61 Artefakt- und Modellmanagement in Technikräumen

Prof. Dr. rer. nat. Uwe Aßmann
Institut für Software- und Multimediatechnik
Lehrstuhl Softwaretechnologie
Fakultät für Informatik
TU Dresden
http://st.inf.tu-dresden.de
Version 12-1.0, 23.01.13

1) Modellmanagement
   1) Einsortige Algebren über Artefakten
   2) Zweisortige Algebren
2) Technikräume mit Modellmanagement

Literatur

- Obligatorisch:
- Zusätzlich:
  - Siehe CBSE im Sommer
  - Jakob Henriksson, Florian Heidenreich, Steffen Zschaler, Jendrik Johannes, and Uwe Assmann. Extending grammars and metamodels for reuse - the reuseware approach. IET Software Journal Special Issue: Language Engineering, 2008.
  - http://www.reuseware.org
  - Model Management 2.0: Manipulating Richer Mappings. Philip A. Bernstein, Sergey Melnik. SIGMOD 07, ACM.

Problem

- Wir haben viele Werkzeuge gesehen....
  - die Files, Modelle, Codedateien, Dokumente, etc. bearbeiten

Wie kann man das Management solcher Artefakte vereinheitlichen?

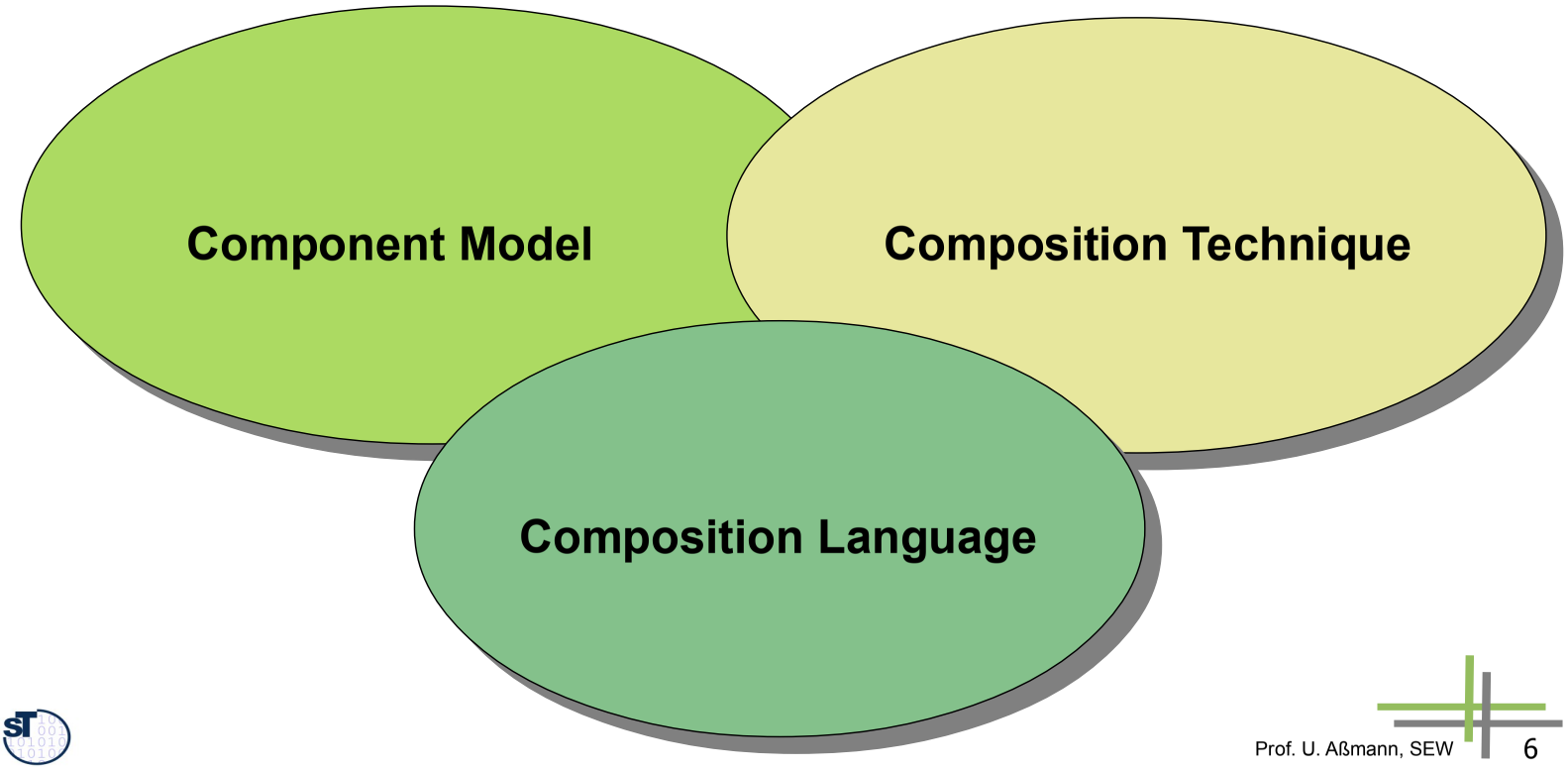
61.1 Model Management

- Model management is:
  - model composition with model algebrae
  - model slicing

