS, VMS, MacOS, Windows (all 8!), PalmOS...
- ▶ Embedded devices (mobile, set-top, etc.)

◆ Networks

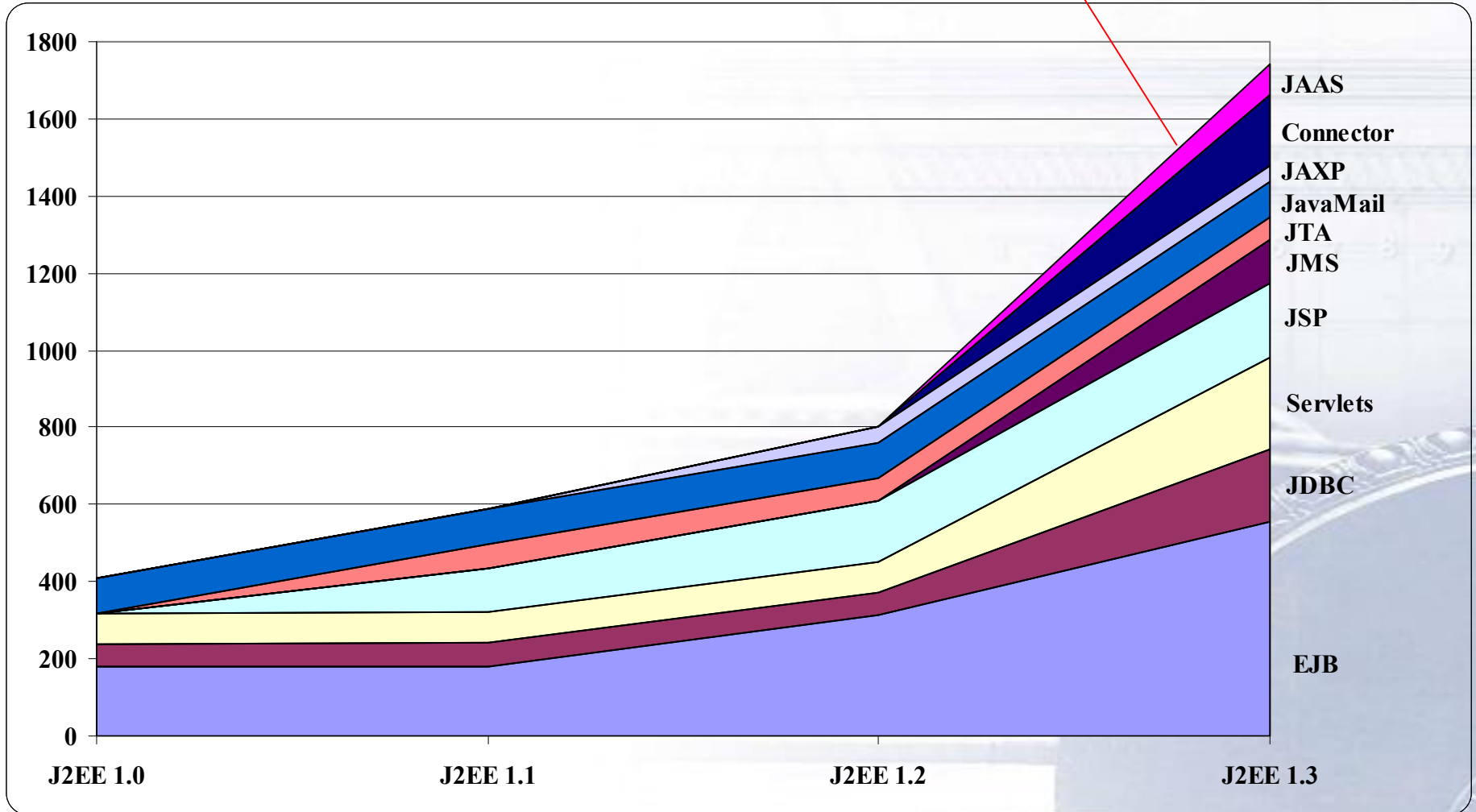
- ▶ Ethernet, ATM, IP, SS7, Firewire, USB
- ▶ Bluetooth, 802.11b, HomeRF

Source: Richard Soley (OMG)

J2EE: Powerful but Complex

Content Index

Widening scope



Heterogeneity: e.g. XML

B2B: is XML the answer?



```
<Car>  
<doors> 2</ doors>  
<colour> red</ colour>  
</Car>
```



```
<auto doors="2" colour="red"/>
```



Source: Andrew Watson (OMG)

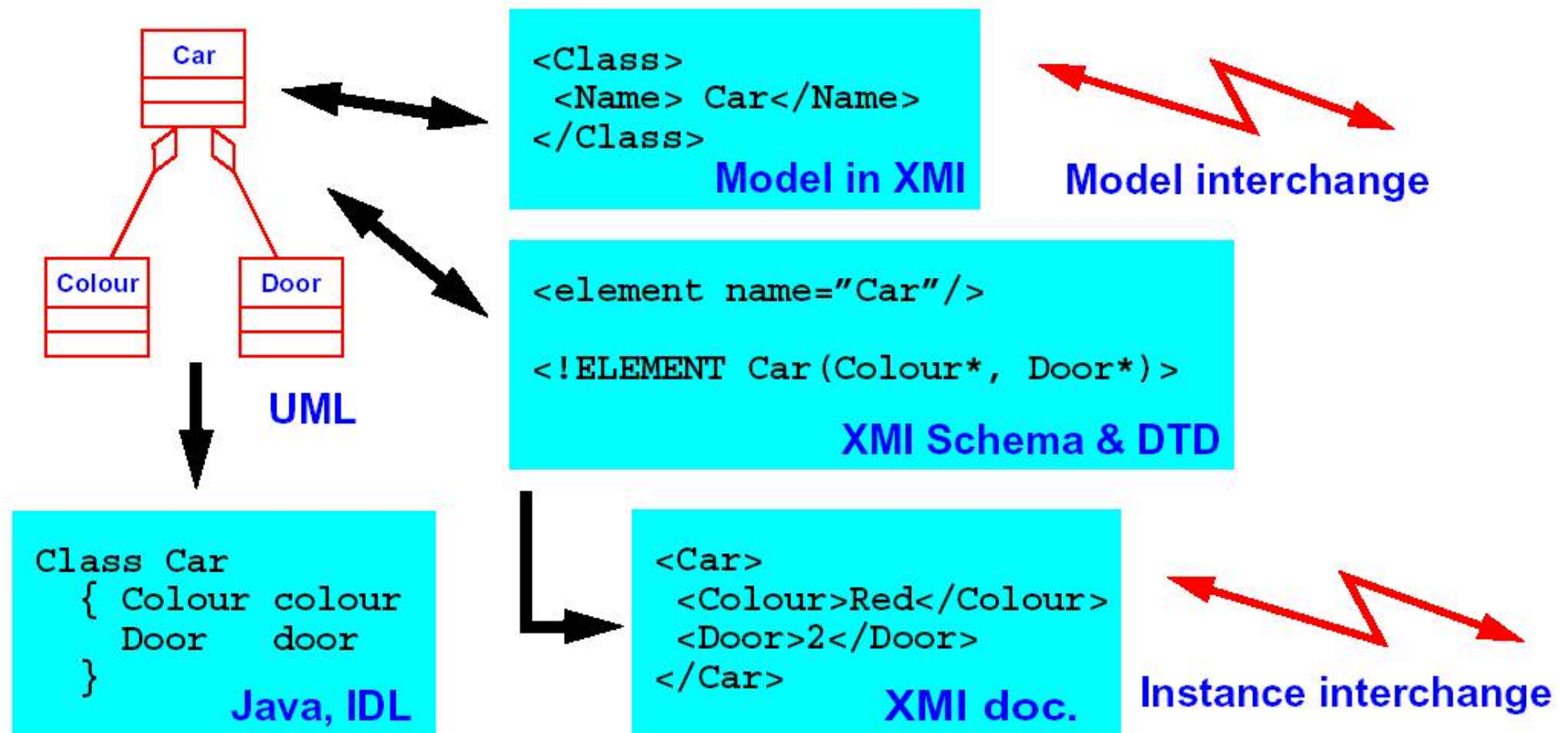
Roadkill on the Info Highway



...and doing things “the way we always do them” isn’t the answer.

