

Media Contract Formalization Using a Standardized Contract Expression Language

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The MPEG-21 Contract Expression Language defines a language for representing media contracts as XML. The MPEG-21 CEL has two schemas: a core defining the contract's structural elements, and an extension with vocabulary for specific applications.

Media 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 that can be used as evidence to prove acceptance of liabilities; preserving them in the face of possible contingencies is advisable at least during the contract's duration.

Companies handling audiovisual contents generally enter into many different contracts, and managing them is critical and sometimes challenging. Over time, contracts in a variety of

formats accumulate, and companies need, at the very least, to access them in a digital and homogeneous form. Thus, different collectives—including broadcasters, libraries, museums, and so on—need to digitalize contracts for mere preservation purposes. Additionally, machine-readable, structured formats are preferred over scanned documents (which are digital, but not easily processed) because they let organizations manage their audiovisual assets within wider media content management systems.

Today, electronic contracts are interpreted in broad terms, and they are required to guide different workflow systems across different organizational business processes and different companies, thereby granting business integration over electronic networks. Although the integrated design of contract formats, frameworks, and collections of related services is quite a heavy task and effectively domain-dependant, an alternative approach aims for a simple, neutral contract format irrespective of its intended use. This was the vision inspiring the OASIS e-Contracts format,¹ 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 favors the coexistence of disparate services acting upon the same document. Specifically, contract preservation and management is of the utmost interest for companies handling audiovisual content, due to the numerous contracts to manage and their key role in the business logic.

The Moving Picture Experts Group (MPEG), known for providing media encoding standards, recommends the MPEG-21 framework for representing and managing arbitrary digital items.² This digital framework is the placeholder for MPEG's latest initiative, which defines 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 MPEG-21,² respectively. Most general aspects are common to both, but MCO describes an OWL-based format, while CEL describes an XML-based one. Thus, implementation and integration issues are clearly different. Here, we focus on CEL, which defines a standard language to formally describe business agreements (parties, operative clauses, and so on) in a machine-readable form. CEL is organized in two schemas: a core, which defines a contract's

Contracts Formalization: Related Work

The electronic version of a media contract lets multimedia systems control the management of digital content, as well as preserve the terms and conditions of these contracts. Several initiatives have been conducted in the past few years to define a format for electronic contracts. Based on their influence on the MPEG-21 CEL design, we selected three to focus on here: the Content Reference Forum (CRF) Contract Expression Language (CEL),¹ the Organization for the Advancement of Structured Information Standards (OASIS) e-Contracts,² and the MPEG-21 Rights Expression Language (REL) extension used in the Axmedis project (www.axmedis.org).³

However, additional related work exists. The Cosmos⁴ system is one of the first initiatives in the area; in it, contracts were modeled and described in Unified Modeling Language (UML). Other early initiatives include the XML-based DocLog⁵ and the rule-based SweetDeal.⁶ The latter was supported by a DARPA Agent Markup Language (DAML) ontology; although other academic proposals appeared that were based on OWL,^{3,7,8} none gained much support. With the intention to produce a standard, it's also worth mentioning the Business Contract Language (BCL).⁹ Furthermore, work on contracts expression is closely related to other technologies, such as Object Constraint Language (OCL),¹⁰ the Web Services Agreement (WS-Agreement) specification,¹¹ and the ConSpec language.¹²

In any case, these other activities didn't have the same objectives as MPEG-21 CEL; they were rather specific to agreements on distribution of audiovisual content and were based on other non-MPEG technologies.

CRF Contract Expression Language

Almost 10 years ago, the CRF, an industry consortium founded to promote specifications for a content distribution framework, developed a CEL to represent agreements between different parties in content distribution contracts.¹³ It took as the starting point the MPEG-21 REL (Part

5 of MPEG-21¹⁴). REL is a standard language defined for the representation of right expressions.

