

Experimental Design Study on Building and Configuring Dynamic Web Site Development Environment

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Abstract: Java Web development is currently the most popular technology for dynamic web development on the market, not only among developers, but it also dominates the majority of the research and development share in current application development markets. In the field of website development technology teaching, environment building and configuration is not only the foundation to ensure the normal operation of experiments, but also an essential prerequisite for students to learn dynamic website development. Additionally, it constitutes an important part of the entire course experimental teaching system, as the success or failure of the development environment will have a direct impact on students' subsequent learning of related knowledge. The article systematically reviews and analyses the experimental process involved in the construction and configuration of the development environment from the aspects of experimental design concept, experimental basic principles, software installation and configuration, and experimental summary, and finally gives a summary and reflections.

Keywords: java web; experimental course; teaching system; tomcat

1. Introduction

With the arrival of an intelligent society marked by artificial intelligence, the Internet of Things, big data, etc., the market demand for dynamic website development technology is also increasing exponentially^[1-2]. At present, the mainstream dynamic website system development languages in the market include Java, C #, Python, and PHP. Among them, dynamic website development technology based on Java language has become the most popular software development technology in application system development due to its advantages fast access speed, good cross platform performance, strict security protection mechanism, pure object-oriented development, and reusable components^[3-5]. The Dynamic Website Development course is an elective course for computer related majors, such as Computer Science and Technology, Network Engineering, Software Engineering, Information Security and Management, Big Data Science and Technology, and Intelligent Science and Technology. The course is based on the Java language and includes front-end and back-end programming techniques such as HTML, CSS, JavaScript, JSP, Servlet, JDBC programming, and asynchronous interaction^[6].

As an introductory course for cultivating students' application system development and practice, the smooth construction of the dynamic website development environment is an important part of entering this course for learning. If the environment construction fails, it will greatly dampen students' learning enthusiasm and cause great psychological obstacles for their subsequent learning of this course^[7-9]. In the learning of dynamic website development courses, students and teachers are often more accustomed to using the integrated IntelliJ IDEA: JetBrains development environment. Although this integrated development environment is powerful, it has powerful code assistants, automatic code prompts, refactoring, Java EE support, various version tools (git, svn, etc.), JUnit, CVS integration, and other functions, eliminating the tedious environment installation and configuration process in development. However, for beginners, highly integrated development tools make it difficult for students to understand the execution process of website pages in server containers, and cannot locate problems in a timely manner, which is not conducive to the comprehensive cultivation of students' problem-solving, thinking, and practical abilities^[10]. Therefore, in the design of experimental course teaching, the article abandons the previous integrated solutions and instead chooses a combination of individual software for installation, configuration, and testing, in order to maximize the presentation of web operating

principles and access mechanisms to students in a more vivid and intuitive way.

In summary, the article conducts design research on the environment construction and configuration experiment of dynamic website development. The dynamic website development course based on Java technology selects various combinations of single software, and provides a detailed overview of the process from the aspects of experimental design concept, experimental principles, software installation and configuration, and experimental summary, in order to meet the needs of daily teaching and student learning.

2. Experimental design concept

The design concept of the experiment described in the article is based on the student-centered principle, following the route of "step-by-step, step-by-step, and flexible application", emphasizing the basic route of "foundational, advanced, and inspiring". By combining theory with practice, good experimental teaching results can be achieved within limited teaching time.

Fundamentals: The installation and configuration of the development environment are the foundation for the smooth progress of the entire course practice and experimental operation. The installation and configuration of the development environment also have a sequence, so the entire process needs to be gradual and step-by-step. The success or failure of the experimental results will directly affect students' enthusiasm for subsequent knowledge learning.

Advanced: The types and quantities of basic software required for the course are relatively fixed, and in actual development, it is necessary to cooperate with other software to improve team development efficiency and enhance team cooperation awareness. Therefore, in the experiment, students are encouraged to independently install and configure tools commonly used in actual development such as Maven, Redis, SVN, etc., laying the foundation for subsequent learning of enterprise application level development courses.

