OTT (Over the Top)
End to End Solution
IPTV and VOD

Proposed by: Greatway Technology Co., Ltd.
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1 General

MOP 2.0 (Media Operating Platform 2.0) is an end to end solution, designed and developed by Greatway Technology for OTT services. It enable network TV provider, web video provider, telecom operator, cable TV operator to extend their services to deliver live IPTV, VOD, information, game and many other value added services via internet cost effectively. The platform has following characteristics:

- Internet based, support local, regional and global deployment;
- P2SP & HLS based, reducing operation cost, enhancing user’s experiences;
- Support multi video format;
- Support DRM, protecting contents effectively;
- Scalable system, up to millions level subscription;
- Support multi terminal, including STB, PC, smart TV, PAD, mobile, etc.;
- Support regional content storage and distribution;
- Complete fault tolerant system.

Figure 1 Diagram of MOP 2.0
2 Components

MOP 2.0 headend system including IP Gateway, Media Coding Server (MCS), Content Distributing Server (CDS), Operating Information Server (OIS), Resources Management Server (RMS), Electronic Program Guide Server (EPGS), etc. Each device can be deployed centrally or regionally. The system can be expanded seamlessly, either at central level or regional level to ensure system and operation expanding cost/effectively on internet.

Contents can be from various sources, including DVB/S/T/C, video camera, video server, media storage system, etc. IP Gateway transform contents from such sources into standard TS streams, the streams further encoded into stream format for distributing via internet, and injected into CDS, and then guided by DB, OIS, EPGS and distributed to regional server or end user’s device. The system is managed and administrated by operator via RMS, including control and operation of head end devices, regional devices, content resources and user’s end devices, as shown in following figure.

Figure 2  Network Structure of MOP 2.0
2.1 IP Gateway

IP Gateway transforms broadcasting streams into IP streams and then put into MCS.
- Each IP Gateway can support up to 6 streams;
- Support DVB-C/S/T/S2/T2 input;

2.2 Media Coding Server (MCS)

MCS is also named as video encoder.
- Each MCS can support up to 4-16 streams, depends on bit rate and video quality;
- Support input from SDI, ASI, AV, LAN etc.;
- Support multi format, including MPEG2/MPEG4/H.264/WMV, etc.;
- Support vary byte rate and ABR technology, support output of UDP/HTTP/HLS;
- State of art technology ensure display quality at low bit rate;

2.3 Operating Information Server (OIS)

Many functions are integrated into OIS, such as user authentication, billing information, device information, channel and movie information, distribution strategy, Load Balance, etc.
OIS grasps almost all of MOP information and provides these services. Base on this design, many specialized servers are reduced. The system is quicker and cost is lower.
- By cluster deployment, support up to millions of subscribers;
- Backup each other without redundancy, ensure safe operation of the system;
- HTTPS enhances system security;
- Simple architecture, easy deployment and upgrade, seamless expansion;

2.4 Content Distributing Server (CDS)

CDS acts as both CDN node and video server. It distributes media content to whole MOP head end storages under the order of OIS, and provides media streaming services under terminals’ request.
- Live TV streaming, Time-shift streaming, Playback streaming, VOD streaming, etc.
- Support P2SP and HLS protocols, reduce load of server, improve user’s experiences;
- With DRM for securing contents, also can support third party’s DRM;
- Support weekly contend recording and play back, support up to 60 minutes time shift;
- Support on line stream soliciting and off line content soliciting;
- Optimized IO, improved storage space efficiency and IO throughput capability;

2.5 Resource Management Server (RMS)

Though RMS, the administrator manages all resources of MOP, including servers, terminals, EPG, storages, subscribers, channels, movies, radios, record files, etc.
- Internet based, remote Web browser operation, easy to install and operate;
- Direct connection with OIS, quick response and high performance;
- Online system operation monitoring, remote diagnostic;
- Functional and specialized data and information statistic reporting, sound for data and
information analyzing;
. Built in network management, point to point control on terminal.

