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Abstract

The 25th China Digital Broadcasting & Network Development Annual Conference and the 16th National Internet and Audio-Video Broadcasting Development Seminar (NWC2017) were held in Changsha from April 19-20, 2017. Over the two-day conference, five keynote reports were delivered by Deputy Director Dong Nianchu, Academician Wu Jiangxing, Academician Jian Shuisheng, Deputy Director Du Baichun, and Mango TV Vice President Cheng Hongrong, addressing topics including "Media Convergence and Management Po…

Full Text

The 25th China Digital Broadcasting & Network Development Annual Conference and 16th National Internet and Audio-Video Broadcasting Development Seminar (NWC2017) Convened in Changsha

The 25th China Digital Broadcasting & Network Development Annual Conference and the 16th National Internet and Audio-Video Broadcasting Development Seminar (NWC2017) were held in Changsha from April 19-20, 2017. Over the two-day conference, five keynote reports were delivered by Deputy Director Dong Nianchu, Academician Wu Jiangxing, Academician Jian Shuisheng, Deputy Director Du Baichun, and Mango TV Vice President Cheng Hongrong, addressing topics including "Media Convergence and Management Policy," "Data Science and Big Data Testbeds," "All-Optical Switching Will Facilitate Broadcasting Network Development," "Media Convergence Requires Establishing Cross-Platform Video Evaluation Systems," and "Mango TV: Coupling Effects Create a New Convergence Development Model." The conference also featured a special report on "SEEi.TV—Customizable IP Cloud-based Live (Relay) Broadcasting Technology/Platform" and two thematic forums on "Traditional Media and New Media Convergence" and "New Technology and

Media Convergence." Leaders and experts attending the opening ceremony included Tong Gang (Deputy Director of the State Administration of Press, Publication, Radio, Film and Television), Wu Jiangxing (Academician of the Chinese Academy of Engineering), Jian Shuisheng (Academician of the Chinese Academy of Sciences), Du Baichuan (Deputy Director of the Science and Technology Committee of SAPPRFT), Dong Nianchu (Deputy Director of the Network Audiovisual Program Management Department), Wang Guoqing (Chief Engineer of Hunan Provincial Press, Publication, Radio, Film and Television Bureau), Huang Wei (Deputy Director of Hunan Broadcasting System), Xie Shenghe (Chairman of the China News Technology Workers Association), Sha Bing (Director of the Cable Television Integrated Information Technology Branch of the Chinese Institute of Electronics), Zhou Yi (Vice President of the Academy of Broadcasting Science), and Chen Zhijiao (Senior Advisor to the Science and Technology Committee of SAPPRFT and former Director of the Science and Technology Department). The opening ceremony was chaired by Zhou Zhiqiang, Executive Chairman of the Conference and Secretary-General of the Science and Technology Committee of SAPPRFT, with opening addresses delivered by Du Baichuan, Qi Lixin (Deputy Director of SAPPRFT's Regulatory Center), and Wang Guoqing.

Conference Theme and Background

The year 2017 marked the inaugural year of the "13th Five-Year Plan" and a critical year for broadcasting media convergence. Accelerating the integration of traditional broadcasting television with new audiovisual media represents both a strategic deployment by the central government and a requirement from SAPPRFT, as well as an inevitable trend in the broadcasting industry's development. Centered on the theme of "Media Convergence and Converged Media," NWC2017 facilitated extensive exchanges and discussions. During the seminar, the Cable Television Integrated Information Technology Branch of the Chinese Institute of Electronics released the *Annual Technical Development Report of China's Broadcasting Cable Networks (2016).*

The "China Digital Broadcasting & Network Development Annual Conference and National Internet and Audio-Video Broadcasting Development Seminar (NWC)" stands as the industry's earliest, most renowned, and influential conference in the digital broadcasting and broadband network sector, and is one of the most important and authoritative large-scale seminars approved and initiated by SAPPRFT. NWC2017 was jointly organized by the Cable Television Integrated Information Technology Branch of the Chinese Institute of Electronics, the Multimedia Professional Committee of the China News Technology Workers Association, and the Strategy Professional Committee of SAPPRFT's Science and Technology Committee, and co-organized by China Radio International, SAPPRFT's Regulatory Center, Hunan Provincial Press, Publication, Radio, Film and Television Bureau, Hunan Broadcasting System, and various professional committees under SAPPRFT's Science and Technology Commit-

tee. Approximately 350 participants attended, including relevant managers, technicians, and editors from national and local broadcasting bureaus, radio and television stations, cable network companies, transmission stations, and monitoring stations, as well as representatives from the Chinese Academy of Sciences, Chinese Academy of Engineering, State Intellectual Property Office, Xinhua News Agency, PLA Television Propaganda Center, Straits Voice Radio, broadband network operators, content providers, and equipment suppliers.

