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**Information technology — Multimedia  
framework (MPEG-21) —**

**Part 21:  
Media Contract Ontology**

*Technologies de l'information — Cadre multimédia (MPEG-21) —*

*Partie 21: Ontologie pour contrats de médias*

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## Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 21000-21 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

ISO/IEC 21000 consists of the following parts, under the general title *Information technology — Multimedia framework (MPEG-21)*:

- *Part 1: Vision, Technologies and Strategy* [Technical Report]
- *Part 2: Digital Item Declaration*
- *Part 3: Digital Item Identification*
- *Part 4: Intellectual Property Management and Protection Components*
- *Part 5: Rights Expression Language*
- *Part 6: Rights Data Dictionary*
- *Part 7: Digital Item Adaptation*
- *Part 8: Reference software*
- *Part 9: File Format*
- *Part 10: Digital Item Processing*
- *Part 11: Evaluation Tools for Persistent Association Technologies* [Technical Report]
- *Part 12: Test Bed for MPEG-21 Resource Delivery* [Technical Report]
- *Part 14: Conformance Testing*
- *Part 15: Event Reporting*

- *Part 16: Binary Format*
- *Part 17: Fragment Identification of MPEG Resources*
- *Part 18: Digital Item Streaming*
- *Part 19: Media Value Chain Ontology*
- *Part 20: Contract Expression Language*
- *Part 21: Media Contract Ontology*

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## Introduction

Today, many elements exist to build an infrastructure for the delivery and consumption of multimedia content. There was, however, no "big picture" to describe how these elements, either in existence or under development, relate to each other. The aim for the ISO/IEC 21000 series has been to describe how these various elements fit together. New standards as appropriate will be developed while other relevant standards may be developed by other bodies.

The result is an open framework for multimedia delivery and consumption, with both the content creator and content consumer as focal points. This open framework provides content creators and service providers with equal opportunities in the ISO/IEC 21000 enabled open market. This will also be to the benefit of the content consumer providing them access to a large variety of content in an interoperable manner. The vision for ISO/IEC 21000 is to define a multimedia framework *to enable transparent and augmented use of multimedia resources across a wide range of networks and devices* used by different communities.

ISO/IEC 21000 aims thus at defining an open framework for multimedia applications, where users distribute, consume, operate on and transact with content represented as Digital Items. These transactions can be automatically governed by the Media Value Chain Ontology (MVCO) from ISO/IEC 21000-19. However, beyond the operative information present in a digital license, the digital representation of the complete business agreements between the parties may prove useful for a number of purposes. The Media Contract Ontology is the ISO/IEC ontology for expressing such contracts in a semantic representation.

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# Information technology — Multimedia framework (MPEG-21) —

## Part 21: Media Contract Ontology

### 1 Scope

This part of ISO/IEC 21000 specifies an ontology for representing contracts in the Multimedia Framework formed for the transaction of MPEG-21 Digital Items or services related to the MPEG-21 Framework.

The Media Contract Ontology (MCO) aims at digitally expressing the agreements made in an environment of use of ISO/IEC 21000, being these contracts about both transactions of content packed as Digital Items as well as services provided around this content, by means of a semantic representation.

The range of contracts under scope includes:

- Contracts about transactions of content as MPEG-21 Digital Items,
- Contracts about the provision of MPEG-21-based services, such as delivery, identification, encryption, search and others.

The aspects represented by MCO contracts include:

- The textual clauses, in natural language as they are in the narrative contract, duly structured;
- The operative clauses, as computer language expressions.

### 2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 15836, *Information and documentation — The Dublin Core metadata element set*

ISO/IEC 21000-3, *Information technology — Multimedia Framework (MPEG-21) — Part 3: Digital Item Identification*

ISO/IEC 21000-5, *Information technology — Multimedia Framework (MPEG-21) — Part 5: Rights Expression Language*

ISO/IEC 21000-19, *Information technology — Multimedia Framework (MPEG-21) — Part 19: Media Value Chain Ontology*

XML Encryption Syntax and Processing Version 1.1, W3C Working Draft 16 March 2010, <http://www.w3.org/TR/xmlenc-core1/>

