



# Microsoft Dynamics NAV 2013 R2 Sizing Guidelines for On-Premises Single Tenant Deployments

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White Paper

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# Microsoft Dynamics NAV 2013 R2 Sizing Guidelines for On-Premises Single Tenant Deployments

This whitepaper provides guidance on how to size a deployment of Microsoft Dynamics NAV 2013 R2 for single tenant databases when you want to optimize your solution and processes for scale and volume. The load tests used to make these measurements simulated up to 500 concurrent users performing a mixture of tasks at a fixed rate per user / per hour on a single-tenant, single-company Microsoft Dynamics NAV database.

The sizing and performance recommendations are very specific to the scenarios performed. The performance result that you find in this document may differ from the results you experience in customer implementations. If you need exact sizing and performance information, then we suggest that you perform similar testing for your solution with a representative mixture of scenarios and appropriate usage patterns.

Many factors influence sizing recommendations and application performance:

- Usage patterns such as the mixture of transactional and consulting scenarios.
- The number of users who carry out the same tasks at the same time, which results in locking delays.
- How the solution is customized from the standard Microsoft Dynamics NAV solution provided by Microsoft.
- The amount of data in the Microsoft SQL Server database.
- How optimized the underlying database is for the transactional and consulting scenarios.
- The underlying software, hardware and network infrastructure.
- Other applications running in the same environment.

## Sizing Recommendations Summary

The test results demonstrate that with the loads described it is possible to run 500 concurrent users, each executing up to 90 transactions per hour on a single Microsoft Dynamics NAV Server instance with 16 GB of RAM and a Quad Core Processor at 2.45 GHz. To determine the resource requirements we compared four Microsoft Dynamics NAV Server configurations with the same workload.

Configuration	CPU (2.45 GHz)	RAM
1	4 Cores	16 GB
2	4 Cores	6 GB
3	2 Cores	6 GB
4 (2 NAV Servers)	2 * 4 Cores	2 * 16 GB

Based on the test results, our recommendations for sizing Microsoft Dynamics NAV Server for single tenant on-premises usage are:

- Up to 150 users per CPU core on each Microsoft Dynamics NAV Server instance
- Minimum 5 MB memory per active user on each Microsoft Dynamics NAV Server instance

## Workloads used in the tests

We based the guidelines in this whitepaper on a series of test simulations on a single-tenant Microsoft Dynamics NAV 2013 R2 deployment. The simulations included Transactional User scenarios and Consulting scenarios. We chose the usage patterns in the tests to simulate a high but sustainable workload rather than to overload the server.

The following tables describe the profiles and the number of scenarios performed per hour for the users in our simulations. For these tests, we used the Intense User profile.

### Transactional scenarios:

Task	Occasional user	Regular user	Frequent user	Intense user
Create And Post Customer Receipt	2	6	12	18
Create And Post G/L Transaction	2	6	12	18
Create And Post Purchase Invoice	2	6	12	18
Create And Post Sales Invoice	2	6	12	18
Create And Post Vendor Payment	2	6	12	18
<b>Total</b>	<b>10</b>	<b>30</b>	<b>60</b>	<b>90</b>

#### Consulting scenarios:

Task	Occasional user	Regular user	Frequent user	Intense user
Customer Lookup	4	3	6	9
Item Lookup	4	3	6	9
Purchase Doc Lookup	4	3	6	9
Sales Doc Lookup	4	3	6	9
Vendor Lookup	4	3	6	9
Chart Of Accounts	4	3	6	9
<b>Total</b>	<b>24</b>	<b>18</b>	<b>36</b>	<b>54</b>

Each user performed the specified number of tasks every hour. The load test agent distributes the tests over the hour using a normal statistical distribution applied to the wait time between the tests. The tests will still run for example 10 tests per hour, but it will not necessarily be a 6-minute delay between them.

Every scenario consists of one or more tasks. For example, the transactional scenario for creating and posting a sales invoice, the following tasks are included:

- Opening the Sales Invoice page.
- Creating a new Sales Invoice header.
- Fill in Sales Invoice header information.
- Creating Sales Invoice lines.
- Posting the invoice.
- Closing the page.

For each task in a transactional or consulting scenario, we defined the tasks and set the targets for a good and an acceptable response time. For details, see [Appendix B: Response Times for the Test Tasks with Goals](#)

#### Simulated Concurrent User Load

During the test run, we increase the user load by 20 users every 10 minutes. Half the users run transactional scenarios and half run consulting scenarios. Thus at a load of 200 users the test agents are executing 9000 transactional scenarios and 5400 consulting scenarios per hour. The combined workloads correspond to the following actual test scenario and task rates per second.

User Load	Total Scenarios/sec	Total Task/Sec
100	2,1	27,3
200	4,1	54,3
300	6,2	79,6
400	8,2	107,6
500	10,4	138,4

## Test Environment

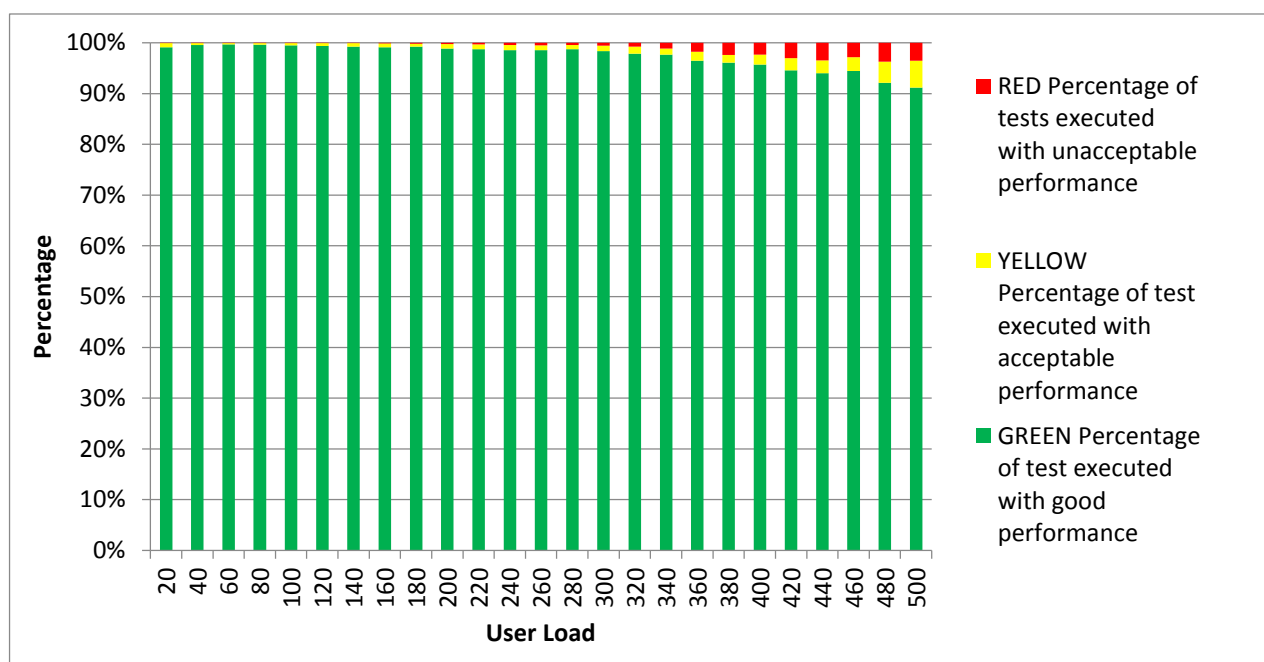
We used Windows 2012 R2 Virtual Machines as the platform for these tests. The test configuration consists of a Visual Studio Load Test Controller, which controls four Load Test Agents, each simulating up to 125 users. The Load Test Agents connects to the Microsoft Dynamics NAV Server, which connects to SQL Server. The sizing guideline does not cover the requirements for the Microsoft Dynamics NAV Windows clients, as the goal is to simulate an environment where each client is a separate machine. When deploying Microsoft Dynamics NAV Windows clients using terminal services, you must consider the resources consumed by each client process.

