

Microsoft Dynamics CRM 2016 Service Pack 1 Performance Benchmark on Azure Infrastructure as a Service (IaaS)

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Microsoft Dynamics CRM

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This performance paper provides a benchmark for the performance of Microsoft Dynamics CRM 2016 Service Pack 1 (SP1) running on Azure Virtual Machines.

Applies to

- Microsoft Dynamics CRM 2016 Service Pack 1

Overview

Microsoft Dynamics CRM is designed to deliver intelligent customer engagement to the market – helping companies deliver customer experiences that are personalized, proactive and predictive. Dynamics CRM helps provide data anywhere and across a wide array of devices, ranging from phones and tablets to PCs, and through a wide array of client types, such as smartphone apps, tablet apps, and Microsoft Dynamics CRM for Outlook. This paper highlights the scalability and performance that can be achieved in terms of concurrent users and feature functionality with the latest release of Dynamics CRM 2016 SP1, running on standard “off the shelf” Azure Virtual Machines.

Objective

This white paper had two broad objectives.

- Benchmark the performance for Microsoft Dynamics CRM 2016 SP1.
- Demonstrate the scalability and performance of Microsoft Dynamics CRM 2016 SP1 on standard “off the shelf” Azure Virtual Machines, which will benefit customers looking at infrastructure as a service (IaaS) as a path to migrate their CRM deployment into the Azure cloud platform.

Results summary

Performance testing was performed on a Microsoft Dynamics CRM 2016 SP1 implementation that included Windows Server 2012 R2 Datacenter and Microsoft SQL Server 2012 Service Pack 2. The infrastructure was hosted in the Azure US West region utilizing standard Azure Virtual Machines. Testing was carried out to benchmark the performance of Dynamics CRM 2016 SP1 running on standard Azure Virtual Machines and serving 44,670 concurrent users, performing tasks with a think time of 10 minutes. In this environment Dynamics CRM 2016 Server with SP1 demonstrated the following performance characteristics.

Concurrent Users⁺	Total Record Count	Web Requests per hour	Average Page Response Time	Average Transaction Time	Business Transactions *	Average SQL Server Utilization	Average Microsoft CRM Server 2016 SP1 Utilization
44,670	3.1 billion	1.9 million	0.23 secs	0.31 secs	2,855,311	34.9%	15.2%

⁺44,670 users, each performing a business transaction once every 10 minutes.

*Business transaction is a full user scenario, which is simulated by the various steps in a test case. This is not a measure of system capacity or throughput, but reflects the total number of business transactions that completed successfully in this test run. Since this metric is influenced by test configurations like the number of users, think time, number of Dynamics CRM servers and so on, customers may achieve better results in their environment.

Important

These results reflect the scalability and performance achieved on a specific Microsoft Dynamics CRM 2016 SP1 implementation running in a particular test environment. Factors ranging from specific customizations deployed by enterprise organizations to geographic distribution of users

can affect how enterprise organizations use the Dynamics CRM system. Therefore, results will vary for each implementation. Customers might be able to achieve higher levels of performance by fine-tuning or optimization.

This benchmark focuses on server-side performance and metrics. The response times reported here are for the clients in a test environment without network latency and bandwidth constraints and client-side rendering time that the clients might face when they are connected remotely. As a result, response times published here are in no way indicative of client responsiveness that might be seen when rendering in a browser.

Data load

The user load was modeled to reproduce 44,670 concurrent users, which models an enterprise-class deployment of a Microsoft Dynamics CRM organization.

The target load was arrived after reviewing the baseline from previous releases and the capacity (memory, compute power) of the previous Azure Virtual Machines benchmark.