IETF RFC 1738, Uniform Resource Locators (URL), December 1994, <http://www.ietf.org/rfc/rfc1738.txt>

IETF RFC 2141, Uniform Resource Name (URN) Syntax, May 1997, <http://www.ietf.org/rfc/rfc2141.txt>

IETF RFC 2396, Uniform Resource Identifiers (URI): Generic Syntax, Internet Standards Track Specification, August 1998, <http://www.ietf.org/rfc/rfc2396.txt>

### 3 Terms, definitions and abbreviated terms

#### 3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

##### 3.1.1

###### **MPEG-21 Contract**

representation of agreements formed for the transaction of MPEG-21 Digital Items or services related to the MPEG-21 Framework

##### 3.1.2

###### **MPEG-21 Service**

system supplying utility in the Framework of MPEG-21

#### 3.2 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

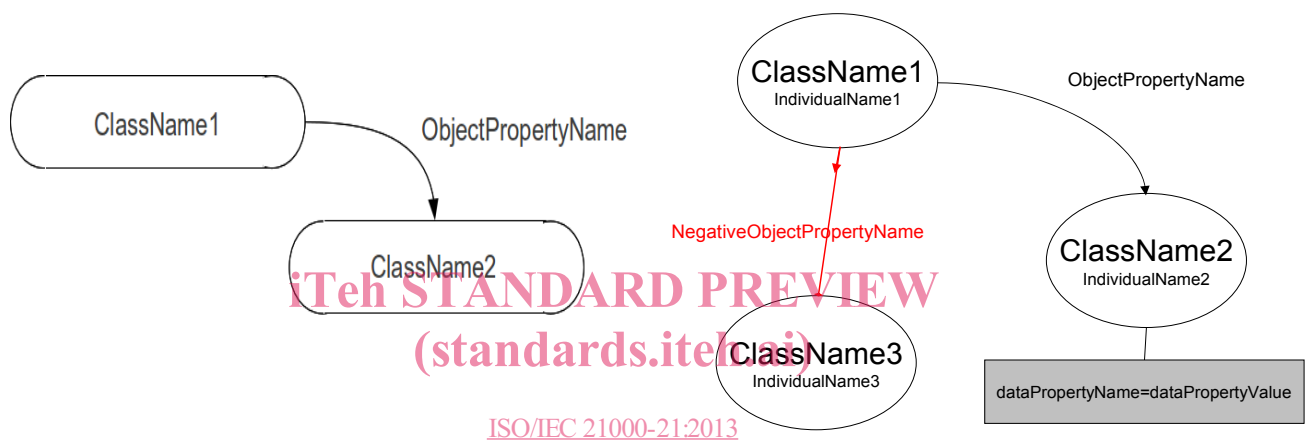
<b>MCO:</b>	Media Contract Ontology
<b>CEL:</b>	Contract Expression Language
<b>MPEG:</b>	Moving Picture Experts Group
<b>MPEG-21:</b>	ISO/IEC 21000
<b>MVCO:</b>	Media Value Chain Ontology
<b>OWL:</b>	Web Ontology Language
<b>RDF:</b>	Resource Description Framework
<b>REL:</b>	Rights Expression Language
<b>URI:</b>	Uniform Resource Identifier (IETF Standard is RFC 3986)
<b>URL:</b>	Uniform Resource Locator (IETF Standard is RFC 1738)
<b>URN:</b>	Uniform Resource Name (IETF Standard is RFC 2141)
<b>W3C:</b>	World Wide Web Consortium
<b>XML:</b>	Extensible Markup Language (W3C Recommendation)

## 4 Conventions

### 4.1 Document conventions

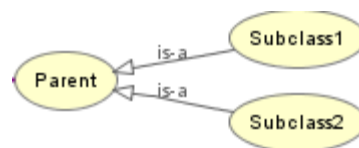
#### 4.1.1 MCO OWL Representation

Along this document, OWL will be expressed with the RDF/XML [6] syntax and its excerpts will be boxed in grey text. Additionally, when diagrams are needed, two different notations are used as shown in Figure 1: we use the representation on the left for the OWL classes and the object properties used to relate them, while for representing class individuals (instances), the related object properties and data properties we use the notation reported on the right. Moreover, for diagrams referring to individuals, negative object properties are represented in red, with a different arrow style, while data type properties, including name and value, are represented in a grey box, linked to the balloon of the respective class individual.



