SuperGIS Server 3 High Availability Test Report

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Content

1. Preface

SuperGIS Server 3 is the complete and centralized enterprise class server software. It allows the enterprises to have the capability of creating, managing, integrating and publishing various GIS services with the centralized server architecture so that the various spatial data, image and GIS functions could be used as GIS services on the desktop, mobile and web service applications. Meanwhile, an ideal enterprise workflow can be built up to improve the capability of decision-making and enhance productivity.

SuperGIS Server 3 provides the enterprises with a high scalable GIS server platform, allowing the enterprises to expand the server host machine at any time according to the request and organization size to build up a suitable server environment. Definitely, you can deploy the GIS services to the cloud computing environment with SuperGIS Server 3 to increase the enterprise's competitiveness.

SuperGIS Server 3 supports many client applications. The client users can use the GIS services published by SuperGIS Server 3 easily through SuperGIS Desktop, SuperPad and the various common browsers, such as Internet Explorer, Firefox, Chrome, Safari and Opera, etc.

The purpose of the report is to examine if SuperGIS Server 3 website can operate normally within the network load balancing environment and provide map services of high availability and high performance.

2. What is High Availability ?

Users always hope the system they use is high stability since they do not have to worry about the system failure during the process of manipulation.

"High Availability (HA)" of system refers that the system can recover from a failure without being fixed or processed manually while the system is running. In brief, high availability is to effectively improve the usability of system and decrease the instability users may face in using the system. Generally speaking, we can use the hardware redundancy, software redundancy or information redundancy to create such a high available fault-tolerant system.

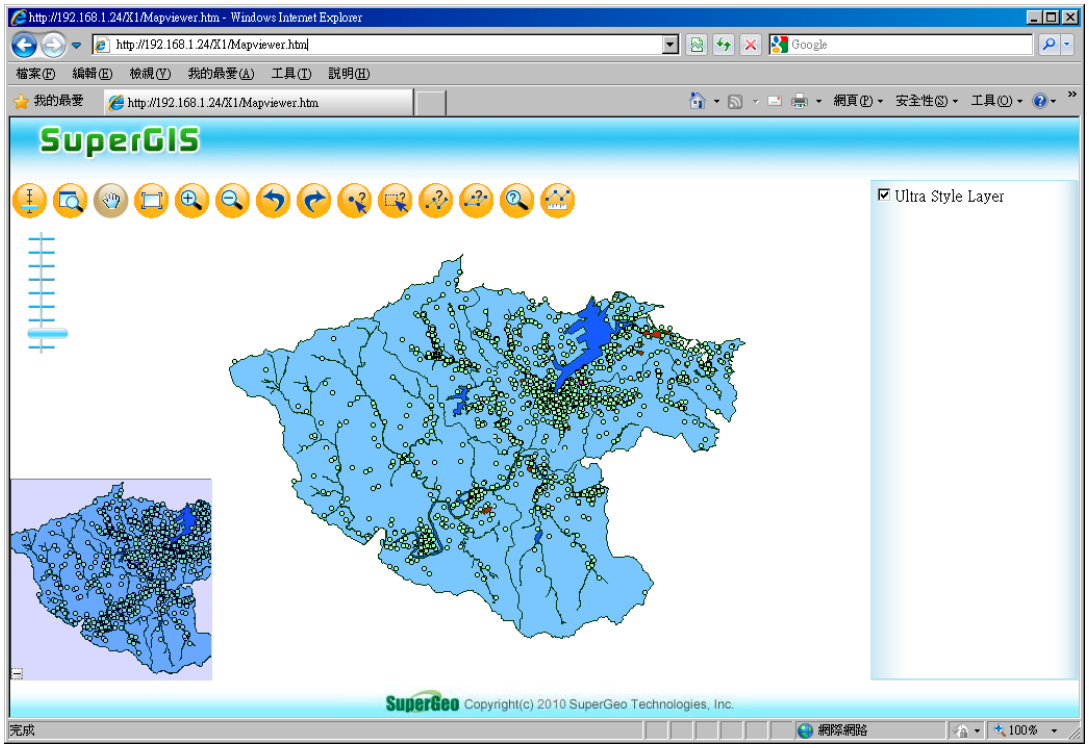
For instance, if the system only operates on one machine, the single point of failure

problem might occur. Once the single point of failure occurs, the entire system might not be able to operate and provide the related services continuously; it is obvious that the availability of the system is not enough. Therefore, to provide the high availability system, we equip with more redundant devices or components, such as the second set of system or the second copy of data source to prevent the system from halting. Basically, to be high availability, the system must meet at least five nines in the high availability standard, which is 99.999% of operating time (it almost equals to the downtime of the system less than 318.00 seconds, around 5.30 minutes in one year).

