Towards a Digital Rights Expression Language Standard for Learning Technology

A Report of the IEEE Learning Technology Standards Committee Digital Rights Expression Language Study Group

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1 Goals of this Report

This report has been generated within the context of the Learning Technology Standards Committee (LTSC) of the Institute for Electrical and Electronic Engineers (IEEE). The LTSC develops accredited technical standards, recommended practices and guides for learning technology.

"Digital rights" is an area of vital importance to all industries that deal with digital content, including the industries of learning, education, and training. As a consequence the LTSC formed a study group in 2002 to examine digital rights standards and standards development efforts in light of applications to learning technology.

This effort has focused on *digital rights expression languages*, i.e., languages in which rights can be expressed and communicated among cooperating technologies. Digital rights themselves exist as policy or law and are therefore not within the scope of a standards development organization. Technology *is* involved in enforcing digital rights, for example by disabling the ability to make unauthorized copies, but the LTSC almost exclusively deals with standards that support interoperability and not with implementation issues of this type. In this spirit the LTSC study group concentrated on making recommendations for standardizing a digital rights expression language with the specific charge to

- Investigate existing standards development efforts for digital rights expression languages (DREL) and digital rights.

- Gather DREL requirements germane to the learning, education, and training industries.

- Make recommendations as to how to proceed. Possible outcomes included, *a priori*, recommending the adoption of an existing standard, recommending the creation of an application profile of an existing standard, or creating a new standard from scratch.

- Feed requirements into ongoing DREL and digital rights standardization efforts, regardless of whether the LTSC decides to work with these efforts or embark on its own.

This report represents the achievement of these goals in the form a of a white paper that can be used as reference for the LTSC, that makes recommendations concerning future work, and that can be shared with other organizations.

2 Digital Rights Management

Digital rights permit a person or organization to perform specific actions with digital information under specific conditions. For example, a user may have the right to play an MP3 provided a fee has been paid, a company may have the right to resell a software application, or a learner may have a right to take an online quiz exactly once. Digital rights determine *who* can do *what* under *which conditions*. For further information: www.indecs.org

Digital rights are governed by intellectual property law and contract law. They can be licensed, sold, or assigned to others with conditions attached [2]. As digital information is processed and transferred, new rights may arise and rights may change. For example, an article has copyright associated to it when it is written. Copyright may be assigned to a publisher when it is published, and specific usage rights may be assigned to a reader when the article is purchased or acquired.

Digital rights management is the process of recording, transmitting, interpreting and enforcing digital rights. The goal is to prevent unauthorized use and to preserve the integrity of digital information. Achieving this requires standardized ways of communicating digital rights as well as systems that can be trusted and are capable of abiding by the rights expressed. This has led to standardization efforts, primarily by the multimedia production, publishing, and consumer electronics industries, with a view towards making it possible to enforce digital rights associated to commercial multimedia content.

Digital rights management often depends on information security (e.g., on encryption techniques, digital signatures, and on secure authorization protocols) but also involves complex issues ranging from legal constraints to e-commerce models and usability. In this context, *digital rights expression languages* play a key role. Rights expression languages are used to specify the set of permissions that are given to users (and mid-tier entities such as distributors and libraries) and the conditions and obligations that have to be satisfied for these permissions to be exercised. The focus of this white paper is on the standardization of digital rights expression languages, in the context of learning applications.

2.1 Digital Rights in Learning, Education, and Training

As with other industries that rely on the digital content, a major obstacle facing e-learning is the vulnerability of intellectual property to improper and undesired use. Motives for ensuring proper use include avoiding adverse legal actions, ensuring payment, ensuring proper attribution, and ensuring the intellectual fidelity of content. For example, recent revisions to U.S. copyright law (known as the TEACH Act) allow accredited educational institutions to transmit copyrighted displays and performances in online learning settings

but only if they institute policies and technology that safeguards against unauthorized use or redistribution. The ability to specify and enforce digital rights is crucial to the success of e-learning.

Many of the requirements for e-learning are not specific to e-learning. A significant number derive purely from the fact that e-learning involves digital media. But there are requirements that appear to be either emphasized by e-learning or imposed by e-learning. The next section addresses these. In the end, it is hoped that the e-learning community can make use of rights expression and rights management technologies that apply to more general areas as well, possibly with the addition of domain-specific extensions. This is made clear in the recommendations of Section 7.

3 General Requirements Presented by E-learning

Digital rights management is complex and difficult regardless of the application domain. Nonetheless, learning, education, and training place some very specific demands on a digital rights expression language. These fall into several categories, with many being relevant for other application areas too.

3.1 Joint Authorship and Learning Object Aggregation

Learning and training content often has multiple authors. In the educational arena, joint authorship is common, and the standards being developed by the learning technology industry aim at allowing learning experiences to be constructed from multiple learning objects.

Complex legal issues can arise when content is jointly authored by individuals or organizations whose policies place different restrictions on its use. Similarly, combining fees, royalties and.or attribution requirements becomes an issue in cases where content is aggregated from learning objects that may have been separately authored. A rights expression language can neither resolve legal questions nor create a policy for collecting fees, but it must be able to *identify rights associated with component learning objects and with contributing authors as distinct from rights associated with aggregate works. A rights language can associate multiple fee conditions with components, as well as with aggregate works. This characteristic, which is supported in existing rights languages, is of special importance learning, education and training.*

3.2 Heterogeneous Cultures

E-learning is used

- behind corporate firewalls
- in external customer training
- in schools and higher education institutions

- in the military
- as a means of publicly disseminating information

Each of these has its own culture of information protection. Corporations impose "business rules" that demand managerial approval for the use of content and that include internal charge-backs and other accounting mechanisms. Educational institutions often support open dissemination and acquisition of intellectual property. Military institutions (as well as corporations) deal routinely in classified information whose access requires the proper level of security clearance.

