



A new approach to interoperability between ODRL and MPEG-21 REL

Jaime Delgado, Jose Prados, Eva Rodríguez

DMAG (Distributed Multimedia Applications Group)

<http://dmag.upf.edu>

**Universitat Pompeu Fabra, UPF
Barcelona (Spain)**

1



Contents

- Introduction. The approach
- OMA DRM REL
- Profiling MPEG-21 parts?
- OMA-based MPEG-21 REL DTDs
- MPEG-21 REL & OMA DRM REL v2.0 interoperability
- Tools developed
- MPEG-21 REL Authorization Model
- Conclusions and Future Work

- Interoperability of RELs (ODRL & MPEG-21 REL)
- Initial contribution in 1st ODRL Workshop, 2004:
 - § Simple mapping with XSLT (XML Transformations)
 - § But
 - ú We need to be sure about the semantic equivalence!
- New approach:
 - § Map licenses only for a specified subset of both languages: **A profile?**

- Analysis of OMA DRM REL v1.0 and v2.0
- Restriction of MPEG-21 REL that provides the same features (MPEG-21 REL DTDs)
- Extension of MPEG-21 REL to provide missing functionalities as inheritance or security elements.
- *MPEG-21 Authorization Model simplification*

- Open Mobile Alliance (OMA)
- OMA DRM REL
 - § Rights Expression Language of OMA DRM System
 - § Mobile profile of ODRL
 - § Two different specifications
 - ú OMA DRM REL v1.0 (approved)
 - ú OMA DRM REL v2.0 (candidate)

- We don't propose any specific profile
- What is happening in MPEG?

MPEG-21 Multimedia Framework

- Part 1: Vision, Technologies and Strategy
- Part 2: Digital Item Declaration
- Part 3: Digital Item Identification
- **Part 4: Intellectual Property Management and Protection**
- **Part 5: Rights Expression Language**
- **Part 6: Rights Data Dictionary**
- Part 7: Digital Item Adaptation
- **Part 8: Reference Software**
- Part 9: File Format
- Part 10: Digital Item Processing
- Part 11: Evaluation Methods for Persistent Association Technologies
- Part 12: Test Bed for MPEG-21 Resource Delivery
- (Part 13: Scalable Video Coding)
- Part 14: Conformance
- Part 15: Event Reporting
- Part 16: DID binarisation
- Part 17: Fragment Identification for MPEG Media Types
- **Part 18: MPEG-21 Schema Files**

Profiling MPEG-21 parts

- We don't propose any specific profile
- What is happening in MPEG?
- ... *the current status at the end*

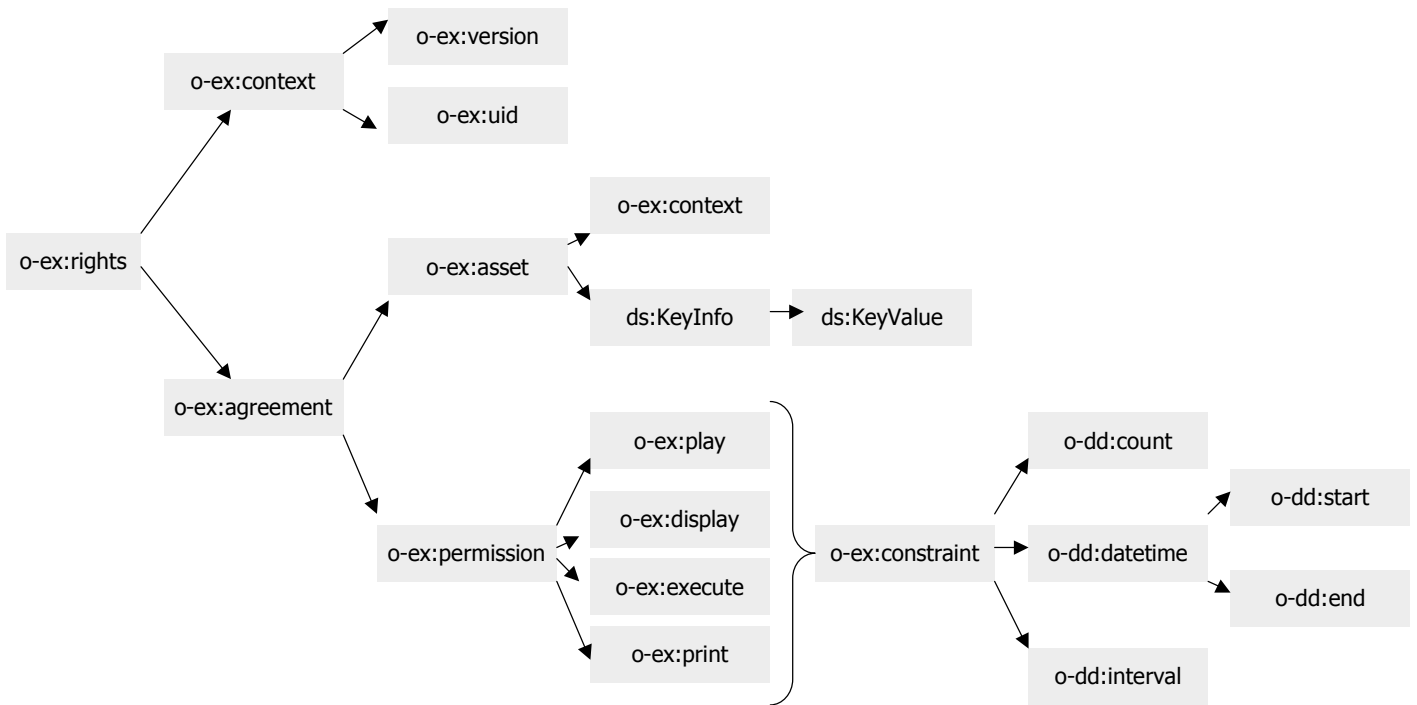
What do we propose?