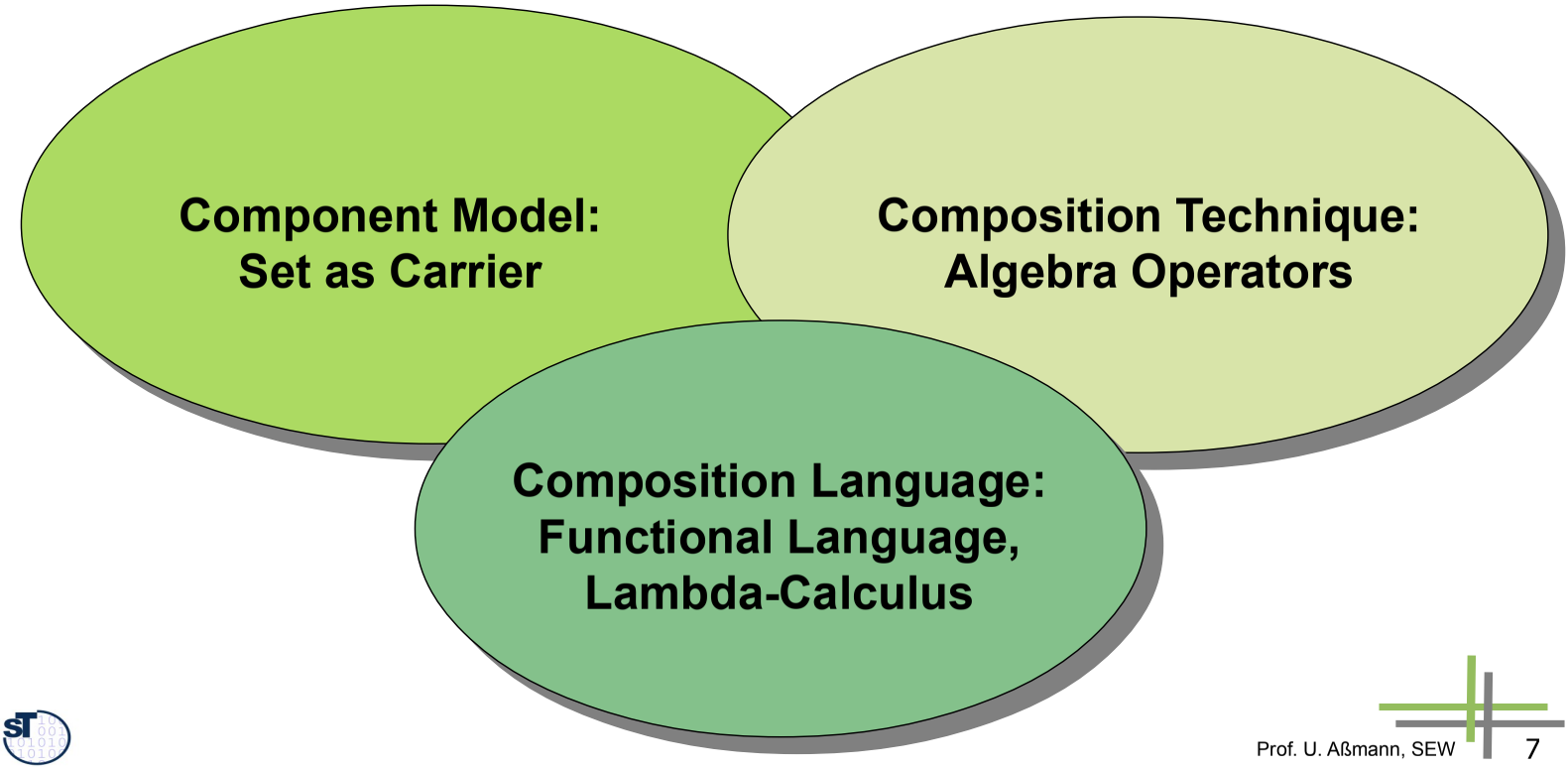
61.1.1 Einsortige Algebren über Modellen und anderen Artefakten

Text-Algebren, Modell-Algebren

Composition



Composition with Algebrae



Einsortige Algebra über Texten

- Eine **einsortige Algebra** ist eine Menge von Operatoren über einer Trägermenge (Carrier) eines Typs (einer Sorte)
- Beispiel: Texte sind Folgen von Zeichen, in Zeilen aufgeteilt
- Die UNIX Programmers Workbench enthält eine Algebra über Texte, bestehend aus Zeilen:
  - diff : Text x Text → Transformation (Editiersequenz)
  - cmp: Text x Text → Boolean
  - patch: Text x Editiersequenz → Text
  - diff3: mine:Text x older:Text x yours:Text → Editiersequenz
  - split: Text x Splitzeichen → Text*
  - match: Text x Muster → Text*
  - check-property: Text x Muster → Boolean
  - is-consistent: Text x Text → Boolean
  - format: Text → Text
  - expand: Text-template x Text* → Text

Einsortige Algebra über Ascii-Tabellen

- Tabellen sind Folgen von Zeilen, in Spalten aufgeteilt, die durch einen Spaltentrenner (TAB , |) getrennt werden
  - .csv-Dateien (comma separated values)
  - html-Tabellen, tex-Tabellen
- rdb enthält eine Algebra über Tabellen:
  - diff : Tabelle x Tabelle → Transformation (Editiersequenz)
  - cmp: File x File → Boolean
  - patch: Tabelle x Editiersequenz → Tabelle
  - diff3: mine:Tabelle x older:Tabelle x yours:Tabelle → Editiersequenz
  - split: Tabelle x Splitzeichen → Tabelle*
  - match: Tabelle x Muster → Tabelle*
  - check-property: Tabelle x Muster → Boolean
  - is-consistent: Tabelle x Tabelle → Boolean
  - join, sort, group-by...
  - format: Tabelle → Tabelle
  - expand: Tabelle-template x Tabelle* → Tabelle

