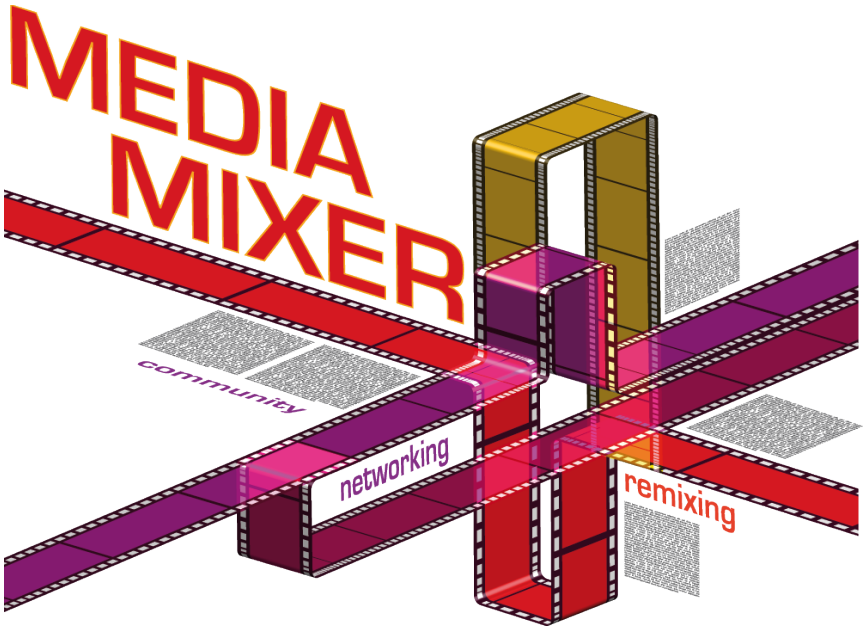
Semantic Technologies for Copyright Management



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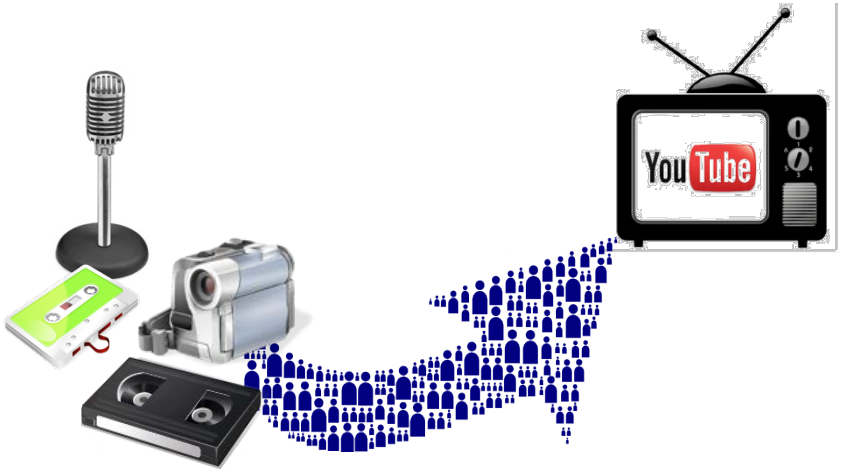
1st Winter School on Multimedia Processing and Applications (WMPA'14)

January 6th, 2014, Dublin, Ireland

Contents

- **Motivation**
- Introduction
- Approach
- Conceptualisation
- Implementation
- Conclusions

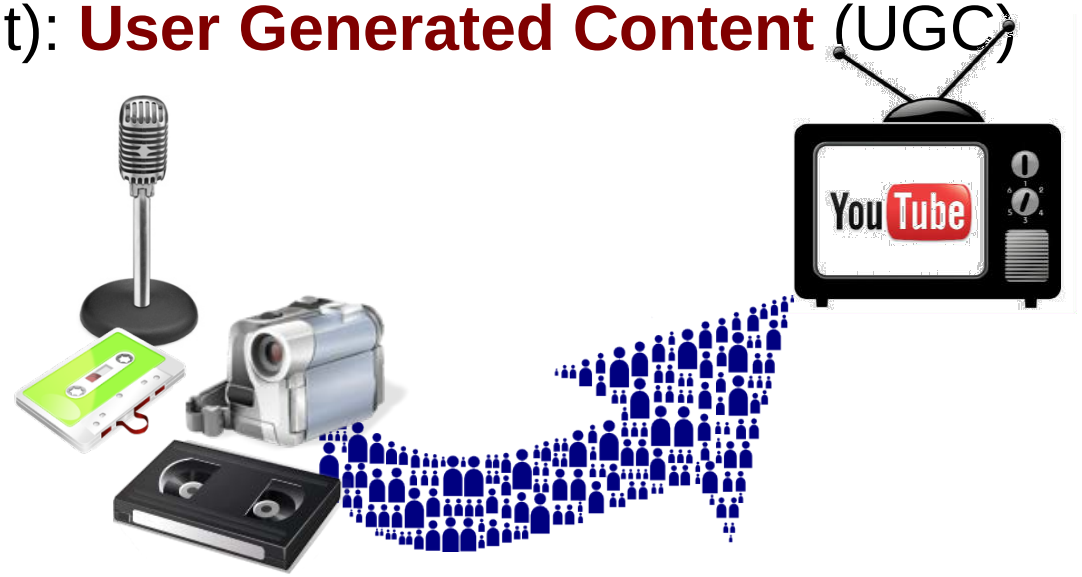


Motivation

- Why **copyright management** on the Web is more important than ever?
- And why **Digital Rights Management** isn’t enough?
- Why **semantic technologies** seem a good choice for Web-scale copyright management?

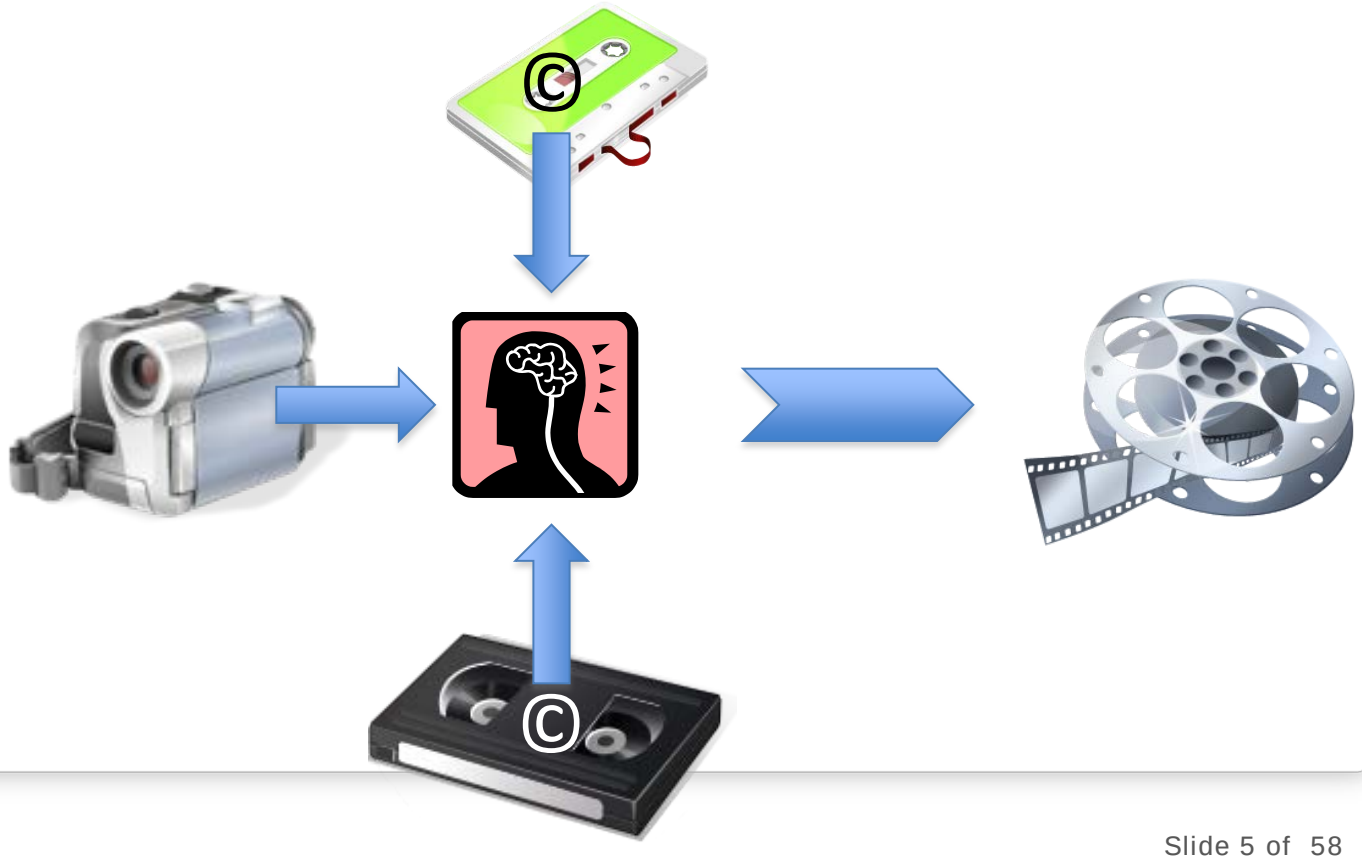
Motivation - Use Case

- Web media business models go **beyond digital** version of **“copy/distribute”** vinyls, cassettes, CDs, DVDs,…
- Growing **Streaming** (Spotify, Pandora, Netflix, Hulu…)
- Promising big scale **remixing** (make money if others reuse your content): **User Generated Content** (UGC)

