Exploring Digital Video Service Solutions Based on New Media Technology (Postprint)

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Abstract

In the 21st century, human society has officially entered the information age, wherein video services have gradually emerged as the primary business form of modern communication services. Without video services, any new media platform would lose its vitality and find it difficult to achieve sustainable development in the media market. This article will commence with the fundamental aspects of new media technology and explore digital video service solutions from two perspectives—DVB-C/C2 and the Internet—aiming to provide additional support and reference for the development of digital video services.

Full Text

Preamble

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Abstract: In the 21st century, human society has officially entered the information age, and video services have gradually become the primary business form of modern communication services. Without video services, any new media platform would lose its vitality and struggle to achieve sustainable development in the media market. This article begins with an overview of new media technology and explores digital video service solutions from two perspectives: DVB-C/C2 and the Internet, aiming to provide additional support and reference for the development of digital video services.

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Introduction

In recent years, with the widespread adoption of communication and information technologies in people's lives and work, the integration of digital video encoding and new media technologies has become the mainstream paradigm for business development. Whether in personal communications, broadcast television, network mobile phones, or smart homes, digital video based on new media technology can be seen everywhere, bringing tremendous convenience to people's lives. However, faced with multi-network and multi-user scenarios, traditional digital video services can no longer meet practical demands and exhibit significant lag. Consequently, coordinating relationships among multiple networks and improving network bandwidth utilization have received widespread attention.

1. Overview of New Media Technology

New media refers to media forms that, built upon high technologies such as digital technology and mobile communication technology, connect through communication channels like the Internet and communication networks to terminals, enabling the transmission of massive amounts of media information. In real life, since new media technology is an integration of multiple technologies, it demonstrates advantages such as interactivity, immediacy, and personalization.

Currently, there are numerous common types of new media, such as mobile media, digital television, and IPTV. Mobile phones are no longer limited to voice calls and text messages; the emergence of various social software has endowed mobile media with digital video playback capabilities. Digital television has transformed from analog to digital mode, and through network renovation and upgrading, has added interactive on-demand functions to its original capabilities. High-definition video and 4K technologies are also in a stage of rapid development, offering broad market prospects. The new media industry constitutes the core of modern media development, especially in Europe and America, where the proportion of new media industries far exceeds that of traditional media. By 2015, the world had entered the era of all-digital entertainment and information. Simultaneously, users can create works using new media technology, upload them to network platforms, share them with friends, or engage in commercial activities.

2.1 DVB-C/C2 Architecture-Based Video Service Solution

As new media technology continues to evolve, users increasingly prefer high-quality video programs. Therefore, supporting high-definition video has become

an inevitable choice for video services. Currently, digital broadcast television is primarily designed and implemented according to the DVB-C/C2 standard of the European Broadcasting Union [1]. Based on this foundation, this article focuses on two access methods: PON+EOC and LAN. The DVB architecture is built upon MPEG-2, uses coaxial cable as the transmission medium, possesses strong anti-interference capabilities, and delivers higher signal strength. In practical applications, optimization of digital video services can be achieved through scrambling, encoding, and other means. Figure 1 [Figure 1: see original paper] illustrates the DVB modulation and demodulation block diagram.

2.1.1 System Architecture

The high-definition interactive service architecture designed in this paper can be refined into a three-tier structure consisting of front-end, network, and terminal components. For the high-definition interactive system, the corresponding functions of each part include the business management system, media asset management system, and storage distribution system. These subsystems cooperate and coordinate with each other, performing their respective duties to execute commands. Among them, the business management system serves as the core of the interactive system, providing business management interfaces to the system and maintaining good communication relationships with various subsystems to enhance the effectiveness of system business processing. Media asset management is a comprehensive management system whose functions extend beyond the interactive platform to include the collection, editing, and review of original programs, thereby providing users with high-quality video services.

2.1.2 System Scale

The goal is to construct an interactive platform that is "manageable and operable," provides good user experience, supports large-scale commercial operation, and integrates organically with digital television, broadband data, and other systems to form a unified high-definition interactive business platform.

From a scale perspective, the storage capacity reaches 25,000 hours of content plus massive information web pages, with initial planning for 3,000 on-demand programs. From a network planning viewpoint, the transmission network capable of carrying high-definition interactive services can be divided into backbone and access networks. The former primarily utilizes hybrid transmission via fiber, SDH, and OTN networks, featuring standard interfaces and redundant protection. The latter employs HFC+IP and HFC to carry downstream data flows for services, thereby meeting network application requirements. For terminals, user requirements must be fully considered, allowing for differentiation into three levels: high-definition interactive, full-service, and multimedia gateway.

