

# Installation

- Grab a USB key
- Install Eclipse
- Save the zip files to your disk
  - `host_workspace.zip`
  - `runtime_workspace.zip`

# Xtext for Beginners

Moritz Eysholdt, Jan Köhnlein, Holger Schill

# Outline

- Example Application
- Build your DSL with Xtext
- Generate Code with Xtend
- Validate Models
- Introduce Cross-references
- Outlook

# Outline

- **Example Application**
- Build your DSL with Xtext
- Generate Code with Xtend
- Validate Models
- Introduce Cross-references
- Outlook

## Eclipse Community Survey 2012

Evaluate

What is the *primary* type of software you are personally involved in developing?

- ☐ Desktop client applications
- ☐ Embedded software
- ☐ Mainframe applications
- ☐ Mobile applications
- ☐ Plug-ins for Eclipse
- ☐ Research/scientific applications

# Demo

Applications

lications (client/server, CRM, database

are

☐ DON'T KNOW☐ Other (please specify)

What is the *primary* server framework you use for deployed applications?

- ☒ Apache Struts
- ☐ Apache Struts 2
- ☐ Apache Tapestry
- ☐ Drupal

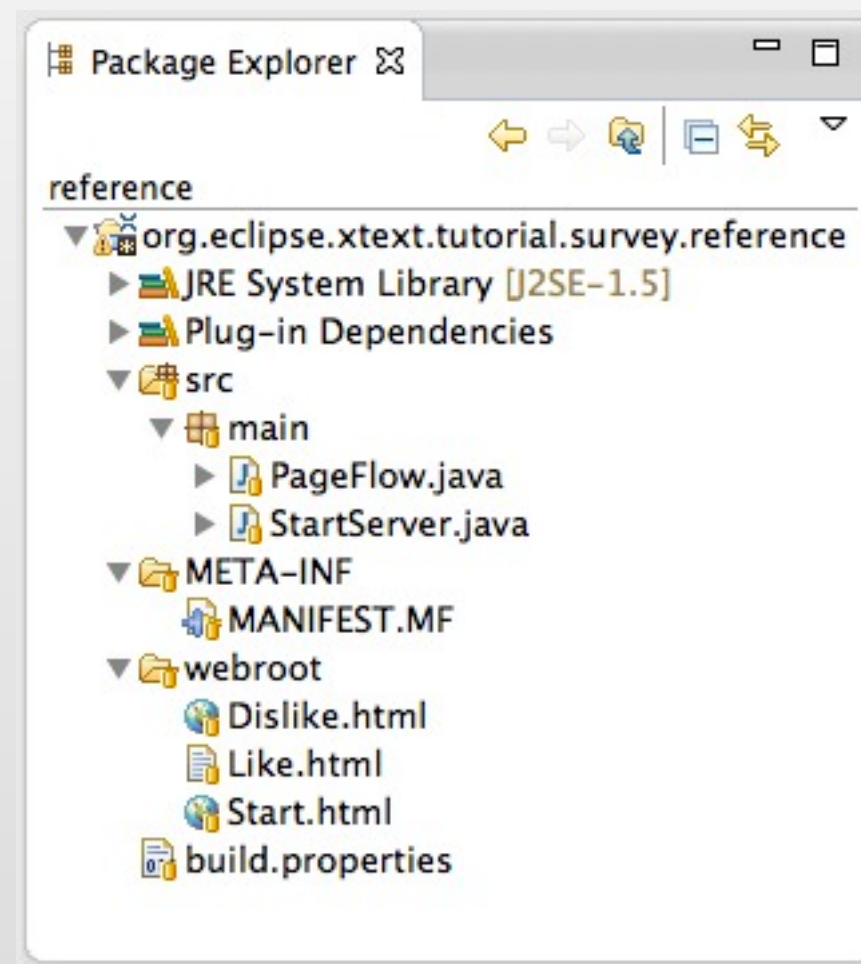
# Example: Surveys

- A web-based app for surveys
  - online answering
  - multiple pages
  - different types of questions
  - online evaluation

# Architecture

- HTML forms
- Twitter Bootstrap CSS / JavaScript
- Jetty server
- Simple pageflow engine
- In memory persistence

# API View





# Challenges

- A heterogeneous platform
  - Java, HTML, maybe a Database
- Difficult to extend
  - more questions, multiple surveys
  - other front ends
- Hard to maintain

# The Domain

- The application is about **Surveys**.
- A **Survey** consists of **Pages**.
- A **Page** holds a couple of **Questions**.
- **Questions** can be answered with **FreeText** or predefined **Choices**.
  - Some **Choices** are **exclusive**.
- A page defines its **FollowUp** pages
  - **FollowUps** may depend on on given answers.

