MDSD mit Xtext und Xtend

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Was ist ein Modell?

Abbildung

Verkürzung

Pragmatismus

Wer?

Wann?

Wozu?

Modellgetriebene Softwareentwicklung

Aus formalen Modellen lauffähige Programme erzeugen

Verwendung einer DSL mit Codegeneratoren oder Interpretern*

Beispiel Modell

Oracle Data Dictionary

select * from user_tables

select * from dba_free_space

Beispiel DSL

Fachsprache

Reguläre Ausdrücke

SQL

XUnit Frameworks

Beispiel DSL

```
<changeSet author="jsmith" id="2">

    <createTable tableName="employees">
        <column name="id" type="number(4,0)">
              <constraints nullable="false" primaryKey="true"
                           primaryKeyName="EMP_PK"/>
        </column>
        <column name="ename" type="varchar2(14)"
                remarks="The first and last name"/>
        <column name="salary" type="number(6,2)"
                remarks="The full remuneration"/>
        <column name="dpt_id" type="number(4,0)"/>
    </createTable>

    <addForeignKeyConstraint baseColumnNames="dpt_id"
                             baseTableName="employees"
                             constraintName="emp_dpt_fk"
                             referencedColumnNames="id"
                             referencedTableName="departments"/>

</changeSet>
```

Beispiel DSL

NeubewertungMesswert(TypA) :
erzeugeNeuenMesswert(TypB) und
erzeugeNeuenMesswert(TypC) wenn
messwertExistiertNicht(TypD)

Beispiel DSL

```
new Html => [

   head [
       it.title [$("HTML with Xtend")]
   ]

   body [
       h1 [$("HTML with Xtend")]
       p [$("this format can be used as an alternative to templates.")]

       a("http://www.xtend-lang.org") [$("Xtend")]

      p [
          $("This is some ")
          b[$("mixed")]
          $(" text. For more see the ")
          a("http://www.xtend-lang.org")[$("Xtend")]
          $(" project")
        ]
        p [$("More text.")]
   ]
]
```

Beispiel DSL

```
Feature: Addition

  In order to avoid silly mistakes
  As a math idiot
  I want to be told the sum of two numbers

  Scenario: Add two numbers
    Given I have entered "50" into the calculator
    And I have entered "70" into the calculator
    When I press "add"
    Then the result should be "120"
```

Warum überhaupt eine DSL verwenden ?

Deklarative Beschreibung

Bessere Lesbarkeit

Weniger technischer Code

Statische Validierung

Leichte Erlernbarkeit

```
ui_table {
  config {Scrollable, MultiSelection}
  content_provider Array
  column "Internal-Id"    width 100  property #internId
  column "Description“    width 500  property #desc
}
```

DSL = 6 Zeilen
Java Code = 56 Zeilen

Nachteile?