Inspiration: Given the diversity of types and quantities of development languages and programming tools, teaching emphasizes the theoretical and practical details of environmental installation and configuration, allowing students to verify theory through hands-on operations, deepen their understanding and understanding of theoretical knowledge, learn to draw inferences from one example, cultivate students' hands-on practical and reflective abilities, and enhance their problem-solving skills and teamwork awareness [10].

3. Experimental principles

3.1 Principles of development environment installation and configuration

At present, the Java web software development technology environment relies on various software development kits, but the basic software development kit should be able to write, compile and execute Java source programs, and be able to The front-end user responds to the page request and can access the user's database data. On this basis, other subsequent functions of the development and learning can be extended. The commonly used basic tool for Java source program compilation and execution is the JDK development kit. Development tools are common in Eclipse, MyEclipse, etc. The service software that responds to user requests is Tomcat, weblogic, etc., and the software that manages user data includes MySQL, sqlserver, Oracle etc.

Among them, JDK includes JAVA running environment such as JVM, Java system class library and JAVA tools. It is responsible for compiling Java programs (files ending with .java). JRE is responsible for running the compiled jar or .class or other archive files. Tomcat itself contains an HTTP service, which specifically receives front-end browser requests, forwards the requests to the corresponding services, and receives, processes, and returns the request content through preset functions. As an open source database software, MySQL is specially used to store data generated during system operation. It maps the tables in the database through the JavaBean class, operates the Dao class through the services provided by Tomcat, and uses the Servlet class for business access logic. control. Eclipse is a software writing software that integrates the above three softwares and calls the corresponding software to perform the required operations after editing the program.

Since different versions may conflict, the experiment described in the article uses the relatively stable and tested software combination of JDK1.8+Eclipse (neon)+MySQL5.6+Tomcat8.5. Different

version combinations may It will lead to running errors. During the experiment, the experimenter needs to choose a verified version combination based on actual development and experimental needs.

3.2 JDK installation and configuration

After downloading JDK from the official website, double-click to enter the installation interface. The version used in the experiment in this article is 1.8.0_121. The entire installation process only needs to click the next button directly. Select complete as the installation type. Finally, install JRE and use the default path for the installation path. The whole process does not require too much manual involvement. After the installation is complete, the JDK needs to be configured so that the .Java file can find environmental support when compiling and running. Therefore, taking the win7 system as an example, right-click on my computer-select Properties-Advanced System Settings-Environment Variable.

Click the New button, enter Java_home in the pop-up dialog box, and then create a new input path again, and create a new ClassPath. Different operating systems need to be added or modified differently according to the actual situation. Under the default installation path, the paths of each configuration item are as follows:

Java_home:C:\Program Files\Java\jdk1.8.0_121;

Path:%JAVA_HOME%\bin;

ClassPath:.;%JAVA_HOME%\lib;%JAVA_HOME%\lib\tools.jar;%JAVA_HOME%\lib\dt.jar;%JAVA_HOME%\jre7\lib;

Java_home is configured so that you don't have to repeat the long string when configuring the path later. Any character in the path can be replaced by %JAVA_HOME%. ClassPath stands for the compilation path. When compiling Java classes, you need to use the existing classes in this path. Users can also put custom classes in this directory. These classes are packaged in the form of jar packages. When you need to use the packaged classes, you only need to import the packages into the project and run them. Path is the execution path. When a Java class is compiled into a class byte file, you can use the executable exe file under this path to execute the bytecode file. In general, the path can be configured to the lib and bin directories. Some operating systems have their own JDK and automatically registered their paths because of their higher versions. At this time, you can use the system's own JDK instead of installing it separately.

