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Mobilemedia SPL Creation by FeatureIDE using FODA

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Abstract

Software Product Lines are used in many areas, combining to form new technologies and products. A product line is a group of products that share a common development platform and vary by the composition and implementation method for the functionalities. This paper describes the implementation or creation of MobileMedia feature model using FODA (Feature Oriented Domain Analysis) methodology using FeatureIDE eclipse plug-in. The feature model created in this depicts various outlines as feature model as visual model, collaboration diagram view of model, its configuration, FeatureIDE Statistics. Basically the paper shows the concept how SPLs can be viewed as feature diagrams using various tools in order to deal with them. This modelling has been widely used by software product line communities and a number of extensions have been proposed.

Index terms— featureide, feature model, mobilemedia, SPLS.

1 Introduction

ith the advancement in the software engineering, many new concepts have been introduced and changing drastically. Software Product Lines (SPLs), an innovative approach in the Software Engineering has changed many things in the industrial area. A product derived from a software product line consists of various components selected from existing component libraries; these components communicate with a common platform to perform specific functionalities.

Skilled software engineers use technologies and practices from a variety of fields to improve their productivity in creating software and to improve the quality of the delivered product called as Product Line Engineering (PLE) **??**6]. SPLs can be viewed as models by using the concept of feature modelling involving various methodologies. In this paper, FODA (Feature Oriented Domain Analysis) methodologies in designing the SPL using eclipse plug-in FeatureIDE.

2 II.

3 Software Product Lines (SPLS)

A Software Product Lines are defined as a family of different products which shares same set of core assets or it can be said, a product line consists of multiple systems, which have same architecture and share common core assets with variability among systems. A core asset includes shared components, framework or infrastructure, tools, process, documentation, test cases as these are reused.

Basically, SPL is a family of products designed to take advantage of their common aspects and predicted variability in order to improve quality, delivery time and reduction in cost. Product line engineering (PLE) helps to design, develop, deliver, and evolve a portfolio of common products, with feature variations and functions, through which each stage of the systems and the software development lifecycle from requirements to design, development and testing. Many methods and practices are introduced that is Software Reuse, Component-Based Development and Product Line Engineering (or Product Family Engineering). Enhance the efficiency of SW development when multiple products are to be developed simultaneously:

? Higher productivity

4 ? Higher quality

? Faster time to market

5 ? Lower labour needs

Software Product Line Methods (SPLMs) are the software development approaches in which a set of software systems share a common set of feature produced from a set of reused core assets. Core assets are software artifacts that are re-used in the production of customized products in a software product line (SPL). The assets include the requirements, architecture, components, modelling and analysis, plans, etc. A SPL product can be quickly assembled from core assets, and hence it achieves manufacturing efficiency. SPLM supports "producing goods and services to meet individual customer's needs with near mass production efficiency". The following figure depicts the overview of Software Product Line Methods:

6 III. Feature Model by foda Methodology

Feature model, a representation of products of SPL in a way to express features. Feature models were first introduced in FODA (Feature-Oriented Domain Analysis) method by Kang in 1990 and since then this modeling has been widely used by software product line communities and a number of extensions have been proposed. A feature model is represented by means of feature diagrams. A feature diagram is a graphical or visual notation of a feature model in the form of AND-OR tree, and also various other extensions as feature cloning, feature attributes, collaboration diagrams, configurations etc. This model is basically used as a input to produce other different assets like documents, architecture definition or code. A feature can be defines as a quality or characteristic of software system or system. Therefore, a feature model is a model that defines features and their dependencies depicting in the feature model as cross-tree constraints. A feature configuration, a set of feature describing a member of an SPL and the member will contain a feature if and only if features are in its configuration.

7 IV.

8 Basic Feature Model Notations

Basic Feature Model is a relationship between a parent feature and its child features categorized as [1]:

? Mandatory -child feature is required.

? Optional -child feature is optional.

? Or -at least one of the sub-features must be selected.