Vendor Lockin

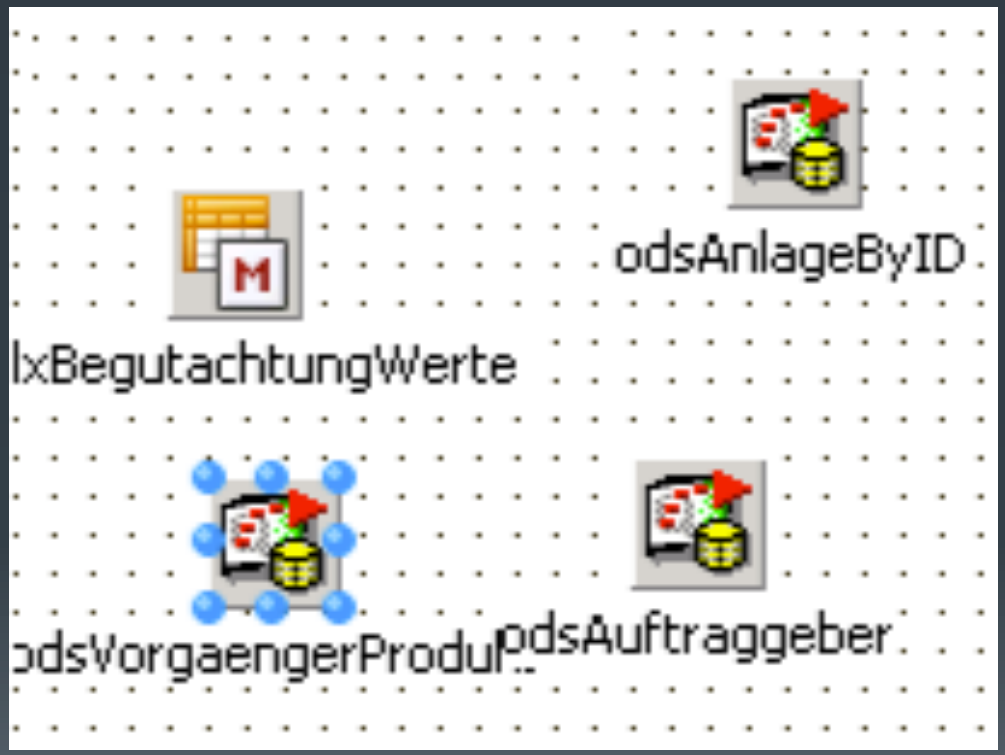
Lernaufwand

Toolsupport für DSL

Finden des Abstraktionsniveaus

Initialaufwand

Motivation?


odsAnlageByID
lxBegutachtungWerte
odsVorgaengerProdul
odsAuftraggeber

```
class Behaelterinfo < ActiveRecordSqlBase

  entity :BehaelterInfo, :preload => true,
        :load_all_order_by => :Beschreibung do

     column :Groesse,                  :IGroesse
     column :VolumenInM3,              :Double, :field_name => "vol"
     column :Special,                  :IJaNein
     column :Kurzbez,                  :string
     column :KurzbezFakturierung,      :string
     column :Beschreibung,             :string
     column :LeergewichtInKg,          :Double

     find_by :columns => [:=> :Groesse],
           :result => :record, :IBehaelterInfo
           :verify => :only_one_found

  end

end
```

Java Code Generierung

Vorteil

Deklarative Beschreibung

Bessere Lesbarkeit

Weniger technischer Code

Statische Validierung

Leichte Erlernbarkeit

Nachteil

Weitere Sprache Ruby/ JRuby

Toolsupport

Alternativen ?

http://createyourproglang.com/

JetBrains MPS

http://www.heise.de/developer/artikel/mbeddr-Embedded-Entwicklung-mit-erweiterbarem-C-1647220.html

Spring ROO

(Source is the model)