3.3 Installation and Configuration of Tomcat

The Tomcat version used in this experiment belongs to the installation free version. After extracting the files to a certain directory, only a small amount of configuration is required before use. Compared to the version of executable files that start simultaneously with the system every time, the installation free version can minimize the occupation of computer operating system resources by development software to the greatest extent. The configuration process is the same as that of JDK, as long as the path is added to the corresponding path and ClassPath, the compressed package will be directly extracted in the D drive directory of the computer. The configuration content is as follows:

CATALINA_BASE: D:\apache Tomcat-8.5

CATALINA_HOME: D:\apache Tomcat-8.5

Tomcat_HOME: D:\apache Tomcat-8.5

Configure Tomcat's bin and lib directories in path and ClassPath, and refer to the JDK configuration path above for this process. However, if you want to run multiple versions of Tomcat on one computer, you should pay attention to modifying the port number in the configuration file so that the system can consider different versions of Tomcat as different applications. Otherwise, when starting one Tomcat, due to the port being occupied, the other will not be able to start, and an error message will be displayed indicating that the port is already occupied.

3.4 Installation and Configuration of MySql

The installation of MySql can also be completed by following the next prompts. Before installation, the computer needs to have a complete .net plugin. If MySql software has been installed before, it

needs to be completely uninstalled before proceeding with the software installation. During the installation process, directly select the next step or the default configuration mode, and select the full version installation when selecting the typical and full versions. As shown in Figure 1, the password setting interface during the MySQL installation process is displayed. Root is the super administrator of the database and has all permissions for database operations. When configuring the username and password, try to set the password of the administrator root to a combination of characters and numbers that are easy to remember during the learning process, in order to prevent forgetting the password in later use and causing difficulties for learning. If in a development environment, simple password combinations should be avoided as much as possible to prevent the system from being attacked by SQL injection from the outside world.



Figure 1 Password confirmation during MySql installation process

3.5 Installation and Configuration of Eclipse

Although the Eclipse used in this experiment is less intelligent, integrated, and adaptable than popular tools such as Intel IDEA, it is still advisable for students to type out their own code during the learning stage, in order to understand the code execution process and help them deepen their knowledge learning and internalize it. The provided version in class belongs to the green version. After directly extracting it, double-click the start.exe file to execute it. When selecting the version, the article uses the Neon2 X64 version that supports web development. When users download online, they need to choose different versions based on their computer configuration. If the downloaded version is relatively low, you can use the online update function to upgrade the version online.

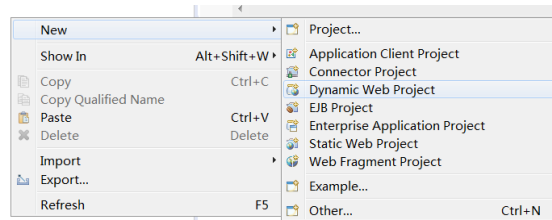


Figure 2: Creating a new web project

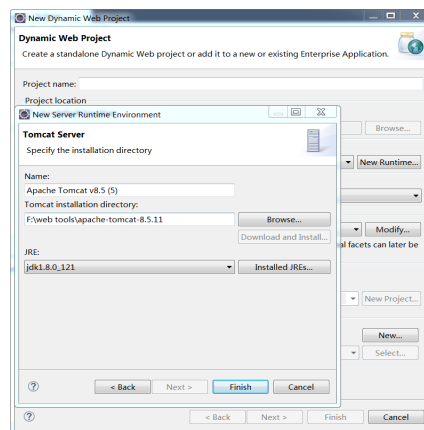


Figure 3 Configuration of JDK and Tomcat

After starting the development tool, it is necessary to configure the above installed software in this tool in order to proceed with normal software development operations [9]. You can choose to create a dynamic web project here, right-click in the working directory - Create Dynamic Project, as shown in Figures 2 and 3. Figure 2 shows the options for creating a new web project, and Figure 2 shows the dialog box that pops up after clicking on "new runtime" after creating a dynamic project. Here, select the JDK and Tomcat prompts for installation.

