

TEAM Digital Commons — Activating the Market by a Network Content Delivery Revolution

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Abstract

This paper introduces “TEAM Digital Commons”, a project that aims to activate the digital content market by creating a revolution in content distribution, leading to a virtuous circle in content transfer between the commons and proprietary domains. An interdisciplinary approach is taken to establish a framework for exhibiting transformative content that can be used freely by attaching Digital Rights Expression, the Creative Commons Public License. The framework has the potential to accelerate the growth of the market that currently seems to prevent the content delivery network (CDN) from functioning properly and reaching economic maturity, as indicated by the estimate that the Japanese market size will reach only around 1 trillion JPY (9 billion USD) in 2008.

1. Introduction

With the advent of high-speed networks, well represented by photonic networks, the distribution and sharing of content with a relatively high volume are increasingly becoming common practice. A content delivery network (CDN) delivers digital content such as music, images, video, text, and computer programs to consumers over a network such as a local area network or the Internet. Although it is a promising concept, in every country it is currently trapped in a downward spiral due to the lack of network-oriented content. Even though there have been several trials, the major content holders, such as movie studios and record companies, still hesitate to open their content to the network. Apple’s iTunes model can be said to be a recent revolution in CDN, but in other cases, the situation has stifled the growth of a viable commercial market on the network. One can view this as

a chicken-and-the-egg problem: which came first? Is the hesitation holding back market growth or is the immature market raising concerns?

According to one estimate, the Japanese market for digital content over the network in 2008 will be worth only approximately 1 trillion yen, which is around 9 billion US dollars (Fig. 1) [1]. Market growth is too moderate to achieve a realistic return on investment

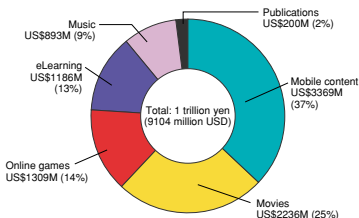


Fig. 1. Estimated market size of Japanese network content market in 2008 (Nomura Research Institute).

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for the CDN, which creates skepticism among investors about participation in CDN development.

The CDN needs to be activated by increasing the amount of network-oriented content to accelerate the growth of the market. It is essential to provide more flexible ways to handle the content and to support people's creativity by fully utilizing the distributed network, i.e., the Internet, which provides more opportunities for people to interactively encounter desired content than the unilateral content distribution schemes and logistics conventionally exercised by the major content holders. This paper introduces "TEAM Digital Commons", a project based on the idea that "together everyone achieves more (TEAM), which aims to create a revolution in network content distribution and thus create a virtuous circle of content moving between the commons^{*1} and proprietary domains and eventually lead to an increase in network-oriented content. An interdisciplinary approach is taken to establish a framework for exhibiting transformative content that can be used freely and safely by attaching a Creative Commons Public License [2], which is a form of Digital Rights Expression (DRE)^{*2}.

2. Framework of digital commons

The CDN is often discussed in terms of the "proprietary" domain because most content is now delivered this way. For example, you can purchase digital music or video that is generally controlled under Digital Rights Management (DRM). Our idea is much more focused on the balance between the proprietary domain and the "commons" domain, in which content has more flexibility in terms of the conditions for sharing and using it; we refer to this kind of content as "transformative"^{*3} content; it is a rich source of network-oriented material. The CDN will initially be fed by the addition and circulation of private transformative content. Unwanted content will probably be simply dropped, but the rest will be transformed

into derivative or value-added content that is distributed in the proprietary domain. Three basic frameworks for stimulating the metabolism of the CDN are needed.

- A framework that brings transformative content into the commons domain
- A framework that nurtures the transformative content
- A framework that bridges the commons and proprietary domains

For the first framework, use of the Creative Commons Public License (described in section 4), will increase the volume of transformative content and provide easy access to it. The license is part of the Creative Commons Project, which takes two basic approaches: restricting excessive legal control over copyrights and increasing the creative culture within the network [3]. Leaving the legal issues to the experts and taking a cultural viewpoint, we can classify people who will place content in the Creative Commons as those who create content purely as a hobby and those who want to become successful professionals in that field. The common desire of both groups is recognition of their efforts. Therefore, a minimum requirement to fulfill this desire is some way to verify the creators of each piece of content. Our contribution is to satisfy this requirement technologically and systematically. The second framework provides a secure and reliable system for verifying content creators so that they can at least take pride in their handiwork. The third framework provides a way to expose the content to more people, from consumers to producers who may want transform the content for commercial use. This desire will create positive feedback between the commons and proprietary domains. **Figure 2** shows the framework in an abstract manner. This bridge will also encourage the ejection of unpopular or obsolete work from the proprietary domain and recycling in the commons domain to stimulate more creativity.

