



# IBM Lotus Domino 8.5 performance for iNotes users

Level: Intermediate

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Improving input/output (I/O) performance is one of the major goals for IBM® Lotus® Domino® 8.5. The developerWorks® article "IBM Lotus Domino 8.5 performance for IBM Lotus Notes users" showed the impressive I/O reductions of Lotus Domino 8.5 with the Lotus Notes client. This article shows the I/O performance improvements of Lotus Domino 8.5 performance with Lotus iNotes® users. Lotus iNotes had been called Lotus Domino Web Access in the past; its name is iNotes in Lotus Domino 8.5.

The measurements that we show in this article use the new, heavier Notesbench workloads that were designed to more accurately mimic the behavior of iNotes users performing common messaging and calendar operations using a single Lotus Domino server. We used the DWA8 mail workload for Lotus Domino 8 iNotes full mode, the DWA85 mail workload for Lotus Domino 8.5 iNotes full mode, and the DWA85Lite mail workload for Lotus Domino 8.5 lite mode. This article compares the iNotes performance between Lotus Domino 8 iNotes full mode and Lotus Domino 8.5 iNotes full mode, and also its performance between Lotus Domino 8.5 iNotes full mode and Lotus Domino 8.5 iNotes lite mode.

The new iNotes workloads emulate the same high-level actions as the N8Mail workload; an article on the Lotus Domino Web Access workloads will be published soon. For more information on the N8Mail workload, refer to this developerWorks article, "[IBM Lotus Notes V8 workloads: Taking performance to a new level.](#)"

For more information on [Lotus Domino 8.5 iNotes](#) full and lite modes, refer to the [Lotus Domino wiki](#).

Lotus Domino server configurations for testing on all platforms

In general, the tests were set up with 5000 users in the Lotus Domino directory on the server. These users were defined with the format preference "Keep in senders' format." DWA8init or DWA85init initialized 3000 documents in the mail databases with varying message sizes and attachments. The average document message size in the inbox was 100 KB, and the mail databases size was 300 MB. We enabled MIME compression for attachments (MimeCompressAttachments=1) to reduce the size of the mail databases and the amount of disk space required. The resulting mail database size was 170 MB. We enabled transaction logging with the favor run time setting, mail journaling set to journal all messages locally, and DDM probes enabled for messaging and operating systems for both Lotus Domino 8.0 and Lotus Domino 8.5. We enabled notes compression for Lotus Domino 8.5.

We used standard Lotus Domino HTTP tuning parameter settings of the Lotus Domino server and mail template. The configurations listed in table 1 were used on all platforms, with additional platform-specific items discussed in the section that discusses the results on that particular platform. See the appendix at the end of this article for details on what Notes.ini settings can accomplish.

**Table 1. Lotus Domino server configuration for testing on all operating systems**

Configuration	Lotus Domino 8.0 measurements	Lotus Domino 8.5 measurements
Mail template	Mail8.ntf with ODS 48	Mail85.ntf with ODS 51
Workload	DWA8	DWA85 / DWA85Lite
Transaction log	Enabled / Favor runtime	Enabled / Favor runtime
Lotus Domino attachment and object service (DAOS)	N/A	Enabled with encryption (only on Microsoft® Windows® operating system)
Mail journaling	All messages local	All messages local
Additional, nondefault, mail database options	Disable automatic update of views Don't overwrite free space	Don't overwrite free space Disable automatic update of views Compress document data
Server tasks	Replica,Router,Update,AMgr,Adminp, Sched,CalConn,RnRMgr,LDAP,HTTP	Replica,Router,Update,AMgr,Adminp, Sched,CalConn,RnRMgr,LDAP,HTTP
Notes.ini additions	RouterDbCacheSize=6100 Schedule_No_Validate=1 NSF_DbCache_Maxentries=6000 Create_R8_Databases=1 Debug_NSF_Show_Allstats=1  iNotes_WA_ProfileCacheSize=6000 NSF_DBUCCACHE_MAX_ENTRIES=6000	Same as Lotus Domino 8.0 plus: Create_R85_Databases=1 Debug_NSF_Compress_All_Notes=1 Create_R85_Log=1 Enable_LZ1_Encrypted_Notes=1 MIMECompressAttachments=1

**NOTE:** The results in this article are from benchmarks executed in a controlled environment. While effort was made during the creation of the benchmark to include typical user operations, it is likely that real users will make different use of Lotus Domino than the narrow range of functions that are used by the benchmark. These numbers should therefore be used primarily to understand the relative performance of the Lotus Domino releases, and they do not represent recommendations for real-world deployment. For assistance with capacity planning, consult your hardware vendor and IBM TechLine.

Also, although we show results on a variety of hardware platforms, these configurations are not of uniform capacity. It is our intent here to focus on the performance of Lotus Domino only, and this data should not be used to compare operating systems with each other.

The following sections show the detailed results on the operating systems that we tested. We support Lotus iNotes for Lotus Domino 8 and Lotus Domino 8.5 for the System z® Linux® operating system. Tests results are not included in this article due to hardware availability for measurements.

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## AIX results

Table 2 summarizes the configuration used for the IBM AIX® measurements.

**Table 2. AIX configuration**

<b>Model</b>	<b>P570 PowerPC® Power5™</b>
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Processors for test / speed	Four physical / four logical processors (SMT) 1.5 GHz
Memory	16 GB RAM
Active physical drives	IBM DS4000® Series using FastT Fiber Channel storage, seven trays each with 14 15000 RPM using RAID 0
Active logical volumes	Three logical units on Lotus Domino binaries/data, one logical unit for transaction logging
Operating system	AIX V5.3 ML5 64-bit
Lotus Domino version	Lotus Domino 8.0 32-bit application with Mail8.ntf template Lotus Domino 8.5 64-bit application with Mail85.ntf template
Notes.ini settings in addition to those commonly used for these tests	None DAOS is not enabled

### Lotus Domino configurations

The pSeries® test system used was a p570+ configured into multiple logical partitions (LPARs). A logical partition is the division of a computer's processors, memory, and hardware resources into multiple environments so that each environment can be operated independently with its own operating system and applications. The LPAR that we used for these tests was configured as a single DPAR (Lotus Domino partition running an instance of the Lotus Domino server). We configured the LPAR to have four (capped) physical processors, and because we were running AIX 5.3, we were able to utilize the SMT (symmetrical multi threading) feature that additionally enabled four logical processors.

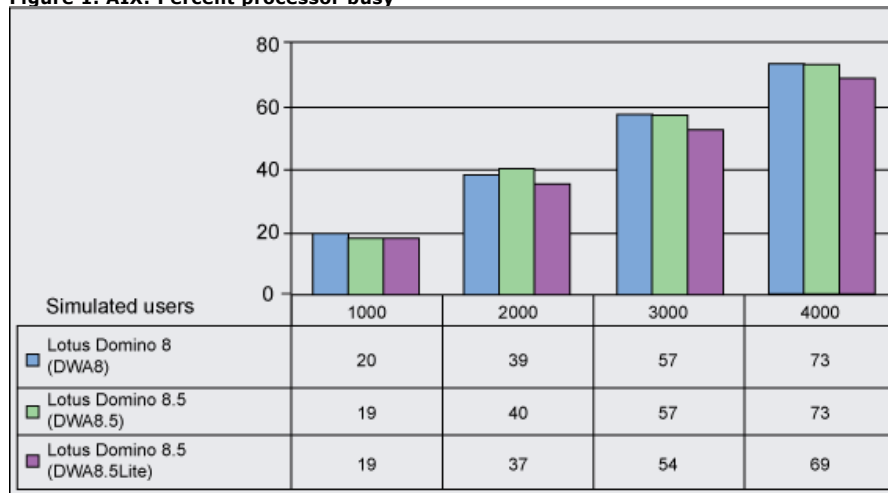
The IBM DS4000 series FastT iber channel attached storage has been configured using RAID 0 and JFS2.

