

EXTENSIBLE RIGHTS MARKUP LANGUAGE (XRML) INTEROPERABILITY WITH DIGITAL TRANSMISSION CONTENT PROTECTION (DTCP)

Authored by ContentGuard, Inc. with contributions from Intel Corp. and Microsoft Corp. Copyright 2002.

ABSTRACT:

This paper addresses interoperability across the digital content industry with its multiple devices and a myriad of different business models. This interoperability is based on open widely accepted standards within the industry and will allow for maximum flexibility for content owners, device manufacturers and consumers.

As a proof of concept, the following technical discussion will address the manner in which leading industry standards, XrML and the rights expression function within DTCP, are capable of interoperability. XrML is a semantically precise language for expressing rights and business rules related to the use, duplication and distribution of content. DTCP, also sometimes referred to as "5C," is a specification that enables secure distribution of digital content between devices across IEEE 1394 and other home network interconnects. We will discuss the benefits of using XrML in combination with DTCP to expand the range of application of both technologies, and to explore ways for rights management systems using XrML to interoperate with devices that support DTCP.

A guiding principle in the technical approach is to ensure systems using either or both technologies can relate to each other in a way that content can efficiently flow between them while retaining the content owner's expressed rights, rules and restrictions.

CONCEPT:

DRM technologies are necessarily complex and dynamic. For the market advantages of moving content from analog to digital to be fully realized, there must be a common framework to allow for consistent, precise expression of owner intent over content use permissions. This will enable all the participants in the value chain; content owners, technology components suppliers, distribution players and consumers, to exercise their preferred business models. The requirement for this is interoperability between various business models and technology components based on industry defined open standards.

Key features of interoperability include:

- Exchange of content across multiple device types.
- Support of multiple business models while maintaining the maximum flexibility for rights expression of owner intent.
- Faithful transfer of rules expressing licensing intent from devices that can interpret complex expression to or from those that are only capable of interpreting and enforcing a simpler set of rights. This permits the secure transfer of protected media files from content owners to computers and/or portable devices while keeping the owner's intent for content use clear.

To this end, emerging standards like the rights language XrML, make it possible to express precise rights on a given type of content or "bundle of bits" that are clear, interpretable, and consistent across multiple systems. These rights remain associated with the content throughout its life. XrML, recently adopted by MPEG 21 as the starting point for development of its rights expression language, expresses a rich set of comprehensive yet scalable rights and conditions. It

can be applied to digital IP of all types; film, video, audio, books, programs, services and documents.

For consistent application of rights interpretation and to ensure the integrity of content owner's intent, it is essential that this standard also interoperate with less expressive rights mechanisms. As an open standard, XrML not only permits precise, granular expression of rights, it can effectively interoperate with simpler rights expression systems like that used by DTCP to faithfully map a subset of those rights to the restricted set. The following is an example of how such interoperability technology works today.

TECHNICAL INFORMATION

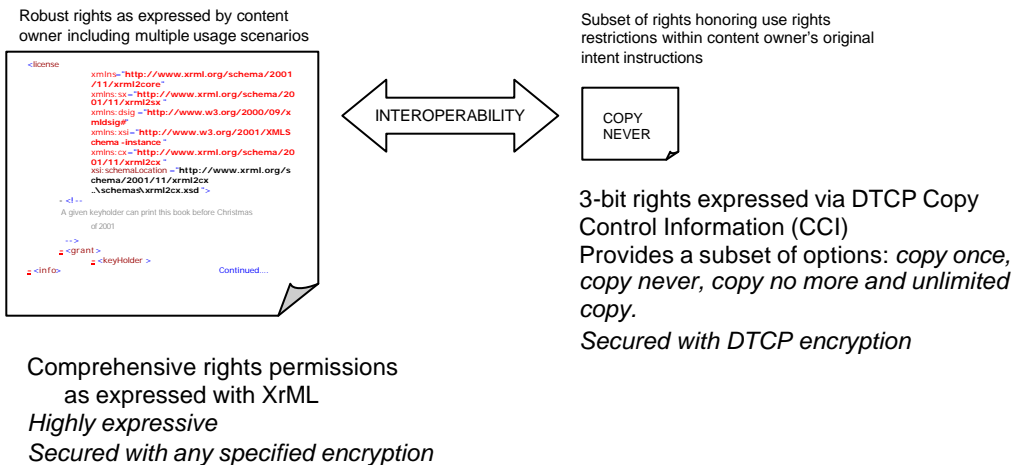
XrML is a rights language that uses an XML syntax to describe rights and conditions associated with digital content or services. It is designed to be both human and machine-readable. Standards organizations, like MPEG 21, are quickly recognizing that a single rights language standard is a fundamental component of DRM system and a key enabler for the e-content market.

