INF

FAKULTÄT FÜR
INFORMATIK

How to Use FeatureIDE

Thomas Thüm

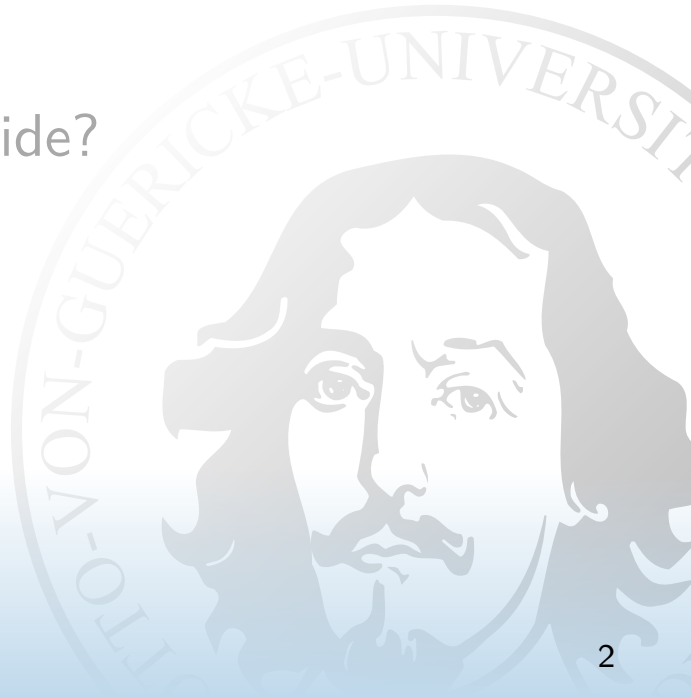
July 21, 2010

Content

- What is Feature-Oriented Software Development?
- What functionality does FeatureIDE provide?
- How to start working with FeatureIDE?

Content

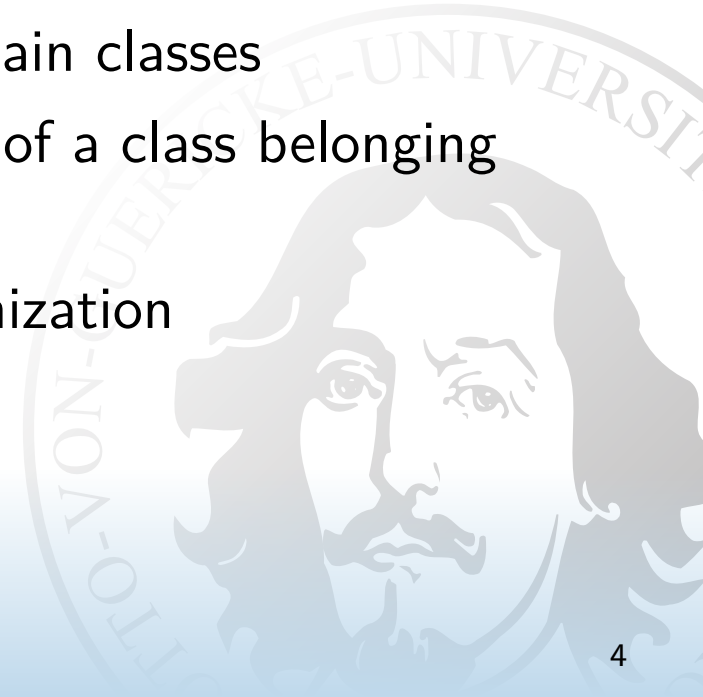
- What is Feature-Oriented Software Development?
  - Feature-Oriented Programming + Example
  - Configurations
  - Feature Model
  - Composition Engines
- What functionality does FeatureIDE provide?
- How to start working with FeatureIDE?



Content

Feature-Oriented Programming (FOP)

- Introduced 1997 by Christian Prehofer
- Based on Object-Oriented Programming
- Features realize functionalities
- Features are cross-cutting to objects
- Features modularize fragments from certain classes
- Fragment contains some methods/fields of a class belonging to one functionality
- Goals: code traceability, software customization



FOP Example

```
package util;
class Calc {
  void add() {
    e0 = e1 + e0;
    e1 = e2;
  }
}
```

feature: Add

•

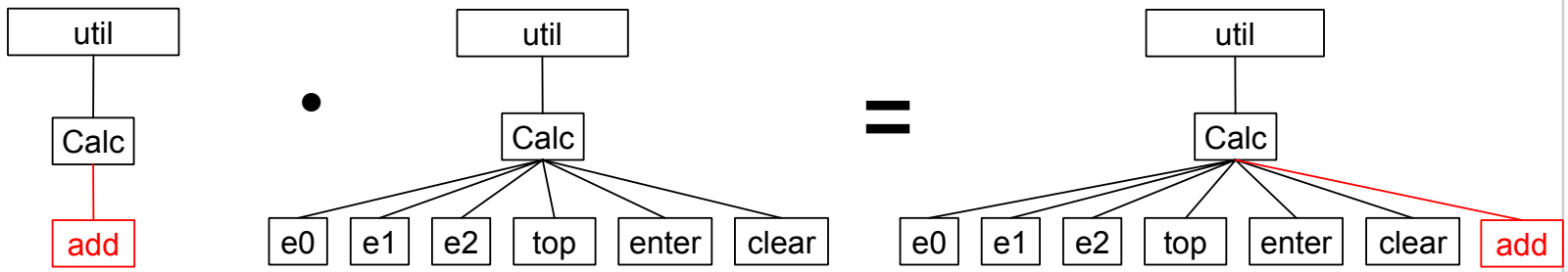
```
package util;
class Calc {
  int e0 = 0, e1 = 0,
      e2 = 0;
  void enter(int val) {
    e2 = e1; e1 = e0;
    e0 = val;
  }
  void clear() {
    e0 = e1 = e2 = 0;
  }
  String top() {
    return String.
      valueOf(e0);
  }
}
```

feature: CalcBase

=

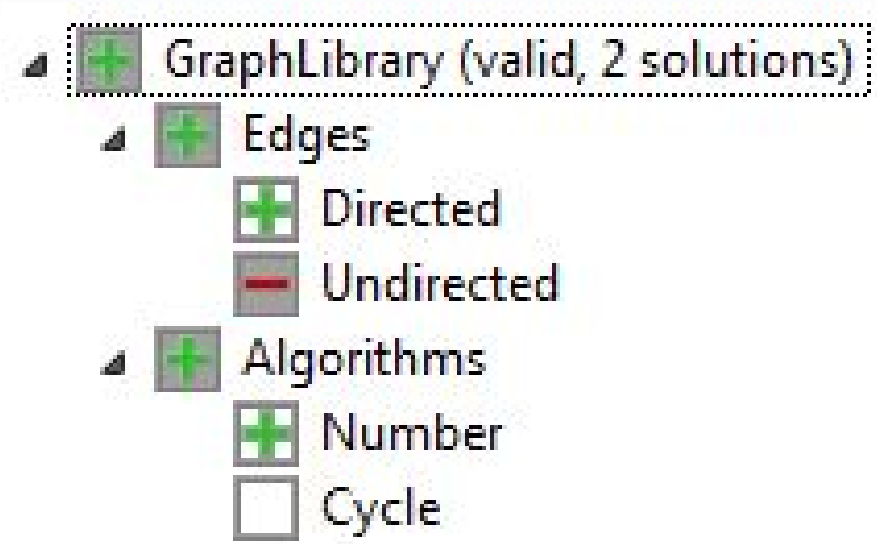
```
package util;
class Calc {
  int e0 = 0, e1 = 0,
      e2 = 0;
  void enter(int val) {
    e2 = e1; e1 = e0;
    e0 = val;
  }
  void clear() {
    e0 = e1 = e2 = 0;
  }
  String top() {
    //...
  }
  void add() {
    e0 = e1 + e0;
    e1 = e2;
  }
}
```

feature: CalcAdd



http://wwwiti.cs.uni-magdeburg.de/iti_db/lehre/epmd/2009/slides/06_FOP.pdf

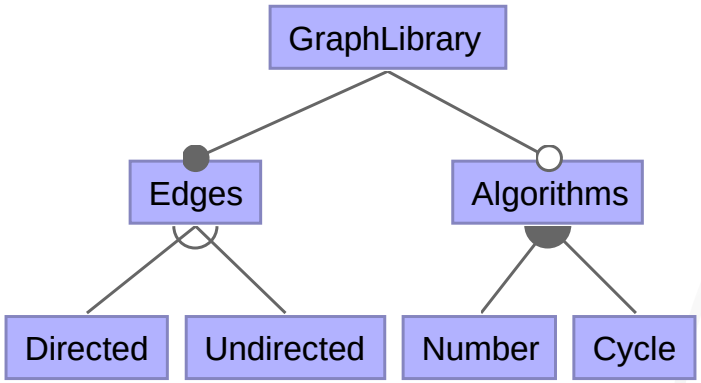
Configuration

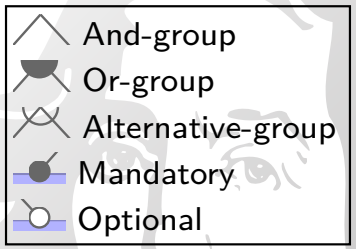


- Selection of features
- Composition of features results in a program variant
- Not all combinations are useful

Feature Model

- Specifies valid combinations of features
- Graphically represented by a feature diagram
- Created for a particular domain
- Describes a software product line (SPL)





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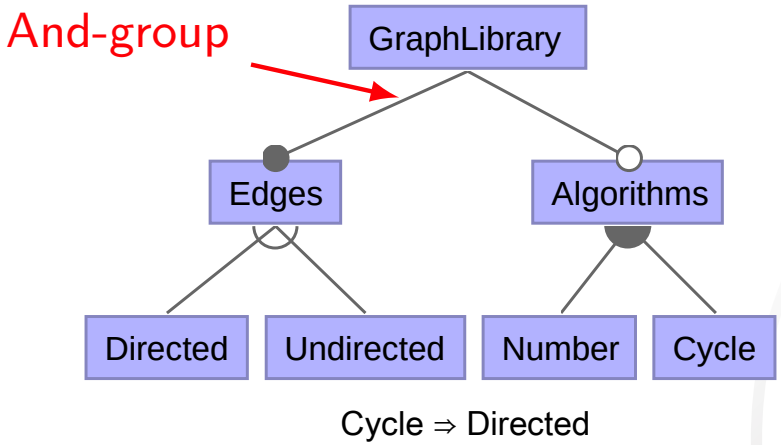

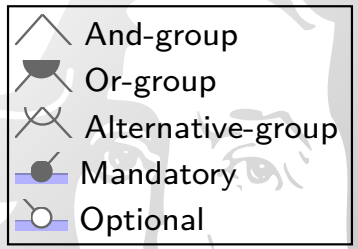

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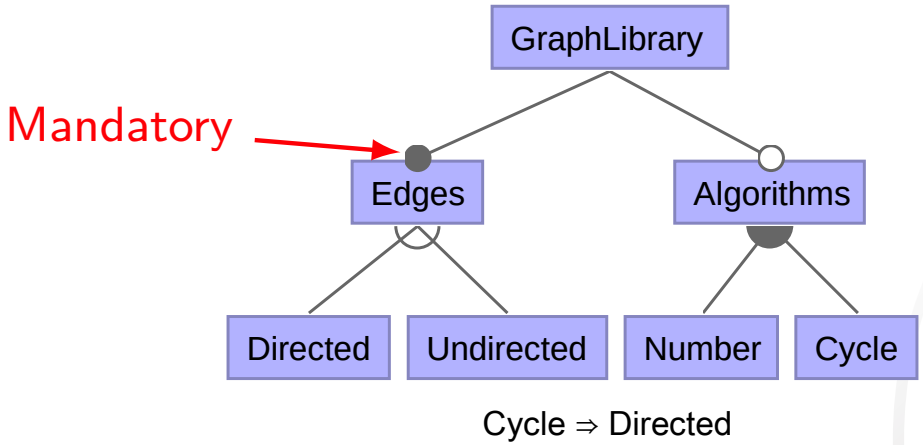

