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## A Preliminary Study on the Renovation and Construction Project for Modernized Branch Office Data Centers of Xinhua News Agency: Postprint

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### Abstract

The construction of modern sub-bureaus constitutes a major foundational endeavor for Xinhua News Agency in its pursuit of building a world-class, new-type global news agency, and represents a significant exploration into clarifying the future development trajectory of Xinhua's undertakings. The data center serves as a critical infrastructure for the informatization construction of modern sub-bureaus, wherein high-reliability, high-availability data center infrastructure will provide robust foundational support for the technical operations of modern sub-bureaus. This paper draws upon the data center renovation experience from 23 domestic sub-bureaus under the project team of the "Phase I Communication Infrastructure Renovation Project for Xinhua News Agency Domestic Sub-bureaus" (hereinafter referred to as the project team) from the Xinhua News Agency Communication Technology Bureau, outlines the renovation and construction concepts for modern sub-bureau data centers, and elucidates the advantages of modular data centers in the construction of modern sub-bureau data centers, with the aim of enhancing the communication infrastructure support capabilities of domestic sub-bureaus.

### Full Text

#### A Brief Discussion on the Renovation and Construction of Modern Branch Data Centers at Xinhua News Agency

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**Abstract:** The construction of modern branch offices represents a major foundational project in Xinhua News Agency's efforts to build a world-class new-type global news agency, and constitutes a significant exploration in clarifying the future development path of the Agency. The data center machine room serves

as critical information infrastructure for modern branch offices, and highly reliable, highly available data center infrastructure will provide solid foundational support for technical operations. This paper draws on the renovation experience of 23 domestic branch data centers by the “Phase I Renovation of Xinhua News Agency Domestic Branch Communication Infrastructure” project team (hereinafter referred to as the project team) to outline the renovation and construction approach for Xinhua News Agency’s modern branch data centers. It also introduces the advantages of modular data centers in branch data center construction, aiming to enhance the communication infrastructure support capabilities of domestic branches.

**Keywords:** renovation of legacy machine rooms; modular data center; energy conservation and emission reduction; communication infrastructure

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## 1. Characteristics of Xinhua News Agency’s Domestic Branch Data Centers

Between 2016 and 2018, the project team conducted on-site surveys of more than ten branch data centers in Guangxi, Guangdong, and Shandong, identifying several key characteristics of Xinhua News Agency’s domestic branch data centers. First, most data centers were converted from partial office spaces within branch office buildings, which suffer from numerous deficiencies in load-bearing capacity, floor height, power supply, fire smoke exhaust, and outdoor air conditioning unit installation locations. Second, due to insufficient infrastructure investment over the years, most branches have not adopted dedicated precision air conditioning, lack gas fire suppression systems and dynamic environment monitoring systems, and face safety hazards that constrain the modernization process. Third, some branch machine rooms have been in operation for excessively long periods without proper maintenance, resulting in severely damaged infrastructure, inadequate scalability, and inability to provide reliable operating environments for new services. Fourth, as branch data and business systems have gradually centralized to the headquarters in recent years, branch data centers now primarily serve as network aggregation equipment, backbone network uplink devices, carrier network equipment, security audit equipment, and some branch-specific application servers. Consequently, branch data centers have evolved to focus more on network aggregation and as core nodes for branch office building structured cabling systems.

## 2. Modernization and Construction Approach for Branch Data Centers

Based on the characteristics of domestic branch data centers and research into operational models and design concepts from other media and financial institutions, the project team has determined that modern Xinhua News Agency branch data centers should possess four key attributes. First, they must demonstrate strong site adaptability, rapid deployment capability, and high scalability to flexibly accommodate evolving all-media business needs. Second, they should achieve high standardization with unified configurations for core components including air conditioning, cabinets, UPS, monitoring, and distribution cabinets to meet diverse all-media business development needs while maintaining consistent equipment configuration and performance. Third, they must be safe and reliable, with comprehensive systems for air conditioning and cooling, power distribution, fire alarm, dynamic environment monitoring, and security surveillance to completely eliminate existing vulnerabilities. Fourth, they should be green and energy-efficient, employing advanced technologies and design concepts to minimize operational costs.

Guided by these principles, the project team decomposed the renovation work into several key systems.

### 2.1 Site Space and Air Conditioning/Cooling Systems

For branch data centers in operation for over ten years, complete renovation should be considered if the branch has suitable alternative office space. The proposed renovation area should be no less than 80 square meters with a beam height of at least 2.6 meters, while also accommodating plumbing, fire smoke exhaust ducts, and convenient installation and maintenance of outdoor air conditioning units. During the design phase, original building drawings should be consulted to obtain load-bearing capacity data, which should inform the design of dedicated load-bearing frames for UPS battery banks and cabinets to ensure structural safety. If necessary, the number of servers per cabinet may be limited.