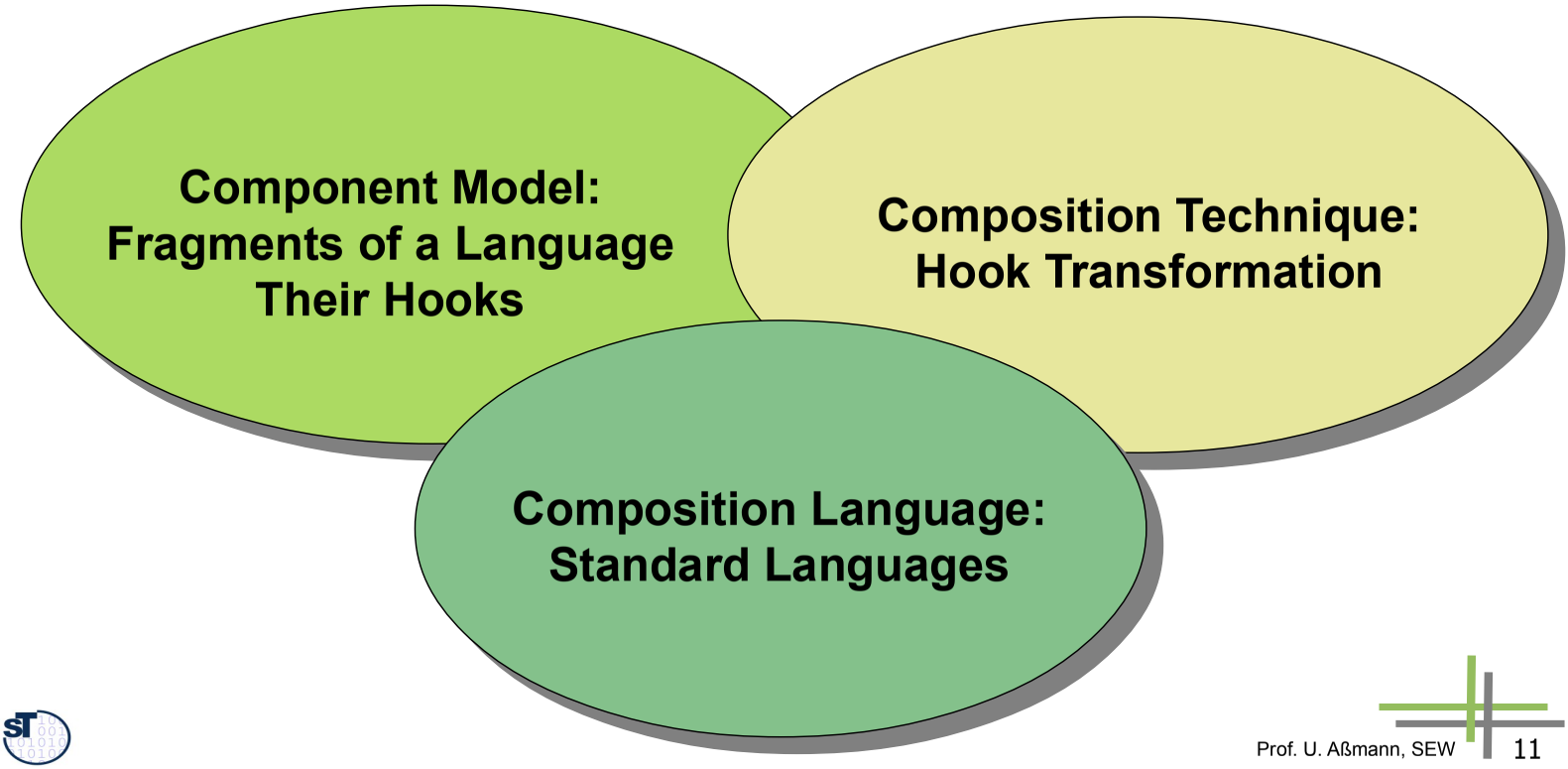
61.1.2 Zweisortige Algebren über Artefakten

Invasive Software Composition with Graybox Components

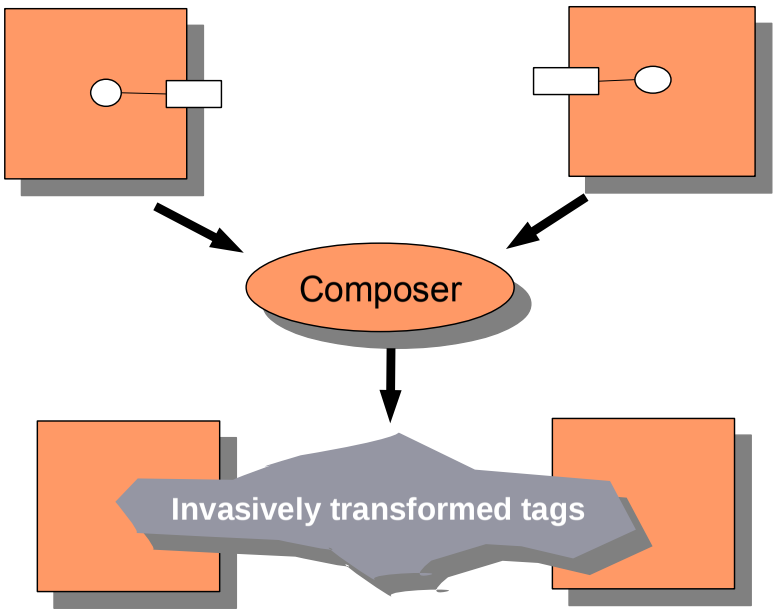
... preview onto the summer

(CBSE course)

