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Design of a Distribution Management System for IPTV Systems

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Abstract

IPTV, acronym of Internet Protocol Television, is a system that delivers television services through Internet protocol networks. Therefore, an IPTV system consists of many subsystems including content management, user management, and broadcast management systems. Among the main subsystems, the distribution management system handles purchasing orders from distributors, transcoding original content into the format designated by the distributor, and transmitting transcoded content to the server designated by the distributor. In order to realize one source multi-use and to boost content circulation, an IPTV system should be open in that any authorized content providers are allowed to upload their content for circulation and any authorized distributors are allowed to circulate content. The distribution management subsystem of an IPTV system allows distributors to request for content circulation and system managers to process distributors' requests. Therefore, a distribution management system is one of the most important subsystems of an IPTV system. This paper introduces our design of a distribution management system for IPTV systems.

Keywords: *IPTV, Distribution Management System, Content Management System, User Management System, One Source Multi-Use.*

1. Introduction

One of the most successful examples of convergence is the Internet Protocol Television (IPTV) system, which is a convergence of communication and broadcast methods. IPTV is defined by the ITU-T FG IPTV as: "IPTV is defined as multimedia services such as television/video/audio/text/graphics/data delivered over IP based networks managed to provide the required level of quality of service and experience, security, interactivity and reliability" [1, 2].

There are many IPTV system configurations proposed by various organizations. ZooinNet Co. proposed a configuration of centralized IPTV system consisting of Broadcasting center, IDC (Internet Data Center), and Branch offices [3]. The authors of [4] introduced their research results to reduce network traffic. The authors of [5] introduced a simulation tool with which we can estimate network traffic of IPTV systems accurately.

However, there are few IPTV systems in which content can be purchased for distribution. The authors of [6] proposed an IPTV system that consists of many subsystems such as a content registration system, a distribution management system, a metadata hub system, a global interface system, a user management system, an operation log system, a distribution log system, a deploy system, and an authoring system. This system allows content distributors to purchase content to circulate. One of the main subsystems that are essential for circulating content is distribution

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management system. This paper introduces our design of a distribution management system.

2. Related works

The authors of [6] introduced a design of an IPTV system as shown in Figure 1. The system consists of many subsystems. Each of them requires computer servers. The hardware structure of the system is shown in Figure 1.

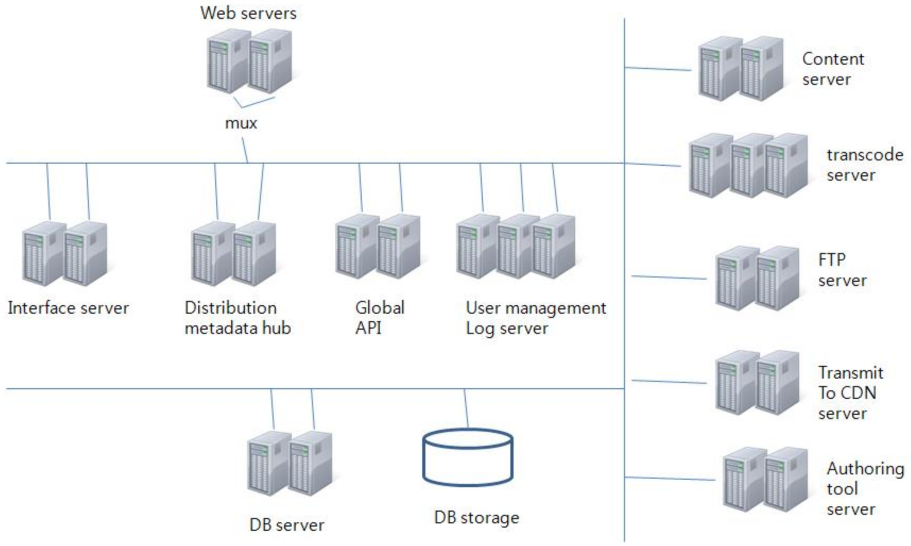

Figure 1. Description of the Hardware Structure of the IPTV System [6]

1) 2 web application servers for content registration: Windows Server 2008, IIS 7.0, Kendo UI control, content registration web application, open Flash Player, and the content registration Web application are installed here.

2) 2 interface servers: Windows Server 2008, IIS 7.0 and the content registration web service program are installed here.

3) 2 servers for distribution metadata hub: Cent OS 6.3, Spring 3.1, Tomcat 7.0, JAVA, distribution meta hub web application program are installed here.

4) 2 global API servers: Cent OS 6.3, Spring 3.1, Tomcat 7.0, JAVA, global API interface program are installed here.

5) 3 servers for user management and log: Cent OS 6.3, Spring, Tomcat, MySQL, JAVA, the distribution log system, the operation log system, and the user management system are installed here.

