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# Media contracts formalization using a standardized contract expression language

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**Abstract**— Contract Expression Languages allow representing business contracts in a digital and structured form. Some examples are the Content Reference Forum format, the OASIS eContracts standard or a proposed extension for MPEG-21 Part 5. These formats have influenced the design of the MPEG-21 Contract Expression Language (CEL), which has been recently specified by modelling the most relevant clauses in audiovisual contracts. The MPEG-21 CEL, described in this paper, defines a language for representing media contracts as XML. It is structured in two schemas, a core defining the structural elements of a contract, and an extension with vocabulary for specific applications.

**Index Terms**— Digital media contracts, contract expression languages, content management architectures, audio visual

## I. INTRODUCTION

**M**edia contracts specify business agreements between two or more parties transacting digital media or providing services around media content. As with any contract, they are legally binding documents which can be used as an evidence to prove acceptance of liabilities, and preserving them in the face of possible contingencies is advisable at least during the contract duration.

Companies handling audiovisual contents generally enter into many different contracts, whose management is a critical and not always easy activity. Along the years, contracts with a variety of formats accumulate, and at least their access in a digital and homogeneous form is desirable. Thus, different collectives as broadcasters, libraries, museums, etc. have had the need to digitalize contracts for mere preservation purposes.

Additionally, machine-readable, structured formats (as opposed to scanned documents, which are digital but not easily processable) are preferred as they enable the management of the audiovisual assets within wider media content management systems.

Electronic contracts are today interpreted in broad terms and they are required to gear different workflow systems, across different organizational business processes and different companies,

granting business integration over electronic networks. While the integrated design of contract formats and the frameworks and collections of related services is quite a heavy task and effectively dependant on the domain, an alternative approach vows for a simple, neutral contract format irrespective of the use it is given. This was the vision inspiring the OASIS e-Contracts [1] format, which merely proposes a structured schema to contain the information and is almost agnostic of the contract use, negotiation process or life-cycle. This neutral approach favours the coexistence of disparate services acting upon the same document.

Specifically, the contract preservation and management is of the utmost interest for companies handling audiovisual content, due to the large number of contracts to manage and their key role in the business logic.

The Moving Picture Experts Group (MPEG), known for having provided media encoding standards, recommends the MPEG-21 framework for representing and managing arbitrary digital items [2]. This digital framework is the placeholder for its latest initiative, the definition of two related electronic formats for representing media contracts: the Contract Expression Language (CEL) and the Media Contract Ontology (MCO), Part 20 and Part 21 of [2] respectively. Most general aspects are common to both, however the latter describes an OWL-based format, while the former an XML-based one. Thus implementation and/or integration issues are therefore clearly different. This article focuses on CEL.

The MPEG-21 CEL defines a standard language to formally describe business agreements (parties, operative clauses, etc.) in a machine readable form. It is organized in two schemas, a core defining the structural elements, and an extension for the exploitation of intellectual property rights, which results from the broadcasters' requirements including the most common acts and constraints in the media field.

Once media contracts can be formally represented by means of a machine readable language, it is important to facilitate the integration of contracts' services in existing multimedia content management platforms. To this end, a set of services and tools has been developed to create, load, present, validate, and authorize media contracts.

This paper describes the MPEG-21 CEL, its design process and explanatory examples of how it can be used. The next section describes previous approaches highlighting those which most influenced MPEG-21 CEL, specifying the Section III which was the context, the followed methodology and the most important requirements. Section IV describes the MPEG-21 CEL itself, and Sections V and VI describe an application scenario and two contexts of use.

## II. CONTRACTS FORMALIZATION: RELATED WORK

The electronic version of a media contract enables multimedia systems to control the management of digital content, as well as preserving the terms and conditions of these contracts. Several initiatives have been conducted in the past years to define a format for electronic contracts. Based on their influence on the design of MPEG-21 CEL, we have selected three of

them to provide more details: OASIS e-Contracts [1], CRF Contract Expression Language [4] and MPEG-21 REL extension used in the AXMEDIS<sup>1</sup> project [5].