In this report, we use a test sample, simulating 30 users browsing SuperGIS Server 3 on-line at a time through Microsoft Web Application Stress Tool, to examine how SuperGIS Server 3 supports the high availability architecture.

3. Test Data

In the test report, the point, polyline and polygon layers of Keelung area in Taiwan are used to compose a map project file whose size is about 350 MB. Then, we use SuperGIS Server 3 to publish the map project as the map service on two servers of different specifications and take it as the target of the test.

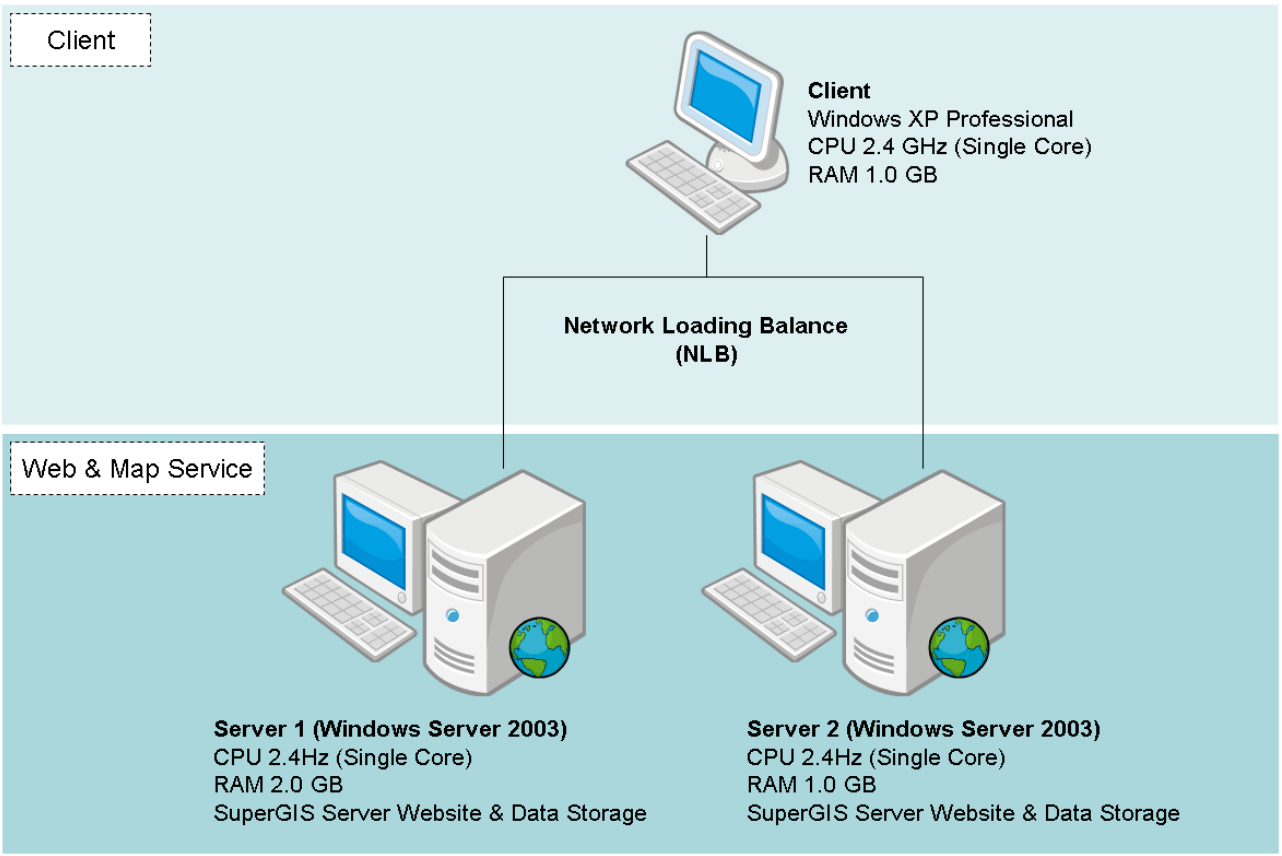


4. SuperGIS Server 3 High Availability Test Deployment

SuperGIS Server High Availability Test will be conducted in the 100Mbps LAN, including two testing server host machines and one client side computer. Both of the two server host machines adopt Windows Server 2003 Standard as the operating system for the website server, and the client side computer uses Windows XP Professional. Please see the figure below to find the specs of the machines used in this test.