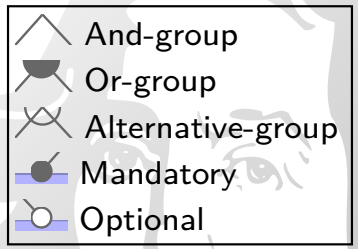

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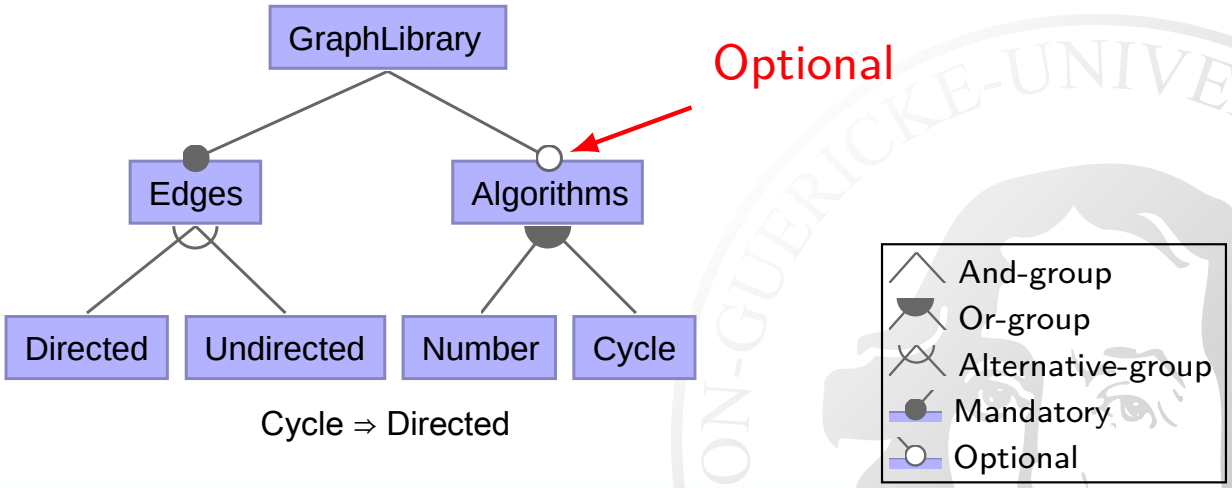

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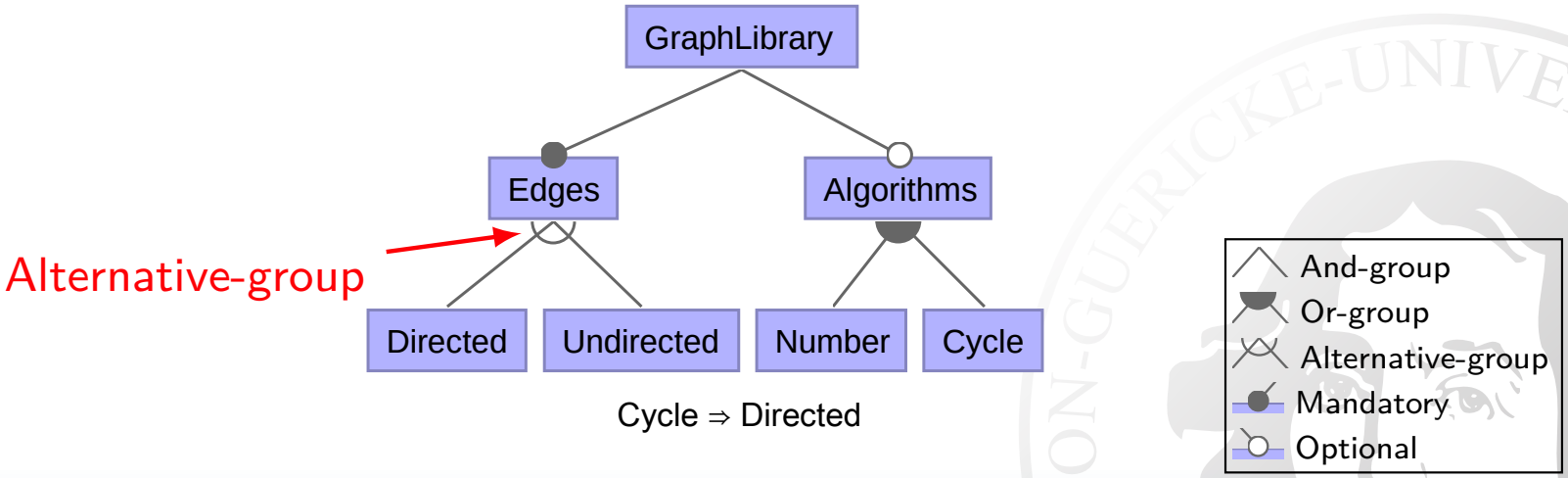

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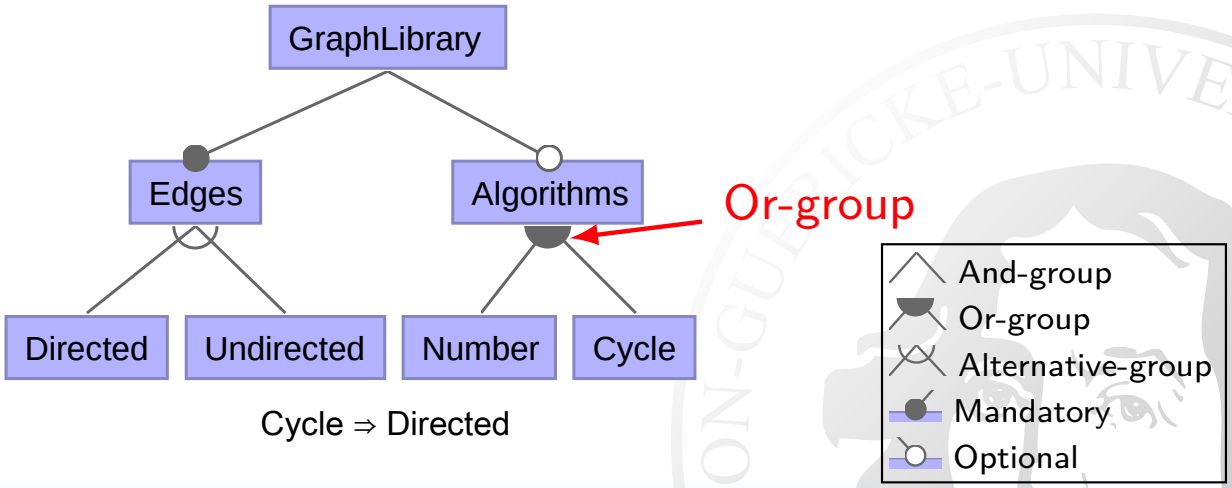

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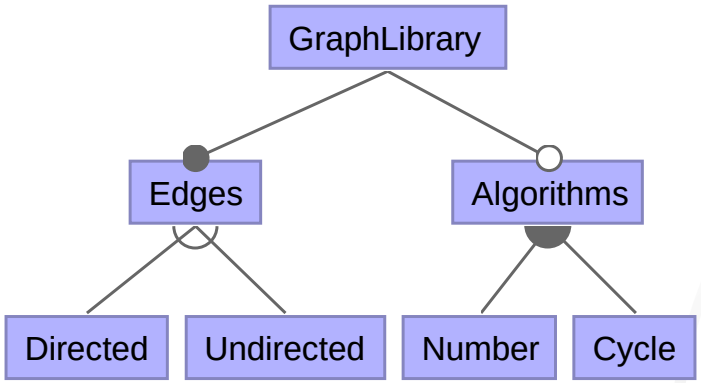

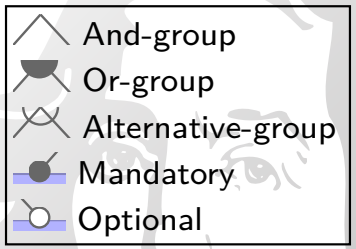

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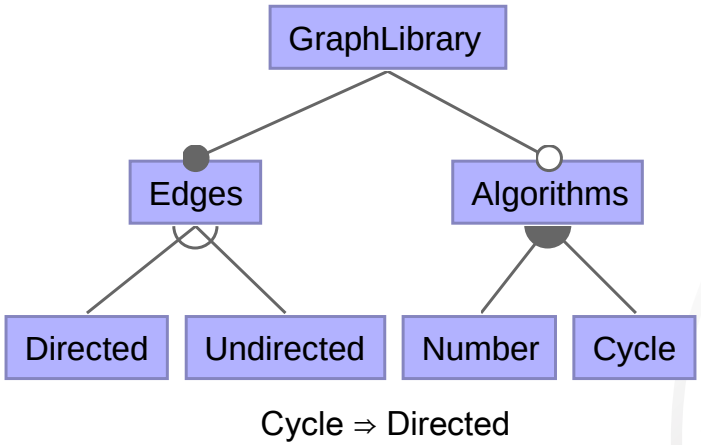
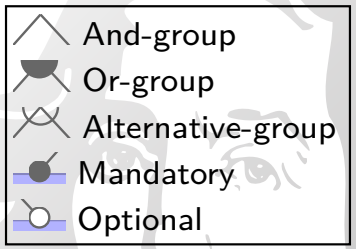
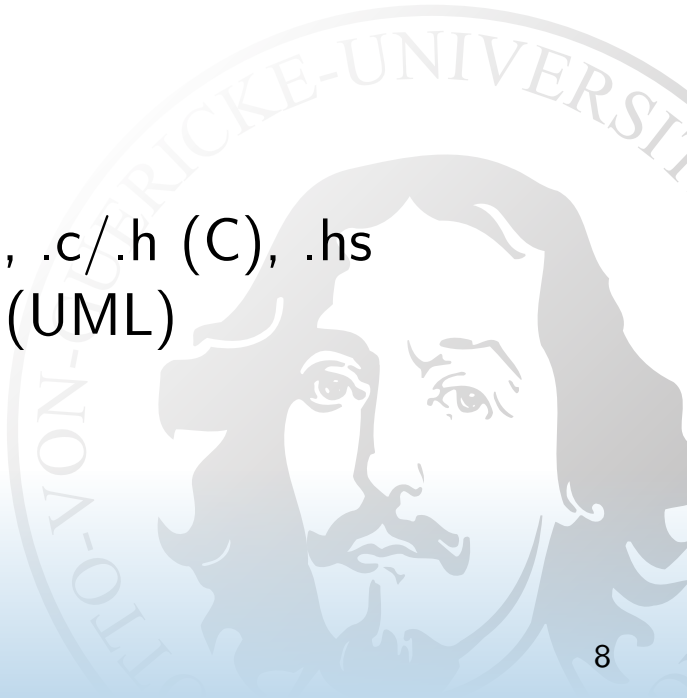




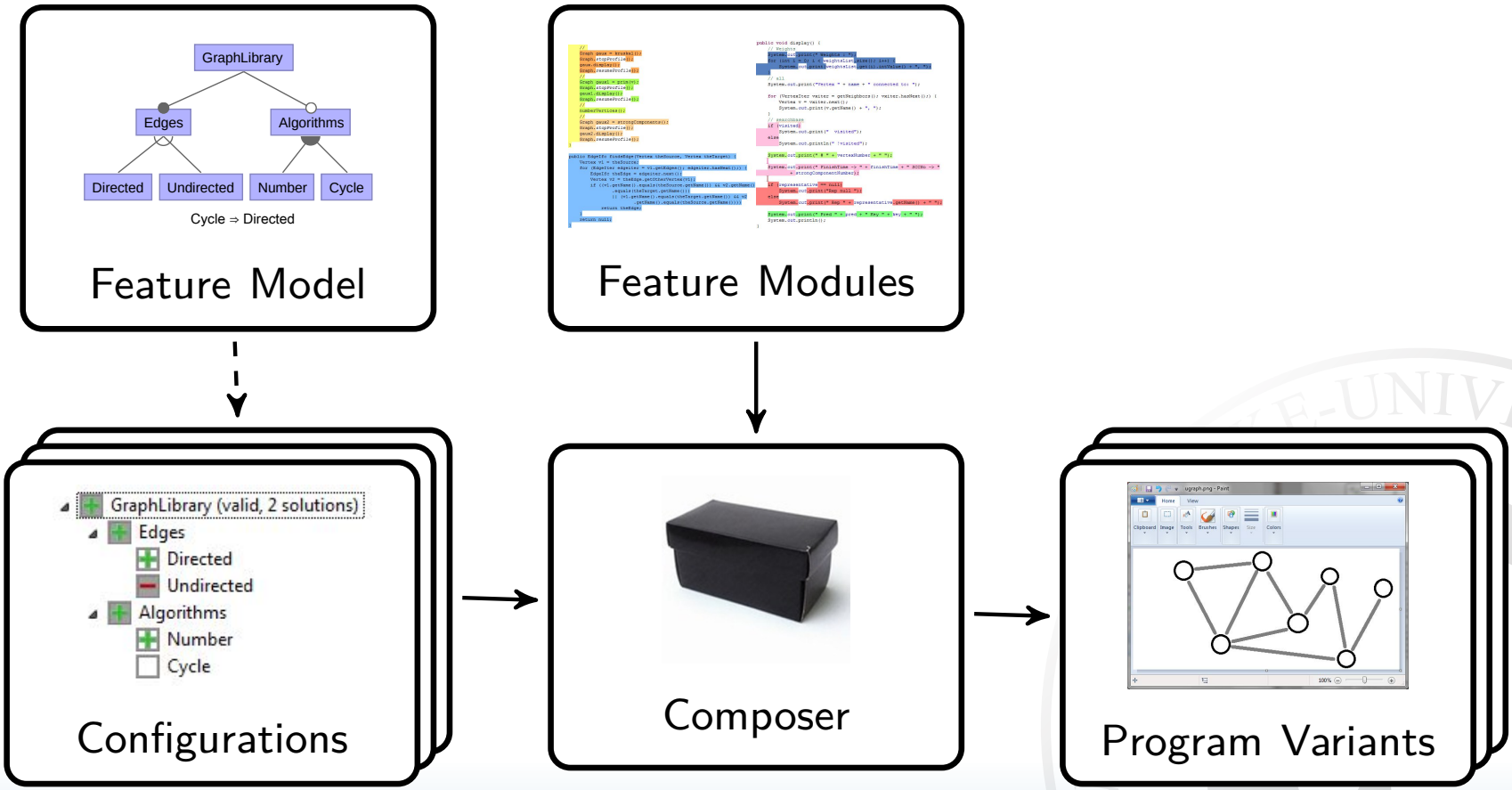
Composition Engines

Command-line tools used to compose files within FeatureIDE:

