The Network Architecture and Schematization of Henan Electric Power Video-conference System

Li Yongjie

Information & Telecommunication company of state grid Henan electric power corporation
Zhengzhou, China
E-mail: liyongjie20032000@163.com

Xu Dongjiao

Information & Telecommunication company of state grid Henan electric power corporation
Zhengzhou, China
E-mail: xudongjiao_1234@sina.com

Chang Ying

Information & Telecommunication company of state grid Henan electric power corporation
Zhengzhou, China
E-mail: rainwave@126.com

Wang Xin

Information & Telecommunication company of state grid Henan electric power corporation
Zhengzhou, China
E-mail: wangxin_njtu@126.com

Abstract—The Henan electric power video conference system is very important for the corporation's work such as manufacturing management, emergency training and so on. This paper mainly introduces the network architecture and schematization of Henan electric power video conference system, and it also analyzes the network characteristic. The gradual perfection and stability operation of Henan electric power video conference system will provide strong support to the corporation's operation and the improvement of work efficiency.

Keywords- Video conference; Network Architecture; Multi Control Unit; Conference Terminal

I. INTRODUCTION

The video conference system can realize the real-time transmission of video and voice with different place, and it became widely using official automation way in many businesses [1-5]. The Henan electric power (HNEP) video conference system is an important communication professional network to guarantee the corporation's operation , emergency training and so on and it is also an important guarantee to transmit video and voice between State Grid Corporation, the province, the city and the county and convey the related work deployment.

With the continual strengthen of intensive management and efforts to build the "One Powerful & Three Excellent " enterprise in the State Grid Corporation. The company increasingly demands for the video conference systems, growing enlarge the frequency of meetings and the coverage of video-conference [6-11]. HNEP video conference systems dedicated to construct "SG vision" meeting platform, internationalize, network, self-help and standardized, it achieves many meetings demand for unified management, sharing resources, interconnection at all levels, organizational capacity, and satisfies the requires for administration, emergency response, training, consultation. Which promote the efficiency of the work and operations in the company.

II. THE ARCHITECTURE OF HENAN ELECTRIC POWER VIDEO CONFERENCE SYSTEM

A. The video conferencing system network

1) Backbone networks provide a bandwidth guarantee: The backbone communication networks has completed in 2011, it includes Huawei and ECI backbone network, the capacity is 2.5G-10G bit/s. all cities and province company have double transmission channels, which meet the high-bandwidth requirements in all kinds of information.

2) Integrated data networks provide network infrastructure. HNEP has built information WAN, covering the whole province, the network has core layer, convergence layer and access layer. The bandwidth between the cores is 2 x 622M bit/s. The bandwidth between core layer and convergence layer is 622M bit/s. Province, Luoyang (Spare), Xinxiang and Luohe are core layers, other cities are convergence layers. The convergence layers connect the core layer through two networks of the backbone transmission. Every counties and cities has built comprehensive data network. The network speed rates for n x 2M-100M, due to the limit of network conditions.

B. The present situation of video conference network in HNEP

HNEP, 18 cities power companies and 107 countries power companies, has connected in video conference network. It builds the network through the private communication line and date network, which fully cover all the cities and counties. The city company alternates each other in two ways, the county company currently uses only private or independent network channel access.

The private communication line system: 2M private line, private Ethernet transport corridors;

Data network system: VPN or intranet network.

Independent network channel: n x 2M Ethernet bridge or P2P connection using individual fiber.

At present, private communication and VPN channels are using between the province and city company. The VPN channel mostly connected between city and county company, partly connected through n x 2M private communication line.

C. The network architecture of HNEP video conference system

HNEP video conference system is mainly contained in administrative, emergency, integrated and flexible video conference systems.

1) Introduction of HNEP video conference system

HNEP administrative television system consists of three sets of video conferencing systems: State Grid high definition (HD) video conference system, the provincial HD video conference system and provincial standard video conference system. HNEP has built administrative HD video conference system between three levels - province, city and county until 2012, which keep synchronous with State Grid through Huawei MCU VP8660 and HD terminal VP9039S. It transfers HD picture, improves the frame quality and stability. Currently, HNEP can attend the State Grid HD video conference, hold the HD or standard video conference between province, city and county.

