A Brief Analysis of the 5G+4K/8K+AI Strategic Layout of Central Radio and Television Station
—— Taking the 2019 National Day Campaign Publicity Report as an Example

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Abstract: On August 20th, 2019, at the Beijing International Radio, TV & Film Exhibition, the Central Radio and Television General Station announced the 5G+4K/8K+AI strategy, including four main parts: integrated broadcasting, ultra-high-definition television, mobile new media and artificial intelligence. CCTV is now comprehensively abandoning standard production system to achieve comprehensive high-definition, comprehensively promoting the development of 4K/8K, building the first national 5G new media platform, combing artificial intelligence with media, and building a new strategic layout. On the occasion of the 70th anniversary of the Chinese National Day, the Central Radio and Television Station integrated various television channels, broadcast frequency, and website platforms, carried out panoramic and three-dimensional live and broadcast, realized the whole process of 5G+4K ultra-high-definition and 5.1 stereo live broadcast, and provided a new audio-visual experience for end users. This article will take 2019 National Day 70th Anniversary publicity report as an example, excavate the characteristics and advantages of 5G+4K/8K+AI strategic layout, and discuss the development trends and predicament of the initial stage of strategic layout.

1. Introduction
5G is a new generation of mobile communication system developed for mobile communication demand, which has ultra-high spectrum & energy efficiency[1]. Simply put, 5G is the 5th generation of mobile communications. The scenarios fit 3G and 4G are mainly "mobile broadband". As the rate of 5G can reach 20G, it can break through the temporal and spatial limits of information transmission and give users a strong interactive experience with its high rate and high reliability. 4K means 4K resolution, which is a kind of super HD resolution. If you don’t consider the aspect ratio, the horizontal pixel value reaches or even approaches 4096. Users can see every detail and feature in 4K program videos. 5G+4K refers to the transmission of 4K audio and video information through 5G with its wireless high speed. With low delay and high reliability, 5G+4K can enhance user's interactive experience. The application of the 5G+4K/8K+AI strategy of the Central Radio and Television Station provides a panoramic and three-dimensional experience for the audience. At the same time, its full elements and ultra-high-definition features meet the visual enjoyment of end users.
2. Features of Panoramic and Stereo Presentation

According to McLuhan's "media is information ", the media itself is the truly meaningful message, and human beings have some kind of media to engage in corresponding communication and other social activities[2]. From the tribal society under the spoken media to the off-tribal society under the print media, and then to the global village under the present electronic media, the development and revolution of the media determine the social development and the change of the social form. The change of news reporting mode also depends on the change of technologies, from the communication of letters and newspapers by Gutenberg's invention of printing, to the advent of radio and television in the late 19th century, the mobile broadband of 3G and 4G, and the panoramic and stereoscopic presentation of news scene in 5G+4K. The technological change has continuously promoted the renewal of news scene, and the maturity of Internet technology has made great innovation in the form and content of news report.

The Central Radio and Television Station has used live broadcast technology for news reporting and large-scale events recording such as the Spring Festival Gala and the two sessions (NPC and CPPCC) in recent years, and has more maturely adopted 5G+4K live broadcast technology at the 70th anniversary parade ceremony, providing panoramic experience through mobile phone client and seven special seats. The application of 5G and 4K realizes the synchronous live broadcast of 4K and HD, introduces 4K subjective visual angle to send back the picture more clearly that the audience can see each detail clearly, which enhances the user to watch the feeling and the participation degree. The live broadcast set several 4K cameras on the marching floats and sent them back to CCTV's main station in real time through 5G. This is a big broadband and low delay of 5G technology and mobile 4K camera combination of a new experience(Table 1).

| Performance               | Data      |
|---------------------------|-----------|
| Faster experience         | 0.1~1Gbps |
| Higher connection density | 1 million/Km² |
| Lower air port delay      | 1ms       |
| Faster mobility           | 500+Km/h  |
| Higher peak rate          | 10~20Gbps |
| Greater flow density      | 10~100Tbps/Km² |

The parade also uses VR 8K FOV technique to provide real time feedback of VR lens through 5G, which lets the audiences watch 8K ultra high definition picture, and has the immersive experience by wearing the 4K decoding ability of VR head display at the same time. VR panoramic live broadcast takes the end user's angle of view to carry on the stereoscopic shooting and satisfies the audience's individualized experience. Compared with the traditional television's plane view, VR panoramic live broadcast provides the user with a lot of details and information. It gives a more real and comprehensive restoration of the scene. National Day VR live broadcast also uses multi-station mode, which provides multiple perspectives. Live broadcast team has 12 fixed seats in total. Among them, people can watch the raising of the national flag in the national flag area and watch the overall magnificent picture in the Great Hall of the People point. Starting from the National Museum, along the direction of the parade there are Donghua Watch, Square East, West China Watch, Square West, West View Platform, which fully covered the parade forward scene. The audience can also watch the ceremony from the square east view platform to the scene audience view, which greatly improve the user's visual effect. End users switch at any time according to their own preferences with more power to choose independently, rather than passively accepting pictures from a single perspective when watching traditional TV. Moreover, in the 4G era, when watching the 4K ultra-high-definition live broadcast program, the picture will appear the phenomenon of trailing, seizing and hysteresis so the effect of perception is not smooth. The high return and high reliability of 5G could solve the problem and provide better audio-visual effects.
3. Full-element and ultra-high-definition picture information collection

The technological change not only changes the way of news broadcast, but also improves the audio-visual effect of news content. The development of TV resolution can be divided into three stages: standard SD (below 720P), high definition HD (1080P) and ultra-high definition UHD (4K to 8K) according to the change of resolution. With the development of technology, audio-visual equipment has been upgraded and evolved. People have higher and higher requirements for the clarity and resolution of video images and audio quality.