[Appendix C: Test Environment](#) describes the specifications of the hardware, software, and the virtual machines used during the tests.

## Test Results

The chart below shows the percentage of user tasks with response times meeting the goals as the user load is increased. The graph shows that with even with 500 concurrent users 90% of tasks are completed within an acceptable response time.

- X-Axis: % of scenarios executed within the response time range
- Y-Axis: Number of concurrent user sessions



For more detailed test information, see [Appendix A: Detailed Test Results](#).

For more information about the timeframes that are good or acceptable for each scenario, see [Appendix B: Response Times for the Test Tasks with Goals](#)

## Sizing Conclusions for Single-Tenant On-Premises Deployments

### *Resources consumed by Microsoft Dynamics NAV Server instances*

The following recommendations are based on the resources metrics collected from the test machines at the start of the test run and at the maximum load of 500 users.

### *Memory Requirements*

At the peak load of 500 concurrent users the memory consumed by the Dynamics NAV Server process was approximately 3.3GB. Each user session that connects to a Microsoft Dynamics NAV Server was calculated to need approximately **5 MB of RAM per user**, this takes into account the operating system and initial server memory requirements.

The following table shows approximate memory usage requirements based on the performance counters collected during the test run.

Windows Server 2012 R2 Initial Memory	1.5 GB
Microsoft Dynamics NAV Server Initial Memory	0.5 GB
Estimated Peak Memory Use for 500 User Sessions	2.5 GB
Total Memory used at 500 User Session	4.5 GB

### *The need of processor cores versus memory*

The test showed that adding RAM to the server is not sufficient to scale out to more users; however, other scenarios like reporting might benefit from additional RAM. In our scenarios, the limiting factor on the virtual machine size is not RAM, but the amount of available cores. In our tests, we used 4 cores on 1 virtual machine to support 500 concurrent users.

A rule of thumb for sizing is that **each processor core is capable of handling up to 150 users at the loads described**.

When you calculate your resource requirements, you must take into account the minimum server requirements and the requirements of any additional components on Microsoft Dynamics NAV Server. For more information, see System Requirements for Microsoft Dynamics NAV 2013 R2 in the MSDN Library at the following location:

[http://msdn.microsoft.com/en-us/library/dd301054\(v=nav.71\).aspx](http://msdn.microsoft.com/en-us/library/dd301054(v=nav.71).aspx).

### *Adding additional Microsoft Dynamics NAV Server instances to the topology*

We have discussed the sizing based on how many users you can fit on the virtual machine setup described. Increasing the resources of the virtual machine is called *scaling up*.

*Scaling out* is adding more virtual machines to the environment and load balancing the clients across the machines. One Microsoft Dynamics NAV Server instance with 4 CPU cores and a minimum 6 GB RAM can handle 500 concurrent users. Additional Microsoft Dynamics NAV Server instances will increase the capacity but with the cost of increase SQL Server load and CPU usage due to server cache synchronization. We recommend scaling out by adding additional machines with one Microsoft Dynamics NAV Server instance on each.

For more information, see Scaling the Microsoft Dynamics NAV Network Topology in the MSDN Library at the following location: [http://msdn.microsoft.com/en-us/library/dn271671\(v=nav.71\).aspx](http://msdn.microsoft.com/en-us/library/dn271671(v=nav.71).aspx).

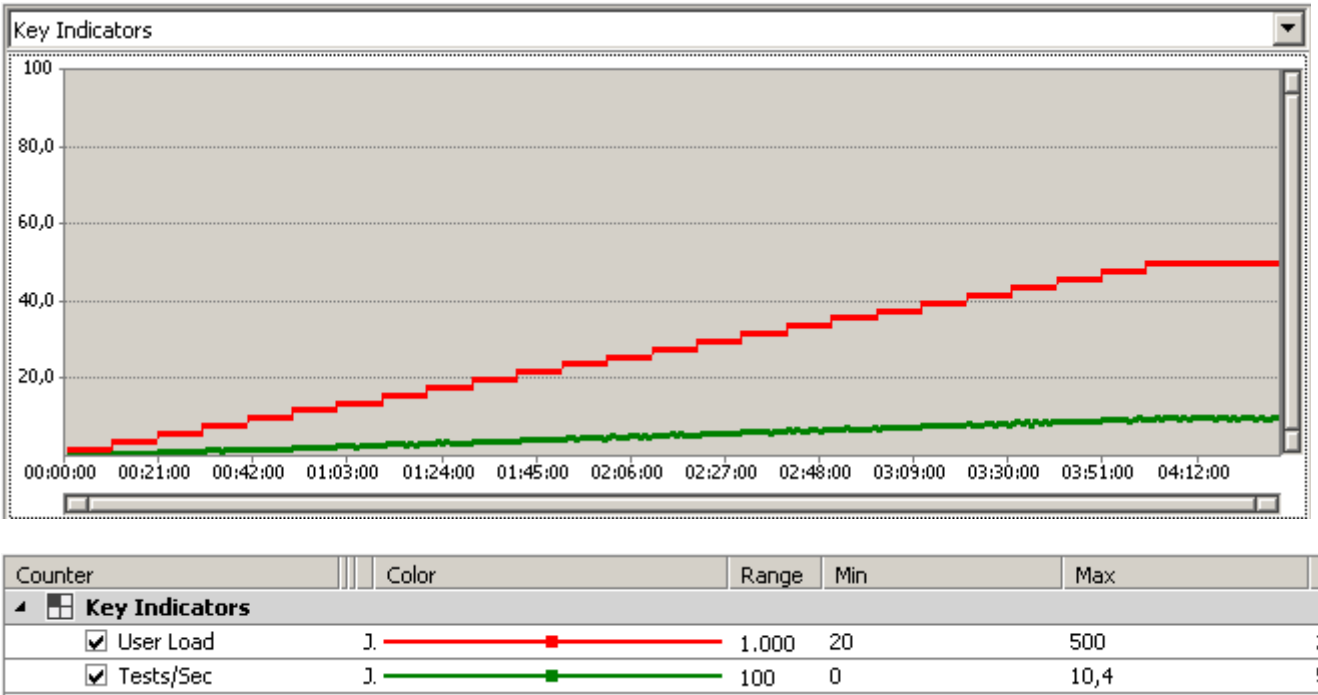


# Appendix A: Detailed Test Results

To confirm the sizing guidelines (150 users per core, 5MB per user), we did the same test runs with different configurations with reduced memory and with reduced number of cores. Performance indicators for each test run are shown below:

## User Load

The same user load applies for each test run. During the test run, the User Load grows as shown in the graph below. The User Load is kept stable for 10 minutes, then over 60 seconds, 20 more users are added. The tests per second increases with the user load.