Source: Richard Soley (OMG)

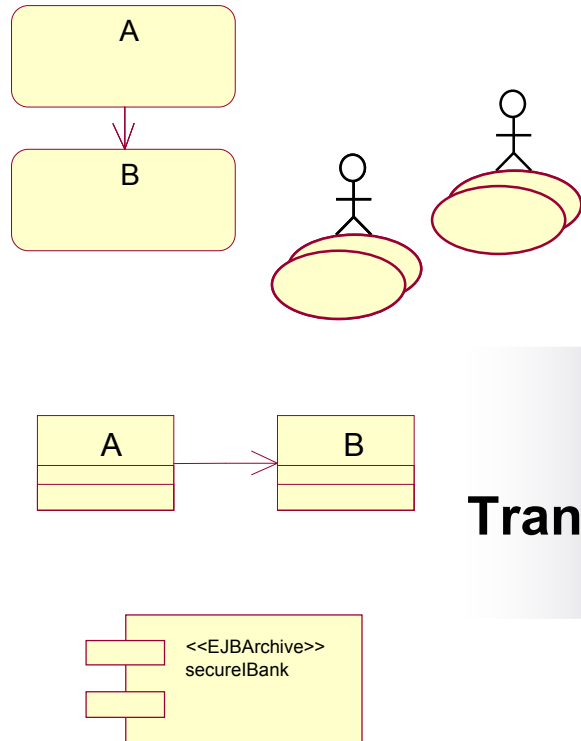
Simple MDA Example: creating XML DTDs



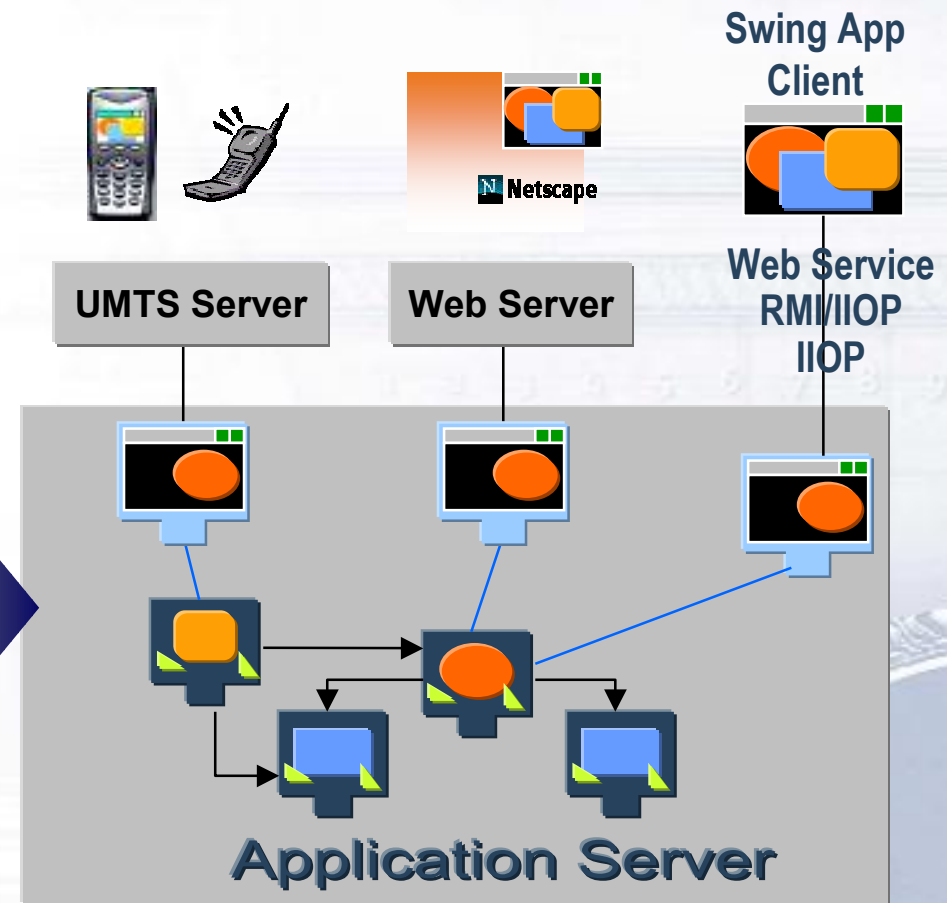
Source: Andrew Watson (OMG)

Model Driven Architecture: The Idea

Business Modeling



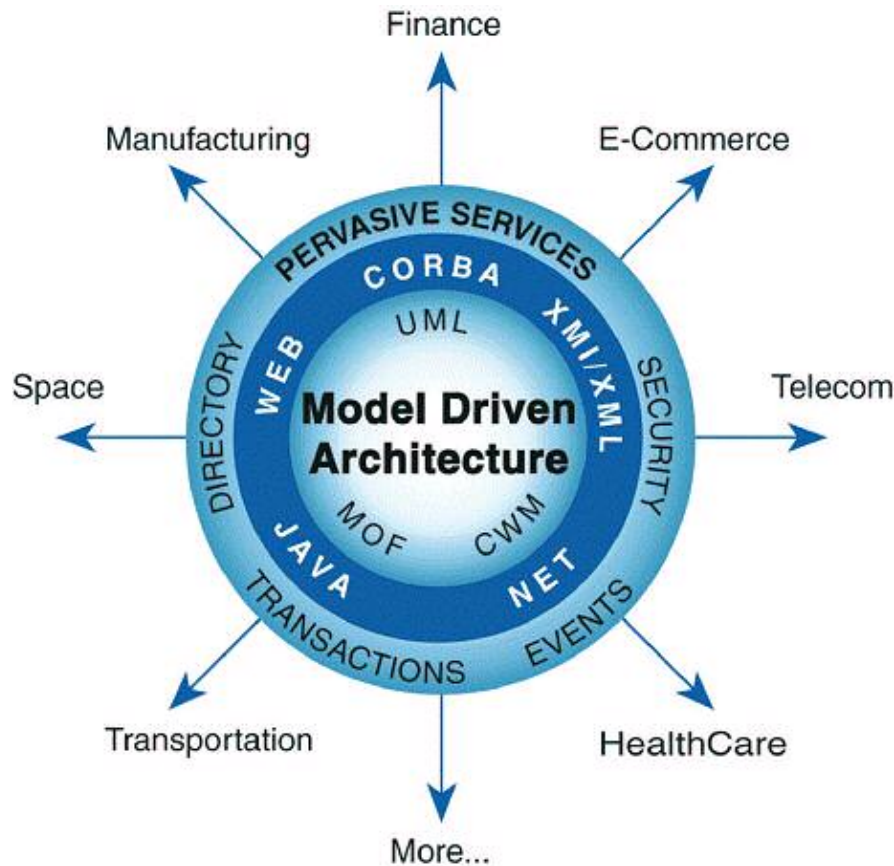
- Business Object Models
- Business Use Cases
- ...



- Deployable Components
- Build & test environment
- ...

Automating Architecture for new levels of ROI

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- ◆ Business-level, technology-independent models define detailed aspects of the system being modeled
- ◆ These models can be tested and checked to ensure that the resultant system will meet requirements
- ◆ Platform-specific system components are then generated from the model to complete the development cycle

Driving the MDA, not a market follower...

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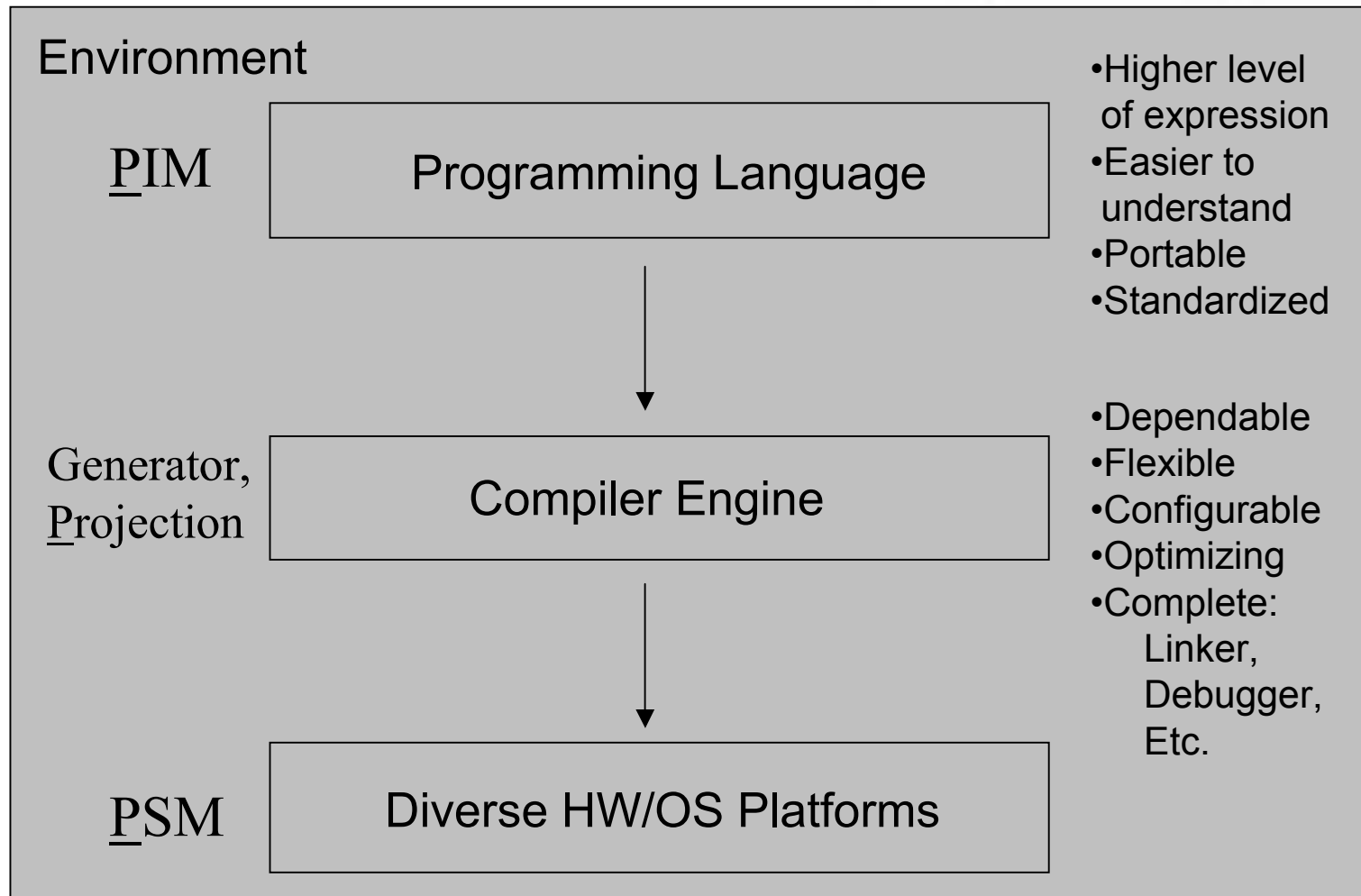


"Interactive Objects Software was already moving in the same direction as the OMG when MDA was announced."

