Installation

- Grab a USB Key

- Install Eclipse

- Save the Zip Files to Your Disk

  - host_workspace.zip

  - runtime_workspace.zip

Xtext

for Beginners

Jan Köhnlein, Sebastian Zarnekow

itemis

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 2013

Evaluate

What is the *primary* computer language you typically use to develop software?

○ C/C++

○ C

○ Lua

○ Groovy

○ Java

○ Java Script

Demo

○ Ruby

○ Scala

○ Visual Basic/Visual Basic .Net

○ None – I don't use a computer language for software development

○ Don't know

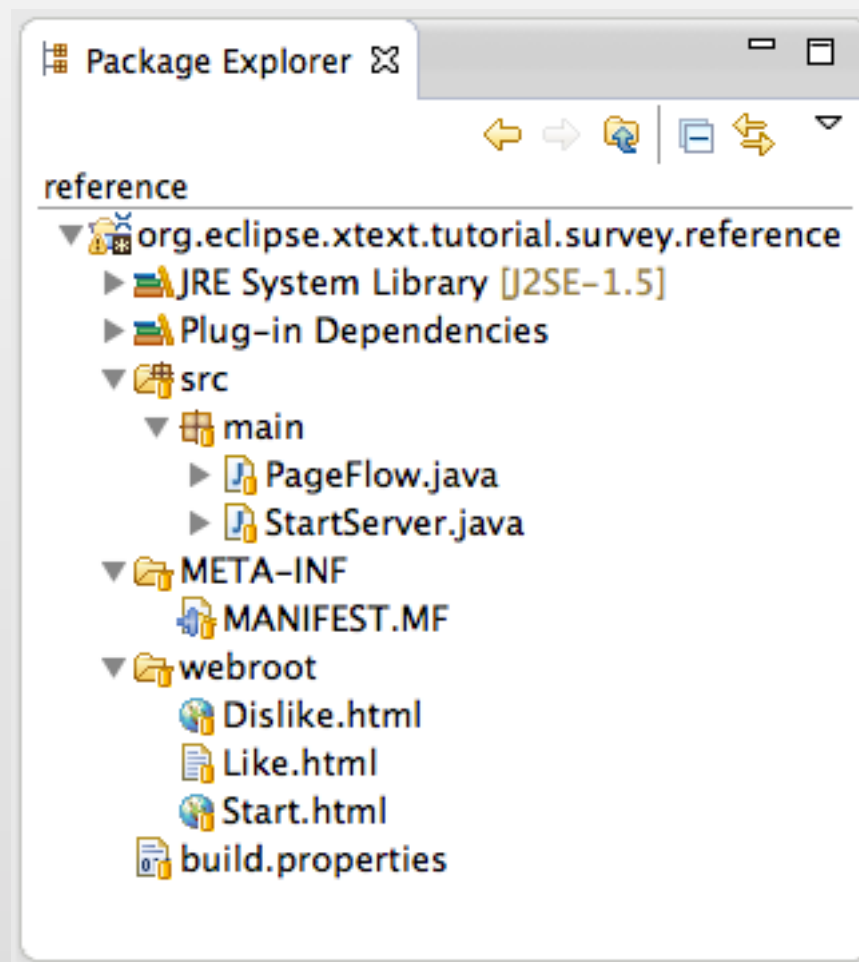⦿ Other (please specify)   Xtend

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 Page-Flow Engine

- In-Memory Persistence

API View

Challenges

- A Heterogeneous Platform
    - Java, HTML, Database …
- Difficult to Extend
    - More Questions, Other Surveys
    - Other Front-Ends (iOS, Android, PDF, …)
- Hard to Maintain

The Domain

- The application is about **Surveys**.

- A **Survey** consists of **Pages**.

- A **Page** holds **Questions**.

- **Questions** are answered with **FreeText** or predefined **Choices**.

    - Some **Choices** are **exclusive**.

- A **Page** defines its **FollowUp** pages

    - **FollowUps** may depend on given answers.