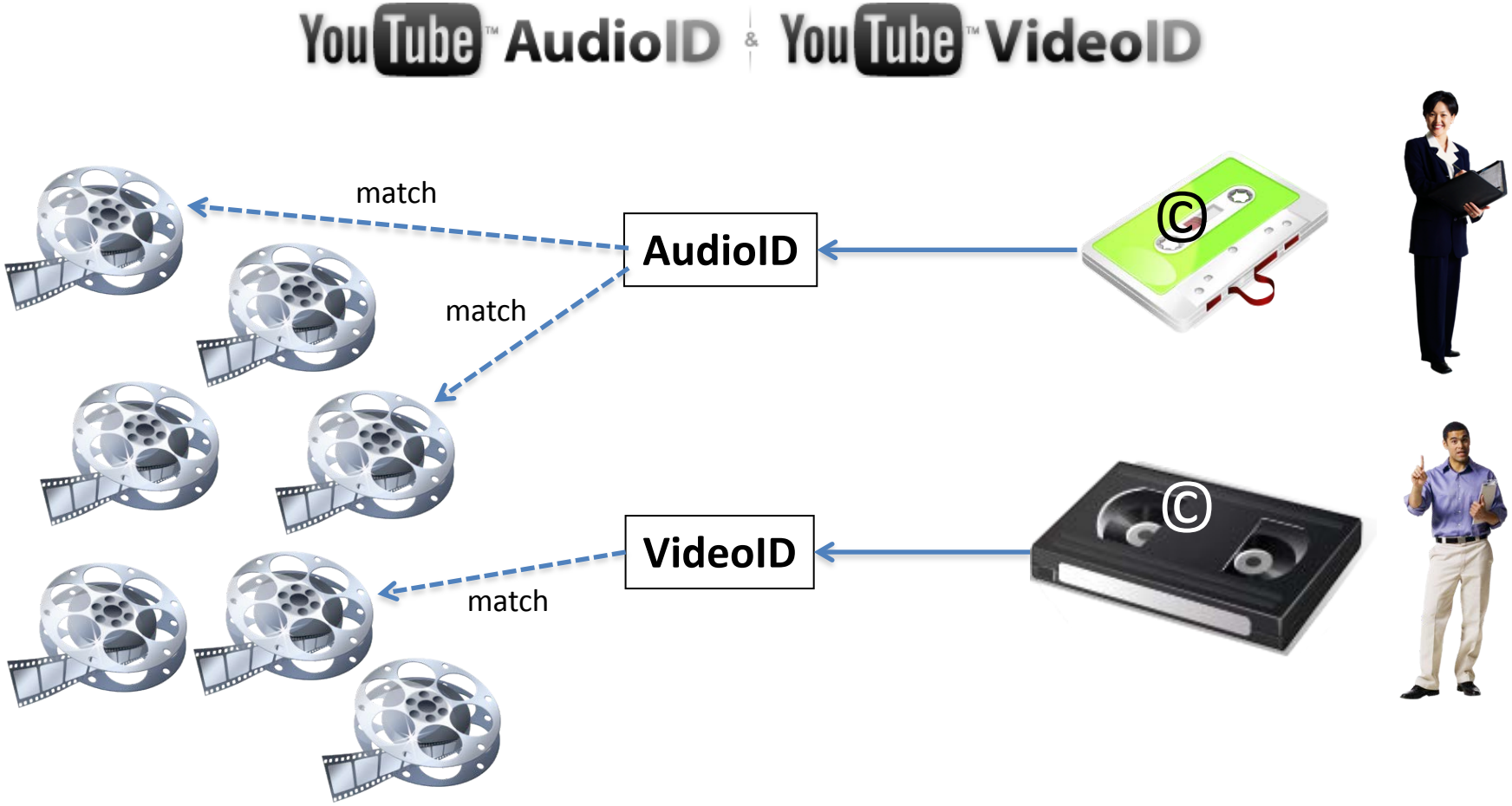


Motivation - Use Case

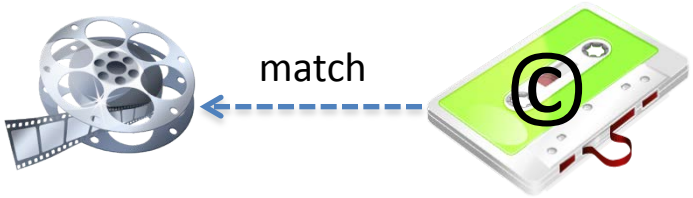
- UGC from reused media



Motivation - Use Case



Motivation - Use Case



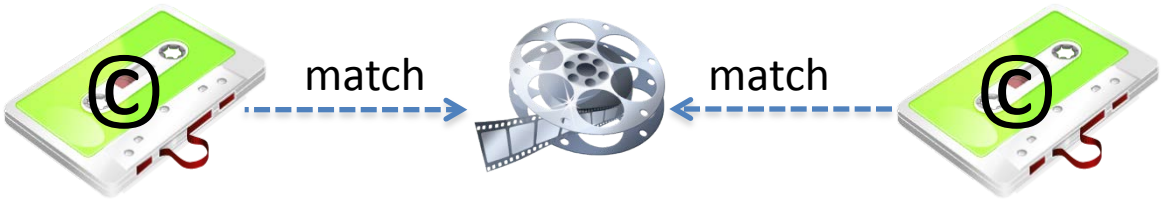
Choices:

- ○  Block
- ○  Track
- ◉  Monetize

“Gangnam Style”, +33,000 videos using it, more than $870,000 ad revenue - New York Times, Dec 7th 2012

Motivation - Use Case

- What if more than one ownership claim?



- If disputed, no one can monetize

Motivation - Use Case

- Are we **sure** we can claim?
- Do we own that particular **copy**?
- In that **territory**?
- Also streaming on **YouTube**?
- Does the **artist** authorise YouTube?
- …

DRM → **Copyright Management**

Motivation - Use Case

…1000s of pieces of registered content…

…1000s of videos on YouTube…

- **Decision Support System** (DSS):
  - Disputes with Media.com on A and B, can we claim?

  - Trade A for B with Media.com (both win, start to get revenue)

Motivation - Use Case

- Rights DSS requirements:
  - **Fine grained**
  - Scalable (largely **automatized**)
  - Takes **into account**:
    - **Contracts**

      "…all rights on the live version but studio version just in the US."
    - **Policies**

      "…artist does not want his music together with violent images".
    - **Rights Expression Languages**

      DDEX metadata:
      ```
      <UseType>OnDemandStream</UseType>
      <TerritoryCode>Worldwide</TerritoryCode>
      ```

Monetize “Bullet in a Bible” in YouTube.com?

“Bullet In A Bible”
– Green Day

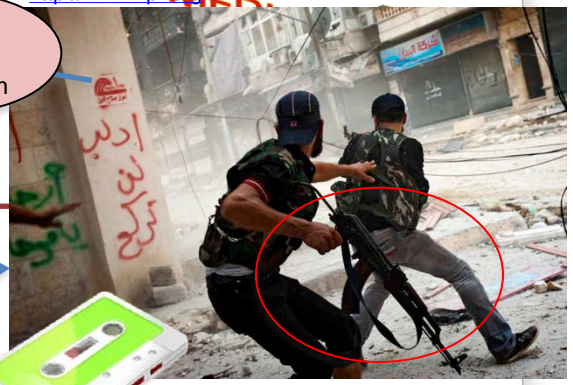
Digital Operations (DDEX)

```
<isrc>USREV0500293</isrc>
<DealTerms>
  <ValidityPeriod>
    <StartDate>2005-11-15</StartDate>
  </ValidityPeriod>
  <Usage>
    <UseType>OnDemandStream
    </UseType>
    <DistributionChannelType>
    Internet</DistributionChannelType>
  </Usage>
  <TerritoryCode>US</TerritoryCode>...
```

Green Day’s Contract: “Avoid making available our work together with war images”

Digital Operations says YES but we should check Green Day’s contract…

Seeing Syria's War Through the Lens
by SOPHIA JONES - October 09, 2012
http://www.npr.org



"Bullet In A Bible" – Green Day

dbpedia:Category:Syrian_civil_war

topic

broader

Semantic Media Annotation

dbpedia:Category:War

dbpedia:Green_Day

part of

topic

schema:CreativeWork

part of

author

author

schema:CreativeWork

sameAs

Isrc:USREV0500293

theme

Green Day's Contract:
"Avoid making available our work together with war content"

Rights Builder User Interface

theme

Rights Language Mapping

cro:MakeAvailable

subClassOf

ddex:AdSupported Streaming

Digital Operations (DDEX)

Disagree

Agree

RDF Store & Reasoner

medium

ddex:Internet

is a

```
<isrc>USREV0500293</isrc>
<DealTerms>
  <ValidityPeriod>
    <StartDate>2005-11-15
    </StartDate>
  </ValidityPeriod>
  <Usage>
    <UseType>AdSupportedStreaming
    </UseType>
    <DistributionChannelType>
      Internet
    <DistributionChannelType>
  </Usage>
  <TerritoryCode>US
  </TerritoryCode>...
```

Isrc:USREV0500293

theme

ddex:AdSupported Streaming

medium

http://youtube.com

?

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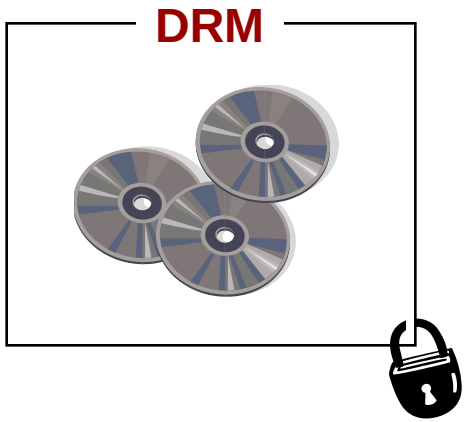
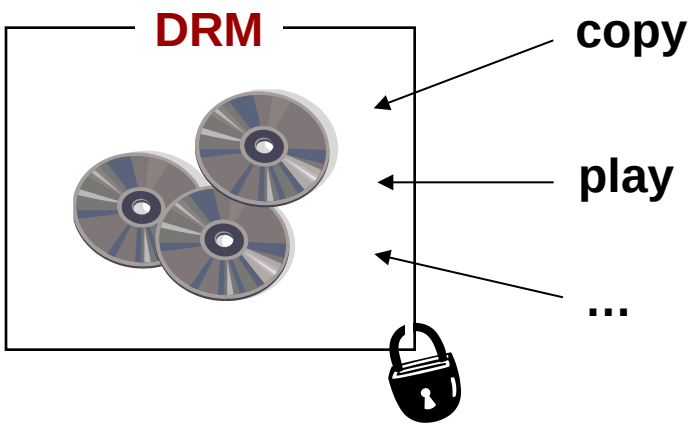


Introduction

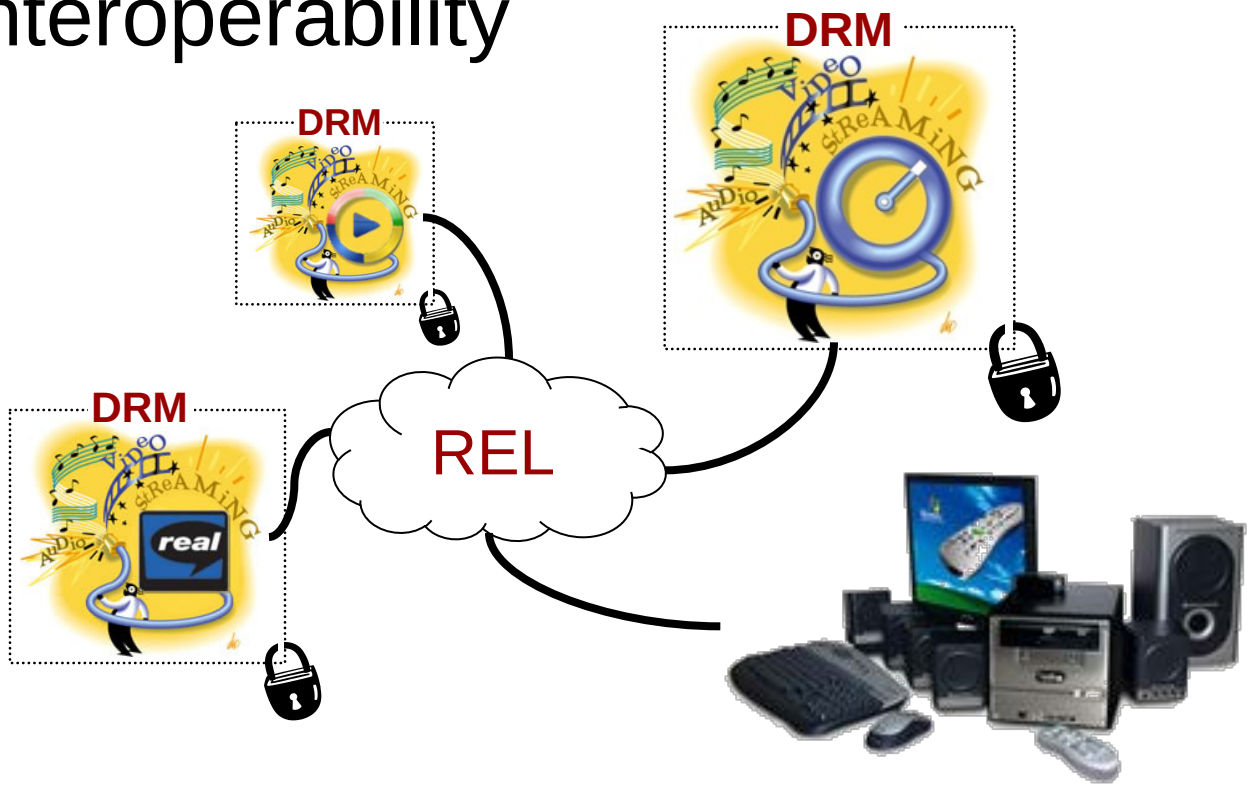
- Digital media: easy production and copy
- Digital Rights Management (DRM)



- Windows Media DRM, iTunes FairPlay, RealNetworks Helix, Sony MagicGate…

Introduction

- Internet: easy distribution
- DRM interoperability



Introduction

- Need for a standard REL
  (Rights Expression Language)
- Some efforts:
  - XML-based RELs
    - Formal syntax
      XML Schema for standard grammar
    - Informal semantics
      Rights Data Dictionaries
  - Creative Commons
    simple predefined licenses …but copyright management

Introduction

- XML-based RELs:
  - Limited expressivity
  - No interoperability mechanisms
  - Informal semantics, re-implement for each tool
- Creative Commons:
  - Predefined set of licenses
    - Extension mechanism CC+ but unstructured
  - Non-commercial purposes

…but semantic metadata

Introduction

- DRM Watch:
  "2005 Year in Review: DRM Standards"[1]
  - "…**consumer complaints** have moved beyond overly restrictive DRMs to **lack** of **interoperability** among them…"
  - "…we see **no production implementations**…"
- Electronic Frontier Foundation[2]
  - "…fail to accommodate… **copyright** regimes."
- Some years after…

