

Towards a Contract Expression Language for Audiovisual Content

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Abstract. Different initiatives have been started in the last years to achieve long term digital preservation of audiovisual content. This process also implies the preservation of the associated metadata, digital rights, etc. The adoption of standard solutions is essential to enable interoperability in a preservation framework. The narrative contracts dealing with the audiovisual content written in natural language can be digitally represented following two different approaches. The former constrains the definition of the contracts to a specific rights model. While the latter derives a usable model from the analysis of a relevant contract sample set. Following the second approach, this paper proposes a model, which faithfully represents audiovisual contracts, resultant from the extension of the MPEG-21 Media Value Chain Ontology standard.

Keywords: Rights ontology, Audiovisual contracts

1 Introduction

The faithful representation of the Rights owned by an organisation about their audiovisual materials is crucial for allowing both the compliance to the terms agreed with other parties and the optimisation of the exploitation of their assets. Several international standardisation efforts have been made in the last years, and they are currently being done, trying to help accomplishing this goal. Examples may include the old language from the Content Reference Forum (CRF) [1], the work by OASIS on eContracts [2] and the current work from ISO/IEC in the scope of MPEG-21 [3], in which this paper focuses.

MPEG-21 specifies a Multimedia Framework for users to exchange digital content. Compared to other popular platforms, promoted by distributors for end-users to consume final products, MPEG-21 proposes an environment where each party in

the media value chain can enjoy equal opportunities in an open market, including content creators, producers, distributors and service providers.

From this idea, an MPEG-21 User is neutrally defined as any agent transacting with or making use of a generic digital container, called Digital Item. The conditions under which content circulates between MPEG-21 Users are then unspecified and can take many different forms, much in the contrary of the distributor to end-user platforms where the flow of multimedia content is unidirectional and subject to fixed restrictions which can only be accepted or rejected by the end-user.

The specification of MPEG-21 currently consists of 19 parts, describing in hundreds of pages the nature and representation of these abstract containers called Digital Items, including how to identify them, which operations can be performed on them, how they should be adapted in different environments and the way they should be stored or streamed. It also describes how Digital Items can be managed and protected, and how digital licenses can be issued for their consumption with the specific vocabulary of a rights dictionary, and the semantic description of the value chain itself.

Such a long and complete specification, however, has ignored so far how to describe the conditions under which products and services are exchanged in the multimedia framework, and up to date there is no digital replacement for the contracts in the business-to-business (B2B) transactions. Current practice still manages narrative contracts written in natural language, maybe stored as digital documents but not in a machine-readable form. The newest effort in MPEG-21 is to cover this gap, by means of a new Contract Expression Language (CEL), machine-readable and integrated with the rest of the MPEG-21 specification.

This paper is organized as follows. First, the motivation of this work is presented, that is, the need to preserve audiovisual contracts in an electronic format. To this end, two technologies have been studied (presented in section 3): the MPEG-21 REL and the MPEG-21 MVCO. Then, we justify our choice, the MVCO and how we have extended it to support current clauses in audiovisual contracts. Section 4 presents process and results of this work, the Audiovisual Rights Ontology, which has been adopted as a new part of the MPEG-21 standard, the MPEG-21 CEL. Finally, section 5 concludes the paper and points out the future research directions.

2 Motivation: Preservation of Audiovisual Contracts

The key element in current narrative audiovisual contracts is “rights”. The trade of rights is constrained by the negotiation boundaries, resulting from the combination of:

- (1) the rights owned by the seller,
- (2) the purpose of purchaser in terms of intended use of the intellectual property entity, and
- (3) the laws.

Within those boundaries, the parties freely define and agree on conditions and terms in narrative contracts.

The parties evaluate the price of rights in relation to their expected use, which is affected by the technical framework related to the means for reaching their objective. The terminology used in the contract for defining the rights statements are completely left to the freedom of the parties, who are not constrained to adopt any standard vocabulary, and till the present time the text of the contract clauses is left free without any legally imposed form. In the last years, any new technology suitable to the exploitation of rights has been mentioned in contracts as the object of specific permission, so that we can find in narrative contracts the rights for Free television, Internet rights, new media rights, UMTS rights, ringup-tone rights, and so on. The same “term” has not always the same meaning for all operators and often the meaning is different from that of technical or engineering environments.