DSL Approach

◉ Create a Domain-Specific Language

◉ Describe the Data Formally

◉ Generate Code from DSL Files

Survey

Page
  TextQuestion
  ChoiceQuestion (single)
    Choice
    Choice
  FollowUp
  FollowUp

Page
  ChoiceQuestion
    Choice
    Choice
    Choice

Page
  ChoiceQuestion
    Choice
    Choice
    Choice

```
survey tutorial "EclipseCon 2013 Tutorial Survey"

page Start (
    text name 'Your name'
    single choice like "Do you like the tutorial?" (
        yes "Yes"
        no "No"
        wat "Which tutorial? I'm waiting for the bus!"
    )
    if like=yes -> Like
    if like=no -> Dislike
)

page Like (
    choice particular "What do you like in particular?" (
        xtext 'Xtext is awesome'
        excercises 'The funny exercises'
        tutors 'The handsome tutors'
    )
)

page Dislike (
    choice particular "What do you hate in particular?" (
        xtext 'Xtext sucks'
        excercises 'The boring exercises'
        tutors 'The tutors stink'
    )
)
```
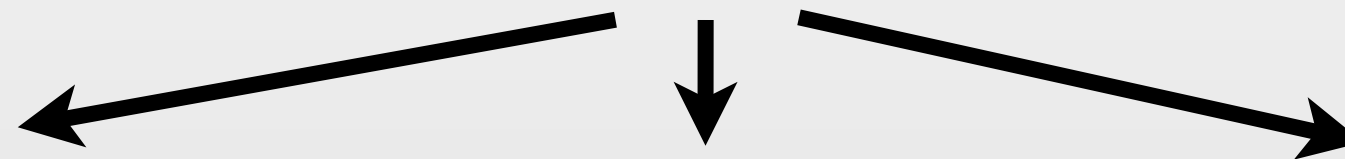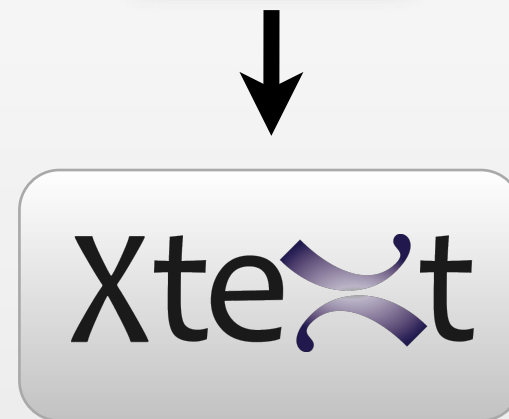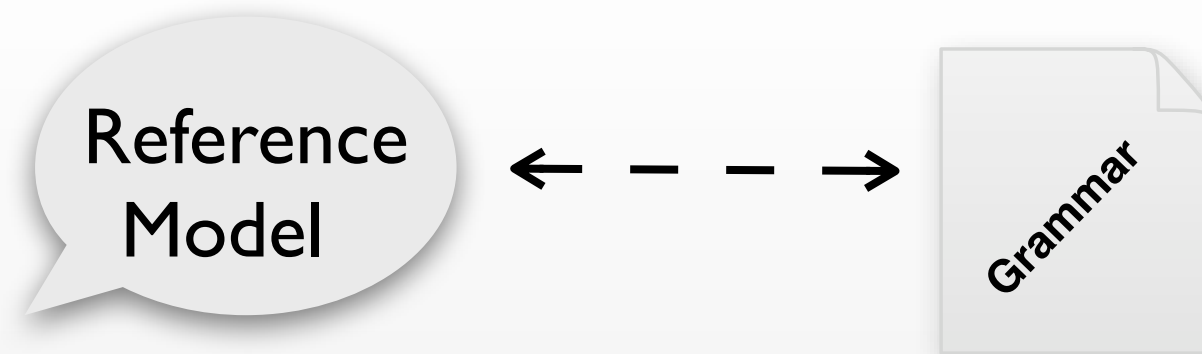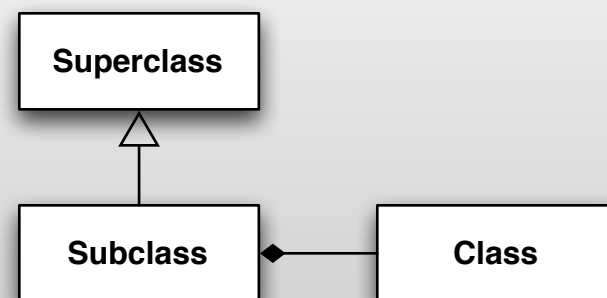
Advantages

