ChinaRxiv

AI translation · View original & related papers at
chinarxiv.org/items/chinaxiv-202310.01497

System Design and Architecture Construction for Xinhua News Agency' s Global Video Intelligent Media Platform (Postprint)

Authors: Xiaohua Lu

Date: 2023-10-08T00:00:00+00:00

Abstract

The core objective in constructing a media convergence technology platform should be to enhance systemic competitiveness. The Global Video Intelligent Media Platform of Xinhua News Agency, grounded in the global operations of Xinhua' s video business, deep media convergence, mobile-first strategy, and the requirement to establish temporary editorial offices anytime and anywhere, integrates acquisition, production, distribution, and data analysis into a unified whole. It comprehensively reshapes the audio-visual production service workflow, unifies the underlying layers of all systems related to audio-visual production, and constructs a technical and business system for audio-visual content production services. The platform achieves six major objectives—large-scale workflow, large-scale system, data flow, mobility, convenience, collaboration, and scalability—and realizes six major innovations, thereby enhancing the reporting capacity, dissemination power, and influence of Xinhua' s video business, and strengthening systemic competitiveness.

Full Text

Preamble

System Design and Architecture of Xinhua News Agency' s Global Video Intelligent Media Platform

Abstract: The core objective of building a media convergence technology platform should be to enhance systemic competitiveness. Xinhua News Agency' s Global Video Intelligent Media Platform, designed to support Xinhua' s global video operations, deep media convergence, mobile-first strategy, and the need to establish temporary editorial offices anywhere, integrates acquisition, production, distribution, and data analysis into a unified whole. By completely

reshaping the audio-visual production service workflow and connecting all underlying systems related to audio-visual production, the platform has constructed a comprehensive technical and operational system for audio-visual content production and services. This achievement realizes six major objectives—large-scale workflow, large-scale system, data flow, mobility, convenience, and synergy—along with six key innovations, thereby strengthening Xinhua' s video reporting capacity, dissemination power, and influence while enhancing systemic competitiveness.

Keywords: intelligent media; system integration; systemic competitiveness; process reengineering; data

1. Design Basis: Adapting to Global Operations and Enhancing Systemic Competitiveness

Competitiveness is a comprehensive capability that evolves with and manifests through competition. A media organization or enterprise may lead in individual competitive areas, but systematic confrontation and competition have become the dominant form of competition in modern society. In the economic sphere, corporate competitiveness depends not only on innovation capability but also on the ability to implement innovative outcomes and the integrated control of supply and sales systems. The so-called ecosystem competition in the mobile internet domain is essentially a contest of system construction and utilization effectiveness—a form of systematic competition. Compared with traditional competitiveness, effective integration and system construction that creates systemic aggregation can more efficiently concentrate media resources and production factors, more effectively unleash the potential and vitality of the system, and generate more comprehensive and powerful systemic competitiveness.

Systemic competitiveness represents a comprehensive competitive advantage based on the aggregation of technical systems, institutional arrangements, media resources, and production factors into an operational system. It is a multi-element, multi-dimensional collaborative operation based on systemic operational efficiency and a sustainable comprehensive competitive advantage. Objectively, two foundations support systemic competitiveness: first, building a media convergence platform based on IT networks, big data processing and analysis, video processing and transmission, and cloud computing technologies; second, constructing an operational system that can effectively leverage the platform' s functions and scalability through institutional arrangements, training development, and systematic management. Both are indispensable. Technology platform construction divorced from system building and systemic competitiveness enhancement often remains limited to simple equipment addition and large-screen work environments, potentially perpetuating old habits that create information silos and hindering the formation of systemic aggregation and competitiveness. Conversely, system building detached from media convergence

technology platform construction and utilization would be ineffective under current competitive conditions.

