INFORMATION TECHNOLOGIES AND DEVELOPING A SINGLE PAGE WEB APPLICATION USING THE REACT LIBRARY

Artur OGHLUKYAN
Master of Software Engineering at National Polytechnic University
of Armenia (NPUA) & Polytechnic Institute of Bragança (IPB)
Gevorg KARAPETYAN
Ph.D. in Economics

Introduction. Together with the increase in the number of such systems in the corporate infrastructure, the question of choosing software products for the implementation of an effective, modern and fault-tolerant system is being raised. Therefore, Single Page Application (hereinafter referred to as SPA) gained popularity.

SPA applications are web applications that use an HTML document as a shell for all web pages and organize the exchange of information with the user through dynamically loaded HTML, CSS, JavaScript.

The aim of the work is to analyze the existing frameworks for creating web applications, determine their features, pros and cons according to various characteristics, and choose the appropriate framework for implementing the client side of the application. Of course, optimizing the developer's work is a requirement.

Economic significance. Digital technologies affect the structure of trade by increasing the service component, stimulating trade in certain commodities such as urgent goods, changing patterns of comparative advantage, and influencing the complexity and length of global value chains. E-commerce is the activity of electronically buying or selling goods through online services or over the internet. E-commerce affects economic variables and growth rates. This results in higher wages, a higher standard of living for the people, the structuring of markets and the expansion of marketing, increased sales and exports and thus increased production and growth rates. React is an excellent JavaScript framework for building an E-commerce web application.

Methodology and literature review. The main SPA-architecture is the view (View) - it is with this that the user of the system interacts. Often views are based around templates (Template) - blanks that are converted into HTML. To store information, you need a model (Model). A model is a set of data and functions required to work with events and data. All model information is fully stored in memory (Storage). To maintain the integrity of the information, the view tracks any changes to the data in the model. Similarly, the model responds to the presentation notification and provides continuous interaction between the WEB service and the server, executing requests for information

transfer (including using REST) [Klochkov, 2018, 1-5; Results for js web frameworks benchmark, 2020].

A feature of the implementation of SPA is a modular structure. This is necessary in order to simplify refactoring and testing, as well as improve and simplify the maintenance of the application. Modular architecture means dividing the application into separate packages with explicit dependencies. Each package is a file and a module [Results for js web frameworks benchmark, 2020]. In the beginning - using this architecture may feel like a slowdown but creating and having compact elements increases the expected performance, and a large project will be clean and easily changeable.

JavaScript is the language of the World Wide Web. It originally was a tool for managing certain types of web page elements (such as images and form fields), but the language has evolved rapidly since then. Now, in addition to creating client-side scripts executed by the browser, JavaScript is used to develop cross-platform programs [Suvrova, Gavrilenko, 2018]. JavaScript is included in the list of the main modern technologies that web programmers need to know and be able to use HTML (markup language), CSS (style language) and the JavaScript programming language that determines the behavior of web pages [Potapov, 2014].

The ReactJS JavaScript library is used to implement the client side of the program. ReactJS is a powerful tool for implementing user interfaces. The purpose of this tool is to provide ease and scalability of the application, ensuring the display of all that is characteristic of web pages at high speed [Bondarenko, 2018, p. 46-48].

React and Angular are libraries and, depending on the requirements, the use of each of them makes it possible to create dynamic web applications in a short time. Obviously, good architecture with core-js, especially high-quality code, requires more experience and more time. As an example we may assume that 10 students are tasked with doing form manipulation with a framework and pure-js for comparison.

