

Supporting i^* -Based Context Models Construction through the DHARMA Ontology

W. Pérez¹, K. Abad¹, J.P. Carvallo², X. Franch³

¹U. Cuenca (Ecuador)

²U. del Azuay (Ecuador)

³U. Politècnica de Catalunya (Spain)



TENTH
INTERNATIONAL
 i^* WORKSHOP

12-13 June 2017, Essen, Germany

CAiSE '17

29th International Conference on
Advanced Information Systems Engineering

Introduction

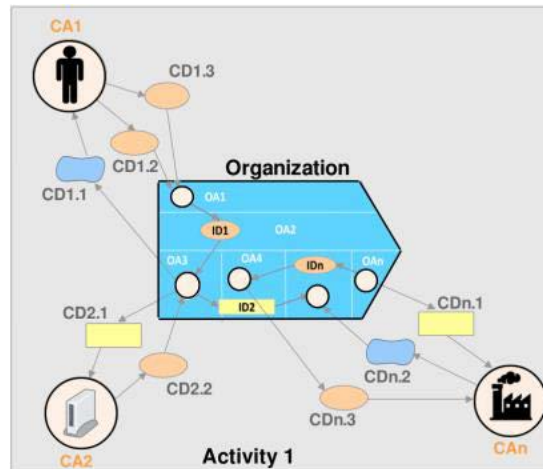
- Enterprise Architecture
 - conceptual blueprint that defines the structure and operation of an organization
 - from business strategy to implementation
- The DHARMA Method (*cf.* POEM'09)
 - construction of EAs
 - starts from a model of the context expressed with i^*

Motivation

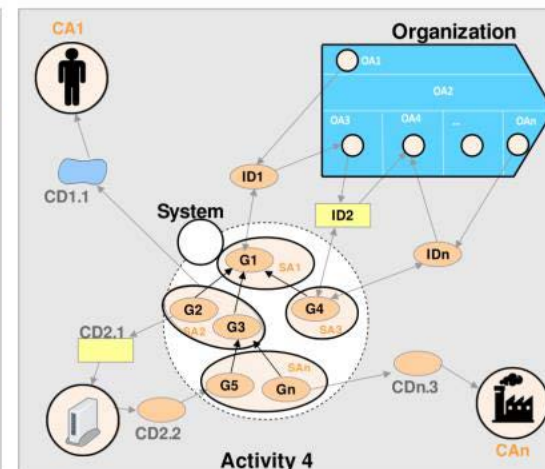
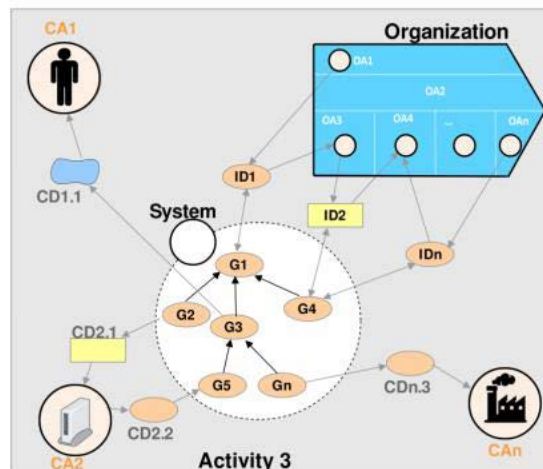
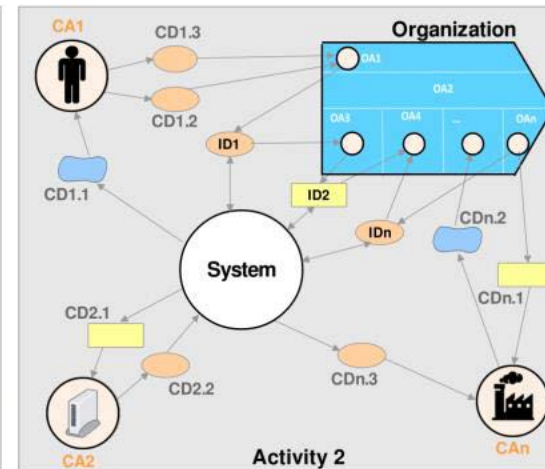
- DHARMA applied in several industry cases (*cf.* SAC'17)
 - repetitive elements do emerge
 - construction of a pattern catalogue (*cf.* TEAR'12)
- Practical limitations due to its syntactic nature
 - synonyms/antonyms
 - queries in natural language
- Proposal: the DHARMA ontology
 - integrating different domains and vocabularies
 - catalogue from syntax to semantics