**Figure 1 — Graphical notation used for Classes and related ObjectProperties (left) and for individuals (right)**

The class hierarchy as defined in the ontology is shown as in Figure 2, where the circle with the arrow represents the parent class.



**Figure 2 — Diagram with OWL class hierarchy**

### 4.2 Namespace prefix conventions

The base URI for MCO core OWL is:

```
urn:mpeg:mpeg21:mco:core:2012
```

The base URI for the MCO extension on exploitation of Intellectual Property Rights is:

```
urn:mpeg:mpeg21:mco:ipre:2012
```

4.2.1 Use of prefixes

The MCO makes use of elements defined in other schemas, either given by MPEG-21 or others. The used namespace prefixes together with their reference is given in Table 1.

Table 1 — Mapping of prefixes to namespaces in examples and text

Prefix	Corresponding namespace	Ref
mco-core	urn:mpeg:mpeg21:mco:core:2012#	Here
mco-ipre	urn:mpeg:mpeg21:mco:ipre:2012#	Here
dc	http://purl.org/dc/elements/1.1/	ISO 15836
xsi	http://www.w3.org/2001/XMLSchema-instance	[4]
dsig	http://www.w3.org/2000/09/xmldsig#	[1]
mvco	http://purl.oclc.org/NET/mvco.owl#	ISO/IEC 21000-19
dii	urn:mpeg:mpeg21:2002:01-DII-NS#	ISO/IEC 21000-3
owl	http://www.w3.org/2002/07/owl#	[2]
xenc	http://www.w3.org/2001/04/xmlenc#	W3C XML Encryption Syntax and Processing

5 Relationship to other ISO/IEC 21000 Parts

The Digital Item is the fundamental unit of distribution and transaction in the Multimedia Framework. While the different parts of ISO/IEC 21000 deal with the components and different aspects of Digital Items, together they form a complete integrated interoperable framework. This clause describes the relationship of this part of ISO/IEC 21000 with the other parts of ISO/IEC 21000 in addressing the representation of the agreements for the aforementioned transactions.

Contracts expressed with the semantic representation described in this part of ISO/IEC 21000 may entail permissions passed through the value chain whose representation shall be included as ISO/IEC 21000-19 Permission class instances.

A contract represented following this part of ISO/IEC 21000 contracts may become a part of a Digital Item (whose declaration is given in ISO/IEC 21000-2). If so, they will be declared with the Type element of ISO/IEC 21000-3 Part pointing to the MCO URI.

This part of ISO/IEC 21000 formalizes how to express contract information by means of a semantic representation, as OWL or RDF, while ISO/IEC 21000-20 provides a structured representation of contracts, in XML. Both parts share the goal of defining a contract document able to provide the information listed in 6.1.

6 Overview

6.1 General aspects

A Media Contract Ontology (MCO) contract is a document providing the following information, optional unless otherwise stated:

- Identification of the contract itself – Required.
- Possible relationships with other contracts.
- The Parties – Required.

- The textual version of the contract.
- A number of textual clauses which can be referenced by the operative part element.
- The Object of the contract (Content or Service) – Required.
- The Operative part, containing the contract information which have to be machine readable (deontic expressions, links to textual clauses) – Required.

MCO supports the possibility to encrypt either the whole contract or part of it.

The MCO aims at providing the structural elements to semantically represent operative clauses, in a machine-readable form.

## 6.2 Semantic representation

The MCO contract document is defined by a OWL-2 Ontology model [5], made by a core, described in details in Section 7.2 and by its extensions, detailed in Section 7.3.

The Contract document itself can be serialized according to any of the following syntaxes, resulting in serializations which are logically equivalent so that it must be possible to swap between them losslessly:

- RDF/XML [6]
- OWL/XML [7]

Annex A contains the MCO normative specifications of the semantic representation, which are provided according to the RDF/XML serialization only. Equivalent versions using the OWL/XML serialization can be derived without difficulties.