- AHEAD (jampack): .jak (Java 1.4)
  `http://userweb.cs.utexas.edu/~schwartz/ATS.html`
- FeatureC++: .cpp (C++)
  `http://www.fosd.de/fcpp`
- FeatureHouse: .java (Java 1.5), .cs (C#), .c/.h (C), .hs (Haskell), .jj (JavaCC), .als (Alloy), .xmi (UML)
  `http://www.fosd.de/fh`



Feature-Oriented Software Development

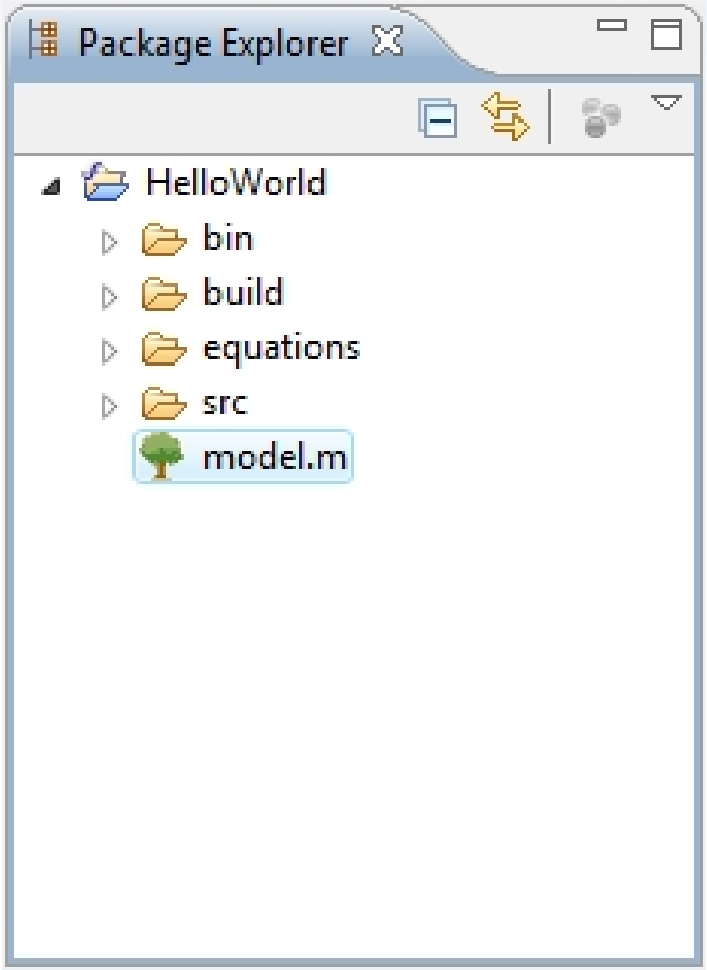


Content

- What is Feature-Oriented Software Development?
- What functionality does FeatureIDE provide?
  - FeatureIDE project structure
  - Feature Model Editor + Edit View
  - Configuration Editor
  - FeatureIDE Project Builder
  - Jak Editor
  - Collaboration Diagram
  - Run Configurations
  - Creation Wizards
- How to start working with FeatureIDE?

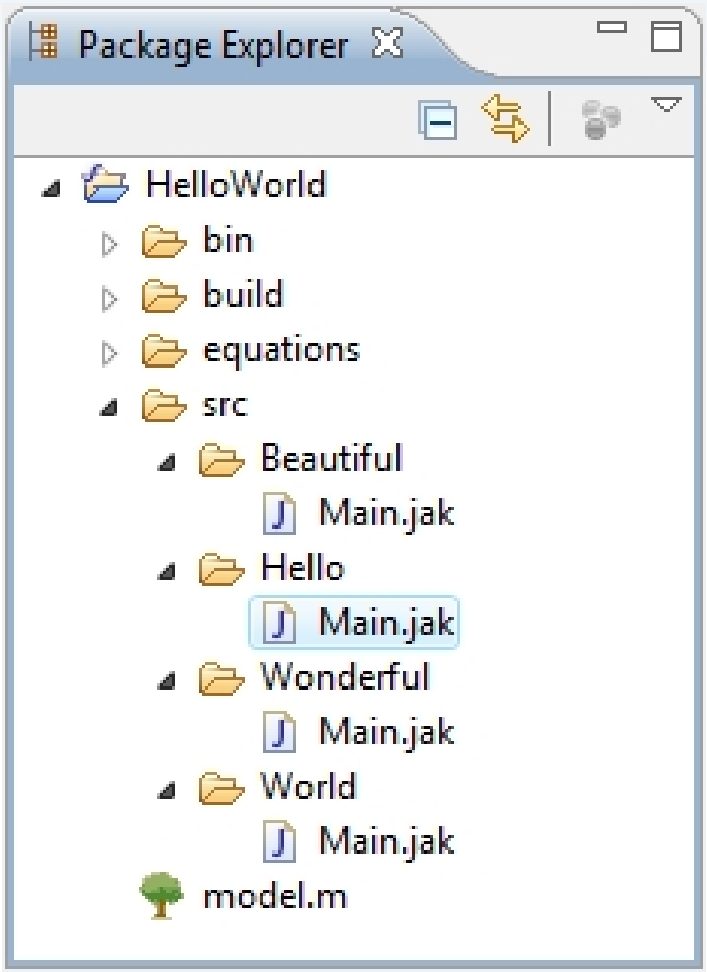
Content

FeatureIDE Project Structure



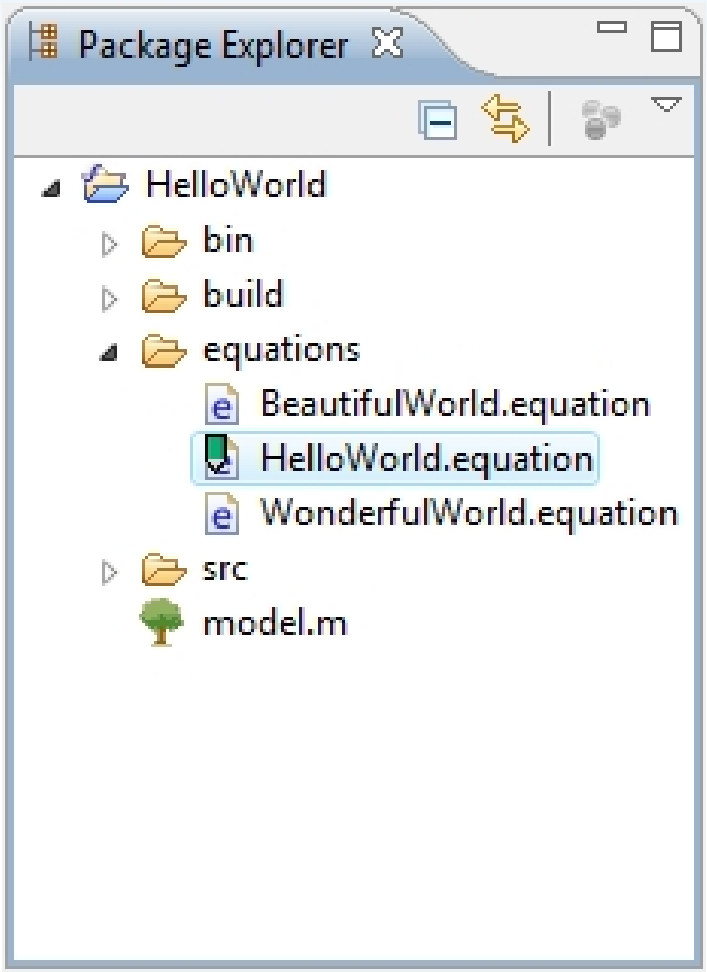
- Feature model file in the GUIDSL-format

FeatureIDE Project Structure



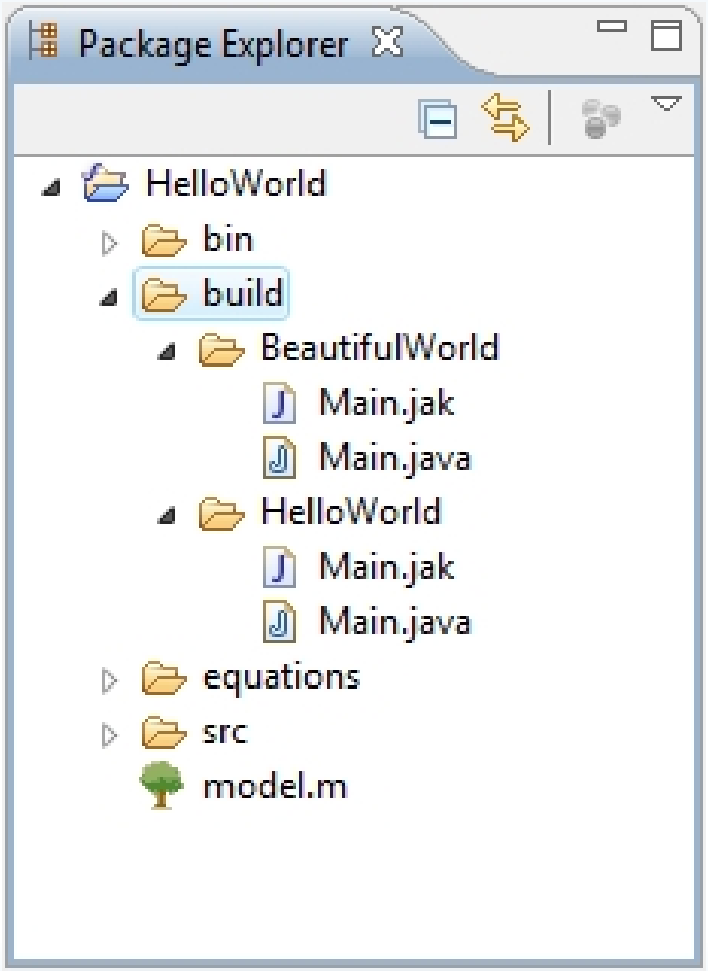
- Feature model file in the GUIDSL-format
- Source folder containing a folder for every feature including files to compose

FeatureIDE Project Structure



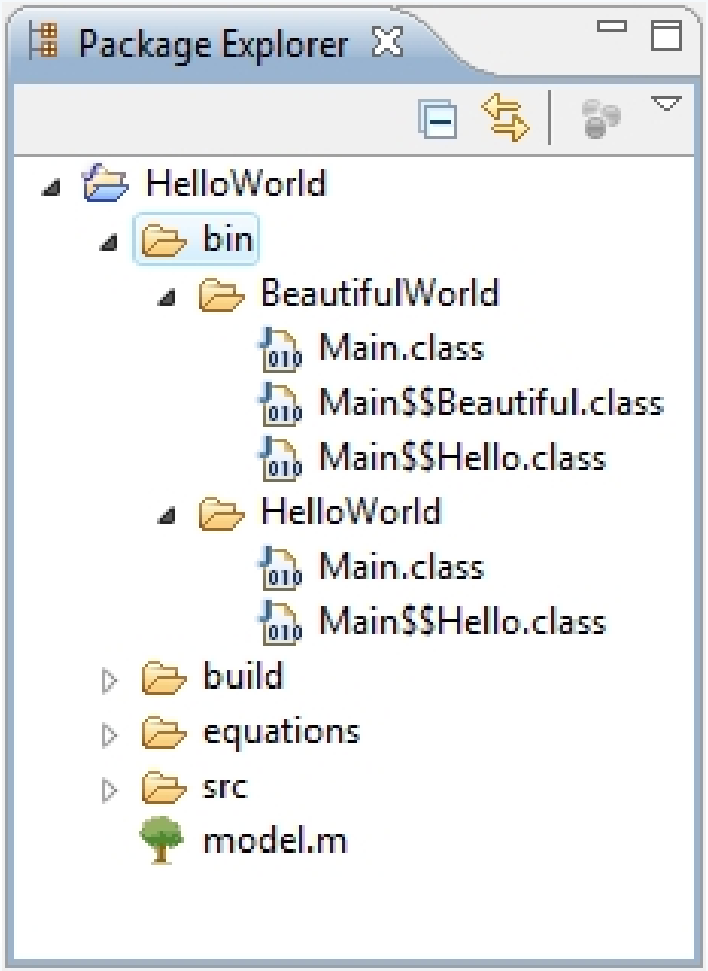
- Feature model file in the GUIDSL-format
- Source folder containing a folder for every feature including files to compose
- Configurations containing selected features from the feature model

