

# Regulatory Ontologies: An Intellectual Property Rights approach

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**Abstract.** Regulatory ontologies combine ideas and results from different fields. Our approach to the topic is based on two aspects. First, the work we have done in the development of an ontology for Intellectual Property Rights (IPR), based on previous work done by our group and others. The second aspect is to apply these results to a new regulated area, that of the Data Privacy Protection. The paper describes the IPR ontology (IPROnto) and analyses how we can proceed in the area of Data Privacy Protection.<sup>1</sup>

## 1 Introduction

Digital Rights Management (DRM), or the wide issue of protection and management of Intellectual Property Rights (IPR), is a key aspect for the real and full deployment of multimedia content through the net. We refer to multimedia content that has associated property rights.

Although several solutions exist, most of them are closed solutions and do not interoperate with other approaches. To solve this problem, many efforts are being done to standardise the way to approach DRM, without limiting the freedom of application developers, but facilitating interoperability. It is worth mentioning here the new standards being specified by ISO/IEC through its MPEG group (ISO/IEC JTC1 SC29/WG11) [1], namely a Rights Expression Language (REL) [2] and a Rights Data Dictionary (RDD) [3], that will be parts of the MPEG-21 standard.

Those standards, or similar initiatives in other organisations (see for example [4] for more information), should facilitate the implementation of applications allowing protection, distribution and control of copyrighted content. However, for sophisticated applications that might need an extra intelligence to interpret rights (for example, when negotiating rights between two parties), a more abstract representation of IPR information is needed. For this reason, we have developed an ontology to help us in the representation of IPR information, thus easing complex implementations. This ontology, IPROnto [5], is described in detail in section 2, the major part of the paper.

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There are other initiatives in the development, learning and modelling of ontologies, such as [6].

On the other hand, there are other aspects also relevant here, apart from the technical ones just mentioned. In particular, IPR is something that is normally regulated, something that applications do not always take into account. In order to help solving this problem, we could express these regulations in a formal way. A clear candidate approach for this expression is the use of ontologies, giving place to regulatory ontologies. Although IPRonto does not follow a specific law, it tries to cover the entire IPR domain. It would be easy to produce versions of the ontology following specific laws.

Both from a technical and a legal point of view we came to the objective of developing regulatory ontologies. Now, we could move this approach to another domain. The domain we have selected is that of Data Privacy Protection. Section 3 of the paper introduces how we will deal with the issue, again both from a technical and a legal point of view.

## **2 IPRonto: An Ontology for Intellectual Property Rights**

In order to improve the management of Intellectual Property Rights (IPR), there is a need for a common language for IPR representation in the open and global framework provided by the Web. This language is aimed to help building a reliable Web where intellectual property rights can be managed in an open, global and adaptable form, so people can share, sell, buy, etc. multimedia content subject to IPR, depending on their needs. A semantic approach seems a more flexible and efficient way of achieving these activities than a syntactic one. We have developed an ontology for IPR, IPRonto [5], that puts into practice this approach.

Current initiatives focus on a syntactic approach, the formalisation of some XML DTDs and Schemas that define rights expression languages. The semantics of these languages, the meaning of the expressions, is formalised separately into term-definition dictionaries where definitions are given in natural language, solely for human consumption and not easily automated.

Our idea is to facilitate the automation and interoperability of IPR frameworks by integrating both parts, called Rights Expression Language (REL) [2] and Rights Data Dictionary (RDD) [3].

This can be accomplished using ontologies. They can provide the required definitions of the rights expression language terms in a machine-readable form. Thus, from the automatic processing point of view, a more complete vision of the application domain is available and more sophisticated processes can be carried out.

Moreover, the modularity of web ontologies allows its free extension and adaptation without losing the connection to previous roots.

We have two views for our IPRonto ontology, the Static one and the Dynamic one. Section 2.1 explains the different entities that constitute the static view of IPRonto, while section 2.2 describes the events, processes and subontologies related to the dynamic view.

