Microsoft Dynamics NAV 2009

Performance Guide

April 2009

Microsoft Dynamics

DISCLAIMER 3

INTRODUCTION 3

PERFORMANCE MEASUREMENT 3

TESTS 3

CONFIGURATIONS 4

HYPER-V VIRTUALIZATION 4

DATABASE 4

SUMMARY 5

HARDWARE CONFIGURATIONS 6

MULTIUSER TESTS FOR APPLICATION SCENARIOS 6

SETUP 1: THREE TIERS WITH NO SHARED HARDWARE 7

SETUP 2: THREE TIERS WITH SHARED HARDWARE 7

SETUP 3: CLIENT AND COMPONENT SINGLE USER TESTS 8

HYPER-V VIRTUALIZATION 9

SUMMARY 10

MEASURED RESULTS 11

COMPONENT TESTS 13

APPLICATION TESTS 13

HYPER-V 16

NETWORK LATENCY AND BANDWIDTH REQUIREMENTS 21

TEST AND METHODOLOGY DESCRIPTION 21

RESULTS 21

EXPLANATION OF GRAPHS 21

APPENDIX A: APPLICATION SCENARIOS 26

APPENDIX B: CLIENT SCENARIOS 28

APPENDIX C: COMPONENT SCENARIOS 30

APPENDIX D: TEST DATABASE 31

APPENDIX E: PERFORMANCE COUNTERS (SCALABILITY TESTS) 37

APPENDIX F: PERFORMANCE COUNTERS (CLIENT TESTS) 39

DISCLAIMER

The performance tests and ratings that are specified in this white paper were measured using specific computer systems and components and reflect the performance of Microsoft® software as measured by those tests. These benchmark results were performed in a controlled lab environment running Microsoft Dynamics® NAV 2009 software, without any other applications running during the execution of the benchmark testing. The benchmark was executed on optimized hardware using Microsoft Dynamics NAV 2009 without reporting activity during execution. The results in this benchmark apply only for the listed hardware, generally available versions of Microsoft Dynamics NAV 2009, transaction mix, data composition, and indexes. Differences in system hardware or software design or configuration will cause the performance results to vary depending on the degree, invasiveness, and quality of change.

INTRODUCTION

This document discusses how performance is tested in Microsoft Dynamics NAV and gives guidance to the hardware that is used, how it is configured, and what different configurations are used in the performance lab. It also discusses the performance that was observed on all the tested configurations.

This paper does not include any high-availability scenarios. The possibilities with the current version of Microsoft Dynamics NAV Server are limited to having several computers running Microsoft Dynamics NAV Server and prepopulating the URLHistory string on clients to contain all possible servers to which clients can connect. This does not allow the client to automatically reconnect upon failure but does assist the end user in finding additional computers running Microsoft Dynamics NAV Server to which she can connect. Microsoft Dynamics NAV Server does not limit the high-availability features in Microsoft SQL Server® that can be used to provide high availability for the data tier. For more information, see http://technet.microsoft.com/en-us/magazine/2007.03.highavailability.aspx.

PERFORMANCE MEASUREMENT

In Microsoft Dynamics NAV, performance is determined by measuring responsiveness with different tests, configurations, and Hyper-V virtualization options. The same database is used for all tests.

TESTS

The following tests are used to measure performance:

- Application

  An application test uses the Microsoft Dynamics NAV Application Benchmark Toolkit to measure performance of common application operations in a multiuser environment. There are 26 different test scenarios that are executed randomly from a configurable number of concurrent users. These scenarios run for four hours and measure the performance for three hours. They start 30 minutes into the execution and end 30 minutes before the end of the execution. For details, see Appendix A. These tests were carried out in different environments. For details, see Multiuser Tests for Application Scenarios.

- Client UI

  A client user interface (UI) test measures the performance of the client when it is isolated from the application. There are 26 different test scenarios for the UI of the RoleTailored client. These tests are run in single-user and multiuser environments to enable the performance of the UI and the target test client with a given number of users to exercise the server code. To simulate client performance running on a server under load, these tests were also performed while the application tests were running. Each test is executed once for cold scenarios and five times for warm scenarios, where average measurements between runs two through five provide the number for the given scenario. For details, see Appendix B.

- Component

  A component test tests a specific system component, such as Web services and reporting. These tests are also single-user tests, which means that the scenarios are run by one client at a time. For details, see Appendix C.

The following section describes the different hardware configurations that are tested. For all configurations, performance is defined as acceptable for the combination of hardware and the number of users connected to the system. The client tests all abide to general goals for responsiveness of UI that were defined by the Microsoft Dynamics NAV user experience team.

CONFIGURATIONS

CLIENT UI

Tests were performed in the following configurations to show server response under a heavy load:

- One RoleTailored client that was connected to the computer running Microsoft Dynamics NAV Server.
- Forty concurrent users that were running the 26 application scenarios on the computer running Microsoft Dynamics NAV Server. This test shows the responsiveness of the RoleTailored client when the server is running under a heavy load.

In both configurations, the server is connected to a 50-GB database.

COMPONENT

Reporting tests were performed as a single user from within the UI of the RoleTailored client. Web services tests are performed with a .NET component that connects to a page-based Web service and performs a single operation.

APPLICATION

Tests were performed in the following configurations:

- One computer running Microsoft Dynamics NAV Server and SQL Server. The server was connected to a 50-GB database, and 40 concurrent users were running the 26 application scenarios.
- Two computers that were each running Microsoft Dynamics NAV Server and one computer with a database server. The servers were connected to a 50-GB database, and 25 and 50 concurrent users on each server were running the 26 application scenarios.

For details, see Appendix A.

HYPER-V VIRTUALIZATION

- The Hyper-V tests were performed with the Application Benchmark Toolkit as described in the application test section. The difference is that for Hyper-V tests, these same tests were performed multiple times with different hardware configurations. For details, see Hyper-V Virtualization.

DATABASE

The database that is used for all tests is a large version of the demonstration database that you can install from the product media with the W1 version of Microsoft Dynamics NAV. The database that is used in its initial state is identical across all tests. The database was created using the Application Benchmark Toolkit, which ran for several days to generate entries. For more information about the tables and sizes, see Appendix D.

SUMMARY

These tests enable the Microsoft Dynamics NAV team to track performance of the product across multiple daily builds on a set of tests that exercise the platform. The tests do not cover specific scenarios, such as production planning, manufacturing, or other verticals. The test platform does allow for testing these scenarios.

HARDWARE CONFIGURATIONS

MULTIUSER TESTS FOR APPLICATION SCENARIOS

For application scenarios, two different hardware setup configurations were tested.

The first setup was a three-tier setup where each tier resided on its own computer. Two identical middle tiers ran with an equal amount of users connecting to the same database tier. In this configuration, each middle tier had 50 concurrent users.

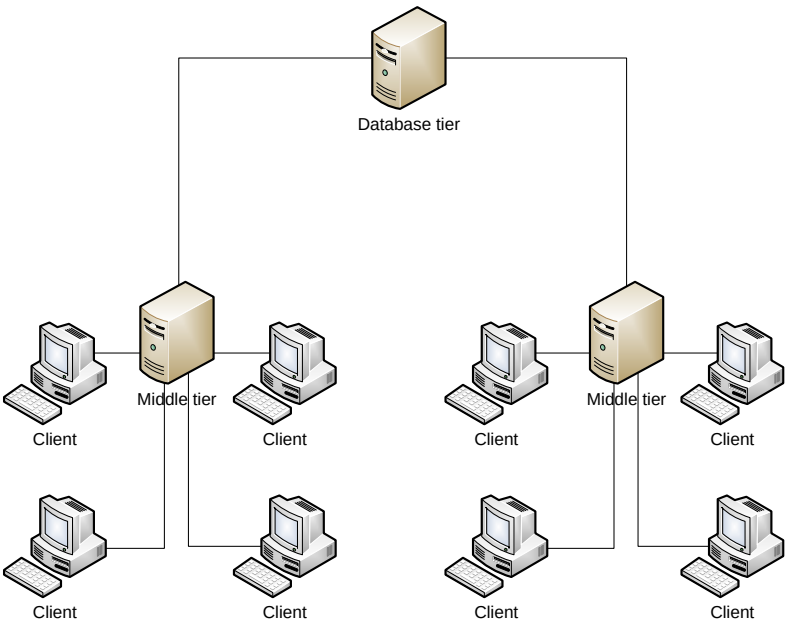

Figure 1 Multiuser tests with three-tier setup on separate computers

The second setup was a three-tier setup, where the middle tier and database tier resided on a single computer. In this setup, the server had 50 concurrent users.

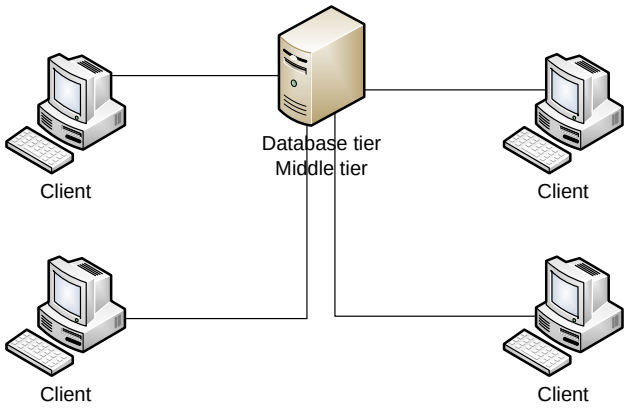

Figure 2 Multiuser tests with three-tier setup and middle tier and database tier on the same computer

The following section describes the hardware for the setup configurations.

SETUP 1: THREE TIERS WITH NO SHARED HARDWARE

Database Server

- HP Proliant DL380 G5

Hardware

- Intel® Xeon® E5335 Quad Core Processor 2 GHz
- 8 MB (2 x 4 MB) Level 2 cache
- 8 GB RAM
- HP Smart Array P400/256 MB Controller (RAID 0/1/1+0/5)
  - System drive – Raid 1+0
  - Temp Drive - Raid 0
- External Rack Storage P800
  - DB log drive – Raid 1+0
  - DB data drive - Raid 1+0

Software

- Installed with Microsoft Windows 2003 Server Enterprise x86 SP2 R2 and various server tools
- Microsoft SQL Server 2005 SP2 installed on system drive
- Fully patched with security updates
- WinZip 8.1

Middle-Tier Servers

- FujitsuSiemens Esprimo E5915

Hardware

- Intel Core 2 Duo E6300 1.83 GHz, 1066 MHz FSB
- 4 GB DDR2-533 RAM, 2 MB L2 Cache
- 2 x 160 GB SATAII 7200 rpm hard-disk drive
- NVIDIA GeForce 7200LE, 256 MB

Software

- Installed with Microsoft Windows 2003 Server Enterprise x86 SP2 R2
- Visual Studio 2005 SP1
- Microsoft SQL Server 2005 SP2 installed on system drive
- Fully patched with security updates

SETUP 2: THREE TIERS WITH SHARED HARDWARE

Database Tier and Middle Tier

- HP Proliant DL380 G5

Hardware

- Intel® Xeon® E5335 Quad Core Processor 2 GHz
- 8 MB (2 x 4 MB) Level 2 cache
- 8 GB RAM
- HP Smart Array P400/256 MB Controller (RAID 0/1/1+0/5)
  - System drive – RAID 1+0
  - Temp Drive - RAID 0
- External Rack Storage P800
  - DB log drive – RAID 1+0
  - DB data drive – RAID 1+0

Software

- Installed with Microsoft Windows 2003 Server Enterprise x86 SP2 R2 and various server tools
- Microsoft SQL Server 2005 SP2 installed on system drive
- Fully patched with security updates
- WinZip 8.1

Disk Layout

- 2 x 146 GB Raid 1 for OS = 146 GB.
- 4 x 146 GB Raid 10 for = 292 GB for DB Data and DB log. The OS is on a different channel, and data and log share the same channel.

SETUP 3: CLIENT AND COMPONENT SINGLE USER TESTS

Client Machine

- FujitsuSiemens Esprimo E5915

Hardware

- Intel Core 2 Duo E6300 1.83 GHz, 1066 MHz FSB
- 2 GB DDR2-533 RAM, 2 MB L2 Cache
- 2 x 160GB SATAII 7200 rpm hard-disk drive
- NVIDIA GeForce 7200LE, 256 MB

Software

- Installed with Microsoft Windows 2003 Server Enterprise x86 SP2 R2
- Visual Studio 2005 SP1
- Microsoft SQL Server 2005 SP2 installed on system drive
- Fully patched with security updates

Server Machine

- FujitsuSiemens Esprimo E5915

Hardware

- Intel Core 2 Duo E6300 1.83 GHz, 1066 MHz FSB
- 2 GB DDR2-533 RAM, 2 MB L2 Cache
- 2 x 160 GB SATAII 7200 RPM HDD
- NVIDIA GeForce 7200LE, 256 MB

Software

- Installed with Microsoft Windows 2003 Server Enterprise x86 SP2 R2
- Visual Studio 2005 SP1
- Microsoft SQL Server 2005 SP2 installed on system drive
- Fully patched with security updates

HYPER-V VIRTUALIZATION

To test Hyper-V, a computer with a dual Quad Core Xeon 2 GHz (Intel Xeon E5335) processor with 8 GB of memory was used. This computer was configured in the following ways to test similar hardware with and without Hyper-V:

- The server operating system was the 64-bit edition of Windows Server 2008, and the guest operating system was the 32-bit edition of Windows Server 2003.
- The database was hosted on hardware that was separate from this computer.
- The tests were split to test both one service tier with and without Hyper-V and two service tiers with and without Hyper-V.
- The 26 application scenarios were used for all tests.

