

Microsoft



PERFORMANCE AND SCALABILITY

Database Scalability for the
Enterprise

Microsoft Dynamics CRM 4.0

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Database Scalability for the Enterprise

Executive Summary

Microsoft Dynamics™ CRM business software is designed to help enterprise organizations achieve a 360-degree view of their customers across marketing, sales, and service. Engineered to deliver performance that meets the needs of the largest global deployments, Microsoft Dynamics CRM has been tested for user scalability, data scalability, and network performance. This white paper focuses on database scalability.

Microsoft Corporation conducted scalability testing to evaluate the performance of a single instance of Microsoft Dynamics CRM 4.0 in a very large database scenario. The results of these tests demonstrated that Microsoft Dynamics CRM is capable of achieving sub-second response times running user transactions against a database of over 1 billion records.

These tests were performed for a Microsoft customer whose service representatives require rapid access to records in a very large customer database. The test database was designed based on the customer's production data and the database server received only basic tuning for the test. Microsoft Dynamics CRM exceeded performance goals for this test, ultimately enabling the customer to reduce their final hardware requirements for the deployed solution.

RESULTS SUMMARY

In this test environment, Microsoft Dynamics CRM demonstrated the following performance characteristics:

Table 1: Benchmark Test Results Summary

Concurrent Users	Number of Records	Database Size	Average Response Time	Average Database Transactions	Average Page Time	SQL Server Utilization
1,500	1.03 billion	1.3 TB	.29 seconds	654 / second	3.29 seconds	12.9%

MICROSOFT DYNAMICS CRM IS CAPABLE OF ACHIEVING SUB-SECOND RESPONSE TIMES RUNNING USER TRANSACTIONS AGAINST A DATABASE OF OVER 1 BILLION RECORDS.

MICROSOFT
DYNAMICS CRM
TAKES UNIQUE
ADVANTAGE OF THE
MICROSOFT
WINDOWS AND SQL
SERVER PLATFORMS
TO PROVIDE
ENTERPRISE LEVELS OF
PERFORMANCE AND
SCALABILITY.

THE DATABASE WAS
DESIGNED BASED ON
THE CUSTOMER'S
OWN ENTERPRISE
CALL CENTER
DATABASE.

Overview

Microsoft Dynamics CRM 4.0 addresses the stringent requirements of the enterprise in the areas of performance and scalability, application flexibility, efficient manageability, and network configurability.

- **Performance and scalability:** Microsoft Dynamics CRM takes unique advantage of the Microsoft® Windows® operating system and Microsoft SQL Server® database platforms to provide enterprise levels of performance and scalability while keeping costs under control. Application tuning can be carried out using commonly-available skills and tools sets, and the application is designed for easy horizontal scaling through standard network load balancing methods.
- **Application flexibility:** Microsoft Dynamics CRM is engineered for change with point-and-click customization and a metadata-driven portable application model. The application is built on a highly flexible architecture based on industry standards such as Microsoft .NET, XML, and Web services.
- **Efficient manageability:** Microsoft Dynamics CRM helps improve application manageability through integration with enterprise systems management products such as Microsoft System Center Essentials. Multiple deployment models are available, including on-premise, hosted, and hybrid, and customers can change between deployment models seamlessly as their needs change.
- **Network configurability:** Microsoft Dynamics 4.0 allows customers to provide a streamlined and high performance experience to users in global enterprise deployments. Microsoft Dynamics CRM components can be customized based on an organization's business model and bandwidth requirements to provide efficient bandwidth utilization for their environment.

Testing Methodology

Microsoft undertook a performance and scalability study to demonstrate the performance capabilities of Microsoft Dynamics CRM running in a simulated high volume call center. The test scenario included 1,500 users generating a data load of 5 transactions per user per minute against a database with over 1 billion records and containing more than 1 TB of data.

The test environment was comprised of 2 application servers and a single database server. Microsoft Visual Studio® 2005 Team Suite development system was used as the test harness, and test cases were created based on the customer's environment. The database was designed based on the customer's own production enterprise call center database.

Half of the user load was comprised of new users with caching enabled. A step load was used to create a user load pattern starting at 100 initial users and increasing by 10 users every 10 seconds until it reached 1,500 users. Once all 1,500 concurrent users were loaded, the test was run for 30 minutes.

In this test, Microsoft Dynamics CRM 4.0 scaled to meet the test requirements with sub-second response times, demonstrating its ability to meet the needs of enterprises with large data volume requirements.

BUSINESS TRANSACTIONS

The test scenarios were designed to accurately simulate an enterprise-level customer service organization. In this test, simulated users performed complex business transactions against three entities which typically see heavy use in enterprise call centers: Contacts, Contracts (with contract lines), and Customer Address. Each business transaction simulated an end user performing an end-to-end business process involving multiple interactions between the user and the system. Each business transaction includes an average of three read actions and two write actions, with a mix of new and updated contacts and contracts, and using Quick Find functionality to locate records in the system.

