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2019 5.22.~25.

KOBETA
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KOBA 2019 to Open at COEX in Seoul, Starting From May 22

The Korea International Broadcast Audio & Lighting Equipment Show (KOBA) 2019, is scheduled to be held at COEX in Gangnam, Seoul, on May 22. The event, now in its 29th year, is co-organized by the Korea Broadcasting Engineers and Technicians Association (KOBETA) and Korea E&EX Inc.

KOBA 2019 is a leading international expo on broadcasting equipment, and ranks among other major broadcasting events such as the US National Association of Broadcasters (NAB), the European International Broadcasting Convention (IBC), and Japan's International Broadcasting Equipment Exhibition (InterBEE). Sponsors of KOBA 2019 include the Ministry of Science and ICT, the Ministry of Trade, Industry and Energy, the Korea Communications Commission, the Korea Trade Investment Promotion Agency (KOTRA), KBS, MBC, SBS, EBS, OBS, the Electronics and Telecommunications Research Institute, the Korean Association of Sound Artists, and the Acoustical Society of Korea, among others.

Scheduled to run for four consecutive days from May 22 to May 25, KOBA 2019—organized under the theme "Media, Make a Choice"—will provide event visitors with glimpses at the latest trends and prospects in the broadcasting and ICT market. The recent launch of 5G telecommunications in the market is expected to boost the quality of UHD broadcasting services on display at the show. There will also be a wide variety of products and business models on display that apply cutting-edge virtual and augmented reality (VR and AR) technologies, artificial intelligence (AI), the Internet of Things (IoT), and blockchains.

The KOBA World Media Forum & the Global UHD Conference will also be taking place in Suite 401 at the COEX Conference Center at 10 a.m. on May 22. Co-organized by the KOBETA, the Broadcasting Engineer Academy, and the Korea Radio Promotion Association, the international forum will equip participants with the insights necessary to predict and prepare for new trends in the global media market. The forum has been held each year on the first day of KOBA since 2015.

This year's forum—also organized under the theme "Media, Make a Choice"—will feature lectures from world-renowned experts. Lecture topics and speakers include: "Sub-Second latency streaming Solution, RTS" by Steve Miller Jones, the Vice-President of Product Strategy at Limelight Networks; ATSC 3.0 - 5G, convergence media framework for the U.S market by Park Kyungmo, Team Leader at SK Telecom's ICT R&D Center, Tech. Innovation Group; "HbbTV at the heart the transformation of Broadcast in Europe" by Vincent Grivet, Chairman of HbbTV; Better is better. Next Gen TV Development in the United States by Sam Matheny, CTO and Executive Vice-President of NAB; and "UHD, HDR, HFR, NGA, IP and 5G - European Experiences" by Frans de Jong, Senior Engineer at EBU.

The International Broadcasting Technology Conference, scheduled to take place on May 23 and 24, is another major KOBA 2019 event that should not be missed. A KOBETA spokesperson explained, "We have prepared dozens of lectures on major issues in the broadcasting market today, including not just UHD, but also 5G, AI, blockchains, and other advanced ICTs. We expect that this year's show will result in many lively discussions."

KOBA 2019,

Media, Make a Choice

President, KOBETA
Lee Sanggyou

President, Korea E&EX Inc.
Kim Jungjo

The Korea International Broadcast Audio & Lighting Equipment Show (KOBA) 2019 is the largest international expo in Korea dedicated to broadcasting, audio, and lighting equipment. This year's event, which has been co-organized by the Korea Broadcasting Engineers and Technicians Association (KOBETA) and Korea E&EX Inc. under the theme "Media, Make a Choice," has gotten off to an excellent start.

In 2019, as KOBA celebrates its 29th anniversary as Asia's largest international expo on broadcasting and media technologies, KOBA is focusing on introducing cutting-edge production, transmission and new media technologies as well as software solutions from around the world. The wide variety of broadcasting systems and production solutions on display at this year's event offer visitors a glimpse at the new technologies emerging in the broadcasting and media world as well as insights into the current state of the broadcasting equipment industry, strengthened by the application of the latest information technology.

In particular, KOBA 2019 highlights the transition of ultra-high definition (UHD) broadcasting from 4K to 8K. The National Association of Broadcasters (NAB) Show 2019, held in the United States earlier this year, has already hinted at this transition. At KOBA 2019, major players in the global broadcasting equipment industry are exhibiting their new 8K devices, and display manufacturers such as Samsung and LG are exhibiting their 8KTVs, which they have already launched into the market one after another. Although there is still a lack of UHD content, this shortage will soon be overcome as state-of-the-art information and communication technologies continue to develop and lead the content market. KOBA 2019 introduces not only UHD devices, but also perfected versions of augmented and virtual reality (AR and VR) solutions that have been already been introduced over the last couple of years. KOBA 2019 is also an excellent opportunity for visitors to get a real sense of how the latest ICTs, such as the Internet of Things (IoT) and artificial intelligence (AI), will soon converge with the broadcasting industry.

In addition to these exciting contents, KOBA 2019 has also invited media experts from all around the world to a forum to participate in in-depth debates and exchanges on the latest media trends and technologies. At this year's World Media Forum & the Global UHD Conference, Vincent Grivet, Chairman of Europe's HbbTV Association, and Sam Matheny, CTO of the NAB, are addressing the next-generation currents in the European and American broadcasting communities, respectively, and encouraging forum participants to participate in the debate on the future evolution of the media. This is a valuable opportunity for Korean TV networks, which have become the world's first networks to provide UHD broadcasting, to consider different changes they can make to continue to improve the quality of their services.

The International Broadcasting Technology Conference 2019, conducted over the course of approximately 40 sessions at the COEX Conference Center, is run in conjunction with KOBA 2019, and features in-depth lectures on major issues related to the media and technology, such as the Fourth Industrial Revolution, IP broadcasting, UHD production, new media services, AI, and 5G telecommunication. The tech demonstrations and seminars held as part of the conference include demonstrations of cutting-edge equipment, systems, and solutions from a variety of companies.

We hope that all the visitors and participants of KOBA 2019—a celebration of innovative broadcasting and media technologies—can gain the valuable insights they need to prepare for the rapid changes taking place in the media. My sincere thanks goes to the members of the National Assembly, employees and management of broadcasting companies, government representatives and CEOs of broadcasting equipment makers for their contributions toward KOBA's development. Thank you.

President, KOBETA Lee Sanggyou   President, Korea E&EX Inc. Kim Jungjo

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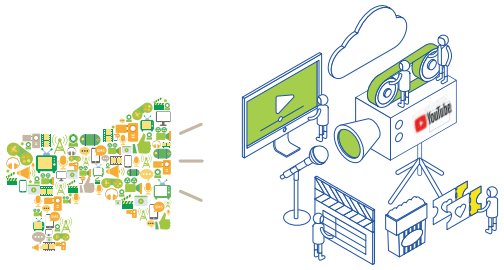

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Trend of Vertical Videos and the VERTIGO Project

Senior Research Engineer, Media Technology Research Institute, KBS | Lee Yoonjae

Emergence of Vertical Videos through Mobile Advertising

Vertical videos first emerged with Snapchat, a messenger application used mainly by youths in the United States. In 2015, Snapchat launched the vertical video mobile advertising platform 3V (Vertical Video Views). At the time, this was a rather bold move, as it required advertisers to bear the additional costs of producing commercials in the vertical video format. Despite concerns, however, the platform performed surprisingly well, recording an engagement rate nine times higher than existing forms of advertising.

Snapchat gradually secured greater competitiveness in the mobile advertising market by breaking away from the stereotype that been entrenched since the advent of television that "videos should be horizontal." When a horizontal video is played on a device held vertically, it only uses 25 percent of the screen, but vertical videos use 100 percent of the screen, allowing them to provide a greater amount of content and information.[Fig. 1]

Trend of Vertical Videos

Snapchat's success extended beyond the advertising sector, leading vertical videos to spread rapidly throughout the mobile video market. And YouTube and Facebook were the first to respond. In the second half of 2017, the two services issued updates that brought support for the vertical video format. Previously, vertical videos had been played with empty black screen above and below the video, but the updates enabled them to be played full screen. At around the same time, the BBC also began providing news in vertical video format through its news application, leading to a 30-percent increase in views.

Recently, services have emerged that exclusively support vertical videos. In June 2018, Instagram launched its video service IGTV (Instagram TV), which supports only vertical video uploads.[Fig. 2] TikToc, which created quite a stir when it exceeded Uber's market capitalization, uses vertical video as its basic format. In July 2018, Netflix began offering trailers in vertical video format as a way to reduce the inconvenience of users having to turn their devices horizontally to watch a short trailer less than one minute long.[Fig. 3] Also, the Mobile Live quiz app, which represents a new, emerging marketing platform, uses the vertical video format to capture and convey the emcee's vitality and liveliness.[Fig. 4]

Why are so many services taking an interest in vertical videos? The reason is simple. The most natural way to hold your smartphone is vertically. According to a survey by MOVR (2017), smartphones are used in portrait-mode 90 percent of the time.

K-Pop x Vertical Video = "Vertical Directcam"

In Korea, in contrast to other countries where vertical videos began with mobile advertisements, it began with K-pop content. Vertical videos, referred to as "vertical directcam" in Korea, started being uploaded on the Internet in the early 2010s. Specifically, a vertical directcam video is a long-form video of a single member of a multi-member idol group filmed by a fan. Early on, idol fan clubs were the first to create vertical directcam videos, using personal filming devices rather than professional broadcasting equipment. This often meant that the quality of the videos was not so good, because of excessive shaking or the presence of the backs of other people's heads, but they gained huge popularity as they successfully captured and conveyed the energy on the stage. A study conducted by LGU+ (2018) showed that idol fans preferred vertical directcam videos (54%) over music videos (43%). Boosted by such popularity, terrestrial TV broadcasting stations and cable broadcasters that produce music programs now produce and distribute vertical directcam videos.

In the case of KBS, it produces and distributes vertical directcam videos through the NaverTV Music Bank channel. The vertical directcam video of Kang Daniel that was uploaded in April 2018 generated a tremendous response among viewers, recording an unprecedented 38 million views.[Fig. 5] Taking things a step further, LGU+ launched its vertical directcam service "U+ Idol Live" in October 2018.[Fig. 6] Through this service, up to 11 cameras film vertical directcam videos of each member of an idol group for its fans.

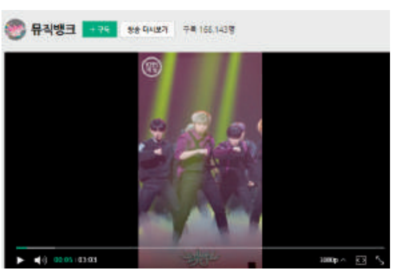
Efficient Vertical Video Production Tool "VERTIGO"

For broadcasting companies, the production of vertical videos is directly linked to costs. Even though such video are popular in the mobile environment, TV remains the main target environment for broadcasters. Broadcasting companies produce vertical videos largely in two ways: through the allocation of additional cameramen to film in the vertical video format or the conversion of existing horizontal videos to the vertical video format. The first method is constrained by cameras blocking the subject to be being filmed and studio space. It is often the case that cameras obstruct filming in actual music broadcasting environments.[Fig. 7] While The second method requires significant editing time and costs. These days, there are large idol groups with more than 10 members, which necessarily require more editing time. Furthermore, it is not easy to edit a moving subject (idol group member) using the typical NLE (non-linear editing) method.

To address this issue, the VERTIGO Project was launched to promote the efficient conversion of typical broadcast videos to vertical videos.[Fig. 8] VERTIGO uses facial-recognition artificial intelligence (AI) and clustering technologies to minimize the burden of such editing. Testing of this technology showed that it enabled vertical videos to be created 10 to 15 times faster than NLE editing. More details on the VERTIGO Project can be found at the KOBA Conference.

[Fig. 2] Vertical Video-based SNS "IGTV" (Source: IGTV website)

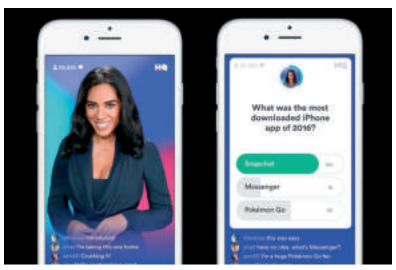
[Fig. 3] Netflix Vertical Video-format Trailer (Source: Netflix blog)



[Fig. 5] Vertical Directcam Video on the NaverTV Music Bank Channel with More Than 38 million views (Source: NaverTV)

[Fig. 7] Cameras May Block the Subject of a Video.

[Fig. 1] Advantages of Vertical Videos (Source: InMobi)



[Fig. 4] HQ Trivia Live Quiz Service (Source: HQ Trivia website)

[Fig. 6] New Vertical Directcam Service "U+ Idol Live" (Source: LGU+ website)

[Fig. 8] The VERTIGO Project Converts Typical Broadcast Videos to Vertical Video Format.

MBC High-precision Positioning Service Prepares for the Age of Self-driving Cars

Research Engineer, Technology Research Center, MBC | **Shin Honggi**

Summary

Over the past decade, the TPEG real-time traffic information service, has greatly contributed to the popularization of vehicle navigation, and is still the main data broadcasting service used in navigation devices. MBC recently released the 'MBC RTK' commercial service, a high-precision positioning service that is accurate within centimeters. The MBC RTK has been developed in preparation for the age of self-driving cars, which will soon become a reality. With the release of its new service, MBC hopes to contribute once again to the development of the industry. This article introduces the 'MBC RTK' service and explains how the service is particularly well suited for self-driving cars.