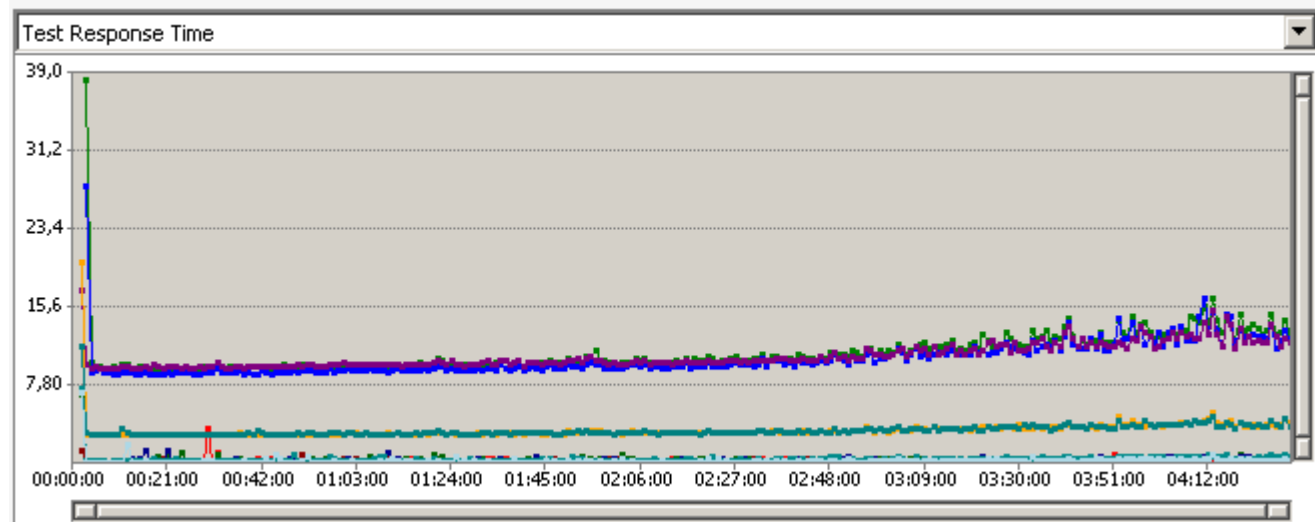
## Configuration 1: Microsoft Dynamics NAV Server 4 CPU Cores, 16GB RAM

### Performance Metrics

Machine	Process Total CPU %	Process Peak Memory	SQL Batches/Sec	SQL Disk Sec/Write	SQL Disk Write Queue
Microsoft Dynamics NAV Server	36%	3.3GB			
Microsoft SQL Server	29%	5.8GB	1846	21ms	1.12

### Test Response Times

The Average Test Response times grows slightly as expected but remains stable when the load is stable.

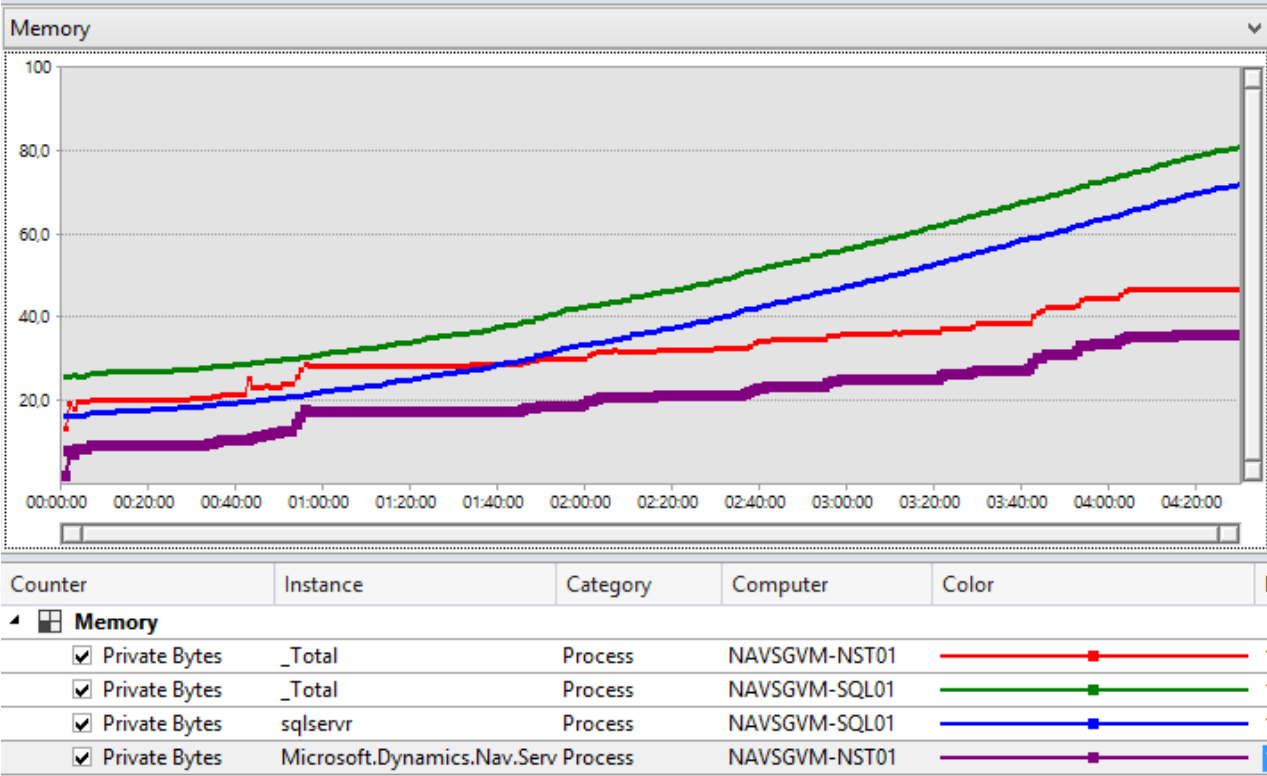


Profile	Scenario	Total	Average (sec)	Percentile 95% (sec)
Consulting	CustomerLookup	5403	0,37	1,12
Consulting	ItemLookup	5365	0,39	1,18
Consulting	PurchaseDocLookup	5390	0,28	1,03
Consulting	SalesDocLookup	5383	0,40	1,18
Consulting	VendorLookup	5391	0,47	1,29
Consulting	ChartOfAccountSim	5395	0,31	1,10
Transactional	CreateAndPostCustomerReceipt	10773	3,41	5,32
Transactional	CreateAndPostGLTransaction	10714	11,11	16,67
Transactional	CreateAndPostPurchaseInvoice	10786	11,53	17,94
Transactional	CreateAndPostSalesInvoice	10689	10,93	17,00
Transactional	CreateAndPostVendorPayment	10829	3,43	5,37



Memory Consumption

When the test load stabilizes at 500 users, the Microsoft Dynamics NAV Server process memory remains stable at 3.3 GB, whereas SQL Server memory continues to increase because SQL Server continues to cache the data that is created by the tests.