However, more related work exists. The COSMOS [6] system is one of the first initiatives in the area, in which contracts were modeled and described in UML. The XML-based DocLog [7] or the rule-based SweetDeal [8] are also old initiatives. The latter was supported by a DAML ontology, but other academic proposals appeared also based on OWL, as [9][10] or [11], but none of them gained much spread. With the intention to produce a standard, it is also worth mentioning the BCL (Business Contract Language) [12]. Furthermore, work on expression of contracts is closely related to other technologies, such as OCL (Object Constraint Language) [13], the WS-Agreement specification [14] and the ConSpec language [15].

In any case, these other activities did not have the same objectives as MPEG-21 CEL, which was rather specific to agreements on distribution of audiovisual content and was based on other MPEG technologies.

#### A. CRF Contract Expression Language

The Content Reference Forum (CRF), an industry consortium founded to promote specifications for a content distribution framework, developed almost ten years ago a Contract Expression Language devised to represent agreements between different parties in content distribution contracts [3]. It took as the starting point the MPEG-21 Rights Expression Language (REL), Part 5 of MPEG-21 [2], a standard language defined for the representation of right expressions.

The *Clause* is the core element in this format, which declares the permission, obligation or prohibition of a principal for acting over a resource if a set of conditions are met or if some event has to occur. It has the same structure and purpose of its counterpart in REL, the *Grant* element, but adds the possibility to include some events to occur. This is one of the weaknesses of this language: since it is based on the MPEG-21 REL it does not allow to express complex facts, like unions, intersections or negations, and pre-conditions.

#### B. OASIS LegalXML eContracts

The Organization for the Advancement of Structured Information Standards (OASIS) established in 2007 the LegalXML eContracts Technical Committee to develop an XML-based contracts language. The eContracts language was designed to enable the creation, management, distribution and publication of a wide range of narrative contracts in digital form. To this end, an XML schema was defined with a generic structure for contract documents. This schema enables the definition clauses in contracts for further reutilization.

The eContracts language makes use of a model in which contract clauses are represented by item elements, which can be grouped by means of block elements, and metadata with textual information of the contract. eContracts can be digitally signed by parties making use of the party-signature element.

<sup>1</sup> <http://www.axmedis.org>

### C. AXMEDIS extension of the MPEG-21 REL for contracts

One of the objectives of the AXMEDIS project was to manage audiovisual media governed by narrative contracts. For this purpose, a contract expression language able to digitally express the terms and conditions in narrative audiovisual contracts was needed. As the AXMEDIS project was interlaced in the framework of the MPEG-21 standard, the adopted solution was evolving its Part 5, to include the missing vocabulary.

The design process in AXMEDIS started by analyzing a representative sample set of real narrative paper contracts dealing with diverse audiovisual material (including audio tracks, ringtones, photographic material or video excerpts), different distribution channels (small retailers, internet download, online services, etc.), different parties (traditional and internet distributors, producers, etc.), and different countries of origin and application of the contracts.

MPEG-21 REL, originally intended for licenses, suited well as a basis language for contracts with the due changes, and thus, an additional, non-standard profile was created [5]. A difference was made between *License clauses*, whose enforcement and control could be put in hands of a computer and *Lawyer clauses* whose interpretation would always be left to the human intellect. Only the *License clauses* were represented in a well-structured form, being the *Lawyer clauses* included in REL licenses simply as a textual information present only for notarial purposes.

Besides specifying the contract format, AXMEDIS promoted tools for easily editing electronic contracts, or transforming narrative contracts in a semi-automatic process [9]. Conversely, tools existed which taking an electronic contract as input, returned a natural-language text with a description of the clauses as output.

## III. REPRESENTATION AND PROCESSING OF MEDIA CONTRACTS

### A. Framework of the MPEG-21 Contract Expression Language

Influenced by the work done in the AXMEDIS project described before, in April 2008 a proposal was made to provide an extension for Part 5 of MPEG-21, Rights Expression Language, supporting the representation of contracts on audiovisual material. This work was supported by 11 organizations, but it did not materialize in updating the standard. Later on, new work was conducted in the area of contract representation in the PrestoPRIME European Project<sup>2</sup>, which included several broadcasters and digital archives as project partners, such as RAI<sup>3</sup>, BBC<sup>4</sup>, INA<sup>5</sup>, B&G<sup>6</sup>, ORF<sup>7</sup>.