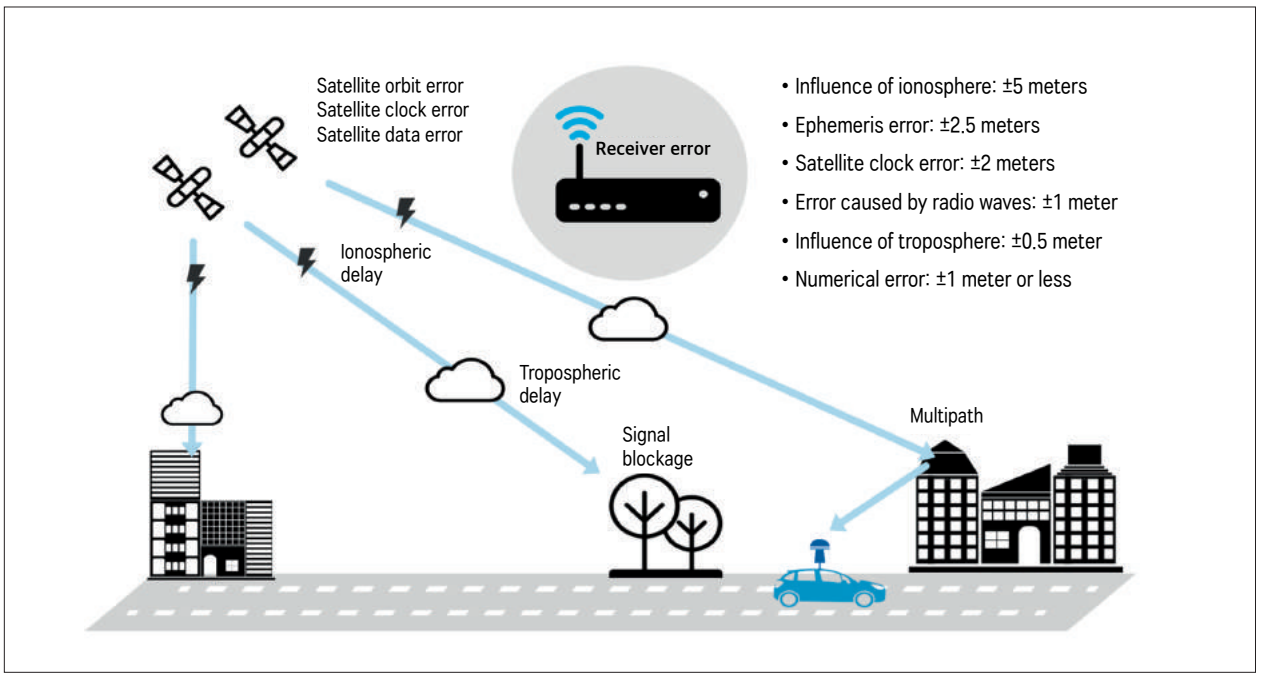
Ⅰ. Introduction

Up until recently, there was a difference of opinion among leading technicians in the field of self-driving cars—some experts strongly favored sensors such as cameras and radars, while others highly preferred high-precision maps. Recently, however, a general consensus has been reached that cameras, radars, and maps are all equally necessary. In order to enable self-driving based on a high-precision map, an electronic map that can be precisely constructed using a reference coordinate system and a centimeter-level precision positioning device that uses the same coordinate system are needed. One of the systems that enables this is the GPS based on WGS84 (World Geodetic System 84) using RTK (Real-Time Kinematic) technology, accurate within centimeters, serviced by MBC.

Ⅱ. Centimeter-level Precision Positioning Technology, RTK

1. 'RTK' (Real-Time Kinematic) Technology Overview

Due to a variety of different reasons as shown in [Fig. 1], most GPSs have an average margin of error of 5 to 10 meters. Most of these error components occur in the same direction within several tens of kilometers. Therefore, common errors can be offset and a more precise positioning value can be obtained by generating real-time error information using a sophisticated GNSS receiver (BASE) installed at a fixed position that transmits information to a moving GNSS receiver (ROVER). This technology is called DGNSS (Differential GNSS). RTK technology, a type of DGNSS technology, allows for precise positioning within 2 to 3 cm by not only using the code phase of the satellite signal (the signal used by ordinary GPSs), but also the carrier phase, which is 1,000 times or more precise.



[Fig. 1] Reasons for GPS Errors

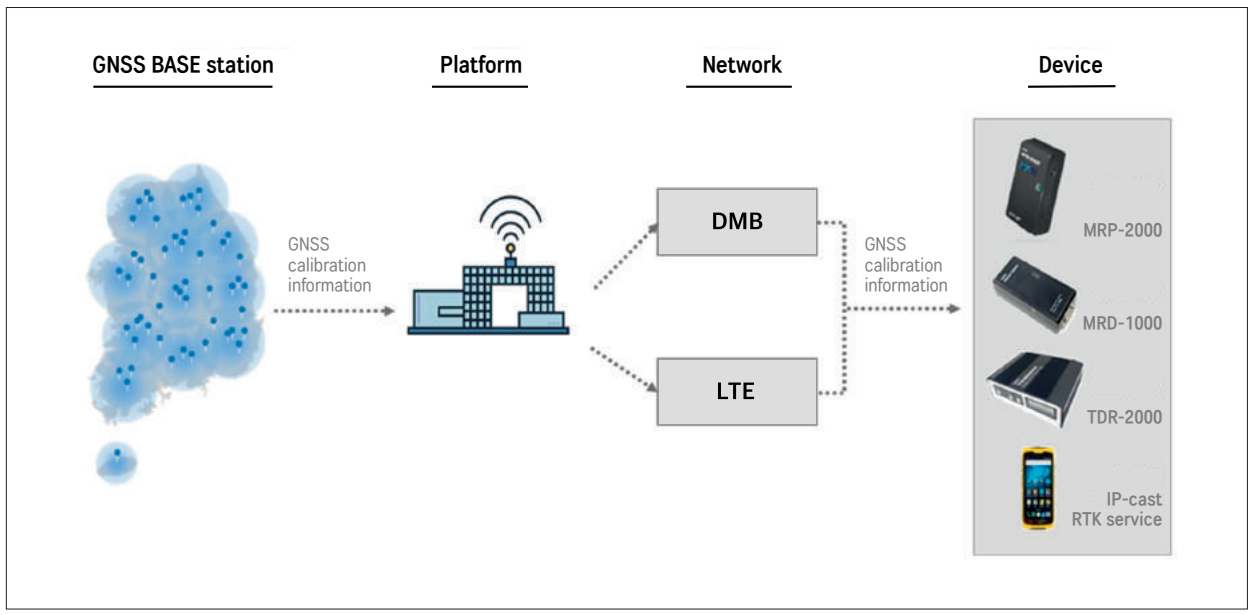
2. Increases in Network RTK and the Demand for Precise Positioning

As previously mentioned, in order to use the RTK system, the centimeter-level precision positioning technology, it is necessary to install a BASE (base station) that generates calibration information. For fields such as self-driving cars that require an extremely high level of positioning precision and accuracy, it is necessary to find the exact absolute coordinates of the BASE. However, it is not easy to install a BASE and determine its absolute coordinates.

[Fig. 2] Applications of RTK Technology

The RTK technology was introduced to help solve some of the issues related to the BASE. Under the RTK system, central and local governments install BASE station infrastructures that correspond to the BASE service areas, and the central control server collectively manages the BASEs to generate and provide calibration information. The RTK network technology includes a VRS (Virtual Reference System), FKP, MAC, and more. In Korea, the VRS service provided by the National Geographic Information Institute (NGII) is the most commonly used VRS service.

In years past, the GNSS receivers that now support RTK technology were used only in specialized industries, such as geodetic surveying and civil engineering, due to their high costs of tens of millions of won. Recently, however, with the explosion of the machine control market, due to the popularization



[Fig. 3] MBC RTK System Configuratio

of drones and self-driving, the cost of these expensive receivers has decreased dramatically, and RTK technology is becoming more popular than ever.

Having realized these market needs early on, MBC commercialized the world's first 'MBC Broadcast RTK' service, a nationwide RTK calibration information service using the DMB network. The service was released in August 2017, and currently offers IP-based services as well.

Ⅲ. Introduction of the MBC RTK Servic

MBC defines the configuration of its network RTK service as 'CPND,' a general service structure for broadcasting and communications that stands for 'Contents, Platform, Network and Device', and completed the end to end total service platform.

1. Contents: GNSS BASE Station

Out of all the components of the MBC RTK service, MBC invested the most in the establishment of its GNSS BASE station infrastructure. In order to ensure perfect service coverage nationwide and service stability for self-driving cars, it is important to have enough physical BASE stations with overlapping coverage. Recognizing this, MBC established 30 more BASE stations in addition to the existing BASE stations of the National Geographic Information Institute.

2. Platform and Network

Since MBC terrestrial DMB covers more than 90 percent of the nation, it can conveniently be used anywhere in Korea. In addition, since DMB can deliver data to many unspecified individuals in a single direction, it is seen as the calibration information delivery medium most able to meet the needs of the current market, in which there is an ever-increasing demand for high-precision positioning technologies. DMB is also advantageous in that it does not involve any additional communication costs, unlike mobile communication. In addition to its use of DMB, MBC has also developed a dedicated algorithm to avoid the problem of base station handover, which can potentially affect mobile objects such as drones and/or cars.

DMB has many advantages in terms of being able to transmit RTK calibration information, but there are still many areas in which it is difficult to receive DMB broadcasting due to the mountainous terrain. As a solution to this problem, MBC provides IP support for the MBC RTK service using IP networks, including LTE, in DMB shadow areas.

3. Device: MBC RTK Receiver

The main thing to note about MBC RTK is that it combines the RTK GNSS receiver, calibration information service, and network. This is a very unique method that is the first of its kind worldwide. MBC RTK terminal users can obtain precision positioning information with a margin of error of only 2 to 3 cm anywhere in Korea simply by turning on the service—there's no need for the user to worry about RTK technologies, including BASE stations, calibration information, or communication methods. Although the terminals shown in [Table 1] were originally developed as receivers for verifying the MBC RTK service, they are now being sold to many related industries due to their excellent usability and performance.

Model Name	MRD-1000B	MRD-1000T	TDR-2000	MRP-2000
Photo of exterior				
Release Date	April 2018	December 2018	April 2018	January 2019
Product Features	DMB RTK Calibration Information Receiving Dongle Terminal	LTE RTK Calibration Information Receiving Dongle Terminal	High Performance All-in-one Terminal	World's First Ultra-small Lightweight All-in-one Terminal

[Table 1] Receivers Supporting MBC RTK

Ⅳ. Conclusion: MBC RTK Service and Self-driving Cars

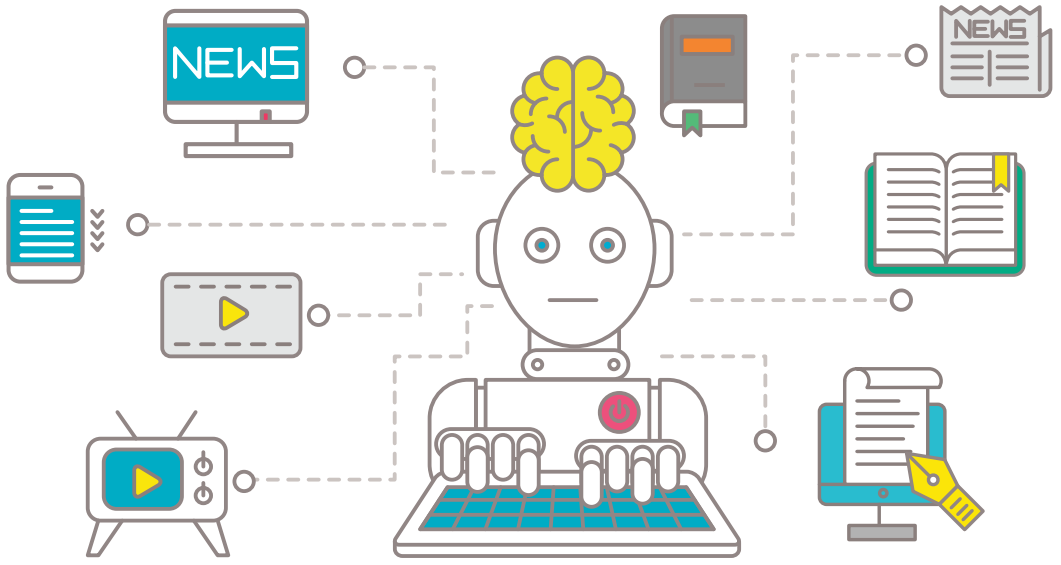
Before the MBC RTK service can be applied to actual, self-driving vehicles, it must be able to meet the highest safety standards. That is safety. Unlike for existing RTK applications, precision positioning for self-driving cars is a technology in which human lives are at stake. Therefore, the calibration information must be able to guarantee the reliability of the positioning results, the stability of the service system, and continued service availability, in addition to offering centimeter-level precision.

The MBC RTK is already operating at the same high level as MBC's broadcasting system in terms of stability and availability, and guarantees QoS through the overlap of broadcasting and communication transmission mediums. Moving forward, MBC plans to develop and apply technology that can detect any possible positioning errors by adding integrity information to the MBC RTK.

The MBC RTK is a convenient and reliable service that allows for centimeter-level precision positioning anywhere in the country. The success of the system is particularly significant given the increasing global competition for the development of self-driving cars. MBC will continue to pursue technological and service advancement in the field of high-precision positioning services, and hopes to help secure national competitiveness in the self-driving car industry.

Media Curator: a Deep Learning-based System for the Generation of 'Hot Clips'

Manager, Media Technology R&D Center, SBS | **Hong Soongi**



Viewers today are taking the lead in how they consume media. Broadcasting companies are already providing clip media services that compress the long episodes of broadcasting programs into short videos to allow viewers to consume media how and when they want. These video compression services, used to make short media clips, are carried out manually by most broadcasting companies. In order to reduce the economic and time costs associated with manual video compression, the SBS Media Technology R&D Center has been conducting research to create a deep-learning-based system for the generation of 'Hot Clips' (short video clips).

This system is called the 'Media Curator' because of its key function of automatically identifying and effectively providing the media information desired by the user. When the user inputs a video, the Media Curator finds the desired section of the video and provides it in a clip format. The 'desired section' is defined according to different search parameters. For instance, if the 'producer' (or 'user') wants to find a section in a video where people are running ('desired section'), the Media Curator will automatically find the section of the video where people are running and provide it in a clip video format ('section information'). If the search parameters are changed to 'funny sections,' the Media Curator will offer clips ('Hot Clips') that match.

However, the service is limited in terms of its accuracy, even though it has been created using the latest technologies, backed by academic research. The fact that the service has limited accuracy—despite countless hours of research—shows just how difficult this technology is to master. In particular, identifying and pulling the desired section from a series of continuing frames is extremely difficult technologically. The service, which utilizes the latest technology, adopts the approach of recommending several related video clips ('section information') from an original video to enable the user (known as the 'producer' or 'company') to easily identify the desired section. Research to enhance the accuracy of this technology is currently underway.