HNEP emergency video conference system can connect State Grid emergency video conference system, provincial emergency standard video conference system and provincial HD video conference system. HNEP emergency video conference system has been reformed for HD video conference system in August, 2013, which keeps synchronization with State Grid's Huawei equipment by Huawei MCU VP8660 and VP9039S HD terminal. In the provincial emergency command & controlling, HNEP can attend the compound conferences which be convened by State Grid emergency HD video conference system.

Integrated video conference system was extended by State Grid in 2013, mainly using Huawei VP9660 MCU and RP200 integrated high-end video conferencing terminal network, to meet the demand for self-help or flexible small scale meeting, and can convent provincial - city - county meeting.

Flexible video conference system as an independent system or extension for video system, is deployed in information intranet. It ranges desktop computer terminal from the conference room computer, small range of professional conferences, to hold private desktop conference in small range. It takes form of dispersed distribution of servers. All terminator can connect in the conference by intranet, to achieve the demand for the small scale meeting between State Grid and provincial company, provincial company and company departments, provincial - city - County level.

2) HNEP video conference system network architecture

The network architecture of Henan electric power video conference system is shown in Figure 1. It fully takes appoint in the construction stability of the system, using the tree structure, two-stage MCU. In the MCU joints, HNEP is key point, the city company is secondary point, the county company's conference terminal connects with city company MCU joint through internet switch. The administrative television systems, emergency video conference system are equipped the primary and spare system. The administrative television primary and spare systems share the private MSTP channel, 2 x 12M communication. The administrative spare video conference systems and emergency spare video conference system share the 2 x 20M information on MPLS/VPN channel.

In 2013, HNEP unified the network between administrative and emergency network, communication network and information data network, established the integrated network platform for administrative and emergency video conferences, according to State Grid IP address planning. From figure 1, it shows that, provincial administrative and emergency main & spare conferences terminal, two state grid integrated conference terminals and the main & spare Huawei VP8660 MCU respectively collected the private line of H3C S7506E-S three-layer core switch and data network of H3C S7506E-S three-layer core switch.

State grid integration MCUVP 9660 is duplex with data network and two H3C S7506E-S three-layer core switches in private network, which becomes redundant links. H3C S7506E-S three-layer core switch in data network and H3C S7506E-S three-layer core switch in private line interconnected upward state grid video CE1 and video CE2, accessing state grid video conference system, and interconnected down city core switch in data network and core switch in private network through provincial data network and MSTP private network respectively.

Administrative and emergency HD video conference has hardware MCU in HNEP and every city and county, originally formed independent MCU resources pool. In 2013, administrative and emergency HD video conference has been integrated, formed the present video conference network architecture, achieving full network interworking, unified administration and management to administrative and emergency MCU resources pool. The resources of MCU in administrative and emergency video conference have been shared.

In the network schema aspect, administrative HD video conference system has two channels: private line and data network, the private line of emergency and administrative HD video conference system shares the same physical chain, the emergency and administrative data network are independent for each other. During integration for the administrative and emergency video conference system, to fully use the network equipment of emergency and administrative HD video conference system, to use core three layers switch H3C S7506E-S equipment of original administrative and emergency video conference system, to respectively connect the original switch with the two core devices, so, the whole network is more clear, and the structure is more powerful.

Flexible video conference server double connect to the provincial company data network and private network core switch, through the provincial company video conference system, the information intranet firewall connected to the information intranet. In