? Alternative (xor) -one of the sub-features must be selected In addition to the parental relationships between features, cross-tree constraints are allowed. The most common are:

? A requires B -The selection of A in a product implies the selection of B.

? A excludes B -A and B cannot be part of the same product.

V.

9 Foda Methodology

As said earlier, Feature models were first introduced in FODA (Feature-Oriented Domain Analysis) method developed by Software Engineering Institute. It is a domain analysis or product analysis method (analyzing related software systems in a domain to find commonality and variations), which involves conversion as feature model to domain engineering being used in the advance concepts in software engineering and software reuse. Domain Analysis was coined by James Neighbors in 1980s and is the first phase of domain engineering. Therefore it can be said that FODA is a domain analysis technique. The main objective of feature-oriented domain analysis if to create a domain model which represents the family of systems which is then refined into a particular desired system within a domain supporting the functional and architectural reuses [4]. FODA methodology not only identifies the systems in the domain but also the external system interacting with the domain which is known as FODA context analysis. Then further FODA feature analysis from the feature model, configures requirements and the candidate systems by analyzing the end-user's view. Configurable requirements can then be selected from the developed feature model in order to specify the final system and from this view the customer's demands can be satisfied by following this process and achieving the efficiency through technology reuse.

VI. SPL Tools Supporting Feature Models [2] ? FeatureIDE

? Clafer Feature IDE provides a way to implement or create following feature:

? A feature model editor, graphical and text-based.

? Constraint editor with syntax and semantic checking like dead feature detection.

? Configuration Editor for creation and editing of features.

? SPL source code abstraction.

? Supports refactoring, generalizations etc.

? Statistics display of FeatureIDE project.

? Outline view of feature model.

? Collaboration Diagram view.

? Debugging and Lay outing the feature models or manyother new implementations are under development.

VIII.

10 Mobilemedia Feature model

MobileMedia manipulates media on mobile phones that is music, photo and video. It is basically a family of multimedia management application for mobile In the figure, or-relation has also been used as an arc among the children's from which at least one features from them is selected if their parent is selected. In Feature-Oriented Programming, a feature is implemented as an independent feature module. When a feature is selected, then the corresponding module is compiled together with the other feature modules which have been selected. A group of optional features may interact with another group also mandatory one does can also interact. This feature model involves Abstract and concrete features involving various mandatory and optional feature with AND, OR features. Mobile Media, Basic Media Operation and SMS Transfer are the abstract features and remaining the concrete features and terminal features.

11 Conclusion

In this paper, SPLs has been discussed as how they can be presented as graphically. Number of tools has been introduced in the market to work upon it as PLE is the new trend in the software engineering. "Engineering" in product lines means the activities are taken into account involved in planning, producing, delivering, and deploying, and retiring products etc. SPLs are under research in various areas. A feature model of Mobile Media that is SPL has been proposed in this paper which is providing a way to represent software product lines in graphical manner in the Feature IDE tool as eclipse plug-in using the FODA methodology. Also defining how it works and shows various outputs of Mobile Media SPL. The feature model created in this depicts various outlines as feature model as visual model, collaboration diagram view of model, its configuration, Feature IDE Statistics and also how a main jak file is created and other files refine the main jak file. [1]

1

Figure 1: Figure 1 :

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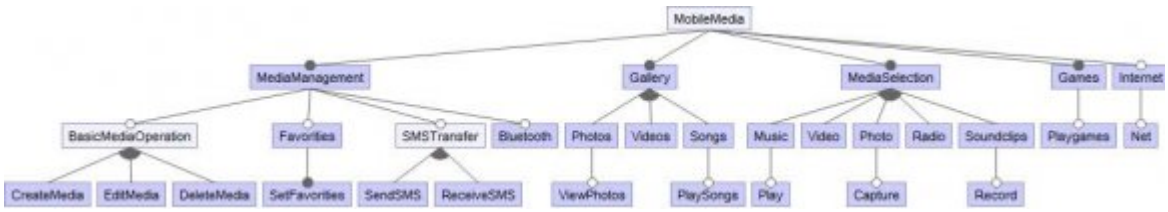

Figure 2: ??