DTCP is a technology, which enables digital content to be securely distributed between different devices (including consumer electronics and PCs) connected to a home network. DTCP licensed products must implement a set of compliance rules that govern how content may be handled within the product and how it may be transferred to an output or recordable media. DTCP is an important building block to grow the consumer market for e-content and deployment and interoperability of devices on the home network.

When solution providers enable interoperability between the rights expressed by DTCP and the comprehensive rights offered with XrML, industry benefits:

- Products and systems governing content will have the flexibility to offer a much richer set of rights and conditions.
- Devices which support DRM solutions that use XrML will be able to exchange DTCP protected content with other DTCP capable devices within the home, extending the usefulness of these DRM solutions, particularly in the consumer home market.

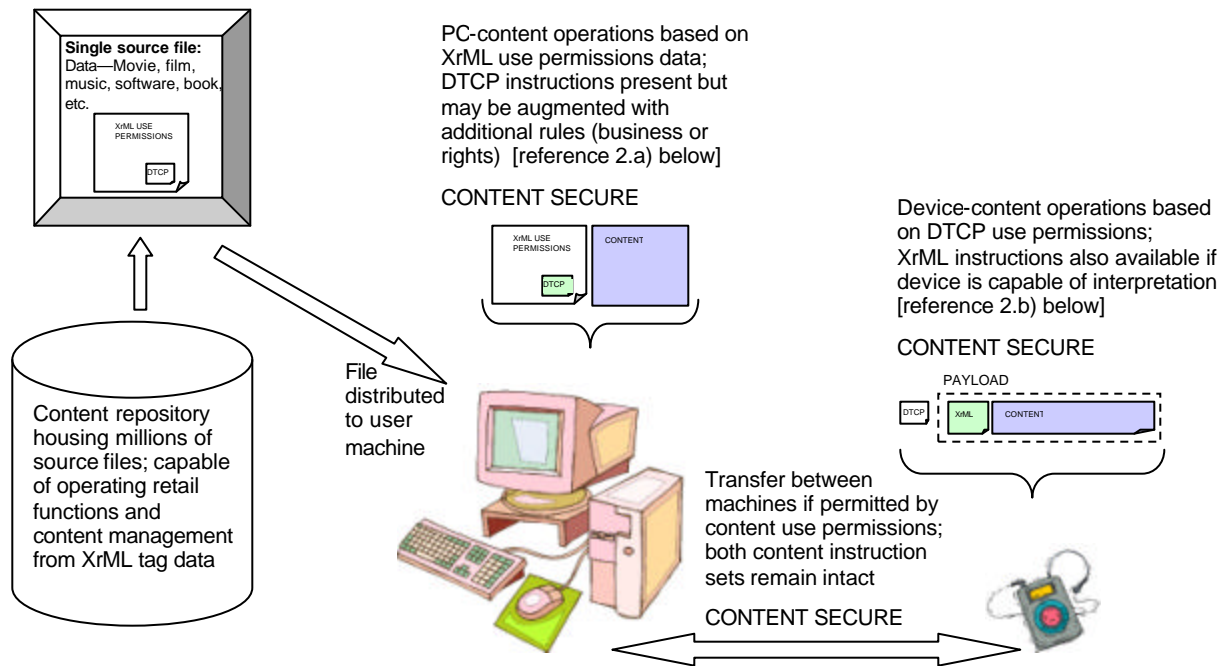
Fig 1:
Graphic representation of interoperability between use permissions permitted by XrML and DTCP



WAYS FOR XRML BASED DRM SYSTEMS TO INTEROPERATE WITH DTCP

As an example, Fig. 2 illustrates a content provider distributing to both a PC and a player device from one source file while maintaining control over expression of intent. Here, the source file contains both the XrML use permissions data and the more compact 3-bit DTCP Copy Control Information (CCI) use permissions data. Because both sets are included in the source file, the intent of the content owner controls the use options for the file in both environments. The file can also be shared from the PC to a device (and back) while the use permissions remain intact.

Fig. 2: Suggested model for interoperability between XrML based DRM system and DTCP



From an implementation standpoint, there are two primary challenges associated with transferring content between an XrML based DRM system and a DTCP channel secured devices.

