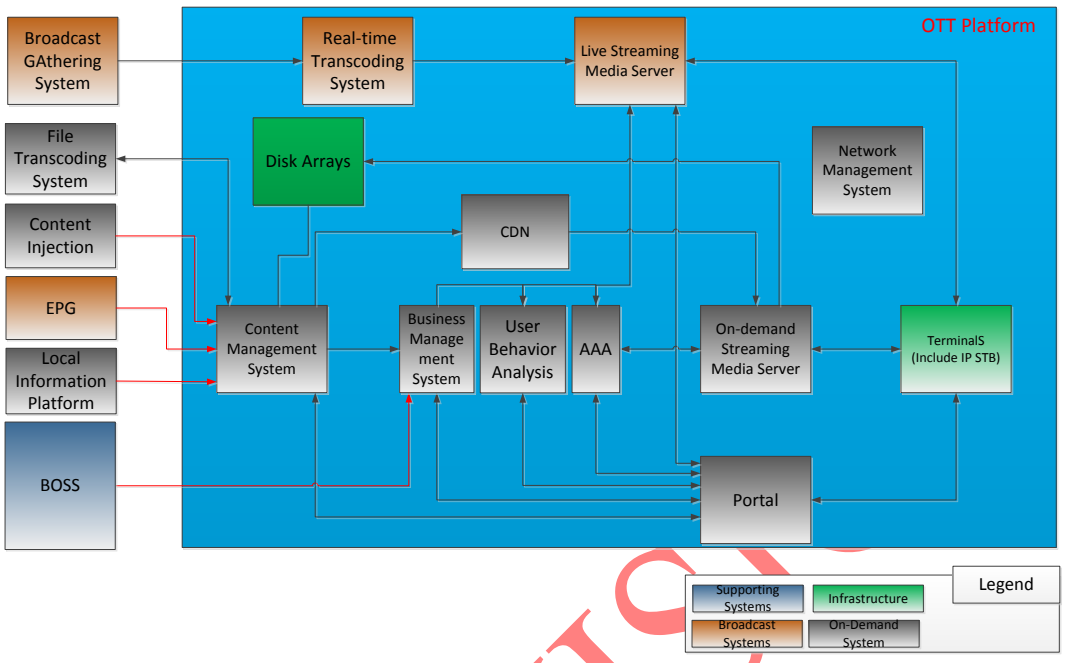
OTT System Introduction

Sumavision Technologies Co., Ltd.

Content

1. OTT System Architecture



1.1 Real-time Transcoding System

Real-time transcoding system transcodes the input TS stream into live stream with suitable screen solution and bit rate for various multi-screen terminal devices. It could output multiple live streams according to request from different operators.

Both the input and output transcoding streams follow UDP (multicast) protocol in order to be received by cluster and distributed live streaming media servers.

Real-time transcoding system is powered by Sumavision's XStream2000 transcoding servers. The input media format/mode is TS/UDP, while the output media format/mode is also TS/UDP.

1.2 File Transcoding System

File transcoding system generate on-demand transcoding file from TS file corresponding to multi-screen terminals. File transcoding system performs transcoding tasks according to request from media asset information injection module of CMS. The generated transcoding files will be stored into a specified location.

1.3 Live Streaming Media Server

Live streaming media server receives the output live stream from real-time transcoding system and then delivers it to end-users according to their request.
Live streaming media server is responsible for the end-user concurrent loading bearing.

The live stream will have a slight delay compared to real-time broadcast TV signals due to the segmentation strategy used by the live streaming media server.

Live streaming service provided by live streaming media server is based on reliable HTTP transmission protocol which is in the HTTP layer. The transmission follows unicast mode.

Live streaming media server adjusts to different transmission protocols accordingly for different terminal device platforms. The transmission protocols include Http Live Streaming (HLS), Adobe Flash Media Stream and etc.

1.4 On-demand Streaming Media Server

On-demand streaming media server receive playback requests from mobile terminal devices, conduct user authentication and then deliver the on-demand streams to

end-user based on HTTP protocol.

