Modern web application development technologies

A I Dzhangarov1,3, K K Pakhaev1 and N V Potapova2

1 Faculty of information technology, Chechen State University, 32 Sheripov Street, Grozny, 364024, Russia
2 Department of Information Educational Technologies, Kuban State University, Stavropol’skaya street 149, Krasnodar, 350001, Russia
3 E-mail: dzhangarov1995@gmail.com

Abstract. One of the key areas of modern information technology is the area of programming. Programming is the creation of various programs. If earlier it was, for the most part, about writing programs for the interaction of a user and a computer, today the applied field of programming is no longer limited to anything. These are programs for portable gadgets, medical equipment, space nanotechnology, and so on. Within the framework of this research, the work will focus on web development and specifically - on the development of a web application. This direction is quite popular, since the Internet segment has played a key role in human life. Whether it's a government-owned company, a private enterprise, or a personal blog, having a website or application is a kind of business card. A web application is a client-server interaction model using browser software. In terms of their structure and logic of work, web applications often resemble the most common desktop solutions, but with one condition - such applications are always launched and executed in the browser.

1. Introduction
If we briefly consider modern trends in web development, we can highlight several areas at once:

1.1. Progressive Web Applications
The so-called Progressive Web Application architecture sets itself the task of integrating a full-fledged adaptive user interface for both web applications launched in a browser and web applications launched on mobile devices.

1.2. Implementation of artificial intelligence tools and voice assistants
The field of DataScience is densely bursting into all areas of human life. And, of course, such technologies need to be supported by applications that claim to be a serious and wide audience and strive to keep up with the times. Therefore, when developing web applications, developers try to include these options as well.

1.3. Serverless technologies
Perhaps the most important trend in modern web development is the use of cloud solutions as servers. In fact, this can be the same appeal to classic servers, but using cloud providers. The most important benefit is that the necessary server calculations are carried out directly in the cloud, and the ready
generated request is already sent to the server [1]. Such an implementation can significantly speed up the processing requests and, accordingly, receiving responses.

Summing up the review of the key areas of 2021 in web development, it is significant to notice the importance of choosing the right development tools. First of all, it is a popular programming language that supports web development and has a variety of multifunctional frameworks [2].

2. Selection of development tools
Today there are many different ways of web development. In addition to choosing a specific programming language, IDE, there are already entire platforms that allow you to build an application from scratch without using programming tools and principles.

And at the same time, the decision to use such generators, without having practical programming skills, web technologies, can be considered reckless, since if any problems or failures occur, it will be almost impossible to resolve them on your own or to improve various components of the application yourself.

As a programming language, it was decided to choose Java. Despite the rather controversial public opinion regarding web development in the Java language, it has a very wide range of different tools and frameworks that set it apart from its competitors. The source of this opinion is that the development of web-applications on it is a more time-consuming and complex process than existing analogues.

A large IT company TIOBE has carried out a large-scale study to identify the most popular programming languages. The survey involved both professional developers from all over the world, large corporations, and novice programmers and startups [3]. This rating is updated every month and for April 2021 the list of the most popular languages is as follows:

| Apr 2021 | Apr 2020 | Change | Programming Language |
|----------|----------|--------|----------------------|
| 1        | 2        | ↑      | JavaScript           |
| 2        | 1        | ↓      | Java                 |
| 3        | 3        |        | Python               |
| 4        | 4        |        | C++                  |
| 5        | 5        |        | C#                   |

Figure 1. Rating of programming languages.

Development environment - IntelliJ IDEA Ultimate Edition. JetBrains software is the leader among the Java programming language IDEs due to its very user-friendly, intuitive interface and support for many different libraries and frameworks.

IntelliJ IDEA comes in two flavors: the free Community version and the paid Ultimate Edition. The essential difference between them is that Ultimate Edition (built on top of Community) is a full-fledged commercial IDE and, in addition to many additional functions, allows for corporate and web development. What, in fact, is required to achieve this goal.