2.6 Electronic Program Guide Server (EPGS)

EPGS provide web user interfaces for subscriber to enjoy the abundant entertainment and information services. Subscriber can select service via EPG-Web page, which are easy to redevelop and upgrade;

. Provide channel list, history program (defaulted as one week);
. Provide VOD program;
. Support EPG advertisement injection;
. Specialized EPG for various terminal, including STB, Pad, smart TV, etc.;
. Hot data buffering, enhanced capability of concurrent request;
. Open for secondary design and re-development, easy to upgrade.

2.7 Terminal

. Support STB, PC, PAD, smart Phone, smart TV;
. Support devices with OS of iOS, Android, Windows, Linux;
. Support play back of LD, SD and HD;
. Support 2D and 3D games;
. Support IR remote control, smart remote control, keyboard, mouse, sensor etc.
. Support multi screen interacting, Airplay and DLNA.
3 Services and Applications

3.1 Live TV Program

Live TV program can be from DVB C/S/T, or other sources. Original streams are encoded by IP gateways and encoders, injected into MOP system, and delivered to terminals via internet by P2SP or HLS protocols.

- Using P2PS protocol to save 50-90% bandwidth needed from head end to Internet;
- Using HLS protocol to support ABR, dynamic adjust bit rate to ensure smooth play;
- Time delay limited within 3 minutes;
- Support multi language audio channel and subtitles;
- Support multi screen interactive;
- Support DRM and subscription authorization;
- H.264-TS recommended.

Figure 3 Diagram of Live TV Program of OTT TV

3.2 Time shifting & Playback

The MOP supports using HDD, RAID, NAS as storage media to record TV program at central or regional head end. Subscriber can playback recorded contents guided in EPG interface.

- Time length of recorded program can be set as needed (one week recommended);
- Work with EPG, subscriber can playback missed program conveniently;
- Support play list batch processing;
- Support multi storage media, including HDD, RAID, NAS, etc.;
- Support PVR function;
- Support DRM and subscription authorization;
- Support ABR and dynamic bit rate adjustment.
3.3 VOD

Movies, dramas, record files and other contents can be stored at headend storage (HDD, RAID, NAS, etc.) and delivered via CDS to subscriber on request. Subscriber can select interested movie by category, and/or list instantly (for lower definition), or can store the content on local storage media (USB memory, USB HD, etc.) for enjoying downloaded high definition contents.

- List by category, region, time, staring, etc.;
- Flexible billing strategy, pay per view, pay per package, or by daily, weekly, monthly, annually charge, etc.;
- Support PVR function;
- Support DRM and subscription authorization;
- Support ABR and dynamic bit rate adjustment;
- Support multi language and subtitle;
- Support multi screen interaction, Airplay and DLNA;

3.4 Push VOD

Administrator select some contents and put them to terminal storage (USB flash, USB HDD, etc.) through RMS. Subscriber can get much better experience than VOD.

- Push content between specified time range;
- Flexible pushing strategy based on P2SP, low cost of bandwidth;
- Adaptive pushing bit rate at back, does not affect current play;

3.5 Radio

- Very small bandwidth needed;
- Support mono and stereo;
- Customizable screen background;
- Support advertisement injection.

3.6 Advertisement

EPG advertisement can be displayed on TV screen during subscriber viewing EPG, in
dedicated area without interrupting or sheltering normal information displaying, advertisement can be displayed:

- During STB booting up;
- Overlaying on volume indicator bar when subscriber adjust audio volume;
- During live TV channel changing;
- In blank area of EPG;
- Instant text notification.

3.7 Others
- Digital photo album
- Weather forecast
- Travel information
- E-Business

4 System Management
Operator can manage headend system and its operation on RMS via interactive interface.
4.1 Administrator

Administrator can be authorized with various levels for accessing MOP system, such as general operational; technical and maintenance, media announcement and management, subscription management, etc.