For one service tier, the following configurations were used:

- **Configuration A**: No Hyper-V and Windows Server 2003 on four cores with 3.2 GB of RAM. One CPU was physically removed so that there were four cores in the computer. This configuration was considered the base setup and can be used as a base to compare similar setups without Hyper-V.
- **Configuration B**: Hyper-V with Windows Server 2008 as the host operating system and Windows Server 2003 as the guest operating system on two cores with 3 GB of RAM. All eight cores were available to the host operating system.
- **Configuration C**: Hyper-V with Windows Server 2008 as the host operating system and Windows Server 2003 as the guest operating system on four cores with 3 GB of RAM. All eight cores were available to the host operating system.

For two service tiers, the following configurations were used:

- **Configuration D**: No Hyper-V and Windows Server 2003 on eight cores with 8 GB of RAM. Two service tiers were configured with different instance names on the same TCP port. Clients were manually distributed evenly between the two service tiers.
- **Configuration E**: Hyper-V with Windows Server 2008 as the host operating system and Windows Server 2003 as the guest operating system on two cores with 3 GB of RAM. Two guest sessions were set up with a service tier configured for each session. Clients were manually distributed evenly between the two service tiers.

SUMMARY

The setup configurations were designed to be as mainstream as possible to reflect typical customer configurations. Performance has not been tested on state-of-the-art hardware platforms with many resources but instead was tested on mainstream, real-world setup configurations. Hyper-V is intended for larger, more complicated hardware setup configurations.

MEASURED RESULTS

The following sections describe the system performance for each test.

CLIENT UI TESTS

The following table describes the scenarios and results from the tests that are run in the client UI. In these tests, the client benefits from the server having a warm cache, which results in some scenarios being faster than single-user scenarios.

The following tests were run on the environment that was described in setup 3.

	Single user		Multiuser	
Scenario	**In %**	**In ms**	**In %**	**In ms**
Open sales order list place, warm	100%	853	30%	252
Step to next line on sales order list place	100%	0	100%	16
Refresh info part after moving to new sales order line	100%	117	127%	149
Open existing sales order, warm	100%	753	0%	0
Enter a new sales order line	100%	30	100%	30
Set sales order line type	100%	305	116%	354
Add item	100%	230	101%	232
Create new sales order, warm	100%	626	104%	649
Autogenerate sales order number	100%	130	112%	145
Show customer drop-down list	100%	136	113%	153
Show customer details	100%	471	105%	495
Show item line info	100%	175	125%	219
Show item details	100%	186	105%	196
Change focus and show item details	100%	153	100%	153
Post and ship	100%	606	118%	716
Sales order validation	100%	249	114%	285
Total	100%	5.020	81%	4.044

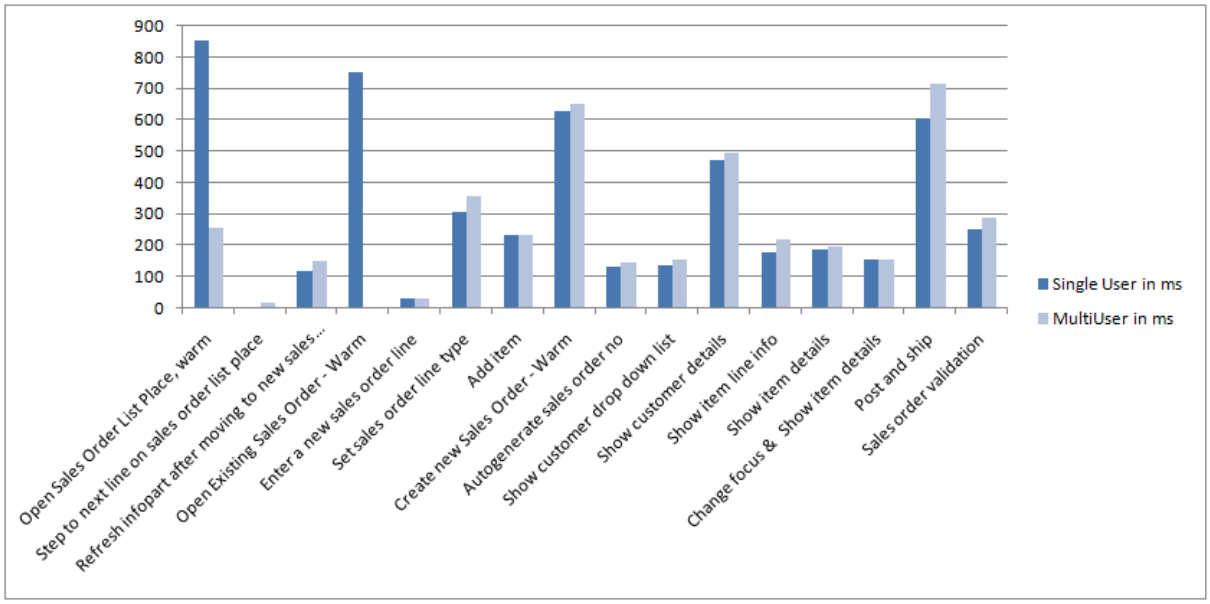

Figure 3 Comparison of single-user and multiuser UI tests, in measured execution time, in milliseconds

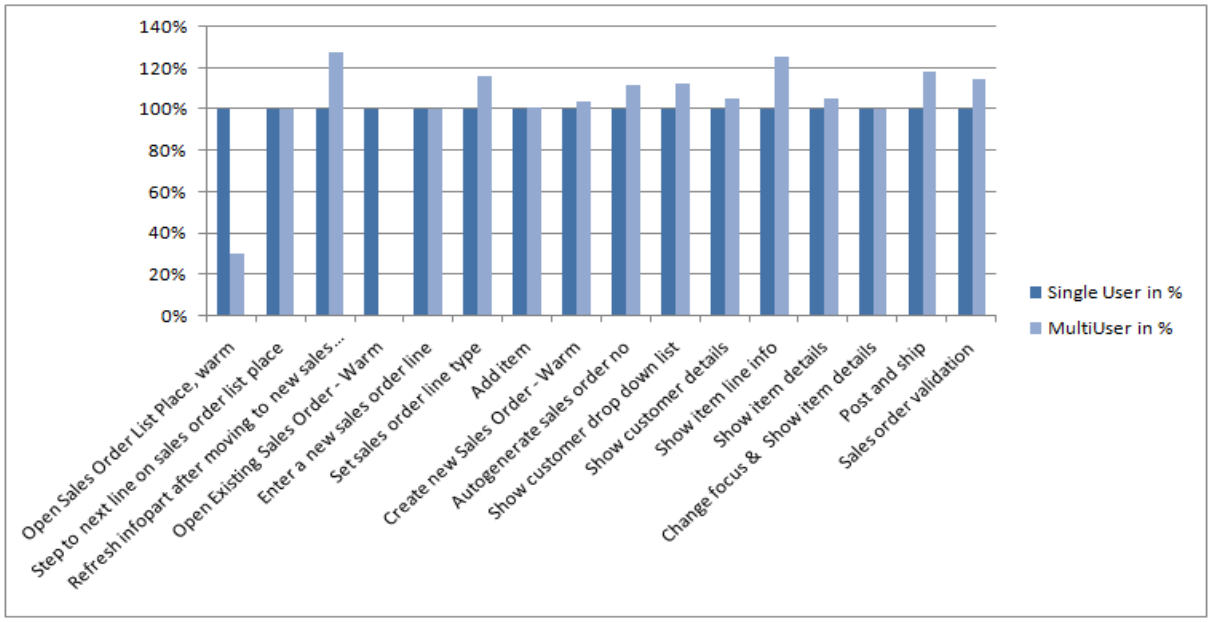

Figure 4 Comparison of single-user and multiuser UI tests, in percentage difference where single user is 100%

SUMMARY

Client and application performance improved as caches were warmed up by multiple users who were looking at the same data. In many cases, the client became more responsive when moving from a single user system running each test 5 times to a 40-user scenario when adding a UI client to the clients that were connected through the Application Benchmark Toolkit.

COMPONENT TESTS

The component tests are single-user tests like the client tests and run through a set of tests that are targeted against a single component in the system that is exposed to the end user. The two separate components that were tested were Web services and reporting, and the results are shown in the following table.

Scenario	Single user In ms
Sales Invoice report	2.712
Order Confirmation report	3.740
Trial Balance report	2.788
Insert a new sales order with Web services, warm	261
Delete an existing sales order with Web services	267
Find an existing sales order with Web services	262
Modify an existing sales order with Web services	236

APPLICATION TESTS

In the following tables, the results for 40 users on one server, 25 users on two servers, and 50 users on two servers are included. Because these configurations were run on different hardware setups, you cannot directly compare the numbers. You can use this information to see the benefits and costs of running on shared and nonshared hardware between databases.

40 users on one server were running on setup 2, and 25 users and 50 users on two servers were both run on setup 1.

Scenario	2 x 25 users In ms	1 x 40 users In ms	2 x 50 users In ms
Create general ledger transaction	4	8	15
Post general ledger transactions (all)	68	182	451
Chart of Account simulation	2	1	4
Create sales quote and make order	360	362	480
Create sales order (percent post)	381	412	520
Create and post sales order (ship and invoice)	1.372	1.523	1.724
Create sales invoice (percent post)	240	278	316
Create and post sales invoice	344	322	413
Post shipment from sales order	889	708	1.257
Post invoice from sales order	924	945	1.109
Create customer receipt	13	23	23
Post customer receipt (all)	314	255	535
Customer lookup - simulation	0	0	1
Sales documents lookup - simulation	75	64	80
Create purchase quote and make order	263	257	373
Create purchase order (percent post)	194	296	291
Create and post purchase order (receive and invoice)	1.214	1.266	1.612
Create purchase invoice (percent post)	184	191	293
Create and post purchase invoice	1.205	1.212	1.519

Scenario	2 x 25 users In ms	1 x 40 users In ms	2 x 50 users In ms
Post receipt from purchase order	634	630	1.090
Post purchase invoice	581	421	793
Create vendor payment	10	25	23
Post vendor payment (all)	497	469	689
Vendor lookup - simulation	0	0	1
Purchase document lookup - simulation	64	51	69
Item lookup - simulation	2	1	4
Total	**9.833**	**9.902**	**13.685**

Scenario	2 x 25 users In %	1 x 40 users In %	2 x 50 users In %
Create general ledger transaction	100%	215%	403%
Post general ledger transactions (all)	100%	267%	662%
Chart of account - simulation	100%	54%	215%
Create sales quote and make order	100%	101%	134%
Create sales order (percent post)	100%	108%	136%
Create and post sales order (ship and invoice)	100%	111%	126%
Create sales invoice (percent post)	100%	116%	131%
Create and post sales invoice	100%	94%	120%
Post shipment from sales order	100%	80%	141%
Post invoice from sales order	100%	102%	120%
Create customer receipt	100%	173%	173%
Post customer receipt (all)	100%	81%	171%
Customer lookup - simulation	100%	0%	465%
Sales documents lookup - simulation	100%	85%	106%
Create purchase quote and make order	100%	98%	142%
Create purchase order (percent post)	100%	153%	150%
Create and post purchase order (receive and invoice)	100%	104%	133%
Create purchase invoice (percent post)	100%	104%	159%
Create and post purchase invoice	100%	101%	126%
Post receipt from purchase order	100%	99%	172%
Post purchase invoice	100%	72%	136%
Create vendor payment	100%	245%	226%
Post vendor payment (all)	100%	94%	139%
Vendor lookup - simulation	100%	0%	407%
Purchase document lookup - simulation	100%	79%	107%
Item lookup - simulation	100%	53%	212%
Total	**100%**	**101%**	**139%**