FeatureIDE Project Structure



- Feature model file in the GUIDSL-format
- Source folder containing a folder for every feature including files to compose
- Configurations containing selected features from the feature model
- Composed source files for several configurations (might be helpful when debugging)

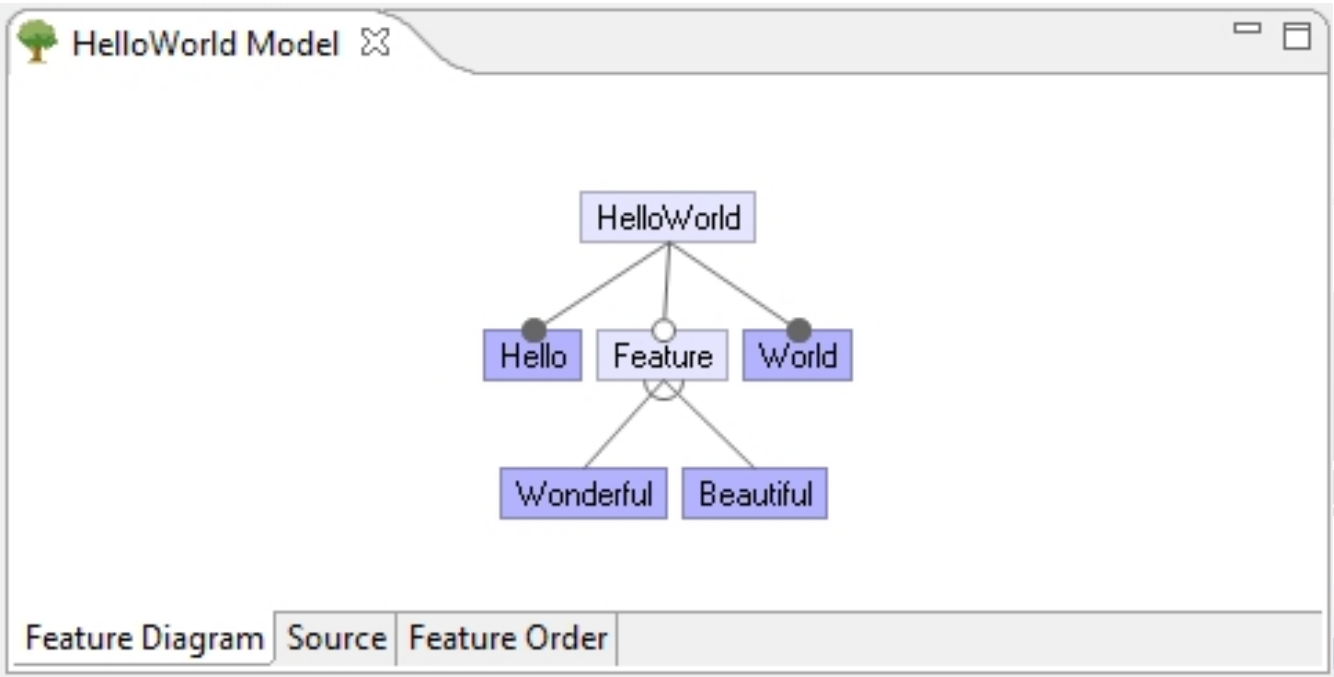
FeatureIDE Project Structure



- Feature model file in the GUIDSL-format
- Source folder containing a folder for every feature including files to compose
- Configurations containing selected features from the feature model
- Composed source files for several configurations (might be helpful when debugging)
- Binary files for several configurations

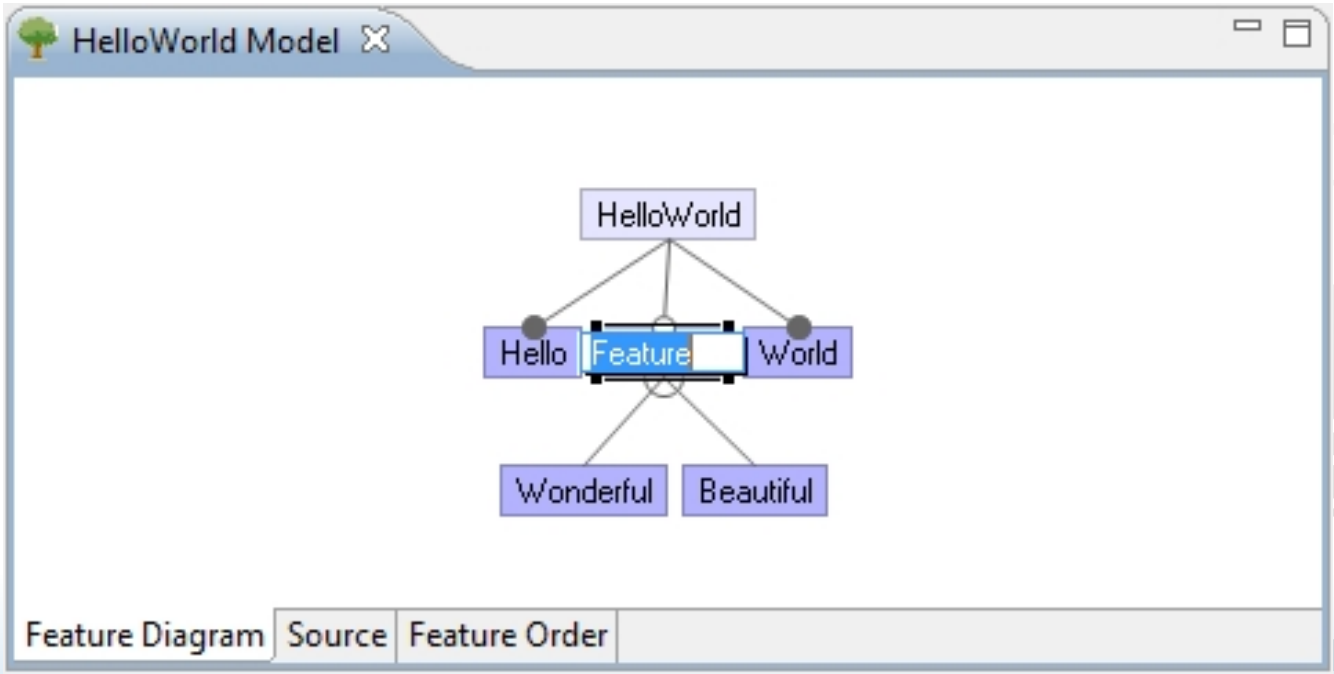
Feature Model Editor: Feature Diagram

- Double click to change connections and mandatory property



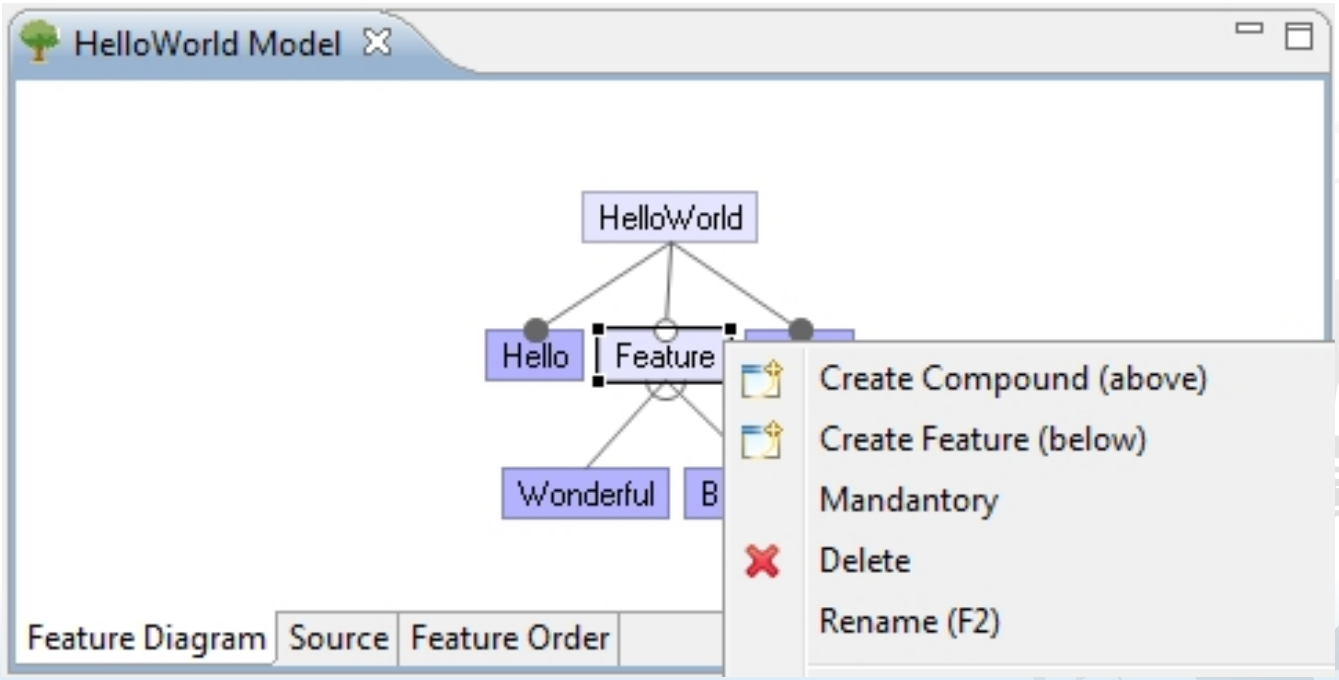
Feature Model Editor: Feature Diagram

- Double click to change connections and mandatory property
- Single click to rename features



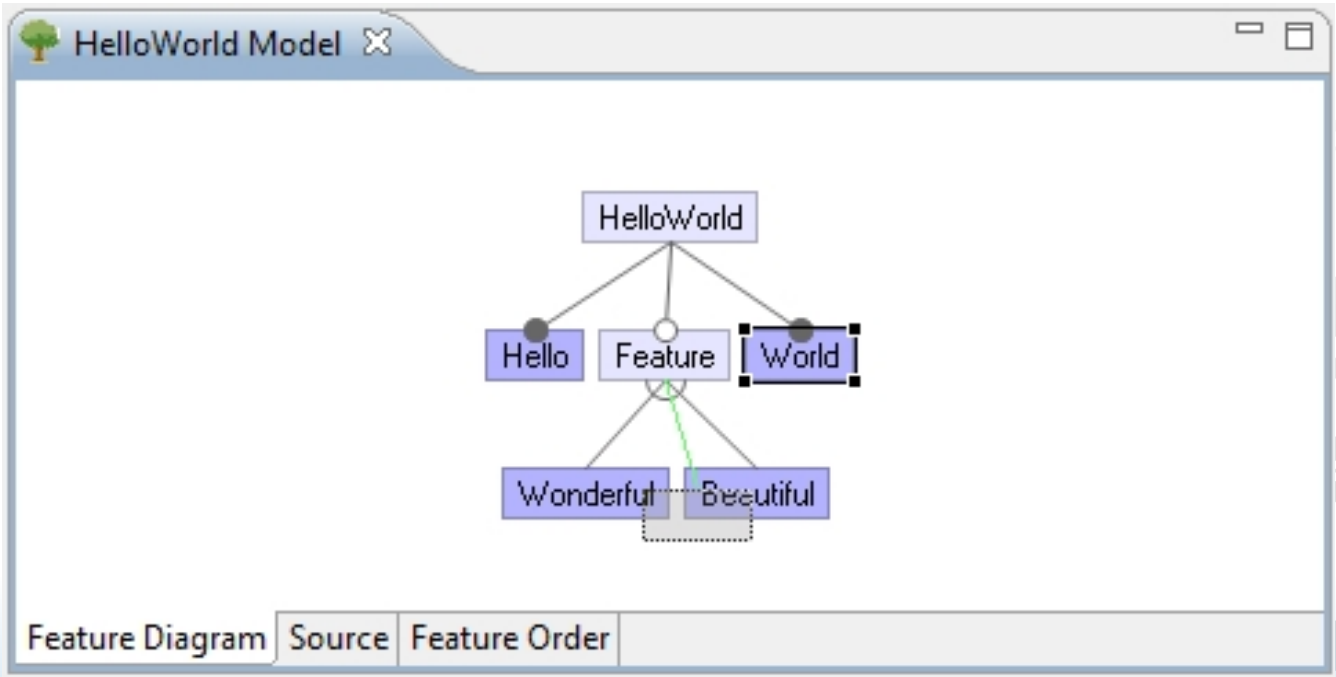
Feature Model Editor: Feature Diagram

- Double click to change connections and mandatory property
- Single click to rename features
- Right click to open context menu for features/connections



