

EM/OS am 9.11.2009 im AKOO

Architektur des EM/OS-Systems MDSD-Werkzeugkette und Laufzeitsystem

Andreas Leue
Sphenon GmbH, Hamburg

Sphenon

Inhalt

Sphenon

Warum überhaupt Model Driven Solutions?

EM/OS – Architektur & Innovationen

Live Demo



Sphenon: Geschichte

2010 EM/OS 3.0 (Complete Executable Models)

2008 Release EM/OS 2.0

(incl. SirFace 3.0, SWT)

2007 Konsolidierung Desktop-GUI,
100% Java, Processor, Tooling, Cleanup)

2006 Release SirFace 2.0

(OoGenerator, State/DB etc.)

2005 Release SirFace 1.0

(ehemals VUI, mit Java OoGenerator)

2002 - Hypovereinsbank (Generator), HLG (VUI, Generator),

2007 Rekord AG (VUI), Skymaster (EM/OS 1.0),
Bosch Versicherungsportal (EM/OS 2.0)

2000 Onsecure Versicherungsportal

(vollautomatische Produktion, Architektur)

1999 Gründung Sphenon GmbH

1998 Generator in perl, XML, mächtige Templatesprache

1997 POET WebFactory “Database Publishing” & CMS

1995 Prototyp “Medienneutrale Oberfläche”

1994 Architektur-Studie “Cyberspace Architecture Project”

1993 Template-basierter Generator in C

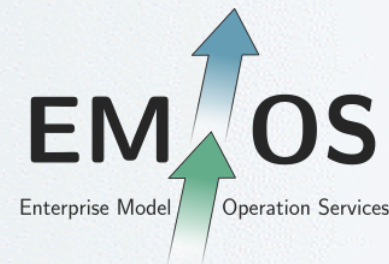
Sphenon: Leistung



- EM/OS Enterprise Model Operation Services
- Maßgeschneiderte individuelle Applikationen
- Modelle für IT und Unternehmen (UML, BPM)
- Beratung, Schulung

Partner - Netzwerk

Produkt



Open Source



Sphenon

Inhalt

Sphenon

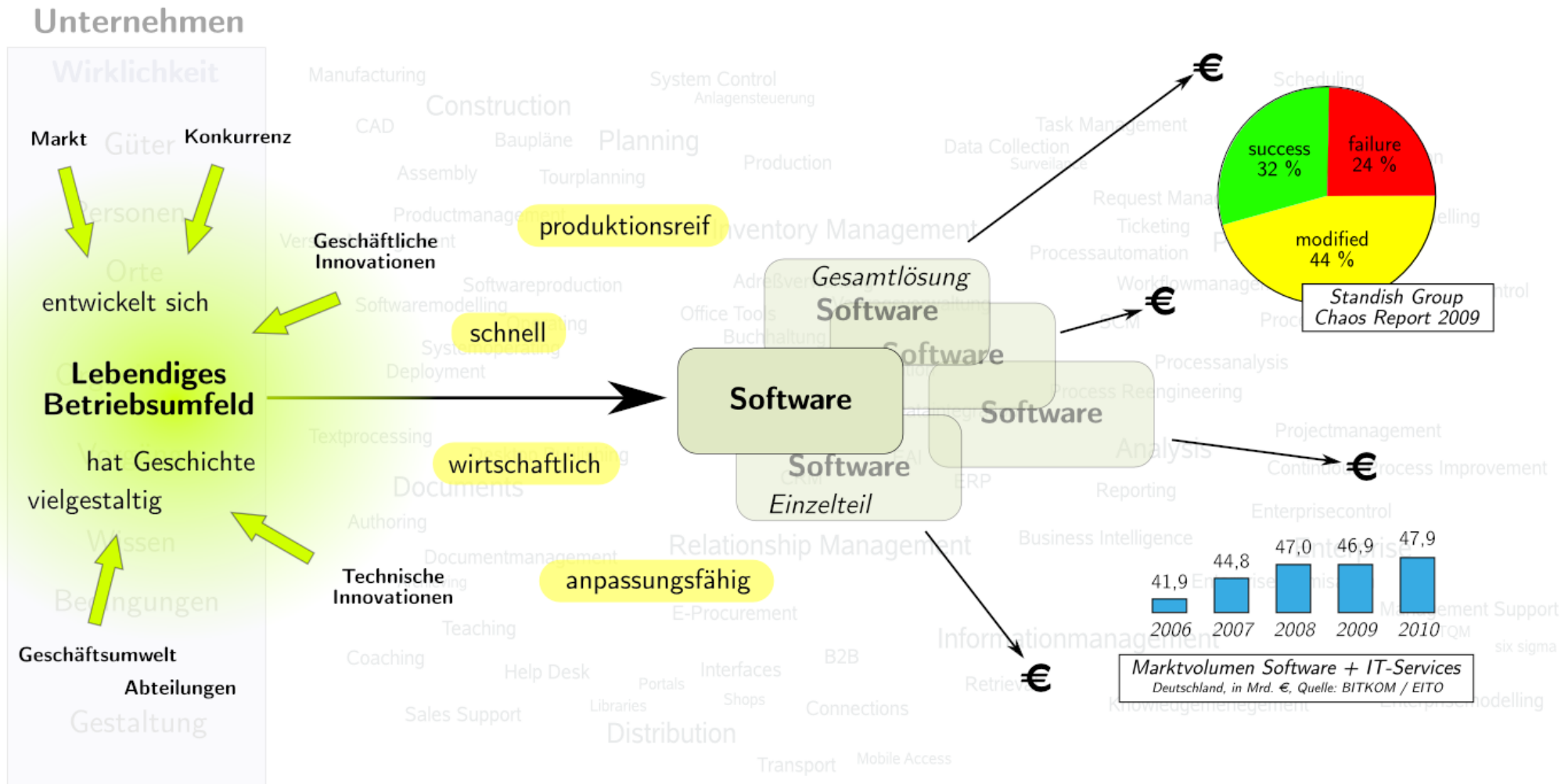
Warum überhaupt Model Driven?

EM/OS – Architektur & Innovationen

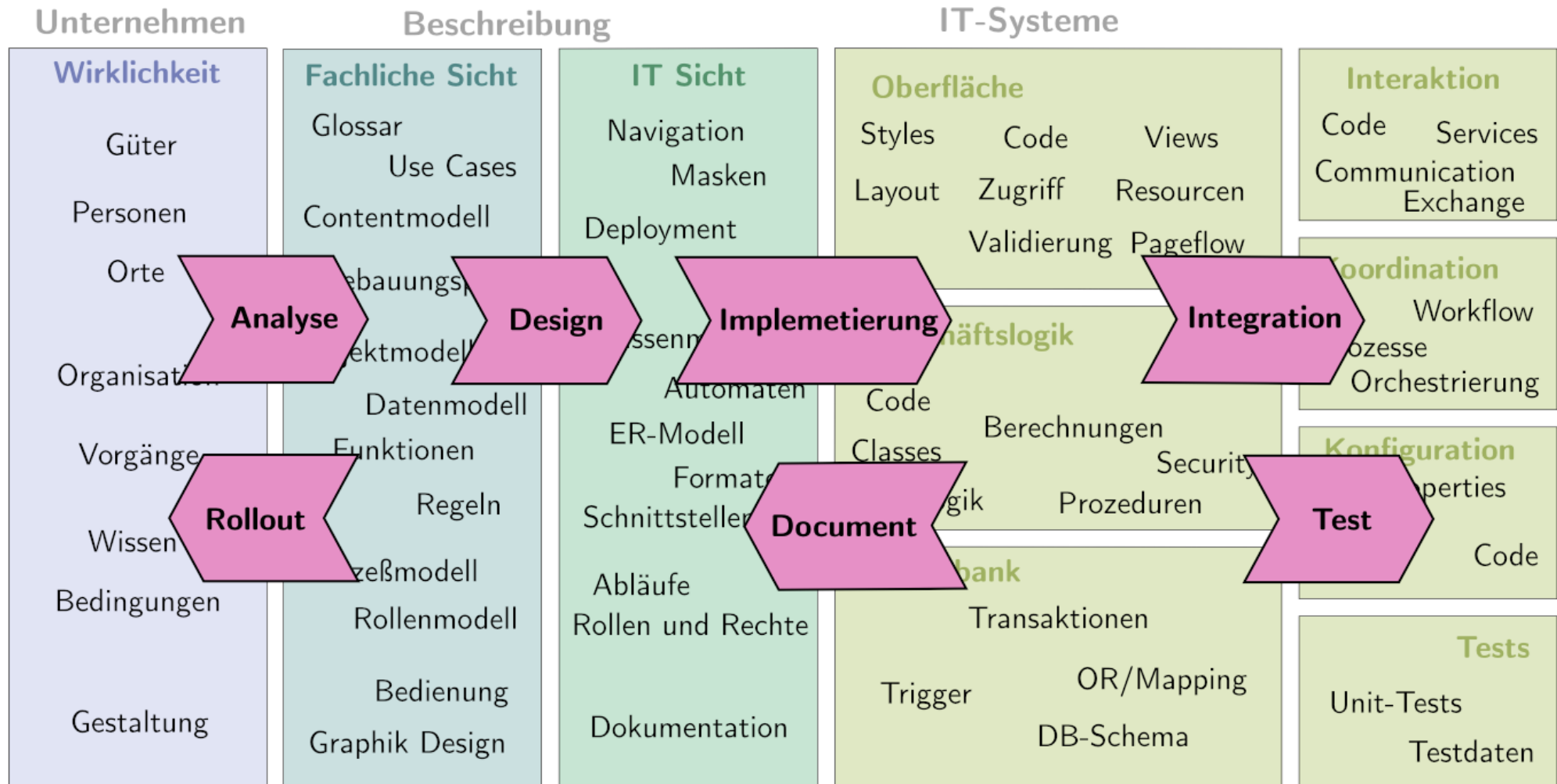
Live Demo



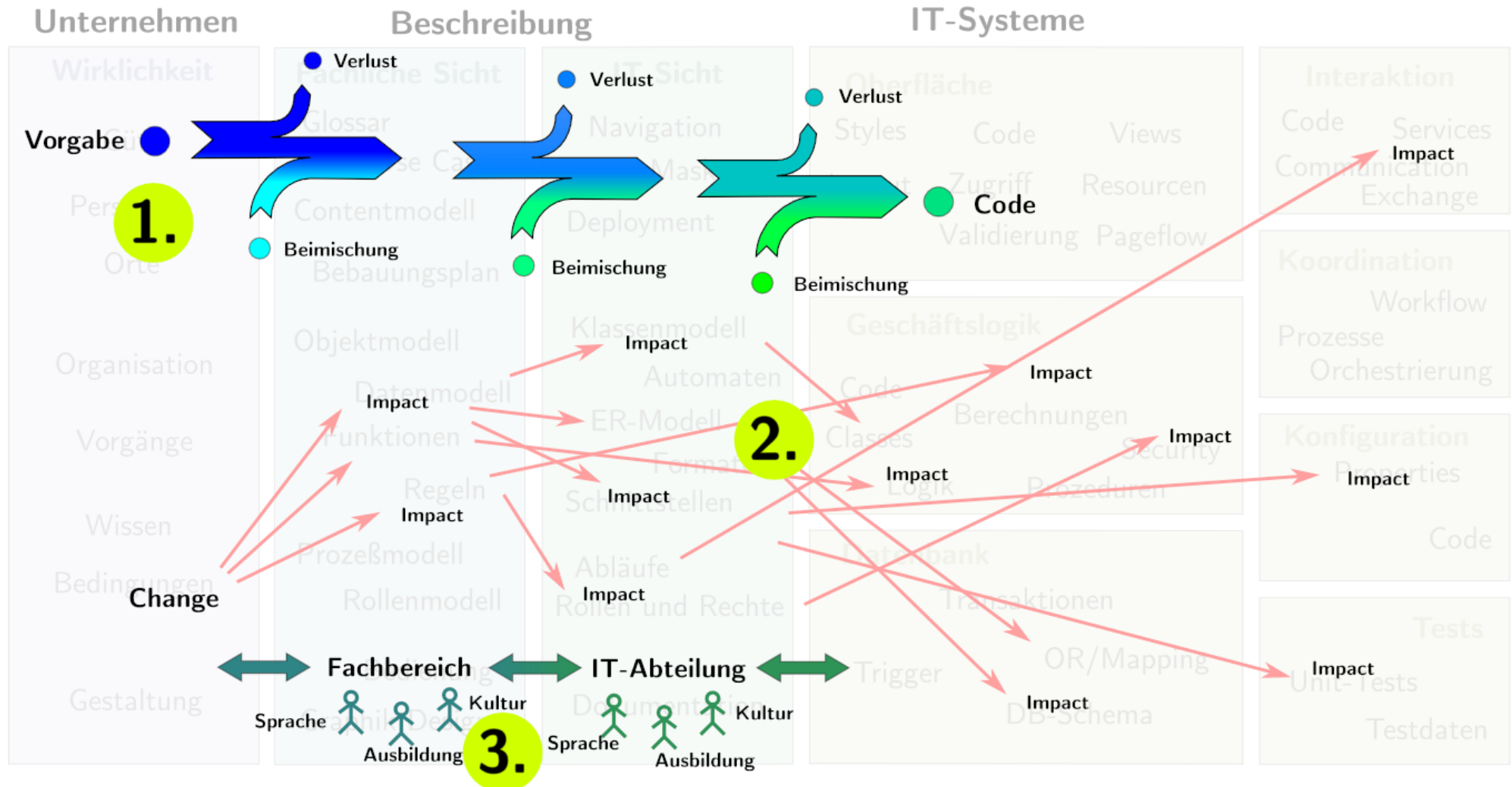
Formbare Software für lebendige Unternehmen