Keynote Address: Data Science and Big Data Testbeds

Academician Wu Jiangxing, Distinguished Senior Advisor to SAPPRFT's Science and Technology Committee, delivered a keynote report titled *Data Science and Big Data Testbeds*. In his view, data constitutes the sole existence in cyberspace, which comprises artificial networks including computer networks, broadcasting networks, telecommunications networks, satellite networks, IoT, and sensor networks. Some data represent mappings of reality ("real-world data"), while others represent non-real mappings ("network data"). Data science encompasses three aspects: First, understanding real-world data as the foundation for comprehending the universe, matter, life, and society, providing a new methodology—data-driven scientific research—for natural and social sciences to reveal patterns in natural phenomena and human behavior. Second, understanding network data as the basis for recognizing online games, network viruses, cyber weapons, and junk data, which constitutes core content for cyberspace security and a key element for future competitiveness. Third, understanding the development and changes in the data realm, studying data flow and traffic patterns in networks, network traffic civilization, and how big data emerges and evolves.

Wu explained that by using computers to analyze massive datasets generated by experimental instruments or simulation systems, we can discover knowledge and patterns. He offered an accessible example: Everyone today is concerned about smog. To understand how smog forms and how to prevent it, we first need to establish meteorological stations at "representative" locations to collect parameters related to smog formation. Based on existing mechanistic understanding, smog formation relates not only to emission sources and atmospheric chemical composition but also to topography, wind direction, temperature, and humidity. Even these limited parameters exceed conventional monitoring capabilities, forcing simplification by artificially removing seemingly unimportant factors and retaining only simple parameters. However, might those seemingly unimportant parameters play crucial roles under certain conditions? Considering spatial heterogeneity of different parameters, are the spatial distributions of these meteorological stations rational and sufficient? From this perspective, acquiring more comprehensive data may be necessary for truly scientific predictions—this represents the starting point of the "fourth paradigm," perhaps the fastest and most practical problem-solving approach.

Wu emphasized that data-driven innovation represents the future direction and

a new innovation model. Innovation requires experimentation, and data-driven innovation demands data testbeds. When datasets expand to the point where existing information technology cannot manage, process, and analyze them within acceptable timeframes, how should we proceed? Therefore, obtaining desired results within acceptable timeframes constitutes a core technical challenge. The ubiquitous application of information technology has led to explosive growth in data resources, which in turn confronts information technology with severe challenges in big data transmission, management, computation, and analysis. Each new breakthrough in information technology further accelerates data resource growth, creating an iterative development characteristic. To effectively develop and utilize big data resources, we must continuously develop corresponding information processing technologies. Big data testbeds provide development and experimentation platforms for innovative information processing technologies, playing a fundamental role in big data applications and the entire information field's academic, technological, and industrial development. They can serve as bridges connecting government, enterprises, capital, technology, and data resources. Establishing a big data testbed in Shanghai first would have global leading significance.

Google drives product innovation iteration through operational data, achieving big data technology development. The company advocates allowing employees 20% of their time to use the company's abundant data and computing resources for personal projects, innovating core technologies like AdSense. Google X Lab now drives forward-looking innovative applications including autonomous driving and space elevators, all requiring the company's large-scale data and computing platforms—resources that cannot be shared with other enterprises or social organizations.

China currently has the strength and opportunity to build a nationally leading big data testbed through multi-party collaboration. The construction principles follow: leveraging regional advantages, relying on national strength, and utilizing global resources. First, leverage regional advantages including science and innovation center construction, comprehensive big data pilot zones, leading data science research, earliest big data planning, strong big data alliances, and capital advantages. Second, rely on national strength including the NDRC, MIIT, MOST, and NSFC, as well as brother provinces and cities. Third, utilize global resources through international cooperation, research programs, scientists, and open-source alliances.

Keynote Address: All-Optical Switching Will Facilitate Broadcasting Network Development

Academician Jian Shuisheng, Distinguished Senior Advisor to SAPPRFT's Science and Technology Committee, delivered a keynote report titled *All-Optical Switching Will Facilitate Broadcasting Network Development*. In his view, the internet is now ubiquitous, driving social development, particularly during the explosive growth period spurred by the government's "Internet Plus" initia-

tive. Due to information explosion, existing core router and switch capacities are limited by electronic switching bottlenecks, resulting in backbone network switching capacity being only one percent of access network capacity—this is why end-users often obtain far less bandwidth than their configured port bandwidth.

