Application of Mobile Development Components in Xinhua News Agency' s Mobile Office System (Postprint)

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Abstract

Mobile informatization is developing rapidly, and an increasing number of mobile development components are being applied in the construction of mobile applications. Based on Xinhua News Agency' s mobile informatization construction, this paper compares three mobile development frameworks, introduces the specific application scenarios of the React framework and Bootstrap framework in Xinhua News Agency' s mobile office, and finally summarizes the development of Xinhua News Agency' s mobile informatization.

Full Text

Preamble

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Abstract: With the rapid development of mobile informatization, an increasing number of mobile development components are being applied in mobile application construction. Based on Xinhua News Agency' s mobile informatization initiatives, this paper compares three mobile development frameworks, introduces specific application scenarios of the React and Bootstrap frameworks in Xinhua' s mobile office system, and concludes with a summary of the agency' s mobile informatization development.

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In the mobile Internet era, the development trends of mobilization, fragmentation, flattening, socialization, and platformization represent the direction of transformation. These trends demand more lightweight and timely performance than traditional Web applications in terms of business functions, and higher adaptability than traditional native Apps in terms of user experience. Currently, Xinhua News Agency' s mobile office system has been deployed and is operational, achieving an agency-exclusive mobile instant messaging platform that provides secure and controllable communication tools with internal directory functions for the entire organization. The system has also realized a unified information publishing portal for mobile distribution of editorial, distribution, contribution management, and office administration information, as well as unified integration of mobile lightweight applications. Leveraging lightweight development frameworks, the system has completed development and deployment of finance, notification, and email lightweight applications. Following the laws of mobile Internet development, the technical team established two fundamental principles for mobile application development: lightweight development and high adaptability, aiming to maximize the use of foundational modules from traditional office systems and provide services through lightweight components to reduce development and debugging complexity.

2. Mobile Development Frameworks

Currently, conventional mobile development technologies based on standard front-end HTML5 frameworks cannot achieve dynamic loading. In terms of terminal adaptation, the multiplicity of mobile device sizes requires individual matching for different terminals, and adaptation to various resolutions introduces numerous challenges. These issues not only result in complex page structures but also consume excessive traffic and battery power on terminal devices, compromising user experience. After analyzing and comparing the advantages and disadvantages of multiple development frameworks, and balancing the technical requirements for bidirectional interaction between traditional office systems and mobile Internet, the technical team adopted a management approach of parallel "deployment + iteration" for system construction.

Guided by the two fundamental principles of lightweight development and high adaptability, the technical team selected three popular mobile front-end development frameworks—Bootstrap, jQueryMobile, and React—for comparative evaluation, with the goal of focusing on business functions and enabling rapid integration. The team employed a hybrid application development framework to accommodate the rapid development needs of mobile services.

2.1 Bootstrap Mobile Front-End Development Framework

The Bootstrap mobile front-end development framework is an open-source architecture designed by Twitter that combines HTML, CSS, and JavaScript languages, making numerous improvements on top of jQuery to form a uniquely styled, rapid Web application front-end framework. From its initial design to its widespread adoption across the Internet, Bootstrap has matured considerably over the years, with numerous excellent websites such as Ghost, Starbucks, and Laravel beginning to adopt it for development to meet the demands of continuous technological iteration. The framework has gained widespread industry recognition for its features including rapid adaptation for both PC and mobile interfaces, high compatibility, responsive layout, and grid-based design. Although its relatively short open-source history means that a comprehensive public component library is still under development, this should quickly cease to be an issue given the vigorous development of mobile Internet today.

2.2 jQueryMobile Mobile Front-End Development Framework

jQueryMobile is also a widely recognized powerful open-source project developed by a team led by Alexander Schmitz. It utilizes the jQuery core library and jQuery mobile UI framework for mobile web development, providing mobile application developers with a framework for achieving uniform interface styles across mobile platforms such as Android and iOS. jQueryMobile offers excellent compatibility, supporting various types and levels of devices, and can provide better experiences for devices that do not support JavaScript. Although the framework has gained recognition from numerous website developers both domestically and internationally, its implementation of resolution and size adaptation for different devices is relatively cumbersome, and its response to dynamic effects is comparatively poor.

2.3 React Mobile Front-End Development Framework

Since its release by Facebook in 2013, React has attracted an increasing number of developers, with derivative technologies such as React Native and React Canvas emerging continuously. JSX, which uses XML markup to directly declare interfaces, constitutes a core component of React. UI components can be nested within each other, and interface programming is driven by data models. UI layers achieve cascading refreshes through Virtual DOM. React implements a set of DOM APIs using JavaScript in the browser. When developing with React, all DOM construction occurs through Virtual DOM. Whenever data changes, React rebuilds the entire DOM tree and then compares it with the previous DOM tree to identify structural differences, updating only the changed portions in the actual browser DOM. Moreover, React can batch Virtual DOM refreshes, merging two data changes within a single Event Loop.