Attached to many contracts it is possible to find a glossary of used terms, but a common reference one was lacking.

Within the European project PrestoPRIME [4], RAI [5] has studied a relevant contract sample set, for trying to derive a glossary of rights terms commonly used in negotiations at the European level. The used sample set included examples provided by the project partners, such as BBC [6] and INA [7], in addition to a large selection of agreements signed by RAI and involving overall various operators for cases such worldwide sports events, movies, and international co-productions, so that the used terms are already established and shared.

It was necessary to adopt criteria for the selection of the glossary entries and their respective definitions. Once identified a concept, the most used term has been selected among the possible aliases, together with the least restrictive definition in order to allow subsequent refinements.

The activities of analysis of the text of narrative contracts and of creation of the common glossary of rights terms permitted to reach the conclusion that an exploitation right is expressed as the combination of an Intellectual-Property Rights component, where at least one action as defined by copyright law is indicated, and a set of conditions and/or constraints which can restrict the use of the right.

3 MPEG-21 and the Media Value Chain Ontology

As introduced before, MPEG-21 is an ISO/IEC suite of standards for a multimedia framework which includes many parts strictly related to the digital rights representation.

In addition to the authoritativeness of the standard body, MPEG-21 provided two possible promising options as the standard basis of an extended audiovisual rights model, which could be suitable to represent contracts.

On one hand, MPEG-21 REL (Rights Expression Language) [8] and related profiles, providing a normative XML schema for rights representation, and on the other hand the MPEG-21 MVCO (Media Value Chain Ontology) [9], making use of an ontology-based model expressed in OWL. A comparison between these possible representations can be found in [10].

The DMAG [11] had proposed several years ago how to represent narrative contracts with MPEG-21 REL [8] [12]. In this first attempt, the only natural way of representing contracts in MPEG-21 was using MPEG-21 REL licenses, but now, the MVCO can also be used to give a more precise meaning to the elements in the electronic contract. It is worth noting that the DMAG has been deeply involved in the development of the MVCO [9]. Moreover, in both attempts we realized that most of the clauses in contracts could be vaguely modelled using the MPEG-21 REL, nevertheless, when trying to formalise them was practically impossible. For example, clauses in a contract as common as the declaration of a buying option for the new episodes of a series, if done, could not be modelled using the MPEG-21 REL, neither key elements in a contract, such as the nature of a transmission cannot be expressed using the MPEG-21 REL.

Then, based on our first experience, the requirements of the PrestoPRIME project and the limitations of the MPEG-21 REL, our choice has fallen on MVCO because of the greater flexibility and expressiveness for representing contracts and the greater research interest in the ontology. For every editorial entity to be preserved by an archive, this approach results in the creation of one or more files containing contract instances, which are written in the same language as the ontology itself. This will permit to any software component processing the contract instance to directly make use of the model (the ontology) to performing its task, e.g. validating against format and consistency or answering to a query about the permission for a given action.

The rest of this section is devoted to present the MPEG-21 MVCO.

ISO/IEC21000-19 [9] standardises a Media Value Chain Ontology (MVCO), which formalizes the representation of the Media Value Chain. It represents in a standard way the Intellectual Property (IP) along the Value Chain, by means of different kinds of Intellectual Property entities, Actions and User roles. The act of creation is the starting point of the chain. The work and the successively derived objects in the value chain are called *IPEntities*, which are all the different kind of objects that can be subject to Intellectual Property. More specifically, the different types of *IPEntities* defined in this model are: Work, Adaptation, Manifestation, Instance, Copy, and Product. Actions are the processes of doing something over *IPEntities* relevant to the Intellectual Property. The actions defined in this model are: *CreateWork*, *MakeAdaptation*, *MakeManifestation*, *MakeInstance*, *MakeCopy*, *Produce*, *Distribute*, and *EndUserAction*. Finally, *Users* are the agents that interact with *IPEntities*. They interact according to a set of generic roles that can be adopted by persons, institutions, machines, or even a group of them. The roles defined in the MVCO model are: *Creator*, *Adaptor*, *Instantiator*, *Producer*, *Distributor*, and *EndUser*.