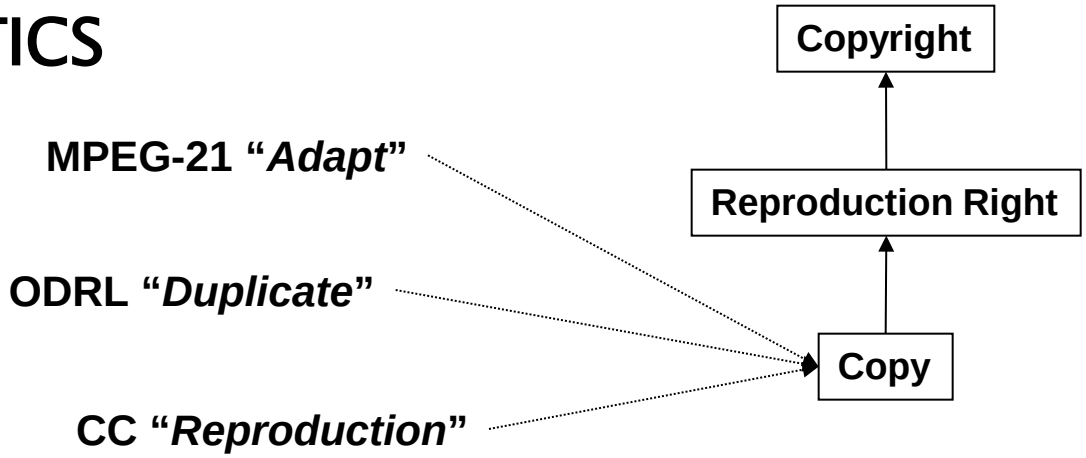
[1] http://www.drmwatch.com [2] http://www.eff.org

Introduction

- **DRM Officially Dead: Last Major Label Sony BMG Plans to Finally Drop DRM**
  Gizmodo.com, January 2008
  http://gizmodo.com/340598/drm-officially-dead-last-major-label-sony-bmg-plans-to-finally-drop-drm
- **DRM Was a Bad Move: Sales Found to Increase 10% After Dropping the Chains (Study)**
  Billboard.com, December 2013
  http://www.billboard.com/biz/articles/news/digital-and-mobile/5812288/drm-was-a-bad-move-sales-found-to-increase-10-after
- And industry moving to **copyright management initiatives**:
  –PLUS Coalition, Linked Content Coalition, CopyrightHub,…
  …and even considering **semantic data** and **ontologies**

Introduction

- Post-DRM standardisation difficulties
  - Web open and heterogeneous
  - Business models beyond copy and distribute
  - Copyright a complex domain
  - High level of abstraction (not bits or pixels)
- Concentrate on the roots, formalise **SEMANTICS**



From Controlled Vocabularies… to Ontologies

Features	Controlled Vocabularies	Synonyms	Taxonomies	Thesaurus	Ontologies
Control Ambiguity	X		X	X	X
Control Synonym		X	X	X	X
Hierarchical Relations			X	X	X
Associative Relations				X	X
Custom Relations					X

INCREASE EXPRESSIVENESS

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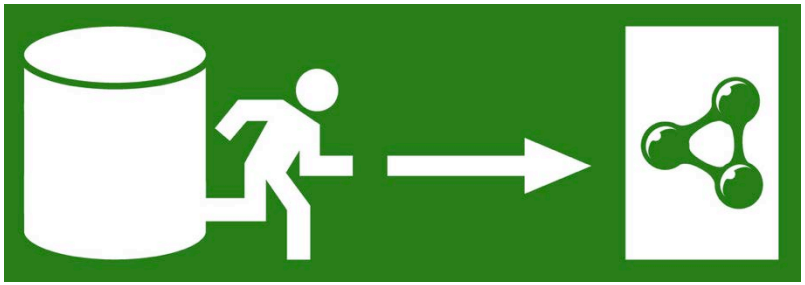

Approach

- Semantic Web approach to DRM:
  - Knowledge Representation tools
  - Web Wide applicability
  - Build Copyright Ontology

- Potential benefits:
  - Formalise **semantics**
  - Facilitate **interoperability** and **implementation**
  - Include **copyright**
  - Support **full value chain** and **remix-based** business models

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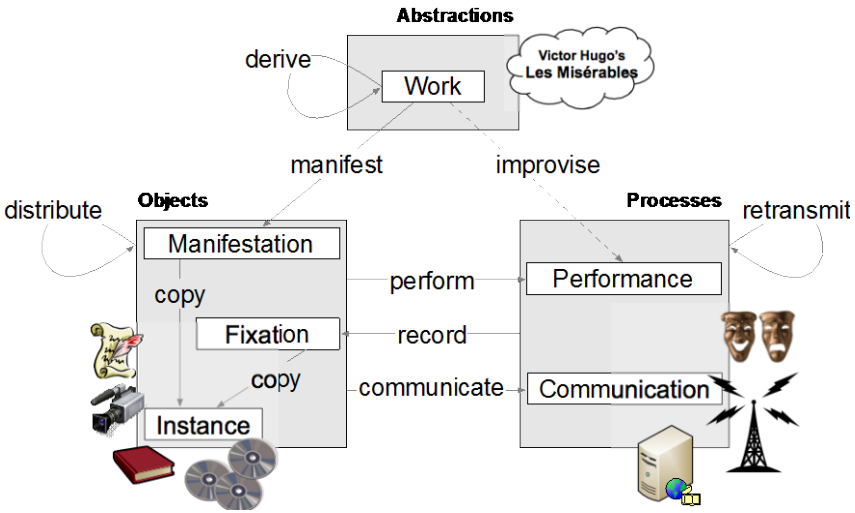
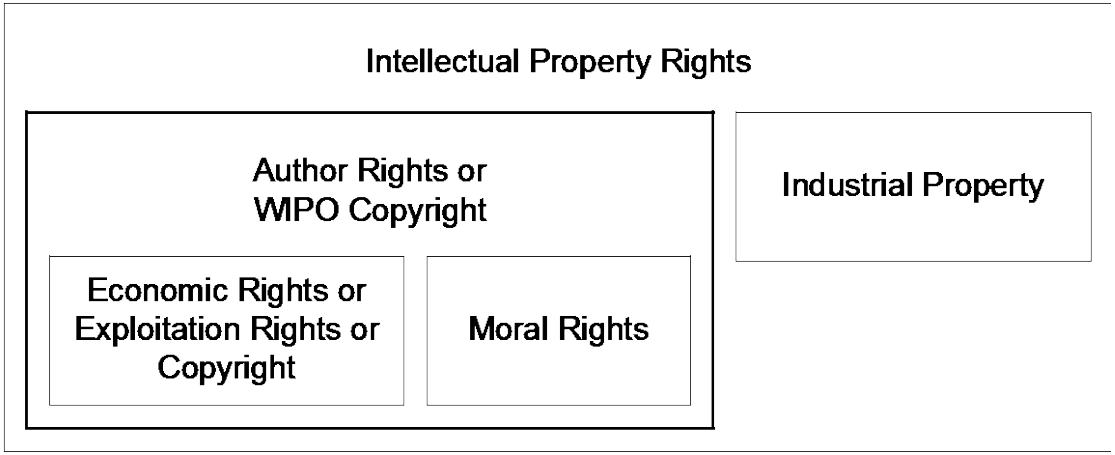


Conceptualisation

- Copyright domain analysis
- Generic Ontology
  - Based on WIPO[1] worldwide harmonisation
- Literary, artistic and scientific works (not ideas)
- Maybe derived, but always original



[1] World Intellectual Property Organisation Copyright Treaty, 1996

Conceptualisation

Exploitation Right (Copyright)

- Reproduction Right
- Fixation Right
  - Sound Recording Right
  - Motion Picture Right
- Communication Right
  - Broadcast Right
  - Public Performance Right
- Distribution Right
  - Rental Right
- Transformation Right
  - Adaptation Right
  - Translation Right

MoralRight

- Dissemination Right
- Paternity Right
- Respect Right
- Withdrawal Right

Neighbouring Rights

Performers, Producers, Broadcasters Rights

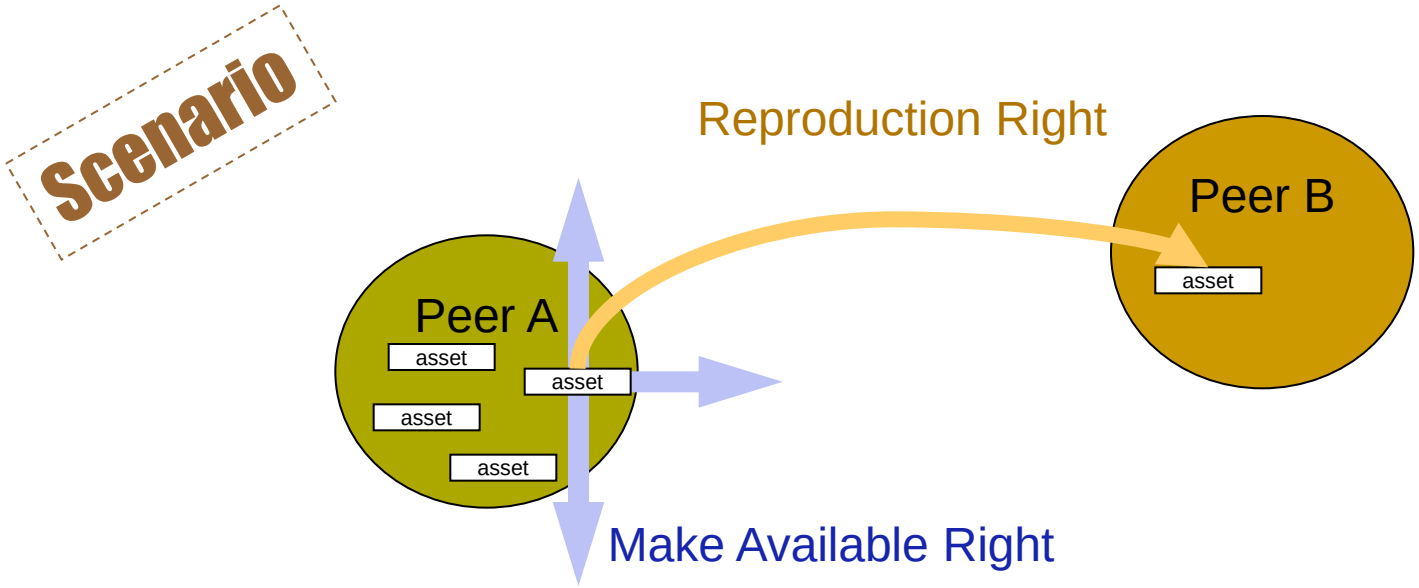
Sui Generis Right

Rights Exceptions

- Private Copy
- Quotation
- Education
- ...

Conceptualisation

- How rights apply to to the
  "Peer-to-Peer asset sharing scenario"



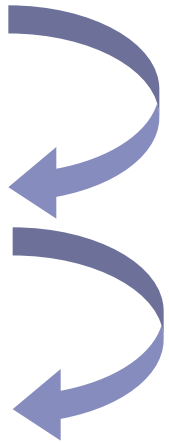
Conceptualisation

- Complex domain,
  build model in three steps:

Creation Model

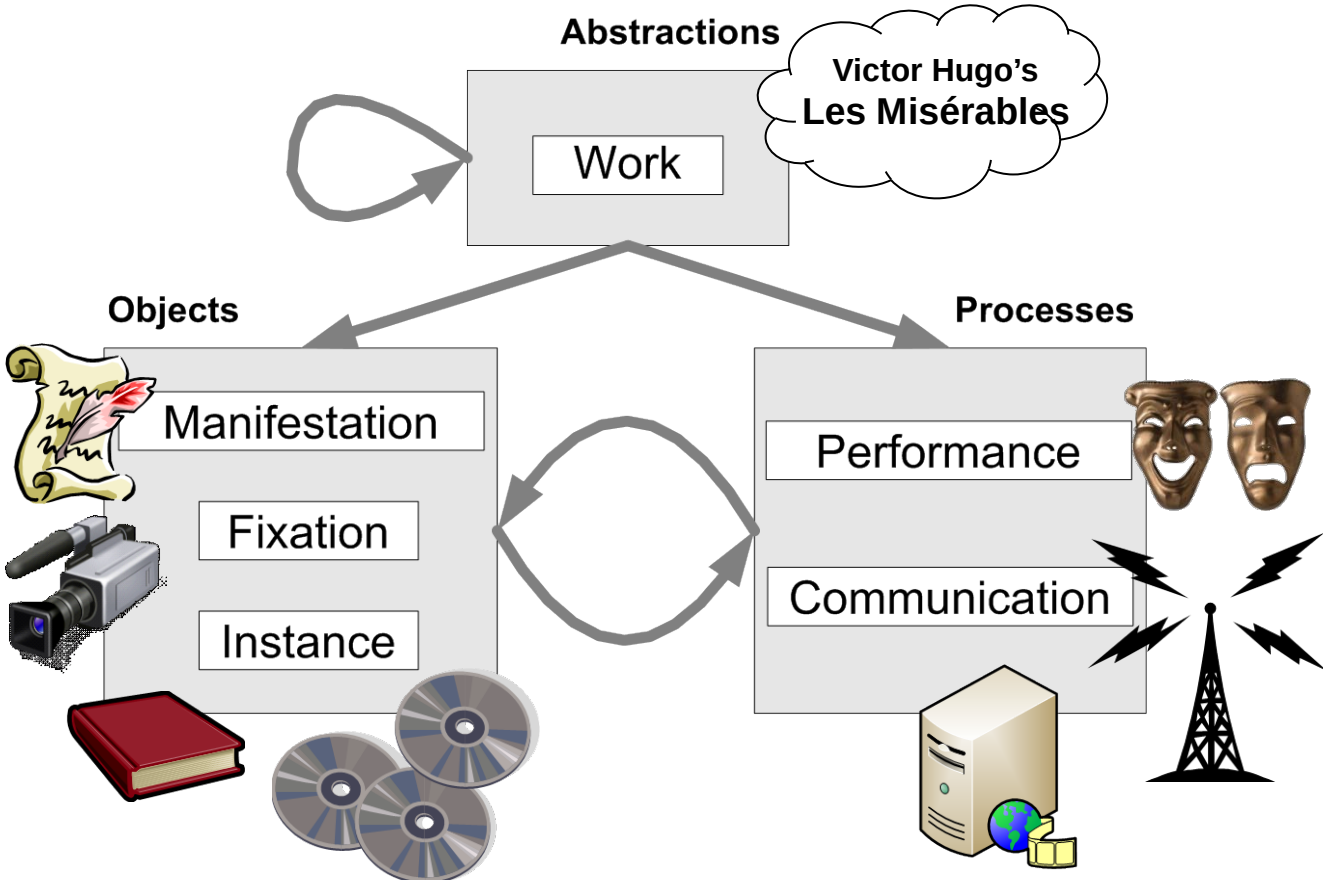
Rights Model

Action Model



Conceptualisation

Creation Model



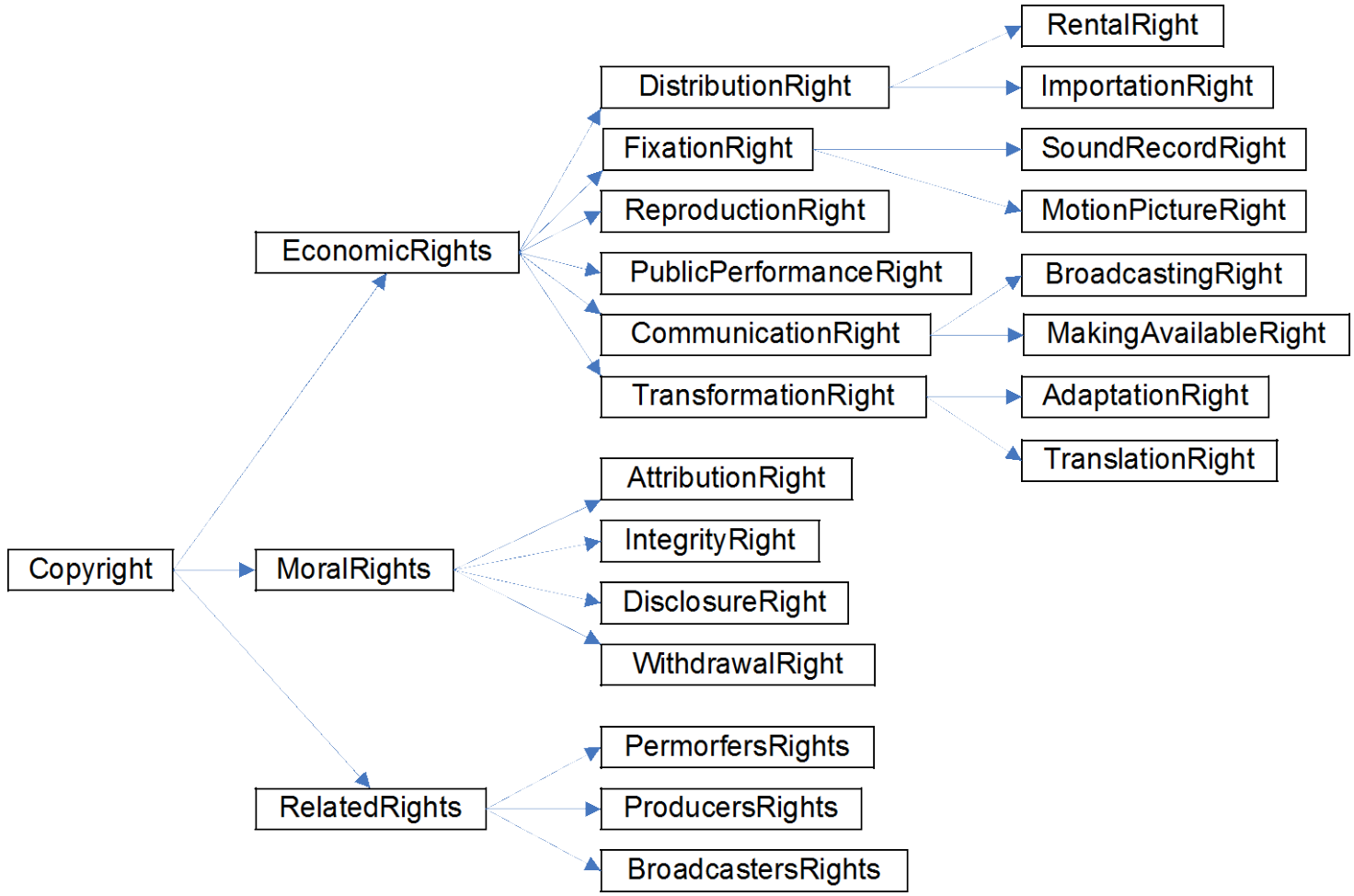
Conceptualisation

Creation Model

- **Work** ←hasDerivation↵
  - "Mozart's The Magic Flute". *ISWC*
- **Manifestation** ←hasManifestation↵
  - "The printed scores". *ISBN*
- **Performance** ←hasPerformance↵
  - "A scenic play".
- **Fixation** ←hasFixation↵
  - "A sound recording". *ISRC*
- **Communication** ←hasCommunication↵
  - "An Internet stream".
- **Instance** ←hasInstance↵
  - "A CD". *UPC*

Conceptualisation

Rights Model



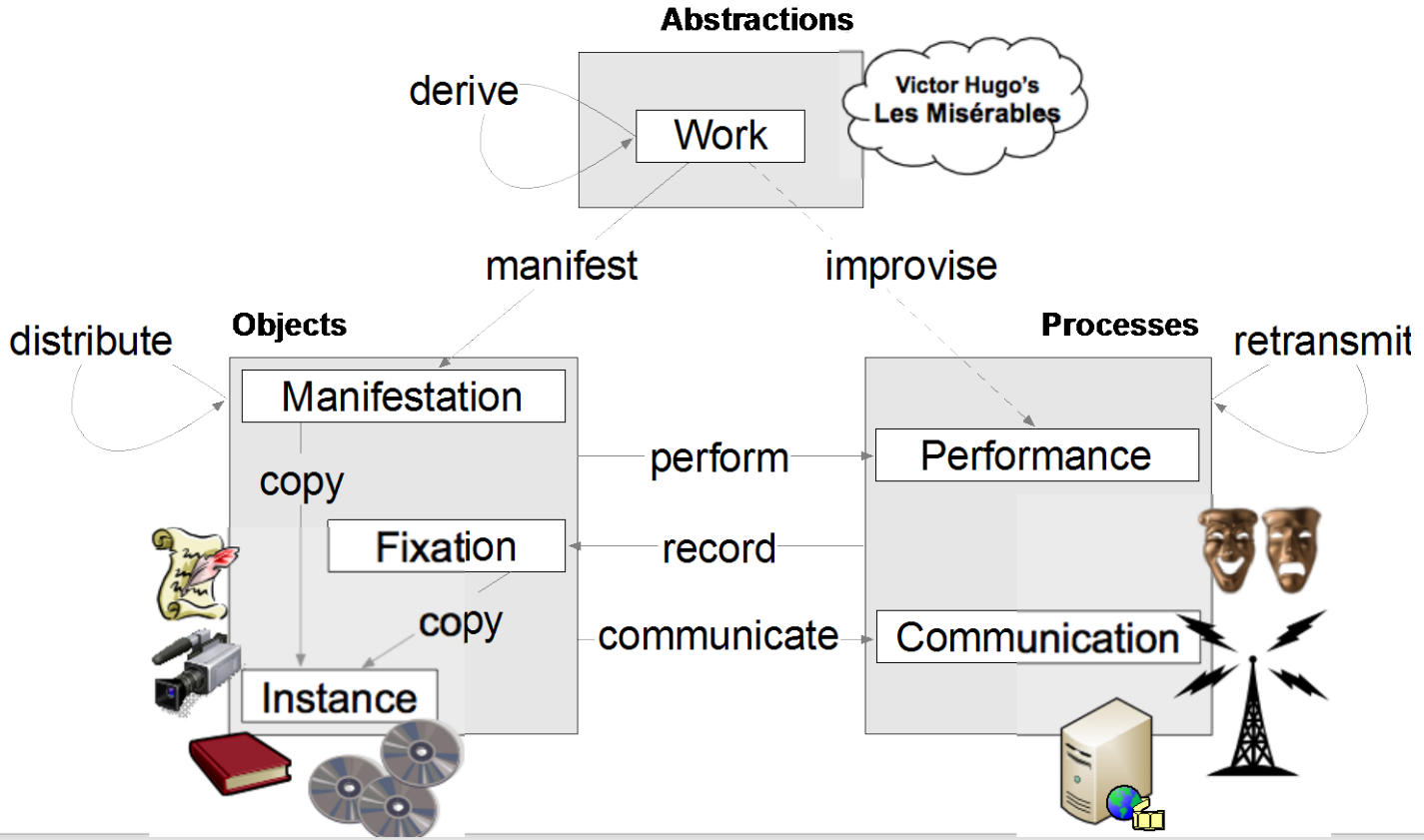
Rights Model

- End-users do not hold rights
  - Get licenses to use (play, view…)
  - Special permissions:
    - Quotation
    - Education
    - Information
    - Official Act
    - Private Copy
    - Parody
    - Temporary Reproduction

Conceptualisation

Action Model

- Actions, the building blocks



Conceptualisation

Action Model

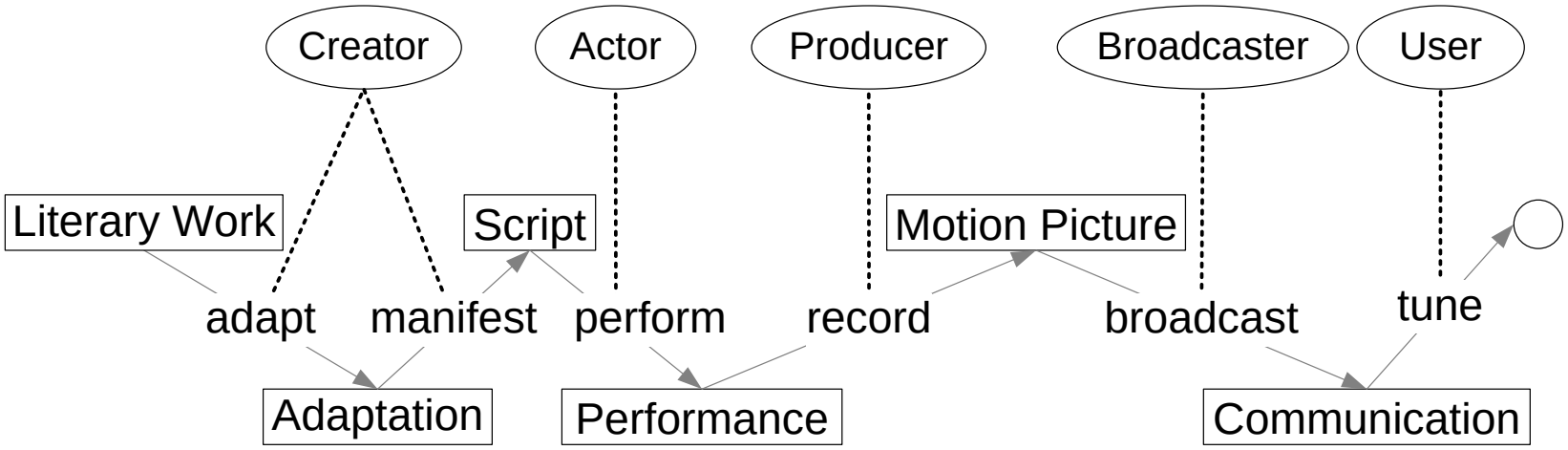
- Actions governed by Economic Rights:
  - **Reproduction Right**:
    copy
  - **Distribution Right**:
    distribute; sell, rent, lend
  - **Public Performance Right**:
    perform
  - **Fixation Right**:
    record
  - **Communication Right**:
    communicate; retransmit, broadcast, make available
  - **Transformation Right**:
    derive; adapt, translate

