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On Integration of Digital Rights Management Processes Predicting Content Publishing

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ON INTEGRATION OF DIGITAL RIGHTS MANAGEMENT PROCESSES PRECEDING CONTENT PUBLISHING

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Abstract

The methods and technologies providing advantages in controlling and managing intellectual property rights are currently associated under the term Digital Rights Management (DRM). Our study revealed that the issues related to the DRM processes and components of DRM systems have been neglected from the perspective of the upstream of a value chain and the creator-side of a value network. This results in lack of mature solutions for the management of copyrights together with creation of content. Identifying and dividing the processes and components into categories according to the organizational and information system boundaries facilitate the discussion on the relations between processes. The present contribution therefore illustrates relevant components of content management and digital rights management systems for the upstream processes, introduces the processes that components are required to execute, and examines currently neglected integration issues in terms of relations between the components. As a result, we provide a conceptualization of integration needs, and from cases within industrial environment and university community we are able to draw the applicable relations between identified components.

Keywords: Digital Rights Management, Content Management, Integration, Digital Rights Expressions.

1 INTRODUCTION

Intellectual property generally refers to creations of mind and denotes the legal rights resulting from intellectual activity in the industrial, scientific, literary and artistic fields. Traditionally, the legislative framework and social policies related to copyrights have protected organizational assets against parties out of the asset owners' reach. In digital environment, rights and obligations related to the content usage can be negotiated and agreed in comparatively straightforward manner, even with an individual consumer. In addition, recognition of conditions and obligations described in copyright agreements may be monitored and enforced more effectively. Methods and technologies providing such advantages are currently associated under the term Digital Rights Management (DRM). The term covers the identification, description, trading, protection, monitoring and tracking of digital rights over assorted assets (Iannella 2001). Thus, it is our belief that the value of agreements assigned between parties will be emphasized in the digital environment.

Consequently, this article assigns a particular importance to a novel way of describing rights and obligations within agreements through digital rights expressions languages, such as ODRL, XrML and MPEG 21 REL (Iannella 2002, ContentGuard 2002, Bormans & Hill 2002). A special workgroup within Learning Standard Technology Committee (WG4, 'Digital Rights Expression Language') has defined such languages to consist of information concerning copyrights and usage rights, and parties involved in creation, trading, distributing and utilizing assets. The elements of languages, having multipurpose semantics and XML syntax, define which, how, by whom, where and when the assets may be utilized. Advantages of deploying rights expression languages are gained through digitalization and automation of information management and, moreover, digitalized contract terms can be utilized with the content in delivery channel. Before presenting the digital asset, rendering applications interpret digital contract terms, i.e. licenses, whether and how user of the application is allowed to access and utilize the asset (Rosenblatt et al. 2002).

Current research and technology development activities on the DRM domain are characterized by their focus on controlling and tracking access to content. On one hand, the scope of interests neglects the issues of individuals and organizations operating on the upstream of value chain or on the creator side of value network. On the other, the trend results in various mature solutions for managing the usage of content (i.e. information security), but not in applications for management of copyrights (i.e. rights to utilize the content commercially or otherwise). It should be noted that in the case of information products, licenses concerning usage rights must be propagated from copyrights agreements, as companies and organizations may only operate according to the copyrights transferred to them by the individual creators or other organizations. Further, there is a close relation between content management activities and digital rights management, both in downstream and in upstream processes. For these reasons, we have conducted conceptual and case studies having scope on the integration of management issues mentioned and especially on the upstream processes.

The purpose of the present contribution is to present relevant components of content management and digital rights management systems for the upstream processes, to introduce the processes that components are required to execute, and to examine currently neglected integration issues in terms of relations between the components. As a result, we provide a conceptualization of integration needs and suggestions on how integration may be achieved. The rest of the paper is organized as follows. First, in section two we discuss the current solutions for integration of content management and digital rights management processes and systems, present relevant components within both types of systems, and derive some emerging requirements for further discussion. Then, section three presents our conceptualization of systems characteristics through channel separation framework. Section four presents case studies from industrial environment and university community, which we use to point out the relevancy of studying upstream processes and their relations in more detail. Finally, we conclude our discussion in section five with apparent relations between identified components.

