

## Design and Implementation of the Xinhua News Agency Photo Mobile Reporting System for the Tokyo Olympics: Postprint

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### Abstract

The Tokyo Olympics represented Xinhua News Agency's inaugural participation in Olympic coverage as an International Olympic Committee-accredited international news agency. The Xinhua photo reporting team also participated for the first time as a member of the International Olympic Photographers Pool (IOPP), assuming responsibility for supplying photographic content to the International Olympic Committee (IOC). The frontline distribution platform served as the most critical technical system for the entire mobile reporting operation. To meet the requirements of mobile reporting—including high distribution volume, ease of deployment, and user-friendliness—a mobile photo reporting system was designed and developed employing a microservices architecture. The system was deployed at the Tokyo Olympics Press Center and utilized during the 2020 Tokyo Olympics. Throughout the Games, the system distributed 40,000 photographs, with an average daily output exceeding 2,000 images.

### Full Text

#### Preamble

**Title:** Design and Implementation of Xinhua News Agency's Mobile Photo Reporting System for the Tokyo Olympics

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**Abstract:** The Tokyo Olympics marked Xinhua News Agency's first participation as an IOC-accredited international news agency. The Xinhua photography team also participated for the first time as a member of the International Olympic Photo Pool (IOPP), tasked with supplying content to the International Olympic Committee (IOC). The frontline dispatch platform represents the most critical technical system for the entire mobile reporting operation. To meet the

demands of high-volume mobile reporting with easy deployment and usability, a microservices architecture was adopted to design and develop the photo mobile reporting system. The system was deployed at the Tokyo Olympics Media Center during the 2020 Tokyo Olympics, issuing 40,000 photos throughout the Games with a daily average of over 2,000 dispatches.

**Keywords:** 2020 Tokyo Olympics; mobile reporting system; virtual editorial office; on-site editing and immediate transmission

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## 1. Background

The 2020 Tokyo Olympics represented Xinhua News Agency's inaugural participation as an IOC-accredited international news agency. The Xinhua photography team also participated for the first time as a member of the International Olympic Photo Pool (IOPP), assuming responsibility for supplying content to the International Olympic Committee (IOC). The frontline dispatch platform constitutes the most critical technical system for the entire mobile reporting operation. Photo reporting exhibits strong dependence on dispatch platforms due to three key factors: First, the sheer volume of photographic content, with peak transmission rates reaching nearly 400 photos per minute and daily dispatches exceeding 2,000 images. Second, stringent timeliness requirements, as journalists typically transmit directly to editorial systems. Third, the need for portability, as the system must fit within a compact rack-mounted enclosure for transportation. These factors impose higher demands on the design and development of photo reporting dispatch platforms.

## 2. Design Philosophy

Based on the characteristics of frontline photo reporting, the following design principles were adopted:

### 2.1 Easy Deployment

The system architecture emphasizes scalability, enabling rapid and flexible deployment configurations that support single-machine, dual-machine, cloud-based, and cluster deployments.

## 2.2 Ease of Use

The system maintains consistency with the editorial interface that editors and journalists use in their daily operations at the headquarters, eliminating the need for retraining. Editorial groups and review workflows can be customized at any time according to frontline business requirements, supporting teams ranging from a few individuals to over a hundred journalists.

## 2.3 Low Dependency on Networks and Third-Party Services

The system minimizes reliance on networks and third-party services. When deployed internationally with poor network conditions, the system can operate independently within a local area network, providing complete editorial and review functionality. When deployed domestically with better network connectivity, the system can integrate external third-party services to offer additional features.

## 3. System Architecture

The photo mobile reporting system employs an open-source architecture with independent development. The design follows a layered approach, divided from top to bottom into: page view layer (using Vue framework for the front-end), business logic layer (based on Spring Boot controllers calling services), database access layer (using Spring JPA for object-oriented data operations), and remote file storage layer (for storing images and thumbnails). All foundational components utilize open-source software including Redis, RabbitMQ, Elasticsearch, MongoDB, and OpenResty.

The system is developed using microservices, with core services including: an ingestion service for importing photographs along with metadata and audio attachments; a manuscript service providing editing interfaces and editorial workflows; a distribution service for delivering approved content to users, including images, photo sets, and graphics, supporting both traditional subscribers and new media clients such as mobile apps, as well as IOPP photo exchanges with foreign news agencies; an image processing service for operations like thumbnail generation, compression, and online cropping; a backend management service for user authentication, permissions, and editorial processes; and additional services for index pushing to Elasticsearch and system monitoring. The front-end supports both browser-based and plugin-based access.

## 4. Core Functional Design

### 4.1 Professional Image Editing Capabilities

The system supports browser-based online image editing functions such as cropping, brightness adjustment, and logo/border insertion, enabling rapid editing. It also supports plugin installation on editors' desktop computers for integration with third-party professional software like Photoshop and Adobe Illustrator.

The editor plugin can automatically download images for editing in batches, invoke third-party editing software, and automatically upload the edited files back to the server, where the system automatically updates data, extracts thumbnails, and refreshes content. Beyond image editing, the system automatically extracts IPTC and EXIF information from images for editorial reference, including camera model, flash usage, and other technical details.