The format's core element is the *clause*, which declares the permission, obligation, or prohibition of a principal for acting over a resource if a set of conditions is met or if some event must occur. The clause has the same structure and purpose of its counterpart in REL—the *grant* element—but also lets users specify events that must occur. This is one of the weaknesses of this language: because it's based on the MPEG-21 REL, it doesn't let users express complex facts—such as unions, intersections, or negations—or preconditions.

OASIS LegalXML eContracts

In 2007, OASIS established 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.

In the eContracts language model, contract clauses are represented by item elements, which can be grouped using block elements, and metadata with textual information of the contract. eContracts can be digitally signed by parties using the party-signature element.

Axmedis Extension of MPEG-21 REL

One of the Axmedis project's objectives was to manage audiovisual media governed by narrative contracts. For this purpose, it needed a CEL able to digitally express the terms and conditions in narrative audiovisual contracts. Because the Axmedis project was interlaced in the MPEG-21 standard's framework, 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

structural elements; and an extension for exploiting intellectual property rights, which results from broadcasters' requirements to include the media field's most common acts and constraints.

Once media contracts can be formally represented in a machine-readable language, it's important to facilitate the integration of contract 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. Here, we describe the MPEG-21 CEL, its design process, and examples of how it can be used.

Representing and Processing Media Contracts

This section presents the work and decisions that influenced the definition of the MPEG-21 CEL, as well as the design process followed for the specification of digital contracts.

dealing with diverse audiovisual material (including audio tracks, ringtones, photographic material, and video excerpts), different distribution channels (such as small retailers, Internet download, and online services), different parties (such as traditional and Internet distributors, and producers), and different countries of origin and application of the contracts.

MPEG-21 REL, originally intended for licenses, was well suited as a basis language for contracts with the due changes and thus an additional, nonstandard profile was created.³ The profile differentiated between *license clauses*, whose enforcement and control could be put into a computer's hands, and *lawyer clauses*, whose interpretation would always be left to the human intellect. Only the license clauses were represented in a well-structured form, given that the lawyer clauses included in REL licenses were simply textual information presented only for notarial purposes.

In addition to specifying the contract format, Axmedis promoted tools for easily editing electronic contracts or transforming narrative contracts in a semi-automatic process.³ Conversely, tools existed that took an electronic contract as input and returned a natural-language text with a description of the clauses as output.

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Framework

Influenced by work done in the Axmedis project (see www.axmedis.org and the "Contracts Formalization: Related Work" sidebar), a proposal was made in April 2008 to extend Part 5 of MPEG-21, Rights Expression Language, to support the representation of contracts on audiovisual material. This work was supported by 11 organizations, but it didn't result in an update of the standard. Later on, new work by the PrestoPRIME European Project (www.prestoprime.org) was conducted in the contract representation area and included several broadcasters and digital archives as project partners, including Radiotelevisione Italiana (RAI), the Italian national public service broadcaster; the British Broadcasting Company (BBC); the Institut National de l'Audiovisuel (INA); Beel en Geluid (B&G), the Dutch national institute for sound and vision; and Österreichischer Rundfunk (ORF), the Austrian national public service broadcaster.

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The PrestoPRIME partners' new work on contract formalization was mainly done in the context of digital preservation of content.³ The work used more than 30 audiovisual contracts representing real business-to-business (B2B) activities for requirements analysis and validation, and it was tested in a practical application setup.⁴ This led MPEG-21 experts to reconsider the previous approach and take into account the MPEG-21 Media Value Chain Ontology (MVCO, Part 19 of MPEG-21²), 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 in MPEG-21 CEL and MCO, respectively. Although most general aspects are common to both, the activities address two different technical environments: OWL and XML. Depending on contexts and practical reasons, such as tool availability or integration with other services, the balance between the pros and cons of adopting one or the other can vary. For example, the MPEG-21 reference software (MPEG-21, Part 8 Amendment 3)² provides some services and modules specific for either MCO or CEL, but a particular conversion module lets users switch between the two formats, supporting the completion of the toolset and integration between different operative environments.