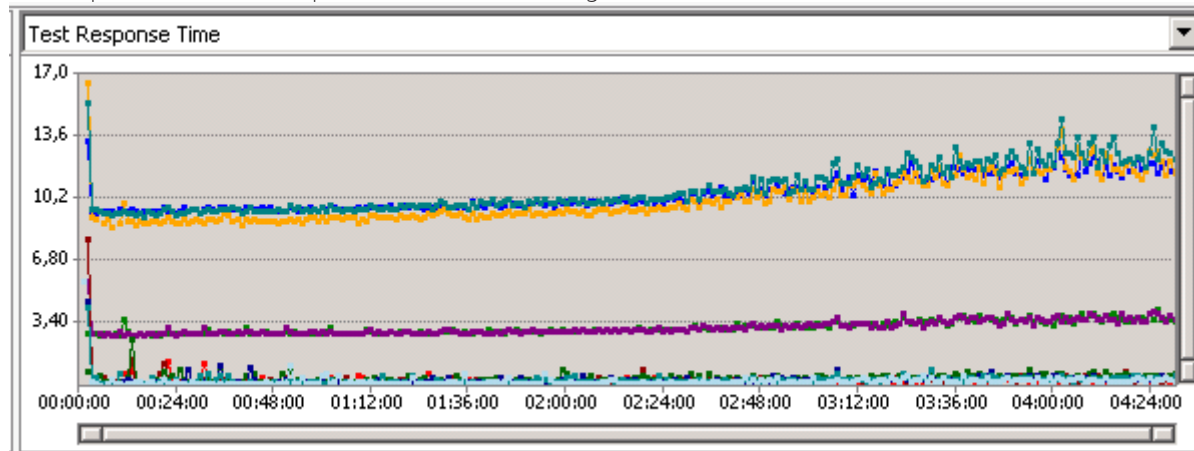
Machine	Category	Counter	Instance	Min GB	Max GB
NAVSGVM-NST01	Process	Private Bytes	_Total	1.3	4.4
NAVSGVM-NST01	Process	Private Bytes	Microsoft.Dynamics.Nav.Server	0,3	3.3
NAVSGVM-SQL01	Process	Private Bytes	_Total	2.6	7.6
NAVSGVM-SQL01	Process	Private Bytes	Sqlservr	1.6	6.7

## Configuration 2: 1 Microsoft Dynamics NAV Server 4 Cores 6 GB RAM

The purpose of this configuration is to confirm the minimum memory requirement for Microsoft Dynamics NAV Server with the workload described in the previous section.

### Test Response Time

Test response times are comparable to the 16 GB configuration.

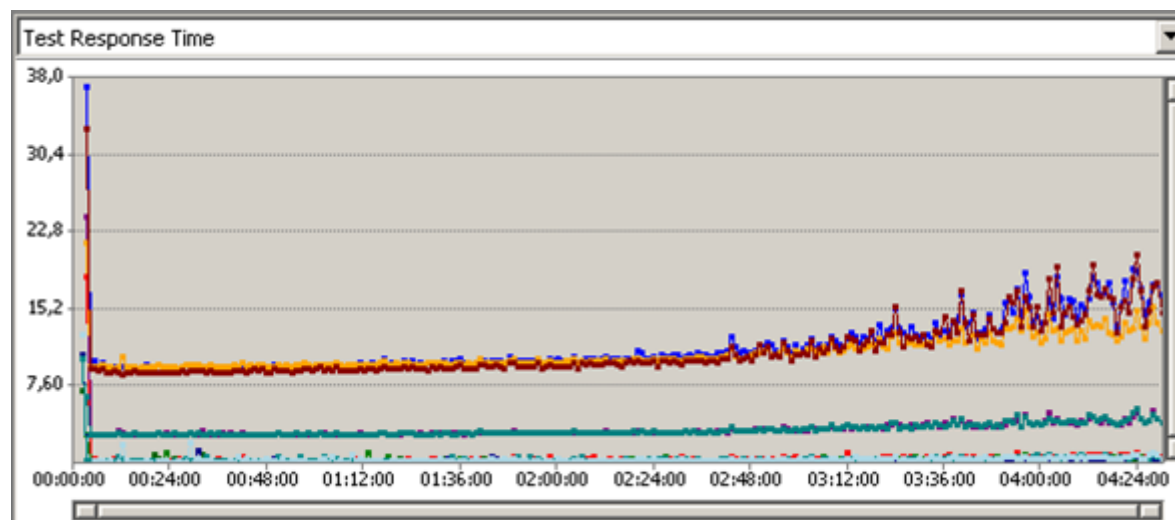


Profile	Scenario	Total	Average (sec)	Percentile 95% (sec)
Consulting	ChartOfAccountSim	5.608	0,29	0,89
Consulting	CustomerLookup	5.616	0,37	1,06
Consulting	ItemLookup	5.596	0,37	1,10
Consulting	PurchaseDocLookup	5.613	0,27	0,86
Consulting	SalesDocLookup	5.594	0,37	1,00
Consulting	VendorLookup	5.628	0,48	1,35
Transactional	CreateAndPostCustomerReceipt	11.189	3,38	5,06
Transactional	CreateAndPostGLTransaction	11.212	11,0	15,7
Transactional	CreateAndPostPurchaseInvoice	11.192	11,4	16,8
Transactional	CreateAndPostSalesInvoice	11.145	10,8	16,1
Transactional	CreateAndPostVendorPayment	11.243	3,38	5,04

### Configuration 3: 1 Microsoft Dynamics NAV Server 2 Cores 6 GB RAM

The purpose of this configuration is to confirm the minimum CPU and memory requirements for Microsoft Dynamics NAV Server with the workload described in the previous section.

Response time starts to degrade at a User Load above 300. This confirms the recommended 150 users per CPU core. The number of errors grows because the tests run while the run slower when CPU is limited, which means there is a greater risk of concurrency issues.