2 LITERATURE SURVEY REVEALING THE EMERGING REQUIREMENTS

Content Management Systems (CMS) are generally applied to support the distribution and maintenance of documents. Basically, a CMS consists of data repository for content, user interfaces to access data in the repository, editorial tools for content creation and editing, workflow scheme to keep track of content life cycle, and of output utilities (Kartcher 1998). The relation between Content Management Systems and Digital Rights Management Systems (DRMS) has been studied in the DRM field. Rosenblatt and Dykstra (2003) clarify the capabilities of both categories of systems and describe the integration opportunities between these two. Their white paper lists processes that CMS support, e.g. adding metadata creation to what was previously mentioned, and introduces a set of DRMS functionalities that can be divided to ones

- utilized to prepare packages of content and metadata placed into encrypted containers,
- for generating and delivering copyright expressions and usage licenses, and
- controlling access and usage after delivery of content according to the usage license terms.

Rosenblatt and Dykstra (2003) propose an integration of CMS and DRMS by the means of rights metadata, i.e. digital rights expressions, which is stored with content and descriptive metadata in the CMS simultaneously as the content is ingested into CMS. Writers suggest that rights expressions could be captured either by applying default rights template with fixed set of expressions, by inferring rights from the type of content, or manually by replenishing the template.

We agree that the rights expressions hold an important role in integration of DRMS and CMS and that these should be brought into the systems' processes at the ingestion time: this enables automation of rights workflow and license terms propagation from copyright agreement terms. However, writers imply the capturing of rights expressions into systems to be a trivial data merging issue. Therefore, it does not identify the various aspects of contracting over copyrights that takes place before one obtains a set of digital rights expressions. It should be recognized, that the transfers of copyrights generally include negotiation process between creators, content providers or other rights holders (see e.g. Milosevic (1995) for details). It seems beneficial to differentiate the process into system components, which may control and enhance the exchange of offers and counteroffers between parties (which further is out of the CMS' scope).

Further reasoning for separate system components may one discover from the business and legal imperatives. As an example, the proposing of a predefined agreement template may initialize the process, in which the template acts as an initial offer to the negotiations. However, the agreement template and the negotiated agreement should, in addition to digital rights expressions, contain the textual agreement terms in order to meet the requirements set by the legal framework and the organizations way of doing business. Furthermore, since legality of agreements is in question, in some cases there is a need to involve a trusted party to manage the contracting process and to govern the agreements. Altogether, we suggest legality and business issues to offer support for an unambiguous separation of copyright agreement creation process from CMS processes and claim that more attention needs to be set on the matters occurring before the data merging may be performed in the CMS.

Iannella (2003) reports on an implementation containing CMS and DRMS functionalities in COLIS project, which is developing collaborative online learning services. Their learning management systems architecture consists of components for storing and delivering metadata and content, for authenticating and authorizing individuals and for exchange of learning objects through LOX component. The exchange is enabled in a publishing process with an insertion of a learning object into the system, a definition of descriptive metadata and a designation of an ODRL offer to the content. Before being accessible to another user, the submitted learning object is also subject to an approval process. Once the user accepts the offer, access to the content is allowed and the transaction (approval of rights and obligations) is committed to a database.

The processes, which LOX component implements, clearly address the information gathering needs for DRM. The exchange of immaterial content requires the identification and description of parties, of

content through metadata, and of rights and obligations through rights expressions (Bide & Rust 2000, Luoma et al. 2003). Conversely, an issue entailing reconsideration is the management of the content, metadata and rights in a single process. The pieces of information will eventually be associated in described ‘publishing process’, however, there is a need to recognize the preceding activities, which actually are the sources of required information.

The recognition of processes prior to publishing facilitates the deployment of different metadata and content creation, contracting and financial processes. As Erickson (2001) has brought up the design principles of W3C in the context of digital rights management, DRMS must adopt to the different existing and forthcoming infrastructures. Principles of modularity and extensibility should therefore be acknowledged. Moreover, representation leaves out the possibility that processes are carried out in an altered order. For instance, in the case of projects that are creating content, contracting may take place before the actual creation of content and metadata is used to describe the subject of agreement or as Rosenblatt, Dykstra and Iannella describes; contracting has an effect after production.