This new work of the PrestoPRIME partners on the formalization of contracts, which was mainly done in a context of digital preservation of content [16], made use of more than 30 audiovisual contracts representing real business-to-business (B2B) activities for requirements

<sup>2</sup> <http://www.prestoprime.org/>

<sup>3</sup> RAI Radiotelevisione Italiana, the Italian national public service broadcaster

<sup>4</sup> BBC British Broadcasting Company

<sup>5</sup> INA Institut National de l'Audiovisuel

<sup>6</sup> B&G Beel en Geluid, Dutch national institute for sound and vision

<sup>7</sup> ORF Österreichischer Rundfunk, the Austrian national public service broadcaster.

analysis and validation, and was tested in a practical application setup [17].

This led to MPEG-21 experts to reconsider the previous approach, taking also into account the MPEG-21 Media Value Chain Ontology (MVCO, Part 19 of MPEG-21 [2]), which defines a formal language for representing different kinds of intellectual property in the media value chain, as well as roles for users and actions regarding intellectual property.

In this context two different activities were jointly conducted, resulting respectively in MPEG-21 CEL and MCO. Although a number of general aspects is common to both, they are addressing two different technical environments: OWL and XML. Depending on contexts and on possible practical reasons, such as tool availability or integration with other services, the balance between the pro and cons of adopting one or the other can vary. The MPEG-21 reference software (Part 8 Amendment 3 of [2]), for instance, provides some services and modules specific for either MCO or CEL, however a particular conversion module permits to switch between the two formats, supporting the completion of the toolset and integration between different operative environments.

### *B. Design process of a contract expression language*

The process followed by the authors in the definition of a new language for the representation of narrative contracts was the following:

1. Collection of a corpus of real contracts, representative of the actual contracts in the industry and diverse enough to include the different contract flavours.
2. Identification of the key information in the contracts which cannot be dismissed. The task is deciding which nuances cannot be lost (amounts, temporal terms...) and which information can be dropped in the final digital representation (unimportant details, formalism appearing in every contract, etc.).
3. Definition of a model for representing that information, taking into account that the contracts expression language will be structured as XML.
4. Development of an application to generate contracts, so that non-“IT experts” can also write their own electronic contracts.
5. Use of the application of Step 4 to generate the XML-based contracts.
6. Validation of the resulting representation.

The modeling step, which was repeated as many times as necessary to satisfy the whole sample set, may be represented in two levels: the first is for identifying the general contract elements and the relationships among them, while the second is specifically for conditions. Indeed, while the major contract elements could be easily found in all contracts, with poor and motivated exceptions, the range of conditions was wide and potentially bounded only by the will of the parties. The importance of having a large and representative sample set was due to the need of finding examples of almost all possible patterns of conditions.

### C. Requirements

The first step in the design process of the contract language definition was collecting the corpus of contracts. The work towards the MPEG-21 CEL started precisely from the analysis of a set of actual contracts provided by RAI in the context of the PrestoPRIME project and provided by AFI<sup>8</sup> in the context of the AXMEDIS project –in this case representing 200 SME of diverse sectors including movie producers, broadcasters, edition contracts, etc.

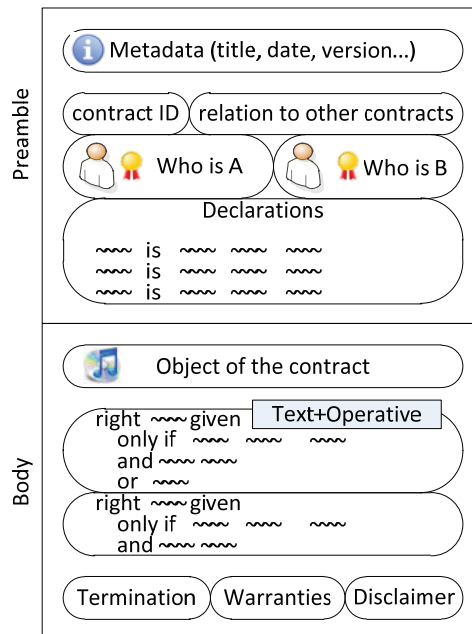


Figure 1. Prototype of contract

**Key elements in a contract.** Besides the legal requirements of the electronic contract (see [18]), the common structure present in most contracts (Figure 1) was taken as the skeleton for webbing the schema. This structure consists of a header or preamble and a body. The preamble had to contain:

- Metadata of the contract (date, version, title, etc.)
- Identification of the contract
- Possible relationships with other contracts
- The parties, possibly identified by their public key.
- A set of declarations –statements that the parties recognize as true

Possibly allocated in the body, the following information should be present:

- The Object of the contract (Content or Service)

<sup>8</sup> <http://www.afi.mi.it/>

- The operative part containing the contract information which has to be machine readable. That is, deontic expressions which include permissions, obligations and prohibitions.
- a mechanism for linking, if desired, an operative part element to the textual clauses which it is representing.

Finally, contracts are accompanied of other provisions like legal disclaimers, termination clauses, etc.

**Support to contract-based services.** The ability to encrypt either a whole contract or any part of it was required. Giving support to other contract-based services, having contract templates should be possible, as well as declaring a distinction between contract offers and signed contracts, supporting a negotiation process or tracking its management along a contract life-cycle.

**Rights and conditions in media contracts.** From the requirements, the rights and conditions used in media contracts were defined. They included the following exploitation rights:

- Rights for *communication to the public* (from a single place where the public is not present, by broadcasting or making available the work)
- Distribution rights*
- Reproduction*
- Transformation* rights (all forms of modification)
- Public Performance* rights (the work is showed or played in public)

Those rights are hyperonym of several more specific rights, which were formalized adding restrictions to generic rights.

The conditions present in contracts clauses are: *Access policy*, for restricting how or if the final user is charged (or not) for fruition; *Delivery modality*, regarding who has (and how) control of time and place of fruition; *Device*, regarding the type of equipment used by the final user for fruition; *Means*, regarding the technology used for delivering content to the public; *Service Access policy*, regarding if access to service delivery is restricted; *User Time Access*, regarding if fruition time for the user is restricted; *Number of Runs*, *Time Period*, *Territory*, and *Language*. Other relevant information present in contracts is: *Exclusivity*, *Percentage* of use, *Percentage* of receipts and *Sub-licence*.

#### IV. MPEG-21 CONTRACT EXPRESSION LANGUAGE

MPEG-21 CEL is structured in two parts. The CEL Core, which provides an extensible model for representing generic agreements between parties, and an extension for the Exploitation of Intellectual Property Rights (IPRE), which defines the most common acts and constraints in the media field, which are used in digital media contracts.

##### A. CEL Core

A CEL contract consists of its plain-text version containing the whole narrative contract,



metadata (for example its author, language, etc.), references to pre-existing contracts that might affect its validity, the parties of the contract, and the body with the contract clauses represented by the deontic concepts of permission, prohibition and obligation. A contract can be protected, in such case it only consists of the *encryptedContract* element, which contains the encrypted version of the contract. If a contract has zero parties, it represents a contract template, while if it has just one issuer party with signature, it expresses an offer, either general or to other parties not having yet signed. Parties can represent persons or organizations.

The core element of MPEG-21 CEL contracts is the operative part modelled as container for deontic expressions, represented in Figure 2. Deontic expressions represent permissions, prohibitions and obligations in contract clauses expressed in a machine readable form. They can reference to their textual representation in natural language by means of the *idrefs* attribute. If some clauses are related they can be grouped in the *deonticStructuredBlock* element. A deontic clause consists of metadata; contextual information; pre-conditions; the entity to which the deontic clause applies, the right to be applied; the resource against which the right applies; the resource resultant of executing the action, if any; the conditions which must be fulfilled; post-conditions; and the party that issues the permission, prohibition, obligation or statement specified in the deontic clause.

Pre and post-conditions of narrative contracts are represented in CEL by means of a deontic structured clause. Once defined, CEL contracts can refer to them using the *idref* attribute.