6) 2 content essence hub servers: These servers allow users to store, retrieve, manage essence files. Cent OS 6.0, Spring 3.2, Gson 1.4, Tomcat, Apache, cronolog are installed here.

7) 3 transcode servers: ffmpeg, faac, x264-0.128, yasm-1.2.0, nodejs-0.8.19, curl-7.19.7, tinyxml2-1.0.9, jconcpp-0.6.0 rc2 are installed here.

8) 2 FTP servers: Cent OS, vftpd, and a Wowza Media Server are installed here.

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9) 2 servers for transmitting to CDN: Cent OS, nodejs, curl, tinyxml, jconcpp are installed here.

10) 2 authoring tool servers: Windows 7, .Net framework, Declink drivers are installed here.

11) 2 cross media DB servers: Cent OS and Oracle 11g are installed.

12) 1 storage: A huge capacity storage to store information of content providers, metadata for essence files, metadata for distribution, and essence files.

A database system for IPTV systems was introduced in [7]. A fast algorithm for IPTV system response time analysis was introduced in [8]. A protocol for secure mobile IPTV service delegation to support service level agreements was proposed in [9]. A channel domain system that logically extends channel allocation capability over limited channel resources was proposed in [10]. A handover scheme over standard Mobile IPv6 that provide good quality of service was proposed in [11].

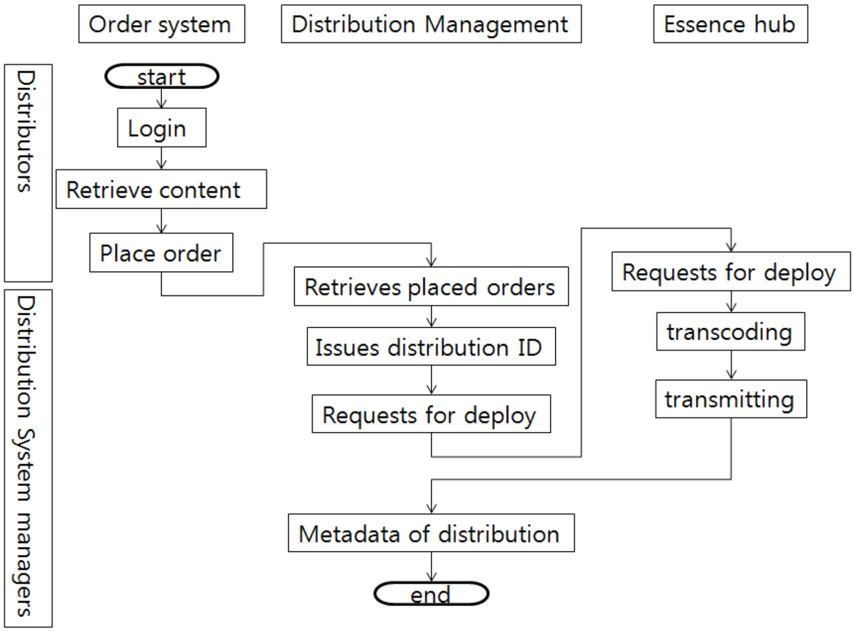

Figure 2. The Process of Issuing Distribution ID and Recording Metadata of Distribution

3. Design of the System

3.1. Functional Requirements

The distribution management system allows distributors to circulate content in the IPTV system by interacting with other component systems of the IPTV system. As is shown in Figure 2, the distribution management system allows the system managers to retrieve placed orders, to accept or reject orders, to issue distribution IDs for all accepted orders, and to request the essence hub system to deploy the ordered content. This system allows system managers to record metadata of the distribution when a deployment completion message arrives.

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Distribution management system records all events of issuing distribution IDs, of writing metadata of distribution, and of requesting for deployment in the Log System as shown in Figure 3.