UNIVERSAL and BONA FIDE projects (Brantner et. al. 2001, BONA FIDE 2001) have additionally proposed high-level architectures for intellectual property rights brokerage systems consisting of the essential components of CMS and DRMS. In the view of the upstream processes, we agree with the contributors that the basic components are the following. In order to alleviate the discussion, we named the components after the respective processes.

- authentication and authorization component; for user profile administration and for authorizing users to perform their role specific operations and commit transactions,
- metadata creation and modification components; for creating and modifying (e.g. supplementing, translating, aggregating etc.) the descriptive metadata for a piece of content,
- content creation, modification and publishing components; for content storage and retrieval and for supporting various functions regarding content lifecycle,
- agreement creation component; for contracting (i.e. specifying agreement templates, offers, counteroffers and agreements) over intellectual property rights,
- monetary transactions component; for managing payments flows (if required) such as royalties and grants.

Although modification for our purposes was necessary, the illustrations of system components identify the required components. However, they exclude the various potential relations between the processes, as associations between system components and between processes are not defined. Taking a perspective other than that of a linear push-oriented value chain, requirements emerge for flexible integration of modular CMS and DRMS crossing organizational boundaries and for clarity on how the processes may be carried out.

3 CONCEPTUALIZATION OF THE INTEGRATION REQUIREMENTS THROUGH THE CHANNEL SEPARATION FRAMEWORK

Our examination revealed an important aspect to draw attention to in terms of the integration of DRM functionalities to the existing or evolving content management processes. First, because of the potential complexity and to some extent unpredictable ways of carrying out the contracting process, we proposed that DRMS could operate as a separate system from CMS. This way one could employ solutions matching the required contracting process or even carry out different processes for the varied contracting scenarios. Second, we were able to identify the required components to support the upstream processes and argued that it is essential to define the potential relations between processes and probable sequences according to which the processes might be carried out. Third, we discovered that the issue of processes crossing organizational boundaries is relevant in the integration of DRMS to other operational systems.

To conceptualize the integration needs, in the following the introduced components are considered in the context of channel separation framework (Vepsäläinen & Saarinen 1998). According to the

framework, in the digital environment the instances of organizations and information systems restructure into four channels providing distinctive functions and services for the customers. For our analysis, the previously identified components are placed to the framework in figure one and justified as follows.

Metadata is considered having a relationship to an information object, namely content products and product copies. Processes create and utilize the metadata mainly for descriptive and technical purposes (Cartho 1997). Considering the descriptive characteristics of metadata, it is used to communicate the offering towards the next participant of the value chain or network. Although metadata may, by definition, be regarded as an important element in each channel, for the reason elaborated, we suggest the depiction of the metadata lifecycle to fit in the *Channel of Ordering*. According to the framework explanation, the channel includes activities such as advertising, public relations and interaction with the customers and communicates the market offerings to the customers. Along this channel, the delivery of information about the content takes place. In our approach, the channel accomplishes metadata creation and modification in the upstream and metadata representation in the downstream.

The delivery of physical or immaterial product, takes place in the *Channel of Transfer*. The channel generally accomplishes production, distribution, storing, and workflow activities concerning the content. During its lifecycle, the intellectual property evolves from being an expression of the creators' ideas, on to different manifestations (i.e. content products) of the particular expression with defined medium and format, and finally content appears as an item (i.e. product copy), which the customer acquires and receives (Plassard 1998). According to abovementioned CMS and DRMS functionalities, for our purposes the Channel of Transfer encompasses content creation, editing, publishing, preparation and delivery.

Agreements, guarantees and claims are managed with the help of the *Channel of Commitments*, which is of particular interest on making available a view to rights and obligations with relation the DRM. From the customer perspective, the channel makes the usage rights (and obligations) available. The copyright agreement creation process designated to the *Channel of Commitments* is intended to address the exchange and management of both non-binding proposals, binding offers and agreements (Clark 2001). From our point of view, the channel activities on the upstream serve two purposes. First, it enables transferring copyrights in order to publish content. Then, it provides a basis for creation of usage licenses, as these are propagated from copyright agreements.