Paul Harmon, Market Analyst

The first level of automation. ~30 Years

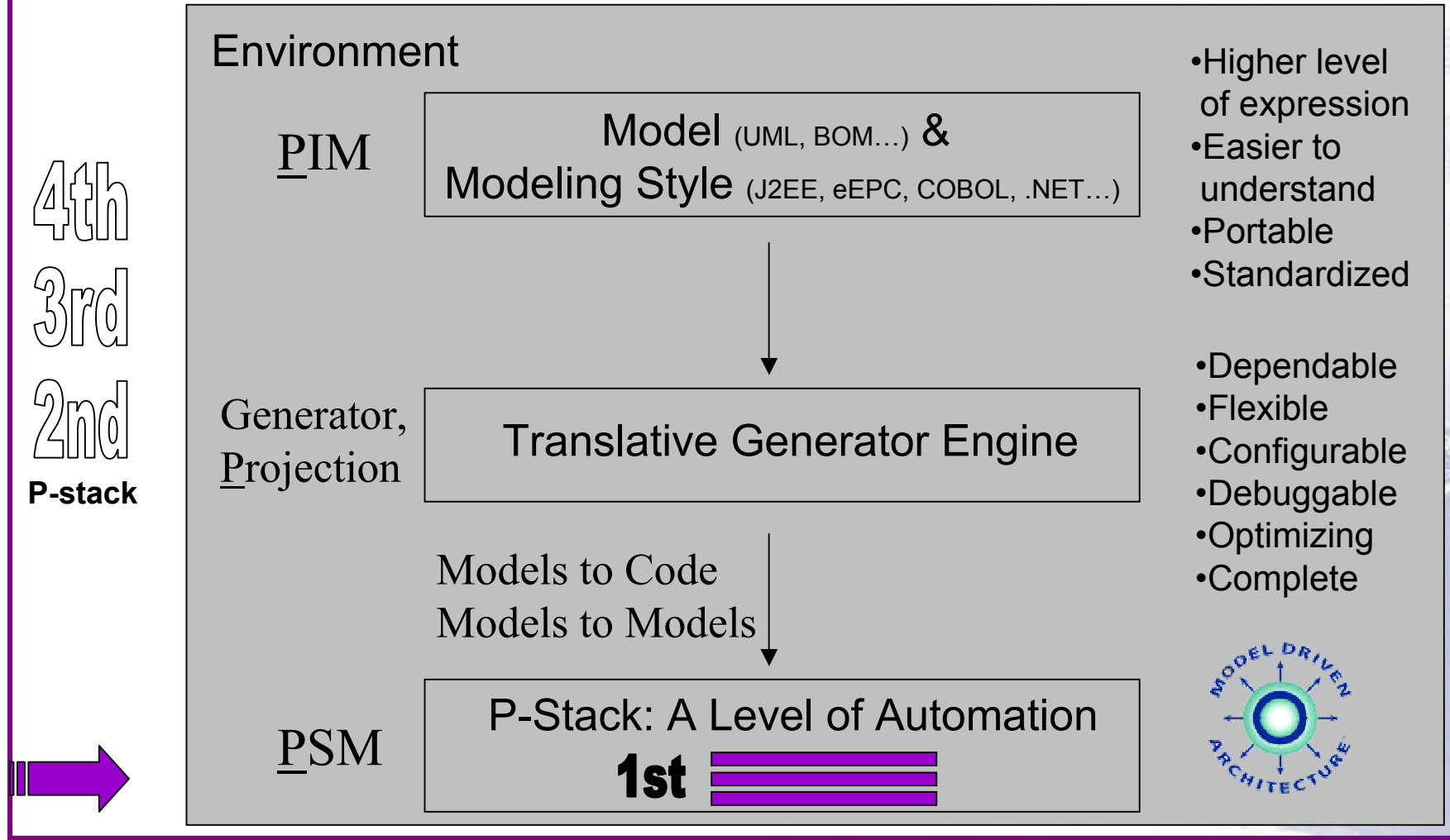
Programming IDEs (e.g. JBuilder, NetBeans, Eclipse...)



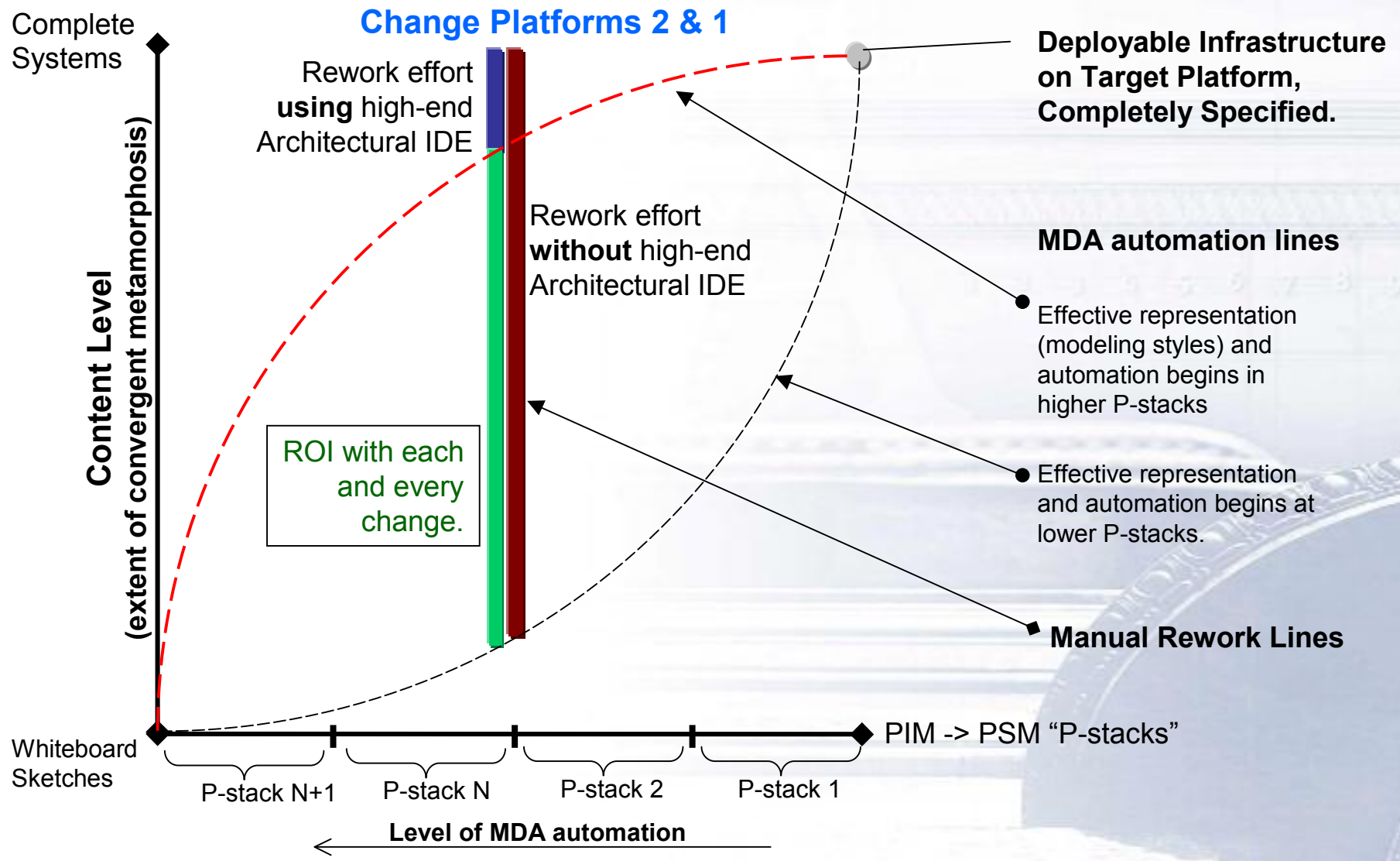
1st
P-stack

MDA = New levels of automation. ~ Last 8 Years

Architectural IDEs



MDA: Objectively high ROI



MDA simplifies by separating and automating.

The Business Of IT-Architecture

Stable evolution of your business designs

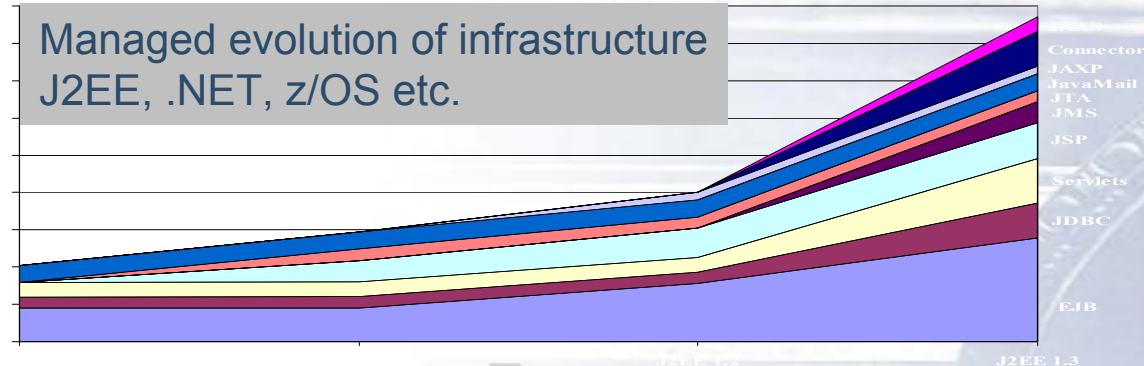
Convergent MDA mapping for business continuity. ↓

