The Research on Single Page Application Front-end development Based on Vue

Nian Li¹, Bo Zhang¹*

¹School of Computer Science, Wuhan Donghu University, Wuhan, China
email: 43370279@qq.com
*Corresponding author’s e-mail: zhangbo@wdu.edu.cn

Abstract. ‘Vue.js’ is a popular front-end framework, which uses MVVM (Model View View-Model) design pattern to support data-driven and component-based development. This paper discusses the basic working principle and development mode of Vue, and on this basis, uses SPA (Single Page Application) to design and implement a mobile mall front-end page based on Vue. This research fully demonstrates the advantages of front-end and back-end separation technology in Web development, and provides a powerful front-end support for full stack development.

1. Introduction
With the development of Internet and the coming of Web2.0 era, more and more data processing and business logic in web development begin to lean to the front end. The traditional front-end development model with the core of jQuery can’t fully meet today's business needs. More complex business scenarios appear in web projects, such as SPA, component decoupling and so on. In order to improve the development efficiency and reduce the maintenance cost, MVVM mode with the characteristics of data bidirectional binding and componentization has been widely introduced into the field of front-end development in recent years. This paper studies the development of web front-end based on MVVM mode, and uses the ‘Vue.js’ to implement the front end of a SPA mall.

2. Basic working principle of Vue
Vue is a set of progressive JavaScript framework to build user interface, and its data driving is realized through MVVM mode. Different from other heavyweight frameworks, Vue is built with the idea of data-driven and component-based, adopts the design of bottom-up incremental development. In MVVM mode, data and views are separated, they can't communicate directly. We need to use view-model listener to monitor the actions of both sides and make corresponding binding operation in time.

The MVVM architecture diagram of Vue is shown in Figure 1. The architecture is different from the original manual operation of DOM nodes, ‘Vue.js’ is a responsive bidirectional binding. Once the binding is created, the DOM will be synchronized with the data. When the data is updated, the corresponding DOM nodes will also be updated synchronously. On the contrary, if the view in the DOM changes, the view-model will call the relevant application logic to update the data in the model to realize the bidirectional binding of data.
Figure 1. The MVVM architecture diagram of Vue

3. The SPA development mode based on Vue framework

SPA (Single Page Application) is usually composed of one HTML file and some JS loaded on demand. Different from the traditional B/S mode application on PC, there is only one complete HTML page in a SPA, which has a container to insert the code fragments to be loaded. The design mode is very suitable for app development on mobile terminals.

3.1. Webpack: a front-end engineering tool

Webpack is a front-end resource loading / packaging tool. It will carry out static analysis according to the dependency relationship of modules, and then generate the corresponding static resources according to the specified rules. This feature of webpack just provides a strong support for the development of SPA. In the world of webpack, a picture, a CSS or even a font can be called a module, and there are dependencies between modules. Webpack handles the dependencies between modules by installing different loaders, and then packages them. In SPA development, webpack will hang HTML under the back-end program, render the page by the back-end routing, and deploy all static resources (CSS, JS, image, iconfont, etc.) to CDN or back-end program separately. According to this, the front-end and back-end can be separated completely, and the front-end development is more independent, efficient, and highly reusable.

3.2. Vue-router: front-end routing

Front-end routing means that the routing rules are maintained by the front-end, which can ensure the persistence of the page and separate the front-end from the back-end completely. The core of SPA is front-end routing. There are two ways to implement front-end routing: one is to use the hash of URL, which is often called anchor point, and the other is the history mode of HTML5. Vue-router, which is the front-end routing framework of Vue, routes different pages, and loads different components dynamically. Each page corresponds to a component which is a vue file in fact.

Setting mode to history will turn on the history routing mode of HTML5, and set the path through '/', otherwise, '#' will be used to set the path. This project adopts the history routing mode.

3.3. Vuex: state management

A component can be divided into data (model) and view (view). When data is updated, the view will be updated automatically. In the view, you can also bind some events, which trigger the methods specified in methods, so that you can change the data and update the view. It is necessary to share data across components in project development. Vuex, which is a plug-in of Vue.js, can be used to manage component state uniformly, it defines a series of specifications to operate data, so as to make component application more efficient.
4. The front-end development of SPA mall based on Vue

4.1. The front-end architecture design of the shopping mall
The directory structure of front-end project SPA mall is shown in Figure 2, which is followed by any project development based on Vue. ‘package.json’ is the static resource package of a project, which stores resources such as pictures, font icons, CSS style files, etc; ‘components’ is a common component library, which can manage the pages of various sections according to the menu level, each page constitutes a view in the form of a single file component; ‘router’ is mainly responsible for the routing configuration module of page jumping; ‘App.vue’ is the root component, which is used to define the overall structure of SPA; ‘main.js’ is the entry file for the project.

![Figure 2. The directory structure of the front-end project](image)

4.2. The page structure design
A Vue page usually consists of three parts: template, script and style, ‘App.vue’ component mainly defines the contents of these three parts. ‘main.js’ is the entry file of the project, which mainly introduces the Vue framework, root components and routing settings, and defines the Vue instance. The key codes of the entry documents of this project are as follows:

```javascript
import Vue from 'vue'
import App from './App'
import router from './router'
import store from './store'
Vue.config.productionTip = false
new Vue({
  el: '#app',
  router,
  store,
  template: '<App/>',
  components: {App}
})
```
4.3. The design and implementation of interface

4.3.1. Interface design. The interface design of this mall project is divided into four sections: ‘HOME’, ‘MEMBER’, ‘DISCOUNT’, ‘MINE’. The HOME page mainly displays the commodity classification, discount activities, hot goods and so on. The structure of the page is divided into five modules: promotion activity carousel display, product classification, discount activity, best-selling products and bottom navigation. The content display of other sections is set by vue-router.

4.3.2. Writing components. The specific implementation of the mall page is completed in the process of splitting and writing components. According to the business logic of the mall project, the components are divided into four parts: home, member, discount and mine, the routing address of each component is defined in the script module of the root component ‘App.vue’, and then, the components corresponding to each routing address are defined in the file ‘index.js’. The HOME page of this mall project is shown in Figure 3:

![HOME page of the mall project](image)

Figure 3. The HOME page of the mall project

5. Conclusions
‘Vue.js’ is a set of progressive framework to build visual interface, it is very easy to bind and combine with other libraries or existing projects. This paper uses ‘Vue.js’ to complete the development of a front-end project, which realizes the separation of front-end and back-end in the real sense of web development, and also provides front-end support and technical reference for the complete development of a SPA.

Acknowledgments
This paper was co-supported by the Middle-aged Scientific and Technological Innovation Team of Hubei University in 2019, ‘WduHos Machine Data Analysis Platform’ under grant T201937. Thanks for the support of Education Department of Hubei Province and Wuhan Donghu University.

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