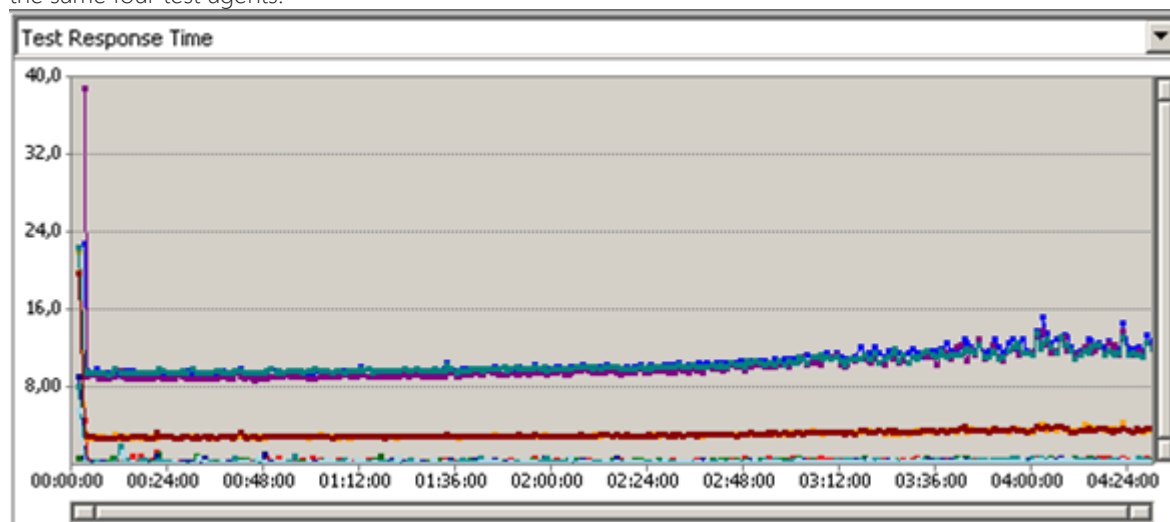


Profile	Scenario	Total	Average (sec)	Percentile 95% (sec)
Consulting	ChartOfAccountSim	5.627	0,31	0,95
Consulting	CustomerLookup	5.602	0,43	1,24
Consulting	ItemLookup	5.578	0,43	1,22
Consulting	PurchaseDocLookup	5.596	0,30	0,99
Consulting	SalesDocLookup	5.594	0,47	1,32
Consulting	VendorLookup	5.608	0,54	1,38
Transactional	CreateAndPostCustomerReceipt	11.213	3,59	5,42
Transactional	CreateAndPostGLTransaction	11.174	11,5	16,3
Transactional	CreateAndPostPurchaseInvoice	11.175	12,7	20,2
Transactional	CreateAndPostSalesInvoice	11.218	12,3	20,0
Transactional	CreateAndPostVendorPayment	11.186	3,58	5,38
Concurrency failures		254		

The error displays a message to the user: "The operation could not complete because a record in the Item Ledger Entry table was locked by another user. Please retry the activity."

#### Configuration 4: 2 Microsoft Dynamics NAV Server Instances with 4 CPU Cores 16 GB RAM:

To measure the effect of having multiple Microsoft Dynamics NAV Server instances, we further configured an extra virtual machine with a Microsoft Dynamics NAV Server instance and distributed the load across the two instances using the same four test agents.



As can be seen response time graph looks flatter, but the price is a little slower response time:

Profile	Scenario	Total	Average (sec)	Percentile 95% (sec)
Consulting	ChartOfAccountSim	5.606	0,32	1,10
Consulting	CustomerLookup	5.629	0,39	1,12
Consulting	ItemLookup	5.601	0,41	1,18
Consulting	PurchaseDocLookup	5.609	0,30	1,03
Consulting	SalesDocLookup	5.597	0,42	1,18
Consulting	VendorLookup	5.593	0,49	1,29
Transactional	CreateAndPostCustomerReceipt	11.228	3,48	5,32
Transactional	CreateAndPostGLTransaction	11.128	11,3	16,7
Transactional	CreateAndPostPurchaseInvoice	11.231	11,8	17,9
Transactional	CreateAndPostSalesInvoice	11.118	11,2	17,0
Transactional	CreateAndPostVendorPayment	11.253	3,49	5,37

## Appendix B: Response Times for the Test Tasks with Goals

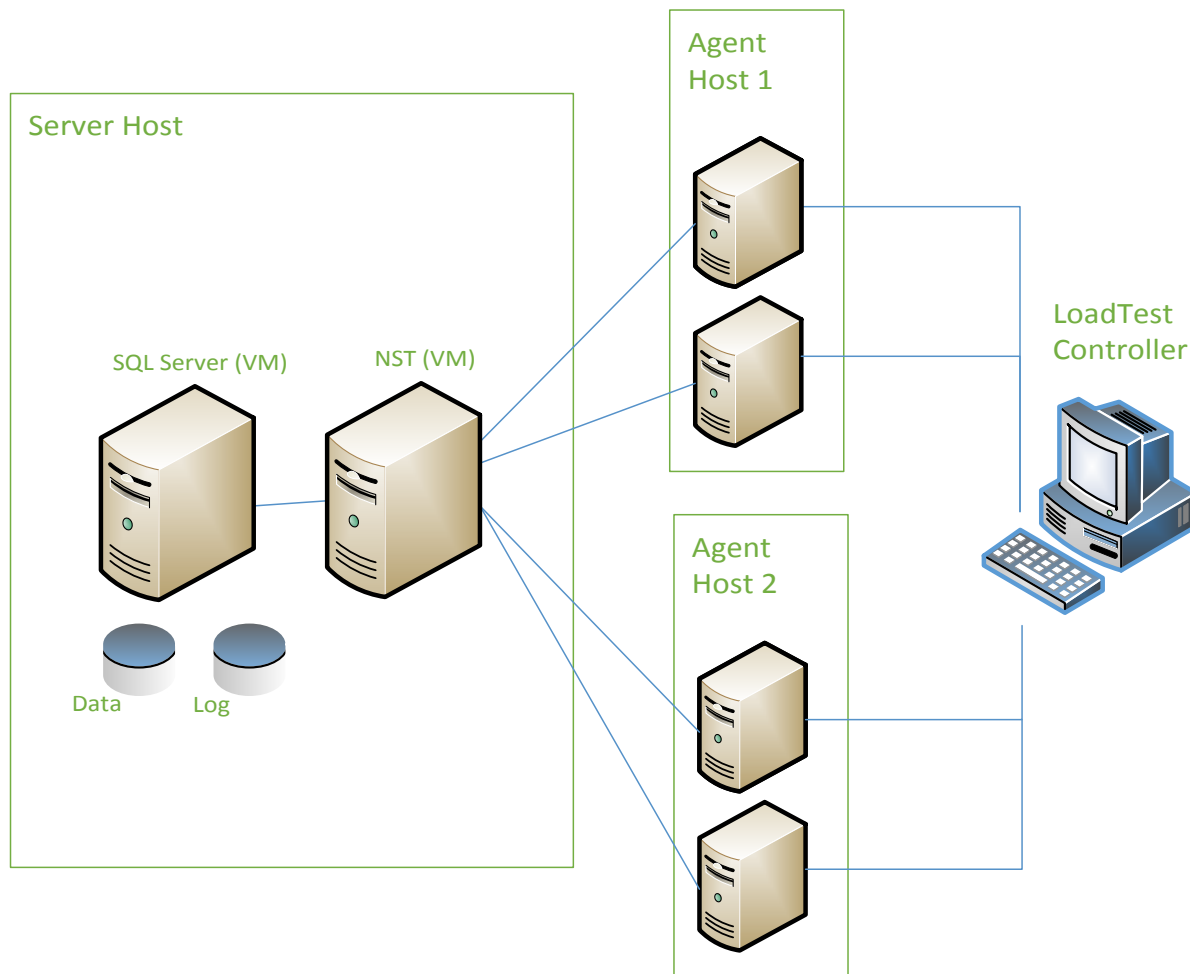
The following table lists the tasks performed in each scenario. Response time is in number of milliseconds. These results are for Test Configuration #1.