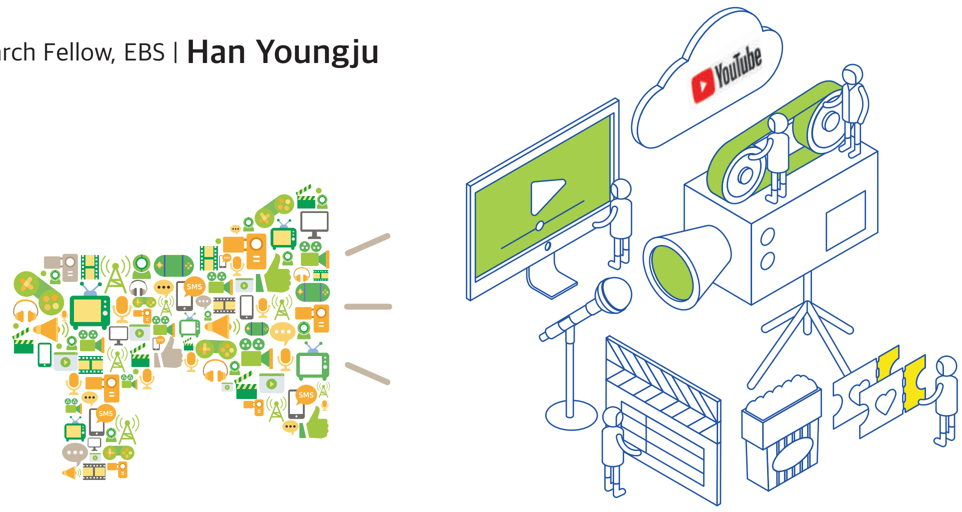
One thing to note about deep-learning technology is that accuracy constraints do not apply strictly to the Media Curator. In fact, the performances of all deep-learning technologies can be defined by their accuracy (%), which means that there is an inherent possibility of error. Given this, it is not yet possible to fully substitute the important tasks carried out by people in the broadcasting industry, who bear the full responsibility of any broadcasting mistakes, with deep-learning technology. At the same time, it is important to acknowledge that some tasks in the broadcasting industry are currently only carried out manually because of a lack of an automated system, and some tasks cannot be carried out at all due to a lack of manpower and/or financial resources. Deep-learning technology can be used in these cases to enable people to devote more time and energy to tasks that are more important, and can also be used to make new tasks possible when working with a small workforce and/or budget. The same can be said of the Media Curator, as more people learn how to utilize the system in multiple ways.

One of the ways the Media Curator can be used commercially is as follows. Many of the programs produced by SBS over the past 30 years are still competitive and appeal to the public today. We also frequently see old programs produced by other companies on YouTube that are well loved by viewers. However, it is not possible to manually sort through the huge number of programs in order to identify the ones that viewers like the best. In this context, the Media Curator can be used to generate Hot Clips from past programs and recommend them to users. The Hot Clips generated in this way can also be used to generate profits as they are distributed through YouTube.

The future vision for deep-learning can be explained using the following analogy. If a very smart student refuses to study or review home-study materials, or studies subjects that are not related to an upcoming exam, the student will not perform well on the exam. Another important point is that home-study materials must be accompanied by answer sheets. In order to learn, the student must be able to refer to the answer sheet and understand how to the solve problems that he or she initially got wrong. In this same way, it is important for a deep-learning system to acquire large amounts of learning for specific purposes, as this enables the system to develop smarter algorithms. Fortunately, SBS has a large amount of video data that can be used as learning data. Unfortunately, the metadata, which can serve as the answer sheet, is not tailored to specific purposes and cannot be immediately utilized as learning data. This is not a problem that pertains only to SBS, but rather is a common issue for all broadcasting companies. SBS plans to construct a system using videos that generates learning data that can respond to various demands made by users. The learning data generated in this way can then be utilized to enhance the performance and application range of the Media Curator.

How Should TV Networks Approach YouTube?

Policy Research Fellow, EBS | **Han Youngju**



Although Korean network TV shows still perform fairly well in terms of ratings, the subscription rates of digital streaming enterprises continue to rise by an annual average of 25 percent. As these platforms become increasingly central to the media industry, viewership grows less and less dependent on mediums and nationalities. In other words, viewership no longer requires linear services, and broadcasting systems can no longer afford to stick to their old ways. Although network TV was born in a non-digital era, the rapid transformation of the broadcasting environment now requires that broadcasters relentlessly pursue innovation. The era in which we now live requires the fundamental innovation of even invisible things, going above and beyond the mere tweaking of different outcomes.

With more and more viewing content concentrated on YouTube, YouTube has become synonymous with visual media in the popular perception today. Over 300 hours of video content are uploaded on the platform every minute, for a total of over 200 million posts every single day. Even if you were to spend the next 65 years watching YouTube without ceasing, you would not be able to watch all of the content currently on YouTube. YouTube has established itself as the center of mainstream media, satiating international viewers' thirst for new videos with a vast reservoir of visual data. So far, users themselves have been the main source of YouTube's explosive growth. The platform draws an ever increasing number of users worldwide by allowing users to participate on the platform and use the platform as a form of self-expression.

Although, compared to the United States, cord-cutting is still a minor practice in South Korea, it is becoming all the more common among younger viewers. Indeed, the growth of YouTube presents a formidable challenge to the Korean TV broadcasting market. With its infinite capital and global influence, YouTube has threatened to completely demolish the conventional notions of production, service, and broadcasting. So far, the Korean broadcasting market has sought to ward off YouTube's encroachment by citing the principles of fair competition; however, the market is still struggling to find a clear solution. Given that even mainstream broadcasting networks have begun to incorporate YouTube into their new online platform strategies, it seems that the broadcasting market has been skewed in favor of the platform already. YouTube is no longer being seen as the enemy; rather, it is being seen as a partner with which TV networks must actively collaborate.

Viewers are increasingly leaving TV. TV networks must forget the past glory of their traditional TV days, and actively embrace the changes that are already permeating the market. Some networks may still be inclined to shun YouTube as a disruptive and low-quality medium. However, although YouTube may have begun as a platform of simple video posts, it is quickly transforming into a new forum for comprehensive entertainment.

On YouTube, there is no barrier between producers and users. Video production, consumption, sharing, and dissemination occur in a matter of seconds. YouTube videos enjoy a much shorter lifespan than TV-broadcast contents, are subjects of frequent communication, and are relationship-oriented. YouTube videos cater to users' need for communication during their busy days. They are also destroying the conventions of traditional broadcasting. In 2012, Psy's Gangnam Style first rose to international fame on YouTube. BTS as well was made known to worldwide audiences and rose up the Billboard Charts thanks to their YouTube performance. Original YouTube content featuring BTS also generated immense traffic among boy band fans worldwide. According to a study by the Hyundai Research Institute (HRI) released in December 2018, BTS was estimated to have a production inducement effect of KRW 4 trillion and a value-added inducement effect of KRW 1.42 trillion, much of which can be attributed to YouTube.

Unique creative contents have also been pivotal to the growth of YouTube. Individual creators broadcast contents on YouTube that match their own interests, sharing the proceeds generated by traffic on their posts with the YouTube corporation. Over time, some creators have gone on to become major figures in the media industry, generating corporate-level profits and making their presence part of the established system. With more and more celebrities—who gained their fame on TV or the silver screen—also participating in YouTube, YouTube is no longer a niche platform of B-grade subcultures. On YouTube, niches have grown so large that they are now poised to become mainstream media.

Yet the vast majority of YouTube content that is consumed worldwide today is soft content with a strong entertainment focus. Since YouTube continues to use its own algorithms to recommend contents that users already like and enjoy, the platform has made it difficult for viewers to find new content and build social connections with others.

YouTube rules supreme in the media world today, and the broadcasting industry is being increasingly realigned with a central focus on platforms. Commerce, however, should not be broadcasting's only concern. When e-Books first made their appearance in the publishing market, everyone spoke of the death of paper books. Over time, both e-Books and paper books strengthened their respective presences in the publishing market. However, as technology continues to advance, now is the time for us to abandon our old ways of thinking and rethink broadcasting from the perspective of the viewer. For example, we must ask ourselves, "What contents do viewers expect from YouTube and TV, respectively?" TV networks must also outgrow their dependence on TV as their one and only defining platform, and, instead, embrace their role in "public media." TV networks need not, and must not, change their public missions in order to join in the YouTube hype. Instead, they should strategically use YouTube's growth to enhance their role and influence in society.

< Annual Economic Effects of BTS >

Type	Number / effect	Note
Number of international tourists to Korea	796,000 / year	7.6% of all international tourists to Korea (10.416 million as of 2017)
Price of consumer exports	USD 1.117 billion / year	1.7% of all consumer exports (USD 65.2 billion as of 2017)
Economic effects from increased number of international tourists and price of consumer exports	Annual production inducement effect: KRW 4.14 trillion	26 times the average sales of a strong medium-sized corporation (USD 159.17 billion as of 2016)
	Annual value-added inducement effect: KRW 1.42 trillion	8.9 times the average sales of a strong medium-sized corporation

Source: HRI (December 17, 2018), "Economic Effects of BTS," Current Issues and Tasks , No. 18-15

Hybrid Radio and Contemplation on the Future of Radio

Manager, Media Policy Department, CBS | **Choi Younghak**

[Fig. 1] EBS 'bandi' App

[Fig. 2] CBS 'Rainbow' App

[Fig. 3] Smartphone FM Radio App

In the era of the Fourth Industrial Revolution, the convergence of various ICT technologies has brought about new innovations and services, but only the radio has continued to adhere to analog broadcasting. Despite discussions on the possible adoption of digital radio, little progress has been made since 2013. In contrast, television was digitalized in the early 2000s and has been offering high resolution videos and services, later transitioning to HDTV and more recently, UHDTV broadcasting services.

In principle, the radio cannot deliver information other than audio contents. Although it can offer limited added-value information services through data channel services (RDS, DARC) using FM broadcasting, most radio broadcasting companies in Korea do not offer these services. In the era of broadcasting and telecommunications convergence—an era in which huge amounts of information are exchanged via the internet—attempts must be made to enhance the value and convenience of radio by providing diverse added-value information services that meet the needs and expectations of listeners.

Today, listeners' demands are met through internet radio services operated by radio broadcasting companies. These companies provide basic broadcasting added-value data, such as program, song, and song list information, and additional information for the convenience of listeners, such as interactive services (listener bulletin boards), weather information, and the latest news. Although digital radio has yet to be fully adopted, the limits of FM radio are being overcome through digital radio services and functions that use internet radio.

Internet radio, however, transmits contents using telecommunication networks instead of radio frequencies, and consumers have to bear the burden of consumed smart phone data and battery life. Receiving over-the-air FM radio on a smart phone can minimize data consumption and significantly reduce battery consumption. Since 2016, the National Assembly, the Korean national government, broadcasting companies, and civil groups have strongly lobbied for smartphones to be equipped with over-the-air FM radio functions. As a result of these efforts, since 2018, new smartphones sold in Korea have been equipped with FM receivers.

Thanks to these advancements, radio has been able to shrug off its image of being "old media" and has transformed into "smart media" by offering hybrid radio services, which combine FM broadcasting, internet-based value-added broadcasting information, and listener feedback. Furthermore, smartphone FM radios are emerging as an important and practical medium in the case of a disaster or national emergency—such as the earthquake in Gyeongju in 2016—when telecommunications networks are disrupted.

The first hybrid radio service was launched in 2018 by EBS in the form of its 'bandi' application. In April 2019, CBS launched its hybrid radio service in collaboration with LG Electronics in the form of CBS's 'Rainbow' application. Similar services are currently being developed by the Buddhist Broadcasting System (BBS), KFM, and the Traffic Broadcasting Network (TBN).

Although the foundations of FM radio and hybrid radio on smartphones have been established, the radio industry still faces the challenge of utilizing the latest technologies, such as AI and 5G, to strengthen its competitiveness against other forms of media.

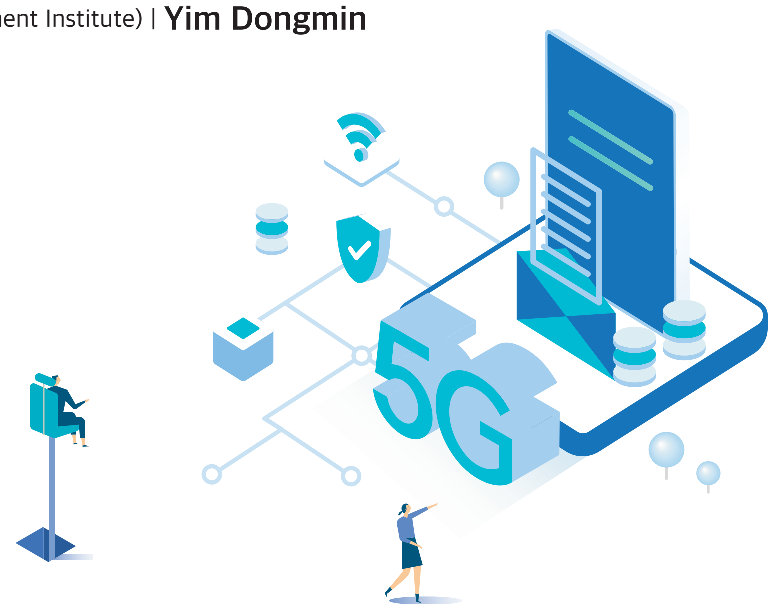
The radio is beloved by the public because it allows people to listen to all sorts of songs and information while carrying out other tasks; it is also a medium that engages and interacts with its listeners. Cars and homes are some of the main places where people listen to the radio, but the radio is now being threatened even in these two places.

Autonomous vehicles offer an environment in which drivers can enjoy other activities in the car, such as watching videos, which will lead to a gradual decline in the use of radios. Additionally, AI speakers are likely to replace the role of radios in the home. This means that there will be a decline in the number of listeners using the current form of radio broadcasting services, and that the radio may face increased challenges unless it makes new attempts and offers new services.

The radio industry must understand the impending changes in the listening environment and prepare multilaterally, so that it can provide services and contents that appeal to users. Now more than ever, the industry must contemplate the development of a collaborative model. Along with this, the industry must: effectively utilize cutting-edge technology, such as by providing the recently launched hybrid radio in the form of an integrated application; provide tailored services and contents by analyzing the usage patterns and preferences of listeners using AI technology; and provide proactive audio contents through AI speakers.

Development and Efficient Utilization of Broadcasting Technology in the 5G Era

Associate Fellow, International Cooperation Research Department,
KISDI(Korea Information Society Development Institute) | **Yim Dongmin**



The media market, which includes the traditional broadcasting market, has been undergoing continuous change. Recently, OTT (over-the-top) media and Internet video services have become primary means through which people access video content and are thus causing significant change in the composition of the market. The major transition of people's viewing behavior from traditional TV broadcasting services to on-demand and Internet services has thus become a major issue today.