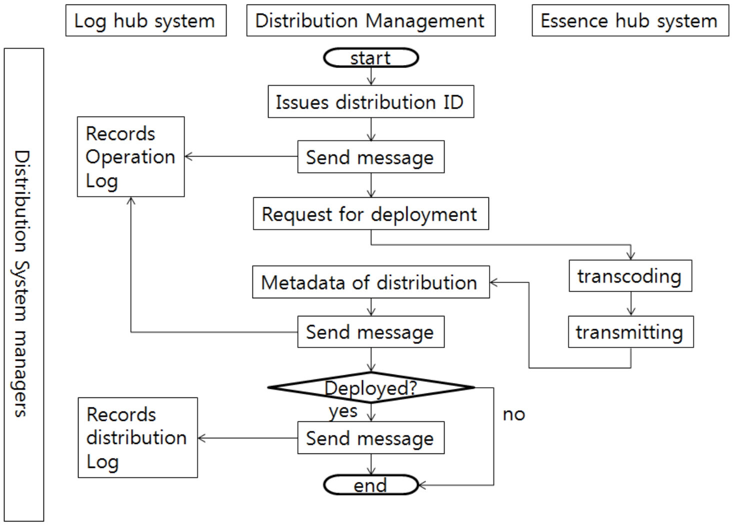

Figure 3. The Process of Logging Distribution Events

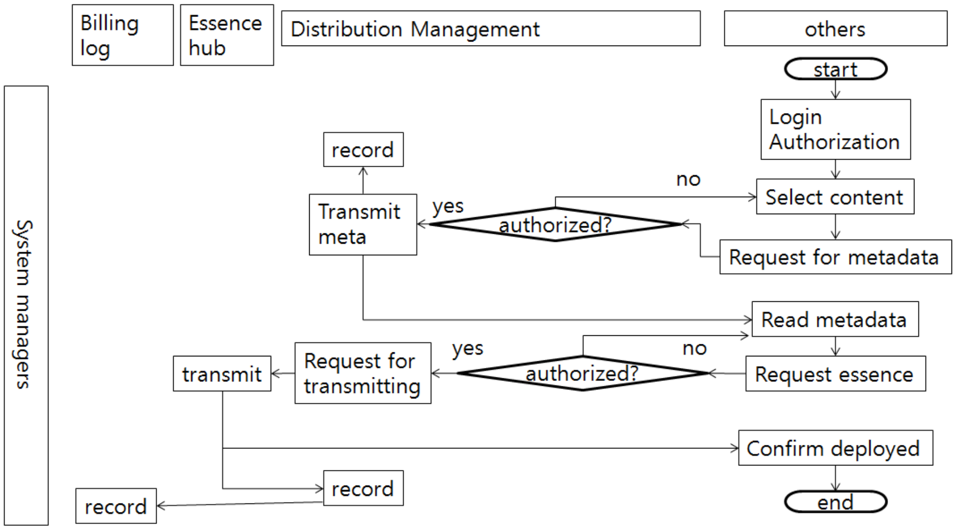

Figure 4. The Process of Using Distribution Metadata

Authenticated users can select content for distribution and request for metadata of the selected content. Then the distribution management system checks if the user is authorized to use the content. If the test is positive then the distribution management system transmits the requested metadata to the user and records the event of deploying the metadata. Referring to the metadata, the user can request for content for distribution. After checking authority, the distribution management system asks the essence hub to send the content for distribution to the user. The event of sending the content for distribution out is recorded in the operation log system and the billing log system.

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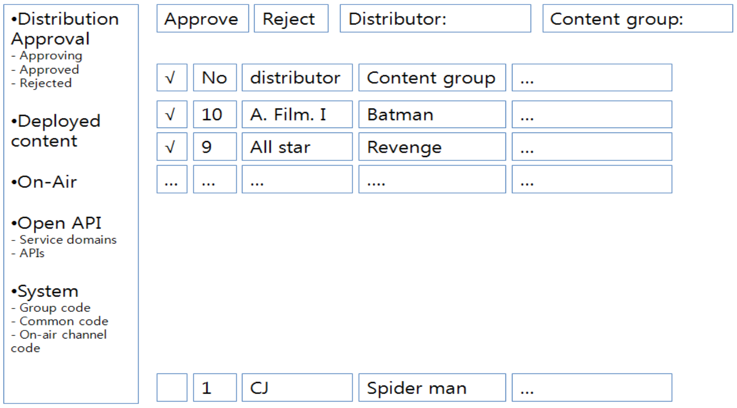
3.2. User Interface

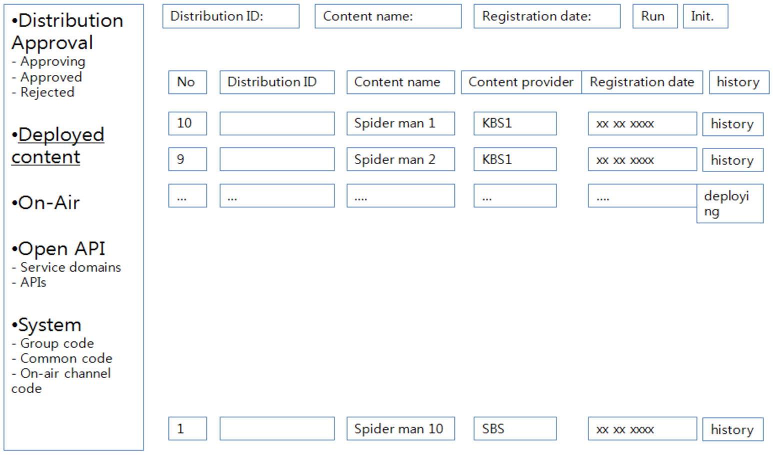
This system allows system managers to retrieve placed orders, to select orders, and accept or reject selected orders. Therefore, we need a user interface as shown in Figure 5. In the figure, we can find a list of all content requested for distribution. We can specify a distributor name or a content group as search condition. After making check marks on interested items, we can click the button, 'approve' or 'reject'. If the manager clicks the button, 'approve', the system pops up a window in which a confirmation button is shown, whereas if the manager clicks the reject button, then the system pops up a window where the manager can describe the reason of rejection. By selecting the menu 'Approved'/'Rejected', we can retrieve information of approved/rejected purchase orders.