A consistent color scheme is used to present the data in figures 1, 2, and 3:

- The first, blue bar represents results for the DWA8 mail workload on Lotus Domino 8 using the Mail8 template.
- The second, green bar represents results for the DWA85 mail workload on Lotus Domino 8.5 using the Mail85 template.
- The third, purple bar represents results for the DWA85Lite mail workload on Lotus Domino 8.5 using the Mail85 template.

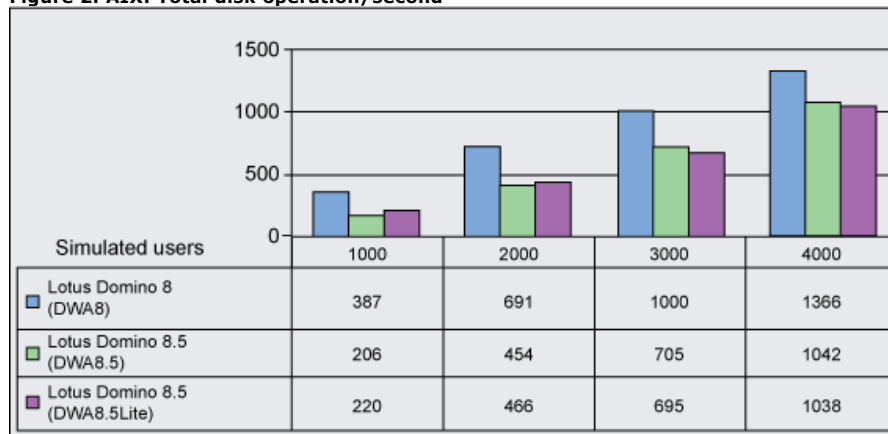
Each interval showed the average of the one-hour steady state of each increment of 1000 users. We did not enable DAOS for Lotus Domino 8.5.

**Figure 1. AIX: Percent processor busy**



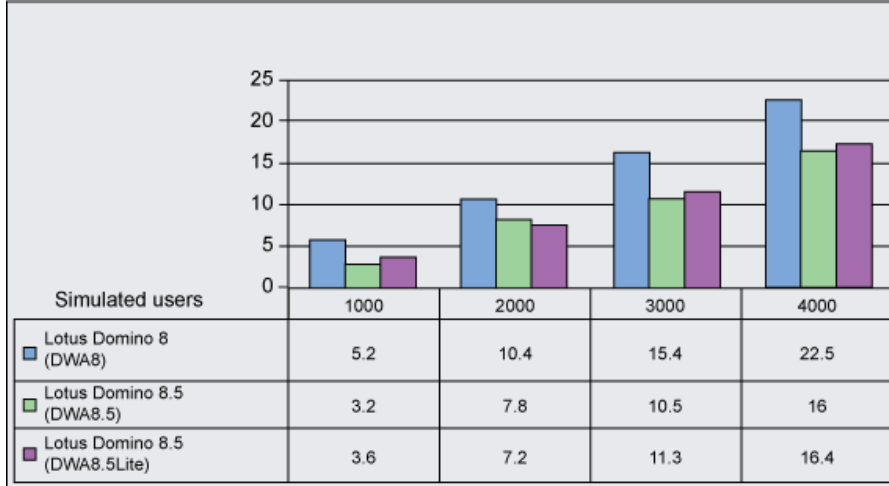
The Lotus Domino 8.0 iNotes full mode and Lotus Domino 8.5 iNotes full mode processor busy rate is approximately the same for all simulated user intervals. Lotus Domino 8.5 iNotes lite mode showed up to a 7 percent reduction in processor utilization.

**Figure 2. AIX: Total disk operation/second**



The Lotus Domino 8.5 measurements shown in figure 2 enjoy a substantial reduction in disk I/O operations. The full mode workload shows savings of between 24 and 47 percent. The lite mode workload showed about the same performance as the full mode workload.

**Figure 3. AIX: Total disk megabytes transferred/second**



The amount of data read and written to disk also shows a substantial reduction with Lotus Domino 8.5 as shown in figure 3. With the full mode workload, there is a reduction of between 25 and 38 percent when using Lotus Domino 8.5. The lite mode workload showed performance similar to that of the full mode workload.

**Table 3. AIX V6.1: Resource usage at 4000 users comparing DWA8 to DWA85**

Resource	Lotus Domino 8 DWA8	Lotus Domino 8.5 DWA85	% change
Processor percent busy	73	73	0%
Total disk operations/second	1366	1042	-24%
Total disk reads/second	561	284	-49%
Total disk writes/second	805	758	-6%
Total disk MB transferred/second	22.5	16	-29%
Total disk MB read/second	4.9	2.2	-55%
Total disk MB written/second	17.5	13.8	-21%
HTTP shared memory used in MB	1336	1334	0%
HTTP process memory used in MB	0.15	0.38	153%
Network MB / second	1.2	1.17	-2%

The data for HTTP process memory used bytes was so small, and so that factor is considered insignificant in this table.

**Table 4. AIX V6.1: Resource usage at 4000 users comparing DWA85 to DWA85Lite**

Resource	Lotus Domino 8.5 DWA85	Lotus Domino 8.5 DWA85Lite	% change
Processor percent busy	73	69	-5%
Total disk operations/second	1042	1038	0%
Total disk reads/second	284	278	-2%
Total disk writes/second	758	760	0%
Total disk MB transferred/second	16	16.4	2%
Total disk MB read/second	2.2	2.2	0%
Total disk MB written/second	13.8	14.2	3%
Shared memory used in MB	1936	2056	6%
Process memory used in MB	0.38	0.31	-18%
Network MB / second	1.17	1.08	-8%

We see that on the same hardware, Lotus Domino 8.5 using the new, heavier workloads (DWA85 and DWA85Lite) both generate less disk I/O activity and transfer less data than was observed with Lotus Domino 8.0 using the new, heavier workload (DWA8). The processor utilization rate for all workloads on both Lotus Domino 8.5 and Lotus Domino 8 remain approximately the same.

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## IBM i results

All performance test results documented here were completed using an IBM i570 with two active processor cores and 11 GB of memory. The system was configured with 48 disk drives with RAID-5 protection. Network access occurred through a single 100 MB Ethernet adapter running in full-duplex mode.

**Table 5. IBM i configuration**

Model	IBM i570 (9406-MMA)
Processors for test / speed	Two 4.7 GHz processor cores
Memory	3 GB dedicated for machine pool 8 GB dedicated for base pool
Disk drives	48 drives with RAID-5 protection
Operating system	IBM i 5.4
Lotus Domino version	Lotus Domino 8.0 with Mail8.ntf template Lotus Domino 8.5 with Mail85.ntf template
Notes.ini settings in addition to those commonly used for these tests	None DAOS is not enabled

## Lotus Domino configurations

The system was configured with one Lotus Domino partition. The transaction logging and mail journaling files were under the Lotus Domino data directory. For the tests performed on Lotus Domino 8.5, DAOS was not enabled.