1. Devices that implement DTCP cannot presently interpret the rich set of rights captured in XrML. Rights are associated with specific content in the DTCP domain whereas in XrML rights can be assigned to any principal including devices, software components, individuals, groups, or communities.
2. Content coming from the DTCP domain does not have any XrML associated with it, so components in an XrML system do not know what rights are associated with the content.

These challenges are addressable in the following ways:

1. Content traveling from the XrML domain to the DTCP domain:

By using the XrML **export** right a content owner can define when, if, how, and under which conditions, their content can be released to the DTCP domain (or any other domain for that

matter). As a result, an XrML based DRM system will transfer content to a DTCP device when the owner or licensor of the content expressly grants an “**export to DTCP**”.

There are at least two ways the DTCP use permissions can be inferred from an XrML license:

- a) The rights expression options in the DTCP domain are: copy once, copy never, copy no more and unlimited copy. These options are a subset of the rich set of rights specifiable in XrML. This subset can be mapped to corresponding XrML rights. The DTCP CCI bits are then set according to the **condition** part of the XrML **grant**.
 - b) DTCP instructions can be in effect embedded in the XrML license and all of the rights described for DTCP contained therein.
2. Content traveling from the DTCP domain to the XrML domain. The DTCP license agreement can permit DTCP protected content to be handed off to the protection of other “approved” protection technologies. This approval could be granted to an XrML capable DRM system by working with the licensor of DTCP. Two options are possible:
- a) If both the DTCP CCI bits and XrML license are present in the DTCP protected content, the receiving XrML capable system can abide by the rules expressed in the XrML license. This enables such a device to support the full rights & rules.
 - b) If only the DTCP CCI bits are present in the DTCP protected content, the XrML system receiving the content would create an XrML license associated with the content based on the DTCP CCI. The components within the XrML system would then honor this XrML license.

Industry benefits of interoperability

Devices that are built today based on the DTCP specification have been granted certain usage rights for the DTCP protected content that they receive. These rights are bound to the content itself via the CCI bits. XrML has the ability to specify the use of DTCP when permitting the export of content to devices. By enabling interoperability between these technologies, industry and consumers can take part in a broader set of business models and can maximize opportunities throughout the content value chain.

As a business case example, Microsoft’s DRM technology, incorporating XrML, will be capable of enabling interoperability with DTCP. This approach will bring together the benefits of a robust digital rights language and a high degree of protection for entertainment content distribution to the consumer. This in turn will help to demonstrate the foundation of technology and standards needed to enable a more rapid transition to the digital economy.

ADDITIONAL BACKGROUND ON XRML

XrML is an XML-based language for specifying rights and conditions to control the access to digital resources, such as content, services, or software applications. XrML had its roots in Digital Property Rights Language (DPRL), which was developed at Xerox Palo Alto Research Center and first introduced in 1996. DPRL became XrML when the meta-language (used to define the language) was changed from LISP-like syntax to XML in 1999.

Using XrML, anyone owning or distributing digital resources (such as content, services, or software applications) can identify the parties allowed to use those resources, the rights available to those parties, and the terms and conditions under which those rights may be exercised. Since

XrML is XML-based, the structure of the language is familiar to anyone who knows XML, or even HTML

XrML is recognized as the most advanced, mature rights language in use today because it is:

- *Comprehensive*, by providing a framework to express rights at different stages of a workflow or lifecycle of resources.
- *Generic*, by defining a large collection of format and business neutral terms (over 100) and using these terms to specify rights to any digital content and service.
- *Precise* through the development of XML schemas for the XrML Core and its extensions and processing rules that ensure unambiguous interpretation of the language.

XrML is also content and application agnostic, easily extensible and scalable, and adaptive to any applications that requires granting of rights and conditions in any part of a value chain.

A more general introduction to the language and the definitive description for the language can be found at <http://www.xrml.org/>.

ADDITIONAL BACKGROUND ON DTCP

DTCP provides manufacturers with an effective solution for protected content against unauthorized use as traverses digital interconnects within the home. The DTCP specification relies on strong cryptographic technologies to provide device authentication, key exchange, encrypted content exchange, and revocation. This technology was developed by Hitachi, Intel, MEI, Sony, and Toshiba and is licensed by the Digital Transmission Licensing Administrator.

Further information about DTCP can be found at www.dtcp.com.

For additional information about subjects discussed in this white paper, please contact:

Bruce Gitlin
Vice President, Business Development
ContentGuard, Inc.
(240) 694-1223
bruce.gitlin@contentguard.com

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