Microsoft Dynamics® NAV

Dynamics – NAV / Cenium Scalability Test

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CENIUM

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Revision and Sign-Off

Change Record

Date	Author	Version	Change Reference
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1.   *Executive / Project Overview*

The purpose of these test were to verify the scalability, concurrency, and current transactional limits of the Cenium Hospitality Solution for Microsoft Dynamics – NAV 2009 SP1. We also wanted to "prove out" the scalability of the Dynamics – NAV and Cenium solutions with what would be considered by most "modest" hardware. We had the ability anytime during the course of these test to move to hardware with twice the CPU, RAM, and Disk capacity but this was not necessary to meet the stated test goals.

Test Goals (running concurrently)

Turn over a 5000 room hotel in 2 hours

Take 5000+ reservations in the same 2 hours

Run the night audit for 5000 rooms under 1 hour

Post large journal batches while the first two processes are running

2.   Hardware Configuration

Database Server

HP DL585

Windows Server 2008 R2 x64 Enterprise Edition

SQL Server 2008 x64 SP1 Enterprise Edition

Hardware

4 Dual Core AMD Opteron 880 2.4 GHz Processors

32 Gigabytes of RAM

Gigabit Ethernet card connected directly to network backbone

Internal SAS RAID 1

4 Gigabit Fiber HBA card connected to HP MSA 1000 Fiber/SCSI SAN

Applicable Configuration Settings

SQL Server

Auto Create Statistics Enabled

Auto Update Statistics Enabled

Max Degree of Parallelism set to 1

Read Committed Snapshot Isolation Level (RCSI) Enabled

Max Server Memory set to 29 Gigabytes

Database Collation Latin1_General_CS_AS

Server Default Collation Latin1_General_CS_AS

TempDB broken into 8 data files

Transparent Data Encryption Enabled* (Please See Addendum)

Operating System

None – Default Server 2008 Install

External Disk Array

HP MSA 1000 Fiber/SCSI SAN w/500 Megabyte onboard cache

Drive M:\ - NAV MDF and NDF data files and TempDB data files

12 – 15K RPM SCSI U320 Drives in a RAID 0

Drive L:\ - NAV LDF data file

2 – 15K RPM SCSI U320 Drives in a RAID 0

Controller Cache setting 80% Read / 20% Write

Windows Remote Desktop Servers (aka Terminal Services) x2

    AMD Engineering (These Servers do not have brand name as they came directly from AMD R&D)

