RACKSPACE WHITEPAPER:

TESTING MAGENTO
PERFORMANCE

Magento®

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ABSTRACT

If you search the Internet for statistics about website page load times and the relationship with conversion, you will find plenty of relevant examples (e.g. Walmart, Amazon and Firefox). The clear message is that optimising performance will directly improve customer experience, which can lead to more sales. One thing that is often overlooked by online retailers is performance measurement. Carrying out regular testing not only enables a benchmark of user experience, it also enables the identification and remediation of operational bottlenecks. Understanding how a site performs under load will supply transaction metrics which help predict capacity and ensure that maximum return can be achieved from targeted marketing activity.

Magento is the fastest growing e-commerce application for production websites in use today (Internet Retailer top 500 http://www.internetretailer.com/top500/). Thousands of retailers trust the platform worldwide but effective deployment onto a hosting infrastructure can be a challenge. This whitepaper presents the benefits of optimising the application stack to increase performance.

By analysing different application configurations it is possible to validate the benefits of a tuned deployment. This document will also demonstrate a clear methodology for performance testing and measuring the results.

Testing Methodology

INTRODUCTION

In order to demonstrate that optimisations deliver a significant performance improvement for Magento we put together a comprehensive testing strategy. There are many tools available but we use Neoload. It is an all-embracing performance tool and highly configurable, enabling detailed analysis.

READ MORE ABOUT NEOLOAD IN THE APPENDIX.

The process of building user journeys, which accurately mimicked human browsing, took a significant effort. This reflected the completion of purchases from an ecommerce website, and provided more realistic results. Many tests do not do this to a sufficient level, meaning the outcomes can be unreliable. If you just siege test a website then you aren't able to test the difference between browse and transactional customers.

The first place to start was to build a number of journeys which each virtual user would be associated with. Two groups reflected users who were just browsing and two were for transactional users.

In order to test both infrastructure performance and realistic shopping simulations, two tests were performed. The first used a default Magento installation, effectively a blank store with only core features. The second used configuration and data from a real customer store www.illamasqua.com. This included functional plugins, a product catalogue and registered user group.

READ MORE ABOUT OUR CUSTOMER ILLAMASQUA IN THE APPENDIX.

We wanted to reflect a website under peak trading conditions so a conversion percentage (browse to buy ratio) of over 5% was used. The average items in each purchase was randomised from 1 – 4. The details for numbers are outlined in each test.

User Journeys

USER JOURNEY 1: FILTER VISITORS

Virtual users who did not log in to the store using an account. Filters were used to find a product, the product page was visited before leaving the site.

(Homepage > random category > random sub-category > random product > end)

USER JOURNEY 2: SEARCH VISITORS

Virtual users who did not log into the store using an account. The search feature was used to find a product, the product page was visited before leaving the site.

(Homepage > random search (from 15 popular) > select a random product > end)

USER JOURNEY 3: BUYERS

Virtual users who searched the site for a product, added it to the shopping basket, then added up to 3 more products, then proceeded to the checkout. Half completed their purchase and the remainder abandoned the transaction.

(Homepage > login > random category > random product > add to basket > review basket > checkout or abandon > end)

USER JOURNEY 4: WISHLIST SHOPPERS

Virtual users who searched the site for a random product, added it to a wish list, then added up to 3 more products before leaving the site.

(Homepage > login > random category > random product > add up to 4 items to wishlist > review wishlist > remove an item > end)

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The Optimised Application Stack

The application infrastructure deployed to run Magento was split into "standard" and "optimised" builds (or stacks) and was made up of the following configurations:

STANDARD:

Using the default application versions and settings as provided by CentOS 6.

Apache, PHP 5.3 (with mod_php), Magento 1.14 (including FPC) with File Caching. MySQL 5.1.

OPTIMISED:

Apache (worker), PHP 5.4 (FPM), Opcache, Magento 1.14 (including FPC), Redis object and session caching, Percona 5.6 (with tables converted to InnoDB).

In addition to deploying a more capable set of applications the optimisation skill comes in carrying out tuning to meet the infrastructure. On the web tier this involved configuring Apache to have processes running and prepared for max users and the available server resources. This effectively sets up the solution on a "ready for traffic" manner and reduces time spent to begin a process. The use of caching services enables objects to be stored in memory and can be read immediately as opposed to the wait experienced with reading from a disk or storage device.