Stable evolution of your UML designs

Convergent MDA mapping for business continuity. ↓

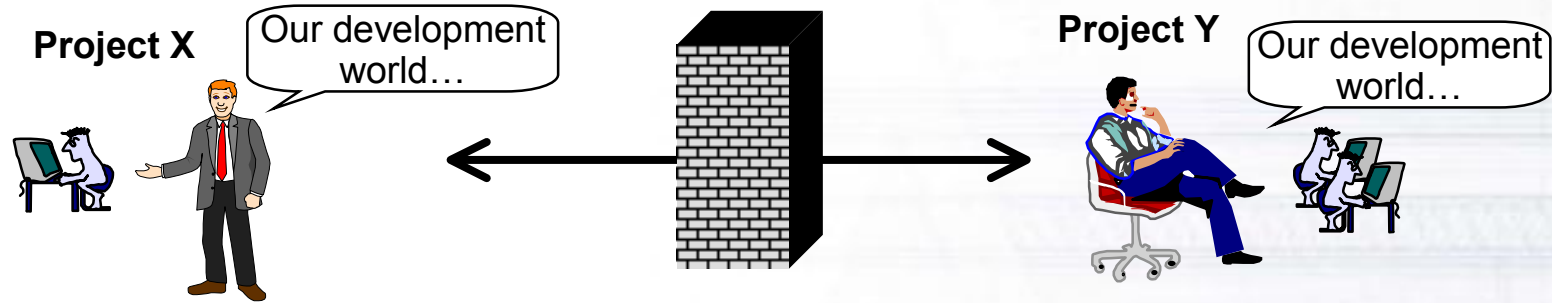
Delivering Business Solutions

Managed evolution of infrastructure
J2EE, .NET, z/OS etc.



BEA, IBM, Borland, IONA, MSoft, z/OS...

ROI by removing ad-hoc complexity at the source...



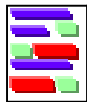
Adding a common Architectural Style supported by an MDA automation simplifies the use and reuse of designs and technology



Automatic Migration & Refactoring (M&R)

MDA Models

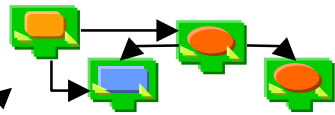
MDA enabling existing designs



Automatic merge and refactoring support across new versions

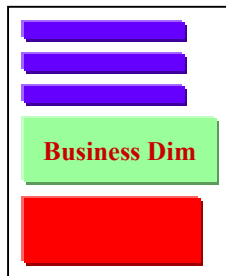
and across new products

optimizing code each time while maintaining clear visibility of the Business Dimension.

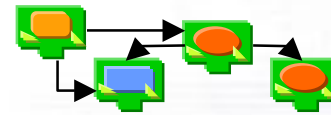


e.g. BEA WLS 6.1

e.g. Borland BES

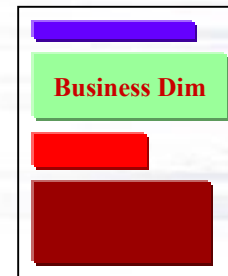


Swap MDA Cartridge

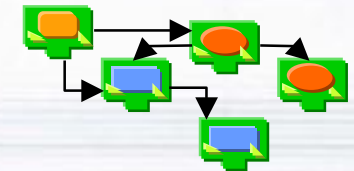


BEA WLS 7.1

BES
IONA E2A
IBM WAS



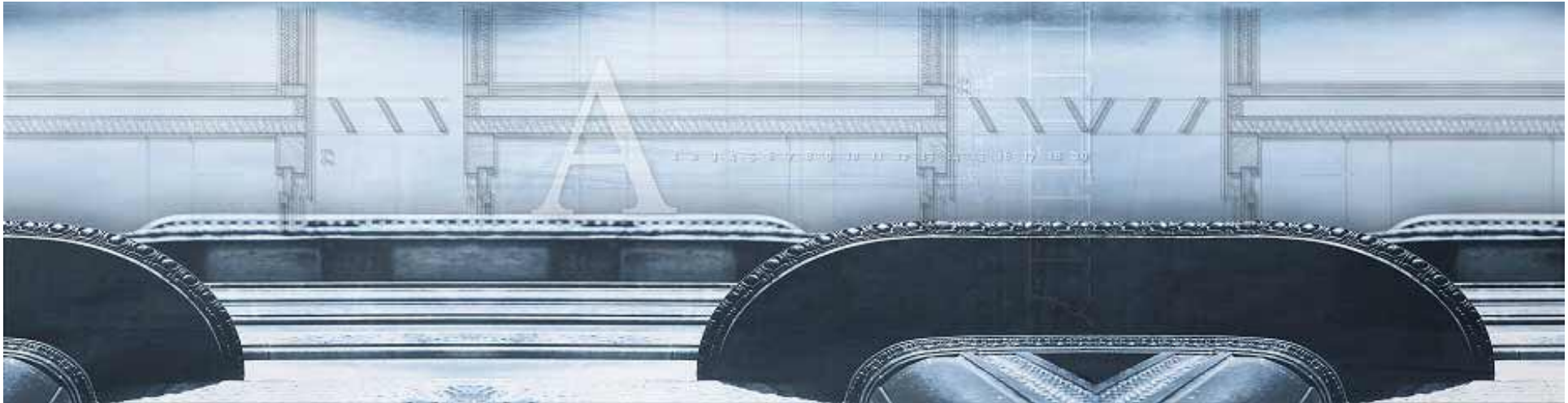
Swap MDA Cartridge



BEA WLS 8.1

BES
E2A
WAS on z/OS
BEA WLS



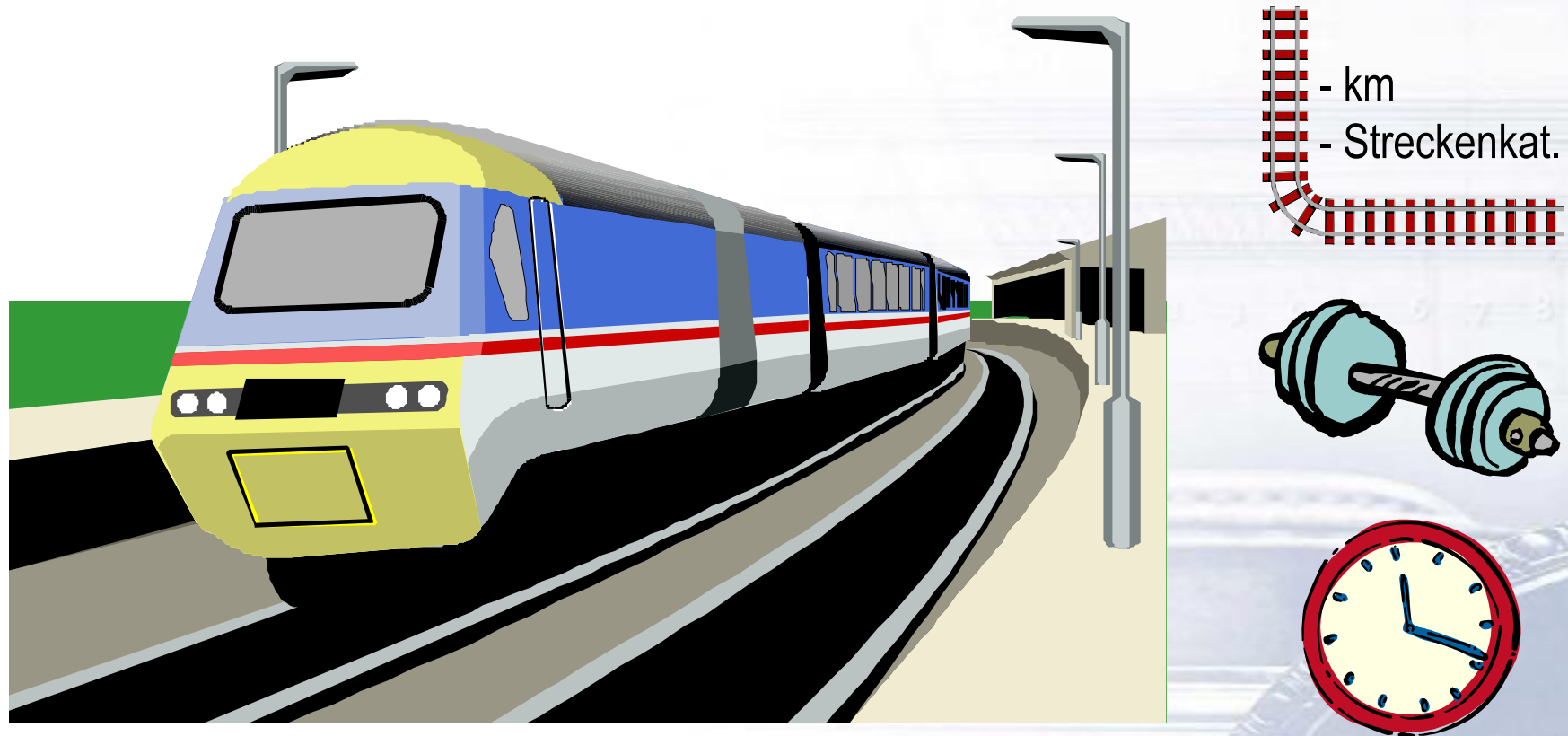


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MDA@Work

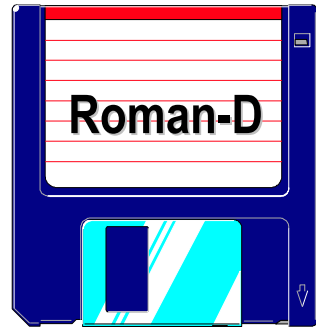
Many of these features contain
Patent Pending Mechanisms and Technologies