4.2 Subscriber

- Subscriber account open, close, and management;
- Support multi devices under one account;
- Support up to millions subscription, seamless expansion;
- Support online or offline notification.

4.3 Server

- Add/Remove/Enable/Disable OIS,CDS,EPGS;
- Load Balance;

4.4 Terminal

- Batch registration, reduce work load and fault;
- Remote automatic STB software/firmware/application upgrade (for STB);
- Support STB upgrade by point, group, area.

4.5 Media Resource

- Live TV channel/stream generation, edition;
- VOD media upload, storage, categorization, distribution.
- DRM for media encryption;
- Push media from server to terminal;
- Subscribers initiatively download media from server.

4.6 Billing

- Customizable billing strategy;
- Support pay per view, by package, daily, weekly, monthly, annually subscription;
- Support billing discounting and preferential;
- Support subscription information recording and analyzing.
4.7 EPG

- EPG generation, edition, synchronization;
- Multi style EPG for various terminal;
- Channel list;
- History program;
- VOD list;
- EPG advertisement;

4.8 Monitor & Statistics

- Online monitoring of equipment, servers, living stream, terminals.
- P2P efficiency statistics by channel or terminal;
- Server or terminal flow statistics;
- Subscriber action statistics.
- Log exportation and inquiry;

4.9 Others

- Media group;
- Bandwidth testing;
- Database backup;
5 Terminals

5.1 Greatway STB

Greatway S-Box family is a series of IPTV, OTT TV STBs, ranging from low cost entrance level SD STB to high end level STB with features of SD/HD, PVR, DVB-IP hybrid, which works perfectly with Greatway MOP, enable OTT TV operator deliver the services to subscribers easily, quickly and cost effectively. The state of art design and innovative technology adopted, stable and durable operational performance ensure quality of services and guarantee use’s experiences. With Android OS, and features of Wi-Fi, DLAN, Airplay, S-Box can fully interact with other devices such as mobile, Pad, PC, etc.

5.2 Others

APP and APK are available for subscriber enjoying OTT TV services on iPhone/iPad and Android phone/pad. Subscriber can use such device to control Greatway STB.
### 6.1 System Headend Hardware

<table>
<thead>
<tr>
<th>Item</th>
<th>Performance</th>
<th>Disaster Recovery</th>
<th>Server Configuration</th>
<th>Recommending</th>
</tr>
</thead>
<tbody>
<tr>
<td>OIS</td>
<td>100K Subscribers</td>
<td>Main and Standby</td>
<td>CPU: 4 core 3GHz HD: 500GB RAM: 8GB NET: 1000M</td>
<td>Dell R710</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CDS</td>
<td>2000Mbps</td>
<td>Mutual Standby</td>
<td>CPU: 4 core 3GHz HD: 500GB RAM: 8GB NET: 1000M x 4</td>
<td>IBM X3100M4 Xeon</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EPGS</td>
<td>20K Subscribers</td>
<td>Mutual Standby</td>
<td>CPU: 4 Core 3GHz HD: 500GB RAM: 8GB NET: 1000M</td>
<td>IBM X3100M4 Xeon</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DB</td>
<td>8000pcs per second</td>
<td>Asynchronous</td>
<td>CPU: 2 core 2GHz HD: 500GB RAM: 4GB NET: 1000M</td>
<td>Dell R410</td>
</tr>
<tr>
<td></td>
<td></td>
<td>replication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RMS</td>
<td></td>
<td>Asynchronous</td>
<td>CPU: 2 core 2GHz HD: 500GB RAM: 2GB NET: 100M</td>
<td>Dell R210</td>
</tr>
<tr>
<td></td>
<td></td>
<td>replication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCS</td>
<td>4-16 channels</td>
<td></td>
<td>CPU: 4 core 3GHz HD: 200GB RAM: 2GB NET: 1000M</td>
<td>Dell R410</td>
</tr>
<tr>
<td>SWICH</td>
<td>1000M</td>
<td></td>
<td></td>
<td>H3C S5500 EI (28P-52P)</td>
</tr>
</tbody>
</table>