Jian argued that China's current decision to massively develop mobile internet actually treats mobile internet as merely the nerve endings of the internet. To greatly expand internet communication capacity, both core routers and all levels of networks require enormous capacity expansion. Existing internet architecture can no longer meet these requirements—the only solution is implementing all-optical switching. While China has provided substantial support for quantum communication development, many problems remain unsolved before practical application, which will still require a long time. Even when quantum communication becomes practical in the future, it will rely on fiber optic information networks, and must be all-optical switching networks, because quantum communication cannot use routers and requires optoelectronic conversion. Therefore, all-optical switching information networks will be humanity's secure information infrastructure for a considerable time.

Another major problem with the current internet is network security. China attaches great importance to network security, with General Secretary Xi Jinping providing important instructions: "Without cybersecurity, there is no national security; without informatization, there is no modernization. Building a cyber power requires our own technology, strong and reliable technology." On October 9, 2016, when presiding over the 36th collective study session of the Political Bureau of the CPC Central Committee, General Secretary Xi elevated China's cyber power strategy to a new height of comprehensive policy implementation, proposing six "accelerations": accelerate independent innovation in network information technology, accelerate digital economy's promotion of economic development, accelerate improvement of network management capabilities, accelerate enhancement of cyberspace security defense capabilities, accelerate use of network information technology to advance social governance, and accelerate enhancement of China's international discourse power and rule-making power in cyberspace, striving toward the goal of building a cyber power.

Due to high-definition television development and naked-eye 3D television demand, broadcasting information network communication capacity will welcome explosive growth. China's current development target is 100Mbps to households, yet 4K television already requires 60Mbps, future 8K television will need 500Mbps, and naked-eye 3D television will demand even higher bandwidth. Such broadband television programs fundamentally do not require router packet switching—all-optical switching will be more suitable for various high-speed information, image, and digital transmission. Current research on 1Gbps-10Gbps to households is progressing smoothly and may represent the world's simplest and most effective access method. Without routers, network backdoors can be eliminated, reducing vulnerability to attacks and eavesdropping, and adapt-

ing to explosive information traffic growth demands—this is the advantage of all-optical switching.

Currently, one optical fiber can transmit 80 wavelengths, each at 100Gbps, with total transmission capacity of 8Tbps per fiber, while fiber costs approximately 40 RMB per kilometer. One optical cable can contain thousands of fibers, even up to 4,000 fibers—optical path channels are virtually unlimited, providing important advantages for implementing optical path switching.

Keynote Address: Media Convergence Requires Establishing Cross-Platform Video Evaluation Systems

Du Baichuan, Deputy Director of SAPPRFT's Science and Technology Committee, delivered a keynote report titled *Media Convergence Requires Establishing Cross-Platform Video Evaluation Systems*. In his view, broadcasting's pressure lies in insufficient innovation motivation and capability. The boundary between traditional and new media is gradually blurring and will change traditional operational models—the disappearance of boundaries is precisely the result of convergence. Internet news has become a high-frequency basic network application. By June 2016, China's internet news market reached 579 million users, representing 81.6% usage penetration; mobile news users reached 518 million, accounting for 78.9% of mobile netizens. Some 61.9% of citizens go online daily to read news, with 62.4% browsing for less than half an hour each time. Social media has become an important channel for news acquisition, commentary, forwarding, and redirection, with 90.7% of users obtaining news through social media, which is becoming the source for generating and fermenting social hotspot events.

Social news receives the highest attention, with browsing, commenting, and forwarding rates reaching 74.3%, 60.2%, and 59.6% of network news users respectively. However, user attention depth for network news is relatively low—30% of users only read headlines and first-screen news. Awareness of news authenticity needs improvement, with over 60% of users not considering authenticity before forwarding news. Network news users can be divided into four categories: Traditional Current Affairs Faction (23.5%), Mobile Entertainment Faction (35.2%), Opinion Expression Faction (26%), and Multi-Screen Low-Profile Faction (15.3%), with the latter two groups being core users.

Du identified the development trend of internet news industry convergence as manifesting in three aspects: First, industry development has formed relatively mature mechanisms in news production and channel distribution, with increasingly diverse participants. In production models, user-generated content (UGC) is gradually transitioning toward institutionalization, forming a convergence trend between professional and user production. In distribution models, "algorithmic distribution" is becoming the primary method. In communication models, media is becoming "decentralized" and communication "multi-layered." In business models, commercial advertising dominates with diversified models

coexisting.

Second, the competitive landscape shows mobile terminals have become the primary market, with social media, mobile browsers, and news clients becoming main entry points for mobile news. In the PC market, comprehensive portals and traditional news websites still dominate.