## 2.1 Static View of the IPR Ontology

We can see the static view of IPROnto as a tree where elements are related from the bottom to the top. In the next subsection we introduce a skeleton of the tree where only key elements, for simplicity, are presented. In the rest of subsections, some of the key elements are detailed to give a more complete view of the ontology.

### IPROnto key elements of the skeleton

As already said, this skeleton ontology, shown in Fig. 1, only contains some of the key elements. The root of the tree is an Entity, which may be Physical or Abstract. In turn, a Physical entity may be an Object or a Process, being this one more interesting, which might be an Event or a Situation.

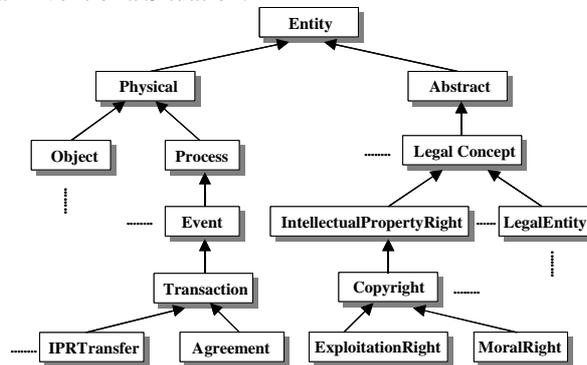


Fig. 1. IPROnto key elements of the ontology skeleton

In the other side of the tree, although several elements may belong to an Abstract entity, only the Legal Concept is presented in the skeleton. Nevertheless, other options, not sketched here, are possible, such as Relation or Quantity. While the Legal Concept might come from a few elements, only details are given for two cases: Intellectual Property Rights and Legal Entity. The presence of dotted lines in the tree means that other “brother” elements exist, but have not been included in the skeleton.

The most interesting part of the IPROnto related with the problem of the privacy of the rights, is the part related to the Legal Concept Entity, specifically Intellectual Property Rights Entity and their derived rights. These rights are associated to multimedia digital content for automatic commerce in the Internet, in special the Author’s Rights or Copyright. All elements of the tree below Legal Concept, together with all leaves, are detailed in the following subsections.

### IPROnto Legal Concept

Fig. 2 shows the Legal Concept together with its dependent elements.

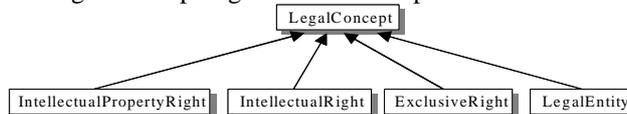


Fig. 2. IPROnto Legal Concept

A Legal Concept is a concept defined by law, statute or international convention. Its terms are generally understood and defined in a series of international conventions and treaties and under national laws.

### LegalEntity

An entity possessing capacity in law to exercise or enjoy an intellectual property right is a LegalEntity. It can be divided into two categories, Corporate Legal Entity, which refers to a legal entity inside a corporation and a Natural Legal Entity, which could also be seen as a person in the real world.

The starting point, from an IPR's point of view, is the selection of the model in which to base IPR representation and negotiation. The IMPRIMATUR Business Model [7], the one we selected, identifies a series of entities that may take different roles, such as Creator, Provider, Rights Holder, Distributor, IPR Data Base, or Watermarking & Fingerprint marking (see Fig. 3).

1. Creator: Owner of the copyright in a work. He/She holds the exclusive right to use or authorize others to use the work on agreed terms.
2. Rights Holder: Provides a license to exploit the creation on terms which may be either predefined subject to negotiation.
3. Content Provider: It acts in name of the Rights Holder, compiles and packs creations to provide to the distributors with multimedia content.
4. Media Distributors: Apply to a Rights Holder for a license to exploit the creation.
5. Customer: Person who wants to make use of a creation.

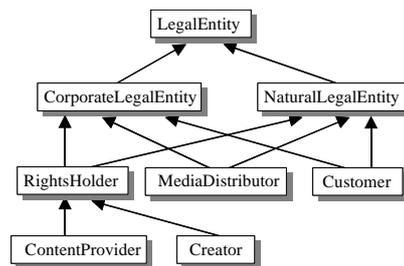


Fig. 3. IPROnto Legal Entity

### IPROnto Intellectual Property Right

Intellectual Property Rights (IPR) are legal instruments that provide a limited monopolistic right to the owner of things such as patents, trademarks or copyrighted works. They provide an incentive for the creation of and investment in new works (music, films, print media, software, performances, broadcasts, etc.) and their exploitation, thereby contributing to improved competitiveness, employment and innovation.