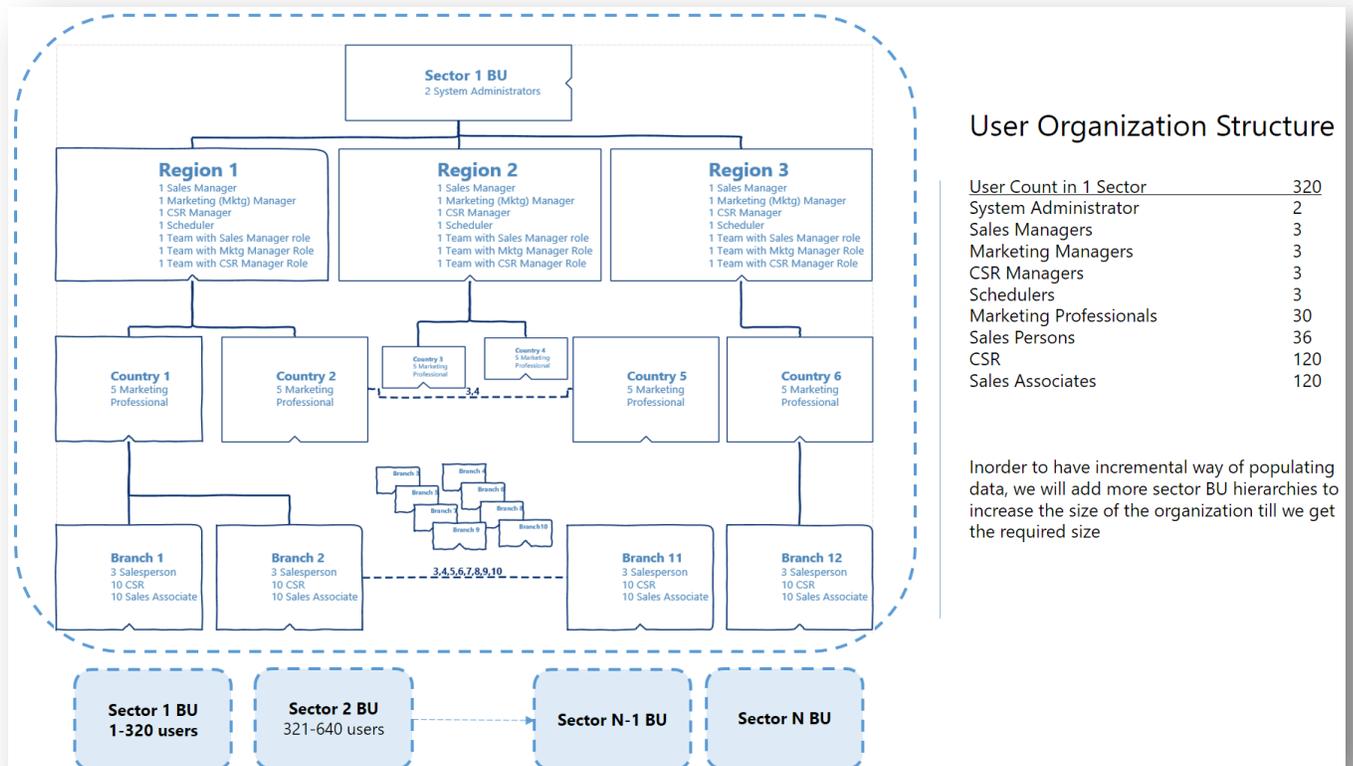
Organization Database Size: 4.97 TB

Organization structure

To test the scale of a business unit defined security model, a complicated business unit (BU) hierarchy with 141 sectors (4 BUs per sector for a total of 564 BUs) was created. The depth of business units was set to 4. To test the performance of a CRM system in a realistic manner, each of the business units was assigned users of different security roles. Nine security roles were selected for all the users in the Dynamics CRM organization, of which eight were security roles that come with Microsoft Dynamics CRM and one (Sales Associate) was a custom security role. The security roles were:

- System Administrator
- Sales Manager
- Marketing Manager
- Customer Service Representative Manager
- Scheduler
- Marketing Professional
- Salesperson
- Customer Service Representative
- Sales Associate

This diagram showcases the distribution of users and teams in each of the business units.