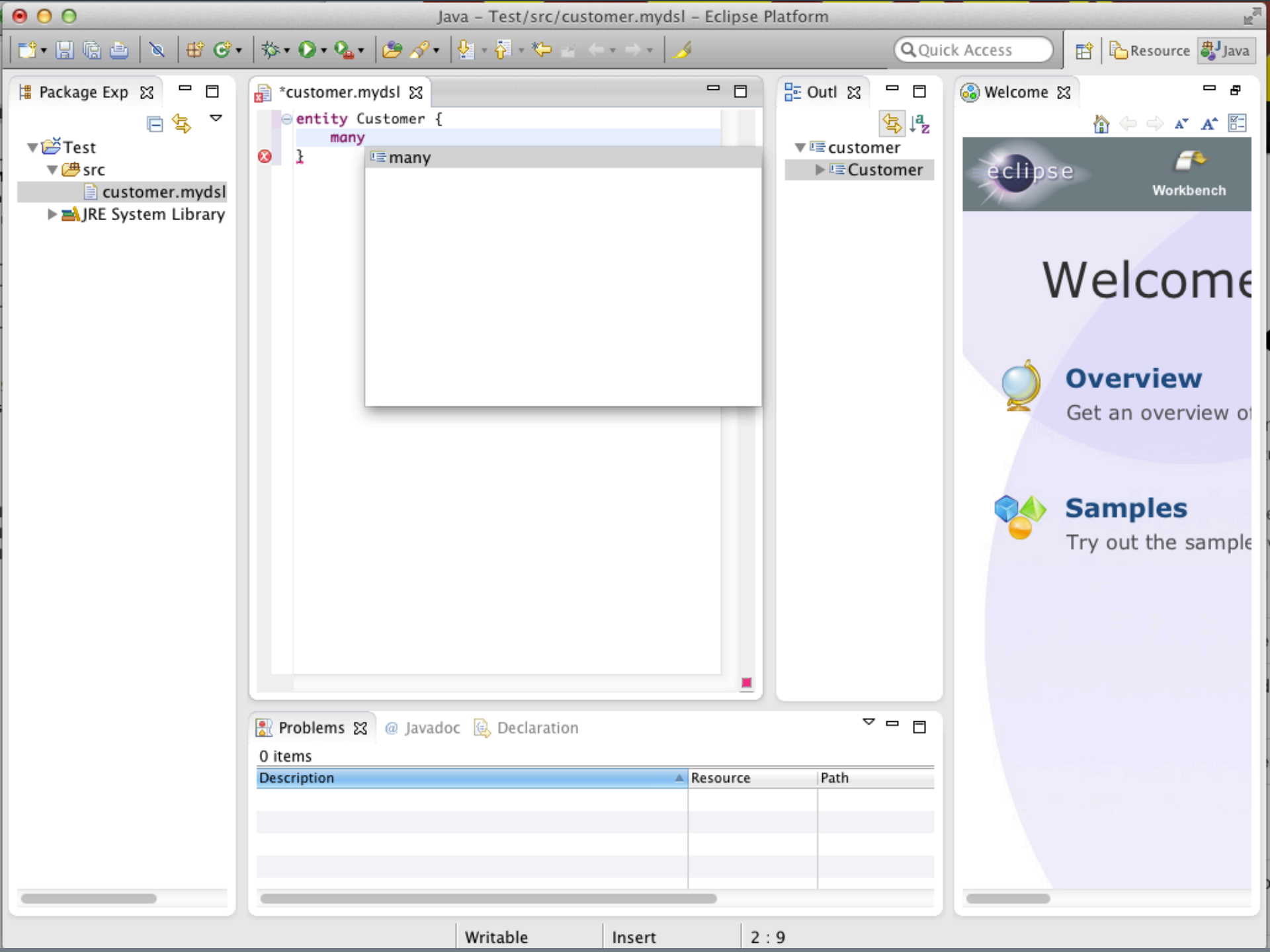
JaMoPP

(Source is the model)

EMF

Xtext/Xtend

```
grammar org.example.domainmodel.Domainmodel with
                                org.eclipse.xtext.common.Terminals

generate domainmodel “example.domainmodel”

Domainmodel :
  elements += Type*
;

Type:
  DataType | Entity
;

DataType:
  'datatype' name = ID
;

Entity:
  'entity' name = ID ('extends' superType = [Entity])? '{’
     features += Feature*
  '}’
;

Feature:
  many?='many'? name = ID ':' type = [Type]
;
```


Java – Test/src/customer.mydsl – Eclipse Platform
Quick Access
Resource
Java
Package Exp
Test
src
customer.mydsl
JRE System Library
*customer.mydsl
entity Customer {
many
}
many
Outl
customer
Customer
Welcome
eclipse
Workbench
Welcome
Overview
Get an overview of
Samples
Try out the sample
Problems
Javadoc
Declaration
0 items
Description
Resource
Path
Writable
Insert
2 : 9

Xtend

Coffeescript for Java

Spracheigenschaften

Keine Semikolons

```
val page = PlatformUI::workbench.activeWorkbenchWindow.activePage
Environment::enableTest()
display = Display::current
```

Everything is an expression

```
val data = try {
  fileContentsToString('data.txt')
} catch (IOException e) {
  'dummy data'
}
```

var/val

```
val combo = widget1 as Combo

var data = "String”
data = "New Data"
```

Typeinference

```
val greetings = newHashMap(
  "german"  -> "Hallo",
  "english" -> "Hello"
)

val jobManager = Job::jobManager
```

Typeinference Methods

```
def rowCount(EventDestination ed) {
    return ed.wf.doCommandReturnInt(
        new Property(ed.propertyName),
        [widget |
            val table = widget as Table
            table.itemCount])
}
```

Keine Checked Exceptions

Dispatch Methods

```
def dispatch printType(Number x) {
  "it's a number"
}

def dispatch printType(Integer x) {
  "it's an int"
}
```

Extended Switch Expression

```
val myString = "Hello“
switch myString {
  case myString.length > 5 : "a long string."
  case 'some'              : "It's some string."
  default                  : "It's another short string."
}
```

```
val x = list(1, 2, 3) as Object
switch x {
  String case x.length > 0 : x.length
  List<?>                  : x.size    List
  default : -1
}
```

Extension Methods

```
def removeVowels (String s){
  s.replaceAll("[aeiouAEIOU]", "")
}

removeVowels("Hello")
"Hello".removeVowels
```