Suppose 100K subscribers in the system, 30% on-line rate, 40 channels live TV, contents data rate 500Kpcs~4Mbps (average data rate 1Mpbs), the system hardware should be:

1) OIS: 2pcs, one main and one standby
2) CDS: 100000*0.3*1M/2000M = 15pcs. If there is live TV service only, the CDS number can be 15*(1-0.8) = 3pcs (considering the 80% P2P efficiency).
3) EPGS: 100000/20000 = 5pcs
4) DB: 1pcs
5) RMS: 1pcs (RMS can be stand-by with DB each other)
6) MCS: 40/4=10pcs

If the subscribers are located in a big area belonging to different ISP, the servers should be distributed in the Central area and Edge area.

6.2 Storage

Broadcast Recording: the storage capacity is \(7 \times 24 \times 3600/8 \times 40 = 3024000MB = 3TB\) based on 40ch live SD TV at 1Mbps data rate each channel for 7 days. If the broadcast needs ABR, each channel should have 3 kinds of data rates (high, middle and low), the storage capacity is 9TB.

VOD Storage: Based on online 15000 hours contents and 1Mbps data rate, the storage capacity is \(15000 \times 3600/8 = 6750000MB = 7TB\). If VOD needs ABR, the content should have 3 kinds of data rates (high, middle and low), the storage capacity is 21TB.

Other storage: System software and database etc. need 10GB.

In summary, the storage space can be 10TB to 30TB or 100TB if there are more SD or HD contents. Due to the limited IO capacity of the server Hard Disc, we recommend the
following storage solutions:

<table>
<thead>
<tr>
<th>Storage Solution</th>
<th>Extra Storage Technology</th>
<th>Features</th>
<th>Network Subscribers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Hard Discs along with the server</td>
<td>No</td>
<td>Low cost, easy installation, Standard Hard Disc IO, No Disaster Recovery</td>
<td>Less than 50K</td>
</tr>
<tr>
<td>With NAS Software</td>
<td></td>
<td>Current Hard Disc Resource, Better IO Capacity, Disaster Recovery Capability</td>
<td>50K~100K</td>
</tr>
<tr>
<td>RAID5 along with the server</td>
<td>No</td>
<td>Better IO Capability, Better Disaster Recovery, Bigger Contents Capacity</td>
<td>50K~100K</td>
</tr>
<tr>
<td>With NAS Software</td>
<td></td>
<td>Better IO Capability, Better Disaster Recovery, Bigger Contents Capacity</td>
<td>100K</td>
</tr>
<tr>
<td>Central Hub with NAS</td>
<td>Edge Hard Disc</td>
<td>Stronger IO Capability, Stronger Disaster Recovery, Good Contents Capacity</td>
<td>100K</td>
</tr>
<tr>
<td>Edge Hard Disc with NAS Software</td>
<td></td>
<td>Excellent IO Capability, Excellent Disaster Recovery, Excellent Contents Capacity</td>
<td>100K or above</td>
</tr>
</tbody>
</table>

Recommended NAS Solution: Initstream NAS (http://www.initdream.com)