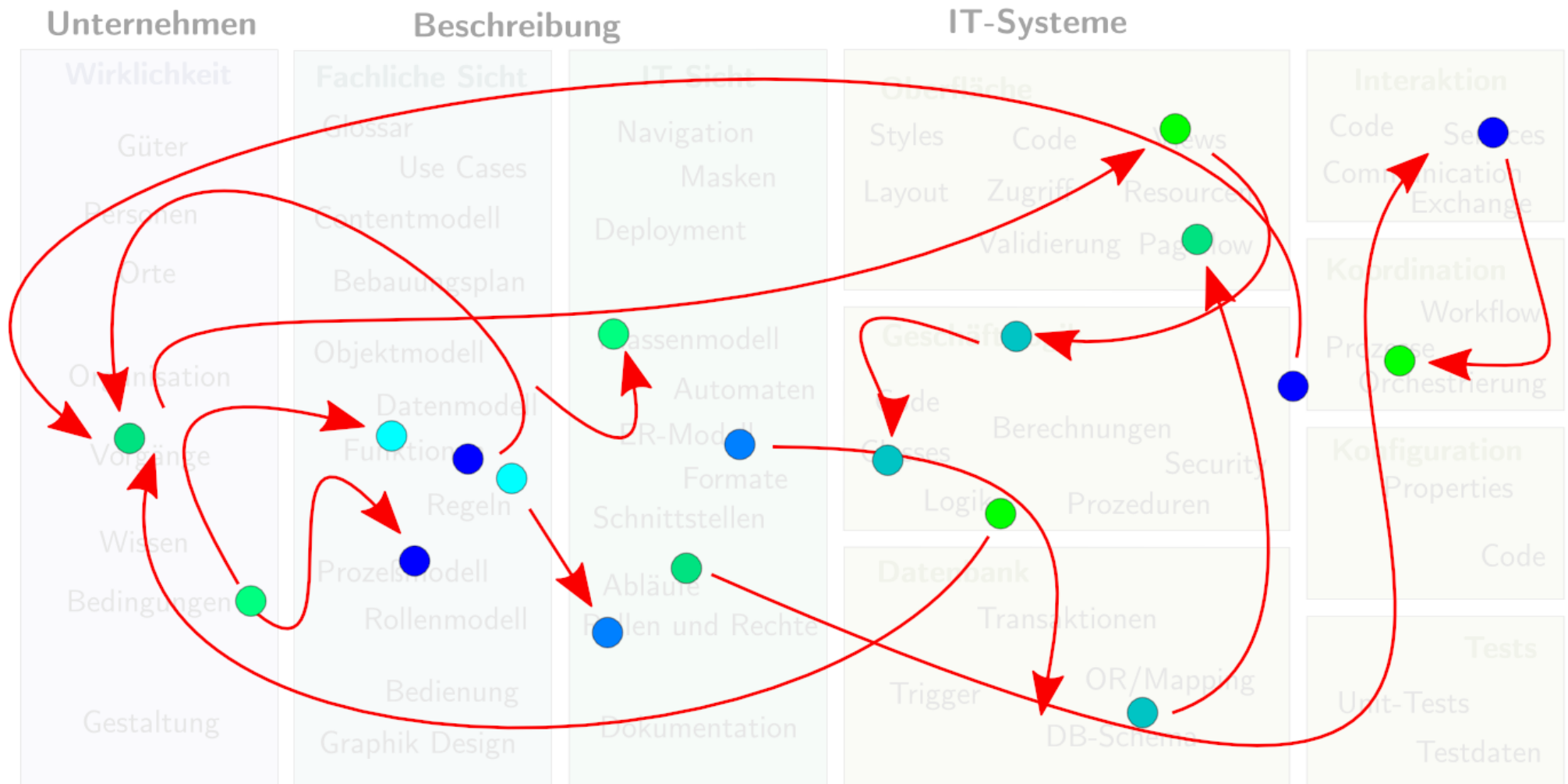
Artefakte & Herstellung



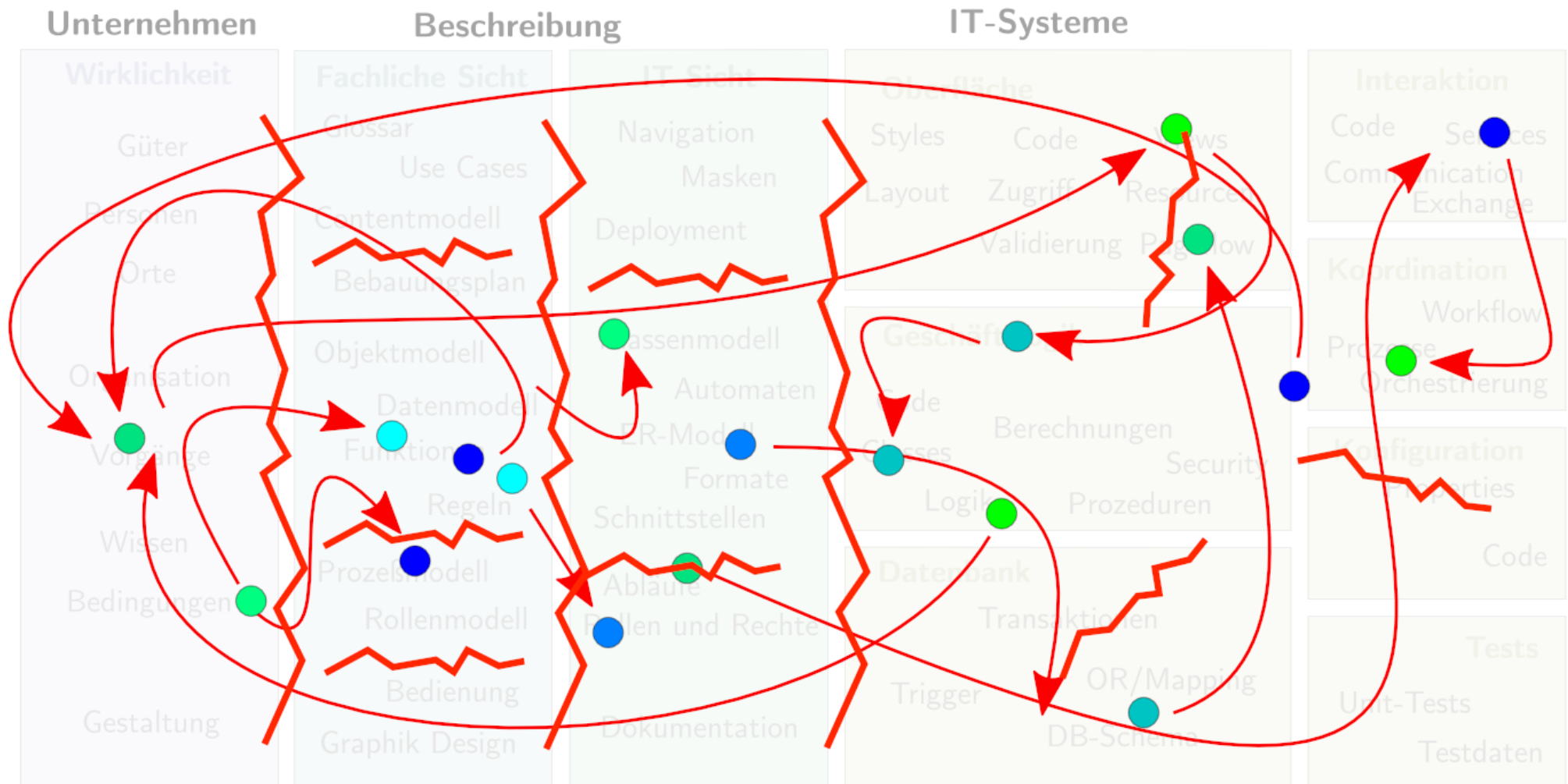
Software-Manufaktur



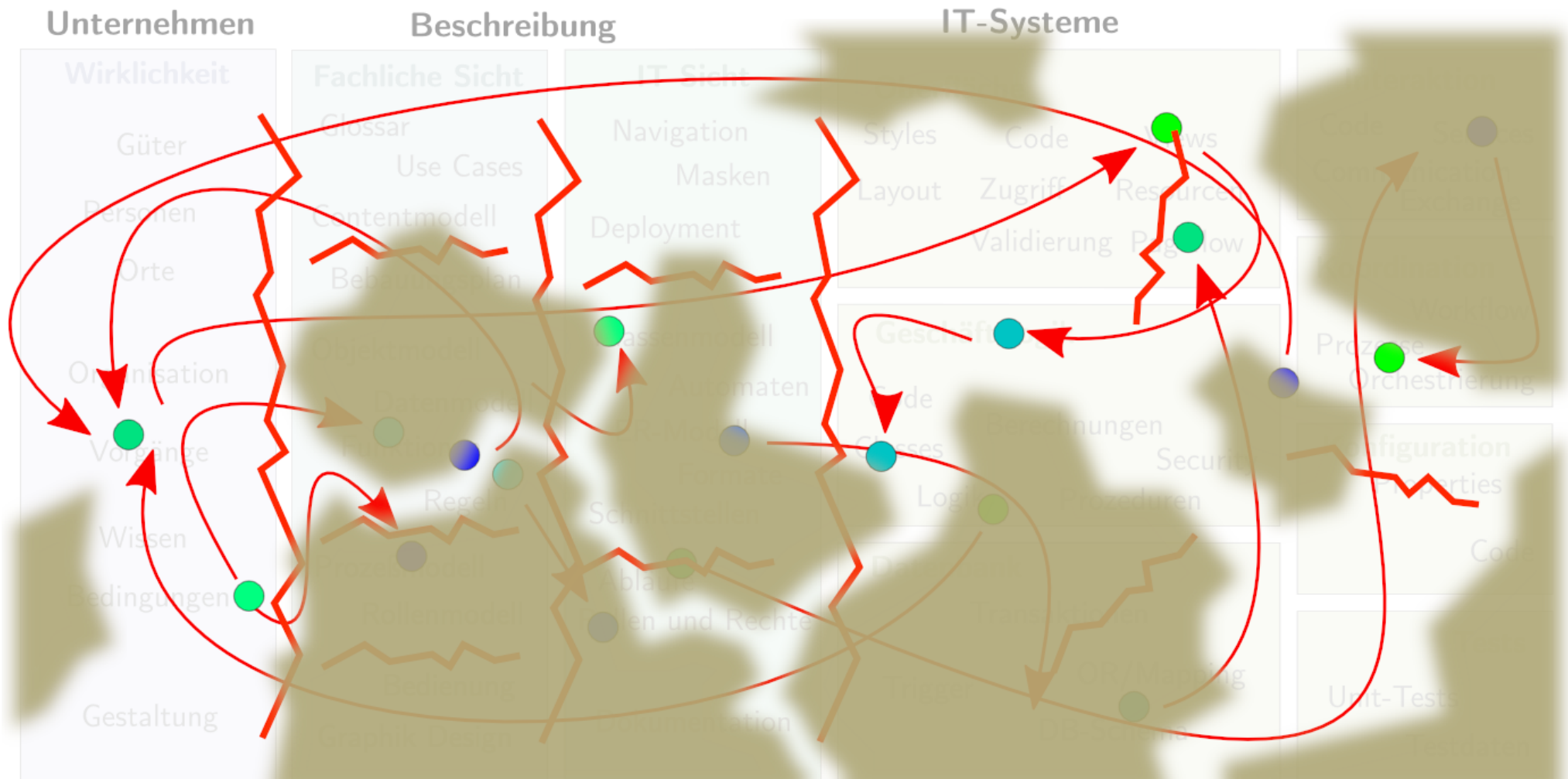
Chaos



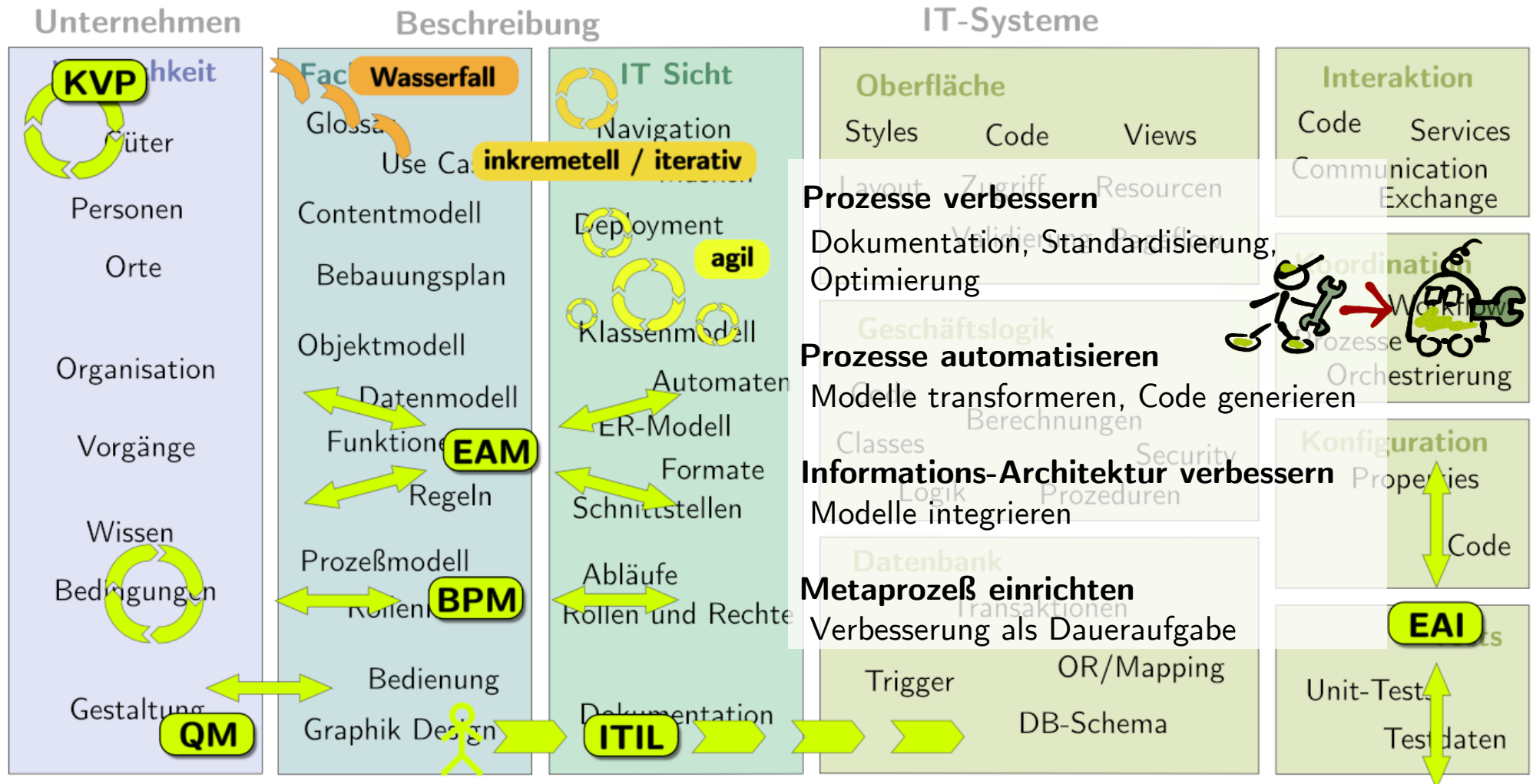
Chaos, Brüche



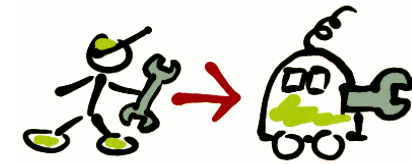
Chaos, Brüche, Erosion



Gegenmaßnahmen



CASE...



Unternehmen

Wirklichkeit

CASE
1990

Personen

Orte

Organisation

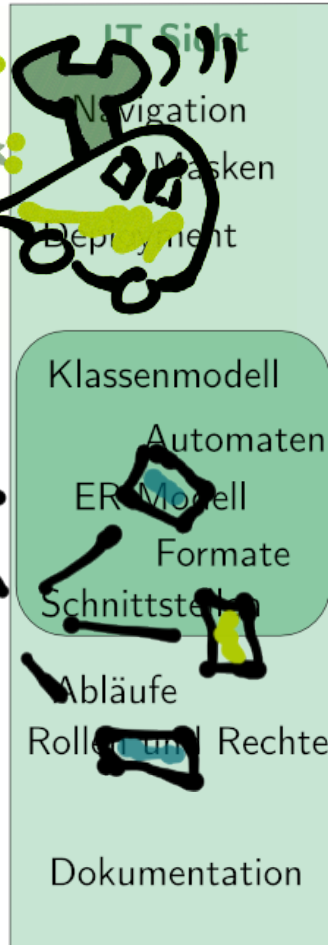
Vorgänge

Wissen

Bedingungen

Gestaltung

Beschreibung



IT-Systeme

Oberfläche

Styles Code Views
Layout Zugriff Ressourcen
Validierung Pageflow

Geschäftslogik

Code
Classes
Logik
Berechnungen
Security
Prozeduren

Datenbank

Transaktionen
Trigger
OR/Mapping
DB-Schema

Interaktion

Code Services
Communication
Exchange

Koordination

Workflow
Prozesse
Orchestrierung

Konfiguration

Properties
Code

Tests

Unit-Tests
Testdaten

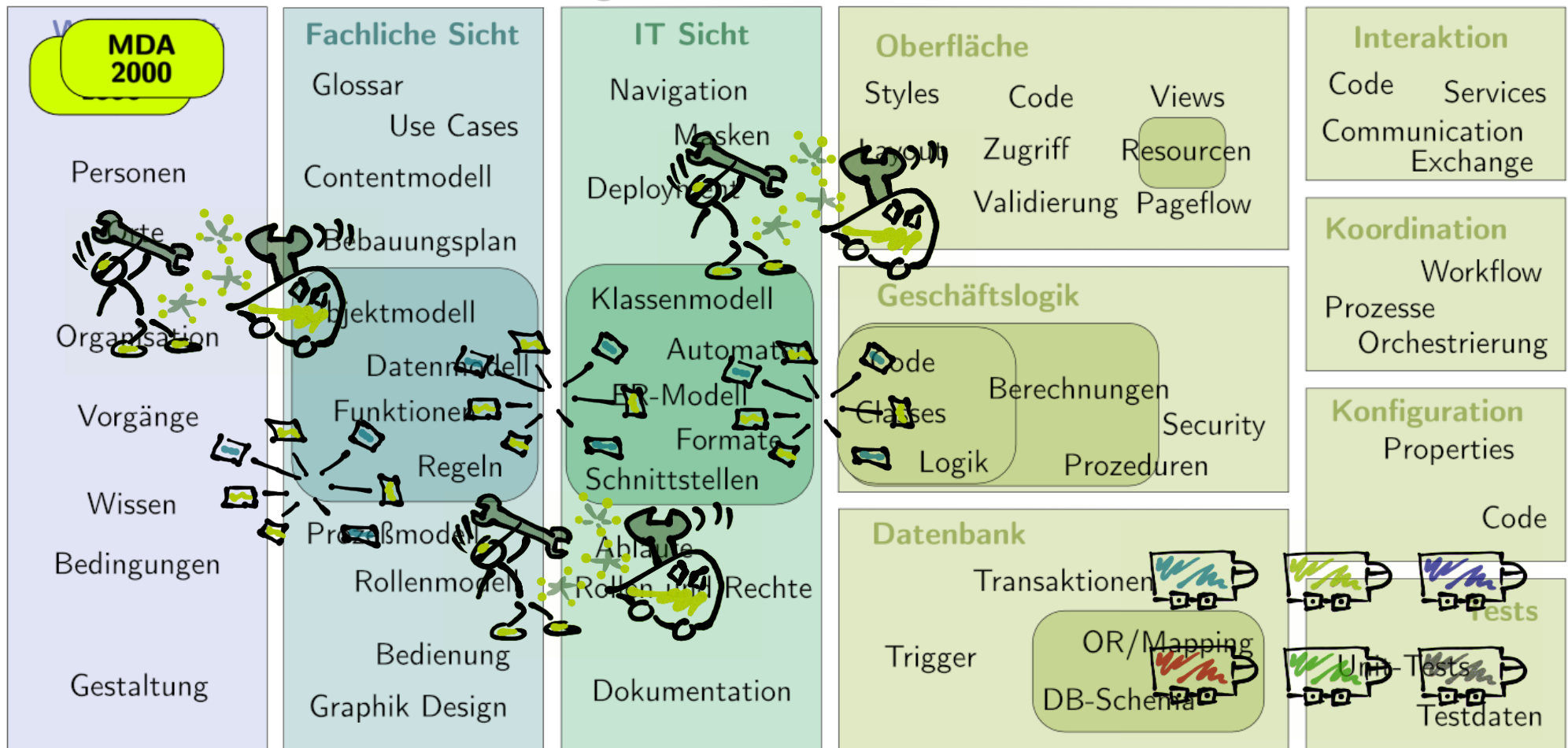
...MDA...