- **Berechnung des Infrastrukturbenützungsentgelts**

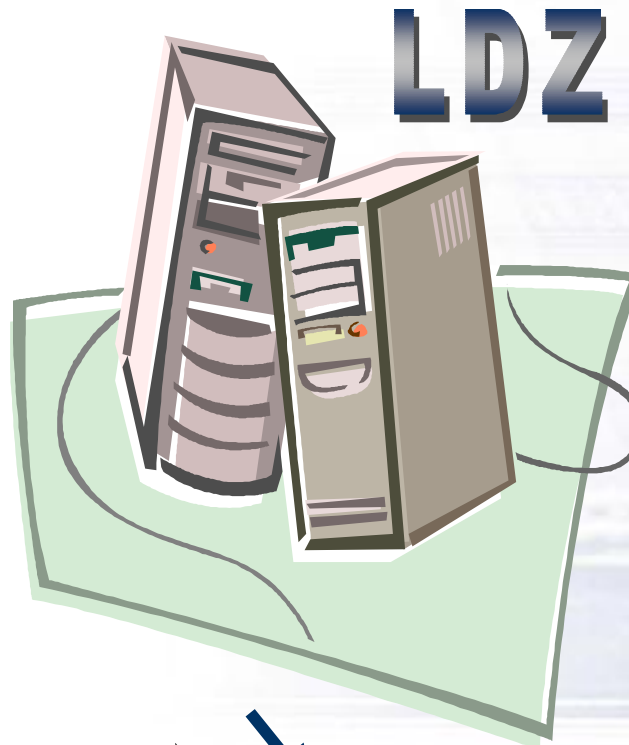
Fachlicher Überblick – Ablauf



- 15.000 Trassen
- mit ca. 100 Tpkt.



- 200 Änderungen pro Tag
- 50 Regionalleiter



- ARTIS / RZÜ
- 8.000 Züge + 400.000 Meldepkt.



- Rechnungen pro Monat

- ◆ Ziel: Berechnung des Infrastrukturbenützungsentgeltes
- ◆ Voraussetzung für die Berechnung

Plandaten	<ul style="list-style-type: none">◆ 15.000 Trassen pro Jahr◆ 750.000 Trassenpunkte pro Jahr
Solldaten	<ul style="list-style-type: none">◆ 8.000 Züge pro Tag◆ 200 – 300 manuelle Änderungen
Ist-Daten	<ul style="list-style-type: none">◆ 400.000 Zugmeldepunkte pro Tag

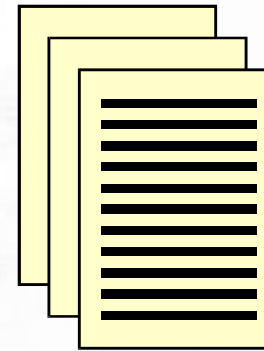
- ◆ Berechnung des Benützungsentgeltes anhand
 - ▶ Kilometer; Gewicht und zusätzlichen Faktoren wie Zeitscheibe

Umfang des technischen Projektes

- ◆ Anzahl der Anwendungsfälle - 15
- ◆ Anzahl der Komponente – ca. 250
- ◆ Anzahl der modellierten Klassen – ca. 700
- ◆ Intensive Vorarbeit von ca. 2 Monaten mit 3 Personen
- ◆ 15 Personen in vier Teams
- ◆ 1. Sichtbare Version nach ca. 3 Monaten
- ◆ Pilotbetrieb ab Mitte Mai
- ◆ Inbetriebnahme Anfang Juli – Rechnung Anfang August

Was wird generiert? (1)

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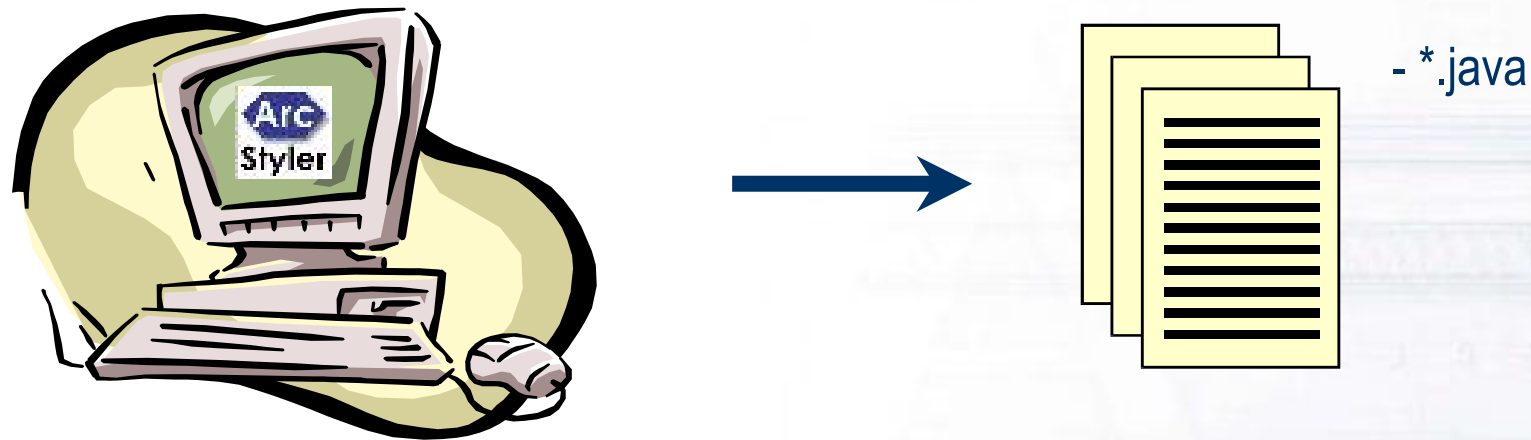


- *.java
- *Home.java
- *Bean.java
- *.xml

◆ Für EJB's

- ▶ Home- und Remote-Interface komplett
- ▶ Bean-Klasse mit Funktionsrümpfen für die fachlichen Methoden
- ▶ Zusätzlich Hilfsfunktionen
 - Zugriff auf Home-Interface bei Dependencies

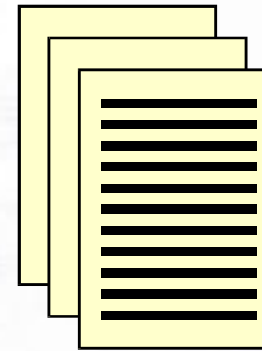
Was wird generiert? (2)



◆ Für Java-Klassen

- ▶ Generierung der Attribute und Operationen, mit ihren definierten Eigenschaften
- ▶ Bei Attributen mit Zugriffsmethoden

Was wird generiert? (3)



- *.java
- *.html
- *.jsp

◆ Web-Applikation

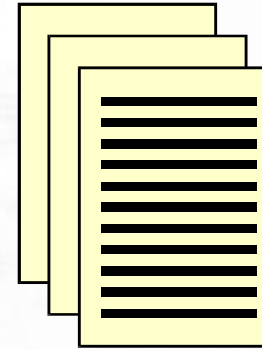
▶ Accessors

- Implementierte Zustandsmaschine – nach Modell

▶ Representer

- HTML-Seiten und JSP's mit schon vordefinierten Elementen

Was wird generiert? (4)