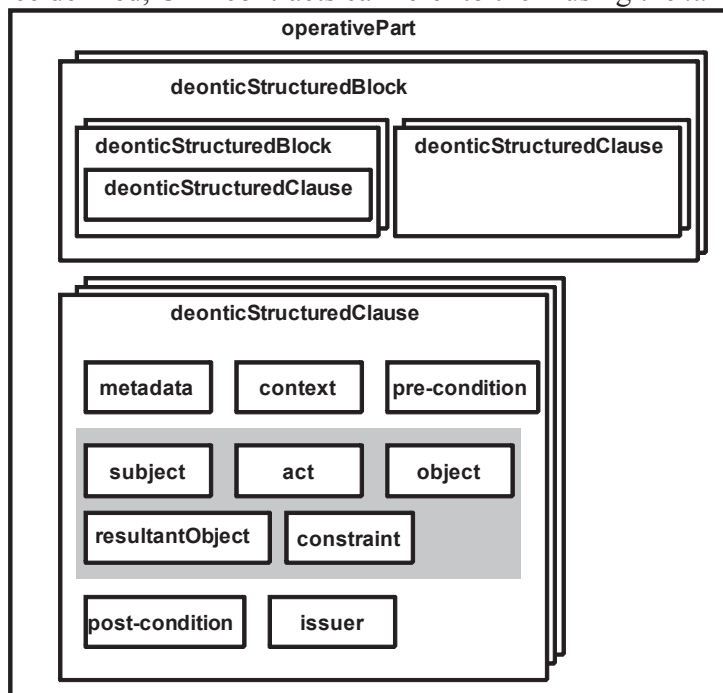


Figure 2. MPEG-21 CEL contract operative part

The constraint element specifies the conditions, restrictions and constraints present in contract clauses. Simple constraints include those defined in the CEL IPRE or in MPEG-21 REL. The constraint element also enables the representation of complex conditions, that is, unions, intersections and negations of simple and/or complex conditions. Logical constructs, which consist of multiple simple and/or complex facts, can be grouped in fact compositions whose truth value depends on one or more facts according to the logical constructs defined by its child elements. An example of usefulness of logical constructs is the representation of a constraint on delivery means offering a choice (“...either by Satellite or Terrestrial TV...”) going with a constraint on the number of runs (“...limited to 10 (ten) runs...”); the first one needs to be represented by a union, because the respect of the second condition doesn’t take into account the means when subtracting an exploited run.

### B. CEL IPRE

The CEL Extension for Exploitation of Intellectual Property Rights has been defined for representing the most common acts and constraints in the media field, which can be later used in CEL contracts.

Acts and constraints have been defined depending on the necessities identified in the requirements phase. The acts required for modelling rights in media contracts include IP-rights, as well as those related with the offering and consumption of services. Examples of CEL IPRE rights are *distribute*, *communicationToThePublic*, or *makeInstance*. Restrictions include those required for modelling conditions, restrictions and constraints in media contracts. Example of CEL IPRE restrictions are *copyrightExceptionFact*, *device*, or *userTimeAccess*.

It is expected that new extensions, with new actions and constraints, will be constructed for representing contracts in other domains or applications. To this end, MPEG-21 CEL has defined an extension mechanism. Future extensions will include a set of new XML elements, types, URIs and QNames to be used in conjunction with the CEL Core and optionally the CEL IPRE and/or the future ones. The new elements will be mainly derived from elements and types in the CEL Core, or even in one of its extensions.

## V. APPLICATION SCENARIO

This section presents an example of contract taken from a broadcasting scenario. The contract grants to a broadcaster the rights to execute his activity of “communication to the public” on a specified territory and during the “license period”. The broadcaster is also constrained by other conditions depending on the number of runs, the means used for the transmission of content to end users, the language, and the payment access policy for the final user. In this particular example the broadcaster gets exclusivity at the agreed conditions, however the rights holder can still agree other contracts with other parties (not necessarily broadcasters) provided that they don’t conflict with the present one.

Figure 3 shows part of the narrative version of the contract, in natural language, highlighting the fragments related to general terms, that is parties, object of the license agreement and rights

granted to RAI (clauses 1 and 2 of the contract) and first permission granted to RAI (linear delivery, with free-of-charge access policy and a number of runs limited to 10).

