

Formalising ODRL Semantics using Web Ontologies

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Outline

1. Introduction
2. Motivation
3. Objective
4. Methodology
5. Conceptualisation
6. Implementation
ODRL Ontology
7. Conclusions

Introduction

- Digital Media Web explosion.
- Global Web-wide media market.
- Initially isolated and proprietary DRM Systems.
- New requirement: DRM interoperability.
- Two interoperation dimensions:
 - Legal: WIPO, DMCA, EU Directives,...
 - Technological: MPEG-21, ODRL, DMP,...

Motivation

- Mainly technological interoperability initiatives at the syntactical level: Rights Expression Languages (RELs).
- Syntactic solution fails short:
 - Domain complexity
 - Implementation issues
 - Interoperability problems ...
- “Mixed” solutions
- à Solutions with the approach of profiles
- **Semantic approach: Web Ontologies.**

Motivation

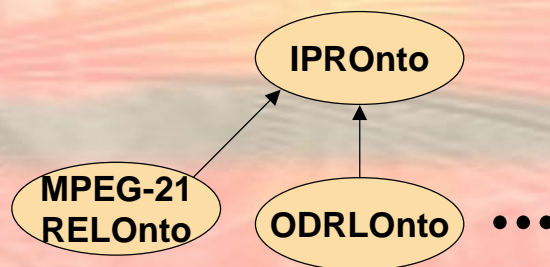
- Example ODRL Licenses checker: get usage constraints (interval, purpose,... 23).
 - Syntactic approach: 23 different XPath's.
 - Semantic approach: 23 subclasses of Constraint, 1 semantic query.
- Semantic approach facilitates development and maintenance.

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Objective

- Build Ontological framework for DRM.
Components:
 - General IPR Ontology (IPROnto) for IPR formalisation.
 - Specific REL ontologies for broader coverage.
 - Mapping rules for interoperability.

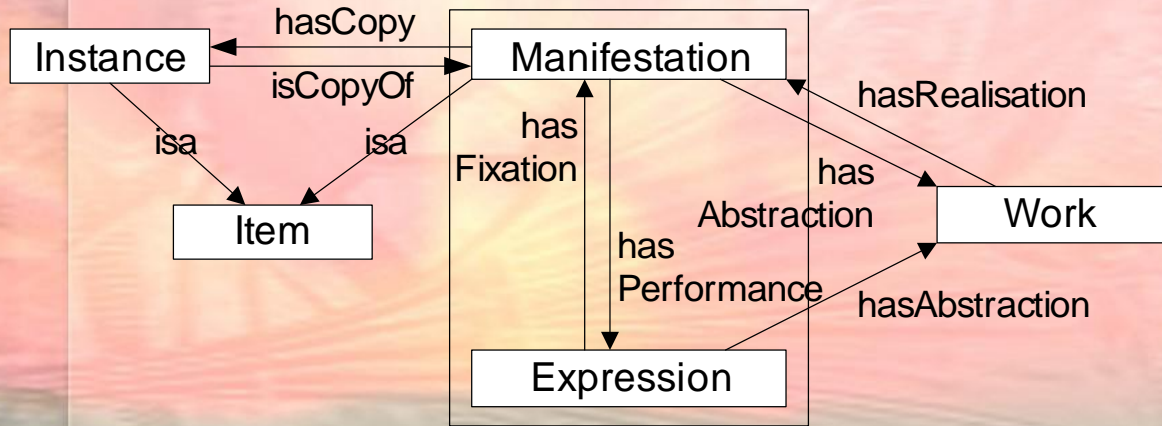


Methodology

- Methontology.
- Sources:
 - IP Commerce: < indecs >
 - Business Model: Imprimatur
 - Legal: WIPO
 - ...
- Tools: Semantic Web technologies.
- First version of IPROnto late 2001.

Conceptualisation

- Creation Model:



Copyrighted Creation
 \equiv (Manifestation \cup Expression)

Conceptualisation

- Rights Model:

Intellectual Property Rights

ExploitationRight (Copyright)