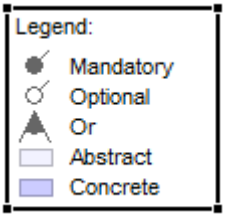

Figure 3:

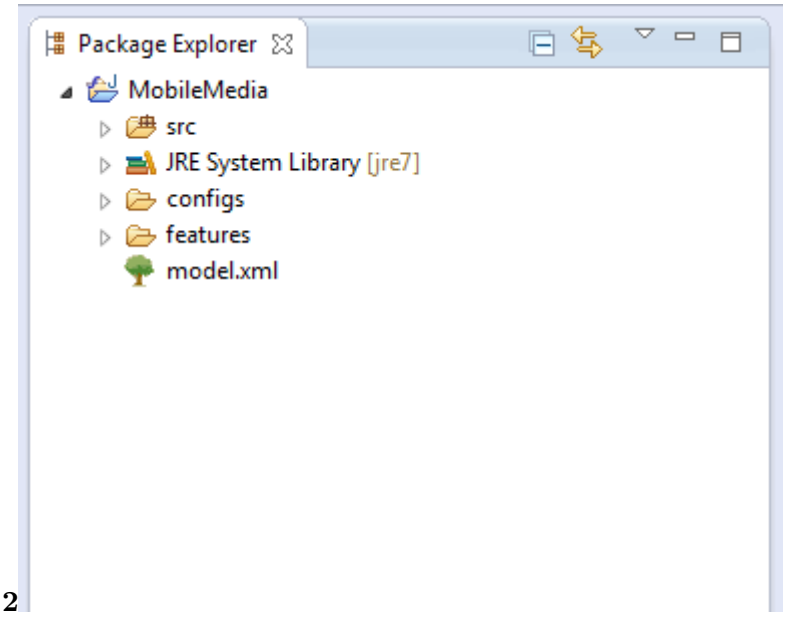

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Figure 4: Figure 2 :