Proposal of Agreement Rai (Licensee) - XXXX (Licensor)  
[...]  
That being stated, it is hereby formulated the following Proposal:  
1) [...]  
2) OBJECT OF THE LICENSE AGREEMENT RIGHTS GRANTED TO RAI  
2.1 (Acquisition of 100% exploitation rights both by free of charge and upon any kind of payment communication to the public and/or by making the Program available to the public, both free of charge and upon any kind of payments, at the time and place chosen by the viewer, in Italy, Vatican City, Republic of San Marino and Principality of Monaco) Under this Agreement, Rai acquires from XXXX, on an exclusive basis and with the fullest and unconditional authority to assign/grant/sublicense to any third parties, 100% (one hundred per cent) of the following utilisation and economic exploitation rights - and 100% (one hundred per cent) of the relative net receipts related to the following : First Run Animated Tv Series (hereinafter also the Animated Series and/or the Program and/or Series) in the Italian language dubbed version, and to the pertaining filmed materials, in the Italian language dubbed version thereto, for the entire term specified below (the Licensed Period) in the territories of Italy, Vatican City, Republic of San Marino and Principality of Monaco, being however agreed that overspill does not constitute a breach of the Agreement (hereinafter, jointly, the Territory):  
[...]  
i) by communication to the public through remote diffusion/broadcast, whether or not a charge is being paid by the viewer [i.e. any and all free of charge and upon any kind of payment forms of circular diffusion/broadcast (point to multipoint), including the so-called Free TV, Pay Tv, Pay per View, Near Video on Demand, Pay per channel, Pay per Day, etc.] and/or  
ii) [...]  
The grant is made for n. 5 (five) years starting on [...], until [...], (the so-called License Period);  
Within the Territory and during the License Period, Rai shall have the right:  
[...]  
The following number of runs are hereby granted during the License Period:  
- with reference to the communication to the public by unencrypted and free of charge television diffusion/broadcast (point to multipoint communication) - the so-called Free TV by any means and methods on general content channels, with the sole exception of original transmissions by digital terrestrial technology as better specified in the following sub paragraph: 10 (ten) runs;  
- [...]  
3.2 [...]  
3.3 (Right to use separate excerpts)  
[...]

Figure 3. Textual contract in natural language<sup>9</sup>

When modelling contracts, the first stage implies the identification of its deontic clauses. The contract under consideration is made up of five ones. Three of them grant RAI the permission to communicate to the public the Animated Series (*isan:ab123yz*) for five years in Italy, Vatican City, Republic of San Marino and Principality of Monaco, in the Italian language on an exclusive basis, with respectively the following further conditions:

<sup>9</sup> Note that all sensitive information has been removed from the original contract. Also, due to space limitations we have removed sub-clauses related to the other four permissions.

- to linear delivery, that is a communication to the public in a point-to-multipoint modality in which many final users access the content simultaneously, with free-of-charge access policy and a number of runs limited to 10.
- to non-linear delivery, that is for fruition at the moment chosen by the end user at his individual request on the basis of a catalogue of programs selected and made available by the media service provider
- to linear delivery, with pay access policy, without limitations to the number of runs.

The two other clauses grant to RAI permissions, for five years and on an exclusive basis, to create excerpts from the Animated Series and to make communication to the public for those excerpts in the same countries as for the Animated Series.

The deontic clauses also specify that RAI gets 100% of permission use (if permissions were shared with other parties, they could not be exploited without the consensus of the other holders, possibly granted with another agreement), 100% of net receipts, and the right to sublicense the granted permissions to third parties.

Figure 4 shows graphically the model for the first deontic clause.