- Addresses Heterogeneity

- Easy Design of Surveys

- Easy to Add New Front-Ends

- Separation of Roles During Development

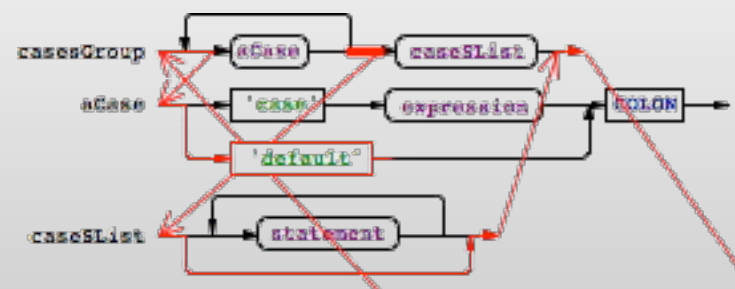- Speed-up for Development

- Improved Maintainability

Outline

◉ Example Application

◉ **Build your DSL with Xtext**

◉ Generate Code with Xtend

◉ Validate Models

◉ Introduce Cross-References

◉ Outlook

Namespace

```
grammar org.eclipse.xtext.tutorial.Grammar
    with org.eclipse.xtext.common.Terminals
```

Parser Rule

```
generate entities "http://www.eclipse.org/xtext/tutorial/Grammar"
```

Cardinality 0..*

```
Model:
    entities+=Entity*;
```

Multivalue assignment

Simple assignment

Optional

```
Entity:
    abstract?="abstract" "entity" name=ID (tableName=ID)?"{"
        attributes+=Attribute+
    "}";
```

Boolean assignment

Cardinality 1..*

```
Attribute:
    StringAttribute | IntAttribute;
```

Alternative

```
StringAttribute:
    "string" value=STRING;
```

Keyword

```
IntAttribute:
    "int" value=INT;
```

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

Outline

- Example Application

- Build your DSL with Xtext

- **Generate Code with Xtend**
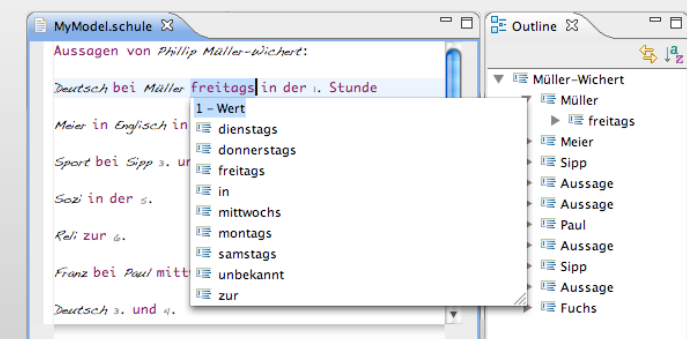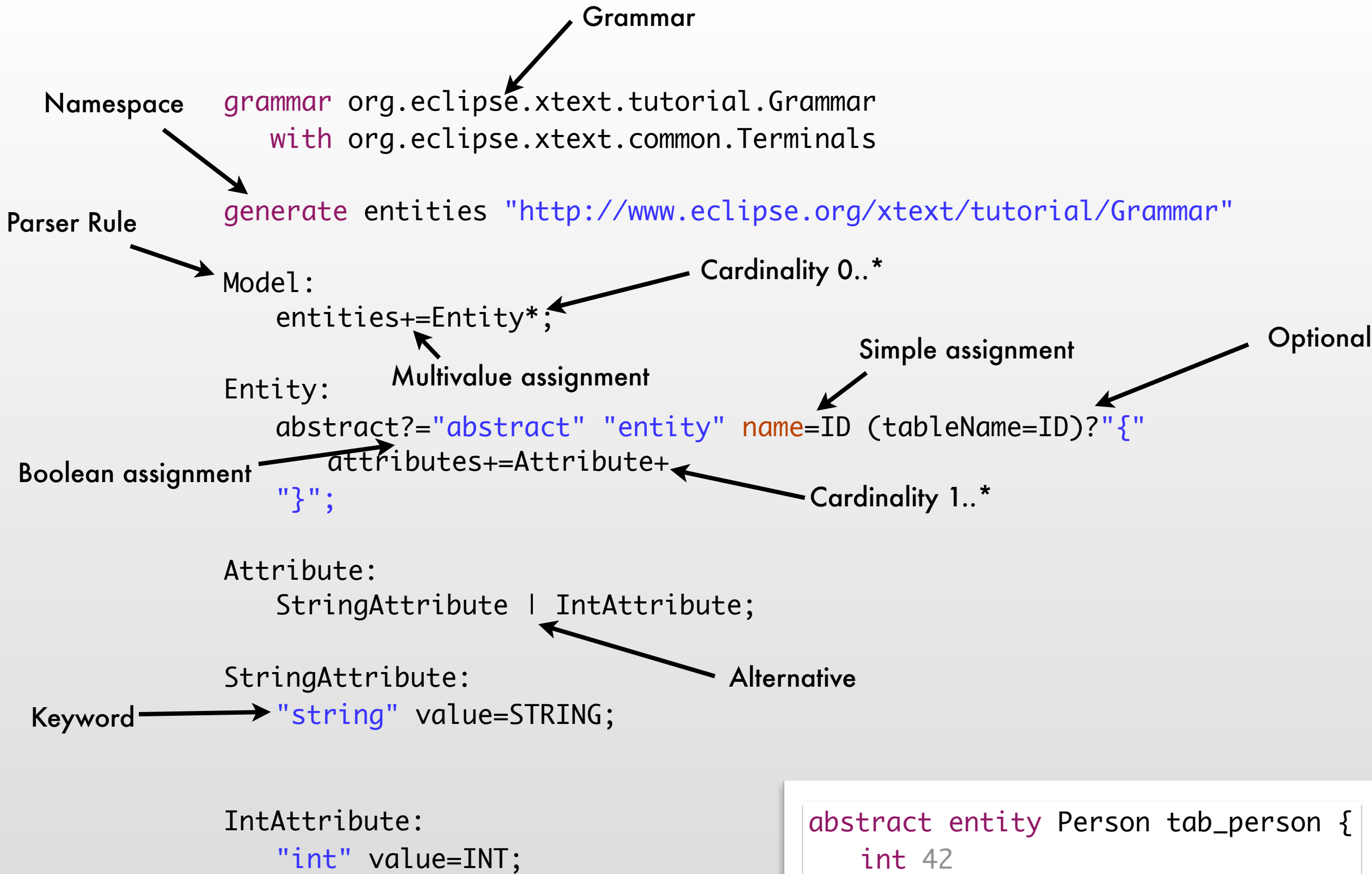
- Validate Models