"Invasive" Composition with 2-Sorted Algebrae

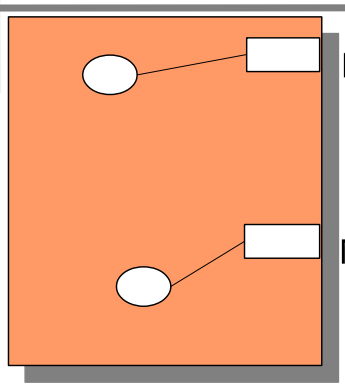


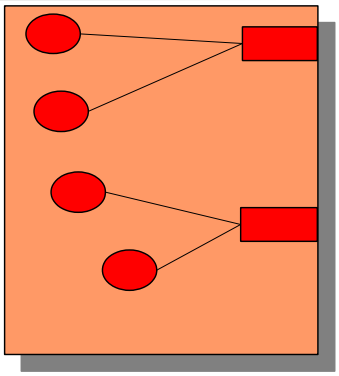
Invasive Composition as Hook Transformations



Invasive Composition
adapts and extends
components
at hooks
by a composition
operator

Binding Implicit Hooks with Fragments





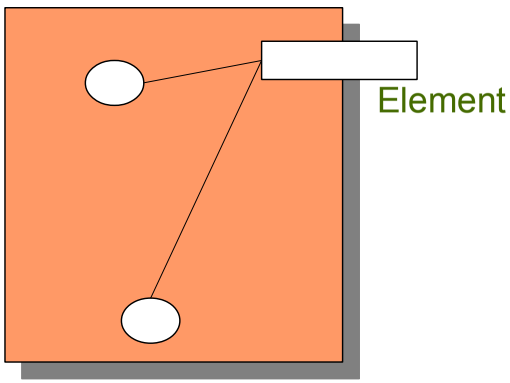

```
m (){

    abc..
    cde..

}
```

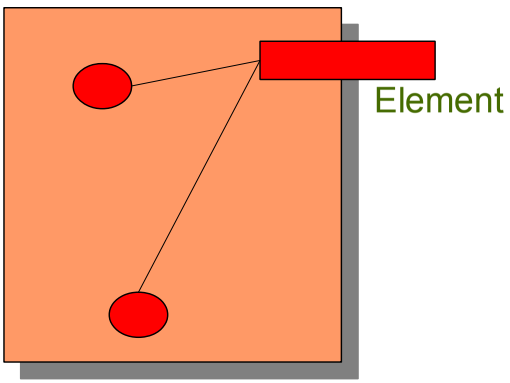
```
m (){
    print("enter m");
    abc..
    cde..
    print("exit m");
}
```

box.findHook(„.MethodEntry“).extend(“print(\”enter m\”);”);

box.findHook(„MethodExit“).extend(“print(\”exit m\”);”);

Binding Declared Hooks with Fragments



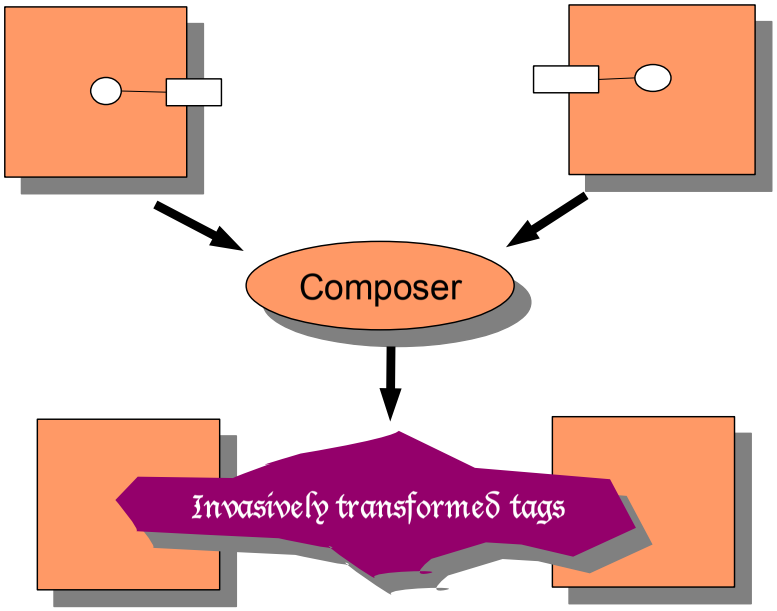



```
List(Element) le;

....
le.add(new Element());

...
```

```
List(Apple) le;

....
le.add(new Apple());

...
```

box.findHook(„Element“).bind(“Apple”);

Invasive Composition as Hook Transformations



- Invasive Composition works uniformly on
  - declared hooks
  - implicit hooks
- Allows for unification of
  - Inheritance
  - Views
  - Aspect weaving
  - Parameterization
  - Role model merging

Zweisortige Algebren

- Invasive Softwarekomposition bildet eine zweisortige Algebra
  - Sorten: Fragmentkomponenten mit Haken (hooks)
  - Sowohl Haken als auch Komponenten können komponiert werden

Simple composition operators

- **bind** hook (parameterize)
  - generic programming
- **rename** component, rename hook
- **remove** value from hook (unbind)
- **extend** component or hook
  - extensions
- **copy** fragment component

Compound composition operators

- **inheritance** from component
  - object-oriented programming
- **view** of component
  - view-based programming
- **connect** hook 1 and 2
  - connector-based programming
- **distribute** component over other component
  - aspect weaving