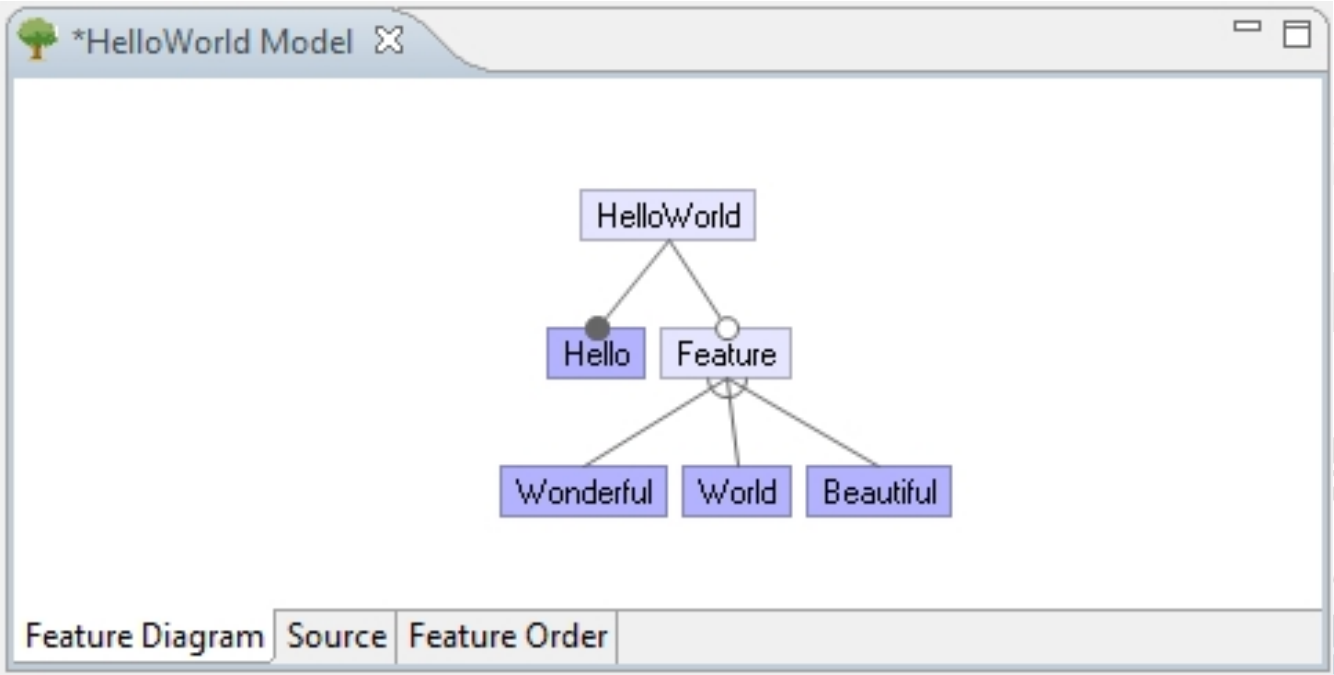
Feature Model Editor: Feature Diagram

- Double click to change connections and mandatory property
- Single click to rename features
- Right click to open context menu for features/connections
- Drag



Feature Model Editor: Feature Diagram

- Double click to change connections and mandatory property
- Single click to rename features
- Right click to open context menu for features/connections
- Drag and drop features



Feature Model Editor: Feature Diagram

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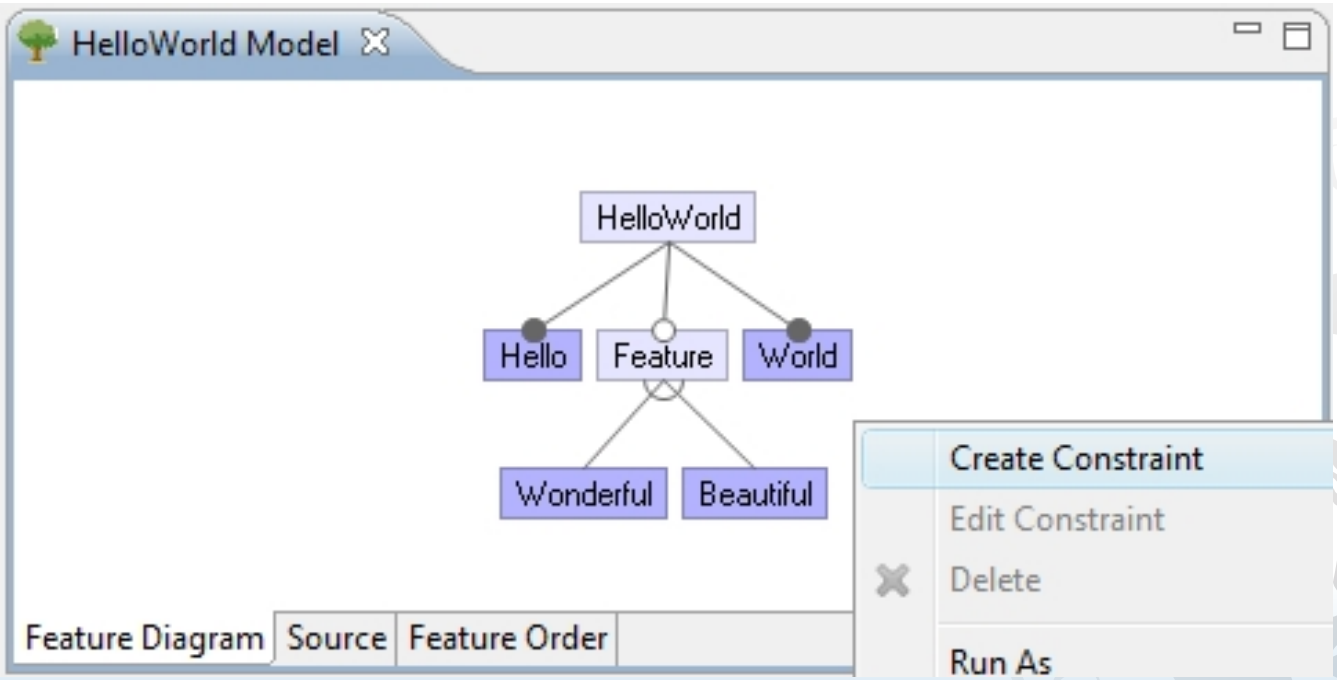
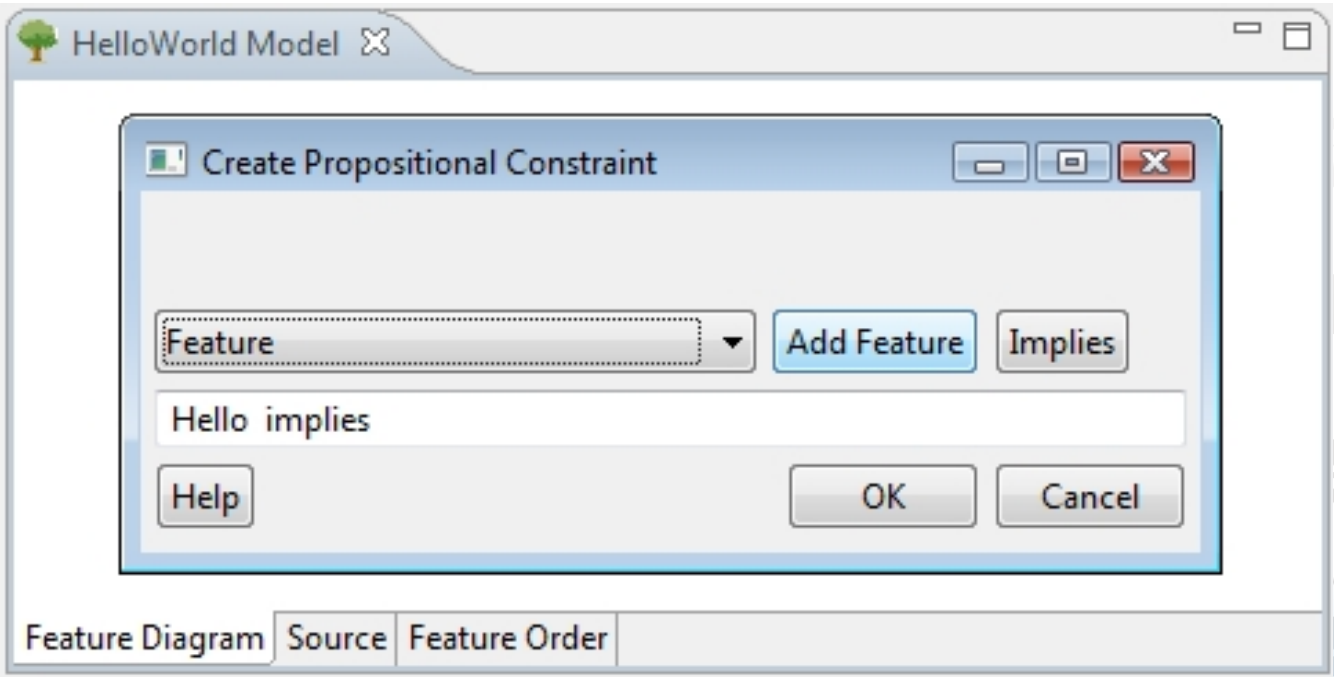
- Right click to open context menu for features/connections
- Drag and drop features
- Context menu



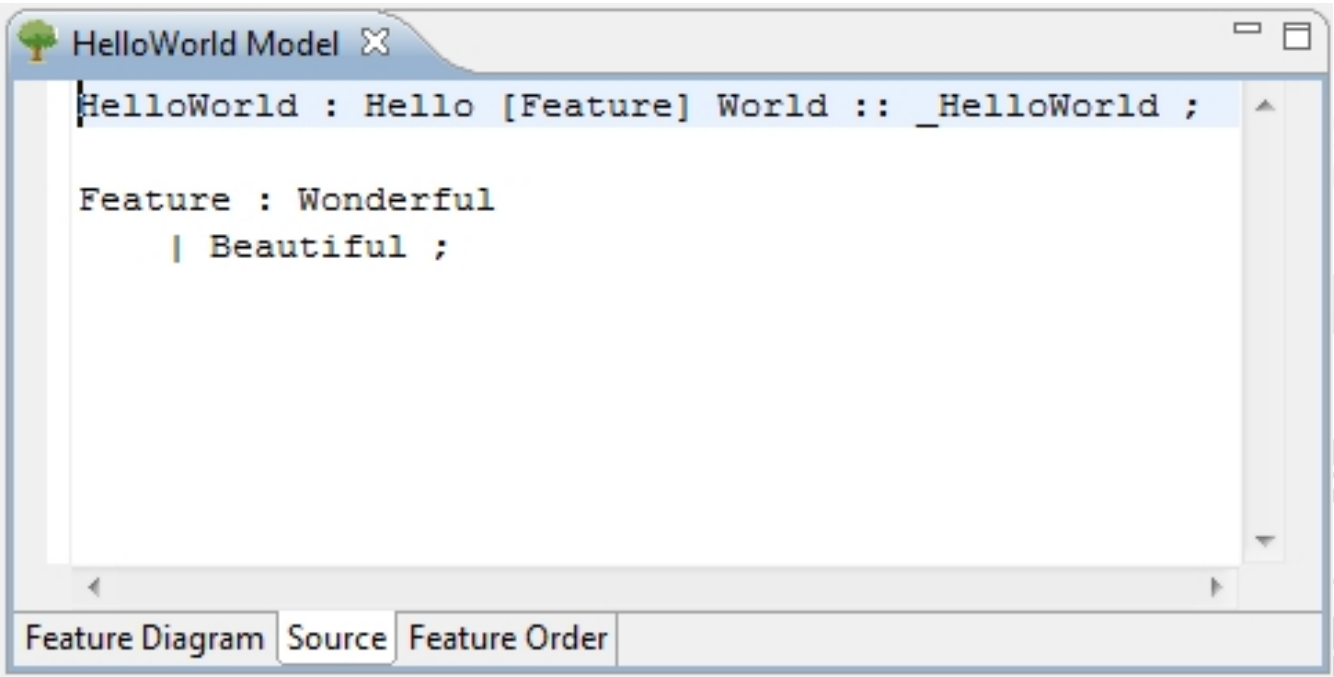
Feature Model Editor: Feature Diagram

- Double click to change connections and mandatory property
- Single click to rename features
- Right click to open context menu for features/connections
- Drag and drop features
- Context menu to open Constraint Editor