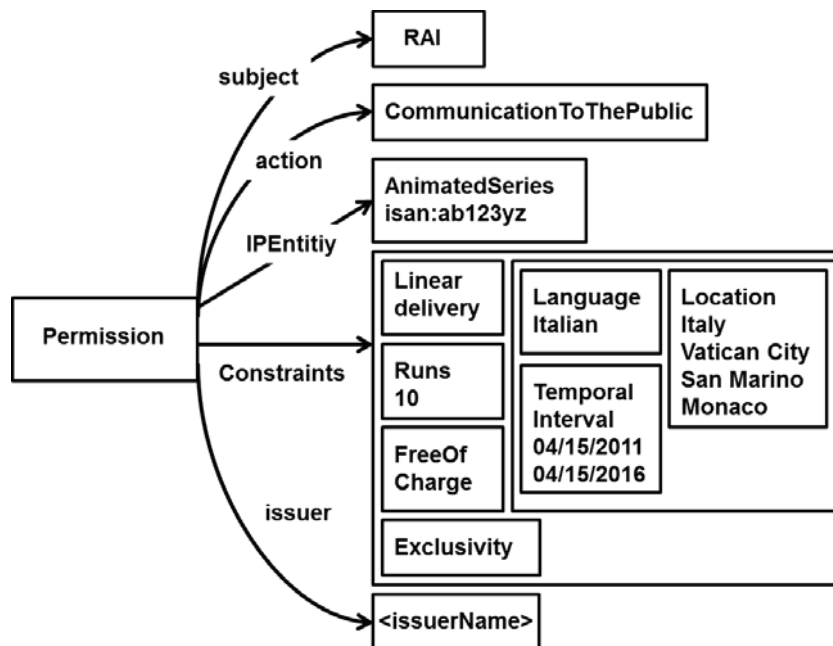


Figure 4. Communication to the public permission

Finally, the contract is digitally represented according to the MPEG-21 CEL obtaining its machine readable version. An extract of it, showing the *linear delivery with free-of-charge access policy* clause is presented in Figure 5.

```
<cel-core:contract>
  <cel-core:textVersion>
    <!-- TEXT OF THE ORIGINAL NARRATIVE CONTRACT-->
  </cel-core:textVersion>
  <cel-core:metadata>
    <cel-core:simpledc>
      <dc:title>Example One</dc:title>
      <dc:date>2012-10-09</dc:date>
      <dc:creator>RAI</dc:creator>
      <dc:identifier>urn:mpeg:mpeg21:cel:cel-ipre:2012:cel_example_n1_v2</dc:identifier>
    </cel-core:simpledc>
  </cel-core:metadata>
  <cel-core:party id="licensor">
    <!-- LICENSOR DATA-->
  </cel-core:party>
  <cel-core:party id="RAI">
    [ ... ]
  </cel-core:party>
  <cel-core:body>
    <cel-core:operativePart>
      <cel-core:deonticStructuredClause id="P892" deonticType="Permission">
        <cel-core:subject partyRef="RAI"/>
        <cel-core:act>
          <cel-ipre:communicationToThePublic/>
        </cel-core:act>
        <cel-core:object>
          <cel-core:item name="AnimatedSeries">
            <dii:Identifier>isan:ab123yz</dii:Identifier>
          </cel-core:item>
        </cel-core:object>
        <cel-core:constraint>
          <cel-ipre:accessPolicy access="freeOfCharge"/>
          <cel-ipre:deliveryModality mod="linear"/>
          <cel-ipre:runs number="10"/>
          <cel-core:factIntersection>
            <cel-ipre:language lang="it"/>
            <cel-ipre:spatialLocation>
              <cel-ipre:location>
                <cel-ipre:country>VA</cel-ipre:country>
                <cel-ipre:country>IT</cel-ipre:country>
                <cel-ipre:country>SM</cel-ipre:country>
                <cel-ipre:country>MC</cel-ipre:country>
              </cel-ipre:location>
            </cel-ipre:spatialLocation>
            <cel-ipre:temporalInterval>
              <cel-ipre:afterDate>2011-04-15T00:00:00</cel-ipre:afterDate>
              <cel-ipre:beforeDate>2016-04-15T23:59:59</cel-ipre:beforeDate>
            </cel-ipre:temporalInterval>
          </cel-core:factIntersection>
          <cel-ipre:isExclusive value="true"/>
        </cel-core:constraint>
        <cel-core:issuer partyRef="licensor"/>
      </cel-core:deonticStructuredClause>
      [ ... ]
    </cel-core:operativePart>
  </cel-core:body>
</cel-core:contract>
```

Figure 5. MPEG-21 CEL contract example extract

The presented example shows how CEL is suitable to represent faithfully and in a structured way the typical terms of the broadcaster application scenario. However all the media B2B scenarios can be covered within the same paradigm of CEL-IPRE, while for other domains it may be useful to further define other specific extensions to CEL-core.