Within media organizations or technology markets, technology, systems, equipment, and R&D capabilities often exist in a fragmented state. Each media organization has its particularities and, driven by competitiveness needs, may prioritize different problems, objectives, and special pursuits. No ready-made technical system can directly support the workflow reengineering of a specific media organization' s editorial process. This requires media leaders and technology system builders to deeply understand media evolution trends and deep convergence requirements, comprehend the demands that content production systems and modern dissemination systems place on technical systems, and maintain clear process thinking, systems thinking, and systematic thinking. It is not simply about proposing technical system requirements based on existing business processes but rather establishing key requirements and metrics for technical system construction at the intersection of present and future business transformation.

Xinhua' s Video Intelligent Media Platform, decided upon by Xinhua' s Party Group and organized by the Audio-Video Department as the responsible entity with technical personnel from the Technical Bureau forming a joint project team, was implemented under the leadership of the Audio-Video Department Director. Serving as both a practitioner and manager, I had the opportunity to apply my scholarly research and thinking in practice while implementing Xinhua' s HD transformation project and constructing the Global Video Intelligent Media Platform. In my dual capacity as Audio-Video Department Director and project leader, I was compelled to function like a chief architect and chief engineer, holding weekly meetings with subsystem engineers and countless special sessions to solve cross-domain problems involving business process arrangements and system architecture. Through this process, we achieved full workflow integration and incorporated all systems into a unified system, thereby moving toward systemic aggregation.

The platform' s major requirements involved creating the large-scale workflow and supporting technical system needed for a converged operational system through process reengineering. This large technical system must 贯穿 (run through) the entire process of acquisition, transmission, content production, distribution, and user services. Existing technical systems used by professional video production institutions were often built as multiple small systems under historical constraints to meet the needs of different production stages. These small systems often lacked direct connectivity, requiring manual upload and download to bridge information silos. Business processes supported by multiple small technical systems were relatively inefficient, with upload/download speeds and manual processing time determining content processing efficiency and timeliness. Therefore, process optimization meant process reengineering. This large technical system could 贯穿 (run through) the entire process, so we connected the HD system primarily serving acquisition and production with an-

other internet-based video distribution system that I also led, creating a large system to support the large workflow. This new large technical system became a subsystem of Xinhua' s all-media acquisition, editing, and distribution platform.

Based on this concept and positioning, building Xinhua' s Global Intelligent Media Platform meant optimizing processes through reengineering. A technical system' s most important aspect is precisely its "soft" components—the construction of large systems and their integration with subsystems, the automatic accumulation of content data, quantitative data, and behavioral data to support the construction of a converged operational system. Our goal was to eliminate "tape-running," information silos, and manual upload/download processes that affected overall system efficiency. By building a large system, we eliminated all routine manual upload/download positions in the business process, enabling automatic signal, video file, and data flow between systems according to workflow, procedures, and instructions. This approach eliminated previously existing information silos and objectively reengineered and optimized processes.

---

2. Construction Principles: Achieving Six Goals by Connecting System Foundations

The construction of the Video Intelligent Media Platform had to improve resource utilization efficiency, dissemination efficiency, and operational efficiency. It needed to break down information silos formed by traditional media technology construction and build a full-process, full-system, integrated open platform. The platform had to achieve six major goals:

2.1 Large-Scale Workflow: Optimizing Processes Through Reengineering

The Video Intelligent Media Platform, based on Xinhua' s global video business deployment, global acquisition, global editing and distribution, and global feed services—that is, the needs of global operations—comprehensively considered deep media convergence, mobile-first strategy, and the need to establish temporary editorial offices anytime, anywhere. It constructed a complete workflow from user demand awareness through acquisition, content production, and user services, connecting all underlying systems related to audio-visual production, sharing data, distributing signals, delivering products, and feeding back status. By building a global video intelligent media platform that integrates acquisition, production, distribution, and data analysis, it completely reshaped the audio-visual production service process and constructed a technical and business system for audio-visual content production and services. This effectively supported converged operations and innovation, drove transformation of business and service models, and enabled Xinhua' s video business to operate efficiently in HD, data-driven, and convenient modes globally, achieving systemic

aggregation of Xinhua' s audio-visual production system and forming systemic competitiveness.

