Postprint: Research on Production and Broadcasting System Data Centers

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Abstract

Currently, the broadcast network and production network in our station's data center share databases, storage arrays, core switches, and other resources. This network architecture presents numerous potential security risks, such as security risks from database sharing, switch failures that could cause simultaneous downtime of both broadcast and production networks, and lack of maintenance windows. In view of this, this paper reviews our station's new production-broadcast system and enumerates the existing issues, with a view to further improvement.

Full Text

Abstract

Currently, our station's data center shares databases, storage arrays, and core switches between broadcast and production networks. This architecture poses significant security risks, including database mixing vulnerabilities, potential simultaneous network failures, and lack of maintenance windows. This paper analyzes our new broadcast-production system architecture and identifies existing issues for further improvement.

1. Hardware Architecture

The new system achieves physical isolation between the internet, broadcast network, and production network, substantially enhancing data and network security. The entire infrastructure is partitioned into three distinct LANs: production, broadcast, and office internet, with data flow between them controlled by network gates (data diodes). The production network incorporates a media asset system for long-term program storage, while the broadcast network ensures normal program transmission across all channels. Production stations are standard office computers deployed in the office internet zone; by installing

xstudio client software, they can interact unidirectionally with the production LAN through the network gate, though they cannot access the broadcast zone.

All critical servers—including domain controllers, web servers, database servers, and broadcast servers—utilize Windows Server's built-in failover cluster software for hot standby configuration. Broadcast servers implement service node redundancy through failover clustering and incorporate database authentication servers to ensure high availability for the onair broadcast software's database access.

2. Software Architecture

The integrated system is built upon service-oriented software, functionally organized into three layers: the business layer (encompassing production and management operations), the data interaction layer (ESB and EMB), and the infrastructure layer (underlying hardware and software). WebService enables interoperability across the SOA architecture, with the production system, media asset system, and broadcast system all implementing business logic through WebService interfaces.

The production network zone operates within a high-security, isolated environment, with external service access provided through a network gate (NG200). This zone comprises storage systems, servers, SOA-based application services (X1AppServer, EMB+ESB), emergency scheduling, and backend management. All user terminals, including emergency scheduling and monitoring management stations, must adhere to customized domain policies and implement necessary authentication and identification measures. Even technical administrators require comprehensive security authentication for restricted system access, with all operations logged for security auditing.

The broadcast system interacts with production and media asset systems via the ESB+EMB service bus, which includes OnAirAppServer and Infomedia Media Server (IMS). The scheduling subsystem encompasses iScheduler, AdScheduler, SendAs, news editing, and media asset publishing, while the broadcast subsystem comprises the main playback module OnAir, CartPlayer, LogEditor (which can operate independently for automatic/manual playlist editing), AirRecorder for live recording, and SegueEditor for transition effects. The management subsystem handles resource management, permission control, service monitoring, and security auditing. Both broadcast software and manual scheduling units invoke unified WebService interfaces for program template loading and centralized permission control.

The ESB+EMB bus serves as the media data exchange hub, providing resource registration, data migration, format conversion, and task scheduling. The AIR5Backup scheduling service, a broadcast-specific EMB, distributes broadcast materials and playlists from the main server to various backup devices—such as backup servers, primary/backup broadcast stations, and comprehensive backup systems—ensuring broadcast playlist redundancy. Broadcast stations

can switch data sources in real time without program interruption. Based on the TCP/IP protocol suite, the system employs streaming server technology to deliver audio/video data to clients via UDP/RTP protocols. Through support for WSDL and UDDI standards, the architecture achieves standardized, bus-based interface services with loose coupling rather than point-to-point tight coupling.

The system is not constrained by LAN boundaries, enabling access from internal networks, office networks, or even the internet. The internal and external networks employ Infomedia's hardware-based data ferrying network gate, allowing external users transparent access (practically indistinguishable from internal network usage).

Overall, this upgrade enhances system security and operational flexibility. Production stations no longer require dedicated editing workstations—installing client software on office computers suffices. Physical isolation between production and broadcast networks prevents faults in one network from affecting the other. Broadcast and production applications no longer share databases or storage. The addition of telephone interview recording services and scheduled recording functionality enables data sharing on xstudio. The ESB service bus architecture facilitates seamless communication between heterogeneous services and platforms, improving extensibility.

However, several issues persist in practice. The onair broadcast software exhibits instability, with frequent crashes in the automatic recording function. Client installation remains complex without proper packaging, requiring component-by-component manual installation. No mobile device clients or apps have been developed. While unified authentication has been implemented for broadcast and production operations, it has not been extended to all business services. The platform has not achieved physical resource virtualization; servers and networks remain traditionally deployed without virtualization, resulting in low hardware utilization and increased operational workload.

In summary, while the system construction has achieved certain progress, neither the software nor hardware platform has realized true cloudification, leaving considerable distance from achieving full media convergence goals.

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