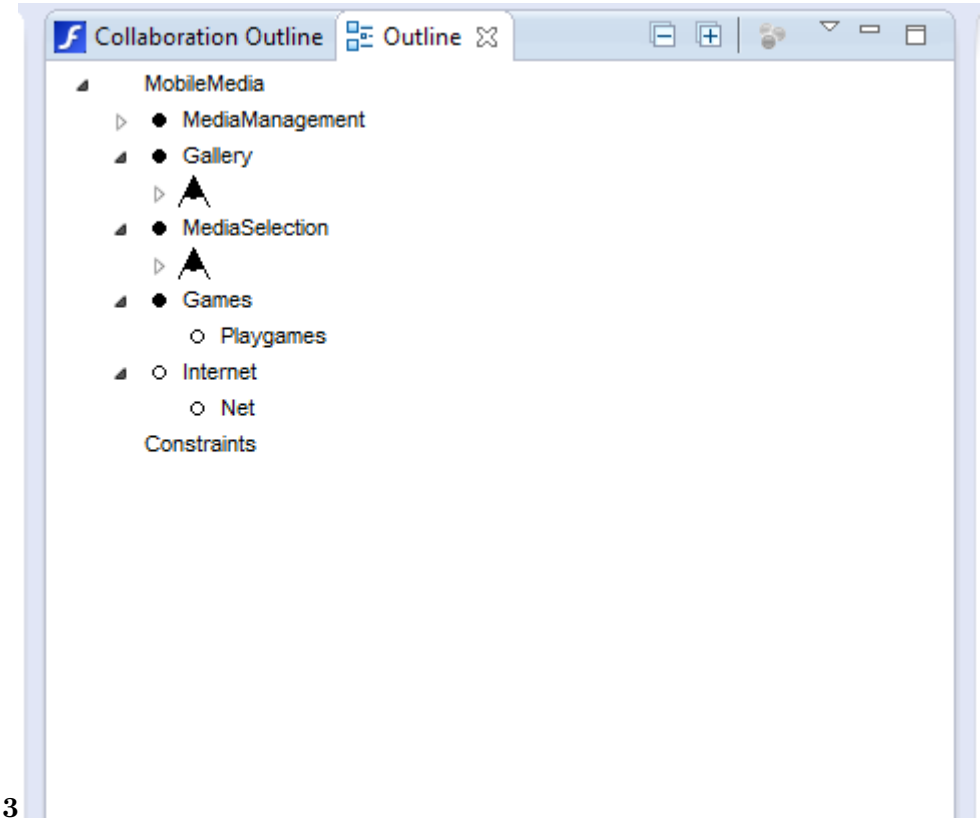

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Figure 5: Figure 3 :