Template

```
def someHTML(List<Paragraph> paragraphs) '''
                <html>
                  <body>
                    «FOR p : paragraphs BEFORE '<div>'
                       SEPARATOR '</div><div>' AFTER '</div>'»
                      «IF p.headLine != null»
                        <h1>«p.headline»</h1>
                      «ENDIF»
                      <p>
                        «p.text»
                      </p>
                    «ENDFOR»
                  </body>
                </html>
              '''
```

@Property / @Data

@Property String name

Functional Programming

Functional Programming I

```
val colors = list("red", "blue", "green")
colors.head => "red"
colors.tail => iterable("blue", "green")
colors.last => "green"
colors.empty => false
```

Functional Programming II

```
var (String)=>int lambda = [length]
lambda.apply("hello")
=> 5
```

Functional Programming III

```
list("a string", 42, true).filter(typeof(String))
 =>  iterable("a string")

list("red", "blue", "green").filter[startsWith("b")]
 => list("blue")

val strings = list("red", "blue", "green")
val charCount = strings.map[s|s.length]
          .reduce[sum, size | sum + size]

charCount => 12
```

Xtext

```
grammar org.xtext.example.hdsl.HibernateDsl with org.eclipse.xtext.xbase.Xbase
generate hibernateDsl "http://www.xtext.org/example/hdsl/HibernateDsl"

DomainModelFile:
        ('package' name=QualifiedName)?
        imports+=Import*
        entities+=Entity*
;

IMPORT:

  'import' importedNamespace=QualifiedName
;

Entity:
    'entity' name=ValidID ('extends' superType=JvmTypeReference)? '{'
        features+=Property*
    '}'
;

Property:
   name=ValidID ':' type=JvmTypeReference (notNull?='NotNull')?
        (columnName=ValidID)?
;
```

```
import de.mcs.company.*

/*
A customer
*/
entity Customer {
     name              : String notNull
     lastname          : String
     company           : Company
     age               : Integer
}
```

```
class HibernateDslJvmModelInferrer extends AbstractModelInferrer
{

  @Inject extension JvmTypesBuilder
  @Inject extension IQualifiedNameProvider

  extension TypesFactory = TypesFactory::eINSTANCE

  def dispatch infer(Entity entity, IJvmDeclaredTypeAcceptor
       acceptor, boolean prelinkingPhase) {

       acceptor.accept(
              entity.toClass( entity.fullyQualifiedName )
       ).initializeLater [

              documentation = entity.documentation
              annotations +=
                entity.toAnnotation("javax.persistence.Entity")
```

```
members += entity.toConstructor() []
```

```
for ( f : entity.features ) {

    switch f {

        Property : {
         val a = f.toAnnotation("javax.persistence.Column")
         val v  = createJvmStringAnnotationValue
         val op = a.annotation.members
             .filter(typeof(JvmOperation))
              .filter(o|o.simpleName == "name").head

         v.operation = op; v.values += f.name; a.values += v

         val field = f.toField(f.name, f.type) [
               annotations += a
               if (f.notNull) {
                 annotations +=
                    f.toAnnotation
                      ("javax.validation.constraints.NotNull")
               }
        ]
        members += field
```

```
members += entity.toMethod("get" + f.name.toFirstUpper, f.type) [
        body = [append('''
            return this.«f.name»;''')]
                                                ]


members += entity.toMethod("set" + f.name.toFirstUpper,
        entity.newTypeRef(Void::TYPE)) [
                parameters += toParameter(f.name, f.type)
                body = [append('''
                        columnValues.put("«f.name»", «f.name»);
                        this.«f.name» = «f.name»;''')]
                                                ]
```

```
val stringType = entity.newTypeRef(typeof(String))
val objectType = entity.newTypeRef(typeof(Object))

members += entity.toMethod("setKey", entity.newTypeRef(Void::TYPE))
[
   parameters += toParameter("key", stringType)
   parameters += toParameter("value", objectType)
   body = [append('''
   «FOR f : fields»
        if (key.equals("«f.simpleName»")) {
          set«f.simpleName.toFirstUpper»(
               («f.type.simpleName»)value);
               return;
        };
   «ENDFOR»''')]]]
```

Resultate

Episode 36: Modellierst du schon oder programmierst du noch?

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Quelle:
http://www.eclipse.org/xtend/
http://www.eclipse.org/Xtext/
http://jnario.org/org/jnario/jnario/documentation/20FactsAboutXtendSpec.html
http://de.wikipedia.org/wiki/Modell