TESTING INFRASTRUCTURE

The same set of hardware was used for each test to help ensure that there was no variation in performance due to server hardware or networking devices. To represent a highly available Enterprise Edition application we deployed the following physical server platform:

Perimeter Firewall:	Cisco ASA5515x
Load Balancer:	F5 Big IP 1600s LTM
Web Server:	Dell r720 (dual 8 core intel processor 2.7GHz, 64GB RAM, 2 x 300GB SAS HDD (RAID1))
Database Server:	Dell r720 (dual 6 core intel processor 2.5GHz, 64GB RAM, 2 x 300GB SAS HDD (RAID1), HBA card)
SAN Deployment:	100GB "gold level performance shared SAN" presented for MySQL database storage. 250GB "silver level performance shared SAN" presented for NFS share.

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Presentation of Results

TEST 1: INFRASTRUCTURE PERFORMANCE

To test the effect of performance on infrastructure, two iterations were run against a default Magento Enterprise installation. The first was a standard Linux stack deployment (apache, PHP and MySQL), the second consisted of a Rackspace optimised configuration. The following population of 500 virtual users was deployed:

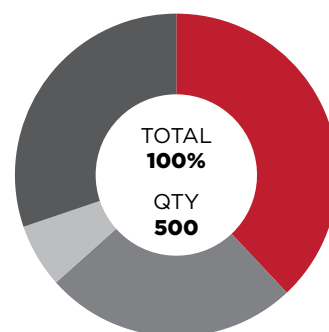|		
■ Filter visitors	38.0%	190
■ Search visitors	25.4%	127
■ Buyers	6.4%	32
■ Wishlist shoppers	30.2%	151
TOTAL	**100%**	**500**

TOTAL
100%

QTY
500

FIG 1.0 Population of virtual useres deployed in Test 1.

The tests were run over a fixed time period of 6 minutes, simulating a throughput of 32 transactions.

RESOURCE USAGE: WEB SERVER

Comparing the use of resources allows us to measure the strain on the servers. In both cases a lower value is better. A serious impact on performance leading to considerable delay and even failure to display pages will take place when 100% utilisation occurs.


■ standard
■ optimised

74

32

47

20

CPU %   Memory %
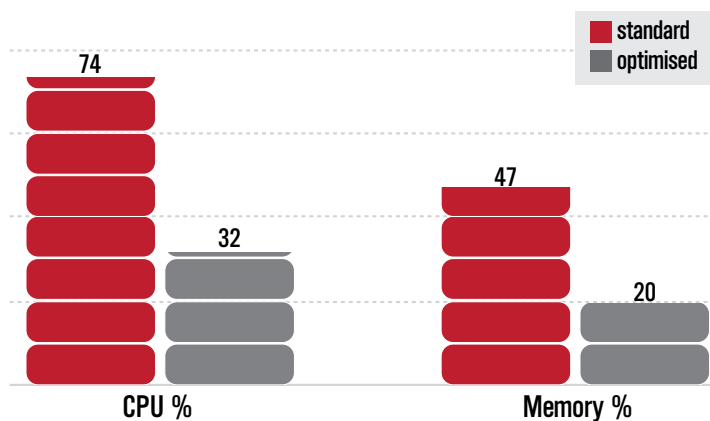
92.2%

decrease
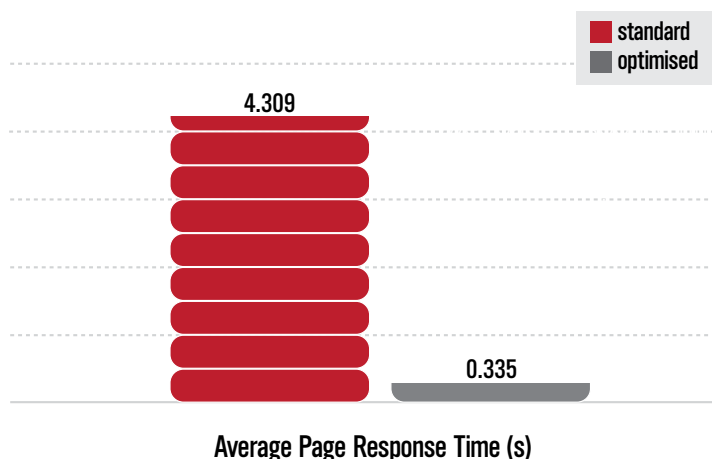
in page response

time.