# DSL Approach

- Create a domain-specific language
  - Describes the data formally
- Generate code from its models

## Survey

### Page

**TextQuestion**

**ChoiceQuestion (single)**

**Choice**

**Choice**

**FollowUp**

**FollowUp**

```
survey tutorial "EclipseCon 2013 Tutorial Survey"
```

```
page Start (
```

```
  text name 'Your name'
```

```
  single choice like "Do you like the tutorial?" (
```

```
    yes "Yes"
```

```
    no "No"
```

```
  )
```

```
  if like=yes -> Like
```

```
  if like=no -> Dislike
```

```
)
```

### Page

**ChoiceQuestion**

**Choice**

**Choice**

**Choice**

```
page Like (
```

```
  choice particular "What do you like in particular?" (
```

```
    xtext 'Xtext is awesome'
```

```
    excercises 'The funny exercises'
```

```
    tutors 'The handsome tutors'
```

```
  )
```

```
)
```

### Page

**ChoiceQuestion**

**Choice**

**Choice**

**Choice**

```
page Dislike (
```

```
  choice particular "What do you hate in particular?" (
```

```
    xtext 'Xtext sucks'
```

```
    excercises 'The boring exercises'
```

```
    tutors 'The tutors stink'
```

```
  )
```

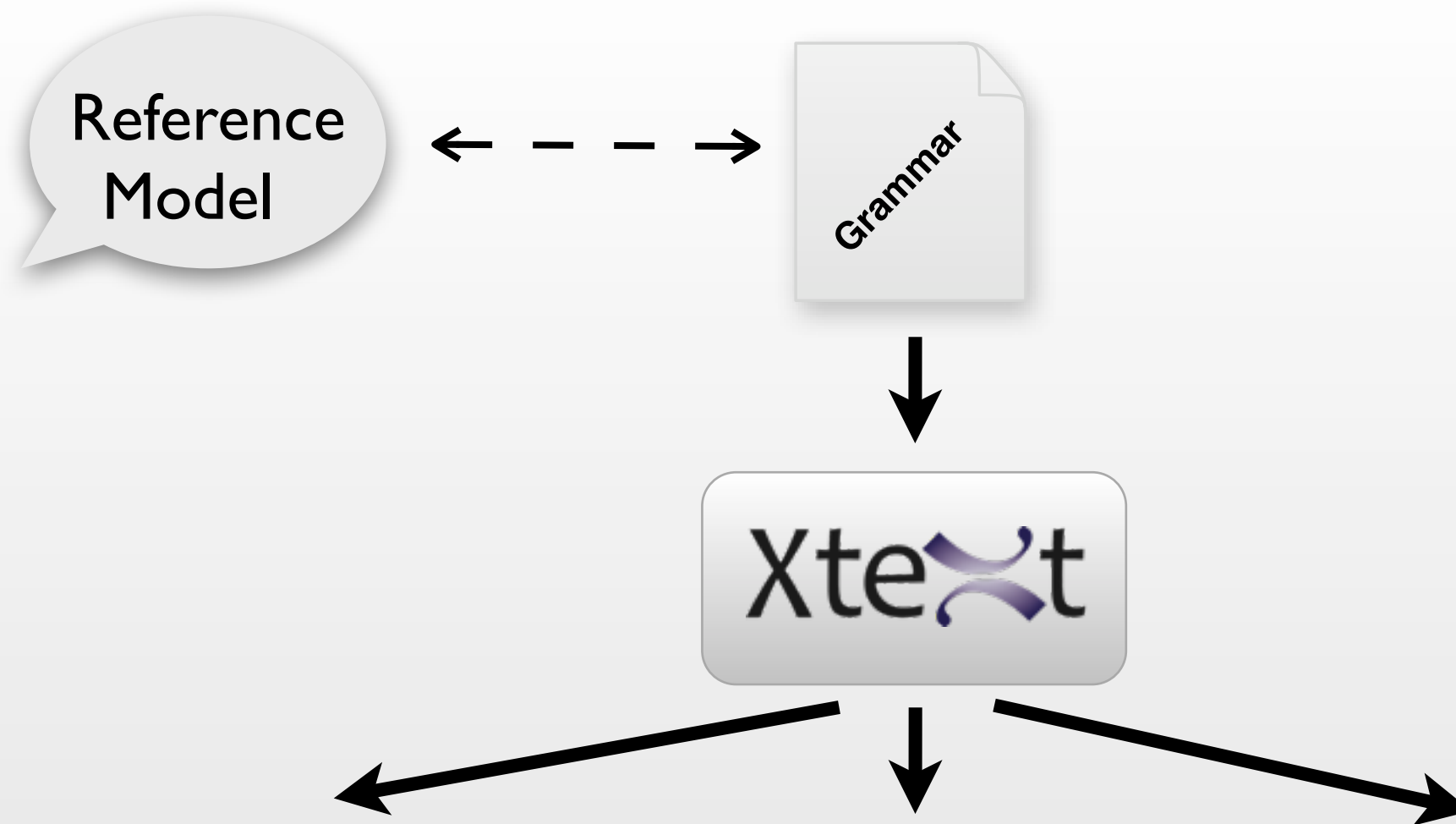
```
)
```

# Advantages

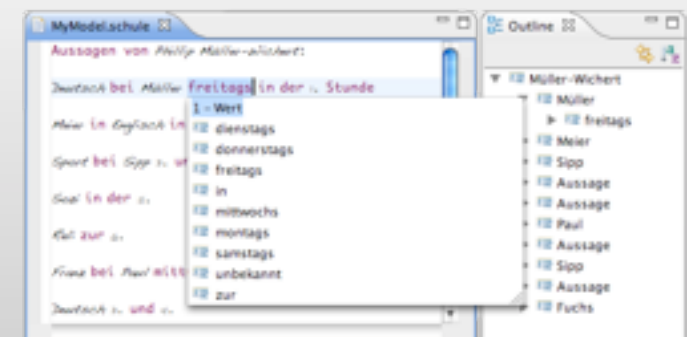
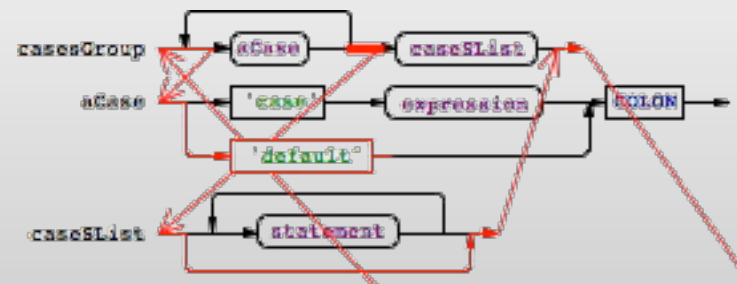
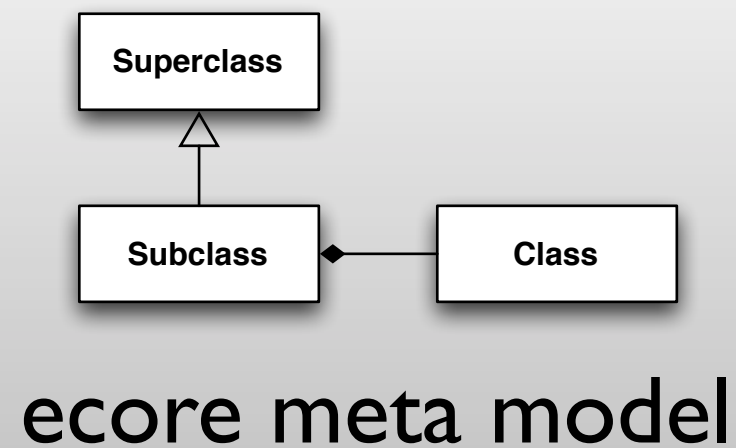
- ◎ Addresses heterogeneity
- ◎ Easy design of surveys
- ◎ Easy to add new front ends
- ◎ Separation of roles during development
- ◎ Speedup for development
- ◎ Improved maintainability