        Windows Server 2008 R2 x64 Enterprise Edition

            Remote Desktop Services Role Installed

        Microsoft Dynamics – NAV 2008 SP1 Classic Client

    Hardware

        2 Quad Core AMD Opteron 2.0 GHz Processors

        8 Gigabytes of RAM

        Gigabit Ethernet card connected directly to network backbone

        Internal SAS RAID 1
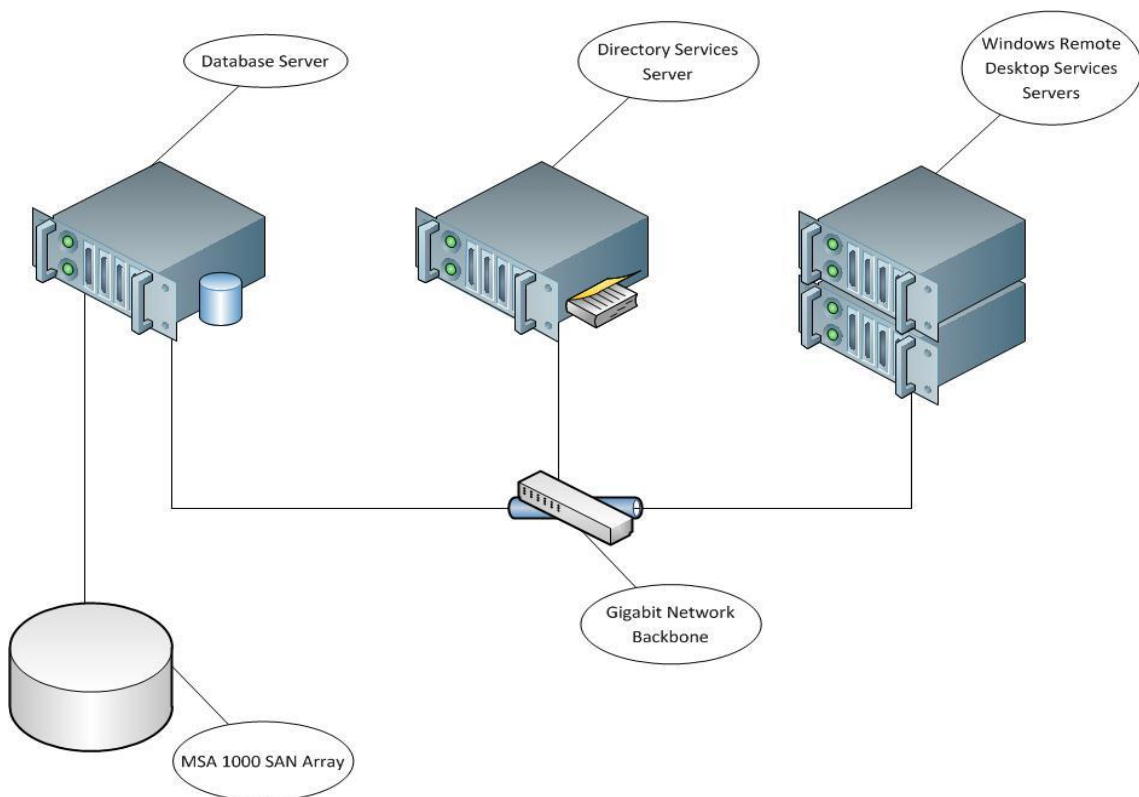
    Applicable Configuration Settings

        Dynamics – NAV

            Static Lock Time Out set to 20 seconds

            Record Set Caching set to 50 (FINDSET)

        Operating System

            Remote Desktop Services Role Installed

3. Test Parameters

The following is a description of the Tests, Test Profiles, and Test Parameters used during this Scalability Test. The tool that was used for this scalability test was the Microsoft Dynamics – NAV Application Bench Mark Tool. During this test we concentrated on 5 major daily activities that generate the highest overall transaction volume; Reservations, Check-In, Check-Out, Night Audit, and Journal Batch posting. These processes were run concurrently during some of the tests. The tests except where specified in the summary and detail sections of this document were run in 2 hour increments with 100 concurrent NAV users all accessing the database via the Dynamics – NAV 2009 SP1 Classic Client binaries on Windows Remote Desktop Services. Four client instances were launched per RDS session. There were a maximum of 50 concurrent users per RDS Server and their test profiles were assigned randomly at the time of the test. There was a 1 second delay before the "launch" (beginning of processing) on each client profile so no two clients begin processing at the test at exactly the same instant. The 100th client started 99 seconds after the 1st client was started.

Three Test Profiles were created and used during the testing

Profile 1 - Call Center Reservations

This profile simulated the activity of a customer service representative making reservation from 2 weeks to 12 months out. The Profile was setup to continuously make new reservations with a 20 second delay between each one.

Profile 2 - Check-In

This profile simulated the activity of a Front Desk user checking in guests from the reservations created in the previous tests. It also included an inventory check as well as rate availability test. The Profile was setup to continuously check-in guests with a 5 second delay between each one.

Profile 3 - Check-Out

This profile simulated the activity of a Front Desk user checking out guests from the check-ins from the previous test and included a room assignment. The Profile was setup to continuously check-out guests with a 5 second delay between each one.

Manual Processes (These executed manually during some of the test runs)

Night Audit

This process was executed manually the size of the night audit was dictated by the number of guests that were checked out in the previous test.

Journal Batch Posting

This process was executed manually while the three test profiles were running concurrently posting the batch created by the previous night audit.

Database Information

The Dynamics – NAV database used for these tests was provided by Cenium with their ISV code already installed and usable test data generated. The size of the database was 20 Gigabytes. This database was using the Dynamics – NAV 2009 base objects plus the objects included in the Cenium Hospitality Solution.