For example, the following activities comprise the *Update Contact* transaction:

1. Search for a contact by first or last name using Quick Find.
2. Select the desired contact from the results list.
3. Update the address, phone, and e-mail address.
4. Save the contact.

The test workload was comprised of the following:

Table 2: Test Workload Composition

Test Case	Percentage of Workload
Update Contact	30%
Update Contract	30%
New Contact	10%
New Contract	10%
New Contract line items (2 per test)	10%
Advanced Find	10%

TUNING AND OPTIMIZATION

The generally available version of Microsoft Dynamics CRM 4.0 was used in all testing without customization to simulate an out-of-the-box deployment.

The database server received only the most basic level of optimization according to common best practices. Seven non-clustered indexes were created, three for contact and four for contract, to improve page load performance. One clustered index was moved to a different disk partition to improve disk I/O following Microsoft SQL Server best practices for managing large indexes.

For more information on tuning and optimizing Microsoft Dynamics CRM, see the *Microsoft Dynamics CRM Tuning and Optimization* white paper.

SIMULATED USERS
PERFORMED
COMPLEX BUSINESS
TRANSACTIONS
AGAINST ENTITIES
WHICH TYPICALLY SEE
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ENTERPRISE CALL
CENTERS.

HARDWARE ENVIRONMENT

This section describes the hardware used in the test configuration, as well as the software installed on each system:

Table 3: Hardware Description

Test Component	Number	Hardware	Processor	Operating System	RAM	Software
Load Generation Server	1	HP DL740	8 proc 2.8 GHz	Microsoft Windows Server® 2003, Enterprise Edition	8 GB RAM	Visual Studio 2005 Team Suite
Load Generation Servers	3	Dell 1550	Dual pro x86	Windows Server 2003, Enterprise Edition, SP1	1 GB RAM	Visual Studio 2005 Team Suite
Application Servers	2	Intel Xeon 3.6	Dual core, hyper-threaded Nocona core 3.6 GHz	Windows Server 2003	8 GB RAM	Microsoft Dynamics CRM 4.0 RCO
Database Server	1	Unisys ES7000	Dual socket, dual core Intel 3.4 GHz	Windows Server 2003	64 GB RAM	Microsoft SQL Server 2005 SP2 Enterprise Edition

Test Results

The results of this benchmark validate that Microsoft Dynamics CRM can support the needs of organizations with extremely large data volumes. The following table provides detailed test results:

Table 4: Detailed Performance Test Results

Counter	Category	Computer	Minimum	Maximum	Average
User Load	LoadTest:Scenario	BLADE1	0	1,500	1,078
Requests / Second	LoadTest:Request	BLADE1	512	1,007	734
Request Execution Time	ASP.NET	IIS 1	0	609	62
Request Execution Time	ASP.NET	IIS 2	0	1,484	241
% Processor Time	Processor	IIS 1	24.5	87.4	52.2
% Processor Time	Processor	IIS 2	48	100	92
% Processor Time	Processor	SQL Server	2.6	44.7	12.9
Transactions / Second	SQLServer:Databases	SQL Server	153	1,180	654
Requests / Second	ASP.NET Applications	IIS 1	21.5	72	42.4
Requests / Second	ASP.NET Applications	IIS 2	16.6	48.5	29.8
Average Response Time	LoadTest:Request	BLADE1	0.14	0.29	0.2
Average Page Time	LoadTest:Page	BLADE1	0.24	7.03	3.29
Tests / Second	LoadTest:Test	BLADE1	0	2.6	1.02

Conclusion

Microsoft Dynamics CRM 4.0 demonstrated its ability to scale to support the needs of an enterprise organization with a very large customer service database. In a test based on a customer database of over 1 billion records, Microsoft Dynamics CRM was able to achieve sub-second response times using a modest hardware configuration.

The deep integration with key Microsoft business applications and components helps companies realize cost benefits by allowing them to take advantage of existing investments in technology, infrastructure, and resources to maintain and optimize the application. The flexible application architecture offers companies choices, including the deployment model that meets their needs and the user interface that is best for them.

Resources

Resources related to Microsoft Dynamics CRM 4.0 in the enterprise:

- [Microsoft Dynamics CRM User Scalability for the Enterprise white paper](#)
- [Microsoft Dynamics CRM Bandwidth Utilization Improvements white paper](#)
- [Microsoft Dynamics CRM Database Scalability for the Enterprise white paper](#)
- [Microsoft Dynamics CRM Tuning and Optimization white paper](#)
- [Microsoft Dynamics CRM Performance and Scalability Toolkit](#)
- [Microsoft Dynamics CRM in the Enterprise brochure](#)
- [Microsoft Dynamics CRM Web Site](#)

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