E-learning providers include

- commercial publishers and media companies
- internal training departments
- individual authors who "self-publish"
- digital libraries and other repositories that have collected content or metadata from multiple sources

Different types of providers have different needs. For example, an individual author may wish to permit free use for educational purposes, charge a fee for commercial purposes, and forbid use by military organizations. As another example, publishers have expressed interest in making scholarly literature available subject to a "moving wall" policy that would allow free distribution of literature older than a number of months or years.

Many learning objects are applets and software applications. Software is subject to a variety of licensing schemes – it can be freeware, shareware, open source, subject to a Gnu Public License, proprietary; but in each case, it is still copyrighted and subject to dissemination restrictions. Software licenses often include different fee structures and usage restrictions for educational use.

All of this illustrates that *a digital rights expression language must be able to express conditions dependent upon refined classifications of users and providers*.

3.3 Testing, Email, and Interactive Content: User Authoring

There are many instances in e-learning where learners create or alter content as part of the learning experience. Learners take tests, produce documents, write email, engage in synchronous online learning that is recorded, interact with simulations, and post to bulletin boards.

Work created in this way may be protected by privacy acts and may be subject to copyright laws and local policies. Tests may only be visible for a limited time and may be subject to restrictions on viewing and printing. Tests and other submissions may not be editable once submitted, but instructors may also need to annotate them and return them in a form that can be altered and re-submitted. Postings of email may be intended only for an instructor's eyes or for course participants who belong to a specified group.

Another related type of work created by end users is that of scholarly reviews, referee reports, and less formal annotations and comments relating to an existing work.

Rights for content generated by learners will presumably be associated with the content when it is created. These rights must also presumably be derived from some general rules associated with the learning context combined with rights associated *with the learner* that are transferred to any work done by the learner.

A digital rights expression language must be able to express rights derived from a combination of learning context and from policies, laws, and procedures associated with groups or individuals engaged in the learning process.

3.4 The Local Nature of Learning, Education, and Training

Learning, education, and training are highly local activities, yet distributed learning allow these activities to take place across jurisdictional and domain boundaries, e.g., there are many projects that involve international collaboration between students throughout Europe. The rights and policies associated with learning, education and training activities differ according to legal jurisdiction, local culture, and local context. Content, however, is often created and distributed on a global scale. This emphasizes the need for a rights language to *express local policies and rights frameworks and to support the derivation and instantiation of rights from a combination of local and global contexts.*

3.5 Attribution and Other Non-monetary Value Systems

Monetary gain is not the sole objective of creating intellectual property. In academic and research circles, and indeed in the entire knowledge economy, *attribution* is at least as important. An author may create content and grant permission to use it *as long as the author is properly acknowledged.*

In addition to attribution, *fidelity* of ideas and interpretations is important. An author may *not* wish to allow his or her ideas to be referenced without assurances that they are in fact being properly expressed. A concrete example is the denial of permission to use a quote out of context.

Although issues of attribution and fidelity are not specific to e-learning, they are of increased importance in comparison to domains like multimedia publishing.

A rights expression language for use in learning, education and training must be able to express conditions associated with attribution and intellectual fidelity.

3.6 Pre-existing Standards

E-learning standards already exist, both as industry standards and as standards that have completed or are near to completing formal accreditation. Examples include the *Sharable Content Object Reference Model* (SCORM) and IEEE *Learning Object Metadata* (LOM).

These standards will interact with digital rights expression languages in several ways. LOM contains a *rights* category into which an expression language can be placed, but this means that the language must be compatible as structured data and have compatible bindings. If the languages are bound in XML, for example, namespaces and element names must be compatible.

SCORM not only includes metadata but also now includes a *sequencing* specification that instructs learning delivery systems in what order and under what conditions to deliver specific learning assets. If a system is to respect the rights associated with a learning asset, which may preclude or restrict its delivery or form of delivery, information on rights will need to be processed together with sequencing information.

A rights expression language for e-learning must be compatible with the existing e-learning standards program.

3.7 Patents

International standards organizations prefer standards that are not subject to patents, but are willing to produce licensed standards that are offered on a *reasonable and non-discriminatory basis.* This creates a potential problem for educational institutions that are accustomed to preferential pricing and licensing. *A standardized rights expression language for e-learning must be available for use by educational and research institutions at no cost or at very low cost.*

4 Specific Requirements and Suggestions

The requirements given in Section 3 are general in nature and may suffice to inform existing standardization efforts. They are provided as an aid to future work and in order to help other organizations understand the types of approaches that might be taken. The work of taking them to the level of detail required for standardization is appropriate for a *working group* and not a *study group*.

4.1 Aggregate Content and Local Policies

Section 3.1 discusses the need for expressing rights associated with both "atomic" and aggregate learning objects. To examine this issue in greater detail, consider the use of the relation category in Learning Object Metadata, see also Section 4.5 below. This element category corresponds to Dublin Core *relation* and can be used to express relationships among aggregate works such as collections of articles, journals with multiple volumes, etc.

The question of how this affects rights is a matter of policy or law. For the purpose of enforcement by digital technology, policy and law must be (a) expressed and (b) expressed in form that can be machine processed.

This suggests, as is also suggested by Sections 3.2, 3.3 and 3.4, that *a digital rights expression language for e-learning must be able to handle* rights policies *as well as rights.* One approach to this might be to create a standardized *digital rights policies expression language*. Since policies are local in nature, a rights expression language would likely not include policy expressions itself but would instead reference local policies via an appropriately identified URI.

4.2 User Roles

Section 3.2 identifies the need to express user roles as conditions for the granting of rights. Experience in developing metadata and other standards suggests an approach to the identification of roles that entails

- Standardizing a basic and generic vocabulary
- Providing an extension mechanism for additional taxonomies to be referenced by uniquely identifying a source (e.g., through a URI).