Client	Server 1	Server 2
		
Windows XP Professional	Windows Server 2003 Standard	Windows Server 2003 Standard
Intel Pentium(R) 4 2.4GHz (Single Core)	Intel Pentium(R) 4 2.4GHz (Single Core)	Intel Pentium(R) 4 2.4GHz (Single Core)
1.0GB RAM	2.0 GB RAM	1.0 GB RAM

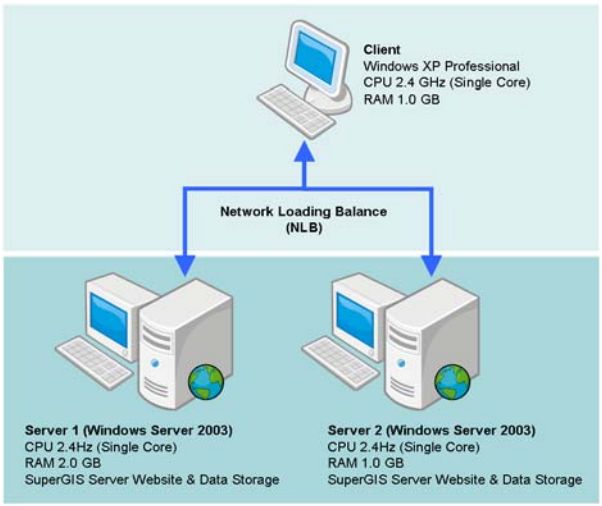
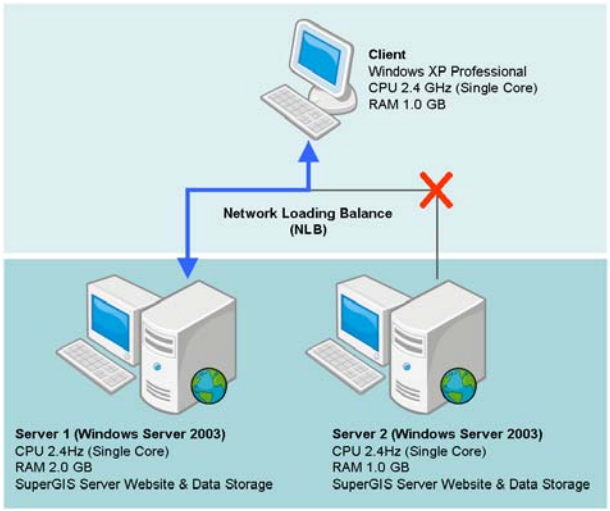
We will establish SuperGIS Server 3 Ultra website on two website server host machines (Server 1 & Server 2). The map project file and the files (350MB Geo File) what map service uses are stored in both of the machines, too. Besides, the network load balancing mechanism is created between the two server host machines by setting the same cluster IP address, and then set the two machines in Active/Active status. In this way, when users are browsing SuperGIS Server 3 website, the network load balancing mechanism will automatically distribute the users' requests to the two server machines equally. Thus, the servers could share the work equally and increase the entire output, and the client side will be provided with the high availability map service. About the operating environment for the test, please see the figure below.


Client
Client
Windows XP Professional
CPU 2.4 GHz (Single Core)
RAM 1.0 GB
Network Loading Balance
(NLB)
Web & Map Service
Server 1 (Windows Server 2003)
CPU 2.4Hz (Single Core)
RAM 2.0 GB
SuperGIS Server Website & Data Storage
Server 2 (Windows Server 2003)
CPU 2.4Hz (Single Core)
RAM 1.0 GB
SuperGIS Server Website & Data Storage

5. SuperGIS Server 3 Ultra Website High Availability Test

Under the network load balancing environment, SuperGIS Server 3 Ultra website high availability test consists of two stages. The first stage is to examine if the network load balancing mechanism can effectively allot the user requests and server resources to offer the users a high performance web service when all the server host machines operate normally. The second stage will examine whether the server host machine will still be able to offer web services continuously when the other server host machines fails.