Third, competitive dynamics show deepening capital participation and accelerating media convergence. Capital involvement continues to deepen in content resources, commercial resources, channel resource competition, and ecological layout, with market competition gradually upgrading from primary product competition to capital-level competition. Media convergence is accelerating, with new competition-cooperation eras emerging, primarily reflected in channel convergence and content convergence.

Channel convergence has become standard configuration for "two micros and one terminal" (Weibo, WeChat, and client). After the 2014 media convergence inaugural year and 2015 convergence development layout, 2016 saw continued deepening. First, traditional news organizations and websites accelerated competitive layout in mobile channels. According to the *2016 China New Media Development Report* by the Chinese Academy of Social Sciences' Institute of Journalism and Communication, traditional media Weibo accounts reached 17,323; pan-media WeChat public accounts exceeded 2.5 million; mainstream media clients reached 231 nationwide, with over 90% of traditional media establishing dedicated "two micros and one terminal" teams. Second, traditional news organizations and websites showed converging strategies in mobile channels, achieving mutual benefit through media cooperation platforms while expanding influence through commercial platforms. In August 2016, Xinhua News Agency's all-media platform launched, opening its all-media terminals to member media to enable local media dissemination through Xinhua's client and website channels.

Content convergence spans from news production to dissemination forms, with traditional and mobile new media gradually integrating. As mobile news platform media diversifies, traditional media, institutional media, and self-media all show convergence trends in internet news content production and forms. First, content production convergence. Compared to traditional news media, mobile new media necessitates content integration with traditional media, leveraging self-media while improving content quality through mergers, acquisitions, equity investments, copyright purchases, or cooperation with traditional news media. Penetration between traditional and new media in content fields accelerates, forming various convergence forms and complementary development trends. Second, content reporting method convergence. Traditional news media now emphasize interactivity with audiences, exploring new reporting forms. During the 2016 "Two Sessions," *People's Daily* launched H5 news products containing graphics, audio-visual, and gaming elements, presenting "supply-side reform" and "Internet Plus" from the government work report. It also launched panoramic video *VR Takes You Into the Venue: How the CPPCC Opens*, at-

tracting young users to participate and forward.

Du noted that television and online video are becoming indistinguishable. While broadcasting faces serious challenges, competition ultimately depends on content quality. High-quality online video streams, whether live or on-demand, have never been more important. OTT providers like Netflix, Amazon, and Hulu have invested billions of dollars purchasing premium television content licenses and developing original programming that can rival the best offerings from traditional television networks. However, for OTT video services to compete effectively, they require premium quality experiences, making ultra-high definition particularly important.

The trend of replacing traditional television viewing with online video comes with expectations of uncompromised overall experience and delivery quality. Unfortunately, many online video viewers currently receive far below expected quality. If video playback is delayed by five seconds, approximately one-quarter of the audience may be lost; if delayed by ten seconds, nearly half may be lost. This means a few seconds' delay can represent millions of dollars in potential revenue loss, not to mention irreparable brand impact. Tolerance for video start-up delay varies by content type. For long videos, a two-second start-up delay yields an abandonment rate of about 3%, while short videos nearly double that rate. Similarly, a five-second delay yields a 13% abandonment rate for long videos, again nearly doubling for short videos.

Keynote Address: Media Convergence and Management Policy

Dong Nianchu, Deputy Director of SAPPRFT's Network Audiovisual Program Management Department, delivered a keynote report on *Media Convergence and Management Policy*. Internet audiovisual program services implement an industry access system. As of December 15, 2016, the "Video Service User Experience Standards Working Group," jointly established by domestic video service providers, released China's first *China Video Service Experience White Paper*, which for the first time authoritatively articulated user experience levels for major video services including IPTV, online video, and mobile video from a consumer perspective. The White Paper divides video service user experience into three main indicators: video display quality, interactive experience, and viewing experience, each decomposed into multiple quantifiable sub-indicators forming an evaluation system.

The Akamai online video measurement methodology indicates that from viewers' perspective, online video experience quality metrics can be divided into two major components: (1) playback reliability, and (2) video image quality. When these two aspects are correct, viewers will be satisfied; when incorrect, they cause disasters. However, too many factors can cause errors that undermine these principles.

Playback reliability involves two basic situations that appear unreliable to view-

ers: video playback pauses mid-stream, or slow video startup. All online video viewers are familiar with frozen-state buffering during re-caching, when the client's small video buffer empties while waiting for more video data. This causes several problems: (1) If server-client connection quality degrades excessively during playback, the server may lack sufficient bandwidth to provide even low-quality video; (2) The client may be too slow or other background tasks may be too busy, preventing display operations from keeping up with video streaming; (3) In rare cases, streaming server overload prevents sufficiently fast video streams from maintaining playback speed. Regardless of cause, re-buffering leads to high abandonment rates.