Lower page response time means a quicker load time – this is vital to improve customer experience and site conversions.

RESOURCE USAGE: DATABASE SERVER

Resources on the database server come under pressure at high transaction level. In terms of a database transaction this relates to activity of logged in users who might be checking order history to completing a purchase.
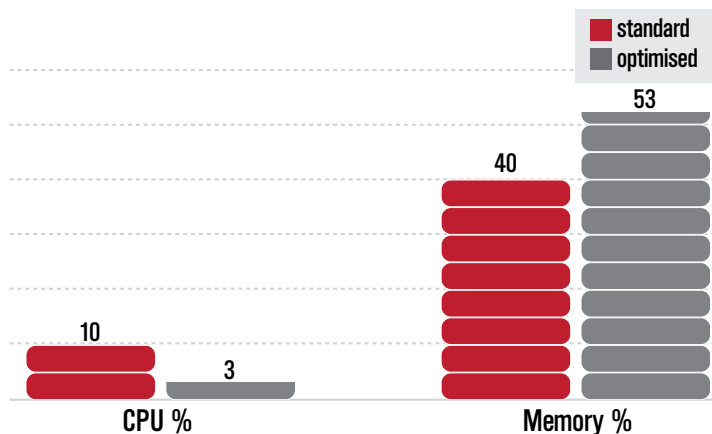
AVERAGE PAGE RESPONSE TIME – 92.2% DECREASE

Average Page Response Time (s)

Page response time is a measure of the time taken for all elements on the page to be gathered. This does not take into account the time

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37.4%

increase

in pages served per second.

Higher pages per second means your site can handle peaks of traffic more efficiently.

a browser takes to render the page. For this metric a lower value is better. The average value is across all the pages which were served.

PAGES SERVED PER SECOND – 37.4% INCREASE

Pages served per second is a measure of full page delivery. For this metric a higher value is better. On two identical server infrastructures one can see the true value of application performance.

Pages per Second

Legend: standard, optimised. Values: 19.8 (standard), 27.2 (optimised)
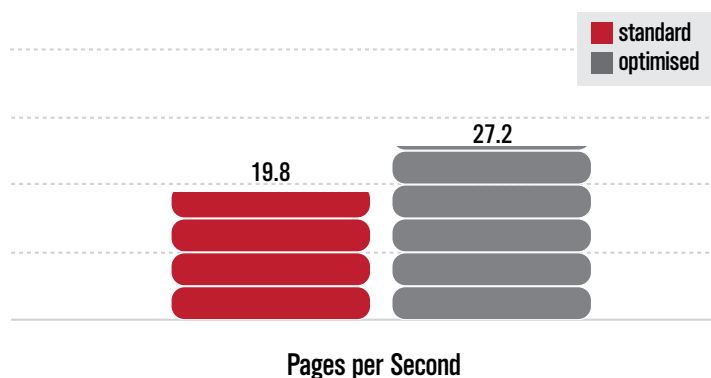
The impact of virtual user load on the server resources was significant. The optimised deployment not only performed better, but it did it with a lower impact on the servers. The web servers used less than half the resources available for both CPU and memory, to serve 500 users completing 32 transactions. Interestingly the peak memory use on the optimised database server was higher due to the increased effectiveness of the web nodes and the optimised configuration making better use of the resources available.

Based on this test, using an optimised application infrastructure deployment would deliver a significantly improved efficiency of resources. This would allow you to host a solution using a lower specification of server and still deliver better performance.

122%

increase

in average pages

per second.

An optimised solution is
able to serve more pages
to customers, that means a
quicker site.

TEST 2: CUSTOMER EXPERIENCE

By testing performance against code from an actual Magento store,
we are able to gauge the impact on a customer in a more realistic
fashion. Again we used a standard Linux stack and a Rackspace
optimised configuration, but this time we had code and data from
our customer, Illamasqua.