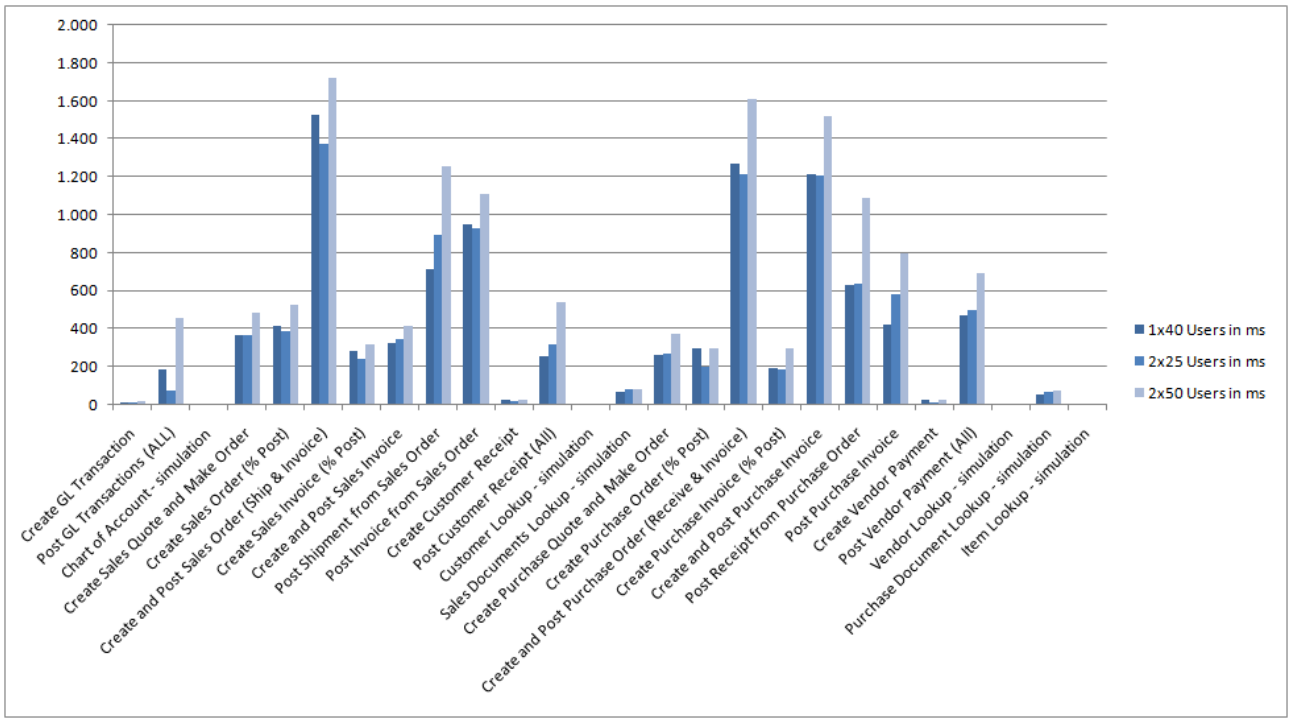

Figure 5 Comparison of application test configurations, in differences per test in milliseconds

As expected, Figure 5 shows that the tests with the fewer number of users were faster. Looking at the following performance counters, the lock waits were significantly higher with a higher number of users and that the memory consumption was moving toward 2 GB for the higher number of users.

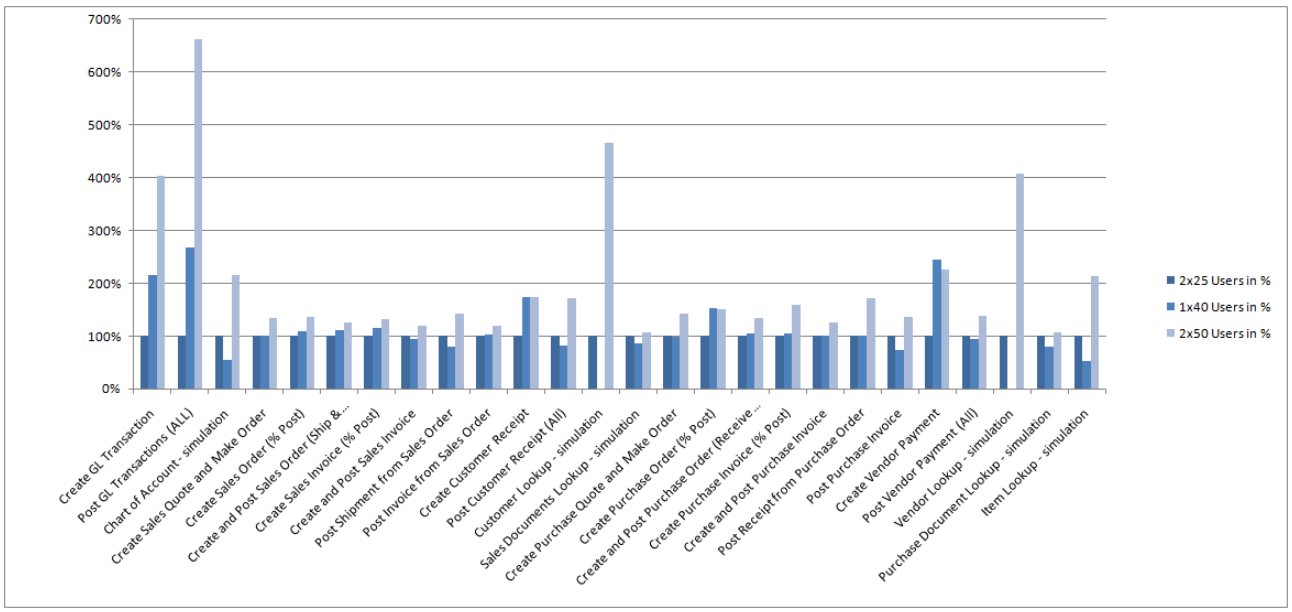

Figure 6 Comparison of test configurations, in differences per test in percentage where 2 x 25 users is 100%

As the graph in Figure 6 shows, there is a large range between the different setups in hardware and concurrent users for the performance of individual scenarios.

SUMMARY

As the number of users changes from 2 x 25 users to 1 x 40 users to 2 x 50 users in different hardware configurations, the timings follow a pattern within a margin.

Each connected user consumes a certain amount of memory when accessing Microsoft Dynamics NAV Server. Because Microsoft Dynamics NAV Server is a 32-bit application and works with 3 GB or less of RAM, it can only handle a limited number of concurrent users. The performance counters for the server with 50 concurrent users show that the memory consumed by the Microsoft Dynamics NAV Server process is 1.7 GB. Theoretically, this leaves 1 GB for spikes in memory usage for heavy calculations or large datasets in reports. If the database tier and the service tier are located on the same computer, then the amount of available memory is less, because SQL Server is also running on that computer.

Because of certain limitations in Microsoft Dynamics NAV Server for Microsoft Dynamics NAV 2009, the performance testing has focused on showing performance that does not cross these limitations for Microsoft Dynamics NAV Server. The focus has been on Microsoft Dynamics NAV Server and not on the database behavior. The subsystem that accesses the database is largely unchanged between older releases of Microsoft Dynamics NAV and Microsoft Dynamics NAV 2009. The behavior that is observed when increasing the number of users is also similar to the observed behavior in previous releases.

HYPER-V

SINGLE MICROSOFT DYNAMICS NAV SERVER MEASUREMENTS

The results in the following table provide measurements for a single Microsoft Dynamics NAV Server in virtualized and nonvirtualized environments.

	Configuration A		Configuration B		Configuration C	
Scenario	**In %**	**In ms**	**In %**	**In ms**	**In %**	**In ms**
Create general ledger transaction	100%	8.93	202%	17.99	193%	17.19
Post general ledger transactions (all)	100%	112.19	206%	230.86	133%	148.97
Chart of Account - simulation	100%	2.14	326%	6.99	335%	7.19
Create sales quote and make order	100%	369.54	148%	548.55	149%	549.08
Create sales order (percent post)	100%	418.31	142%	592.59	137%	573.30
Create and post sales order (ship and invoice)	100%	1,427.98	117%	1,668.43	113%	1,609.11
Create sales invoice (percent post)	100%	246.44	150%	370.04	152%	373.64
Create and post sales invoice	100%	349.21	137%	477.54	137%	479.37
Post shipment from sales order	100%	931.32	122%	1,140.27	110%	1,020.64
Post invoice from sales order	100%	994.41	110%	1,098.05	99%	989.36
Create customer receipt	100%	15.60	196%	30.56	189%	29.43
Post customer receipt (all)	100%	204.13	132%	269.42	84%	172.39
Customer Lookup - simulation	100%	1.03	165%	1.70	158%	1.63
Sales documents Lookup - simulation	100%	69.91	113%	79.27	109%	76.07
Create purchase quote and make order	100%	313.84	132%	412.81	129%	405.36
Create purchase order (percent post)	100%	237.35	131%	309.77	124%	294.04
Create and post purchase order (receive and invoice)	100%	1,285.96	120%	1,537.39	117%	1,508.95

Scenario	Configuration A		Configuration B		Configuration C	
	In %	In ms	In %	In ms	In %	In ms
Create purchase invoice (percent post)	100%	240.17	123%	296.34	137%	328.45
Create and post purchase invoice	100%	1,122.57	136%	1,528.19	130%	1,457.69
Post receipt from purchase order	100%	654.32	136%	888.72	127%	829.09
Post purchase invoice	100%	595.62	117%	698.25	113%	670.20
Create vendor payment	100%	14.62	179%	26.16	170%	24.83
Post vendor payment (all)	100%	454.84	126%	573.72	152%	689.48
Vendor lookup - simulation	100%	.97	159%	1.54	140%	1.36
Purchase document lookup - simulation	100%	62.63	111%	69.30	105%	65.92
Item lookup - simulation	100%	1.52	687%	10.44	800%	12.17
Total	100%	10,135.56	127%	12,884.90	122%	12,334.90