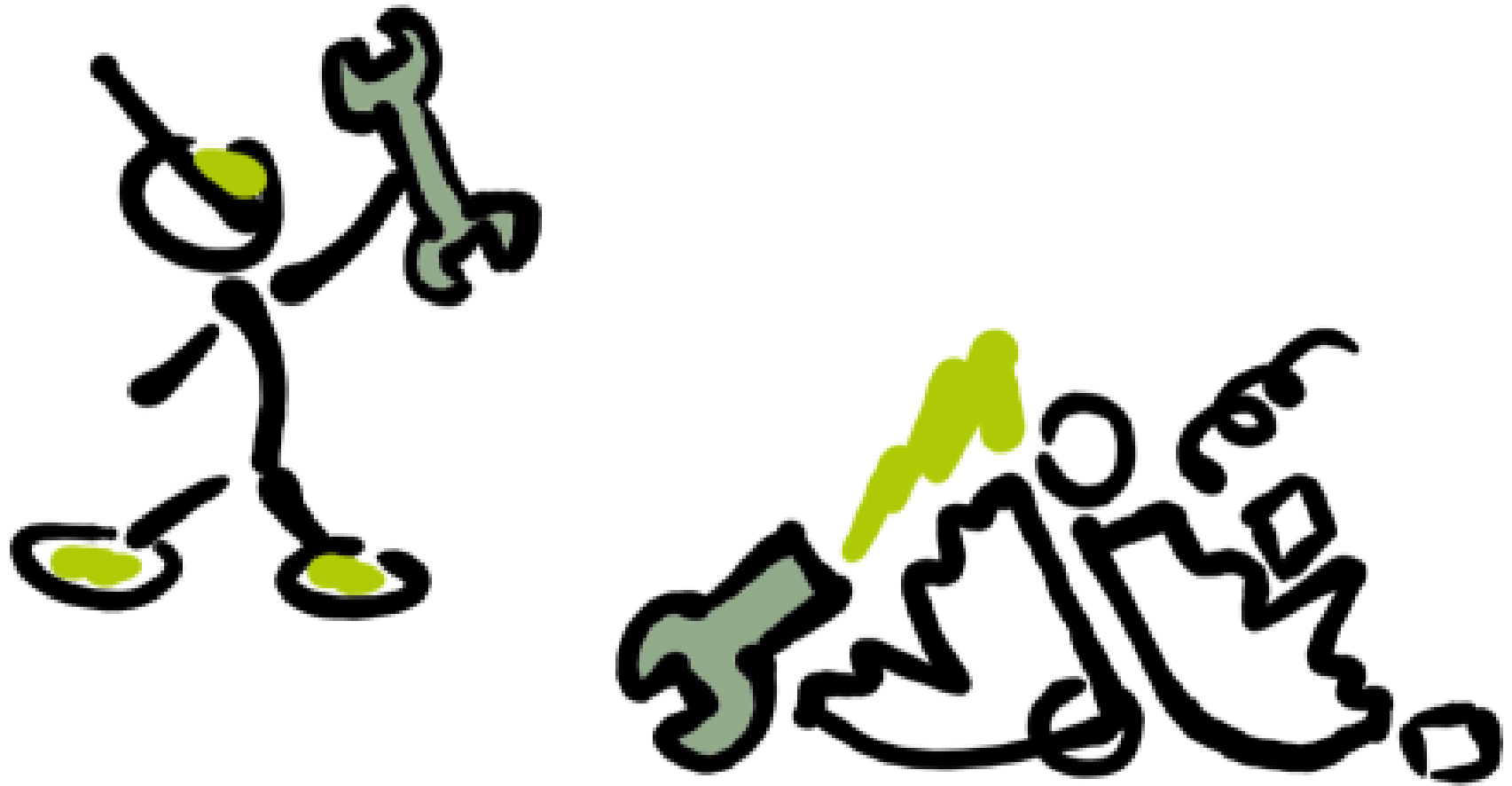
Unternehmen

Beschreibung

IT-Systeme



...in die Tonne?



Sphenon

Inhalt

Sphenon

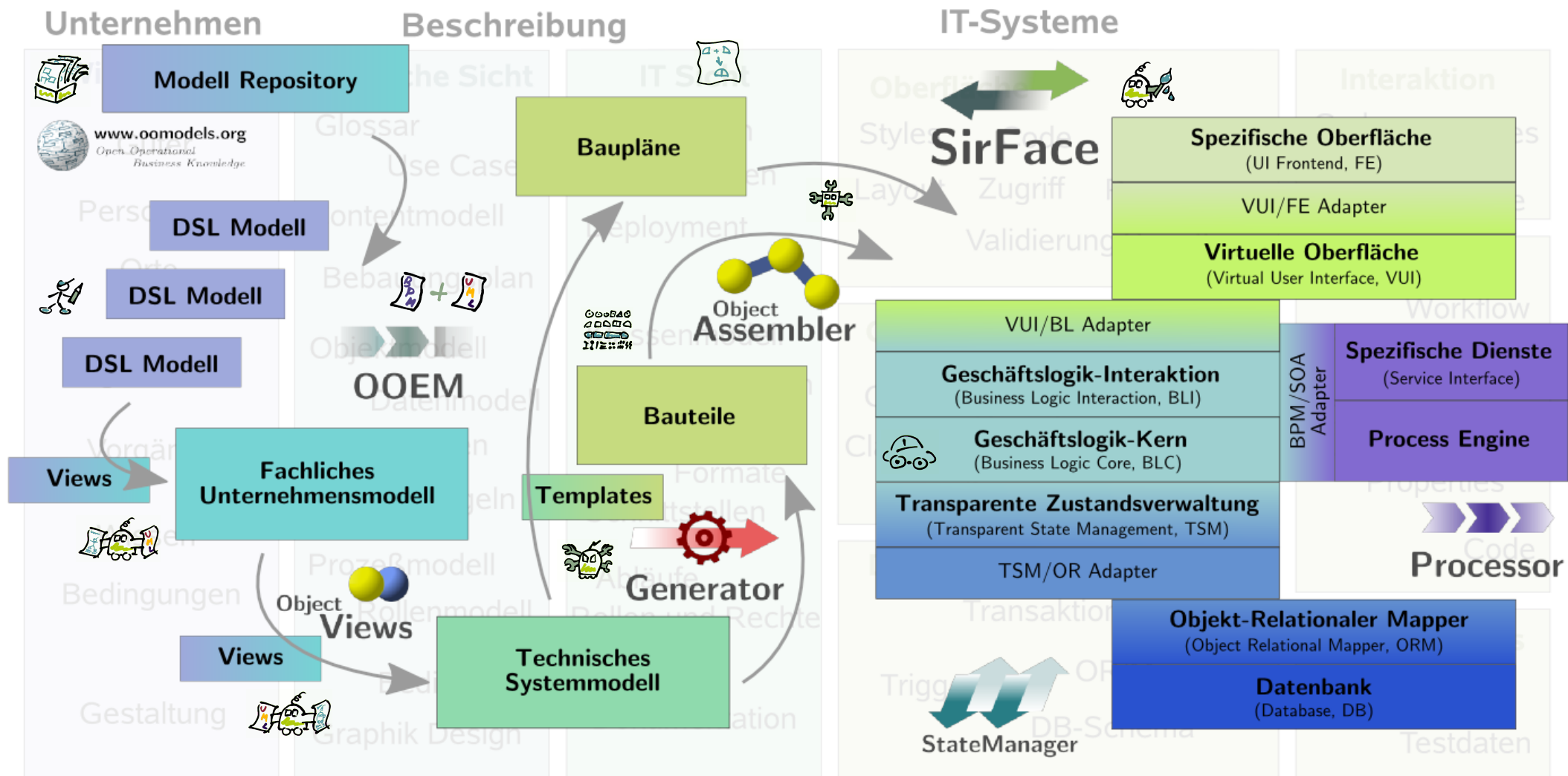
Warum überhaupt Model Driven?

EM/OS – Architektur & Innovationen

Live Demo

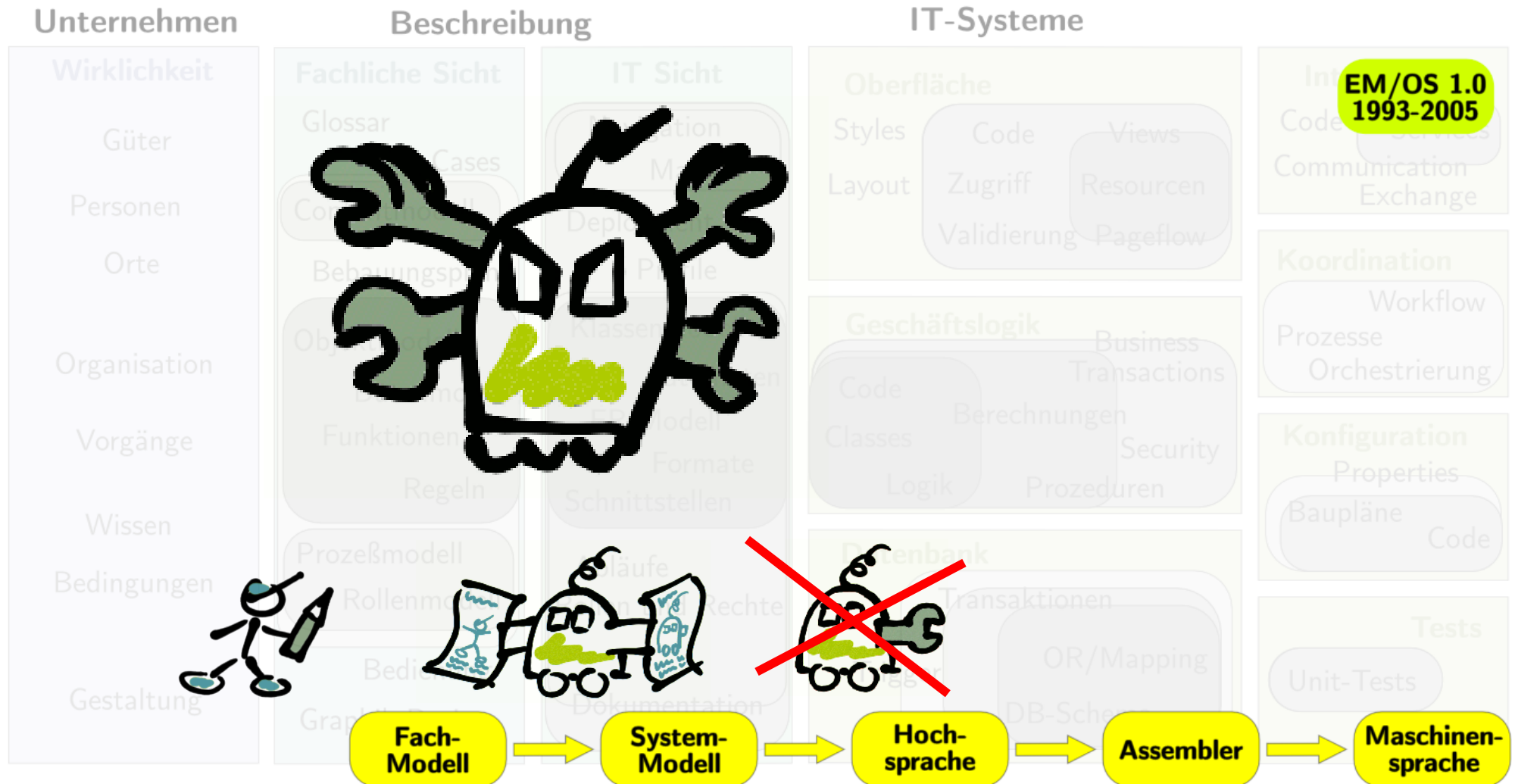


EM/OS Architektur



Hochmoderner Generator in 4. Generation

www.oogenerator.org (open source)



Hochmoderner Generator in 4. Generation

www.oogenerator.org (open source)

UML-2.0-uml-1.0 *- coding: utf-8; *-

Attributes

> ...

Attributes(Object current) ...

⋮ «V(a: || "P/Attributes") { » ...

protected <type> <|| "P/Name" ⌘ MC/LCU/JAVID ▶;

public <type> get▶ || "P/Name" ▶ ();

⋮ «}/V» ...

/ < > ...



Fach-
Modell

System-
Modell

Hoch-
sprache

Assembler

Maschinen-
sprache

EM/OS 1.0
1993-2005

Communication
Exchange

Coordination
Workflow
Orchestrierung

Configuration
Properties

Baupläne
Code

Tests
Unit-Tests

Hochmoderner Generator in 4. Generation

www.oogenerator.org (open source)



G-2.0-uml-1.0 -*- coding: utf-8; -*-

< Attributes

> ...

☐ ☒ Attributes(Object current) ☐...

⋮ «V(a: || "P/Attributes") { »...

protected <type> ◀◀ "P/Name" ⚡ MC/LCU/JAVID ▶▶;

public <type> get◀◀ "P/Name" ▶▶ ();

⋮ «}/V»...

☐ /☒ ☐...

«V(a: || "P/Attributes") { »

- Sehr gute Lesbarkeit durch Unicode
- Modular wählbare Syntax
- OO Templates
- Modularisierbarkeit schafft Ordnung
- Extrem performant, dynamische Übersetzung
- Voller Java Sprachumfang verfügbar
- Zahlreiche, konfigurierbare Syntaxelemente
- Sehr reife Software



Hochmoderner Generator in 4. Generation

www.oogenerator.org (open source)



G-2.0-uml-1.0 -*- coding: utf-8; -*-

< Attributes

> ...

□ ☒ Attributes(Object current) □...

⋮ «∀(a:| "P/Attributes") {»...

protected <type> ◀| "P/Name" %MC/LCU/JAVID▶;

public <type> get◀| "P/Name"▶ ();

⋮ «}/∀»...

□ /☒ □...

<% for(Object a:...

```
public class MyClass<X, Y<X>> {
    public X getX() { ...
```

- Sehr gute Lesbarkeit durch Unicode
- **Modular wählbare Syntax**
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G-2.0-uml-1.0 -*- coding: utf-8; -*-

< Attributes

> ...

□ ☒ Attributes(Object current) □...

⋮ «∀(a:⋮"P/Attributes") {»...

protected <type> ◀⋮"P/Name"⌘MC/LCU/JAVID▶;

public <type> get◀⋮"P/Name"▶ ();

⋮ «}/∀»...

□ /☒ □...

G-2.0-uml_state_machine...

□ base ClassTemplate □...

□ ☒ Features(String myarg) □...

□ → super.Features(myarg) □...

- Sehr gute Lesbarkeit durch Unicode
- Modular wählbare Syntax
- **OO Templates**
- Modularisierbarkeit schafft Ordnung
- Extrem performant, dynamische Übersetzung
- Voller Java Sprachumfang verfügbar
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www.oogenerator.org (open source)



G-2.0-uml-1.0 -*- coding: utf-8; -*-

< Attributes

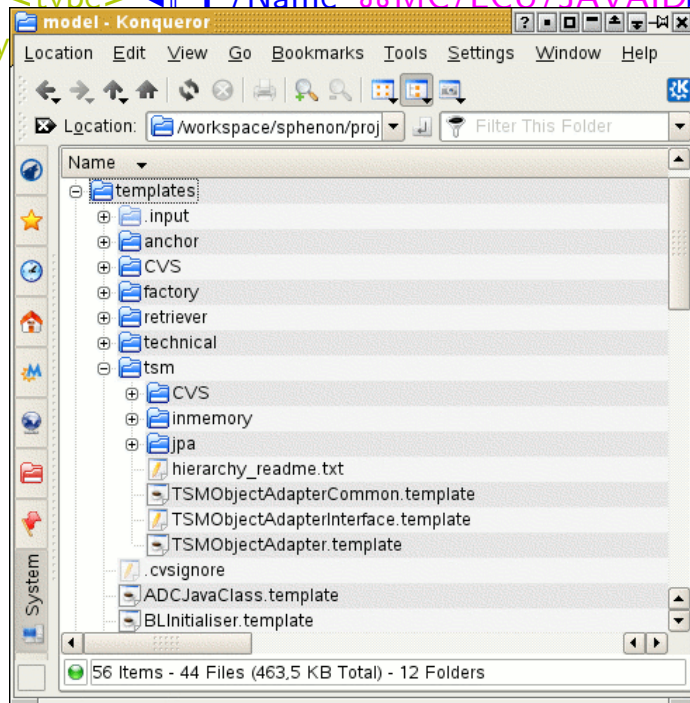
> ...

☐ ☒ Attributes(Object current) <...>

: «V(a: || "P/Attributes") { }»...

protected <type> <|| "P/Name" & MC/LCU/JAVID>;
public <ty

☐ /<input checked="" type="checkbox"/> <...>



- Sehr gute Lesbarkeit durch Unicode
- Modular wählbare Syntax
- OO Templates
- **Modularisierbarkeit schafft Ordnung**
- Extrem performant, dynamische <bersetzung
- Voller Java Sprachumfang verfügbar
- Zahlreiche, konfigurierbare Syntaxelemente
- Sehr reife Software

Hochmoderner Generator in 4. Generation

www.oogenerator.org (open source)



G-2.0-uml-1.0 -*- coding: utf-8; -*-

↳ Attributes

↳ ...

☐ ☒ Attributes(Object current) ☐...

⋮ «V(a:⋮"P/Attributes")»...

protected <type> ◀⋮"P/Name"⌘MC/LCU/JAVID▶;

public <type> get◀⋮"P/Name"▶ ();

⋮ «}/V»...

☐ /☒ ☐...

- Sehr gute Lesbarkeit durch Unicode
- Modular wählbare Syntax
- OO Templates
- Modularisierbarkeit schafft Ordnung
- **Extrem performant, dynamische Übersetzung**
- **Voller Java Sprachumfang verfügbar**
- Zahlreiche, konfigurierbare Syntaxelemente
- Sehr reife Software



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⋮ «∀(a:⋮"P/Attributes") {»...

protected <type> ◀⋮"P/Name"⌘MC/LCU/JAVID▶;

public <type> get◀⋮"P/Name"▶ ();

⋮ «}/∀»...

☐ /☒ ☐...

◁mytag(myarg,...)▷

- Sehr gute Lesbarkeit durch Unicode
- Modular wählbare Syntax
- OO Templates
- Modularisierbarkeit schafft Ordnung
- Extrem performant, dynamische Übersetzung
- Voller Java Sprachumfang verfügbar
- **Zahlreiche, konfigurierbare Syntaxelemente**
- Sehr reife Software



Hochmoderner Generator in 4. Generation

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G-2.0-uml-1.0 -*- coding: utf-8; -*-

< Attributes

> ...