Some of the Intellectual Property Rights considered in IPROnto are shown in Fig. 4. This description is based on the Berne Convention [8] and the WIPO Copyright Treaty [9]. It is, as the sources state, broadened enough to ensure international applicability. There are local initiatives to implement these recommendations, as the

EC Directive on Copyright 2001/29/EC [10] or the US Digital Millennium Copyright Act [11].

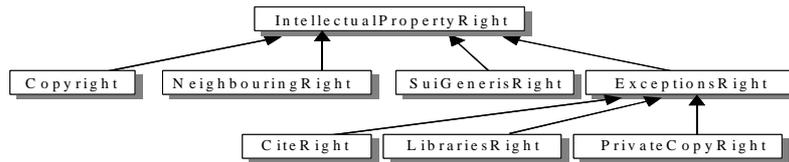


Fig. 4. IPRonto Intellectual Property Right

In the context of copyrighted works, IPR includes author's rights, which will be referred to later, sui generis rights (applicable for databases) and neighbouring rights (especially concerning artist-interpreters).

### IPRonto Copyright

All these rights are automatically given to originators of works (creators) by the simple fact of their authorship. They include Moral rights that are independent of the author's economic rights and even after their transfer and Exploitation rights (economic rights), which are oriented to guarantee financial profit to originators of works.

Fig. 5 shows the relationship between Copyright, ExploitationRight and MoralRight.

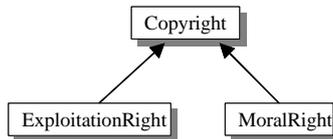


Fig. 5. IPRonto Copyright

### Moral Right

Moral rights are independent of the author's economic rights, and even after their transfer, the author has the following rights:

1. Dissemination Right: Exclusive right to disclose the work.
2. Paternity Right: Exclusive right to claim authorship of the work.

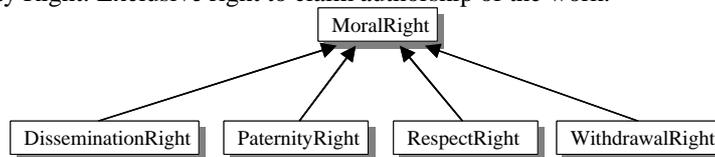


Fig. 6. IPRonto Moral Right

3. Respect Right: Exclusive right to object to any modification to the work prejudicial to his reputation.
4. Withdrawal Right: Exclusive right to withdraw the work.

Fig.6 shows the MoralRight together with its dependent rights.

### Exploitation Right

The complete ExploitationRight subtree is shown in Fig. 7.

Exploitation rights (so called economic rights) are oriented to guarantee financial profit to originators of works. They include:

1. **Reproduction Right:** Exclusive right to authorize the reproduction, direct and indirect, permanent or temporary, in any manner or form.
2. **Communication to the Public Right:** Exclusive right for the authorisation of any communication to the public of their works. These includes that members of the public may access them from a place and at a time individually chosen by them. Examples are: public performance, broadcasting, interactive on-demand transmission, etc.

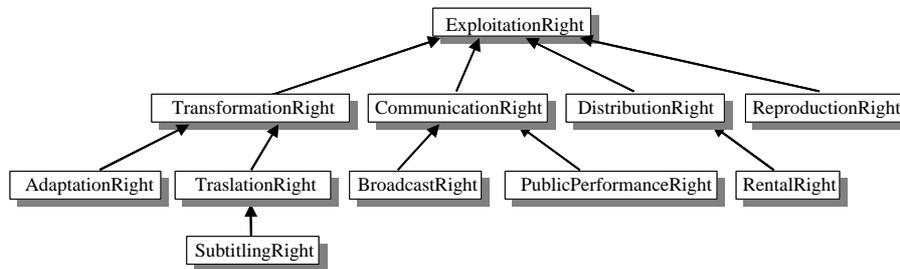


Fig. 7. IPRonto Exploitation Right

3. **Distribution Right:** Exclusive right to authorize the making available to the public of the original or copies of the work by sale or other transfer of ownership. Relevant only to tangible objects.
4. **Transformation Right:** Exclusive right to authorize the manipulation of their works in any manner or form.

