

December, 4th, 2008
Koblenz, Germany

A Semantic Model for the Authorisation of Context-Aware Content Adaptation

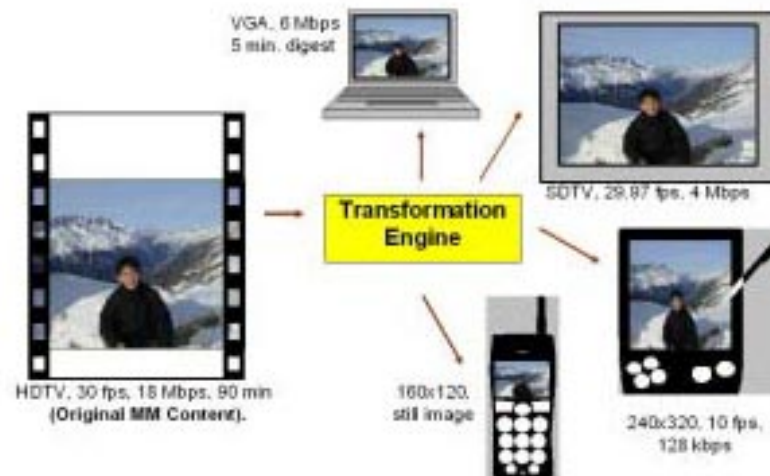
Víctor Rodríguez Doncel, Anna Carreras, Vitor Barbosa, Jaime Delgado,
Maria Teresa Andrade

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INESC Porto

Introduction

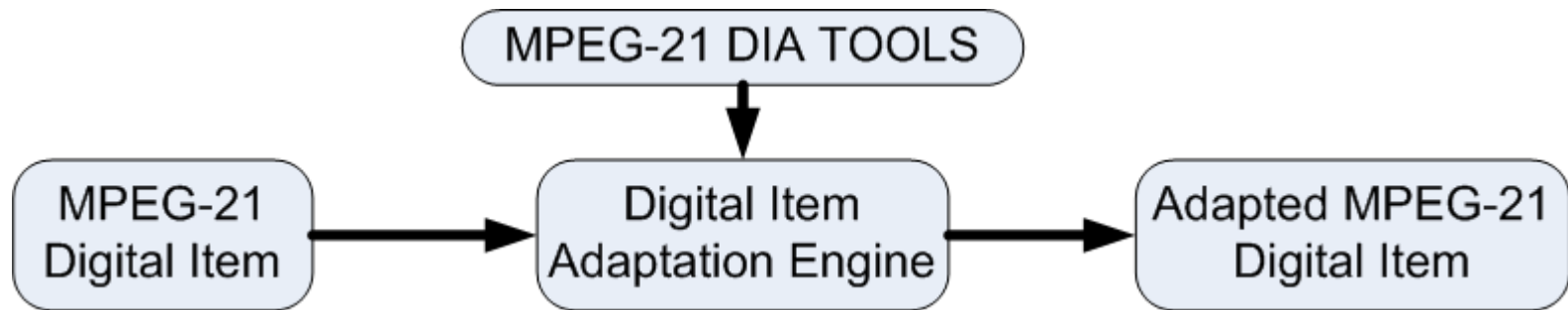
“The current Internet gold rush will be dwarfed by what is about to happen with Wireless Internet Access.” – The Economist

- **Universal Multimedia Access (UMA):** *the universal access to multimedia content or the availability of audiovisual material to any terminal through any network at any moment.*
- Content Adaptation



