Research on Studio System Security: A Preliminary Study of Langfang Radio and Television Station Studio Postprint

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Abstract

As China' s broadcast technology continues to develop, television studio systems in China are increasingly emphasizing the construction of system security. In the new era, a path suitable for television studio security system construction has been gradually forged through continuous innovation in working philosophies and the development of comprehensive television studio systems. Safeguarding the security of television studio systems in the digital age has become a critical factor determining the operations of television stations. This paper first introduces the technologies and environments related to all-media and television studio systems, then elaborates on the functional composition and characteristics of television studio systems, and further explores the construction principles of television studio system security and strategies for security system development, aiming to provide theoretical support for security construction efforts for television studio systems in the new era.

Full Text

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Abstract

With the continuous development of broadcast technology in China, television station studio systems are increasingly prioritizing security infrastructure. In this new era, the industry has gradually forged a viable path for studio security system construction, continuously innovating operational concepts to build robust television studio systems. Ensuring the security of digital-age television studio systems has become a critical determinant of broadcasting success. This paper first introduces the technologies and environments associated with All

Media and television studio systems, then elaborates on the functional composition and characteristics of television studio systems, and further explores the construction principles and strategies for building secure studio systems, aiming to provide theoretical guidance for studio security construction in the new era.

Introduction

Studio system security construction is paramount in television operations and a key factor affecting program broadcasting in China. Studio system security carries higher error potential compared to other operational aspects, drawing increasing attention to security issues. Serving as the "brain" of television operations, any security vulnerability in the studio system can cause irreparable damage to program production and broadcasting. Therefore, it is essential to develop a suitable path for studio security system construction, continuously innovate work concepts, and build comprehensive television studio systems that safeguard digital-age operations.

1.1 Definition of All Media

All Media integrates multiple media forms for unified presentation, encompassing not only traditional television and radio but also emerging internet-based media—representing the complete spectrum of contemporary Chinese media forms. The quality of traditional media development and dissemination largely determines overall news reporting quality, necessitating deeper understanding of All Media concepts and targeted promotion of All Media development according to fundamental requirements in the new era [1]. In recent years, as All Media concepts have permeated traditional television, stations have prioritized infrastructure development, particularly for the studio system—the "brain" of programming. During system construction, security has become absolutely critical. Virtual screen display technology, large-screen technology, and automatic tracking technology have significantly enhanced traditional program production capabilities. For security performance, 4G technology and online-offline interactive software have improved program engagement and interactivity, diversifying program types while rapidly establishing channels for audience interaction and maximizing studio system security during these interactions.

1.2 Technical Components of Television Studio Systems

The system involves two key technical components: First, establishing a comprehensive digital program production platform effectively integrates television program resources and ensures optimal equipment utilization. Second, Tally controllers, DCU & UMD control units enable tracking of all sources and destinations, displaying dynamic Tally and video system-wide on video walls.

1.3 Technical Environment of Television Studio Systems

The technical environment comprises three critical elements: First, all input sources connect to switcher and matrix inputs via patch panels, with five dedicated paths enabling seamless communication between switchers and matrices for arbitrary signal routing. Second, a management platform deployment provides real-time backup functionality between switchers and matrices—if the switcher fails, the matrix can perform hard cuts in real time, with backup subtitle switching ensuring normal subtitle operation during transitions. Third, backup broadcast servers and delay units effectively reduce live broadcast failures, while a 4G return system enhances real-time capabilities.

2. Functional Composition and Characteristics of Television Studio Systems

[Figure 1: see original paper] shows the master control equipment diagram for the television studio system.

2.1 Full Digital Processing Capability

A fundamental studio requirement is high image quality and reliable systems. To fully satisfy this, video signals must undergo high-definition digital processing. The primary equipment is designed and developed to accommodate program production performance and functionality, establishing a solid foundation for program creation.

2.3 System Selection and Configuration

To enhance studio system security quality, equipment selection should prioritize modular architecture to ensure primary structures and devices meet combinatorial requirements.

First, **cameras** are fundamental studio equipment. After extensive evaluation and budget consideration, the cost-effective SONY high-definition studio camera E85 was selected to meet basic shooting requirements. The system employs a replaceable camera design for convenient upgrades—for instance, the 2580 model used in equipment racks [Figure 2: see original paper] provides superior shooting results.

Second, **peripheral systems** should strictly follow security system construction requirements. The selected AXON 32$×$32 matrix and peripheral video processing cards support network-based centralized control, integrating all signal sources to maximize operational convenience.

Third, **switcher equipment** should be selected based on security system construction and operational simplicity. The SONY MVS-3000 switcher was chosen for its powerful functionality.

Fourth, the **OSEE multiviewer system** paired with video wall displays enables flexible presentation and deployment of arbitrary signals through the matrix, offering high-performance control at excellent cost efficiency.

Fifth, the **audio system** employs two-stage mixing: primary mixing for live studio sound capture and secondary mixing for program recording and broadcast transmission. Other peripherals such as synchronization, intercom, external signal access, transmission, lighting, and large-screen equipment are not detailed in this paper.

Sixth, the **system integrates advanced network technology**, enabling special configuration of management systems, switches, matrices, and cameras under integrated equipment frameworks. These systems allow full computer-based monitoring and operation while facilitating data storage and adjustment.

During operation, physical performance causes significant heat generation, necessitating adequate cooling equipment to maintain stable operations. Diverse signals and interference from other platforms can disrupt program signal transmission during production, requiring signal shielding devices to prevent external equipment and signals from affecting normal transmission and ensuring studio system security and stability.

3. Security Construction Strategies for Studio Systems

3.1 Comprehensive Application of All Media

The emergence of All Media presents both a significant opportunity and challenge for traditional television studio system security. First, comprehensive and correct understanding of All Media connotations enables television operations to adapt to All Media era requirements, facilitating effective implementation in studio system security construction [3].

3.2 Perfecting Studio System Equipment

The system is equipped with a SONY 3000 switcher and AXON matrix with peripherals, where the switcher handles signal routing. This enables matrix switching of both DH and DS signals, simplifying the system. The plug-in architecture allows the main CPU to achieve low power consumption, space-saving processing, and easy maintenance.

3.3 Selecting High-Performance Equipment

Equipment selection for television studio systems must be rational, balancing cost considerations with security requirements. To improve studio system security construction efficiency, equipment selection demands careful attention to safety and efficiency, focusing on verification of model numbers and details to ensure selected equipment meets final operational requirements and satisfies relevant security construction standards [4].

3.4 Establishing Fully Digital Processing Systems

As China's information All Media era arrives, fully digital studio system processing has become an inevitable trend. Compared to traditional systems, digital processing systems offer advantages of compact size, fast processing speed, and high efficiency. Connecting cameras, switchers, and audio-video systems via digital signals prevents potential errors in each workflow segment. Additionally, full digitalization eliminates security risks from manual operations, enhancing system security.

Conclusion

In summary, as China' s media sector continues achieving new developments, television studio system security faces higher requirements. Only through continuous equipment debugging and improvement, strengthened security construction, and guaranteed normal operations can television stations deliver superior news programs—an imperative demand on television media as living standards continue to improve.

References

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