MVCO defines the relationships among Users, IP Entities and Actions as depicted in Fig. 1. In this figure, the round boxes represent classes, and the arrows object properties (heading from domain class to range class).



Fig. 1. MVCO model – Relationships among User, Action and IPEntity.

In the MVCO ontology, permissions represent the transfers of rights. A *Permission* relates an *IP Entity* with the transmitted right, the original and the new rights owners. A *Permission* may require the prior fulfilment of conditions, and these conditions are represented as Facts. These Facts are general statements with a binary truth value, describing any constraint related to the context or the users. Fig. 2 shows the Permission model in MVCO.

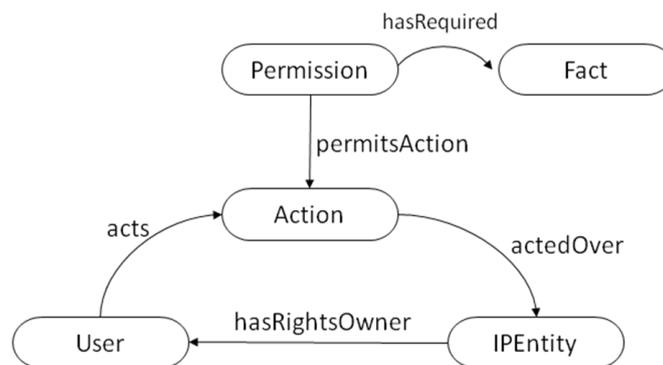


Fig. 2. MVCO Permission model

4 Contracts preservation – The process

In order to preserve current narrative contracts, we decided to develop an audiovisual rights ontology model. To achieve our goal, we have developed a process in which we take advantage of the extension possibilities of the MVCO.

The MVCO was designed to be extended to address the particular representation needs in different business models, while keeping a common core. This common core is per se only able to represent the most essential information, and for practical uses, the extension is needed. Therefore, the process of mapping can be said to comprise the following stages:

1. Identify the key information in the contracts which cannot be dismissed. The task is deciding which nuances cannot be lost and which information can be dropped in the final digital representation.
2. Define the MVCO extension to represent that information, with the form of a derived ontology.

3. Define the process for instantiating the classes of the MVCO extension, so that non IT experts can also write their own electronic contracts. This step can be done with the help of an application.
4. Use Step 3 to generate the instances.
5. Validate the resulting representation.

Once the initial analysis has been done and steps 1-2-3 are completed with some representative contracts, only steps 4-5 are needed to model additional contracts. Steps 1-2 can be iterated evaluating different contracts, until an acceptable model is reached.

4.1 Analysis of contracts

The collected contract sample set has been divided into two subsets, one was used in the first analysis and one in the validation stage.

The first subset was made of six contracts, three of which written in English language, two in Italian, and one in French language with English translation.

Two contracts are agreements for co-production, respectively of animated series and movie, three contracts are license or acquisition agreements for the utilization and exploitation rights, one contract is a licence agreement for the exploitation of audiovisual sequences in new productions.

The analysis carried out permitted to identify the parts of contracts which are most relevant for the goal of rights representation. They include the identification of the parties, the object of the agreement, the territory of application, the license period, the actions granted (communication to the public, use excerpts), the number of runs depending on the modalities of transmissions, the exclusivity of the right transferred, the percentages of exploitation, the possibility to sublicense, the possibility to have simultaneous transmissions.

4.2 Audiovisual Rights Ontology Model

This section provides a description of the extensions to MVCO which have been identified as necessary to support the requirements of representation of audiovisual exploitation rights.

This extension set was jointly developed by the 3 organizations of the authors and first made public in [13] as PrestoPRIME Audiovisual Rights Ontology (PPAVRO). This ontology is available at [14].

Fig. 3 shows a basic MVCO representation with permissions. One user, the licensee, is allowed by means of the permission issued by the licensor user to act a specific action over an IP Entity, the action may result in a new IP Entity. The permission is valid if its requirements (conditions), expressed as Facts, are all true.