Video startup time also presents problems. While playback pauses annoy viewers, long startup times for long videos also cause issues. Many causes of startup delay mirror those of mid-playback delays, with startup demonstrations often confused with playback pauses because re-buffering frequently occurs during the first few seconds of playback.

Technical supervision of new audiovisual media primarily relies on national and provincial-level regulatory platforms, with the internet audiovisual program supervision platform being relatively mature while mobile internet audiovisual program supervision platforms, IPTV, mobile TV, and internet TV supervision platforms continue to improve. Technical supervision means are indispensable and have been widely adopted at multiple levels. Industry entities can use technical means to filter out many malicious upload websites and program content, significantly reducing manual review pressure. Government management departments can use technical means for online searches to discover harmful content, significantly improving monitoring efficiency. Closing and blocking harmful websites also requires technical means.

New audiovisual media business is growing rapidly. By the end of 2016, online video users reached 544.55 million (74.5% of netizens), and mobile video users reached 500 million. Online video industry revenue grew from 6.3 billion RMB in 2012 to 39 billion in 2015, reaching 60.9 billion in 2016. Paid online video users reached 75 million in 2016, with paid revenue accounting for nearly 20% of online video industry income. By the end of 2016, IPTV total users reached 64.06 million, and internet TV users reached 99.96 million. In 2016, websites registered 4,558 web dramas, 5,556 micro-films (web movies), 197 web animations, 140 web documentaries, and 1,616 web columns with SAPPRFT; 765 foreign film and television dramas totaling 4,961 episodes were imported for online broadcast exclusively. Micro-video exploded, with Kuaishou registering over 400 million users, 50 million daily active users, and over 6 million daily video uploads, attracting 350 million USD investment from Tencent.

Internet industry market concentration further increased. In fiscal year 2016, Alibaba's revenue reached 101.1 billion RMB; Tencent's revenue reached 151.9 billion RMB (42% growth) with profits of 41.4 billion RMB (42% growth); Baidu's revenue reached 70.5 billion RMB with profits of 11.6 billion RMB; NetEase's revenue reached 38.1 billion RMB with profits of 11.6 billion RMB;

Sohu's revenue reached 1.65 billion USD (15% decrease); Sina's revenue reached 1.03 billion USD (17% growth). Alibaba and Tencent have established complete ecological systems, with media business becoming important components and crucial traffic support. Micro-video, news, and artificial intelligence have become the next battlegrounds.

Fortunately, traditional broadcasting media and emerging media convergence has achieved positive progress. By February 2017, CCTV's new media total users reached 1.142 billion, with CCTV.com monthly unique visitors reaching 535 million and the "CCTV Video" client accumulating 566 million global downloads. The CCTV News mobile network officially launched and began operation. Beijing, Shanghai, Jiangsu, Zhejiang, and Hunan have actively promoted in-house converged media platform construction with remarkable results. Hunan has basically formed a content-centered media convergence ecosystem, leading the nation. Shandong has played an active role in promoting city and county station convergence development. Guangdong has distinctive features in IPTV integrated platform construction.

However, traditional broadcasting media and emerging media convergence still faces a long road ahead, requiring substantial efforts in video content, credibility, and other aspects.

Forum on New Technology and Media Convergence

Media Big Data Applications

Luo Xiaobu, Vice President of Oriental Era Network Media Co., Ltd., delivered a special report titled *What Should Be Done, Counting Backward from 2020* at the *New Technology and Media Convergence* thematic forum. In his view, the social foundation for cable network companies' survival is changing. In the wireless television era, it was welfare-oriented public welfare; in the cable television era, it became business-oriented public welfare. However, telecom bundling of television harms cable by strengthening telecom's business-oriented broadband, destroying cable's survival foundation of business-oriented public welfare. Cable must return to welfare-oriented public welfare.

Rich and flexible big data interaction and display mainly manifest as multi-dimensional data interaction and cross-screen data display, being intuitive and interactive, fully demonstrating media convergence effectiveness and directly guiding media production activities. Clear audience positioning enables precise targeting for program promotion and advertising placement. Timely program interaction monitoring enables dual-screen interaction, real-time monitoring, and establishment of new audience evaluation metrics. Advertising effect monitoring uses data-driven insights for more accurate placement and evaluable results. Multi-dimensional audience emotional feedback reveals not just "whether they watched" (traditional ratings) but "whether they loved it" (media big data). Full lifecycle program heat tracking shows program popularity trends at a glance. Theory and practice have proven that big data technology is comprehensive,

with large data volumes, multiple analysis dimensions, and wide applications, delivering significant economic and social benefits with broad application and development space in the broadcasting media industry.