## 4.2 Group Photo Mode for Enhanced Editing Efficiency

Editors typically work with related images as a set. The system's group photo function aggregates related images into collections, automatically dividing manuscript text into multiple sections. Editors can first edit common metadata for the entire set, such as headline, general description, dateline, and byline. After editing one photo, clicking "synchronize" automatically generates corresponding content for other photos in the set according to predefined rules. Subsequent editing then focuses only on photo-specific metadata. Upon completion, the system automatically aggregates all section-based edits. This significantly reduces repetitive work. After approval, content can be delivered as individual images or automatically converted into photo galleries for subscribers, formatted either for traditional clients or optimized for mobile app display for new media users.

## 4.3 Family Manuscript Function for Editorial Collaboration

A single photograph often undergoes multiple rounds of editing—for example, being processed separately by Chinese and English editors as distinct manuscripts. When the Chinese editor corrects inaccurate textual descriptions, the English editor must be notified to avoid errors or duplication. To facilitate better collaboration, the system introduces a family manuscript function. All manuscripts derived from the same original photograph belong to the same "family." When one editor modifies a family manuscript, the system notifies other editors working on manuscripts from the same family. Editing and approval operations automatically apply tags and color codes to corresponding family manuscripts, alerting other editors.

## 4.4 Integration with Third-Party Professional Software

The system supports integration with third-party professional software such as PhotoMechanic and Lightroom. For instance, journalists can use PhotoMechanic for offline editing of images and captions, with edited content stored in IPTC fields and transmitted back to the system via built-in FTP functionality. The system automatically extracts IPTC information into manuscript content and workflows, enabling journalists to complete editing in the field without returning to the editorial office.

## 4.5 Virtual Editorial Office for Flexible Workflow Customization

The virtual editorial office function adapts to various reporting formats, enabling customized editorial roles and workflows.

### 4.5.1 Immediate Transmission Mode from Journalists to Editorial

Journalists capture photos with optional voice annotations, using the camera's network transmission module to automatically send photos and audio to the system. Upon receipt, the system automatically supplements manuscript content according to predefined rules and distributes them to different editorial groups. Photos appear in the system as unedited "originals," allowing journalists to focus entirely on photography without editorial responsibilities.

### 4.5.2 Standalone Pre-Editing Mode by Journalists

After shooting, journalists perform basic editing on their laptops using installed editing software before transmitting to the system. According to preset configurations, the system routes content to designated editorial groups for review, automatically supplementing manuscript content and workflow information. These manuscripts are inserted directly into the appropriate department's edited queue as pre-edited content. This mode enables journalists to complete initial editing offline using portable computers and submit directly to the edited queue, preventing 后方 editors from overlooking content due to lack of situational awareness.

### 4.5.3 On-Site Editing and Approval Mode

In sports reporting, opening/closing ceremonies and key venues often organize small teams for on-site editing and approval. Journalists transmit photos in real-time to on-site photo selectors, who then forward selected images to on-site approvers. Manuscripts circulate only within the specific on-site team, with other editors not participating. This mode enables rapid completion of the entire photo dispatch workflow with journalists, editors, and approvers all present on location.

### 4.5.4 Independent Frontline and Headquarters Editorial Office Mode

For major reporting events, some editorial staff must be dedicated exclusively to frontline coverage. The virtual editorial office function supports creating a logical frontline editorial office while maintaining the headquarters structure. This allows reassigned editors to be reorganized beyond their original departments into a new "virtual" editorial office. Frontline editors only see frontline originals and process manuscripts, while headquarters editors only see headquarters content, enabling both teams to work independently without interference. After approval, all editors can share content, with headquarters editors able to perform secondary editing and distribution on frontline content as regular manuscripts. The virtual editorial office function also enables dynamic redefinition of editorial groups and automatic assignment of manuscripts to different groups based on configured rules, facilitating focused editing.

#### 4.6 IOPP Functionality Support

According to international photo exchange requirements, IPTC information must be embedded in exchanged photos. The system includes an IOPP module that automatically extracts metadata from approved photo manuscripts, writes IPTC information into the image files post-approval, and automatically translates certain content based on language requirements. During the Olympics, the system provided over 30,000 photos to the IOC, with a daily average of more than [Figure 1700: see original paper] images.

#### 4.7 Advanced AI Capabilities

The system supports powerful AI functions including image tampering detection to identify manipulated photos, sensitive image recognition to identify specific symbols and alert editors, and facial recognition for political figures and sports stars. These capabilities continue to expand.

### 5. Usage

The system was deployed at the Tokyo Olympics Media Center during the 2020 Tokyo Olympics, issuing 40,000 photos throughout the Games with a daily average of over 2,000 dispatches. The project received the Third Prize of the Wang Xuan News Science and Technology Award.

**References:** [1] Jiao L. Technical Exploration on Improving the Timeliness of News Photography Reporting [C]. 2020 Annual Conference of China Federation of News Technology Workers, 2020. [2] Wang J, Jiao L, Lin B. Image Tampering Detection Technology Helps Prevent Publication Errors [J]. News Business Weekly, 2021(3).

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**Note:** The original document contained an unrelated paper on server virtualization technology in television broadcast systems that has been omitted as extraneous content. Table and figure markers have been preserved as instructed.

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

*Source: ChinaXiv – Machine translation. Verify with original.*