## VI. CONTEXTS OF USE FOR MEDIA CONTRACTS

There are various possible contexts of use for media contracts, all along the media life-cycle in the business domain, which includes media creation - involving the authors and the production companies, the media delivery - involving broadcasters, distribution and telecommunication companies, and the archives – which hold the content at disposal for re-use in new productions or for exploitation “as is”. This section presents first the context of media archives, not necessarily broadcasters, that was the focus of PrestoPRIME project, and then the context of Digital Rights Management (DRM), taking the example of AXMEDIS project that embraces also the business-to-consumer (B2C) domain.

### A. Media Archives

The contexts of use engaged within the PrestoPRIME project deal with audiovisual preservation issues. Running long term preservation processes is expensive and requires commercial exploitation of the archive contents, by increasing its re-use and keeping it alive. This effort is not justified for archival items for which the situation of rights remain uncertain because the terms of old contracts are not managed by the legacy systems and any decision requires the interpretation of the contract text by human staff.

Therefore rights clearance is the area that can get the greatest benefits from the adoption of a rights format able to represent the contract conditions unambiguously and machine readable.

Rights clearance activity can be summarized by the “Checkwith” use case, in which the user has a defined target exploitation and she wants to check either which archival items, or whether a specific archival item, has associated rights matching the target request<sup>10</sup>, where the target exploitation context is fully defined by the action and the set of constraints which the user is willing to accept.

Check-with rights is certainly required for the broadcasting schedule planning or other preparation of communications to the public, but it is also relevant to the estimation of the value of the media holdings and thus to the optimization of the exploitation activity. For instance the broadcaster will schedule the broadcast of programs close to expiration of the license period or will organize negotiations for purchasing new rights, according to the estimated needs.

Eventually Check-with is also necessary for sales use case. When the rights owner aims to be the issuer in a new contract, she must verify in advance about full ownership of offered rights and availability of sublicense right. If the sale is on an exclusive basis, it will be necessary to derive the impact of the sale on the remaining rights for the object of the contract.

### B. Digital rights management

The AXMEDIS project developed an interoperable DRM platform for the secure management of multimedia content, protecting and managing rights for a wide range of content, in both B2B and B2C markets. In the AXMEDIS project, the aim of contracts digitalization was to control the

<sup>10</sup> “true” if, according to the given contract, the user is allowed to act the target exploitation on the given intellectual property entity, “false” otherwise.

exploitation of rights, besides preservation. To this end, a semi-automated system to digitize audiovisual contracts was developed, where users can easily obtain the electronic version of a narrative contract with the support of a computer. The user introduces the contract in text format and following a computer wizard finally obtains the correspondent electronic license. The contracts' converter first converts the text file into an intermediate contract descriptor file, analyze all the sentences in the contract, and those that belong to the AXMEDIS set of contracts clauses are automatically pre-classified in a new tagged file, which is XML structured. Then, a guided process starts, where the user is asked to fill some forms, basically to confirm the vocabulary chosen by the application to represent rights and conditions in of the narrative contract. Once the license version of the contract has been generated associated contents can be securely distributed, ensuring the protection of the intellectual property rights, through the AXMEDIS platform.

## VII. CONCLUSIONS AND FUTURE WORK

This paper shows how MPEG-21 CEL provides the means for representing media contracts in form of XML documents, permitting the verification of the agreed deontic expressions even when defined by specifying complex conditions, as found in real contracts. The machine readable part is also conceived to provide internal references to the included narrative text, of both the complete contracts and their excerpt clauses.

Globally MPEG-21 CEL overcomes most limitations of previous works summarized in section II, and is therefore a good candidate standard option for adoption in media rights operations.

Further work is although necessary in order to: (1) identify any possible gaps which might prevent adoption because of consequent need to handle exceptions to full machine readable terms; (2) specify and clarify the relationships between this and other latest related works, such as MPEG-21 MCO, so as to be able to indicate for all the most suitable contexts of use; (3) propose approaches in which new contracts are directly created and signed in machine readable formats.

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