TransformationRight
 AdaptationRight
 TranslationRight
 SubtitlingRight

CommunicationRight

BroadcastRight
 PublicPerformanceRight

DistributionRight

RentalRight

ReproductionRight

FixationRight

MoralRight

DisseminationRight
 PaternityRight
 RespectRight
 WithdrawalRight

NeighbouringRights

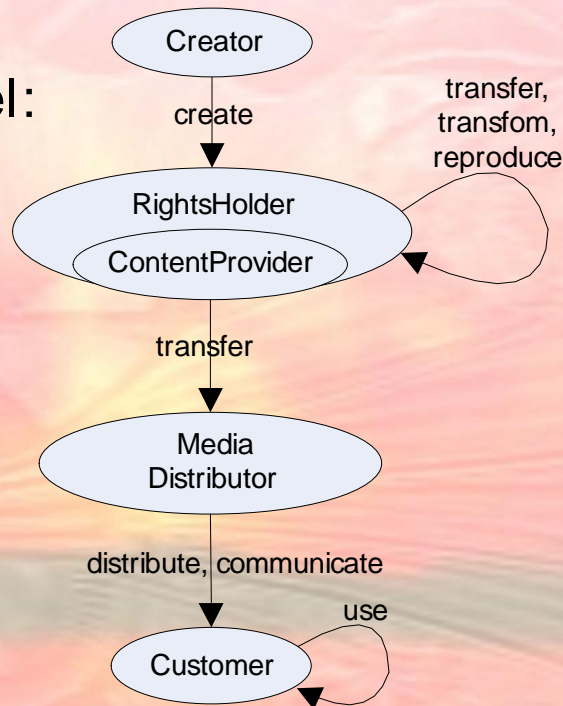
SuiGenerisRight

RightsExceptions

PrivateCopy
 Cite
 Libraries

Conceptualisation

- Business Model:



Conceptualisation

- Action Model: verbs

- *TransformationRight*: Adapt, Translate,...
- *CommunicationRight*: Broadcast, Access,...
- *DistributionRight*: Distribute, Rent,...
- *ReproductionRight*: Reproduce, Fix,...
- *MoralRight*: Attribute, Retire,...
- *RightsExceptions*: Cite,...
- *Licensing*: Agree, Disagree, Transfer,...

Conceptualisation

- Action Model: thematic roles

	initiator	resource	goal	essence
Action	agent, effector	instrument	result, recipient	patient, theme
Process	agent, origin	matter	result, recipient	patient, theme
Transfer	agent, origin	instrument, medium	experiencer, recipient	theme
Spatial	origin	path	destination	location
Temporal	start	duration	completion	pointInTime
Ambient	reason	manner	aim, consequence	condition

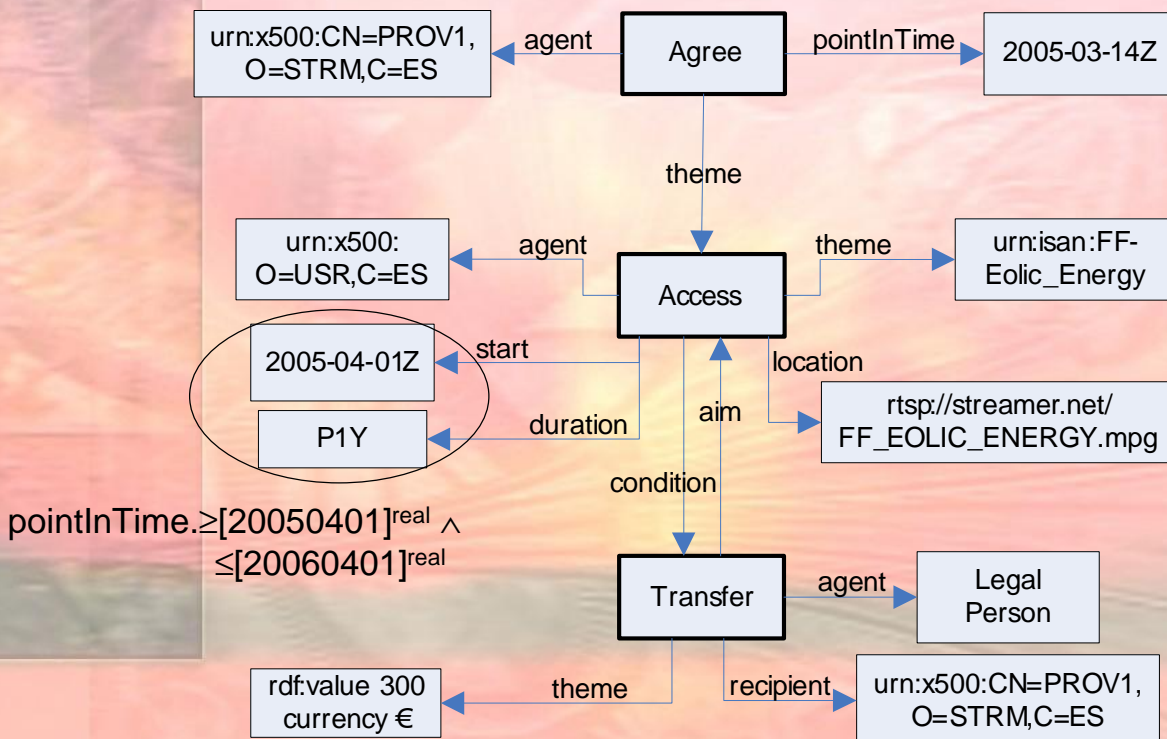
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Implementation