Broadcasting has been growing and developing in a different market and based on different technologies from communications. After the world's first black-and-white TV broadcast in the United Kingdom in 1936, many countries started providing terrestrial broadcasting services. The United States started providing black-and-white TV broadcasting service in 1938, two years after the United Kingdom, and Korea started providing it relatively late in 1956. The United States, driven by the fact that it had lagged behind the United Kingdom, was the first in the world to provide color TV broadcasting service in 1954, followed by Japan in 1960, Europe in 1967, and Korea in 1980. Since the late 1980s, these analog terrestrial TV broadcasting services have been transitioning to digital broadcasting. Terrestrial digital TV broadcasting has been rapidly introduced in the United States and United Kingdom, and many countries around the world have switched from terrestrial to digital broadcasting, leading them to terminate analog broadcasting altogether. In line with the trend of global digital broadcasting, major countries have made efforts, including regulatory improvements, to introduce digital broadcasting and revitalize related industries. Through these processes, the broadcasting markets in each country have developed unique structural characteristics that are now manifesting.

Recently, the spread of OTT and Internet video services, driven by the popularization of the Internet and expansion of mobile Internet with the growing use of smartphones, has become the main driver of change in the market. In particular, while operators, including existing terrestrial broadcasters, cable TV companies, and satellite broadcasters, tend to be limited to their domestic markets by the existing licensing system, Internet video service providers, including OTT service providers, are expanding their influence both globally and in their domestic markets owing to the unique characteristics of their media. Therefore, the influence of these operators in the broadcast video content market is expected to increase in the future.

TV transmission technology, which has continued to evolve amid such changes, has recently developed to a level where it has the potential to bring about drastic changes in the market. Specifically, the ATSC 3.0 terrestrial broadcasting standard that was developed in 2015 was designed to allow for the convergence of terrestrial digital broadcasting with 5G, the newest mobile communication technology. This is why both technologies are based on Internet protocol. Therefore, in the future, it is expected to be possible to select the transmission method, from among broadcast, multicast, and unicast, depending on the number of broadcast content users. This means that video services will be able to be provided at lower cost by selecting whichever transmission technology is more efficient given the number of users. That is, it will be possible to select the optimal transmission technology in any given situation where the marginal distribution cost varies depending on the number of users, because the cost competitiveness of the broadcast network is high for large numbers of users, while the cost competitiveness of the communication network is high for small numbers of users. Specifically, content transmission through terrestrial TV and satellite broadcasting, among others, becomes more cost effective as the number of viewers increases as well as more competitive for content with a certain number of viewers or more. On the other hand, through the evolution of the current LTE-enhanced multimedia broadcast multicast service (eMBMS), mobile broadband (MBB) can achieve a level of cost efficiency similar to that of broadcasting for popular content that is favored by more than a certain number of people as well as VOD (video-on-demand) content viewed by small numbers of users.

Currently, the evolution of smartphones and expansion of high-capacity mobile communication networks are accelerating the growth of the mobile video service market, but the transmission cost of the communication network is still higher than terrestrial and cable broadcasting. However, this cost is expected to decline gradually due to cost reductions achieved through the development of new technologies, such as 5G, allowing mobile broadband to compete with other means of delivery for TV and video transmissions. Therefore, for 5G and IP-based broadcasting networks, it is desirable to prevent the creation of obstacles to the appropriate use of cost-effective technologies, depending on the method and number of users of broadcasting content. This can be achieved by making it possible to use the broadcasting and communication networks together in a flexible manner. To do this, it will be necessary to discuss and establish plans for the stable development of the entire ecosystem and promotion of broadcasting and communication. Ⓚ

< References >

1) Kim Deukwon et al. (2018), "A Study on Broadcasting Frequency Management and Utilization Trends," Korea Information Society Development Institute, Policy Study, December 2018.
2) Kim Sangyong et al. (2014), "A Study on the Efficient Introduction and Management of Broadcasting Technology and Broadcasting Frequency," Korea Information Society Development Institute, Policy Study, December 2014.

* This article was written to complement the KISDI expert column of the same title that was written by the author on February 11, 2019.

Competition Strategies of Multinational Media Corporations

Vice President, KT | **Lee Sungchoon**

Mergers and acquisitions, more commonly referred to as M&A, are by far the most pressing topic in the global media market today. As [Table 1] shows, major multinational media corporations are undertaking M&A deals on an unprecedented scale. One of the major factors contributing to this phenomenon is Netflix, which has unveiled the true potential of the global media market. Netflix is living proof of how a small Internet streaming company can transform itself into one of the most powerful providers of global media content. Its sophisticated user interface (UI) and experience (UX) design caters to, and further encourages, new behavior in global media consumers. This company has also shown the world that it is possible to blaze a new trail and still increase a subscriber base by more than 25 percent every quarter.

The unstoppable march of Netflix is a major threat to multinational media corporations. The threat is mainly that it could end up monopolizing the global media market. In 2018 alone, the company invested nearly USD 1.2 billion in content production. This is a staggering figure when we remind ourselves that the entire Korean paid broadcast market generated gross revenues of some KRW 16 trillion (roughly USD 14 billion) in 2017. That is how much Netflix invests in content production in a single year. The ferocious growth of Netflix is evident in its dramatic increase in market capitalization, which, at one point in 2018, even exceeded that of Disney. Conventional media conglomerates were thus compelled to review their global strategies. The result is an abrupt rise in M&A action, as summarized in [Table 1].

There are three main patterns emerging from the current M&A boom. First, media corporations favor business partnerships that encompass both platforms and content. Even companies that began as platform providers, like AT&T, have resorted to M&A activity with the goal of securing content. Second, companies merge and acquire as a means of securing an edge in platform and content, ultimately so as to target both the legacy media market and the online digital market. Verizon, for instance, seeks to challenge the conventional cable market with FIOS, its IPTV service, while also launching Oath as its online platform. Verizon has also acquired a multichannel network to gain content to provide, while even taking aim at CBS - a conventional network giant. Third and finally, companies are also using M&A activity not only to enhance their abilities to provide video and streaming services, but also to strengthen their appeal to advertisers interested in e-commerce.

Global media competition strategies will begin to exert concrete effects on the market in 2019. Most importantly, Disney, presently regarded as the one company capable of holding its ground against Netflix, has announced plans to launch Disney+ on November 12, 2019, thereby threatening to shake the global OTT (over-the-top) market that is now dominated by Netflix, Amazon, and Hulu. Disney+ is expected to offer an abundance of family-friendly content, and further attract global media consumers with a dazzling array of content from powerful content providers (with fan bases that are already strong), such as Pixar, Marvel, Lucas Film, and National Geographic. Furthermore, Disney+ is expected to offer their programming at just USD 7 per month - lower than Netflix's currently lowest monthly subscription rate of USD 9. With such advantages in content and price, Disney+ is expected to change the playing field. The market has responded favorably to this announcement, raising Disney's share price by over 10 percent.

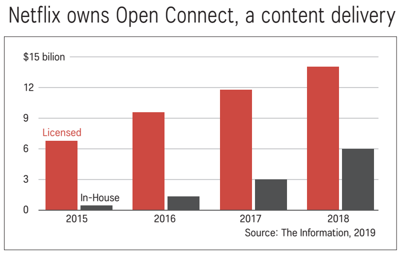
Whereas Netflix and Disney have espoused subscription-based business models, YouTube has embraced advertising as the central feature of its profitmaking model. The ad-based business model has an advantage in expanding user base as it can provide content free of charge for users. Roku is another such ad-based OTT service, now with 24 million users. Amazon, too, has made use of its asset, IMDb, to launch an ad-based OTT service known as Freedive. For its part, Hulu gives users the option of enjoying its content at a lower price through voluntary viewing of ads. There is speculation that AT&T, which has acquired Time Warner Inc., will launch into the global OTT service market with an ad-based, rather than subscription-based, business model.

Corporation	Platform		Content		Ads & Commerce
	Legacy	Online/OTT	Legacy	Online/OTT	
AT&T	U-verse, DirectTV	DirecTV Now Hulu (10% of shares) Otter Media (underway)	Time Warner	Full-Screen Machinima TV	AppNexus
Verizon	FIOS Charter (acquisition attempted)	Go90 Dish (interested in acquiring) Oath (launched)	CBX, Viacom (rumors of possible acquisition)	AwesomenessTV (25% of shares) Tumblr, HuffPost	AOL, Yahoo
T-Mobile	Layer3TV	Netflix (partner)			
Comcast	Xfinity	X1 Hulu (30% of shares)	NBC Universal DreamWorks	AwesomenessTV (51% of shares) Movie Clip (investor)	
Charter	TWC	Netflix (partner) Dish (interested in acquiring)			
CBS		CBS All-Acess	Showtime	Defy Media (if acquired by Viacom)	
Disney	C onventional PP channel	Direct channel (underway) Hulu (60% of shares)	21C Fox	MakerStudio	
Netflix	Devices	App	Millarworld		(A/B test)

[Table 1] M&A Trends among Global Media Corporations

Let's look more closely at the Netflix strategy. How is this company, which has spearheaded the global OTT market so far, preparing for the future? The main weapons at its disposal are its already-sizable subscriber base and its acclaimed original content. It is impossible for a media company to secure tens of millions of paying subscribers overnight. It took Netflix nearly a decade, since 2010, to increase its subscribers to 150 million by the first quarter of 2019, including 60.23 million (40 percent) in the United States and 88.63 million (60 percent) worldwide. The significant presence of Netflix subscribers therefore sets a considerable entry barrier for competitors. Cultivating such an expansive subscriber base not only buys Netflix time, but also gives it economy of scale. With the same amount of investment in the production of original content, Netflix can simply reach far more subscribers than any of its rivals on the market today. Such economy of scale offers effective competition against powerful players like Amazon and Apple, while its original content kills potential competition from others. [Fig. 1] shows the success Netflix has had, and that its strategy enhances the value of the company's original content, helping to reduce its dependence on content from external sources.

The new competition strategy of global media corporations carries another significant implication for competition between tech giants and media corporations. Netflix, to be exact, is a tech company rather than a media company. It reaches over 1,700 devices across 190 countries around the world. Netflix owns Open Connect, a content delivery network which optimizes traffic control in global content deliveries using artificial intelligence (AI). The recommendation algorithms, which have been consistently evolving since the Cine Match days, now account for 70 percent of all content usage on Netflix. The company manages its content across 77,000+ categories or "micro-genres," in addition to analyzing millions of frames in each film to select the single best thumbnail image that has maximum appeal for users. Imagine what this tech-savvy company is out to accomplish by investing billions of dollars each year in the incredibly uncertain world of content production.



[Fig. 1] Value Comparison of Netflix's Original and Licensed Content

Note that Amazon and Apple are two other tech giants that have begun to make their way into the global media market. Google, in the meantime, already occupies a quarter of the global online traffic with YouTube. The entire global content market has favored tech companies thus far.

Disney, on the other hand, is a conventional media corporation now about to enter the world of global content distribution. The company itself anticipated, while announcing the launching of Disney+, that the new service would run deficits from 2019 to 2023. Disney may be an expert on minimizing the risks associated with uncertainty over content creation, but it lacks experience in predicting and fending off risks associated with global content distribution. Disney prepared itself somewhat by launching DisneyLife in 2015 and also acquiring BamTech for USD 1.5 billion with the aim of enhancing its streaming capabilities. The success of Disney's new endeavor will likely attract other conventional media corporations to test their luck on the global content distribution market as well.

M&A trends in the global media market today bear important implications for South Korean media companies, too. Netflix has already entered the Korean market and is actively strengthening its presence here through partnership with Korean telecommunication and cable providers. Disney has announced that it, too, will introduce Disney+ into the Asian market starting early 2020. The Korean market will not be immune to the profound changes that are about to occur in the global media ecosystem. The different strategies among global media corporations challenge Korean media players to consider new strategies to survive the next wave of competition, whether by increasing investment, achieving economies of scale, or occupying an important axis of global content production. Ⓚ

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Limelight Realtime streaming includes the following features:

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- **Self-Configuration**—Create, update, delete streams, as needed using an API or through the self-service UI.
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- **Redundant Ingest**—Seamless failover from primary to a backup ingest location is available with auto-reconnect.
- **Custom Stream Naming**—Make stream publishing fast and simple, so that Limelight Realtime Streaming integrates easily with your video publishing and CMS workflows.

DELIVERY

- **Sub-Second Latency**—Video delivery from ingest to edge, anywhere in the world in less than one second.
- **Scalable Global Delivery**—Limelight's global private network bypasses internet congestion with direct connections to more than 900 ISPs and end-user networks and Points-of-Presents (PoPs) in every region in the world.
- **Configurable Streaming Options to Support Different Devices**—Define a custom bitrate and resolution for your video streams for optimum viewing experience.
- **Deliver through Enterprise Firewalls**—Limelight Realtime Streaming video can be delivered via TCP transport when corporate firewalls block UDP traffic.

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- **Prevent Unauthorized Access to Your Videos**—Restrict access to video using geo-blocking based on viewer location, IP address whitelist & blacklist access control, URL tokenization, and Transport Layer Security (TLS) encryption.
- **Cross Origin Resource Sharing (CORS) Support**—Allow multiple syndication and distribution websites and applications to connect to a single origin.
- **CDN Stream Authentication**—Restricts ingest of live streams to authenticated sources.

PLAYBACK

- **Adaptive Bitrate (ABR) Streaming**—Viewers automatically receive the highest possible picture quality for their available bandwidth and current network conditions.
- **RTMP and HLS Fallback**—If the end-user device does not support WebRTC, the output stream will default to RTMP or HLS with ABR. Audio will continue to play if bandwidth drops and video freezes.
- **Video can be Viewed Using Standard Web Browsers**—Live streams can be viewed in standard web browsers including Chrome, Firefox, Safari, and Opera (soon with Microsoft Edge)—without the need for special plug-ins.
- **Integration with Android and iOS Applications**—SDKs are available to integrate Limelight Realtime Streaming capabilities with Android and iOS applications.

ANALYTICS

- **Integrated Analytics for Decision Making**—Robust usage data is available to help you understand viewer behavior and make strategic business decisions.

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- **Develop Your Own Interactive Applications**—Integrated data sharing allows you to create interactive applications that provide realtime video and data to viewers, and let them provide realtime feedback such as voting, chat, and more.

ABOUT LIMELIGHT NETWORKS

Limelight Networks Inc., (NASDAQ: LLNW), a leading provider of digital content delivery, video, cloud security, and edge computing services, empowers customers to provide exceptional digital experiences. Limelight's edge services platform includes a unique combination of global private infrastructure, intelligent software, and expert support services that enable current and future workflows. For more information, visit www.limelight.com, follow us on Twitter, Facebook, and LinkedIn.