4K resolution is an ultra-high resolution. Different from the HD TV we watch at home, its picture reaches 4096×2160 resolution, which makes it more fine and clear(Figure 1). The parade adopted a high quality standard of 4K resolution/50 frames/HDR/BT2020/10bits, and broadcast the parade scene more carefully. The end user can see every detail of the scene more clearly through the client. The viewing effect has been greatly improved. As home cinemas continue to enter every household, 4K TV is gradually popularized. 4K TV reaches or exceeds the level of cinema in both image and sound, even based on the effect of VIP hall. During the ultra-high-definition television era, the full integration of film and television will meet the needs of home theater, and home theater will also lead the transformation and upgrading of television with the popularity of 4K television. Therefore, accelerating the promotion of HD to UHD upgrading, rapidly improving the production capacity of ultra-high-definition television and increasing the output of programs, providing a wealth of ultra-high-definition television programs for the majority of users, is not only to meet and meet the needs of the audience, but also has become the direction of progress and efforts.

![Figure 1](image1.png)  The color richness of 4K TV is 1.5 times that of 4K movie.

![Figure 2](image2.png)  China's first "live blockbuster", "At this moment-celebrating the 70th birthday of New China", which entered the cinema line, was broadcast simultaneously.

Not only ordinary families can watch 4K live pictures, but also 70 cinemas in China are connected to four live signals. With the combination of the ultra-high-definition pictures of 5G+4K and the huge screens of cinemas, the audience can feel the grandeur of the parade. On the day of this year's 70th anniversary national day parade, the live blockbuster "celebrating the 70th birthday of new China at this moment" produced by the central radio and television station "CCTV frequency" entered more than 70 cinemas in the country(Figure 2). This is the first time that our country has tried to transmit ultra-high-definition signals through 4K satellite to the theaters. The whole film optimizes the details of the scene, adjusts the picture frame by frame and corrects the color. Each lens is made of 4K ultra-high definition signal and 5.1 surround sound, which greatly strengthens the user's visual effect and experience. From live broadcast to access to the theater, a film will roughly go through television production, live coding, satellite transmission, real-time decoding and adaptation of these processes. 4K ultra-high-definition programs have the advantages of high resolution, wide color range, high dynamic range and so on. The live 4K ultra-high-definition TV programs are putting into the cinema for real-time broadcast. It combines the timeliness, diversity, professionalism and high quality of radio and television content effectively to bring a more impactful new audio-visual experience to the audience.
4. AI Promoting content production change

The development of artificial intelligence will completely reconstruct the production and dissemination of TV and new media, also the network and new media will gradually become intelligent. Artificial intelligence plays an important role in content production, fact checking, content editing and content distribution. On the topic of the BIRTV2019, the Central Radio and Television General Administration proposed a strategic layout of AI, using speech recognition, image recognition, semantic recognition to innovate the media production, dissemination, and distribution process. A new form of man-machine communication media is constructed. The characteristics of new media are virus communication, simple style, and mobile communication based on mobile phone. The use of AI can reconstruct the process of new media production and communication, and greatly improve the production capacity and level of media.

On the 70th anniversary of the National Day parade, CCTV News used AI technology for the first time to assist manual editors in editing work and launched nearly 300 fine short videos in a short period of time. They restore the picture seen by the audience during the live broadcast, which was clipped about twenty seconds by the scene director, to videos that are more than one minute through the complete reassembly of each signal screen, to show each party and square array going through Tian‘An Men Square. Intelligent editing according to the video and audio is the application of artificial intelligence in the media. For multi-lens, AI intelligent editing technology can automatically determine, clip, and automatically film. Originally, the editor's task was to separate the line-up and the mass parade in the National Day parade. In order to accomplish this task, the editor needs to find the final shot from dozens of cameras. The whole editing process is very cumbersome and laborious. If AI is used to assist editing, the editor only needs to take out the film of the 1993 military parade in 2015 before the live broadcast, and let the artificial intelligence analyze how the broadcast signal used the lens before(Figure 3). Artificial intelligence can generate the logic of this National Day parade by learning the lens of the 93 military parade. During the official live broadcast of the military parade ceremony, AI can analyze the location and action in the camera as well as which lens is stable when the signal is transmitted. After that, it matches the sound with the picture. The whole process only takes three to four minutes. This will ensure that the screen will be presented to the audience in front of the TV set in the fastest and most accurate way. AI intelligent editing technology can reduce the original huge editing team of more than thirty people to the AI director team of only five to six people, making more editors work in other posts, greatly releasing the productivity(Figure 4).