3.6 Development Environment Installation and Configuration Verification

After completing the above configuration, start the Tomcat server automatically or manually in Eclipse or in the Tomcat directory. In the experiment, choose to use the server tab in the status bar of Eclipse, right-click the start command on the server below, as shown in Figure 4 for server startup testing. After startup, you can check the console interface for any errors. If the page does not display characters such as 404 or 500, The configuration was successful. If there is no corresponding server in the server toolbar when opening Eclipse tools, you can click on the add server command in the server toolbar, follow the guidance to select the corresponding Tomcat and JRE paths, or right-click on the service and select the add or remove service command to add and remove the project, and complete the recompilation during restart.

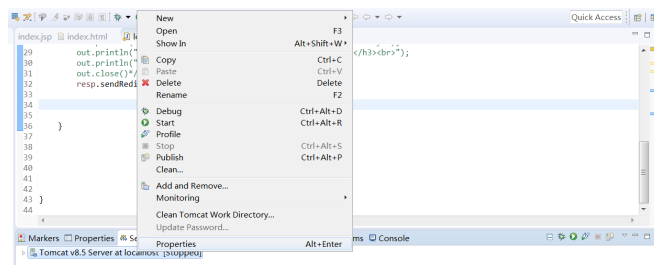


Figure 4 Service startup test

3.7 Experimental analysis and requirements

During the installation and configuration of the development environment, you need to pay attention to some key links. During the installation and configuration of the JDK, you should pay attention to adding the directory "." at this level when configuring ClassPath. The purpose of this is to allow the Tomcat server to process the JSP page. When translating or compiling Java classes, it will first search by default to see if there is a compiled file in this directory on the computer. If the required package does not exist, the system will search one by one under the path configured by ClassPath to provide guidance as needed. The package is found, otherwise an error is reported. Therefore, when configuring, you can clearly configure the lib directory path of the packages it needs to depend on under this address.

When installing the MySQL database, students will always encounter the problem of unsuccessful database installation in the final stage. The main reason for this result is that the computer has installed this software before, or the software has been running in the system, so it leads to the failure in the final stage. Link installation failed. Different versions of MySQL are installed on students' own computers, resulting in all versions of MySQL occupying the same 3306 port during runtime. The solution can be to completely uninstall the previous installation environment, or modify the conf.xml file Configuration, change the port numbers of different versions to different ports. When uninstalling the software, in addition to deleting the database file, you also need to delete the original registration information from the registry, find the installation directory, and delete the entire previous installation folder. Only in this way can the MySQL database be completely uninstalled from the computer. When using it, you can perform database operations through the command line, or you can use interface tools such as nativeMySQL and SQLYoung to perform database operations. Through interface operations, you can greatly facilitate user operations.

The installation-free version of Tomcat is used in this experiment. When using it, only need to decompress it and configure the necessary environment in the path. Then start the service program by double-clicking start.bat to test whether it can run normally. If the running interface flashes after Tomact is started, it means there is a problem with the previous JDK and Tomcat environment configuration, and you need to recheck whether their installation is correct. If it is because Tomcat has

been started in the integration tool, you need to stop the service in the integration tool. If you are using the installation version of the software, you do not need to make other modifications during the installation process. Select each step. The default configuration is enough.

Finally, when integrating Eclipse, since different tools have slightly different operation steps, they all need to select the corresponding configured JDK, JRE and Tomcat when creating the project. Higher versions of Eclipse will generally be backward compatible with lower versions, but there will be conflicts between JDK and Tomcat versions, so you need to use a tested version. Otherwise, errors will often be reported when running. To verify whether each software in the development tool is configured properly, you only need to use Eclipse

4. Experiment summary

Since the correct installation and configuration of the software development environment directly affects the normal progress of student learning and teaching, this experiment starts with the introduction of dynamic website development software and gives a detailed description of the installation and configuration of the software development environment. The normal operation of the development environment is conducive to improve students' enthusiasm for learning dynamic website development technology, in addition to the software development environment used in this experiment, real development also needs to use other software as support. Therefore, students need to learn through the installation and configuration of development tools to achieve the experimental results. Only in this way can we truly cultivate qualified program developers that our society needs.

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