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2019 KOBA World Media Forum & Global UHD Conference

Presented under the theme "Media, Make a Choice," the 2019 KOBA World Media Forum & Global UHD Conference aims to diagnose the current state and explore the issues of the broadcasting and media industries. The Forum also surveys future-oriented changes and added values as seen through the evolution of broadcasting technology, expansion of internet-based platforms, and convergence of broadcasting and telecommunication technologies. We invite you to join us as global media experts share their thoughts on the current media environment and changes/trends in the media industry.

Theme: Media, Make a choice

Date and time: Wednesday May 22, 2019, 10:00-17:30

Venue: Conference Room 401, COEX

Participation Fee: Free

Official Languages:Korean and English
(simultaneous interpretation available)

Hosting/Supervisory Institutions:
KOBETA (Korea Broadcasting Engineers & Technicians Association)
BEA (Broadcasting Engineers Academy)
RAPA (Korea Radio Promotion Association)
Korea E&EX Inc.

Sponsor: Korea Broadcasting Development Fund (Ministry of Science and ICT), Korea Communications Commission

22 Wed

Time	Contents
10:00~10:20	Opening
	[Session I] Challenges and Opportunities of Broadcast-broadband Convergence
10:20~11:00	Sub-second Latency Streaming Solution, RTS Steve Miller Jones Limelight Networks Vice President of Product Strategy
11:00~11:40	ATSC 3.0 - 5G, Convergence Media Framework for the U.S Market Park Kyungmo SKT, ICT R&D Center Team Leader
11:40~13:20	Lunch Time
	[Keynote]
13:20~14:00	HbbTV at the Heart the Transformation of Broadcast in Europe Vincent Grivet HbbTV Chairman
14:00~14:40	Better is better. Next Gen TV Development in the United States Sam Matheny NAB CTO & Executive Vice President
14:40~15:00	Coffee Break
	[Session II] The Evolution into Next Gen Broadcasting
15:00~15:40	UHD, HDR, HFR, NGA, IP and 5G - European Experiences Frans De Jong EBU Senior Engineer
15:40~16:20	Implementation and Testing of ATSC 3.0 in Phoenix (USA) Pete Van Peenen Pearl TV Technical Consultant
16:20~16:40	Coffee Break
	[Session III] Wrap-up
16:40~17:20	Panel Discussion : Ascertaining and Predicting Changes in the Media Environment/Industry that are Caused by Technology
17:20~17:30	Closing

KOBA 2019 International Broadcasting Technology Conference

Theme: Media, Make a choice

Hosting organizations: KOBETA, Korea E&EX Inc.

Sponsor: Ministry of Science and ICT,
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Special Sponsor: SONY, Grass Valley

Venue: Conference Room (3F), COEX

Inquiries: KOBETA T) 02-3219-5635~42

KOBA 2019 International Broadcasting Technology Conference, which will be held at COEX from May 23 through 24, will cover current technological trends in broadcasting and media. The media market and broadcasting environment are changing at a rapid pace, and even more so within the context of UHD broadcasting and the Fourth Industrial Revolution. In fact, the very paradigm of broadcasting is changing (5G services, IP broadcast production, AI-based data management, etc.), prompted by the entry of large corporations in the media industry. This year's conference will explore not only media trends, but also issues such as data journalism and disaster broadcasting—fields which are increasingly the focus of popular interest. It is our hope that visitors to KOBA 2019 will be able to directly experience the changing media environment of today.

23 Thu

Conference Room No.	Session	Time	Theme	Speaker
317	Media Platform I	10:00~10:50	The War for Media Platforms in 2019	Kim Johan, Director of Gom&Company
		11:00~11:50	MBC's RTK service for precise positioning of self-driving cars	Lee Seungho, Deputy Director of Spatial Information Business Team, MBC
	Media Platform II	13:00~13:50	OPS, SBS' digital distribution platform	Yoo Seong, Manager of Media Research Institute, SBS
	Diagnosis of the Broadcasting Environmentt	14:00~14:50	Changes in the media topography and status of the broadcast advertising market	Choi Jiwoong, Associate Researcher of Korea Broadcast Advertising Corporation
		15:00~15:50	Significance of legal system improvements based on changes in the media environment (with a focus on technological development and social change)	Park Sangho, General Manager of Institute for Public Media
		16:00~16:50	North Korea today and the future of inter-Korea exchange	Lee Jungmin, Reporter of Unification and Foreign Affairs Department, KBS
318	UHD Production	10:00~10:50	UHD ATSC 3.0 transmission technology	Lee Jaekwon, Senior Research Engineer of KBS
		11:00~11:50	Production and transmission of MBC's UHD HDR documentary "Bear"	Kim Chongmo, Deputy Director of DI&VFX Team, MBC
	IP Broadcasting Technology	13:00~13:50	IP-Based UHD Studio	Kim Haejung, Executive Director of TV Technical Department, KBS
		14:00~14:50	4K / UHD Creative Grading	Klaus Weber, Principal Camera Solutions & Technology, Grass Valley
		15:00~15:50	SDN: Next-generation networking as a reality	Seo Youngseog CEO of NAIM Networks
		16:00~16:50	Content value and changes in HDR workflow in the UHD era	Byoun Sanghyouk, Department Head of PS Division Marketing Department, Sony Korea
327	Fourth Industrial Revolution I	10:00~10:50	The Next Media Revolution: meaningful changes and values prompted by blockchain	Han Youngju, Policy Research Fellow of EBS
		11:00~11:50	Introduction of technologies and examples of the application of distribution platforms for blockchain-based decentralized digital content	Kim Iksoon, Principal Researcher of Electronics and Telecommunications Research Institute
	Fourth Industrial Revolution II	13:00~13:50	5G technology and services	Choi Changsoon, Team Leader of SK Telecom
		14:00~14:50	5G technology-based planning of UHD broadcasts	Kim Hakhyun, Manager of Technical Planning Team, SBS
	Data Journalism	15:00~15:50	Leading examples of data journalism and future challenges	Leo Kim, CEO of Ars Praxia
		16:00~16:50	Data journalism as seen through actual broadcasting examples	Jung Hanjin, Team Leader of KBS

24 Fri

Conference Room No.	Session	Time	Theme	Speaker
317	Media Platform III	10:00~10:50	Media trends from the perspective of social media	Kim Joongtae, Director of IT House
		11:00~11:50	Media at war (with a focus on conflicts and examples of disputes in the media industry)	Lee Changhoon, Deputy Director of Nationwide Content Distribution Department, MBC
	AI and the Media	13:00~13:50	NUGU as a media platform	Lee Hyuna, SK Telecom
		14:00~14:50	Media and recommended personalization technologies	Baek Seungkook, CSO & Co-founder of Dable, Inc.
		15:00~15:50	AI and broadcast media	Oh Juhyun, Deputy Manager of Media Technology Research Institute, KBS
		16:00~16:50	5G-based AI media technology	Na Taeyoung, Manager of Media Processing Development Team, ICT R&D Center, SK Telecom
318	Production Technology I	10:00~10:50	Thinking about the future of news production support: a review of the concept of comprehensive control	Kim Sunguk, Deputy Director of MBC
		11:00~11:50	Current status and trends of broadcast production in China: six years of experience as a lighting director	Kim Wonyoung, lighting Deigner of SoJung Lighting Design Lab
	Disaster Broadcasting	13:00~13:50	National disaster alert system: twenty years of experience and direction for the future	Choi Seongjong, Professor of University of Seoul
		14:00~14:50	A new model of disaster broadcasting	Kwak Chunsub, Ph.D of KBS
		15:00~15:50	Status of R&D and standardization of terrestrial UHDTV disaster broadcasting services	Bae Byungjun, Project Leader of ETRI
	Production Technology II	16:00~16:50	VERTIGO: An AI-based vertical video editing project	Lee Yoonjae, Senior Research Engineer of Media Technology Research Institute, KBS
327	Fourth Industrial Revolution III	10:00~10:50	5G-broadcasting network combined service (with a focus on cases in North America)	Park Kyungmo, Team Leader of Tech. Innovation Group, ICT R&D Center, SK Telecom
		11:00~11:50	The smart city world introduced by cloud-based 5G	Kim Hongjoon, Head of New/Overseas Business Division, Namutech Co., Ltd.
	Fourth Industrial Revolution IV	13:00~13:50	Competitive strategies for video services in a mobile-centric era	Lee Sungchoon, Vice President of KT
		14:00~14:50	Status and potential for the development of the (viewer) rating survey	Hwang Sungyon, Senior Manager of Nielsen Company Korea
		15:00~15:50	Fourth Industrial Revolution and media channels	Kim Younggi, Adjunct Professor of Kyung Hee Cyber University
	Radio Broadcasting	16:00~16:50	Hybrid radio and radio of the future	Choi Younghak, Manager of Media Policy Department, CBS
		17:00~17:50	Trends in technologies and services for AM high-efficiency modulated broadcasts	Lee Sangwoon, Professor of Namseoul University

What is an Artificial Intelligence (AI) Speaker?

Director, Digital Contents Department, CBS | Ahn Jongwoo

1. Introduction and Background of the Artificial Intelligence Speaker

In years past, people were only able to communicate with their computers through an intermediary device such as a keyboard, mouse, or touchpad. The AI speaker is attracting attention because it understands and reacts to human voices without special intermediary devices, which means that it can communicate with users much in the same way they communicate with one another. At this point in time, AI speakers can search for information related to weather, music, and news, and help users control electronics and shop online. In terms of its level of interaction, the AI speaker is still in its infancy, but it has many uses in real life and is gaining a good response in the market.

In addition to market needs, the technological advancement of deep learning was what prompted the initial development of AI speakers. Deep learning is a technology that enables computers to act "intelligently" through continuous iterative learning. This technology was first applied to AlphaGo. When applied to AI speakers, deep learning technology allows the speakers to interpret the meaning of words and sentences through the iterative learning of numerous speech data. Deep learning technology plays a pivotal role in the continued development of AI speakers, as speaker voice recognition rates and interaction levels increase along with the amount of data being analyzed.

2. AI Speaker Status

- Overseas Status

The Amazon Echo, launched in 2014, dominates the global voice recognition speaker market with over 70 percent of the market share. However, most leading IT companies, including Google, Apple, and Microsoft, are fiercely competing to increase their representation in the market.

- Domestic Status

Starting with the launch of NUGU by SK Telecom in September 2016 and the release of the KT GiGA Genie, which focuses on TV-linked services, large companies in Korea, including Naver and Kakao, have been competing in the domestic AI speaker market. Domestic companies have been focusing on expanding the AI speaker ecosystem by forming strategic partnerships with other companies, each aiming to become the leading platform that Korean users choose over global services. SK Telecom has linked NUGU with T map, LG Electronics has formed a comprehensive partnership with Naver, and Samsung Electronics has partnered with Kakao. Since AI speakers are also at the center of the smart home market, KT has formed a partnership with Lotte Castle to install its AI speakers in newly constructed apartment buildings. In this same way, Kakao has joined forces with POSCO E&C, and Naver has partnered with Daewoo Engineering and Construction. Domestic AI speaker market has surpassed 3 million in 2018 and is growing rapidly to be expected to reach 8 million this year.

3. Broadcasters and AI Speakers

Broadcasters should take an interest in AI speakers because they are changing the way users access media and the patterns in which they consume contents. It is also important for broadcasters to note how the introduction of new platforms, namely AI speakers, is causing changes in media consumption trends by allowing users to search for and consume contents in more convenient ways such as through voice commands. User convenience is why Google, Naver, and Daum now support voice search as part of their portals.

Up until now, broadcasters have been participating in the AI speaker market as PP (Program Providers) through content partnerships with AI speaker platform companies. Through these partnerships, broadcasters have been providing contents based on real-time radio streaming services and existing broadcast audio contents such as AOD services by program. Although many of these partnerships began with paid content services, AI platforms have secured the necessary contents and compete by voluntarily putting contents on open AI platforms. This shift in the service relationship proves that the platform has gained more stature and has secured a large number of users. Broadcasters can now freely put contents on AI platforms after completing a simple inspection process, such as seen in the existing smartphone application market, so that users can select and use the contents they want. This means that the right to select contents and/or services has been transferred from the platform company to the user. As a result, broadcasters now have the mission of creating the contents and services that users actually want, so that their created contents will be selected.

4. Future Prospects

Many IT specialists define the past decade as the "mobile age" and predict that the coming decade will be the "AI age." In light of this, it is more important than ever to use AI speakers to collect data about users' tastes and preferences. The reason why leading IT companies at home and abroad are competing so fiercely over the AI speaker market is because the company that dominates the AI speaker market is likely to dominate the internet market and lead future industry trends.

AI voice recognition technology is expected to expand beyond individuals and homes to general industries including the automobile industry and department stores. For example, the Hyundai Motor Company recently installed Alexa, an AI solution developed by Amazon, in Genesis cars launched in North America, and Kakao i in cars launched in Korea. Taking it one step further, if AI speakers are more heavily applied in the robotics market, it will be possible to use voice recognition technologies to develop personal assistant robots.

Considering the recent changes to media devices—including radio, television, computer, and smartphones—and the effect these changes have on content consumption patterns, the AI speaker has the great potential to attract and be utilized by broadcasters everywhere. In the world of IoT (Internet of Things), based on 5G, which will continue to expand and develop along with AI technology, broadcasters must closely observe the media usage patterns of the general public, and make efforts to create user-friendly contents that can interact with users, instead of focusing on one-way broadcasting.

Category	Echo (Amazon)	Google Home (Google)	HomePod (Apple)	Ivoke (MS)
Image				
Launch Date	November 2014	November 2016	February 2018	December 2017
AI Platform	Alexa	Google Assistant	Siri	Cortana
Features	- Linked to Amazon shopping mall - Over 7,000 partners - Largest number of users	- Installed with Android OS - Supports Korean	- Linked to Apple devices (iPhone, AppleTV, Mac PC) - High-quality audio	- Installed with Windows 10 - Harman Kardon speaker

[Table 1] Comparison of Overseas AI Speakers

Category	NUGU (SK Telecom)	GiGA Genie (KT)	Wave (Naver)	Kakao Mini (Kakao)
Image				
Launch Date	September 2016	January 2017	August 2016	November 2017
AI Platform	NUGU	GiGA Genie	Clova	Kakao i
Features	- First service in Korea - Linked to Btv and T map - Open platform	- Linked to Olleh TV, KT-IoT and Genie music - Open platform	- Linked to Naver contents and Genie music	- Linked to Kakao Talk and Melon music

[Table 2] Comparison of Domestic AI Speakers

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SLIM (Social Live MCR): Next-generation Live Streaming System for Mobile Platforms

Manager, Media Technology R&D Center, SBS | **Yang Jaeseong**

According to data on smartphone usage by age group in Korea released by the mobile application analysis company WiseApp, YouTube is the most used application in all age groups, from people in their teens to those in their 50s or older. The average usage time per person was 882 minutes a month. This shows that the video content viewing patterns of not only Gen Z (people in their early 20s or younger) but also older generations (people in their 50s or older), whom we assume to be unfamiliar with mobile platforms, are rapidly shifting from TV to mobile devices.