security border dividing aspects, HNEP video conference system adapted the unified IP, completely independent network, for transverse, it included administrative HD video conference system, emergency video conference system, integration conference and flexible video conferencing system. For the longitudinal, it included province, city, county company and conference terminal in network, switch, sound video matrix, and recorded broadcast server and other applications. The State Grid flexible video conference system independently connected with Cisco 6509 in information intranet two core switches, and configured the policy for access and control, which only opened to conference IP addresses and operating ports, it could shut down completely when it didn't operate, in order to protect conference system running smoothly.
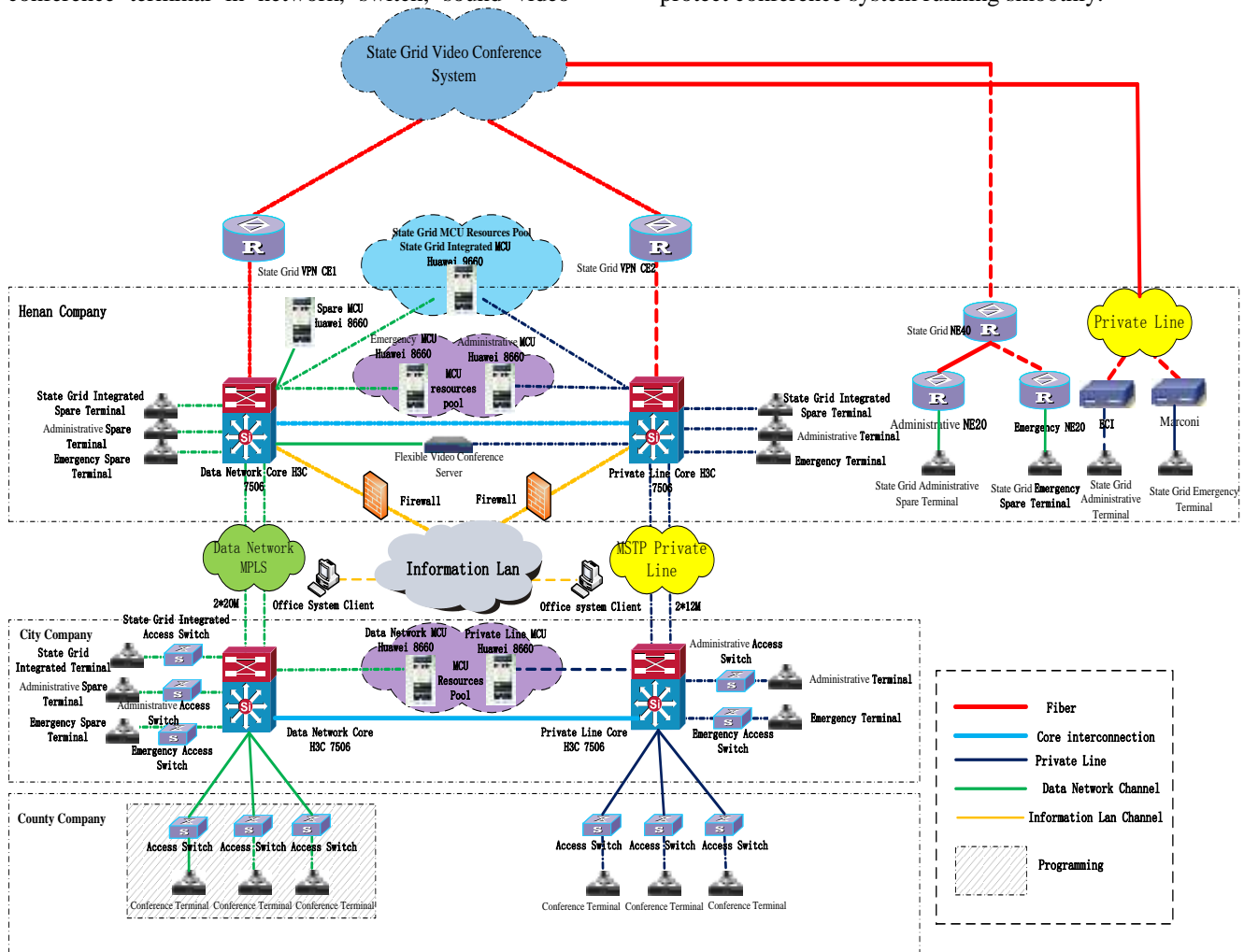

Figure 1 Henan electric power video conference system network architecture

3) State Grid administrative HD video conference system

Currently, HNEP and State Grid, Central China administrative and emergency HD video conference system only accessed with video terminal, in management on video conference system, the State Grid didn't allow provincial MCU devices to access, thus, the province company are using video conference terminal to connect with video conference MCU devices of Central China and State Grid Corporation. At present, Henan province has two video conference channels: Henan- Central China-State Grid, Henan- State Grid. HNEP can directly listen to State Grid Corporation conference video signal, and translate the sound and images to State Grid. When the city company watches the State Grid conference, through the back-to-back measure, using provincial video conference system to broadcast State Grid Corporation signal, the city company can take the same way to transfer the signal to county company.

At present, HNEP's state grid administrative and emergency HD video conference system equiped main and spare HD video conference terminal, the main terminal accessed regional grid company through E1 or MSTP private line, State Grid's video conference used private line, HNEP connected the headquarter in State Grid through Central China, the spare terminal connected the spare MCU in State Grid network through data network of the State Grid. State Grid video conference used network, Henan directly accessed headquarter, State Grid. Figure 2 is the connection diagram in state grid network channel HD video conference system.

