Scalability Tests of this Size are a Challenge

One of Europe's Largest Java Applications is Looking for a Home

By Gerd W. Naschenweng

How do I find the right hardware platform for 6,000 users and a highly complex integrated application? This is the question that BG-PHOENICS GMBH was asking when it needed to migrate one of the largest Java applications in Europe to new hardware. BG-PHOENICS GMBH decided on an IT infrastructure. The test team was composed of employees of BG-PHOENICS GMBH, the manufacturer, and MaK DATA SYSTEM.

Rolling out and managing increasingly complex applications is a challenge for today's enterprise IT. These mission-critical applications are the basis for customer satisfaction and long-term business success. For new applications to survive in practice, it's necessary to test the overall system, the interplay between hardware and software, under the most realistic possible conditions, starting right in the development phase.

The Participants

The eight employers' insurance associations of the construction industry started the "Phoenics" overall project in 1998. In 2000, the employers' insurance association for the food and catering industry joined. The original motivation for the project was the desire to merge eight computer centers and consolidate their similar software systems into a shared infrastructure.

From these subprojects, BG-PHOENICS GMBH was born, functioning as a service provider for the participants. The first step was to merge the five IBM and three FSC computer centers into two, and allow the GmbH to take over operations. Currently, about 6,000 users are served here.

The Application

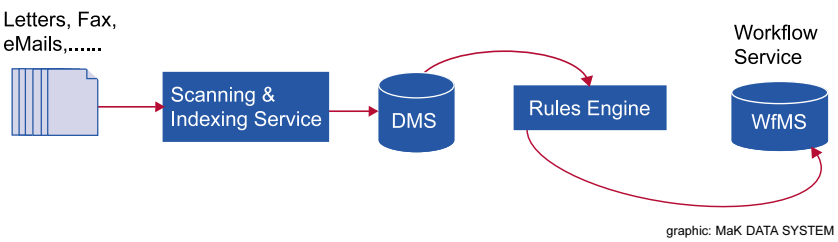
Simultaneously, as one of the largest Java projects, the common development of a new Java-based application landscape got underway. The application itself was developed as a Java-Swing client for a J2EE application server (BG-PHOENICS GMBH decided to implement on IBM WebSphere 4.07). In most cases, a business process is started by the arrival of an input document as letter, fax, or email. If the input is in written form, a mature text recognition package is used to identify it and the resulting data is pulled into the application. The document management system (DMS) then generates tasks and directs them to the appropriate clerks. These employees have access to an electronic file folder and are able to create a new document automatically as output, as shown in Illustration 1. Staff response times were dramatically reduced, which on the one hand saves money, and at the same time increases the satisfaction of clients, whose requirements can be met more quickly.

From analysis of existing business processes as well as the functional and nonfunctional requirements for the new landscape, a Java/J2EE-based architecture evolved which consists of the following components:

- Websphere Application Server as platform-independent J2EE server with high market acceptance
- MQ-Series Workflow for the control of workflow logic
- IBM Content Manager for archival and retrieval of electronic files
- ISIS/Papyrus for the generation and print output of new documents
- A custom-developed J2EE framework for the modeling of business processes

... and the Hardware?

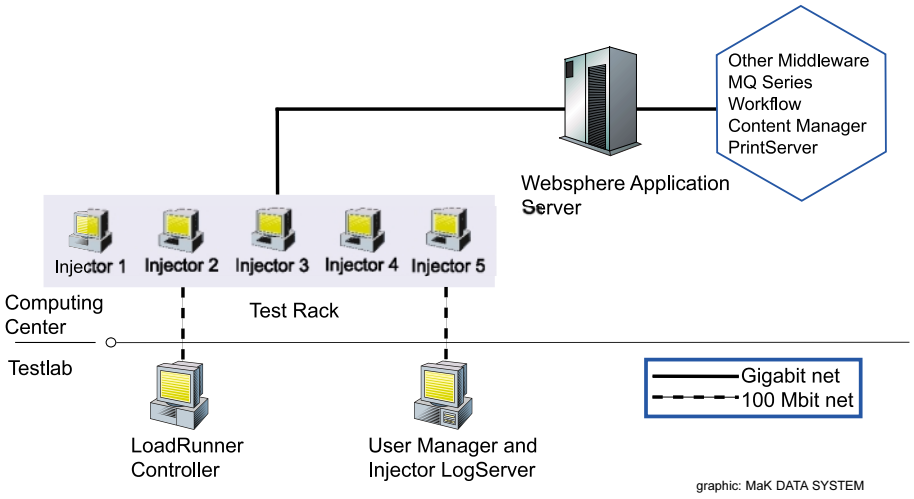
A significant component of the success of the overall project was the



Business processes often begins with the arrival of documents

choice of the hardware platform from the technical viewpoints of performance, scalability, and stability, while taking note of the overall cost-effectiveness of the solution chosen. In the framework of an RFQ, four suppliers proposed five hardware solutions. After a first round of selections, three manufacturers with as many solutions were still in the running. At the end of 2003, BG-PHOENICS GMBH started performance and load testing in the suppliers' test facilities.

The system had to be highly scalable. After introduction of the new application, about 300 users will be working with it. In the final phase, it will be roughly 6,000 users.



BG-PHOENICS test infrastructure

The Test Procedure

Before beginning the selection process, the project team defined metrics such as different numbers of users, response times for individual tasks, and other performance standards. Beyond that, the test procedure itself was standardized in the form of guidelines for execution, including standard for test development as well as for measurement of the testing process itself.

For the laboratory tests, a test environment was configured, procedures for automated testing defined, test data mapped against test procedures, and realistic test sets developed, which would simulate normal user behavior.