Features of on-demand streaming media server include:

- Responding to user authentication requests
- Responding to user playback request and distribute video on-demand accordingly.
- Recording users' video on-demand playback data which is useful for operating statistics, accounting and etc.

1.5 CMS

CMS (Content Management System) which provides services such as media asset metadata injection management, media asset metadata maintenance management and media asset information navigation, is one of the core subsystems of OTT platform.

- Media asset metadata injection management

  Content management system provides original media asset metadata information by ADI or FTP based on the data sources from operators' AMS. It achieves the functions of media asset metadata parsing and import.

- File transcoding

  File transcoding module generates corresponding MP4 files from TS files. File transcoding module performs transcoding tasks according to requests from media asset information injection module of CMS. The generated transcoding files will be stored into a specified location.

- Media asset information management

  Provide management functions include media asset metadata edition, columns maintenance, classification maintenance and etc. Ultimately, data for program navigation is generated.

- Media asset information navigation service

  Provide data service interface externally and service for portal subsystem in order to achieve program navigation for mobile terminal devices.

1.6 OSS

OSS (Business Management System) (Operation support system), which provides user information import, business ordering, product management and other core function to support business operation, is one of the core subsystems of OTT platform.

- User information import

  Boss output subscribers' identity information to OSS as the authoritative data source. OSS manages users' information independently in initial stage.

- Business ordering

  BOSS handles the subscription information from business office and then output to OSS. OSS generates and saves locally the subscription information simultaneously for on-line subscribers. In the meanwhile, the information is synchronized to BOSS for further authorization and accounting.

- Product management

  Provide product packaged service for injected media asset metadata.

1.7 AAA

- Authentication

  Provide legitimacy identity verification for mobile terminal users.

- Authorization

  Provide access control of end-users' requests according to subscription information.

- Accounting

  Generate billing information after end-users complete program order.

1.8 Portal

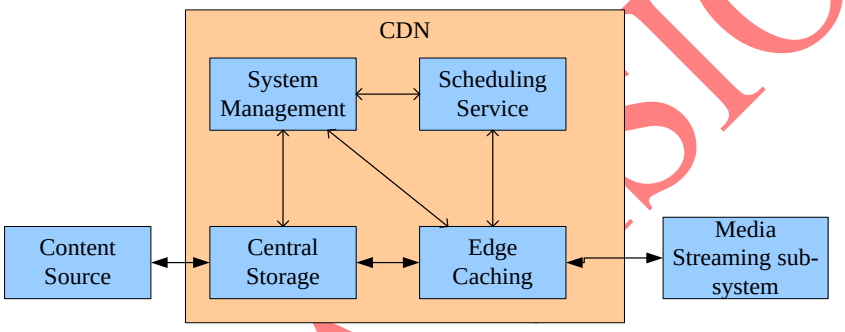
Portal gets relevant program data from CMS and then presents to mobile terminals.

Portal server provides regional differential services. End terminals will connect to different portal servers according to their regional location.

1.9 CDN

CDN (Content Distribution Network System, optional) provides services, which include content distribution, content update, content deletion, distribution cancelation and broadcast result notification, for streaming media server and image server.

Structure of CDN is as follows:



CDN (Content Distribution Network) includes the following main functions:

- System management

  Manage the equipment and hosted service in the system. Manage central storage, edge caching and etc. In the meanwhile, it also collects event log and provides the report tools.

- Central storage and edge caching

  The data obtained from content source is stored in central storage and cached to edge caching based on strategy in order to provide content to edge media streaming server.

- Scheduling service

  Choose the most suitable edge caching strategy and actin according to schedule strategy to provide content for edge media streaming server.

The input/output interfaces of CDN follow standard protocols. The user experience

depends on the hit rate of user clicked program which is influenced by the intelligent algorithm of the content caching and the program invalidation strategy on edge nodes.

1.10 Terminal Player

Terminal player, whose function includes organization and presentation of media program as well as download, reception, is an application or webpage on browser. Terminal player also interact with the terminal set-top box in order to complete function like screen synchronization. Terminal player have different versions for different platform that follow corresponding streaming media protocol mentioned above.