A standardized vocabulary might include types of *people* involved in the creation and consumption of e-learning:

- Author
- Editor
- Manager
- Administrator (i.e., learning or training administrator)
- Student
- Teacher (or instructor)

Such a vocabulary might also include *sectors* involved in learning, education and training:

- Education
- Commercial
- Government

Note: *This report is not suggesting that the above lists are the right ones. It suggests that this general approach has met with some success.*

4.3 Learning Context and Collaboration

Section 3.3 points out the need for rights to be assigned to content that is *generated* by end users, and for these rights to be derived from context. To do this, it may be convenient to introduce a name space for this context.

Note: XrML uses context already and for slightly different purposes. ODRL has a <context>tag but very little vocabulary to describe educational or learning contexts.

Learning context must identify local policies and procedures by reference. Any digital rights expression language must therefore include a mechanism for retrieving the data needed to

- Describe local policies and procedures
- Derive rights from them

Local policies and procedures might, for example, take the form of a matrix of locally defined *user roles* matched against *learning contexts* that would assign to each such pair a set of rights expressions.

As in Section 4.1, such policies and procedures might be expressed in a standardized format and referenced via a URI.

Note that indirect reference allows local authorities to modify policies without touching any content itself.

4.4 Attribution and Permissions Addressing Fidelity

Section 3.5 makes the point that some cultural contexts emphasize proper attribution and the fidelity of content above other rights restrictions. This seems rather easy to handle by including the proper elements in a digital rights expression language. For example, a proscription on alterations would be a core condition expressible by such a language.

Learning Object Metadata has an extensive structure for expressing contributors to the creation of content. Once again, this suggests a mapping of local policies to the information could be expressed in this metadata. However, attribution may be so important that globally constant expressions of attribution would be preferable.

To be concrete, here is a list of the types of conditions that must be expressed:

- Authors must be cited (with a specified method)
- Links to original work must be included
- Work may not be altered by any process

4.5 Rights Expressions, Learning Object Metadata and SCORM

A number of organizations are been contributing to e-learning standardization in domains which have coalesced into several major areas of common concern:

- Metadata (about content)
- Learner Information (now called *participant* information)
- Standards for exchanging information between content and delivery systems at run time
- Aggregating, transporting, and disaggregating content
- Means of encoding specific types of content, such as test questions
- Standards that enable designers to *sequence* a series of learning objects in a way that depends on test outcomes, competencies, and other learner information
- Architectural standards and standardized APIs that enable components of learning and training systems to communicate with each other and with the enterprise environments in which they operate

Of these, the standards that have progressed the farthest and that have the most industry impact are those for learning object metadata (IEEE 1484.12.1-2002) and the set of specifications and standards that make up the Advanced Distributed Learning Initiative's Sharable Content Object Reference Model (SCORM).

This section explains some of the compatibility issues between a standard for digital rights expression languages, learning object metadata, and SCORM.

4.5.1 Learning Object Metadata and Digital Rights Expression

Learning Object Metadata includes an element category for rights description. This category is comprised of the following elements:

- 6.1 Cost
- 6.2 Copyright and Other Restrictions
- 6.3 Description

The first two elements permit only "yes" or "no" as values. The intended use of the third element is for a human readable description. As the LOM standards document itself explains, its “intent is to reuse results of ongoing work in the Intellectual Property Rights and e-commerce communities. This category currently provides the absolute minimum level of detail only".

The approach supported by the LOM Working Group within the Learning Technology Standards Committee is to incorporate a standardized rights expression language into the LOM standard. This leads to the following issues:

- LOM is a *data model*. The LTSC is working on several bindings, not all of which are XML based. To be "included in LOM" a rights expression language must also be abstracted as a data model.

- Assuming that a rights expression language is given in XML and that "inclusion in LOM" is restricted to an XML binding of LOM, the XML for both standards must be compatible. If, for example, an XML binding of LOM is taken to be a schema, then so must the rights expression language be a schema. Similarly, if both use name spaces, possible conflicts must be resolved.

- LOM and a rights expression language must have the same (or compatible) extension mechanisms.

4.5.2 SCORM and Digital Rights Management

SCORM is a collection of specifications and standards, not a single specification or standard. (More accurately, SCORM is an *application profile* that incorporates several specifications and standards.) The pieces comprising the most recent version of SCORM, version 1.3, are:

- Learning Object Metadata
- IMS Content Packaging
- A CMI runtime communication data model that is being standardized by the LTSC
- An ECMAScript runtime communication API that is being standardized by the LTSC
- IMS Simple Sequencing, a specification that has not yet been finalized by the IMS Global Learning Consortium but is nonetheless considered a part of SCORM 1.3.

Since SCORM includes Learning Object Metadata, Section 4.5.1 applies to SCORM, although SCORM specifically is interested in an XML binding for this metadata.

Content Packaging is intended to describe aggregations of content. It does so by creating a *manifest* that references the resources available in a package and that also includes means of organizing the resources for display and delivery by a learning platform. Since the Learning Object Metadata (potentially) describes each resource, and since it is envisioned that rights will be expressed through this metadata, the Content Packaging specification may need no modifications itself. However, the issues identified in Sections 3.1 and 4.1 apply.

The CMI runtime data model defines what type of data may be exchanged between a delivery system and content at runtime. Draft versions of the standard are publicly available. Currently, rights are *not* part of this data.

The only "content" expressed in the CMI data model results from "interactions" such as test questions. This content should be subject to rights and policies as explained in Section 3.3. It is impossible to say whether rights must be expressed as part of this

runtime exchange without an understanding of where and when rights are associated with the content that is created by learners. From a standards perspective, this type of understanding should be based on existing practice, of which there is very little.

In addition to content generated by learners, the CMI data model includes test results, learner identifiers, and many other objects that may be subject to privacy policies and legal restrictions. It is not clear where and how the mapping between these objects and their associated rights will be made for the purpose of enforcement.

The ECMAScript API defines how elements of the CMI data model (and any other data models) are exchanged between content and a delivery platform. It also includes mandatory calls for initiating and terminating sessions. Without a model of rights enforcement it is hard to say whether it is necessary, for example, to include error states in the API that are related to rights enforcement.