The Channel of Financing involves payments, the insuring of transactions, funding and risk management. From our point of view, the channel facilitates return on intellectual efforts and investments on intellectual property. Differing from the other flows in the channel separation framework, payments and payment details generally move from downstream to upstream between the participants of the channel. Although the illustration suggests that customer will eventually compensate the utilization of content, in the upstream, the content provider is responsible for managing payments to creators and rights holders. In such case, the details of the payment (or other consideration) are resolved by the copyright agreement causing an adjacent relationship between this channel and the Channel of Commitments.

The focus our representation is on the interaction between creators and content providers, that is, on the upstream processes. Additionally, the downstream processes are introduced to indicate the reasoning of particular upstream activities.

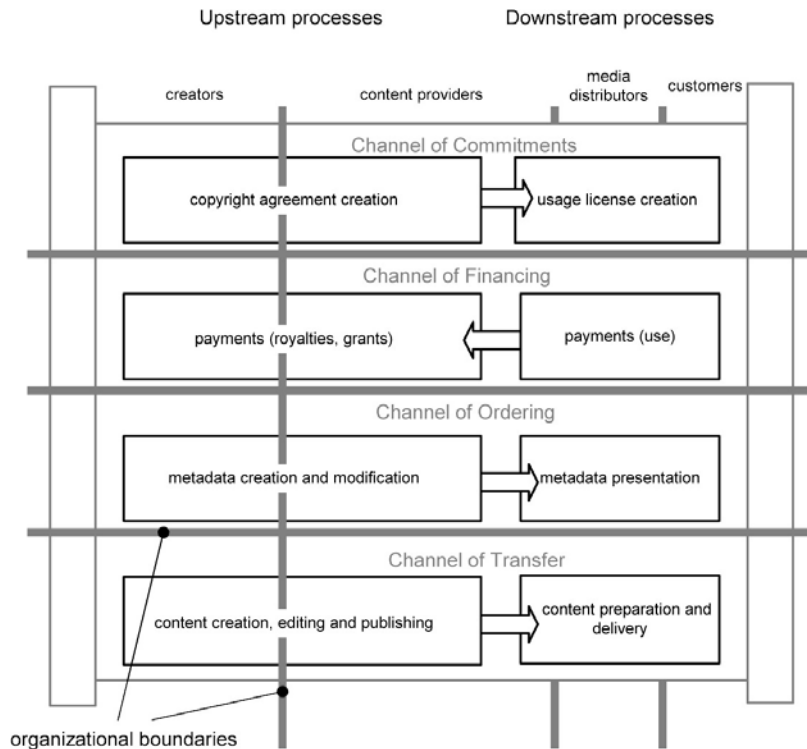


Figure 1. *Applied channel separation framework (Vepsäläinen & Saarinen 1998) indicating potential organizational boundaries*

For specific purpose, the channels can be observed from the perspective of individual organization or divided horizontally to represent the boundaries of organizations and/or information systems. In figure one, we have partitioned the channels according to basic roles involved in content creation and distribution: creators, content providers, media distributors and customers (IMPRIMATUR 1999). As a result, utilizing the channel separation framework we are able to point out the potential variation of applied processes both in vertical and horizontal axis. This is to say, the configuration and execution of processes may differ within a channel (vertical axis) in each individual case and, additionally, tasks within each process can differ on the both sides of the organizational/information system boundary on the horizontal axis. The information system components, which in our situation relate to publishing of content, are subject to similar examination.

Two conclusions may be drawn based on the observation. First, the activities before publishing the content are fragmented into several dissimilar processes. We find the diversity excessively complicated to be solved with a single presentation of integrated architecture. Therefore, we recommend taking first a modular approach to the upstream DRM system development or acquisition within organizations, since number of benefits can be achieved through modularity. These include capability satisfy a wide range of processes within channels, to adapt to new technologies over time and upgrade of a specific functionality, to integrate additional component with the existing infrastructure.