Background: DHARMA

1. Modeling the Enterprise Context



2. Modeling the Environment of the System



3. Decomposition of System Goals

4. Identification of System Architecture

Design of the DHARMA ontology

- Application of the NeOn methodology to build an ontology network (*cf.* Hase et al., 2008)
 - collection of interconnected and interrelated ontologies through meta-relations
 - nine scenarios to drive the process
 - in DHARMA, focus on the scenarios:
 1. From specification to implementation
 3. Reusing ontological resources
 8. Restructuring ontological resources

From specification to implementation

- Elicitation of the elements of the ontology
 - competence questions arranged into groups

CQG1	Actors
CQ1.1	Which are the types of actors?
CQ1.2	Which are the instances of a type of actor?
CQG2	Actor Relationships
CQ2.1	Which are the types of relationships between actors?
CQ2.2	...

Reusing ontological resources

- Four activities applied
 1. Search: OntoiStar, OntoiStar+, Offer-job, Classification, ValueChain

Reusing ontological resources

- Four activities applied
 1. Search
 2. Evaluation:
 - Organization: Offer-job, Classification
 - *i** models: OntoiStar, OntoiStar+
 - Organizational areas: ValueChain

Reusing ontological resources

- Four activities applied
 1. Search
 2. Evaluation
 3. Selection: OntoiStar left out

Reusing ontological resources

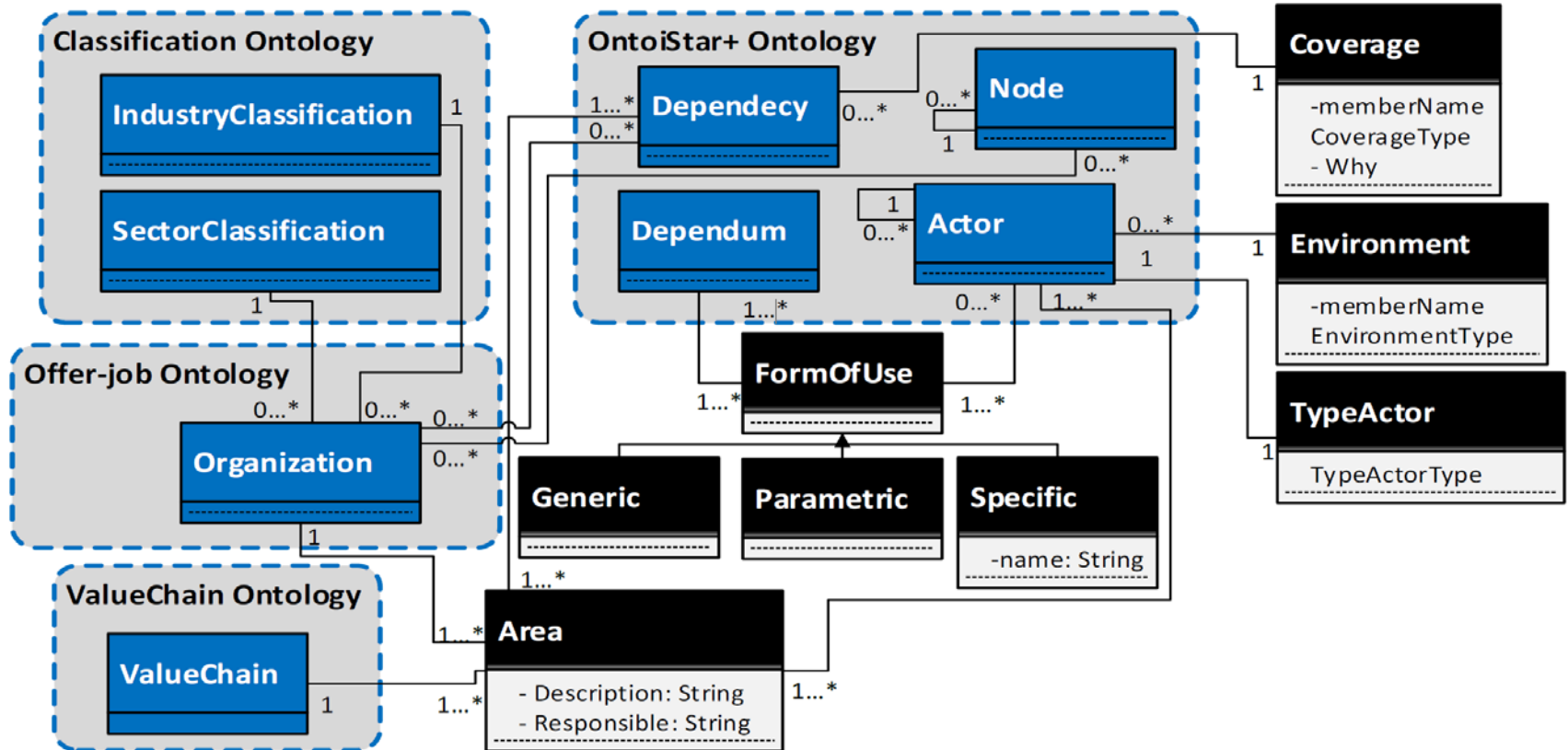
- Four activities applied
 1. Search
 2. Evaluation
 3. Selection
 4. Integration:
 - Reuse-as-is: OntoiStar+, ValueChain
 - Reengineering: Offer-job, Classification → some irrelevant parts removed