The newest part of SCORM is *simple sequencing*. Roughly speaking, simple sequencing views content as a tree and also views it as a delivery system as traversing the tree and delivering the content attached to nodes of the tree based on rules. The rules allow a delivery system to make decisions dependent upon competencies, but the rules have no current mechanism for making decisions based on rights.

To incorporate rights enforcement directly into simple sequencing would likely posit the existence of a rights enforcement engine. It might also be necessary to attach rights expressions to nodes of the content tree itself. As mentioned above, questions like this cannot be resolved without an agreed upon model of rights enforcement in learning technology. Moreover, they may bring into play licensing restrictions of digital rights management systems involving patent claims.

4.6 Rights Expression and Other Proposed Standards

This report does not cover all specifications and proposed standards for learning, education and training that may interact with digital rights expressions. However, in the interests of expressing requirements to other organizations it highlights three more in addition to Learning Object Metadata and SCORM

4.6.1 Question and Test Interoperability

The IMS Question and Test Interoperability specification is an extensive data model and XML binding for encoding test questions, tests, and test banks. It includes a piece for results reporting as well. The comments made in Section 3.3 apply to the content that is encoded and reported using this specification. Perhaps more than in any other case, it seems to make sense to include expressions of rights, possibly indexed to local policies and practice, in the encoding of tests. The issues this would entail include those raised before: XML compatibility, the need for an enforcement model to make decisions as to what rights must be expressed, and the issues surrounding user generated content.

4.6.2 Learner (or Participant) Information

Information about people is often protected through local privacy policies. It would be premature for this report to suggest any technical solutions. However, it should be noted that containers for privacy and access restrictions exist in specification like the IMS Learner Information Package and in other specifications that have been contributed by the LTSC to various subcommittees of ISO/IEC JTC1.

4.6.3 The Open Knowledge Initiative

The Open Knowledge Initiative™ specifies a layered architecture that helps define the technological environment of learning applications. The lowest level is enterprise infrastructure. The next level consists of common services such as authentication and the ability to write to file systems. On top of that comes standard educational services, and then specialized education applications build on the educational services. The deliverables of the Open Knowledge Initiative include standardized APIs for accessing the common services and educational services. Authentication and Authorization are examples of services that play a role in digital rights enforcement. Perhaps others should be identified and standardized as well. For example, the OKI might consider a "copyright service" that would accept a unique identifier for a document and information about the user (expressed as roles) and return a rights expression string.

The Open Knowledge Initiative embodies an approach to building learning modular learning technology on standardized interfaces. This same approach is evident in work being undertaken by the IMS Global Learning Consortium and, to some extent, in the older Learning Technology Systems Architecture standard that is in the final stages of formal standardization in the LTSC. Although the issues raised by this approach may be independent of a rights expression language, agreement upon such an approach would clarify the places at which rights expressions play a role and how they need to be transported among learning technology systems.

5 The Digital Rights Expression Language Standardization Landscape

This section reports on the current state of existing and proposed standardization efforts targeting digital rights expression languages.

5.1 Existing Languages

There are many existing specifications that may be considered to be rights expression languages. The ones listed here are the most general and the ones that are getting the most attention in industries related to learning, education and training.

5.1.1 ODRL – Open Digital Rights Language

ODRL is an XML rights expression language developed by the international ODRL Initiative. Information on the ODRL Initiative and the current specification is available at <http://odrl.net>. ODRL has been formally adopted by the Open Mobile Alliance (formerly the WAP Forum) as the standard for rights information over mobile content, and recently published as a Note by the W3C. ODRL has also been adopted by some large companies and has been incorporated into the international COLIS Project that shows the feasibility of integrating "rights-enabled" learning objects across numerous course and content management systems, digital repositories of learning objects, and library e-reserve systems. The COLIS project has proven that ODRL meets the requirements of the education sector and application profiles have been developed for IMS Content Packaging and LOM.

ODRL is based on a model that establishes relationships among *assets, parties*, and *rights.* Assets are digital objects identified by a globally unique identifier. Parties are people or organizations that can also be rights holders. Rights include permissions, constraints, requirements, and conditions. The primary relationships in ODRL are *offers* and *agreements*, both of which can be made or revoked. Agreements transform offers into formal contract licenses. In addition, ODRL includes the notion of a *context* that can modify an asset, party, permission, constraint, requirement, or condition.

In ODRL, offers can be hierarchical. Assets maybe considered as individual or aggregates, although separate rights may be assigned to parts of assets that have their own identifier. ODRL can also reference *roles* by pointing to an external source and taxonomy as well as supporting the International Library Federations "works, expressions, manifestations, item" model. ODRL includes an extensive vocabulary of permissions, constraints, requirements, rights holder descriptions, and contexts. These are defined by a data dictionary. As part of its extensibility scheme, ODRL allows the definition of alternative data dictionaries for these types of elements.

5.1.2 XrML – Extensible Rights Markup Language

XrML, having its roots with Xerox dating before 1994, is an XML rights expression language developed by ContentGuard (http://www.contentguard.com). Information on XrML is available at http://www.xrml.org. XrML is currently being used as a base document for a standard by the MPEG-21 working group within ISO/IEC JTC1 SC29 and is being further developed by a working group within the Organization for the Advancement of Structured Information Standards (OASIS). In addition, the Rights and Rules Working Group (RRWG) of the Open eBook Forum (OeBF) has selected XrML as a foundation rights expression language for developing detailed material in its Rights Grammar specification and has also established a formal liaison with MPEG-21. Several companies including Microsoft have also adopted XrML.

XrML is designed to express *rights, terms,* and *conditions.* XrML expressions are *licenses* that grant *rights* to *principles* (people or organizations) associated with *resources* (including digital media) and subject to *conditions.* Information security is woven into the data model used by XrML, as is support for the identification of Web services.

