Integrating Ontology Models and Conceptual Models using a Meta Modeling Approach

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Agenda

• Motivation
• Conceptual Modeling
• Meta Modeling
• Three approaches for an integration
• Implementation and Application Scenarios
• Outlook
Motivation

- Several business cases for the use of web-based ontologies:
  - Enterprise Content Management
  - Enterprise Information Integration
  - Enterprise Service Bus
  - ...

- Some common goals:
  - Let machines manage complexity
  - Using explicit semantics and reasoning
  - Based on shared, web-based, explicit conceptualizations

- How to analyze the contribution to business value?

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Conceptual Modeling

- Conceptual Modeling:
  - Supporting humans to analyze organizational and technical relationships
  - Based on formal syntax and notation
  - Optional definition of formal semantics
  - Goal: Improvement of Human understanding

- Examples:
  - Analysis of business models, strategic goals, performance measurements, opportunities for action
  - Management of business processes including representation, analysis, simulation
  - ...

- How to bring together ontologies and conceptual models?

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Spectrum of „Ontologies“

Humans usually do not express themselves in a logic-based language...

“Ontologies are usually expressed in a logic-based language...”
(Obrest, 2003)
DKE Meta Modeling Framework

Meta Modeling Approach
Example for the Realization of a Process Meta Model

Semantic Issues

- Meta Models for Conceptual Modeling:
  - Assumption of implicit, human-interpreted semantics
  - Only „execution“ of models requires strict formalization incl. formal semantics
  - Formalization of semantics only for particular purposes, e.g. simulation
  - No consideration of inherent semantics of the model content, e.g. an activity in a process is named „print report“ but no information about „print“ or „report“ is made explicit
  - IT-based communication of semantic information requires common semantic base, e.g. an ontology

  How to make semantics explicit?
Integrating Explicit Semantics

Three Approaches:
• Integrating Ontologies on the Meta Model Level
• Defining References between Meta Model Elements and externally kept Ontologies, resp. between Model Elements and Ontologies
• Using a Combination of Integration and External Linkage

Example for the Realization of an Ontology Model
Integrating Ontologies on the Meta Model Level

Linkages on the Meta Model Level

Meta Model | Ontology Meta Model
--- | ---
Class | OWL Class
Activity | Domain
Decision | Property
Relationship | Meta Model
Subsequent | Model

Contact Customer | Notify Customer | Write E-Mail

Advantages:
• Coherent conceptual approach for both ontologies and domain aspects
• Inherent graphical representation of ontology
• General mechanisms and algorithms for meta models directly applicable to ontologies

Disadvantages:
• Graphical modeling of large ontologies is difficult
• Visualization of large and complex ontologies difficult to handle for users
• Specific ontology aspects might need to be re-implemented / re-configured

References between (Meta) Models and External Ontologies

Meta Model | Meta Model Extensions | Ontology Repository
--- | --- | ---
Class | Attribute | Class
Activity | | Customer
Decision | | Notify Customer
Relationship | | Write E-Mail
Subsequent | | Customer reached

Advantages:
• Independent modifications of ontologies in the repository possible, e.g. sharing with third parties
• Ontology repository may better meet user needs for ontology manipulation
• Less implementation effort on meta model side

Disadvantages:
• Consistency problems, e.g. in case of modifications of the ontology or the models
• Different representations of models and ontologies may require extra user training
• Possible time delays in interaction btw. systems

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Using a Hybrid Approach of Integration and Referencing

### Advantages:
- Coherent conceptual approach for both ontologies and domain aspects
- Independent modifications of ontologies in the repository possible, e.g. sharing with third parties
- Ontology repository may better meet user needs for ontology manipulation
- No consistency problem on meta model side
- Not all ontology concepts required on meta model side

### Disadvantages:
- Consistency problems still persist btw. ontology meta model and ontology repository
- Specific ontology aspects might need to be re-implemented on meta model side

Implementation Platform

The meta modeling approach has been implemented as a multi-user platform (ADONIS®).

Adonis Community Edition for free download:

http://www.adonis-community.com

CORE (Modeling subsystem)

Database

http://www.dke.univie.ac.at
Scenarios

Scenario A: AGES Management of Clinical Trials
   → Integrating Ontologies on the Meta Model Level

Scenario B: Semantic Culture Guide
   → Using a Hybrid Approach of Integration and Referencing via Protégé

Implementation A

Visual views on process models based on terms
SCG Project Outline

**Goal:** „Make Austria’s culture events accessible through a decentralized one-stop shop by using semantic technologies.“

**Innovative Aspects:**

- Creation of an adequate **Modeling Method** for the description of Business Models, Business Processes and Services of the organizers of culture events.
- Creation of a **Culture-Ontology** for the coherent description of the involved actors, the culture events and genres and the user feedback dimensions
- Implementation of **semantic services** and **serviceworkflows** for the support of visitors and event organizers
- **Practical trial** of the semantic services and workflows

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**Implementation B**

**Meta Model**

**Ontology Model**

**Ontology Repository**

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SeMFIS on Open Model

- Semantic-based Modeling Framework for Information Systems (SeMFIS)
- Provision of modeling framework, technologies, and tools to support semantic information models
- Current tasks:
  - Provision of a web-based modeling tool based on Java applets (AdoWeb)
  - Coupling of AdoWeb and Protégé on a common platform
  - Extension of the modeling functionalities for using ontologies and conceptual models
  - ...

Outlook: www.openmodels.at
SeMFIS Community

SeMFIS Technologies: Web-based Modeller
SeMFIS Technologies:
Applet Version of Protégé incl. Plugin

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Thank you for your attention!
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