Design

To define a new language for representing narrative contracts, we followed a six-step process:

1. Collect a corpus of real contracts, representative of actual industry contracts and diverse enough to include the different contract flavors.
2. Identify the key contract information that can't be dismissed. The task here is deciding which nuances can't be lost (such as amounts and temporal terms) and which information can be dropped in the final digital representation (unimportant details, formalism appearing in every contract, and so on).
3. Define a model for representing that information, taking into account that the CEL will be structured as XML.
4. Develop an application to generate contracts, so that non-IT experts can also write their own electronic contracts.

5. Use the application from Step 4 to generate the XML-based contracts.
6. Validate the resulting representation.

The modeling step, which is repeated as many times as necessary to satisfy the whole sample set, can 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 almost all contracts, the range of conditions was wide and potentially bounded only by the will of the parties. The importance of a large and representative sample set is due to the need to find examples of almost all possible patterns of conditions.

Requirements

The first step in the design process of the contract language definition was to collect the corpus of contracts. The work towards the MPEG-21 CEL started precisely from the analysis of a set of actual contracts: these were provided by RAI for the PrestoPRIME project, and by Associazione Fonografici Italiani (www.afi.mi.it) for the Axmedis project—in the latter case, the contracts represented 200 small and medium enterprises from diverse sectors, including movie producers, broadcasters, and edition contracts.

Key contract elements. In addition to the legal requirements of the electronic contract,⁵ we took the common structure present in most contracts as the skeleton for webbing the schema. As Figure 1 shows, this structure consists of a header (or *preamble*) and a body. The preamble must contain

- contract metadata (date, version, title, and so on);
- unique identification of the contract;
- possible relationships with other contracts;
- the parties involved, possibly identified by their public key; and
- a set of declarations—that is, statements that the parties recognize as true.

Although more flexible than the preamble, the body should include the following specific information for the contract:

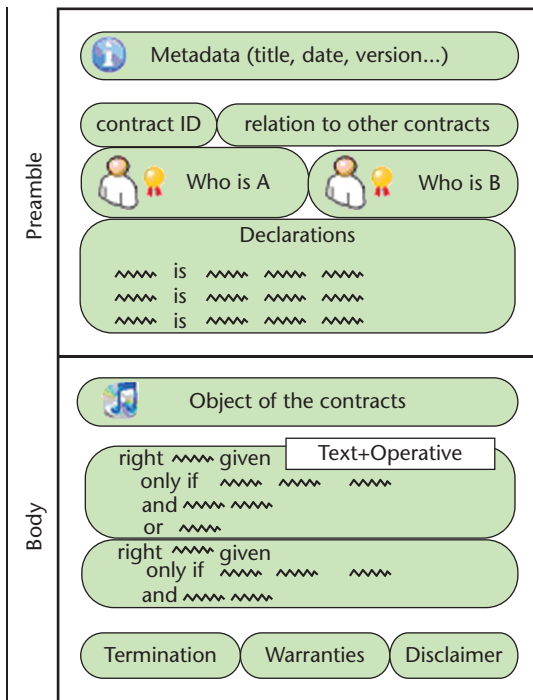


Figure 1. Contract prototype. The common structure consists of a header (or preamble) and a body.

- the object of the contract (content or service);
- the operative part containing the contract information—that is, deontic expressions such as permissions, obligations, and prohibitions—which must be machine readable;
- a mechanism for linking, if desired, an operative part element to the textual clauses that it's representing.

Finally, contracts are accompanied by other provisions, such as legal disclaimers and termination clauses.

Support for contract-based services. The ability to encrypt either a whole contract or any part of it was required. To support other contract-based services, it should be possible to use contract templates, as well as to declare a distinction between contract offers and signed contracts, support the negotiation process, and track the negotiation's management along a contract life cycle.

Rights and conditions in media contracts. The requirements defined the rights and conditions

used in media contracts. These included the following exploitation rights:

- rights for communication to the public (from a single place where the public is not present, by broadcasting or otherwise making the work available);
- distribution rights;
- reproduction;
- transformation rights (all forms of modification); and
- public performance rights (the work is showed or played in public).