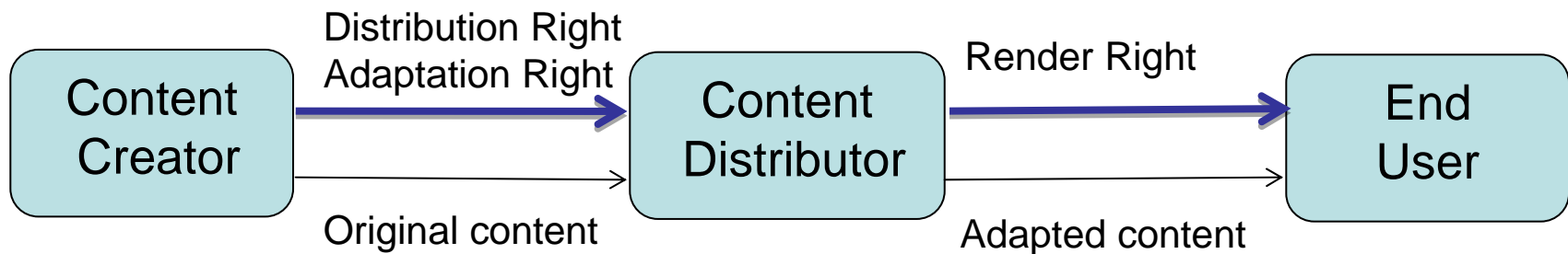
Content Adaptation in MPEG-21

- MPEG-21: A Multimedia Framework with the Digital Item at its center (a generic media container)
- MPEG-21 Part 7: Digital Item Adaptation



Adaptations and the Intellectual Property

- **Adaptation needs to be authorised!**
 - Content is often considered an artistic work subject to the Intellectual Property (IP) legislation.
 - Adaptations may infringe Copyright Laws.
 - Both Content Creators and Content Distributors have to express digitally their authorisation in the framework of a Digital Rights Management (DRM) system.



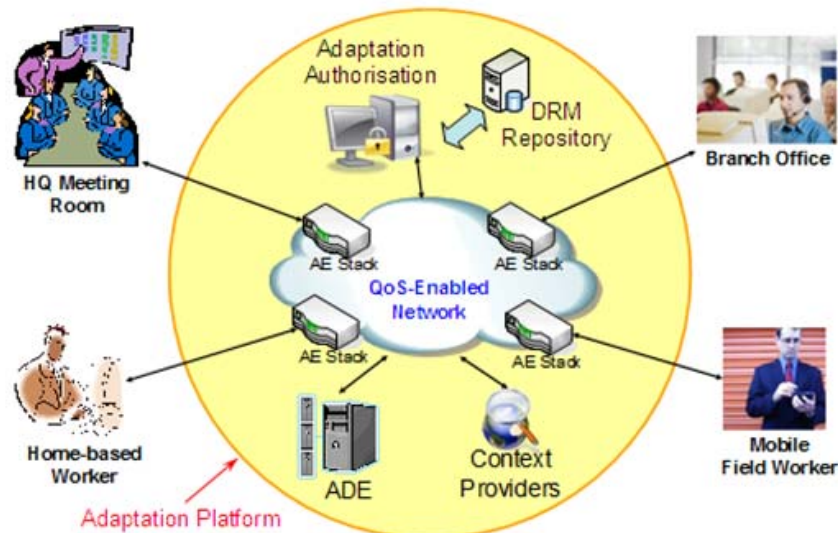
Existing alternative proposals

- First ammendment to DIA standard:
 - permittedDiaChanges and changeConstraints
 - Write MPEG-21 REL licenses referring to DIA constraints
- Vocabulary in RDD: mx:adapt, m1x:governedAdapt

```
<r:license>
  <r:grant>
    <r:keyHolder licensePartIdRef="Student"/>
    <mx:play/>
    <mx:diReference licensePartIdRef="Lesson"/>
    <r:allConditions>
      <dia:permittedDiaChanges>
        <dia:ConversionDescription xsi:type="dia:ConversionUriType">
          <dia:ConversionActUri uri="urn:visnet:TemporalResolutionScaling"/>
        </dia:ConversionDescription>
      </dia:permittedDiaChanges>
      <dia:changeConstraint>
        <dia:constraint>
          <dia:AdaptationUnitConstraints>
            <dia:LimitConstraint>
              <dia:Argument xsi:type="dia:SemanticalRefType" semantics="urn:mpeg:mpeg21:2003:01-DIA-MediaInformationCS-NS:20"/>
              <!-- 20 refers to frame rate -->
              <dia:Argument xsi:type="dia:ConstantDataType">
                <dia:Constant xsi:type="dia:IntegerType">
                  <dia:Value>10</dia:Value>
                </dia:Constant>
              </dia:Argument>
              <dia:Operation operator="urn:mpeg:mpeg21:2003:01-DIA-StackFunctionOperatorCS-NS:13"/>
              <!-- 13 refers to the operator ">"-->
            </dia:LimitConstraint>
          </dia:AdaptationUnitConstraints>
        </dia:constraint>
      </dia:changeConstraint>
    </r:allConditions>
  </r:grant>
  <r:issuer>
    <r:keyHolder licensePartIdRef="Teacher"/>
  </r:issuer>
</r:license>
```