Functions of terminal player include:

- Presentation of program list
- Request and reception for program streaming
- Program playback
- Complete the end-user login, registration and other function.
- Complete the process of product purchasing

Complete interaction with set-top box

2. OTT Function Introduction

2.1 Multi-terminal Platform Support

The basic requirement of OTT platform is to deliver service to various terminals such as PC, Phone, Pad and other devices. Although there are a number of terminal types, they can be classified into two categories according to their presentation forms.

- Presentation in the form of browser

User can access to OTT business homepage through browser, on which live broadcast, time shift and back review of program and other functions can be achieved. With presentation in the form of browser, users can experience OTT service through terminals with lower configuration in purpose of attracting them to download OTT client.

- Presentation in form of client

After downloading the client software, not only the live broadcasting, time shift TV can be watched, but also interactive functions such as multi-screen switch and mobile remote control can be achieved through the client.

2.1.1 Android Terminal

OTT platform support mobile phone and PAD terminals with Android system. Users can play live broadcast program and time shift TV through the terminal client. In the mean while users can also experience interactive functions with the STB such as screen switch and mobile remote control.

2.1.2 iOS Terminal

OTT platform supports terminals such as iPhone, iTouch and iPAD with IOS system. Users can play live broadcast program and time shift TV through the terminal client. In the mean while users can also experience interactive functions with the STB such as screen switch and mobile remote control.

2.1.3 WEB Player

OTT platform supports presentation in form of Webpage. Users can play live broadcast program and time shift TV through internet browser (IE, Safari) installed on Windows, Mac, IOS or other operating systems.

2.2 Video Functions

Video functions include live streaming, time shift and back review TV, EPG, Program recommendation, personalized setting and etc.

2.2.1 Live Streaming

OTT terminals support live streaming. The features are listed as follow:

- Support channels on TV broadcasting
- Support regional live broadcast programs
- Support H.264/ACC encoding format
- Support EPG display for current playing channel
- Support multiple terminal types
- Support multi bit rate automatic and manual adaption according to different terminals and network environment.

Operators can choose the output video bit rate according to terminal configuration and head-end bandwidth capability.

2.2.2 Video On Demand

OTT terminals support video on demand viewing. The features are listed as follow

- Support programs from VOD platforms
- Support column categorization, classification, program search and other basic functions.
- Support display of program description information, including: poster, director, starring, synopsis and other information.
- Support H.264/ACC encoding format
- Support pause, fast forward, rewind, drag progress bar, continued streaming

and other functions.

- Support multiple terminal types
- Support multi bit rate automatic and manual adaption according to different terminals and network environment.

Operators can choose the output video bit rate according to terminal configuration and head-end bandwidth capability.

2.2.3 Time Shift and Back Reviewing TV

OTT terminals support time shift and back reviewing TV. The features are listed as follow.

- Support time shift TV for all the live channels. Default time shift length setting is 4 hours which is adjustable according to operator's requirement.
- Support back reviewing TV for all the live channels. Default time shift length setting is 7 days which is adjustable according to operator's requirement.
- Support H.264/ACC encoding format
- Support start, pause, stop, drag progress bar and other control functions.
- Support multiple terminal types
- Support multi bit rate automatic and manual adaption according to different terminals and network environment.

2.2.4 Offline Viewing

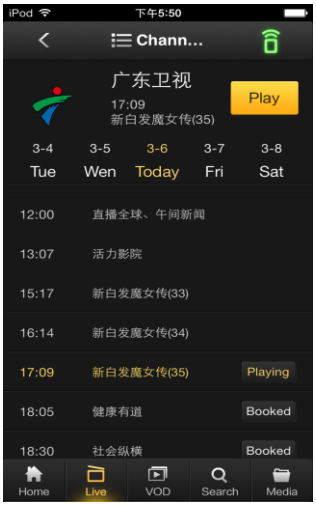
OTT terminals can download the video on demand programs to local storage so that they can be watched offline. Below is a list of specific functions.

- Support to download all the video in demand programs in OTT platform
- Support to monitor programs' downloading status
- Support pause, resume broken download, delete and other controls during the process of downloading
- Support playback of downloaded programs locally
- Support multiple terminal types

2.2.5 EPG

OTT platform supports electronic program guide feature. EPG is presented to user with different styles due to the convenience feature of PC, PAD, Phone and other mobile devices. User can browser the programs played last week and will be played this week through EPG.

