Key Technologies Research of Transfer Rate Test in Information Exchange Platform

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Abstract: This paper studies the key technology of improving the transmission function and stability of information exchange platform, relevant technology of realizing function improvement in JAVA, the impact of polling interval of IIP engine upon system transmission rate and relevant technology of improving performance of IIP, and the relation between sending sliced data of varying size and the data transmission rate and so on. The whole technology that has applied to the development and test of Large-scale E-administration system has made good application effect.

Keywords: information exchange platform; data rate test; XML; performance improvement Document .

1. Introduction

With the growing popularity of network technology, the development of e-government has become the core of the development strategy of country information and has been the important means of promoting the reform of government affairs system and enhancing managerial effectiveness for governments at all levels. The structure of data exchange platform of e-government includes information layer, data exchange layer and application layer. And data exchange layer is the most important distributed information exchange platform (IIP) among the above three modules in e-government, which includes many data exchange services such as perfect data exchange protocol, supporting data pulling and data pushing, data routing, data validation and data management and so on. Data exchange is the fundamental function of information exchange platform, which realizes data transmission in safety on platform between authorized users. This platform should support the presentation of isomeric data and data exchange between isomeric application systems, and the exchange between structured data (such as data in relational database) and unstructured data (such as graphic files), and the data transmission mode of one-to-one and one-to-many, and provide the mechanism of resume broken transfer and perfect security mechanism.

It is the efficiency and the transmission rate of data exchange function that is an important technological index measuring the e-administration system. Remarkably, the further improvement of platform relies on the guidance of test results such as stability,rate, concurrency and so

on. Therefore, it is the information exchange platform that is the main target of performance test and stability test.

This paper studies the key technology of transmission performance and stability of information exchange platform. And its overall performance has already been applied to the development and test of a large-scale e-administration system with satisfactory results.

2. Study of the Method of Performance Test

Testing the performance depends on specific performance target of the system being tested and determines whether applications satisfy these requirements. It is important to eliminate variables as much as possible, for example, the error in code may lead to the performance problems or even cover them. It need to compare different performance test results precisely. If adjustment process has changed the realization of components, the function of applications should be tested again. After the application passes the functionality test, can its performance be tested. Besides the application changes, other things such as the hardware, the amount of network communication, software configurations, system services can be changed unexpectedly also, so it is also important to control the changes of applications.

2.1. Measure Performance

Adjusting its performance correctly needs to record each test result correctly and comprehensively and also maintain them. The record work of test includes: first, precise system configuration, especially the differences from the previous. Second, original data and the results computed

by performance monitoring tools. These records can not only indicate whether applications achieve performance goals, but also help to identify the potential causes of future performance problems. It can not distinguish whether different results are caused by changes in the test or changes in the application unless running a series of identical performance test in each test. That making performance test operations run automatically as much as possible is helpful to eliminate the differences made by operators. Some other benign factors can also effect performance test results, for example, running time before applications being tested, and the consumptive time before or during the test results being recorded by the test case, which is not the result data by tests but the necessary consumption of running programs and can effect the final test data greatly. That is just like the differences between the performance of cold car-engines and heat car-engines. Applications having run long time are different to applications just start at the beginning because of factors such as memory fragments.

2.2. Set Benchmark Performance

Run one test to establish benchmark after setting performance goals. The more similarity certification environment has with production environment, the larger satisfying possibility of performance arranged by applications will be. Therefore, a practical certification environment seems to be much important at the beginning. The benchmark performance can also be set by traditional methods or use performance index of existing programs that have similar functions. For example, the benchmark of large-scale system with data transmission function is that it can run normally more than 72 hours under continuous data transmission.

2.3. Pressure Test

Pressure test is one special form of the performance tests which is similar to destructive tests of other engineering fields. The purpose of pressure test is to make applications fail. It reduces its performance by adding load to be processed until applications fail because of resource saturation or making mistakes. Pressure test is helpful to reveal small mistakes which will be found when deploying applications. Pressure test should start on each area of applications early in stages of development as this type of mistake is always caused by design defects. It should better restore these small mistakes rather than restore them until symptoms appear after neglecting them.

2.4. Solve Performance Problem

It is time to solve the problems showed in the results after performance test results come out. It always put the performance problems down to more than one factor when analyzing the problems showed up. Therefore, finding the solution for worse performance is quite similar to carrying out scientific experiments. Scientific experiment

traditionally follows a process including six steps: observation, initial assumption, forecast, testing, controlling and conclusion. The conclusion is composed of hypothesis supported by the best evidence aggregation accumulated in that process. It can solve the performance problems following the same process. Certainly there are many aids helping to analyzing performance problems, such as Optimization Suite for Java of Borland Company, which has a obvious effect in analyzing the problems of occupying memory.