A consistent color scheme is used to present the data in figures 4, 5, and 6:

- The first, blue bar represents results for the DWA8 mail workload on Lotus Domino 8 using the Mail8 template.
- The second, green bar represents results for the DWA85 mail workload on Lotus Domino 8.5 using the Mail85 template.
- The third, purple bar represents results for the DWA85Lite mail workload on Lotus Domino 8.5 using the Mail85 template.

Data points were measured with 1000, 2000, 3000, and 4000 simulated users, and the values represent averages for one hour of steady state workload execution.

**Figure 4. IBM i: Percent processor busy**

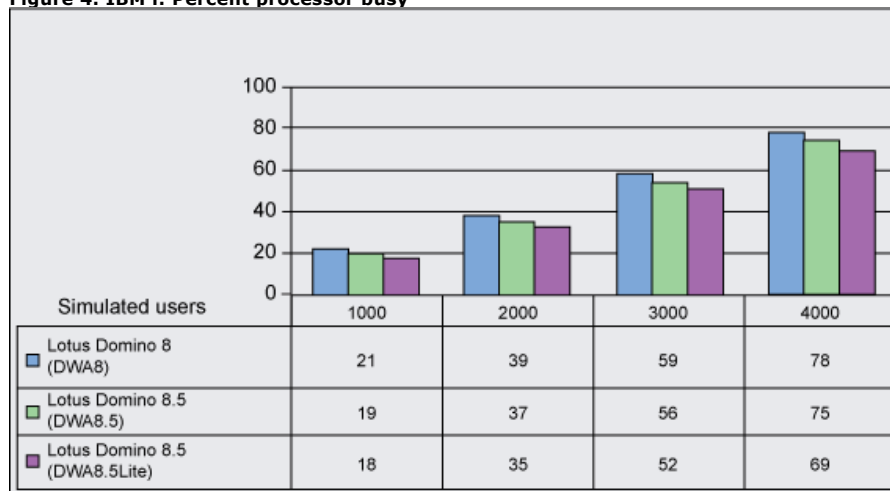


Figure 4 shows the processor utilization of the system at different simulated user loads. As you can see from this data, results for Lotus Domino 8.5 with DWA85 show lower processor utilization at each data point compared to Lotus Domino 8 with DWA8. Results with DWA85Lite show the lowest processor utilizations.

**Figure 5. IBM i: Total disk operation/second**

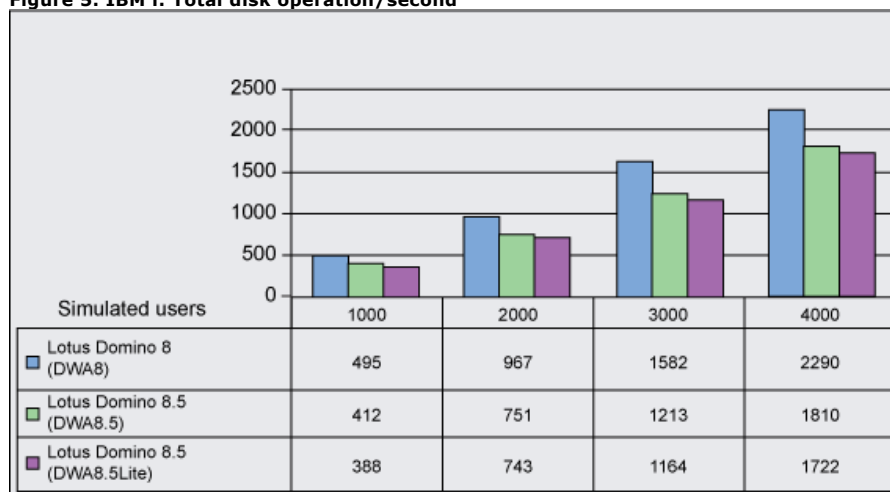


Figure 5 shows the total disk I/O operations per second of the system at different simulated user loads. As you can see from this data, Lotus Domino 8.5 with DWA85 shows reduced disk I/O operations per second at each data point compared to Lotus Domino 8 with DWA8, with improvements ranging from 17 to 23 percent. Results for Lotus Domino 8.5 with DWA85Lite showed the lowest number of disk I/O operations per second.

**Figure 6. IBM i: Total disk megabytes transferred/second**

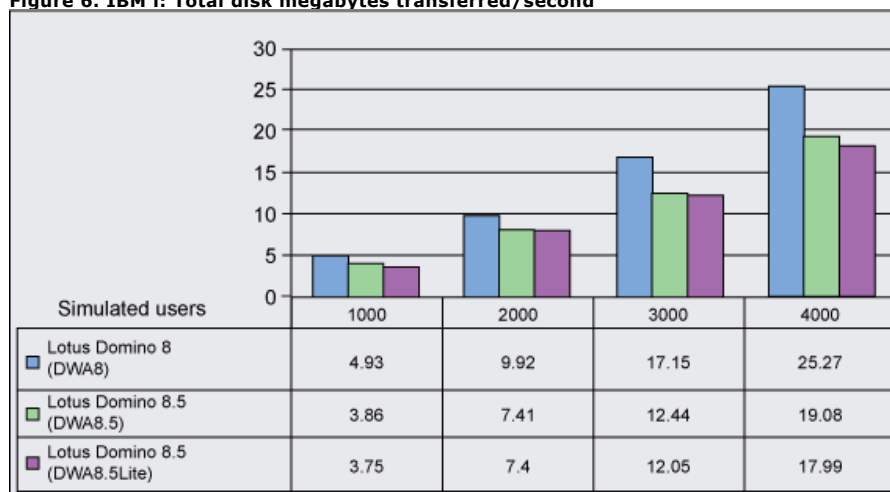


Figure 6 shows the total disk megabytes transferred per second at different simulated user loads. As you can see from this data, Lotus Domino 8.5 with DWA85 shows fewer disk megabytes transferred per second at each data point compared with Lotus Domino 8 with DWA8, with improvements ranging from 22 to 27 percent. Results for Lotus Domino 8.5 with DWA85Lite show the lowest total disk megabytes transferred per second, with reductions ranging up to 6 percent, compared to Lotus Domino 8.5 with DWA85.

**Table 6. IBM i: Resource usage at 4000 users comparing DWA8 to DWA85**

Resource	Lotus Domino 8 DWA8	Lotus Domino 8.5 DWA85	% change
Processor percent busy	78.1	74.5	-5%
Total disk operations/second	2290.4	1809.5	-21%
Total disk reads/second	852.4	586.4	-31%
Total disk writes/second	1438.0	1223.1	-15%
Total disk MB transferred/second	25.27	19.08	-24%
Total disk MB read/second	9.41	6.18	-34%
Total disk MB written/second	15.87	12.90	-19%
Base pool pages/second	748.60	497.2	-34%
Network MB / second	1.26	1.24	-2%

Table 6 shows performance improvements for Lotus Domino 8.5 with DWA85 compared to Lotus Domino 8 with DWA8 at a workload level of 4000 simulated users. The rate of total I/O operations per second improved 21 percent, the rate of total disk megabytes transferred per second improved 24 percent, and the page faulting rate improved by 34 percent.