The core objective of Video Intelligent Media Platform construction was to aggregate all media resources and production factors related to Xinhua' s video business, form systemic aggregation, and enhance systemic competitiveness. Simultaneously, the video technology platform had to interconnect with all of Xinhua' s existing and newly built technical systems, making the resources, factors, functions, and capabilities aggregated on this platform organic components of Xinhua as a whole and important parts of a higher-level system, thereby forming stronger systemic competitiveness for Xinhua.

2.2 Large-Scale System: Connecting All Related Systems

The technical system or higher-level platform needed to build a converged operational system should be a large system, not merely a content editing platform. Large workflows require using relevant functions from multiple technical systems for support, many of which already exist and must continue to be used. Although we could connect and build the two technical projects we organized into a large system supporting acquisition, processing, distribution, and services, this still couldn' t meet all business requirements or support the goal of building a media convergence operational system. Therefore, my approach was to first require the joint project team to strengthen communication with contractors, deepen design, and completely connect the studio and non-linear editing sections they separately designed. Second, during the detailed design and construction phase, we added an internet-thinking-based audio-visual production system management platform and connected all new and old systems related to audio-visual production business services.

Connecting the underlying layers of all systems is a difficult leap. The systems under construction and existing systems involve multiple contractors, various hardware devices, and diverse original design concepts, with some even showing "generational gaps" that reflect different eras of technical routes and thinking. Quite a few systems were never designed by hardware manufacturers or system designers to meet this underlying connectivity requirement. To connect with the audio-visual production system management platform, the joint project team had to consult repeatedly with relevant manufacturers' technical personnel to develop unified interface specifications, redesign interfaces between relevant systems and the audio-visual system management platform, reset relevant rules, and restandardize data formats.

2.3 Data Flow: Automatic Accumulation, Automatic Aggregation, and Real-time Sharing

Building a large technical system that 贯穿 (runs through) acquisition, transmission, content production, content distribution, and user services requires not only controlled automatic flow of signal streams and file streams according to

workflow, procedures, and instructions but, more importantly, automatic flow of data streams to achieve automatic accumulation, automatic aggregation, and real-time sharing of data. Connecting the underlying layers of all new and old systems not only enables sharing of signal and file streams to realize large workflows but, more crucially, connects with the audio-visual production system management platform to achieve automatic aggregation and sharing of data streams.

At the first joint project team meeting for the HD project on May 30, 2016, I explicitly proposed the goal of achieving automatic accumulation, automatic aggregation, and real-time sharing of data. Subsequently, the implementation of data flow throughout the entire process and all systems became our important pursuit and key challenge. In my view, connectivity of signal streams is the contractor' s core competency, but this project' s focus was data flow acquisition and connectivity, with specific goals like automatic accumulation and automatic aggregation presenting major difficulties.

2.4 Mobility: Supporting Mobile-First Strategy and Building Editorial Centers Anywhere

At the overall design level of Xinhua' s Global Intelligent Media Platform, mobility was a key consideration. The Video Intelligent Media Platform had to achieve six goals: first, adapt to mobile acquisition needs by accepting, transmitting, and processing content collected and transmitted through mobile terminals like smartphones and drones. This primarily meant the professional video production system had to handle video materials and resources in various formats. It needed to not only provide receiving interfaces for content collected and transmitted through multiple mobile terminals but also automatically detect technical formats and quality, automatically enter non-linear editing and archive systems, and automatically transcode video materials and resources outside the whitelist before entering non-linear editing and archive systems.

Second, it had to adapt to mobile editing and issuance needs, enabling the construction of temporary or long-term editorial centers at major event sites and locations worldwide. These mobile editorial centers could use video resources and archives transmitted back globally, along with other resources and data in the system, just like the headquarters editorial department. Third, it had to adapt to mobile internet terminal users' needs by producing and providing suitable content products, such as vertical-screen videos. Fourth, it had to adapt to Xinhua' s domestic and overseas mobile terminal distribution needs, enabling one-click issuance to multiple mobile terminals as needed. Fifth, it had to adapt to mobile internet terminal users' needs for content product supply methods by completely adopting internet-based content distribution and user service models instead of using satellites as the primary delivery method.