2.1.3 Security Design

To provide quality services to users throughout the province after completion, the system must maintain high stability and reliability. Therefore, the system should be constructed as a telecom-grade operational platform with reliability maintained above 99.5%. Consequently, during design, we must fully consider security factors and employ robust security measures and strategies to strengthen system protection. For instance, integrating multiple network devices to form multi-routing connections can prevent platform failures caused by link failures.

2.1.4 Platform Networking

Generally, provincial high-definition interactive platforms involve multiple aspects including system deployment, network transmission, and authentication. During specific deployment, comprehensive consideration must be given to factors such as user volume throughout the province, adopting targeted strategies. For example, during the initial construction phase when user volume is low and the provincial backbone network can meet user demands across the province, a centralized deployment approach may be considered.

2.1.5 Construction Planning

According to the construction plan, the initial objective is to complete front-end system construction and pilot deployment. The front-end of the interactive platform should be deployed in the core machine room of the provincial company. For regions with good network capacity, branch companies can be responsible for local-level construction. Regarding the centralized networking approach adopted this time, edge nodes can be considered for deployment on servers and IPQAM devices to facilitate rapid user access and enhance user experience. Additionally, edge nodes can be located in branch companies, preferably selecting machine rooms that can cover entire cities to provide hot storage and portal services.

2.2 Internet Technology-Integrated Video Solution

In the 1990s, Internet technology developed and proliferated rapidly, and by the early 21st century, with the support of smartphones, Internet technology had entered a new stage of development. Based on this, advancements in source coding technology and network bandwidth have provided tremendous support for the promotion and application of video services. Initially, digital video transmission based on Internet technology faced significant difficulties and could not meet high-quality video transmission requirements [2]. However, with updates in video compression coding technology, network video has expanded in a scaled manner, capable of meeting standard-definition digital video signal transmission.

2.2.1 Key Technologies

The video solution integrating Internet technology primarily involves several key technologies. Multicast technology, for instance, can transmit different information to multiple receivers. Even when multiple users watch the same video program simultaneously, as long as users are within the multicast group, excessive network bandwidth resources will not be occupied. CDN technology, or Content Delivery Network, can avoid network segments that affect transmission speed and stability during application, achieving the goal of fast and stable transmission. Additionally, support from high-performance network switching equipment is required, expanding from initial tens of Kbps to 10 Mbps according to increasing user volume, thereby ensuring video service transmission quality.

2.2.2 Design Goals and Principles

Based on specific application requirements, the goal is to build a platform that integrates different content services and value-added services with various storage distribution systems and access networks. The design of the new media integrated broadcast control platform primarily focuses on constructing a platform that integrates multiple contents and can face different users [3]. To ensure scientific platform design, the following principles should be adhered to in practice: First, the practicality principle—system design emphasizes practicality, genuinely considering user needs to make various functional operations convenient and meet multi-level user requirements. Second, the advancement principle—adopting mainstream technologies such as broadcasting and networking to enhance system modernity. Third, the reliability principle—the system and business must possess strong fault tolerance functions, taking into account current environmental application requirements while maintaining the ability to resist external environmental interference.

2.2.3 System Planning

System planning can be approached from three aspects: First, business-centric—providing basic video services for telecom IPTV and other users while accommodating content production functions. Second, business expansion-focused—expanding advertising, value-added, and other businesses on top of existing functions to achieve unified user payment. Third, multi-service integration—building a system based on mobile phones, the Internet, and other foundations to meet personalized user needs [4].

2.2.4 Deployment Scheme

During deployment, two different routers can be set up as switching devices in a master-slave configuration. Due to the platform's high security requirements, during system design, to effectively prevent hacker attacks and destruction, two firewalls are actively introduced for protection. During system operation, once security risks are detected, they can be promptly blocked outside the system,

creating a good and harmonious technical application environment for users, thereby optimizing video services.

3. Conclusion

In summary, video services have become a hotspot in various media applications today, and building a manageable and controllable business system on the platform is crucial. However, video service system construction is a long-term, systematic process, where video coding technology and network technology are key to implementing the business platform. In practice, relying solely on video coding technology and network technology cannot achieve platform control and management. Therefore, it is essential to actively integrate various new technologies and business forms to construct an advanced and scientific business system. This paper discusses video service system construction schemes from two aspects: broadcasting DVB and Internet technology. With continuous scientific and technological development, research on digital video service solutions must be further deepened to continuously optimize system performance and promote the long-term development of video services.

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Note: Figure translations are in progress. See original paper for figures.