Action Model

- End-user actions, to **use** a…
  - manifestation: **buy** — picture, sculpture
  - instance: **buy** — book, CD, DVD
  - performance: **attend** — projection, recital, exhibition
  - communication: **access**
    - broadcast: **tune** — TV channel, radio station
    - something made available: **access** — web page, stream

Action Model

- Altogether: model copyright value chains
  - E.g. “serials adapted from literary works”



Conceptualisation

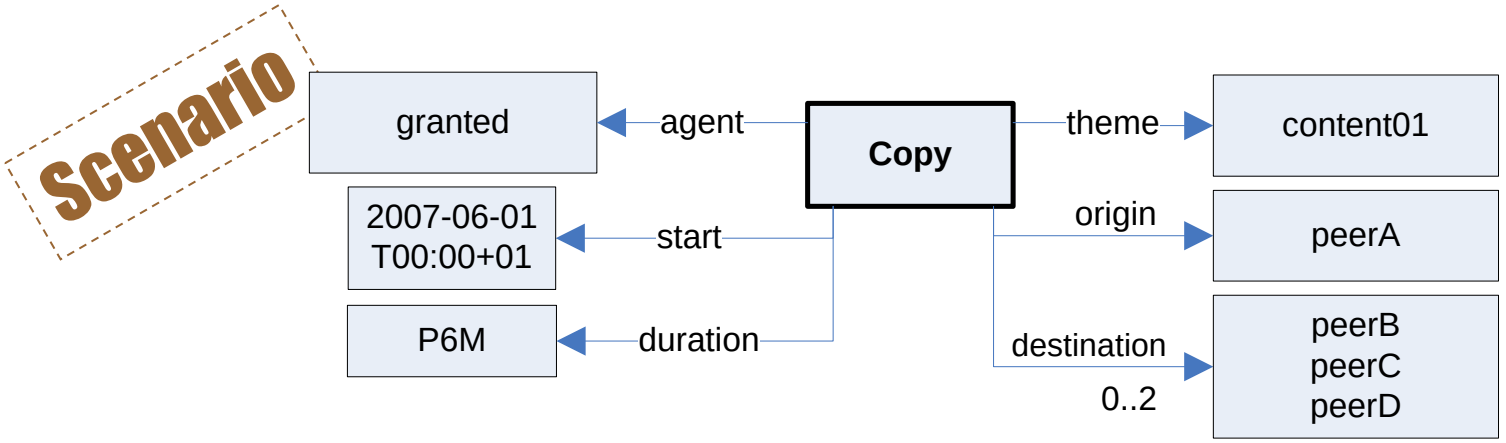
Action Model

- **Case roles** (linguistics): relate actions to involved entities

Facet	Main role	Other roles
Who?	agent	participant (indirect co-agent), recipient
When?	pointInTime	start, completion, duration
Where?	location	origin, destination, path
What?	object	patient (changed), theme (unchanged)
With?	instrument	medium
Why?	aim	reason
How?	manner	
If?	condition	
Then?	consequence	

Action Model

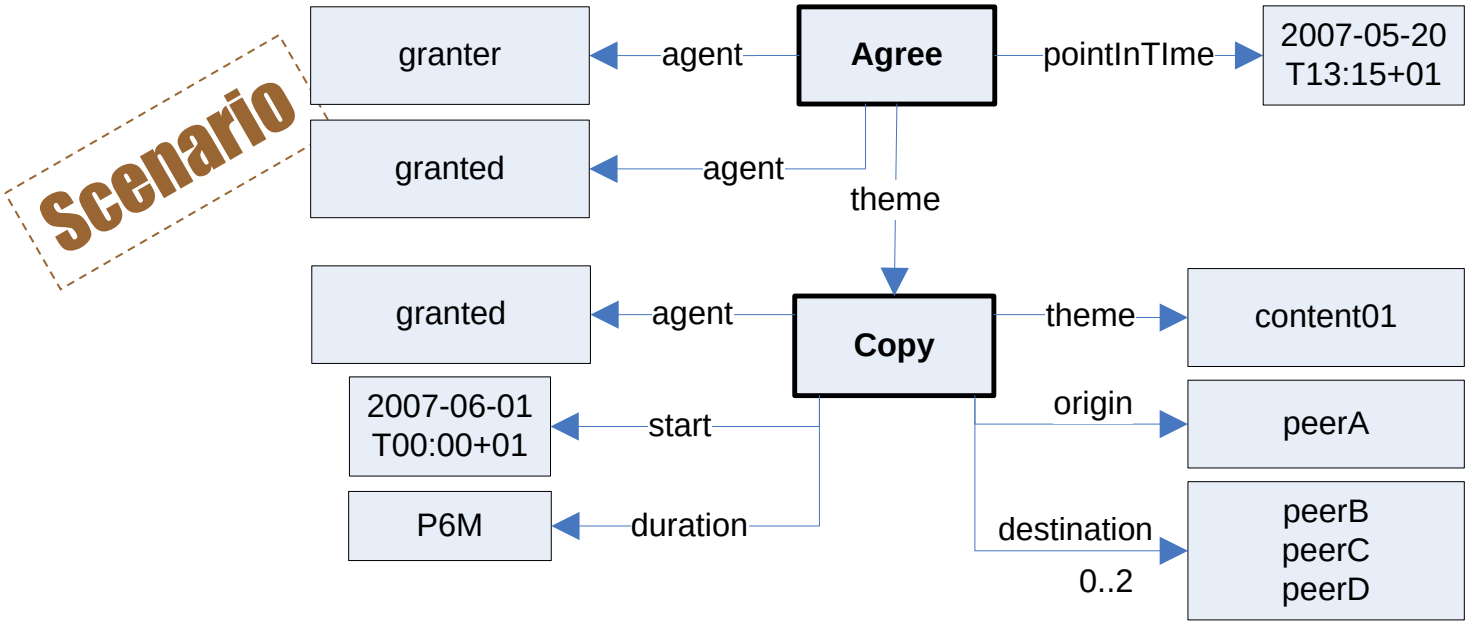
- License building primitives:
  - **Action Patterns**:
    to state what is obliged, permitted or prohibited
    - Built from actions and case roles



All **copy** events performed by agent "**granted**" who copies "**content01**" from "**PeerA**" to **two** peers **from** the set "**PeerB, PeerC, PeerD**" at any time point **six months after** "**2007-06-01**"

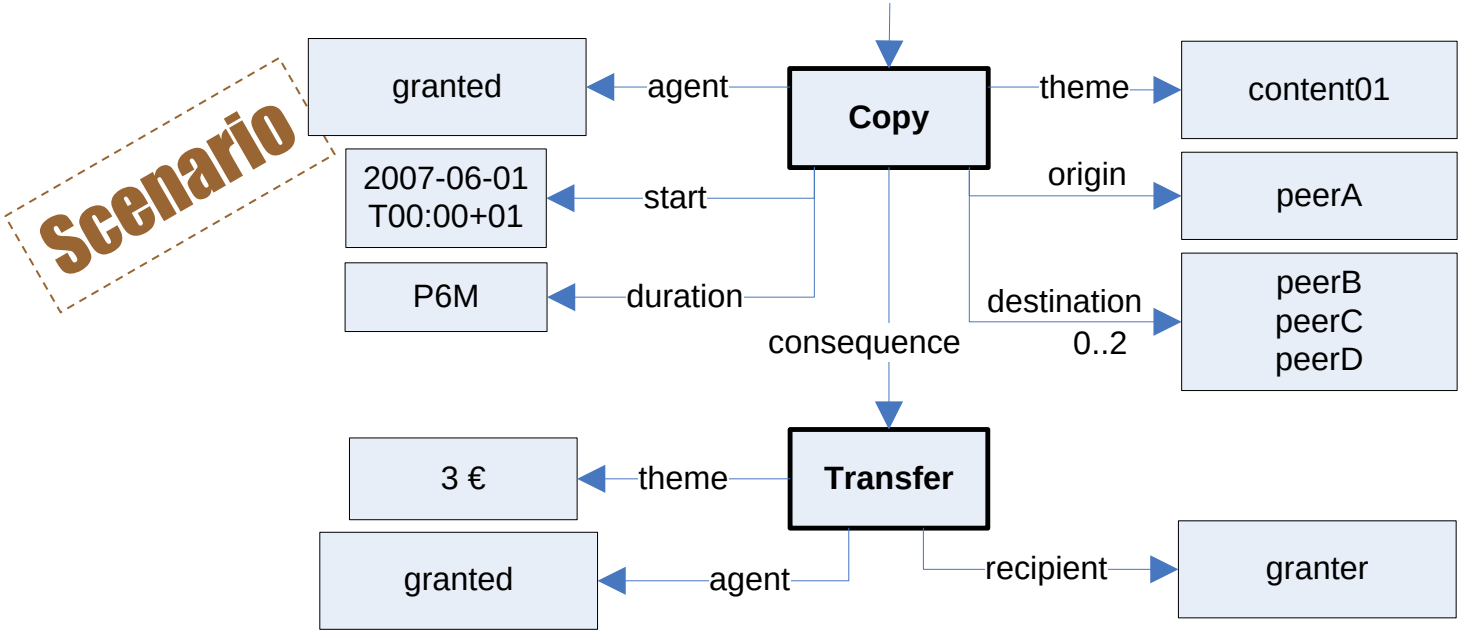
Action Model

- License building primitives:
  - **Agree**: model permissions
    - *theme* points to the permitted event pattern



Action Model

- License building primitives:
  - **consequence**: model obligations
    - Points to the obliged event pattern



Action Model

- License building primitives:
  - **condition**: model a priori conditions
    - Points to the condition event pattern
  - **Disagree**: model prohibitions
    - *theme* points to the prohibited event pattern
  - Other concepts:
    - Additional actions: Transfer, Attribute,…
    - Time, Location
    - Logical operators (UNION, INTERSECTION, NOT)
    - …

Exercise

- Model this license using the previous primitives:

creative commons

Attribution-ShareAlike 4.0 International (CC BY-SA 4.0)

You are free to:

Share — copy and redistribute the material in any medium or format

Adapt — remix, transform, and build upon the material

for any purpose, even commercially.

Under the following terms:

Attribution — You must give **appropriate credit**, provide a link to the license, and **indicate if changes were made**. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

ShareAlike — If you remix, transform, or build upon the material, you must distribute your contributions under the **same license** as the original.

Facet	Main role	Other roles
Who?	agent	participant (indirect co-agent), recipient
When?	pointInTime	start, completion, duration
Where?	location	origin, destination, path
What?	object	patient (changed), theme (unchanged), result (new)
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Why?	aim	reason
How?	manner	
If?	condition	
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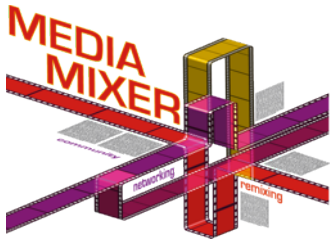
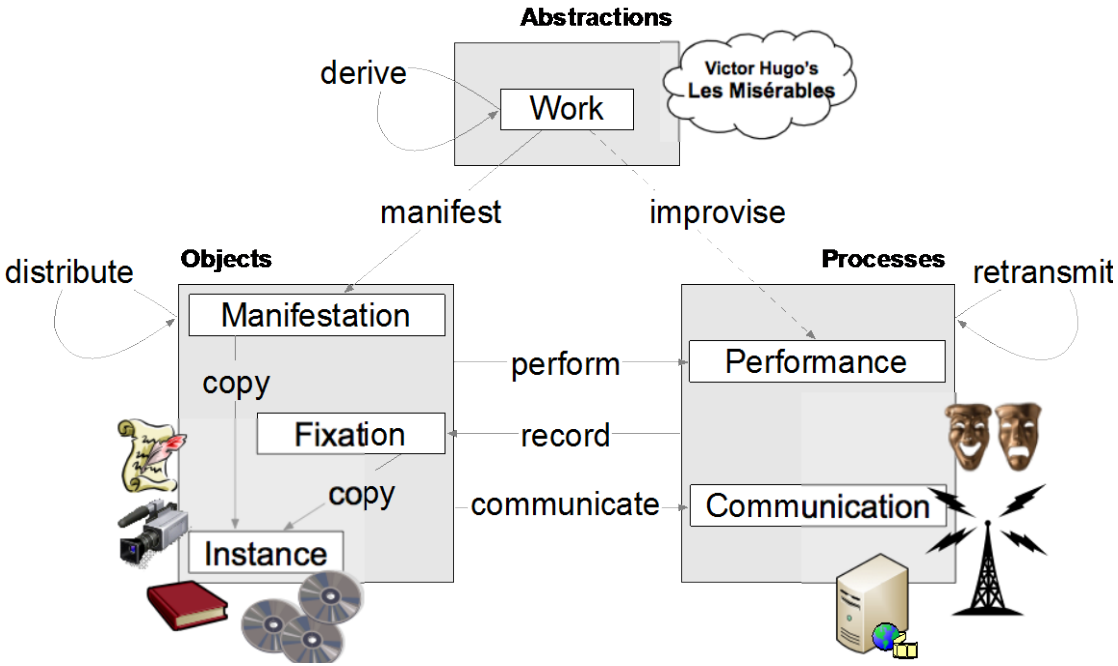