Considering this trend, it is now necessary to create in-house systems that allows people to live stream new and existing videos via the mobile platform. In the past, many broadcasting companies, including SBS, provided live streaming services on the mobile platform. Most terrestrial and cable TV networks, however, simply provided TV on-air broadcasting content on mobile devices. Live streaming requires facilities, such as a master control room and secondary control room, like those necessary for the existing HD-SDI-based broadcasting system, which involves significant additional costs and personnel. It thus became necessary to establish a simple and scalable advanced live streaming system suitable for the mobile platform. In this article, I will describe the process through which an advanced live streaming system for the mobile platform and its components were established.

In order to establish a next-generation live streaming system, we decided to expand and develop the Online Publishing System (OPS) that was originally developed within SBS, as the OPS system had already been equipped with the content and technology necessary to establish an advanced live streaming system. The OPS is a system that was developed as part of SBS' in-house distribution infrastructure over the course of two and a half years beginning in late 2015. It consists of a real-time automatic encoding system, an integrated content management system (CMS), and an open API for sharing and external distribution. Based on the main control room's automatic process control (APC) and transfer program only (TPO) watermark, the real-time automatic encoding system completely separates the commercials that are played prior to and after TV shows from the TV shows themselves. This allows installments of TV series to be shared immediately after broadcasting through external services without requiring editing. This system was thus perfect for organizing reruns of TV shows on the live streaming system. In addition, the OPS system supports online media upload and transcoding functions, allowing the various video footages captured by the production teams to be uploaded. Therefore, not only episodes of TV shows but also various video clips could be provided through the live streaming system.

As we were developing an advanced live streaming system for the mobile platform, we decided to name it SLIM (Social Live MCR). SLIM serves the following functions: ① automatically transmits TV shows in connection with TV show programming information in the SBS On Air main control room; ② utilizes various video clips, including TV show installments and other video footage within the OPS; ③ receives and transmits various live sources from inside and outside SBS in network-based RTMP format; ④ provides a programming UI to enable the automatic control of various input sources; and ⑤ transmits the final signals to multiple platforms simultaneously.

Let us examine SLIM's functions in detail. First, when TV shows on SBS On Air need to be broadcasted on the mobile platform, SLIM allows the shows (such as SBS Eight O'Clock News) to be broadcasted automatically at the scheduled times in connection with the show ID-based programming information function without the need for an administrator. This reduced the burden of the mobile platform administrator in charge of news and other programs, whose programming schedule changes frequently, by making it so that he or she no longer had to wait from early in the morning until late at night in order to edit the shows and transmit them to the mobile platform.

SLIM also made it possible for not only the latest TV show installments, which are automatically encoded on the OPS system, but also 100,000 hours of video content produced over the past 27 years to be used for live streaming programming. In addition, it allowed various video content created by production staff to be easily uploaded and transcoded via an in-house web UI, making it ready for live streaming.

In addition, the system allows various live sources from inside and outside SBS to be received and transmitted in the network-based RTMP format. Breaking away from the HD-SDI-based transmission method used in the current TV broadcasting system, all signal transmissions in SLIM use the network-based RTMP format, which is well-suited to accommodate the characteristics of the mobile platform. Videos filmed by the various studios within the SBS building are transmitted to the SLIM system via a dedicated network or in-house OA network. With the emergence of the 5G era, the system now also allows videos filmed outside the SBS building to be transmitted to SLIM's relay server via the LTE or 5G network, enabling various live sources to be used in production or programming in the future. This is particularly useful for breaking news, as videos can be promptly filmed and submitted by reporters via mobile devices while at the scene, giving us access to highly mobile advanced live streaming technology.

Lastly, SLIM supports multiple platform distribution, which allows simultaneous video transmissions not only to YouTube, which currently dominates the mobile platform, but also to other popular live streaming platforms, including Twitch, NaverTV, and KakaoTV. Theoretically, it is possible to create an infinite number of such channels. Therefore, SLIM makes it easy to create and operate new channels for the mobile platform without the constraints of TV broadcasting, which requires the establishment of a new master control room whenever there is a change in programming.

To make the most of SLIM, it is important to establish a studio where competitive live broadcasts specific to the mobile platform can be created. Therefore, we set up a dedicated mobile platform studio, called "M Studio," inside the company building. Occupying minimal space and operating mobile equipment, M Studio is much more efficient than existing production studios. Live broadcasts produced for the mobile platform in the well-equipped studio have been linked with the SLIM system and are utilized for various live streaming channels.

SBS is now preparing to provide various live streaming services using SLIM. The first live streaming service that took off was SBS Mobile 24 from the New Media Bureau of the News Headquarters. Under the slogan "Play! News Life," SBS Mobile 24 broadcasts shows 24 hours a day through the SBS News YouTube channel. The channel live streams SBS On Air TV programs, such as SBS Eight O'Clock News, at the specific times such programs are aired. In between such programs, sports-related programs headed by the company's main anchors and other exclusive online content are broadcast. Moreover, SBS Mobile 24 is expected to provide complete versions of the short videos that are broadcast on terrestrial TV, footage that is not shown on terrestrial TV during special and breaking news stories, and videos of news events live streamed from the scene via smartphone and other mobile devices.

Today, when people want to learn about breaking news, they bring up live streams on YouTube instead of reaching for the TV remote control. Also, when people need to find some particular information, they look for it through VOD services, instead of conducting text searches on web portals such as Naver. This is the nature of the times in which we now live. The rise of large-scale mobile video platforms such as YouTube could be a crisis for terrestrial TV networks. On the other hand, it could be the opening of a new market. In this respect, the establishment of an advanced live streaming system for the mobile platform is an interesting and essential task that needs to be supplemented in the future.

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Second Screen Service Based on UHD Terrestrial Broadcasting

Research Engineer, Technology Research Center, MBC | **Ban Youngmo**

Service Overview

Terrestrial TV networks have provided live UHD broadcasts of the PyeongChang 2018 Olympic Winter Games and 2018 FIFA World Cup Russia, and they are working hard to provide even more UHD broadcasts in the future. For instance, MBC produced the nature documentary Bears in the UHD HDR format earlier this year, providing a more vivid and vibrant experience for viewers.

More than simply a means of providing ultra-high-definition video and stereo content, UHD territorial broadcasting is a platform that allows the development of additional interactive services using the Internet network. The most notable of these services include TIVIVA, which is provided by terrestrial TV networks, and live broadcasts and replays of UHD content via the Internet. Moreover, broadcasting companies are also considering providing UHD broadcast services that are accessible via various devices, including smartphones and in-vehicle infotainment systems.

One type of UHD broadcast service that is linked to the mobile platform is second screen service. Second screen service refers to the provision of additional broadcast content through the linkage of TVs with mobile devices. For instance, while watching a sports game on TV, individual viewers can receive useful information, such as game schedules or the results of previous games, on their mobile devices and use the screen-mirroring function to display media content playing on the small screens of their mobile devices on their larger TV screens. This screen-mirroring function is a major second screen service that is supported by YouTube, Netflix, and other applications.

A characteristic of second screen services provided by UHD terrestrial broadcasters is their organic linkage to broadcast networks. For example, information on players in sports games or notifications during disasters can be dynamically transmitted to TV and the mobile platform simultaneously.

This article will examine the case of the trial development of a second screen service for UHD terrestrial broadcasting to explore the kinds of services that can be provided in this system.

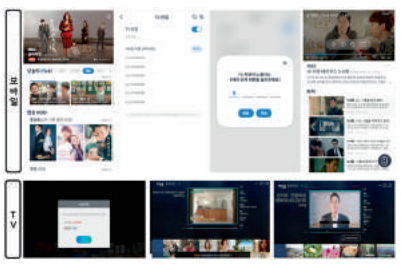
[Fig. 1] Mobile App Design

Service Development

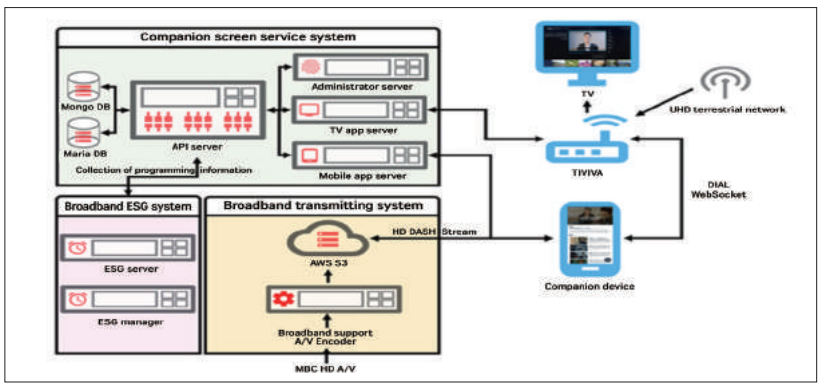
The purpose of the service that we developed was to allow viewers of UHD terrestrial broadcasts to easily acquire information related to TV shows and participate via their mobile devices. Its main functions include: providing programming schedules and real-time broadcasts on mobile devices, allowing viewers to view and mirror video clips related to particular TV shows, allowing viewers to control their TVs via mobile devices, and compiling statistics on the viewing history of viewers. [Fig. 1] provides images of the design of the main functions of the mobile app that was developed.

The UHD terrestrial broadcasting standards define the standards for second screen services, and mobile and TV services are linked and provided according to these standards. TV applications run in the browser app environment of the devices that receive UHD broadcasts and show the webpages that correspond to the URLs. In addition, the browser app environment provides an API that allows users to look up WebSocket information for controlling TV channels and volume or communicating with the mobile platform.

Communication between the mobile platform and the TV network begins with the DIAL protocol, in accordance with the relevant standards, and messages are exchanged via WebSocket. As the types of messages that are exchanged are not defined in the standards, they can be defined depending on the services to be provided. For instance, these messages can include authentication message requests and responses for connecting TV and mobile devices as well as requests and responses for terminating connections, changing TV channels, controlling volume, and mirroring related clips. [Fig. 2] provides an example of a scenario where a TV requests a verification code for security purposes on a mobile device that is requesting a connection.



[Fig. 2] Connecting a TV and Mobile Device



[Fig. 3] Components of a UHD Terrestrial Network-based Second Screen Service

UHD terrestrial broadcasting uses the DASH format and is designed to make it possible to provide real-time channel services via the Internet, which also allows viewers to watch broadcasts in real-time on mobile devices. The only problem is that UHD terrestrial broadcasts use the HEVC video codec and MPEG-H 3D audio codec. As the latter cannot yet be decoded on Android and iOS devices, an additional transcoding process is necessary to view UHD terrestrial video broadcasts on mobile devices.

Aside from mobile and TV apps, second screen services can also collect and provide TV programming information to viewers via mobile devices, as shown in [Fig. 3], through their connection with the backbone broadcasting system. UHD terrestrial broadcast programming information is provided via TV networks and the Internet and includes not only broadcast times but also other metadata, including program title, synopsis, genre, and related video clips. Mobile devices can use such information to provide viewing notifications for TV shows or show video clips related to the TV show viewers are watching at any given moment. In addition, based on people's viewing history, it is possible to provide customized services, such as tailored content recommendations. As user information is easily acquired via mobile apps that require users to log in, users' viewing history of mobile and TV content can be organized and analyzed to enable the service provider to offer recommendations of real-time content based on the actual interests of the user.

Future Tasks

This article took a simple look at services that link the mobile platform to TV by examining the development of a second screen service. I expect these services to receive a boost and increase in number as UHD mobile broadcasts begin in earnest and the number of mobile devices capable of directly receiving TV network transmissions increase. This would also enable the provision of second screen services linked with disaster announcements. As natural disasters have been occurring more frequently, prompt disaster notifications are becoming increasingly important. On the mobile platform, it is possible to receive disaster warnings via TV broadcasts and emergency alerts and use map applications to gain information on evacuation routes.

Conclusion and Imlications

According to the Korea Broadcasting Advertising Corporation's 2018 Consumer Behavior Survey Report, the highest number of respondents (50 percent) answered that they use smartphones while watching TV. In addition, 43 percent answered that they had searched for information on their smartphones while watching TV. To better accommodate viewers' consumer behavior, it is necessary to provide more services, such as second screen services, that allow the active participation of viewers via the mobile platform while watching TV broadcasts. In this era of UHD terrestrial broadcasting, I hope that more attempts will be made to provide viewers with a greater range of ways to consume media content conveniently via TV networks and the Internet regardless of the devices they use.

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Multiplatform Broadcasting System for Mobile and TV Simulcast: Jam Live Quiz Room

Manager, Production Facilities Department, KBS | **Song Sangkeon**

1. KBS Jam Live Quiz Room: System Overview

Broadcasting and communications technologies have undergone revolutionary transformation over the last several years, now not only available on computers and industrial platforms, but also on automobiles and smart devices. With the ubiquitous availability of smart devices worldwide today, these new broadcasting technologies have become integral to everyday life. This technological advancement, moreover, has revolutionized the relationship between broadcast content providers and platforms from unequal to more equal. Viewers, who were formerly bound to sitting in front of the TV to view broadcast content, can now view nearly whatever they want, wherever they go, even while going there, on a multitude of smart devices or other such media players. The cutting-edge telecommunication and broadcasting technologies have thus expanded viewer freedom and choice, while dismantling the previously unchallenged TV-based monopoly of networks, and spurring those networks into infinite competition.

The term "N-screen" is quickly becoming a household term for today's viewers. Acknowledging that a growing majority enjoy broadcast content not only on TV, but also on their smart devices, TV networks are now struggling to devise new survival strategies that will ensure the survival and success of their content on multiple platforms.

As a public broadcasting corporation, KBS has been spearheading efforts to develop diverse and innovative media platforms and services, introducing a variety of channels to keep the viewing public informed. KBS has also launched TVUT[1], a mobile application that enables TV viewers to participate in the programs they watch.

As part of these ongoing efforts, the company adopted plans for a new program that allows TV viewers to participate in a live TV quiz show via their smartphones. In collaboration with Jam Live, a mobile content developer, KBS has successfully become the first network in Korea to launch a TV-mobile simulcast program.