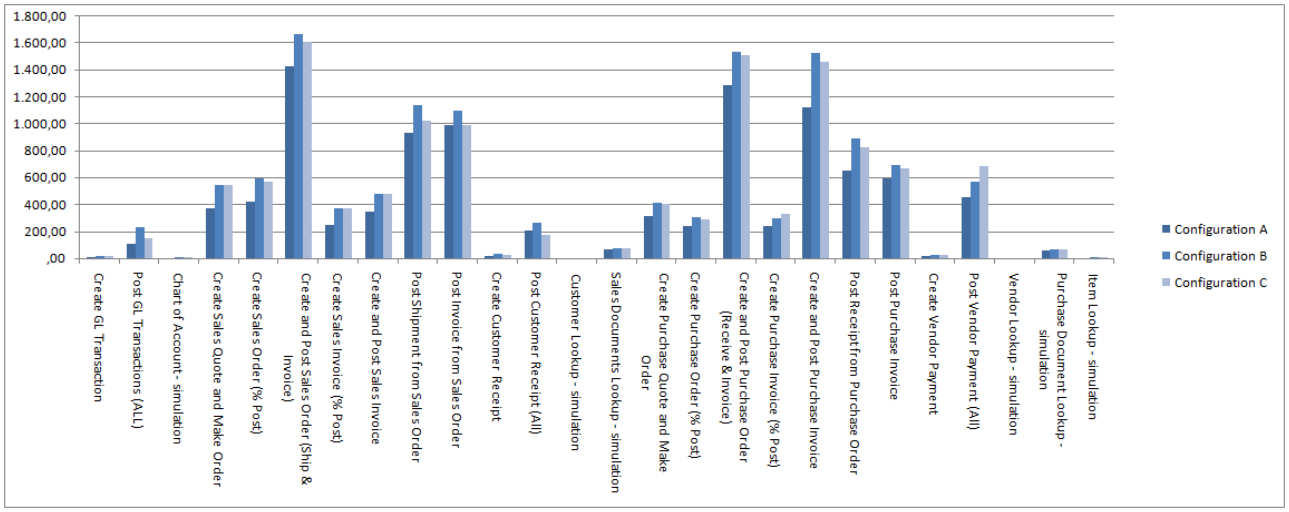

Figure 7 Hyper-V configurations, in milliseconds

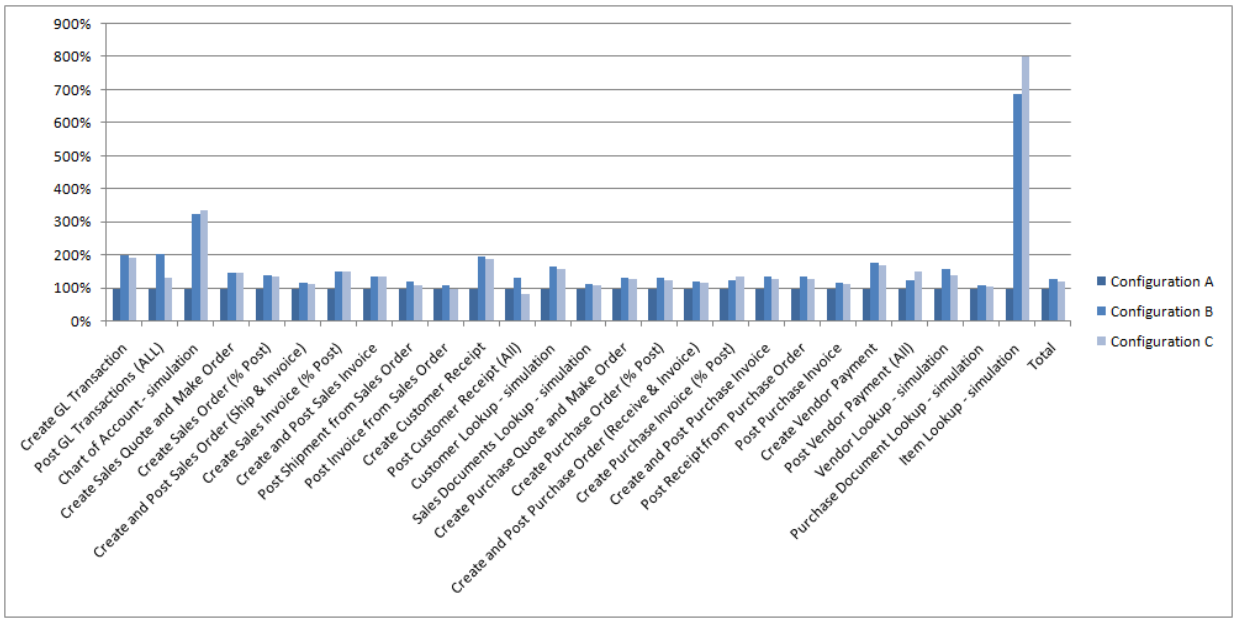

Figure 8 Hyper-V configurations, where reference configuration is 100%

SUMMARY

For a single Microsoft Dynamics NAV Server, the cost of virtualization with Hyper-V other than the differences in hardware is between 22 and 27 percent. Adding two more cores to the computer running Microsoft Dynamics NAV Server gives a 5 percent gain over two cores.

MEASUREMENTS FOR TWO INSTANCES OF MICROSOFT DYNAMICS NAV SERVER

The results in the following table provide measurements for two instances of Microsoft Dynamics NAV Server in virtualized and nonvirtualized environments on a single computer. The graphs in Figure 9 and Figure 10 show the same data.

Scenario	Configuration D		Configuration E	
	In %	In ms	In %	In ms
Create general ledger transaction	9.26	100%	20.89	226%
Post general ledger transactions (all)	321.29	100%	516.34	161%
Chart of Account - simulation	2.40	100%	10.31	429%
Create sales quote and make order	389.91	100%	613.56	157%
Create sales order (percent post)	429.07	100%	631.52	147%
Create and post sales order (ship and invoice)	1,591.23	100%	1,961.93	123%
Create sales invoice (percent post)	256.43	100%	407.73	159%
Create and post sales invoice	354.28	100%	514.38	145%
Post shipment from sales order	1,082.76	100%	1,286.19	119%
Post invoice from sales order	989.28	100%	1,288.06	130%
Create customer receipt	15.86	100%	37.78	238%
Post customer receipt (all)	415.29	100%	563.68	136%
Customer lookup - simulation	1.01	100%	1.90	189%

Scenario	Configuration D		Configuration E	
	In %	In ms	In %	In ms
Sales documents lookup - simulation	71.33	100%	83.67	117%
Create purchase quote and make order	332.65	100%	454.82	137%
Create purchase order (percent post)	244.66	100%	341.91	140%
Create and post purchase order (receive and invoice)	1,455.67	100%	1,742.98	120%
Create purchase invoice (percent post)	269.38	100%	350.68	130%
Create and post purchase invoice	1,318.81	100%	1,838.09	139%
Post receipt from purchase order	897.96	100%	1,230.38	137%
Post purchase invoice	687.71	100%	1,061.82	154%
Create vendor payment	14.34	100%	33.24	232%
Post vendor payment (all)	521.03	100%	902.74	173%
Vendor lookup - simulation	0.96	100%	1.81	188%
Purchase document lookup - simulation	62.38	100%	74.81	120%
Item lookup - simulation	1.62	100%	13.23	819%
Total	**11,736.55**	**100%**	**15,984.45**	**136%**

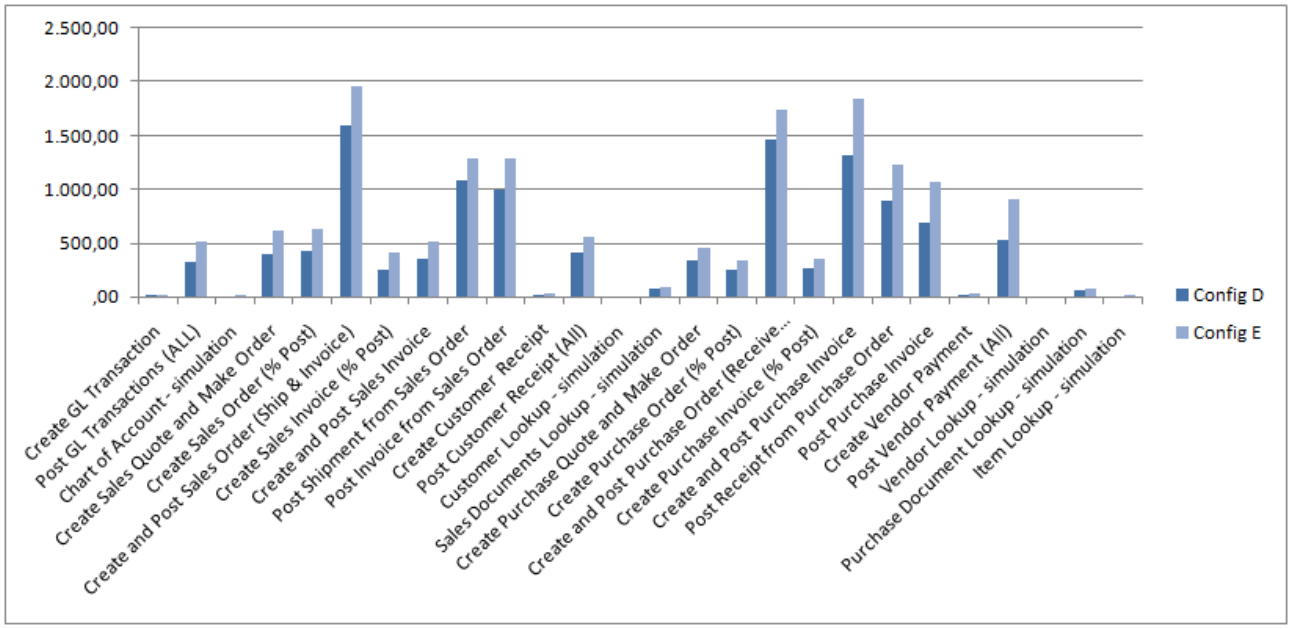

Figure 9 Hyper-V with two instances of Microsoft Dynamics NAV Server, in milliseconds

In Figure 9, configuration D is not virtualized.

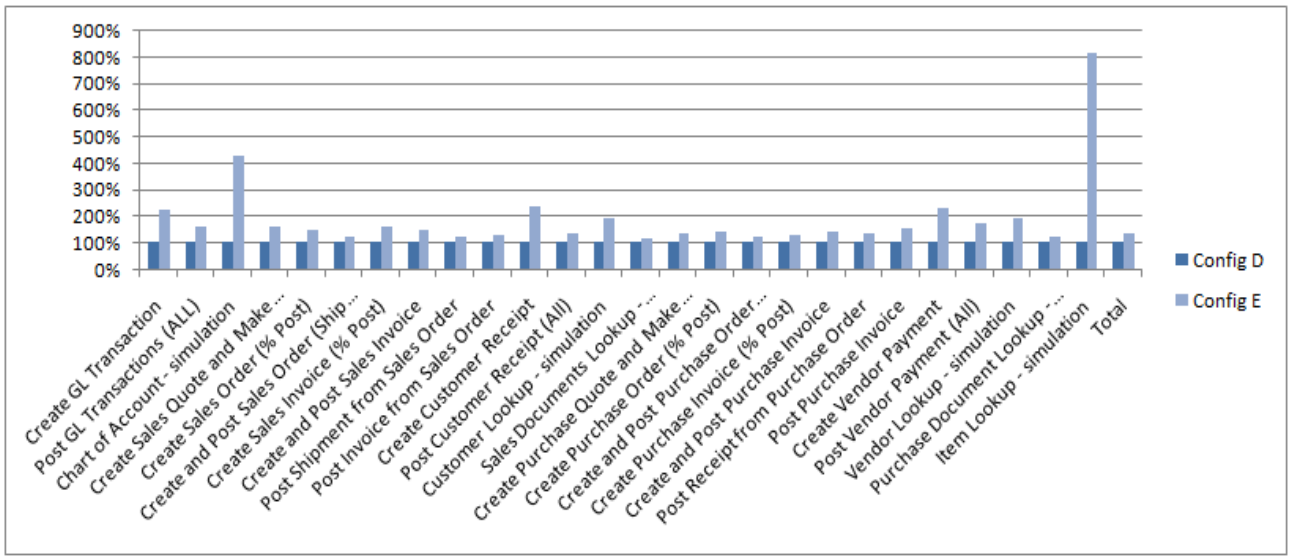

Figure 10 Hyper-V with two instances of Microsoft Dynamics NAV Server, in percent where configuration D is 100%

In Figure 10, configuration D is not virtualized.

SUMMARY

The nonvirtualized setup with two instances of Microsoft Dynamics NAV Server on the same hardware with different instance names performs faster than when running the virtualized setup on the same hardware. We are investigating how to improve virtualization support in future releases. The current performance in a virtualized environment implies that Microsoft Dynamics NAV should not be run in a virtualized environment for performance. Instead, you should consider a virtualized environment for other benefits. For example, you could run the two instances of Microsoft Dynamics NAV Server separately and dedicate system resources to the virtualized environment without sharing between the instances with the correct configuration.

We do not recommend deploying a virtualized environment with Hyper-V for production use. You can consider using a virtualized environment in a testing or QA setup.

NETWORK LATENCY AND BANDWIDTH REQUIREMENTS

TEST AND METHODOLOGY DESCRIPTION

Single-user performance tests run on a two-computer setup with the three-tier architecture. Computer A runs the client tests, and computer B runs the service tier and the database to represent the server.

During the test, a network throttling tool was used on computer A to simulate limited bandwidth and high latency on the connection to computer B.

The different settings on the network throttling simulate high-speed ISDN and different connection speeds for a typical ADSL connection that ranged from 128 kilobits per second (kbps) up to 50 megabits per second (Mbps). During the test, lost packages and network errors that can occur in a real-world Internet connection were not simulated.

The latencies represent the different distances between the client and the server.

- 0 ms represents both computers being located in the same building or on the same site.
- 10 ms represents a short-distance link within a small country, such as Denmark. For example, the latency from Copenhagen to Aarhus (191 mi or 307 km) is 9 ms.
- 30 ms represents a country/region in Western Europe, such as Germany, Switzerland, or France.
- 60 ms represents countries or regions such as Turkey or Greece.
- 90 ms represents a long distance between countries or regions, such as Denmark to the United States.

RESULTS

Because these tests were not designed to be run with limited network conditions, the test script occasionally failed because of timeouts before the test was completed and no performance data was registered for those cases. Even without data for these cases, it is a good indication that performance would not be acceptable on those network conditions.

EXPLANATION OF GRAPHS

Each following figure contains a set of series called Latency 00.00 through Latency 90.90 and a series called Regular Network. The Regular Network series is the measurement of the same scenario on a 100-MB LAN with less than 1 ms latency. The notation 00.00 means 0 ms uplink latency and 0 ms downlink latency. The notation 90.90 means 90 ms uplink latency and 90 ms downlink latency. The X axis contains data points such as DL-04096 and UL-00256. This describes the bandwidth for that data point. In this example, the data point represents 4096 kbps downlink and 256 kbps uplink.