Restructuring ontological resources

- The selected ontologies are integrated
 - Combined used of NeOn Toolkit and Protégé



An excerpt of the result



Restructuring ontological resources

- Transformation of concepts into ontological constructors (*cf.* Nájera et al., iStar'11)
 - concept, concept relation and enumeration class → OWL class
 - enumeration element → OWL class instance
 - class property → OWL axioms
 - association → OWL object property
 - enumeration and primitive data → OWL data property

Result

- Final DHARMA ontology
 - integrates four ontologies
 - results in:
 - 856 classes
 - 72 data properties
 - 175 object properties
 - 20 annotation properties

Validation

- Annotation and query of several context models formerly created with DHARMA

```
PREFIX dharma: <http://www.ucuenca.edu.ec/ontologies/DHARMA.owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
SELECT ?type, ?instance WHERE {
dharma:Actor/UC a ?instanceC. ?dharma:Actor/UC rdfs:label ?name.
dharma:Actor/UC dharma:has_Actor_TypeActor_source_ref ?typeC.
?instanceC rdfs:label ?instance. ?typeC rdfs:label ?type.}
```

Validation

- Annotation and query of several context models formerly created with DHARMA

```
SELECT distinct ?Actor1 ?Dependum ?Actor2 ?IntentionalType ?direction
WHERE {
?DependumLink OntoIStar:has_Dependency_DependumLink_source_ref ?URI.
?DependumLink OntoIStar:has_Dependency_DependumLink_target_ref ?DependumE .
?DependumE <http://www.cenidet.edu.mx/OntoiStar.owl#Node_label> ?Dependum .
?DependumE OntoIStar:has_IntentionalElement_IntentionalType ?IntentionalTypeE .
?IntentionalTypeE rdfs:label ?IntentionalType .
?DependerLink OntoIStar:has_Dependency_DependerLink_target_ref ?DependerE .
?DependerLink OntoIStar:has_Dependency_DependerLink_source_ref ?URI .
?DependeeLink OntoIStar:has_Dependency_DependeeLink_target_ref ?DependeeE.
?DependeeLink OntoIStar:has_Dependency_DependeeLink_source_ref ?URI .
?URI OntoIStar:Node_sannotation ?direction .
?URI dharma:has_Dependency_Organization_source_ref
<http://www.ucuenca.edu.ec/ontologies/DHARMA.owl#Organization/CSPC> .
?URI dharma:has_Dependency_Area_source_ref ?URIArea .
?DependerE <http://www.cenidet.edu.mx/OntoiStar.owl#Node_label> ?Actor2.
?DependeeE <http://www.cenidet.edu.mx/OntoiStar.owl#Node_label> ?Actor1 .
```


Future work

- Use of reasoning engines e.g. to infer and generate new (parts of) EAs
- Incorporating metrics in the ontology (*cf.* CAiSE'09)

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