- Subset of MPEG-21 REL based on the OMA DRM RELs *specs.* à not on OMA DRM *requirements.*
- Content protection information
 - § OMA DRM REL includes this information in the license
 - § Two possibilities in MPEG-21:
 - ú Consider this information as IPMP information
 - ú Include this information in the "otherinfo" field of a MPEG-21 REL license
- REL/IPMP profile?

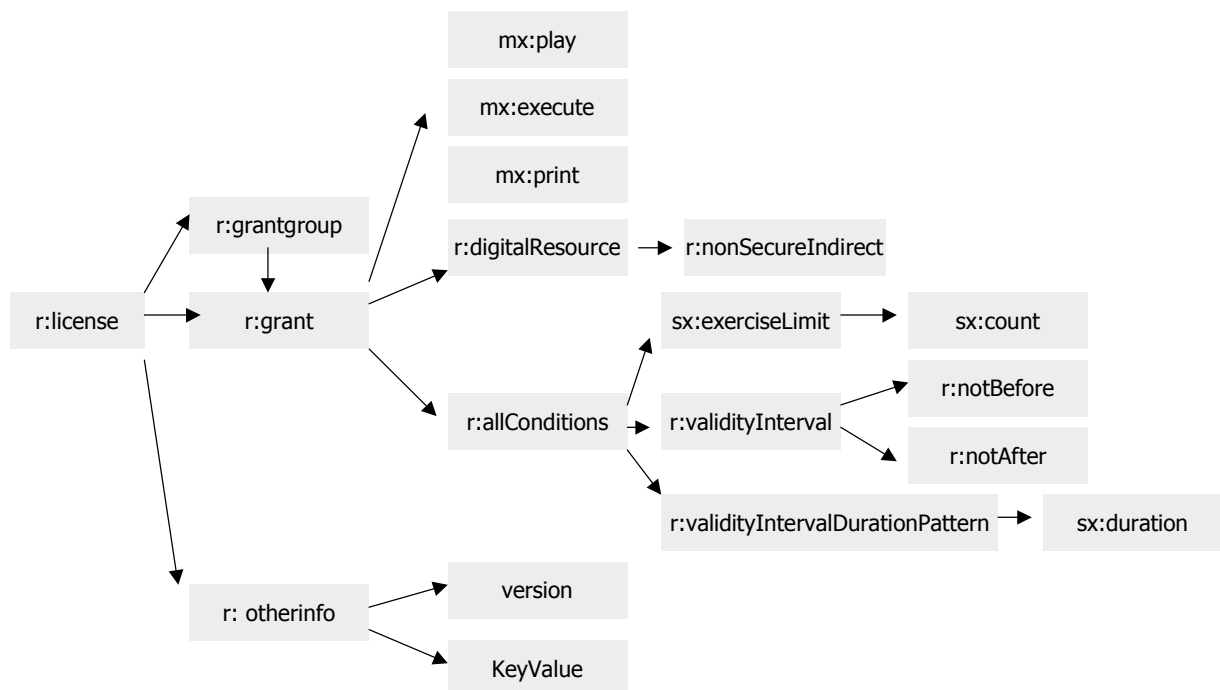
Contents

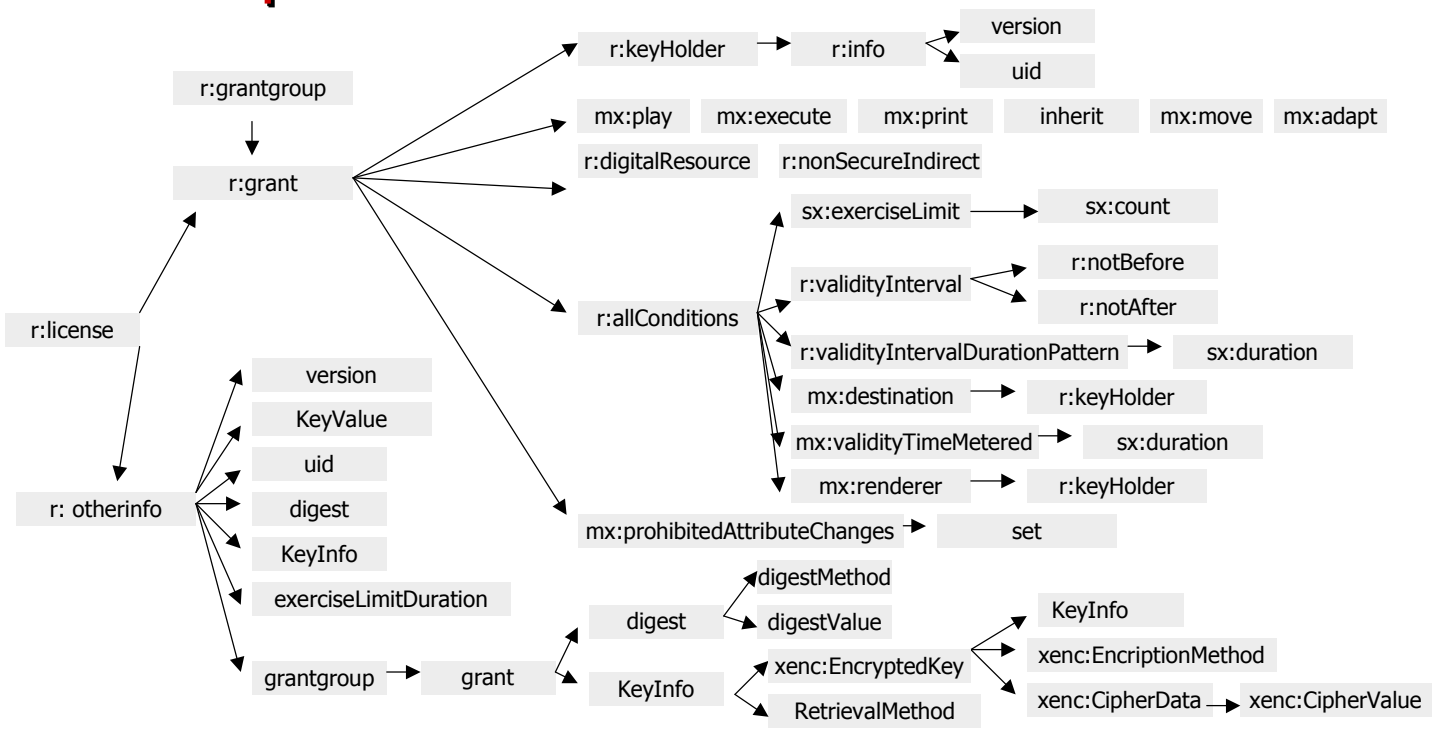
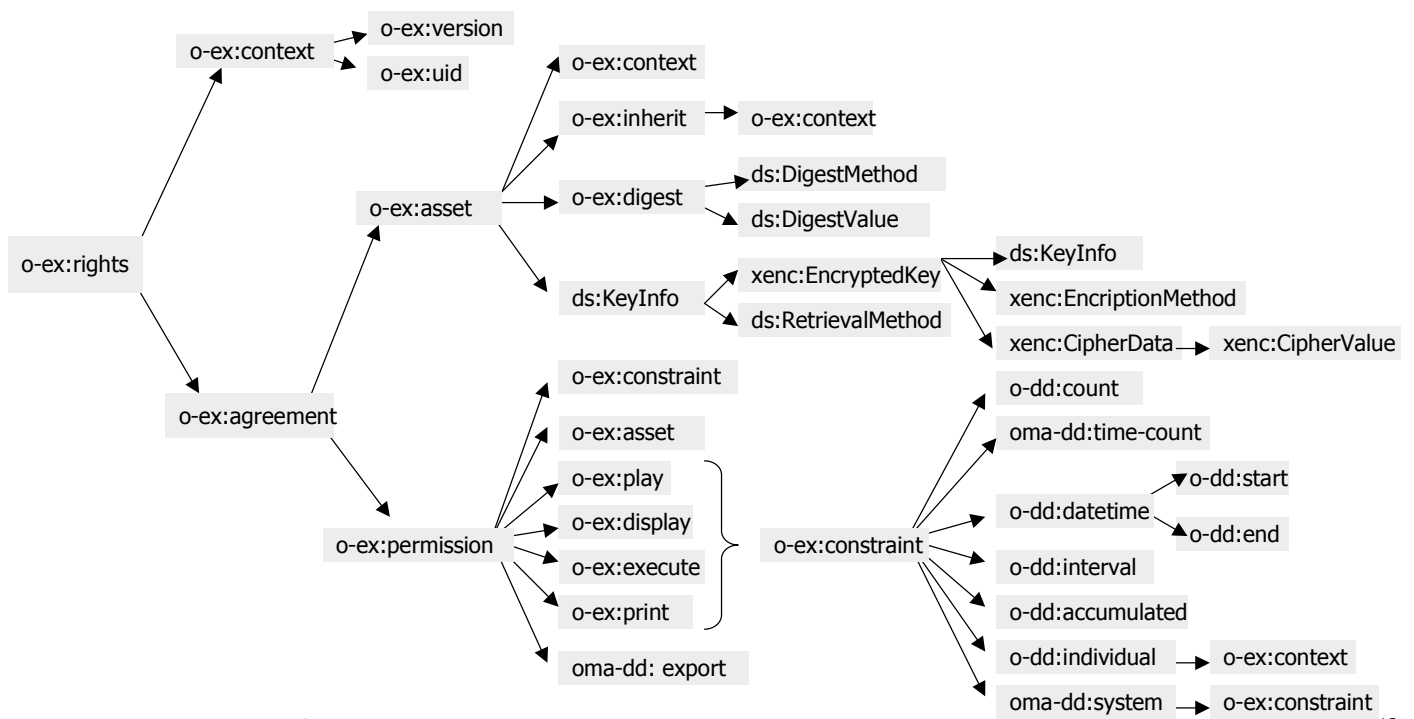
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OMA DRM REL 1.0 DTD

