LABVANTAGE® PERFORMANCE

LABVANTAGE®
Laboratory Knowledge. Delivered.

OVERVIEW

LABVANTAGE® Laboratory Information Management Solution has at its foundation a thin-client based architecture, developed to provide LABVANTAGE users, both internal and external to the laboratory, with the ability to access their solution from any internet access device utilizing Microsoft Internet Explorer 6.0 or higher. LABVANTAGE's pure browser/server architecture (with no applets on the client) leverages standard corporate infrastructures by enabling the open flow of information between internal and external systems, and by enabling the integration of third-party instruments and applications. LABVANTAGE's scalable, high performance environment is based on a 4-tier architecture and allows organizations to configure a hardware environment tailored to its specific workload and required system performance. It should be noted that LABVANTAGE also accommodates the use of rich and thin clients together, for those laboratories with internal computing standards requiring rich clients.

As the only pure thin-client laboratory information management solution on the market today, LABVANTAGE often gets questioned about the performance of its LIMS compared to thick client solutions or just web-enabled solutions. Can LABVANTAGE really manage workflows and laboratory operations with the same speed and efficiency of thick client systems? Can it do so while offering the benefits of thin client systems –namely, low total cost of ownership, ease of use, and enterprise visibility? Accordingly, LABVANTAGE, in conjunction with the University of Guelph, set out to test the performance and scalability of its LIMS.

THE TEST CASE

System scalability is measured by a system's ability to process an increasing load without a significant degradation in performance or response time. An exceptional scalable system should exhibit a first order, linear response curve. At some point, as the load increases, resource limits are reached and the system's performance will start to deteriorate at an ever-increasing rate. There is only so much load a particular central processing unit (CPU) can handle. In addition, other factors affect performance, such as context switching, CPU scheduling, disk I/O (input/output), and network bandwidth.

The premise of the test scenario was to evaluate how well LABVANTAGE handles concurrent users performing the same actions and the effect of these actions on performance. Realistic usage of LABVANTAGE was critical, so appropriate test scripts were created. Background actions were associated with pulling information into LABVANTAGE's browser pages from the database for reporting or reviewing, and foreground actions addressed daily activities associated with a typical laboratory, including sample login, data entry, quality review, and batch approval.

All performance tests conducted by the performance team were run on a Pentium® 4, 2.8GHz with 1GB memory as the application server and a Pentium® 4, 2.8GHz, with 1GB memory as the Oracle® database server, both running Windows® 2000. According to LABVANTAGE's hardware recommendations (see LABVANTAGE Hardware Configuration Requirements White Paper at www.labvantage.com), this hardware configuration is equivalent to ½ a Base Computing Unit (BCU), which is half of the standard recommended computing power of 1 BCU. The test harness software or client was executed on a laptop with a Pentium® M, 1.6GHz, with 512MB memory running Windows® XP with Internet Explorer 6.0+. All pages in the LABVANTAGE solution used for the test were out-of-the-box or created using the Evergreen™ configuration tool.

THE RESULTS

Based on the results of the test, LABVANTAGE proved itself to be an extremely scalable system. As shown in Figure 1, LABVANTAGE averaged under a 2 sec. response time with 30 users, under a 5 sec. response time with 40 users, and under a 5 sec. average response time at 50 users. Response time is defined as the time from the request being submitted to the server until the client receives the last byte of the response.

Specifically, each line in the graph represents the average response time for an individual web page in the test scenario. These averages were calculated over 10 iterations of the test scenario. As can be seen, the response curve is linear up through about 30 users and all the response times are 2 seconds or lower. At 30 users and above the response curves break into an exponential curve as would be expected when the limitations of the test hardware are reached.

Performance results with the Windows operating system found that LABVANTAGE could handle about 50-60 process thread switches per second, uses a simple round robin scheduling for CPU time slices, and as soon as a process requires disk I/O, the process is placed at the end of the round robin queue. In fact, according to the Hardware Configuration Requirements White Paper specifications, the test hardware should have only been capable of handling the load of about 15 users.

Table 1 shows the mean and maximum response times (in ms) for all the pages in the test scenario combined, for different numbers of simulated users.