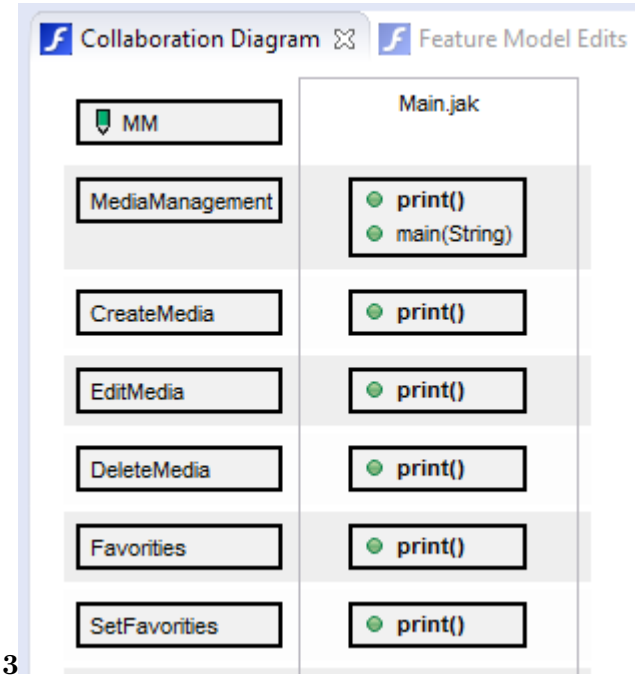

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Figure 6: Figure 3

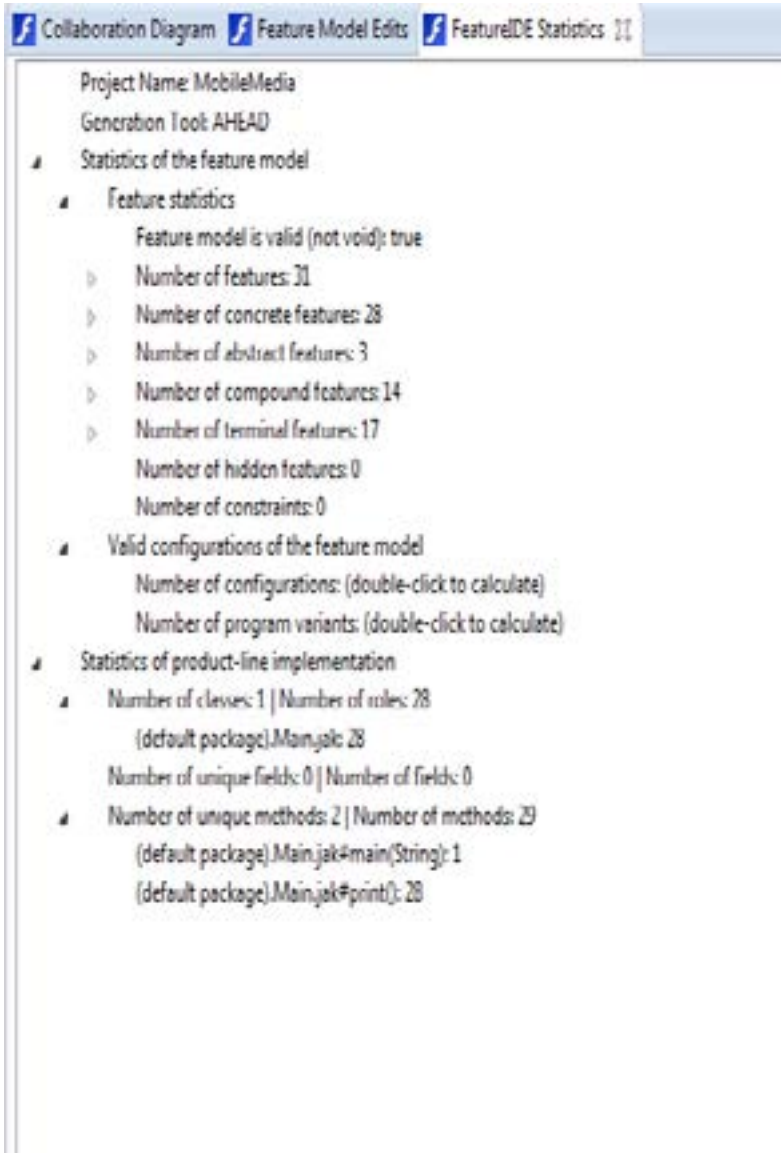
Collaboration Diagram
Feature Model Edits
FeatureIDE Statistics
Project Name: MobileMedia
Generation Tool: AHEAD
Statistics of the feature model
Feature statistics
Feature model is valid (not void): true
Number of features: 31
Number of concrete features: 28
Number of abstract features: 3
Number of compound features: 14
Number of terminal features: 17
Number of hidden features: 0
Number of constraints: 0
Valid configurations of the feature model
Number of configurations: (double-click to calculate)
Number of program variants: (double-click to calculate)
Statistics of product-line implementation
Number of classes: 1 | Number of roles: 28
(default package).Main.jak: 28
Number of unique fields: 0 | Number of fields: 0
Number of unique methods: 2 | Number of methods: 29
(default package).Main.jak#main(String): 1
(default package).Main.jak#print(): 28

Figure 7:

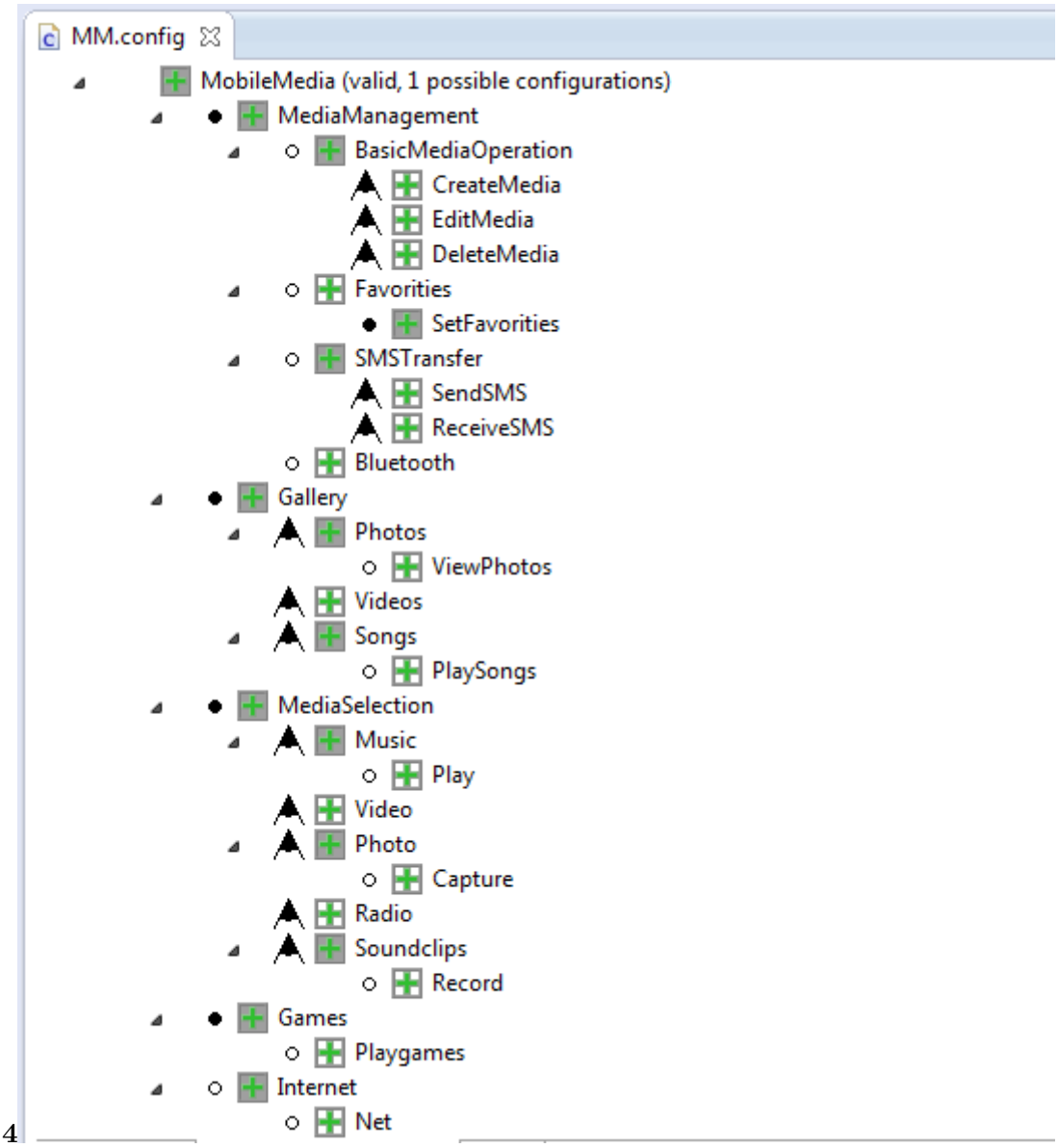

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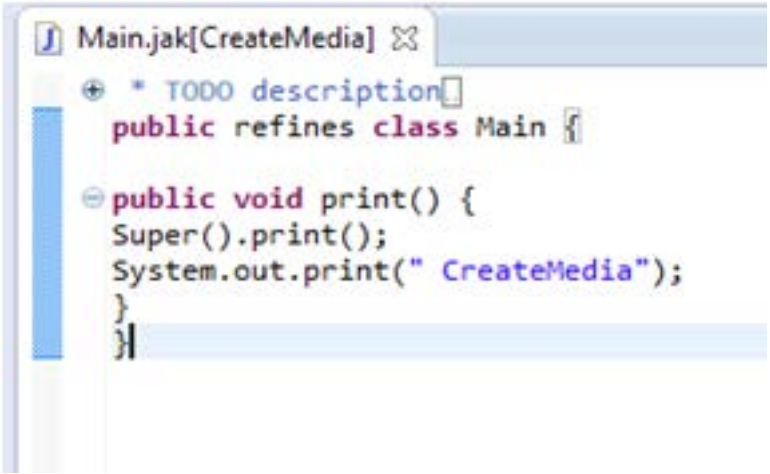
Figure 8: Figure 4 :



5

Figure 9: Figure 5 :

Main.jak[MediaManagement]