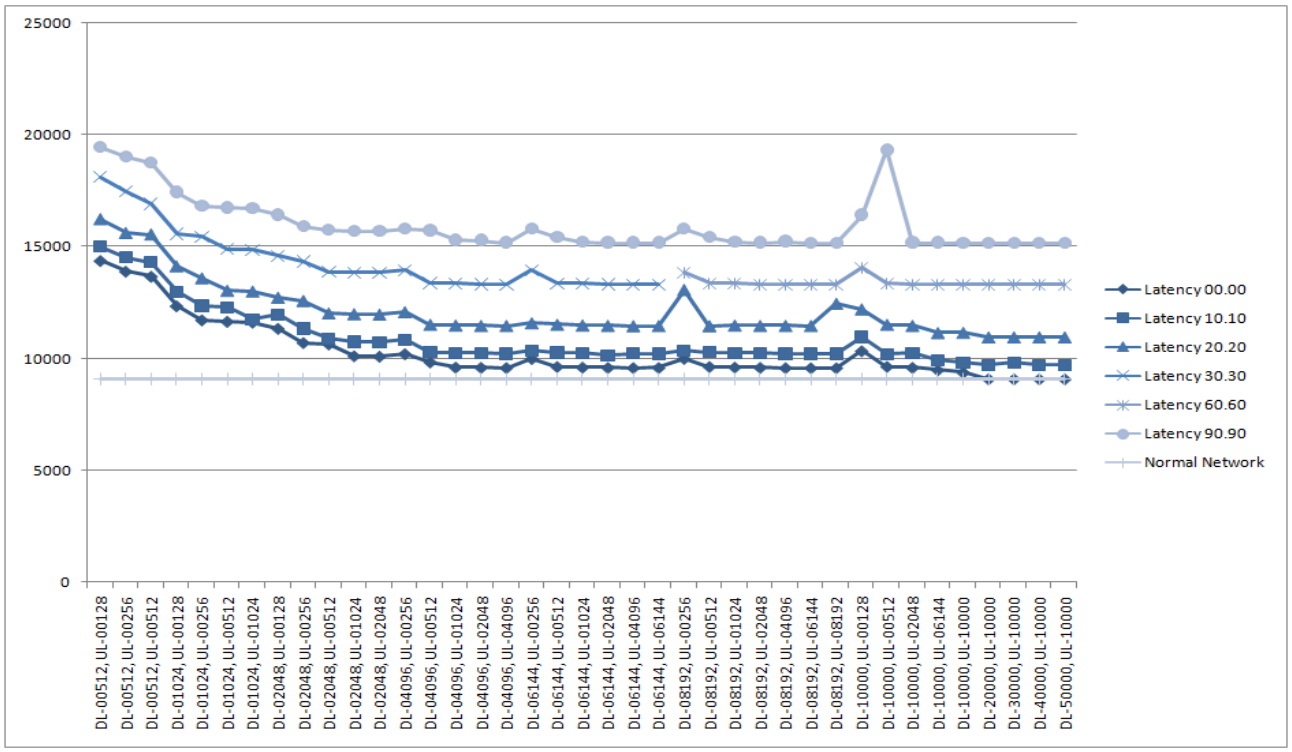

Figure 11 Client startup

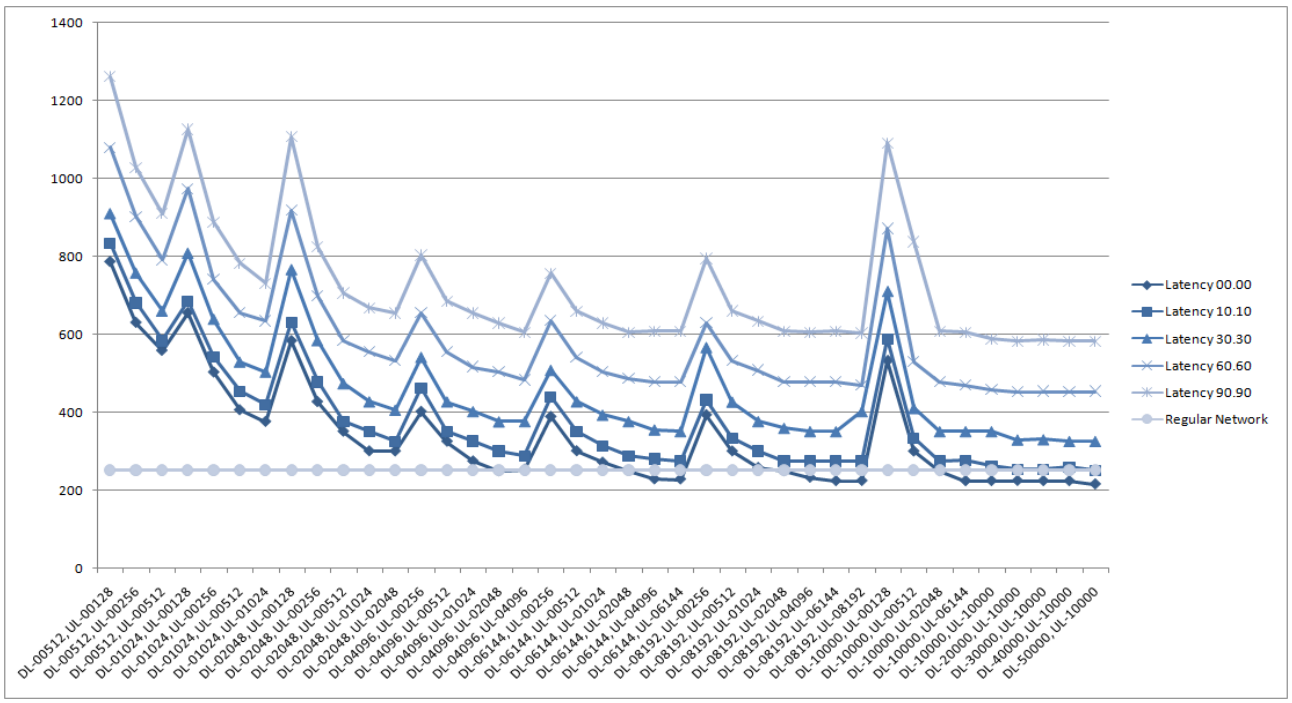

Figure 12 Client - open sales order list place

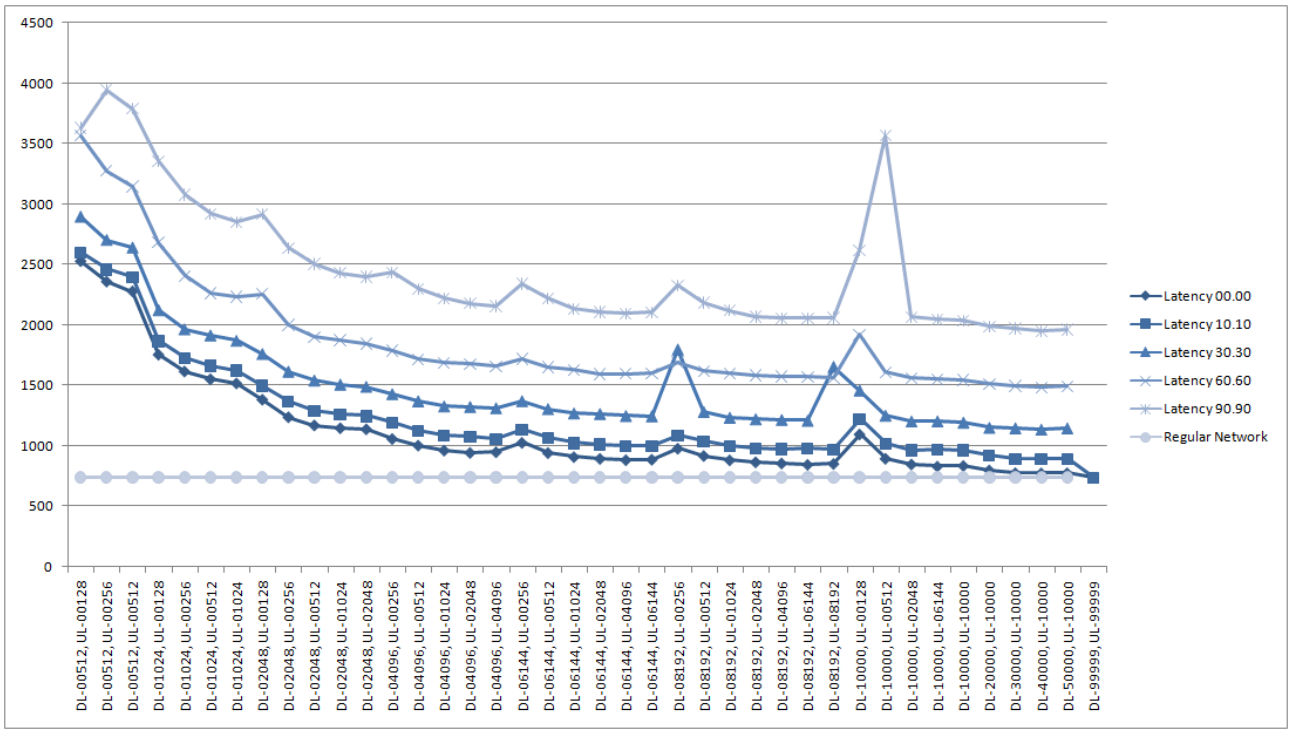

Figure 13 Open existing sales order

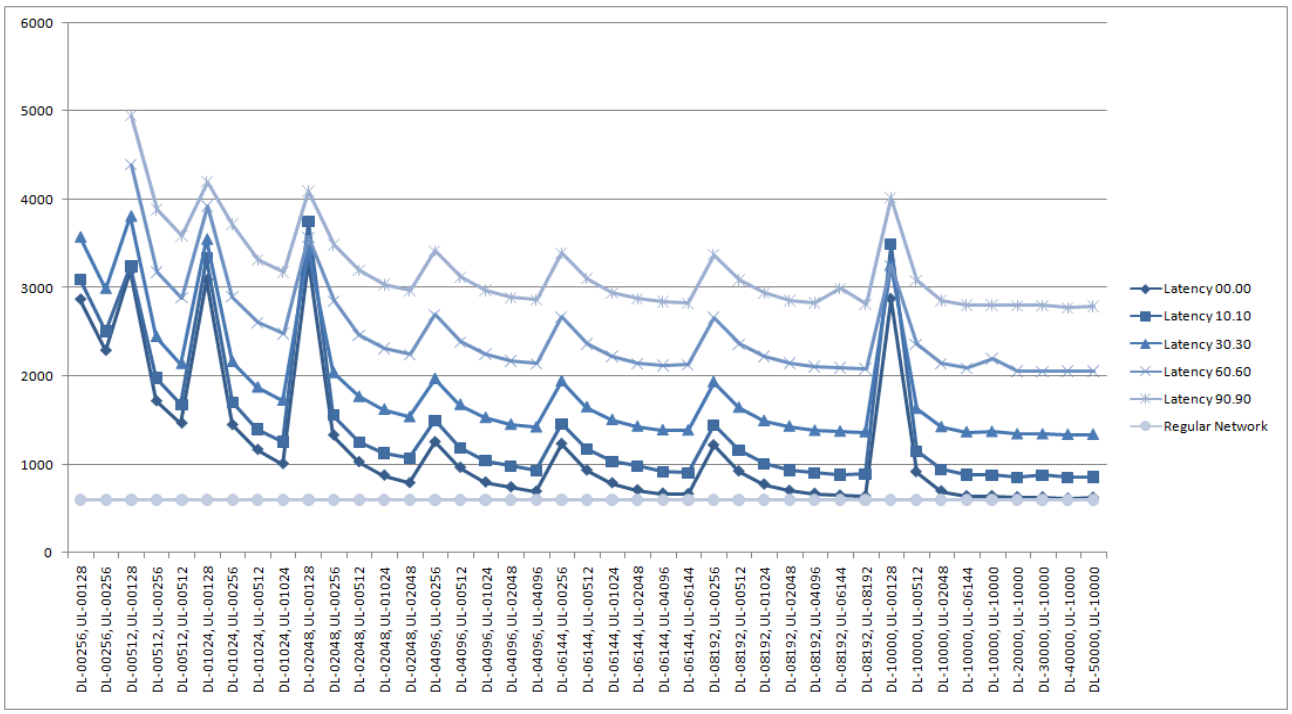

Figure 14 Client - post and ship sales order

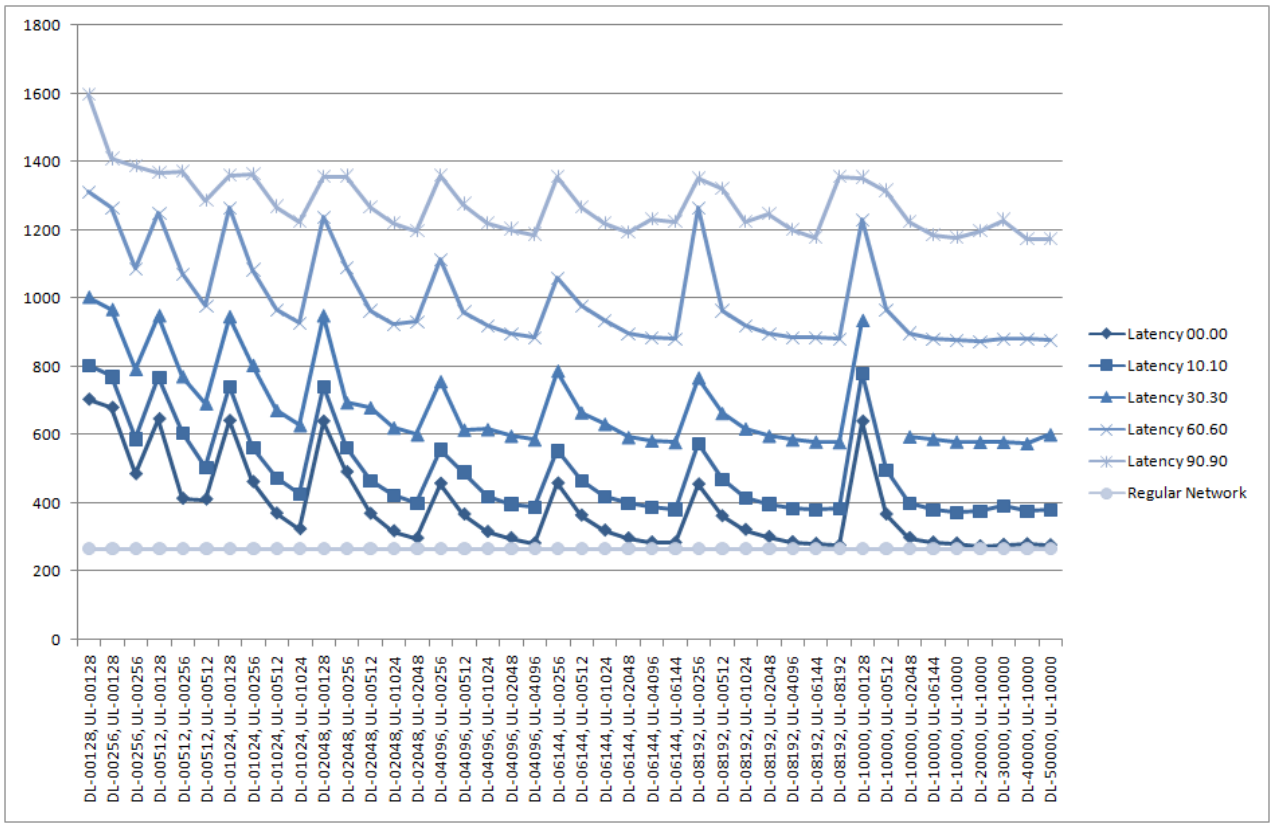

Figure 15 Web services - delete sales order

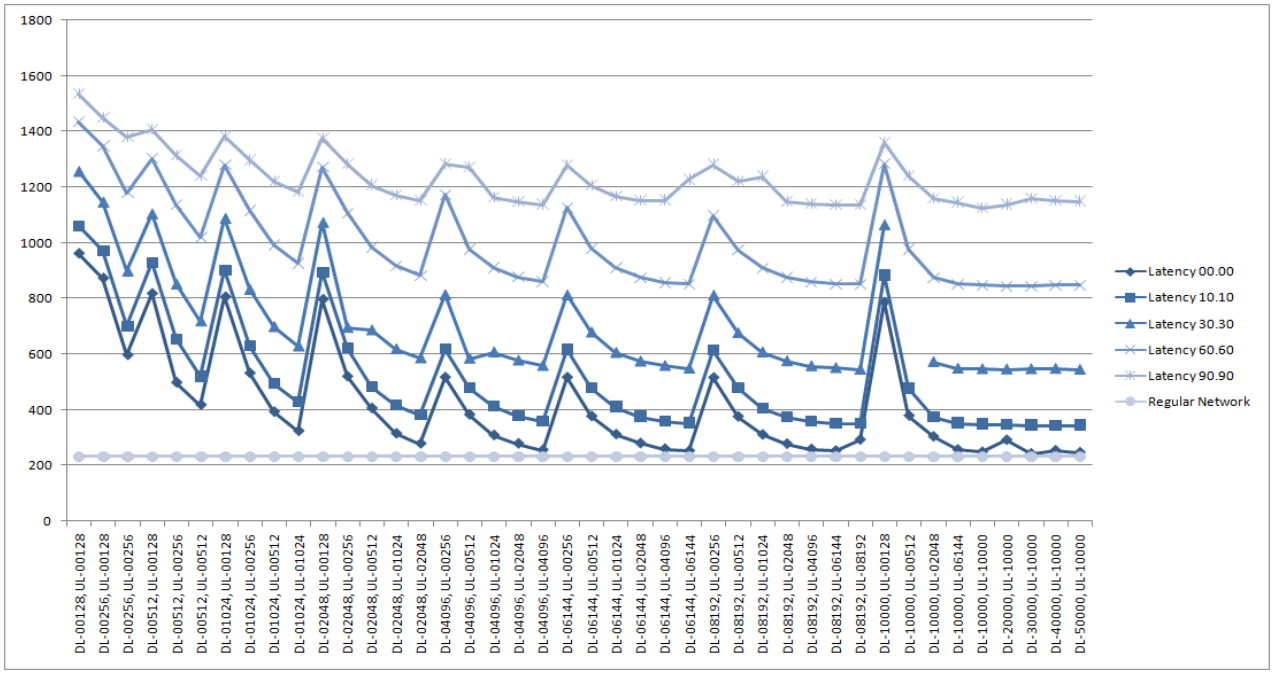

Figure 16 Web services - modify sales order

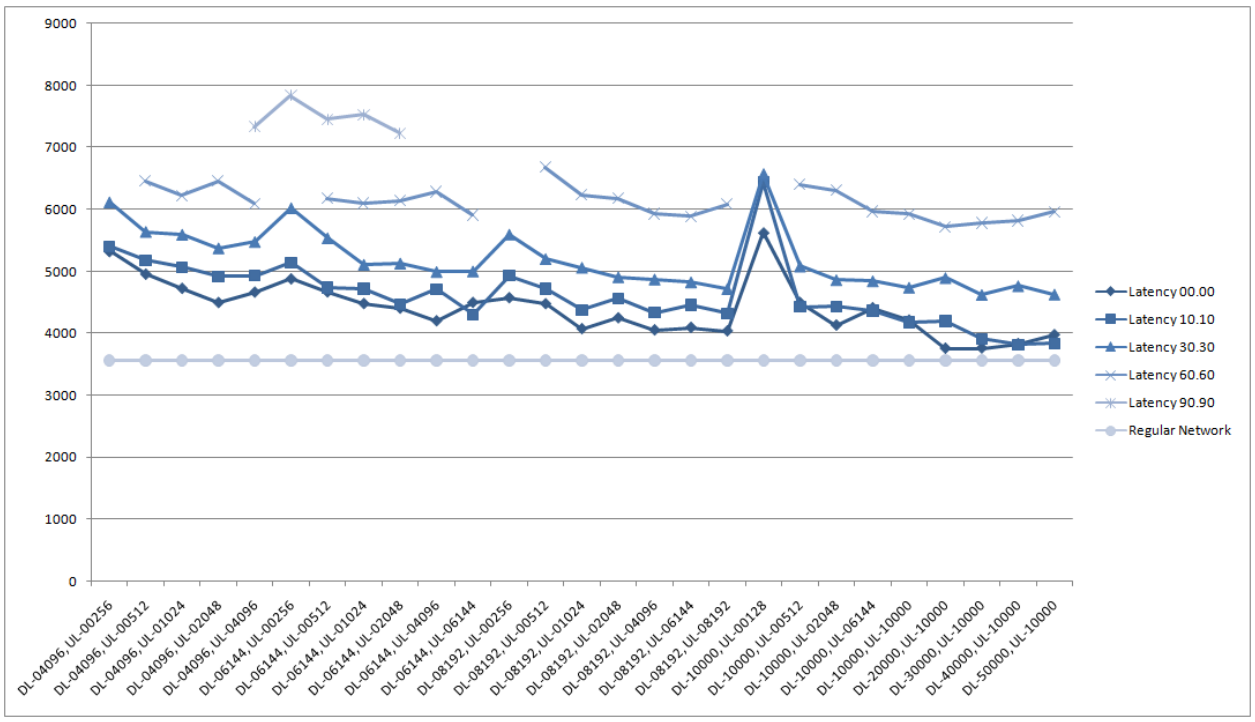

Figure 17 Reporting - order confirmation

APPENDIX A: APPLICATION SCENARIOS

Scenario ID	Description	Measurement criteria and steps
ABT 01	100 Create GL Transaction	Application Benchmark Tool code unit 99600 Profile-Create GL Transaction
ABT 02	101 Post GL Transactions (ALL)	Application Benchmark Tool code unit 99601 Profile-Post GL Transaction
ABT 03	150 Chart of account simulation	Application benchmark tool code unit 99602 Profile-ChartofAcc. simulation
ABT 04	200 Create Sales Quote and Make Order	Application Benchmark Tool code unit 99604 Profile-Create SQ, SO, SI, SC
ABT 05	201 Create Sales Order (% Post)	Application benchmark tool code unit 99604 Profile-Create SQ, SO, SI, SC
ABT 06	202 Create and Post Sales Order (Ship & Invoice)	Application Benchmark tool code unit 99604 Profile-Create SQ, SO, SI, SC
ABT 07	203 Create Sales Invoice (% Post)	Application Benchmark Tool code unit 99606 Profile-Create SQ, SO, SI, SC
ABT 08	204 Create and Post Sales Invoice	Application Benchmark Tool code unit 99604 Profile-Create SQ, SO, SI, SC
ABT 09	206 Post Shipment from Sales Order	Application Benchmark Tool code unit 99604 Profile-Create SQ, SO, SI, SC
ABT 10	207 Post Invoice from Sales Order	Application Benchmark Tool code unit 99604 Profile-Create SQ, SO, SI, SC
ABT 11	210 Create Customer Receipt	Application Benchmark Tool code unit 99600 Profile-Create GL Transaction
ABT 12	211 Post Customer Receipt (All)	Application Benchmark Tool code unit 99601 Profile-Post GL Transaction
ABT 13	250 Customer Lookup - simulation	Application Benchmark Tool code unit 99607 Profile-Customer Lookup Sim.
ABT 14	251 Sales Documents Lookup - simulation	Application Benchmark Tool code unit 99616 Profile-Sales Doc. Lookup Sim.
ABT 15	300 Create Purchase Quote and Make Order	Application Benchmark Tool code unit 99609 Profile-Create PQ, PS, PI, PC
ABT 16	301 Create Purchase Order (% Post)	Application Benchmark Tool code unit 99609 Profile-Create PQ, PS, PI, PC
ABT 17	302 Create and Post Purchase Order (Receive & Invoice)	Application Benchmark Tool code unit 99609 Profile-Create PQ, PS, PI, PC
ABT 18	303 Create Purchase Invoice (% Post)	Application Benchmark Tool code unit 99609 Profile-Create PQ, PS, PI, PC
ABT 19	304 Create and Post Purchase Invoice	Application Benchmark Tool code unit 99609 Profile-Create PQ, PS, PI, PC
ABT 20	306 Post Receipt from Purchase Order	Application Benchmark Tool code unit 99609 Profile-Create PQ, PS, PI, PC
ABT 21	307 Post Purchase Invoice	Application Benchmark Tool code unit 99609 Profile-Create PQ, PS, PI, PC
ABT 22	310 Create Vendor Payment	Application Benchmark Tool code unit 99600 Profile-Create GL Transaction