For aim of illustrating the various serializations, the examples presented in Chapter 7 and in Annex B are given in whatever of the two allowed syntaxes, without always providing the corresponding example in the other syntax.

## 7 Description of Contract Semantic Representation

### 7.1 Media Contract Ontology Extension Mechanism

The Contract Semantic Representation of MCO, based on the definition of a core and of an extension for the exploitation of intellectual property rights, implies an extension mechanism that might be used either in further versions of this specification or for the definition of other specific context application extensions.

The core defines all the contract entities which have no defined parent classes and provides the definition of general mechanisms, such as metadata or encryption. In order to fully convey the most common rights and conditions appearing in media contracts, regarding the exploitation of intellectual property rights, the extension defined in Clause 7.3 is necessary.

A possible further future extension can be defined as in the following:

- As an extension of the complete MCO: by importing the extension for exploitation of IP rights described in clause 7.3 and defined in clause 8.2.
- As an alternative extension of the MCO core: by only importing the core described in clause 7.2 and defined in 8.1.

## 7.2 Media Contract Ontology Core

### 7.2.1 Introduction

The MCO core OWL makes intensive use of the MPEG-21 Part 19 Media Value Chain Ontology (MVCO), reusing and extending some of their classes and properties. The MVCO is the language to represent the transformation of one kind of intellectual property object (called IP-Entity) to another one, as well as the required permissions to execute these transformations.

The URI of MCO core is:

urn:mpeg:mpeg21:mco:core:2012

and the prefix used in this document is:

mco-core

### 7.2.2 The contract and the contract parties

The MCO core defines the Class `mco-core:Contract` to express the contract entity. Within the contract document, an individual of such Class shall represent the contract itself, which can thus be identified through its IRI (Internationalized Resource Identifier). A contract may have references to pre-existing contracts whose validity might be affected.

The contract can have any number of parties. When there are no parties, the document has to be considered a template; when only one party is present, the document can be considered as a possible offer to other parties; however a contract can be binding only if there are at least two parties, with their signature.

A party can be a `mco-core:Organization` or a `mvco:User`. In the former case, in order the contract be binding, it is required that a `mvco:User` is also given as a signatory.

Figure 3 depicts how the model expresses this context.

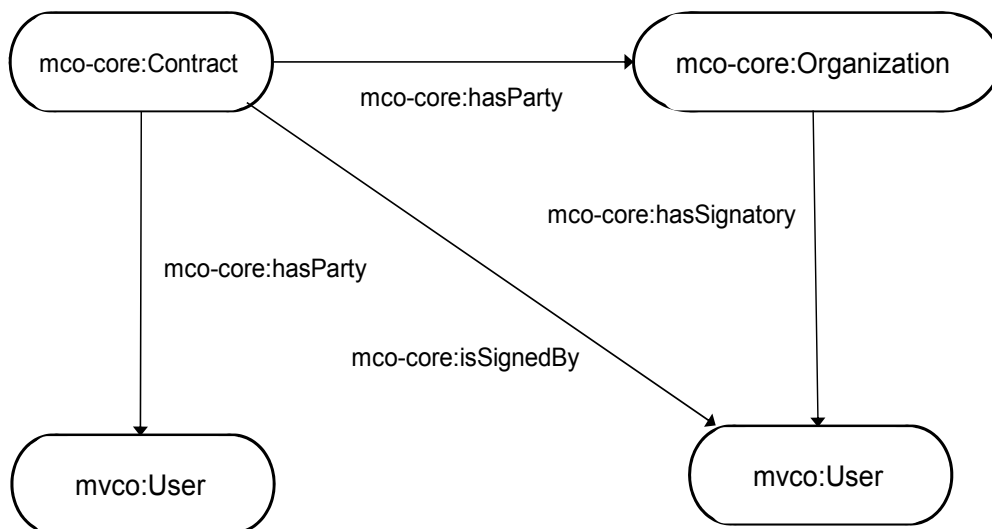


Figure 3 — Classes and Object Properties about the contract and its parties

Both the contract and the parties can have metadata as explained in 7.2.6.