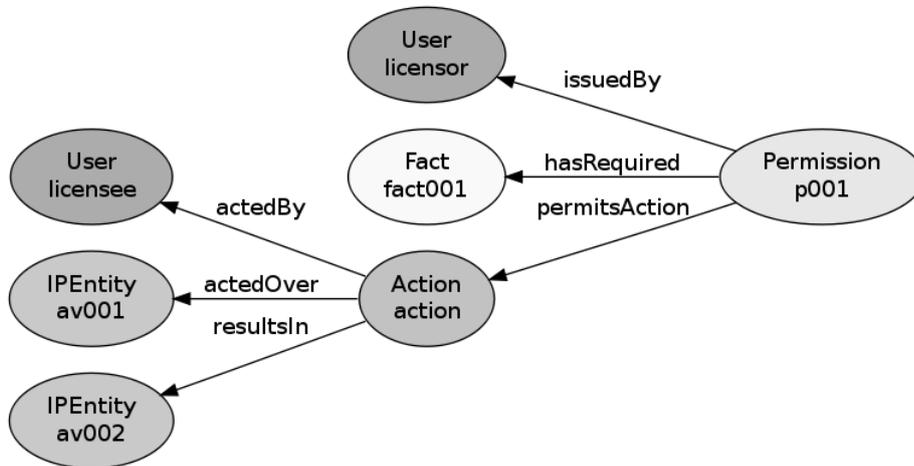


Fig. 3. MVC O rights representation with Permissions

The identified necessary extensions consist of:

- (1) an Action class hierarchy for modelling the actions related to the exploitation rights;
- (2) a Fact class hierarchy for modelling the various conditions and constraints found in the real contracts;
- (3) a set of DataProperties to be associated to some of those classes; and
- (4) a mechanism for defining more complex logic constructs of Facts.

In order to faithfully support the actions identified from the analysis of the legal framework and related to the economical exploitation of IP Rights, the six identified actions (*Fixate*, *Duplicate*, *Transform*, *AudivisualDistribute*, *PublicPerformance*, and *CommunicationToThePublic*) are defined as subclasses of *ExploitIPRights*, which itself is used for modelling the entirety of IP rights, substantially equivalent to having all rights granted.

The typical constraints found in the analysed contracts are about:

- (1) the restriction on the Territory, basically given as list of countries, which gives the *SpatialContext*;
- (2) the license period given by the *TemporalContext*;
- (3) the language to be used for the communication to the public, such as that for dubbing and/or subtitles; and
- (4) the maximum number of runs.

Within the contracts we could identify several dimensions used for limiting the exploitation of granted rights and thus increasing the number of possible customers, as shown by Fig. 4.

The *Access Policy* is the concept used for expressing restrictions on the way the final user is charged (Pay, Pay-per-view, Subscription) or not (Free of charge) for the content fruition.

The restrictions on *Delivery Modality* are about the control of the time and place of fruition of the communication to the public. For example the broadcasting delivery modality is specific of a linear service, provided to many simultaneous

listeners/viewers for viewing of audiovisual content on the basis of a programme schedule.

There are restrictions on the *Device*, which is the type of equipment for the fruition of content by the final user, such as television sets, mobile phones, computers, etc.

Another dimension is that of the *Means*, i.e. the technology used for delivering the content to the final users, such as broadcast or telecommunication technologies, or the internet.

Eventually contracts may have restrictions on how the access of the final user is established and if it must be defined or not an expiration time for content availability (Open/Restricted, Limited /Unlimited).

A glossary for the terms can be found in [15]. The glossary was partially validated through a publication on PrestoPRIME web site, with a request for feedbacks.