☒ Attributes(Object current) ▢...

⋮ «V(a:| "P/Attributes") { »...

protected <type> ◀| "P/Name" ⌘ MC/LCU/JAVAID ▶;

public <type> get◀| "P/Name" ▶ ();

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☐ /☒ ▢...

- Sehr gute Lesbarkeit durch Unicode
- Modular wählbare Syntax
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- Zahlreiche, konfigurierbare Syntaxelemente
- **Sehr reife Software**

- C 1.0 1993...
- C++ 1996...
- perl 1998..., 1.0 2000
- Java 1.0 2002, 2.0 2005, 3.0 2008



Mehrstufige dynamische Modelltransformation

Unternehmen

Beschreibung

IT-Systeme

Wirklichkeit

Fachliche Sicht

IT Sicht

Oberfläche

EM/OS 1.0
1993-2005

Güter

Glossar

Navigation

Styles

Code

Views

Code

Communication

Personen

Use Cases

Masken

Layout

Zugriff

Regeln

Workflow

Orte

Contentmodel

Deployment

Lieferung

Benutzung

Business

Configuration

Organisation

Abbildung

Klassifizierung

Classifikation

Classifikation

Classifikation

Classifikation

Vorgänge

Funktion

Format

Classifikation

Classifikation

Classifikation

Classifikation

Wissen

Regeln

Schnittstellen

Classifikation

Classifikation

Classifikation

Classifikation

Bedingungen

Prozeßmodell

Rechte

Classifikation

Classifikation

Classifikation

Classifikation

Gestaltung

Rollen

Rechte

Classifikation

Classifikation

Classifikation

Classifikation



Fach-
Modell

System-
Modell

Hoch-
sprache

Assembler

Maschinen-
sprache

Mehrstufige dynamische Modelltransformation

- Völlige Entkopplung fachlich & technisch

- effektiv wieder-verwendbare Modelle

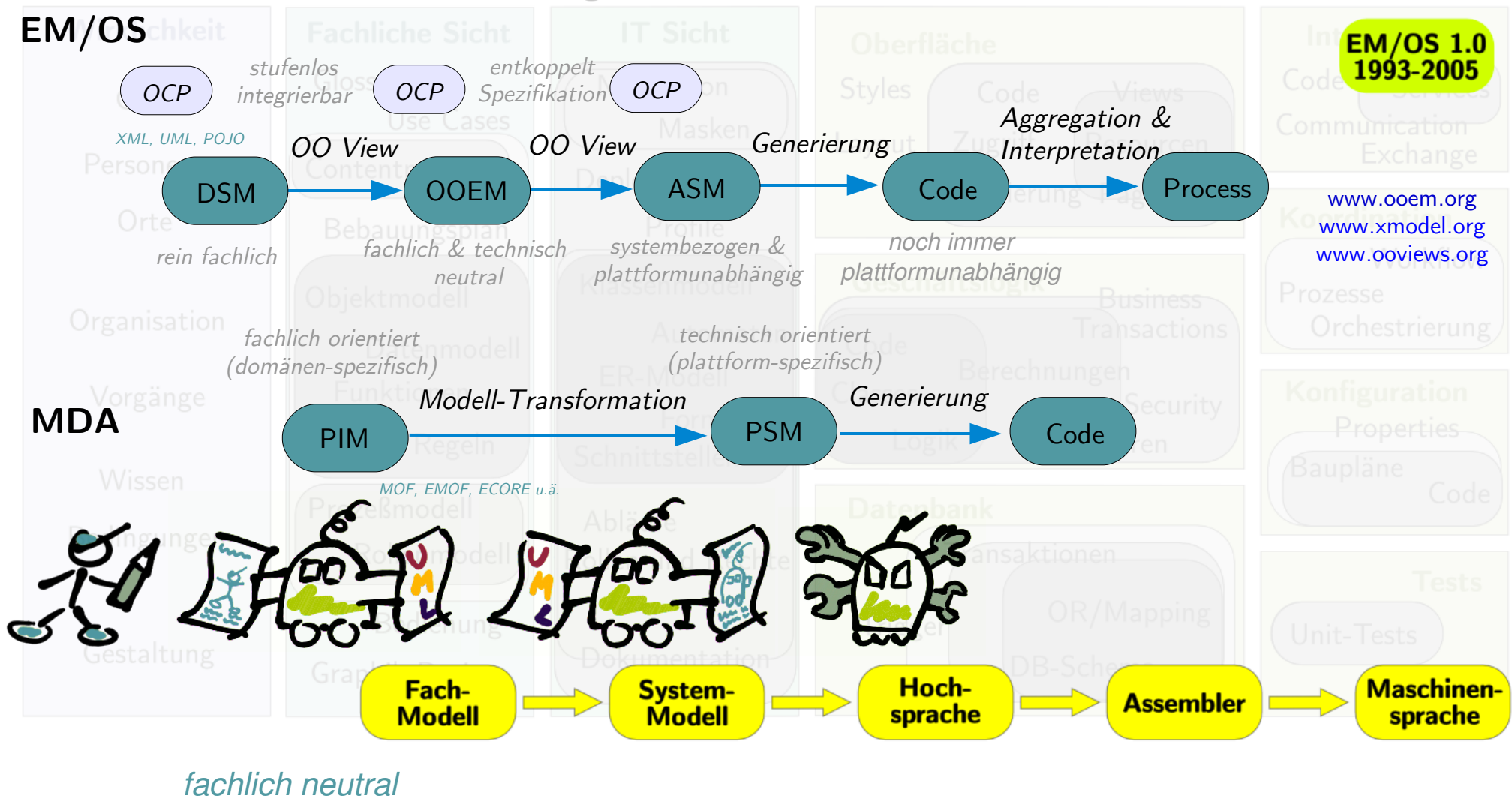
- handliche Optionen für DSLs u.a.: DSM & OCP-Macros

- <berschaubare Themen auf jeder Stufe

Unternehmen

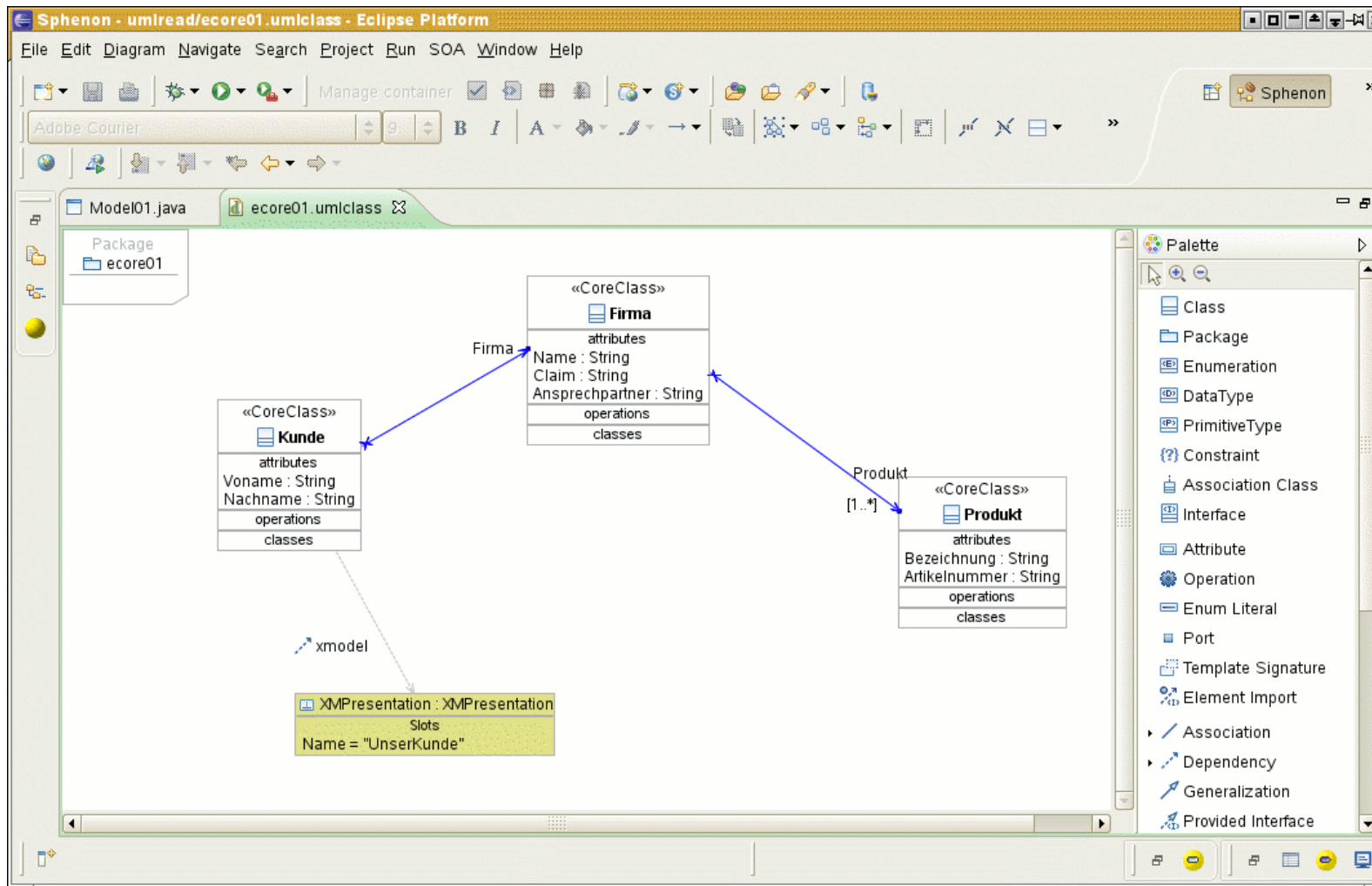
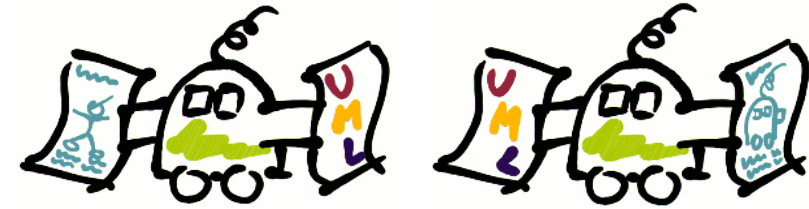
Beschreibung

EM/OS



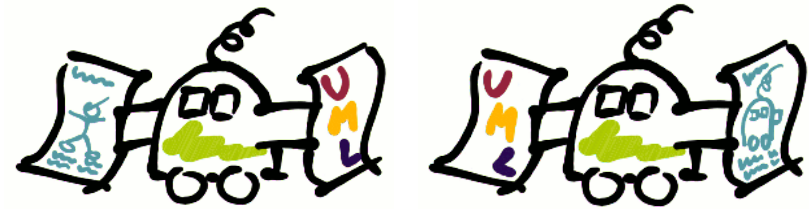
Mehrstufige dynamische Modelltransformation

Eclipse UML 2 Editor



Mehrstufige dynamische Modelltransformation

OOEM 2.0 (XML, mit OCP gelesen)



```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
```

```
<Class>
```

```
  <StereotypeModelImport>org.uml.stereotypes.*</StereotypeModelImport>
```

```
  <ModelImport>org.oomodels.business.foundation.entities.*</ModelImport>
```

```
  <Name>Person</Name>
```

```
  <Base Parent="Entity"/>
```

```
  <Stereotype>CoreClass</Stereotype>
```

```
  <Attribute Name="Name" Type="NameOfPerson"/>
```

```
  <Attribute Name="Sex" Type="Sex"/>
```

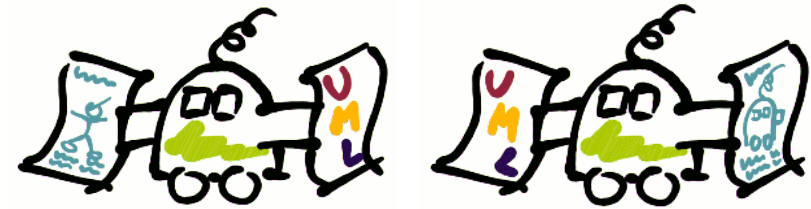
```
  <Attribute Name="Birthday" Type="Date"/>
```

```
</Class>
```



Mehrstufige dynamische Modelltransformation

WIML – Wiki Modeling Language



```
<wiml>
```

```
* Person CoreClass
```

```
> Entity
```

```
A human person
```

```
** Name NameOfPerson
```

```
** Sex Sex
```

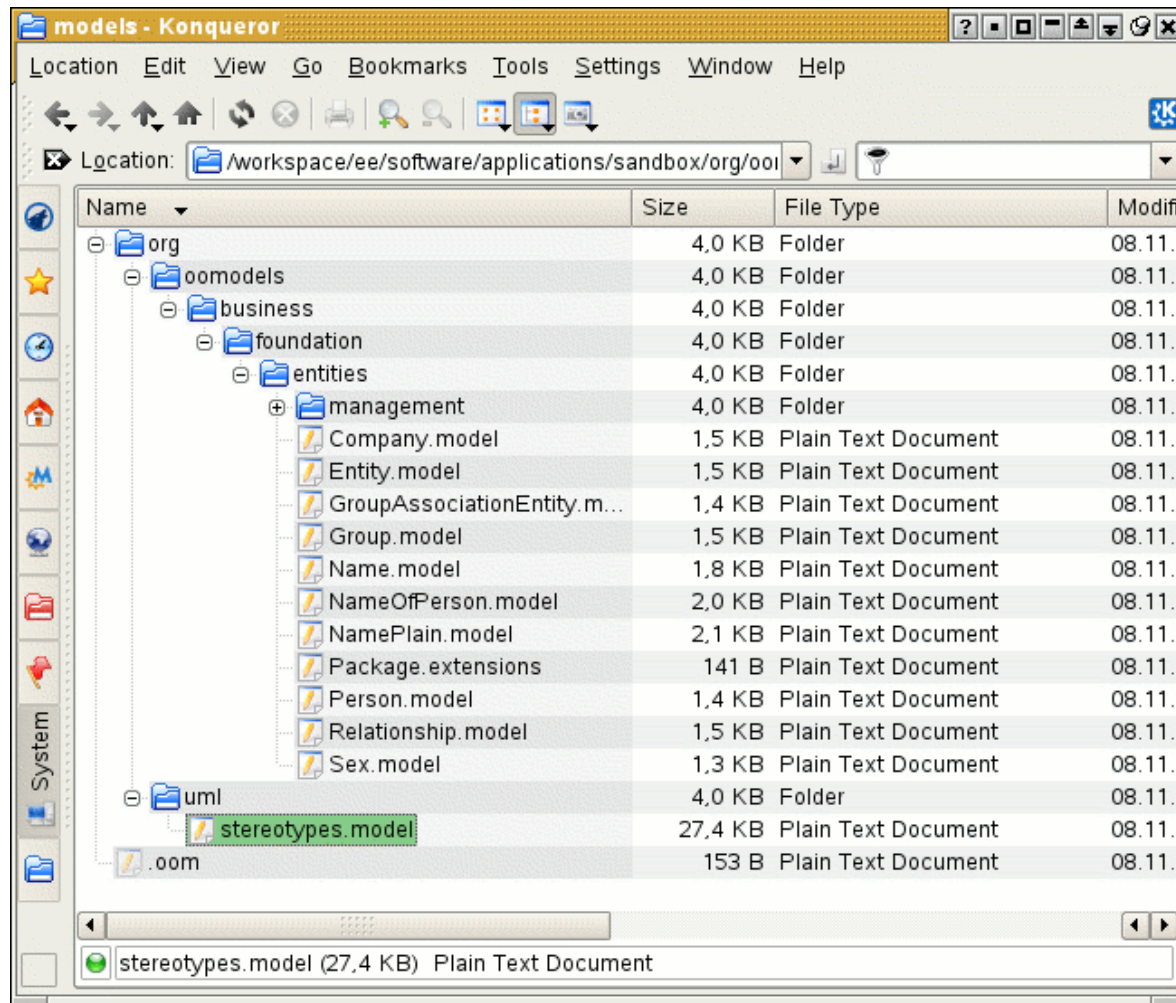
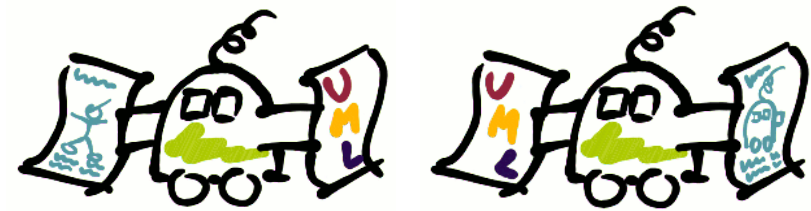
```
** Birthday Date
```

```
</wiml>
```



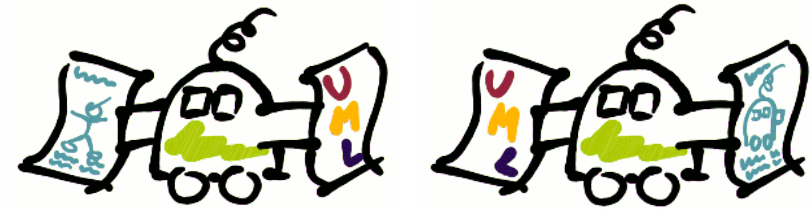
Mehrstufige dynamische Modelltransformation

