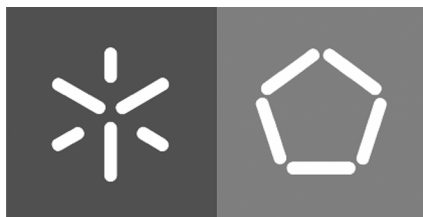


Universidade do Minho
Escola de Engenharia

Sofia Manuela Fevereiro de Azevedo

**UML Metamodelling and ERP Software
Solutions: Experiments with Microsoft DSL
Tools**

Maio de 2008



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Dissertação de Mestrado em

Sistemas de Informação

Trabalho efectuado sob a orientação do

Professor Doutor Ricardo J. Machado

Departamento de Sistemas de Informação

Maio de 2008

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Para os que me trouxeram até aqui...

Abstract

Microsoft DSL (Domain-Specific Language) Tools allow the definition at the metamodeling level of graphical languages suited to a particular domain. The DSL Tools also allow the conception of models with those graphical languages. The proof of concept reported in this dissertation focuses on the domain of a part of the Primavera ERP (Enterprise Resource Planning) software solution. It exposes a metamodeling approach which can be followed when using the tool to model visual domain-specific languages. It includes a stereotyping approach, abstract and concrete syntaxes' setting down. The stereotypes allow the adaptation of the graphical language to the domain. Together, stereotypes and language definition through a metamodel make up the DSVL (Domain-Specific Visual Language). This dissertation explains how to perform both the abstract syntax design through metamodels resembling UML (Unified Modelling Language) class diagrams and the concrete syntax definition through the mapping between the elements in the abstract syntax and the visual constructs of the DSVL. Having metamodels inspired by UML is a pertinent approach defended in this dissertation. UML is a standard with worldwide impact, therefore, graphical languages inspired by UML can be handled by professionals worldwide to design their applications and communicate their design decisions. We can create UML-based graphical languages with Microsoft DSL Tools in order to be able to reason about the solution to the problem domain of a portion of the Primavera ERP and still be able to communicate with professionals familiarized with UML about our design decisions. A compromise between domain knowledge and cross-domain knowledge is established with a UML-inspired language tailored to a specific domain. In this dissertation, stereotypes and domain-specific concepts tailor the graphical languages to the domain, whereas metamodels determine a UML-based syntax for the graphical languages.

Resumo

As Microsoft DSL (*Domain-Specific Language*) Tools permitem a definição ao nível da metamodelação de linguagens gráficas ajustadas a um domínio em particular. As DSL Tools também permitem a concepção de modelos expressos nessas mesmas linguagens. A prova de conceito reportada nesta dissertação foca-se no domínio de uma parte da solução de software Primavera ERP (*Enterprise Resource Planning*). A dissertação expõe uma abordagem de metamodelação que pode ser seguida durante a utilização da ferramenta DSL Tools para modelar linguagens visuais específicas de um domínio. Inclui uma abordagem de estereotipagem, bem como a definição de sintaxes abstracta e concreta. Os estereótipos permitem a adaptação da linguagem gráfica ao domínio. Juntos, os estereótipos e a definição da linguagem através de um metamodelo constituem a DSVL (*Domain-Specific Visual Language*). Esta dissertação explica como executar tanto o design da sintaxe abstracta através de metamodelos que se assemelham a diagramas de classes UML (*Unified Modelling Language*), como a definição da sintaxe concreta através do mapeamento entre os elementos da sintaxe abstracta e os elementos visuais da DSVL. Construir metamodelos inspirados pela UML é uma abordagem pertinente defendida nesta dissertação. A UML é um standard com impacto mundial, logo, linguagens gráficas inspiradas pela UML podem ser manuseadas por profissionais a nível mundial para desenhar as suas aplicações e comunicar as suas decisões de desenho. Podem ser criadas linguagens gráficas baseadas em UML com as Microsoft DSL Tools com o intuito de tornar possível o raciocínio acerca da solução para o domínio do problema de uma porção do ERP Primavera e mesmo assim ser possível comunicar com profissionais familiarizados com a UML acerca das decisões de desenho tomadas. Um compromisso entre o conhecimento do domínio e o conhecimento que é transversal a vários domínios é estabelecido com uma linguagem inspirada em UML e talhada para um domínio específico. Nesta dissertação, os estereótipos e os conceitos específicos do domínio adaptam as linguagens gráficas ao domínio, enquanto que os metamodelos determinam uma sintaxe baseada em UML para as mesmas linguagens gráficas.

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Acronyms

4SRS	<i>Four Step Rule Set</i>
API	<i>Application Programming Interface</i>
CAE	<i>Computer-Aided Engineering</i>
CASE	<i>Computer-Aided Software Engineering</i>
CIM	<i>Computation Independent Model</i>
DSDE	<i>Domain-Specific Design Environment</i>
DSME	<i>Domain-Specific Metamodelling Environment</i>
DSL	<i>Domain-Specific Language</i>
DSVL	<i>Domain-Specific Visual Language</i>
EJB	<i>Enterprise JavaBeans</i>
ERP	<i>Enterprise Resource Planning</i>
FAST	<i>Family-Oriented Abstraction, Specification and Translation</i>
FMOTS	<i>Functional Modules Off-The-Shelf</i>
FODA	<i>Feature-Oriented Domain Analysis</i>
GME	<i>Generic Modelling Environment</i>
GPL	<i>General Programming Language</i>
GUI	<i>Graphical User Interface</i>
HTML	<i>HyperText Markup Language</i>
IIS	<i>Industrial Information System</i>
MDA	<i>Model-Driven Architecture</i>
MDD	<i>Model-Driven Development</i>
MOF	<i>Meta-Object Facility</i>
OCL	<i>Object Constraint Language</i>
OMG	<i>Object Management Group</i>
OO	<i>Object-Oriented</i>
PBSS	<i>Primavera Business Software Solutions, S.A.</i>
PDM	<i>Problem Domain Matrix</i>
PIM	<i>Platform-Independent Model</i>
PSM	<i>Platform-Specific Model</i>
QVT	<i>Query/View/Transformation</i>
RUP	<i>Rational Unified Process</i>
SDK	<i>Software Development Kit</i>

SDL	<i>Specification and Description Language</i>
SDM	<i>Solution Domain Matrix</i>
SF	<i>Software Factories</i>
SPL	<i>Software Product Line</i>
SQL	<i>Structured Query Language</i>
UML	<i>Unified Modelling Language</i>
VA	<i>Virtual Automation</i>
VAT	<i>Value Added Tax</i>