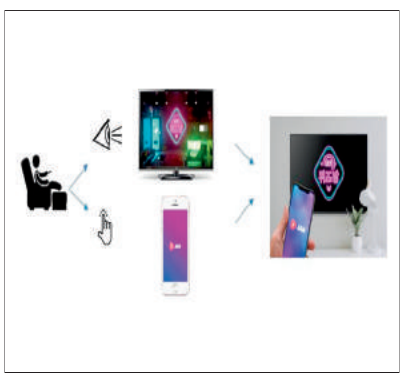
2. A Participatory TV-Mobile Simulcast Program: Design

A. Time Synchronization

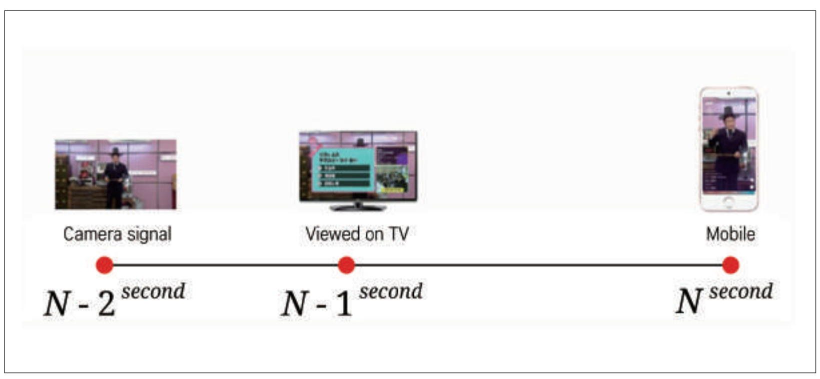
The first and foremost key to the successful production of a TV-mobile simulcast program is to eliminate the time lag in transmission and encoding between platforms. The N-screen services provided in Korea so far (e.g.,, My K[2], POOQ, Naver Streaming) have rather overlooked the between-platform time lags. The TV-mobile simulcast program of the kind KBS has envisioned, however, requires perfect delayless synchronization between these platforms, as viewers must participate and compete in real time to win rewards. As a matter of fact, TV programs can be transmitted to viewer televisions in less than a second, even with the transmission and encoding involved. Jam Live, on the other hand, takes longer to transmit, encode, and deliver the same content to viewers as it is crucial to ensure streaming reliability in the process. It was therefore important to synchronize Jam Live Quiz Room perfectly between the two platforms in light of the inevitable delay in mobile transmission.

The paramount concern in designing synchronicity between the two media has been ensuring the stability of mobile streaming servers irrespective of traffic fluctuations. Assuming that TV viewer participation in the program would increase mobile traffic, the minimum mobile encoding and transmission time was upped, while the transmission and encoding of TV video and audio signals and computer graphics (along with the data and quiz information involved) were deliberately delayed to the mobile transmission processing time.

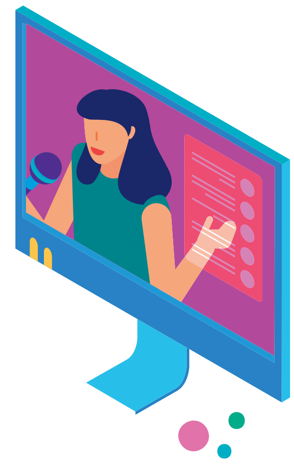
That two different time zones were to be broadcast on the TV screen presented another major issue to consider. Broadcasting Jam Live Quiz Room involved inserting scenes of viewers answering the questions in real time into the images being broadcast on TV as picture-in-picture (PIP) images via a mobile news gathering (MNG)[3] system. Mobile users themselves shot and sent such scenes of themselves answering and instant-messaging broadcast

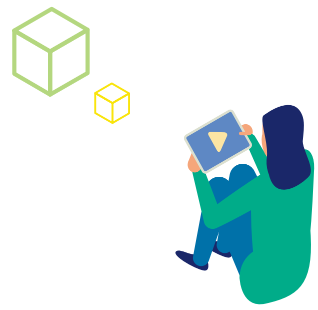


[Fig. 1] Jam Live Quiz Room Concept
(TV-mobile simulcast quiz show)



[Fig. 2] Transmission and Encoding Timeline: Mobile & TV





as PIP images on TV in real time. This meant time delays between images simultaneously broadcast on TV as well. The production team overcame this time lag by distinguishing between images before and after the delay and designing the system so that the video images and information from the different time zones would be processed in accordance with the TV program production system and procedure at KBS.

B. Data Synchronization

The data on participating viewers must also be synchronized for simulcast of a quiz show like Jam Live Quiz Room on mobile devices and TV. Participant information to be broadcast on TV includes the number of viewers participating in real time, the numbers of viewers that have given correct and incorrect answers, the questions and the answers, the number and names of the finalists, and the values of final prizes. These forms of information must be updated relentlessly every single second. KBS has developed an automatic data coder program to ensure efficient management and use of this data. The coder program has been designed to transmit the data it gathers from mobile data servers to the CG equipment client in the TV assistant coordination room via TCP/IP. KBS and Jam Live officials discussed details of data transmission protocols and together chose how the communications are to be secured and data transmitted. The resulting coder program allowed the administrator to click the button upon a call sign from the TV producer so that the data gathered via mobile servers could be mixed into the images being broadcast on TV in real time via the coder. The number of real-time participants and the list of winners were automatically updated with the data being transmitted via the mobile data servers. The mobile data was processed into Web-based captions and mixed into TV images, while the TV team parsed[4] the data transmitted into the coder program so that the data would be updated and inserted into predefined locations on the computer graphics broadcast on TV.

3. Review

KBS has been simulcasting Jam Live Quiz Room on TV and mobile devices at 8:30 p.m. every Friday since September 21, 2018. The system design has proven capable for the most part, and the episodes have aired without major errors or mix-ups. The simulcast system behind the quiz show provides a helpful template upon which multiplatform and N-screen programs can be produced in the future, while the program itself has been catering to the viewing public's growing demand for bidirectional and multiscreen broadcast programs.

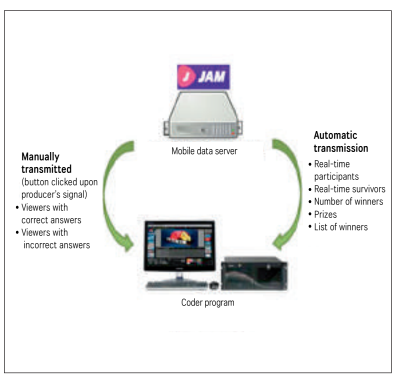
Nevertheless, KBS' simulcast system has not been without problems so far. Foremost is the delay in time arising from differences in TV signal-receiving conditions. The system, along with the necessary delays in encoding and transmission, was designed chiefly for households receiving HDTV signals directly via antenna. Fortunately for KBS, the delays remained minimal with IPTV, the favored means of watching TV among Koreans today. Viewing the program on other platforms, such as CATV, satellite and UHD, however, generated additional delays. Depending on the type of TV service a viewer is using, some viewers probably experience greater delays between their mobile and TV experience than others.

KBS may not be able to solve this problem right away. As a public broadcasting corporation, though, it must address and correct this systemic error over time to keep the viewing public equally informed and engaged and perfect N-screen services. The system and associated hardware must be upgraded to minimize differences in delays between broadcasting settings. The broadcasting technologies can also continue to evolve so that it will be much easier to achieve time synchronicity.

Ratings and proceeds from commercials are plummeting for TV networks today. These problems, in part, reflect a change in the viewing public's consumption of media content. They, however, also present a challenge for TV networks that refuse to cater to the viewing public's changing needs and embrace that change. KBS and other TV networks in Korea today ought to identify these growing and diversifying needs, and actively pioneer new platforms.

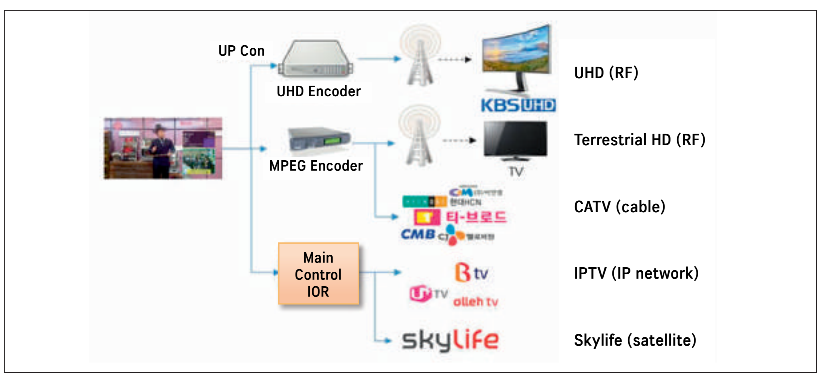
The TV-mobile simulcast system design and program discussed herein provide a guideline and new hope for TV networks to provide multiplatform services in today's changing broadcasting environment. KBS will continue to rise to the new challenges ahead with its extensive broadcasting expertise, production system, and infrastructure. It will, moreover, continue to expand and update participation-based N-screen services using simulcast systems like the one described here.

[1] TVUT: A mobile application that enables users to cast votes and otherwise participate in live KBS programs.
[2] My K: KBS' Internet streaming service, which allows users to enjoy TV and radio content live and also stream past content.
[3] MNG: A system in which video footage shot by for-TV cameras and other such equipment is transmitted via wireless telecommunication networks, such as those using long-term evolution (LTE).
[4] Parsing: The process of extracting and processing needed data from certain pages (text, html, etc.) using certain patterns and sequences.



[Fig. 3] Coder Program Structure

[Fig. 4] Data Transmitted by the Coder Program



[Fig. 5] Different TV Settings and Additional Delays

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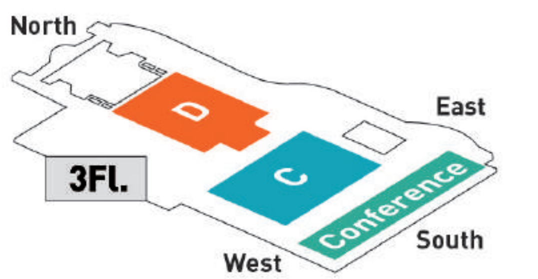
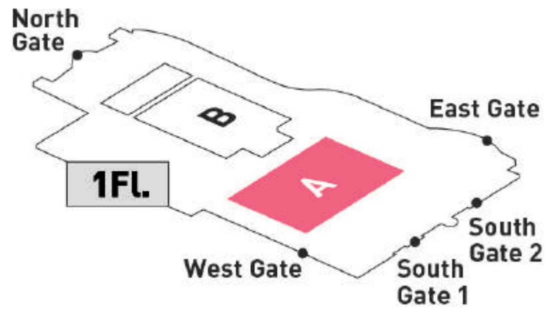
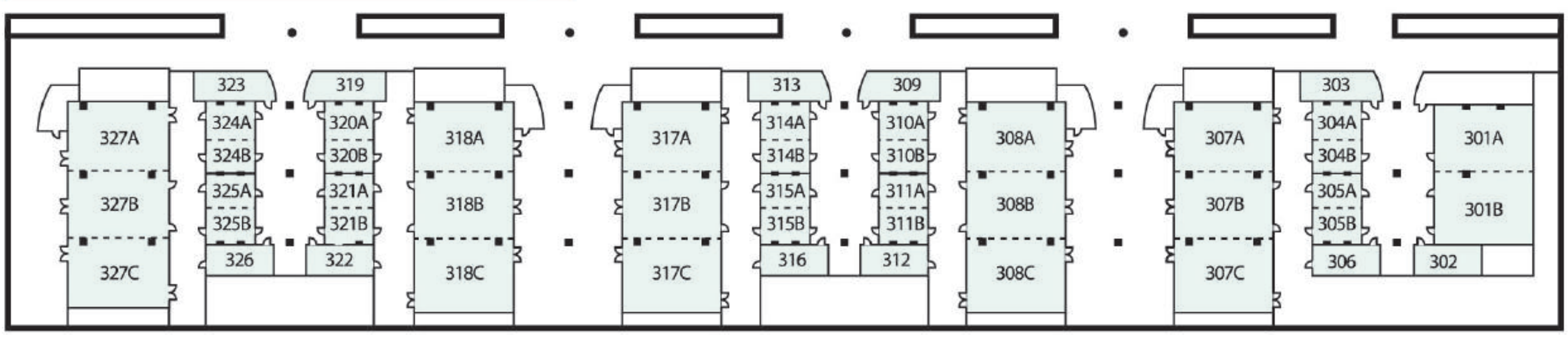




Conference Center (3Fl.)