ABT 23	311 Post Vendor Payment (All)	Application Benchmark Tool code unit 99601 Profile-Post GL Transaction
ABT 24	350 Vendor Lookup - simulation	Application Benchmark Tool code unit 99612 Profile-Vendor Lookup Sim.
ABT 25	351 Purchase Document Lookup - simulation	Application Benchmark Tool code unit 99617 Profile-Purchase Doc. Lookup

Scenario ID	Description	Measurement criteria and steps
ABT 26	450 Item Lookup - simulation	Application Benchmark Tool code unit 99614 Profile-Item Lookup Simulation

APPENDIX B: CLIENT SCENARIOS

Scenario ID	Description	Measurement criteria and steps
S01.2	Warm server, cold client	Measure time it takes to start up the RoleTailored client and it becomes responsive
S02	Open Sales Order list place (warm server, cold client)	Open Sales Order list place from Cue on home page
S02	Open Sales Order list place (warm server, warm client)	Open Sales Order list place from Cue on home page
S03	Step to next line on Sales Order list place (warm server, cold client)	Use ARROW DOWN on the Sales Order list place line and verify that the following renders correctly: 1) Focus on list is moved to the next row
S03	Step to next line on Sales Order list place (warm server, warm client)	Use ARROW DOWN on the Sales Order list place line and verify that the following renders correctly: 1) Focus on list is moved to the next row
S03.2	Refresh info part after moving to new sales order line	Open the Sales Order list place and select a line. Select a new line in the list place and measure the amount of time that it takes to refresh the related FactBox.
S04.01	Open existing sales order (warm server, warm client)	Open existing unposted sales order as task page from Sales Order list place by clicking any line from the sales order list.
S04.01	Open existing sales order (warm server, cold client)	Open existing unposted sales order as task page from Sales Order list place by clicking any line from the sales order list.
S04.02	Enter a new sales order line	Click on a new line in the sales order, putting focus in line type field.
S04.02	Enter a new sales order line (cold client, warm server)	Click on a new line in the sales order, putting focus in line type field.
S04.03	Set sales order line type	Set line type to item and press TAB. Measure time to focus on next field.
S04.03	Set sales order line type (cold client, warm server)	Set line type to item and TAB. Measure time to focus on next field.
S04.04	Add item to sales order line	Add item 1000 and tab out. See item line info automatically filled out.
S04.04	Add item to sales order line (cold client, warm server)	Add item 1000 and tab out. See item line info automatically filled out.
S04.05.2	Create and post new sales order (warm server)	Create and post new sales order.
S04.06	Create new sales order (warm server)	Create new sales order by clicking from promoted actions, which makes a new task page.
S04.07	Autogenerate sales order number	Move from Sales Order No. field to Customer field. Measure time that it takes to generate the sales order number.
S04.07	Autogenerate sales order number (cold client, warm server)	Move from Sales Order No. field to Customer field. Measure time that it takes to generate the sales order number.