The contract document can optionally contain the narrative contract text version by means of the data property `mco-core:TextVersion`, related to the contract individual.

The contract document may contain other individuals of the Class `mco-core:Contract` for representing relationships between contracts.

For contract parties and signatories, namely `mco-core:Organization` and `mvco:User`, it is possible to include some address information either by the data property `mco-core:Address`, with simple literal value, or by referencing a VCard [3] through the object property `mco-core:hasVCard`.

### 7.2.2.1 Example

Figure 4 depicts the diagram of an example for this context, while the subsequent box contains the same entities serialized in RDF/XML.

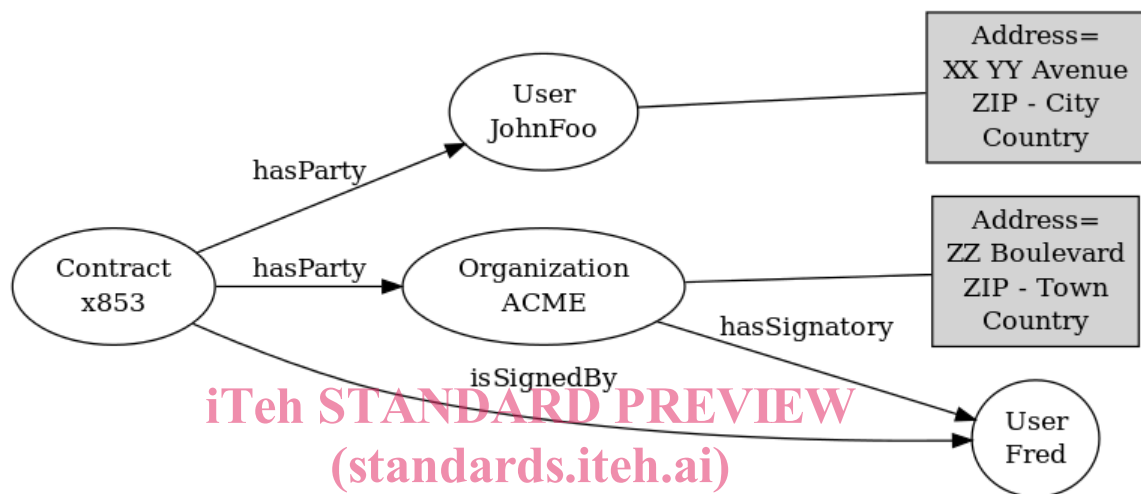


Figure 4 — Example of contract with parties  
<https://standards.iteh.ai/catalog/standards/sist/2ae3bfac-fb00-4f14-9274-5f50ca1d7564/iso-iec-21000-21-2013>

```
<!DOCTYPE rdf:RDF [
  <!ENTITY mcoex "urn:mpeg:mpeg21:mco:examples#" >
  <!ENTITY mco-core "urn:mpeg:mpeg21:mco:core:2012" >
  <!ENTITY DII-NS "urn:mpeg:mpeg21:2002:01-DII-NS#" >
  <!ENTITY mco-ipre "urn:mpeg:mpeg21:mco:ipre:2012" >
  <!ENTITY dc "http://purl.org/dc/elements/1.1/" >
  <!ENTITY xsd "http://www.w3.org/2001/XMLSchema#" >
  <!ENTITY mvco "http://purl.oclc.org/NET/mvco.owl#" >
  <!ENTITY rdfs "http://www.w3.org/2000/01/rdf-schema#" >
  <!ENTITY rdf "http://www.w3.org/1999/02/22-rdf-syntax-ns#" >
]>

<rdf:RDF xmlns="http://www.w3.org/2002/07/owl#"
  xml:base="http://www.w3.org/2002/07/owl#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  xmlns:mco-core="urn:mpeg:mpeg21:mco:core:2012"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:mvco="http://purl.oclc.org/NET/mvco.owl#">
  <Ontology rdf:about="urn:mpeg:mpeg21:mco:examples/mco.2012-10-03.852.owl">
    <imports rdf:resource="urn:mpeg:mpeg21:mco:ipre:2012"/>
  </Ontology>

  <mco-core:Organization rdf:about="&mcoex;ACME">
    <rdf:type rdf:resource="http://www.w3.org/2002/07/owl#NamedIndividual"/>