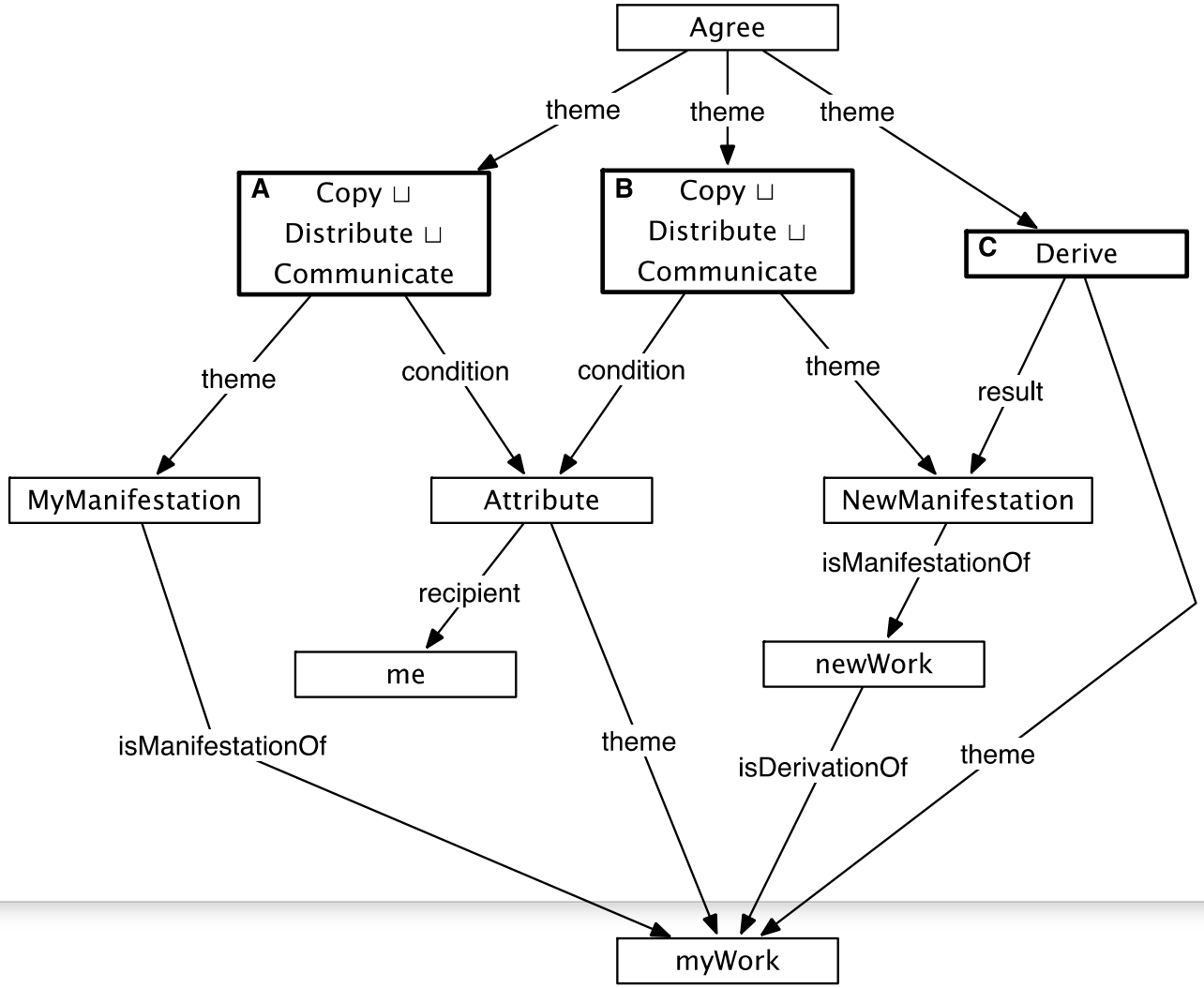
http://mediamixer.eu
http://rhizomik.net/mediamixer
http://rhizomik.net/ontologies/copyrightonto

Other Actions:
Agree, Disagree, Transfer, Attribute,…

Work ←hasDerivation (isDerivationOf)↵
"Mozart's The Magic Flute". *ISWC*
Manifestation ←hasManifestation (isM…Of)↵
"The printed scores". *ISBN*
Performance ←hasPerformance (isPer…Of)↵
"A scenic play".
Fixation ←hasFixation (isFixationOf)↵
"A sound recording". *ISRC*
Communication ←hasCommunication (is…)↵
"An Internet stream".
Instance ←hasInstance (isInstanceOf)↵
"A CD". *UPC*



Exercise - Solution



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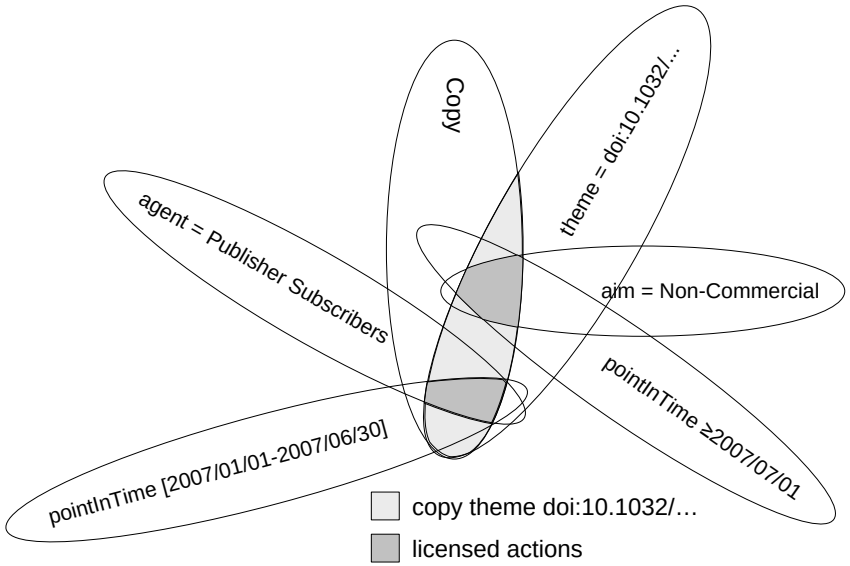
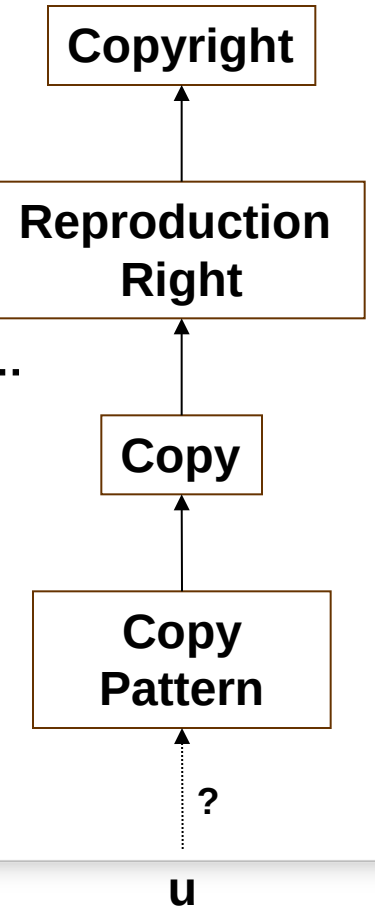


Implementation

- One conceptual model, **many implementations**
- **Semantic Web implementation** with Web Ontology Language (OWL)
- **Rights** and **License Patterns** implemented as **Classes**
  - Copyright, Reproduction Right, Copy, CopyPattern,...
- **Uses** implemented as **Instances**
  - u
- *if* u is a Copy Pattern *then* license pattern **authorises/prohibits** u



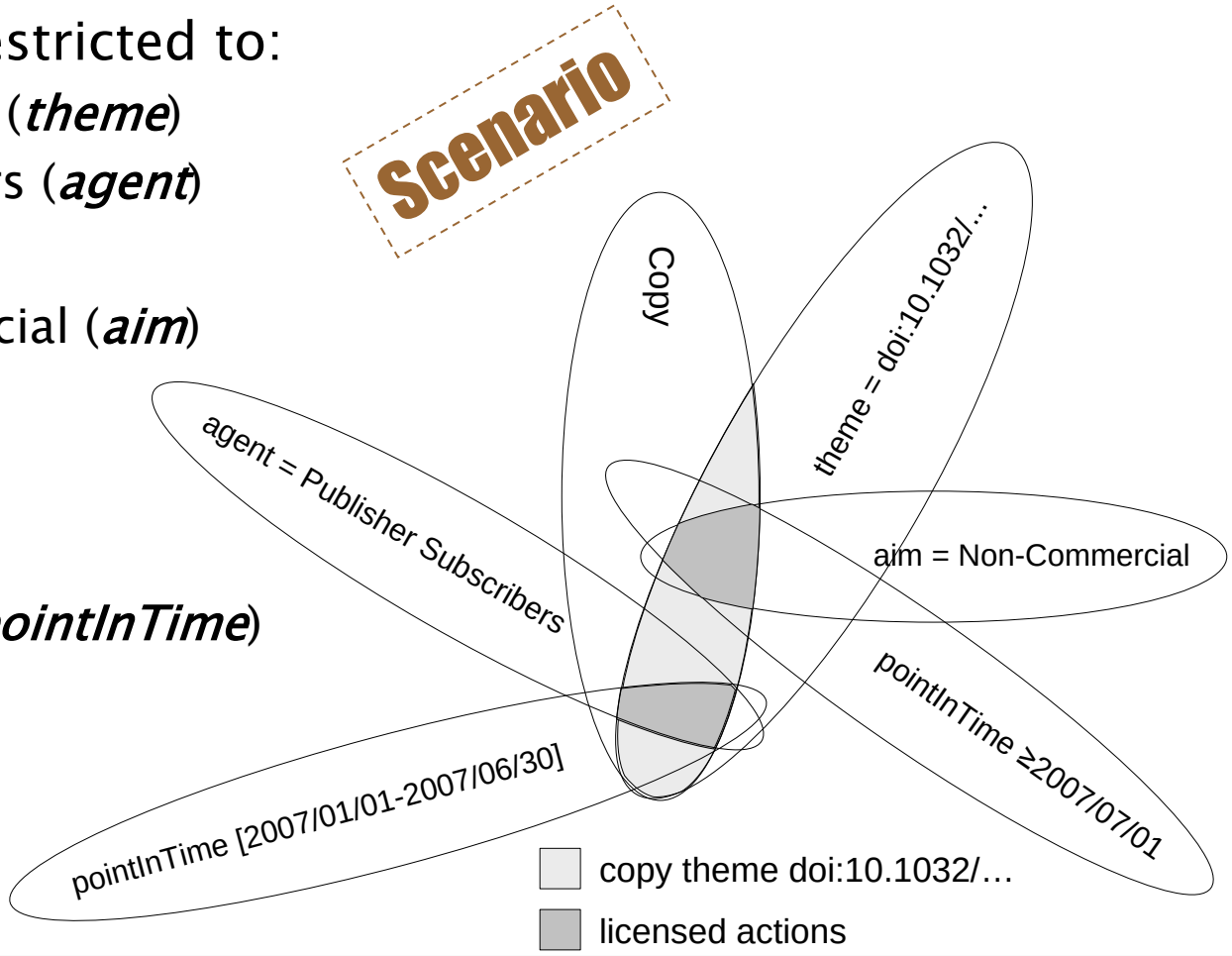
Implementation

- **License Pattern (Class)**
  built from constraints on kind of actions, agents, time points, locations, etc.