- Description Logic (OWL) and Rules (SWRL).
 - Model licenses as classes.
 - Model usages as instances (classes).
 - Model constraints as rules.
- Usage validation as instantiation (subsumption) checking with DL Reasoner.
- Custom datatypes (e.g. time ranges).

Implementation



Implementation

- Integrate syntactic initiatives:
 - XML Schemas à OWL Ontologies
 - MPEG-21 REL à RELOntos
 - ODRL à ODRLOntos
 - Map to IPROnto
- Benefits:
 - Formal semantics
 - Check IPROnto coverage
 - Implementation ease (semantic queries, license checking and search,...)

Implementation

- Some XML Schemas to OWL mappings:

XML Schema

element | attribute

element@substitutionGroup

complexType

extension | restriction@base

OWL

owl:DatatypeProperty | ObjectProperty

rdfs:subPropertyOf

owl:Class

rdfs:subClassOf

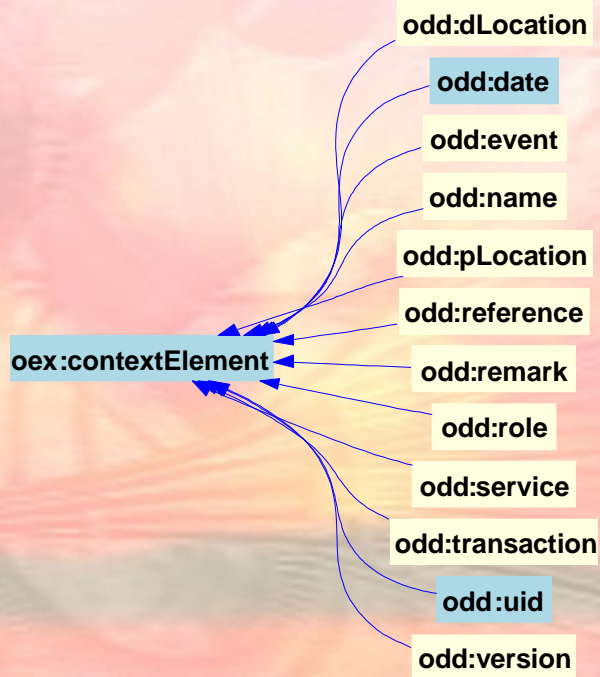
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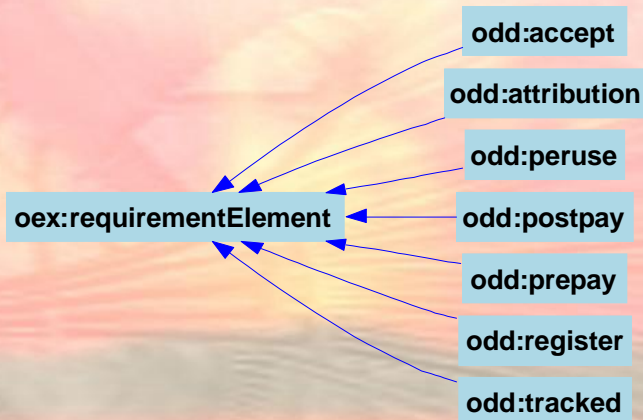
ODRLOnto

- Use XML Schema to OWL mapping on:
 - ODRL- EX
 - ODRL- DD
- Get one OWL ontology integrating both.