User can also access to back reviewing TV through EPG.



2.2.6 Program Recommendation

OTT terminals support program recommendation features. Below is a list of specific functions.

- Support poster recommendation
- Support ranking recommendation
- Support search based recommendation

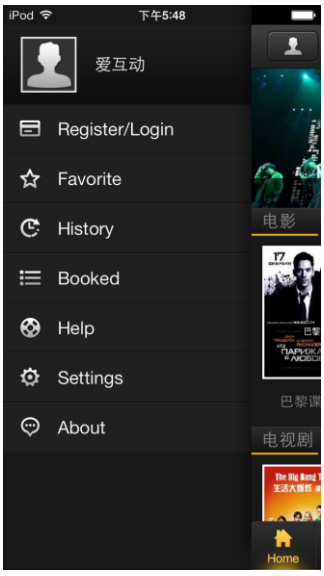
2.2.7 Personalized Features

Personalized features include collection, play history, ranking, search, broadcast alert, play list, cloud synchronization and others.

2.2.7.1 Collection

OTT terminals support collection feature. Below is a list of specific functions.

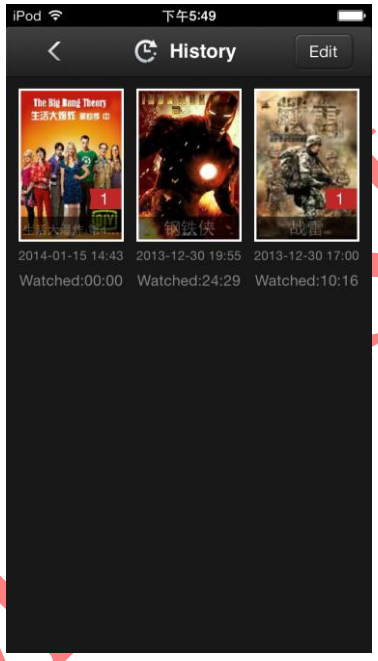
- Collection of live programs
- Deletion of collected program
- Empty the entire collection



2.2.7.2 Play History

OTT terminals support play history feature. Below is a list of specific functions.

- View the play record of program which includes program name, playback start time, and length of time for watching.
- Continue to broadcast after click on the program in play record,
- Deletion of certain record
- Deletion of the entire record



2.2.7.3 Search

OTT terminals support search feature. Below is a list of specific functions.

- Keywords fuzzy search;
- Hot recommendation search;

2.2.7.4 Broadcast Reminding

OTT terminals support broadcast alert feature. User can set alert for a program or series. Below is a list of specific functions.

- Live broadcasting program alert which is set through EPG
- Support terminal system notification, push message can be sent to remind the start hot programs
- Remind of update on series
- Cancelation of alert

2.2.7.5 Cloud Synchronization

OTT terminals support cloud synchronization feature. User's personalized information on collection, play record, broadcast alert, and play list is stored in the cloud. User can synchronize their information on multiple terminal devices. Below is a list of specific functions.

- Support multiple devices recognition per user and synchronize via cloud the user determined presentation of recordings, alerts and tags
- Cloud Sync of collection data

- Cloud Sync of play record content
- Cloud Sync of play alerts
- Cloud Sync of play list

2.3 Interactive Features

Interactive features include screen switch, mobile remote control, voice control, photo pushing, twitter sharing, DLNA, couple screen, TV social network and others.

2.3.1 Screen Switch (Mobile Terminal to STB)

OTT system support program switch from mobile terminal screen to TV screen. Below is a list of specific functions.

- Switch program from mobile terminal to STB for continued viewing
- Support live broadcasting program switch
- Support VOD switch for continued viewing
- Support both click and gesture commands for functionality

2.3.2 Screen Switch (STB to Mobile Terminal)

OTT system support program switch from TV screen to mobile terminal screen.

Below is a list of specific functions.