**Table 7. IBM i: Resource usage at 4000 users comparing DWA85 to DWA85Lite**

Resource	Lotus Domino 8.5 DWA85	Lotus Domino 8.5 DWA85Lite	% change
Processor percent busy	74.5	69.1	-7%
Total disk operations/second	1809.5	1721.7	-5%
Total disk reads/second	586.4	521.3	-11%
Total disk writes/second	1223.1	1200.4	-2%
Total disk MB transferred/second	19.08	17.99	-6%
Total disk MB read/second	6.18	5.45	-12%
Total disk MB written/second	12.90	12.54	-3%
Base pool pages/second	497.2	448.1	-10%
Network MB / second	1.24	1.13	-9%

Table 7 shows reductions in resource usage for Lotus Domino 8.5 with DWA85Lite compared to Lotus Domino 8.5 with DWA85 at a workload level of 4000 simulated users. The processor utilization decreased 7 percent, the rate of total I/O operations per second decreased 5 percent, the rate of total disk megabytes transferred per second decreased 6 percent, the page faulting rate decreased 10 percent, and the total network megabytes received and transmitted decreased 9 percent.

Overall, the measurement results show that, compared to Lotus Domino 8, Lotus Domino 8.5 reduces processor utilization and provides significant improvements for disk I/O operations per second, disk megabytes transferred per second, and page faulting rate. Lotus Domino 8.5 with DWA85Lite shows a reduction in all measured resource requirements compared to Lotus Domino 8.5 with DWA85.

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## Linux results

The server used for our Linux (on Intel® hardware) testing is a single quad core processor with 32 GB RAM. It was configured with DS4000 storage using FastT with three trays of 14 disk drives each. The DS4000 storage was divided into three RAID-0 logical units of 13 drives each to hold the Lotus Domino data and executable files and a separate four logical RAID-0 volumes of three disk drives that contain the Lotus Domino transaction log.

**Table 8. Linux configuration**

Model	Intel 64-bit platform
Processors for test / speed	Intel Xeon® MP configured as one quad core CPU 2.4GHz
Memory	32 GB
Active physical drives	DS4000 using fiber channel storage, three trays of 14 x 75 G disk drives, configured into four logical volumes
Active logical volumes	Three logical volumes for Lotus Domino data, one logical volume for transaction logging
Operating system	SuSE SLES 10 x86-64
Lotus Domino version	Lotus Domino 8.0 with the Mail8.ntf template Lotus Domino 8.5 with the Mail85.ntf template
Notes.ini settings in addition to those commonly used for these tests	NSF_buffer_pool_size_MB=256 DAOS is not enabled

## Lotus Domino configurations

This section covers the iNotes results of testing on an Intel system running 64-bit Linux version SuSE SLES 10 x86/64. It should also be noted that even though the operating system is 64-bit, the Lotus Domino versions used in the test were all 32-bit. There are advantages to running a 32-bit application, such as Lotus Domino, on 64-bit Linux. One of these advantages is memory. On 32-bit Linux, a 32-bit application can get a maximum of 3 GB of memory to use, whereas on 64-bit Linux, a 32-bit application can get up to 4 GB of memory. Lotus Domino is very good at utilizing this additional memory for additional server tasks or applications.

DWA8 workload was used to test Lotus Domino 8 with the Mail8.ntf template. DWA85 and DWA85Lite workloads were used to test Lotus Domino 8.5 with the Mail85.ntf template. The Lotus Domino executable files were installed on one of the RAID-0 logical volumes. Lotus Domino data, mail journal, and mail databases were located on the three RAID-0 logical volumes. The Lotus Domino transaction log was located on a small RAID-0 logical volume. We enabled mail journaling and transaction logging for Lotus Domino 8 and Lotus Domino 8.5. Lotus Domino attachment and object service was not enabled for Lotus Domino 8.5. All the mail databases in Lotus Domino 8.5 server tests had data document compression, design compression, LZ1 attachment compression, and "Disable Automatic Update of views" database properties enabled.

A consistent color scheme is used to present the data in figures 7, 8, and 9:

- The first, blue bar represents results for the Lotus Domino 8 with The Mail8 template with the DWA8 mail workload.
- The second, green bar represents results for the DWA85 mail workload on Lotus Domino 8.5 using the Mail85 template.
- The third, purple bar represents results for the DWA85Lite mail workload on Lotus Domino 8.5 using the Mail85 template.

Each interval shows the average of the one-hour steady state of each increment of 1000 users.

**Figure 7. Linux: Percent processor busy**

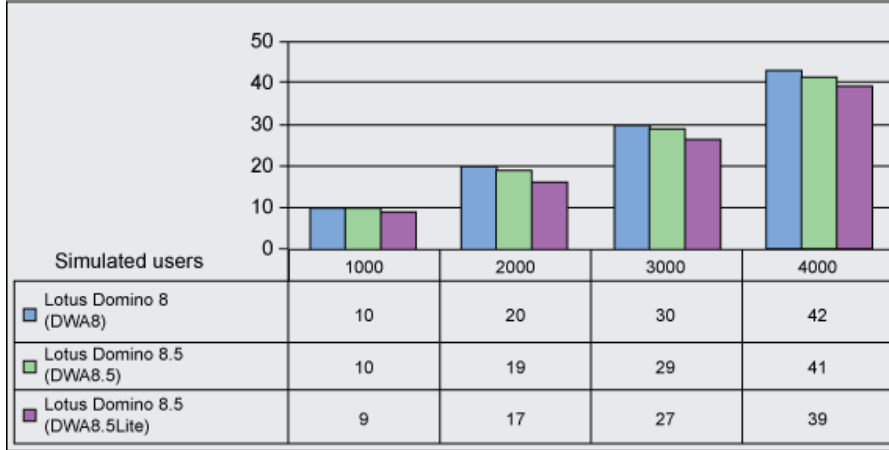


Figure 7 shows the percent processor busy at different simulated user loads. The processor utilization was about the same between Lotus Domino 8 and Lotus Domino 8.5 in full mode. DWA85Lite, however, showed processor improvements, ranging from 5 to 10 percent, compared with DWA85 full mode.

**Figure 8. Linux: Total disk operations/second**

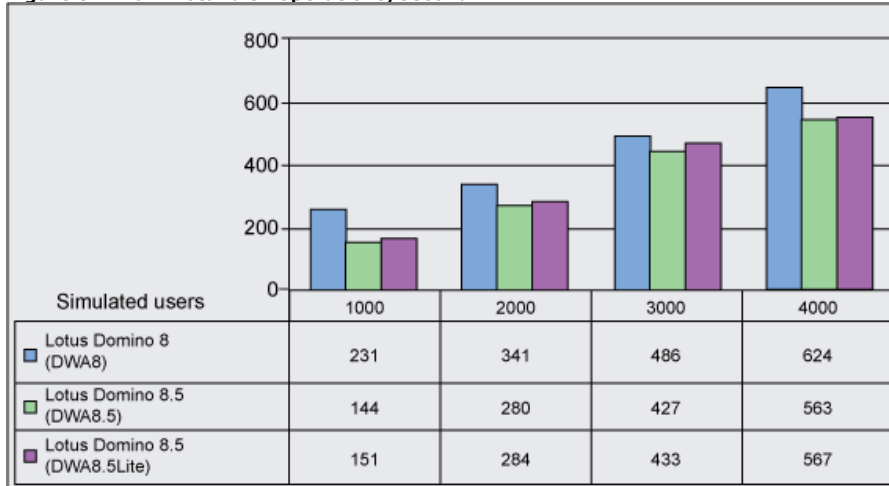


Figure 8 shows the total disk I/O operations per second (also known as IOPS) at different simulated user loads. Lotus Domino 8.5 (for both iNotes full and lite modes) improved the total disk IOPS by 10 to 35 percent when compared with Lotus Domino 8.0. The disk IOPS were the same for Lotus Domino 8.5 workloads in full and lite modes.