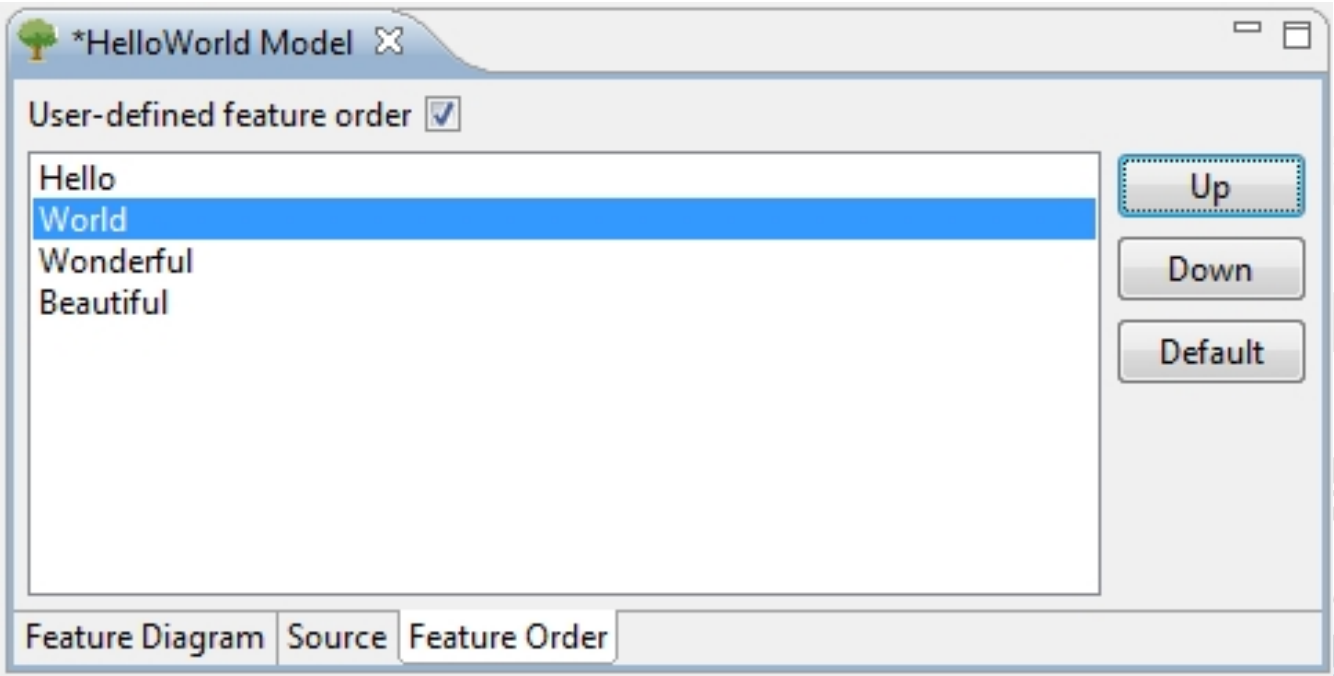
Feature Model Editor - Grammar

- Source tab contains the GUIDSL grammar representation
- [] - optional feature
- | - Or-group -or- Alternative-group depending on parent
- + - mandatory feature and Or-group below
- * - optional feature and Or-group below



Feature Model Editor - Feature Order

- Order of features matters: can influence program behavior
- Default order: pre-order traversal of the feature diagram
- User-defined order possible
- Applies to all configurations



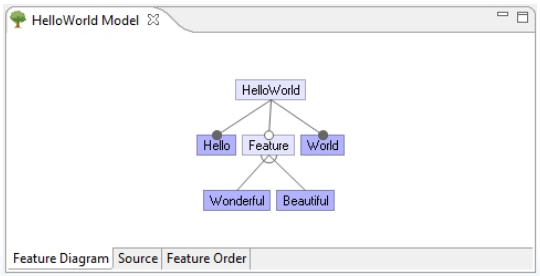
Feature Model Editor - Synchronization

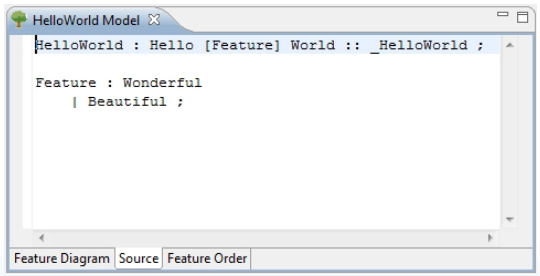
Before saving:

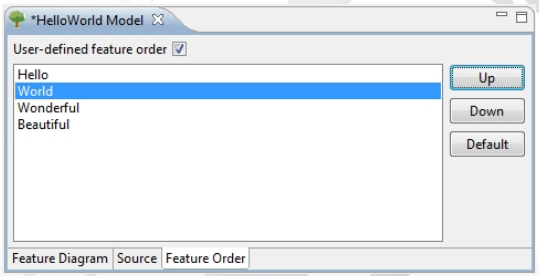
- When switching tab, changes are propagated

When saving:

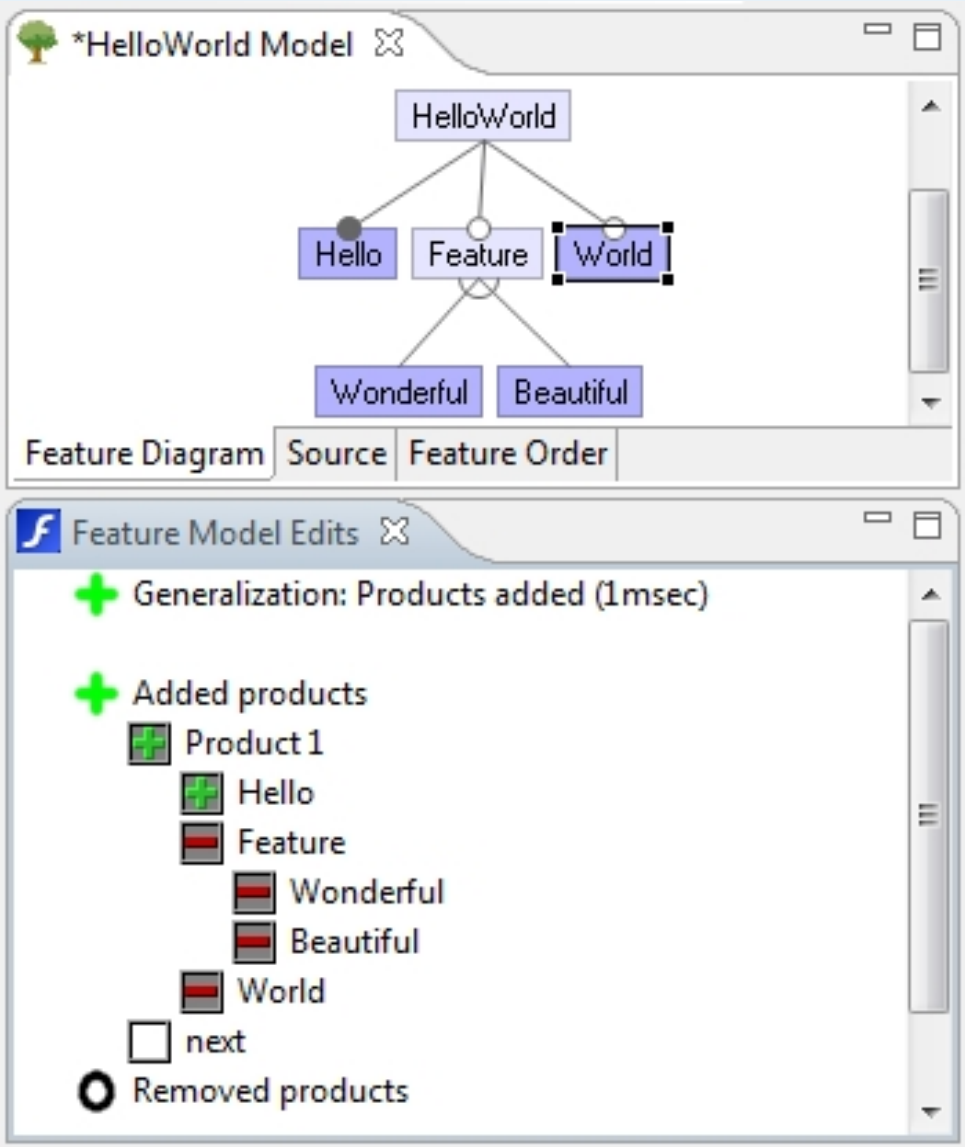
- Feature folders are created, removed, and renamed
- Updating order of features in configurations
- Checking which configurations are valid/invalid
- Current content of Configuration Editor updated







Feature Model Edit View



- Compares current edited feature model with last saved version
- Result: variants were added, removed, both, or none
- Provides examples for added/removed variants
- Statistical data for both versions of the feature model

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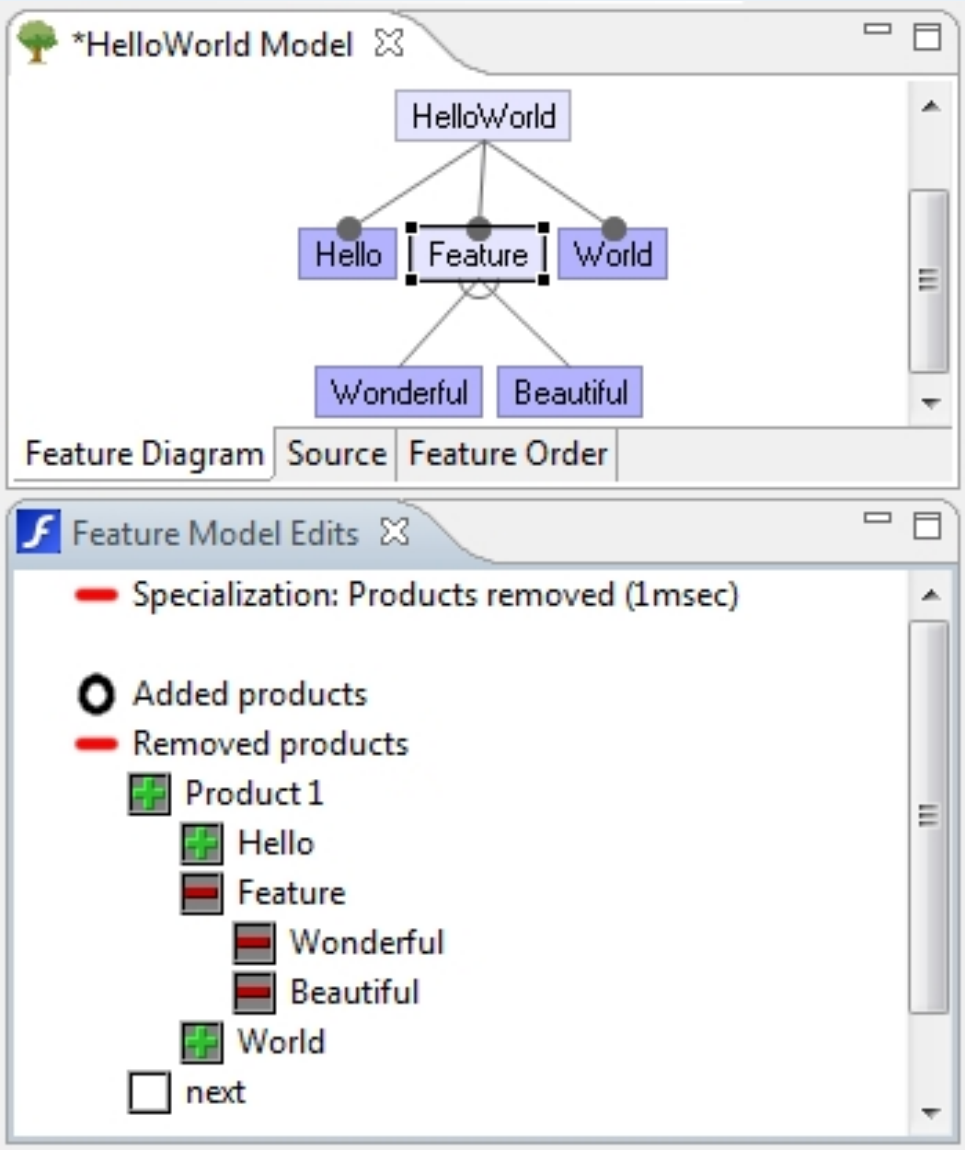