Second, as the channel separation framework is applied to the discussed components, we may define potential vertical and horizontal interfaces and examine the integration of CMS and DRMS components. While the implementation of components is required to match the needs of organization-specific process, the output of a single component may be standardized enabling interpretation of passed information in other components. The decomposition the upstream processes into respective one-to-one (creator-content provider) associations facilitates the definition of interfaces and the information passed across the interface.

4 CASE STUDIES FROM TWO DIFFERENT DOMAINS

To make the discussed needs and issues more concrete, next we will concisely describe three cases from two different domains. The factor in common for the cases is the outcome of activities: a learning material product comprised of heterogenic parts. The target organization of the first case is a customer-training unit of an international corporation designing and manufacturing pulp and paper industry processes, machinery and equipment. The latter two cases consider creation of learning material in the Finnish university community. The cases depict the current upstream procedures and future scenarios with a focus on the changes brought by the introduction of digital right management. We mainly concentrate on describing the relationships drawn as a result of the partition of CMS and DRMS according to the channel separation framework.

In the case from the industrial environment, the target organization produces vast amounts of aggregated learning material, which combine subject matter expertise both in audiovisual and textual form. A part of the audiovisual material is produced autonomously and a part is outsourced to multimedia producers. For the most part, our target organization employs a fixed set of suppliers. Consequently, a copyright agreement is made with the producers on a yearly basis. The creation of annual agreement involves negotiation procedure, but the process is characterized by content provider's (target organization's) dominance. The agreement template drafted by the content provider is the basis for negotiations, and only rarely does the actual agreement deviate from the contract clauses regarding copyrights. Other delivery conditions (usually just the price of production) are decided on individually in each case. In special cases, the parties occasionally undergo a similar negotiation initialized by an agreement template.

After production, the multimedia producers send the created content to the producers of the target organization, who add the new content to the information repository. The target organization is in charge of the production of the actual learning material product in a process, in which the parts of the learning material are associated together with metadata into a structured format. In addition, the parts are aggregated with a similar method and system.

In the first case, the future DRM development plans of the target organization emphasize the distribution channel, and the reason for this is obvious. The role of DRM solutions on the upstream processes is relatively small, since the number of outsourced producers is less than ten and the agreement practices are uncomplicated due to the dominating position of the target organization. However, the produced learning material is reasonably valuable because of the high productions costs as well as the expertise knowledge on the target organisation's core business knowledge the material entails. The protection of the valuable material and its rights requires adopting DRM technologies in the downstream process.

In the university community, content is produced in very heterogenic ways, which are next described with two rather generalized scenarios. A part of the learning material production by university faculties is performed in special project-like activities. In this case, the creators and the university negotiate and sign a project agreement, which states the details of the content in question, the payment and the transfer of copyright to the university. A basis for the agreement negotiations is the agreement template prepared for university projects that may be modified on a case-by-case basis. As a result of the agreement, the project receives financing for accomplishing their work. Usually, the parts of the bundled content are created by several academics or academic organizations separately and the content expressions are assembled only in the final publication. Moreover, for example pictures or entire publications and, thus, copyrights from the publications of other universities are acquired for the learning material.

The university library operates in the role of the media distributor and offers services for the production of descriptive metadata to academic individuals and organizations. For instance, an information specialist as the expert in metadata matters supplements the descriptive metadata in case an academic has not known how certain parts of descriptions should be specified. When finished, the

produced metadata and content is put into the repository managed by the library and from the repository they are distributed to the library customers. Furthermore, the library is prepared to manage the monetary flow, in other words, is prepared to collect a fee from the customers when needed and to convey the royalties to the processing of the university administration invoicing system.

In another case from university environment, an academic has produced a smaller learning material package, possibly for a lecture, on the basis of the person’s own research. In such a case, a large part of the material is left unpublished, because the authors of the material are either unwilling to publish the material or they consider the publication process to be too difficult in relation to the content value. Some of the content will nevertheless be published. The producer of the content will create a compact set of metadata and makes an agreement with the library about the distribution and administration rights transfer to the university according to the library’s template. Descriptive metadata, actual content and copyright descriptions are combined with each other in the publication process.