Domestic QR Code Research and Application

Among over 200 one-dimensional and two-dimensional barcode technologies worldwide, QR Code (Quick Response Code)—a Japanese-invented international standard and national standard (2001)—currently dominates Chinese television screens. However, according to national information security regulations, researching and implementing domestically produced QR code technology solutions suitable for Chinese television screens, conducting technical experiments on QR code applications in broadcasting television, and forming relevant standard proposals are imperative tasks. This will establish technical foundations for future specifications on barcode systems used in audio-visual products and television broadcasting.

The domestic GM code is a national standard, MIIT standard, and military standard: in May 2006, GM code was promulgated as an electronics industry standard by the Ministry of Information Industry; in December 2008, it was officially approved and released as an advanced foreign two-dimensional barcode standard by AIMglobal; in May 2011, it was approved and released as a national military standard (GJB7365-2011) by the PLA General Armaments Department; and in December 2011, it was jointly released as a national standard (GB/T27766-2011) by the General Administration of Quality Supervision and the Standardization Administration. GM code's anti-pollution and anti-interference capabilities are many times stronger than QR code. Future QR code management will involve specialized management agencies for television broadcast QR code generation and recognition, terminal recognition of GM codes (such as WeChat and other APPs supporting GM), and research on color codes utilizing RGB three colors to increase GM information capacity.

Light Field Imaging Technology R&D and Application

VR/AR film shooting relies on panoramic shooting equipment and motion capture equipment. While motion capture technology has been used in top Hollywood film production since the 3D film era, panoramic shooting equipment represents an emerging force in the VR/AR industry.

High-Speed Camera R&D and Application

The developed camera uses Bayer filter 30-bit color and higher-sensitivity 10-bit monochrome for shooting, utilizing part of the effective 2450$\times$1720$resolutioninCMOSsensorstoachieveover8$
$gradeHDmode$(1920$\times$\$1080 resolution).

Forum on Traditional Media and New Media Convergence

Mango TV: Coupling Effects Create New Convergence Development Models

Cheng Hongrong, Vice President of Mango TV, delivered a thematic report titled *Mango TV: Coupling Effects Create New Convergence Development Models*. In just over two years, Mango TV has grown from a "disruptor" in the online audiovisual industry to an innovative benchmark recognized by the industry for new-type online audiovisual media convergence development. By the end of February 2017, Mango TV's all-terminal daily active users exceeded 47 million (UV), daily video clicks exceeded 220 million (VV), monthly PC video player coverage reached 185 million, mobile APP downloads reached 450 million, OTT terminal activated users reached 50.65 million, and Mango TV operator business covered 34.8 million users nationwide, including 4.16 million Hunan IPTV users.

Coupling Induction typically refers to the phenomenon where multiple individuals in a group generate enhanced power through mutual interaction and influence. Mango TV's rapid rise strategy relies on multi-wheel driving through platform, content, technology, product, and capital to achieve converged development "coupling effects," primarily manifested in several aspects:

First, "One Body with Two Wings, Dual-Engine Drive" moves media convergence from "addition" to "integration." Since its establishment, Mango TV has enjoyed equally important status with Hunan Satellite TV, jointly planned, and formed Hunan Broadcasting & TV's "One Body with Two Wings, Dual-Engine Drive" basic strategy, becoming Hunan Broadcasting System's irreplaceable "nuclear power." Mango TV's rapid rise and vigorous momentum stem from deep convergence development and coupling effects with Hunan Satellite TV across content, platform, strategy, technology, and teams, primarily referring to content convergence, platform convergence, self-rise, and ecological convergence.

Second, "One Cloud with Multiple Screens, Multiple Screens Integration" enhances platform dissemination power, guidance power, influence, and credibility. Mango TV adheres to General Secretary Xi Jinping's requirements of maintaining correct "political direction, public opinion guidance, news ambition, and work orientation," aiming to build and develop a national first-class emerging media platform. With "One Cloud with Multiple Screens, Multiple Screens Integration" platform entry and video content as distinctive advantages, Mango TV promotes cyberspace construction, dedicated to building its dissemination power, guidance power, influence, and credibility.