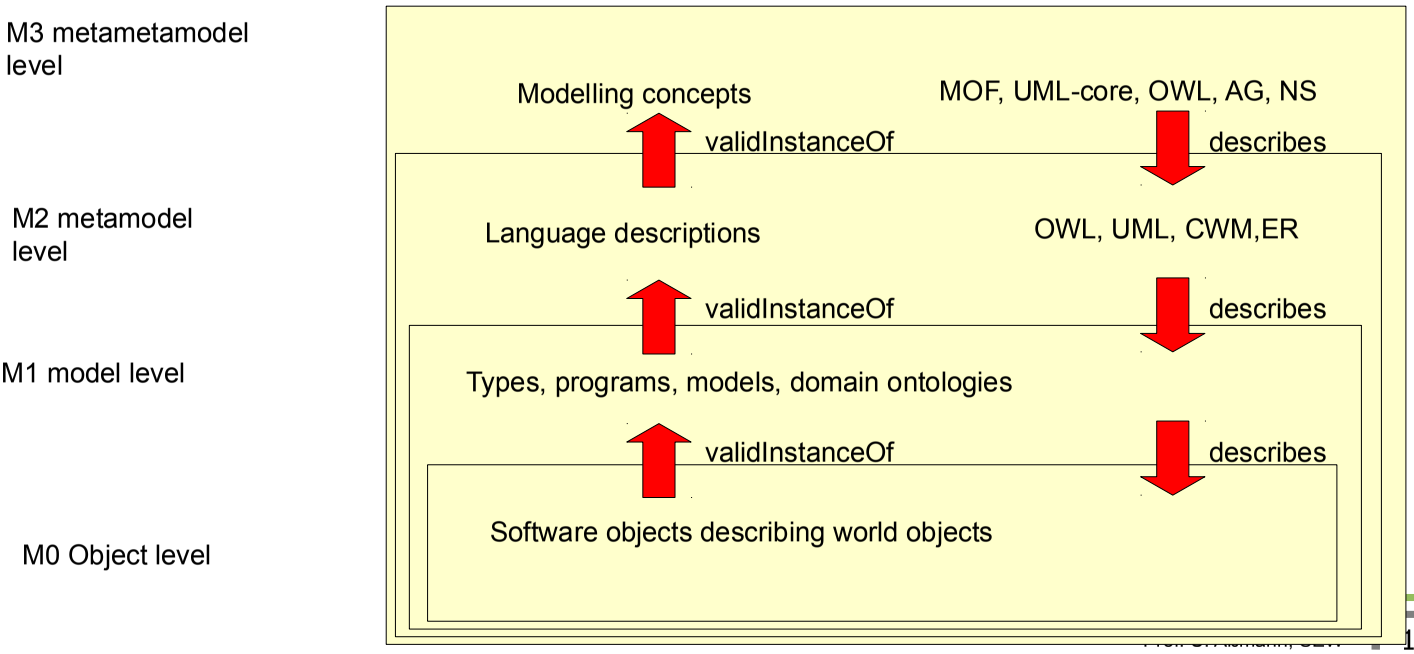
61.2 Technikräume und Algebren über Artefakten

Technical Spaces (Technikräume)

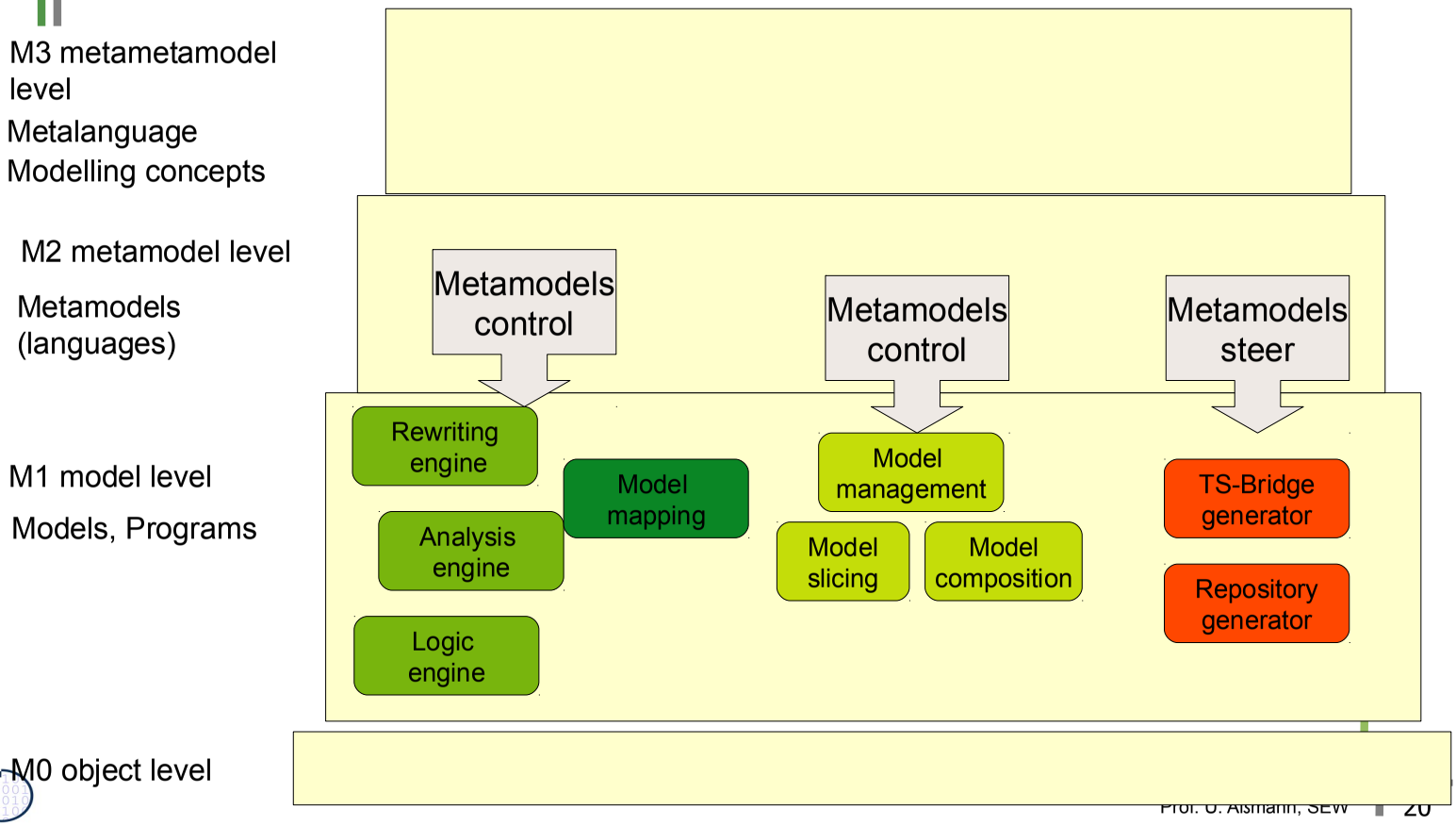
	Grammarware (Strings)		Tableware (Tables)		Treeware (Bäume)		Graphware/Modelware				
	Strings	Text	Text-Tabelle	Relationale Algebra	XML	NF2	MOF/ OMG	Eclipse	CDIF	MetaEdit+	OWL-Ware
M3	EBNF	EBNF		CWM (common warehouse model)	XSD	NF2-Sprache	MOF	Ecore	ERD	GOPPR	
M2	Grammatik einer Sprache	Grammatik mit Zeilentrennern	csv-header	Relationales Schema	XML Schema-beschreibung, z.B. xhtml	NF2-Schema	UML-CD, -SC, OCL	UML, many others	CDIF-Sprachen	UML, many others	
M1	String, Programm	Text in Zeilen	csv Datei	Relationen	XML-Dokumente	NF2-Baumrelation	Klassen, Programme	Klassen, Programme	CDIF-Modelle	Klassen, Programme	
M0					dynamische Semantik im Browser						