- OWL Building Blocks
  - **Classes** for actions (e.g. Copy)
  - Logical **operators** (AND, OR, NOT)
  - OWL **Restrictions**, constraints on case roles (e.g. *agent* all values from PublisherSubscribers)

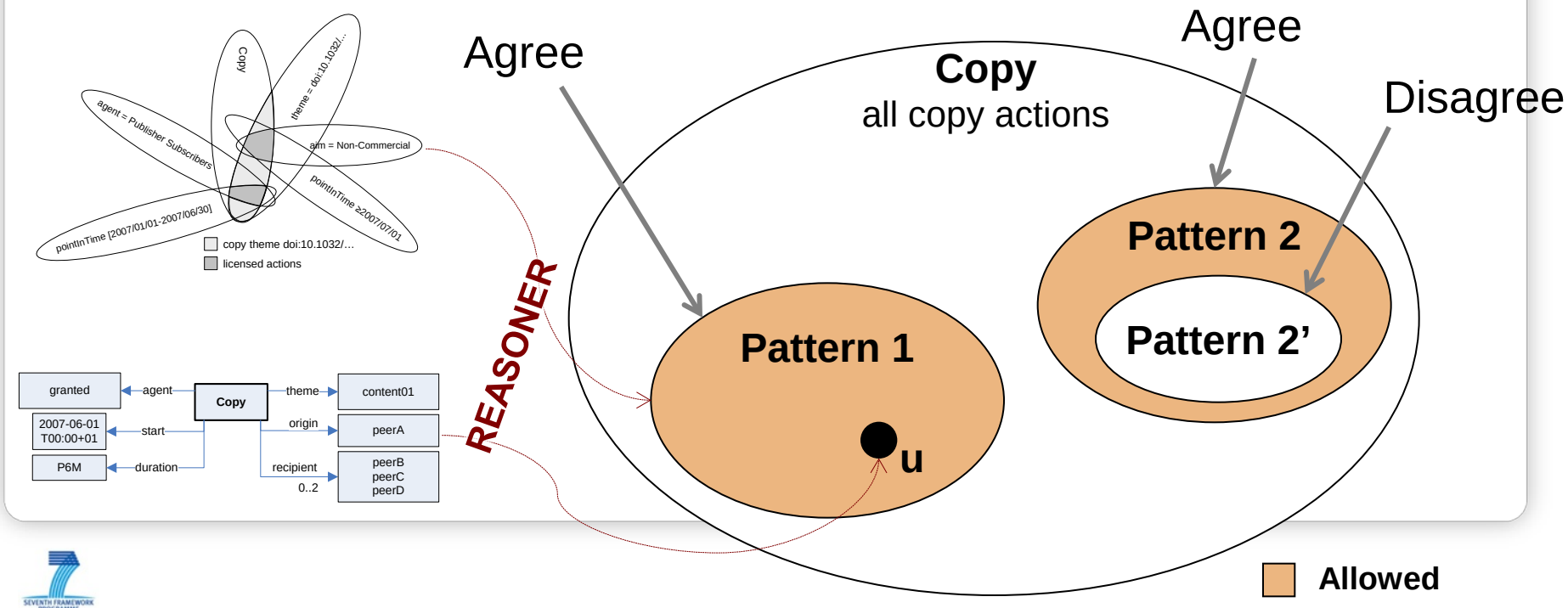
Implementation

- **Copy** pattern restricted to:
  - digital object (***theme***)
  - group of users (***agent***)
- or
  - non-commercial (***aim***)
- depending on
  - time range (***pointInTime***)



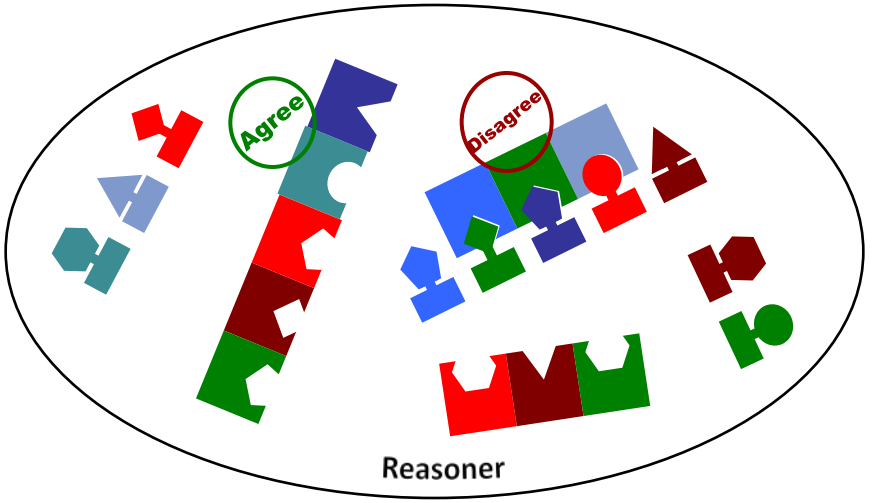
Implementation

- Patterns allowed by Agrees and prohibited by Disagrees:
  - If not agreed → not allowed
  - If agreed and not disagreed → allowed
  - If disagreed → not allowed

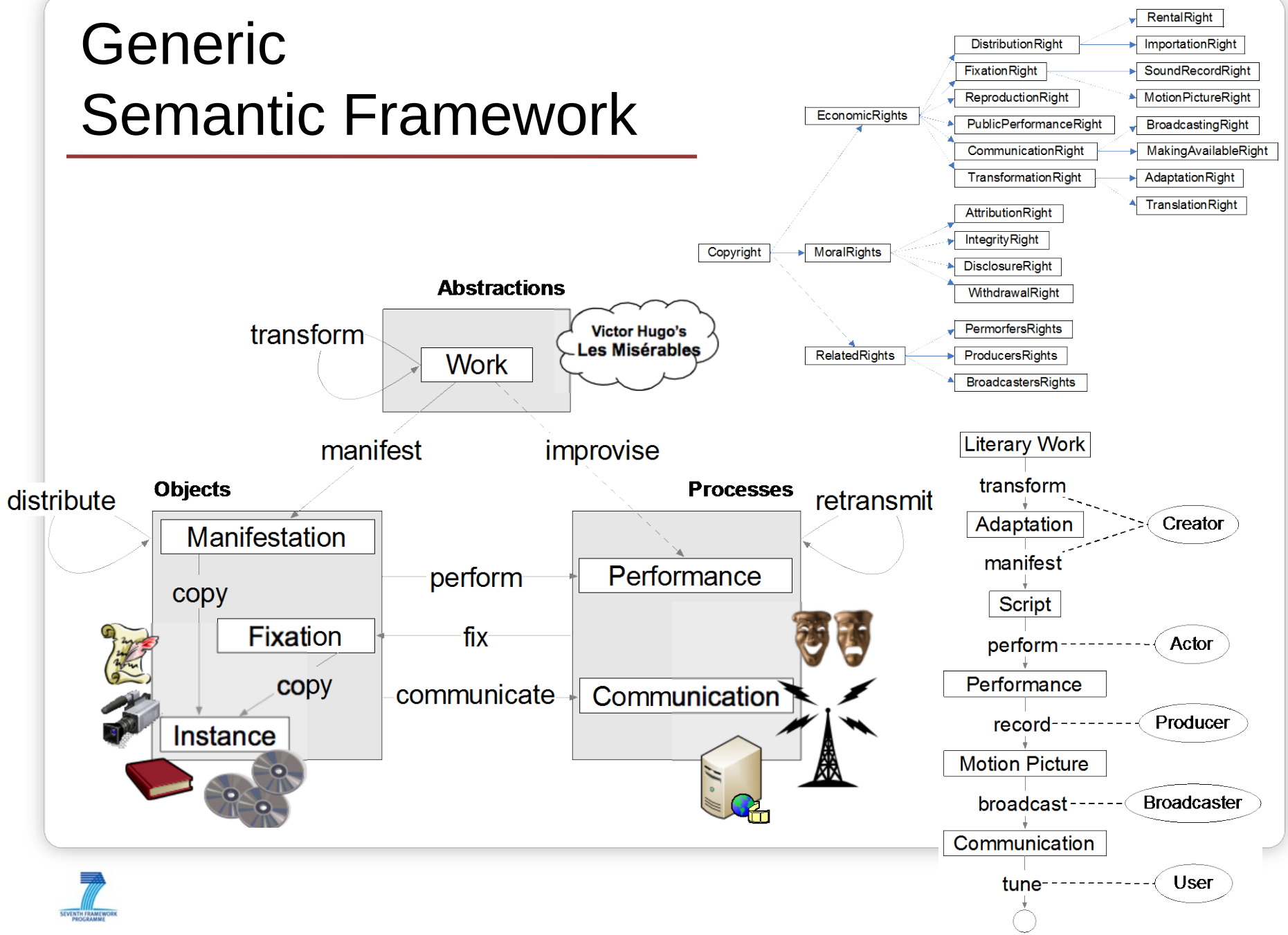


Contents

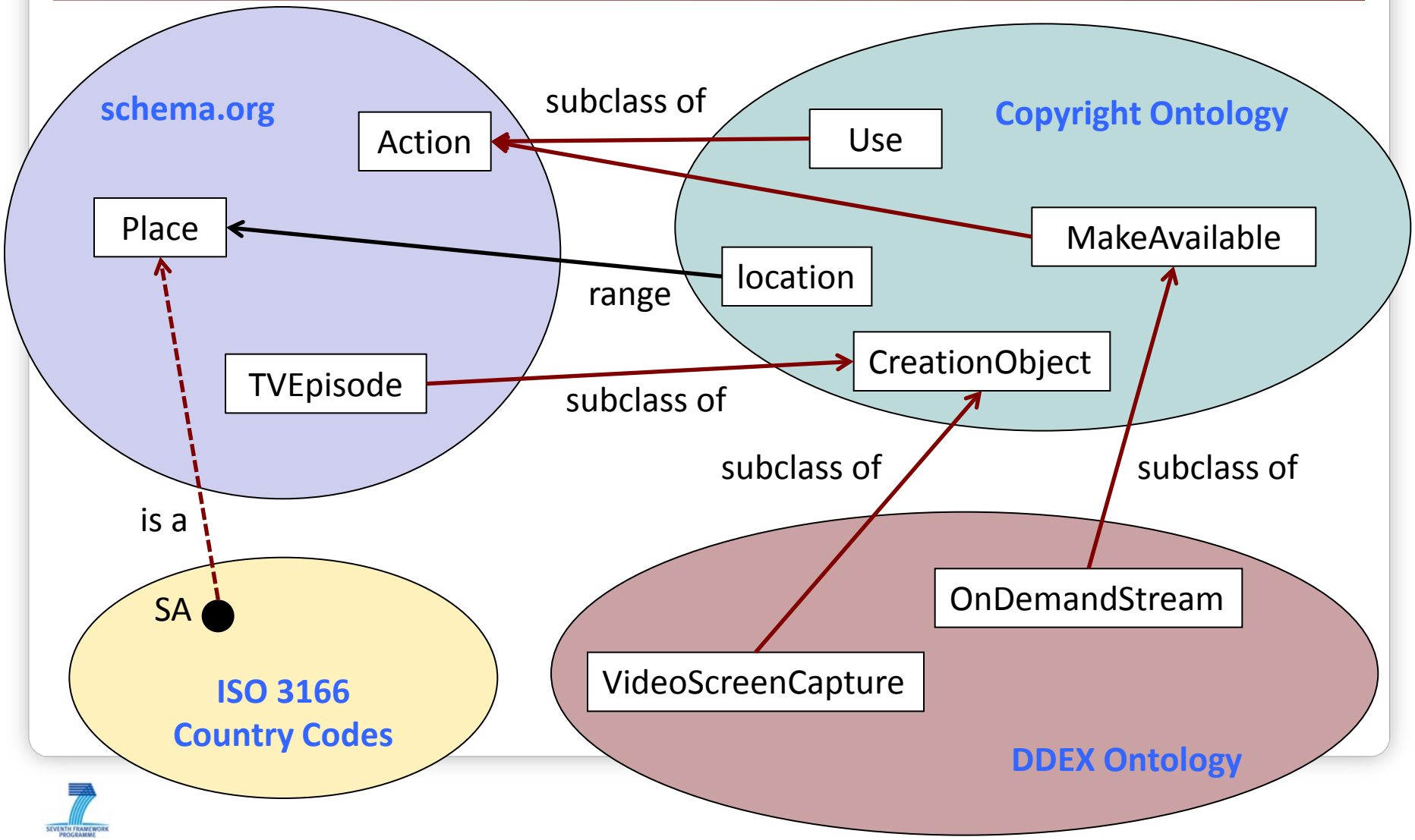
- Motivation
- Introduction
- Approach
- Conceptualisation
- Implementation
- **Conclusions**



