

IBM® Lotus® Domino® 7

Performance Improvements



Razeyah Stephen, IBM Lotus Domino Performance Team

Rob Ingram, IBM Lotus Domino Product Manager

September 2005

Table of Contents

Executive Summary	3
Impacts of performance improvements on total cost of ownership (TCO)	3
Performance goals for Lotus Domino 7	3
Performance highlights for Lotus Domino 7	3
Detailed Performance Results.....	4
NotesBench Results	4
What do NotesBench benchmarks workloads measure?	4
Lotus Notes client (NRPC) 6 Mail NotesBench workload results.....	5
Lotus Domino Web Access 6 NotesBench workload results	6
CPU Improvements for Lotus Domino 7 Notes Mail over NRPC	7
CPU Improvements for Lotus Domino Web Access 7	8
New Enterprise Mail workload	9
Appendix	11
Planned performance papers for Lotus Domino 7	11
Resources on Lotus Domino 6 Performance improvements	11

Executive Summary

Impacts of performance improvements on total cost of ownership (TCO)

The total cost of ownership (TCO) of Lotus Domino Messaging and Collaboration is influenced by many factors, including hardware, software, administration, support, system downtime, and user productivity. Improved server performance can have a measurable impact on many of these costs. With Lotus Domino 7, fewer servers are typically required to deliver messaging to the same user population, often leading to one or more of the following savings:

- Lower server hardware costs per user
- Reduced server administration time needed for fewer servers
- Lower downtime costs due to fewer points of hardware failure
- More responsive systems, delivering faster service to users, can lead to increase productivity.

Performance goals for Lotus Domino 7

The goals of Lotus Domino 7 server performance improvements were to:

- Improve users' scalability by up to 50% [as measured by NotesBench Lotus Domino 6 Mail and Lotus Domino Web Access 6 (formerly Lotus iNotes Web Access) workloads]
- Reduce CPU resource utilization

Tests were performed in both our laboratory test environment and with Lotus Domino 7 deployment data collected on live IBM production Lotus Domino mail servers, to validate the laboratory results. The two goals are separate, in that you will not see scalability improvements and CPU utilization reductions with the same tests. Also, for the scalability tests, the configurations used had no resource bottlenecks, so we could focus on Lotus Domino 7 scalability. This article details the results in each of these areas.

Performance highlights for Lotus Domino 7

The tests results cited below are for a single Lotus Domino partition. Here are some of the key findings:

- 50-80% improvement in both NotesBench Lotus Domino 6 Mail and Lotus Domino 6 Web Access scalability on most platforms (except on IBM zSeries® where many performance improvements were delivered in 6.5)

- Up to 400% improvement in Intel® Linux® NotesBench Lotus Domino 6 Mail users' scalability (in part due to exploitation of the Linux 2.6 kernel)
- Up to 25% reduction in Lotus Domino server CPU utilization for Lotus Notes Remote Procedure Call (NRPC) client access
- Up to 50% reduction in Lotus Domino server CPU utilization for Lotus Domino Web Access
- Up to 35% CPU utilization reduction experienced on IBM mail servers in production use

Detailed Performance Results

NotesBench Results

What do NotesBench benchmarks workloads measure?