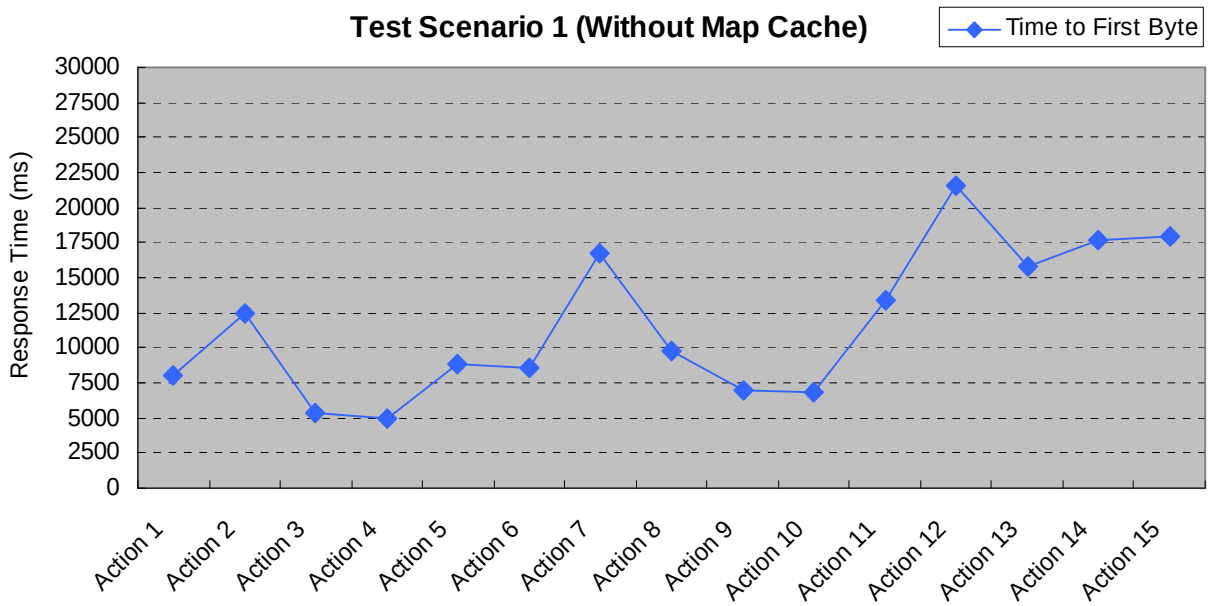
In addition, comparing the test data of the different scenarios in the two stages, we expect to find out the differences in server performance and to prove that SuperGIS Server 3 supports network load balancing mechanism. Also, we intend to prove that the website can provide high stability and high availability services when SuperGIS Server 3 Ultra website is kept being accessed for continuous 30 minutes. The testing scenarios for the two stages are described below.

Test Scenario 1	Test Scenario 2
	
2 Servers work normally.	Server 2 is failure.

This test simulates that 30 users respectively send requests to obtain 15 pieces of map image of different extent (Action1~Action15) at the same time. After the client side request is received by server, the server will output the assigned extent as a PNG image of 256 pixel x 256 pixel. In addition, to simplify the test data, we do not set up watermark (including visible and invisible watermark) on the map service published by SuperGIS Server 3 for none of the two stages in the test.