**Figure 9. Linux: Total disk megabytes transferred/second**

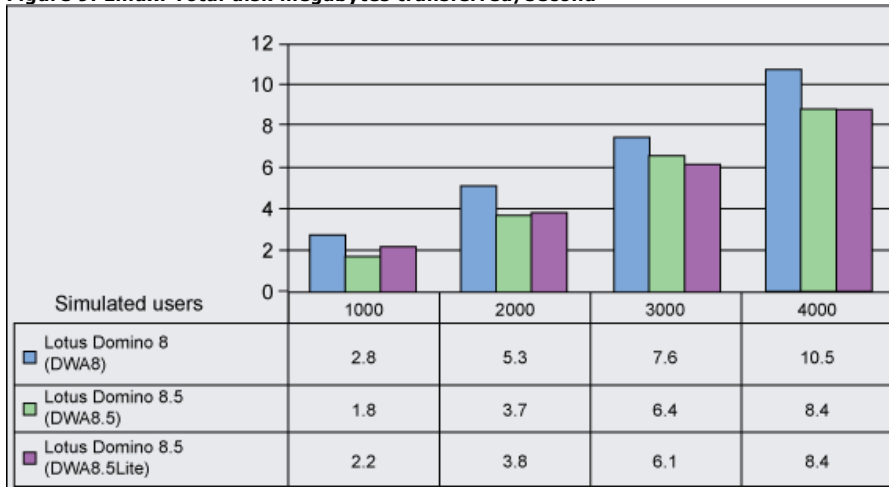


Figure 9 shows the total disk megabytes transferred per second at different simulated user loads. Lotus Domino 8.5 (for both iNotes full and lite modes) improved disk megabytes transferred per second by 53 to 67 percent when compared to Lotus Domino 8.0. The disk megabytes transferred per second were the same for the Lotus Domino 8.5 workloads in full and lite modes.

**Table 9. Linux: Resource usage at 4000 users comparing DWA8 to DWA85**

Resource	Lotus Domino 8 DWA8	Lotus Domino 8.5 DWA85	% change
Processor percent busy	42	41	-2%
Total disk operations/second	624	563	-10%
Total disk reads/second	40	51	28%
Total disk writes/second	584	513	-12%
Total disk MB transferred/second	10.5	8.4	-20%
Total disk MB read/second	0.7	0.6	-14%
Total disk MB written/second	9.8	7.8	-20%
Shared memory used in MB	944	1000	6%
HTTP process memory used in MB	76	83	9%

Table 9 compares the key server resource metrics of iNotes on Lotus Domino 8.0 and iNotes full mode on Lotus Domino 8.5 at 4000 simulated users. The processor usage is at par comparing iNotes on Lotus Domino 8 and Lotus Domino 8.5 full mode. Total disk IOPS show a 10 percent improvement, and total disk bytes transferred per second show a 20 percent improvement. Also, the 64-bit Linux kernel can take advantage of the large 32 GB physical memory for the file system cache, which helps to reduce the disk read I/O operations per second. Lotus Domino 8.5 iNotes full mode shows an increase of 6 percent for the Lotus Domino allocated shared memory. There is a very small improvement of 3 percent for network bytes transferred per second with Lotus Domino 8.5 iNotes full mode, as compared to iNotes on Lotus Domino 8.0.

**Table 10. Linux: Resource usage at 4000 users comparing DWA85 to DWA85Lite**

Resource	Lotus Domino 8.5 DWA85	Lotus Domino 8.5 DWA85Lite	% change
Processor percent busy	41	39	-5%
Total disk operations/second	563	567	1%
Total disk reads/second	51	60	18%
Total disk writes/second	513	507	-1%
Total disk MB transferred/second	8.4	8.4	0%
Total disk MB read/second	0.6	0.8	33%
Total disk MB written/second	7.8	7.6	-3%
Shared memory used in MB	1000	998	0%
HTTP process memory used in MB	83	83	0%
Network MB / second	1.18	1.12	-5%

Table 10 compares the key server resource metrics between iNotes full mode and lite mode on Lotus Domino 8.5 at 4000 simulated users. The processor usage is roughly 5 percent better with Lotus Domino 8.5 lite mode than with Lotus Domino 8.5 full mode. There is also a 5 percent improvement for network bytes transferred per second with Lotus Domino 8.5 lite mode, as compared to the Lotus Domino 8.5 full mode. The rest of the server resource metrics, such as disk I/O and memory, are almost the same for both the full and lite modes on Lotus Domino 8.5.

For the iNotes full mode, Lotus Domino 8.5 shows no processor degradation compared with Lotus Domino 8 for iNotes users. Lotus Domino 8.5 reduces I/O significantly in both total disk operations per seconds and total disk bytes transferred per second, as compared to Lotus Domino 8.0 for iNotes users. The iNotes lite mode on Lotus Domino 8.5 also shows minor improvements over the full mode for both processor and network bandwidth consumed.

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**Solaris results**

The server used for our Solaris testing is a eight-processor domain with six RAID-0 logical units of nine drives each to hold the Lotus Domino data and executable files. In addition, a seventh six-disk RAID-0 logical unit contains the transaction log. Table 11 summarizes the details of the Solaris configuration.

**Table 11. Solaris configuration**

Model	Sun 6800
Processors for test / speed	8 / 1050 MHz
Memory	32 GB
Active physical drives	60
Active logical volumes	7 - T3 logical volumes configured as RAID 0
Operating system	Solaris 10
Lotus Domino version	Lotus Domino 8.0 with the Mail8.ntf template Lotus Domino 8.5 with the Mail85.ntf template
Notes.ini settings in addition to those commonly used for these tests	DAOS is not enabled

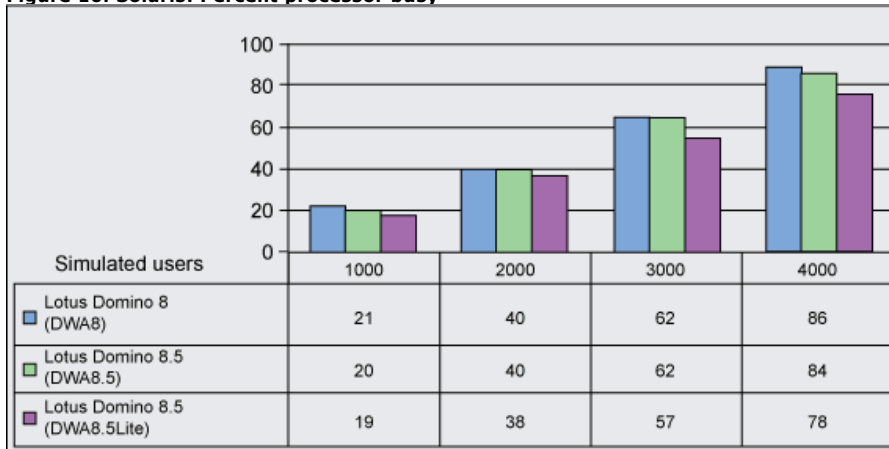
**Lotus Domino configurations**

The Solaris system was configured with the Lotus Domino settings outlined at the beginning of this article, and the NSF buffer pool was allowed to default to 512 MB for both measurements. This system had an abundance of memory that Solaris put to good use for file caching. Also, the file systems used the normal Sun 8K block size, which resulted in somewhat different disk I/O rates than those we saw for other systems that use a 4k block size. We see excellent improvements in disk usage with Lotus Domino 8.5 with no processor penalty on this system.