XrML offers a core schema, a standard extension schema intended for all uses of XrML and an additional schema intended for use with digital content or with traditional media such as books or music.

An important assumption underlying XrML is that it will be used by a digital rights enforcement system that will recognize no right *unless explicitly granted.* (This is the same as with ODRL.)

5.1.3 DOI – Digital Object Identifier

The American Association of Publishers developed DOI, primarily for the purposes of creating a universal referencing scheme and for identifying and exchanging intellectual property in the digital environment. There are currently over 6 million DOI instances in use in the publishing industry (Nov. 2002).

At the core of DOI is a system for assigning and resolving globally actionable unique identifiers together with a registration authority that manages the identifiers. DOI meets many important requirements of the publishing and related communities: It permits the incorporation of existing identifier schemes like UPC and ISBN, it solves problems of URL persistence by providing a level of indirection, it allows descriptive metadata to be associated with digital objects by linking to metadata standards like Dublin Core, LOM, and ONIX, and it uses open standards with a standard syntax (ANSI/NISO Z39.84-2000).

Although not a rights expression language in the sense defined in this white paper, one of DOI's core functions is to enable automated copyright management for all types of media. To this end DOI has adopted the <indecs> approach and will implement a subset of the indecs2 dictionary. The publishing industry strongly associates digital rights management concerns with DOI. More information is available at: www.doi.org.

5.1.4 OeB – Open E-book

The Open eBook Forum was established in early 2000 to develop standards for the emergent eBook industry. In the Spring of 2001, the work of the Electronic Book Exchange Group was merged with OeBF. Following the merger, the Open eBook Rights and Rules Group was chartered to create an open and commercially viable standard for interoperability of digital rights management (DRM) systems, providing trusted transmission of electronic publications (ePublications) among rights holders, intermediaries, and users.

Currently the Rights and Rules group is beginning work on a specification for a Rights Grammar, taking as a baseline the MPEG-21 Rights Expression Language which in turn is based on XrML. The specification will provide the publishing community with a means to express business rules by granting unambiguous access permissions. By basing the specification on the MPEG-21 Rights Expression language, it is hoped that interoperability with other content verticals (the audio and audio-visual sectors) can be achieved.

More information is available at: http://www.openebook.org/

5.1.5 XML Security Standards

XML is the markup language of choice that is used to express digital rights. Thus it is important to briefly describe efforts related to XML Security Standards efforts:

- XML Digital Signature (http://www.w3.org/Signature/)

  This standard defines a flexible, XML-based syntax and processing model for digital signatures applied to any combination of XML documents, XML document parts, and Web resources. An XML Digital Signature provides integrity and non-repudiation.

- XML Encryption (http://www.w3.org/Encryption/2001/)

  This standard defines a flexible, XML-based syntax and processing model for encrypting any combination of XML documents, XML document parts, and Web resources. XML Encryption provides confidentiality.

- Security Assertion Markup Language (SAML) (http://www.oasis - open.org/committees/security/)

  SAML defines an XML-based syntax for security assertions, such as authentication assertions, attribute assertions, and authorization assertions. It also defines a set of protocols for requesting and retrieving such assertions. SAML assertions can optionally signed by using an XML Digital Signature.

- XML Access Control Markup Language (XACML) (http://www.oasis-open.org/committees/xacml/)
  XACML defines a flexible language framework for describing access control policies. Access control requests and authorization decisions can be represented as SAML assertions.

- XML Key Management Services (XKMS) (http://www.w3.org/2001/XKMS/)

XKMS defines a set of protocols to request a trusted third party to generate, register and validate cryptographic keys. This trusted third party is defined as a Web service. These keys can be used in XML Digital Signature and XML Encryption.

5.2 Digital Rights Standardization Initiatives

This section contains a brief overview of some of the initiatives that are developing or proposing standards for digital rights management. The initiatives chosen here are either globally significant or significant within the learning technology community.

5.2.1 MPEG-21 (Motion Picture Experts Group – 21)

MPEG-21 is defining a normative open framework for delivering and using multimedia. MPEG-21 standards are based on a fundamental unit of distribution and transaction (the digital item) and the concept of users interacting with digital items. Digital items are multimedia objects like video collections and music albums. The goal of MPEG-21 is to define the technology needed to support the exchange, access, consumption, trade and manipulation of digital items in an efficient, transparent and interoperable way.

Within this context, as previously mentioned, MPEG-21 is standardizing both a *rights expression language* and a *rights data dictionary*. The expression language is based on XrML and the data dictionary is based on <indecs>.

5.2.2 OASIS

The Organization for the Advancement of Structured Information Standards (OASIS) is a not-for-profit, global consortium contributing to the development, convergence and adoption of e-business standards. OASIS produces worldwide standards for security, Web services, XML conformance, business transactions, electronic publishing, topic maps and interoperability within and between marketplaces. OASIS has more than 500 corporate and individual members in 100 countries around the world. OASIS and the United Nations jointly sponsor ebXML, a global framework for e-business data exchange.

One of the current OASIS technical committees is the OASIS Rights Language Technical Committee (RLTC). The purpose of the RLTC is to define the industry standard for a digital rights language that supports a wide variety of business models and has an architecture that provides the flexibility to address the needs of the diverse communities that have recognized the need for a rights language. OASIS RLTC uses XrML as the basis in defining the industry standard rights language in order to maximize continuity with ongoing standards efforts.

More information is available at http://www.oasis-open.org.

5.2.3 CEN/ISSS Workshop on Learning Technology

The Comité Européen de Normalisation / Information Society Standardization System (CEN/ISSS) Workshop on Learning Technology encourages standards development for learning technologies in Europe by promoting collaboration with international standards organizations and between the participating members. [1]

The CEN workshop has been working on DREL-related issues since its inception in1999 and has prepared an overview that outlines the different legal contexts in various European countries. Currently, it is focusing on the development of specific educational copyright mechanisms, including variants on the GNU Public License model for educational purposes, as well as more commercially oriented approaches. The goal is to offer rights holders clear guidelines on how to declare which uses they would like to allow and disallow, potentially through a set of templates that can be instantiated for specific purposes.