Top 50 Tables by number of Records

Table Name	No. of Records	Table Name	No. of Records
Ledger Entry Dimension	10775906	Room Maintenance Status	216259
G/L Entry	3314418	Comtrol In Entries	215583
Package Details	1807231	Contact	172630
Ws Listener Log	1582121	Value Entry	160107
CWILog	1185132	Gen. Journal Line	157809
Change Log Entry	1144474	PMS Payment Lines	154418
Detailed Vendor Ledg. Entry	1023146	Item Ledger Entry	143101
Conf. Resource Entry	983695	Rooms Reservation	125200
Ariane Main Log	832865	Ariane Main	123416
Detailed Cust. Ledg. Entry	652488	Cleaning Plan - Versioning	114110
Trans. Sales Entry	608950	Preaction	108259
Trans. Sales Entry Status	608291	Cenium Comments	107258
Client Log Entry	587781	Comtrol Out Entries	101818
Transaction Log	581563	CO Invoice Header	98872
VAT Entry	563069	Room Type Gen. Avail. Matrix	98604
Vendor Ledger Entry	510881	Posted Document Dimension	92650
Trans. Payment Entry	494921	Price History	78537
Transaction Header	448005	Sales Invoice Header	75849
Rooms Entry	422516	BOM Print Line	74925
Cust. Ledger Entry	387431	G/L - Item Ledger Relation	67568
Analysis View Entry	347146	Guest History	67294
Journal Line Dimension	304417	Random Profile Line	67220
Transaction Status	288975	HOA SMS 2009 YTD	66037
Rooms Account Entry	286221	Statement Lines	64494
Sales Invoice Line	240898	Contact Alt. Address	10428

4. Test Results – Summary

The following are the summary test results for each test pass. Some test passes have been omitted as they were used to optimize the SQL Server buffer pool and plan cache, create reservations to work from, to obtain a general baseline of the transactional throughput before any optimization, test failure before the scheduled two hours, and to test the validity and functionality of the test profiles.** (Please see Addendum)

Test 1*

Profile(Actvity)	# of Concurrent Users	Duration	Total
Reservation	50 Users	2 hours	5364
Check In	25 Users	2 hours	5014
Check Out	25 Users	2 hours	4984

 *With Change in Number Series Assignment Logic

Test 2*

Profile(Actvity)	# of Concurrent Users	Duration	Total
Reservations	50 Users	2 hours	2614
Check In	25 Users	2 hours (60 Minutes)	5150
Check Out	25 Users	2 hours (60 Minutes)	5150

*With a Change in the Auto-Increment Logic for [Entry No.]. This essentially opened the "flood gates" on the Check-In and Check-Out process which caused blocking in the Reservation activity causing the number of reservation to drop by 50% from the previous tests. The 5150 Check-Ins and Check-Outs where processed in a little over 1 hour, this represented a 50% increase over previous tests.

Test 3*

Profile(Actvity)	# of Concurrent Users	Duration	Total
Reservations	50 Users	2 hours	14061
Check In	25 Users	2 hours (50 minutes)	3833
Check Out	25 Users	2 hours (60 minutes)	5150

*Created new, modified existing, and dropped existing indexes to alleviate the blocking in Reservation caused by the changes made in Test 2. This allowed us to increase the number of reservations taken in 2 hours by a factor of 7 while preserving the throughput increase in Check-In and Check-Out. Note there were only 3833 rooms to check in due to the blocking in the previous test.

Test 4* (Same as Test 3 with Transparent Data Encryption Turned on, AES256 and the duration lowered to 1 hour)

Profile(Actvity)	# of Concurrent Users	Duration	Total
Reservations	50 Users	60 minutes	7643
Check In	25 Users	60 Minutes (45 minutes)	4681
Check Out	25 Users	60 Minutes (30 minutes)	3358

*We manually posted a 40000 line Item Journal Batch > 1 hour during this test. Transparent Data Encryption did not negatively impact performance.