    <mco-core:Address rdf:datatype="&xsd:string">ZZ Boulevard\nZIP - Town\nCountry</mco-core:Address>
    <mco-core:hasSignatory rdf:resource="&mcoex;Fred"/>
  </mco-core:Organization>

  <NamedIndividual rdf:about="&mcoex;Fred">
    <rdf:type rdf:resource="&mvco;User"/>
  </NamedIndividual>
```

```

<NamedIndividual rdf:about="&mcoex;JohnFoo">
  <rdf:type rdf:resource="&mvco;User"/>
  <mco-core:Address rdf:datatype="&xsd:string">XX YY Avenue\nZIP - City\nCountry</mco-
core:Address>
</NamedIndividual>

<mco-core:Contract rdf:about="&mcoex;x853">
  <rdf:type rdf:resource="http://www.w3.org/2002/07/owl#NamedIndividual"/>
  <mco-core:hasParty rdf:resource="&mcoex;ACME"/>
  <mco-core:isSignedBy rdf:resource="&mcoex;Fred"/>
  <mco-core:hasParty rdf:resource="&mcoex;JohnFoo"/>
</mco-core:Contract>
</rdf:RDF>

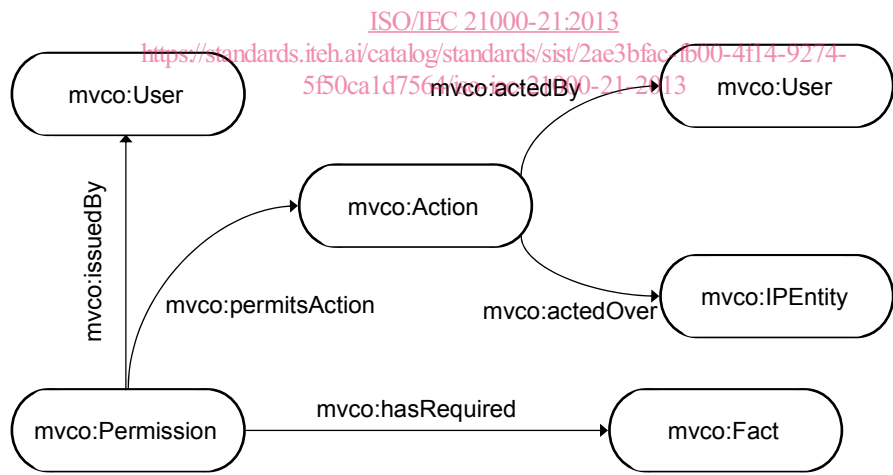
```

**7.2.3 Expression of permissions, prohibitions and obligations**

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. These concepts can be expressed by solely using the MVCO class `mvco:Permission` and combinations of the properties. However, to facilitate the task for MCO, specific classes have been defined: `mco-core:Prohibition`, `mco-core:Obligation`.

Any `mco-core:Prohibition`, or `mco-core:Obligation` or `mvco:Permission` is a `mco-core:DeonticExpression`.

The MVCO mechanism for expressing permissions centers around the `mvco:Permission` class. Figure 5 shows a diagram with OWL classes and object properties around the Permission class. A `mvco:Permission` permits an action, subject to a `mvco:Fact` to hold, and it can be acted by a given `mvco:User` on a specified `mvco:IPEntity`. There is no restriction on the relationships, so each of the elements may or may not appear.



**Figure 5 — Classes and object properties around Permission**

Making reference to the unified concept of “deontic expression”, Figure 6 shows how permissions, prohibitions and obligations are expressed within the MCO Contract model.