Teil-Modell-Artefakte im Dateisystem



Mehrstufige dynamische Modelltransformation

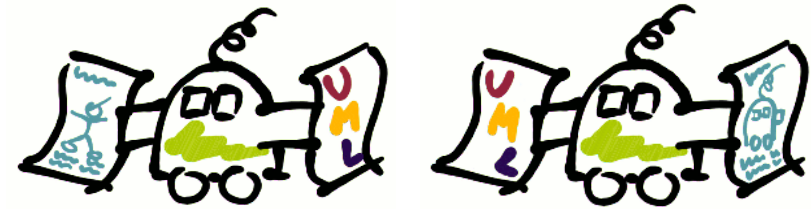
M2M mit OO View mit OCP



```
<?xml version="1.0" encoding="UTF-8"?>
<UMLClass
  SIGNATURE="UMLClass Source, ADCModelOptions Options ..."
  POLYMORPHIC="Class" DEFINE="..." xmlns="...">
  <ModellImport
    FOREACH="m_import : ::*'Source/ModellImports'"
    EXPRESSION="true">m_import</ModellImport>
  <ArtefactOrigin><Track>
    <o1 OID="Origin">com/sphenon/ad/adcore/model/coremodel/UMLClass_Interface</o1>
    <o2 EXPRESSION="true">Source.getPath(context)</o2>
  </Track></ArtefactOrigin>
  <Base FOREACH="base : Source.getBases(context)"
    IF="var ifc = ::[base]'//XModel/Generalization/Interface!; ..."
    >
    <Parent EXPRESSION="true">jspp: prefix + ::[base]'//Property/Parent/Id'</Parent>
  </Base>
  <Name OID="Name" EXPRESSION="true">prefix + Source.getName(context)</Name>
  <Attributes...
```


Mehrstufige dynamische Modelltransformation

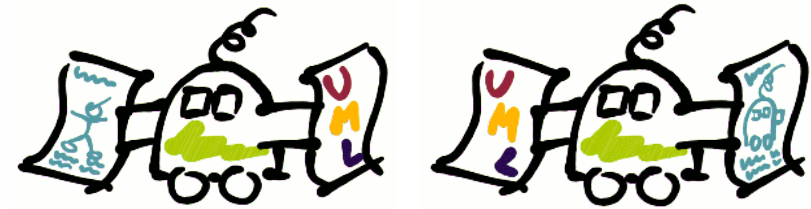
Vermischte Modelle



```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<Package CLASS="Aggregate::com/sphenon/tools/emfumloov/UMLPackage_EMF">
  <Resource>/DATA/work/eclipse34_ws/umlread/ecore01.uml</Resource>
</Package>
```

Mehrstufige dynamische Modelltransformation

OOEM View auf Ecore UML

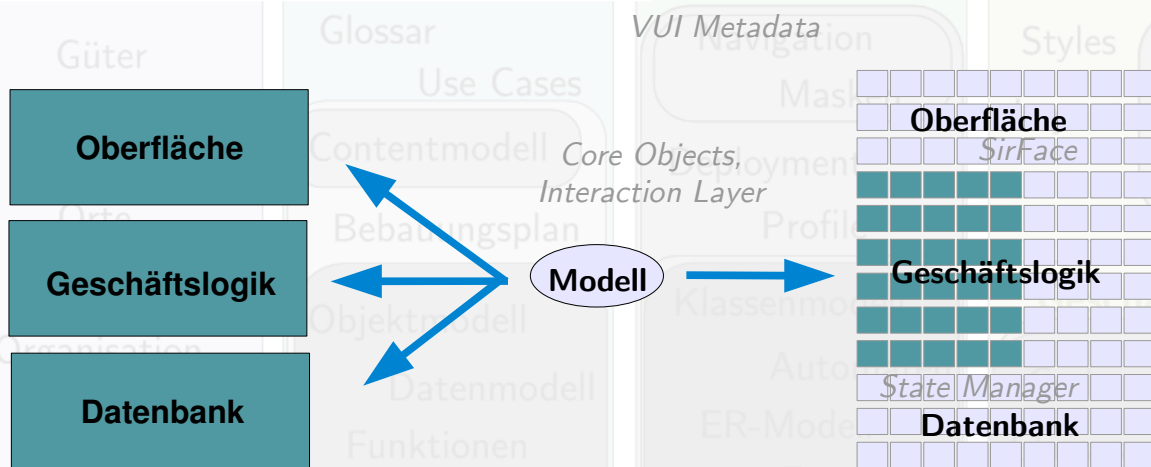


```
<?xml version="1.0" encoding="UTF-8"?>
<UMLPackage
  SIGNATURE="String Resource"
  CLASS="UMLPackage"
  DEFINE="pkg : new Packages.com.sphenon.tools.emfumloov.ECoreAccessor(context, Resource).getPackage(context)"
  xmlns="http://xmlns.sphenon.com/com/sphenon/ad/adcore/model" xmlns:code="code">
  <InternalModelImport>org.uml.stereotypes.*</InternalModelImport>
  <ExternalImport>java.lang.String</ExternalImport>
  <Name EXPRESSION="true">pkg.getName(context)</Name>
  <ArtefactOrigin><Track><o1 EXPRESSION="true">'EMF Resource ' + Resource</o1></Track></ArtefactOrigin>
  <Classes>
    <Class FOREACH="cls : pkg.getClasses(context)">
      <Stereotype FOREACH="sttp : cls.getStereotypes(context)" EXPRESSION="true">sttp.getName(context)</Stereotype>
      <Name EXPRESSION="true">cls.getName(context)</Name>
      <Attributes>
        <Attribute FOREACH="att : cls.getAttributes(context)">
          <Name EXPRESSION="true">att.getName(context)</Name>
          <Type EXPRESSION="true">att.getType(context)</Type>
          <Extensions>
            <XModelExtension FOREACH="xme : att.getXModelExtensions(context)"
              FACTORY="GenericFactory_XModelElement">
              <Class EXPRESSION="true">xme.getClassifiers(context).get(0).getName(context)</Class>
              <Properties EXPRESSION="value">xme.getProperties(context)</Properties>
            </XModelExtension>
```


Roboter baut keinen Monolithen, sondern Bauteile und Baupläne

- Handgefertigte Bauteile koexistieren problemlos mit generierten Bauteilen und Fertigteilen
- Mannigfaltige Möglichkeiten (Baupläne, abgeleitete Klassen, Variantenpools, usw.)
- Von Konfektionsware zu Handarbeit mit vielen Auffangnetzen

EM/OS 1.0
1993-2005



- Trennung von Themen: je feiner, umso formbarer

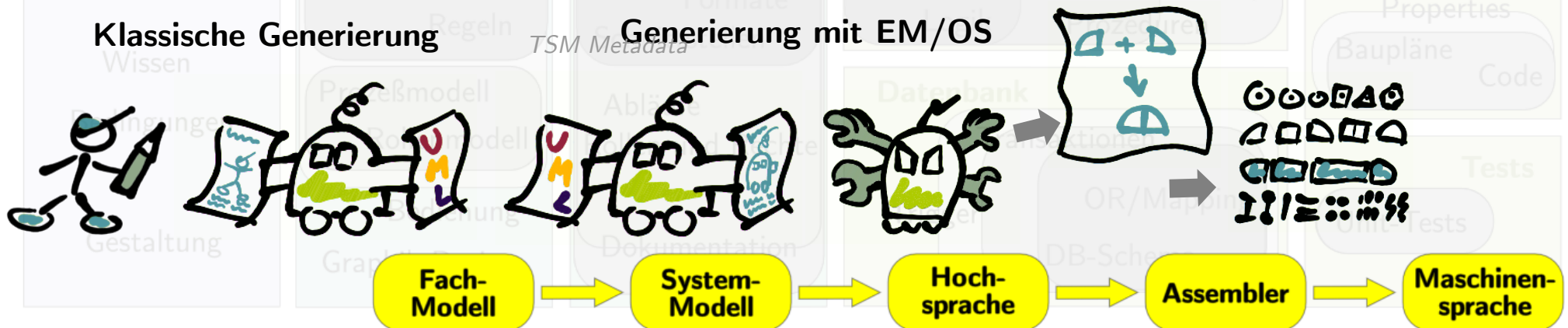
Traditional Business Layer

BIL - Business Interaction Layer

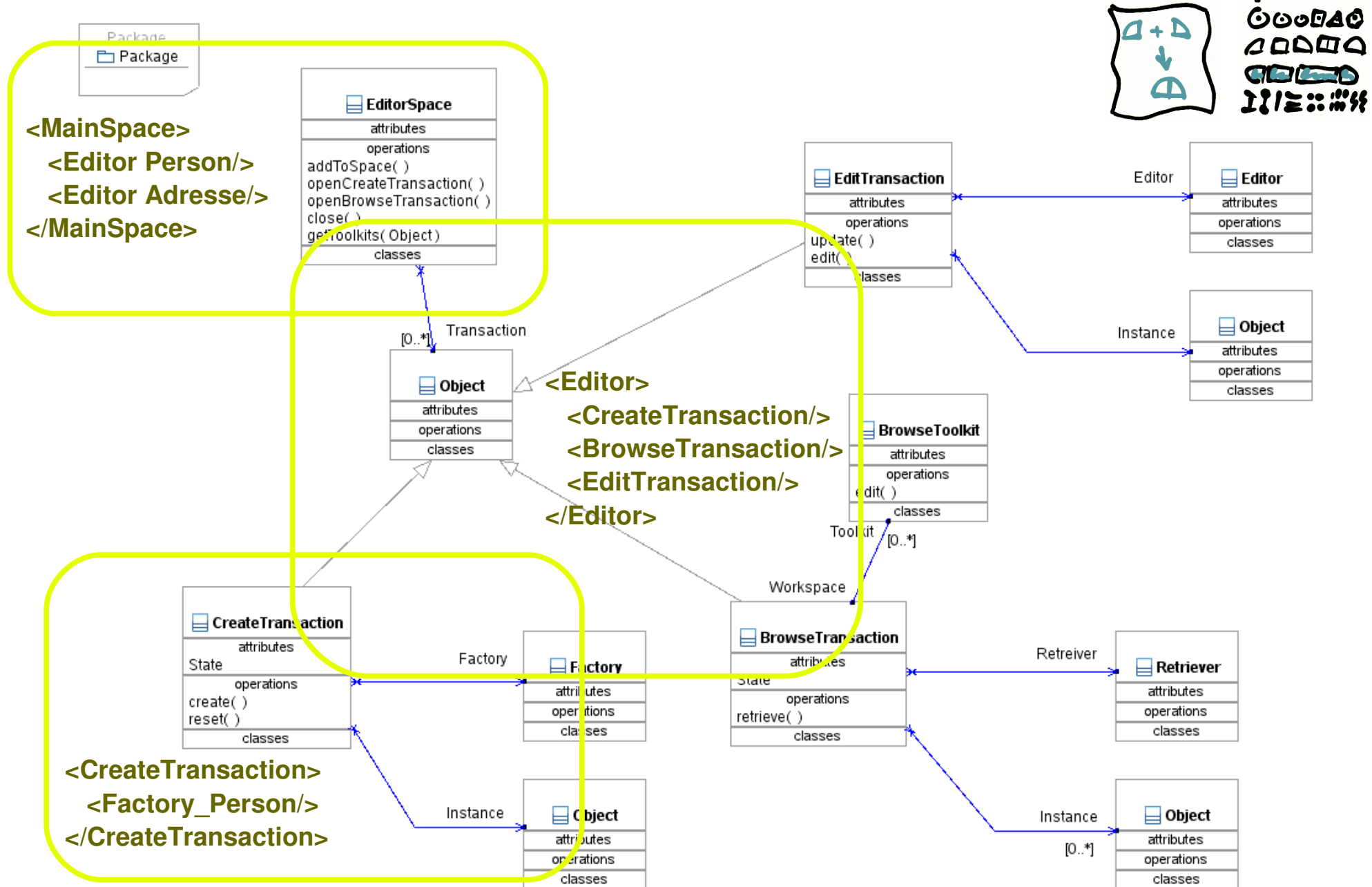
Transactions Workspaces Services Views

BCL - Business Core Layer

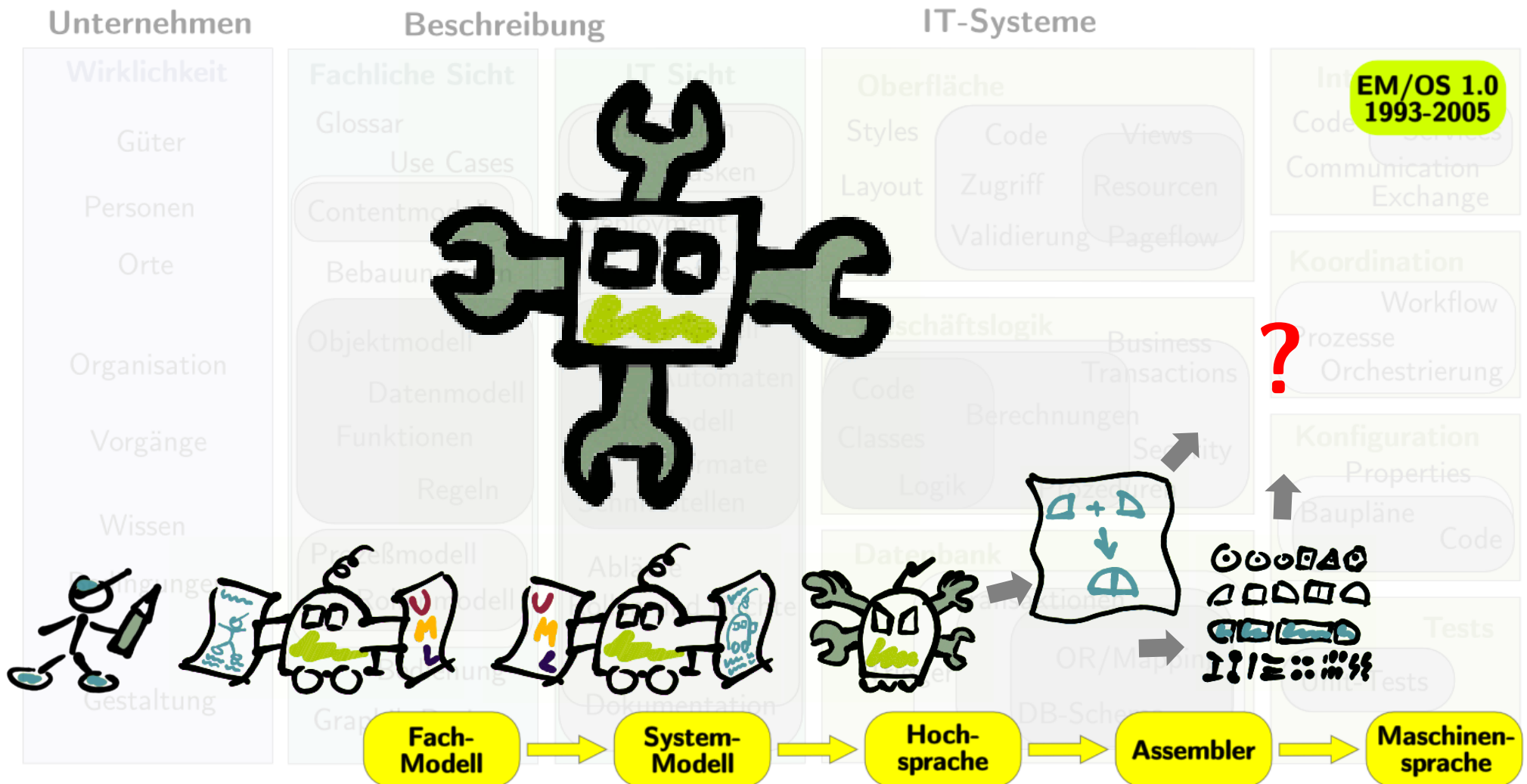
POJOs VUI & TSM Metadata Locating



Roboter baut keinen Monolithen, sondern Bauteile und Baupläne



Neuer Roboter versteht Bauanleitungen und baut Teile zusammen



Neuer Roboter versteht Bauanleitungen und baut Teile zusammen

Objektbaupläne und der Object Assembler - www.xocp.org (open source)

Unternehmen

- baut Objektaggregate aus Bauteilen anhand von Bauplänen
- ehemals: gluecode/hardcoded
- breites Anwendungsspektrum
- extrem performant (JIT Compiler)
- dynamisches Laden und Neuübersetzen
- OO Baupläne

Beschreibung

IT-Systeme

IT Sicht

```
package my.code;
class JavaClass {
    //...
}
```

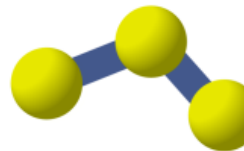
Java Source Code

```
<?xml?>
<MyAggregate>
  <!-- ... -->
</MyAggregate>
```

Object Construction Plan

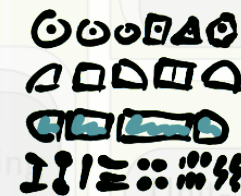
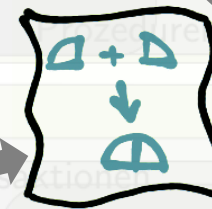
Oberfläche