■ Filter visitors	36.0%	360	
■ Search visitors	24.0%	240	
■ Buyers	12.0%	120	
■ Wishlist shoppers	28.0%	280	
TOTAL	**100%**	**1000**	
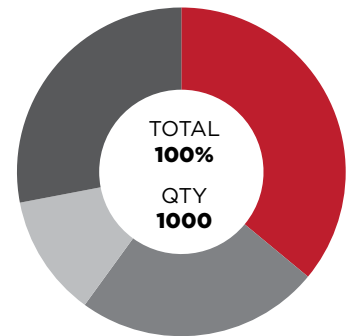
FIG 2.0 Population of virtual useres deployed in Test 2.

TOTAL
100%

QTY
1000

This test was used to measure the speed of transactions. 60
transactions were processed and the time to complete this for 1000
virtual users was measured. In this case, rather than using a fixed time
period, as soon as the users were processed and the transactions
were finished the test was completed.

AVERAGE PAGES PER SECOND – 122% INCREASE

■ standard
■ optimised

104.5

47

Pages per Second

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48.⁹%
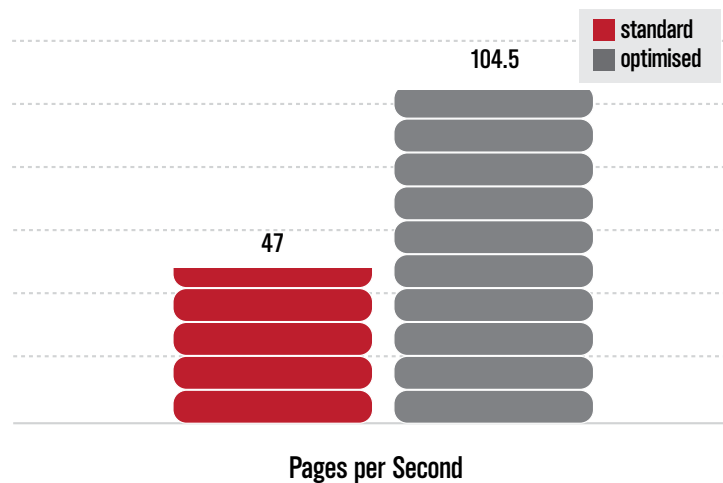
48.**⁹%**

decrease

in total time

to process

transactions.

Getting more customers to transaction quickly means your site will be more effective at peak trading.

As before there is clear increase in performance based on the quantity of pages served by time. These figures are higher than the previous test due to the schedule of virtual user deployment.

AVERAGE PAGE RESPONSE TIME (S) – 92.9% DECREASE

Average Page Response Time (s)
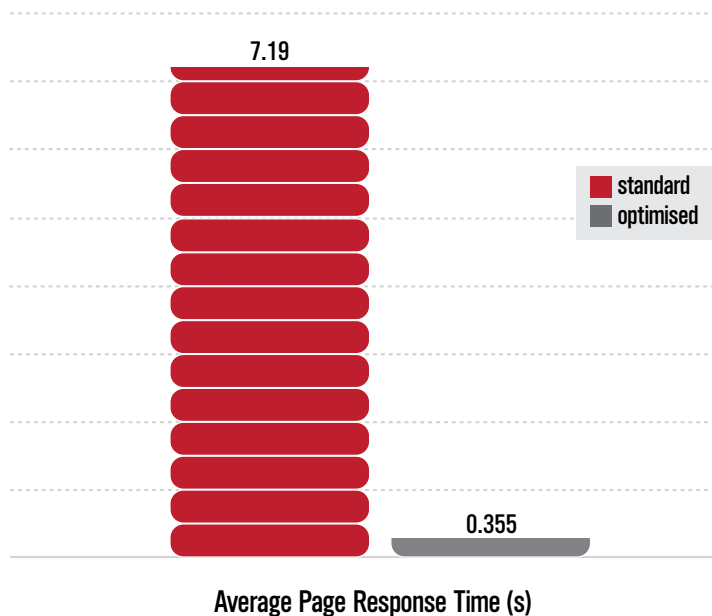
By comparing these figures with those from the previous test we can see the impact of additional page elements. The difference with the optimised solution clearly shows the benefits of the caching strategy.