Scenario ID	Description	Measurement criteria and steps
S04.08	Show customer drop-down list	Similar to S04.07. Move from Sales Order No. field to Customer field. Measure time that it takes to open the customer number drop-down list.
S04.08	Show customer drop-down list (cold client, warm server)	Similar to S04.07. Move from Sales Order no to Customer field. Measure time that it takes to open the customer number drop-down list.
S04.09	Select customer	Click to select customer 10000, which closes the drop-down list and transfers the number to the Customer ID field.
S04.09	Select customer (cold client, warm server)	Click to select customer 10000, which closes the drop-down list and transfers the number to the Customer ID field.
S04.09.1	Add customer information to sales order after selection	A customer has been selected as described in S04.09. Press TAB in the Customer ID field. Measure time that it takes to fill the sales order with customer data.
S04.09.1	Add customer information to sales order after selection (cold client, warm server)	A customer has been selected as described in S04.09. Press TAB in the Customer ID field. Measure time that it takes to fill the sales order with customer data.
S04.10	Show customer details (cold client, warm server)	The same click from S04.09 shows the data in the customer details info part.
S04.10	Show customer details (warm server, warm client)	The same click from S04.09 shows the data in the customer details info part.
S04.11	Show item line info	Adds item 1000 and show remaining item line info after pressing TAB to go to the next field.
S04.11	Show item line info (cold client, warm server)	Adds item 1000 and show remaining line item info after pressing TAB to go to the next field.
S04.12	Show item details	After pressing TAB from S04.11, show the data in the item details info part.
S04.12	Show item details (cold client, warm server)	After pressing TAB from S04.11, show the data in the item details info part.
S04.14	Change focus and show item details	Verify the correct items by reselecting first Item Line info and viewing the item details info part data for that line.
S04.14	Change focus and show item details (cold client, warm server)	Verify the correct items by reselecting first Item Line info and viewing the item details info part data for that line.
S04.16	Post and ship	Post and ship by pressing F11.
S04.16	Post and ship (cold client, warm server)	Post and ship by pressing F11.
S07	Sales order validation	On a new sales order, set the shipment code to ‘aaa’. Leave the field, and an error message dialog box must open, stating that the code is invalid.
S07	Sales order validation (cold client, warm server)	On a new sales order, set the shipment code to ‘aaa’. Leave the field, and an error message dialog box must open, stating that the code is invalid.

APPENDIX C: COMPONENT SCENARIOS

Scenario ID	Description	Measurement criteria and steps
T01	206 - Sales Invoice Report	Run Report 206 with no filter criteria. Should be timed from after request page until all rendering complete.
T02	205 - Order Confirmation Report	Run Report 205 with no filter criteria. Should be timed from after request page until all rendering complete.
T03	6 - Trial Balance Report	Run Report 6 with no filter criteria. Should be timed from after request page until all rendering complete.
T04	116 - Statement Report	Run Report 116 with date filter = 12-12-2012. Should be timed from after request page until all rendering complete.
T05	1001 - Inventory Valuation Report	Run Report 1001 with no filter criteria (Date Filter=01-01-01..31-01-01). Should be timed from after request page until all rendering complete.
T07A	Insert a new sales order with Web services (warm server)	Inserts a new sales order with Web services with only the Sell_to_Address_2 field specified. Measurement starts from invoking the Insert method from the SOAP HTTP client and ends when the call returns with a response.
T08	Delete an existing sales order with Web services (warm server)	Deletes a sales order that was previously inserted with Web services. Measurement starts from invoking the Delete method from the SOAP HTTP client and ends when the call returns with a response.
T09	Find an existing sales order with Web services (warm server)	Finds a sales order with Web services with a filter that is based on the field that was specified when the sales order was inserted. Measurement starts from invoking the Find method from the SOAP HTTP client and ends when the call returns with a response.
T10	Modify an existing sales order with Web services (warm server)	Modifies the Bill_to_Address_2 field of the sales order that was previously inserted with Web Services. Measurement starts from invoking the Modify function from the SOAP HTTP client and ends when the call returns with a response.

APPENDIX D: TEST DATABASE

Table no.	Table name	No. of records
3	Payment Terms	6
4	Currency	50
5	Finance Charge Terms	2
7	Standard Text	4
8	Language	49
9	Country/Region	64
10	Shipment Method	15
13	Salesperson/Purchaser	8
14	Location	8
15	G/L Account	272
17	G/L Entry	7054151
18	Customer	70
19	Cust. Invoice Disc.	4
21	Cust. Ledger Entry	1758063
23	Vendor	68
24	Vendor Invoice Disc.	5
25	Vendor Ledger Entry	579936
27	Item	144
30	Item Translation	52
32	Item Ledger Entry	6007401
36	Sales Header	57901
37	Sales Line	289335
38	Purchase Header	24712
39	Purchase Line	117756
42	Rounding Method	1
45	G/L Register	1202293
46	Item Register	1201492
50	Accounting Period	38
77	Report Selections	40
79	Company Information	1
80	Gen. Journal Template	8
81	Gen. Journal Line	4028
82	Item Journal Template	8
84	Acc. Schedule Name	4
85	Acc. Schedule Line	47
88	BOM Journal Template	2
90	BOM Component	116
92	Customer Posting Group	2
93	Vendor Posting Group	3
94	Inventory Posting Group	3

Table no.	Table name	No. of records
95	G/L Budget Name	2
96	G/L Budget Entry	1728
97	Comment Line	1
98	General Ledger Setup	1
99	Item Vendor	20
110	Sales Shipment Header	888242
111	Sales Shipment Line	4441073
112	Sales Invoice Header	888230
113	Sales Invoice Line	4484454
114	Sales Cr.Memo Header	16938
115	Sales Cr.Memo Line	85495
120	Purch. Rcpt. Header	290837
121	Purch. Rcpt. Line	1454085
122	Purch. Inv. Header	290836
123	Purch. Inv. Line	1466660
124	Purch. Cr. Memo Hdr.	5488
125	Purch. Cr. Memo Line	27663
156	Resource	5
160	Res. Capacity Entry	1044
167	Job	2
169	Job Ledger Entry	25
170	Standard Sales Code	2
171	Standard Sales Line	5
172	Standard Customer Sales Code	2
173	Standard Purchase Code	4
174	Standard Purchase Line	8
175	Standard Vendor Purchase Code	4
200	Work Type	1
203	Res. Ledger Entry	60
204	Unit of Measure	11
205	Resource Unit of Measure	6
206	Res. Journal Template	2
207	Res. Journal Line	1
208	Job Posting Group	1
209	Job Journal Template	2
222	Ship-to Address	4
224	Order Address	4
225	Post Code	356

Table no.	Table name	No. of records
230	Source Code	65
232	Gen. Journal Batch	23
233	Item Journal Batch	9
236	Res. Journal Batch	1
237	Job Journal Batch	1
240	Resource Register	33
241	Job Register	11
242	Source Code Setup	1
244	Req. Wksh. Template	2
245	Requisition Wksh. Name	2
250	Gen. Business Posting Group	4
251	Gen. Product Posting Group	6
252	General Posting Setup	28
254	VAT Entry	2225270
255	VAT Statement Template	1
256	VAT Statement Line	50
257	VAT Statement Name	1
258	Transaction Type	22
259	Transport Method	7
260	Tariff Number	10
270	Bank Account	5
271	Bank Account Ledger Entry	39
275	Bank Account Statement	3
276	Bank Account Statement Line	13
277	Bank Account Posting Group	4
279	Extended Text Header	2
280	Extended Text Line	7
281	Phys. Inventory Ledger Entry	118
286	Territory	14
287	Customer Bank Account	78
288	Vendor Bank Account	80
289	Payment Method	6
291	Shipping Agent	4
292	Reminder Terms	2
293	Reminder Level	6
294	Reminder Text	10
301	Finance Charge Text	2
308	No. Series	132
309	No. Series Line	261
310	No. Series Relationship	5

Table no.	Table name	No. of records
311	Sales & Receivables Setup	1
312	Purchases & Payables Setup	1
313	Inventory Setup	1
314	Resources Setup	1
315	Jobs Setup	1
323	VAT Business Posting Group	3
324	VAT Product Posting Group	3
325	VAT Posting Setup	12
328	Currency for Fin. Charge Terms	3
329	Currency for Reminder Level	3
330	Currency Exchange Rate	50
333	Column Layout Name	2
334	Column Layout	7
337	Reservation Entry	2
339	Item Application Entry	3160803
340	Customer Discount Group	2
341	Item Discount Group	5
348	Dimension	8
349	Dimension Value	36
350	Dimension Combination	3
351	Dimension Value Combination	3
352	Default Dimension	268
354	Default Dimension Priority	8
355	Ledger Entry Dimension	66369004
356	Journal Line Dimension	10207
357	Document Dimension	1481830
358	Production Document Dimension	48
359	Posted Document Dimension	44967117
361	G/L Budget Dimension	2094
363	Analysis View	4
365	Analysis View Entry	1142
366	Analysis View Budget Entry	1173
379	Detailed Cust. Ledg. Entry	1795689
380	Detailed Vendor Ledg. Entry	594827
381	VAT Registration No. Format	29

Table no.	Table name	No. of records
388	Dimension Translation	8
389	Service Contract Dimension	30
394	XBRL Taxonomy	2
395	XBRL Taxonomy Line	2257
396	XBRL Comment Line	1729
398	XBRL Rollup Line	2255
399	XBRL Schema	2
400	XBRL Linkbase	4
401	XBRL Taxonomy Label	2257
410	IC G/L Account	265
411	IC Dimension	3
412	IC Dimension Value	21
413	IC Partner	2
750	Standard General Journal	1
751	Standard General Journal Line	7
752	Standard Item Journal	1
753	Standard Item Journal Line	9
1001	Job Task	35
1003	Job Planning Line	38
1015	Job Entry No.	1
5050	Contact	435
5051	Contact Alt. Address	31
5052	Contact Alt. Addr. Date Range	34
5053	Business Relation	10
5054	Contact Business Relation	164
5055	Mailing Group	2
5056	Contact Mailing Group	14
5057	Industry Group	6
5058	Contact Industry Group	27
5059	Web Source	5
5060	Contact Web Source	36
5062	Attachment	16
5063	Interaction Group	8
5064	Interaction Template	39
5065	Interaction Log Entry	88
5066	Job Responsibility	6
5067	Contact Job Responsibility	105
5068	Salutation	8
5069	Salutation Formula	84
5070	Organizational Level	6
5071	Campaign	4
5073	Campaign Status	6
5076	Segment Header	4

Table no.	Table name	No. of records
5077	Segment Line	173
5078	Segment History	173
5079	Marketing Setup	1
5080	To-do	109
5081	Activity	9
5082	Activity Step	33
5083	Team	6
5084	Team Salesperson	2
5085	Contact Duplicate	10
5086	Cont. Duplicate Search String	1280
5087	Profile Questionnaire Header	7
5088	Profile Questionnaire Line	150
5089	Contact Profile Answer	2031
5090	Sales Cycle	4
5091	Sales Cycle Stage	21
5092	Opportunity	49
5093	Opportunity Entry	70
5094	Close Opportunity Code	18
5095	Duplicate Search String Setup	10
5097	Segment Criteria Line	12
5103	Interaction Tmpl. Language	8
5104	Segment Interaction Language	8
5105	Customer Template	6
5111	Rating	56
5117	Search Word	3174
5118	Search Word Detail	10350
5122	Interaction Template Setup	1
5199	Attendee	5
5200	Employee	8
5201	Alternative Address	2
5202	Qualification	9
5203	Employee Qualification	12
5204	Relative	8
5205	Employee Relative	12
5206	Cause of Absence	3
5207	Employee Absence	671
5209	Union	3
5210	Cause of Inactivity	3
5211	Employment Contract	3
5212	Employee Statistics Group	3
5213	Misc. Article	4

