

Design and Implementation of Pinxixi Group Buying Program

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Abstract: This program constructs a B2C e-commerce system connecting merchants to customers, utilizing the backend server framework MINA developed by the WeChat team. The MINA framework provides a comprehensive set of JavaScript APIs to the upper layer by encapsulating the WeChat client's capabilities, such as the file system, network connections, and task management. It is important to note that the front end of this program is developed using the highly efficient Vue framework and Element UI components. By establishing an online store, the program eliminates challenging operational tasks and reduces unnecessary expenses like commission fees on orders for merchants. Not only does it allow customers to place orders anytime and anywhere with ease, but it also facilitates online management for store owners.

Keywords: WeChat Mini Program, group buying, Vue framework, MINA framework

1. INTRODUCTION

In traditional e-commerce development solutions, most approaches involve implementing various B2C^[1] and C2C^[2] business models tailored to different scenarios, with C2C models constituting the majority. Relying solely on online images for purchases often lacks sufficient visual appeal and attractiveness. In recent years, the microservices architecture has matured, enabling servers to support diverse services and accommodate richer content. This program builds an e-commerce WeChat mini-program based on the MINA framework, where services communicate via HTTP/HTTPS APIs^[3]. By bypassing third-party platforms and eliminating intermediaries, it directly connects merchants with customers for product sales, allowing users to place orders and shop directly within the mini-program.

2. REQUIREMENT ANALYSIS AND SYSTEM ARCHITECTURE DESIGN

The system adopts a B/S architecture overall, which represents a business-to-consumer e-commerce model where suppliers directly engage with customers. Built upon the MINA framework^[4], its responsive data binding system facilitates seamless synchronization between data and views. High concurrency for web requests within the MINA framework is managed through the database operations of the NIMA framework. Pages rendered by the mobile simulator are compiled and bundled by the Vue framework, generating HTML, CSS, and JavaScript files. HTTPS requests between the server and the simulator ensure data protection during transmission. The design pattern of the MINA backend framework is MVT^[5]. While Template was previously used to render the homepage, this project separates the frontend and backend frameworks for development, utilizing the Vue framework for page rendering. Designing the frontend pages independently with Vue allows for more convenient debugging, and after debugging, the bundled files can be viewed in the WeChat Developer Tools^[6]. The database is constructed using a combination of MySQL^[7] and Redis^[8].

3. Detailed Design of Pinduoduo Group Buying Mini Program

3.1 User Module

The MINA framework includes built-in model classes for users and user groups, which can directly generate corresponding database tables. However, this project requires modifications to the existing tables to add additional information, such as username, nickname, login mobile number + device ID, login password, total sales amount, and other related details.

3.2 Commodity Category Module

The product table (`nideshop_goods_attribute``) includes fields: ``id`,`goods_id`,`attribute_id`,`value``. The `@RequestMapping`` annotation does not specify the content-type. To standardize operations, the image URI is converted to a file path before being placed into ``uploadImage``. If the uploaded document is an empty file, it prompts: "The uploaded file cannot be empty." `@ApiImplicitParams``: Used on request methods to provide a set of parameter descriptions. The product information table (`nideshop_goods``) includes fields: ``id`,`category_id`,`goods_sn`,`name`,`brand_id`,`goods_number``, etc.

3.3 Order and Shopping Cart Module

The order form and shopping cart form share many identical fields. For convenience, the design of the order table is based on the shopping cart table, with additional fields such as shipping address, recipient phone number, courier company, and tracking number. To "archive" the populated order data, no foreign keys are allowed in the order data table, and only necessary fields are created independently. The payment function for orders utilizes the WeChat platform's interface by registering an account on the WeChat Open Platform, creating an application, and using the sandbox environment. Since WeChat keys are typically encrypted using the RSA2 method, OpenSSL is downloaded and installed from the official OpenSSL website.

4. System Testing

4.1 User Function Testing

When accessing the Pinduoduo mini-program, the homepage features a rotating advertisement banner, a "Super Group Buying" entry, and four sections: Featured Selections, New Arrivals, Popular Recommendations, and more. The second tab is "Categories," which includes eight major categories, each containing various types of items. The third tab is "Special Topics," primarily showcasing cost-effective products of various types with numerous discounts. The fourth tab is the "Shopping Cart," where users can place their favorite items. On this page, users can edit the shopping cart, remove items from it, or select items to place an order. The fourth tab also includes a "My Account" section, where users can view their personal information, check distribution commissions, withdrawable balances, and their orders—including pending payment, pending shipment, pending delivery, and return/refund orders. User services include inviting friends, coupons, recommended products, favorites, browsing history, feedback, address management, and customer support.

4.2 Administrator Function Testing

After logging into the administrator account, the page redirects, and the left side displays the functions the administrator can operate. Clicking on "Member Management" reveals eight options: "Distributor Settings," "Member Management," "Member Coupons," "Member Favorites," "Member Footprints," "Search History," "Shopping Cart," and "Shipping Address Management." Clicking on "Member Management" provides functions such as "Add User," "View Customer Information," "View Coupons," "View Shopping Cart," "Download Member Information," "Modify Member Information," "Delete Member Information," and "View Shipping Address." Clicking "Add User" redirects to the addition page. After entering and submitting the information, a "Submission Successful" message appears. Upon returning to the page, the newly added user information can be seen. Clicking "Edit Products" displays functions like "All Products," "Product Specifications," "Product Settings," "User Reviews," and "Product Recycle Bin." Clicking "All Products" shows information for all products, and actions such as "Add," "Modify," "Delete," "List," and "Delist" can be performed here. Clicking "Add" allows the addition of a product. After entering the product information and clicking "Submit," a "Submission Successful" prompt appears. Refreshing the WeChat Developer Tools displays the newly added product on the page. Clicking "Order Management" enables viewing of "Group Buy Lists" and "All Management." Opening "All Management" shows all user orders, and the administrator can perform "Ship" and "Confirm Receipt" operations on products from the page. Clicking "Promotion Management" allows management of coupons, including adding, modifying, and deleting coupons.

5. CONCLUSION

The Pinduoduo WeChat group buying mini-program relies on the vast user base of WeChat and can be launched simply by authorizing login through the mini-program interface. Compared to other shopping apps, it occupies less memory and is more convenient to maintain. The development of the Pinduoduo WeChat group buying mini-program is mainly divided into two parts: users and administrators. Users authorize login to access the mini-program, browse products on the homepage and category pages, add items to the shopping cart, and make purchases. Administrators can add products from the backend, manage users, check logistics status, and perform other tasks.

6. REFERENCES

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