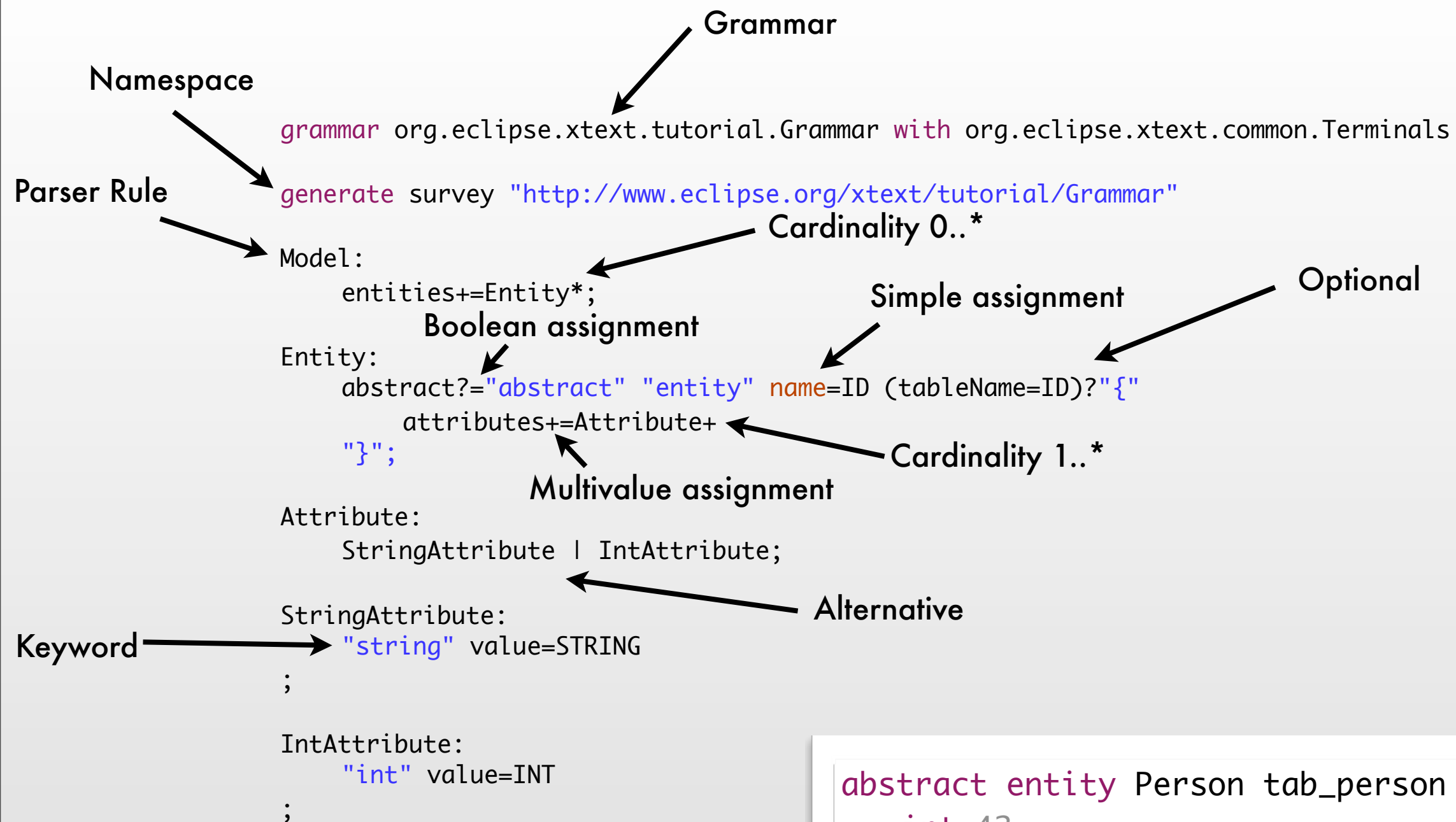
# Outline

- Example Application
- **Build your DSL with Xtext**
- Generate Code with Xtend
- Validate Models
- Introduce Cross-references
- Outlook