2.5 Convenience: Supporting System Operations Through Enhanced Integration and Usability

From the perspective of building a media convergence operational system, the measurement standards and performance goals for enhancing system integration are more concentrated on the convenience level of system functions and human-machine interfaces. Convenience determines the acceptance and effectiveness of the technical system and influences the construction of the media convergence operational system. Therefore, the Video Intelligent Media Platform not only had to connect all new and old systems related to audio-visual business but also demonstrate integration and convenience in its human-machine interface. During the detailed design and implementation process, our goal was to enable users to access all functions through one interface and one account, arranging the positions and usage methods of various system and function icons according to usage logic.

To achieve single-account access to all functions, implementation required coordination with administrators of original systems. If original systems required dedicated account login, we adopted methods such as binding users' Video Intelligent Media Platform accounts with their accounts in original systems. After first logging into the Video Intelligent Media Platform and then logging into an original system with that system' s account, subsequent logins to the Video Intelligent Media Platform would not require re-entering the subsystem account to use its functions. This enhanced the user-friendliness of the Video Intelligent Media Platform and improved user experience.

Audio-Video Department content products can be simply divided into audio and video components. How to enhance convenience through improved system integration? One approach was enhancing audio sharing levels, including directly connecting on-site audio signals to studios and editing systems to improve response speed to breaking events and enrich on-site information in stories. It also included interconnecting audio production systems with video production systems to enhance sharing of audio components in video live signals and materials. The Video Intelligent Media Platform provided strong support in both aspects and achieved high performance.

2.6 Coordination: Achieving Systematic Operations Through Synchronization and Systematic Functions

Coordination is the core requirement of a converged operational system and a key indicator that the technical platform must support. During the detailed design and implementation process, the platform had to meet coordination requirements. The synchronization issue of signals transmitted through different channels represents one manifestation of system coordination. From the perspective of building a media convergence operational system, when this intelligent media platform uses signals from different sources, media, and transmission methods for live broadcasting, it must consider synchronization. Technically,

live signals transmitted via satellite have longer delays compared to those transmitted via fiber optic; signals sent from the other side of the globe via satellite sometimes require relay through two satellites, creating delays of nearly four seconds. Signals sent back via 4G backpacks sometimes add delay at the backpack end when mobile network signals are weak to ensure signal quality.

When signals transmitted through different channels all enter this system and studio to support the same live broadcast, their different speeds and delays require technical and operational solutions to enhance synchronization as much as possible. Therefore, during the detailed design phase, I required the joint project team to research this issue. If signals transmitted through different media and channels serve as primary and backup signals with different delays, synchronization must be considered to ensure truly seamless switching to backup signals when needed. This is a requirement that comes instinctively from those with years of live broadcast command experience.

From the perspective of building a converged operational system, the pursuit of coordination also means enabling content producers on this Video Intelligent Media Platform to see demand information and user feedback in real time to respond and adjust promptly. This requires that while automatically accumulating and aggregating data, the data flow achieves a more important step: the platform can perform multi-factor analysis, present in certain ways, and retrieve according to certain permissions for content production data, user demand data, and related behavioral data. My goal was that after data flow reached a certain stage, this multi-factor analysis, presentation, and retrieval would gradually open up from the platform's and editorial department's main managers to editors and journalists worldwide, allowing content producers to simultaneously learn about user and netizen feedback and demands while users simultaneously learn about content being produced and about to be provided. Achieving this synchronization pursuit could realize a closed loop of demand, content production, content distribution services, and feedback, achieving continuous improvement through decision-making, control, feedback, re-decision-making, re-control, and re-feedback, enabling a relatively ideal closed-loop management through this intelligent media platform.