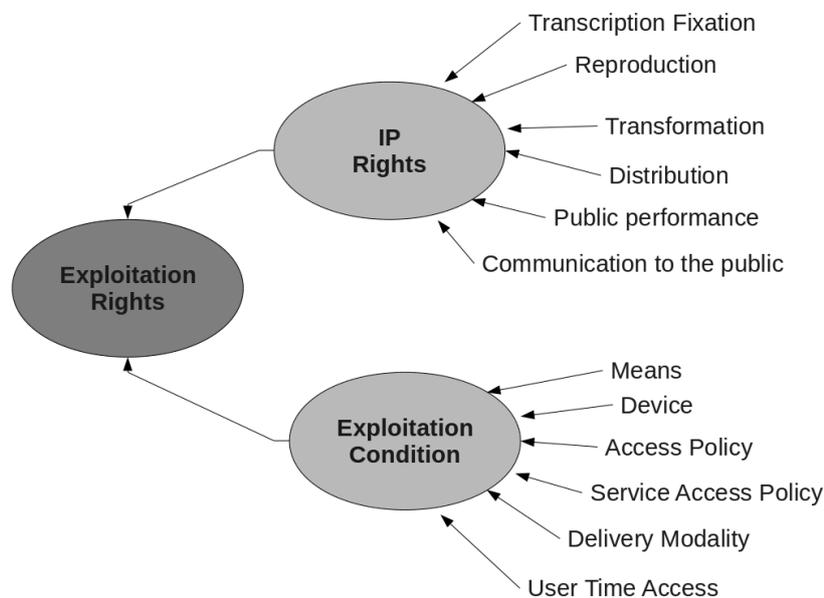


Fig. 4. Exploitation rights

5 The current results – MPEG-21 CE

From the work presented in this paper, a new part for the MPEG-21 standard comes up: part 20 of ISO/IEC 21000, the MPEG-21 Contract Expression Language (CEL), which takes into account for its standardization the model described in this paper.

In fact, the authors contributed several documents [16] to the corresponding ISO/IEC working group (ISO/IEC JTC1 SC29/WG11). The current version of MPEG-21 Part 20, now under CD (Committee Draft) ballot, is mainly based on these contributions.

For two or more MPEG-21 Users to transact Digital Items, there may be an agreement between them. And while the representation of this agreement has been traditionally supported by means of narrative contracts, the Contract Expression Language should be the electronic counterpart in the framework of MPEG-21.

MPEG-21 Contracts can be thus defined as the representation of agreements formed for the transaction of MPEG-21 Digital Items or material representable as such, or the provision of services based on MPEG technologies in a wider sense. CEL therefore is the representation of these contracts.

The description of MPEG-21 Contracts with the Contract Expression Language enables the integration of the contracting process (formation, execution, archiving) with the MPEG-21 business work-flow.

The contracts under scope are therefore both those about transactions of content as MPEG-21 Digital Items and those about the provision of MPEG-21-based services, representing aspects which include the business clauses (expressed in natural language as they appear in the original narrative contract) and the operative clauses (computer language expressions).

As with other technologies in the MPEG-21, the CEL is an XML based language structured in different schemas. But in any case, a CEL contract is a XML document.

Being so, the specification of the Contract Expression Language is the specification of the XML Schema against which a CEL contract should validate, plus the interpretation of their elements given by this Part of the standard. The CEL specification is organized in a CEL core plus CEL extensions:

- The Contract Expression Language core provides the elements to structure the natural language clauses, plus the language elements in OWL to structure operative clauses.
- The Contract Expression Language extensions provide the elements and vocabulary to describe specific contracts about content or services. The audiovisual rights ontology model described in Section 4.2 fits here.

The Contract Expression Language core consists of an XML Schema to specify the general elements to structure the natural language clauses of contracts plus an OWL part to specify operative clauses, notwithstanding the use of MPEG-21 REL when more convenient. Hence, an MPEG-21 Contract typically contains an exchange of promises between the parties, which correspond to one of the deontic concepts of permission, prohibition and obligation. Some of the clauses are specified to be operative clauses, and some others can be labelled to be merely textual. Operative clauses are intended to eventually be authorised, in contrast to the text clauses.

A representation of MPEG-21 CEL core elements is shown in Fig. 5.