Mango TV has built a modern new-type communication system, reaching global audiences with happiness. Through all-terminal, global platform construction and dissemination including video websites, Mango TV APP, Mango TV APP International Version, Mango Live APP, Mango Internet TV (OTT), and IPTV, Mango TV has established coverage across mobile, computer, and television

terminals, extending from "Happy China" to "Happy Global." After several revisions and optimizations, Mango TV APP launched version 5.0 in November 2016, pioneering a "variable speed playback" function with four major product upgrades: channels, on-demand, live broadcast, and personal features, becoming the first and only video application software recommended by the domestic AppStore. The international version provides traditional Chinese display, better suited for Hong Kong, Macao, Taiwan, and Southeast Asian users, transmitting Chinese voices, culture, and Hunan characteristics worldwide. Mango TV currently covers users in 183 countries, over 11.62 million overseas Chinese, and also serves overseas users through Facebook, YouTube, and Dailymotion, with total YouTube clicks exceeding 3.4 billion and viewing duration exceeding 33.7 billion minutes, making Mango TV a special state-owned overseas strategic resource.

Mango TV focuses on producing benchmark-level entertainment programs, singing "Youthful Chinese Dream." With young users as the main force and female users accounting for nearly 70%, Mango TV stands out uniquely in the video industry. Therefore, Mango TV emphasizes using quality content to enhance platform influence, generating outstanding effectiveness in uniting young generations to sing "Youthful Chinese Dream." Mango TV not only exclusively broadcasts authoritative news content produced by Hunan Broadcasting & TV's News Center, singing the main melody and strengthening credibility, but also organized a college student public welfare video competition, collecting 428 works with total video plays reaching 13.39 million. The website has also produced special programs for three consecutive years, including *Promoting Socialist Core Values and Building Chinese Dream National Original Online Audiovisual Program Exhibition* and *Excellent Online Audiovisual Programs*, with total plays exceeding 4 million. Mango TV's self-produced *2016 Super Girl* and *Star Detective* were both awarded "National Broadcasting Integration Innovation Excellent Programs," while micro-film *Life Becomes Beautiful Because of You—Liu Lingli* won the "Online Popularity First Prize" in Hunan Province's first original online audiovisual program competition with 450,000 votes.

Regarding information security management, General Secretary Xi Jinping has repeatedly emphasized: "Without cybersecurity, there is no national security. Building a cyber power requires our own technology, strong and reliable technology." Mango TV has developed a strict, systematic, and innovative information security broadcast control management model through system revision, responsibility refinement, system implementation, and content inspection, and has developed an independent intellectual property rights Mango TV network security management system with industry-leading technology. The system incorporates over 15,000 keywords and can simultaneously monitor up to 20,000 online users, using manual plus intelligent dual filtering with prior review before posting to ensure Mango TV platform information security and establish credibility.

Third, "Comprehensive Layout, Multi-Wheel Drive" cracks Mango TV's brand

fission equation. To capture market opportunities, Mango TV comprehensively lays out content, products (software + hardware), channels, marketing, and users, cracking the "1×(4+N)" brand fission equation: 1 brand, 4 ports, N products, creating a Mango TV ecological closed loop and multi-wheel drive benefits. This includes accelerating iterative innovation of Mango TV APP, Mango Live APP, Mango Big Data Platform, Mango Cloud Platform, and Mango TV media asset broadcast control systems; advancing proprietary operating systems, video players, bullet comments, VR, AR, and other technical product construction; upgrading marketing innovation to achieve multiple interaction forms, expression methods, and communication models; and achieving breakthroughs in terminal products. In April 2016, Mango TV cooperated with XGIMI on screenless TV H1, praised by Premier Li Keqiang. On February 22, 2017, Mango TV launched its first smart TV—Aimango TV 55MQIR Qingmang—featuring 4K ultra-clear intelligence and matrix light source curved screen technology, targeting post-90s users' first curved TV. This represents another major strategic upgrade following "phenomenal content + pioneering technology" driving forces, entering "mid-to-high-end terminal" driving forces.

Finally, Cheng Hongrong stated that facing new markets and targets, Mango TV will further grasp industry trends, promote sharing and integration of all production factors, achieve coupling upgrades, and realize greater breakthroughs in self-production, technology, products, marketing, users, financing, and innovation. Mango TV aims to plant the Malanshan banner on the "video Everest," creating the "online video industry profit inaugural year."

Central People's Broadcasting Station: Promoting Deep Media Convergence to Build New-Type Broadcasting

Li Xiangrong, Deputy General Manager of CNR New Media Culture Media (Beijing) Co., Ltd., delivered a special report titled *Central People's Broadcasting Station Promotes Deep Media Convergence to Build New-Type Broadcasting.* In his view, the "central kitchen" is not just a program production center but the media's nerve center and brain. CNR's media convergence development goals include: first, using convergence development as an opportunity to recreate the collection, editing, and broadcasting process, integrate systems and mechanisms, reorganize internal resources, and achieve integrated development of traditional and emerging media; second, building the China Broadcasting Cloud Platform to integrate broadcasting industry resources, enhance listener and user reach, and promote technological innovation and evolution in the radio industry; third, relying on the all-media content production and operation platform's initial engineering to complete internal resource and process coordination, enhancing comprehensive collection, editing, and dissemination capabilities; fourth, elevating mobile client media development to primary position, based on graphic news, highlighting audio characteristics, and concentrating efforts to build three types of mobile client products.