In the university community, digitalisation has been noticed to increase the volume of content production. In addition to other advantages, digitalization improves the efficiency of content reuse – for example, the high quality learning material produced in other universities may be put to use and distributed rather freely assuming that copyrights are effectively agreed on. On its own part, reuse increases the volume of the contents, metadata and rights expressions managed by each organization. Making the acquisition of copyrights and publishing processes more efficient, entails preparations for the future challenges of information management. For instance, in the future copyrights can be agreed on by using a special information system designed for creating agreements.

The descriptions expose some noteworthy viewpoints forward for further discussion. These two presentations imply that situations, procedures and systems are to some extent different in upstream processes as well as that there are some common factors. In each of our cases, the agreement template is the starting point. Some of the processes include a negotiation, in which the parties exchange offers. In contrast, in some processes the model template is approved as it is. The latter case should not be regarded as negative: the procedure is effective and straightforward if the agreement template has been drafted carefully. In the two first cases, the copyright agreement is signed before the actual content production and in the latter case the content is completed before the agreement. The examples illustrate that upstream agreements are not trivial and that different systems should be developed to support different agreement processes.

In the first case, after receiving the required textual and audiovisual elements, an actor within the target organization produces the learning material simultaneously with the metadata. The production is accomplished with a single system and later on this information will be managed as one entity. In the latter cases, metadata and content are produced separately and they are managed in different systems. This suggests a possibility of different ways of implementing CMS (and thus, the connection to DRMS) in ordering and transfer channels as well. According to the cases, the information created in separate upstream channels is combined in the publication process, as depicted in figure 2 below.

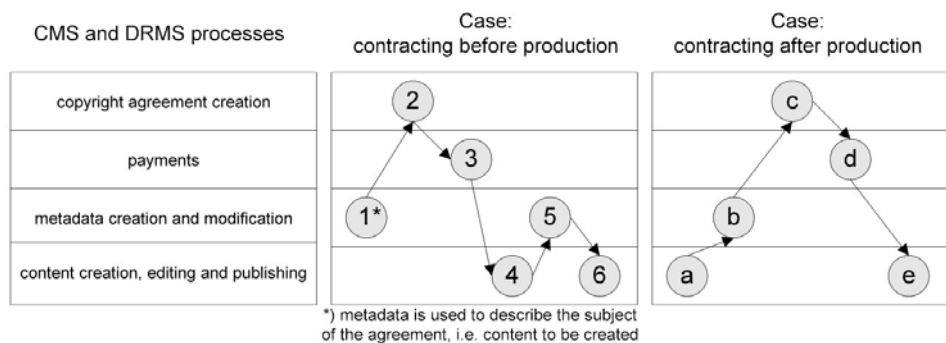


Figure 2. Execution order of processes in two cases and content publishing gathering the activities

The process ensures that the tasks related to each channel are completed: the content is assembled and valid for publication, the content is described with a set of metadata, the required copyrights have been acquired for the content, and the potential payment obligations are fulfilled or services to pay royalties to the creators exists. However, in the presented cases the measures preceding publication are carried out in a different order and certain stages of processes have to be passed before progressing to the next (figure 2). In other words, the stages wait for the inputs and triggers of the previous stage.

5 DISCUSSION AND THE RELATIONS BETWEEN COMPONENTS

Research related to digital rights management has emphasized the protection of content and rights. However, the few presented cases from the target domain were able to point out the complexity of upstream processes. Accordingly, we call attention to the importance of studying the upstream activities from the viewpoint of DRMS and CMS systems and the connections between the systems. It is our belief that it is not adequate to detect the needs for information gathering and to apply data integration for single publishing process. The process is preceded with several activities, which we have recognized by means of the previous studies, the examination related to the framework and the cases. We suggest that a modular approach would be taken for the examination of DRMS related processes and components in each organization. The channel separation framework can be used as a frame of reference when potential organizational and system boundaries are identified. Furthermore, it contributes to the establishment of the modular view of the CMS and DRMS components.