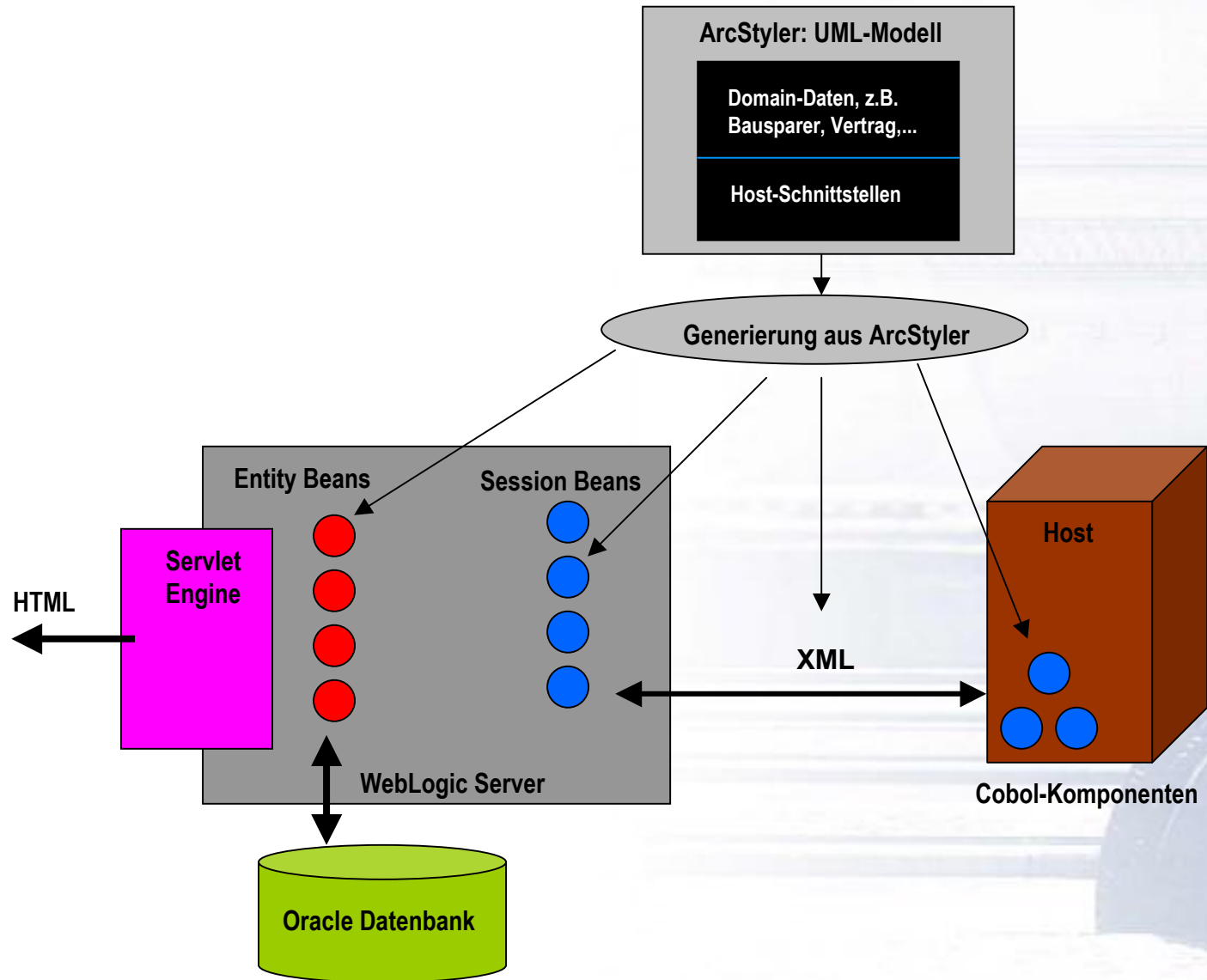


- *.java
- *.xml
- *.bat
- *.jpr

◆ Test- und Buildumgebung

- ▶ Testklassen mit Implementierungsrümpfen
- ▶ Buildscripts für Ant

Deutsche Bank Bauspar AG

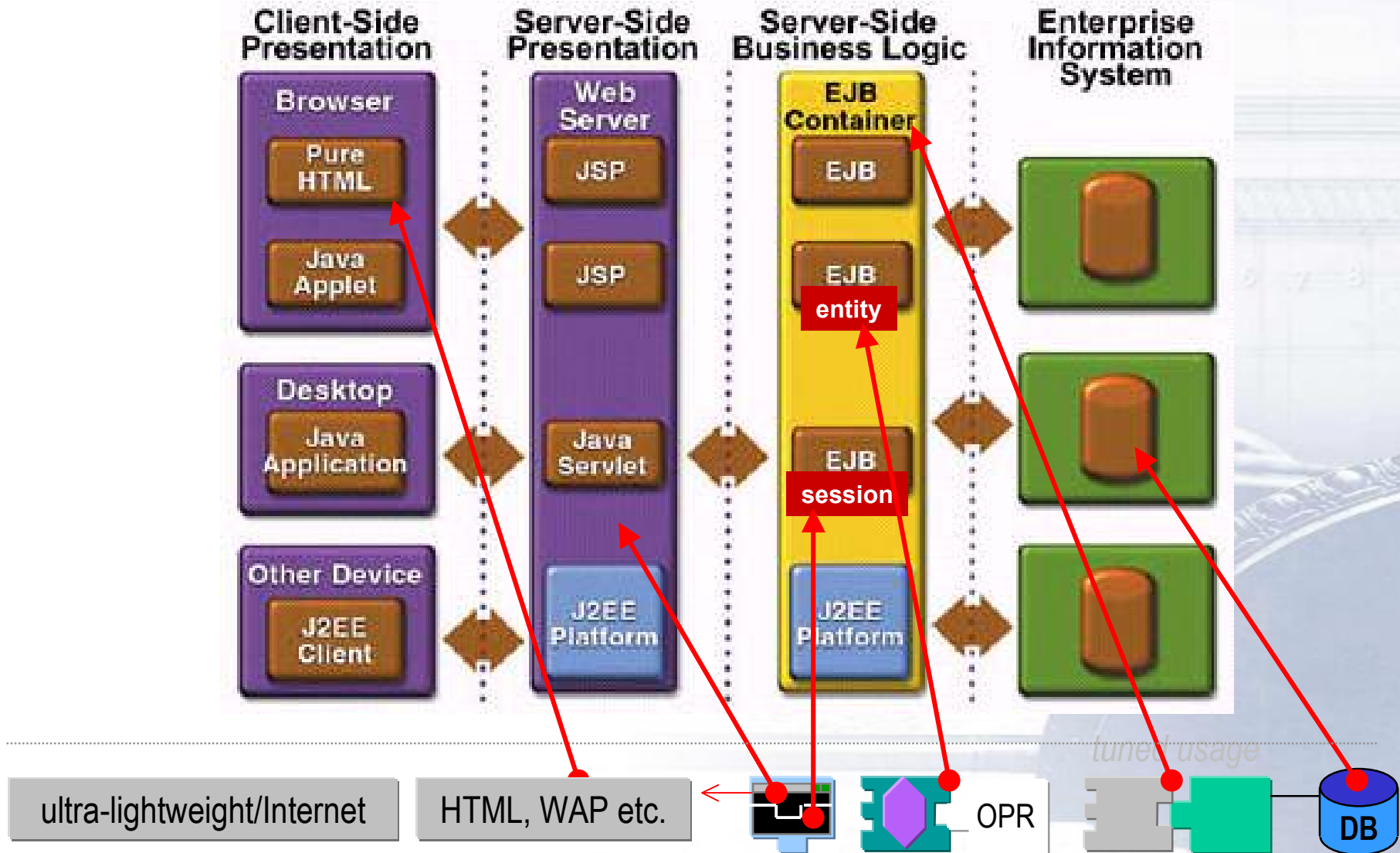


Statistics published by Deutsche Bank Bauspar 2002

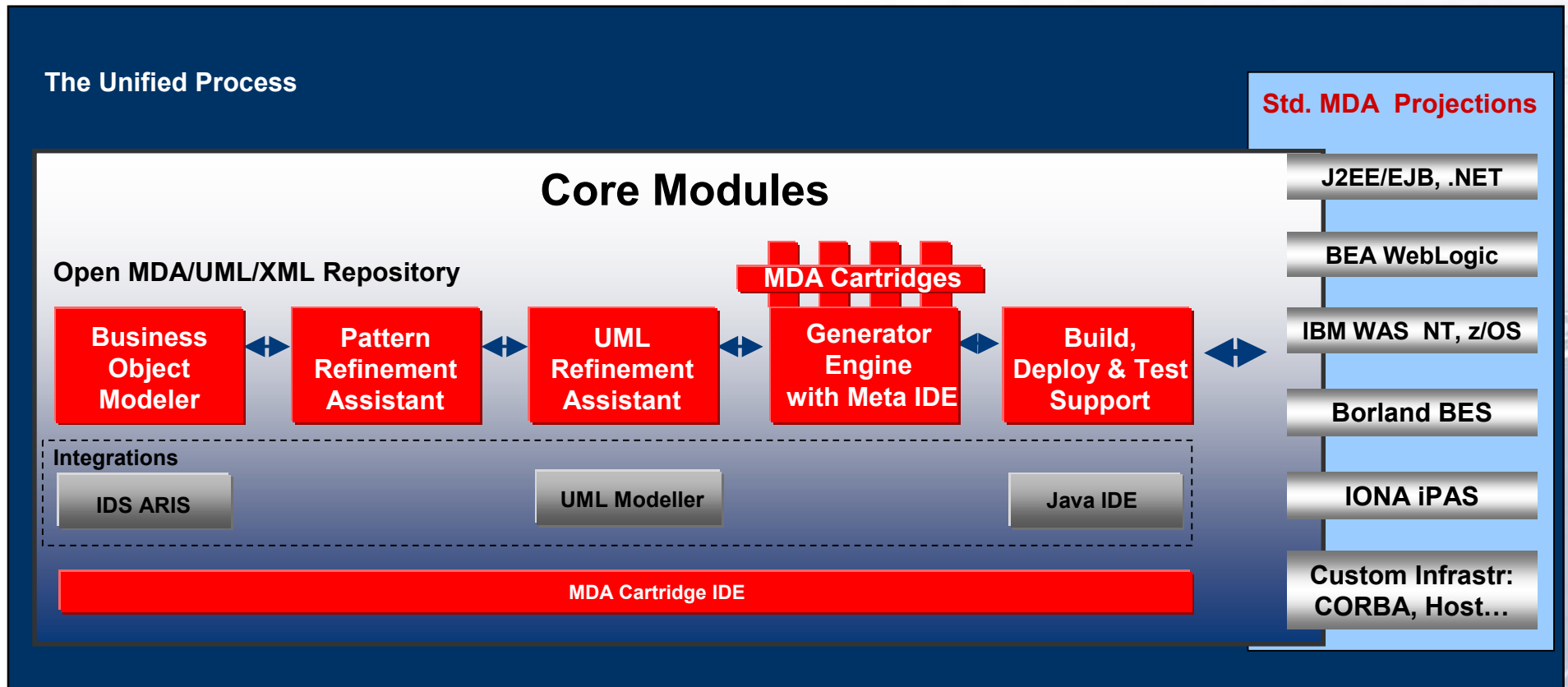
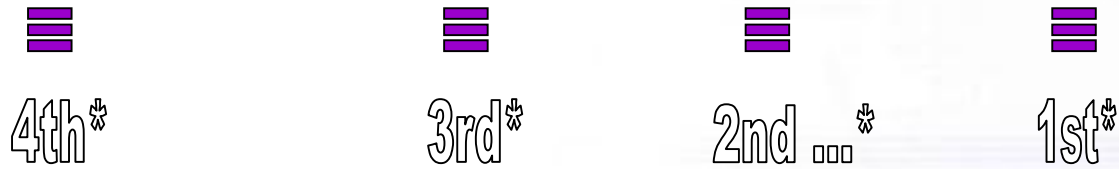
Architektureinheit	Anteil generierter Codezeilen
XML-Schnittstelle	100 %
Frontend-Layer	40 %
Business-Layer Server	60 %
Business-Layer Host	70 %
Logical-Layer Server	70 %
Logical-Layer Host	60 %
Physical-Layer Server	90 %
Physical-Layer Host	90 %

Published in the 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)

Example: Model Driven Projection to J2EE



The Architectural IDE



Pluggable MDA Cartridges... The solution to a big problem



Architectural IDE

CARAT™ standard

Use Cartridges

Set Gen. Options Configure Server Add Cartridges

MDA Development IDE in the Architect Edition

Produce Cartridges

Model & Gen. Refine & Test Package Cartridge



Custom Infrastructure
CORBA, .NET,
OODB, COBOL, etc.