3. The structure and properties of the developed application
As part of this research work, to demonstrate the capabilities of the selected tools, it was decided to develop a reference application that would have the following functions and properties:

- having your own dedicated server;
- data storage using a MySQL database;
- intuitive and user-friendly user interface.
Apache Tomcat was used as a dedicated server. Tomcat is an open source servlet container developed by the Apache Software Foundation. It implements the Servlet Specification, the JavaServer Pages (JSP) Specification, and the JavaServer Faces (JSF) Specification. Written in Java language. Tomcat allows one to run web applications and contains a number of self-configuring programs. Tomcat is also used as a standalone web server, as a content server in conjunction with the Apache HTTP Server web server.

It is worth highlighting that a servlet or Java Servlet API is a standardized API designed to be implemented on the server and work with the client according to a request-response scheme. A servlet is a class that can receive requests from a client and return responses to it. Thus, Java servlets are the building blocks of a client-server architecture.

As already mentioned, web development is divided into two main components: the client side and the server side. For client-side development, the Ext JS, Spring and Apache Maven framework files were additionally connected and the app.js file was created:

The necessary Ext JS styles were included in the index.jsp file. The next step was to develop four views of the elements (which, after creation, must also be initialized in the app.js file) - this is the SearchWebview.js search view, the WebGridView.js table view, the AddWebFormView.js data-adding form view, and the WebCatalogView.js framework view, in which all views of the form are placed:

Further, using the MVC programming pattern, the Controller Model and Store directories were additionally created. Controller - designed to initialize component handlers such as buttons, clickable fields, and so on. The model and storage in this case are required to process requests from the client side. And all of these files are registered in app.js as well [5]:

Figure 2. Connecting additional development tools.

Figure 3. View elements.
Server side development. In the case of the development of the server side, the scheme for dividing the control logic into separate components was also used - controllers, models, service:

Of course, first of all, the main application model was developed, in which such boolean fields as id, name, position were initialized:

Figure 4. Registering data in the app.js file.

Figure 5. Control logic.

Figure 6. Example model.
After creating the models, controllers were developed, the main task of which is to process requests on the server side using the GET, POST, PUT, DELETE methods. As far as service is concerned, the internal file checks for duplicates and has built-in methods for handling such situations (deleting duplicate records, updating the list) [6].

After the management logic settings have been made, there are two steps left - connecting the database using Spring tools (entity manager):

![Figure 7](image1.png)

**Figure 7.** Creating a database.

In the created document my-context, the data hosting facilities of the Spring framework were connected, settings for processing requests, authorization, session duration were set, a login and password were set to protect data. Data that will come from the WebService class.

Finally, the last step is to configure the servlet, which will be the final phase of processing requests:

![Figure 8](image2.png)

**Figure 8.** Servlet mvc-dispatcher.

Dispatcher-servlet has the following main attributes:

- context: component-scan identification and initialization of components in a spring container;
- mvc: view-controller home page of the web application;
- mvc: resources processing requests for receiving static data;

In addition, additional methods for handling the functions of graphic items, such as: onSave, onAdd, onDel, onValidation, and so on [7].

As a result, as a result, the user gets the opportunity to work comfortably with the web application, which has an intuitive interface and contains handling of possible errors in the interaction process:

![Figure 9](image3.png)

**Figure 9.** Duplicate error handling
4. Conclusion

The web development industry is one of the fastest growing and most active in the IT industry. Every day there are new libraries, frameworks and various constructors that allow you to automate the process of creating such applications or websites as much as possible [8].

Despite the fact that such technologies are very useful and reduce the time required for the development, it is necessary to understand that only knowledge and understanding of the fundamental functions of the interface and internal development makes a specialist out of a person, a way not only to improve work in short functional applications, but also to maintain it, to be able to deal with possible errors and problems [9].

In this research, the stages of design, development on the client and application, connecting several frameworks, and organizing data were mainly considered. A functioning web application was developed and the main goal of the work was achieved.

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