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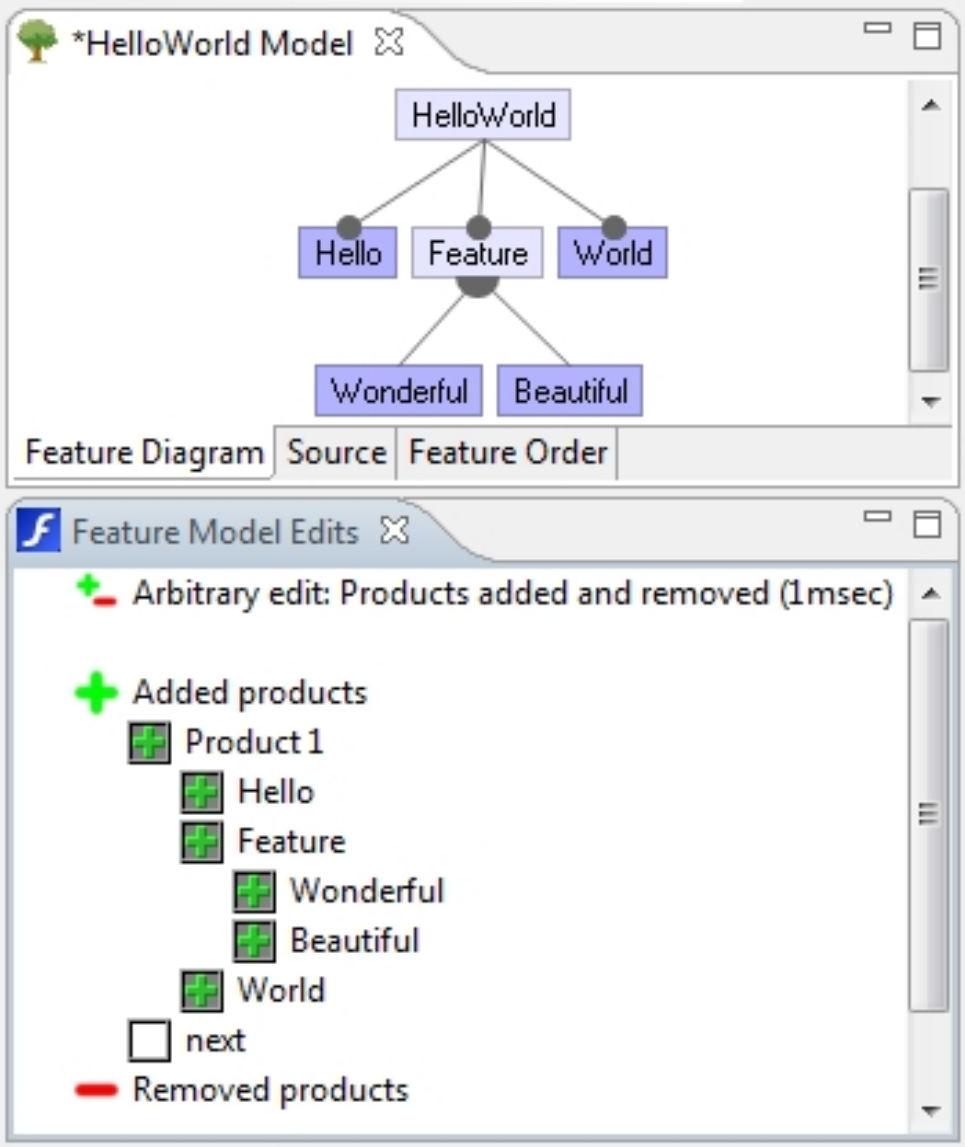

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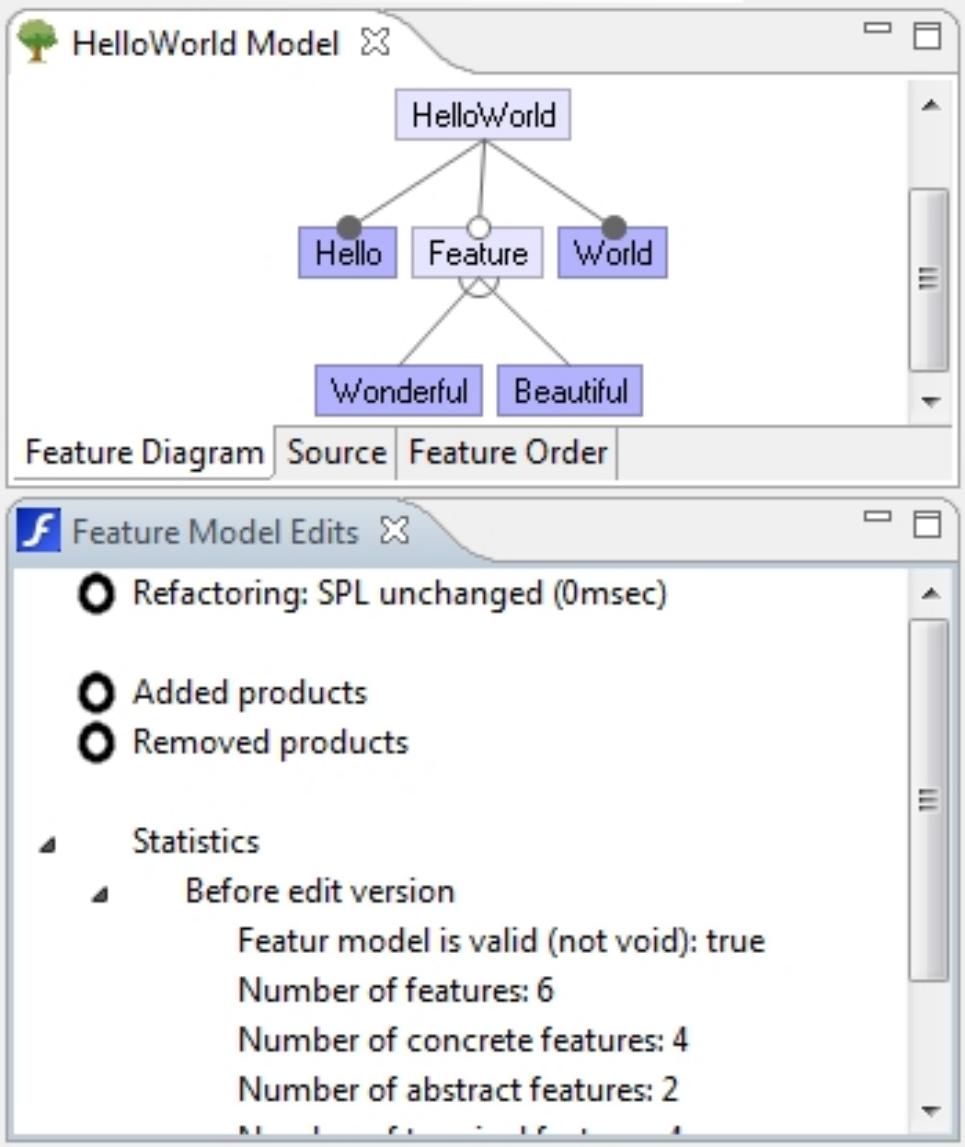

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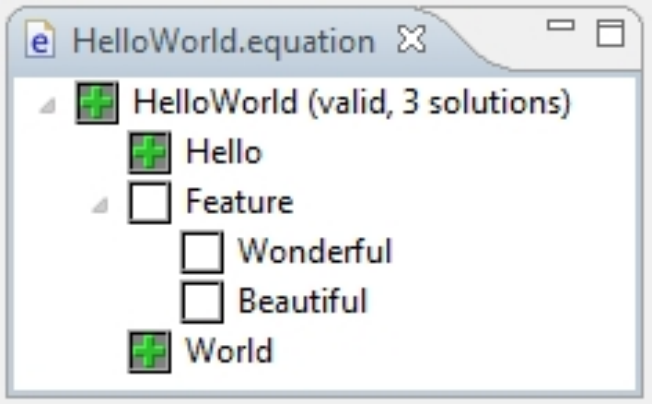

- Manual decisions using double click: selection and elimination of features
- Automatic decisions based on current manual decisions
- Is current configuration valid? assumption: unspecified features are eliminated
- Counting possible configurations

On save:

- Error marker if invalid
- Build process started if current configuration

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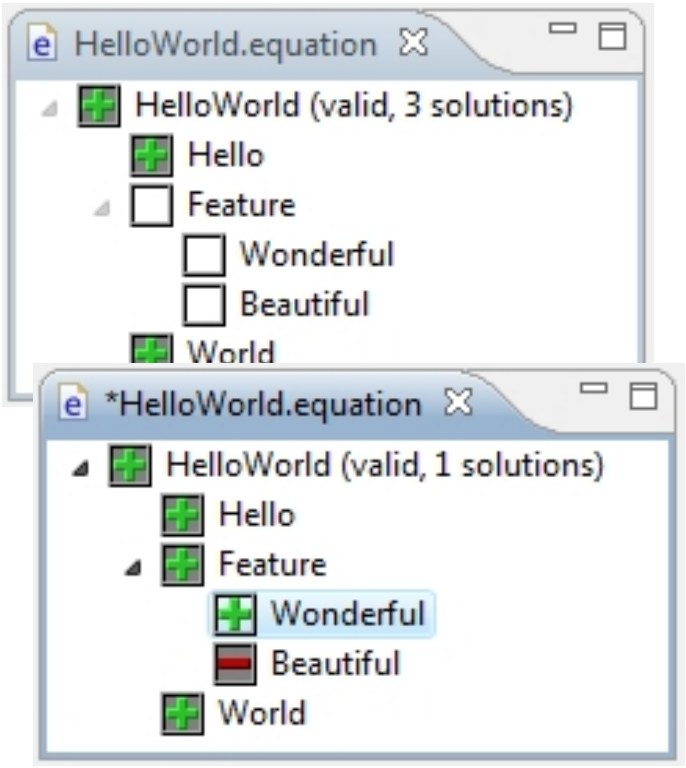

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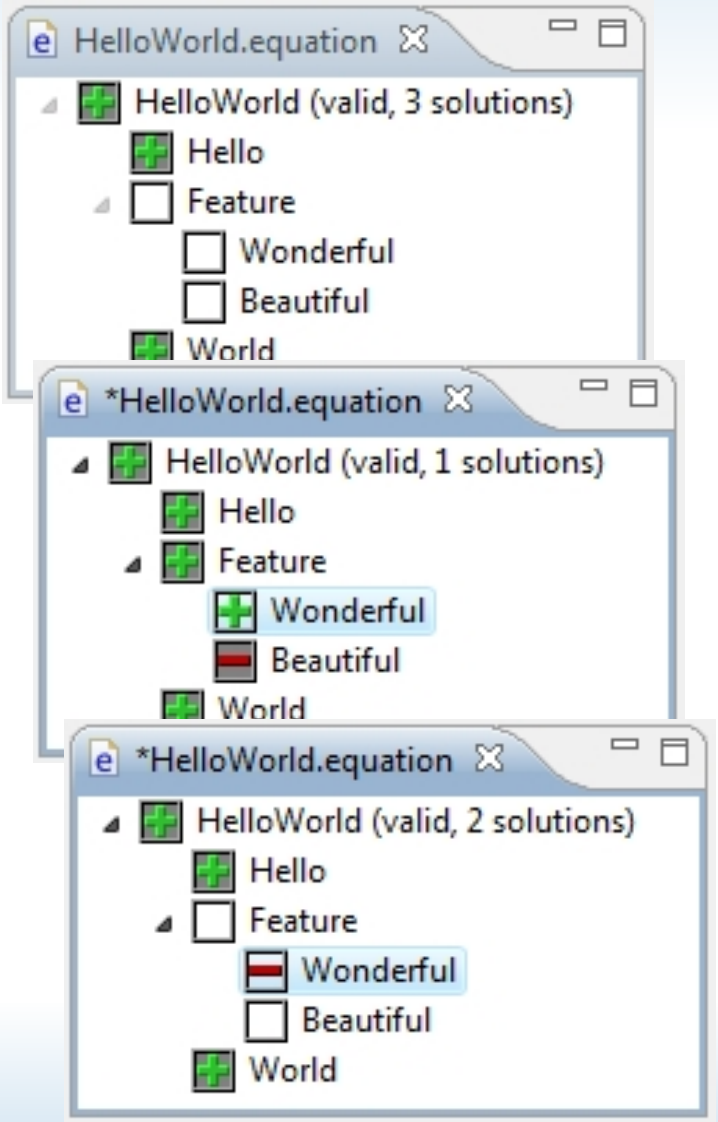
- Build process started if current configuration

Configuration Editor



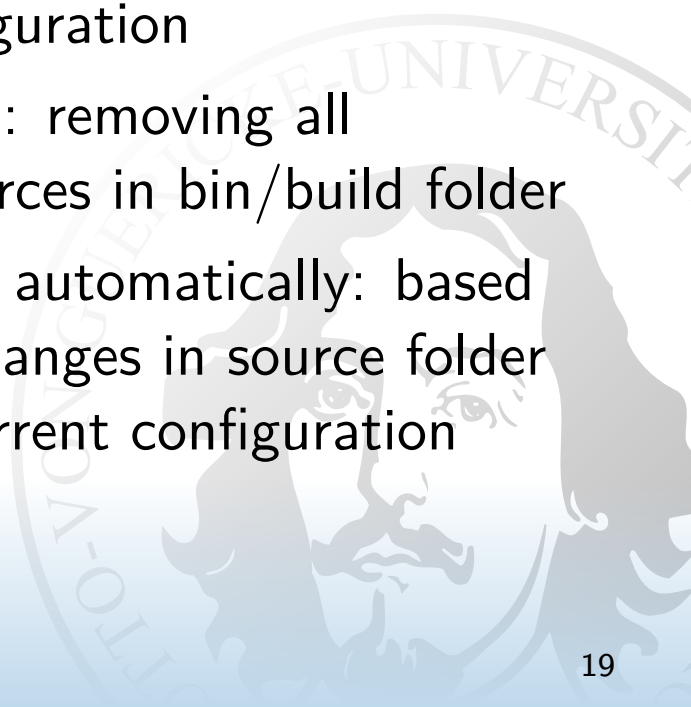
- Manual decisions using double click: selection and elimination of features
- Automatic decisions based on current manual decisions
- Is current configuration valid? assumption: unspecified features are eliminated
- Counting possible configurations