## 2.2 Dynamic View of the IPR Ontology

The dynamic view of IPRonto allows the construction of IPR business models for its use in electronic commerce. In the following sections, some of the events that can occur in the IPR domain are described. Moreover, we describe the creation process with a subontology derived from IPRonto.

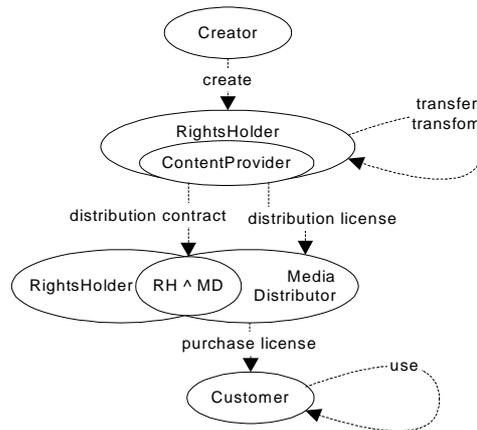
### Events

The concepts and relations defined in IPRonto can be used to represent the typical processes of the IPR domain, and also the agents and resources they involve. These representations can be automatically tested to check semantic consistency, thanks to the explicit semantics that emerge from the ontology structure of concepts and relations.

To show the expressive power of this semantic IPR approach, we present a detailed view of the creation life cycle. Fig. 8 contains some kind of flow diagram relating the different actors involved in the creation life cycle and the transitions that

transfer exploitation of this creation between them. This generic business model has been inspired in the one defined by the IMPRIMATUR Project [7].

In the next clauses, we give a detailed view of the events that provoke each of these transitions. The events are represented using the concepts and relations defined in IPROnto and other reused ones. This is done by means of a graph of nodes, i.e. concepts, and edges, i.e. relations.

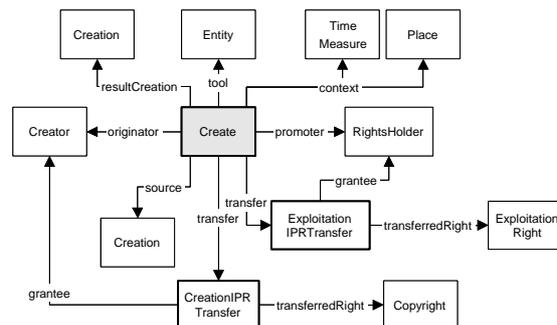


**Fig. 8.** Content life cycle

Finally, it is also worth noting that the whole content life cycle of a particular creation can be retrieved from the concatenation of the diverse events that provoke the transitions in its life cycle, and thus from the representations we made using IPROnto.

### Create Event

The Create Event represents the intellectual property creation, starting the life cycle of this intellectual property and its associated rights. The new creation may be totally new or based on previous ones, so the life cycle of the new creation will affect the used source creations, e.g. some royalty fees might be provided to the source creations rights holders.



**Fig. 9.** Create Event

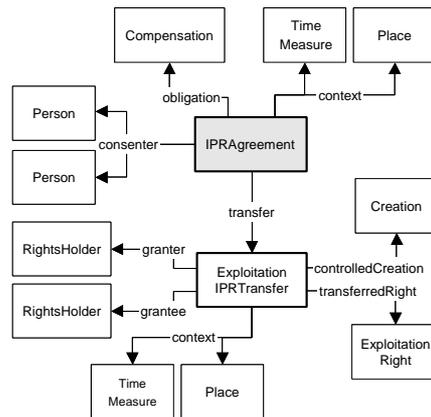
Fig. 9 shows the central concept, the “Create” event that relates all the involved concepts, some of which are:

- Agents: the creator, playing the role originator, and a rights holder that promotes the creative event.
- Result: a creation resulting from the creative process.
- Context: a time and place where and when the event takes place.
- Transfer: relates the main event to the associated events that model the actual transfer of rights provoked by the create event. In this case, all the Copyrights are given to the creator and a subset of them, not including Moral Rights, to the promoter. Therefore, the creator and the promoter rights holder share the Exploitation Rights on the new creation. In both cases there is no granter of rights because they emerge as a result of the creative process.
- Input: the source creations, if they exist, on which the resulting creation is based.