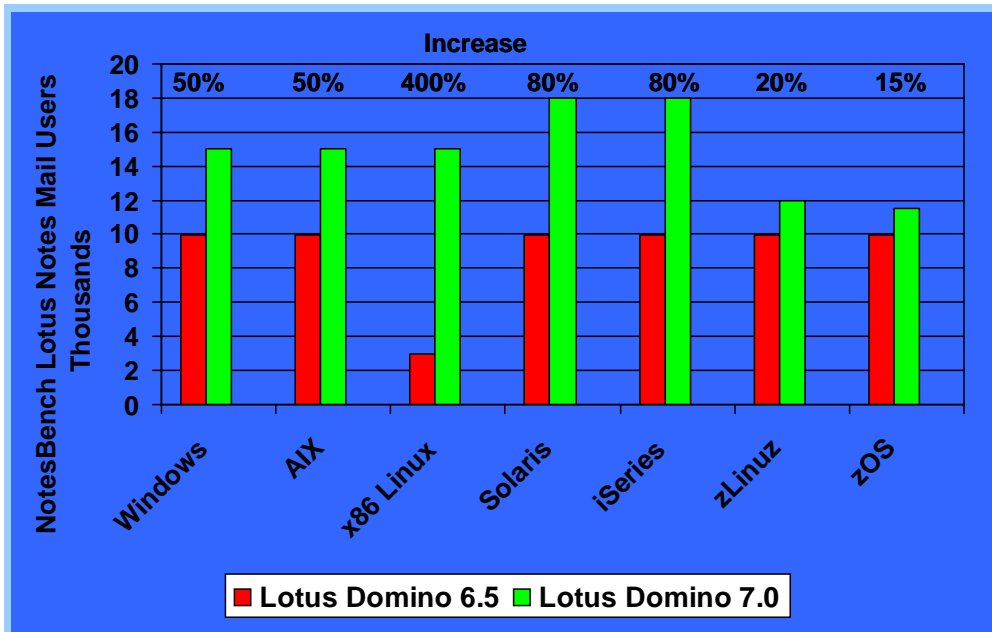
NotesBench benchmarks define various standard workloads running on Lotus Domino servers. NotesBench benchmark workloads are defined scripts used to simulate users' activities through specific applications. The workloads cover a variety of messaging protocols such as IMAP, NRPC, which is Lotus Notes® and Domino native mail, and HTTP. The workloads provide a common tool to apply a consistent, repeatable load against the Lotus Domino server so that we can assess the effects of various operating systems, hardware, and configuration changes. NotesBench benchmarks were used to measure Lotus Domino scalability improvements for email user workloads. The NotesBench benchmark workloads are used by the NotesBench consortium members who publish audited results at www.notesbench.org. The Lotus Notes and Domino server includes a free capacity planning tool, Server.Load, which is GUI based and has all NotesBench benchmark workloads; in addition, users have the ability to customize the workloads to their environments.

For Lotus Domino 7, we focused our testing on two types of email users: Lotus Notes client users accessing Lotus Domino email via NRPC (Lotus Domino 6 Mail workload), and Lotus Domino Web Access for browser access to email via HTTP (Lotus Domino Web Access workload). We used these benchmarks to provide an “apples-to-apples” comparison between Lotus Domino 6.5 and 7 on the same system configuration. For further information on the workloads, refer to the article “*The New Domino 6 NotesBench workloads: Heavier by request*” linked below in the Appendix.

It is important to understand that NotesBench measures an email-only usage workload with no other applications, such as Scanmail, running on

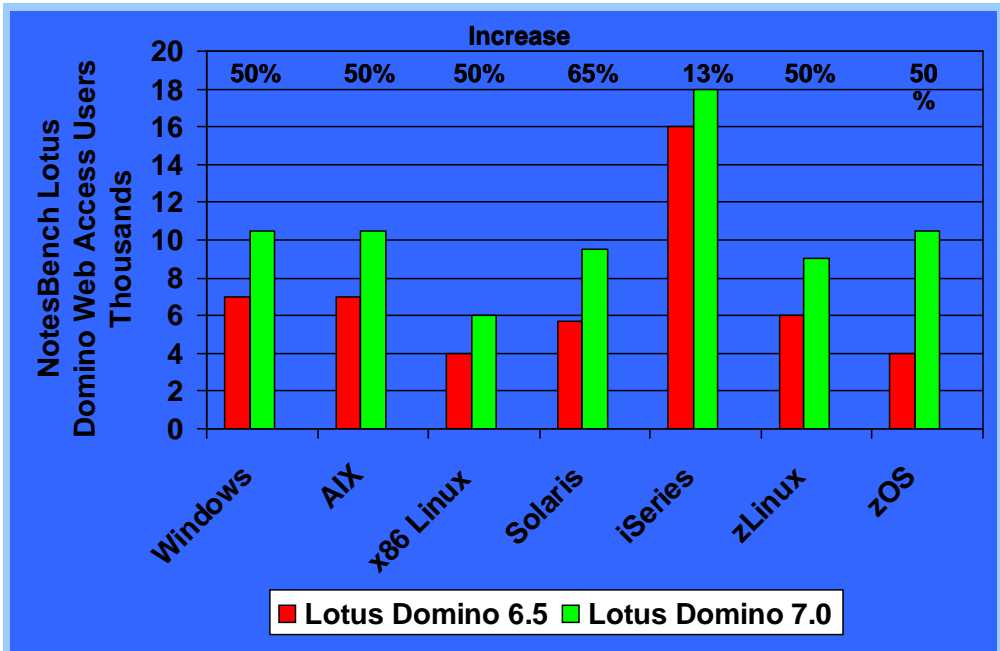
the servers. Variations to the standard workload and other applications running on Lotus Domino servers reduce the number of users that can be supported on any given hardware. To size systems, the NotesBench benchmark data should be used as an initial data point only. For capacity planning information, please contact your hardware vendor and the IBM TechLine E-business Technical Support Team, which handles Lotus Domino sizing for new e-Server sales.