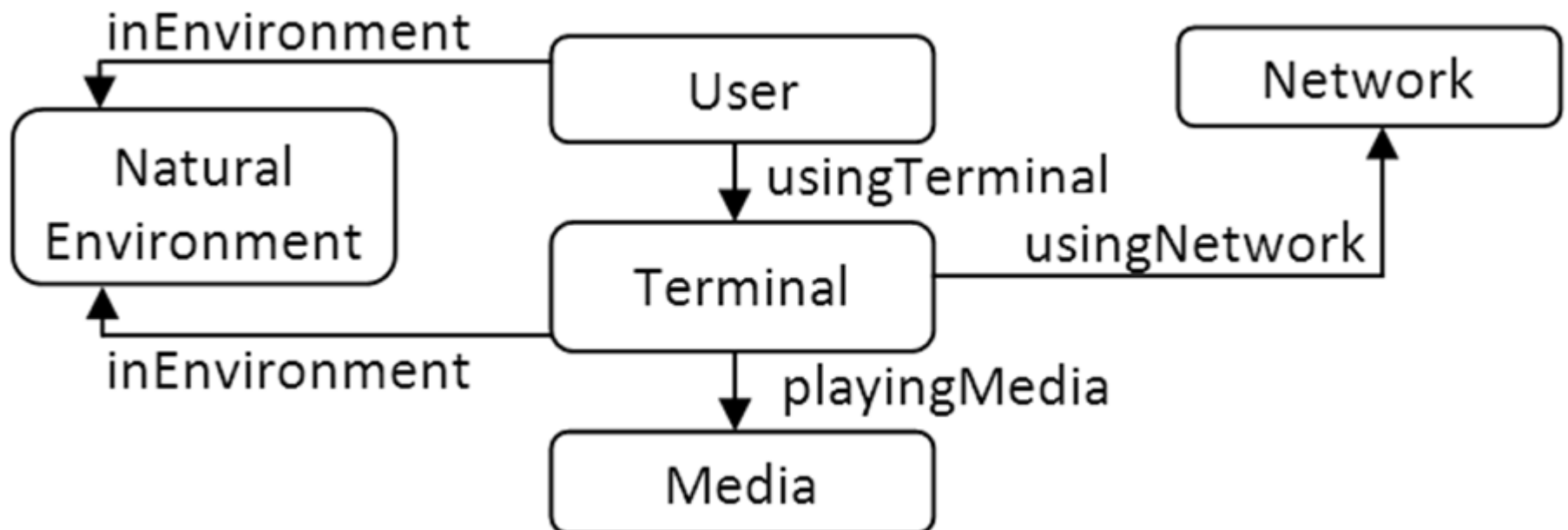
Virtual Collaboration Scenario (VISNETII)

- **Adaptation Decision Engine (ADE):** takes the adaptation decision by inferring higher-level concepts from low-level context.
- **Adaptation Authorizer (AA):** decides whether an adaptation is authorised or not.
- **Context Providers (CxPs):** software/hardware providing explicit contextual information.
- **Adaptation Engine Stacks (AESs):** A suite of Adaptation Engines.