For the purpose of our analysis, we explicate how the upstream processes may differ within each implementation of channels and on the both sides of horizontal boundary, thus, content management systems and digital rights management systems may be divided for examination both horizontally and vertically. On the basis of the notices made from the cases, we are able to examine the interfaces of the recognized components and the potential communication taking place between them. We elaborate our findings with figure three below. As already proposed in chapter three, identifying the communication enables the integration of separated components in the upstream processes. In the following, this communication is described as relating to a process, and presented are the input information from the other processes, the inputs of the user during the process as well as the information sent by the process when it is finished. The reception of an input may also be seen as a trigger commencing the process.

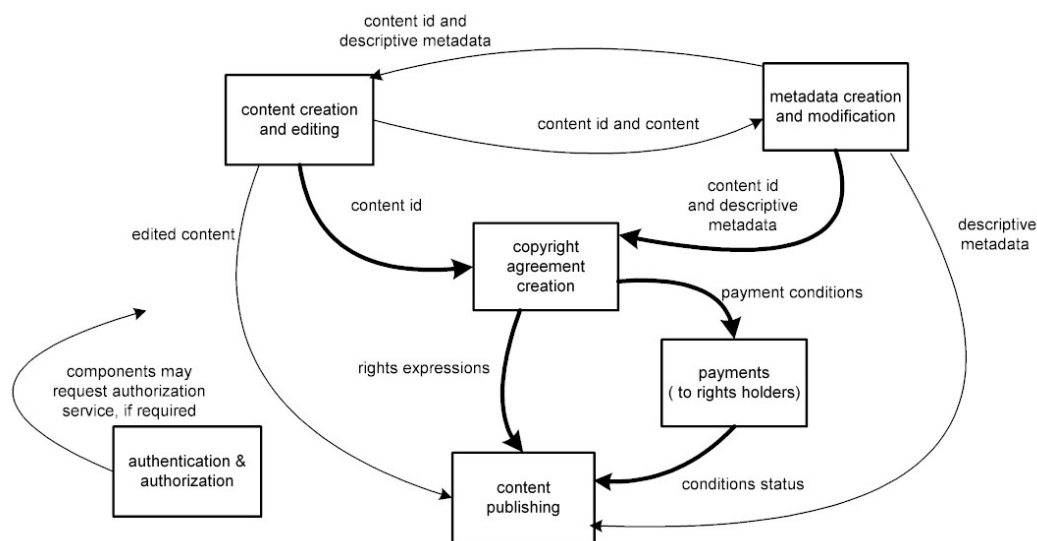


Figure 3. Communication between identified components

In figure 3, the activities within channels are divided into straightforward processes and connections between processes are introduced according to the case descriptions. A connector in the figure indicates that the process produces relevant resource(s) to another and processes may in some cases cross the system or organizational boundaries. A bolded connector additionally indicates that it is *likely* that relations will cross over the organizational or system boundaries, thus, require an integration effort. Moreover, the content publishing process is described to gather the results of all the other processes. Although activities will eventually be considered separately in the downstream processes as well, the content publishing process can be accomplished only in case processes managing content, metadata, copyrights and payments have gone through their particular workflows. The discussion here is limited to integration matters between the channels of the channel separation framework since the communication within each process is undertaken with similar genres that processes share when finished.

The authentication and authorization component is added to the figure to represent centralized or, if preferred, process specific user profile management. In order to commit legitimate transactions, such as entering into an agreement or perform modifications to a content product, users are required to provide proof of their identity using e.g. certificate-based or password-based credentials. On the other, servers executing processes and running components needs to be authenticated in the eyes of individual users. Overall, in case organizational or system borders are crossed, security issues will be emphasized.

The content for distribution is generated in three processes of the figure three: content creation, editing and publishing. The CMS implementing these processes are considered to include tools for authoring, controlling versions and user management for instance. However, content creation is regarded simply as an act of appending original or modified expressions into the CMS, and content editing as similar operations with manifestations. The creation of a manifestation may also include bundling the existing expressions. In any case, the content creation and editing processes are required to communicate a content identifier according standardized scheme such as URN or DOI (Berners-Lee et al. 1998, Paskin 2001). The content identifier is utilized as a set of metadata and as pointing to the subject of the copyright agreement. The identifier needs to be unique for each expression, manifestation and for any versions or composites of content. Additionally, the results of finished content editing process are sent to the content publishing process.