HNEP's HD video conference system connection is showing in Figure 1. The state grid HD video conference system has two channels: the main and the spare – private line and data network. The state grid administrative and emergency HD video conference system connected Central

China Marconi optical transceiver through transmission network, and then accessed the main transmission network, it firstly connected two Huawei NE20 routers through network cable, and then, respectively connected Huawei NE40 through the equipment of state grid data network.
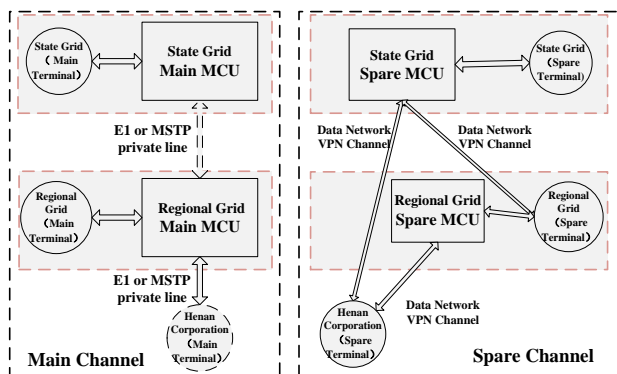

Figure 2 The connection diagram in state grid network channel HD video conference system

III. SUMMARY

From the above, we can see that HNEP's video conference system composed of administrative, emergency, integrated and flexible video conference systems. The network level is clear, and structure is sturdy. Flexible video conference systems have the ability to cooperate with network video conference system interoperability, realizing the combination between private line conference network and intranet data network, daily and emergency, combining fixed and mobile terminals. It not only has the capacity to hold large professional conference, and to meet needs to hold the conferences in the small scare and self-catering meeting, or many group meetings in the same time. With the further advance of "Three Integrate & Five Large-scale" in State Grid Corporation, the company could increasingly strengthen collectivization, the linkages between all levels could be closer, the exchanges in work could have become more frequent, which could put

forward higher requirements in video conference system. As gradual improving and stable operating, HNEP's video conference system is bound to provide strong support for the company and operating efficiency.

REFERENCES

[1] Zhou cheng, Feng Weidong, Zhou Zheng. "Audio and video quality evaluation system of video conference system." TV technology, vol.37.No.8. 2013. pp80-85.

[2] Sun Hai, Shi Minhui, Huang Ting. "Research on key technology of application of media in a video conference." Telecommunications Sciences, vol.,29.No.6,June. 2013. pp53-57.

[3] Dongtao Liu, CongXiao Bao, Xing Li, Xuan Zhang. "DV-Based Extensible Video Transport Terminal for Standard-Definition Video Conference." IPC 2007.pp 146-149.

[4] Yongxiang Zhao, Yong Liu, Changjia Chen, Jianyin Zhang. "Enabling P2P One-View Multiparty Video Conferencing." IEEE Trans. Parallel Distrib. Syst.vol. 25.No.1.2014.pp73-82.

[5] Mody, Mihir, Swami, Pramod, Shastry, Pavan. "Ultra-low latency video codec for video conferencing." 2014 IEEE International Conference on Electronics, Computing and Communication Technologies (IEEE CONECCT). Jan. 2014. pp6-7.

[6] Hua-Zhen Yao, Ya-Tao Jing. "The Design of Video-Conference Encryption System Based on H.264." 2010 International Conference on Multimedia Technology (ICMT). 2010 , pp 1 - 4.

[7] Moongoo Lee. "Implementation of stable video conference system." 2013 IEEE International Conference on Consumer Electronics (ICCE). 2013.pp442 - 445

[8] Yan Longchuan, Zhang Yinchang, Wen Tao. "Telepresence video conferencing technology research." Electric power informatization , vol.1.2012. pp 42-45.

[9] Jin Yan. "Construction and development of video conference system of State Grid Corporation of China." Power system communication. vol. 32.No.223. 2011. pp106-110.

[10] Sun Shuping. "Thought of State Grid Corporation of video conference system engineering construction." Power system communication.vol.27.No.168.2006. pp45-48.

[11] Wang Wenbin, Xiao Yujie, Long Ming. "Cloud-based mobile technology video emergency command system." TV technology, vol.37No.1. 2013. pp161-164.