These rights are hypernyms of several more specific rights, which were formalized by adding restrictions to generic rights.

The conditions present in contract clauses are

- *access policy*, for restricting how or if the final user is charged (or not) for fruition;
- *delivery modality*, regarding who has control (and how they have control) of the 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 whether access to service delivery is restricted;
- *user time access*, regarding whether fruition time for the user is restricted; and
- *number of runs, time period, territory, and language*.

Other relevant contract information includes *exclusivity, percentage of use, percentage of receipts, and sublicensing*.

MPEG-21 CEL

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 and is used in digital media contracts.

CEL Core

A CEL contract consists of its plain-text version containing the whole narrative contract; meta-data (such as its author and language); references to pre-existing contracts that might affect its validity; the parties of the contract; and the body, which includes the contract clauses represented by the deontic concepts of permission, prohibition, and obligation. A contract can be *protected*—that is, it consists only of the `encryptedContract` element, which contains the encrypted version of the contract. If a contract has no parties, it represents a contract *template*. If a contract has just one issuer party with signature, it expresses an *offer*, either general or to other parties who have not yet signed. *Parties* can represent persons or organizations.

The core element of MPEG-21 CEL contracts is the operative part modeled as container for deontic expressions (see Figure 2). Deontic expressions represent permissions, prohibitions, and obligations in contract clauses expressed in a machine-readable form. They can reference 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; preconditions; the entity to which the deontic clause applies; the right to be applied; the resource against which the right applies; the resource, if any, that results from executing the action; the conditions that must be fulfilled; the 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.

The *constraint element* specifies the conditions, restrictions, and constraints in contract clauses. Simple constraints include those defined in the CEL IPRE or MPEG-21 Rights Expression Language (REL). The constraint element also enables the representation of complex conditions—that is, unions, intersections, and negations of simple or complex conditions. Logical constructs, which consist of multiple simple or complex facts, can be grouped into fact compositions whose truth value depends on one or more facts according to the logical constructs defined by its child elements. An example of the usefulness of

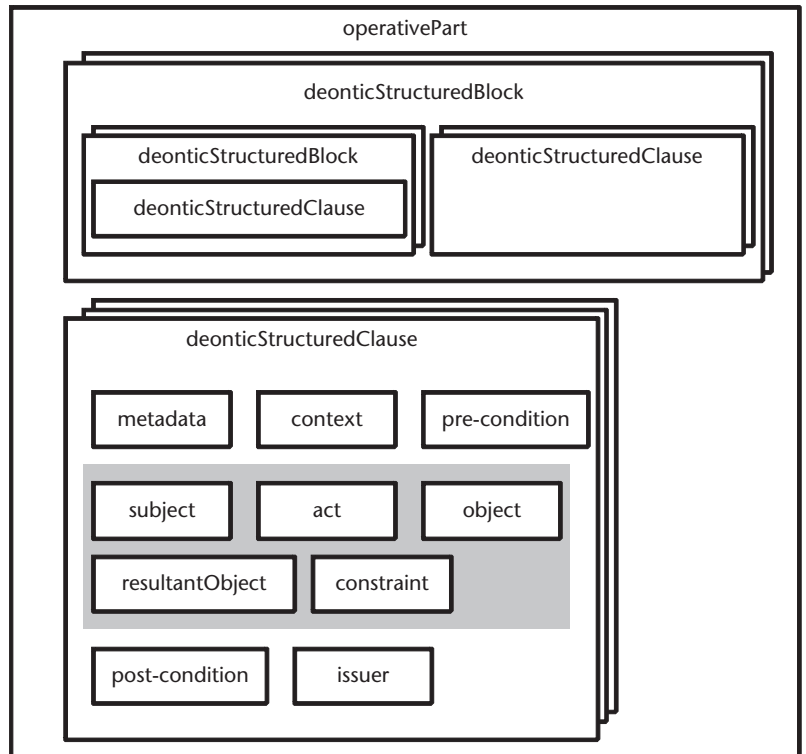


Figure 2. The MPEG-21 CEL contract's operative part. This contract section is modeled as a container for deontic expressions, which represent permissions, prohibitions, and obligations in contract clauses expressed in a machine-readable form.

logical constructs is the representation of a constraint on delivery means that offers a choice (“either satellite or terrestrial TV”) along with a constraint on the number of runs (“limited to 10 runs”); the first construct must be represented by a union, because the respect of the second condition doesn't take into account the means when subtracting an exploited run.