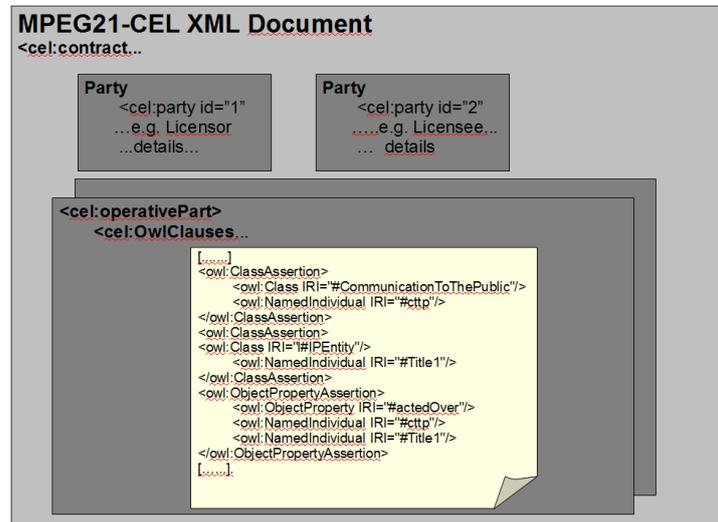


Fig. 5. Core elements of MPEG-21 CEL

Figures from 6 to 9 provide an example of contract representation using MPEG-21 CEL with an OWL part based on the model described in the paper to represent the operative clauses. In the example the XML namespaces have been omitted. The *metadata* element includes some high level descriptors taken from *Dublin Core*, while the parties in the contract are represented using again *Dublin Core* metadata or an alternative representation (vCard). In the body the *textClause* element is used to include the text of the original narrative contract while the *operativePart* element contains the operative clauses represented using OWL.

```

<cel:contract >
  <cel:metadata>
    <cel:simpledc>
      <dc:title>A CEL example</dc:title>
      <dc:date>2011-07-20</dc:date>
      <dc:creator>RAI</dc:creator>
      <dc:identifier>urn:mpeg:mpeg21:cel:mcow1:2011/ce1_example
      </dc:identifier>
    </cel:simpledc>
  </cel:metadata>
  <cel:party id="1">
    <dc:description>Licensor</dc:description>
    <cel:any><vCard: [omissis]</vCard:></cel:any>
  </cel:party>
  <cel:party id="2">
    <dc:description>Licensee</dc:description>
    <cel:any><vCard: [omissis]</vCard:></cel:any>
  </cel:party>
  <cel:body>

```

Fig. 6. Example of MPEG21 CEL – part 1 - root element, metadata and parties

```

    <cel:textClause>
      <cel:text>
<!-- TEXT OF THE ORIGINAL NARRATIVE CONTRACT -->
[omissis]
100% of the exclusive rights to use and exploit the Programme for "free
television" broadcasts, using any existing, linear broadcasting
technique or technology (purely by way of example: terrestrial, cable,
fibre, telephone duplex cable, satellite with either analogue or digital
signal, narrowband, broadband, wireless, dtt, thematic channels, etc.)
in any format, on any medium, through any distribution channel, on any
platform, and with any access terminal or means, technically conceivable
now -excluding mobile TV and internet tv-, in Italian language in Italy,
the Vatican City and the Republic of San Marino, notwithstanding any
technically unavoidable border overlapping.
[omissis]
With reference to the Programme the grant is made starting on November
the 1st, 2011, (the so called License Period);
[omissis]
      </cel:text>
    </cel:textClause>

```

Fig. 7. Example of MPEG21 CEL – part 2 -text of original narrative contract (non operative clauses are omitted)

```

    <cel:operativePart>
      <cel:OwlClauses>[omissis]
<owl:ClassAssertion>
  <owl:Class IRI="urn:mpeg:mpeg21:cel:mcowl:2011#CommunicationToThePublic"/>
  <owl:NamedIndividual IRI="#cttp"/>
</owl:ClassAssertion><owl:ClassAssertion>
  <owl:Class IRI="urn:mpeg:mpeg21:cel:mcowl:2011#TemporalContext"/>
  <owl:NamedIndividual IRI="#t01"/>
</owl:ClassAssertion><owl:ClassAssertion>
  <owl:Class IRI="http://purl.oclc.org/NET/mvco.owl#Permission"/>
  <owl:NamedIndividual IRI="#p001"/>
</owl:ClassAssertion>
<owl:ObjectPropertyAssertion>
  <owl:ObjectProperty
IRI="http://purl.oclc.org/NET/mvco.owl#permitsAction"/>
  <owl:NamedIndividual IRI="#p001"/>
  <owl:NamedIndividual IRI="#cttp"/>
</owl:ObjectPropertyAssertion>
<owl>DataPropertyAssertion>
  <owl>DataProperty IRI="urn:mpeg:mpeg21:cel:mcowl:2011#afterDate"/>
  <owl:NamedIndividual IRI="#t01"/>
  <owl:Literal >20111101</owl:Literal>
</owl>DataPropertyAssertion>
[omissis]</cel:OwlClauses>
  </cel:operativePart>
</cel:body>
</cel:contract>