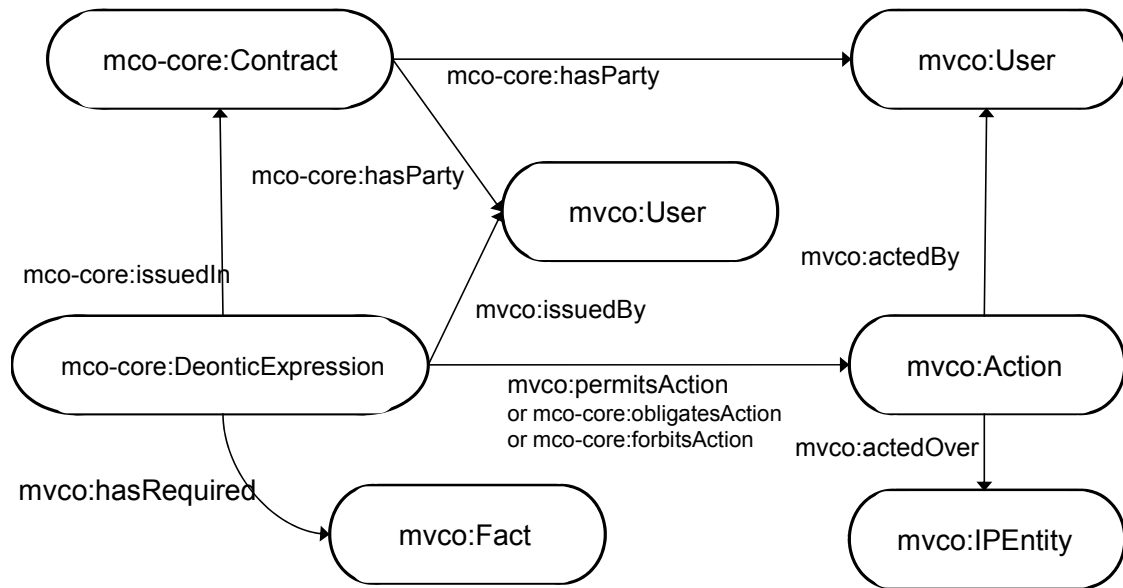


Figure 6 — Deontic Expression issued in Contract

7.2.3.1 Relationships between deontic expressions and textual clauses

The class `mco-core:TextualClause` is defined in order to identify a specific part of a narrative contract which is implemented by the definition of a deontic expression and express such relationship, as shown in Figure 7. The actual text of the clause is given by the data property `mco-core:Text`.

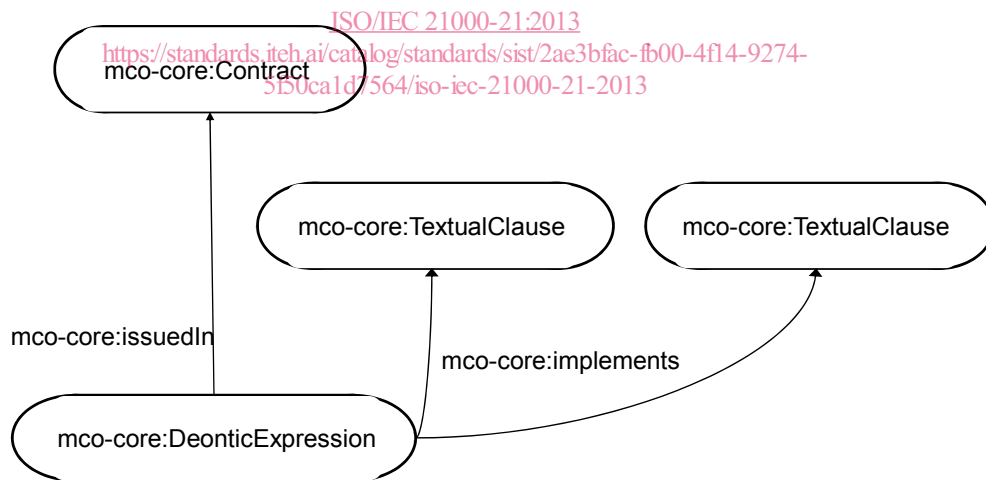


Figure 7 — Classes and Object properties around Textual Clauses

7.2.3.2 Prohibition and Obligation

Prohibitions could also be expressed with the mere MVCO constructs through the `owl:NegativeObjectProperty` assertion, but in order to give an equal treatment to the three deontic expressions, a `mco-core:Prohibition` class has been defined together with the corresponding object property `mco-core:forbidsAction`, as shown in Figure 8.