Manual Test

Actvity	Begin Time	End Time	# of Rooms
Night Audit	1:30	2:42	5226
Night Audit 2*	4:26	5:30	5764
Night Audit 3	8:15	8:30	5014
Night Audit 4	11:08	11:25	5150

Night Audit 2 saw a 4 fold increase in run time. This was due to design changes made to increase the performance of Reservations, Check-In, and Check-Out processes. This was identified and corrected in the subsequent runs of the processes which the data above illustrates.

Test performance measured against stated goals

Turn over a 5000 room hotel in 2 hours

ACHIEVED (5150 Check-Ins and 5150 Check-Outs in 1 hour)

Take 5000+ reservations in the same 2 hours

ACHIEVED (14061 Reservations in 2 hours)

Run the night audit for 5000 rooms under 1 hour

ACHIEVED (Ran night audit for 5150 rooms in 17 minutes)

Post large journal batches while the first two processes are running

ACHIEVED (Posted a 40000 line Item Journal in less than 1 hour)

5.   Test Results – Detail

This section was included to provide detail into the overall hardware utilization of the SQL Server and Remote Desktop Server. I limited the scope to the final test due to its lower run time, TDE usage, and overall transaction throughput. Also it bears mentioning that in the last test the longest running query in SQL Server was under 500 milliseconds. As you can see from the data below even the "modest" hardware used was not stressed to capacity.
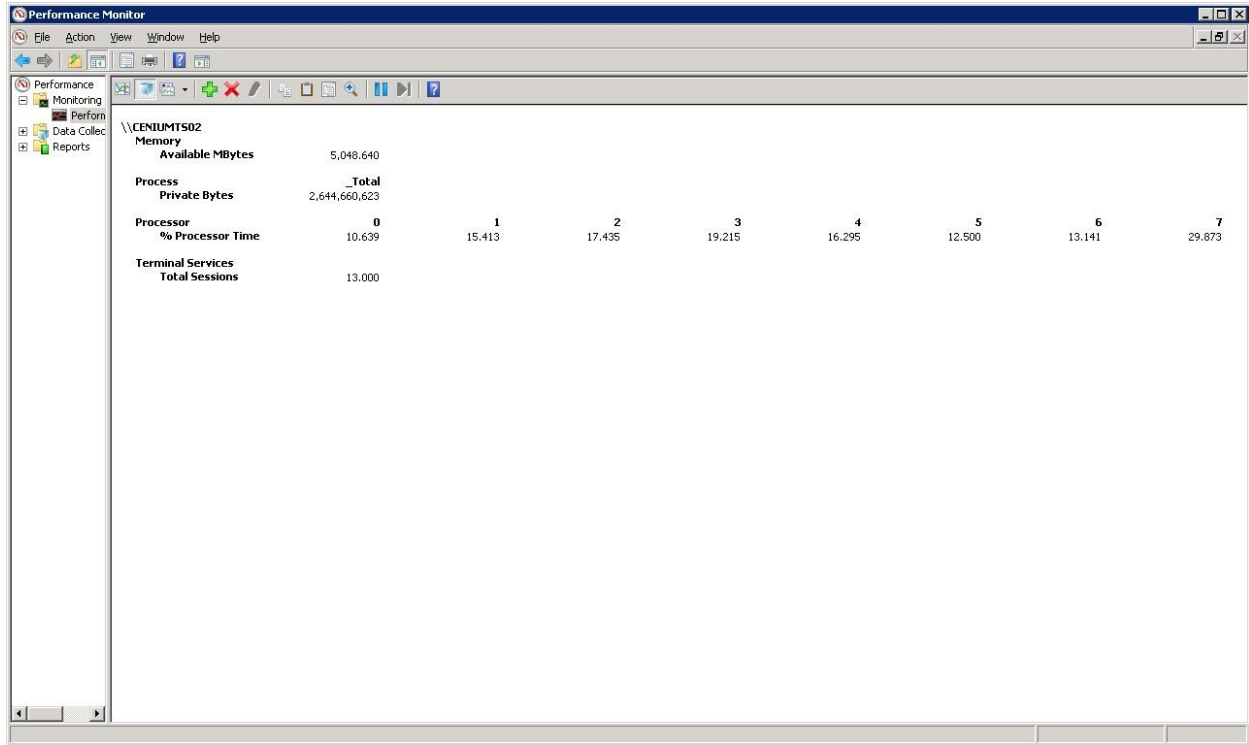
Test 4 (With 40000 Line Item Journal Post)