(More information about ISSS is available at http://www.cenorm.be/isss)

5.2.4 IMS Global Learning Consortium

The IMS Global Learning Consortium is an industry/academic consortium that develops specifications for learning technology.

Its Digital Repositories working group has developed recommendations for the interoperation of a number of common repository functions can interoperate. These functions include searching and gathering repository metadata, as well as submitting, storing, requesting and delivering repository metadata and assets. Its recommendations address systems using emerging XML-based technologies (SOAP, XQuery) as well as longer established protocols (Z39.50, FTP).

The IMS working group has not addressed rights management directly in any form. However, its recommendations speak directly to the distribution of assets from collections, an important problem space for digital rights and their expression. In the context of interoperating digital repositories access rights may need to be expressed on the level of an entire collection. The experience gained in reaching consensus in the IMS Digital Repositories working group also points out the need for a digital rights expression language to interoperate with longer established technologies as well as with newer ones. For more information see http://www.imsproject.org/digitalrepositories/.

5.2.5 The Open Knowledge Initiative

The Open Knowledge Initiative™ (OKI.) is defining an open and extensible architecture for learning technology, initially targeted to the needs of the higher education

[1] CEN/ISSS Learning Technology eBrochure, October 2001.

community. OKI provides detailed specifications for interfaces among components of a learning management environment and open source examples of how these interfaces work.

The Open Knowledge Initiative is delivering a program of APIs that allow educational applications to converse with "common services" including authentication, authorization, and potentially a digital rights service. Such a service would accept a question of the form "is X permitted to do Y with Z?" and return an authorization or denial. For more information, see http://web.mit.edu/oki.

5.2.6 Indecs2rdd Rights Description Dictionary

Indecs2rdd is the result of a consortium based initiative to develop a rights data dictionary. The original interoperability of data in e-commerce systems project <indecs> was established at the end of 1998. In December 2001, <indecs>2rdd was adopted by MPEG-21 as the baseline technology for the ISO/IEC 21000-6 standard, scheduled for completion in March 2003.

For further information: www.indecs.org and
http://www.rightscom.com/tech_indecs2rdd.html

5.2.7 ONIX (Online Information Exchange) Metadata Specification

ONIX is an international standard for representing and communicating book industry product information in electronic form. Publishers can use it to distribute information about their books to wholesale, online and traditional retail booksellers, other publishers, and anyone else involved in the sale of books. Companies such as Amazon, BN.com, Borders, Fatbrain, Ingram and R.R. Bowker use and support ONIX. ONIX and the DOI are currently being used in eBook distribution. Further information is available at: www.Editeur.org and www.bisg.org

5.3 Technology Models

There are several existing models of educational technology that manage and enforce digital rights. Some of these are described here.

5.3.1 ARIADNE

The Alliance of Remote Instructional Authoring and Distribution Networks for Europe (ARIADNE) is a network of repositories and set of related tools supported by the European Union. In the ARIADNE context of sharing and reuse, a number of provisions for digital rights preservation are supported. Learning Objects and their metadata are

stored in a distributed Knowledge Pool System. When material is introduced, it can be made available:

- to everyone: proper citation is ensured when the material is deployed to a user through the ARIADNE Web-Based Learning Environment;
- on the local server only: only identified users with an account on a local server will be able to access the material
- through individual arrangement: because of the intricacies involved in supporting all possible policies, end users must then contact the rights holder individually and negotiate a deal for their specific purposes

See http://www.ariadne-eu.org/

5.3.2 The COLIS Project

The COLIS (Collaborative Online Learning and Information Systems) project is an initiative funded by the Australian Department of Education Science and Technology. Its participants include five Australian universities (Macquarie, Newcastle, Tasmania, UNE, and USQ) and five e-learning vendors (Computer Associates, Fretwell Downing, IPR Systems, WebCT and WebMCQ). Its goal is to build a broad, interoperable, standards-based e-learning environment for the future that includes digital rights management components.

Part of the first phase of COLIS was the creation of a test bed environment to investigate and demonstrate strategies for technical interoperability based on IMS specifications, IEEE LTSC standards, and other applicable specifications including ODRL. The COLIS demonstration project uses ODRL to express "offers" and "agreements" for use of learning objects. Offers are terms and conditions for using a particular learning object. Agreements indicate that a user has a license and will abide by all terms and conditions. The COLIS profile of ODRL provides the core vocabulary for two use cases based on "volume" and "site" licensing that is common in the education sector. The profile also allows differentiation between "educational" and "commercial" usage.

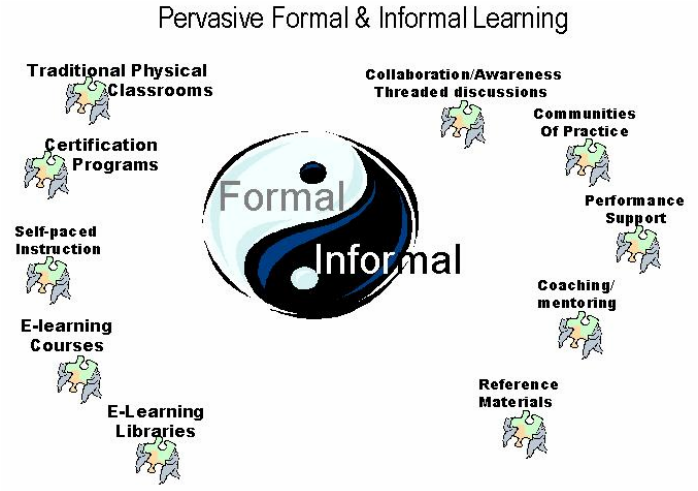
The COLIS environment includes a learning content management system that interprets ODRL assigned to learning objects in an IMS content package. When a student attempts to access a Learning Object via a relevant URL, the environment checks whether the student is entitled to view the Learning Object according to ODRL requirements. In the case of first time (permitted) access, the system presents an end-user license agreement that must be accepted to gain access to the Learning Object. The system maintains an audit trail of all user access and can restrict access if an ODRL criterion becomes relevant (e.g., a maximum number of students per Learning Object).