Lotus Notes client (NRPC) 6 Mail NotesBench workload results



- The number of users supported on Lotus Domino increased by 50 to 80% on the majority of platforms due to the removal of a 10,000-user constraint that is present in Lotus Domino 6.5.
- zSeries platforms tested showed 15-20% increases in scalability.
- The Intel Linux platform showed up to a 400% increase, in part because we were able to exploit the new Linux 2.6 kernel and thread pooling in Lotus Domino 7.
- Lotus Domino 7 NRPC performance details on all platforms will be published in a future report on IBM's developerWorks site.

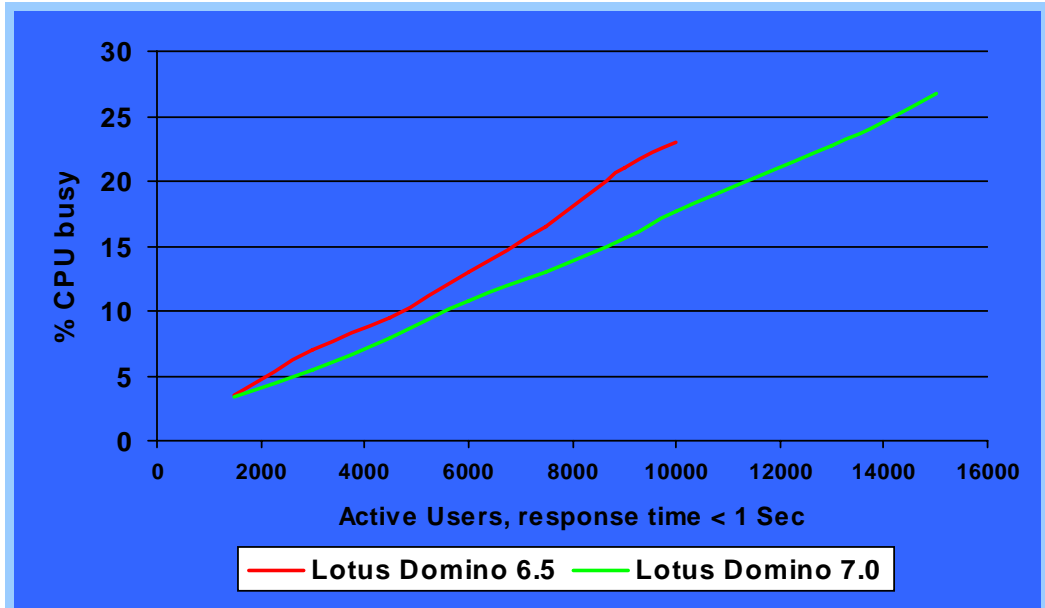
Lotus Domino Web Access 6 NotesBench workload results



- In most cases, the number of users supported increased by 50%.
- Lotus Domino 7 Domino Web Access performance details on all platforms will be published in a future report on IBM's developerWorks site.

CPU Improvements for Lotus Domino 7 Notes Mail over NRPC

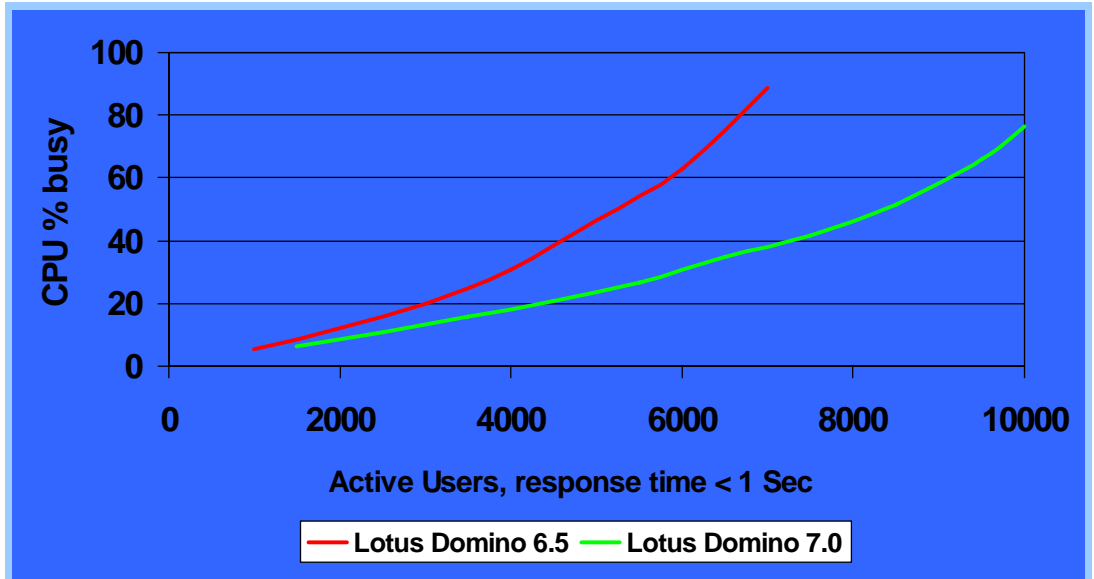
By way of example, we have included the CPU improvement results for the IBM AIX® platform. A detailed report covering Lotus Domino 7 results on all platforms will be published in a future performance paper on IBM's developerWorks site.