Profile	Scenario	Task	Avg.	95 % <sup>1</sup>	Good	Acceptable
<b>Consulting</b>	ChartOfAccountSim	Open Page 16	204	651	500	1000
<b>Consulting</b>	ChartOfAccountSim	Close Page16	25	55	500	1000
<b>Consulting</b>	CustomerLookup	Open Page 22	289	777	500	1000
<b>Consulting</b>	CustomerLookup	Close Page22	32	76	500	1000
<b>Consulting</b>	ItemLookup	Open Page 31	279	746	500	1000
<b>Consulting</b>	ItemLookup	Close Page31	33	67	500	1000
<b>Consulting</b>	PurchaseDocLookup	Open Page 9308	181	618	500	1000
<b>Consulting</b>	PurchaseDocLookup	Close Page9308	24	51	500	1000
<b>Consulting</b>	SalesDocLookup	Open Page 9301	279	734	500	1000
<b>Consulting</b>	SalesDocLookup	Close Page9301	31	73	500	1000
<b>Consulting</b>	VendorLookup	Open Page 27	367	859	500	1000
<b>Consulting</b>	VendorLookup	Close Page 27	36	83	500	1000
<b>Transactional</b>	CreateAndPostCustomerReceipt	Open Page 39	114	217	500	1000
<b>Transactional</b>	CreateAndPostCustomerReceipt	Set Batch Name	82	168	200	500
<b>Transactional</b>	CreateAndPostCustomerReceipt	Set Account Type	62	161	200	500
<b>Transactional</b>	CreateAndPostCustomerReceipt	Set Account No.	109	240	200	500
<b>Transactional</b>	CreateAndPostCustomerReceipt	Set Document No.	55	114	200	500
<b>Transactional</b>	CreateAndPostCustomerReceipt	Set Amount	54	117	200	500
<b>Transactional</b>	CreateAndPostCustomerReceipt	Set Bal. Account No.	61	129	200	500
<b>Transactional</b>	CreateAndPostCustomerReceipt	Press Post	82	176	200	500
<b>Transactional</b>	CreateAndPostCustomerReceipt	Press Yes	67	157	2000	5000
<b>Transactional</b>	CreateAndPostCustomerReceipt	Press OK	48	100	200	500
<b>Transactional</b>	CreateAndPostCustomerReceipt	Close Page	30	72	200	500
<b>Transactional</b>	CreateAndPostGLTransaction	Open Page 39	116	224	500	1000
<b>Transactional</b>	CreateAndPostGLTransaction	Set Batch Name	82	165	200	500
<b>Transactional</b>	CreateAndPostGLTransaction	Set Account Type	27	95	200	500
<b>Transactional</b>	CreateAndPostGLTransaction	Set Account No.	113	246	200	500
<b>Transactional</b>	CreateAndPostGLTransaction	Set Document No.	54	115	200	500
<b>Transactional</b>	CreateAndPostGLTransaction	Set Amount	63	133	200	500
<b>Transactional</b>	CreateAndPostGLTransaction	Set Bal. Account No.	63	132	200	500
<b>Transactional</b>	CreateAndPostGLTransaction	Press Post	77	172	500	1000
<b>Transactional</b>	CreateAndPostGLTransaction	Press Yes	91	188	2000	5000
<b>Transactional</b>	CreateAndPostGLTransaction	Press OK	51	106	500	1000
<b>Transactional</b>	CreateAndPostGLTransaction	Close Page	32	77	500	1000
<b>Transactional</b>	CreateAndPostPurchaseInvoice	Open Page 9308	126	248	500	1000
<b>Transactional</b>	CreateAndPostPurchaseInvoice	New Card	223	409	500	1000
<b>Transactional</b>	CreateAndPostPurchaseInvoice	Set Buy-from Vendor No.	329	595	500	1000
<b>Transactional</b>	CreateAndPostPurchaseInvoice	Set Posting Date	71	144	200	500

<sup>1</sup> 95<sup>th</sup> Percentile value, for the purposes of response times, this statistic is read: "Ninety-five percent of the simulated users experienced a response time of this value or less under the same conditions as the test execution." See [Chapter 15 – Key Mathematic Principles for Performance Testers](#)

<b>Transactional</b>	CreateAndPostPurchaseInvoice	Set Expected Receipt Date	58	120	200	500
<b>Transactional</b>	CreateAndPostPurchaseInvoice	Set Vendor Invoice No.	59	123	200	500
<b>Transactional</b>	CreateAndPostPurchaseInvoice	Set Type	24	60	200	500
<b>Transactional</b>	CreateAndPostPurchaseInvoice	Set No.	76	166	200	500
<b>Transactional</b>	CreateAndPostPurchaseInvoice	Set Quantity	61	127	200	500
<b>Transactional</b>	CreateAndPostPurchaseInvoice	Release	334	660	500	1000
<b>Transactional</b>	CreateAndPostPurchaseInvoice	Press Post	26	63	500	1000
<b>Transactional</b>	CreateAndPostPurchaseInvoice	Press Yes	663	1465	2000	5000
<b>Transactional</b>	CreateAndPostPurchaseInvoice	Close Form	22	47	500	1000
<b>Transactional</b>	CreateAndPostSalesInvoice	Open Page 9301	228	395	500	1000
<b>Transactional</b>	CreateAndPostSalesInvoice	New Card	260	476	500	1000
<b>Transactional</b>	CreateAndPostSalesInvoice	Set Sell-to Customer No.	290	500	500	1000
<b>Transactional</b>	CreateAndPostSalesInvoice	Set Posting Date	72	148	200	500
<b>Transactional</b>	CreateAndPostSalesInvoice	Set Shipment Date	61	124	200	500
<b>Transactional</b>	CreateAndPostSalesInvoice	Set Type	29	80	200	500
<b>Transactional</b>	CreateAndPostSalesInvoice	Set No.	91	200	500	1000
<b>Transactional</b>	CreateAndPostSalesInvoice	Set Quantity	59	126	200	500
<b>Transactional</b>	CreateAndPostSalesInvoice	Press Post	80	182	500	1000
<b>Transactional</b>	CreateAndPostSalesInvoice	Press Yes	588	1407	2000	5000
<b>Transactional</b>	CreateAndPostSalesInvoice	Close Form	31	75	500	1000
<b>Transactional</b>	CreateAndPostVendorPayment	Open Page 39	113	217	500	1000
<b>Transactional</b>	CreateAndPostVendorPayment	Set Batch Name	82	167	200	500
<b>Transactional</b>	CreateAndPostVendorPayment	Set Account Type	62	162	200	500
<b>Transactional</b>	CreateAndPostVendorPayment	Set Account No.	108	240	200	500
<b>Transactional</b>	CreateAndPostVendorPayment	Set Document No.	55	112	200	500
<b>Transactional</b>	CreateAndPostVendorPayment	Set Amount	55	119	200	500
<b>Transactional</b>	CreateAndPostVendorPayment	Set Bal. Account No.	64	134	200	500
<b>Transactional</b>	CreateAndPostVendorPayment	Press Post	79	171	500	1000
<b>Transactional</b>	CreateAndPostVendorPayment	Press Yes	68	156	2000	5000
<b>Transactional</b>	CreateAndPostVendorPayment	Press OK	47	102	500	1000
<b>Transactional</b>	CreateAndPostVendorPayment	Close Page	32	75	500	1000