A Technical Space

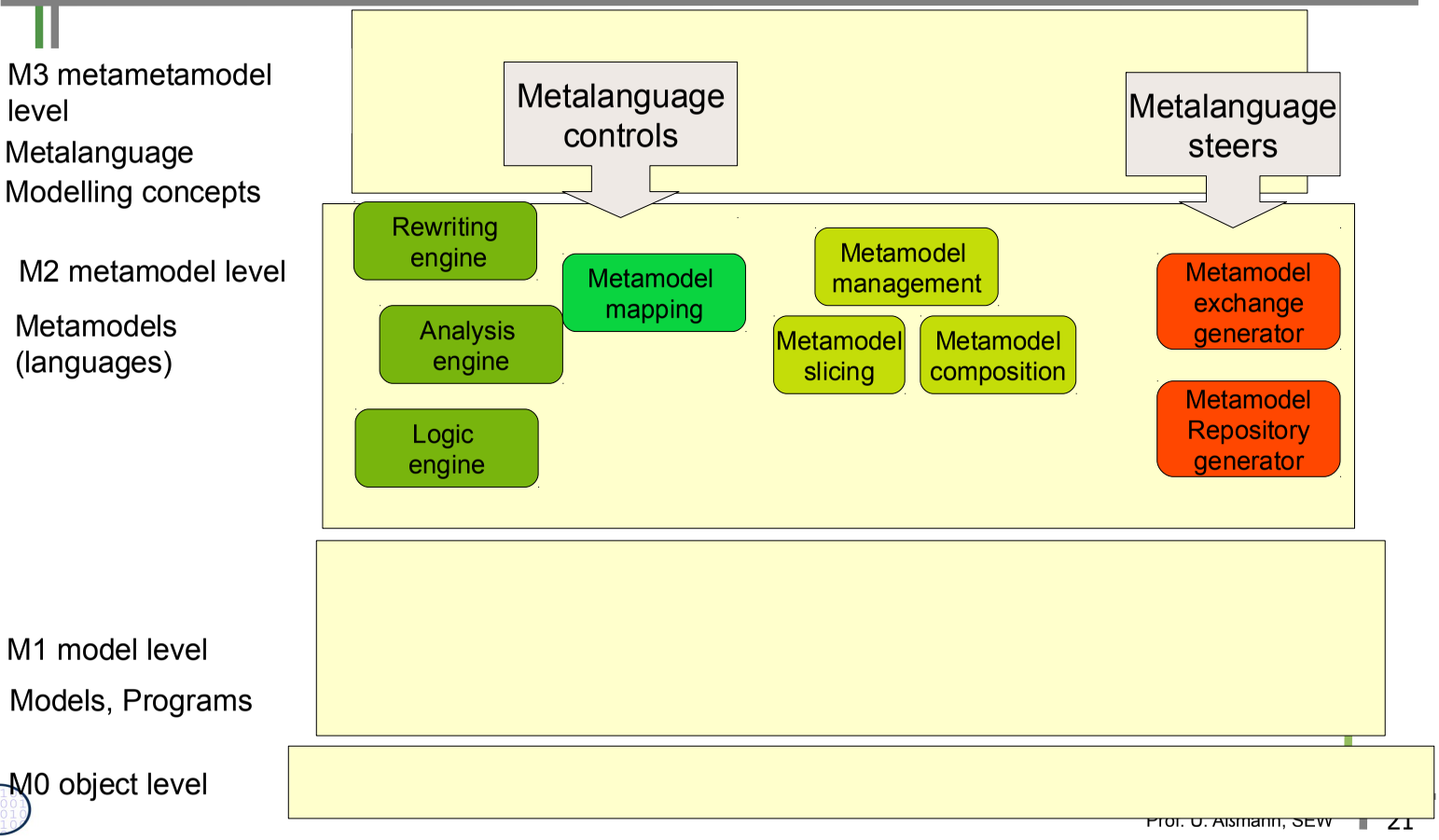
- aka *metapyramid*



The Generic Tools of a Technical Space (TS)