√	No	distributor	Content group	...
√	10	A. Film. I	Batman	...
√	9	All star	Revenge	...
...	...	...	....	...
	1	CJ	Spider man	...

Figure 5. An Example User Interface for Approving Purchase Orders

The menu, 'Deployed content', allows the user to retrieve a list of deployed content as shown in Figure 6. We can specify distribution ID, content name and/or a period of time as the search condition. By selecting a distribution ID on this screen, system managers can type in metadata of the distributed content. Metadata can be classified into standard distribution metadata, deployment information, and essence file metadata. Standard distribution metadata can be further classified into basic attributes, KEM (Korea Educational Metadata) and PPL (Product placement). Figure 7 shows an example UI for typing in basic distribution metadata.



No	Distribution ID	Content name	Content provider	Registration date	history
10		Spider man 1	KBS1	xx xx xxxx	history
9		Spider man 2	KBS1	xx xx xxxx	history
...	...	....	...	....	deploying
1		Spider man 10	SBS	xx xx xxxx	history

Figure 6. Our User Interface for 'Deployed Content'

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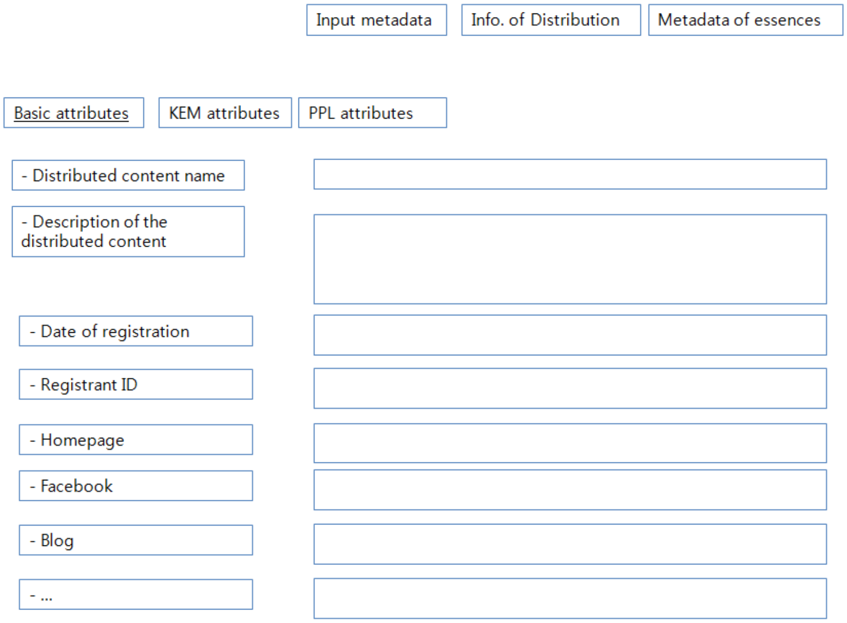

Figure 7. An Example User Interface for Creating Metadata

3.3. Database System

A part of the tables included in our database are:

1) ApprovedDistributionInfo consisting of DistributionApprovalID, contentGroupID, BusinessID, StartDate, EndDate, Status, RegistrationDate, processID, processDate, processReason. An example query to retrieve all approved distributions is as follows:

SELECT DistributionApprovalID, contentGroupID, BusinessID, StartDate, EndDate, Status, RegistrationDate, processID, processDate, processReason

FROM ApprovedDistributionInfo D;

2) transformInfo consisting of DistributionApprovalID and transformType.

3) distributedContent consisting of distributedContentID, status, homepageURL, copyrightExpirationDate, twitterURL, blogURL, me2dayURL, facebookURL, distributedContentName, EnglishName, deployID, distributedContentType, DistributionApprovalID, transformType, RegistrationDate, RegistrantID, modifyDate, modifierID.

4) distributionDeployHistory consisting of distributedContentID, deploySequenceNumber, deployType, requestType, registrationDate, deloyID.

5) userUsergroup consisting of userGroupID and userID.