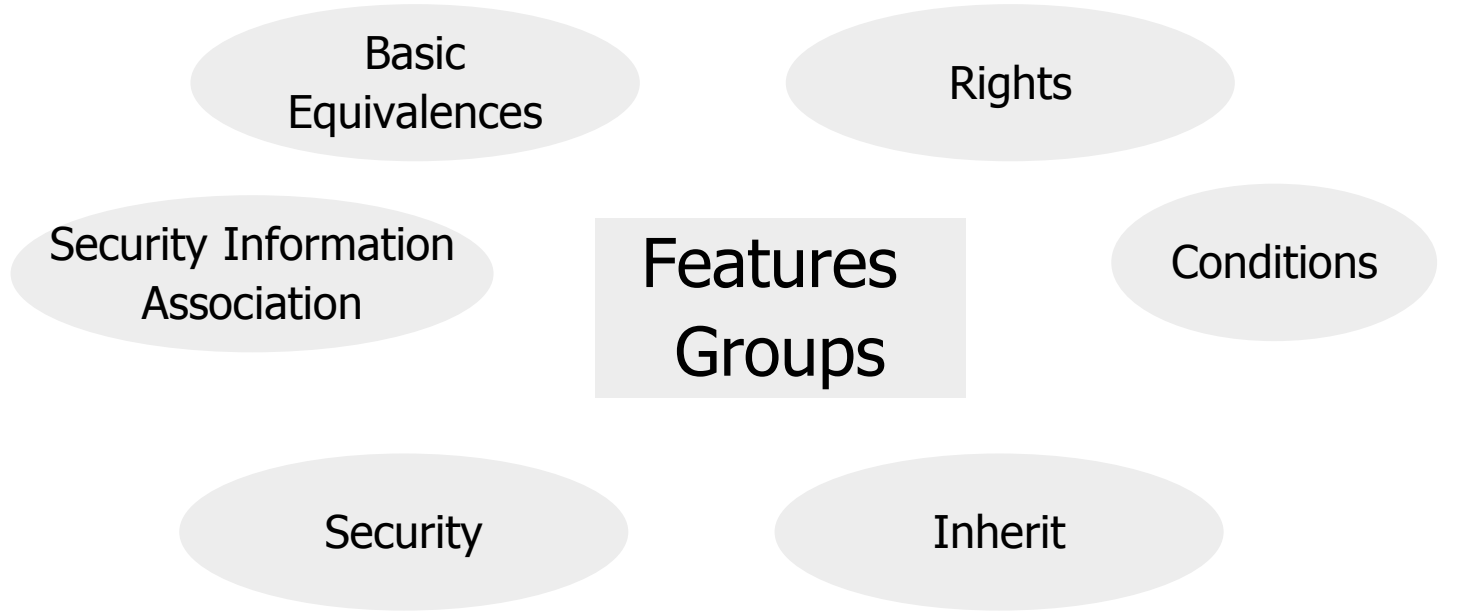


Equivalent OMA MPEG-21 REL DTD



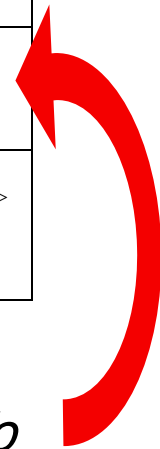


MPEG-21 REL & OMA DRM REL v2.0 interoperability



Basic Equivalences

| OMA DRM REL v2.0 | OMA-based MPEG-21 REL |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code><o-ex:rights></code> | <code><r:license></code> |
| <code><o-ex:context></code> <code><o-dd:version>2.0</o-dd:version></code> <code><o-dd:uid>RightsObjectID</o-dd:uid></code> <code></o-ex:context></code> | <code><r:otherinfo></code> <code><version>2.0 </version></code> <code><uid>RightsObjectID</uid></code> <code></r:otherinfo></code> |
| <code><o-ex:asset></code> <code><o-ex:context></code> <code><o-dd:uid>ContentID </o-dd:uid></code> <code></o-ex:context></code> <code></o-ex:asset></code> | <code><r:digitalResource></code> <code><r:nonSecureIndirect URI='ContentID' /></code> <code></r:digitalResource></code> |