On save:

- Error marker if invalid
- Build process started if current configuration

Feature Project Builder

- Specific to composition engine (AHEAD, FeatureHouse, FeatureC++)
- Build: compose features contained in current configuration
- Clean: removing all resources in bin/build folder
- Build automatically: based on changes in source folder or current configuration

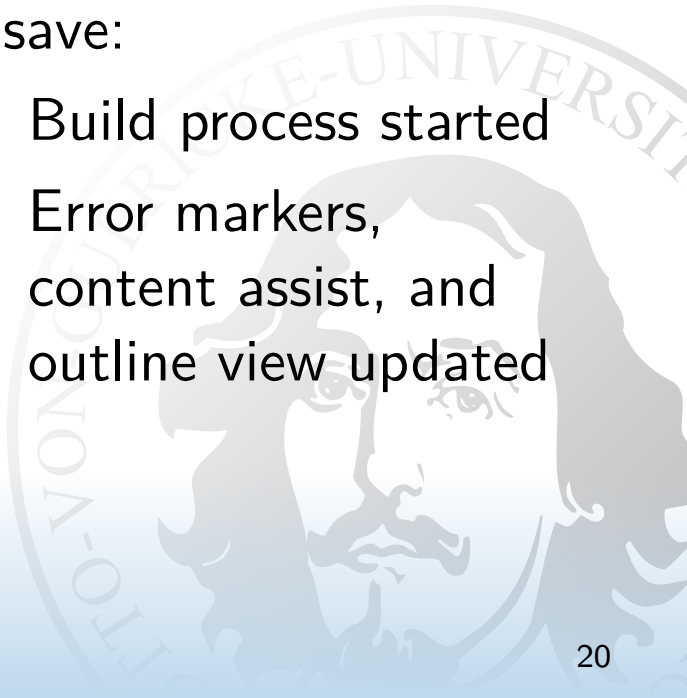


Jak Editor

- Syntax highlighting
- Error markers
- Content assist
- Outline view

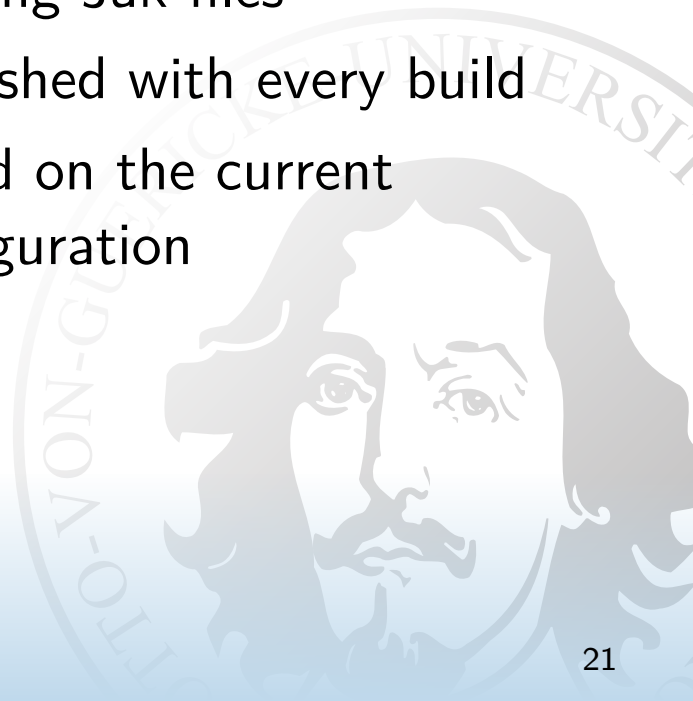
On save:

- Build process started
- Error markers, content assist, and outline view updated

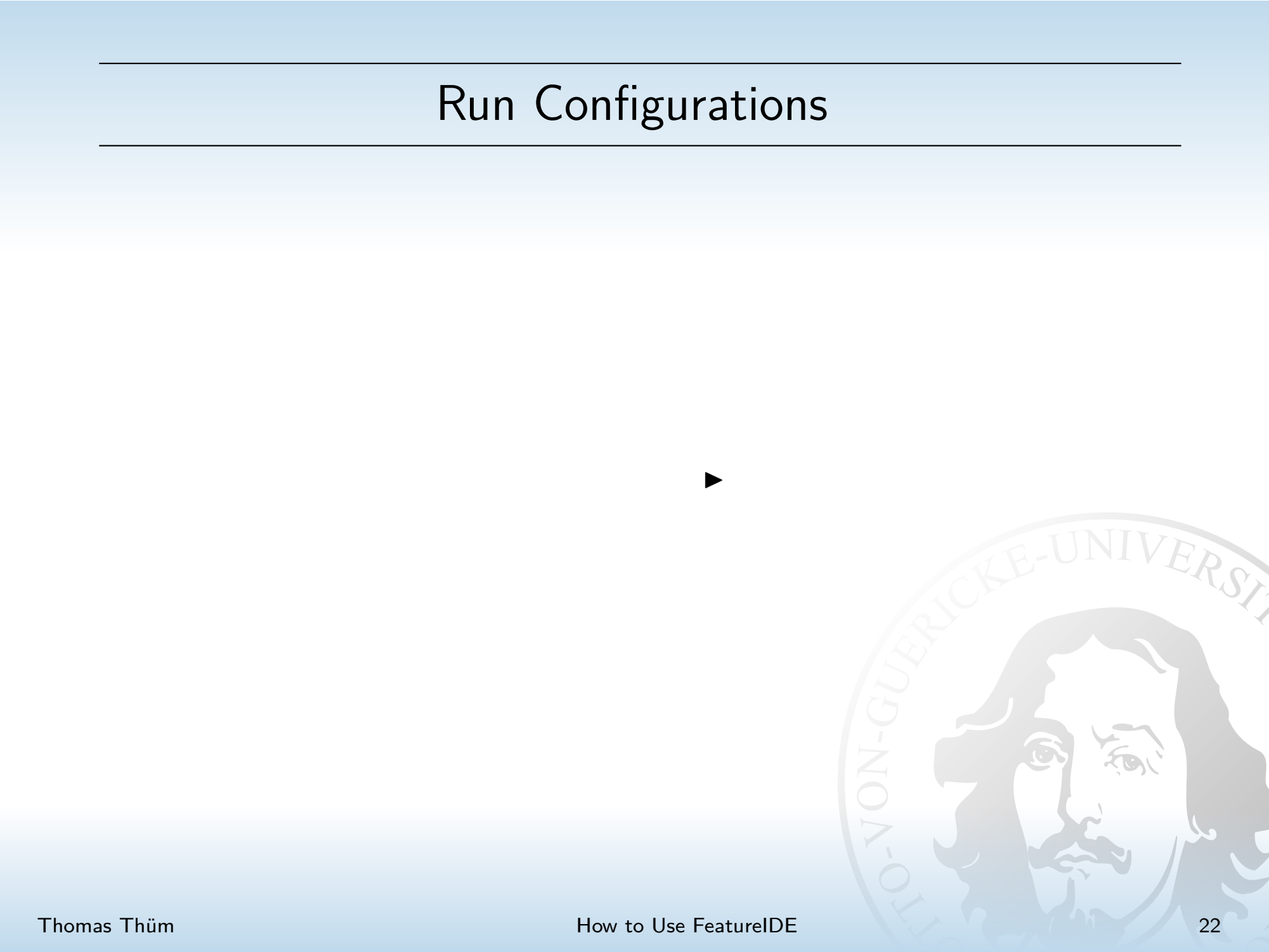


Collaboration Diagram

- Visualizes roles that features add to classes/files
- Adding, removing, and opening Jak files
- Refreshed with every build
- Based on the current configuration



Run Configurations

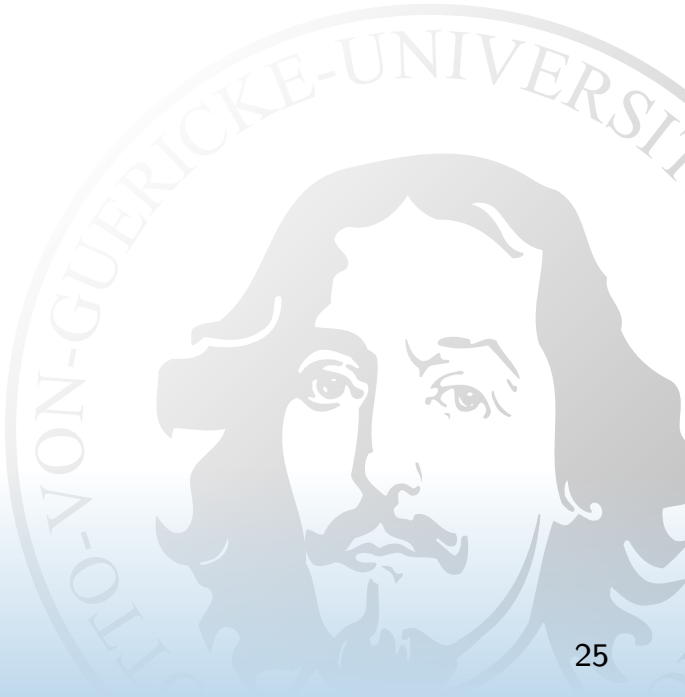


Creation Wizards

Content

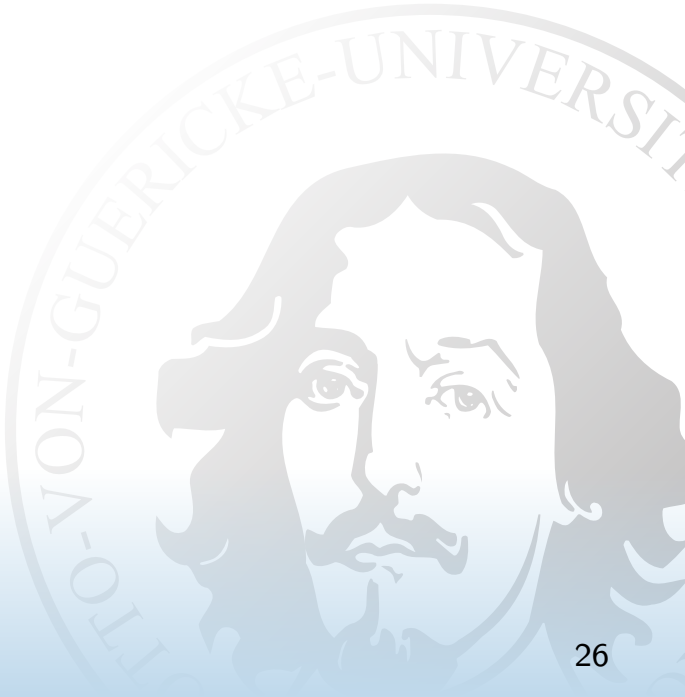
- What is Feature-Oriented Software Development?
- What functionality does FeatureIDE provide?
- How to start working with FeatureIDE?
  - FeatureIDE installation
  - Cheat sheet
  - FeatureIDE example projects
  - Open source FeatureIDE projects

Content



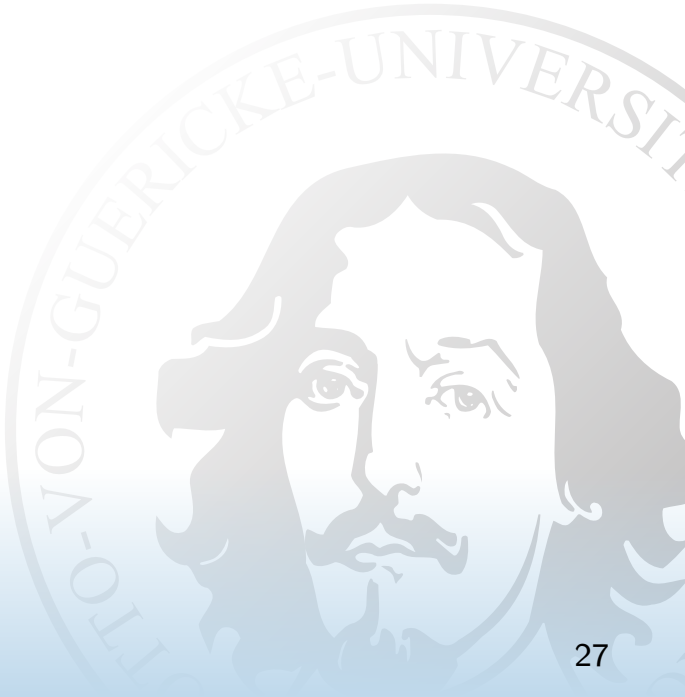
Installation of FeatureIDE

- ...
- ...
- ...



Cheat Sheet

- ...
- ...
- ...



FeatureIDE Example Projects

- ...
- ...
- ...

Open Source FeatureIDE Projects

- ...
- ...
- ...