2.7 Scalability: Adapting to Demand and Technological Changes

Xinhua' s Global Video Intelligent Media Platform must have certain scalability, referring not only to continuous system optimization and adding new functions to adapt to deepening media convergence and system building needs but also to further adapting to technological progress by introducing artificial intelligence and other technological achievements to enhance system capabilities. During the operation of this intelligent media platform, we have already initiated investigations into system optimization projects and artificial intelligence cooperation projects. Although some original systems have been connected to the audio-visual production system management platform, problems such as outdated design concepts and insufficient functions in some original systems have

become more prominent in this large workflow, large system, and data flow, requiring optimization and upgrading. Artificial intelligence technology can help this system further enhance its capabilities.

---

3. Performance Achievement: Enhancing Operational Efficiency Through System Foundation Connectivity and Innovation

Xinhua' s Global Video Intelligent Media Platform began construction in May 2016, breaking through traditional thinking and practices of spatial aggregation and system silos. By reengineering production processes and building large systems, it integrated Xinhua' s global resources related to audio-visual content production and services, including content resources, human resources, technical resources, and data resources from the headquarters, 31 domestic bureaus, and 180 overseas bureaus. The platform achieved interconnection and intercommunication among all audio-visual production systems, full-process data tracking in production workflows, and internet-based, mobile-enabled business production, distribution, and management. The platform' s construction fully considered Xinhua' s global video business production and reporting needs as a world news agency, particularly for video programs and live broadcast converged distribution services oriented toward traditional and new media, effectively integrating global relevant resources and production factors to form a systematic media data sharing, signal distribution, product production and release, and data feedback converged production service system based on the internet.

3.1 Main Construction Content

3.1.1 Audio-Visual Production Service Process Reengineering The reengineering of Xinhua' s audio-visual production service process is the main thread and foundation of the Global Video Intelligent Media Platform construction. Based on the need to fully leverage Xinhua' s global acquisition and reporting forces, fully considering deep integration of traditional and new media, timeliness and effectiveness requirements of news communication, and needs of various users, the platform optimized resource allocation and restructured the audio-visual production service process. The optimized process is configured according to full-chain, full-process production stages including multi-media acquisition, unified aggregation, production and editing, review, multi-channel release, and data feedback. All business operations are conducted online based on workflow and automation, with production data and behavioral data automatically accumulated, aggregated, multi-factor analyzed, presented in certain ways, and retrieved according to permissions, promoting efficient production and management of audio-visual business and enhancing overall communication capacity and systemic competitiveness.

3.1.2 All-Media HD Studio as Creative Workshop Through the combination of modern all-media technology and TV studio technology, using new program production methods such as large-screen packaging, virtual implantation, and interactive commentary, Xinhua' s building studio was transformed into a 5-channel, multi-scene, visualized, interactive internet all-media HD studio integrating signal and data aggregation, scheduling, and control functions. This created a comprehensive news broadcasting center with comprehensive, multi-angle, 360-degree dead-zone-free full-scene integration, achieving comprehensive upgrades of the physical studio, director' s room, and media command center. The HD studio also designed dual network and database security mechanisms to ensure broadcast safety.

The HD studio achieved signal and data interconnection and intercommunication with Xinhua' s audio-visual production system, enabling aggregation, monitoring, scheduling, processing, and distribution of up to 144 external video signals. It established a global live broadcast command and communication system, integrating global video signal acquisition and scheduling based on IP and cloud platforms. As a core component of Xinhua' s audio-visual acquisition, editing, distribution, broadcasting, and storage production stages, the HD studio supports live reporting from Xinhua' s global bureaus and recording and program production by various video acquisition departments, serving as Xinhua' s visualized mobile internet creative space and HD creative production workshop.

3.1.3 Signal Scheduling and Processing System Xinhua' s video live broadcast business has formed normalized reporting patterns including daily live broadcasts, major event live broadcasts, and breaking news live broadcasts, with "Xinhua Live" becoming Xinhua' s live broadcast brand in the media convergence era. Xinhua' s video live broadcast business has distinct news agency characteristics in reporting scope, live broadcast frequency, service targets, service forms, and dissemination channels, requiring comprehensive consideration of traditional media and domestic and international video website users' needs for live feed services.