6) userGroup consisting of userGroupID, userGroupName, deletedTF, description, registrationDate, registratioinID, modifyDate, modifyID.

7) menu consisting of menuID, upperMenuID, menuName, menuDescription, usingTF, linkURL, sortOrder.

8) authorizedGroupMenu consisting of userGroupID and menuID.

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4. Implementation

For management of distribution approval information, we implemented the classes shown in Figure 8. getList() retrieves a list of all distribution approvals. approve() approves the distributions designated by the parameter, appIds. deny() disapproves distributions designated by the appIds input parameter and records the reasons. getDstbApprDtl() retrieves detailed information of the distribution approval designated by the input parameter, dstbApprId. modifyDstbApprPeriod() modifies the period of distribution.

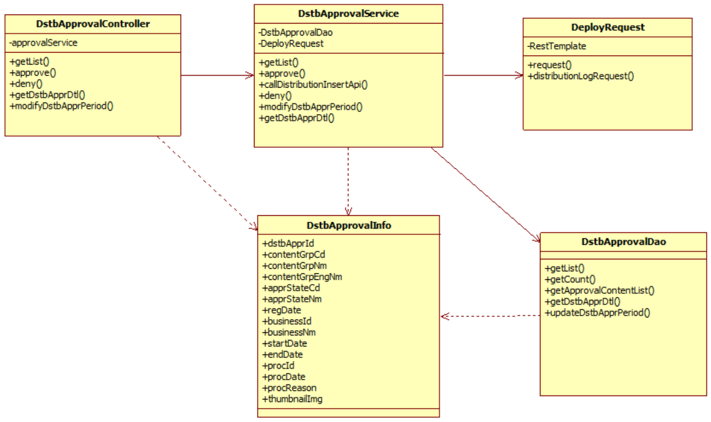

Figure 8. The Classes to Manage Distribution Approval Information

For retrieving deployment and content information, we implemented the classes shown in Figure 9. getDeployInfoDtl() returns detailed information of the deployment designated by input parameter, deployID. Similarly, getCrsContentDtl retrieves detailed information of the content designated by the input parameter, orgCntentId.