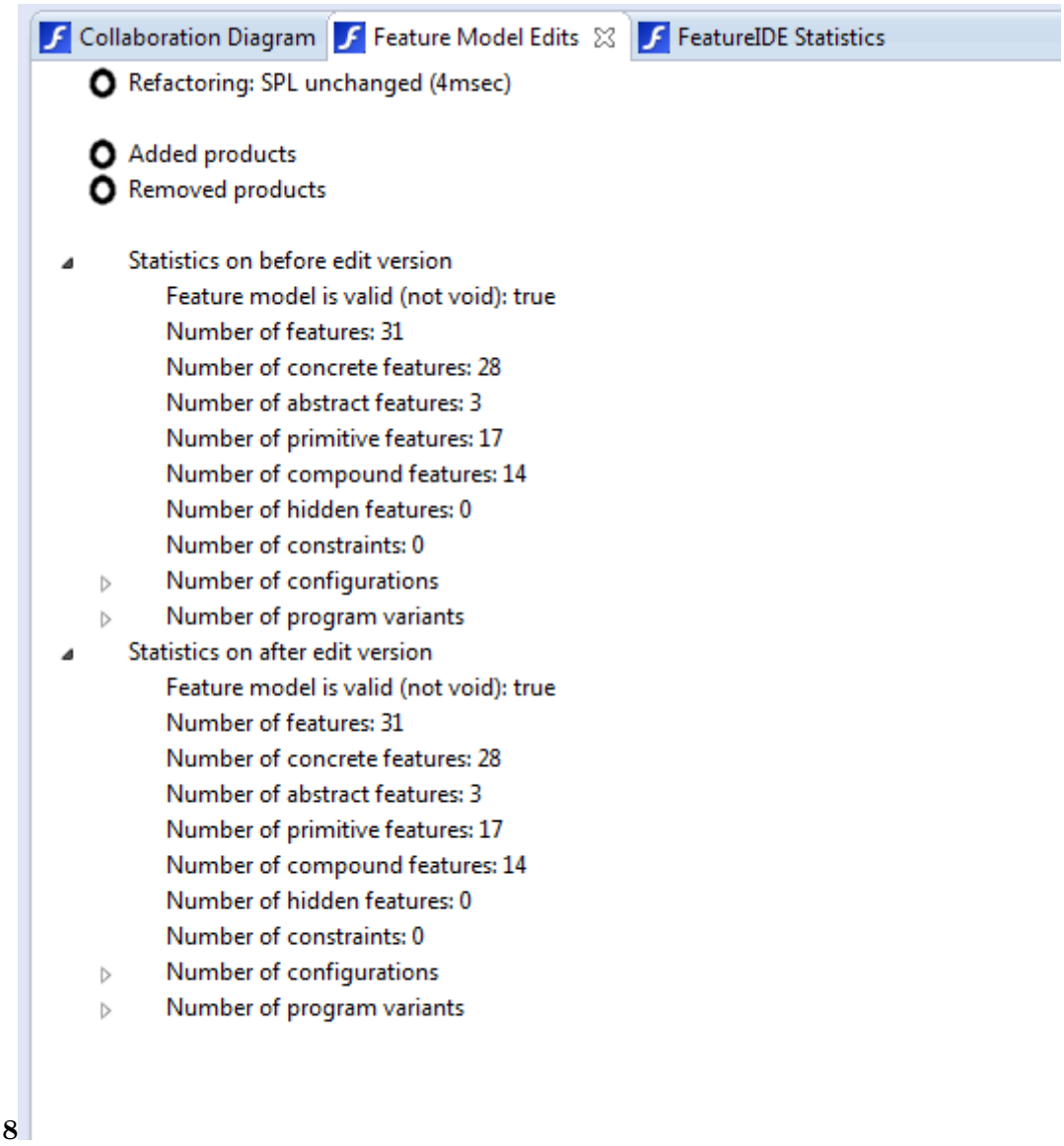
```
/**
 * TODO description
 */
public class Main {

public void print(){
System.out.print("MobileMedia");
}
public static void main(String[] args) {
new Main().print();
}

}
```

6

Figure 10: Figure 6 :c



8

Figure 11: Figure 8 :

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