- Lotus Domino 7 was compared with Lotus Domino 6.5 running the Domino 6 Mail NotesBench NRPC workload.
- The system tested was a p670 Regatta with eight 1.45-GHz CPUs, 32 GB RAM, thirty-two SSA disk drives, and one Lotus Domino partition running on IBM AIX 5.2.
- Lotus Domino 6.5 attained 10,000 users at 23% CPU utilization while Lotus Domino 7 was able to achieve over 12,000 users at the same CPU utilization.
- As the number of users increases, CPU improvements continued in a fairly linear fashion.

CPU Improvements for Lotus Domino Web Access 7

By way of example, we have included the CPU improvement results for the Microsoft® Windows® 2003 platform. Data for other platforms indicates similar results and is planned for publication in a separate paper.



- Lotus Domino 7 was compared with Lotus Domino 6.5 (Lotus Domino Web Access 7 mail template) running the R6iNotes NotesBench workload.
- Lotus Domino 6.5 attained 7,000 users at 89% CPU utilization, while Lotus Domino 7 was able to achieve 10,000 users at 76% CPU utilization.
- As the number of users increased, CPU improvements typically became even higher.

New Enterprise Mail workload

As noted above, the existing NotesBench measures an email-only workload. However, Lotus Domino servers usually have additional tasks running that consume server resources and reduce the number of users that can be supported. With Lotus Domino 7 we are introducing a new Enterprise Mail workload that attempts to match more closely real-world production mail servers. The new Enterprise Mail workload adds the following loads to the existing NotesBench Lotus Domino 6 Mail (NRPC) mail workload:

- Replication
- Clustering
- A mix of server-based and local mail files
- Full text search
- Transaction Logging

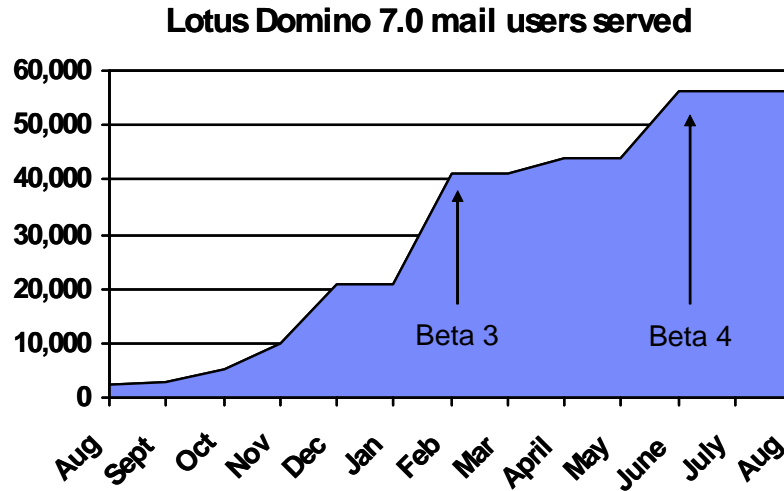
The new workload is advantageous in that it:

- More closely approximates real-world deployment scenarios
- Provides another measure for CPU utilization in Lotus Domino 7
- Delivers additional data for deployment planning and system sizing.