```

Fig. 8. Example of MPEG21 CEL – part 3 - excerpt of the OWL/XML serialization of the OWL Clauses

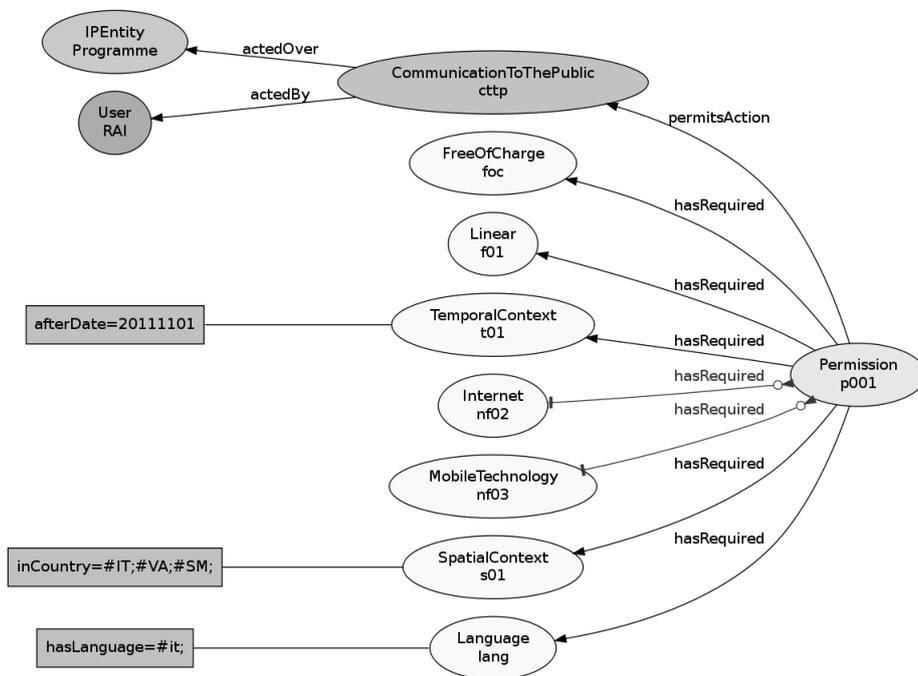


Fig. 9. Diagram of the OWL Clauses of the example given in Fig. 8

6 Conclusions and Future Work

In this paper we presented the existing strong incentive to define and adopt a way to faithfully represent the information about the audiovisual exploitation rights, as they are object of trade in the real world.

We understood that although the results of the former standardisation efforts can constitute a reasonable basis, it is only through the analysis of actual contracts that it is possible to define the necessary extensions.

The proposal of contract expression language which is submitted to ISO as candidate ISO-21000-part 20, defines the format of an XML contract document, in which the rights clauses are expressed as instances of the audiovisual rights ontology model, which resulted from the extension of the MPEG-21 MVCO.

This is going to support the entire rights lifecycle from the first proposal of agreement, to all the trades of exploitation rights. Archived audiovisual contents are going to be related to the information about the rights owned by the archive organisation. Any exploitation activity will be supported by a set of services for rights information handling, including creation, update, query, delivery, and presentation.

Our future work, in addition to support the standardisation activity, will include a prototype which will be integrated within the PrestoPRIME preservation system and submitted to the project trial activities in November 2011 and in 2012.

Acknowledgments

This work was partially supported by the PrestoPRIME project [4], funded by the European Commission under ICT FP7 (Seventh Framework Programme, Contract No. 231161).

This work has been partially supported by the Spanish Government through the project MCM-LC (TEC 2008-06692-C02-01).

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