A consistent color scheme is used to present the data in figures 10,11, and 12:

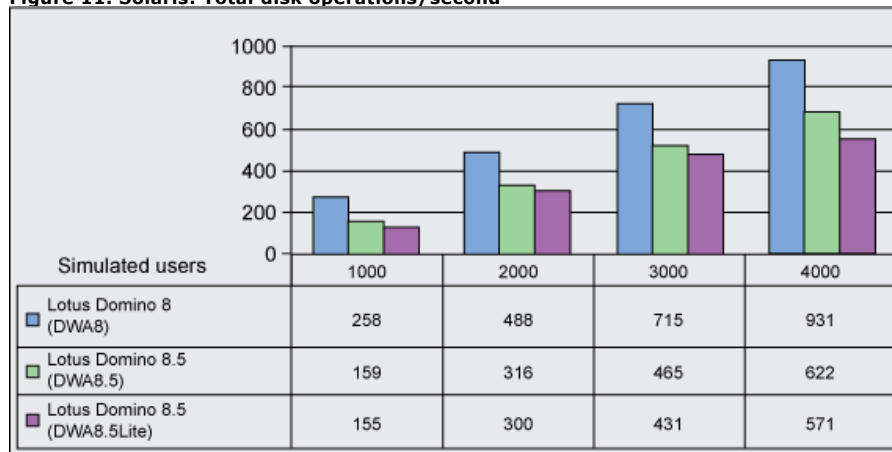
- The first, blue bar represents results for the Lotus Domino 8 with The Mail8 template with the DWA8 mail workload.
- The second, green bar represents results for the DWA85 mail workload on Lotus Domino 8.5 using the Mail85 template.
- The third, purple bar represents results for the DWA85Lite mail workload on Lotus Domino 8.5 using the Mail85 template.

**Figure 10. Solaris: Percent processor busy**



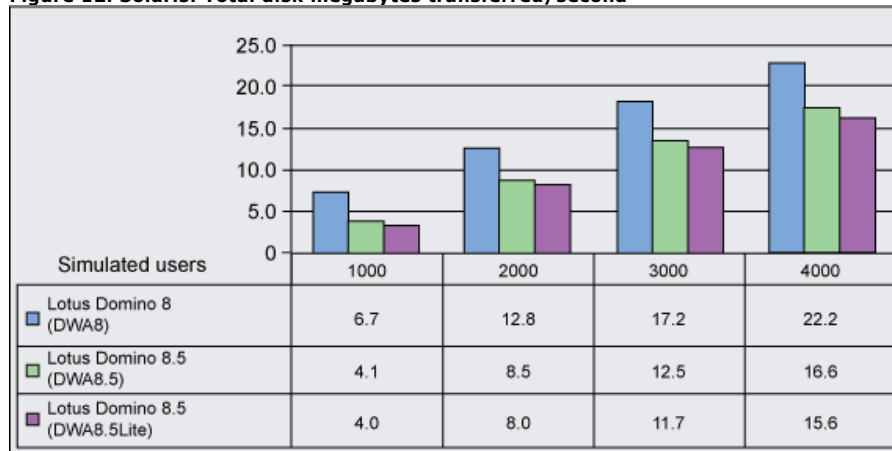
With Lotus Domino 8.5, processor usage is equal to Lotus Domino 8.0 for the full mode workload. With the DWA85Lite workload there is a reduction in CPU usage in the 5 to 10 percent (relative) range. See figure 10.

**Figure 11. Solaris: Total disk operations/second**



The Lotus Domino 8.5 measurements enjoy a substantial reduction in disk I/O operations. The full mode workload shows savings between 33 and 38 percent. The lite mode workload shows further reductions in the 3 to 8 percent range when compared to the full workload on Lotus Domino 8.5. See figure 11.

**Figure 12. Solaris: Total disk megabytes transferred/second**



The amount of data read and written to disk also shows a substantial reduction with Lotus Domino 8.5. With the full mode workload, there is a reduction of between 25 and 38 percent when using Lotus Domino 8.5. For the lite mode workload, there is a further 2 to 6 percent reduction compared to the full workload on Lotus Domino 8.5. See figure 12.

**Table 12. Solaris: Resource usage at 4000 users comparing DWA8 to DWA85**

Resource	Lotus Domino 8 DWA8	Lotus Domino 8.5 DWA85	% change
Processor percent busy	86	84	-2%
Total disk operations/second	931	622	-33%
Total disk reads/second	51	27	-47%
Total disk writes/second	880	595	-32%
Total disk MB transferred/second	22.2	16.6	-25%
Total disk MB read/second	4.4	1.6	-64%
Total disk MB written/second	17.8	15.0	-16%
Shared memory used in MB	946	977	3%
Process memory used in MB	200	281	41%
Network MB/second	1.14	1.12	-2%

On this Solaris server, tremendous I/O benefits are seen when moving to Lotus Domino 8.5 as shown in table 12. Disk operations are reduced 30 percent with no increase in processor expense when compared to Lotus Domino 8.0. With Lotus Domino 8.5, we can store both the design and message content in a compressed format on disk. This approach has the added benefit of enhancing the operating system file cache, in effect doubling its efficiency because it now contains mostly compressed data. This system, which has an exceptionally large 32 GB of memory, shows that efficiency particularly well. The number of reads that need to go to the physical disks is reduced by 47 percent, while the number of bytes needed to be read from disk is down 64 percent compared to Lotus Domino 8.0.

**Table 13. Solaris: Resource usage at 4000 users comparing DWA85 to DWA85Lite**

Resource	Lotus Domino 8.5 DWA85	Lotus Domino 8.5 DWA85Lite	% change
Processor percent busy	84	78	-7%
Total disk operations/second	622	597	-4%
Total disk reads/second	27	26	-4%
Total disk writes/second	595	571	-4%
Total disk MB transferred/second	16.6	15.6	-6%
Total disk MB read/second	1.6	1.4	-13%
Total disk MB written/second	15.0	14.2	-5%
Shared memory used in MB	977	975	0%
Process memory used in MB	281	279	-1%
Network MB/second	1.12	1.02	-9%



Windows 2003 Enterprise x64 results

We used an Intel system with eight active processors that ran Microsoft Windows 2003 Enterprise x64 Edition. The system was configured with 6 GB memory, 42 disk drives with RAID 0, and a local disk drive. The network used a single 1.0 Gbps Ethernet adapter. Table 14 summarizes the Windows 2003 configuration.

**Table 14. Windows 2003 configuration**

Model	Intel 64-bit platform
Processors for test / speed	Eight processors at 3.33 GHz
Memory	6 GB installed
Active physical drives	43 disks
Active logical volumes	Six RAID-0 logical volumes
Operating system	Windows 2003 Enterprise x64 Edition, SP2
Lotus Domino version	Lotus Domino 8.0 32-bit with the Mail8.ntf template Lotus Domino 8.5 64-bit with the Mail85.ntf template
Notes.ini settings in addition to those commonly used for these tests	NSF_BUFFER_POOL_SIZE_MB=512 DAOS is enabled

**Lotus Domino configurations**

DWA8 workload was used to test the 32-bit version of Lotus Domino 8 with the Mail8.ntf template. DWA85 and DWA85Lite workloads were used to test the 64-bit version of Lotus Domino 8.5 with the Mail85.ntf template. The Lotus Domino executable files were installed on a local disk with 68 GB. Lotus Domino data, transaction log, mail journal, DAOS, and mail databases were installed on IBM System Storage DS4000 with six RAID-0 logical volumes. We enabled mail journaling and transaction logging for Lotus Domino 8 and Lotus Domino 8.5. DAOS was enabled for Lotus Domino 85 only on all mail databases, mail boxes, and mail journal.