Chart 1. The results of time management
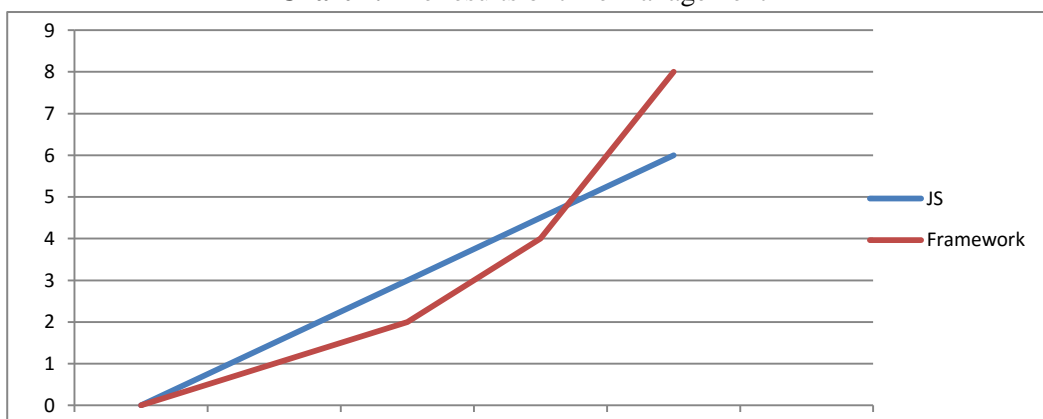
Thus, we spent a little more time at the start and gained a lot of time in the follo-wing tasks. React allows developers to model the state of interfaces and describe them

declaratively. React is just JavaScript, the library has a very small API to learn, just a few functions and how to use them, which allows you to quickly learn it [Suvrova, Gavrilenko, 2018].

Table 1. Difference between modular and non-modular applications

Non-modular application	*Modular application*
Each piece of code is global	Packages provide a single public interface
Variables are global	Local variables in each package
Load order matters because anything can overwrite or change something	The order of loading does not matter thanks to the division into packages
Implicit dependencies on something global	Implementation details not available outside the package
Files and modules have no connection in meaning	Each file corresponds to one module
	Explicitly Declared Dependencies

Basic concepts. Elements are JavaScript objects that represent HTML elements. Components are React elements designed by the application programmer. They are often parts of the user interface that contain functionality and structure. React makes building interfaces much easier thanks to components. JSX is a method for implementing React elements and components. For example, this is a React element written in JSX: <h1> Hello World </h1>. The implementation of a similar element is also possible in Java-Script: ReactDOM.h1(null, 'Hello World'); JSX requires much less effort, it is converted to Java-Script before running in the browser.

Table 2. Performance Comparison

Nomination	angular-v4.1.2-keyed	react-v 15.5.4-mobX-v3.1.9	vue-v2.3.3-keyed
Create lines. Duration to create 1000 rows after page load.	193.17.9 (1.2)	243.99.4 (1.5)	166.78.6 (1.0)
Replace all lines. The duration of updating all 1000 rows of the table (with 5 warm-up iterations)	197.45.3 (1.2)	229.212.2 (1.4)	168.55.0 (1.0)
Partial update. Time to update the text every 10th line (with 5 warm-up iterations)	13.04.5 (1.0)	16.01.8 (1.0)	17.32.9 (1.1)
Select a line. Row selection duration in response to a row click (with 5 warmup iterations)	3.42.3 (1.0)	10.13.8 (1.0)	9.31.7 (1.0)
Change lines. Time to swap 2 rows in 1K table (with 5 warm up iterations)	13.41.0 (1.0)	18.01.2 (1.1)	18.31.5 (1.1)
Delete line. Row deletion duration (with 5 warmup iterations)	46.13.2 (1.0)	53.72.1 (1.2)	52.62.7 (1.1)
Create many lines. Creation time 10,000 rows	1946.041.8 (1.2)	2217.371.5 (1.4)	1587.533.9 (1.0)
Add rows to a large table. Time to add 1000 rows to a 10,000 row table	324.610.1 (1.0)	459.847.2 (1.4)	399.511.0 (1.2)
Clear lines. Cleanup duration for a table populated with 10,000 rows	379.911.3 (1.5)	495.128.8 (1.9)	254.55.0 (1.0)

In order to compare the performance an association is created between the domain data and the DOM element by assigning a "key". When the data changes, the DOM element with the corresponding key will be updated. Any change to an element in the data array causes a corresponding change in the DOM (Table 2) [Klochkov, 2018, p. 1-5]. Also, one of the key indicators is memory allocation (Table 3).

Analysis. Considering the pros and cons of React and Angular 5 in tables 4 and 5 [Karyshev, 2017, p. 47-54].