Object Instance



Object Aggregate

EM/OS 1.0
1993-2005



Fach-
Modell

System-
Modell

Hoch-
sprache

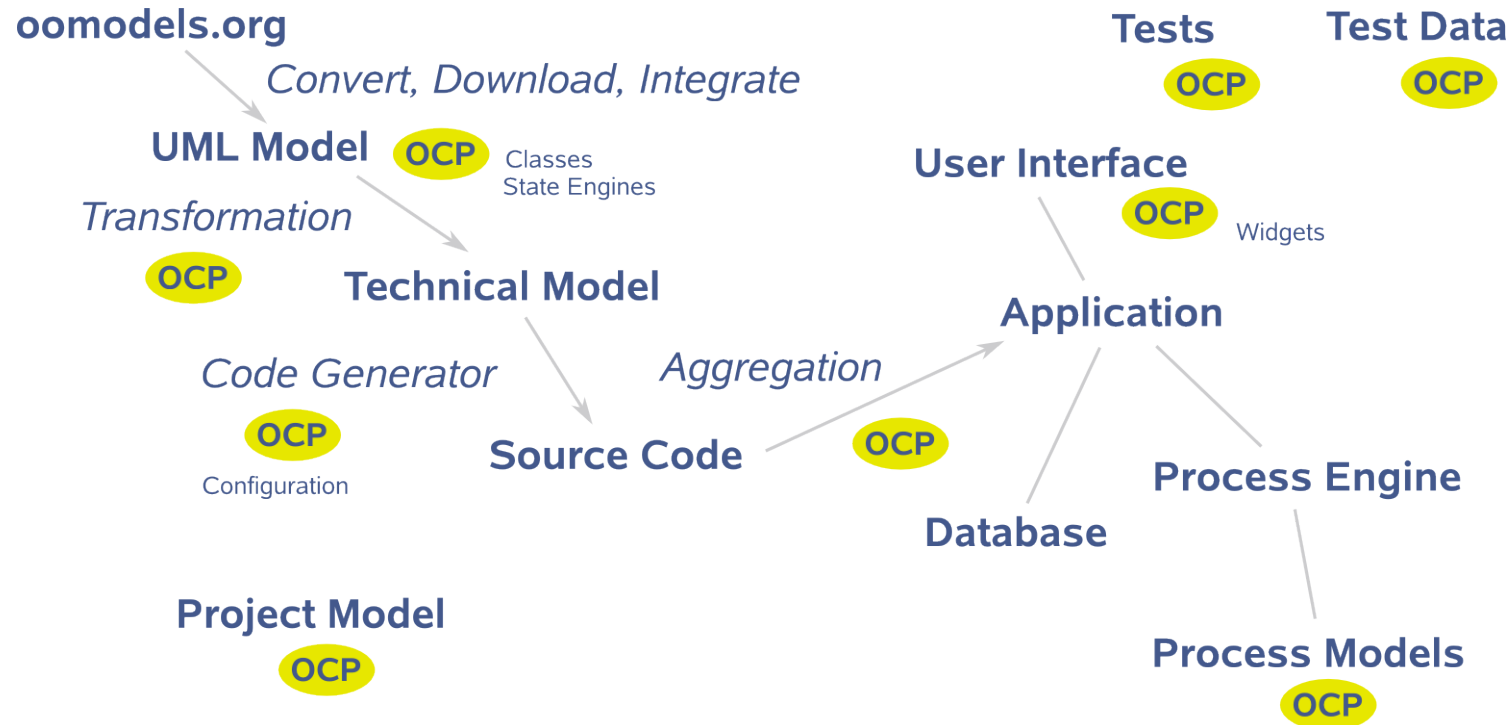
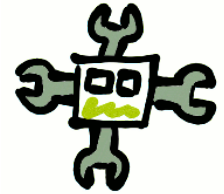
Assembler

Maschinen-
sprache



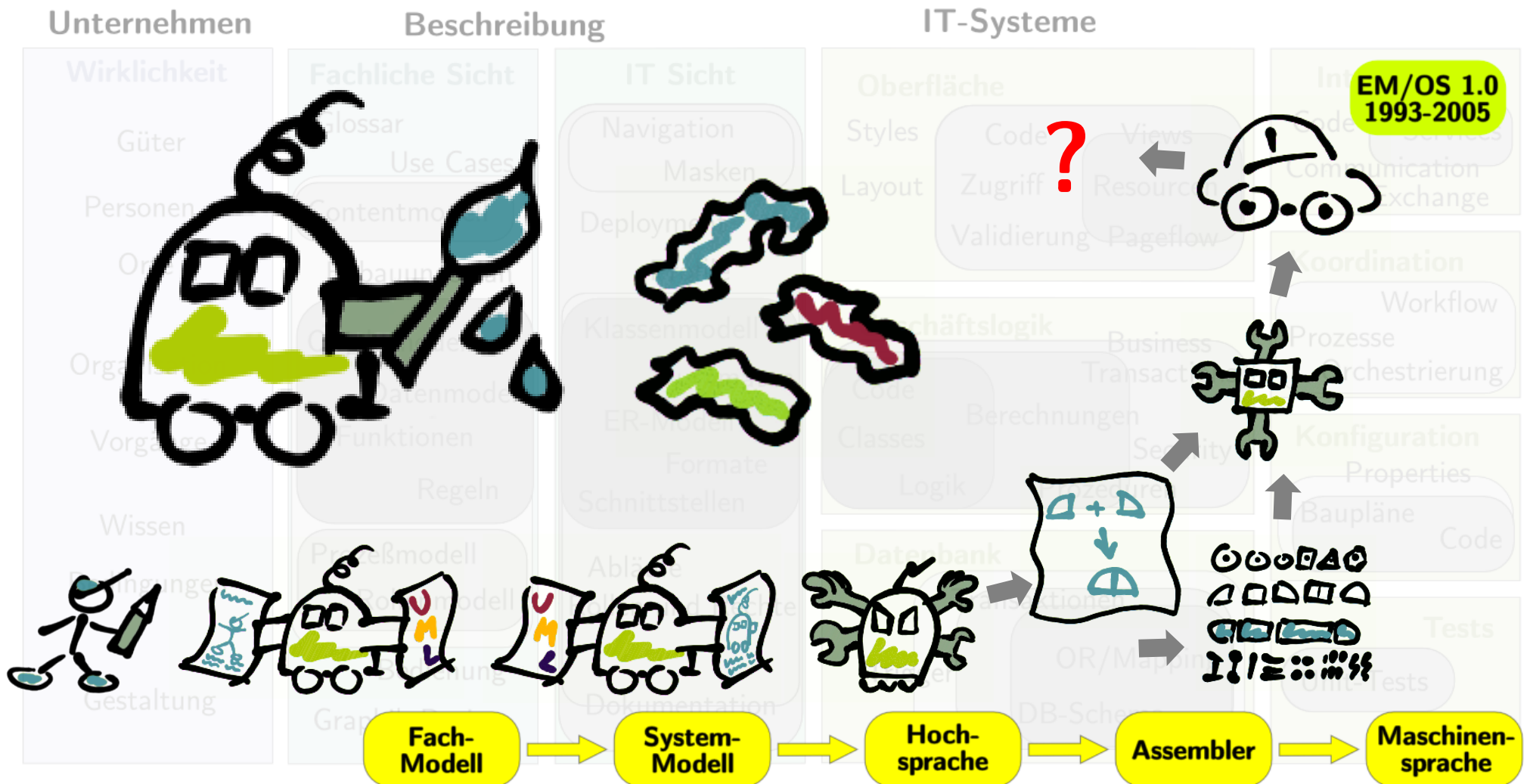
Neuer Roboter versteht Bauanleitungen und baut Teile zusammen

Objektbaupläne und der Object Assembler - www.xocp.org (open source)



- 1996: Laden von Testdaten
- heute: 15% OCP-Anteil, bezogen auf Java

Virtual User Interface mit M3V Entwurfsmuster - www.m3v.org



Virtual User Interface mit M3V Entwurfsmuster - www.m3v.org

Unternehmen

Beschreibung

IT-Systeme

Wirklichkeit

- Oberfläche und Funktion sind völlig (100%) getrennt
- Anpassung an Frontend (Web, Desktop, Mobile usw.) zur Laufzeit

Fachliche Sicht

IT Sicht

Oberflächen

EM/OS 1.0
1993-2005



Standardkomponenten



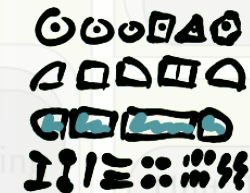
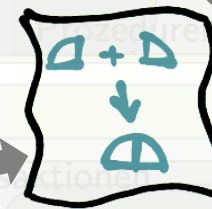
100% BL frei



VUI



100% UI frei



Fach-
Modell

System-
Modell

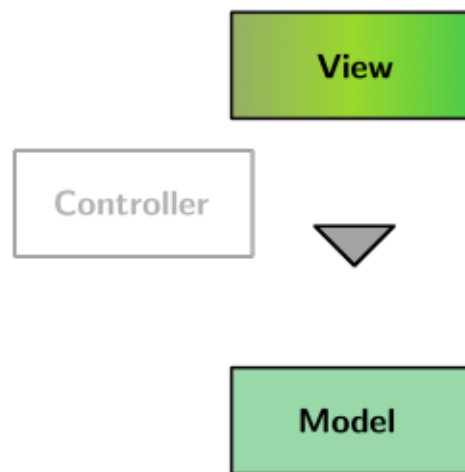
Hoch-
sprache

Assembler

Maschinen-
sprache

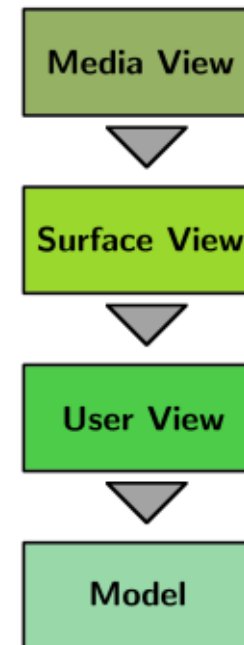
Virtual User Interface mit M3V Entwurfsmuster - www.m3v.org

M3V Muster – 1 Model, 3 Views



MVC

Model-View-Controller

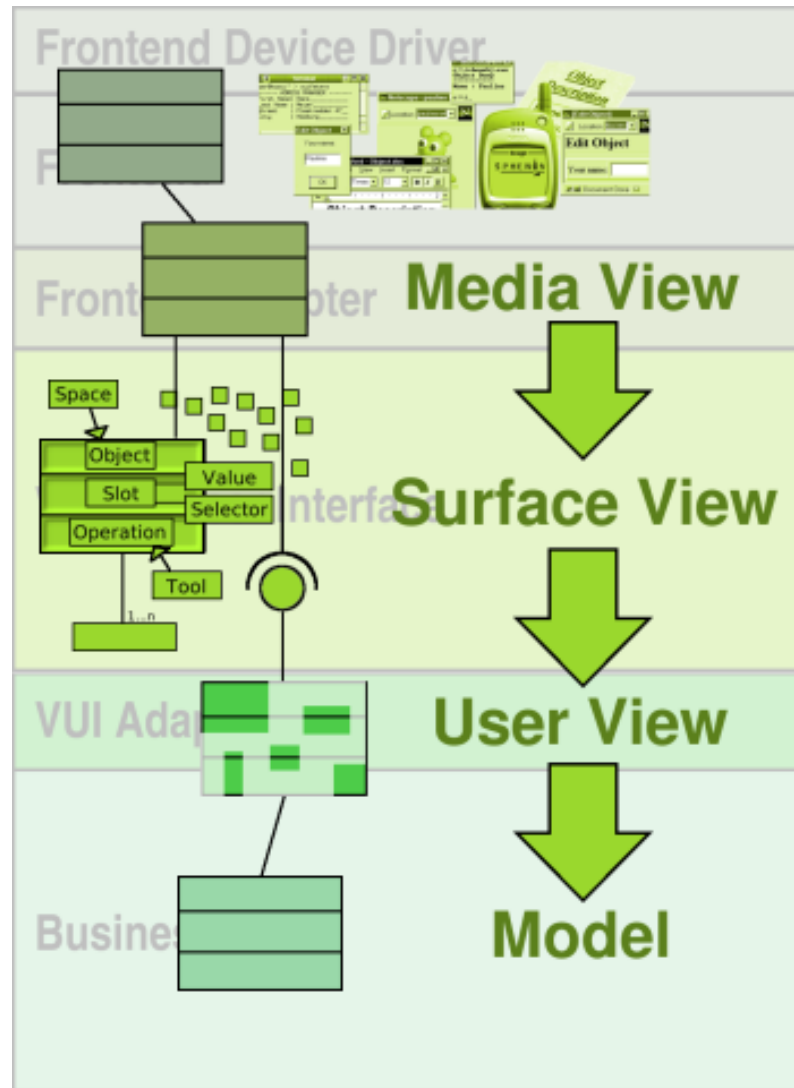


M3V

Model-View-View-View

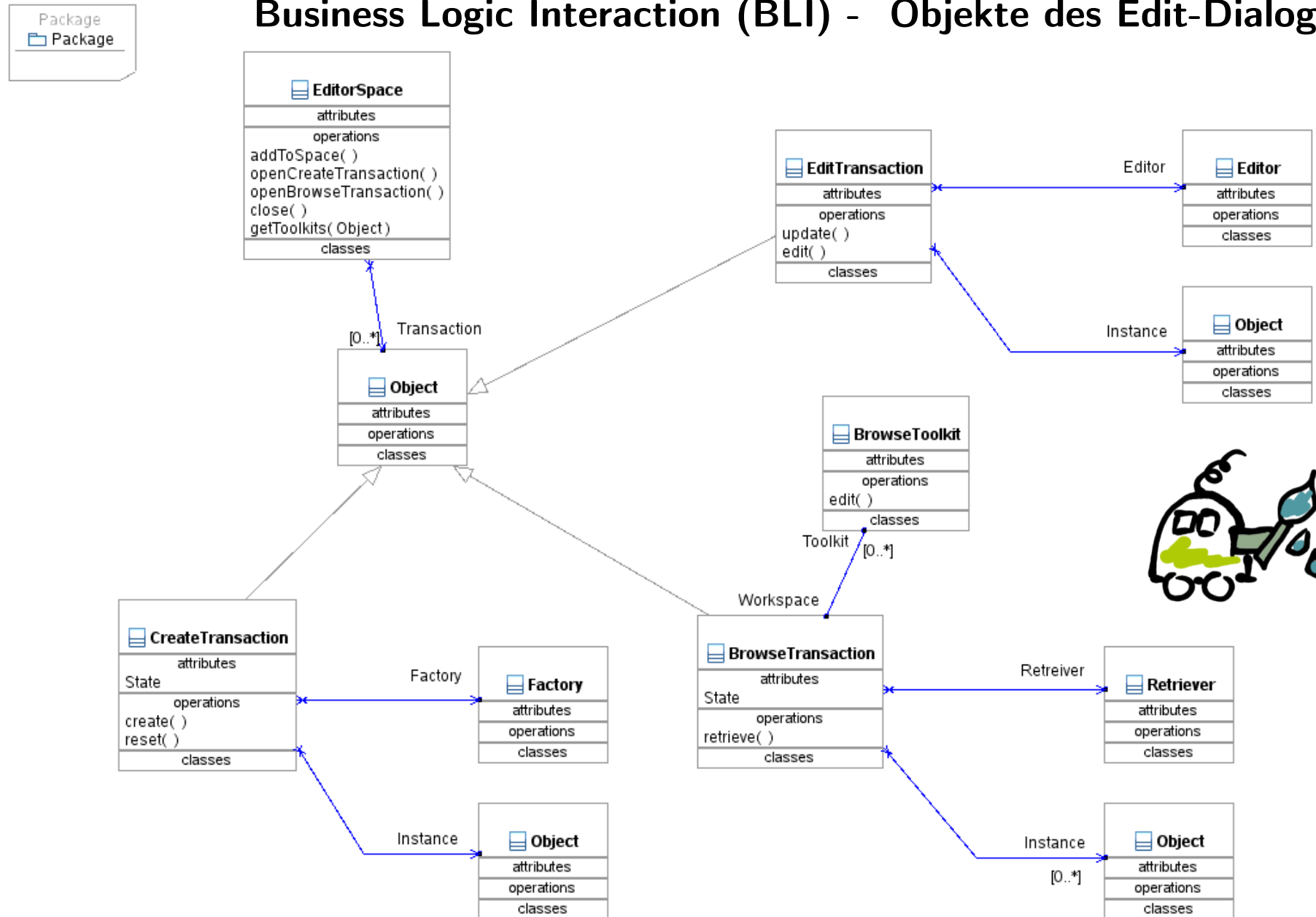
Virtual User Interface mit M3V Entwurfsmuster - www.m3v.org