Generic Semantic Framework

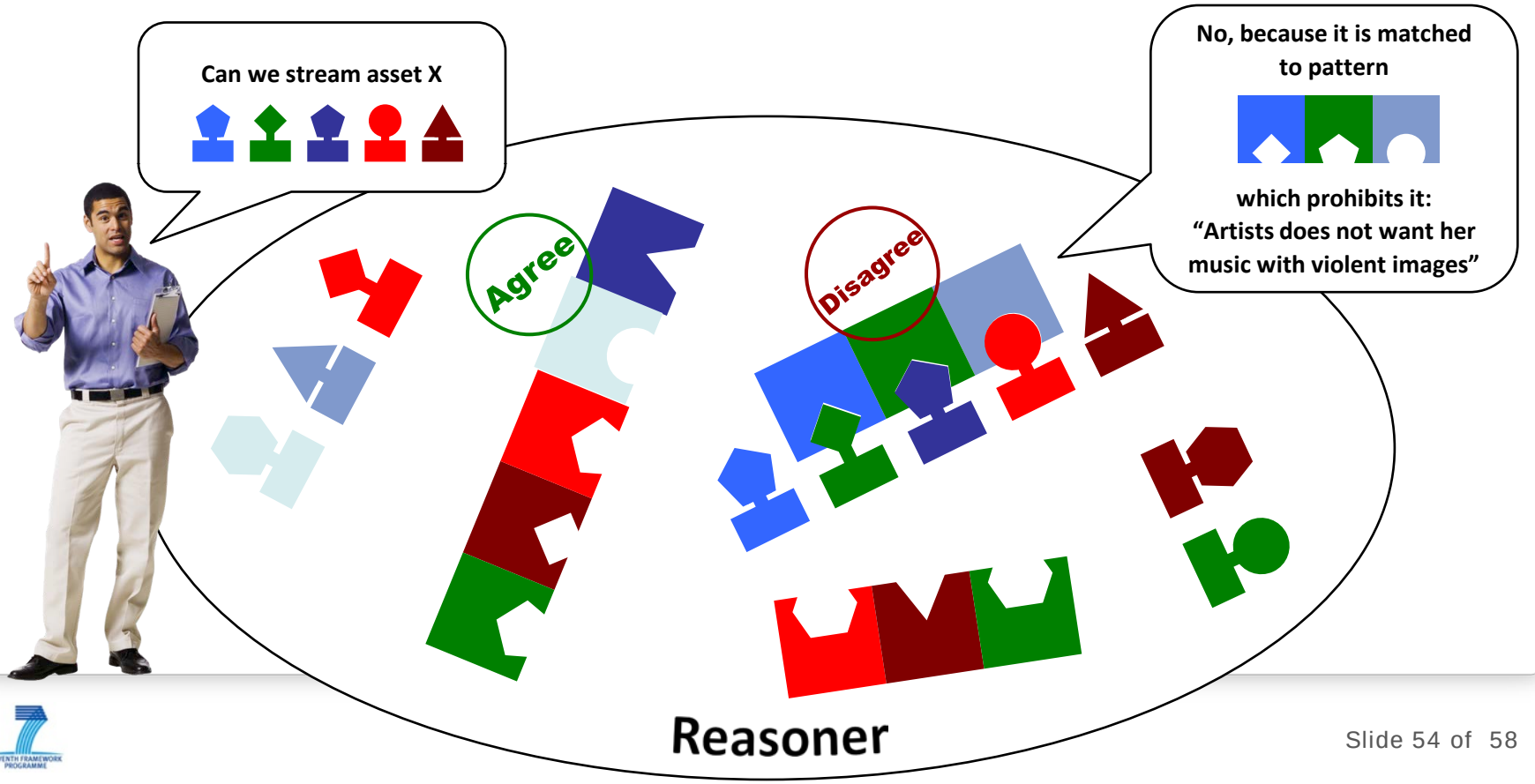


Aligned with other Schemas



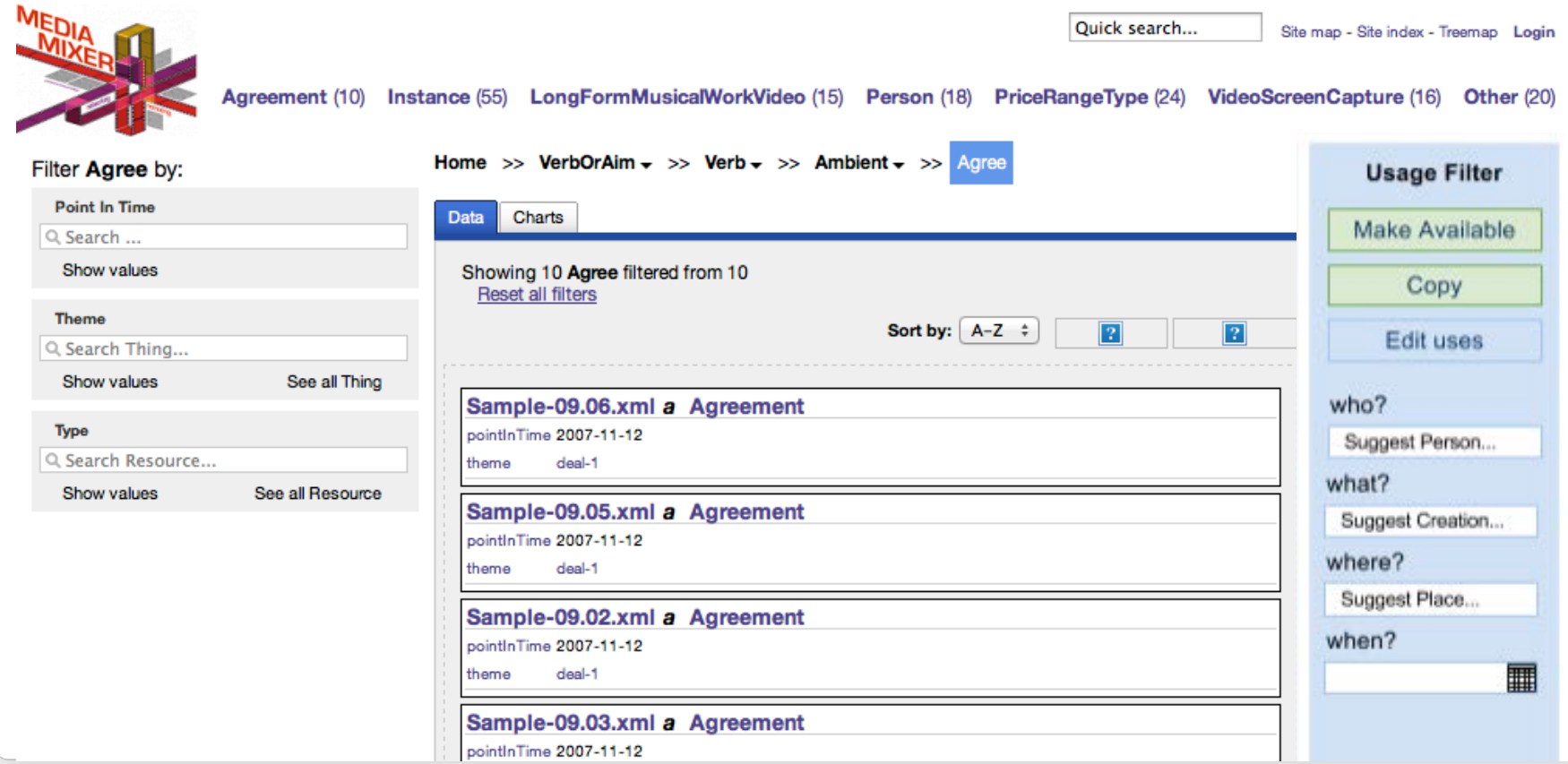
Applied to Facilitate Implementation using Reasoning

- Ontology provides building blocks to model and reason about contracts, policies, rights expression languages…



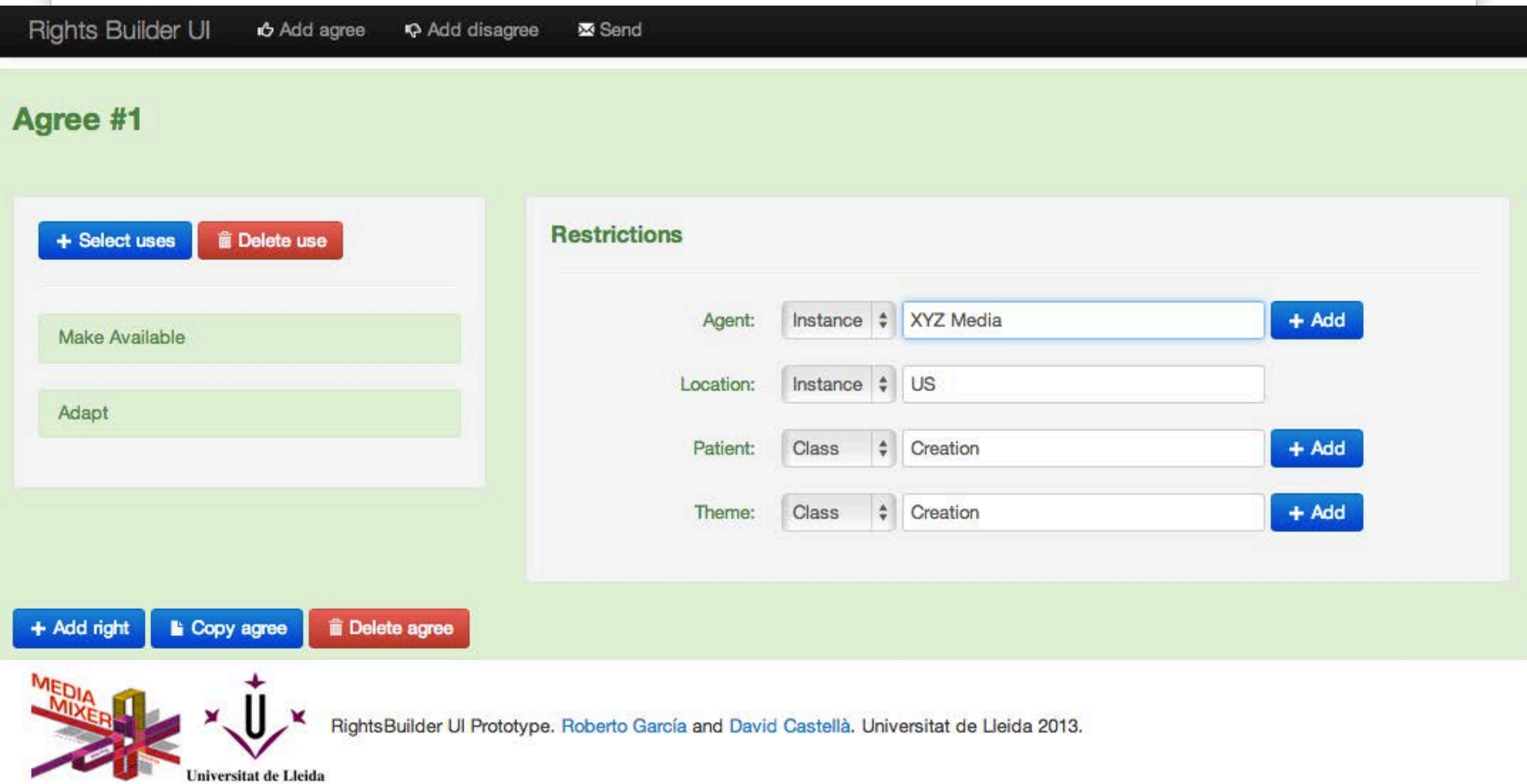
MediaMixer Demo

http://rhizomik.net/mediamixer/



MediaMixer Demo

http://rhizomik.net/mediamixer/rightsbuilderui/



MediaMixer Demo

Policy 1:
The licensor disagrees the licensee adaptsmedia fragments containing…

```
<xml>
<right>
   <play/>
</right>
<content

id="frg1"/>
</xml>
```

Rights Builder User Interface

Rights Language Mapping

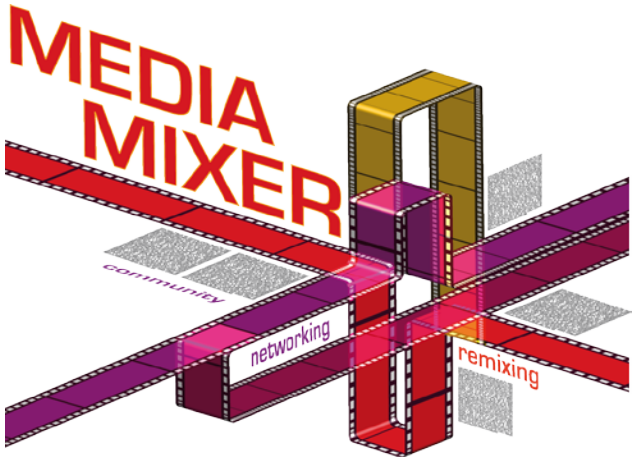
Semantic Media Annotation

MediaMixer Semantic Techs

RDF Store & Reasoner

media fragments, semantic data, annotation, ontologies, reasoning,…

Thank you for your attention



More details:

http://community.mediamixer.eu

http://rhizomik.net/mediamixer

http://rhizomik.net/ontologies/copyrightonto

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http://rhizomik.net/~roberto

1st Winter School on Multimedia Processing and Applications (WMPA'14)

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