MODELING A REAL ESTATE SUBSYSTEM USING SOFTWARE PRODUCT LINES

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Abstract: *The development based on product line allows the identification of similarities and variabilities among certain systems so that it becomes possible to build applications with an architecture. This paper proposes the modeling of a real estate subsystem using software product line. The modeling is performed by applying the adapted method that incorporates best practices offered by Methods: Product Line UML-Based Software Engineering, Family-Oriented Abstraction, Specification and Translation and Feature Oriented Domain Analysis. With the proposed model the developer have a flexible architecture which can be reused or extended to a new system of same domain.*

Keywords: *Software Product Lines, UML Components, Real Estate System.*

1. INTRODUCTION

Technological organizations are currently developing ways to individually meet each customer according to their needs while ensuring quality, speed and low cost. As a result, many companies adopt software product line approaches (LPS) that enable the development and maintenance of similar products belonging to the same domain application (LOBO; RUBIRA, 2009). In this context the reuse of artifacts can meet more number of clients, allowing in the long run, the arrival of the final product to the market so quickly and with a reduced cost.

This paper proposes to model the Financial Management subsystem of a real estate system proposed by Canteri e Dvulatka (2013). Development methods will be exposed based on SPL: FAST (Family-Oriented Abstraction, Specification and Translaction) (HARSU, 2002), PLUS (Product Line UML-Based Software Engineering) (GOMAA, 2005) and FODA (Feature Oriented Domain Analysis) (SEI - Software Engineering Institute, 1990) and Delazeri and Wolf (2012).

After the comparative analysis of the methods, it was decided by Delazeri and Wolf (2012) method for the development of this work, as it includes the best features of the methods cited above, to produce input and output devices for each phase and the subphase Domain Engineering and Application Engineering and with enerate modeling for real estate subsystems.

The real estate domain analysis was performed through the study of systems Imobilis (IMOBILIS, 2013), Ci-PRO (C-PRO, 2013) and interview with the manager of the Real Estate X.

2. SOFTWARE PRODUCT LINE (SPL)

According to Clements and Northrop (2001), SPL is the development of software product families that meet a particular market segment, considering particular requirements of each customer according to the domain analysis, code reuse and features common among SPL in form more intelligent reducing the time and cost of development.

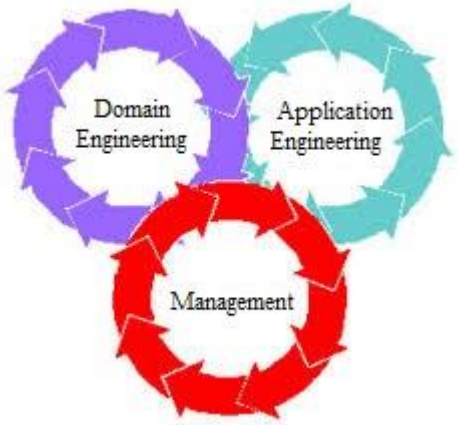
To determine if the software or are not in the same product line, it takes into account an collection of features (LUCENA, 2010). This can be understood as part of the utmost importance to the client system and which is used to define common points or to differentiate products a production line.

Second Schmid et al. al. (2007), there are three main activities of the SPL and together provide practical business and technology. Are they:

- Domain Engineering: Consists of collecting, organizing and storing previous experience in building applications in a specific domain in the form of employable artifacts they can be used to build new applications (SILVA, 2011).
- Application Engineering: It systems construction activity results from through engineering domain, that is, the construction this activity is through the core.
- Management: Include technical and organizational management of product line (Neiva, 2008).

The Figure 1 illustrates the relationship between the three activities, each activity is represented by a circle. Note the iterative there between the same, the output of an activity favors the entry of the other and so successively.

Figure 1 -Activities essential in the process of product lines



Source: Clements; Northrop (2002)

2. DEVELOPMENT METHODS BASED ON SOFTWARE PRODUCT LINES

There are several approaches that can be used for development based on SPL. Among these, the highlight the following: FODA (SEI, 1990), PLUS (GOMAA, 2005), FAST (HARSU, 2002) and DELAZERI and WOLF (DELAZERI, WOLF, 2012).

After the study of approaches, there was a qualitative analysis including considering the following criteria:

- based on features: approach method.
- based on family: approach method.
- phases: are the divisions and subdivisions of each method, the input devices are produced and output.
- iterative: cyclic development of process.

The Frame 1 details the mentioned approaches and their respective characteristics. The lines containing the "X" indicate the presence of the feature in a particular method, otherwise, this method does not includes such particularity.

METHODS	FEATURES			
	Based on features	Based on family	It has phases and subphases	Iterative
FODA (SEI , 1990)	X		X	
PLUS (GOMAA, 2005)	X		X	X
FAST (HARSU ,2002)		X	X	
DELAZERI and WOLF (DELAZERI; WOLF, 2012)	X	X	X	X

Frame 1 - Characteristics based methods in SPL
Source: Author Self

It was observed that the method Delazeri and Wolf it has the same characteristics of FODA methods, PLUS, FAST, because it is an adaptation of the three methods mentioned before. This results in a obtainment the best qualities of each method and also an increase of new artifacts, providing that this method results in phases, documentation and distinct diagrams, this being adopted for this work.

