Application Analysis of Cloud Video Platform in Xinhua News Agency Latin America Regional Bureau (Postprint)

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Abstract

This paper first describes and analyzes the definition and layered architecture of cloud video platforms, comparing their differences and advantages with traditional video conferencing systems; second, it introduces the deployment plan of the cloud video platform at Xinhua News Agency' s Latin American regional bureau, the technical protocols employed to ensure platform security and reliability, as well as the platform' s practical operational application scenarios; third, it presents the economic benefits achieved through platform usage and the improvements in daily work capabilities.

Full Text

Preamble

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Application Analysis of Cloud Video Platform at Xinhua News Agency' s Latin America Bureau

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Abstract: This paper first describes and analyzes the definition and layered architecture of cloud video platforms, comparing their differences and advantages over traditional video conferencing systems. Second, it introduces the deployment scheme of the cloud video platform at Xinhua News Agency' s Latin America Bureau, including the technical protocols employed to ensure platform security and reliability, as well as practical application scenarios. Third, it presents the economic benefits achieved and improvements in daily operational capabilities resulting from platform adoption.

Keywords: cloud computing; cloud video platform; video conferencing system; cross-border collaboration; full-scenario coverage

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In 2020, to fulfill the requirement of "achieving major breakthroughs in international communication capacity building," Xinhua News Agency' s Latin America Bureau (hereinafter referred to as "the Bureau") began deploying and applying a cloud video platform in April, significantly expanding the scope of its video communication services. Building on this new technological application, the Bureau, serving as a hub, creatively established a new cross-border collaboration model —the Spanish-language video joint conference—together with the International Department. For the first time, this model brought multiple departments—including the Reference News Department, Audio-Video Department, New Media Center, and Xinhua News Network—as well as several domestic bureaus onto the same technical platform with various Latin American bureaus, breaking down previous temporal and spatial barriers and enabling a new reporting command and coordination mechanism featuring "joint planning," "joint acquisition," resource complementarity, and synchronized resonance.

The organic integration of this new technology platform and work model not only helped the Bureau produce a series of high-quality reports but also made outstanding contributions to daily meetings, Party building activities, marketing management, and business training. While enhancing communication efficiency between various departments and overseas bureaus, it has also delivered significant economic and management benefits.

1. Introduction to Cloud Video Platform

Video conferencing systems can be categorized into hardware-based and software-based types. Traditional hardware video conferencing employs an embedded architecture for long-distance video communication, using DSP+ integrated software to implement audio-video processing, network communication, and various conference functions. This approach offers clear advantages in performance, security, and reliability, making it the preferred choice for most mid-to-high-end video conferencing solutions in the market. However, its shortcomings are also prominent: complex operation and configuration, requirement for dedicated network deployment, high hardware costs, single application scenarios limited to conference rooms, and the need for dedicated IT personnel maintenance with high associated costs.

For the Bureau, these limitations hindered further expansion of video confer-

encing services to lower-level bureaus lacking professional technical staff. Before adopting the cloud video conferencing system, the Bureau had deployed a hardware-based video conferencing system connecting the Latin America Bureau to Beijing Headquarters via an international network dedicated line years earlier. This system, centered on a single MCU hardware unit, bound specialized hardware with video services, making it impossible to continuously upgrade software and hardware. Moreover, it could only be used for connections between the Bureau's conference room and the Headquarters, failing to meet the Bureau's evolving meeting requirements.

Cloud video systems represent the typical embodiment of software-based video conferencing. They are video streaming services centered on cloud computing. Online service providers offer cloud computing, enabling users to obtain professional video services at low cost and high efficiency, thereby easily conducting online meeting businesses. In the video conferencing workflow, video streams collected from client ends are encoded and uploaded in specific formats. To accommodate different network and terminal playback environments, these video encodings transmitted to cloud servers are transcoded according to various protocols, distributed via Content Delivery Network (CDN), and finally decoded on terminal devices for playback.

Since the U.S. National Institute of Standards and Technology (NIST) proposed its cloud computing definition in 2009, it has gained widespread industry recognition. The cloud video conferencing system deployed by the Bureau is built upon a cloud computing virtual machine architecture that complies with this definition. NIST' s definition proposes a three-layer architecture comprising IaaS (Infrastructure as a Service), PaaS (Platform as a Service), and SaaS (Software as a Service), allowing users to select appropriate layers for customization, further development, or direct product application based on their technical capabilities and requirements. Large ultra-scale users with strong technical capabilities can make 底层 hardware-related development requests in IaaS according to performance or other special needs, while users with general performance requirements can conduct personalized development using middleware at the PaaS layer or directly use productized services at the SaaS layer [1].