Therefore, an internet-based IP live broadcast architecture was adopted, receiving live signal sources from satellites, fiber optics, dedicated lines, the internet, mobile internet, TV systems, and cloud directors. After reception, all signals were processed in IP format for real-time monitoring, scheduling, processing, and distribution, with online real-time scheduling capacity reaching up to 100 channels, supporting simultaneous 4-in-4-out IP stream seamless switching, and enabling IP data stream forwarding across network segments. In the live signal distribution stage, according to live feed and program production needs, IP data streams were simultaneously distributed to studios, HD non-linear editing systems, satellite feed systems, and internet websites. The all-IP live broadcast architecture based on the internet, through IP-standard protocol scheduling and docking with Xinhua' s TV system, HD studio, multi-technical-route live

sources, Xinhua' s client and other domestic and overseas mobile terminals, Xinhua' s domestic and overseas bureau cloud director platforms, commercial internet video websites, and domestic and overseas social media, effectively met Xinhua' s video live signal aggregation, scheduling, and distribution processing requirements, significantly reducing traditional SDI equipment investment and operation wiring workload while improving video signal scheduling flexibility and coverage, making live broadcast operation processes visualized, mobile, and standardized.

3.1.4 System Construction and Integration As a production platform centered on Xinhua' s all-media HD studio, the Global Video Intelligent Media Platform was built based on internet thinking, virtualization technology, and big data technology, highly coupling Xinhua' s video business production needs. Using the platform' s audio-visual program production and management platform as the unified access platform and main interface, it integrated 19 systems and function modules related to audio-visual production. Integrated original systems included video return systems, audio acquisition and editing systems, audio-visual archives, video distribution systems, TV program material exchange systems, and new media databases, ENEWS (mobile acquisition and editing system), etc. Newly developed and launched systems and function modules included HD non-linear editing systems, unified distribution systems, management platform application portals, unified search, live broadcast process management, statistical analysis, data tracking, equipment management, bureau assignment management, file sharing, and other function modules. After interconnecting with the already-built internet-based video distribution platform, it completed the construction of Xinhua' s Global Intelligent Media Platform integrating content acquisition, production, and user service full processes.

Xinhua' s Global Video Intelligent Media Platform' s audio-visual program production and management platform provides a unified entry point and work platform for video editors, journalists, employees, and final reviewers related to video business worldwide, meeting online needs of video business personnel in acquisition, production, editing, program release, data feedback, and other video production-related stages, enabling cross-space, cross-regional global collaborative production and reporting between Xinhua' s domestic and overseas bureaus and headquarters video editorial departments.

3.1.5 Data Service Functions An important objective of Xinhua' s Global Video Intelligent Media Platform is achieving datafication. The platform' s audio-visual program production and management platform realizes automatic accumulation, automatic aggregation, multi-factor analysis, presentation in certain ways, and permission-based retrieval of four types of data: video resource data, production process data, user behavior data, and system operation data. Video resource data includes video material resources collected and returned daily by Xinhua's 31 domestic bureaus and 180 overseas bureaus, 1.3 million historical video materials in the audio-visual archive, and recorded video resources

from live signals. Production process data includes acquisition and return, production, editing and distribution, review, and other behavioral data of video business personnel and manuscript-related resource information. User behavior data includes user information and downloaded manuscript information. System operation data includes operation conditions of hardware equipment, backend servers, storage, networks, and other devices across various parts of the video intelligent media platform.

Through underlying data source interconnection and intercommunication among various systems, Xinhua' s Global Video Intelligent Media Platform' s audio-visual program production and management platform provides data services for video business production and distribution. Video resources can seamlessly flow and be directly shared and used among various stages and systems in the production process. All video resource data is interconnected with Xinhua' s new acquisition, editing, and distribution platform and Xinhua' s "Zhiyun" platform through the audio-visual program production and management platform, achieving unified resource sharing based on text, images, and video. The platform obtains production process data and user behavior data, providing precise data services for Xinhua' s video acquisition, editing, production, operation, and management assessment through scientific data statistical analysis results. By obtaining operation data from all system components, it provides data references for daily system automated operation and monitoring.