4. MODELING

This section describes the use of Delazeri and Wolf (2012) method for identification of similarities and variabilities of the subsystems included in a Estate System, these identified by Canteri and Dvulatka (2013). The Figure 2 illustrates a context model obtained by identification of subsystems.

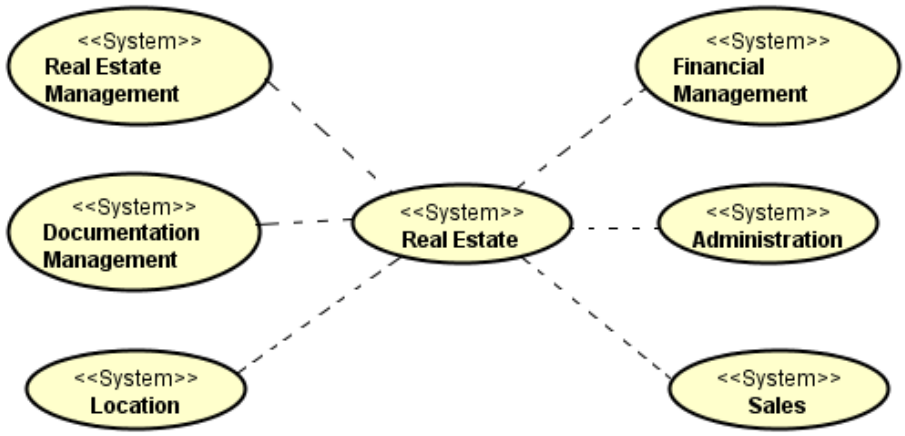


Figure 2 - Context Model Diagram
Source: Adapted from Canteri and Dvulatka (2013).

Altogether, it identified six subsystems that are part of a real estate system. Are they: Real Estate Management, Financial Management, Documentation Management, Administration, Location and Sales. Among the identified subsystems, we chose to demonstrate subsystem modeling Financial Management. Other subsystems will not be addressed in this work by limiting pages.

Requirements and Domain of Modeling

Considering the domain analysis were defined the following common requirements for the subsystem Financial Management: Register Accounts, Factoring Accounts and Select Accounts.

The defined specific requirements are: Payable, Billing Juridical and Calculate.

Figure 3 illustrates the use case diagram with the subsystem similarities Management Financial.

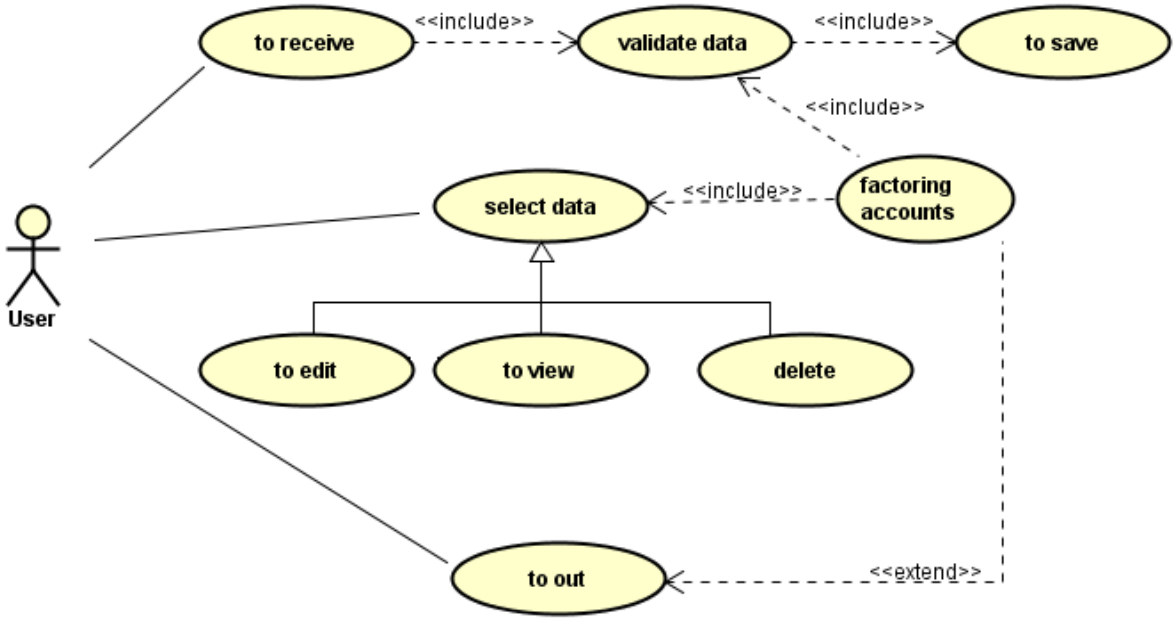


Figure 3 - Diagram Use Case with the similarities Subsystem Financial Management
Source: Author Self

Modeling Architecture

In this subphase each Use Case already analyzed in the domain becomes a system layer interface, as specifies the UML model Components. The Figure 4 shows the generated interface before with their methods for Subsystem Financial Management.