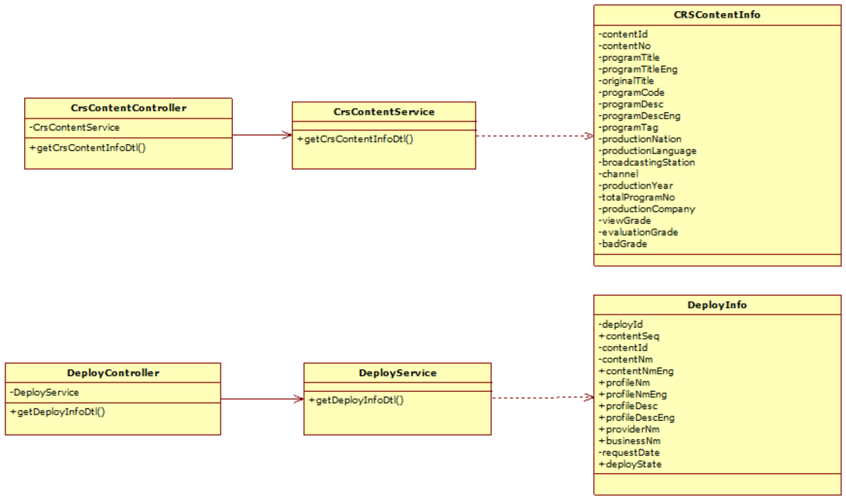

Figure 9. Classes to Retrieve Content and Deployment Information

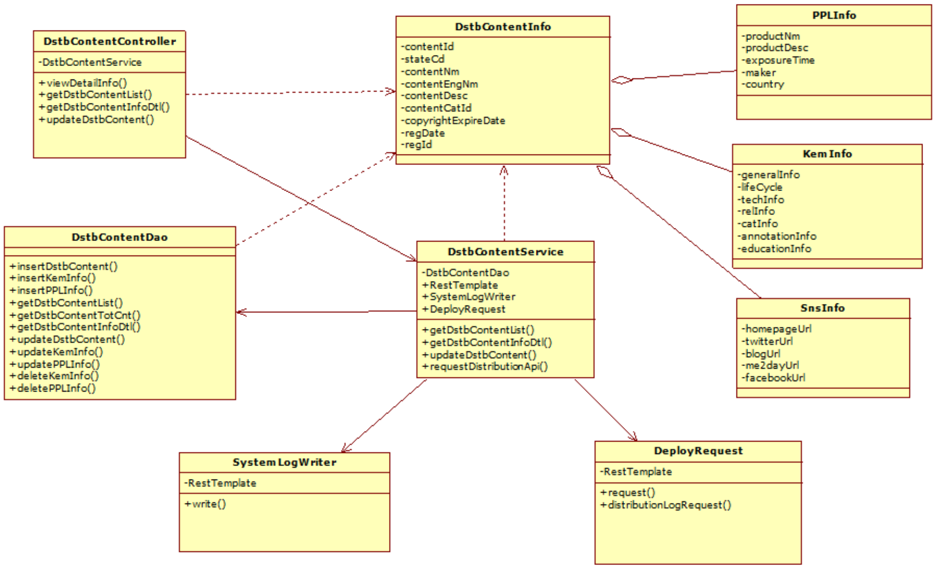

Figure 10. The Classes to Manage Distributed Content

In order to retrieve and update information of distributed content, we implemented the classes shown in Figure 10. getDstbContentList returns a list of all distributed content. getDstbContentInfoDtl() retrieves detailed information of the distributed content designated by the parameter dstrContentID. updateDstbContent() updates distribution content information with input parameters, EducationMetadata, productName, productDescription, and so on.

In order to create, retrieve, update and delete on-air information, we implemented the classes shown in Figure 11. getOnAirList returns a list of all information of on-air. insertOnAirInfo() takes OnAirInfo parameter and insert it into the database.

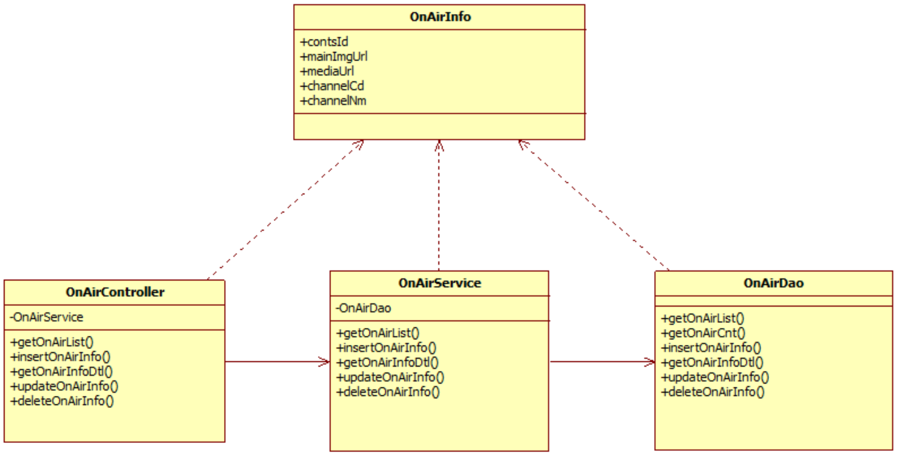

Figure 11. The Classes to Manage On-Air Information

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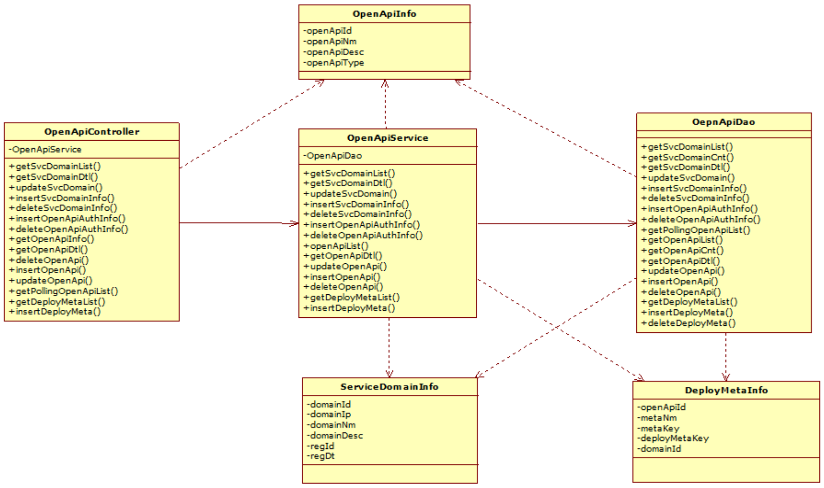

Figure 12. The Open API Classes

The distribution management system provides open APIs shown in Figure 12. getSvcDomainList() returns a list of service domain information. getSvcDomainDtl() returns information of the service domain designated by the input parameter, domainID. getOpenApiInfo() returns a list of all open APIs. getOpenApiDtl() returns detailed information of the API designated by the input parameter, openApiId.