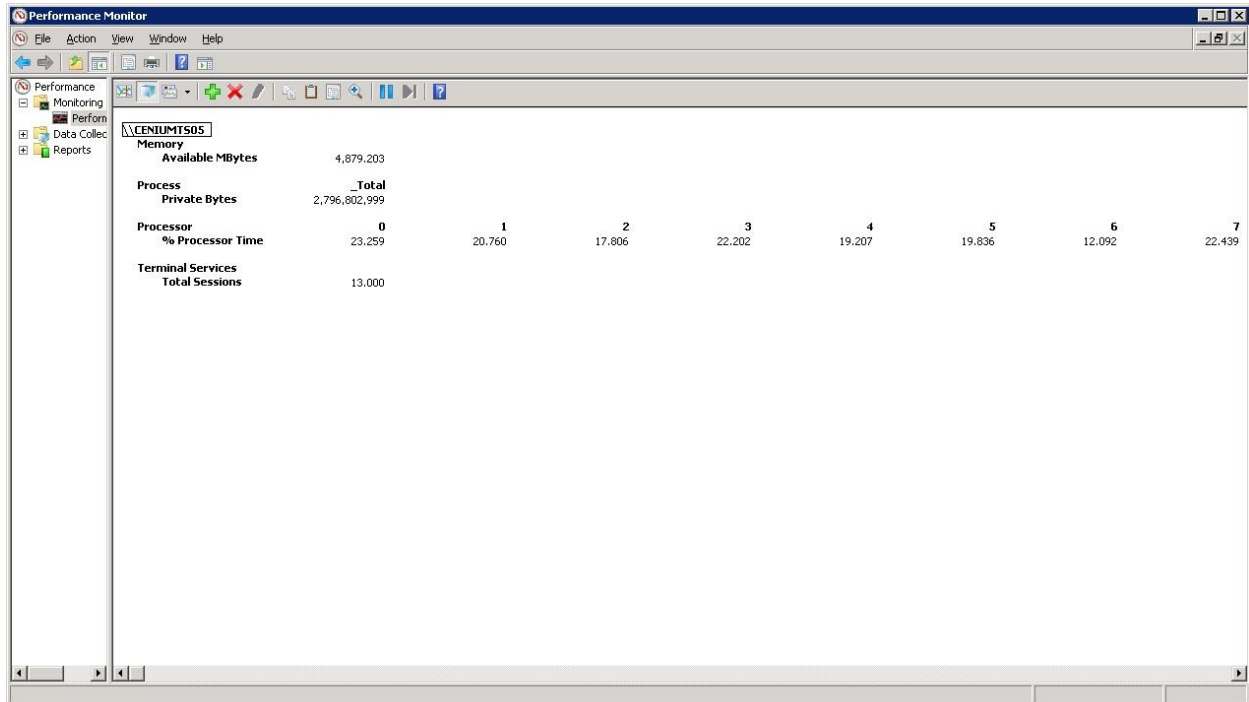| Profile(Actvity)	# of Concurrent Users	Duration	Total
Reservations	50 Users	60 minutes	7643
Check In	25 Users	60 Minutes (45 minutes)	4681
Check Out	25 Users	60 Minutes (30 minutes)	3358