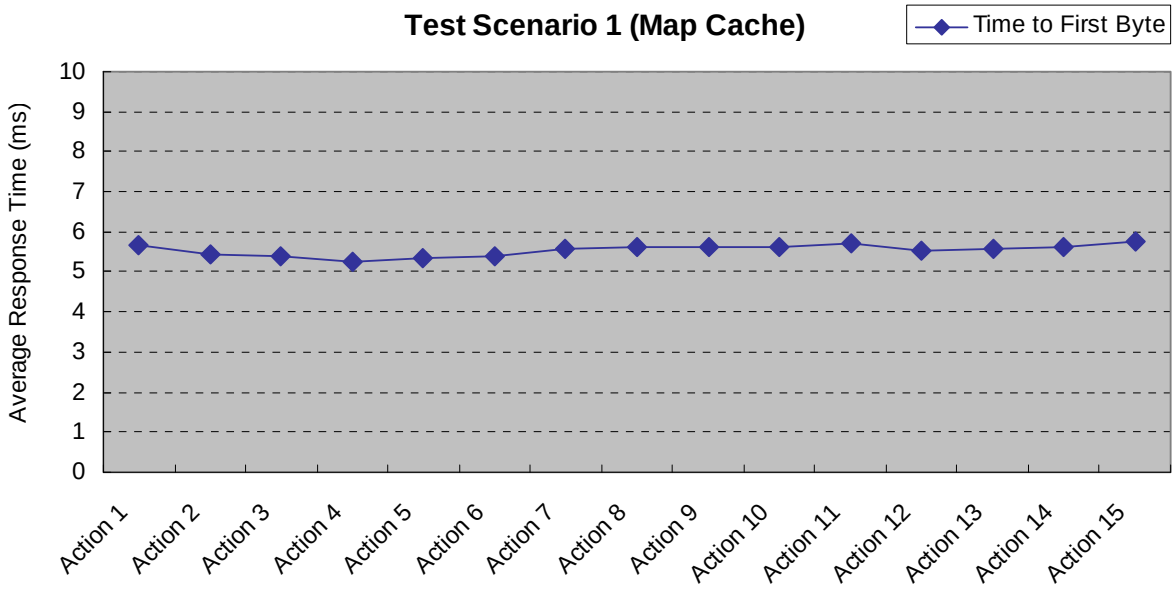
- Test Scenario 1: In the first test stage, we will simulate 30 users continuously browse SuperGIS Server 3 Ultra website on-line for 30 minutes with Microsoft Web Application Stress Tool. In the process of the test, the operation situation and data of the website will be recorded for the following analysis.

Because SuperGIS Server 3 Ultra website supports map cache function, we will discuss the Test Scenario 1 from the 2 aspects, “Real-Time Mapping” and “Map Cache.” First of all, we connect and browse the website without cache function to examine the performance of real-time mapping under NLB mechanism in SuperGIS Server 3 website. The chart below indicates the response time data of the mapping.



The chart above shows that the time taken by SuperGIS Server 3 Ultra website to response the user's request (Action 1~Action 15) differs according to the different image contents required by users. That is to say, map image of different extent or area will influence the handling time for server to map. Besides, because we simulate multiple users continuously access the SuperGIS Server 3 Ultra website, in the process of mapping, the website performance might be influenced when the server is dealing with the requests from multiple users at a time. As a result, the data results in the chart fluctuate greatly. In this sample, the average shortest response time is 4.94 seconds, the longest is 21.63 seconds, and the overall average response time is 11.65 seconds.

In the next, we will conduct the test on SuperGIS Server 3 Ultra website with cache mechanism. The chart below is the results of average response time for the website handling multiple users' requests at a time.