Customizations

In order to model a realistic enterprise, the organization was configured with four customizations. Commonly used entities such as account, contact, lead, and task were modeled with custom attributes. Field-level security was also enabled on custom attributes to reflect a realistic enterprise organization.

User data

Based on customer research, each user of a specific role was assigned a realistic set of data. The data that the user would own was based on the user's role. Before the test, the total data in the test database included over 3.1 billion business records with a total database size of 4.9 TB.

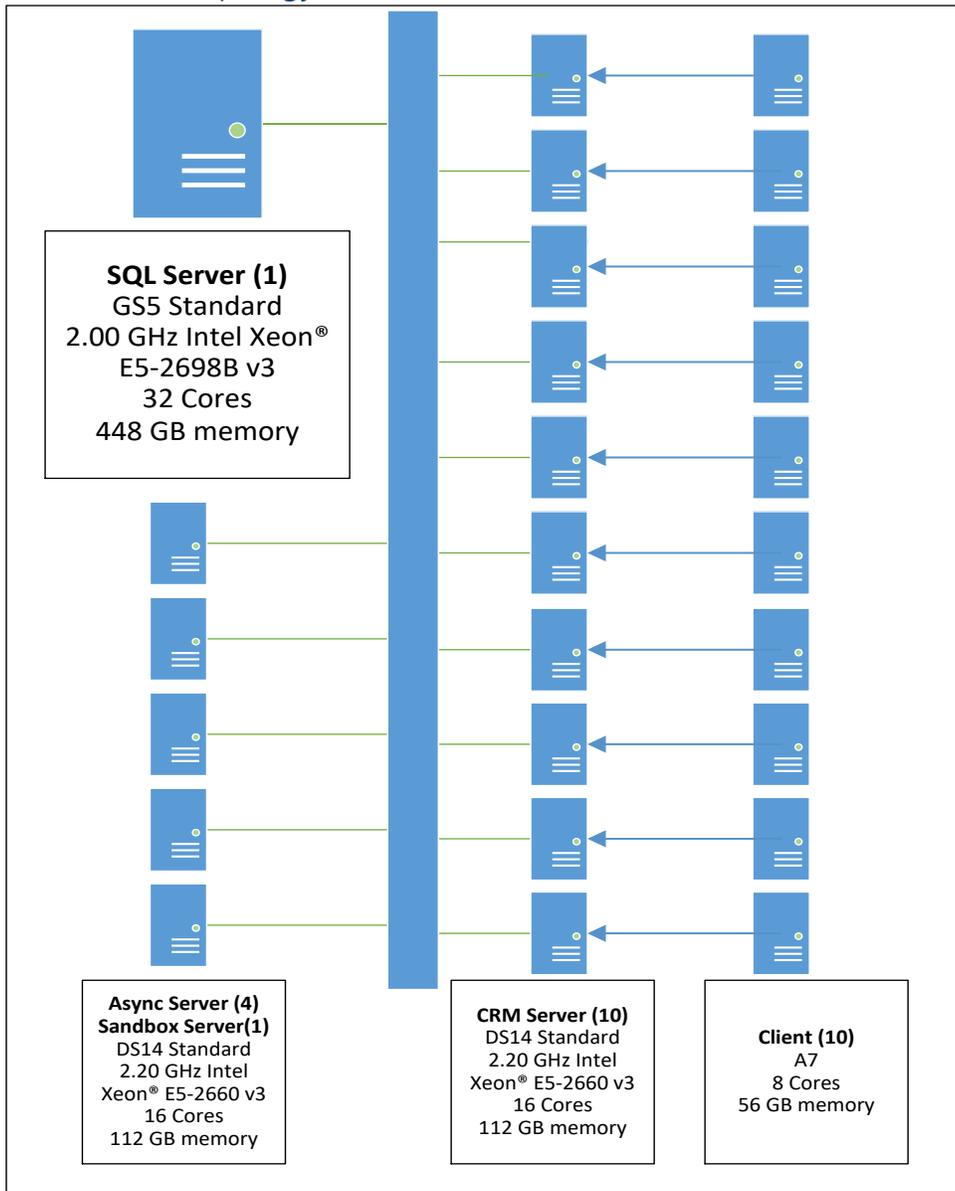
This table provides a summary of the record count for the entities with more than 100,000 records.

