



SugarCRM® on IBM® i

Performance and Scalability

TECHNICAL WHITE PAPER

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The purpose of this white paper is to examine the performance and scalability of SugarCRM on IBM POWER7 processors running the IBM i V7R1 operating system. Deploying SugarCRM on IBM i combines the stability and performance of the IBM i OS and IBM Power Systems hardware with SugarCRM's market-leading customer relationship management solutions.

INTRODUCTION

The performance and scalability test results below exhibit how the SugarCRM application performs on IBM i with many users attempting to access data at the same time.

This white paper details the results of tests executed against Sugar Enterprise Edition version 6.1.3 running against Zend Server version 5.0.4 and MySQL version 5.1.50. The tests were designed to explore the vertical scalability of the Sugar customer relationship management application on a single POWER7 machine running the IBM i OS with test results compared against the IBM Power Systems 720 Express and 740 Express servers. Because SugarCRM is also designed to scale horizontally across a clustered hardware configuration, SugarCRM on IBM i can realize even greater scalability than determined in this white paper by configuring multiple IBM i machines to distribute the SugarCRM web server and database workload.

For more information regarding the data volume and server response time by action for these tests, please see the appendices at the end of this document.

SYSTEM ARCHITECTURE

SugarCRM is a PHP web application that supports a number of relational database systems for its data storage. On the IBM i OS (formerly known as i5/OS or OS/400) the following components are used to deploy SugarCRM.

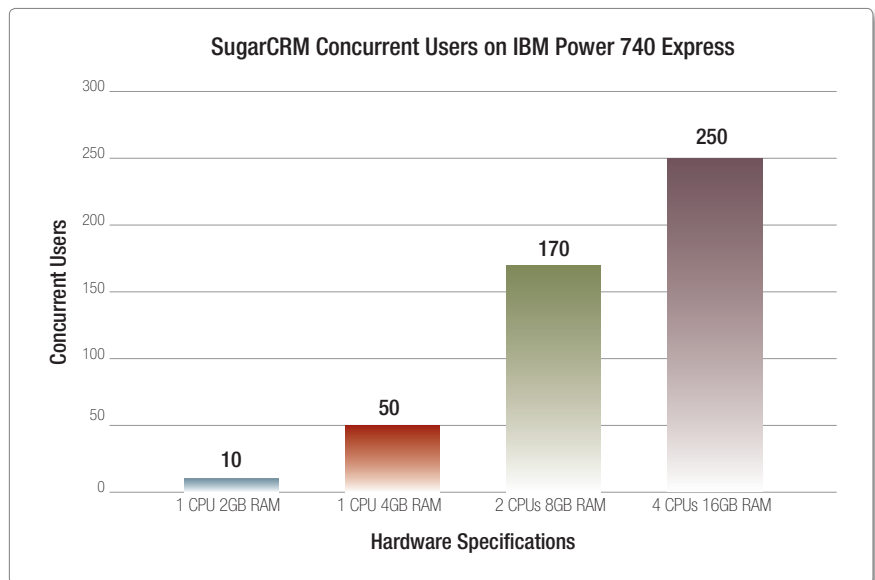
- IBM Apache Web server
- IBM Apache FastCGI module
- Zend Server – PHP Web Application Server
- MySQL Relational Database Management Server

SugarCRM Web requests come through the IBM Apache Server and are handled by the Apache FastCGI module for PHP processing. The FastCGI module then passes the Web requests to the Zend Server. The Zend Server middleware executes the PHP code comprising the Sugar application and passes it back to the IBM Apache Server, which renders the application user interface to the end user via a Web browser. The MySQL relational database system is used for data storage.

SCALABILITY OVERVIEW

The chart below shows concurrent usage numbers on a single IBM Power 750 with a single IBM i OS LPAR (logical partition) running the entire SugarCRM application, middleware and database stack. See Appendix D for POWER7 Express server details. Please note that in typical usage scenarios, only 20% of named users interact with the CRM system concurrently. So a system that supports 250 concurrent users can support up to 1250 named users.

In a call center, or other specialized usage environments where the users spend their entire workday accessing the SugarCRM application, the concurrency rate can approach 100%. In addition, Web Service integrations with other systems can also put a high load on the SugarCRM system, pushing the effective concurrent usage higher. Therefore calculating the concurrent usage for any given SugarCRM system will depend on the usage patterns for that system. However, 20% concurrent usage is an industry standard for calculating system performance and scalability metrics for CRM systems.