- Introduce Cross-References

- Outlook

Hello Xtend

```
class Greeter {
  def static void main(String... args) {
    println('Hello EclipseCon')
  }
}
```

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.empty»
        no elements.
    «ENDIF»
'''
```

Dispatch Methods

```
// Xtend code
def dispatch area(Circle c) {
    c.radius * c.radius * Math.PI
}
def dispatch area(Rectangle r) {
    r.width * r.height
}


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

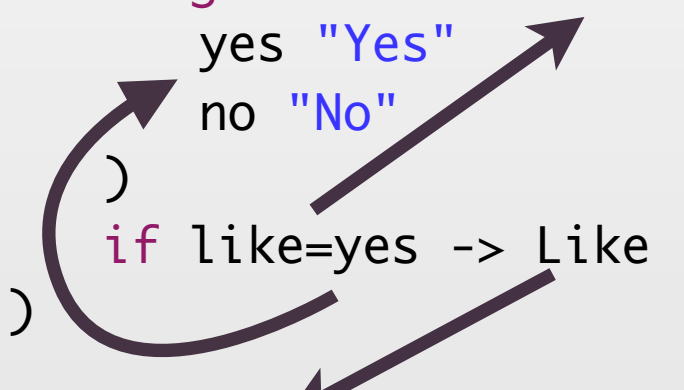◉ Outlook

Validator

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

Outline

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 '...'
    )
...
```

Questions (Default Scoping)	
Global Name	**Local Name**
Start.name	name
Start.like	like
Like.particular	

Choices
Customized
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 Europe 2013

- ◉ What You Get For Free with Xtext
- ◉ Rapid Android Development with Xtend
- ◉ Code Generation with Active Annotations
- ◉ Eclipse Diagram Editors: An Endangered Species
- ◉ Turn Ideas into Code Faster (Lightning talk)
- ◉ STEM 2.0: Helping save the world with EMF, GEF, and Xtext
- ◉ The prospering Eclipse Era in Automotive Industry
- ◉ Integrate your tools to help integrate your stakeholders
- ◉ Eclipse Smart Home
- ◉ Xcore meets IncQuery - How the New Generation of DSLs are Made
- ◉ Add some spice to your application! (using EMF Parsley in your UI)
- ◉ Beyond the box: How we built a JavaScript IDE with Xtext.
- ◉ Sirius: Changing the Game of Systems Architecture

Thank You

... and don't forget the evaluation survey!