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Booth No.	Company Name
A	
A101	Cable Tool Corp.
A102	Prolight+Sound Shanghai/Messe Frankfurt
A103	Sound Plus
A104	ANI
A106	Vision Light
A107	Seyoung Information & Telecommunication
A108	Activelife
A110	Iexco
A114	Sound Media
A118/A250	Kinoton Korea Inc
A201	Sound Tree
A202	Honbo Audio China
A203	Wicommedia
A204	Junjunsa
A206	T-Max Prosound
A210/A220	Inter-M Corp.
A240	Yamaha Music Korea
A260	Best Leading Solutions
A301	Kevic
A310	Sae Korea
A311	CVT Electronics Korea
A312	Green IT Korea
A313	Nowsystem
A320	Media House
A321	JD-Media
A330	Star Networks
A340	Dongkuk Media
A341	Koil
A350	Leica Geosystems Korea
A355	Selvas AI
A356	Innertron
A357	Yallafactory
A401	Ruifan Korea
A402	PKLNS
A405	Hitek Vision
A410	Ingang Audio
A430/A451	Sama Sound
A440	Klausys
A450	Sama D&I
A460	Lugh Scape
A465	Alphalite
A470	ART Tech Lighting
A501	Entergrain
A510	Dasan SR
A520	Dlogixs
A550	Sound Solution
A601	Onecast
A602	Scien
A603	Sunmin M&S
A604	Sound N Music
A610	Musicmetro
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A633	ASL
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A650	Mpakeng
A652	Jungwoo Aureum Industry
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A701	Kary Gifts Enterprises
A702	Modehoist
A703	Bosung Electronics
A704	Sorigio
A707	Citysound
A710	Soundus
A720	Trusic
A721	GNS Electronics
A723	E-One INT
A730	Seki Electronics
A731	Danacoid Korea
A750	Mipro-Korea
A751	Ntu System
A801	Naruad
A810	PHG
A811	AVMIX
A820	DJ Power
A823	Ludicrum
A830	Capstone Pro
A840	Kotobuki Korea
A841	Jinjiang Chengfuxing Electronic Technology
A842	Doanpavis
A850	Techart
A901	Mondo
A902	Pro Audio Asia(PAA)
A903	Jong Ro Lighting
A907	Haonatec
A908	Sunhoomedia
A909	Fine Trading
A910	Falcon Eyes
A913	Seoul Welcome Desk
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C102	Brightcove
C103	JDKAT
C105	Myssd
C106	Streamvision
C107	Bronics Inforcom
C108	Noitom/Fictiocreative
C109	Vision&Tech
C120	Ross Video
C201	Blackmagic Design/Hipixel/Leo Media
C210	Dong Yang Digital
C212	Yegrin
C215	Digiwill
C220	Green Trading
C221	Uwin Info Sys
C230	Visual Research
C235	Shenzhen Dicolor Optoelectronic
C250	Realtecbridge
C260	Basic Tech
C301	TV Logic/Vidente
C310	Koil
C320	Canon Korea Consumer Imaging
C340	Sama Global Video Communications
C350	MBC(Munhwa Broadcasting Corporation)
C401	Shenzhen Lightlink Led Display Technology
C402	Open Stack
C403	Brexel
C404	Ficosys
C410	Lumantek
C410	ANT
C411	Northern Lights/Digital Sputnik
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C435	Iisn Systems
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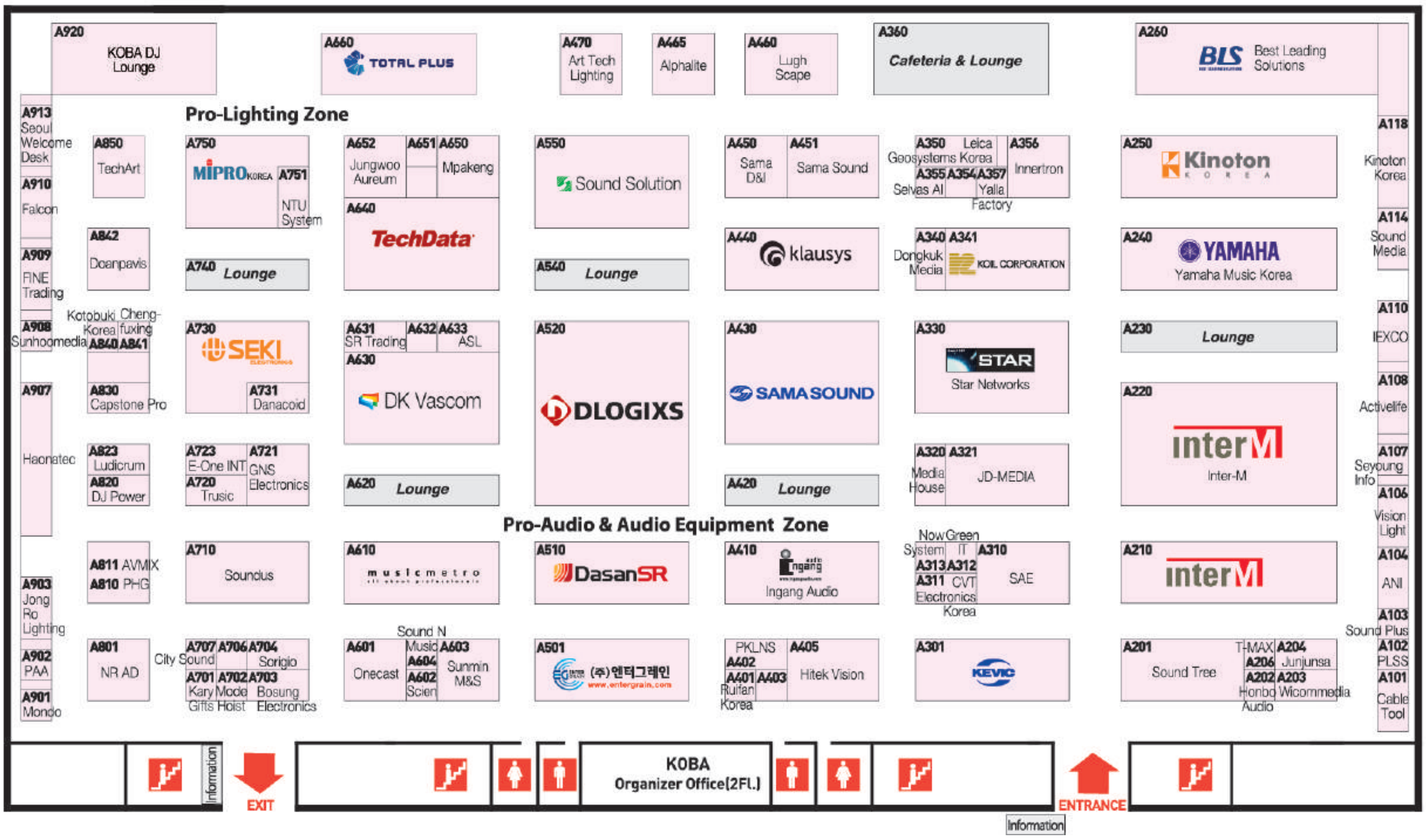
C536	EJ Infosys
C540	Hiperwall
C541	Jinit
C542	Master
C543	Kiosk Korea

Hall A (1Fl.)



C560	KBS(Korean Broadcasting System)
C601	Shenzhen Magnimage Technology
C603	Tamura Professional Solution Korea
C605	It One Shop
C606	Helsel
C607	KRPA
C609	Chameleon Media
C610	Softemotion
C611	Mediamuse
C612	Bridge ENT
C613	C-Vision
C614	Vonda
C630	Nimbus
C631	KBTA(Korea Broadcasting Telecommuniciation Association)
C632	Gen Energy
C633	KAI
C635	Slpower
C636	DS Broadcast
C640	Limelight Networks Korea
C642	Atbis
C645	S3 Consulting
C650	PC Direct
C660	Xi'an Novastar Tech/ASONE
C702	Rtcom
C703	Korea Avics
C704	Kyong Sung Data
C710	Vision TV
C713	Shenzhen Jstron
C715	Unive
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C902	Seaflex
C904	Alida LED
C905	Shenzhen Gloshine Technology
C906	Hanmac
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D

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D101	Alan Dick Broadcast
D102	Motion 9
D103	K.Tivity
D104	A-Jin Engineering
D105	V.A Media
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D112	Video Plus
D113	Infrasoft
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D116	Backstage
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D130	Korea Broadcasting Engineers & Technicians Association(Kobeta)
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D136	Sion Media
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D139	Sun-Photo Corporation
D140	Aving News(NSBS)
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D143	Bast
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D204	Wintek System
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D206	Young In It Engineers Company
D210	Tektronix Korea
D211	Nextreme
D212	Seculine(Cineroid)
D213	Artcompany
D220	Namsung Traders
D221	Telelian
D223	X-Jib/Cobra Studio
D224	Digital Solutions & Services
D226	Miller Camera Support Equipment
D230	Hyundai Fomex
D231	International VH
D233	JM Broadcast
D235	Evosotech(AVID)
D240	Calla
D241	Phovi Digital
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D246	B & C Solution
D247	Kato Vision
D250	For-A Corporation of Korea
D251	Geminisoft
D254	Restar Electronics Korea
D255	Direct Media Solutions System
D301	Plthink
D302	Dong Hwa A.V
D310	K2E
D312	PI International
D313	Association of Broadcasting and Communication System Industry(BCI)
D320	Xein M&C
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D331	Besco S.I
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D432	Gudsen Moza Korea
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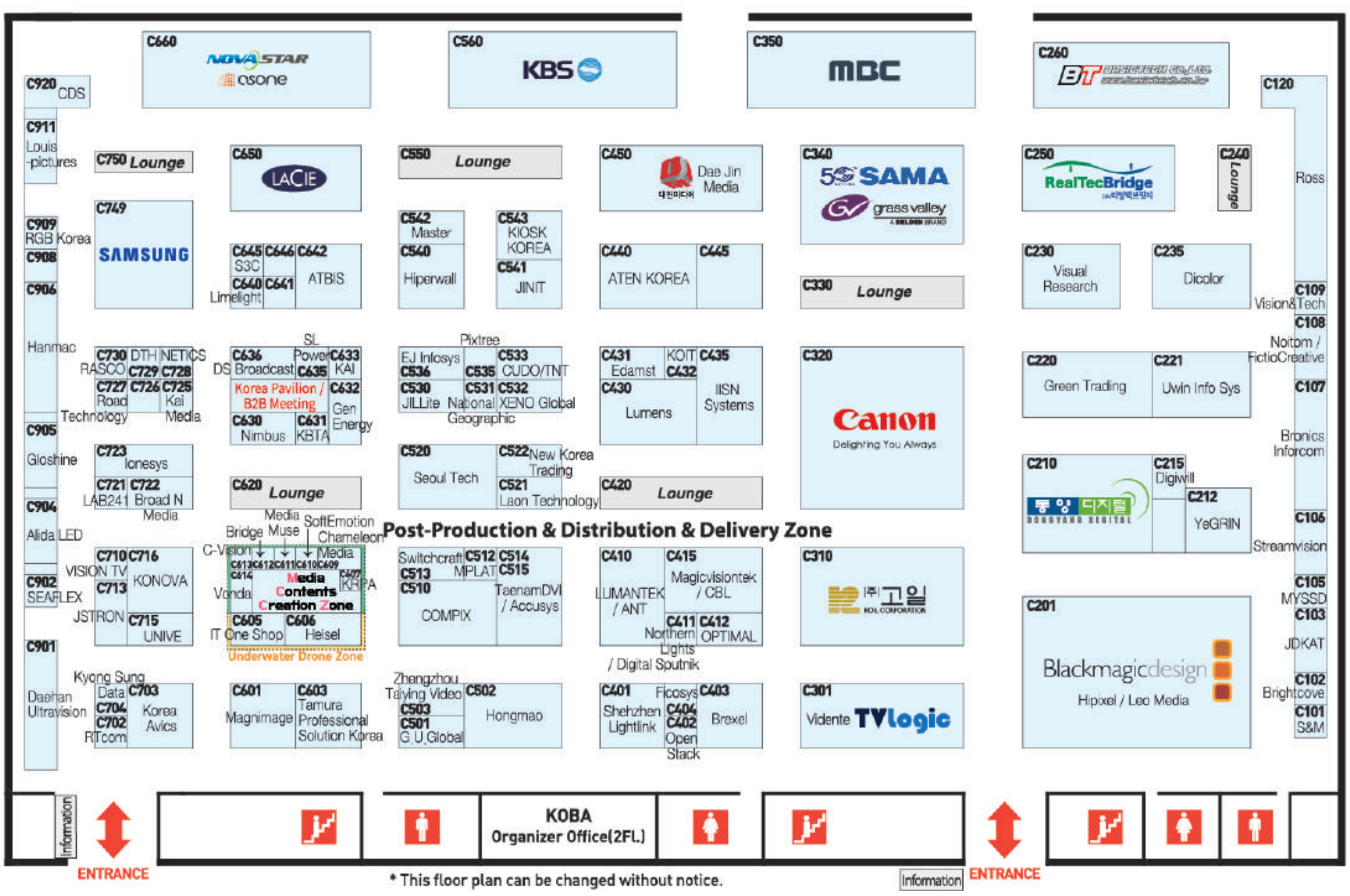
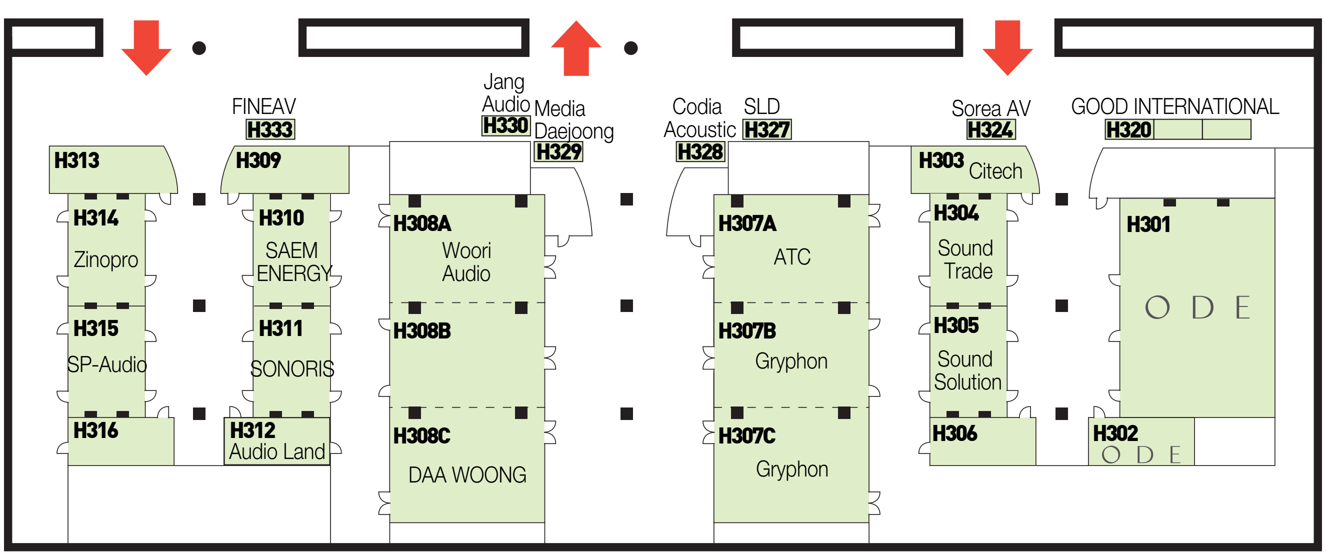
D450	Leader Korea
D451	Baekdoo International
D452	Canare Corporation of Korea
D453	PC Direct
D455	Misonics
D456	Photoclam International

Hall C (3Fl.)



HiFi Audio Show

Conference Center (3Fl.)



· Exhibits Categories

Hall A

Pro-Audio - Amplifiers, Speakers Microphones, PA, SR, Console
Pro-Lighting - Studio/Stage/LED/Outdoor/Indoor Lighting, Lighting Control System, Laser Technology, Effector
Stage Equipment - Stage System, Stage Design, Truss Technology
Church Facilities, Musical Instruments

Hall C

Post-Production - Editing Devices, Non-liner Editing System, Encoder, Media Converter, Title Production System, VR/AR Technology
Distribution & Delivery - Wifi/WiMAX, 4G, 5G, LTE, IPTV, Output & Transmission
Digital Contents - TV, Mobile, Movie
Electric Display, Electric Power Unit, Measuring Equipment

Hall D

Production - Camera, Camcorder, Recording Lenses, Storage, Server Data Compression Technology
Broadcasting Equipment

Hall D (3Fl.)