## Xtext Runtime





```
abstract entity Person tab_person {
    int 42
    string "Some String"
}
```



# Outline

- Example Application
- Build your DSL with Xtext
- **Generate Code with Xtend**
- Validate Models
- Introduce Cross-references
- Outlook

»Xtend

# Xtend: Templates

```
def example(List<String> elements) '''  
    Usually a template consists mainly of text spanning  
    multiple lines.  
    If you want to evaluate an expression you have to write it  
    in french quotes «7*3*2». Code assist inserts a pair of  
    these.  
    You can also iterate a collection with FOR  
    «FOR element: elements»  
        Found another element: «element»  
    «ENDFOR»  
    For decisions there is the IF statement  
    «IF elements.isEmpty()»  
        no elements.  
    «ENDIF»  
'''
```

# Xtend: Dispatch Methods

// Xtend code

```
def dispatch area(Rectangle r) {  
    r.width * r.height  
}
```

```
def dispatch area(Circle c) {  
    c.radius * c.radius * Math::PI  
}
```

```
def someCalculation(Object o) {  
    area(o) // polymorphic call  
}
```

```
// generated Java code (dispatcher)  
public double area(final Object c) {  
    if (c instanceof Circle) {  
        return _area((Circle)c);  
    } else if (c instanceof Rectangle) {  
        return _area((Rectangle)c);  
    } else {  
        throw new IllegalArgumentException();  
    }  
}
```

# Outline

- Example Application
- Build your DSL with Xtext
- Generate Code with Xtend
- **Validate Models**
- Introduce Cross-references
- Outlook

# Validator

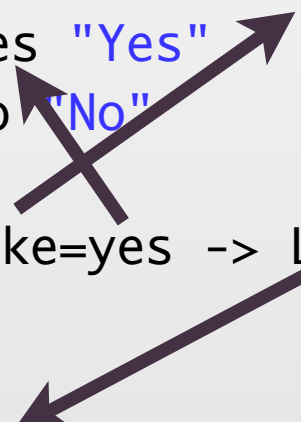
```
class SurveyValidator extends AbstractSurveyValidator {  
  @Check  
  def textMustNotBeEmpty(Question question) {  
    if(question.getText().isEmpty()) {  
      error("Empty question is illegal",  
        question,  
        QUESTION__TEXT)  
    }  
  }  
}
```

# Outline

- © Example Application
- © Build your DSL with Xtext
- © Generate Code with Xtend
- © Validate Models
- © **Introduce Cross-references**
- © Outlook

# Cross References

```
page Start (  
  single choice like "Do you like the tutorial?" (  
    yes "Yes"  
    no "No"  
  )  
  if like=yes -> Like  
)  
  
page Like (  
  choice particular "What do you like in particular?" (  
    xtext 'Xtext is awesome'  
    excercises 'The funny exercises'  
    tutors 'The handsome tutors'  
  )  
)
```





# Grammar

Page:

```
'page' name=ID '('  
    // questions  
    '->' next=[Page|ID]  
'');
```

# Scoping

```
page Start (  
  text name 'Your name'  
  single choice like "..."  
    yes "Yes"  
    no "No"  
)  
if like=yes -> Like  
)
```

```
page Like (  
  choice particular "..."  
    xtext '...'  
    excercises '...'  
    tutors '...'  
)  
...
```

## referable **Questions** (default scoping)

global scope	local scope
Start.name	name
Start.like	like
Like.particular	

## referable **Choices**

custom scope
yes
no

# Outline

- ◎ Example Application
- ◎ Build your DSL with Xtext
- ◎ Generate Code with Xtend
- ◎ Validate Models
- ◎ Introduce Cross-references
- ◎ **Outlook**

# Outlook

- Enhance generator
- Customize IDE
  - Outline, Formatter, Labels, ...
- Add more expressions

# More on Xtext/Xtend at EclipseCon 2013

- DSLs for Java
- Xtext Best Practices
- Xtext in the Web (Orion Symposium)
- Executable Specification for Xtext (Modeling Symposium)
- Getting Started With Xtend
- Internal DSLs With Xtend
- Xtended JavaFX

# Thank You

... and don't forget the evaluation!