#### *IPRAgreement Event*

The “IPRAgreement” event represents a generic contract for rights transference between legal parties that hold rights, the “RightsHolders” (Fig. 10):

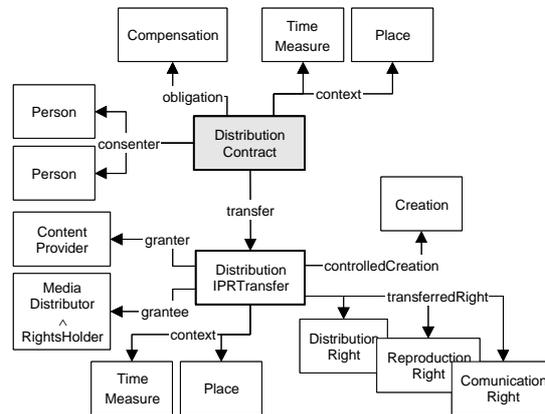
- Agents: two persons consent the agreement, they may be the same individuals as the involved “RightsHolders” or their representatives.
- Transfer: a connection to the rights transfer process that models the actual transference of rights agreed in the referencing “IPRAgreement”, this is an associated event.
- Context: there are two contexts, one for the agreement and the other for the rights transference. The latter may detail a period of time and a geographical region when and where this transfer would be valid.
- Creation: the creation over which the transferred rights apply.
- Compensation: the counterpart that the rights granter receives for the granted rights.



**Fig. 10.** IPRAgreement Event

*Distribution Contract Event*

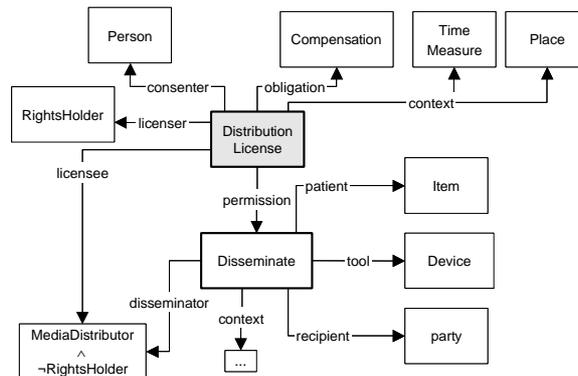
The Distribution Contract is also a kind of “IPRAgreement”. It is established between a “ContentProvider”, or more generally a “RightsHolder” and a “MediaDistributor”. As some rights are transferred, the recipient media distributor becomes also a rights holder. Therefore, the concept playing the role “grantee” of the “DistributionIPRTransfer” must be a media distributor but also a rights holder, thus we use the intersection “^” symbol to represent this. Finally, in this type of contract the transferred rights are the Distribution, Reproduction and Communication Rights. The other involved concepts have more or less been explained in the previous events. See Fig. 12 for a graphical view.



**Fig. 12.** Distribution Contract Event

*Distribution License Event*

Fig. 13 shows the Distribution License Event.



**Fig. 13.** Distribution License Event

We talk about licenses, nor contracts or the more generic “IPRAgreement”, when the agreement between two parties does not involve a transfer of rights, but only a

licensing of certain actions on the creation. The “DistributionLicense” is a kind of license in which a rights holder authorises the dissemination of a certain creation in a determined set of conditions to a “MediaDistributor”. As there is not transfer of rights, the licensed party must not become a rights holder.