M3V Muster – 1 Model, 3 Views



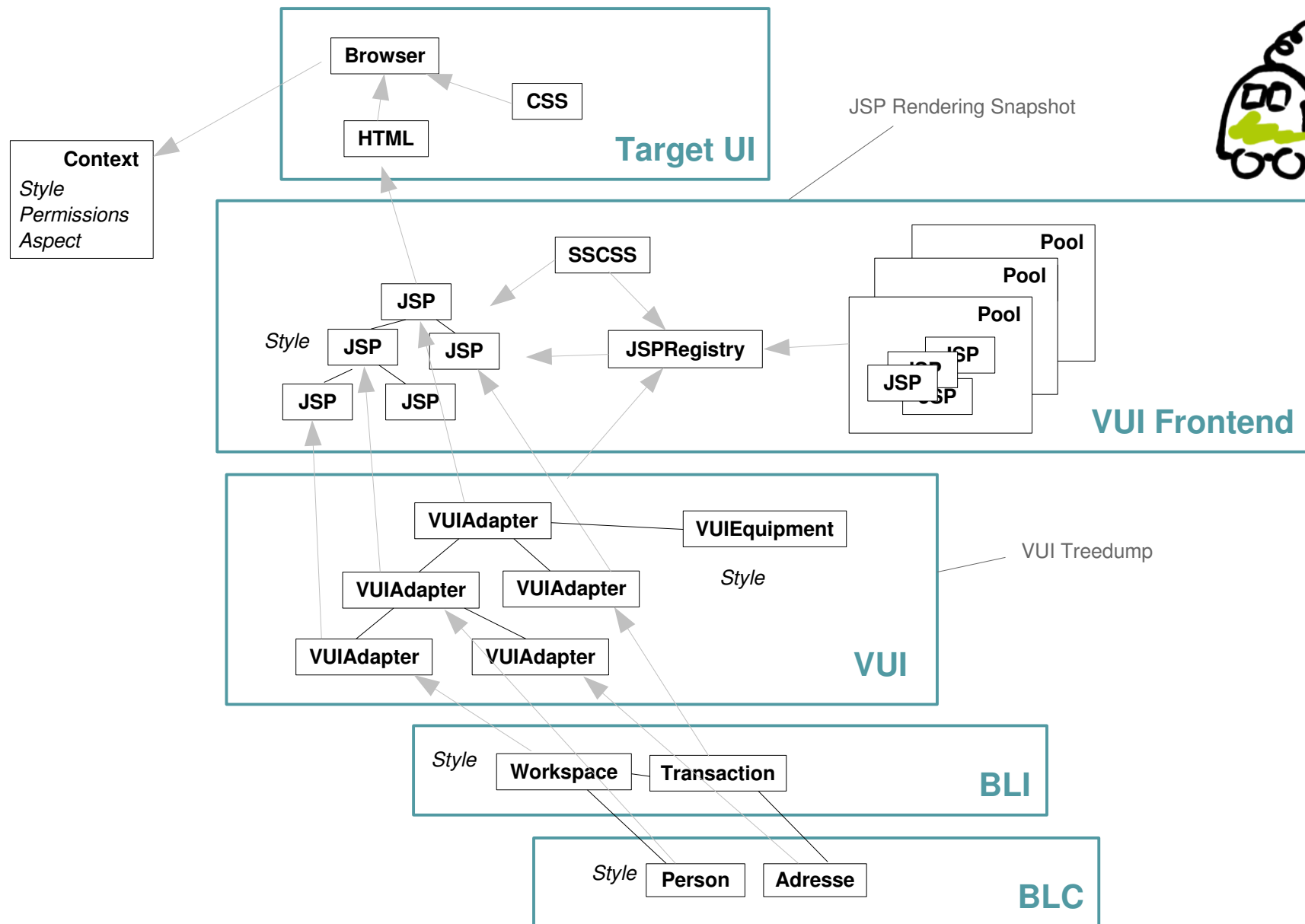
Virtual User Interface mit M3V Entwurfsmuster - www.m3v.org

Business Logic Interaction (BLI) - Objekte des Edit-Dialogs



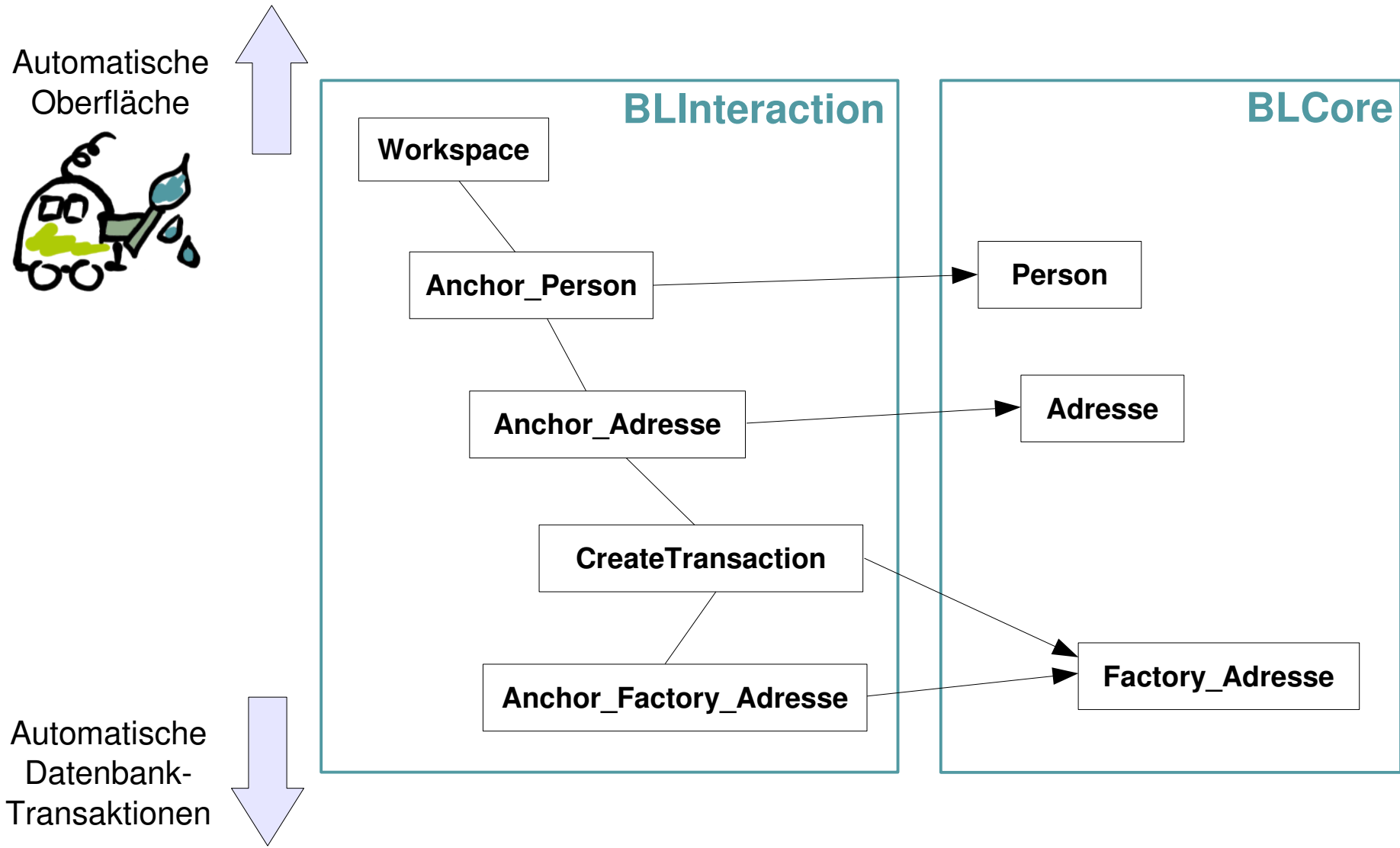
Virtual User Interface mit M3V Entwurfsmuster - www.m3v.org

Erzeugung der Oberfläche am Beispiel Web



Virtual User Interface mit M3V Entwurfsmuster - www.m3v.org

Business Logic Interaction (BLI) - Arbeits- und Transaktionsgerüst



Modell Repository - www.oomodels.org



Artefact:Model/org/oomodels/sandbox/business/foundation/entities/Person - OOModels - Opera

File Edit View Bookmarks Widgets Tools Help

Artefact:Model/org/oo... X +

http://www.oomodels.org/index.php/Artefact:Model/org/oomodels/sandbox/business/foundation/entities/Person

AndreasLeue my talk my preferences my watchlist my contributions log out

discussion edit history delete move protect watch purge

Artefact:Model/org/oomodels/sandbox/business/foundation/entities/Person

< Artefact:Model | org | oomodels | sandbox | business | foundation | entities

Code [edit]

Entity

Person
«CoreClass»

A human person

Name	NameOfPerson	« »
Sex	Sex	« »
Birthday	Date	« »

Comments [edit]

Further attributes: title, sex, etc.

Categories: Type:org/oomodels/WIML/1.0 | Domain:business/foundation/entities | Type:org/oomodels/wiki/Model

Classification

Type	Type:org/oomodels/WIML/1.0
Domain	Domain:business/foundation/entities
Category	Type:org/oomodels/wiki/Model
Maturity	work in progress

More

Download Code (dev)

Diagram

Namespace (more)

Provides a sandbox for modelling.

It is intended to develop generalised, sufficiently abstract artefacts that can serve as common ground for more specific models.

create new pages

navigation

- Main Page
- Glossary
- Roadmap
- Recent changes
- Help
- Impressum

search

Go Search

toolbox

- What links here
- Related changes
- Upload file
- Special pages
- Printable version
- Permanent link

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Modell Repository - www.oomodels.org



models

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Business Knowledge

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Search

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changes
file
pages

Editing / artefact.oomodels.org/oomodels/sandbox/business/foundation/entities/Entity



```
{{Metabox
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| Meta_Domain  = Domain:business/foundation/entities
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| Meta_AddTypeToCategory  = true
| Meta_AddCategoryToCategory = true
| Meta_Maturity = work in progress
}}
```

== Code ==

```
<wiml>
* Person Core Class
> org/oomodels/sandbox/business/foundation/entities/Entity
  A human person
  ** Name org/oomodels/sandbox/business/foundation/entities/NameOfPerson
  ** Sex org/oomodels/sandbox/business/foundation/entities/Sex
  ** Birthday Date
</wiml>
```

Modell Repository - www.oomodels.org



OOModels Download - Select Format - Opera

File Edit View Bookmarks Widgets Tools Help

OOModels Download ... X

http://www.oomodels.org/download/?id=Artefact:Model/org/oomodels/sandbox/business/foundation/entities/Person

oomodels
Open Operational Business Knowledge

Please choose your desired download format:

- ☐ Type:org/oomodels/wiki/ArtefactDescription [info] - (extracted metadata)
- ☐ Type:org/oomodels/WIML/1.0 [info] - (original code, without conversion)
- ☐ Type:org/ooem/UMLClass/Multipart/1.0 [info] - (converted code, via [wiml-1.0-ooem-multipart-1.0])
- ☒ Type:org/ooem/UMLClass/Multipart/1.0/Refactored [info] - (converted code, via [wiml-1.0-ooem-multipart-1.0], [regexp-refactoring])
[add a format]

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100%

Modell Repository - www.oomodels.org



Artefact:Diagram/org/oomodels/sandbox/business/foundation/entities/Entities - OOModels - Opera

File Edit View Bookmarks Widgets Tools Help

Artefact:Diagram/org/o... X

http://www.oomodels.org/index.php/Artefact:Diagram/org/oomodels/sandbox/business/foundation/entities/Entities

AndreasLeue my talk my preferences my watchlist my contributions log out

artefact discussion edit history delete move protect watch purge

Artefact:Diagram/org/oomodels/sandbox/business/foundation/entities/Entities

< Artefact:Diagram | org | oomodels | sandbox | business | foundation | entities

Code [edit]

Classification

Type	Type:org/oomodels/WIDL/1.0
Domain	Domain:it/test
Category	Type:org/oomodels/wiki/Diagram
More	
Download Code (dev)	
Namespace (more)	
Provides a sandbox for modelling.	
It is intended to develop generalised, sufficiently abstract artefacts that can serve as common ground for more specific models.	
create new pages	

Entity
Name : Name

Group
Name : NamePlain

Company
Name : NamePlain

Person
Name : NameOfPerson
Sex : Sex
Birthday : Date

Relationship
End1 : Entity
End2 : Entity

Name

NamePlain
Name : String

NameOfPerson
Vorname : String
Nachname : String

Categories: Type:org/oomodels/WIDL/1.0 | Domain:it/test | Type:org/oomodels/wiki/Diagram

navigation

- Main Page
- Glossary
- Roadmap
- Recent changes
- Help
- Impressum

search

Go Search

toolbox

- What links here
- Related changes
- Upload file
- Special pages
- Printable version
- Permanent link

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Editing Antefact:Diagram/org/oomodels/sandbox/business/foundat