The system is based on virtualization technology, implementing streaming media interaction, business instruction sets, and audio-video processing on cloud servers. Deployment methods are diversified, supporting not only public cloud access with strong openness but also private cloud deployment with higher security, or hybrid deployment combining both approaches. The layered model and multiple cloud deployment methods satisfy user requirements with greatly enhanced flexibility. Cloud video platforms are built on the Internet, making them particularly suitable for large institutions with global deployment. Cloud video platforms deployed at various locations worldwide have uniformly managed software operation modules that convert videos from any website or application into formats compatible with web and mobile devices. From upper-layer system management to 底层 architecture, they automatically analyze resource

usage and network status at each node in real time, intelligently generating corresponding scheduling strategies while ensuring application quality. Another advantage of cloud video platforms is their rental-by-period model with small upfront investment, support for the vast majority of smart devices, simple and quick access methods, and no need for dedicated maintenance, resulting in low post-operation costs.

IaaS/PaaS/SaaS Definitions [2]

2.1 Application Scheme

To conduct platform deployment, the technical office surveyed and compiled information on the Bureau' s meeting requirements, meeting scales, conference rooms, and subordinate bureaus.

2.1.1 Cloud Platform Business Architecture

Through cloud platform deployment, functional reorganization was performed on conference businesses—including daily work meetings, reporting coordination, Party building activities, marketing management, and business training—through software-based, service-based, and microservices-based approaches. Cloud services and containers were utilized to allocate, manage, schedule, and monitor computing network resources.

2.1.2 Multi-Protocol Compatibility Application

The cloud platform' s convergence service module can achieve interoperability with traditional video conferencing systems. The platform provides API/SDK development interfaces for video capability output and business embedding, avoiding information silos and enabling seamless integration with users' other systems and business processes, allowing video applications to be embedded into every business system and process node. Through these interfaces, the Bureau' s existing traditional hardware video conferencing systems—connecting Beijing Headquarters to the Latin America Bureau via international network dedicated lines and connecting domestic bureaus to Beijing Headquarters via domestic network dedicated lines—were functionally and data-wise integrated. This expanded the scope of Latin American video communication services to subordinate bureaus while enabling parallel cross-border collaboration among domestic bureaus, Beijing Headquarters, the Latin America Bureau, and Latin American regional bureaus, allowing continued utilization of the original system' s expensive hardware equipment.

2.1.3 Full-Scenario Coverage

In addition to traditional conference room terminals accessing the platform via fixed lines, the platform provides extensive terminal access methods to achieve

full-scenario video application coverage. The platform offers App clients installed on mobile devices such as smartphones, tablets, and PCs, covering Windows, Android, and iOS systems. By installing unified cross-platform terminal software, the integration and networking of the Bureau' s conference rooms, personal PC clients, and mobile smart terminals are realized, enabling flexible application of multi-location and multi-access scenarios including main conference rooms, reporting frontlines, home-based personal desktop sharing, and mobile office work.

2.1.4 Full-Network Access

The platform supports meeting access anytime and anywhere via the Internet, international/domestic dedicated networks, mobile 3G/4G/5G, satellite, microwave, and Public Switched Telephone Network (PSTN).

To strengthen video conference management at the Bureau, ensure standardized and orderly use of the cloud platform, maintain safe and stable operation, and guarantee quality and effectiveness, all IT technical personnel in the Bureau' s technical office received technical support training for all-network users across various bureaus, and an instant communication contact mechanism for "cloud platform management" was established to promptly handle user feedback.

2.1.5 Operations Management

Infrastructure as a Service (IaaS): (1) Rents hardware such as processors, memory, and storage arrays over the Internet; (2) Provides virtualization services such as virtual machines, firewalls, backup systems, or load balancers; (3) Provides essential cloud computing services and infrastructure for building other services.

Platform as a Service (PaaS): Provides users with a developable middleware platform, including databases, middleware, development tools, business intelligence services, and other applications. This service is ideal for developers who wish to focus solely on implementing and managing their applications. Through hardware and foundational software resources, it improves efficiency and allows focus on areas of interest.

Software as a Service (SaaS): Service providers directly offer users productized software or accept software hosting at this layer without requiring users to maintain the software system. The cloud video conferencing platform uniformly operates related software and functions, such as audio-video transcoding, storage, data downloading, transmission, meeting scheduling, screen capture sharing, whiteboard functions, etc., enabling various users to conveniently access these functions anytime.

2.2 Reliability Analysis

The Bureau' s subordinate bureaus are spread across various Latin American countries, each with significantly different network environments due to varying national economic development levels. Ensuring reliable transmission of video information from all terminals is a critical component. To address this, the platform provides highly reliable resource clusters and media processing technologies.

The platform employs a cloud resource pool deployment architecture with intelligent resource scheduling, intelligently selecting routes based on geography and business requirements. In multi-active states, resources in the pool automatically back up each other. Whether a single point or an entire group fails, other resources in the pool automatically achieve rapid business migration without meeting interruption, with audio and video returning to normal within three seconds without manual intervention, ensuring overall platform reliability.