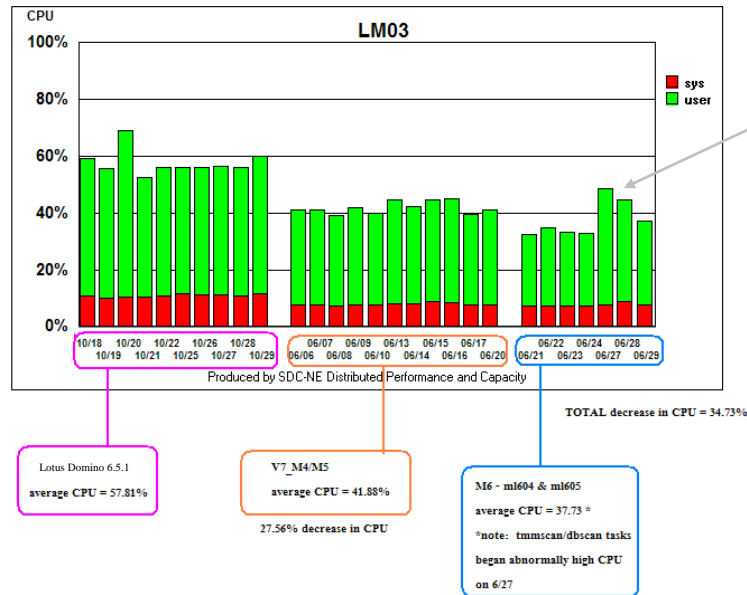
Results for the Lotus Domino Enterprise Mail workload tests are planned for publication in a future performance paper.

Results from early IBM deployments

As part of the release criteria for Lotus Domino 7, IBM ran the Beta versions on production mail servers, serving over 55,000 Lotus Notes Client email users:



As part of that early deployment, data was captured on CPU utilization reductions as IBM servers were upgraded from 6.5.1 to 7. The data in the graphic below shows the results for two mail servers, which demonstrated a **35% reduction in CPU** utilization over the test period from October 2004 to June 2005. The Lotus Notes clients were using the IBM Lotus Domino 6 template.



Lotus Domino 6.5.1 Lotus Domino 7 Beta 3 Lotus Domino 7 Beta 4

IBM production AIX mail servers
A (1,500 registered users) & B (2,000 registered users)

Appendix

Planned performance papers for Lotus Domino 7

Various additional papers are currently planned to describe, in greater detail, the performance findings outlined in this paper. Please check the Lotus Domino performance page for the latest published performance information.

<http://www-128.ibm.com/developerworks/lotus/performance/>

Resources on Lotus Domino 6 Performance improvements

1. The New Domino 6 NotesBench workloads: Heavier by request!
<http://www-128.ibm.com/developerworks/lotus/library/ls-D6NotesBenchWorkloads>
2. Domino 6 performs!
<http://www-128.ibm.com/developerworks/lotus/library/ls-D6Perf/>
3. Domino 6 performance features
<http://www-128.ibm.com/developerworks/lotus/library/ls-D6PerfFeatures/>
4. Network compression in Domino 6
<http://www-128.ibm.com/developerworks/lotus/library/ls-NetComp/>
5. Domino 6 directory performance
<http://www-10.lotus.com/ldd/today.nsf/aa2db969526197dd85256b56004e5a7b/ff63121f2969ebbd85256cd70047b786?OpenDocument>
6. D6 IMAP performance
<http://www-10.lotus.com/ldd/today.nsf/aa2db969526197dd85256b56004e5a7b/74ae4e88390e300c85256cda006de612?OpenDocument>



© Copyright IBM Corporation 2005. All rights reserved.

IBM, Domino, Lotus, Notes, zSeries and AIX are trademarks of International Business Machines Corporation in the United States, other countries, or both.

Intel is a registered trademark of Intel Corporation in the United States, or other countries, or both.

Microsoft, Windows, and Windows NT are registered trademarks of Microsoft Corporation in the United States, or other countries, or both.

Linux is a registered trademark of Linus Torvalds in the United States, or other countries, or both.

Other company, product or service names may be trademarks or service marks of others.

The information contained in this documentation is provided for informational purposes only. While efforts were made to verify the completeness and accuracy of the information contained in this documentation, it is provided "as is" without warranty of any kind, express or implied. In addition, this information is based on IBM's current product plans and strategy, which are subject to change by IBM without notice. IBM shall not be responsible for any damages arising out of the use of, or otherwise related to, this documentation or any other documentation. Nothing contained in this documentation is intended to, nor shall have the effect of, creating any warranties or representations from IBM (or its suppliers or licensors), or altering the terms and conditions of the applicable license agreement governing the use of IBM software.