Further information about COLIS is available at http://www.colis.mq.edu.au.

5.3.3 IBM Lotus Learning Management System

The diagram below provides conceptual overview of the IBM Lotus Learning Management System. The system has been designed to mange both "formal" and "informal learning". Formal learning refers to content and interactions developed to AICC, SCORM 1.2/1.3 specifications. These can be tracked and reported for purposes of item analysis, and for studies of pathing correlation and latency. Informal learning can be integrated into blended learning solutions and tracked, but this type of learning provides fewer opportunities for precise reporting.

The IBM Lotus LMS provides a standards-based authoring tool that can be used to create learning objects. The size and nature of these objects is definable by the consumer. Based on the system configuration, objects can be part of certification paths, curriculum structures, located via searches, or automatically assigned to students. Users can employ profiles, objects, assessments and tracking to create adaptive and prescriptive learning programs.



5.4 Patents

5.4.1 Content Guard

ContentGuard holds and licenses a broad portfolio of patents that apply to the development of products and the implementation of solutions for the digital rights management market, including the use of a digital rights language in a DRM system implementation. Details and references to these patents may be found on the Content Guard Web site (http://www.contentguard.com).

ContentGuard offers the XrML specification royalty and license free. It also offers two different types of royalty-free patent licenses; 1) a Development License which allows the development of applications using XrML or XrML compliant specifications such as MPEG 21, 2) a Royalty Free Right to Use License if the application uses XrML or XrML compliant specifications to only attach or associate usage rights to a digital work such as content or a service.

ContentGuard's royalty-bearing license allows for the distribution and/or commercialization of applications using XrML or XrML compliant specifications. This license is offered to cover those functional categories not listed in the Development License or Royalty Free Right to Use License.

5.4.2 Microsoft

Microsoft has patents for embedding DRM functionality into computer operating systems and for a model for creating and maintaining rights descriptions as objects that are separate from the objects (e.g. files) on which the rights are exercised. (from http://www.giantstepsmts.com/DRM%20Watch/tech.htm).

5.4.3 InterTrust

Intertrust develops and licenses intellectual property for digital rights management (DRM), digital policy management (DPM), and trusted computing. Intertrust holds 26 U.S. patents and has approximately 90 patent applications pending worldwide. The Intertrust patent portfolio covers software and hardware techniques that can be implemented in a broad range of products that use DRM and trusted computing technologies, including digital media platforms and web services, and the enterprise infrastructure (from: http://www.intertrust.com/main/overview/index.html).

6 Jurisdictional Requirements

This section provides a very brief overview of some of the fundamental intellectual property principles relevant to learning, education and training that arefound in different jurisdictions. . It is informational and of general interest only, and does not claim to be complete. It gives a layperson's view that might be considered sloppy if not inaccurate by experts in the field.

Since rights are different from their expressions, this section should not be considered as generating any requirements on a rights expression language, other than the ability to handle the diversity and local nature of rights.

[THE DREL STUDY GROUP SHOULD FIND ONE OR MORE IP AND INTERNATIONAL IP EXPERTS TO VALIDATE AND POSSIBLY RE-WRITE THIS SECTION.]

6.1 Canada, the U.K., and the U.S.

Intellectual property laws in Canada, the U.K. and the U.S. are, from a high level perspective, more similar than different. In all three countries, copyright belongs to the author(s) of a work but can be irrevocably assigned to an employer or publisher. Furthermore, if a work is created in fulfillment of a contract, it is usually considered a *work made for hire,* with the copyright belonging to the entity contracting for the work, not the author. This can have broad implications. Work done in the course of fulfilling an employment contract is the intellectual property of the contracting company. This applies to patents *and* to publications, even academic publications, unless legislated or contracted differently. Even volunteer work can be "work made for hire." The IEEE, for example, asserts copyright over all work produced in its standards committees.

A number of recent U.S. laws affect digital rights management. These include the Digital Millennium Copyright Act (DMCA) and the recent Technology, Education, And Copyright Harmonization (TEACH) Act of 2001. The DMCA makes it illegal to defeat protection intended to prevent copyright violations. The TEACH Act provides an exemption to copyright restrictions for the online equivalent of reading a poem or showing a film to a class. The TEACH Act includes many specific DRM and copyright protection requirements that must be implemented before the exemption can be used.

UK legislation says that copyright in work produced by an employee in the normal course of employment is owned by the employer, but does not go so far as to enact the full US concept of work made for hire - that is, it does not cover freelance work even if under contract. For example, if a UK contract commissioning an author to write learning materials does not specify a transfer of copyright to the institution, then copyright remains with the author.

Another important concept in these countries is the doctrine of fair use. Fair use is an exemption to copyright restrictions that allows portions of copyrighted material to be reproduced for the purposes of scholarship, education, research, and reporting. The criteria to be considered when determining whether a use is fair include the nature of the use, how much of the work is being reproduced and the impact of the use on the market value of the work. There are many Web sites and references that explain the concepts and applications of fair use. See (references needed here and above).

6.2 Europe

Care should be taken in treating European intellectual property laws as a single entity. Legislation differs widely between states, although all EC member states are required to introduce legislation conforming to the minimum requirements set out in a recent EC Directive.

Very broadly, intellectual property laws in Europe differ from those in Canada, the UK and the US in their emphasis on the protection of the moral rights of the author or creator

("droit d'auteur"). These moral rights are separate from copyright and, unlike copyright, cannot be transferred or sold.