Desktop Publishing Systems

PostScript™ standard

Install Printer Driver

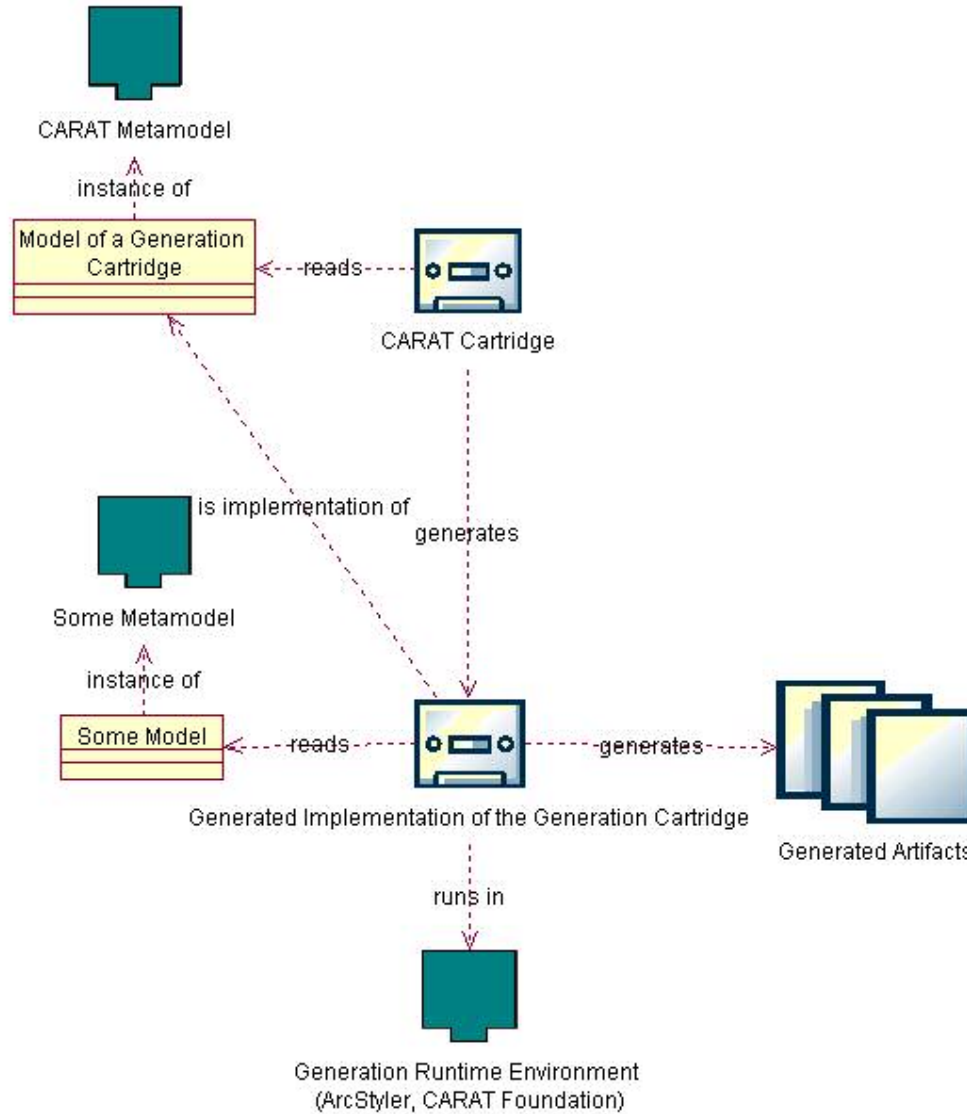
Set Print Options Configure Printer Install Printers

