**ADVISORY MEMORANDUM REPORT
REVIEW OF THE DISASTER CREDIT MANAGEMENT
SYSTEM – PERFORMANCE TEST PLAN
REPORT NUMBER 06-24**

JUNE 8, 2006

U.S. SMALL BUSINESS ADMINISTRATION
OFFICE OF INSPECTOR GENERAL
WASHINGTON, D.C. 20416

ADVISORY MEMORANDUM
Issue Date: June 8, 2006
Number: 06-24

To: Herbert L. Mitchell
            Associate Administrator for Disaster Assistance

            /S/ Original Signed by Marc L. Bickoff for
From: Robert G. Hultberg
            Acting Assistant Inspector General for Auditing

Subject: Review of the Disaster Credit Management System – Performance Test
            Plan

        The purpose of this memorandum is to inform SBA of the disparity between
system requirements presented to and approved by SBA's Business Technology
Investment Council (BTIC) and the performance test success criteria in the Disaster
Credit Management System (DCMS) Upgrade Performance Test Plan. SBA's Office of
Disaster Assistance (ODA) originally proposed that the DCMS Upgrade would
accommodate 10,000 concurrent users of the system when implemented. However,
recent test documentation obtained from ODA does not reflect this requirement.

Background:

        During the Gulf Hurricanes of 2005, SBA utilized the DCMS at about 95 percent
of system capacity and frequently reached 100 percent of system capacity for loan
processing activities of SBA personnel in Fort Worth, Texas; Sacramento, California; and
Buffalo, New York. The DCMS was originally designed for an average of 600 users and
a potential maximum of 1,500 users. To meet demand, SBA has been able to expand or
scale DCMS to accommodate 3,500 users working in two shifts.

        SBA recognized the need to expand DCMS in the event that catastrophic disasters
of the size and scope of the 2005 Gulf hurricanes might again occur. In accordance with
SBA's System Development Methodology (SDM), ODA submitted a "Needs Statement"
to the BTIC for consideration that identified the following expected benefits and
capabilities for the DCMS Upgrade Project:

- Support for 10,000 concurrent users,
- Quicker response times for all users accessing the system resulting in individual improvements to productivity,
- A reliable disaster recovery environment capable of supporting 3,500 or more users with full system functionality, and
- A robust test environment for both fine tuning and adding upgrades to application modules over the long-term.

Based on this information, the DCMS Upgrade Project was approved by the SBA BTIC in December 2005.

SBA purchased the required hardware in February 2006 and built a new environment that is ready for testing. The new environment will move production from Tempe, Arizona, to Sterling, Virginia. Additionally, on May 5, 2006, SBA drafted and revised a performance test plan for the migrated environment in compliance with SBA's SDM and the DCMS Master Functional Test Plan. SBA plans to implement the new environment in June 2006.

Disparities between DCMS Upgrade Project and Performance Test Plan:

The concurrent user requirements in the DCMS Upgrade Project approved by the BTIC were greater than the draft ODA Performance Test Plan for system acceptance. The DCMS Upgrade Project was approved with a requirement that the system support 10,000 concurrent users with a 22 percent reserve margin. The DCMS Performance Test Plan does not include a baseline user test for 10,000 concurrent users. The Performance Test Plan identifies that four baseline concurrent user level tests of 100, 500, 1,000 and 2,000 will be executed. The test plan identifies that a 4,000 baseline concurrent user level test will be executed, if time and resources permit.

The results of these baseline user tests will be used to evaluate against success criteria in SBA's DCMS Performance Test Plan. Additionally, the results of these tests will be used to calibrate and refine a mathematical model that predicts server load and server resource utilization at 4,000 and 8,000 user populations, and estimates maximum user load possible on the new system. Therefore, ODA does not plan to test to either 10,000 concurrent users, nor identify if the 22 percent reserve margin within the system will be met.

Section 3.8.1 of the SDM identifies that test evaluation criteria is defined by the user of the system/subsystem and typically is a mix of functional and performance requirements, such as processing data within a certain time frame, producing a report, or responding to an online query within a certain amount of time. Additionally, the SDM identifies that acceptance criteria is the minimum function and performance criteria that must be met for the system to be accepted as "fit for use" by the user or sponsoring organization and requires user or sponsoring organization approval of all acceptance criteria. Further, Section 5.1 of the SDM identifies how acceptance testing is to be

conducted and reported, and whether the system meets its high-level requirements upon completion of its development.

