Design of a New Generation Terminal Platform for Radio Film and Television NGB

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Abstract. The Next Generation Broadcasting Network (NGB) is not only a revolution in radio and television technology, but also an overall innovation in concept and technology. With its emergence, radio and television will achieve full service and high quality in the future carrier network, and it can also realize the convergence of radio and television networks under different technical systems. This paper described that Xuzhou Radio and Television Company has seized the opportunity of the next generation radio and television network NGB construction in the whole country, to blaze new trails and innovates, and continuously designed a new generation terminal platform according to its own actual characteristics.

1. Introduction
Radio Film and Television does not agree with the construction level of the front-end system as the only index to measure the development level of radio and television network, and it came to the conclusion of "digitalization of radio and television network, success of interaction". Without the support of the terminal, how can the network reform of radio and television achieve the integration of three networks? How to do business? How to meet the increasing cultural needs of the broad masses of people? How to face the fierce competition of other telecom operators? Almost all value-added services, including interactive video-on-demand, broadband Internet access, MPLS VPN dedicated IP phone and streaming media, rely on the support of terminal platforms. When it comes to technology and innovation, some radio and television show examples of how to build a new generation of radio and television front-end platforms in full swing, but we are curious that how do they receive message with no terminal platform? The terminal platform also has the technical gold content, also wants the innovation. However, if the radio and television network does not mention the terminal, as a user, they will assume that digital television is cable television, radio and television network is only radio and television, not the network. Since the radio and television NGB model will be so prominent, it shows the importance of the terminal platform, as well as the great efforts of radio and television NGB model in the terminal platform. Through the innovative construction of terminal platform, radio and television NGB model brings vitality to radio and television, and makes outstanding contribution to meet the spirit and material culture needs of the broad masses of people. The construction of the new generation terminal platform of radio and television NGB model meets the design requirements with high availability, extensibility, security and manageability, etc. The network culture has produced the omnidirectional influence to the human survival way and the social evolution. Because of the characteristics of internet communication, such as universality, transnationality, complexity and vulnerability to aggression, ensuring national information security, cultural security and social stability become the top priority. At the same time, it can meet the requirements of reliability, scalability, network interconnection, communication protocol, network management and security, multicast and so on. The new generation terminal platform for radio and television NGB model is responsible for docking with EPG information publishing and advertising.
system, IP based multicast service system, set-top box network management system, broadband authentication system, data broadcasting system, stock system, digital television system, etc. At the same time, it docks many departments of radio and television, which involves docking with the front end platform of the transmission department of the radio and television network center, the new business docking of the business development department, the terminal troubleshooting of the operation and maintenance department, and the network design and transformation of the general industrial office and the engineering department.

In addition, there are several important technological innovations in the radio and television NGB model, including the flexible and diverse EPG information publishing and advertising system after digitization; Authentication and allocation of IP addresses and multicast technology unlike traditional PPPoEN, DHCP and terminal.

Radio and TV NGB model lays a solid foundation for the development of new businesses. Based on DHCP, the RFC OPTION technology is creatively used. Meanwhile, it has the privilege level bidirectional network failure on-site inspection system. It connects to the notebook computer in the terminal, sets the policy route, and adopts the CMTS head end and Cisco CNR system to complete the spot investigation of the bidirectional network fault. Secondly, in the new video mode, the radio and television NGB model considers the transmission of 3D TV in the cable digital TV system in advance, which are the shining innovation points of Xuzhou radio and television system.

2. Analysis and Design for EPG Information Publishing and Advertising system
The NGB model of Xuzhou Radio and Television has set up a multi-functional advertising carrier platform for digital TV, such as channel switching, stock system, fast program list and so on, that is, the new generation of information publishing and advertising system. The new Generation Information Publishing and Advertising system of Xuzhou Radio and TV NGB Model supports the location and timing of video selection, and this function provides support for the future implementation of flexible information publishing and advertising strategy for Xuzhou Radio and Television NGB model.