Audio Reliability: Both the cloud video platform and cloud video terminals support the Opus audio encoding protocol, which meets most IP network-based audio compression needs—from ultra-low bit-rate narrowband speech to high-fidelity full-band stereo music—providing excellent sound quality reproduction characteristics to ensure optimal sound effects and auditory experience. Additionally, when interfacing and interoperating with other protocols, it also supports G.711 and G.722 encoding standards, demonstrating good compatibility while maintaining technological advancement.

Video Reliability: Video encoding employs SVC (Scalable Video Coding) based on H.264 High Profile. Adaptive call rates accommodate various network accesses, with automatic bandwidth detection from 64K to 8Mbps, dynamically adjusting video SVC layers in real time according to bandwidth changes to ensure optimal video experience even in Cuba with the poorest network conditions [3].

Network Adaptability: On one hand, since available network bandwidth changes dynamically, audio-video encoding needs to support dynamic bit-rate adjustment. On the other hand, due to network packet loss, packet loss compensation and error correction mechanisms are required, necessitating intelligent dynamic anti-packet-loss algorithms to ensure the integrity and continuity of audio-video data.

2.3 Security Assurance

The Bureau' s internal meetings, Party building activities, and other content have certain security and confidentiality requirements. The platform provides high security levels at multiple layers—including network, system, user data, and applications—to ensure users can safely use various business functions provided by the system.

2.3.1 End-to-End Security Encryption

The cloud video platform does not perform encoding/decoding but only handles intelligent routing. Audio-video encryption/decryption and encoding/decoding are performed on the video terminal side, achieving end-to-end encryption.

2.3.2 Business Data Security

Server-client data communication employs SSL-certified encrypted communication, enabling clients to verify server identity while preventing video process data leakage or tampering. The interaction scheme between clients and servers has passed professional security testing and certification, effectively preventing intrusion by outsiders and hacker data acquisition [4].

2.3.3 Media Data Security

All real-time signaling and media during communication employ AES encryption algorithms. Encryption keys are negotiated in real time and randomly generated for each session, avoiding static storage to prevent theft risks.

2.3.4 User Data Security

User account information and passwords only exist in server memory during registration and login. Data stored in databases employs standard algorithms that can effectively resist various network hacking attempts, attacks, and destruction.

[Figure 1: see original paper] Cloud Video Platform Application Architecture Diagram of the Bureau

3. Benefits of Cloud Video Platform Usage

Currently, the platform has been fully deployed and used in the Latin America Bureau and its subordinate bureaus. From its operation between April and November 2020, it has achieved good economic and management benefits.

3.1 Economic Benefits

Compared with traditional video conferencing projects requiring hundreds of thousands to millions in construction investment, the Bureau' s use of the cloud video platform only requires an annual cloud service rental fee of 4,500 RMB paid to the platform provider. Participants can install corresponding client software on their own terminals to access meetings in real time. Cameras, large screens, audio systems, multi-point wireless microphones, and conference control equipment used in the main venue all come from existing equipment. The platform' s greatest advantages are its low cost, strong openness, and low maintenance expenses.

3.2 Reporting Coordination and Management Benefits

Leveraging the cloud video platform, the Bureau, various headquarters departments, and domestic and overseas bureaus have cooperated closely around core topics such as Chinese-Spanish bilingual photo news "Xi Jinping Says," the third China International Import Expo, China-Latin America anti-pandemic cooperation, promotion of China's anti-pandemic experience, extension of the "Belt and Road" initiative to Latin America, and China-Latin America cultural exchanges. This has effectively integrated previously isolated reporting resources through joint planning and synchronized progress, producing a batch of influential high-quality reports.

Since the outbreak of the pandemic in Latin America, the Bureau' s daily reporting work has not only remained unaffected but has actually seen improved organizational efficiency through the use of the cloud video platform. By the end of November 2020, the Bureau had used the platform to host 32 Spanish-language video joint conferences, 7 Latin American regional business meetings, 13 Party building training meetings, and 5 technical marketing management meetings, with 605 instances of cloud video terminal participation and over 1,000 total participants.

The application of the cloud video platform has effectively broadened the scope and channels of information transmission, enhanced the Bureau' s emergency command and editorial dispatch capabilities, and brought profound changes to its meeting models. Various cross-bureau and cross-border collaboration mechanisms, work deployments, special meetings, and Party building training can all be conducted through the cloud platform, providing strong technical support for the Bureau to further transform its management methods and enhance management capabilities. Simultaneously, by eliminating location constraints, travel requirements have been substantially reduced, lowering time and space costs, optimizing financial expenditure structure, and achieving dual improvements in economic and management benefits.

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