Consequently, there is the potential risk that the implemented DCMS Upgrade will not meet the system requirements approved by the BTIC for the support of 10,000 concurrent users.

Recommendations:

We recommend that the Associate Administrator for Disaster Assistance:

1.A   Modify the DCMS Upgrade Performance Test Plan to add scenarios for 10,000 concurrent users and further test for a 22 percent reserve margin for the DCMS upgraded environment. Or, through additional analysis including projections of test results and extrapolation of test data collected; estimate the potential concurrent users with applicable reserve margins as a part of systems acceptance for the June 2006 Upgrade. The resulting information should be provided to the BTIC to determine the extent the DCMS Upgrade Project has met system requirements as identified in the "Needs Statement" approved by the BTIC in December 2005.

1.B   Continue to improve and tune potential module upgrades and system enhancements as identified in SBA's roadmap for system improvement. The results to be reported to the BTIC at a time in the future when the DCMS will be able to attain potentially 10,000 concurrent users with a 22 percent reserve margin.

Management Response:

SBA's ODA agreed that meaningful tests of the system capabilities should be performed as a part of system acceptance. However, ODA did not believe that a specific test execution of 10,000 concurrent is necessary, is a best practice, is cost-efficient, or is capable of being executed in time for the June 12, 2006 roll-out to production of the DCMS Upgrade. ODA's entire response is included in Attachment "A" to this report.

Auditor Comment:

We modified the original recommendation in our draft report to reflect SBA's response. We added an additional qualifier for extrapolation of test data to estimate results of the DCMS Upgrade. Additionally, we added a second recommendation in the event that the DCMS Upgrade is unable to meet the original system requirements in the "Needs Statement" approved by the BTIC to continue to tune the system and report to the BTIC at some point in the future when the system successfully meets its approved requirements.

* * *

Our review was conducted in conjunction with the President's Council on Integrity and Efficiency (PCIE) as part of its examination of relief efforts provided by the Federal government in the aftermath of Hurricane Katrina and Rita. As such, a copy of the report has been forwarded to the PCIE Homeland Security Working Group which is coordinating Inspectors General review of this important subject. The nature and brevity of this assessment precluded the use of our normal audit protocols; therefore, this review was not conducted in accordance with generally accepted government auditing standards. Had we followed such standards, other matters might have come to our attention.

The finding and recommendation in this report are subject to review and management decision, and corrective action by your office in accordance with existing Agency procedures for audit follow-up and resolution.

If you have any questions, please contact Jeff Brindle, Director Information Technology and Financial Management Audit Group at (202) 205-[FOIA Ex. 2].

MEMORANDUM

To: Robert G. Hultberg

                Acting Assistant Inspector General for Auditing

                /S/ Original Signed
From: Herbert L. Mitchell

                Associate Administrator for Disaster Assistance

Re: Review of the Disaster Credit Management System-Performance

                Test Plan

Date: May 26, 2006

This responds to your May 19, 2006 Draft Unnumbered "Advisory Memorandum and Recommendations in the Review of the Disaster Credit Management System – Performance Test Plan." The Report suggests the concurrent user requirements in the DCMS Upgrade Project approved by the BTIC were greater than the draft ODA Performance Test Plan for system acceptance. There is one recommendation to modify the DCMS Upgrade Performance Test Plan to add scenarios for 10,000 concurrent users.

To the extent the Memorandum addresses *the intent* of the DCMS Upgrade Needs Statement to acquire the capability to expand the system to support a 360% increase of the current production system with a 22% reserve, we partially agree with the recommendation. We agree that we should perform meaningful tests of the system capabilities. In fact, however, we believe that we are doing so. Thus, we do not fully agree with the section of the recommendation indicating we should run a 10,000 concurrent user test for several justifiable reasons. We do not believe that a "by execution" test of 10,000 concurrent users is necessary technically, is a best industry practice, is cost-efficient, or capable of being executed in time for the June 12, 2006 roll-out to production of the DCMS upgrade.