- Switch program from mobile terminal to STB for continued viewing
- Support live broadcasting program switch
- Support VOD switch for continued viewing
- Support both click and gesture commands for functionality

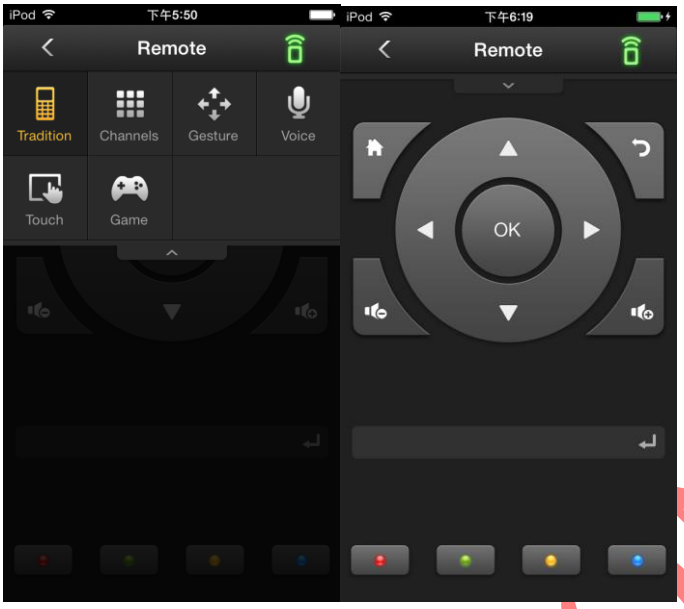
2.3.3 Mobile Remote Controller

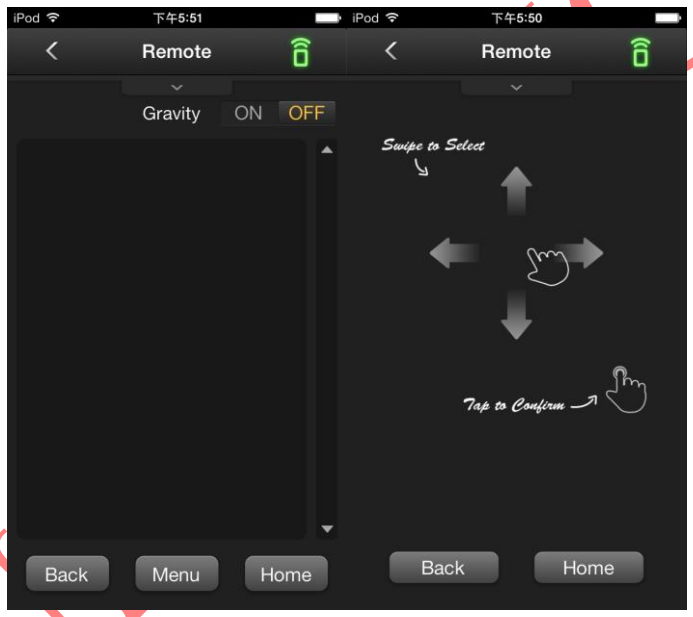
OTT mobile terminals can be used as STB's remote control to achieve the control features.

Mobile remote controller abandons the cumbersome button design of the traditional remote controller. It takes full advantage of the characteristic of the touch screen of the mobile terminal to ensure the ease of use while maintaining the user's operating practice on such application.

Below is a list of specific functions.

- Support icon mode. User can click on the channel icon on the remote controller to switch channel and click the business icon to quickly access value-added services.
- Support traditional mode. Mobile remote controller's button is designed similarly to traditional remote controller. User can control the STB by clicking on the buttons
- Support touch mode. User can control STB by motion gestures like up, down, left and right on mobile terminal's touch screen.





2.3.4 Input Keyboard

User can input information like words and numbers to STB with terminal client instead of the traditional remote controller in order to enhance the efficiency and bring better user experience.