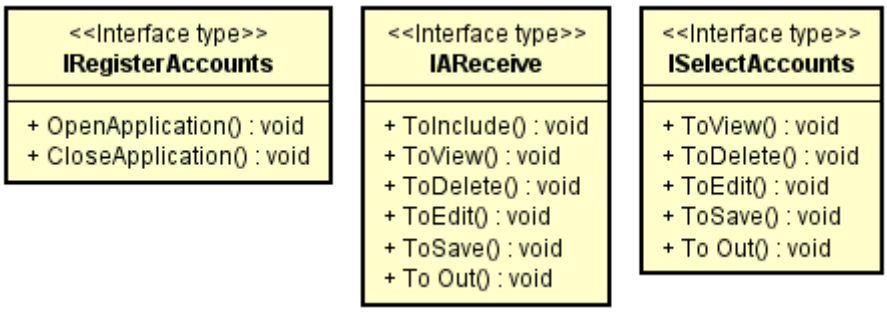


Figure 4 - Interfaces with the methods of the Financial Management Software
Source: Author Self

Component Identification

With the interfaces identified, with components and your respective stereotypes related with use cases included in each component can define the architecture of the Real Estate Software whith the layer of System and combined business. This illustrated in Figure 5.

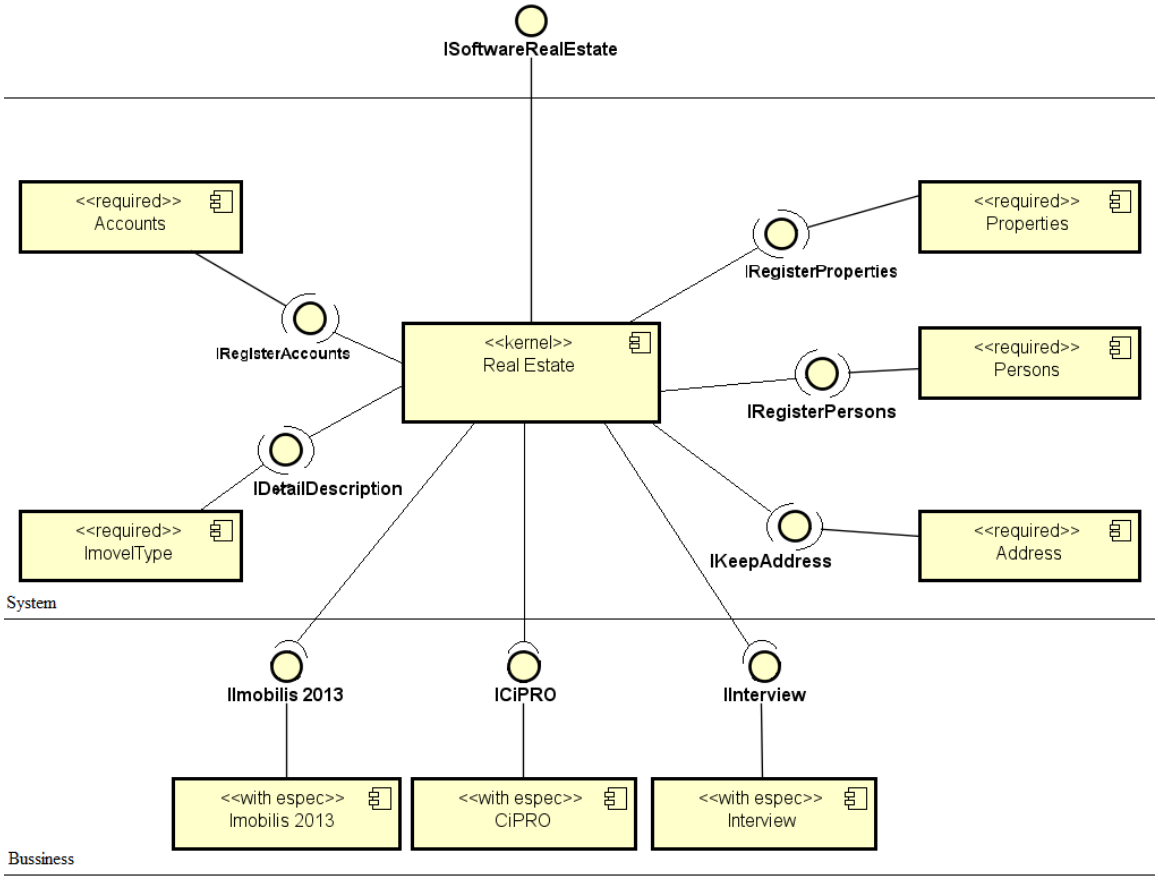


Figure 5 - Software Architecture Real Estate
Source: Author Self

5. CONCLUSION

This paper carried out an analysis of the methods FODA, PLUS, FAST and Delazeri and Wolf, being this one the latter adopted for the realization of the subsystem modeling Financial Management. This model was developed using a development methodology based on SPL. As part of the result of the proposed process, it created the modeling of a real estate system can be used in other applications, since the features common been identified, thereby reducing time and cost for future developments.

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