Add Printer

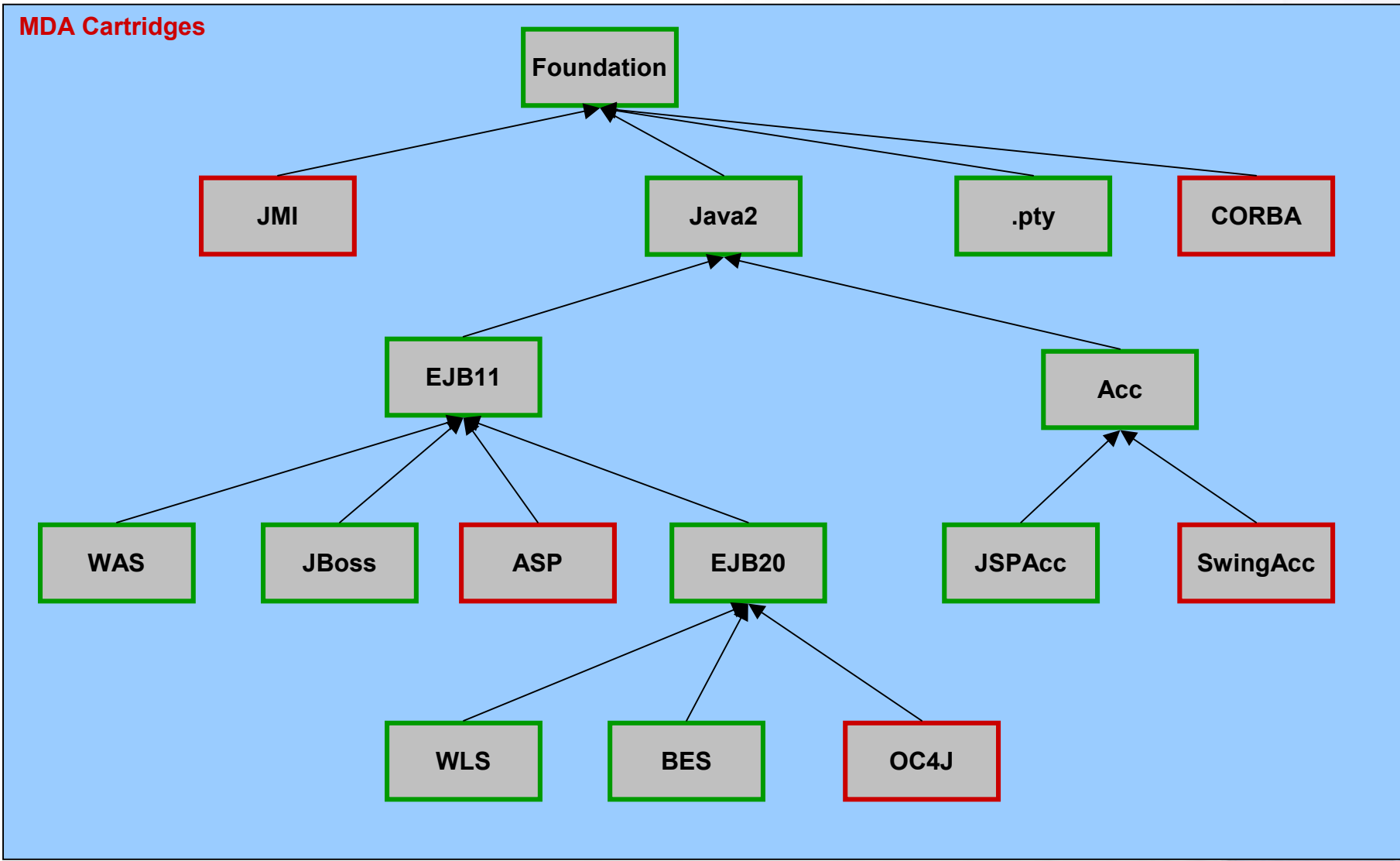


Building Cartridges for MDA Mappings

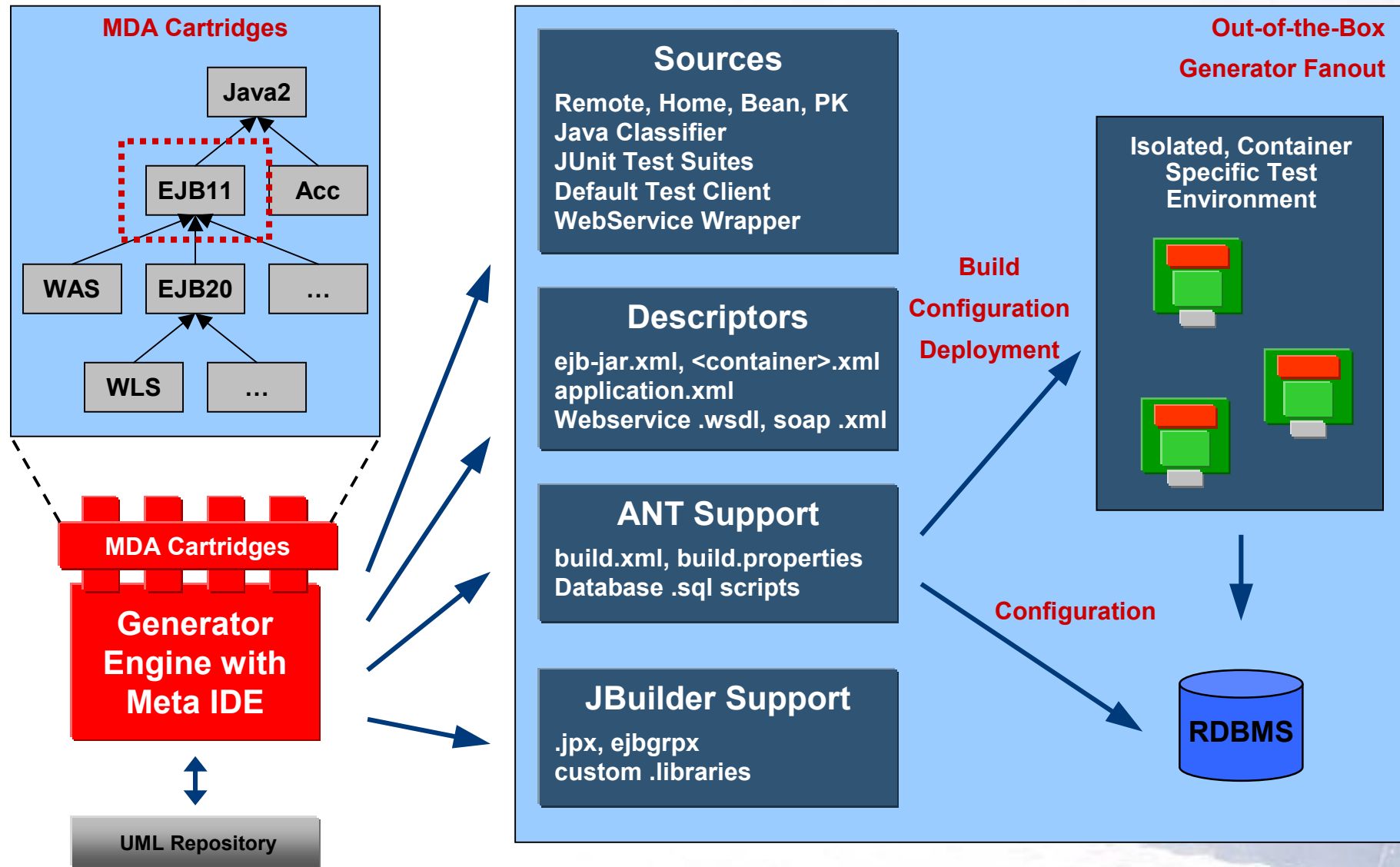
CARAT
UML profile



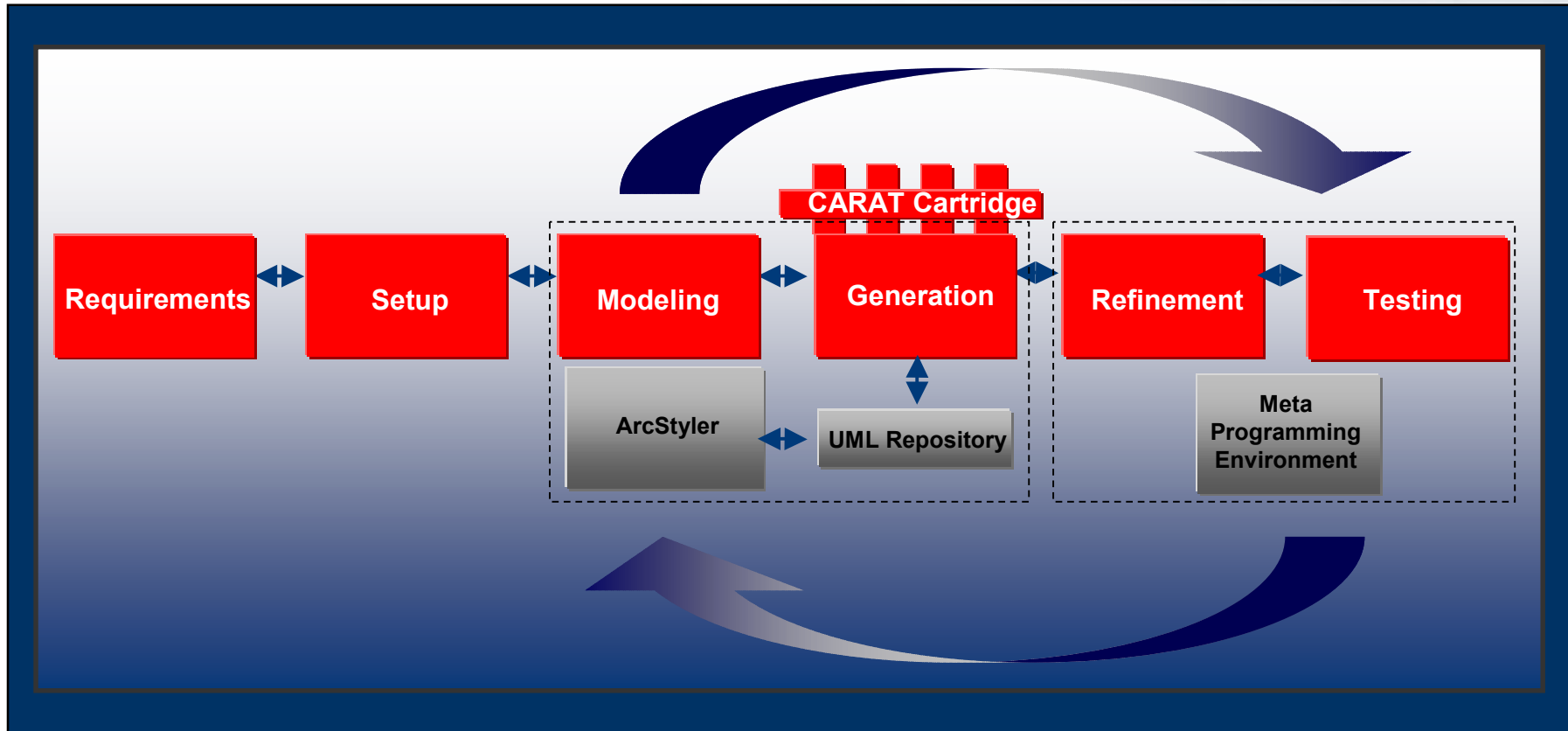
MDA Cartridge Hierarchy



J2EE Fanout



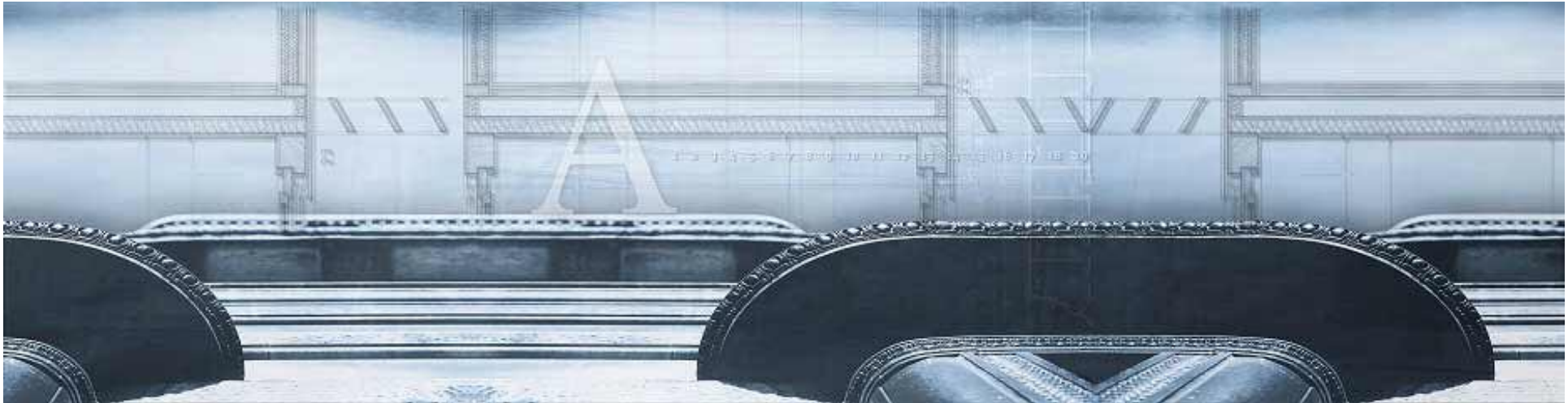
Cartridge Development Process



- ◆ Reaching the goal of increased ROI
 - ▶ New Development
 - Adopt of comprehensive business modeling methods and controls remove uncertainty
 - ▶ Migration and integration
 - Model-driven generation of optimized system components automates and dramatically shortens the process
 - ▶ Consulting and project staffing
 - Develop a consistent corporate IT Architecture style, following concise standards
 - ▶ Training and design investments
 - Use a platform that allows you to reuse existing tools while automating and coordinating the entire development life cycle

To Learn More

- ◆ <http://www.io-software.com/omg>
- ◆ **MDA Concepts and Background from the CEO of the OMG.**
 - ▶ <http://www.omg.org/~soley/eac2002.ppt>
- ◆ **Technical MDA from David Frankel, Chief Consulting Arch. at IONA**
 - ▶ http://www.omg.org/mda/seminar/david_frankel_presentation.htm
- ◆ **Diverse MDA Seminar Presentations on applied MDA**
 - ▶ <http://www.omg.org/mda/presentations.htm>
- ◆ **OMG White Paper on MDA (by iO)**
 - ▶ <http://cgi.omg.org/cgi-bin/doc?ormsc/02-01-04.pdf>
- ◆ **First book on applied MDA and MDA tools**
 - ▶ <http://www.ConvergentArchitecture.com>



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**Model Driven Architecture
for the Enterprise**

<http://www.ArcStyler.com/>

June, 2002

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