3.2 Main Innovations

The construction of Xinhua' s Global Video Intelligent Media Platform, driven by internet-based video manuscript distribution, live stream distribution, and overseas social media and client distribution needs, was conducted according to internet thinking. It achieved unified management of all systems related to audio-visual production and seamless interconnection and docking among systems in the acquisition, editing, and production chain. In live signal scheduling and management, it boldly innovated by adopting an all-IP-based aggregation, scheduling, and distribution architecture. It expanded development in streaming protocol support, source image information display, and global cloud platform deployment, developed a video live broadcast reservation system, achieved full-process management of live broadcast business, and conducted business process management and technical operation management in mobile and networked ways, serving Xinhua' s annual 1,000+ live broadcast distribution and release businesses.

The platform' s system innovations include:

3.2.1 Constructing an all-media HD studio that integrates internet, IP, and cloud platform-based global multi-channel video sources for global live broadcast collaboration. It can aggregate, monitor, schedule, process, and distribute up to 144 external video signals based on IP, with program recording, global live

broadcast command communication, and 360-degree dead-zone-free full-scene multi-scene settings. It realizes multi-language audio de-embedding, embedding, and multi-language multi-channel mixing processing for on-site sound, Chinese, English, French, Spanish, Russian, Portuguese, Arabic, Japanese, and simultaneous interpretation for Xinhua' s video acquisition and editing departments and domestic and overseas bureaus' daily reporting, major event reporting, and special reporting, serving live feed for domestic and overseas video users and new media live broadcast release business for Xinhua' s overseas media and clients.

3.2.2 Designing and implementing a full-process data tracking method for video manuscript production. Xinhua' s video production business involves multiple stages including bureau and headquarters journalists' video acquisition, headquarters editing and production, final review and release, and media user download. Using unique data encoding for association and mapping, it connected manuscript data and behavioral data from all stages including domestic and overseas bureau journalists' return, headquarters editing and production, review and release, and user usage. Manuscript data is defined as information related to specific video manuscripts, including titles, journalists, editors, and final reviewers. Behavioral data is defined as relevant operations in the production process, including material usage, manuscript generation, issuance, and user download information. All data is connected with the unified management platform through unique encoding. After associating all manuscript and behavioral data from all stages of the audio-visual production full process, analysis is performed to achieve full-process data tracking, providing data feedback services for managers and editorial personnel.

3.2.3 Implementing an automatic import method for multi-type video sources into HD non-linear editing systems. Considering Xinhua' s business characteristics of global video acquisition and headquarters editing and production, and fully accommodating multi-type, multi-channel video sources including mobile phones, 4G backpacks, fiber optics, dedicated lines, satellites, the internet, business TV, GoPro, and drones, multi-format, multi-form video sources based on IP streams, signals, and files are automatically imported into HD non-linear editing systems according to different business types including daily business, breaking news, quick editing and distribution, and major event reporting, with different permissions and levels for use by headquarters editors with corresponding account permissions.

3.2.4 Implementing a method for publishing video manuscripts from HD non-linear editing systems to internet-based unified distribution systems. After HD non-linear editing system program production is completed, the video detection module performs legality detection and filtering on the generated video file entity, video manuscript information data, and basic user information data of editing personnel. Validated relevant data enters the manuscript task generation module through the automatic import module. Then, based on the corresponding editor and operator attribute information of the HD non-linear editing system-generated video file, pending manuscripts are automatically generated

in the pending review database of the unified distribution system for review and release, finally achieving distribution to various media, websites, and mobile terminal users through Xinhua' s multiple distribution channels and direct release to overseas social media and Xinhua' s client and other mobile terminals.

3.2.5 Implementing IP video data stream-based transmission scheduling for video signals. After encoding collected video signals through dedicated lines or the internet, transmission scheduling and distribution are conducted using IP video data streams. In addition to supporting common UDP, RTMP, and RTSP protocols, the system also supports reliable transmission and scheduling based on the SRT protocol. The system supports simultaneous 4-in-4-out seamless switching and maximum 100-channel IP source scheduling and switching, achieving cross-network-segment IP data distribution and scheduling for Xinhua' s video live broadcast business for internal and external use, providing daily live feed services for traditional and new media domestic and overseas users. This solved problems of limited transmission and distribution, large equipment wiring operation workload, and other issues under traditional SDI-based technical approaches.