In those jurisdictions following the French code, moral rights are inalienable and perpetual. They cannot be waived or transferred, for example, to the employer or producer, but are passed down to the author's estate.

Moral rights give the author the right to:

- object to derogatory treatment of the work, that is use of the work in ways that damage the reputation of the author or of the work
- be identified (or refuse to be identified) as the author

This has at least the potential to impact significantly upon the ability of institutional rights holders to control absolutely the context in which work may be used or versioned, even in cases where the institutions own or control copyright. It may also impact upon the operation of open source models of courseware production.

The operation of the *work made for hire* principle also varies between states and may be restricted to employees only, not to freelance contractors or volunteers. Contracts commissioning freelance work should address explicitly the ownership of copyright. In some jurisdictions, educational institutions have only a restricted term during which they may own copyright before ownership reverts to the employee.

Fair use provisions in European member states are restricted to six categories specified by the EC Directive. Within this range, member states are free to introduce fair use provisions conforming to the WIPO (World Intellectual Property Organization) 'three step test'. ("Contracting Parties may, in their national legislation, provide for limitations and exceptions to the rights granted to authors of literary and artistic works under this Treaty in *certain special cases* that *do not conflict with the normal exploitation of a work* and *do not unreasonably prejudice the legitimate interests of the author*." [http://www.ukoln.ac.uk/dlis/models/models10/giavarra.html])

6.3 Japan

Japanese intellectual property law has quite similar concepts of "work made for hire" and "fair use" that are found in Canada, the U.K. and the U.S. laws. Since concept of "work made for hire" may apply to the materials made by a teacher or instructor, copyrights of these materials may not belong not to the individual, but to his or her educational institution.

In order to address Internet-based education, the Ministry of Education is proposing a revision of "fair use". At the same time, a working group established by the Ministry of Economy, Trade and Industry is examining policies to promote the interests of content providers. Under the "e-Japan 2002 Program," the subcommittee of Copyright Council published a report titled "*International Copyright Policy in the Progress of Information*

Technology (IT) and Electronic Commerce." This report proposed the development of international rules and measures for intellectual property rights under an alliance with other Asian countries. It is likely that Japanese laws will require digital rights management.

6.4 Other

This section contains a sample of how other countries and cultures deal with intellectual property rights.

6.4.1 Indigenous People

The intellectual rights and restrictions associated with the assets of indigenous peoples and resources can be unique and of a nature that is quite different from commercial requirements and restrictions. Hunter, for example describes a number of these in the specific case of Australian aboriginal peoples (Hunter 2002), where rules and restrictions apply differently to different generations, family groups, etc. Similar exceptional requirements are likely to pertain to aboriginal peoples of other regions, whether they are a part of the non-first world, or indigenous to other regions.

Additional expenses posed by royalty/licensing fees systems supporting a digital rights expression language will likely have greatest impact on the third world. The ability of a digital rights expression language to accommodate fair use exceptions and first use doctrines are also likely to have significant impact on this constituency.

Following are examples of intellectual property regimes in particular countries (from http://www.caslon.com.au/ipguide4.htm):

6.4.2 Australia

The first statutory license for multiple coping within universities was introduced in 1983. The license allowed universities to make multiple copies of copyright works for educational purposes provided that proper records were kept. Those records were used to compute appropriate rates of payment for copying under the license.

In the Digital Agenda Bill, provision was made for an extension of the statutory license provisions to cover digital copying. The reforms establish two separate schemes. One applies to hard copy material, and the other to works in electronic form.

6.4.3 New Zealand

A comprehensive review of New Zealand's intellectual property regime was announced in 2001 and is still underway. The regime includes a rate-setting Copyright Tribunal, collecting societies (most shared with Australia) and special provisions for educational and other uses. The legislation has been amended – e.g. to deal with parallel importation and other questions

6.4.4 China

> China has signed the World Traid Organization "Agreement on Trade Related Aspects of Intellectual Property" (TRIPS). TRIPS states: “The protection and enforcement of intellectual property rights should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations”.

Scott Palmer argues in [*An Identity Crisis: Regime Legitimacy and the Politics of Intellectual Property Rights in China*] that new IP law and accession to multilateral agreements such as TRIPS underpin official efforts to secure foreign investment and enable Beijing to legitimate its broader 'modernization' initiatives. However, the elaborate new body of law lacks the political and social foundations for effective enforcement and as a result is often little more than a wish list.

TO BE REVIEWED AND REVISED

7 Recommendations

[**NOTE**: THESE RECOMMENDATIONS ARE A CORE DELIVERABLE AND WILL IN THEIR FINAL FORM REPRESENT A CONSENSUS OF THE IEEE LTSC DREL STUDY GROUP. DRAFT RECOMMENDATIONS ARE NOT FINAL AND COMMENTS ARE INVITED BY ALL STAKEHOLDERS.]

The recommendations of this report are:

1. Maintain appropriate liaisons between learning technology standards development organizations and those standards development organizations standardizing rights expression languages. The purpose of these liaisons is to continue to feed requirements into broader standardization efforts and to ensure that the voice of the learning, education and training community is heard.

2. Support the creation of application profiles or extensions of XrML and ODRL that include categories and vocabularies for roles common in educational and

training settings. In the case of XrML, a name space for local context may be needed. (A name space is required for both XrML and ODRL for the "application profile" or specifically the application –LT application- extension)

3. Advocate the creation of a standard for expressing local policies in ways that can be mapped to rights expressions. This could be either through a data model or through the definition of an API or service.

4. Launch an initiative to identify models of rights enforcement in learning technology and to possibly abstract a common model for use by architecture and framework definition projects.

5. Further study the implications of patent claims, especially for educational and research purposes.

Note: The LTSC is not a specification or application profile development organization. Nor does it engage in research projects. The LTSC can advocate and support these efforts but not undertake them directly.

8 Bibliography

[A FINAL DRAFT WILL HAVE AN IMPROVED BIBLIOGRAPHY. TO BE DONE.]

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