*1 The commons traditionally refers to England's communal lands where individually owned livestock grazed. In what author Garrett Hardin called the tragedy of the commons, each individual owner increased the number of his cattle, knowing that he would gain but that the environmental cost would be shared by all. As a result the commons was destroyed. The underlying lesson in the tragedy of the commons is the importance of caring for both public and private resources, and the knowledge that the sole pursuit of individual benefits can mean disaster for all. In the context of CDN, the cost of creativity should be shared by all, so a good balance between sharing (public) and control (private) of digital content is important.

www.ficus.usf.edu/docs/glossary/c.htm

*2 Digital Rights Expression (DRE): Unlike Digital Rights Management (DRM), which limits the access to proprietary content without authentication or payment, Digital Rights Expression (DRE) is a way to describe under what conditions content can be used and is often called Digital Rights Description (DRD) as well. DRE does not prevent people from illegitimately using the content, but it is sufficient to provide information that enables people to use the content safely.

*3 "Transformable" is a more common term, but we use "transformative" to include the potential or tendency of the content being transformed by people stimulated by creative activities.

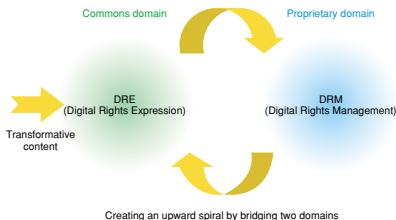


Fig. 2. The world of TEAM Digital Commons.

3. Content migration

We feel that an understanding of economics is helpful in understanding how content changes its resource characteristics as it migrates from the commons domain to the proprietary domain in the process we call “content migration”. Consider two inherent aspects of resource consumption: exclusivity and rivalry. The traditional commons was common land where anyone could freely graze animals. No one owned the resources, but people had to compete for them because they were in limited supply. Thus, we can categorize the traditional commons as exhibiting “non-exclusive ownership and resource rivalry”, as shown in Fig. 3 [4]. Analog content, such as a vinyl music record, is usually controlled to become a commercial product and/or digitized. It migrates to other

categories as shown by the two arrows, “control” and “A/D”, where A/D means analog-to-digital conversion. In the digital world, the ability to produce perfect clones means that unprotected content basically has no limit on its supply. Thus, such content is said to belong to the category of “non-exclusive ownership and resource non-rivalry”. DRE provides a way to move this content to the “exclusive ownership and resource non-rivalry” category by explicitly showing the ownership of the content. Use of DRE can also be considered as issuing a “Content ID”, since the content becomes unique to its creator or owner. The last category, “exclusive ownership and resource rivalry”, is the commercial arena, where perfect clones are controlled by legislation and technology, more specifically, by Digital Rights Management (DRM). Use of DRM is equivalent to issuing a usage license,

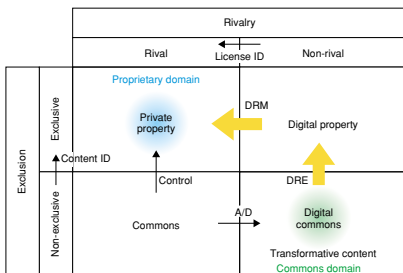


Fig. 3. Content migration and categories of resources.

in other words, a “License ID”. TEAM Digital Commons aims at implementing content migration by using the Creative Commons License and our own technology.

4. Creative Commons License—some rights reserved

Creative Commons is an approach to creating a space for independent, well-regulated criticism that would create a new culture [2], [3]. Incorporating this idea into the CDN could increase the volume of content in the commons domain. Both creators and consumers would appreciate the rights expression provided by the Creative Commons License and this would stimulate more innovation by letting people access and use licensed content freely. Creators need to expose their content as much as possible to the masses to achieve greater recognition, but there must

be a way to verify the ownership of the content.