The three key focuses in building CNR's central kitchen are command center,

process reengineering, and cloud platform. Technology is an important driving force for convergence development and also a shortcoming that media urgently need to address. Promoting deep media convergence must be supported by advanced technology, using the best and latest technologies to enhance collection and editing capabilities and broaden dissemination fields.

In response to the Party Central Committee's 2014 call to "accelerate traditional and new media convergence development," China National Radio adhered to a "self-centered" approach based on the broadcasting industry and its own characteristics. On September 26, 2014, it submitted to the Publicity Department the key project—China Broadcasting Cloud Platform—aiming to transform China National Radio into a new-type mainstream media with diverse forms, advanced means, and strong competitiveness; reshape the national radio's new integrated news communication pattern with China Voice and Economic Voice as main traditional broadcasting platforms and CNR.cn as the new media business foundation; unite national radio stations to achieve the overall development situation of "vertical linkage and content sharing" in the broadcasting industry, enhancing dissemination power, credibility, and influence of China's mainstream broadcasting media.

As a key project of China National Radio's media convergence development, the China Broadcasting Cloud Platform is a hybrid cloud industry comprehensive service platform built around traditional and emerging media convergence development needs, utilizing new technologies such as virtual machines, cloud computing, and big data, and possessing massive news collection and editing and audio-video copyright resources.

Hubei Broadcasting System: Building the "Changjiang Cloud" Converged Media Platform

Dai Mingjie, Director of the Technical Management Department of Hubei Broadcasting System, introduced that with Hubei Provincial Committee's support, in 2015 Hubei launched the "Changjiang Cloud" prototype—Hubei New Media Cloud Platform. In February 2016, the provincial committee decided to build the Changjiang Cloud mobile government new media platform. In April, the provincial "two offices" issued the Changjiang Cloud platform construction plan. Subsequently, Hubei Broadcasting System accelerated construction, promoting implementation city by city and prefecture by prefecture, with the Changjiang Cloud platform comprehensively rolling out across the province.

Changjiang Cloud construction will primarily solve three problems: insufficient mobile orientation, editing and distribution systems unable to keep up with convergence development trends, and insufficient sharing and integrated production. The platform will be built as a regional, ecological, and intelligent media convergence platform, adhering to principles of: mobile-first strategy; leading with virtualization, cloud computing, big data, and artificial intelligence; interconnecting and deeply integrating all-media content production and mobile gov-

ernment new media; reconstructing collection, editing, and distribution systems and reengineering workflows; achieving "one-time collection, multi-generation, multi-channel distribution"; and building a regional, ecological, intelligent media convergence cloud platform.

The Changjiang Cloud technical system primarily comprises two components: mobile government new media platform and converged media production platform. In platform design and construction, the focus is achieving converged media content production interaction. Hubei Broadcasting System has concentrated all its resources to build the "Changjiang Cloud" converged media platform, upgrading it into a comprehensive cloud of "news + government affairs + services" providing full-process services from "source, cloud, management, to terminal," transforming from an all-station new media platform to a province-wide mobile government new platform.

Last summer, when rare flooding struck Hubei, the platform assembled a thousand-person reporting team, completing 8,229 minutes of television live broadcast in just 20 days, setting a national broadcasting live broadcast duration record. The sand animation *Never Forget the Original Aspiration, the Mainstay* created by Changjiang Cloud achieved over 200 million online clicks.

The news command and dispatch system integrates resources, establishing a converged media news center as the command and dispatch institution for the station's news converged production, uniformly planning radio, television, and new media news, uniformly scheduling production resources, and uniformly operating news business. It achieves linkage in planning, collection, editing, and distribution with mobile priority. In scenario-based applications, it integrates traditional camera shooting technology with cloud platform technology to achieve immediate news sharing, cloud editing, news connection, and rapid release. It promotes cloud-network integration, converging economic TV production networks, radio production and broadcasting networks, media asset systems, and other original production networks to Changjiang Cloud IDC. Through rapid, highly automated intelligent analysis and processing technology, the content library automatically classifies content, analyzes and extracts key information, segments programs, and facilitates news production use, thereby achieving unified management.

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