Virtual DOM not only simplifies UI development logic but also introduces component-based development thinking. React defines each functionally inde-

pendent module on the UI as a component, then combines or nests smaller components to form larger components, ultimately completing the entire UI construction. Each component' s UI and logic are defined internally, interacting with the outside entirely through APIs. Complex functions are achieved through composition, and all components can be reused and reorganized.

3.1 Practical Problems Solved by Framework Components

3.1.1 Dynamic Loading of Web Resources

Dynamic resource loading technology must complete calls to mobile native interfaces, resolve performance bottlenecks caused by small files such as images and stylesheets, and address application iteration and lightweight deployment issues with lower development and learning costs. In terms of business and styling, front-end developers only need to reference required plugin libraries in the code block header; logically, developers simply call interfaces provided by the backend for reading and display. The client' s JavaScript engine completes dynamic loading of complex content according to dynamic loading strategies, optimizing user experience.

3.1.2 Pre-built Common Modules

Based on front-end development experience in mobile application projects, commonly used and general modules are summarized and encapsulated uniformly, including modular processing of common information page pagination, unified header references, and frequently used buttons. This approach not only rapidly achieves consistency in mobile page styles but also enables quick problem localization during mobile debugging, realizing the goal of modifying once and applying across multiple locations. Defining multiple modular components with complex differentiation requires strict specification of module names and information to form standardized documentation, ensuring not only that modules do not conflict with each other but also improving developer coding efficiency.

3.1.3 Terminal Interface Adaptation

Browser adaptation work based on different resolutions and screen sizes represents an important challenge in mobile Web application development, which mobile development frameworks effectively resolve. In framework development code, developers only need to set essential attributes such as width and viewport settings to adapt to various mobile devices and phone models, achieving code reuse across multiple platforms. Interface adaptation also standardizes dynamic popups, user waiting, and data loading styles within applications, unifying interactive interface styles while solving adaptation issues. Future plans include customizing multiple style sets for different scenarios.

3.2 Application of Mobile Development Frameworks

Built upon Xinhua' s traditional OA system, mobile development frameworks and components were used to develop a mobile homepage that integrates with OA office, finance, email, and other systems to achieve mobile information publishing and unified application integration. Currently, the mobile homepage integrates multiple lightweight applications including meeting room reservation, leadership leave requests, and Xinhua briefings.

(1) The mobile "Homepage" application uses the React framework for front-end DOM rendering and node.js technology for back-end DOM content resource generation. The "Homepage" application supports column-based, permission-controlled list displays, allowing users to read only information within their authorized scope. Information displays titles, publication times, and other content, with the first image of articles containing pictures shown on the homepage; users can click to enter the detail page. The information directory can be refreshed through pull-down gestures, displaying 20 items per page with a "load more" feature for additional content, as shown below.

[Figure 1: see original paper] React Framework Developed Mobile Homepage

(2) The mobile office system includes multiple auxiliary office lightweight applications involving both traditional PC web office systems and mobile terminals. Developed using the Bootstrap framework, these applications run on the same back-end with a single codebase shared across "both ends." Auxiliary office functions include meeting room reservation, leadership leave requests, shift handover, and other applications. While the traditional OA web client needs to respond to mouse clicks, keyboard input, and data submission, mobile lightweight applications must respond to screen swipe events, tap events, asynchronous refresh, and data submission.

Taking the mobile meeting room reservation function as an example: when users need to reserve a meeting room, they tap the "Meeting Room Reservation" button on the mobile terminal to enter the reservation interface, where they can determine the usage interval through a timeline and meeting room location. After selecting the interval, the request enters the approval process for administrator action. All back-end approval operations can be queried in real-time on the front-end, and users receive push notifications when status changes occur. Figures 2, 3, and 4 show the meeting room reservation function pages in Xinhua' s mobile office system, corresponding to mobile, PC client, and Web interfaces respectively, demonstrating how the Bootstrap framework enables multi-terminal adaptation through single development.

[Figure 2: see original paper] Meeting Room Reservation Mobile Page
[Figure 3: see original paper] Meeting Room Reservation Page in Client Application

[Figure 4: see original paper] Meeting Room Reservation Web Page

The development of mobile office lightweight applications marks the first realization of bidirectional interaction between traditional office systems and mobile Internet, integrating functions suitable for Internet deployment from traditional OA systems with mobile office systems. These functions represent both a controlled integration of traditional office systems with the Internet and a solution that stays close to frontline reporting command needs. During development, challenges emerged including high internal coupling in traditional office systems and different systems using their own frameworks. Moreover, most development frameworks used are open-source with rapid version evolution, placing higher demands on technical staff' s development capabilities.

Xinhua' s mobile office lightweight applications differ from Internet applications in that while Internet applications update extremely rapidly, internal office applications require certain stability. This requires technical staff to develop not only coding skills but also integration and tracking abilities, constantly monitoring new technology developments and rationally integrating development frameworks.

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