The Creative Commons License is designed on a three-layer model (Fig. 4): 1) a human-readable Commons Deed, 2) lawyer-readable Legal Code, and 3) machine-readable Digital Code (based on the resource description framework (RDF)). Offering content under a Creative Commons License does not mean abandoning copyright. It means offering some of the rights to any taker but only on certain conditions. Figure 5 shows the four basic terms of the Creative Commons License. A total of 11 licenses can be created by combining these four terms because some combinations are mutually exclusive: “Share Alike” is only applicable for derivative work and cannot be used together with “No Derivative Works” within a license. At the Creative Commons website, the creator can choose a license and embed the resulting RDF into the HTML (hypertext markup language) document used for accessing it. For example, a com-

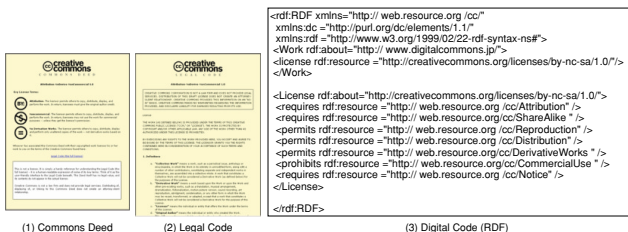


Fig. 4. Three layers of the Creative Commons License.

	Attribution. You let others copy, distribute, display, and perform your copyrighted work — and derivative works based upon it — but only if they give you credit.
	Noncommercial. You let others copy, distribute, display, and perform your work — and derivative works based upon it — but for noncommercial purposes only.
	No Derivative Works. You let others copy, distribute, display, and perform only verbatim copies of your work, not derivative works based upon it.
	Share Alike. You allow others to distribute derivative works only under a license identical to the license that governs your work.

Fig. 5. Basic terms of the Creative Commons License.

poser might publish a song under the “Attribution” license and a photographer might upload a photo under the “Attribution-Noncommercial” license.

5. Digital commons system

5.1 Technologies required

Efforts to utilize the Creative Commons License in the CDN and create a world based on TEAM Digital Commons can only be successful if supporting technologies are available. Managing transformative content will inevitably require the use of content ID, which is also necessary in commercial fields. Binding the license to the content, validating license termination and/or revocation, referencing the content, tracking unauthorized use of the content, and applying DRM are typical examples of the problems that such technologies are expected to solve. Some of them still need further study, but the technologies described below are sufficiently advanced to permit the first release of the Digital Commons System.

5.2 Content ID

Each piece of commercial content such as a book or a piece of music available today has a unique ID issued by the publisher, and it is not easy for transformative content created by individuals to obtain this kind of ID. Transformative content in the Digital Commons system is managed using a Content ID Forum (cIDf) compliant content ID (cID) [5], [6]. The cIDf format is designed for a three-player model consisting of creators, content holders, and distributors, and it can be issued dispersedly to transformative content as well as proprietary or commercial content. Content holders and distributors are considered equal in the commons domain because content is distributed directly to consumers from creators. Attribution fields provided for those two players are filled with identical values. Attributions specific to the Creative Commons License are stored in free-format fields. Implementation of the cID represents total management of both transformative and proprietary content in one standard framework and is essential for developing a bridge between the commons and proprietary domains.

5.3 License binding

The most important technological issue is how to bind the Creative Commons License to the content. People can indicate the usage conditions of their content by inserting an RDF in their HTML document. This creates an icon on the user’s computer that links

to the Creative Commons deed. This provides an effective way to verify content usage, but does not prevent the content from being copied and used in other ways without the proper license being attached. Watermarking and hash functions⁴ can be used with central database archiving, so that the ownership of the content can always be verified even when it is separated from the RDF [7]. Moreover, people can query content attribution and check if the content can be used freely.

5.4 System architecture

The Digital Commons System is designed to support our framework and manage transformative content under the Creative Commons License and to fulfill three requirements: 1) issuing the license, 2) binding the license, and 3) managing metadata used for content retrieval. The system consists of three main components—License Selector, Content Processor, and Metadata Manager—as shown in Fig. 6. Each component incorporates a Web-Service-like functionality, and information is exchanged using XML-based data packages (XML: extended markup language), so the License Selector can easily be replaced by or connected to the Creative Commons website in the US. The application server plays the role of providing the user interface. The system only stores and manages content metadata and does not hold the content itself. We assume that the content is stored in other websites and managed by individual creators.