CEL IPRE

The CEL extension for exploiting IPRE has been defined to represent the most common acts and constraints in the media field that can be used in CEL contracts.

Acts and *constraints* have been defined depending on the necessities identified in the requirements phase. The acts required for modeling rights in media contracts include intellectual property rights, as well as those related to the offering and consumption of services. Examples of CEL IPRE rights are `distribute`, `communicationToThePublic`, or `makeInstance`. Restrictions include those required for modeling conditions, restrictions, and

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. Example of a textual contract in natural language. The fragments are related to general terms of the broadcasting contract: the parties and object of the license agreement, and the rights and first permission granted to Radiotelevisione Italiana (RAI). Sensitive information and subclauses related to the other four permissions have been removed.

constraints in media contracts. Examples of CEL IPRE restrictions are `copyrightExceptionFact`, `device`, or `userTimeAccess`.

We expect new extensions, with new actions and constraints, to be constructed to represent 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 for use in conjunction with the CEL Core and optionally the CEL IPRE or the future ones. The new elements will be mainly derived from elements and types in the CEL Core, in a new CEL extension.

Application Scenario

We now offer an example of a contract taken from a broadcasting scenario. The contract grants to a broadcaster the rights to execute the

broadcaster's 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 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 to other contracts with other parties (not necessarily broadcasters), provided that they don't conflict with the present party.

Figure 3 shows part of the contract's narrative version, in natural language, highlighting the fragments related to general terms—that is, to the parties and object of the license agreement, and to the rights granted to RAI (clauses 1 and 2 of the contract) as well as the first

permission granted to RAI (linear delivery, with free-of-charge access policy, and a number of runs limited to 10).

When modeling contracts, the first stage implies the identification of its deontic clauses. The contract under consideration is made up of five clauses. 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 the following sets of further conditions:

- *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 a free-of-charge access policy and a number of runs limited to 10.
- *Non-linear delivery*: that is, for fruition at the moment chosen by users at their individual request on the basis of a catalog of programs selected and made available by the media service provider.
- *Linear delivery, with pay access policy*: with no limitation on the number of runs.

The two other clauses grant 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 percent of permission use (if permissions were shared with other parties, they could not be exploited without the consensus of the other holders, possibly granted through another agreement); 100 percent of net receipts; and the right to sublicense the granted permissions to third parties. Figure 4 shows the model for the first deontic clause.

Finally, the contract is digitally represented according to the MPEG-21 CEL obtaining its machine-readable version. Figure 5 shows an extract of the contract's clause on linear delivery with free-of-charge access.

As this example shows, CEL is suitable to represent faithfully and in a structured way the typical terms of the broadcaster application scenario. All media B2B scenarios can be covered within the same paradigm of CEL IPRE; for other domains, it might be useful to further