A consistent color scheme is used to present the data in figures 13, 14, and 15:

- The first, blue bar represents results for the Lotus Domino 8 with the Mail8 template with the DWA8 mail workload.
- The second, green bar represents results for the DWA85 mail workload on Lotus Domino 8.5 using the Mail85 template.
- The third, purple bar represents results for the DWA85Lite mail workload on Lotus Domino 8.5 using the Mail85 template.

Each interval shows the average of the one-hour steady state of each increment of 1000 users.

**Figure 13. Windows 2003 x64: Percent processor busy**

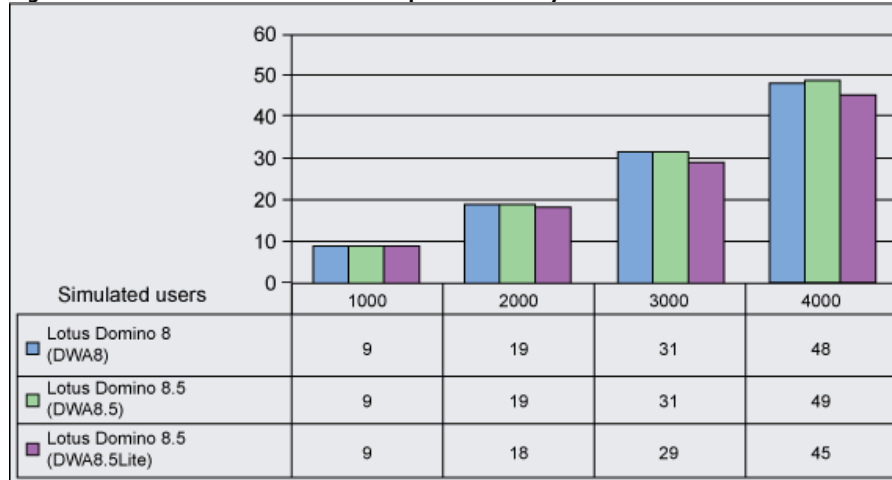


Figure 13 shows the percent processor busy rate at different simulated user loads. The processor utilization rates are about the same for both Lotus Domino 8 and Lotus Domino 8.5 in full mode. The DWA85Lite mode shows that processor rates improved by as much as 8 percent compared with the rate for DWA85 full mode.

**Figure 14. Windows 2003 x64: Total disk operations/second**



Figure 14 shows the total disk I/O operations per second at different simulated user loads. Lotus Domino 8.5 reduces total disk operations per seconds by 22 to 40 percent when compared with Lotus Domino 8. The disk operations per second are the same for the DWA85 and DWA85Lite workloads.

**Figure 15. Windows 2003 x64: Total disk megabytes transferred/second**

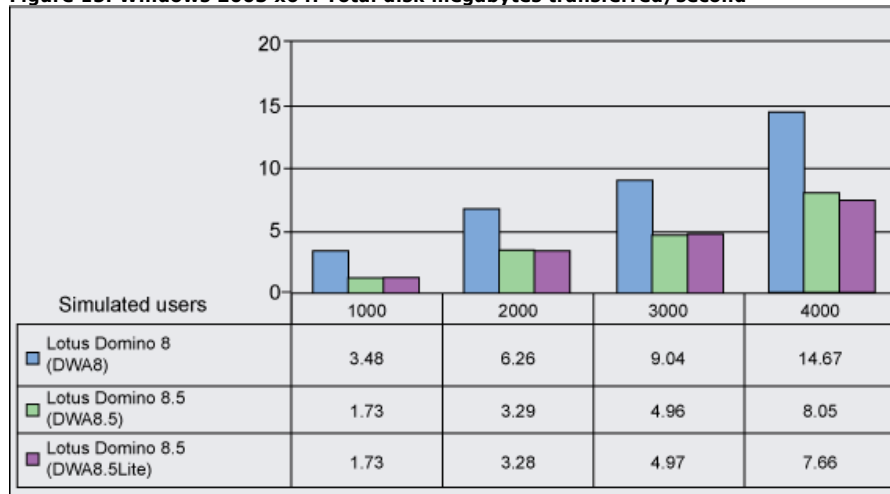


Figure 15 shows the total disk megabytes transferred per second at different simulated user loads. Lotus Domino 8.5 improves disk bytes transferred per second by 45 to 50 percent. The disk bytes transferred per second are the same for the DWA85 and DWA85Lite workloads.

Table 15 summarizes the details of the resource usage at 4000 users for the 64-bit version of Microsoft Windows.

**Table 15. Windows 2003 x64: Resource usage at 4000 users comparing DWA8 to DWA85**

Resource	Lotus Domino 8 DWA8	Lotus Domino 8.5 DWA85	% change
Processor percent busy	47.55	48.65	2%
Total disk operations/second	1071.52	832.04	-22%
Total disk reads/second	474.77	263.03	-45%
Total disk writes/second	596.75	569	-5%
Total disk MB transferred/second	14.67	8.05	-45%
Total disk MB read/second	5.26	1.6	-70%
Total disk MB written/second	9.42	6.45	-32%
Shared memory used in MB	1075.04	1196.07	11%
Process memory used in MB	N/A	N/A	N/A
Network MB/second	1.31	1.24	-5%

Comparing iNotes full mode at 4000 users, the processor utilization is on par between Lotus Domino 8 and Lotus Domino 8.5. The total disk operations per second for Lotus Domino 8.5 iNotes full mode show 22 percent improvement, and total disk bytes transferred per second show 45 percent improvement over Lotus Domino 8. Lotus Domino 8.5 shows that total share memory increased 11 percent because of the 64-bit Lotus Domino 8.5.

**Table 16. Windows 2003 x64: Resource usage at 4000 users comparing DWA85 to DWA85Lite**

Resource	Lotus Domino 8.5 DWA85	Lotus Domino 8.5 DWA85Lite	% change
Processor percent busy	48.65	44.75	-8%
Total disk operations/second	832.04	803.12	-3%
Total disk reads/second	263.03	246.81	-6%
Total disk writes/second	569.0	556.32	-2%
Total disk MB transferred/second	8.05	7.66	-5%
Total disk MB read/second	1.6	1.51	-6%
Total disk MB written/second	6.45	6.15	-5%
Shared memory used in MB	1196.07	1193.0	0%
Process memory used in MB	N/A	N/A	N/A
Network MB/second	1.24	1.09	-12%

Table 16 details the comparison of Lotus Domino 8.5 full mode (DWA85) and lite mode (DWA85Lite) at 4000 users. The DWA85Lite workload shows reductions of 8 percent for processor utilization, 3 percent for total disk operations per second, 5 percent for total disk bytes transferred per seconds, and 12 percent for network bytes per second.