Table 3. Application memory usage

Nomination	angular-v4.1.2-keyed	react-v 15.5.4-mobX-v3.1.9	vue-v2.3.3-keyed
Memory usage after page load	4.80.0 (1.3)	5.40.1 (1.4)	3.80.0 (1.0)
Memory usage after adding 1000 rows	10.90.1 (1.4)	14.30.1 (1.9)	7.50.1 (1.0)

Table 4. Pros of Angular 5 and React

Angular 5	React
Modern features, improved RXJS, faster compilation, HttpClient launch	Easier to learn due to its simplicity in terms of syntax. No need to learn TypeScript in depth compared to Angular
Accessible documentation providing up-to-date information	Maximum flexibility and responsiveness
Bidirectional data binding. This reduces the risk of potential errors.	A virtual DOM that allows documents in HTML, XHTML, or XML format to be arranged into a tree that web browsers better match when parsing various elements of a web application
MVVM (Model-View-ViewvModel), allows programmers to develop the same section of a software product at the same time using the same set of data	In combination with ES6 / 7 ReactJS, the system can work under high load
Component dependency injection related to modules and modularity in general	Downward data binding, which means that with this type of data flow, child elements cannot affect parent data
Rather complex syntax, based on the first version of Angular	There is no easily accessible documentation as ReactJS was developed very quickly
Problems may occur when migrating from an older version to a newer one	Long learning time. React JS requires deep knowledge of how to use the ICC framework

Table 5. Cons of Angular 5 and React

Angular 5	React
Rather complex syntax, based on the first version of Angular	There is no easily accessible documentation as ReactJS was developed very quickly
Problems may occur when migrating from an older version to a newer one	Long learning time. React JS requires deep knowledge of how to use the MVC framework

Scientific novelty. Information technology does not stand still, there are constant changes that affect everything that surrounds us, including web resources. The IT revolution is an important part of the development of any type of enterprise. Regardless of the type and field of activity, the system of Internet technologies, in 2022, has enough opportunities to implement almost any business. Today, corporate and industry web portals are not a static set of informative data but are full-fledged collaboration tools for many users around the world. It is becoming more and more difficult to figure out which software systems do not have (or will not have) this very Internet interface in the coming years, programs become websites, and site building, and actual application programming become indistinguishable.

E-commerce affects economic variables and growth rates. It leads to higher wages, higher standards of living for individuals, structuring markets and expanding marketing, increasing sales and exports, and thus increasing production and growth rates. The use of modern technological means of trade by states increases the strength of its economy and its growth, and this is beneficial to the social, health, and education sectors, because of the use of modern technological means in the dealings, and under electronic commerce, it is possible to develop production in accordance with its electronic nature, which increases sales and increases corporate profits.

Conclusions. Based on the comparison of the performance of AngularJS and React, we can conclude that React (framework from Facebook) is not inferior to AngularJS (framework by Google) in terms of the speed of performing operations with DOM nodes, and the main difference lies in the application architecture. AngularJS is an implementation of the MVVM pattern, while React puts the View first, its main purpose is to render data, and it leaves the rest of the components up to the developer. By virtue of this approach, it is quite possible to combine AngularJS and React in one application to improve the performance of problematic components. And with a simple example, we saw that the correct use of the framework is saving time and resources, which is one of the most important things in the economy. In summary Angular has more strict structure, which allows to develop thinking about it less, meanwhile React has more dynamic structure, but should be caried out carefully.

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Artur OGHLUKYAN, Gevorg KARAPETYAN
Information technologies and developing a single page WEB application using the react library
Key words: single-page application, JavaScript, ReactJS, SPA, Frontend, architecture, modularity, component, HTML, DOM, resource saving

At present, the Internet has firmly entered the life of almost every person, has become an integral environment for supporting business processes. Every year technologies develop, and there is a need for web applications that have a fast response to actions in the user interface and work perfectly on all devices (both stationary and mobile). The article discusses the development of the architecture of the client side of a single-page application, its features and implementation using the modern React JavaScript library, and a comparative analysis of the use and performance of libraries for developing the client side of React and AngularJS applications. Also, why would using one of these be more cost effective for a development company than using core-js. Ecommerce has increased trade in services between countries. The sector accounts for 60% of the world's total production. With the advent of modern ICTs, e-commerce facilitates the process of bringing consumers and producers closer together and eliminating geographic distance. The use of e-commerce will eliminate traditional jobs and replace them with new skills, requiring workers to be trained in the use of technology so they can compete and win jobs. This means that e-commerce has a negative impact on manual and unskilled labor, but has a positive impact on technically trained workers who can easily find jobs and help create positions and disciplines that were previously not needed or known.