Table Name	Records
ActivityPartyBase	905781104
PostRoleBase	377538363
ActivityPointerBase	307120820
PostBase	208816121
PostCommentBase	161673886
AnnotationBaser	143852911
TaskBaser	125645413
PostRegardingBaser	118385813
LeadAddressBaser	86754466
CustomerAddressBaser	77981056
EmailSearchBaser	73608426
ImageDescriptor	71157296
PrincipalObjectAccessr	62868273
BusinessProcessFlowInstanceBaser	58040934
LeadBaser	43377233
IncidentBaser	25857508
new_custom1Baser	25406430
ConnectionBaser	24017960
RollupJobBaser	19908626
ContactBaser	16205378
AccountBaser	14682461
KnowledgeArticleBaser	13535340
InvoiceBaser	13447262
InvoiceDetailBaser	13447255
SalesOrderBaser	13447209
SalesOrderDetailBaser	13447168
OpportunityBaser	11443237

OpportunityProductBaser	11232201
QuoteBaser	8740687
PostFollowBaser	7246854
ListMemberBaser	6920041
DocumentIndexr	6767670
QuoteDetailBaser	6723602
new_imBaser	2735719
ListBaser	2445513
CampaignBaser	881624
PrincipalEntityMapr	697886
PrincipalAttributeAccessMapr	688969
UserEntityUISettingsBaser	361480
SystemUserBusinessUnitEntityMapr	340962
QueueItemBaser	298344
RecurrenceRuleBaser	288850
ResourceGroupExpansionBaser	271790
MailboxBaser	268706
CompetitorAddressBaser	249332
SystemUserPrincipalsr	225322
QueueBaser	223585
AsyncOperationBaser	140617
QueueMembership	135080
CampaignActivityItemBaser	126827
CompetitorBaser	124666
CampaignItemBaser	123981

Infrastructure and environment configuration

Environment topology



Microsoft SQL Server

SQL Server was deployed on an Azure GS5 virtual machine configured with 32 cores and 448 GB of memory.

Microsoft SQL Server

Provider	Azure
Virtual Machine Type	GS5 Standard
Operating System	Microsoft Windows Server 2012 R2 Datacenter
Processor	2.00 GHz Intel Xeon® E5-2698B v3 32 Cores

RAM	448 GB
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Microsoft Dynamics CRM Server

Dynamics CRM Server was deployed on Azure DS14 virtual machines configured with 116 cores and 112 GB of memory.

Microsoft Dynamics CRM Servers

Provider	Azure
Virtual Machine Type	DS14 Standard
Operating System	Microsoft Windows Server 2012 R2 Datacenter
Processor	2.20 GHz Intel Xeon® E5-2660 v3 16 Cores
RAM	112 GB

Testing method

Test scenarios were based on customer research and were created using the Microsoft Dynamics CRM 2013 Performance and Stress Toolkit (Performance Toolkit), which is designed to formalize performance testing of Microsoft Dynamics CRM by facilitating load testing of simulated customer environments.