3. Analysis and Design for Terminal Authentication and Multicast Technology
With the development of interactive services, it provides a platform for the open services with the network. The characteristics of coupling with the network can make the service independent of the specific access technology, which is conducive to the independent development of the service itself. The NGB model of Xuzhou Radio and Television is based on the support of IP technology in the terminal system. The new generation STB has some advantages of IPTV STB, for example virtual LAN, which can support IGMP protocol. We can group the set-top box and its CPE as a member of the multicast and view the set-top box in the multicast table.

4. Network management analysis for set-top box
In November 2017, Xuzhou Radio and Television Company finished the docking of network system with Nanjing Tug Company. This system adopts standard SNMP protocol, which supports network management based on CLI mode of telnet, so it can monitor and analyze bidirectional set-top box in real time. Therefore, the NGB model of Xuzhou Radio and Television can evaluate the network more effectively, discover the problems in the network in time, and improve the quality of network service.

5. 3D HDTV system
Viewers can see 3D video through cable television, but 3D video service has a large amount of data, which has a high requirement for bandwidth saving, so the efficiency of data compression directly affects the market application of 3D video service. The premise of compression is that the audience's perception of 3D visual quality cannot be seriously affected.
5.1. Basic Architecture of 3D Network Video System

The sense of depth of the human eye, namely the sense of three-dimensional, is formed by the parallax of the left and right eyes, and then processed by the brain, so the most basic 3D network video architecture is a system based on two angles of view in multiple perspectives. The left and right video is finally displayed after decoding. However, with the development of 3D technology, the architecture changes gradually.

5.2. Compatibility of 3D and traditional 2D TV in CATV

At present, most of the video in CATV is 2D, and the terminal only supports 2D, so when using 3D, we must consider the support of 2D. At present, most of the video in CATV is 2D, and the terminal only supports 2D, so when using 3D, we must consider the support of 2D. However, the system is different when using different compression coding methods. After the 2D video is recorded independently, it is converted into two kinds of views, then encoded separately, transmitted through digital television network, decoded and displayed separately at the terminal.

5.3. Compression Modeling and Compression Standards

There are many standardised compression standards, but different compression standards have different techniques and different coding models. See Table 1 for compression modeling and coding. Good models have high compressibility, but generally more will be more complex.

| model                   | coded message                      | example                  |
|-------------------------|------------------------------------|--------------------------|
| pixel                   | Pixel color                        | pulse code modulation    |
| Statistical dependent   | Error of prediction or             | Transform coding         |
| pixel                   | transformation                      |                          |
| Moving block            | Motion vector and prediction error  | Block-based coding, such as H.261, MPEG1 |
| excitable area          | Shape, motion, and regional color  | Area-based coding, such as H.263, MPEG4, AVS |
| target                  | Shape, motion, and object color    | Coding based on motion model |
| mask                    | Activity unit                      | MPEG4                    |
| Sound image object      | Object description                 | MPEG7                    |

At present, the coding efficiency of several models based on motion area, object, face and sound image description is relatively high, but H.263, MPEG4, AVS, MPEG4 is commonly used for storage and playback, while H.264, AVS are generally used for streaming media playback. A mature and stable coding standard should be adopted in China's CATV system, and H.264 or AVS can be adopted. Currently, H.264 support devices are widely used, and AVS is a coding standard of China's own intellectual property rights, but the manufacturers supporting this standard are not widely used in H.264.

5.4. Mainstream coding methods

5.4.1. Traditional stereo video coding. Traditional stereo video coding achieves stereo effect by simulating the function of human eyes and obtaining the depth information of video. After the video information is orthogonalized and the color is corrected, the correlation of the two visual angle images is used to predict the time series. However, the difference is not only caused by different perspectives, so there is a lot of space for optimization in the design of time series prediction algorithms.

5.4.2. Depth based video coding. In depth information system, 3D video is composed of color image and depth image, and the stereoscopic image is reassembled at the receiving end. The depth information system has higher efficiency and better 2D compatibility than the traditional stereo video coding, but it
increases the complexity of the sender and receiver systems, so it is necessary to re-synthesize video on the basis of 2D.