3. Test the Flow

We should test systematic function of the whole platform after the function of the whole data exchange platform-- including the function of data exchange, transmission control of data and routing or forwarding of data, has been performed. The major technological index that need be tested is: maximum normal work-time of system, average rate of transmitting different types of data, impact that the system configuration has on the performance of transmission rate such as the size of the sector when transmitting different sizes of data and whether there is defect or bug when checking the function of the system while testing the performance. All of these are credentials to decide whether the system needs improvement or is qualified. Therefore it is absolutely a necessary work of the test of stability and transmission rate. There are two steps in the test:

1. Test the stability of systems when transmitting large amounts of small data less than 2K. The solution is that first writing test cases using existing interface, keeping the platform transmitting data for a long time, then record the total number of transmitting and the time spent in transmission after each transmission, finally outputting the recorded test results into a XML and then analyzing further improvement of IIP on base of the test results.

2. We should test the performance of transmission of IIP including test indexes such as stability, transmission rate and the number of concurrent thread of IIP system in actual network environment after the edition of multidata, development of bottom information tier X-Linker, integration work of IIP and the lower tier X-Linker have all been finished. The test of transmission rate also includes rate of transmitting different sizes of data, rate of transmitting super data and rate of large amounts of small data in different system configurations. Moreover, network environment also includes single-user network in which the receiver and the sender of data are always the computer itself, double-user network in which there are two computers simulating the nodes that are higher nodes for each other and double-user network with middle nodes transmitting and so on. Finally it should analyze the improving demand after test results are recorded.

4.XML technology and their application in testing the rate

XML（Extensible Markup Language）is a general language norm established by W3C organization in Feb,1998, which is a simplified subset of SGML and a set of rules of defining semantic tags which divide the document into several parts and markup them. It is a meta-markup language which defines syntax language concerned with specific field and tag language of structured semantic. XML is a major representation technology of information in e-administration. XML technology mainly centered in XML Parser and the Parser API related with XML include DOM and SAX. Interpreting XML files is the beginning of processing XML files. The interpreter gets XML files and checks whether they are well structured and effective. XML interpreter generally has two types: standard interpreter checking the files are well structured and certification interpreter checking whether the files correspond with DTD.

4. Performance Test of IIP

4.1. JDBC

JDBC is API providing JAVA code with accessing all kinds of database management system using SQL. JDBC has a driver manager which manages and controls various drivers related to different databases. JDBC is a kind of bottom API, which means that it can directly call SQL instructions with easier realization than other database interconnection. Meantime, it is also basic for building advanced API and other database tools.

4.2. Stability Testing

The task needed testing after the single-data edition of IIP has been developed includes: maximum time of getting the system work properly, getting the transmission rate of the tested computer in JBuilder and getting average time spent in a transmission in JBuilder. It is, as it were, stable of data exchange system of IIP operating at full load more than 72 hours in actual network environment, so it can set the decidable stability index up to 72 hours in JBuilder temporarily (the stability test need be tested for several times).

The purpose of the test is stability and therefore the lower tier X-Linker is not included which means it requires IIP to write a functional unit simulating the transmission of information layer instead of X-Linker as this test is not in actual network environment. This function has been performed by false router. Test cases should transmitting data continually in order to make IIP work constantly. This can be implemented using the method of "passing the buck".

Using false router . There are not only modules of data sending, but also Hook functions triggered after the realization of receiving data in the test case. IIP directly sends the data to

its own path of data reception and triggers the Hook function of its own after it has been sent to exclusive path

of thread polling by test cases. It is called one transmission from sending the data to triggering its own Hook function.

Testing data demands that the output should be XML and should record the arrival time of data, consumptive time of the process, the size of data and this transmission rate.

5. Performance Improvement and Innovation of IIP

Based on the technology stated above,we've achieved good application results in testing the function of information exchange and the performance proceeding from development demand of e-administration information exchange platform.

Test results have great help in improving system performance, so the performance of platform will have great improving space. There is available improvement in system implementation and system development on developing language. Therefore the later improvement work is necessary besides the implementation of the function of information exchange platform. And the performance of IIP also has large improvement space.

Firstly, from the pure language point of view, there is much to boost performance for JAVA itself such as addition of strings which need open up new memory space to copy and is inefficient, and the operation on XML files with different method which can make great difference in performance, for example, the method of getNodeByTagName（）is inefficient. Besides, there is also the problem of synchronization, for example, the synchronization of function is more efficient or even thousands of times higher than the synchronization of object and there is synchronization of three objects in IIP. Secondly, from the implementation point of view, there is a lot space to improve such as transaction module. It doesn't need to open files each time because there is an example of the file in the implementation, which can boost performance of the system. Finally, there is a lot space to improve in designing. For example, it uses ceasing-and-waiting protocol in data transmission of IIP, which means sending another frame again after receiving the answer of the first sending. In fact it can entirely be replaced by slipping windows, which means waiting for the answers after sending many frames, if sending successfully after the answer arriving, it can send the same number of frames according to the answers arriving again, which is more efficient.

The innovative point of this paper lies in establishing relevant technology on the impact of polling interval of IIP engine upon system transmission rate and improving performance of IIP, coming to the conclusion of the relation between sending sliced data of varying size and the data transmission rate, and advancing relevant technology of realizing function improvement in JAVA.

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