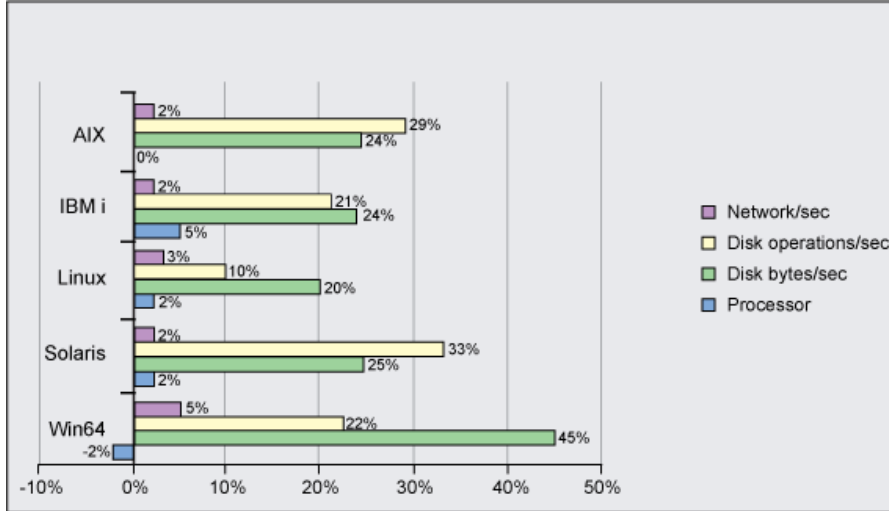
For the full mode, Lotus Domino 8.5 shows no processor degradation compared with Lotus Domino 8. Lotus Domino 8.5 full mode reduces significant I/O in both total disk operations per seconds and total disk bytes transferred per second. The lite mode improves processor performance over the full mode. I/O rates are about the same. In addition, the lite mode improves the network traffic.

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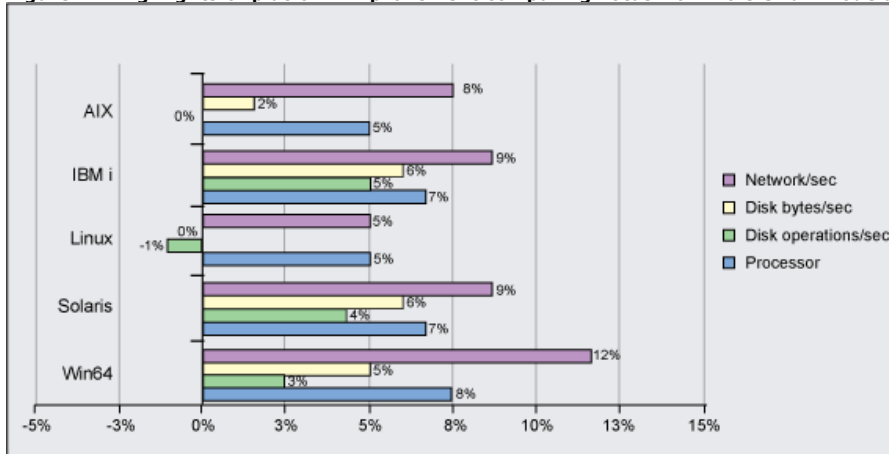
## Conclusion

All these platforms showed encouraging performance results for Lotus Domino 8.5 over Lotus Domino 8 iNotes in full mode. See the summary of performance improvements in figures 16 and 17. The measurements show that Lotus Domino 8.5 iNotes lite mode performance improved or was the same when compared with the performance of Lotus Domino 8.5 iNotes full mode. Every new release contains new features, quality improvements, and bug fixes. One of the goals for this release is to focus on maintaining no degradation in processor utilization and network bandwidth utilization. However, I/O improved by more than 20 percent for Lotus Domino 8.5, which translates into a reduced total cost of ownership for customers.

**Figure 16. Highlights of platform improvement comparing Lotus Domino 8 and Lotus Domino 8.5 at 4000 iNotes users**



**Figure 17. Highlights of platform improvement comparing Lotus Domino 8.5 full mode and Lotus Domino 8.5 lite mode**



All platforms showed improvements of 5 percent or more for processor, I/O, and network performance.

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#### Appendix: Explanation of Notes.ini settings

##### Explanation of Notes.ini settings

Notes.ini parameter name	Explanation
Create_R8_Databases	Applies to Lotus Domino 8 servers. Set it to 1 to create new ODS 48 databases on Lotus Domino 8 servers.
Create_R85_Databases	Applies to Lotus Domino 8.5 servers. Set it to 1 to create new ODS 53 databases on Lotus Domino 8.5 servers.
Create_R85_Log	Applies to Lotus Domino 8.5 servers. Set it to to create the Lotus Domino transaction log in Lotus Domino 8.5 format.
Debug_NSF_Compress_All_Notes	Set it to 1 to enable document compression for all databases on the Lotus Domino server.
NSF_COMPRESS_TXN_LOGS	Set it to 1 to enable compression of log records (used by Linux on zSeries®).
DEBUG_ENABLE_SYS_V_SHM	Set it to 1 to let Lotus Domino use System V for shared memory instead of mmap files on UNIX® platforms.
DEBUG_NSF_SHOW_ALLSTATS	New in Lotus Domino 8. Set it to 1 to enable Lotus Domino I/O statistic collection for database metadata, views, and objects.
EVENT_CORRELATION_POOL_SIZE	Specifies the size of the event correlation pool used by event task and DDM.
Enable_LZ1_Encrypted_Notes	Set it to 1 to enable LZ1 compression of encrypted documents in Mail journal database.
EVENT_POOL_SIZE	Set this variable to specify the amount of memory used for unprocessed events, unprocessed notifications, and event suppression. The default setting is 5242880 (5 MB).
Log_MailRouting	Specifies the level of logging of router events performed by the router process.
MEM_AddressableMemSizeMB	Set to override default setting for the amount of memory that Lotus Domino sees as addressable memory (where VALUE is in megabytes, and the default varies by platform).
MEM_EnablePreAlloc	Set it to 1 to enable pre-allocation of shared memory.
NLCACHE_SIZE	Specifies the size of Namelookup Cache in bytes. The default value is 16 MB.
NSF_Buffer_Pool_Size_MB	Specifies the maximum size (in bytes) of the NSF buffer pool, a section of memory dedicated to buffering I/O transfers between Lotus Domino and disk storage.
NSF_Dbcache_Maxentries	Specifies the number of databases that a server can hold in its database cache at one time.
RouterDbCacheSize	Specifies the size of router database cache used to cache mail databases in the router process.
SCHEDULE_NO_VALIDATE	Enables or disables whether SchedMgr validates its busy time database entry on a daily basis, as follows: 0 (default) - Enables validation 1 - Disables validation
Server_MAX_CONCURRENT_TRANS	Sets the limit for the number of concurrently scheduled transactions on a server.
erver_Pool_Tasks	Total number of physical threads in the Lotus Domino server (DbServer) threads pool.
Server_Show_Performance	Applies to servers. Specifies whether server performance events are displayed on the console. Set this variable to 1 to display server performance events on console.
Server Tasks	Specifies the tasks that begin automatically at server startup and continue until the server is shut down.
MIMECompressAttachments	Enables LZ1 compression of attachments in MIME messages when set it to 1.

HTML5CompressAttachments	Enables HTML compression of attachments in HTML messages when set to 1.
iNotes_WA_ProfileCacheSize	Server: Determines the number of database profile note entries that the HTTP server can cache at one time.

#### Resources

- [Participate in the discussion forum.](#)
- Contribute to the [IBM Lotus Domino wiki.](#)
- Refer to the developerWorks [IBM Lotus Notes and Domino product page.](#)

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