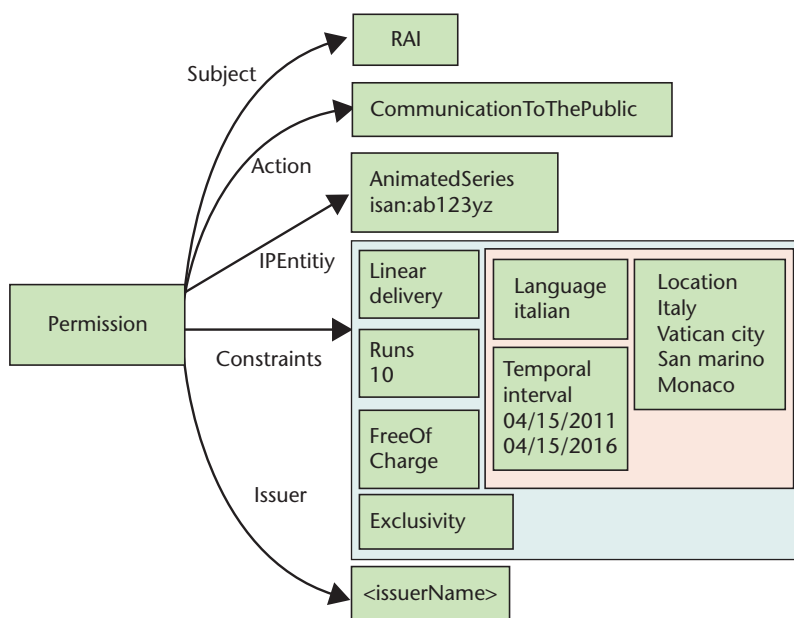


Figure 4. An example of a communication to the public permission. This clause grants RAI the permission to communicate to the public (restricted to linear delivery) the animated series (with *isan:ab123yz*) for five years, 10 times, in Italy, Vatican City, Republic of San Marino and Principality of Monaco, in the Italian language on an exclusive basis.

define other specific extensions to the CEL Core.

Usage Contexts for Media Contracts

Various possible contexts of use exist for media contracts, all along the business domain's media life cycle, which includes

- media creation, involving the authors and the production companies;
- media delivery, involving broadcasters and distribution and telecommunication companies; and
- archives, which hold the content at disposal for reuse in new productions or for exploitation as is.

Here, we discuss two usage contexts: that of media archives, which was the focus of PrestoPRIME project, and that of digital rights management (DRM), using as an example the Axmedis project, which also embraces the business-to-consumer (B2C) domain.

Media Archives

The PrestoPRIME project's usage contexts deal with audiovisual preservation issues. Running a


```

<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. Example extract from the MPEG-21 CEL broadcast contract. This excerpt shows the linear delivery clause allowing communication to the public in a point-to-multipoint modality in which users access the content simultaneously, with free-of-charge access policy and the number of runs limited to 10.

long-term preservation processes is expensive and requires commercial exploitation of the archive contents by increasing its their use and keeping them alive. This effort is not justified for archival items for which the situation of rights remain uncertain because the terms of old contracts aren't 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 adopting a rights format that can represent contract conditions unambiguously and in a machine-readable format. Rights clearance activity can be

summarized by the “check-with” use case, in which users define a target exploitation and want to check which archival items (or which specific archival item) has associated rights matching the target request. The match is *true* if, according to the contract, the user has the right to execute the desired exploitation action on the given intellectual property entity; otherwise, it's *false*. The target exploitation context is fully defined by the action and the set of constraints that the user is willing to accept.

Check-with rights are certainly required for the broadcasting schedule planning or other preparation of communications to the public;

they're also relevant to estimating the value of the media holdings and thus to optimizing the exploitation activity. For instance, the broadcaster might schedule the broadcast of programs close to the expiration of the license period or organize negotiations for purchasing new rights, according to the estimated needs.

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

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 exploitation of rights besides preservation. To this end, a semi-automated system to digitize audiovisual contracts was developed, in which 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, analyzes all the sentences in the contract, and automatically preclassifies those belonging to the Axmedis set of contract clauses in a new tagged file, which is XML structured. A guided process then starts, in which the user is asked to complete some forms, basically to confirm the vocabulary chosen by the application to represent rights and conditions in 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.

Globally, MPEG-21 CEL overcomes most limitations of previous work and is therefore a good candidate standard option for adoption in media rights operations as the digital representation of audiovisual contracts. However, further work is necessary in three key areas. First, we must identify any possible gaps

that might prevent adoption because of consequent need to handle exceptions to full machine-readable terms. Second, we must specify and clarify the relationships between this and other latest related works, such as MPEG-21 MCO, so as to indicate the most suitable contexts of use. Finally, new approaches must be developed in which new contracts are directly created and signed in machine-readable formats. **MM**

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