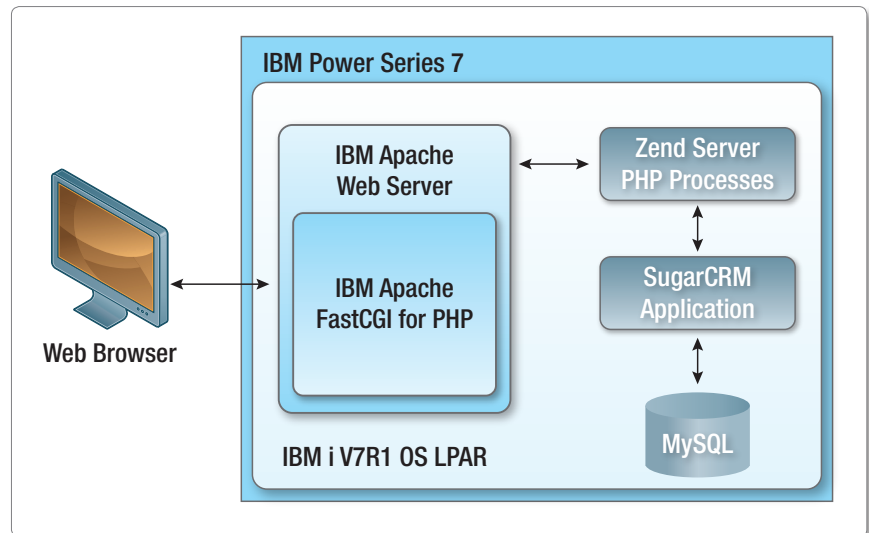
The numbers above reflect 90% of typical CRM interactions returning results to the user within 1 second, and 98% returning results within 2 seconds.

Power 750 Express and 740 Express servers use similar CPUs, and their performance will be similar. The Power 720 Express uses less powerful CPUs, and its capacity will be reduced accordingly (see Appendix D).

PERFORMANCE TUNING

To achieve maximum performance of SugarCRM on IBM i, each architectural component must be tuned independently to reflect the available hardware and intended concurrency load. For details on tuning please refer to the *SugarCRM on IBM i: Installation, Configuration and Tuning Guide* available at www.sugarcrm.com.

The diagram below shows the SugarCRM stack architecture as it relates to the IBM i LPAR.



SugarCRM on IBM i scales linearly. If concurrency beyond 250 users is required, more CPUs and RAM can be added to the LPAR. Please monitor CPU utilization and memory paging to ensure optimum performance. Paging will significantly impact performance of MySQL and in turn of the entire system. For extremely large loads it is possible to move the MySQL database to another LPAR on a different IBM i server. In this scenario one LPAR will be used for the SugarCRM application, Apache, and Zend Server/PHP and one will be used for MySQL exclusively. This is a common configuration to scale out Unix and MS Windows-based SugarCRM systems that do not enjoy the same vertical scalability of the IBM i.

CONCLUSION

Based on these tests, SugarCRM recommends a maximum of 250 concurrent users for a 4 processor/16GB RAM LPAR in order to achieve sub-second responses at least 90 percent of the time. For a typical CRM deployment, this typically equates to 1250 named sales force users (20% of named users using the application concurrently) or 500 contact center users (50% of named users using the application concurrently). As shown in this white paper, the Sugar application scales linearly to accommodate more users by simply adding more processors and RAM to the cluster configuration.

APPENDIX A – DATA SIZES

For this white paper, all tests used a database with over 2,292,200 rows of data. The details of the seed data are below. The total includes the main objects and the relationship rows that link the data together.

Business Objects	Records
Teams	400
Email Addresses	120000
Users	2000
Accounts	10000
Product Bundles	20000
Products	40000
Calls	240000
Emails	160000
Contacts	40000
Leads	40000
Opportunities	20000
Cases	40000
Bugs	30000
Meetings	80000
Tasks	40000
Notes	40000
Documents	10000
Core Records	932400
Total Records	2292200

Database Size: 1.98 GB

Database Size with Indexes: 2.86 GB

APPENDIX B – AVERAGE RESPONSE TIMES

Number of Users	Avg. Response Times	Number of Requests
10	338.06	5423
50	579.25	10874
170	650.09	18164
250	518.6	26827

APPENDIX C – DETAILED RESULTS

This test was executed with 250 concurrent users (1250 named users) on a single Power 750 Express. The LPAR allocated for this test had 4 processors and 16G of RAM.