Comparing with manual video editing, AI clip can preprocess the information in the cloud, so that the information can be transmitted accurately and the production speed can be accelerated. AI can produce more videos online at the same time and transmit them at the first time, thus, effectively improving the productivity and timeliness of news. In content production, applications that combine artificial intelligence with media production include robot writing (such as Tencent dream writer) and AI assisting in news writing. AI helps to write news, including automatically matching icons, charts or videos for reports, automatically grabbing relevant information, automatically collecting news clues.
on social networking sites, and using AI technology to automatically shoot and combine relevant materials into films.

Artificial intelligence is not only used in editing, but also widely used in many aspects, such as algorithm recommendation, robot writing, video image recognition and so on. At the same time, artificial intelligence can be used in the media for voice labels, virtual anchors, audit search, manuscript transcoding and so on, greatly improving the production capacity and level of media. Driven by the tide of technology, artificial intelligence is also respected and adopted by more and more media and enterprises, which makes the way and mode of media content presentation tends to be diversified. Both traditional media and emerging media should make full use of artificial intelligence and other technologies, innovate media forms, optimize the whole process of media production and broadcasting, create media production and communication platform, establish accurate communication system, enhance users' viewing experience, and transform and upgrade traditional media to new mainstream media with world-class level.

5. Analysis on the status of the strategy layout of 5G+4K/8K+AI
The strategic layout of 5G+4K/8K+AI of the main station will make good use of the technological change to adjust the structure and content of media content production, while providing a more interactive user experience, it also occupies an important advantage in the market competition. In the live broadcast before the appliance of 5G + 4K, the live broadcast needs various wiring and optical fiber, which is easily limited by the site conditions, and the screen and lens can only be fixed or moved in a small range [3]. In the 5G era, the photographer carries a portable 5G backpack(Figure 5). Through 5G high-quality signal return and 5G base station switching, the high-speed 4K signal can be kept stable, and the viewing users can choose more views independently. This strategy has greater competitiveness and long-term development potential in the live broadcast of sports events and large-scale events. High level celebrations need Ultra HD live broadcasting, and the network must achieve "ultra-high speed", "ultra-high stability" and "ultra-low delay". Only 5G network with high-speed, large bandwidth and low delay can achieve this goal. CCTV's strategy of developing 5G+4K will gain significantly advantages in live broadcasting.

5G 4K transmission backpack

![Figure 5. The 5G 4K transmission backpack developed by CCTV and Huawei.](image)

In the era of community 3.0 based on Internet of things technology, the community aims to connect everything, and is not only the aggregation of people, but also the carrier of information, services, content and goods[4]. The combination of 5G+4K live broadcast with cinemas and VR broadens the width and relevance of the product portfolio. The main platform is not limited to the application of technology in these two aspects, but also tries more possibilities, such as realizing intelligent connection, material connection, augmented reality, and mixed reality, realizing the choice of "1+1>2" and creating greater commercial value through 5G.

"Central video" breaks the single release mode of traditional video app, focusing on short video, taking into account long video and mobile live broadcast. It can realize 4K screen viewing and bring
new audio-visual effects to terminal users. It also uses AI technology to intelligently recommend personalized services for users, greatly improving the user's experience of watching TV. "Central video" will integrate the high-quality resources and social media creativity accumulated by the head office for a long time, guide the mainstream values, and become the connector between the mainstream media and the majority of users.

6. Conclusion
The application of 5G+4K in the live broadcast of the National Day parade is the beginning of the integration of media and technology. How promoting the development of deep integration of media still needs to be explored. The production and dissemination of modern media content relies more on technology. The 5G+4K strategic layout of the main station starts from four aspects: integrated broadcasting, ultra-high-definition television, mobile new media and artificial intelligence, and brings revolutionary changes to the production[5]. This strategy explores how to realize video communication, video survival and video transformation, breaks through the difficulties in the fields of capital, content, audience, technology and new media, and gives birth to the great potential of mainstream media. The strategic layout of CCTV has created a new era of media convergence. It not only points out the future development plan of CCTV, but also points out the direction for the advancement and development of radio and television and media industry. At the same time, it will also widely affect our lives in the near future.

References
[1] Bo Peng, Xiangming Zhong 2020 China J The Second Half of Internet: Challenges and Governance of Public Opinion Field in 5G Era New Media and Society 2020(02) 03-16
[2] Marshall McLuhan 2011 Understanding Media: The Extensions of Man (Nanjing: Yilin Press)
[3] Jijian Zhou, Chunyuan Jiang 2019 China J Applying "8K + 5G" Technology to Innovate the National Day Parade Reporting Media Review 2019(10) 13-15
[4] Yingbing Peng, Yuanyuan Shan 2016 China J Opportunities and Challenges of Traditional Media to Develop Social Economy Young Journalists 15 9-11
[5] Wenbo Jiang 2019 China J Application Practice of 5G + 4K + AI in TV Media Advanced Television Engineering 2019(06) 22-32