The Context Aware Ontology

- The CAO describes:
 - The Usage Environment Descriptors
 - The MPEG-7 Multimedia Description Schemes
- And upgrades the models them from a syntactic to a semantic level

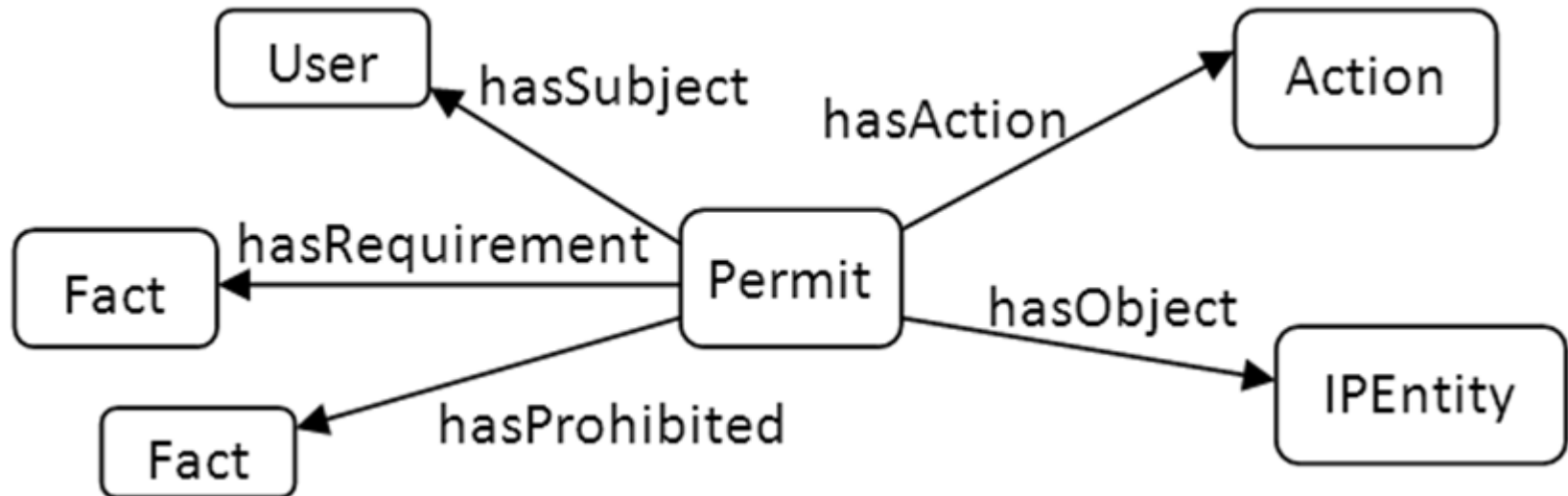


The RRDOnto

- Represent Right Data Ontology
 - Digital Media Project: to *“promote continuing successful development, deployment and use of Digital Media that respect the rights of creators and rights holders to exploit their works, the wish of end users to fully enjoy the benefits of Digital Media and the interests of various value-chain players to provide products and services”*
 - Interoperable DRM Platform: Tools implementing basic common DRM Functions
 - RRD Onto: An ontology about the Intellectual Property Rights along the Value Chain
- Evolved into the **Media Value Chain Ontology (MVCO)**, probable MPEG-21 Part 19

RRDOnto (II)

- The Permit can authorise an Adaptation action based on certain requirements/bans.



Interoperating RRDOnto and CAO

- Ontology integration (subclassOf, equivalence, etc.)

MPEG-21 DIA	CAO Ontology	RRDOnto
UserProfile	User	User
Digital Item	Media	IPEntity
NaturalEnvironment	NaturalEnvironment	subclass of Fact
Terminal set of UEDs	Terminal	subclass of Fact
Network set of UEDs	Network	subclass of Fact
permittedDiaChanges		subclass of Action
hasChangeConstraint		subclass of Fact

Authorisation mechanism

- **Semantic Authorisation Process:**
 - ADE creates instances of the CAO ontology based on the simple XML CxPs information, together with the Media Information and the desired operation and characteristics.
 - CAO class individuals are sent to the AA, which in turn looks up in its license store (a collection of Permit instances) and matches for a suitable one to authorise the requested operation.
 - The authorisation itself is described as a mere result of a rule validation (SWRL).

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