Response Time by Action

This test took one hour with each action being executed at least once by each user. More common actions, such as the various List and Detail Views, were executed with a higher frequency to simulate a more realistic use case. The resulting test executions put minimal loads on the database and web servers. Below is a breakdown of the server response time by action. The action on the left is a typical task performed by a user or the system. The average response time is how long that request took in terms of a server round trip in milliseconds. The number of requests is the number of times that particular action was performed during the load test.

Action	Avg. Response Time	Number of Requests
Login Screen	76.7	250
Login	676.12	250
Leads List View	629.01	1938
Case List View	492.56	1923
Task List View	503.15	1925
Lead Detail View	371.76	1917
Opportunities' List View	498.28	1904
Case Detail View	333.51	1901
Contacts List View	762.42	1938
Notes List View	633.62	1912
Task Detail View	207.52	1908
Opportunity Detail View	403.53	1885
Note Detail View	207.76	1892
Accounts List View	498.58	1914
Quick Create Opportunity	500.73	950
Account Detail View	564.67	1893
Quick Create Account	564.09	250
Quick Create Contact	650.33	250
Quick Create Case	492.62	250
Quick Create Note	325.95	250
Delete Contact	1531.22	250
Quick Create Lead	500.65	250
Delete Account	1597.19	250
Quick Create Task	328.16	250
Delete Case	904.9	250
Delete Opportunity	864.7	250
Delete Note	870.94	250
Delete Lead	846.95	250
Delete Task	860.85	250

Response Time Spread

This table shows response times broken down in time intervals of 100 milliseconds. Each time interval has the number of requests, the percentage of all requests, and the cumulative sum of all responses that came within the upper bound of the interval.

In this test, 99% of all requests have returned under 2 seconds.

Time in Seconds	# of Requests	% Responses	Sum % of Responses
0 - 0.1	433	1.47	1.47
0.1 - 0.2	3402	11.51	12.98
0.2 - 0.3	5656	19.14	32.12
0.3 - 0.4	5277	17.86	49.98
0.4 - 0.5	3974	13.45	63.43
0.5 - 0.6	2926	9.9	73.33
0.6 - 0.7	2110	7.14	80.47
0.7 - 0.8	1617	5.47	85.94
0.8 - 0.9	1113	3.77	89.71
0.9 - 1	751	2.54	92.25
1 - 1.1	531	1.8	94.05
1.1 - 1.2	358	1.21	95.26
1.2 - 1.3	305	1.03	96.29
1.3 - 1.4	218	0.74	97.03
1.4 - 1.5	166	0.56	97.59
1.5 - 1.6	142	0.48	98.07
1.6 - 1.7	100	0.34	98.41
1.7 - 1.8	72	0.24	98.65
1.8 - 1.9	56	0.19	98.84
1.9 - 2	48	0.16	99

APPENDIX D – IBM POWER7 DETAILS

IBM POWER7 Solution Editions for SugarCRM

Editions include	Power 720 Express	4-core Power 720 Express	6- or 8-core Power 740
Processor cores shipped	4	6 or 8	4 - 16
No-charge processor activations	3	5	Half number ordered
No-charge processor licensing for IBM i	0	0	2
Minimum number of IBM i processor licenses required	1	1	4
Processor Speed	3GHz	3GHz	Avg. 3.55GHz*

* Core processing speed may be 3.3GHz, 3.55 GHz or 3.7GHz depending on the feature ordered.

APPENDIX E – CAPACITY PLANNING

The following tables can be used as guidelines to approximate resources required for deploying SugarCRM. Performance will vary depending on end-user activities and data sizes.

Note: A typical SugarCRM system sees 20% concurrency. That means a 100 named user system (i.e. 100 users with login credentials) will typically see on average 20 users accessing the system concurrently at peak load times.

Power740 Express

Maximum Named Users	Maximum Concurrent Users	Cores	RAM
50	10	1	2GB
250	50	1	4GB
850	170	2	8GB
1,250	250	4	16GB

It is highly recommended to use the IBM Performance Capacity and Workload Sizing tool – “IBM Systems Workload Estimator” in case other applications do run in the same partition and additional resources required for SugarCRM have to be evaluated and estimated. Performance data can be collected in the existing environments and fed directly into the WLE tool for further extrapolations. The WLE tool and more information about workload sizing can be found at: www-912.ibm.com/wle/EstimatorServlet?

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