Table no.	Table name	No. of records
5214	Misc. Article Information	25
5215	Confidential	4
5216	Confidential Information	30
5217	Grounds for Termination	4
5218	Human Resources Setup	1
5220	Human Resource Unit of Measure	2
5401	Item Variant	2
5402	Unit of Measure Translation	7
5404	Item Unit of Measure	152
5405	Production Order	10
5406	Prod. Order Line	10
5407	Prod. Order Component	98
5409	Prod. Order Routing Line	28
5410	Prod. Order Capacity Need	56
5500	Production Schedule Setup	1
5600	Fixed Asset	9
5601	FA Ledger Entry	88
5603	FA Setup	1
5604	FA Posting Type Setup	4
5605	FA Journal Setup	1
5606	FA Posting Group	3
5607	FA Class	3
5608	FA Subclass	3
5609	FA Location	9
5611	Depreciation Book	1
5612	FA Depreciation Book	9
5615	FA Allocation	9
5616	Maintenance Registration	8
5617	FA Register	28
5619	FA Journal Template	2
5620	FA Journal Batch	1
5622	FA Reclass. Journal Template	1
5623	FA Reclass. Journal Batch	1
5625	Maintenance Ledger Entry	8
5626	Maintenance	2
5628	Insurance	4
5629	Ins. Coverage Ledger Entry	8
5630	Insurance Type	4
5633	Insurance Journal Template	1
5634	Insurance Journal Batch	1
5636	Insurance Register	8
5640	Main Asset Component	3
5648	FA Allocation Dimension	9
5700	Stockkeeping Unit	22
5714	Responsibility Center	2
5715	Item Substitution	5
5717	Item Cross Reference	4
5718	Nonstock Item	4
5719	Nonstock Item Setup	1
5720	Manufacturer	6
5721	Purchasing	3
5722	Item Category	2
5723	Product Group	4
5740	Transfer Header	9
5741	Transfer Line	19
5742	Transfer Route	8
5744	Transfer Shipment Header	5
5745	Transfer Shipment Line	10
5746	Transfer Receipt Header	2
5747	Transfer Receipt Line	5
5765	Warehouse Request	38
5766	Warehouse Activity Header	3
5767	Warehouse Activity Line	9
5769	Warehouse Setup	1
5771	Warehouse Source Filter	3
5772	Registered Whse. Activity Hdr.	3
5773	Registered Whse. Activity Line	15
5790	Shipping Agent Services	5
5800	Item Charge	7
5802	Value Entry	6379892
5804	Avg. Cost Adjmt. Entry Point	122084
5811	Post Value Entry to G/L	5945730
5813	Inventory Posting Setup	27
5832	Capacity Ledger Entry	8
5903	Service Order Type	4
5904	Service Item Group	14
5905	Service Cost	7
5907	Service Ledger Entry	117
5910	Service Hour	5
5911	Service Mgt. Setup	1
5913	Loaner	5

Table no.	Table name	No. of records
5915	Fault Area	12
5916	Symptom Code	9
5917	Fault Reason Code	2
5918	Fault Code	400
5919	Resolution Code	34
5927	Repair Status	9
5928	Service Status Priority Setup	4
5929	Service Shelf	4
5934	Service Register	42
5936	Service Document Register	21
5940	Service Item	397067
5941	Service Item Component	148
5942	Service Item Log	1588369
5943	Troubleshooting Header	5
5944	Troubleshooting Line	13
5945	Troubleshooting Setup	17
5954	Work-Hour Template	3
5955	Skill Code	6
5956	Resource Skill	1303020
5957	Service Zone	7
5958	Resource Service Zone	10
5964	Service Contract Line	29
5965	Service Contract Header	7
5966	Contract Group	5
5967	Contract Change Log	84
5968	Service Contract Template	4
5969	Contract Gain/Loss Entry	6
5970	Filed Service Contract Header	6
5971	Filed Contract Line	26
5973	Service Contract Account Group	2
6080	Service Price Group	3
6081	Serv. Price Group Setup	3
6082	Service Price Adjustment Group	2
6083	Serv. Price Adjustment Detail	4
6502	Item Tracking Code	6
6508	Value Entry Relation	7
6635	Return Reason	6
6650	Return Shipment Header	5488
6651	Return Shipment Line	27432
6660	Return Receipt Header	16938
6661	Return Receipt Line	84674

Table no.	Table name	No. of records
6800	Employee Portal Setup	1
6804	EP Group	2
6805	EP Web Part Request	55
6806	EP WP Request Table Tab	75
6807	EP WP Request Tab Field	367
6809	EP WP Request Table Action	45
6811	EP WP Request Table	55
6813	EP WPR Table Action Filter	20
6815	EP WPR Header/Line Connection	16
6824	EP WPR Header Create Criterion	2
6827	EP WPR Field Lookup	45
6828	EP WPR Field Lookup Condition	8
6829	EP WPR Field Lookup Mapping	67
6832	EP WPR Table Filter Field	10
6850	EP Caption	58
6870	EP Appln. Server Setup	1
7002	Sales Price	2
7004	Sales Line Discount	9
7012	Purchase Price	20
7014	Purchase Line Discount	3
7111	Analysis Report Name	10
7112	Analysis Line Template	7
7113	Analysis Type	27
7114	Analysis Line	73
7116	Analysis Column Template	6
7118	Analysis Column	46
7132	Item Budget Name	4
7134	Item Budget Entry	3
7135	Item Budget Dimension	3
7152	Item Analysis View	4
7154	Item Analysis View Entry	1992719
7156	Item Analysis View Budg. Entry	3
7300	Zone	9
7302	Bin Content	51
7303	Bin Type	6
7304	Warehouse Class	5
7305	Special Equipment	3
7307	Put-away Template Header	2
7308	Put-away Template Line	9

Table no.	Table name	No. of records
7309	Warehouse Journal Template	3
7310	Warehouse Journal Batch	3
7312	Warehouse Entry	77
7313	Warehouse Register	4
7316	Warehouse Receipt Header	2
7317	Warehouse Receipt Line	8
7318	Posted Whse. Receipt Header	2
7319	Posted Whse. Receipt Line	6
7320	Warehouse Shipment Header	4
7321	Warehouse Shipment Line	16
7324	Whse. Put-away Request	2
7325	Whse. Pick Request	2
7327	Whse. Worksheet Name	9
7328	Whse. Worksheet Template	3
7336	Bin Creation Wksh. Template	2
7337	Bin Creation Wksh. Name	4
7354	Bin	108
7381	Phys. Invt. Counting Period	3
7600	Base Calendar	2
7601	Base Calendar Change	35
7700	Miniform Header	9
7701	Miniform Line	46
7702	Miniform Function Group	10
7703	Miniform Function	41
8000	Notification Setup	1

Table no.	Table name	No. of records
9053	Sales Cue	1
99000750	Work Shift	2
99000751	Shop Calendar	2
99000752	Shop Calendar Working Days	10
99000754	Work Center	4
99000756	Work Center Group	2
99000757	Calendar Entry	9378
99000758	Machine Center	14
99000763	Routing Header	4
99000764	Routing Line	21
99000765	Manufacturing Setup	1
99000771	Production BOM Header	8
99000772	Production BOM Line	37
99000777	Routing Link	3
99000780	Capacity Unit of Measure	3
99000850	Planning Assignment	79
99000851	Production Forecast Name	2
99000852	Production Forecast Entry	12
99000866	Capacity Constrained Resource	1
99000875	Order Promising Setup	1
99000772	Production BOM Line	37
99000777	Routing Link	3
99000780	Capacity Unit of Measure	3
99000850	Planning Assignment	79
99000851	Production Forecast Name	2
99000852	Production Forecast Entry	12
99000866	Capacity Constrained Resource	1
99000875	Order Promising Setup	1

APPENDIX E: PERFORMANCE COUNTERS (SCALABILITY TESTS)

The following section contains an overview of the performance counters from the servers gathered during the application tests with 2 x 25 and 2 x 50 concurrent users and their respective results. All numbers are averages for the entire test, excluding the first 30 minutes and the last 10 minutes, which are considered warmup and cooldown times.

SQL	2 x 25 users	2 x 50 users
SQLServer:Access Methods;Full Scans/sec;	97,81	194,04
SQLServer:Locks;Average Wait Time (ms);_Total	390,01	519,55
SQLServer:Locks;Lock Wait Time (ms);_Total	225,31	753,56
SQLServer:Locks;Lock Waits/sec;_Total	0,57	1,45
SQLServer:Locks;Number of Deadlocks/sec;_Total	0,00	0,00
SQLServer:SQL Statistics;Batch Requests/sec;	567,19	1.128,75
SQLServer:Access Methods;Full Scans/sec;	97,81	194,04

Misc	2 x 25 users	2 x 50 users
PhysicalDisk;Avg. Disk Queue Length;_Total	97,81	194,04
Processor;% Processor Time;_Total	390,01	519,55

General memory	NAV Srvr 1 2 x 25 users	NAV Srvr 2 2 x 25 users	NAV Srvr 1 2 x 50 users	NAV Srvr 2 2 x 50 users
Memory;Available MBytes;	3.285,68	3.268,25	2.891,58	2.888,20
Memory;Page Faults/sec;	257,94	265,93	502,26	504,08
Memory;Page Reads/sec;	4,37	6,15	12,90	12,56
Memory;Page Writes/sec;	0,00	0,00	0,00	0,00

.NET Misc	NAV Srvr 1 2 x 25 users	NAV Srvr 2 2 x 25 users	NAV Srvr 1 2 x 50 users	NAV Srvr 2 2 x 50 users
.NET CLR Memory;# Bytes in all Heaps;_Global_	25.139.460,00	33.568.860,00	32.223.650,00	33.716.980,00
.NET CLR Memory;% Time in GC;_Global_	7,64	7,96	16,01	15,55

Misc	NAV Srvr 1 2 x 25 users	NAV Srvr 2 2 x 25 users	NAV Srvr 1 2 x 50 users	NAV Srvr 2 2 x 50 users
PhysicalDisk;Avg. Disk Queue Length;_Total	0,02	0,03	0,06	0,06
Processor;% Processor Time;_Total	6,85	7,43	15,83	15,70

System	NAV Srvr 1 2 x 25 users	NAV Srvr 2 2 x 25 users	NAV Srvr 1 2 x 50 users	NAV Srvr 2 2 x 50 users
System;Context Switches/sec;	1.232,80	1.241,97	1.968,88	2.018,00
System;Processor Queue Length;	0,12	0,13	0,30	0,27

Microsoft Dynamics NAV Server	NAV Srvr 1 2 x 25 users	NAV Srvr 2 2 x 25 users	NAV Srvr 1 2 x 50 users	NAV Srvr 2 2 x 50 users
Process;Virtual Bytes;Microsoft.Dynamics.Nav.Server	949.259.100	955.625.900	1.709.313.000	1.685.012.000
Process;Working Set;Microsoft.Dynamics.Nav.Server	488.638.500	506.782.500	900.397.400	903.909.300

	NAV Srvr 1 2 x 25 users	NAV Srvr 2 2 x 25 users	NAV Srvr 1 2 x 50 users	NAV Srvr 2 2 x 50 users
Paging File;% Usage;_Total	0,34	0,34	0,34	0,34

APPENDIX F: PERFORMANCE COUNTERS (CLIENT TESTS)

The following section contains performance counters from the client machine during the single-user tests.

CPU usage	Value
.; .NET CLR Jit; % Time in Jit; _Global_	62,85
.; .NET CLR Memory; % Time in GC; _Global_	2,41
.; .NET CLR Security; % Time in RT checks; _Global_	12,62
.; Processor; % Processor Time; _Total	30,33

.NET Misc	Value
.; .NET CLR Exceptions; # of Exceps Thrown / sec; _Global_	0,35
.; .NET CLR Loading; Total Assemblies; _Global_	71,00
.; .NET CLR Loading; Total Classes Loaded; _Global_	2.483,00
.; .NET CLR Remoting; Remote Calls/sec; _Global_	2,30

Memory	Value
.; .NET CLR Memory; # Bytes in all Heaps; _Global_	10.875.524,40
.; Memory; Page Faults/Sec;	3.821,36

Microsoft Dynamics is a line of integrated, adaptable business management solutions that enables you and your people to make business decisions with greater confidence. Microsoft Dynamics works like and with familiar Microsoft software, automating and streamlining financial, customer relationship, and supply chain processes in a way that helps you drive business success.

U.S. and Canada Toll Free (888) 477-7989
Worldwide (1) (701) 281-6500
www.microsoft.com/dynamics

Microsoft