## Appendix C: Test Environment



### Server host:

- 2 x Intel Xenon E5630 @ 2.56GHz Quad (Each PassMark: 5103, Combined: 8876)
- HyperThreading On
- 72 GB RAM
- Disk OS: 2 disks in Raid 1, on Dell PERC 6/i Integrated controller
- Disk Data: 1.6TB on 24x136GB 10k RPM SAS disks in Raid 10
- Disk RAID Controller: Dell PERC H800 and PowerVault MD1220 Direct Attached Storage
- Network: 4 Broadcom BCM5709C NetXtreme II Giga. NIC Teaming on (Network Performance Counters on Host confirms, that the traffic hits the network).

### Agent host:

- Intel Xenon X5450@3.00GHz Quad (Each PassMark 4291, Combined: 7686)
- HyperThreading off
- 32GB Ram
- 1 disk OS
- 4 x 10K SAS disks in Raid0+1 for VMs

### Virtual Machines:

- 1 Microsoft Dynamics NAV 2013 R2 Server Build 37102
  - Windows Server 2012 R2 Datacenter
  - Quad Core Xenon E5630 @ 2.56GHz
  - 16GB RAM
  - Dynamic disk 220GB



- 1 Database Server: Microsoft SQL Server 2012
  - Windows Server 2012 R2 Datacenter
  - Quad Core E5630 @ 2.56GHz
  - 16GB RAM
  - Dynamic disk 220GB, SQL Data Partition 256 GB Fixed, SQL Log: Fixed 64 GB
  - Demo database from the W1 version of Microsoft Dynamics NAV 2013 R2 with Additional Data Initial Size. Approximately 50GB
  
- 4 x Test Agents with NAV Test Clients (each running 125 Users)
  - Windows Server 2012 R2 Datacenter
  - Quad core Intel Xenon X5450@3.00GHz
  - HyperThreading Off
  - 12 GB RAM
  - Dynamic disk 220GB

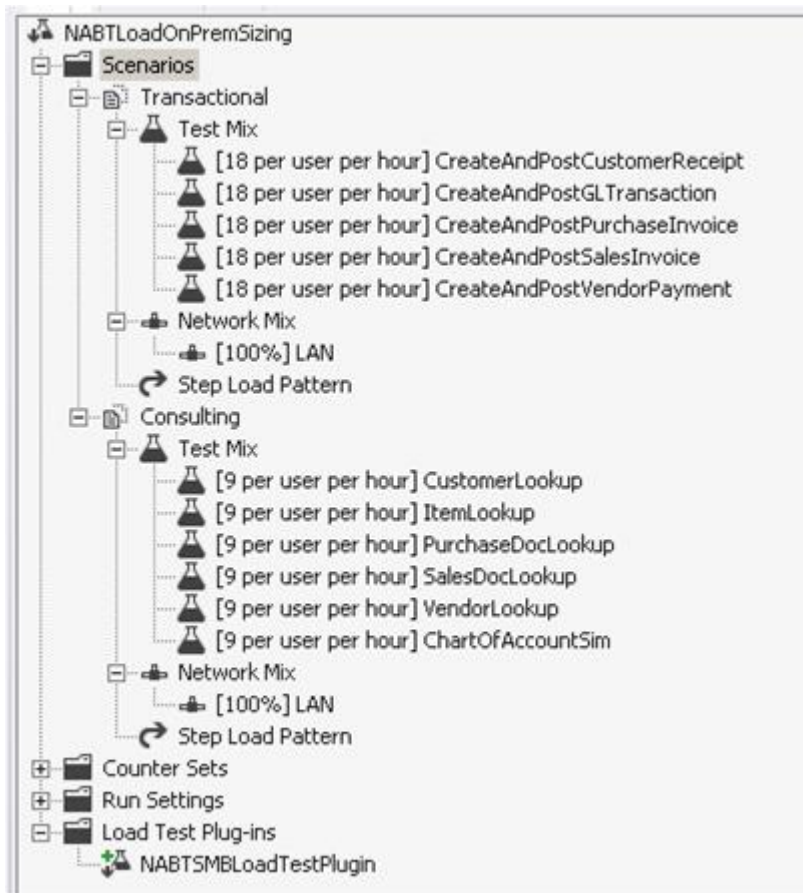
## Appendix D: Load Test Tools

We performed the load test using Visual Studio Load Test with a Test Controller and four Load Test Agents. Test Response times and performance counters are collected by the Visual Studio Load Test framework.

The test client simulates user actions by calling UI Web Services methods in the Microsoft Dynamics NAV Web client. Each Test Client has its own Microsoft Dynamics NAV Web client process. The Microsoft Dynamics NAV Web Server components use the Microsoft Dynamics NAV Client Framework that is used by the Microsoft Dynamics NAV Web client and Microsoft Dynamics NAV Windows client.

To verify that the tests are representative of real client usage we recorded the server operations while performing the “Create and Post Sales Invoice” scenario manually in the Microsoft Dynamics NAV Windows client, compared them with the test scenario, and found that the test scenario executes the same operations on the server.

Here is an image of the Visual Studio Load Test Configuration used in the tests.