SQL Server
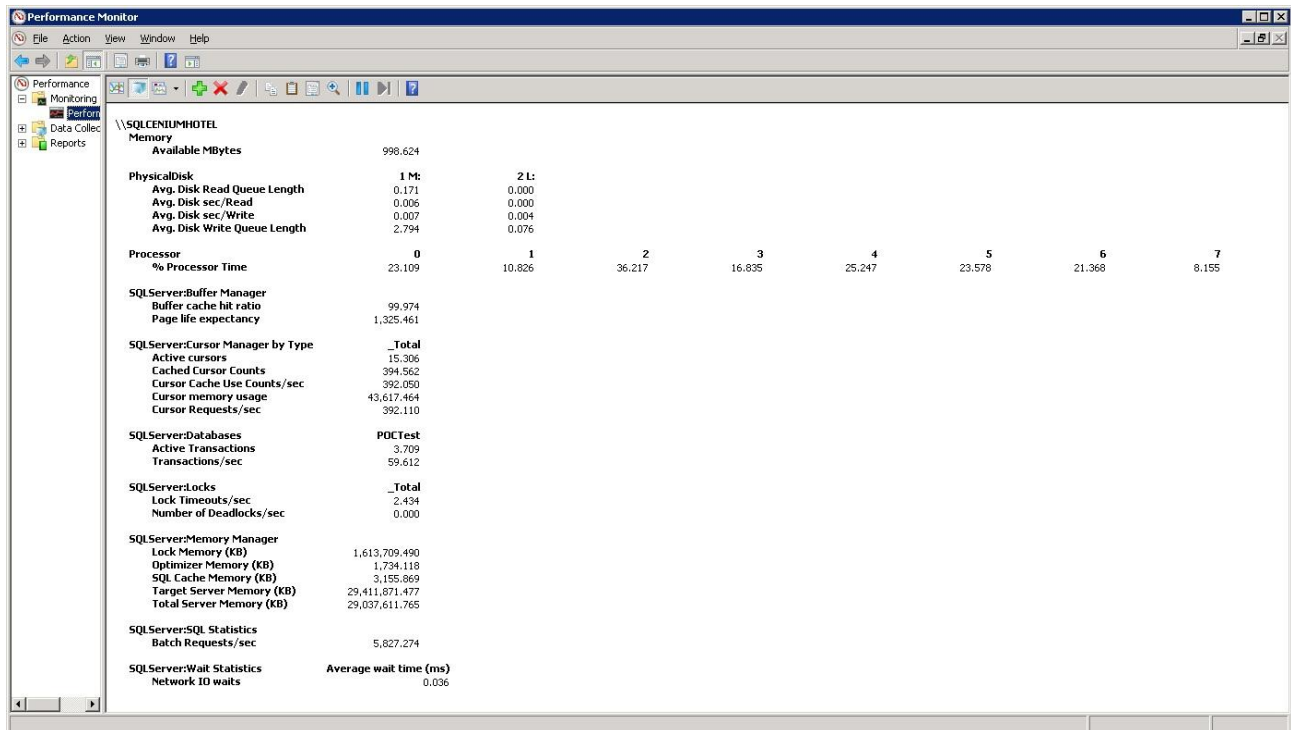
RDS Server 1 (50 Concurrent Users)

RDS Server 2 (50 Concurrent Users)

6.   Conclusion

The above tests lead to the conclusion that the Microsoft Dynamics – NAV 2009 SP1 with Cenium Hospitality was able to achieve and in most cases exceed the scalability targets set. Dynamics – NAV with Cenium has the potential to scale to meet the needs of a 5000 room hotel property.

7.   Addendum

*SQL Server 2008 Transparent Data Encryption was enabled on the POCTest database for the file test run. This was done surface any potential performance issues with the Microsoft Dynamics – NAV and TDE as this functionality is becoming more and more of a requirement for all Dynamics products. No performance of scalability issues where found or experienced (beyond increased hardware utilization to handle the encryption and decryption of the data) during this test.   It took approximately 1 hour to encrypt the 20 Gigabyte POCTest database.

**During an early test pass a systemic bottleneck was detected in the "Number Series Assignment" functionality of Dynamics – NAV essentially serializing the processing of new reservations. This was corrected by bypassing the number series logic and randomly assigning a reservation number based on collection of data points in the reservation and the user. This corrected the issue and removed the bottleneck.

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