New elements in *r:otherinfo*

Rights (I)

| OMA DRM REL v2.0 | OMA-based MPEG-21 REL |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code><o-dd:display/></code> | <code><mx:play /></code> |
| <code><o-dd:play/></code> | <code><mx:play /></code> |
| <code><o-dd:execute/></code> | <code><mx:execute /></code> |
| <code><o-dd:print/></code> | <code><mx:print /></code> |
| <pre> <oma-dd:export oma-dd:mode="move"> <o-ex:constraint> <oma-dd:system> <o-ex:context> <o-dd:version>1.0 </o-dd:version> <o-dd:uid> XYZ </o-dd:uid> </o-ex:context> </oma-dd:system> </o-ex:constraint> </oma-dd:export> </pre> | <pre> <mx:move/> <r:digitalResource> <r:nonSecureIndirect URI="ContentID"/> </r:digitalResource> <r:allConditions> <mx:destination> <r:keyHolder> <r:info> <version>1.0</version> <uid>XYZ</uid> </r:info> </r:keyHolder> </mx:destination> </r:allConditions> </pre> |

Rights (II)

| OMA DRM REL v2.0 | OMA-based MPEG-21 REL |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre> <oma-dd:export oma-dd:mode="copy"> <o-ex:constraint> <oma-dd:system> <o-ex:context> <o-dd:version>1.0 </o-dd:version> <o-dd:uid> XYZ </o-dd:uid> </o-ex:context> </oma-dd:system> </o-ex:constraint> </oma-dd:export> </pre> | <pre> <mx:adapt/> <r:digitalResource> <r:nonSecureIndirect URI="ContentID1"/> </r:digitalResource> <mx:prohibitedAttributeChanges> <set definition="urn:mpeg:mpeg21:2003:01-RDD-NS:2346"/> <set definition="urn:mpeg:mpeg21:2003:01-RDD-NS:2347"/> </mx:prohibitedAttributeChanges> <r:keyHolder> <version>1.0</version> <uid>XYZ</uid> </r:keyHolder> </pre> |

copy à `<adapt>` `<prohibitedAttributeChanges>`

Time Conditions

| OMA DRM REL v2.0 | OMA-based MPEG-21 REL |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre><o-ex:constraint> <o-dd:datetime> <o-dd:start>..</o-dd:start> <o-dd:end>... </o-dd:end> </o-dd:datetime> </o-ex:constraint></pre> | <pre><r:allConditions> <r:validityInterval> <r:notBefore>...</r:notBefore> <r:notAfter>...</r:notAfter> </r:validityInterval> </r:allConditions></pre> |
| <pre><o-ex:constraint> <o-dd:interval>...</o-dd:interval> </o-ex:constraint></pre> | <pre><r:allConditions> <sx:validityIntervalDurationPattern> <sx:duration>...</sx:duration> </sx:validityIntervalDurationPattern> </r:allConditions></pre> |
| <pre><o-ex:constraint> <o-dd:accumulated>PT10H </o-dd:accumulated > </o-ex:constraint></pre> | <pre><r:allConditions> <sx:validityTimeMetered> <sx:duration>PT10H</sx:duration> </sx:validityTimeMetered> </r:allConditions></pre> |

More Conditions (I)

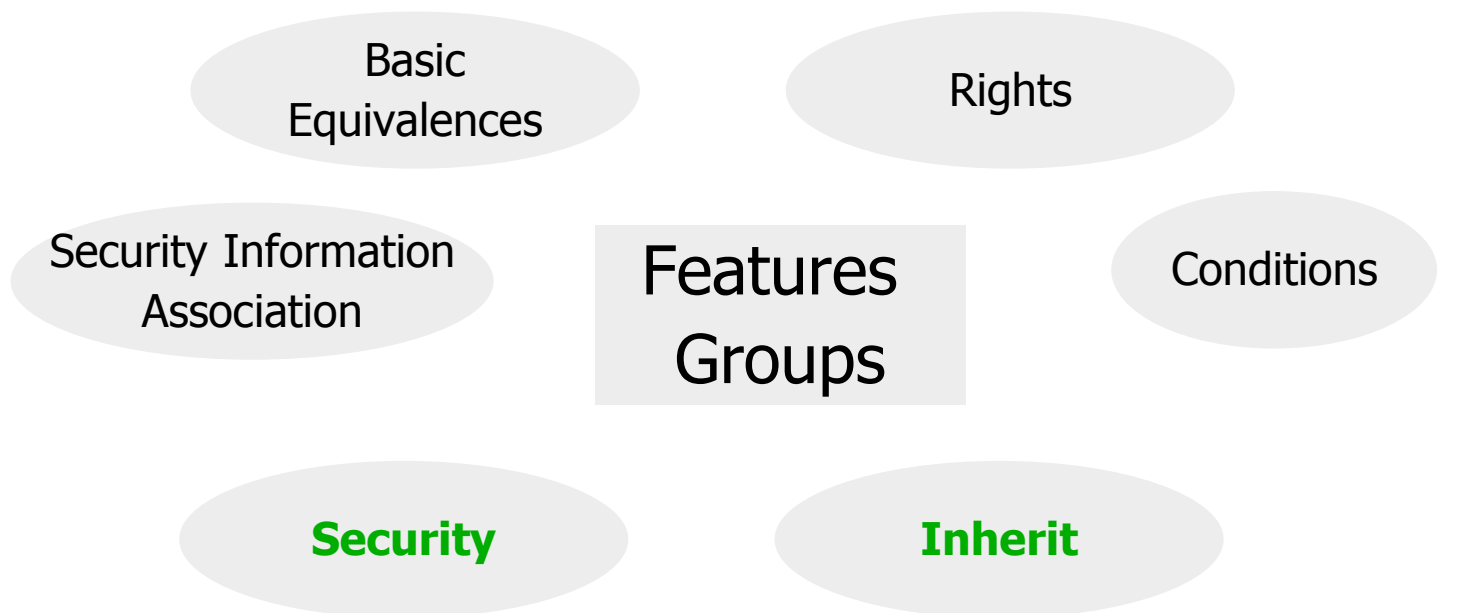
| OMA DRM REL v2.0 | OMA-based MPEG-21 REL |
|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre><o-ex:constraint> <o-dd:count > 1 </o-dd count> </o-ex:constraint></pre> | <pre><sx:exerciseLimit> <sx:count> 1 </sx:count> </sx:exerciseLimit></pre> |
| <pre><o-ex:constraint> <o-dd:timed-count timer="30">1 </o-dd:timed-count> </o-ex:constraint></pre> | <pre><r:otherinfo> <exerciseLimitTime> <sx:count> 1 </sx:count> <sx:duration> 30 </ sx:duration> </exerciseLimitTime> </r :otherinfo></pre> |
| <p><exerciseLimit> and extra Information in <otherinfo> →</p> | <pre><r:grant licensePartId="Asset-1"> <r:allConditions> <sx:exerciseLimit> <sx:count> 1 </sx:count> </sx:exerciseLimit> </r:allConditions> <r:grant> <r:otherinfo> <grant licensePartIdRef="Asset-1"> <exerciseLimitDuration> 30 </exerciseLimitDuration> </grant> </r:otherinfo></pre> |