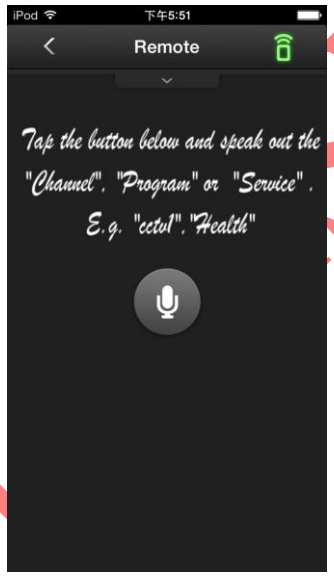
After the user moves the input focus to the text box on TV and types the wanted input words on mobile terminal, the information will be sent to STB and display on the corresponding place on TV.

2.3.5 Voice Control

OTT system support voice control features through mobile terminal. User input the channel keywords by voice intercom through mobile terminal which is connected to the cloud for recognition to complete the action like changing channels.

Below is a list of specific functions.

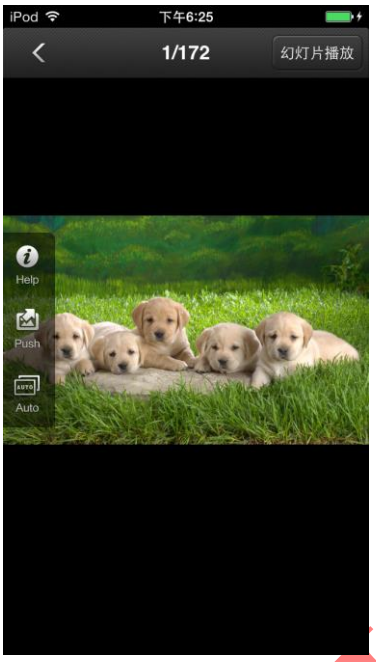
- Switch TV channels by voice commands
- Switch VOD program by voice commands
- Live channel and VOD content search by voice commands



2.3.6 Photo Pushing

OTT system support photo pushing (display photo on TV from mobile terminal). Below is a list of specific functions.

- Support immediate photo taken by camera of the terminal
- Local photo on mobile terminal can be pushed to TV screen for display



2.3.7 Twitter Sharing

OTT system supports twitter sharing features with which user can share the video content to twitter. Below is a list of specific functions.

- Twitter account management
- Twitter account binding (user can set their account name and password, and authorize OTT system to post on twitter)
- Support related topics browsing
- Support word and image twitter

2.3.8 Other Functions

Support the following functions listed below for mobile device to screen interaction

- DLNA capable
- Miracast functionality
- TV social networking

2.4 Operational Support Features

OTT system support operational support features which include identity management, content management, product management, payment ability, DRM, Ads management, viewing statistics, and other operation and maintenance support functions.

2.4.1 Identity Management

2.4.1.1 User Management

User is the one who obtain the identity of service by ordering business from the operator. User management is to establish a unified view of user information in order to keep it into maintenance during its life-cycle.

User information can either from BOSS or be maintained by OTT system itself. Once the OTT system is connected to BOSS, user information data will be synchronized. Else, user information will be self-maintenance by OTT system in order to provide services to the individual users. User can order service through online registration or local operating room. User information must be true, accurate and complete.

OTT system support user management features to help system operation. Below is a list of specific functions.

- Independent user management system(support both registration offline and online)
- User life-cycle management (support open and delete account, frozen and un-frozen account, disable and recover account and other service.)
- Cover a variety of application scenarios (password lost, control the number of accessed terminal and STB binding)
- User level management (can set up regular user, VIP user and other different levels)

- User subscription management (support online and offline subscription)
- Support integration with BOSS

2.4.1.2 Account Management

OTT system support account management feature. User can manage personalized information such as viewing record, collection, play list, friends cycle, and preferences through their account. Below is a list of specific functions.

- Support account registration and cancellation
- Support user account login

2.4.2 Content Management

CMS (Content Management System) is used for media asset metadata injection and management. CMS obtain video information (media file, media asset data, poster, trailer, Ads) externally and publish on portal for the mobile terminal after progressing.

CMS is consists of collection, production, finished-product and transcoding library. Collection library is responsible for the storage of content acquisition. Production library is responsible for storage of program editing and management. Finished-product library is responsible for storage of processed program. Transcoding library is responsible for storage of transcoded program from finished-product library.

2.4.2.1 Self-content

Below is a list of CMS functions.