ODRLOnto: Context Elements

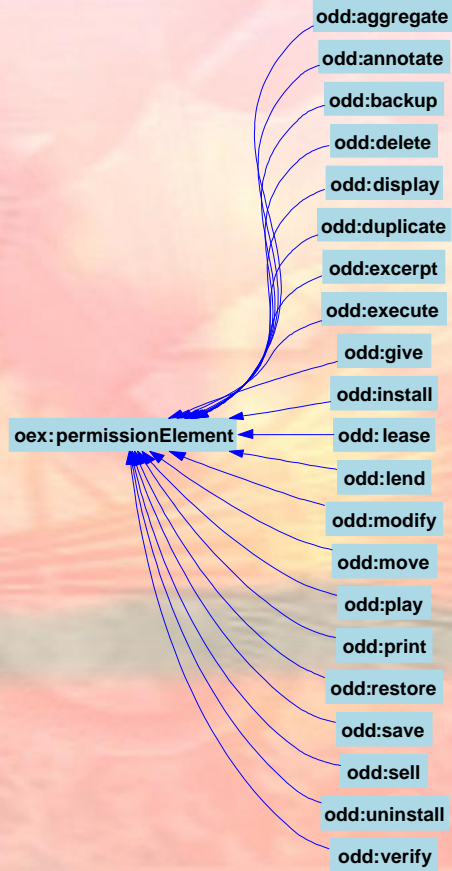


ODRLOnto: Requirements



ODRLOnto: Permissions

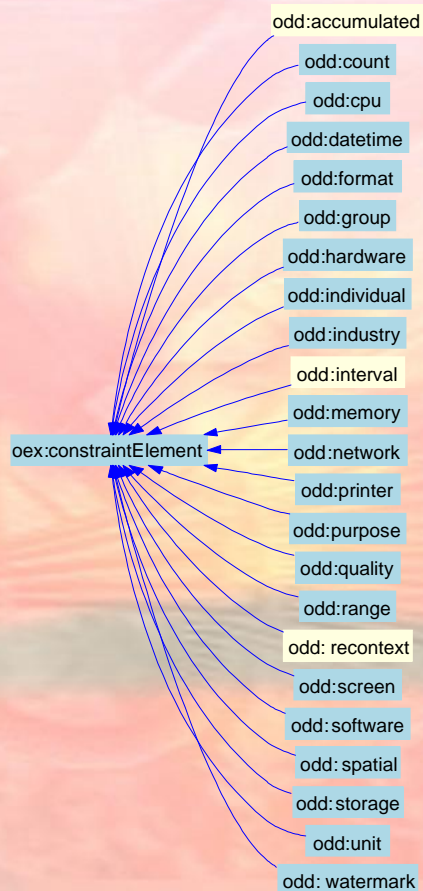
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ODRLOnto: Constraints

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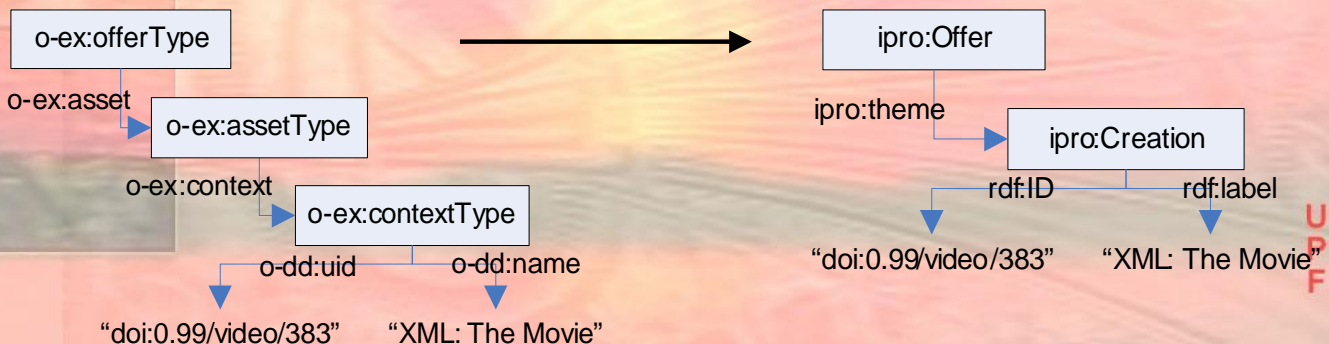
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ODRLOnto: Other Elements



ODRLOnto

- Connect ODRLOnto to IPROnto
 - Use semantic mapping rules, e.g.:

$$o\text{-ex:asset}(?x,?y) \hat{=} o\text{-ex:assetType}(?y) \hat{=} o\text{-ex:context}(?y,?z) \\ \hat{=} ipro:Creation(?z) \hat{=} o\text{-ex:asset}(?x,?z)$$


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Conclusions

- IPR domain complexity demands semantic solutions for interoperability.
- IPROnto provides a common conceptual framework.
- Concrete initiatives integration through specialised ontologies and mappings to IPROnto.
- All together: formalise semantics, facilitate interoperability and implementation.

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