5.4.3. Multi-view video coding. Multi-view video coding is based on multi-camera shooting from multiple angles. There is a great correlation between different visual angles, and a more efficient video sequence is used to code. The control algorithm of video sequence is more complex, and the bandwidth efficiency is only increased by 70% compared with 2D, although the efficiency is obviously lower than the depth coding of video, the biggest advantage of multi-view video coding is that it does not require hardware modification.

5.4.4. Multi-view Video coding based on depth Information. The multi-view video coding based on depth information should have multiple different angles of depth information, and the color and depth of multiple perspectives must be encoded. Multi-view video coding can achieve higher quality visual experience, but it also requires high hardware. The quality of output view depends on the number of encoded video and the quality of view difference. At present, the multi-view video coding technology is not mature, mainly facing two kinds of technical challenges: the depth estimation and view composition.

5.5. 3D video transmission technology

The basic idea of 3D video transmission technology is to assign higher bit rate to the important information coding in 3D video, which is formed on the basis of channel coding of traditional 2D digital TV. In order to consider the quality of service in 3D, CATV should give higher priority to transmission during transmission, so it is necessary to carry out the key protection. For example, the priority of color image should be higher than that of depth information in the process of deep video transmission to ensure that users with poor channel conditions can watch the video.

In the early stage of construction, considering market conditions and cost factors, radio and television companies should not adopt the coding method of depth information, because the terminal set-top box of 2D digital TV can be used directly, on the basis of traditional 2D cable digital TV system, 3D multi-view video coding equipment can be deployed, quadrature amplitude modulation can be carried out and transmitted through cable television network. Finally, the 3D display device is connected to realize 3D viewing.

5.6. Problems in 3D CATV system

Several problems need to be solved in the 3D digital cable TV system: what the video transmission mode should be determined, what standard should be used to deploy the compression format, what kind of resolution should be adopted and so on.

The set-top box needs new hardware support for 1080P. In order to realize 2D and 3D content judgment and automatic switching and playing, the set-top box must also support the compatibility between 3D and 2D for the superposition of graphic and text formats.

3D technology is relatively new, we should consider the degree of consumer acceptance. But in the early stage, cable operators should train consumers as early as possible, so that we can take the lead in three networks convergence. Radio and TV companies and other industries should form a complete industry chain to promote each other, and continue to develop and improve 3D video.

Radio and television companies should bring a new visual experience to consumers and make 3D compatible with traditional 2D TV in cable television, to realize the use of 3D technology in existing CATV system by selecting better modeling and compression method and source coding method.

6. EPON Management system of Xuzhou Radio and TV NGB Model

EPON Integrated Network Node Management system of Xuzhou Radio and Television can uniformly manage all EPON network devices in Xuzhou. Through a network management server, the radio and television company can unify the management of Xuzhou EPON online equipment, and greatly reduce
the construction cost of network management. The EPON management system provides a graphical topology display that is consistent with the actual device appearance and can reflect the current topology of the system and the current state of the equipment in real time. It also provides a centralized and fast method for monitoring and maintenance of the equipment. EPON Integrated Network Node Management system of Xuzhou Radio and Television has the function of automatic device discovery, which can quickly discover the specified equipment in the network and improve the efficiency of network deployment. EPON integrated network node management system adopts SNMP trap technology. By setting up trap, related devices will notify the manager actively, rather than wait for the manager to poll again. In addition, the system uses multi-protocol template for device discovery, which can discover devices according to device type and network address, automatically join the discovered device into subnet according to network address, and synchronize the newly discovered device type automatically.

7. Conclusion
It has been proved that the model of Xuzhou Radio and Television NGB construction can meet the needs of the new service of Xuzhou Radio and Television in the future part of the time, at the same time, it improves the network transmission quality and realizes the multi-service. The interfacing of different network subsystems provides a powerful service and technical support platform for the future development of Xuzhou Radio and Television.

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