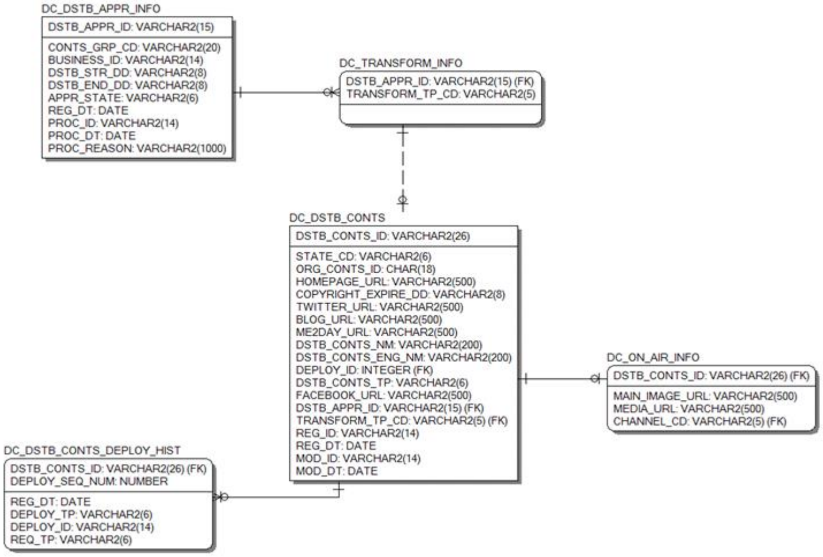
DC_DSTB_APPR_INFO
DSTB_APPR_ID: VARCHAR2(15)
CONTS_GRP_CD: VARCHAR2(20)
BUSINESS_ID: VARCHAR2(14)
DSTB_STR_DD: VARCHAR2(8)
DSTB_END_DD: VARCHAR2(8)
APPR_STATE: VARCHAR2(6)
REG_DT: DATE
PROC_ID: VARCHAR2(14)
PROC_DT: DATE
PROC_REASON: VARCHAR2(1000)
DC_TRANSFORM_INFO
DSTB_APPR_ID: VARCHAR2(15) (FK)
TRANSFORM_TP_CD: VARCHAR2(5)
DC_DSTB_CONTS
DSTB_CONTS_ID: VARCHAR2(26)
STATE_CD: VARCHAR2(6)
ORG_CONTS_ID: CHAR(18)
HOMEPAGE_URL: VARCHAR2(500)
COPYRIGHT_EXPIRE_DD: VARCHAR2(8)
TWITTER_URL: VARCHAR2(500)
BLOG_URL: VARCHAR2(500)
ME2DAY_URL: VARCHAR2(500)
DSTB_CONTS_NM: VARCHAR2(200)
DSTB_CONTS_ENG_NM: VARCHAR2(200)
DEPLOY_ID: INTEGER (FK)
DSTB_CONTS_TP: VARCHAR2(6)
FACEBOOK_URL: VARCHAR2(500)
DSTB_APPR_ID: VARCHAR2(15) (FK)
TRANSFORM_TP_CD: VARCHAR2(5) (FK)
REG_ID: VARCHAR2(14)
REG_DT: DATE
MOD_ID: VARCHAR2(14)
MOD_DT: DATE
DC_ON_AIR_INFO
DSTB_CONTS_ID: VARCHAR2(26) (FK)
MAIN_IMAGE_URL: VARCHAR2(500)
MEDIA_URL: VARCHAR2(500)
CHANNEL_CD: VARCHAR2(5) (FK)
DC_DSTB_CONTS_DEPLOY_HIST
DSTB_CONTS_ID: VARCHAR2(26) (FK)
DEPLOY_SEQ_NUM: NUMBER
REG_DT: DATE
DEPLOY_TP: VARCHAR2(6)
DEPLOY_ID: VARCHAR2(14)
REQ_TP: VARCHAR2(6)

Figure 13. Our Database To Store Information about Distribution Approval

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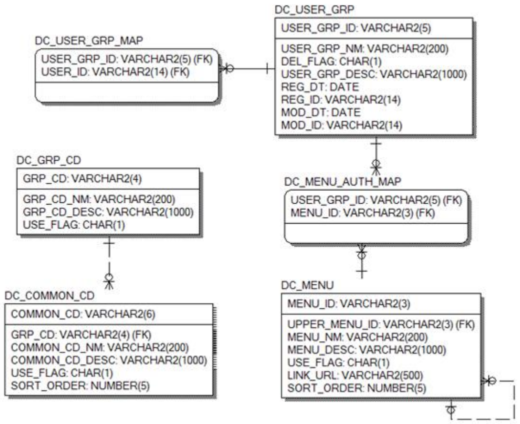