*Purchase License Event*

This is the kind of license that appears at the end of the creation life cycle. It is established between a final user, the customer and the distributor. The license authorises a determined use under certain conditions. See Fig. 14 for a graphical view.

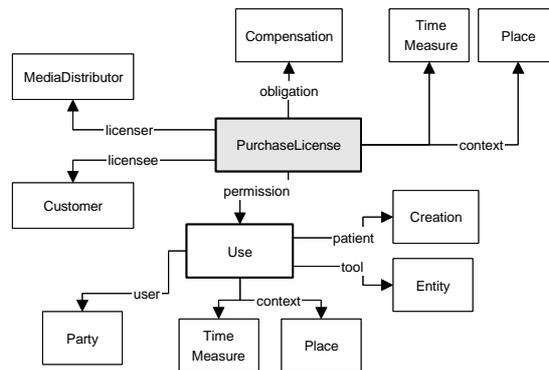


Fig. 14. Purchase License Event

**Subontologies**

The hierarchy of concepts and relations from the static view of the ontology, plus some of their interrelation constraints, has to be translated to a machine aware form. This leads to situations in which the relationship between concepts is difficult to explain in a two-dimensional graph. For this case, we have developed the concept of subontology, that goes one step further from the static view.

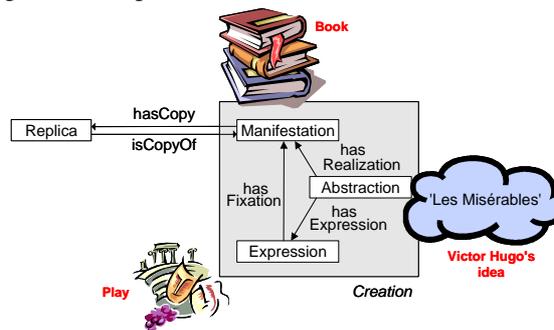


Fig. 15. Creation Subontology

We can see in Fig. 15 a clear example, the Creation subontology (the union of its abstract, material and temporal forms). These are the three points of view of a

creation, the abstract, object and event perspectives that relate it to the upper level ontology from SUMO [12]. For instance, if we take the creation “Les Misérables”, we observe its object view in a script, a book, etc. At the same time, its film projection would be the event part and all (script, book, film...) have in common an abstraction that comes from the original Victor Hugo’s idea.

### **3 Data protection and privacy**

The concepts presented throughout this paper not only can be applied to IPR but also can be considered in the field of data protection and privacy.

In this area we find two completely different viewpoints: the legal viewpoint and the technical viewpoint. In the next sections, it is explained in more detail what do we exactly mean when we separate data protection and privacy issues into these two viewpoints.

#### **3.1 Legal viewpoint**

From the legal point of view, several things can be outlined in this area. First of all, there is a completely different approach in the regulation of data protection and privacy between European Community (EC) and United States (US).

While US defends the self-regulation between companies, EC developed the European Data Protection Directive 95/46/EC [13] for regulating the protection of personal data and the corresponding transposition of this directive (for example, for Spain [14]). One of the articles of this directive obliged to the states inside the European Community to transpose the directive into national laws, but this has not already fully happened, as some countries do not have this national law yet [15]. This can give us an idea of the complexity of working with data protection and privacy legislation even for the experts in law definition (governments), since the directive was already approved in 1995.

There is also another directive related to personal data protection, the European Directive on privacy and electronic communications 2002/58/EC [16]. This directive applies to the personal data that can be obtained and used in the telecommunications sector. This directive has also to be transposed into national laws by each of the members of the European Community by the end of 2003.

Nevertheless, due to the pressure done by EC for the protection of their citizens’ data, the US Department of Commerce defined safe harbour privacy principles [17] for guaranteeing data protection of European citizens’ private data as described on the 95/46/EC directive.

#### **3.2 Technical viewpoint**

From the technical point of view, privacy and data protection is a key issue as many organisations are working in the definition of mechanisms that help the provision and control of data privacy to end users, specially for data being accessed through the

Web. Protection of personal data in off-line environments is a different problem, but by no means less difficult. However, in this paper we concentrate in the Web situation.