- Content Import

  Import content to collection library through methods of ADI file download,

video source and poster file download, information import, ADI information deletion and raw file import.

- Content Information Management

  It provides services including column management, classification management, metadata management and content life-cycle management. Content status and process management service is provided around content initial status, ready for audit, initial audit, final audit, on-line, off-line, transcoding, injection, distribution, notification and other status.

- Content Propagation Management

  It provides file distribution services (inject transcoded file into CDN network and media streaming server) and propagation process management after auditing.

- Content Navigation Service

  It publishes the content to end-terminals after processing by CMS

- Live Channel Management

  It provides services for full channels and regional channels information management. EPG information publishing management and history query services are also achieve.

- Business Management

  Business management, as technical platform for value-added service's multi-screen presentation, supports value-added service for multi-terminals. Business management functions include service information addition, deletion, checking and correcting.

- Program Recording Management

  The functions of program recording management include recording resource management, recording plan development, recording task allocation, recording task executing recording results update and other recording management,

2.4.2.2 Content Import

Imported content is the key to keep the strong vitality of OTT system. Ways of content import including service import, content import and automatic grab. The most feasible way is CP/SP input.

Below is a list of content import functions

- CP/SP information management
- CP/SP life-cycle management
- Contract management
- Storage space management
- Account management
- CP/SP credit control management
- CP/SP monitoring and alert
- Service information management
- Service content management
- Service management
- Content and service relationship management
- Service and product relationship management

OTT system provides identical technical and management support for both self and imported content.

2.4.3 Product Management

OTT system supports product management features to help system operation. Below is a list of product management functions

- Product definition (addition, deletion, checking and correcting for product information)
- Product classification management
- Product life-cycle management (initial status, ready for audit, initial audit,

final audit, on-line, off-line, transcoding, injection, distribution, notification and other product status management)

- Product pricing policy management
- Product discount policy management
- Support product information synchronization with BOSS

2.4.4 Billing Function

OTT system supports billing settlement with third party so that co-operation with third party can be achieved.

Below is a list of functions

- Billing per user on a regular basis(monthly)
- Checkup account with third party on a regular basis
- Billing settlement with third party on a regular basis

2.4.5 AAA Function

AAA management is responsible for functions such as OTT user's login authentication, playback authorization, live broadcast history recording, and user information checking.

Below is a list of functions

- User authentication, authorization and generation of billing information.
- Support integration with operator's BOSS in order to obtain user information, product information and subscription information, and then return billing information.
- Equipped with database in order to synchronize data with current BOSS
- Billing information upload can be configured on a regular basis or instantly.
- Detail log with be generated for any actions
- Support discount policy according to user level and product.

2.4.6 Ads Operation

OTT system support Ads operation. Formats of Ads include video, image, word and link. It can be expanded according to the developing demand. Below is a list of operation mode.

- Recommended home page Ads (User will be navigated to a link or advertising video after clicking on the Ads)
- Pre-roll advertising(display before video program)
- Pausing advertising (display when the video program is pausing)

2.4.7 Viewing Statistic

OTT system supports viewing statistic generation. Below is a list of functions

- Regional concurrent load bearing statistic for live streaming, time shift and back reviewing TV.
- Entire concurrent load bearing statistic for live streaming, time shift and back reviewing TV.
- Regional ranking of audience rating for live channels
- Total ranking of audience rating for live channels
- Statistic results of audience rating for live channel
- The number of connection through STB
- Support expansion according to demand

2.4.8 Client Update

After the initial installation, terminal will be connected to Portal and submit user information data. Software update will be activated after checking the latest version information. Three update modes are supported by OTT system

- Compulsory update: Client is forced to update due to unforeseen BUG or other reason. Software will automatically connected to update after user

open the client.

- Automatic update: Software update is automatically activated when new version is published. User can choose to accept or reject the update.
- Manually update: User click on the update button to update the software

2.4.9 Operation and Maintenance Support

OTT system supports operation and maintenance functions. Below is a list of functions

- Provide differential management permission according to user level. Control the permission of operation staff.
- Provide log analysis function
- Provide detailed help information
- Provide frequent error screening method