My Perspective on the Integrated Media Development of Ningde People's Radio Station (Postprint)

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Abstract

For radio stations, particularly those at the small and medium-sized city/county level, media convergence should begin with underlying technical integration—specifically, applying "cloud" technology to traditional collection, editing, and broadcasting methods to transcend the formal and spatial limitations of conventional review processes, integrating elements such as images and videos to enhance news timeliness and diversity, before subsequently pursuing integration and breakthroughs in content operations and programming.

Full Text

My Views on the Construction of Converged Media at Ningde People's Radio Station

Lin Hua

1. Media Convergence Environment and Current Status

To promote the integrated development of traditional and emerging media, we must follow the laws of news communication and emerging media development, strengthen internet thinking, and uphold the complementary advantages and integrated growth of traditional and emerging media. This integration must be supported by advanced technology and rooted in content construction, achieving deep convergence across content, channels, platforms, operations, and management. We must adapt to the trends of mobile, social, and video-based internet communication, grasp current technological developments, reconstruct the content collection and production workflow, upgrade editorial systems, and establish a unified omnimedia collection, editing, and broadcasting platform to realize "single collection, multiple generation, and diversified distribution."

The IaaS layer provides users with low-level services that offer near-direct access to hardware resources. Our station employs two host servers utilizing virtualization technology to support PaaS and SaaS layer services and applications. Each server is configured with two Intel Xeon 10-core E5-2630 V3 CPUs, 128GB of RAM, two 600GB 10k SAS hard drives in RAID1 configuration, and 8G single-port fiber optic modules to ensure system reliability and performance for all virtualized business platforms. When conditions permit, higher-performance servers can be configured for greater performance and scalability. For storage, given that it must accommodate not only traditional radio audio but also new media elements such as images and videos, as well as some media asset storage operations, we have configured a highly scalable, high-speed storage system based on our station's actual needs.

2. Media Convergence System Design Approach

Ningde Radio Station began constructing its media convergence platform in December 2016. Following the *Technical White Paper on Radio Station Converged Media Platform Construction* and our station's actual circumstances, we prioritized the IaaS infrastructure layer, then built the PaaS platform layer on this foundation, and finally selectively constructed the SaaS application layer. For radio stations, especially small and medium-sized municipal and county-level stations, media convergence should first complete the underlying technical integration by applying "cloud" technology to traditional collection, editing, and broadcasting methods. This breaks through the formal and spatial limitations of traditional collection, editing, and review processes, incorporates elements such as images and video, highlights news timeliness and diversity, and then seeks breakthroughs in content operations and program integration.

The construction of a broadcast converged media platform is a long-term, complex, and innovative process. Building a cloud-based broadcast omnimedia convergence platform cannot be accomplished overnight; it should be oriented toward all station operations, constructed centrally, and implemented in phases. Our design principle is to first transform the hardware resources of information systems into resource pools, enabling quantification of computing and storage resources, and then allocate them reasonably through a cloud computing self-service system before selectively constructing converged business system modules in phases.

3.1.1 Cloud Technology Architecture Design

For the IaaS infrastructure layer, we built a foundational support platform and data exchange platform hardware infrastructure. Our storage system implements a hybrid FC/IP SAN architecture within the same hardware platform while supporting NAS access. It is configured with eight 8Gb FC host interfaces and four 1Gb iSCSI host interfaces, achieving transfer rates up to 8Gbps, fully meeting the business storage needs of the converged media cloud platform.

The system includes ten 1.2TB 10k RPM SAS hard drives and supports expansion to $ $256 drives with a modular architecture that enables fully online, non-disruptive capacity expansion, satisfying both initial storage requirements and future scaling needs. Because the storage capacity is expandable, the initial design capacity is 3–10 times that of traditional radio station storage.

3.1.2 Cloud Computing Platform Design

For the PaaS platform layer construction and the selection and phased implementation of specific SaaS media convergence services, the PaaS layer integrates application services, workflow processes, and algorithm services into a cloud computing platform service, providing an operational and solution service platform. The SaaS application layer primarily handles converged media content production, management, and distribution, including content acquisition and aggregation, business production and publishing, and mobile reporting business systems. Based on our station's practical applications, we selected appropriate modules and used virtualization technology to uniformly allocate resources to each platform. We constructed the PaaS layer's user login management system, converged media content management and storage, audio/video transcoding and archiving, and the SaaS layer's cloud editing platform, media asset management, and multi-channel publishing system modules.

The PaaS layer serves as the data management center for the entire platform, centrally storing and managing all application business data (media data and metadata) while providing efficient data retrieval and media access services and automated lifecycle management, enabling centralized, unified management, storage, and utilization of data with different applications, characteristics, and types.