3.2.6 Implementing a full-process management method for Xinhua' s video live broadcast business. Video live broadcast business involves multiple trades and related resources including Xinhua's domestic and overseas bureau video journalists, headquarters live broadcast reporting personnel, studio personnel, overseas media editors, technical personnel, and equipment. The video live broadcast reservation management system on Xinhua' s Global Video Intelligent Media Platform achieved unified scheduling of personnel and resources and full-process management of live broadcast business. This subsystem provides live task application functions, allowing live broadcast leaders to grasp real-time conditions at various live points for global scheduling. It provides live broadcast lists showing scheduled and completed live broadcasts, accumulates statistics on live broadcast sessions, types, time periods, participating personnel, user adoption, and studio resource usage, and offers both client and PC usage methods.

On March 3, 2017, the content production part of this Video Intelligent Media Platform began trial operation marked by HD live broadcasting. On April 20, 2017, the non-linear editing and archive systems were moved from the traditional internal network to the "green zone" internet, becoming China' s first internet-based HD non-linear editing and archive system. The audio-visual production system management platform on this Video Intelligent Media Platform went online, achieving the important project goal of datafication. By the end of 2017, the upgrade of video reporting equipment for domestic and overseas bureaus was completed.

After the completion of this Intelligent Media Platform, Xinhua' s global video acquisition, production, and service capabilities were greatly enhanced, forming rapid emergency reporting video teams distributed worldwide. Through reengineering audio-visual production service processes and production system aggregation, it drove transformation of video production models and scenarios

and significantly improved work convenience for video business personnel.

The completion and launch of Xinhua' s Global Video Intelligent Media Platform promoted deep integration and development of Xinhua' s video business, enhanced Xinhua's video reporting capacity, dissemination power, and influence, and strengthened systemic competitiveness. The platform technically supports 跨越 (spanning) geographical space, enabling the assembly of video editorial departments anytime, anywhere for video production and live broadcast distribution. Video production workflow, automation, convenience, and datafication levels have been greatly improved, significantly enhancing work efficiency and news timeliness. Relying on this Video Intelligent Media Platform that integrates acquisition, production, distribution, and data analysis and completely reshapes audio-visual production service processes, reporting capacity has been significantly improved. Distribution timeliness has continuously achieved new breakthroughs, with major reports basically achieving "live-style distribution." The fastest time was reduced from nearly two hours previously to four minutes during the Two Sessions, and further to 1 minute and 41 seconds for a short video manuscript "BRICS Leaders Walk into Venue at Xiamen Summit" during the BRICS Xiamen Summit coverage.

During the 2017 Belt and Road Forum, relying on this Video Intelligent Media Platform, we established a video distribution center at the front—marking the first time in Xinhua' s 86-year history. This achievement realized the rapid construction of video editorial departments anywhere based on the Video Intelligent Media Platform, breaking free from traditional constraints of only being able to distribute from headquarters.

This Video Intelligent Media Platform has rapid expansion capabilities. During the 2018 Two Sessions coverage, it expanded functions according to reporting format and business format breakthrough needs, achieving simultaneous completion of Chinese live broadcast, English live broadcast, and audio live broadcast within one business system, with three lines broadcasting simultaneously. Each of these three live broadcasts had its own special requirements, even different in and out points. Live-style distribution must guarantee timeliness, with specific time period image combinations having different requirements from live broadcasts. More important is the precise control of the entire business and technical system centered on signal stream bundling and distribution. This requires the technical team to have a clear understanding of Xinhua' s audio-visual business and the four tasks to be completed, rather than passive execution, and requires close integrated collaboration between business and technical teams.

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

Source: ChinaXiv —Machine translation. Verify with original.