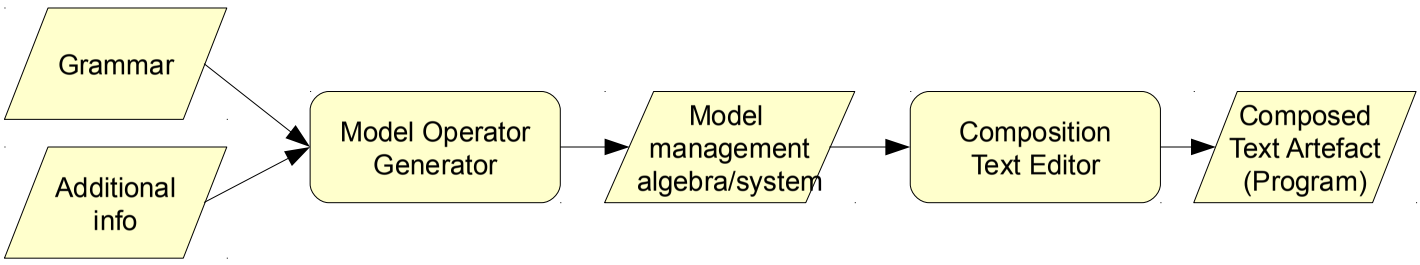


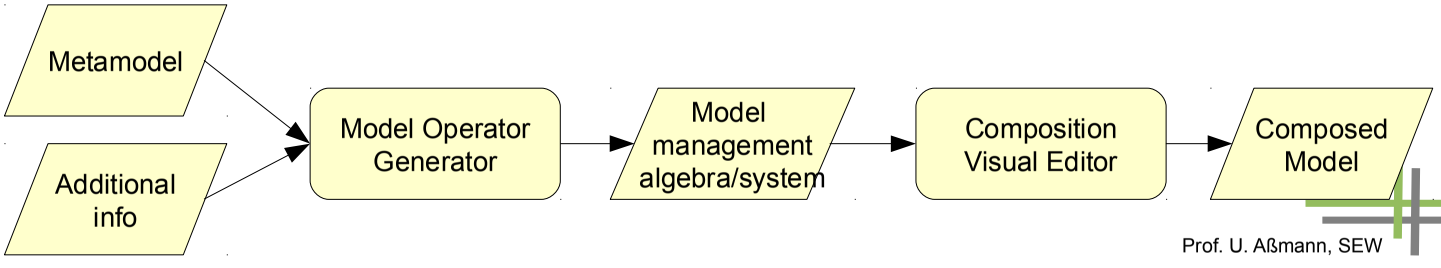
The Generic Tools of a Technical Space (2)



Modelmanagement

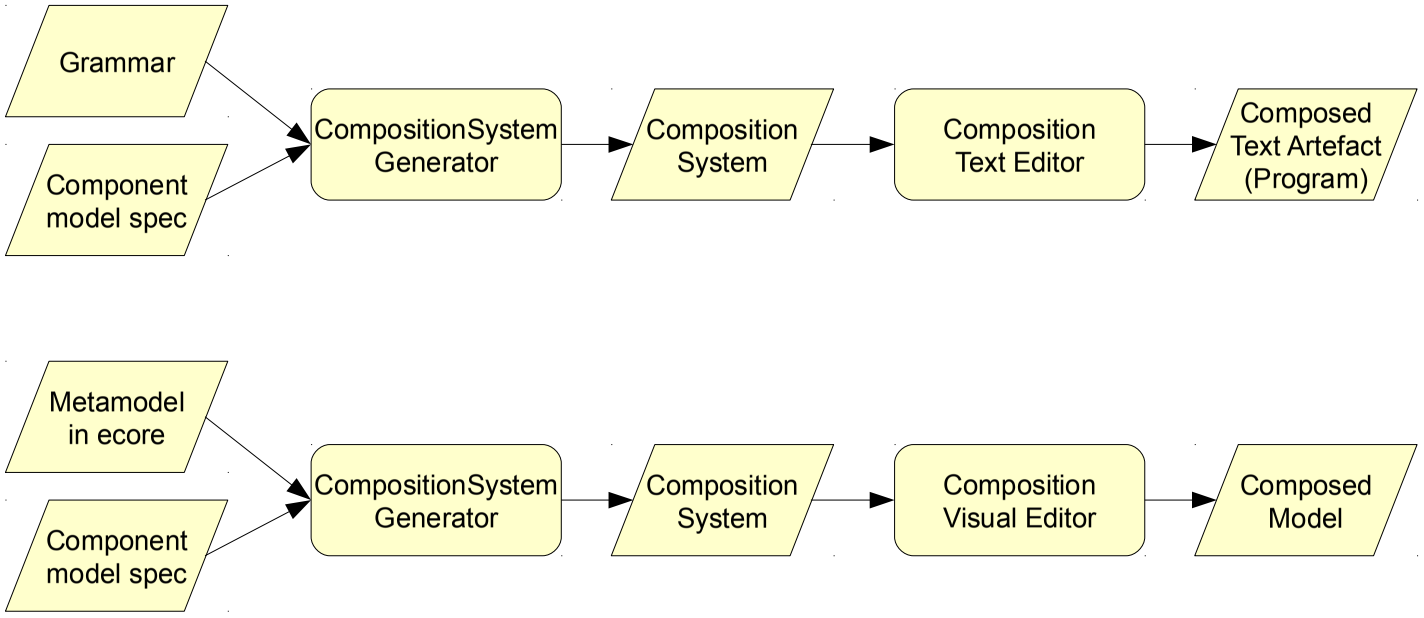
- Eine **Modelmanagement-Umgebung** verwaltet Modelle eines Technikraumes mit
  - Komposition mit einer einheitlichen einsortigen Algebra, oder auch einer zweisortigen invasiven Algebra (invasives Kompositionssystem)
  - Slicing mit einer Reachability Engine