In sum, based upon the collective input of the technical expertise of the DCMS Operation Center and our contracted service providers, we are confident the documented Performance Test Plan provides an appropriate test to determine whether the stated objectives of the BTIC-approved Needs Statement have been achieved. In order to accurately assess the intent and expectations of the requested requirement to upgrade the system, please refer to the following sections:

2.1.1 Production Environment
The existing DCMS production system is currently nearing (averaging over 95% usage) and frequently reaching (100%) its hardware resource capacity (Processing capacity, Memory Capacity, Disk I/O, etc.) during peak times with the current DCMS user load

(currently (12/9) at 3372 users across 2 shifts – 6 AM to 10 PM – driving over 4000 concurrent database sessions). When 100% capacity is reached the ability of SBA personnel to process loans decreases dramatically as system wait times start to grow exponentially.

This section of the Needs Statement identifies the current system capability limited to roughly 1700 concurrent users on one shift and roughly 3400 over two shifts. These figures were used by IBM AOD as a baseline to determine the primary intent of the upgrade which is described in the following section:

2.2   Benefits Expected

The IBM AOD engineering team in combination with the Performance Tuning Team (established by the DCMS project office) has analyzed the current system performance and specified an environment which is expected to provide support for up to 10,000 concurrent users (360% of current capacity) with a 22% reserve margin. This proposed environment assumes the application will scale roughly linearly and the current HW architecture (individual HW units to support specific functionality vs. multiple LPAR machine approach) is maintained.

In order to meet this requirement, it is not from a technical perspective necessary to test the system at the peak level prior to production implementation as there is industry support for performing tests of lesser amounts and then, through analysis, developing logical results for actual system capacity. This is fully described in our Performance Test Plan.

The intent of the ODA requirement was to meet all of the specified benefits of the Needs Statement, yet most urgently expand the production system capacity by a factor of 2.5 to 3.5. We also sought to acquire a system architecture allowing for the capability to continue to expand the system substantially beyond the current hardware and software limitations. As a result, a requirement was given to IBM AOD to architect a system with the capability to achieve 10,000 concurrent users, amongst other requirements.   An IBM AOD proposal was accepted with ODA comments dated November 29, 2005 and forwarded to SBA's OPGM specifying the need to perform the necessary load testing to ensure system capacities are validated before acceptance.

We agree that optimally it is desired to execute performance tests on a system with a ramp up to the target peak load. However, the execution of the peak load is not needed to demonstrate the new system will meet the baseline requirements or to extrapolate to 10,000 from there. Furthermore, we believe we would unnecessarily waste resources by further tuning the simulated performance load tests to determine the actual production system can meet the increased capacities. We believe efforts would be better expended by meeting the criteria established in our plan to gain acceptance of the system into production. While additional tuning of the system may be a necessary outcome of the cut-over without a peak user test, we have full confidence that our operations center staff will continue to exceed the requirements established in the baseline.

Moreover, and importantly, the DCMS approach of executing a transaction load less than the target peak load in order to determine a baseline and extrapolation to estimate ability to support the peak load by component is an industry best practice.

As established by the test team in accordance with these best practices, the DCMS approach is to execute controlled transaction load testing at increasing levels in order to gather data and calibrate the existing baseline performance model. This calibrated model will then be used to estimate the ability of the DCMS system to handle various peak load disaster scenarios which would incur significant time, schedule, and resource costs to execute actual load tests to simulate. This approach represents a typical industry best practice balance between investment in time, money, and schedule and in the modeling, load testing, and system performance analysis required to determine ability of the system to handle various disaster scenarios.

The Performance Test Plan is developed with the schedule and cost constraints in mind. The initial scope of the testing allowed for a 2000 concurrent user test which would establish a capability slightly above the current level of concurrent users on a single shift providing a sufficient reserve to go beyond that level. We believed (and still do) that this test was sufficient. However, we have already modified the upper bound test to a 4000 concurrent user run to provide two key results: The additional data is expected to better demonstrate our ability to achieve 10,000 users through data extrapolation and to attain additional data to understand how far beyond the baseline level we can achieve going forward and make plans to do so.

Also, we do not believe we have sufficient time to execute the OIG proposed tests successfully. They simply will result in schedule and cost overruns which are unacceptable to ODA, to SBA management, and the American taxpayer. The most critical impact to implementation of the new production environment is to schedule so as not to compromise the ability to respond to the expectancy of another active hurricane season. Further tuning/re-engineering/upgrade efforts have already been identified for the application, middleware, and operating system layers (as set forth below). The priority of the upgrades will be established through these tests. We believe additional upgrades will certainly provide some increased capabilities. However, we emphasize these upgrades cannot be applied until the new production and test environments are in place in order to properly run the needed test cycles.