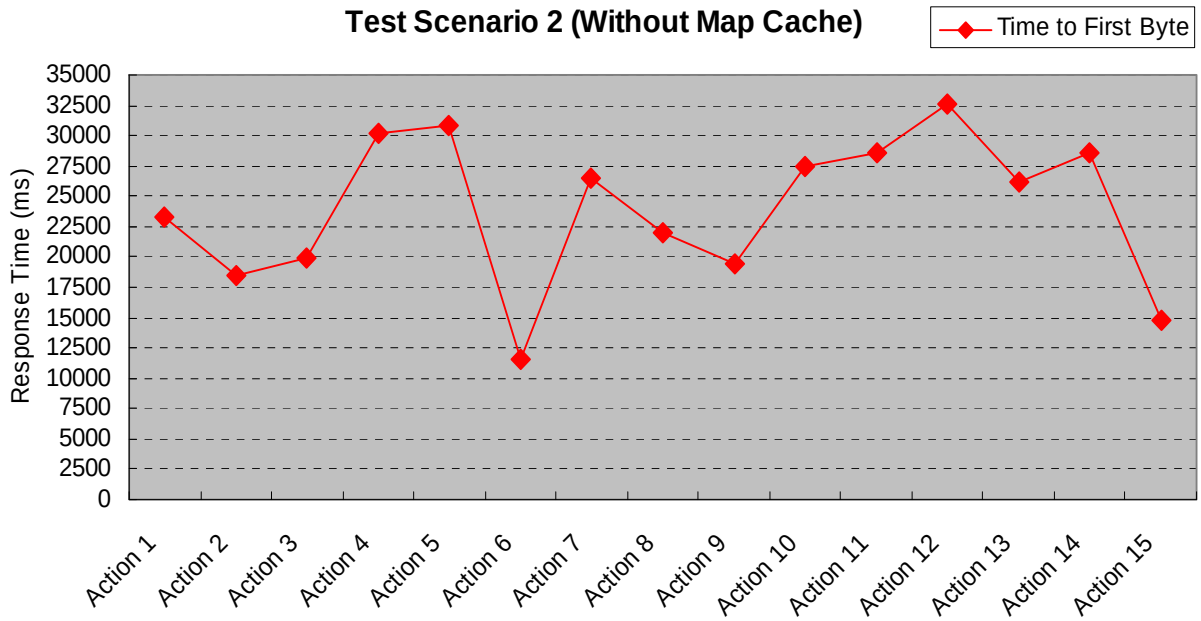
In the test, we record the related data of the two servers handling 30 users' requests at a time, and make a chart to show the results. From the chart above we learn that the website supporting cache function spends almost the same time obtaining each piece of map when the website is manipulated by multiple users for a long time. Furthermore, after 30-minute continuous access, the website can still offer the multiple users the high stability web

service. In the process of the test, the average shortest response time is about 5.23 milliseconds and the overall average response time is 5.54 milliseconds. Comparing this test result with the previous one, we could boldly infer that the website supporting cache function provides the better performance.

From the data in the first stage test, we learn that (1) the cache mechanism in SuperGIS Server 3 Ultra website can effectively enhance the performance of the website; (2) due to the establishment of network load balancing architecture, the client side requests can be equally shared by multiple server host machines to prevent the overloading on one specific server host machine causing website to be unstable and even failed. At last the stability and availability of website service then might be decreased as well.

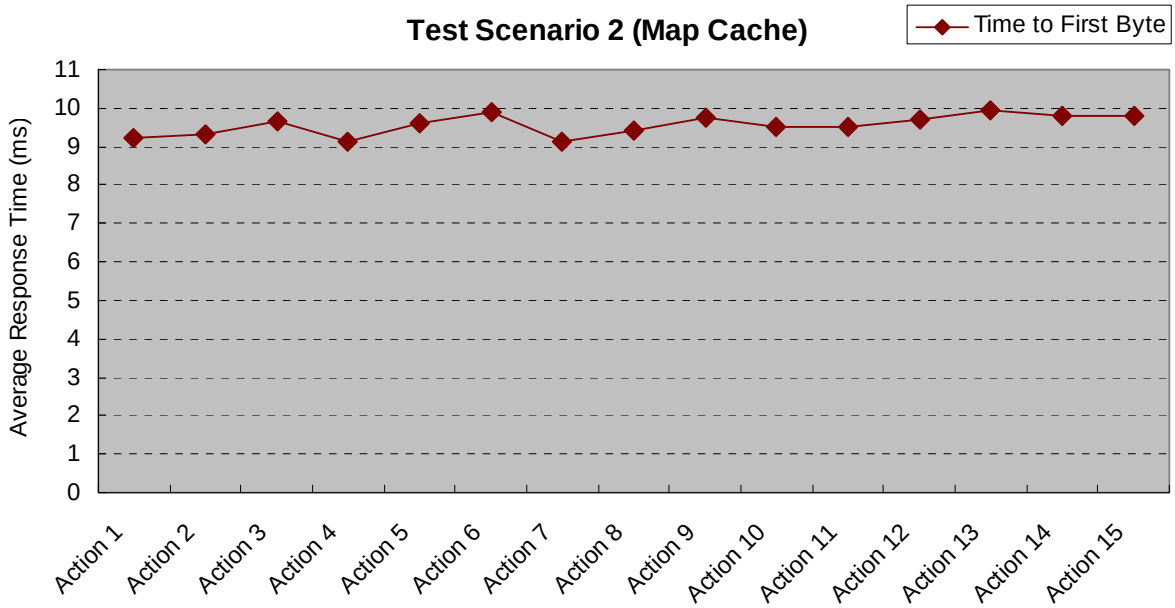
- Test Scenario 2: In the second stage test, it also simulates 30 users continuously on-line browse SuperGIS Server 3 Ultra website for 30 minutes with Microsoft Web Application Stress Tool. In the test, we still maintain the network load balancing architecture between the two servers. However, this time, we set Server 2 Inactive status and only let Server 1 handle all users' requests. The operation situation and the various data are recorded to be compared and analyzed with that of the first stage test.