Setup configuration

- A batch of 44,670 concurrent users will be performing create, update, and delete (CRUD) operations within the CRM system. Data will be collected only when the system has completed generating all virtual users.
- A warm up time of 33 minutes was needed to get each client to load all the users.
- Performance data captured was being captured every five seconds.
- A think time of 10 minutes was used per user to match a real-world scenario. Therefore, virtual users ran tests continuously with a lag time of 10 minutes between each test run.
- Every test run carried an additional overhead of authenticating the virtual users before initiating a test run. The authentication was cached for subsequent test runs.
- A single virtual user performed all the test cases sequentially before moving to the next test run, subsequently repeating all the tests.
- Only LAN connections were used to simulate a network for this test.
- Internet Explorer 11 was used as the browser of choice to render the pages.
- SQL Server was installed and configured in accordance with Microsoft best practices. All data and log drives were SSD drives.
- Dynamics CRM front-end servers had no other services other than the minimal components of IIS installed.

Tuning and optimizations

- Standard T-SQL scripts were used to help ensure that table indexes on the database weren't fragmented and that the statistics were up-to-date, which helped to ensure efficient database operation. Early test runs of the scripts identified several areas in which new or modified indexes could improve query performance. SQL Server Profiler was used to identify long-running queries that were executed frequently,
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and this information was used to carry out additional tuning of the database server. More information: [TechNet: Dynamics 365 organization database indexes](#)

- Performance optimizations options like *SkipGettingRecordCountForPaging* were enabled. More information: [KB: OrgDBOrgSettings tool for Microsoft Dynamics CRM](#)
- Indexes were created as part of database tuning and optimization before starting the test run.
- 16 TEMPDB files and max degree of parallelism setting of 1 on the SQL Server was used for this test.
- Read committed snapshot isolation was enabled for the Dynamics CRM database.
- SQL Server fill-factor was configured to 80%.
- Full-text search was disabled through the Dynamics CRM administration setting.
- There was an updated to an index on the SLA table that was applied. This same fix will be available to customers in the upcoming Microsoft Dynamics CRM 2016 Service Pack 1.1 release.

Test results

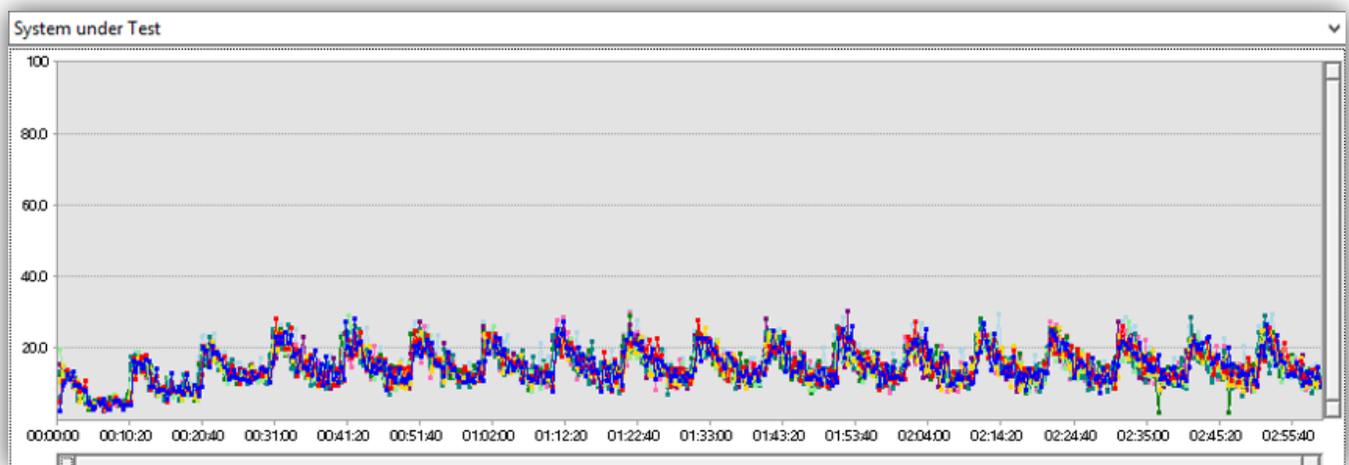
Test run details

Metric	Value
Duration	3 hours
Max User Load	44,670
Test/sec	Average 69.39 tests per second (this is not TPS)
Average Test Time	0.81 seconds (A test includes several pages, web test plugin executions and an additional SQL Server connection to randomly select records)
Average Page Time	0.23 seconds
Total records	3,088,592,211