Since most branch office buildings have ceiling heights under three meters, with some beam heights even below 2.5 meters, they cannot meet the airflow organization requirements of underfloor air distribution systems. Therefore, row-based precision air conditioning with horizontal airflow should be adopted, supplemented by cold or hot aisle containment, with an N+1 redundancy design for the cooling system. The data center room orientation should avoid direct sunlight and exterior windows should be sealed to minimize building heat load. Additionally, branches in North, Northwest, and Northeast China may configure fresh air systems to introduce outdoor cold air during winter, further reducing energy consumption and lowering overall PUE.

## 2.2 Power Supply and Distribution Systems

Most branches lack dual utility feeds from different substations, so equipment should be powered by one utility feed plus one UPS source. Based on experience, existing main incoming cables in most branch data centers have insufficient gauge, constraining future all-media business expansion. UPS configuration depends on available space; where space is limited, modular UPS systems that can be installed within cabinets should be selected. Based on actual IT load experience, UPS capacity should not exceed 60 kVA, and UPS power should not supply equipment outside the data center area.

Given the relatively small actual IT load in branch data centers, UPS battery backup time should not exceed 30 minutes at full load, as excessive batteries would create significant load-bearing and maintenance cost burdens. The project team also found that some branch office buildings lack effective lightning protection and grounding, requiring separate retrofitting to ensure personnel safety and proper electronic information system operation. After building lightning protection renovation, professional testing of the grounding system is required.

## 2.3 Fire Suppression Systems

Considering maintenance convenience and cost-effectiveness, branch data centers should use non-piped HFC-227ea gas fire suppression systems while sealing existing water sprinkler systems. Fire detection and alarm systems should be configured to integrate with access control and aisle containment modules, with alarm signals connected to both the branch office building control room and the data center dynamic environment monitoring system.

## 2.4 Dynamic Environment Monitoring Systems

Due to shortages of technical personnel, most branch data centers will operate unattended during non-working hours, making dynamic environment monitoring essential. The monitoring system should encompass air conditioning, UPS, fire suppression, temperature and humidity, water leakage detection, and access control security, with alarm methods including SMS, phone, and sirens, as well as remote management and control capabilities.

## 2.5 Energy Conservation and Emission Reduction

In response to Xinhua News Agency's call for comprehensive energy conservation and consumption reduction, row-based precision air conditioning should be employed to locate cooling near heat sources, shortening air paths and enabling precise cooling to improve efficiency. Cold or hot aisle containment should be implemented based on whether cryptographic equipment is installed in the data center, isolating cold and hot airflows to improve cooling efficiency. Supply or return air temperatures should be controlled to maintain cabinet intake temperatures no higher than 27°C. Room orientation should minimize solar exposure,

and in northern regions, fresh air systems should introduce outdoor cold air during winter to reduce PUE.

### 3. Results of Branch Data Center Renovation

Since 2016, the project team has renovated 23 domestic branch data centers in batches, achieving substantial results by eliminating major safety hazards such as the lack of dedicated cooling systems and fire alarm systems, thereby providing strong support for comprehensive modern branch construction.

Addressing common problems in domestic branch data centers and following the renovation approach, the project team adopted modular data center solutions for ten branches including Shandong, Guangdong, and Anhui, while performing partial renovations at other branches based on actual needs. A modular data center is a complete solution integrating cabinets, distribution cabinets, UPS, precision air conditioning, and dynamic environment monitoring into a unified product that can be deployed simply through basic room decoration. Compared with traditional data center construction, modular data centers offer rapid deployment, flexible expansion, lower site requirements, and stronger replicability, making them better suited to modern domestic branch communication infrastructure construction.

Using the modular approach, actual construction time for these ten branch data centers ranged from 45 to 70 days. The second batch of 18 branches including Anhui, Inner Mongolia, Heilongjiang, Hubei, and Gansu required only about seven months from construction commencement to trial operation. By comparison, traditional renovation would have required customized designs for cooling, fire suppression, and UPS systems for each branch, with different equipment models and brands procured based on individual site conditions, significantly extending project delivery timelines.

From a reliability perspective, traditional underfloor or overhead air distribution is heavily influenced by room structure, where beams and cable trays can disrupt airflow and create local hot spots. Row-based precision air conditioning with aisle containment minimizes airflow disorder, prevents short-cycling, reduces ineffective cooling, and improves both reliability and economy. Regarding site adaptability, the Inner Mongolia branch provides a compelling example: the original building had beams in the center of the room with only 2.3 meters clearance to the floor, making traditional underfloor cooling impractical. The project team customized the solution by eliminating aisle containment panels under beams and reducing cable tray heights, demonstrating the high flexibility and site adaptability of modular machine rooms. Furthermore, for branches that may relocate, modular data centers offer far greater migration and reusability than traditional data centers.

Modular data centers have seen extensive application in small-scale branch offices in the financial and energy sectors in recent years, with their flexibility and reliability recognized across industries. Based on the project team's experience

in Anhui and other branches, modular data center solutions not only meet the infrastructure needs of Xinhua News Agency' s domestic branches for current and future all-media technology development, but also exceed expectations in construction cycle, standardization, energy conservation, migration capability, and site adaptability, representing the primary development direction for future modern branch data center renovation and construction.

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

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