Because SuperGIS Server 3 Ultra website supports cache function, Test Scenario 2, like Test Scenario 1, will be discussed from the 2 aspects, "Real-Time Mapping" and "Map Cache." First of all, we connect the website without cache mechanism to examine how SuperGIS Server 3 Ultra website performs when only one single server host machine handles the clients' requests. The data of the test result are presented in the chart below.



From the test, we learn that the test result is similar to the Test Scenario 1 (Without Map Cache), but the response time for each map image (Action 1~Action 15) is apparently longer than that of the first stage. The response time for user's request in SuperGIS Server 3 Ultra website differs according to the different image contents. When the server is handling the request, the handling time might be increased because the server is handling multiple users' requests at a time. So the result fluctuates greatly in the chart. In the test, the average shortest response time is about 11.62 seconds, the longest is 32.60 seconds and the overall average response time is 24.02 seconds, which is slower than the test result of Test Scenario 1 (Without Map Cache) by 12.37 seconds. So we can learn that the network load balancing mechanism can improve the performance of Server when the server handles the client side request.

Next, in the second part of Test Scenario 2, we will conduct the test on SuperGIS Server 3 Ultra website with cache mechanism. The result of response time for the website handling multiple users is drawn as the chart below.



In the test, we simulate to stop the operation of Server 2 under the effective network load balancing mechanism and record the various data of Server 1 handling 30 users' requests at a time. From the chart above, we learn that the shortest average response time is about 9.14 milliseconds, and the overall average response time is about 9.56 milliseconds, which is slower than that of Test Scenario 1 (Map Cache) by 4.02 milliseconds. Besides, through the test result we learn that after 30-minute continuous access, SuperGIS Server 3 Ultra website can still offer the high stability web service.

At last, comparing the test result of Test Scenario 1 with Test Scenario 2, we have the conclusion: (1) the cache mechanism in SuperGIS Server 3 Ultra website can effectively enhance the overall performance of the website; (2) SuperGIS Server 3 completely supports the network load balancing mechanism. Under the network load balancing architecture, the client side's requests will be equally distributed to all the server host machines of the website to effectively decrease the risk of instability of system caused by overloading on one specific server host machine. Besides, the network load balancing mechanism will transfer all the user's requests to the other server machines which normally operate when one of the server host machine fails. Although one less server host machine may make the performance of the entire website slightly lower, the failover mechanism on server can make the website operate normally and continuously offer services for the users. Finally the goal of offering users high availability services can be achieved.

6. Conclusion

The test adopts SuperGIS Server 3 Ultra website which offers cache mechanism for the test. Since cache mechanism can offer multiple users better browsing speed, the results of server performance test under network load balancing mechanism are quite close. So, the test data on each stage can be discussed from two aspects; the test results all show that SuperGIS Server is able to offer high availability website service.

In this test report, the performance of SuperGIS Server 3 Ultra website is not discussed. To know more about the performance of SuperGIS Server 3 website, please refer to “SuperGIS Server 3 Website Performance and Stress Test Report.”

There are many methods available to build up the high availability testing environment; in this test report, we only offer one test sample to verify SuperGIS Server 3 supporting to operate under the network load balancing architecture and provide high availability web service. Users could refer to the architecture in this test report to modify the specifications of server or to expand the quantity of server host machines; meanwhile, users can apply the network load balancing architecture to establish a high availability and high performance SuperGIS Server 3 website. The recommended hardware specifications are listed below for you to create SuperGIS Server 3 website.

- **Recommended Server Side Specifications**
  Operating System: Windows Server 2003 (32/64-bit) or higher
  CPU: Single Core 1.6 GHz or higher
  RAM: 1 GB or higher