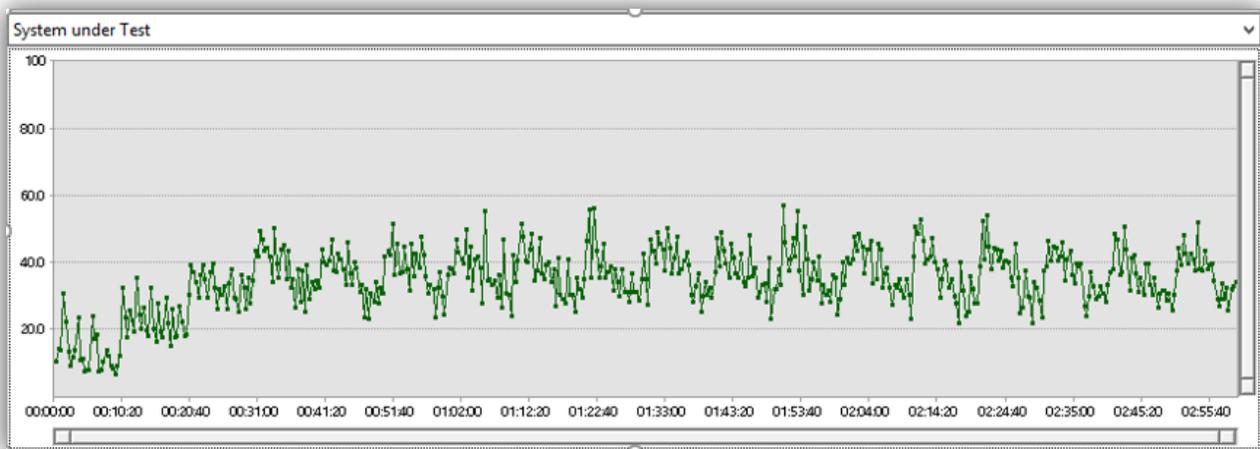
Web Requests/Sec 527.8

Processor utilization

Web servers



SQL Server



Machine	Min	Max	Average
Web1	3.34	31.1	16.9
Web2	3.03	30.3	15.1
Web3	0.16	32.1	15.2
Web4	1.5	29.6	15.1
Web5	2.59	30.7	14.9
Web6	3.24	29.6	14.9
Web7	3.84	28.2	14.9
Web8	3.26	29.4	14.7
Web9	0.61	33.5	14.8
Web10	0.27	28.6	15.4
SQL	5.43	59.7	34.9

Available memory (Megabytes)

Machine	Min	Max	Average
Web1	105,732	109,267	106,737
Web2	106,403	109,595	107,406
Web3	106,935	110,928	107,804
Web4	106,655	109,889	107,686
Web5	106,601	109,952	107,641
Web6	106,417	109,737	107,506
Web7	106,635	109,857	107,679
Web8	106,957	110,714	107,851
Web9	106,780	111,017	107,799
Web10	106,706	111,024	107,722
SQL	7,657	8,071	7,826

Conclusion

The results reflect the scalability and performance achieved on a specific Dynamics CRM 2016 SP1 implementation running on standard Azure Virtual Machines in a test environment. Actual performance may vary based on factors ranging from specific customizations deployed to geographic distribution of users and network latency or bandwidth. Customers should expect that results will vary for each implementation and should perform their own performance testing based on their needs or requirements. In some cases, customers may achieve higher levels of performance by fine-tuning or optimizing the configuration of Microsoft Dynamics CRM.

These results demonstrate the robustness of Dynamics CRM 2016 SP1 and its capability to handle concurrent user activities with ease for enterprise CRM scenarios.