The SaaS layer's cloud editing module implements material collection, script writing, manuscript review, and manuscript circulation and sharing. It can organize, aggregate, classify, and subscribe to various news leads for users, presenting these leads on web pages and pushing desired content to the production network. It enables various client terminals to write, edit, and review manuscripts. After program production is completed, automatic archiving occurs. Programs can then be shared among multiple users within the station and between different stations. The mobile reporting function enables rapid news collection, editing, and review, allowing journalists to collect and edit photos, audio, video, and text materials on-site through the mobile reporting system and send them back for review in real time. Editors can classify and review materials and manuscripts based on news timeliness and importance, ensuring both real-time news delivery and pushing multimedia materials to new media platforms for re-creation, thereby ensuring news completeness and diversity. This represents a key construction module in our SaaS layer.

The multi-channel publishing system module pushes information to various new media platforms. After materials undergo collection, editing, and review in the

cloud editing platform, they can be pushed to platforms such as Weibo, WeChat, mobile clients, web radio, and WeChat official accounts. It also enables comprehensive interaction with live programs, allowing editors/hosts to select relevant content in real time from the multimedia cloud editing system, quickly publish after editing, or simultaneously send program-related activities and information with the program, enabling users to directly participate in activities or voting. The media asset module collects and 沉淀 high-quality programs and resources, serving as backup data for the entire station and as resources for exchanging quality programs with other stations to enrich program sources and even generate revenue.

4. Experiences and Practices from Construction

During construction, Ningde Radio Station referenced relevant documents including the *Regulations on the Security Protection of Computer Information Systems of the People's Republic of China*, the *Radio and Television Security Broadcasting Management Regulations* (SARFT Order No. 62), the *Basic Requirements for Classified Protection of Radio and Television Related Information Systems*, and the *Guidelines for Classified Protection of Radio and Television Related Information Systems*, combining them with our actual situation to summarize practical and feasible experiences and practices.

Virtualizing Hardware Resources into Unified Resource Pools for Allocation. During construction, we discovered that the converged media system contained over a dozen business modules of varying sizes. Following traditional approaches, each module would require a separate server, resulting in severe resource waste and increased maintenance and management costs. During construction, we clustered multiple servers and used virtualization technology to reallocate resources from the server cluster to support each business module, fully utilizing resources. When business expands and additional modules are needed, no new hardware investment is required—resources can simply be reallocated from the pool. When business modules are updated or become obsolete, resources can be conveniently recovered, providing great flexibility. After clustering our two high-performance servers and applying virtualization technology, we virtualized six servers to support business systems, significantly saving construction costs.

Core Server Reliability Approach. We adopted a high-availability dual-server HA (high-availability cluster) system with a fully redundant modular storage system, configured with RAID1 on single servers combined with heartbeat technology. This approach offers two advantages: first, single server hard drive failures can be replaced promptly; second, if a single server fails, the HA system can automatically migrate business systems to another server within a short time through heartbeat technology, achieving uninterrupted business operation and ensuring normal system operation. This practice not only enables non-disruptive maintenance of server system disks but also fully realizes online hot standby for core servers.

Boundary Isolation and Data Protection Practices. The security of media convergence systems differs significantly from traditional broadcast security. Traditional broadcast transmission links generally use physical isolation. Except for some audio archiving requiring boundary devices for isolated import, security can be ensured by protecting transmission equipment from physical damage. However, media convergence systems must connect to the public internet cloud, requiring relevant security devices at the boundary between the private cloud and public internet. Specifically, we installed a network gate between the broadcast audio network and the converged media platform, using the gate's ferry mechanism to allow text, audio, and other resources to enter the broadcast system. There are two methods for broadcasting audio: first, ferrying through the network gate to designated workstations where relevant personnel review before scheduling or broadcasting—this method is relatively secure; second, opening protocols on broadcast workstations to allow audio ferried through the network gate to be directly scheduled into playlists, making the entire process convenient and efficient—this method ensures convenience. Considering broadcast security, we selected the first approach.

As a traditional media outlet, although radio has become one of the fastest-growing media due to automobile 普及 in recent years, it also faces significant crises. On one hand, the traditional advertising model has created a revenue ceiling effect; on the other hand, internet influence has caused massive listener loss. Even radio's strongest fortress—car radios—faces challenges from intelligent vehicle terminals. Once cheap internet-enabled intelligent vehicle terminals become widespread, they will bring catastrophic consequences to traditional radio, as real-time broadcasting will face challenges from thousands of audio apps, and radio's monopoly on automotive entertainment will cease to exist. Therefore, for radio to maintain its position in future media competition, it must leverage its own advantages and characteristics while using the internet to develop itself, integrating traditional broadcasting with mobile internet to develop a new form of broadcast new media business that combines both strengths, making previously impossible achievements possible and delivering previously undeliverable information to the right users.

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