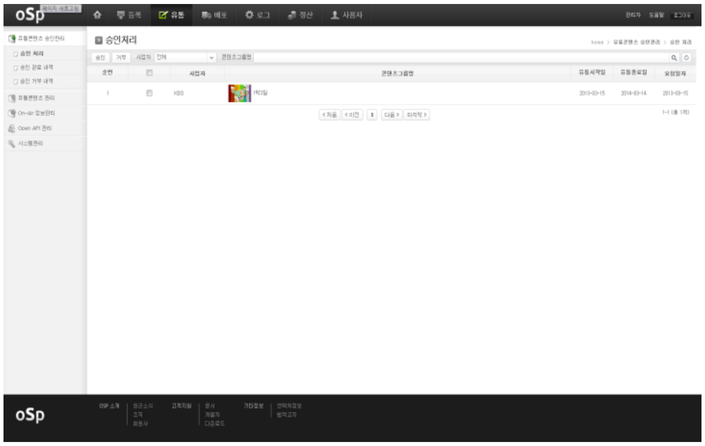
Figure 14. Our Database to Store Information About Authorization

We implemented a database shown in Figure 13 in order to store information about distribution approvals. DC_DSTB_APPR_INFO represents distribution approval information. A distribution approval requests for transcoding original content into the format required by the distributor. A distributor may asks for several content formats for smartphone, PC, tablet PC, and so on.

We implemented another database in order to store information about authorization as shown in Figure 14. Many users belong to a user group, but a user can belong to exactly one user group. A user group can be authorized to perform many menu items.

5. Experiments

We performed experiments of testing our system. An example screenshot of approving a purchase order is shown in Figure 15. A list of purchase orders is displayed in the screen. System operators can select one or more orders to approve or reject.



순번	□	사업자	콘텐츠그룹명	유통시작일	유통종료일	요청일자
1	□	KBS	1박2일	2013-03-15	2014-03-14	2013-03-15

Figure 15. An Example Screenshot of retrieving a List of Purchase Orders to Approve

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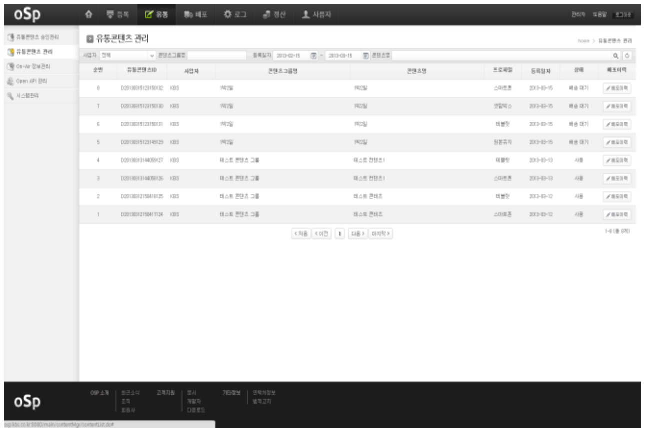
Distribution management system allows system managers to retrieve distribution IDs and to type in detailed metadata of a distribution. A screenshot of the first step of typing in detailed metadata of a distribution is shown in Figure 16.



유통콘텐츠 관리

사업자 전체 콘텐츠그룹명 등록일자 2013-02-15 ~ 2013-03-15 콘텐츠명

순번	유통콘텐츠ID	사업자	콘텐츠그룹명	콘텐츠명	프로파일	등록일자	상태	배포이력
8	D20130315123150132	KBS	1박2일	1박2일	스마트폰	2013-03-15	배송 대기	배포이력
7	D20130315123150130	KBS	1박2일	1박2일	셋탑박스	2013-03-15	배송 대기	배포이력
6	D20130315123150131	KBS	1박2일	1박2일	태블릿	2013-03-15	배송 대기	배포이력
5	D20130315123148129	KBS	1박2일	1박2일	원본유지	2013-03-15	배송 대기	배포이력
4	D20130313144059127	KBS	테스트 콘텐츠 그룹	테스트 컨텐츠1	태블릿	2013-03-13	사용	배포이력
3	D20130313144058126	KBS	테스트 콘텐츠 그룹	테스트 컨텐츠1	스마트폰	2013-03-13	사용	배포이력
2	D20130312158416125	KBS	테스트 콘텐츠 그룹	테스트 콘텐츠	태블릿	2013-03-12	사용	배포이력
1	D20130312158417124	KBS	테스트 콘텐츠 그룹	테스트 콘텐츠	스마트폰	2013-03-12	사용	배포이력

< 처음 < 이전 1 다음 > 마지막 > 1-8 (총 8건)

Figure 16. A Screenshot of Retrieving Distribution IDs

6. Conclusions

The distribution management system of an IPTV system allows distributors to request for content circulation and system managers to process distributors’ requests. Therefore, we can notice that a distribution management system is one of the key components for realizing one source multi-use. Our system will contribute to boost circulating value-added content and to boost the content industry.

Acknowledgments

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