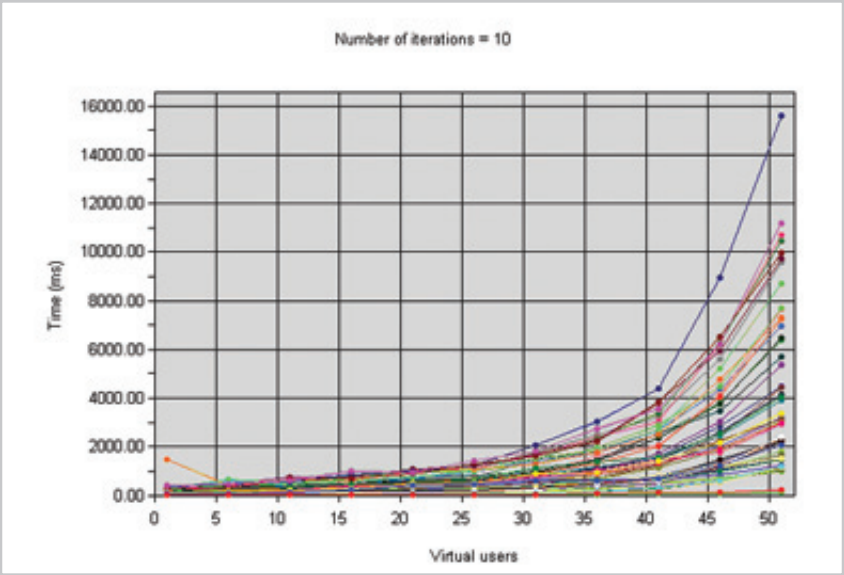

Figure 1: Individual Page Response Time for 1-50 users

Users	1	5	10	15	20	25	30	40	50
Mean	177.36	215.1	259.41	333.53	454.69	558	781.03	1566.63	4523.9
Max	1221.3	664.3	772.98	980.08	1085.57	1408.97	2043	4390.26	15592.2

Table 1: Mean and Maximum Response Time for 1-50 users

Figure 2 shows the same data in graphical form.

From these results, it can be seen that even up to 40 users, the mean response time is less than 2 seconds, and at 30 users the maximum response time is just over 2 seconds. These results are what industry experts expect for a robust scalable system.

Accordingly, these performance results clearly demonstrate that LABVANTAGE provides real-time responsiveness on the web. Moreover, LABVANTAGE's performance matches, if not exceeds, the performance of most thick-client and web-enabled solutions.[1]

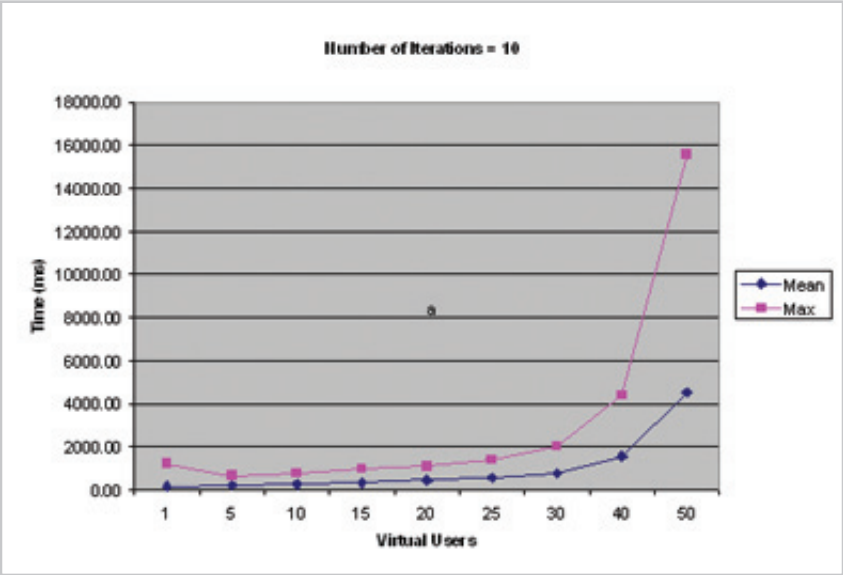

Figure 2: Mean and Maximum Response Time for 1-50 users

[1]As with thick-client solutions, LABVANTAGE's performance is limited by the server hardware. Also, although the performance team attempted to use a realistic LABVANTAGE test implementation, it may not be representative of an organization's particular configuration.

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