TOTAL TIME TO PROCESS TRANSACTIONS (S) – 48.9% DECREASE

This metric measures the time to complete the transactions. A lower value is better. From this result we can calculate a number of statistics which relate to commercial performance of the site.

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95.8%

increase in transactions per hour

for the optimised store.

589 orders per hour (optimised) vs 301 orders per hour (standard)

standard		11:58
optimised		06:07

Time to process all users (m:s)
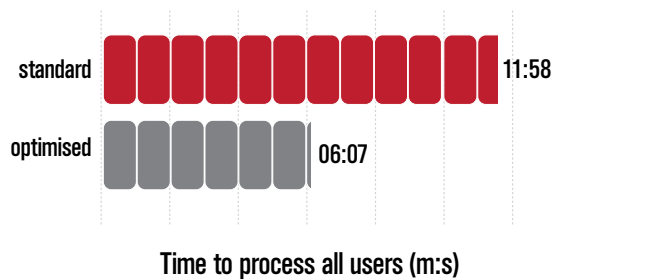
Again the optimised servers showed a significant performance increase with a very noticeable drop in time for page requests. This resulted in the user journeys and transactions being completed in almost half the time.

Speed of transactions and content delivery are directly proportional to customer experience and the conversion rate of an ecommerce site. As you can see there is an almost doubling of performance. While it is impossible to infer that the site would have double the number of paying customers, a significant increase could be expected.

In this test, because we are using real data, the number and value of orders processed was recorded. 60 transactions contained an average basket of 2.8 items at a value of £120.00. In the optimised instance this was completed in 6 minutes 7 seconds. This equates to a store turnover of £70,632 per hour for the optimised store. The standard deployment took 11 minutes 58 seconds, with the same item values equates to £36,072 per hour.

This is an overall increase in commercial productivity of 95.8% or nearly double the total order value (per hour).

Conclusion

The results clearly demonstrate an increase in performance when you deploy a Rackspace optimised application infrastructure stack.

Before running the tests these are the results we expected to see, for several reasons. The process of optimisation makes the best use of resources available, for example PHP processes are configured to be waiting to use available CPU cores. This state of readiness means that there is no delay in spawning a process. This leads to a reduction in response and hence a quicker page load. Using the most efficient resources available is also important, for example caching using memory will produce a much better level of performance than writing to a physical disk (where the data needs to be written and read).

Each of the rewards made from making a change to configuration make very little difference to the overall system performance. Carrying out a large number of small increases however, can deliver a measurable increase. This aggregation of margin gains, leading to much wider improvement, was popularised by British Cycling Coach Sir David Brailsford. It is this methodology of addressing every aspect of application deployment and tuning which delivers such impressive results.

Being able to carry out performance tuning on an infrastructure deployment in this way takes experience and knowledge. The Rackspace optimisations have been tried and tested with hundreds of customer websites, across varying server configurations with different installations of plugins. Being able to assess the best place to start when implementing significant changes requires thought and planning.

Performance testing should be part of any software development cycle not only does this help identify solution bottlenecks but delivers the capacity metric that a platform can handle. Not all customers are able to deploy a complete testing environment to allow such a clear comparison which is why it is so important to benchmark a site at regular intervals, particularly when making a major code change. The other advantage with knowing the capacity of the site is that you can predict a return on investment on infrastructure. It is very easy to work out when you need to deploy more resources and the associated benefit they will bring can be clearly measured to make a business case.