All the information in <otherinfo> element

More Conditions (II)

| OMA DRM REL v2.0 | OMA-based MPEG-21 REL |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre> <o-ex:constraint> <o-dd:individual> <o-ex:context> <odd:uid> XYZ </odd:uid> </o-ex:context> </o-dd:individual> </o-ex:constraint> </pre> | <pre> <r:grant> <r:keyHolder> <r:info> <uid>XYZ</uid> </r:info> </r:keyHolder> </r:grant> </pre> |
| <pre> <o-ex:constraint> <oma-dd:system> <o-ex:context> <odd:uid> XYZ </odd:uid> </o-ex:context> </oma-dd:system> </o-ex:constraint> </pre> | <pre> <mx:renderer> <r:keyHolder> <r:info> <uid>XYZ</uid> </r:info> </r:keyHolder> </mx:renderer> </pre> |

MPEG-21 REL & OMA DRM REL v2.0 interoperability



- OMA DRM REL 2.0 specification includes security information within the license
- We consider two alternative approaches:
 - § First Approach à
 - ú Security information within the license à `<otherinfo>`
 - § Second Approach à
 - ú Security information out of the license à IPMP Components

| OMA DRM REL v2.0 | OMA-based MPEG-21 REL |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre> <o-ex:agreement> <o-ex:digest> <ds:DigestMethod Algorithm="..."/> <ds:DigestValue> DCFHash </ds:DigestValue> </o-ex:digest> </o-ex:agreement> </pre> | <pre> <r:otherinfo> <digest> <dsig:DigestMethod Algorithm="..."/> <dsig:DigestValue> DCFHash </dsig:DigestValue> </digest> </r:otherinfo> </pre> |
| <pre> <o-ex:agreement> <ds:KeyInfo> <xenc:EncryptedKey> <xenc:EncryptionMethod Algorithm="..."/> <xenc:CipherData> <xenc:CipherValue> EncryptedCEK </xenc:CipherValue> </xenc:CipherData> </xenc:EncryptedKey> <ds:RetrievalMethod URI="REKRe"/> </ds:KeyInfo> </o-ex:agreement> </pre> | <pre> <r:otherinfo> <KeyInfo> <xenc:EncryptedKey> <xenc:EncryptionMethod Algorithm="..."/> <xenc:CipherData> <xenc:CipherValue> EncryptedCEK </xenc:CipherValue> </xenc:CipherData> </xenc:EncryptedKey> <ds:RetrievalMethod URI="REKRe"/> </KeyInfo> </r:otherinfo> </pre> |

All the necessary information in `<otherinfo>` element

Security (Second Approach)

```

<o-ex:rights>
  <o-ex:context>
    <o-dd:version>2.0</o-dd:version>
    <o-dd:uid>RightsObjectID</o-dd:uid>
  </o-ex:context>
  <o-ex:agreement>
    <o-ex:asset>
      <o-ex:context>
        <o-dd:uid>ContentID</o-dd:uid>
      </o-ex:context>
      <o-ex:digest>
        <ds:DigestMethod Algorithm="http://www.w3.org/2000/09/xmldsig#sha1"/>
        <ds:DigestValue>DCFHash</ds:DigestValue>
      </o-ex:digest>
      <ds:KeyInfo>
        <xenc:EncryptedKey>
          <xenc:EncryptionMethod Algorithm="http://www.w3.org/2001/04/xmlenc#kw-aes128"/>
          <xenc:CipherData>
            <xenc:CipherValue>EncryptedCEK</xenc:CipherValue>
          </xenc:CipherData>
        </xenc:EncryptedKey>
        <ds:RetrievalMethod URI="REKReference"/>
      </ds:KeyInfo>
    </o-ex:asset>
  </o-ex:agreement>
</o-ex:rights>
  
