

Using UML for Knowledge Representation

Mark Dutra

Sandpiper Software, Inc.

Mdutra@Sandsoft.com

Definitions

- Knowledge representation means that knowledge is formalized in a symbolic form, that is, to find a symbolic expression that can be interpreted. – Klein and Methlie
- Knowledge engineering is the application of logic and ontology to the task of building computable models of some domain for some purpose. – John Sowa

Motivation

- Importance of knowledge representation (ontologies) increasing
- No existing commercial tools for KR modeling
- Pool of experienced ontologists small
- Population of UML experienced engineers is growing
- Need to make KR modeling accessible to domain experts

KR Domain Overview

- Early work on KR done by the Artificial Intelligence community
- KR domain has historically neglected common software engineering discipline
- Mapping between KR concepts and UML not always straight forward
- Granularity of ontology models vary greatly between organizations

UML Profile for KR

Frame-Based KR (Ontology) Element	UML Metamodel Element(s)	UML Stereotype
Ontology	Package	Ontology
Class	Package	ClassFrame
	Class	OntologyClass
Relation	Package	RelationFrame
	Class	Relation
	Association	Domain
Function	Package	FunctionFrame
	Class	Function
	Association	Domain
	Association	Range
	Operation	Function
Individual	Class	Individual
	Association	IndividualOf
Slot	Class	SlotRelation
	Association	HasSlot
Facet	Attribute	Facet
Axiom	Operation, External File	Axiom

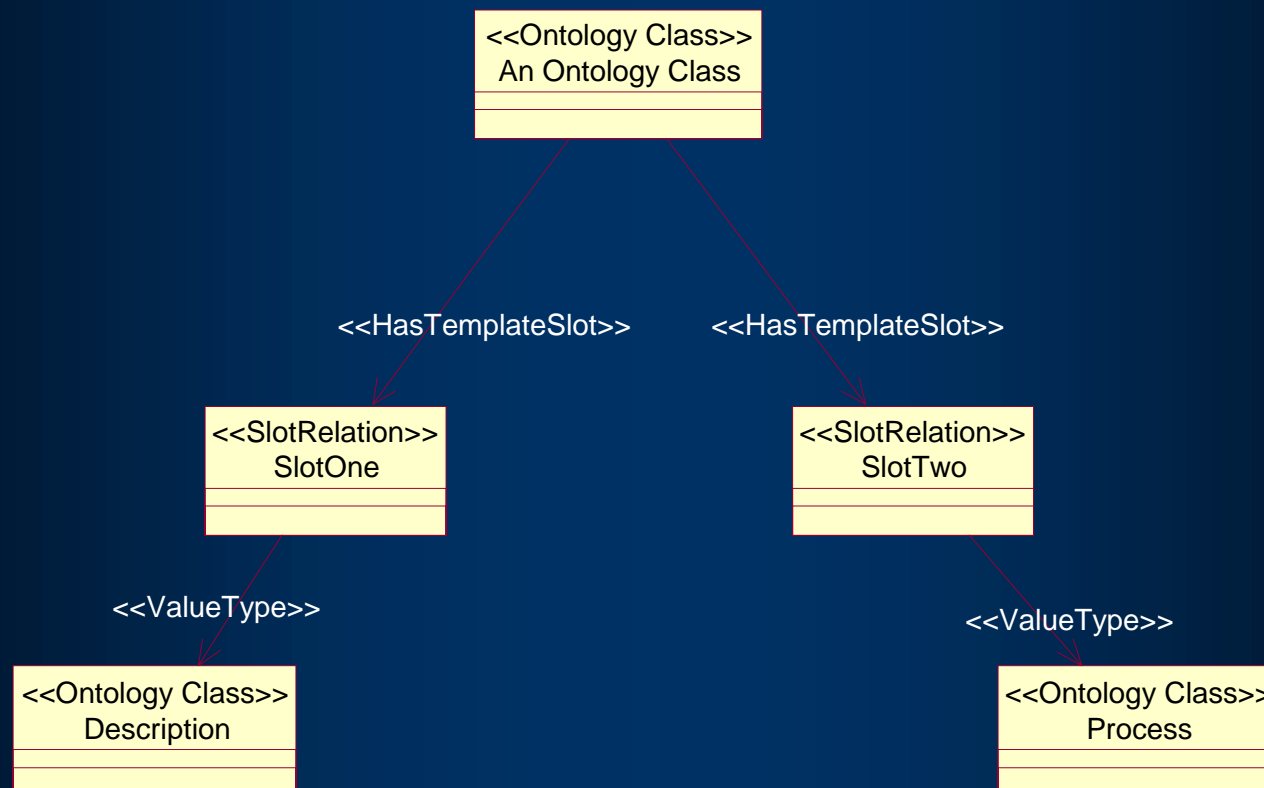
Recipe for UML Profile

- Determine which concepts from each domain are relevant
- Map concepts between domains
- Create stereotypes
- Create properties
- Implement in Rose Add-In
- Try to model some stuff
- Iterate

Issues Encountered

- Conceptual differences between the KR and UML domains
- Limitations in tool support impacted implementation of ontology modeler add-in, and therefore impacted the profile itself

Example – slots of a class



Example – n-ary relationship