## Appendix E: Database Table Information

Company Name	Table No.	Table Name	No. of Records	Record Size	Size (KB)
CRONUS International Ltd.	17	G/L Entry	7267315	428.63	3042016
CRONUS International Ltd.	5802	Value Entry	6659209	683.77	4446640
CRONUS International Ltd.	32	Item Ledger Entry	6286646	344.98	2117912
CRONUS International Ltd.	5811	Post Value Entry to G/L	6208661	44.08	267248
CRONUS International Ltd.	113	Sales Invoice Line	4766423	759.93	3537264
CRONUS International Ltd.	111	Sales Shipment Line	4720301	793.48	3657688
CRONUS International Ltd.	339	Item Application Entry	3166312	91.33	282416
CRONUS International Ltd.	254	VAT Entry	2359013	552.74	1273360
CRONUS International Ltd.	379	Detailed Cust. Ledg. Entry	1854235	315.94	572088
CRONUS International Ltd.	21	Cust. Ledger Entry	1814231	607.34	1076032
CRONUS International Ltd.	5942	Service Item Log	1688301	118.07	194672
CRONUS International Ltd.	123	Purch. Inv. Line	1466928	1,029.64	1475008
CRONUS International Ltd.	121	Purch. Rcpt. Line	1454353	1,029.85	1462656
CRONUS International Ltd.	5956	Resource Skill	1384954	82.02	110936
CRONUS International Ltd.	7154	Item Analysis View Entry	1303125	239.02	304168
CRONUS International Ltd.	45	G/L Register	1259265	80.92	99512
CRONUS International Ltd.	46	Item Register	1257341	96.04	117920
CRONUS International Ltd.	110	Sales Shipment Header	944046	1,128.36	1040256
CRONUS International Ltd.	112	Sales Invoice Header	944034	1,123.44	1035712
CRONUS International Ltd.	380	Detailed Vendor Ledg. Entry	595273	305.94	177848
CRONUS International Ltd.	25	Vendor Ledger Entry	580382	590.28	334560
CRONUS International Ltd.	5940	Service Item	422050	549.83	226616
CRONUS International Ltd.	120	Purch. Rcpt. Header	290882	1,056.10	300000
CRONUS International Ltd.	122	Purch. Inv. Header	290881	1,161.99	330080
CRONUS International Ltd.	253	G/L Entry - VAT Entry Link	133743	26.34	3440
CRONUS International Ltd.	5804	Avg. Cost Adjmt. Entry Point	125862	45.89	5640
CRONUS International Ltd.	39	Purchase Line	117756	2,061.84	237104
CRONUS International Ltd.	115	Sales Cr.Memo Line	85495	761.76	63600
CRONUS International Ltd.	6661	Return Receipt Line	84674	697.94	57712
CRONUS International Ltd.	125	Purch. Cr. Memo Line	27663	970.73	26224
CRONUS International Ltd.	6651	Return Shipment Line	27432	718.50	19248
CRONUS International Ltd.	38	Purchase Header	24712	1,345.22	32464
CRONUS International Ltd.	6660	Return Receipt Header	16938	1,059.19	17520
CRONUS International Ltd.	114	Sales Cr.Memo Header	16938	1,078.53	17840
CRONUS International Ltd.	37	Sales Line	12180	1,666.65	19824
CRONUS International Ltd.	99000757	Calendar Entry	9378	203.53	1864
CRONUS International Ltd.	6650	Return Shipment Header	5488	995.64	5336
CRONUS International Ltd.	124	Purch. Cr. Memo Hdr.	5488	1,067.29	5720
CRONUS International Ltd.	81	Gen. Journal Line	4283	1,516.75	6344
CRONUS International Ltd.	36	Sales Header	2470	1,379.71	3328
CRONUS International Ltd.	401	XBRL Taxonomy Label	2257	123.41	272
CRONUS International Ltd.	395	XBRL Taxonomy Line	2257	210.52	464
CRONUS International Ltd.	398	XBRL Rollup Line	2255	94.45	208
CRONUS International Ltd.	5089	Contact Profile Answer	2031	137.14	272
CRONUS International Ltd.	396	XBRL Comment Line	1729	123.19	208
CRONUS International Ltd.	96	G/L Budget Entry	1728	123.26	208
CRONUS International Ltd.	405	Change Log Entry	1415	335.79	464
CRONUS International Ltd.	5086	Cont. Duplicate Search String	1280	115.20	144
CRONUS International Ltd.	366	Analysis View Budget Entry	1173	125.71	144
CRONUS International Ltd.	365	Analysis View Entry	1142	294.11	328
CRONUS International Ltd.	160	Res. Capacity Entry	1044	141.24	144

CRONUS International Ltd.	127004	Random Profile Line	698	211.26	144
CRONUS International Ltd.	5207	Employee Absence	671	219.76	144
CRONUS International Ltd.	5050	Contact	435	790.95	336
CRONUS International Ltd.	480	Dimension Set Entry	407	100.64	40
CRONUS International Ltd.	5918	Fault Code	400	122.88	48
CRONUS International Ltd.	309	No. Series Line	393	187.60	72
CRONUS International Ltd.	225	Post Code	356	138.07	48
CRONUS International Ltd.	15	G/L Account	272	271.06	72
CRONUS International Ltd.	352	Default Dimension	268	152.84	40
CRONUS International Ltd.	410	IC G/L Account	265	185.48	48
CRONUS International Ltd.	232	Gen. Journal Batch	256	192.00	48
CRONUS International Ltd.	481	Dimension Set Tree Node	195	84.02	16
CRONUS International Ltd.	5078	Segment History	173	189.41	32
CRONUS International Ltd.	5077	Segment Line	173	426.17	72
CRONUS International Ltd.	127002	Job Profile	172	238.14	40
CRONUS International Ltd.	5054	Contact Business Relation	164	199.80	32
CRONUS International Ltd.	5404	Item Unit of Measure	152	269.47	40
CRONUS International Ltd.	5088	Profile Questionnaire Line	150	327.68	48
CRONUS International Ltd.	5941	Service Item Component	148	221.41	32
CRONUS International Ltd.	27	Item	144	3,811.56	536
CRONUS International Ltd.	308	No. Series	132	248.24	32
CRONUS International Ltd.	281	Phys. Inventory Ledger Entry	118	485.97	56
CRONUS International Ltd.	5907	Service Ledger Entry	117	560.14	64
CRONUS International Ltd.	90	BOM Component	116	282.48	32
CRONUS International Ltd.	5080	To-do	109	526.09	56
CRONUS International Ltd.	7354	Bin	108	303.41	32
CRONUS International Ltd.	5067	Contact Job Responsibility	105	156.04	16
CRONUS International Ltd.	5407	Prod. Order Component	98	752.33	72
CRONUS International Ltd.	5601	FA Ledger Entry	88	837.82	72
CRONUS International Ltd.	5065	Interaction Log Entry	88	465.45	40
CRONUS International Ltd.	127006	User Profile Line	86	190.51	16
CRONUS International Ltd.	5967	Contract Change Log	84	390.10	32
CRONUS International Ltd.	5069	Salutation Formula	84	195.05	16
CRONUS International Ltd.	288	Vendor Bank Account	80	512.00	40
CRONUS International Ltd.	99000850	Planning Assignment	79	207.39	16
CRONUS International Ltd.	287	Customer Bank Account	78	525.13	40
CRONUS International Ltd.	7312	Warehouse Entry	77	638.34	48
	2000000111	Session Event	75	436.91	32
CRONUS International Ltd.	7114	Analysis Line	73	448.88	32
CRONUS International Ltd.	5093	Opportunity Entry	70	585.14	40
CRONUS International Ltd.	18	Customer	70	936.23	64
CRONUS International Ltd.	23	Vendor	68	1,084.24	72
CRONUS International Ltd.	230	Source Code	65	252.06	16
CRONUS International Ltd.	9	Country/Region	64	256.00	16
CRONUS International Ltd.	203	Res. Ledger Entry	60	682.67	40
CRONUS International Ltd.	5410	Prod. Order Capacity Need	56	585.14	32
CRONUS International Ltd.	5111	Rating	56	292.57	16
CRONUS International Ltd.	30	Item Translation	52	315.08	16
CRONUS International Ltd.	7302	Bin Content	51	642.51	32

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