B *I* Ab **A**

```

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| Meta_Download      = true
| Meta_AddTypeToCategory = true
| Meta_AddCategoryToCategory = true
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== Code ==

<widl>

        ./Entity                ./Relationship

./Group

        ./Company              ./Name

        ./Person

        ./NamePlain            ./NameOfPerson

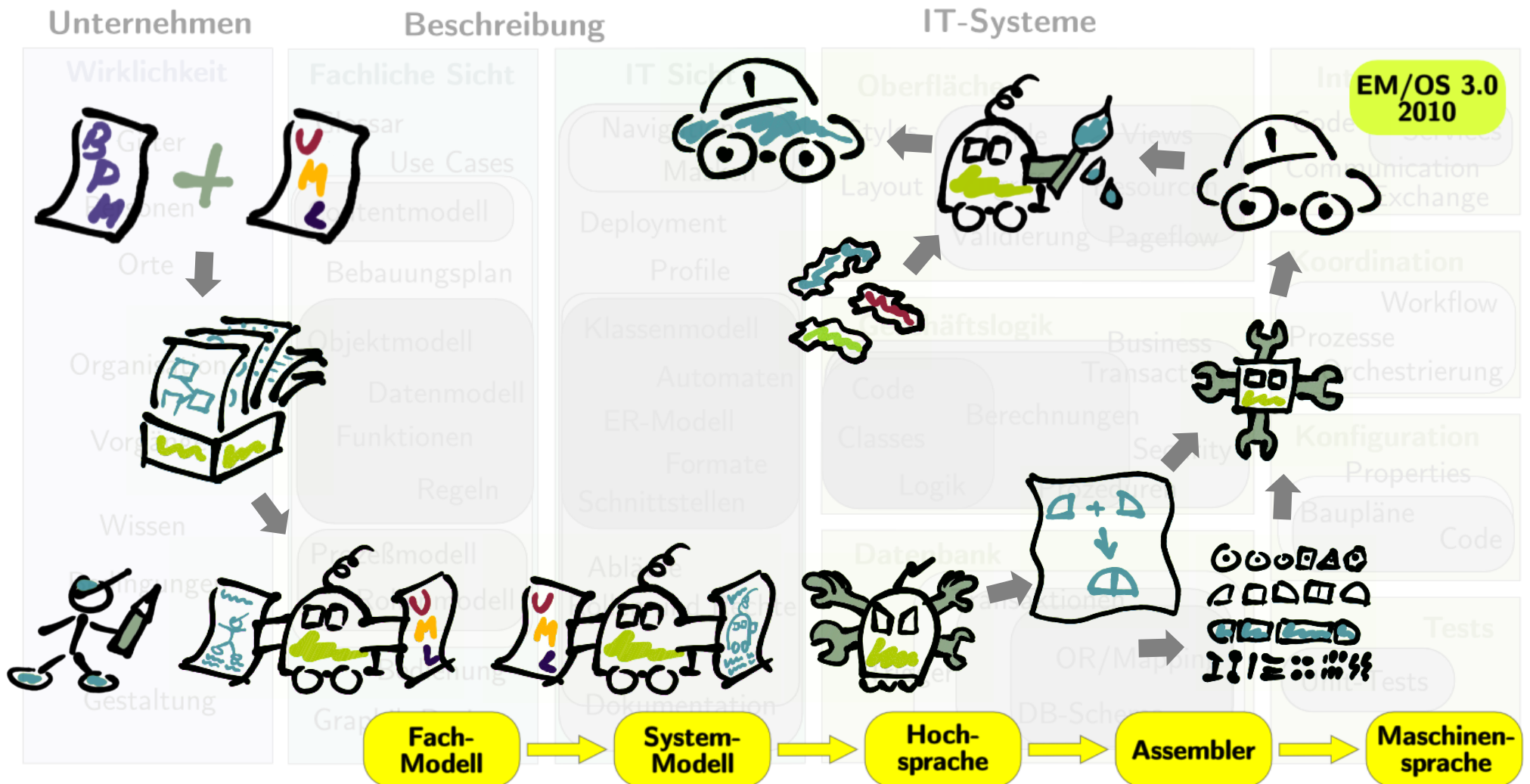
|

</widl>

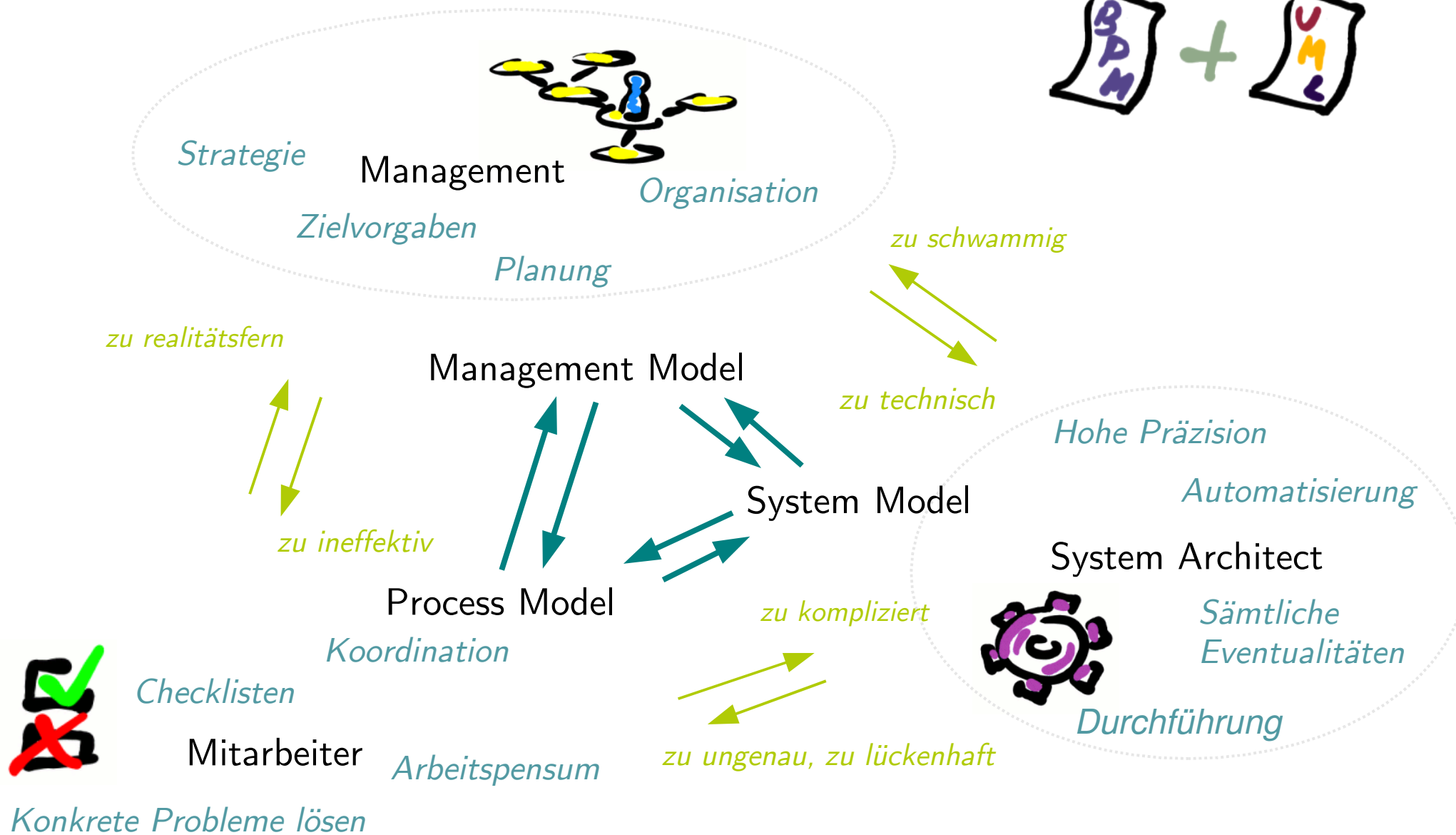
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Management

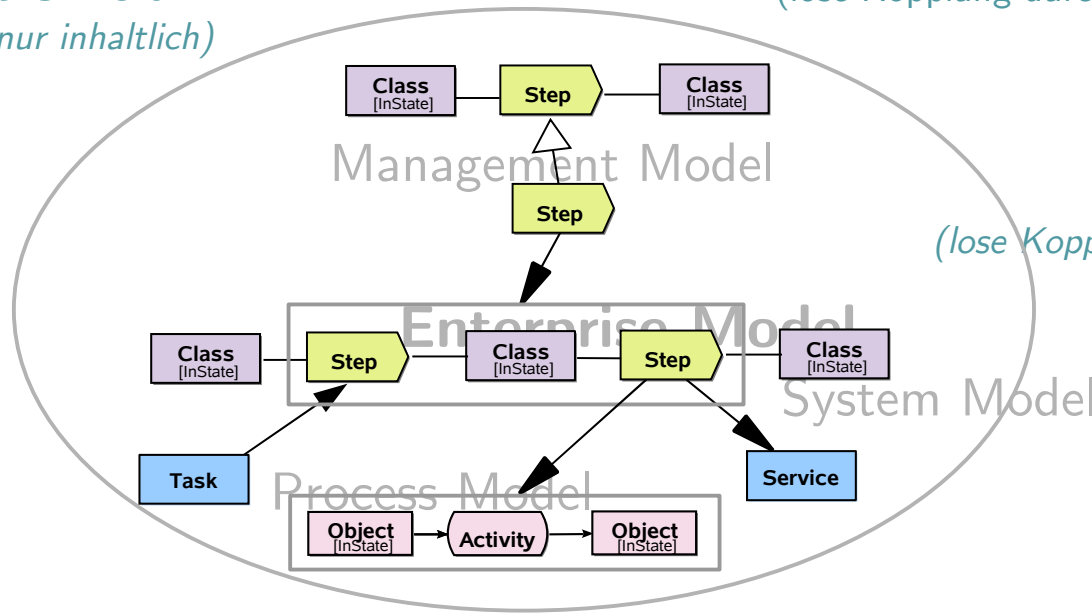


Vererbung

(lose Kopplung durch Abstraktion)

Kein Kontrollfluß

(lose Kopplung: nur inhaltlich)



Verfeinerung

(lose Kopplung durch dynamische Zuordnung)

System Architect



IT Services

(lose Kopplung durch dynamische Zuordnung)



Mitarbeiter

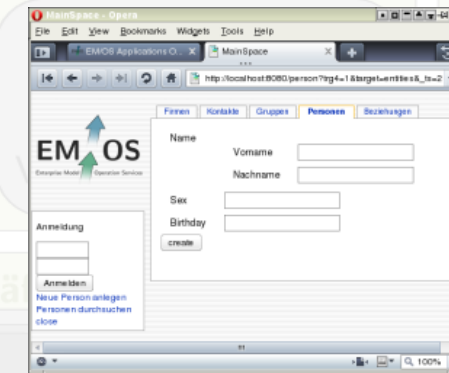
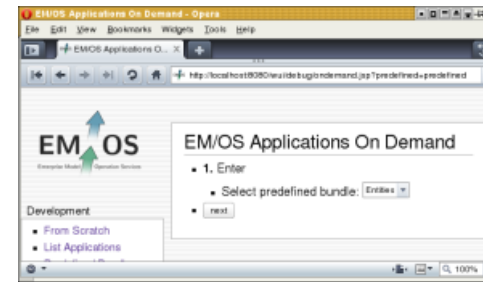
Offen für Erweiterungen

(lose Kopplung durch Prozedur-Abstraktion)

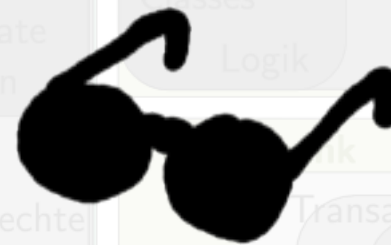


EM/OS 2.0 - Hausaufgaben

- Refactoring & Cleanup
- Usability & First Experience
- 100% Java
- Automation



EM/OS 2.0
2008



Fach-Modell



System-Modell



Hochsprache

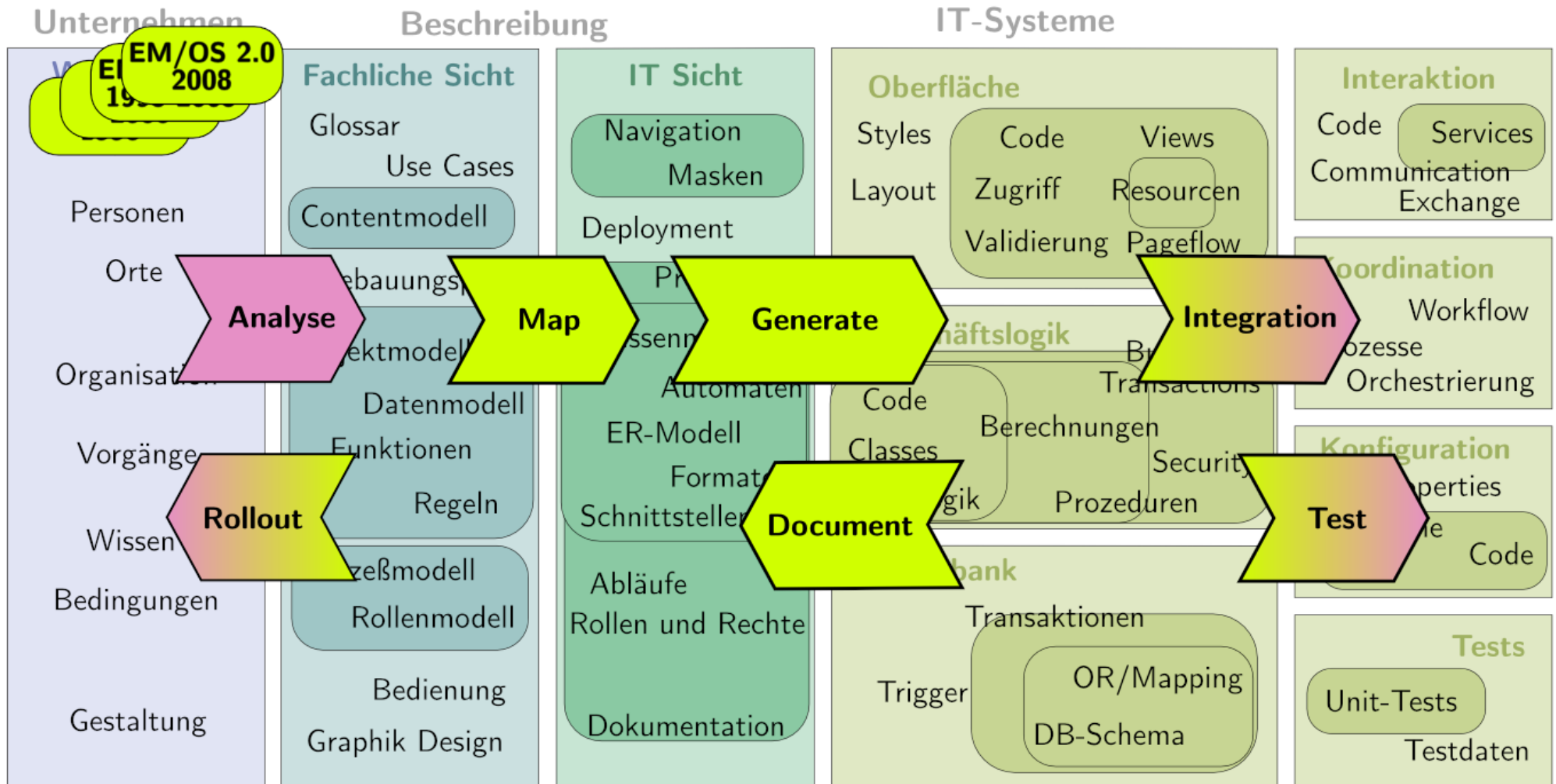


Assembler

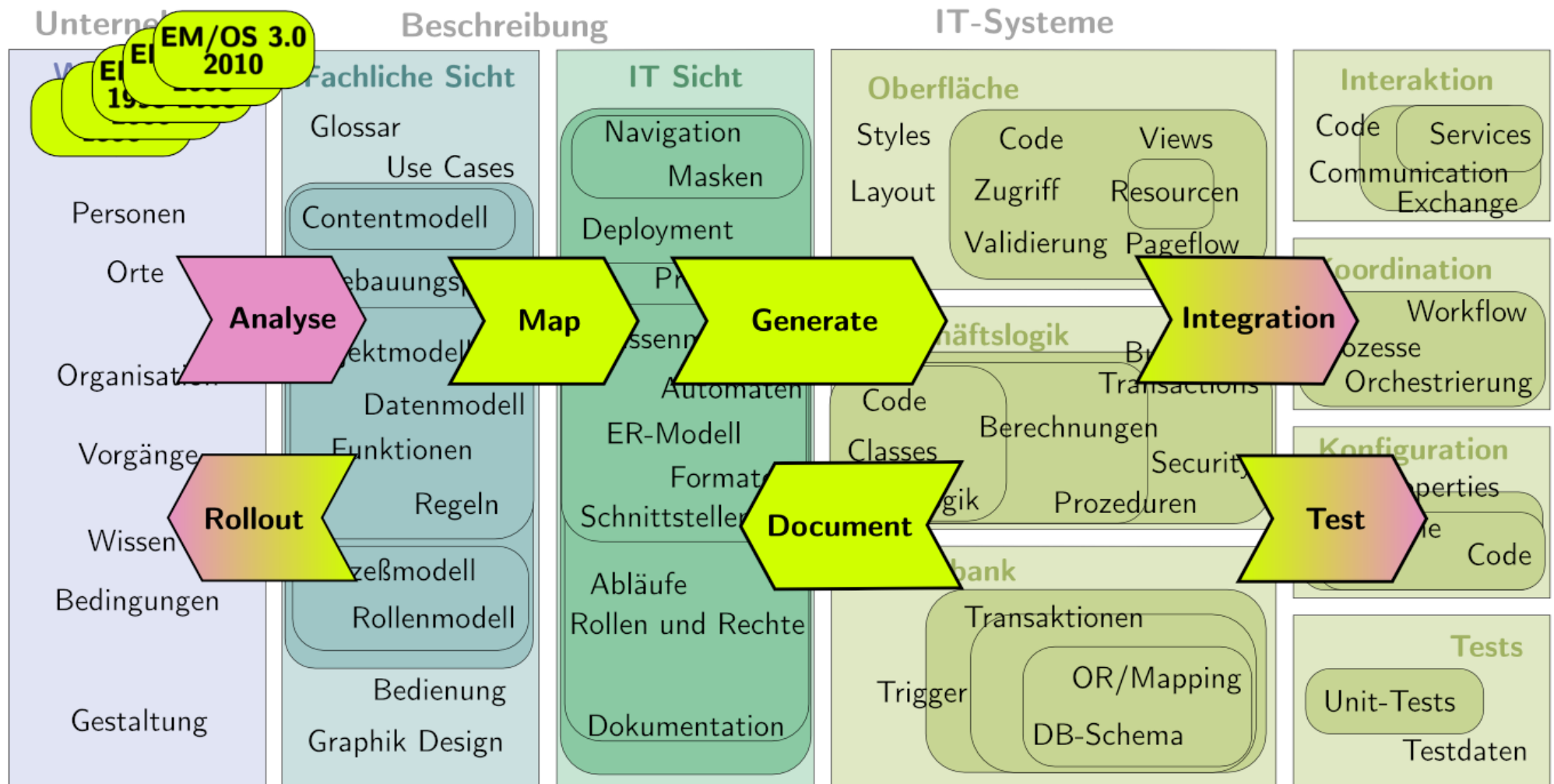


Maschinensprache

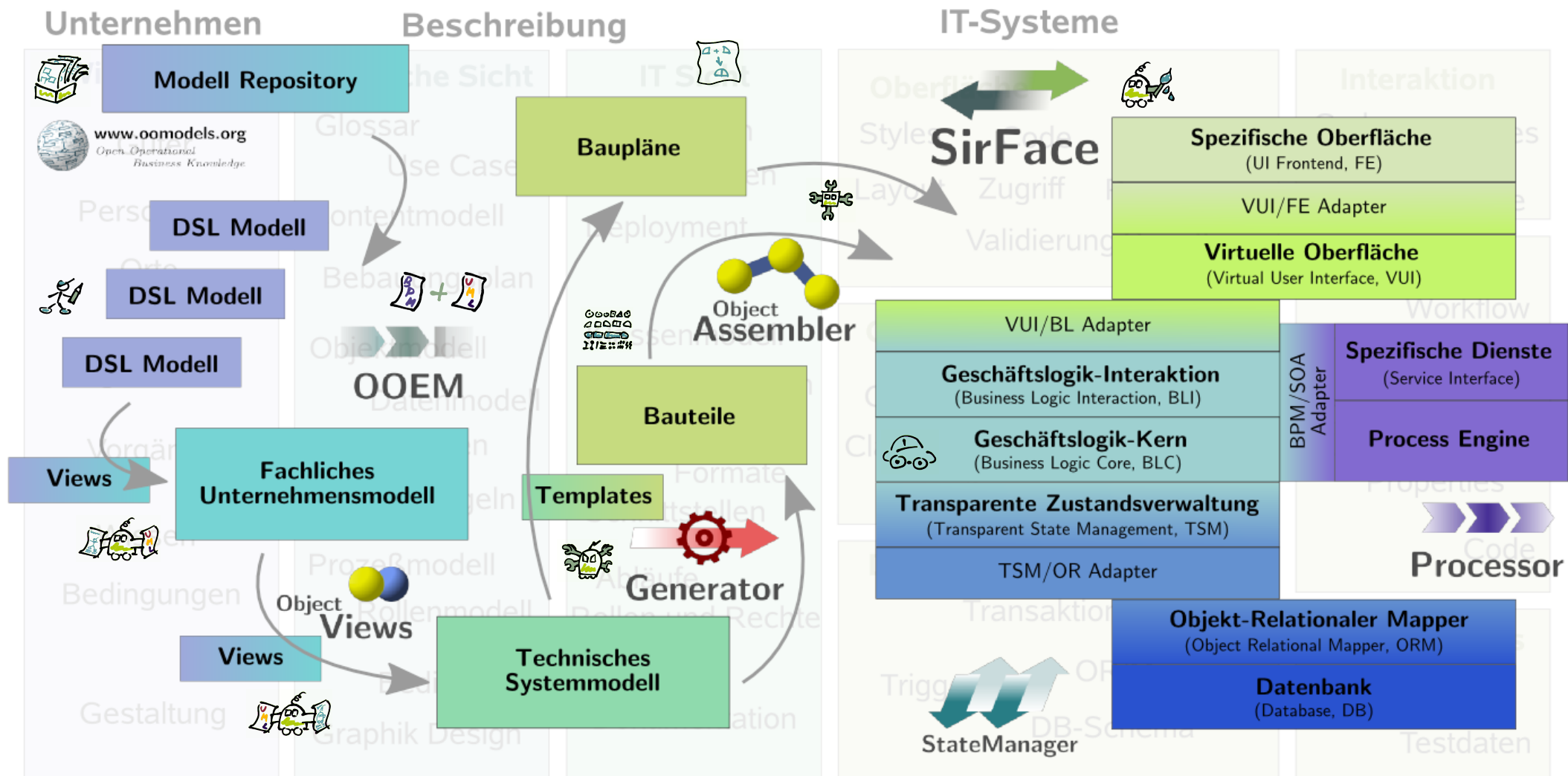
EM/OS 2008



EM/OS 2010



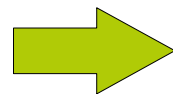
EM/OS Architektur



Fazit

EM/OS ist

- mehr als MDA und kein Vergleich mehr zu “Generatoren”
- praxiserprobt und gereift



industrielle Software-Produktion

Sphenon

Inhalt

Sphenon

Warum überhaupt Model Driven?

EM/OS – Architektur & Innovationen

Live Demo



Ende