```

Provides the integrity for the association of the Rights Object with the DRM Content

It contains the base64 encoded hash value of the DRM Content

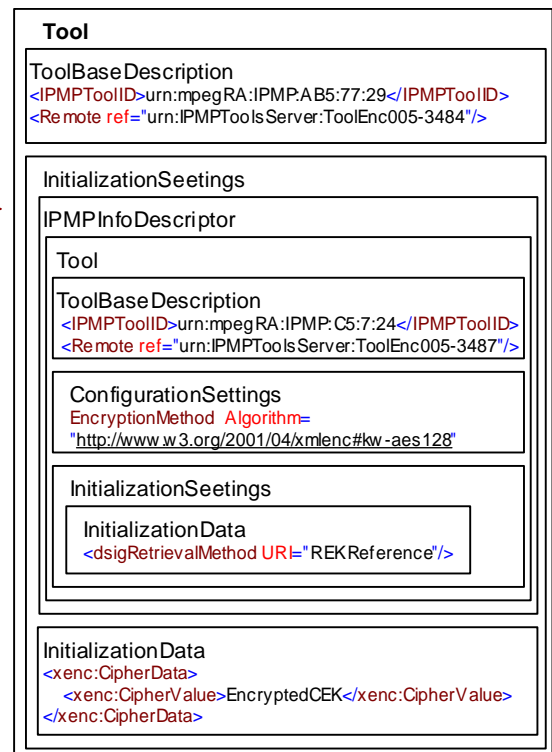
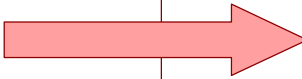
Identifies the encryption method algorithm used to encrypt the CEK

References the key used to encrypt the CEK

Security (Second Approach)

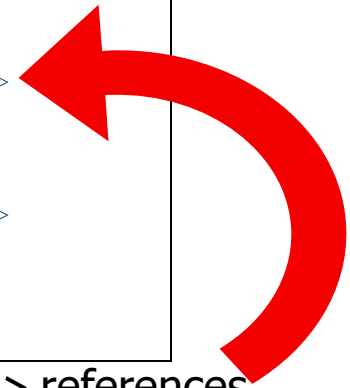
```

< didl:DIDL>
  < didl:Item>
    < didl:Component>
      < didl:Resource mimeType="application/ipmp">
        < ipmpdidl:ProtectedAsset mimeType="video/mpeg">
          < ipmpdidl:Info>
            < IPMPInfoDescriptor>
              < Tool> Protection tools info </Tool>
              < RightsDescriptor>
                < License>
                  < r:license>
                    < r:grant>
                      < mx:play/>
                      < r:digitalResource>
                        < r:nonSecureIndirect URI="ContentID"/>
                      </r:digitalResource>
                    </r:grant>
                  </r:license>
                </License>
              </RightsDescriptor>
            </ipmpdidl:Info>
            < ipmpdidl:Contents ref="ContentID"/>
          </ipmpdidl:ProtectedAsset>
        </ didl:Resource>
      </ didl:Component>
    </ didl:Item>
  </ didl:DIDL>
  
```



Security Information Association

| OMA DRM REL v2.0 | OMA-based MPEG-21 REL |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre> <o-ex:agreement> <o-ex:asset o-ex:id="Asset-1"> <o-ex:digest>...</o-ex:digest> <ds:KeyInfo>...</ds:KeyInfo> </o-ex:asset> <o-ex:asset o-ex:id="Asset-2"> <o-ex:digest>...</o-ex:digest> <ds:KeyInfo>...</ds:KeyInfo> </o-ex:asset> </o-ex:agreement> </pre> | <pre> <r:grantgroup> <r:grant licensePartId="Asset-1"> </r:grant> <r:grant licensePartId="Asset-2"> </r:grant> <r:grantgroup> <r:otherinfo> <grant licensePartIdRef="Asset-1"> <digest>...</digest> <KeyInfo>...</KeyInfo> </grant> <grant licensePartIdRef="Asset-2"> <digest>...</digest> <KeyInfo>...</KeyInfo> </grant> </r:grantgroup> </r:otherinfo> </pre> |



new *<grant>* element in *<otherinfo>* references previous *<r:grant>* element

Inherit

| OMA DRM REL v2.0 | OMA-based MPEG-21 REL |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| <pre> <o-ex:asset> <o-ex:inherit> <o-ex:context> <o-dd:uid>Subs</o-dd:uid> </o-ex:context> </o-ex:inherit> </o-ex:asset> </pre> | <pre> <r:grant> <inherit URI="Subs"/> </r:grant> </pre> |