A creator can either select a Creative Commons License or register the content through the application server. Upon registration, the creator inputs the location of the content so that the Content Processor can download the content and embed its content ID using watermarking. The Content Processor also calculates its hash value so that people can verify the ownership and usage conditions of the content by querying the system with the hash value. Users of the system can also calculate the hash value of local files using an applet⁵ provided by the system.

A DRM system will need to be implemented when the Digital Commons system starts dealing with proprietary content in the future. We have a lot of knowledge in this field obtained through the development of a copyright management platform [8].

⁴ A hash function is a transformation that takes a variable-size input and returns a fixed-size string (hash value).

⁵ An applet is a small program, which can be read from a WWW server over the Internet and executed on demand.

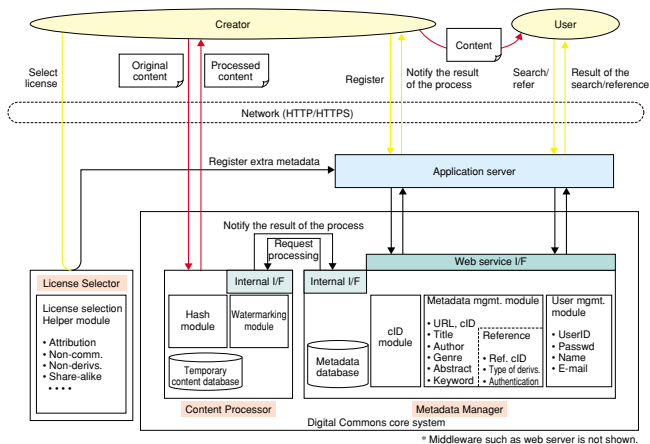


Fig. 6. Architecture of the Digital Commons system.

6. Digital Commons License Portal

6.1 Bridging the commons and proprietary domains

The Digital Commons system merely manages registered metadata about the content and makes it available for public access. To encourage people to access the system and eventually create positive feedback between the commons and proprietary domains, we will need to perform a lot of promotion. The Digital Commons License Portal (<http://digitalcommons.jp/>) will be launched this year on the Internet, and people will be free to register their content on this portal. We plan to create mutual links with Creative Commons in the US and Creative Commons Japan. These represent the first step of this project in a CDN revolution.

6.2 Economic contribution

The Digital Commons License Portal will contribute economically to the CDN. This contribution is indispensable for sustainable growth of the market. **Figure 7** explains the portal and its relationship with

several players. The flow of money is shown by the red arrows. We consider three profit models that would allow the portal to form a bridge between the two domains [9]. The revenue sharing model (1) is based on the traditional idea of paying creators for permission to use their content. The pyramid model (2) shows the functionality of the portal in the future. Both transformative content and proprietary content are managed using cID, and the portal will aggregate customers who are interested in transformative content and who cross-sell or up-sell proprietary content. The switchboard model (3) can be seen in the current film production system. An agent collects producers, actors, and writers and sells the entire production package to a content holder. The agent needs good judgment, but the investment risk is reduced by finding prospective stakeholders. When the portal starts to receive content from the proprietary domain, a good balance between the two domains will become a reality.

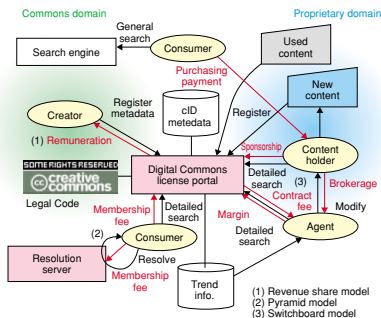


Fig. 7. License Portal as a bridge between two domains.

7. Conclusion

The trend in content production is now changing as people's interests and tastes become more diverse than ever before. Any individual can be a creator or an artist, and at the same time a producer or an agent. TEAM Digital Commons provides an excellent way to create new communities that prosper on the basis of innovation and a new content culture that will eventually stimulate the current content delivery network, creating new markets on top of those communities.

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