The channel of promotion in the upstream employs the processes of metadata creation and modification. These aim to supply the downstream processes with descriptive metadata for information representation and marketing purposes. The metadata processes are commenced usually by a creator party to generate descriptive metadata for existing or totally new material. The metadata may be extracted from content itself, from the file properties or typed manually. Creators are experts in the contents of their intellectual effort and, for that reason, they may supply metadata characteristics that cannot be inferred from the content. However, the creator may not have the expertise to provide full describing metadata according the specific metadata standard and, thus, this task may be given to the information specialist. The metadata modification process is therefore carried out to validate and improve the initial metadata. The processes are reliant on the authorization services and content creation and editing components. Components implementing metadata processes offer content identifiers and metadata for expressions and manifestations through their interfaces.

Negotiation on the terms of the copyright transfer is carried out as parties choose to circulate and acquire the content – offers are created, possibly modified and agreements established in copyright agreement creation process. Once parties accept the terms of the offering, they enter an agreement specifying who (an authorized party) acquires what (content) on which terms (digital rights expressions). The digital rights expressions basically consist of permissions, constraints, requirements and conditions of content utilization (Iannella 2002), which are further organized as XML elements. Permissions indicate the allowed use of the material, downstream transfer of the material, to content management, and to the reuse of the material (e.g. permission to display, sell, make a duplicate and aggregate the content, respectively). Permissions can have constraints such as assigning the permission

to a group of individuals, to some IP address space or to a period of time. Moreover, the rights holder may set some requirements concerning the utilization of material, for instance pre-use or per-use payments.

Our cases point out that the contracts may concern an already existing expression or the subject of the agreement is to be created as a consequence of the agreement establishment. Preferably, the agreements are formed using contract templates, which combine human interpretable text and digital rights expressions. This allows straightforward creation of agreements that are comprehensible to users and systems. After a contract has been created, the output of the process is communicated to desired directions. The permissions, constraints and condition elements, corresponding to the 'rights expressions' in figure three, are communicated to the publishing process to denote settlement of copyrights, thus, to allow publishing process to proceed. Concurrently, the requirement elements are passed on to the process managing payments to rights holders. The component implementing processes in the Channel of Financing registers the received payments and reports them to the publishing process. The status of payments is compared against the condition elements provided and to verify whether the conditions are met.

In section two, the utilization of digital rights expressions was presented as a facilitating factor in integration of the DRMS and CMS (Rosenblatt 2003). Our discussion proves the standardized digital rights expressions to be beneficial. Besides the expressions, we promote the value of content identifiers as enabling DRMS and CMS integration. A single identifier can be used to associate a piece of content, a describing set of metadata, digital rights expressions and information on the monetary flows together in the publishing process. Before entering the copyright agreement creation process a subject to the agreement in form of content identifier must be declared. Additionally, the content identifiers provide means for creating associations between parts of an aggregated content and the corresponding copyright agreements. The main thing, however, is that the effective use of identifiers therefore makes possible the design and implementation of modular and distributed CMS and DRMS, which can be integrated for particular purposes.

6 CONCLUSION

Throughout the paper from introduction to discussion, we have argued that the versatility of upstream DRM processes, having close relationship to content management processes, should be examined more closely than in current research and development activities. The study serves in bringing forth the requirements that organizations on the upstream of a value chain or on the creator-side of a value network. We suggest taking a modular approach to the matter at first and consider DRM and content management systems in the view of the customer channels. Thus, one is able to outline a description of essential processes and manage the integration between processes. For integration purposes, we stated the categories of information that components pass when finished. Moreover, we presented that the content identifiers and digital rights expression have a key role in the integration of considered components. The implementation of channel integration and experiences from such activity, resulting in definition of detailed integration needs, are subject to further research.

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