In this area, the first initiative we have to mention is the Platform for Privacy Preferences (P3P) project [18] from W3C. In the specification for version 1.0 of P3P [19] the syntax and semantics of P3P privacy policies is defined, and also the mechanisms for associating policies with Web resources. They describe a mechanism for defining new data elements and data sets and contemplate the possibility of adding extensions. Also inside the P3P project, we find APPEL (A P3P Preference Exchange Language) [20], for expressing preferences over P3P policies. These preferences are defined in APPEL as a set of rules. A user agent can make automated or semi-automated decisions regarding the acceptability of machine-readable privacy policies from P3P enabled Web sites based on APPEL rules.

However, P3P is only one initiative for privacy policies definition. Many web sites have their own privacy policy described in legal clauses on *plain text*. Users of that site should read these clauses before providing their private data, as they can be considered as a contract between the user and the web site. It is hard to read all legal clauses inside the privacy policy of a web site and this is why P3P is being defined. Nevertheless, P3P has several drawbacks. For instance, it does not allow the access to individuals to the personal data stored in the web sites offering P3P versions of their privacy policies.

Also inside the technical viewpoint, we should mention the CEN/ISSS Workshop on Data Protection and Privacy (CEN/ISSS WS/DPP) [21]. This workshop, just kicked-off in July 2003, follows the conclusions of *The Initiative for Privacy Standardization in Europe (IPSE)* report [22], the aim of which was to analyse the current status of privacy protection efforts and determine whether standardisation actions in the broadest sense could benefit the processes and implementation of the European Data Protection Directive 95/46/EC [13]. The report, prepared by an IPSE Project Team and approved by the IPSE Steering Group, looked at the background and a broad representative sample of the current work in progress on data protection.

Finally, a description of possible use of Digital Rights Management systems to meet the challenges of Privacy Rights Management can be found in [23].

### **3.3 Alignment of legal and technical viewpoints**

Our approach for aligning data protection and privacy from the legal and technical viewpoints is the definition of a common vocabulary for describing the regulations present in this field in the European Union [13,16].

Our objective is the definition of a simple ontology of data privacy terms. To do so, we will base our work on the experience in ontology definition obtained during the development of IPROnto [5], the ontology about IPR described in section 2.

For not starting from scratch in the definition of the simple privacy ontology, we are waiting for the results of the CEN/ISSS WS/DPP [24], mentioned before. One of the objectives of this workshop is the definition of a generic set of contract clauses reflecting the requirements of Articles 17 of Directive 95/46/EC [13]. The results of this work might be very useful for defining our ontology, possibly contributing it to the Workshop. Afterwards, we could also align the simple privacy ontology with P3P,

bearing in mind that there are many tools for automatic checking of P3P policies and APPEAL rules.

Also based on our previous work done in the construction of a framework for negotiation of IPR [25] and on the idea of data licenses for the use of personal data using the P3P language described in [26], we will describe a negotiation scenario for the use of personal data by web sites. It is possible to use our negotiation framework as we have defined it for being able to use different data structures.

## 4 Conclusions

We have presented an ontology for IPR that is being used for developing applications that involve interchange of multimedia content having associated rights. Since IPR is a regulated domain, the approach we have followed to develop the ontology could be used to adapt it to the different regulations, thus simplifying the implementation of systems conformant to laws.

We are currently developing applications that use IPROnto, for example, in the context of IPR negotiation. In our research group, Distributed Multimedia Applications Group (DMAG) [27], we have done some example implementations in the NewMARS and AgentWeb projects [28, 29].

Furthermore, we want to go one step forward and extend again the approach to a new domain, that of Data Privacy Protection (DPP). The high level of activity in this field, and the strong need of having systems that follow DPP laws, seem to confirm that there is a need for this. We have introduced in the paper how we are going to deal with this problem.

Finally, it is also worth mentioning new plans we have in the area. The international standards under development on DRM (see Section 1) specify a set of DRM terms and their relationships and possible extensions, providing a kind of regulation. We are working in a new ontology, that will probably be a formal subset of IPROnto, that would formalise the REL and RDD standards from MPEG-21.

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