6.3 Security

- Signal in HTTPS technology
- Stream in DRM
- Real-time user authentication
- Database Isolation with SOAP interface
- Administration and user access separated
- Servers mutual disaster recovery
- Watching Dog function
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>OTT</td>
<td>Over The Top</td>
</tr>
<tr>
<td>MOP</td>
<td>Media Operating Platform</td>
</tr>
<tr>
<td>OIS</td>
<td>Operating Information Server</td>
</tr>
<tr>
<td>CDS</td>
<td>Content Distributing Server</td>
</tr>
<tr>
<td>RMS</td>
<td>Resource Management Server</td>
</tr>
<tr>
<td>MCS</td>
<td>Media Coding Server</td>
</tr>
<tr>
<td>EPG</td>
<td>Electronic Program Guide</td>
</tr>
<tr>
<td>EPGS</td>
<td>EPG Server</td>
</tr>
<tr>
<td>P2P</td>
<td>Peer To Peer</td>
</tr>
<tr>
<td>P2SP</td>
<td>Peer To Server and Peer</td>
</tr>
<tr>
<td>HLS</td>
<td>Http Live Stream</td>
</tr>
<tr>
<td>RTMP</td>
<td>Real Time Messaging Protocol</td>
</tr>
<tr>
<td>ABR</td>
<td>Adaptive Bit Rate</td>
</tr>
<tr>
<td>ASI</td>
<td>Asynchronous Serial Interface</td>
</tr>
<tr>
<td>SDI</td>
<td>Serial Digital Interface</td>
</tr>
<tr>
<td>DRM</td>
<td>Digital Rights Management</td>
</tr>
<tr>
<td>NAS</td>
<td>Network Attached Storage</td>
</tr>
</tbody>
</table>
H.264 SD/HD IPTV Set-Top- Box

The S-Box8800C is an IP-based Set-Top Box supporting H.264 SD/HD decoding. It offers enhanced capabilities for IPTV services including Multicast, Video-on-Demand and Internet access.

The S-Box8800C enables Service Providers to deliver interactive multimedia services to end-users, thereby increasing the value of the operator's network, enabling operators to increase revenues. It also provides subscriber with more flexible and personalized viewing experience.

Key Features

- Enhanced Video Quality
- Multi Video/Audio Outputs
- Hardware Video Decoding
- Plug & Play, Simple Installation and Setup
- Fully Compatible with Open International Protocol
- Support a range of Middleware and Content Protect Solutions
- Cost Optimized Technology and Design, Low Cost of Ownership

Specifications

Embedded Architecture
Processor: ARM Cortex A9, 1500DMIPs
Flash Memory: 128MB
DDRAM: 256MB
Operation System: Linux

Video
Video Decoding: H.264MP, HP@level4.1 AVS
Video Form: PAL / NTSC
Aspect Ratio: 4:3 and 16:9, auto format detection Out Definition: 480i, 480p, 576i, 576p,720p, 1080i, 1080p
Video Output: HDMI, CVBS,
Encoding: H.264

Audio
Decoding Formats: MPEG (Layer1,2), MP3
Volume Control: 32-level Adjustable, Mute
Output Modes: Mono / Stereo, S/PDIF
Protocols
IP Protocol: IPv4/IPv6
Network Protocol: TCP/IP, HTTP, POP3, DHCP, DNS, FTP, NTP, SSL, PPPoE,
Streaming Protocol:
Multicast IPTV (IGMP)
Video on Demand (RTSP/RSVP control)
HTTP
Adobe RTMP
Transport Protocol: TS over UDP, TS over RTP

Interfaces
Ethernet Interface: 1×10/100M Base-T, RJ45
Video Output: 1xHDMI, 1xRCA,
Audio Output: 2xRCA (L/R) for Stereo, 1x SPDIF
USB2.0 Host ×2
IR Remote Control for TV and Set-top Functions
Plug-top Power Supply (12V Power Adaptor)

OSD
Video/Graphics Plane Multiple Layer
Color: 32-bit ARGB for Video
Alpha Blending: 256 level
OSD Flicker Filter
Picture-in-Graphics
Picture Decoding: JPEG, GIF, PNG

Application Software
Embedded Browser:
HTML5.0, JavaScript 1.5
Webkit
Support Multi Video Servers
Support USB Mouse and Keyboard
Support V4L2 and ALSA Driver
Support Online Software Upgrade

Others
Dimensions: 178×178×33 mm（W×D×H）
Power Supply: External 12 V
Power Consumption: <12 W
Silent Operation: No Forced Air Cooling