With 14 developed test sets, it was possible to get an image of all the requirements for the hardware. Among these were two requirements of a technical nature which had to be met by all manufacturers:

1. Simulation of a computer center with four trade associations and 1,500 users: For all 14 test sets, it must be proved that with the maximum number of users, all business cases could be processed within the required response times.
2. Simulation of a catastrophic situation in which one computer center was lost and the remaining center must assume the load of all eight trade associations with 3,000 users. Here, the assumption was that all currently running business cases must be completed correctly and that the infrastructure must still remain stable under these conditions.

Each scenario was run through several times, in order to ensure that the software and the infrastructure would remain stable over the course of time, and in order to be sure that the test results remained constant from run to run.

The Tool

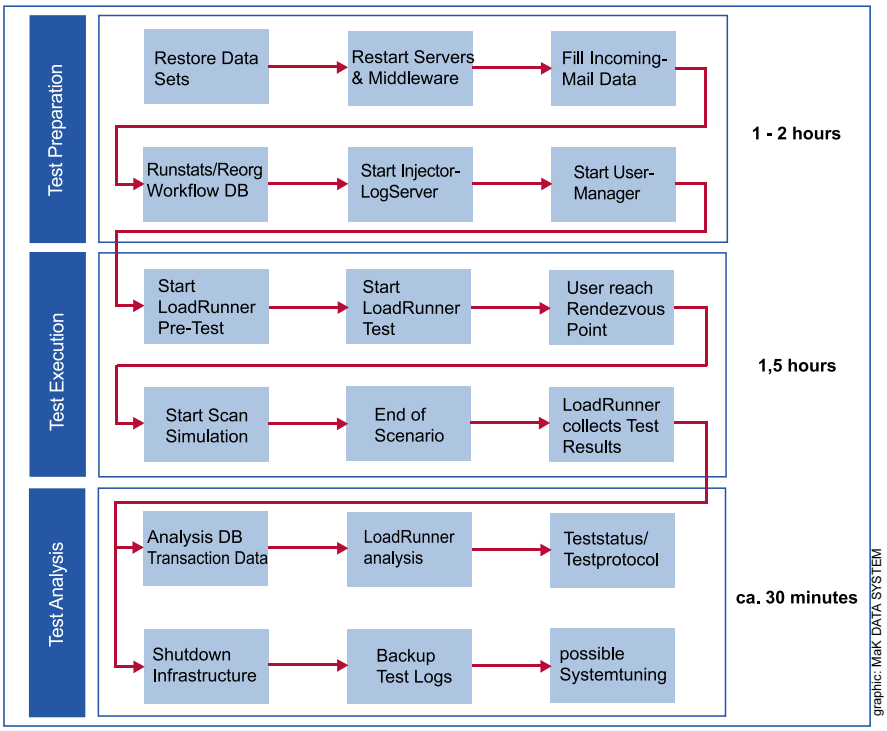
For the execution of the test, BG-Phoenics GmbH decided on the Mercury Interactive LoadRunner test suite. This allows simulation of thousands of users and includes monitoring and analysis functions for monitoring application and hardware performance.

Users were emulated on five machines, and the tests were executed against the hardware. One of the largest challenges was to produce similar loads on the hardware platforms of different suppliers. This was a prerequisite for providing a comparison of results later. The project team developed its own user manager, which then synchronized and controlled the actual test machines.

So that the tests could run smoothly in the suppliers' test facilities, the bulk data for the test runs were generated in advance, and scripts written which would simulate realistic user behavior.

The test scripts were first created using LoadRunner's Virtual User Generator, and later extended with client-specific functionality in order to attain a realistic user load and measure the response times of transactions. During the test preparations, the newly developed Java application was thoroughly tested with the developed test scripts, in order to avoid having to interrupt the tests in the lab due to software errors.

During the test, performance data from LoadRunner Controller was written from the test machines into a database. In this way, the team could compare the results of the various test runs. Simultaneously, by comparing the results of different suppliers, the hardware evaluation process was supported.



Steps to be done for a test szenario

Test Management Critical

It became obvious even before testing began that an efficient test manager would be a deciding factor in the success of the entire process. Since each individual test might last up to four hours, poorly planned or interrupted test runs, besides the waste of time, cost an incredible amount of money, if multiple team members had to monitor an invalid test, only to find out after the fact that the results were inconsistent and that the test would have to be repeated. The team implemented a process for test management to provide a central control point accessible to all team members. That created a clear basis for the entire test process – from the decision as to what had to be tested to the development of tests and the execution of different scenarios. The main goal of this process was better organization, cooperation, and exchange of information during the test phase. To ensure that the test runs were executed in the same way in all the suppliers' labs, a strict test procedure (with checklists) was introduced.

photo: MaK DATA SYSTEM

Kurt Lehner, IT Sales Manager at BG-PHOENICS GMBH

Endless Data

The amount of data produced by the testing was enormous. Several hundred megabytes of measurement data were generated by each individual test, which was then examined and correlated with the LoadRunner Analysis Tool. Additionally, Microsoft Excel spreadsheets were developed to create management reports for each test run, and detailed statistics for each test set.

Based on the analysis of the performance data, each supplier could be given feedback even during testing, to point out performance bottlenecks and to be able to adapt the infrastructure further and thus improve the test results.

Milestone Achieved

In only three months, BG-PHOENICS GMBH could test the performance of the application on three different hardware/software platforms and use that experience and the test results to select the best-suited infrastructure for the production environment. This was a significant milestone on the way to a new IT landscape for the participation trade associations.

The testing team gathered useful information during the test runs which could be used by the development team to improve performance and scalability even more. The successful performance tests served to confirm for the development team that the PHOENICS application runs well and thus also proved that the concept of a platform-independent Java-based software architecture was the right solution.

The experience accumulated and the test procedures developed in the course of performance testing are currently being used for the system testing phase of the project.

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