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Appendices

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APPENDIX 1:
FULL RESULTS TABLES

The testing platform delivered a huge amount of results, presenting and reviewing them all was not possible in this document. These tables cover more metrics we recorded:

TEST 1:

	STANDARD	OPTIMISED	%
Average pages/s	19.8	27.2	+37.4%
Average hits/s	464.6	194.7	-58.1%
Total pages	8632	8604	-0.3%
Total hits	202566	61518	-69.6%
Average Request response time	0.187 s	0.056 s	-70.1%
Total hit errors	0	0	+0%
Error rate	0	0	+0%
Average Page response time	4.31 s	0.335 s	-92.2%
Total throughput	751.88 MB	753.27 MB	+0.2%
Average throughput	13.80 Mb/s	19.07 Mb/s	+38.2%
Total users launched	500	500	+0%
Total iterations completed	500	500	+0%
Total action errors	0	0	+0%
Total duration alerts	0%	0%	+0%

TEST 2:

	STANDARD	OPTIMISED	%
Average pages/s	47.0	104.5	+122%
Average hits/s	633.7	1,219.3	+92.4%
Total pages	33823	38473	+13.7%
Total hits	455637	448711	-1.5%
Average Request response time	0.548 s	0.039 s	-92.9%
Total hit errors	68	31	-54.4%
Error rate	0	0	+0%
Average Page response time	7.19 s	0.355 s	-95.1%
Total throughput	2640.89 MB	1578.93 MB	-40.2%
Average throughput	29.38 Mb/s	34.32 Mb/s	+16.8%
Total users launched	1000	1000	+0%
Total iterations completed	1000	1000	+0%
Total action errors	0	0	+0%
Total duration alerts	38.3%	16.3%	-57.4%

APPENDIX 2: ABOUT RACKSPACE

Rackspace (NYSE: RAX) is the #1 managed cloud company. Its technical expertise and Fanatical Support® allow companies to tap the power of the cloud without the pain of hiring experts in dozens of complex technologies. Rackspace is also the leader in hybrid cloud, giving each customer the best fit for its unique needs — whether on single- or multi-tenant servers, or a combination of those platforms. Rackspace is the founder of OpenStack®, the open-source operating system for the cloud. Headquartered in San Antonio, Rackspace serves more than 300,000 business customers from data centers on four continents.

APPENDIX 3: ABOUT NEOLOAD FROM NEOTYS

NeoLoad (testing software from Neotys) is a load and performance testing software solution designed for web and mobile applications to more realistically simulate user activity and monitor server behaviour. NeoLoad's technology allows you to perform load and performance testing more quickly, efficiently and frequently, which means you can confidently deploy your internet, intranet or native mobile applications no matter which architecture they use, even the newest such as GWT, Silverlight, Flex and Ajax Push. With NeoLoad, the simple tasks are automated, and the difficult tasks are simple.

Neotys' load and performance testing solution can help you prepare your application to perform well under load. They provide an effective load testing solution that can help you build your web or mobile application to meet users' expectations in production.

APPENDIX 4: ABOUT ILLAMASQUA

This make-up brand, that empowers people to express their individuality, has been making a scene in London since its launch in November 2008. The product of a heady mix of influences; from its roots in the dark and illicit 1920s Berlin club scene, to a rich heritage in the manufacture of make-up for film and theatre, Illamasqua takes its inspiration from members of the 'alternative scenes' for whom self-expression is paramount. Illamasqua's highly-pigmented, long lasting products provide consumers and make-up artists alike with the products and inspiration to express themselves, whoever they are and whatever look they want to achieve.

APPENDIX 5:
ABOUT MAGENTO

Magento offers flexible, scalable ecommerce solutions designed to help their customers grow and succeed online. The cost-effective technology platform makes it possible to control the content, functionality, and look and feel of your online store.

They also offer support, services, and training to help you ensure your success. A comprehensive network of solution partners and certified developers offer expertise and resources to help design, build, and host an online store. The partners also offer thousands of apps and extensions to help add custom features and functionality. Ultimately, the ecommerce platform provides an online business with the essential tools to transact with a global customer base.

APPENDIX 6:
ABOUT THE AUTHOR

Mike Bainbridge is a Rackspace solutions architect with a specialisation in designing infrastructure for high performance, transactional websites. With over 15 years in the IT industry and a background in technical pre-sales, Mike has been working specifically with e-commerce customers for the last 4 years. He has designed solutions from small, high-growth start-ups to large established enterprise organisations with complex disaster recovery requirements - covering all market sectors. Understanding traffic peaks and helping customers to get peace of mind by performance testing their environments have been a particular focus in the last 18 months. Working with our customers to solve business critical problems is what gets Mike out of bed in the morning.