<inherit> is not considered in MPEG-21 REL

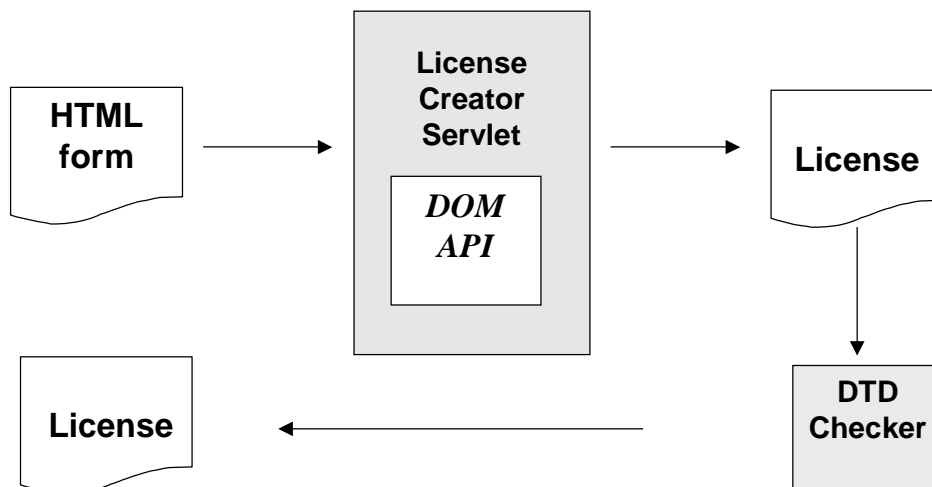


MPEG-21 REL extended with a new *<inherit>* right

MPEG-21 REL subscriptions with *<possesProperty>* element?

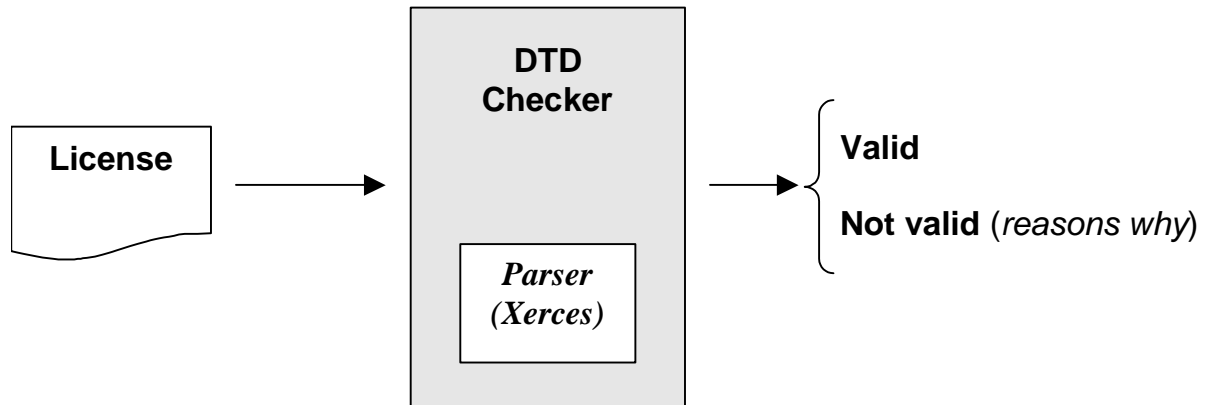
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- MPEG-21 REL Authorization Model
- Conclusions and Future Work

The information is introduced via a Web form; a servlet processes that information and generates the MPEG-21 REL license equivalent to OMA DRM v2.0 one



DMAG DTD Checker

The DTD Checker validates syntactically the license against their DTDs



Authorization Model

- Simplification of license structure implies the restriction of the authorization model complexity
- Restrict the authorization model
 - § Mobile profile of MPEG-21 REL
- One objective of a profile is to simplify implementations

- Authorization Proof restrictions:
 - § The `r:principal` element in the profile is not considered. Then, `g/r:principal` is always absent
 - § Either `g/r:condition` is Satisfied with respect to AR and AS or `g/r:condition` is absent
 - ú The conditions to be Satisfied are also restricted
 - § `e` is always absent. Then, `h` is a member of R

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- **Conclusions and Future Work**

Profiling MPEG-21 parts

- We have not proposed any specific profile **yet**
- What is happening in MPEG?
- ... *the current status*
- Interoperability with OMA desired?
- Requirements?
- Profiles and MAFs

Conclusions and future work (I)

OMA-based MPEG-21 REL
+
subset of the MPEG-21 REL Authorization Model



Basis of a formal profile of MPEG-21 REL?

Conclusions and future work (II)

- MPEG-21 REL might need an extension
 - § Some OMA DRM v2.0 features are hard to express in a reasonable way in MPEG-21 REL
 - § *<inherit>* is not considered in MPEG-21 REL
- Combined profile MPEG-21 REL/IPMP?
- *WHAT ABOUT OMA?*

A new approach to interoperability between ODRL and MPEG-21 REL

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