Universale Invasive Komposition

- Für Grammarware, Tableware, Treeware und Modelware können invasive Kompositionssysteme generiert werden



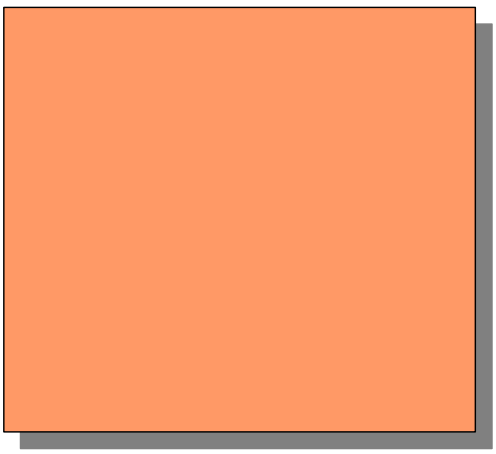
Was haben wir gelernt?

- Zukünftige IDE enthalten für jeden Technologieraum ein universelles Modelmanagement und sprach-universelles invasives Kompositionssystem.

The End - Appendix

The Component Model of Invasive Composition

- A **fragment component** is a set of program fragments (program elements)
- For instance
  - a class
  - a set of classes
  - a package
  - a set of packages
  - a method
  - an aspect
  - a metadata description



Boxes have Hooks

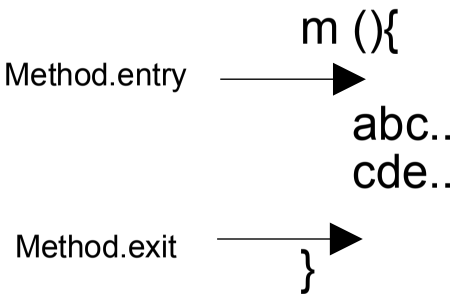
- Examples:
  - beginning/end of lists
  - method entries/exits
  - generic parameters

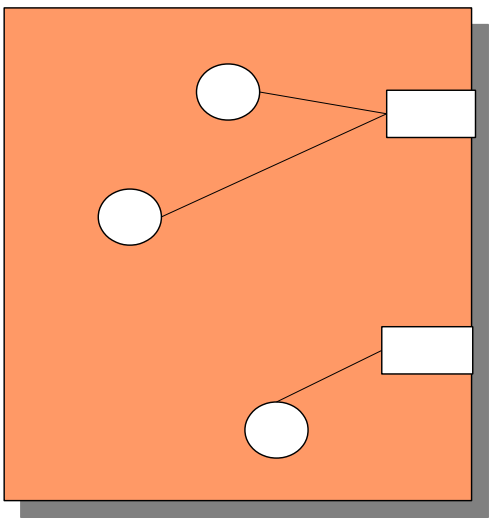
Hooks are arbitrary fragments or spots in a box

which are subject to change

Implicit Hooks (aka Static Join Points)

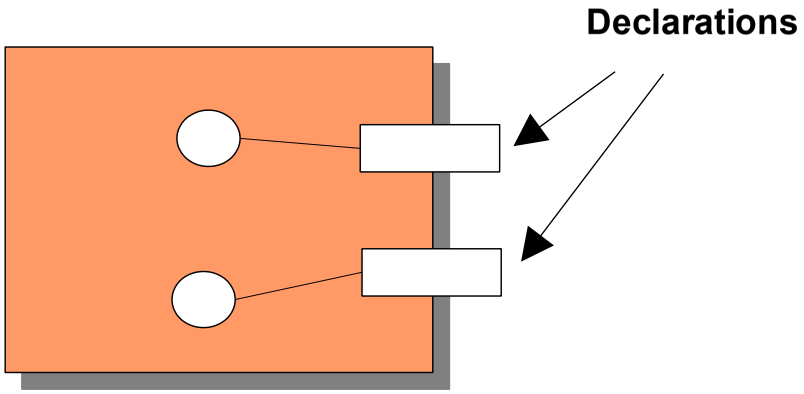
- An implicit hook is a program point, given by the programming language, the DTD or Xschema
  - Example method entry/exit





Declared Hooks (Generic Parameters)

Declared Hooks are declared by the box writer as variables in the hook's tags.



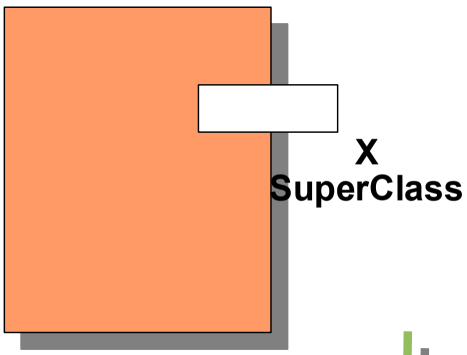
Declaration of Hooks

- Markup Tags
- Language Extensions (keywords..)
- Standardized Names
- Comment Tags

<superclasshook> X </superclasshook>

class Set extends genericXSuperClass { }

class Set /* @superClass */



Invasive Composition
adapts and extends
components
at hooks
by transformation