At a minimum, however, the new environment needs to support the existing user community with sufficient head-room to ramp-up to support additional usage. Specific CPU, memory, and load thresholds are detailed in the performance test plan for this effort. The definition of the test in the performance test plan establishes the following criteria:

1. *Determine the application's ability to perform adequately on the production architecture under the defined load (see Workload Development). Adequate performance is defined as a pre-determined set of simulated virtual users delivering a designated number of business transactions per hour, meeting the response time requirement, with less than 5% of any one transaction failing.*

a. *2000 LoadRunner virtual users will simulate a current production peak hour's transaction rate.*
b. *Transaction rate was determined by sampling production activity at three time periods on January 12, 2006, January 13, 2006 and January 16, 2006.*
c. *The LoadRunner virtual users will emulate the current production DCMS user population in terms of Database connections and system activity.*
d. *Adequate response time for this test is defined as equivalent or better than current production response time.*

With a successful run of a 2000 user test in combination with the functional and infrastructure testing already completed, the system would be ready to be moved into production. No other testing is technically required to meet this specific goal. Nonetheless, we are providing for a 4000 concurrent user test. As stated, a 4000 concurrent user test is not deemed technically necessary, but is now planned in substitution of the original 1000 user test. We have high confidence in our ability to get meaningful results without monetary waste at this level within the schedule's constraints. To continue beyond this level poses an unnecessary cost and risk to the project, and is immediately mitigated upon establishing the new test environment in Tempe where we can further test contentious components, if any.

Further additional testing can be planned to solve component-level problems and would also drive additional concurrent users. Constraints on how much additional performance testing could be executed are and were driven by the schedule, cost of Mercury V-Users and temporary Performance Load Driver Environment Hardware, cost of performance test case development, and cost of performance test support resources. The current schedule of 2½ weeks of performance test execution to a maximum of 4000 concurrent users reflects the most reasonable tradeoff of schedule, cost, and benefits.

Once in production, the DCMS project office has my full support to finalize and execute the most appropriate plans for achieving enhanced capabilities within existing cost and schedule baselines. Enhanced capabilities requiring cost or schedule variance beyond CPIC policies must and will be evaluated as necessary to achieve program objectives.

For the record, there are several opportunities or initiatives currently pending in-plan for tuning. Each of these is expected to provide additional functionality to the DCMS system and users and will be developed using the agency SDM, as appropriate. None of these items could move forward without a fully-functional performance test/validation environment. These potential upgrades include:

- Major OS and COTS upgrades including Solaris, Oracle forms, Oracle database, and webMethods
- Daybreak upgrades/re-engineering activities to support on-line applications
- BPR initiatives
- Set up server to store forms
- Ascent Capture upgrade (to version 7)

- Parallel queries in Oracle
- Implement Oracle RAC on DB servers - Additional network hardware and additional cluster configuration required
- Eliminate external excel based financial analysis tool
- Loss Verification application
- Web access to DCMS for public (online applications, closing scheduling, potentially account management) (remove pre-applications out of shared table first)
- Develop Service Oriented Architecture

DCMS can be described as a "set" of customized applications and COTS products providing a wide range of business process support of the ODA mission critical functions. As such, much of the tuning/performance issues can be isolated to a specific component of the system, *i.e.,* HFAT, BFAT, LV, DOCGEN, etc. As a result of performance tests planned to be performed, data will be collected on each of the following transactions:

- Disaster Declaration Process
- Pre-Application Entry Process
- Application Entry Process
- Application Processing Process
- Review Process
- Obligating Process
- Loss Verification Initial Inspection Process
- Flood Mapping Process
- Loss Verification Re-verification process
- Closing sub-process
- Disbursements
- Loan Modifications

Once the Tempe environment is available for performance testing/validation, specific tuning activities for the above processes (with performance tuning of individual components available re-using existing performance scripts up to 10,000 concurrent users per component) in addition to the overall system tuning initiatives described will be able to be scheduled, planned, and executed in parallel with continued support of 2006 disaster processing. This is the roadmap that will allow DCMS to move towards its overall peak usage goal.

It is also important to note, that SBA's Office of the Chief Information Officer concurs with ODA's approach for the reasons stated. We appreciate the opportunity to discuss this important topic. If you have further questions about ODA's response, please contact Michael Sorrento, Director of the DCMS Operations Center, at (866) 407-[FOIA Ex. 2].

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