



Your Guide in the Virtual World

UBUNTU DISK IO BENCHMARK TEST RESULTS

FOR JOYENT
Revision 2

January 5th, 2010

Scope:

This report summarizes the Disk Input Output (IO) benchmark testing performed in December of 2010 for Joyent Ubuntu Linux cloud servers.

References:

[1]: <http://blog.cloudharmony.com/2010/06/disk-io-benchmarking-in-cloud.html>

[2]: Svn repository: <https://svn.codespaces.com/ims/joyent-ubuntu>
username: joyent **password:** joyent

[3]: Raw test data: DISK-IO_Final_Results.xlsx

[4]: Phoronix Test Suite 2.6.1:
<http://www.phoronix-test-suite.com/download.php?file=phoronix-test-suite-2.6.1>

Joyent Disk IO Benchmark Testing Report

Introduction

The Disk IO testing was performed as part of a larger benchmark effort intended to provide a basis for comparison between the Joyent Ubuntu and other virtual servers offered by cloud service providers.

Earlier in 2010, CloudHarmony engaged in an extensive benchmarking effort intended to provide "information and analysis to enable educated decisions pertaining the adoption of, and migration to cloud services". Their results and analysis are presented in a series of articles published online ref[1]. The CloudHarmony blog does not contain results for the Joyent Ubuntu servers. Our testing procedures are intended to follow CloudHarmony's efforts as closely as possible and extend benchmarking to the Joyent servers.

Instead of trying to reproduce all of the CloudHarmony results, we focused on those outlined for the Amazon EC2 servers used in their benchmark tests ref[1]. Our tests closely approximate the methods from CloudHarmony in regards to calculations and tests used. Figures for the Joyent Ubuntu servers should be a useful addition to the other benchmarks included in CloudHarmony's blog. It should be noted that not all test executables and versions contained in this report are identical to those of CloudHarmony due to differences in operating systems. These results should not be compared side-by-side to those of CloudHarmony, but give a similar reference instead. Our mathematical calculations for the baseline numbers and server instances are however identical.

CloudHarmony standardized on CentOS 64bit as the operating system used for baseline tests except where it was unavailable. The Joyent servers run Ubuntu version 10.04 of the operating system.

The Joyent Ubuntu servers use large commodity hardware with an available 4 hyper-threaded processors that effectively yield 8 processor cores. This means that Joyent's smallest server, the 1 GB, can in some cases outperform Amazon's largest EC2 instance. Due to bursting capability, side-by-side comparisons may not be identical in nature between the Joyent Ubuntu servers and other cloud providers.

Our conclusions outline the similar comparison between Joyent's 8GB Linux server and Amazon's EC2 c1.xlarge instance which both yield similar virtual hardware.

Benchmark Setup

Storm on Demand 's Bare Metal Cloud Server was used as the baseline for all Disk IO tests. We compared both Joyent and Amazon servers to the Storm on Demand server baseline. The EC2 servers used consist of: m1.small, c1.medium, m1.large, m1.xlarge, m2.xlarge, c1.xlarge, m2.2xlarge, m2.4xlarge. The Storm on Demand and Amazon servers – 8 servers in 4 regions – were configured identically in terms of OS, CentOS 5.4 64-bit (or 32-bit in the case of EC2 m1.small and c1.medium where 64-bit is not supported). Joyent servers included: 1GB, 2GB, 4GB, 8GB, 16GB.

To run the majority of benchmark tests, CloudHarmony made use of the Phoronix Test Suite ref[1]. Version 2.6.1 was used for compatibility and comparison with our benchmarks performed on the Joyent Ubuntu Servers ref[2]. There are several differences between version 2.2.0 used by CloudHarmony and 2.6.1 used in this report. These include test versions, source code, and executables. Our tests however used version 2.6.1 on all servers including the baselines.

The Joyent Ubuntu servers utilize version 10.04 and only required minor tweaks if any to the phoronix test suite.

Benchmark Tests

For compatibility and comparison against the scores and results on the CloudHarmony blog ref[1], the following 7 tests were run on all servers under test:

Bonnie++, Blogbench, Dbench, Flexible IO Tester, Iozone, Threaded IO Tester, and hdparm-read.

The default versions contained in the Phoronix Test Suite 2.6.1 were used.

Testing Procedures

The Phoronix Test Suite 2.6.1 was setup on the Storm on Demand's new Bare Metal Cloud Server, Joyent Ubuntu and Amazon servers to run all the Disk IO benchmarks except bonnie++. Phoronix compiles their results in xml files to be displayed in a web browser, and also creates image graphs for visual comparison. Bonnie++ was run independently from the others with output saved to a flat-file for record keeping.

In order to reproduce our testing procedures on the Joyent Ubuntu servers see ref[2]: joyent_ubuntu_diskio.sh, phoronix-test-suite-JoyentUbuntu-2.6.1.tar.gz. The following guidelines should produce similar or identical test results:

1. Install the Phoronix Test Suite into a local directory within the user's folder on each server. Tar files for Joyent Ubuntu are included ref[2]: phoronix-test-suite-JoyentUbuntu-2.6.1.tar.gz. This tar file includes the small tweaks required for Joyent's Ubuntu servers. For these disk io tests, the default version of the phoronix test suite 2.6.1 may also be used ref[4]. If using the supplied tar file ref[2], extract into the user directory and skip to step 4.

2. If installing the default Phoronix Test Suite 2.6.1 ref[4], optionally apply the patch file ref[2] phoronix-suite-2.6.1-ubuntu.patch to the test suite. This patch makes changes to the installation files and performs the minor alterations necessary for the Ubuntu servers. It is recommended to use this patch in case of other tests that may be run.
3. See the script file and manually follow it's procedures to create and install all of the tests required. Several small steps are needed to properly run all of the tests: ref[2] joyent_ubuntu_diskio.sh. Depending on the system, this script may need to be run as root.
4. Either run the benchmarks manually via phoronix and Bonnie++ or use the test executable script ref[2] joyent_ubuntu_diskio.sh to run all the tests. It may be needed to run the script as root for hdparm to run properly. The script automatically packs the output files from each test result and will email them to the address entered at the prompt. Disk IO tests on each server take approximately 4-8 hours to complete.

Note: If tests fail to run, make the following modifications to the test suite core files to see the full executable outputs for troubleshooting:

```
phoronix-test-suite/pts-core/library/pts-functions_shell.php
```

At line 110 add:

```
echo pts_variables_export_string($extra_vars) . "\n\n";  
echo $exec . "\n\n";
```

This will output the Phoronix variables and executable to the command line.

Baselines

A baseline was taken from results of the Storm on Demand's new Bare Metal Cloud Server and calculated based on the methodology used by CloudHarmony. It should be noted that there are two sets of IOP scores. For the Joyent Ubuntu results, IOP is accurate for comparison. IOP 2 excludes tests that are not compatible with the Joyent SmartMachines operating system. If comparing the Joyent Ubuntu and Joyent SmartMachine, use IOP 2.

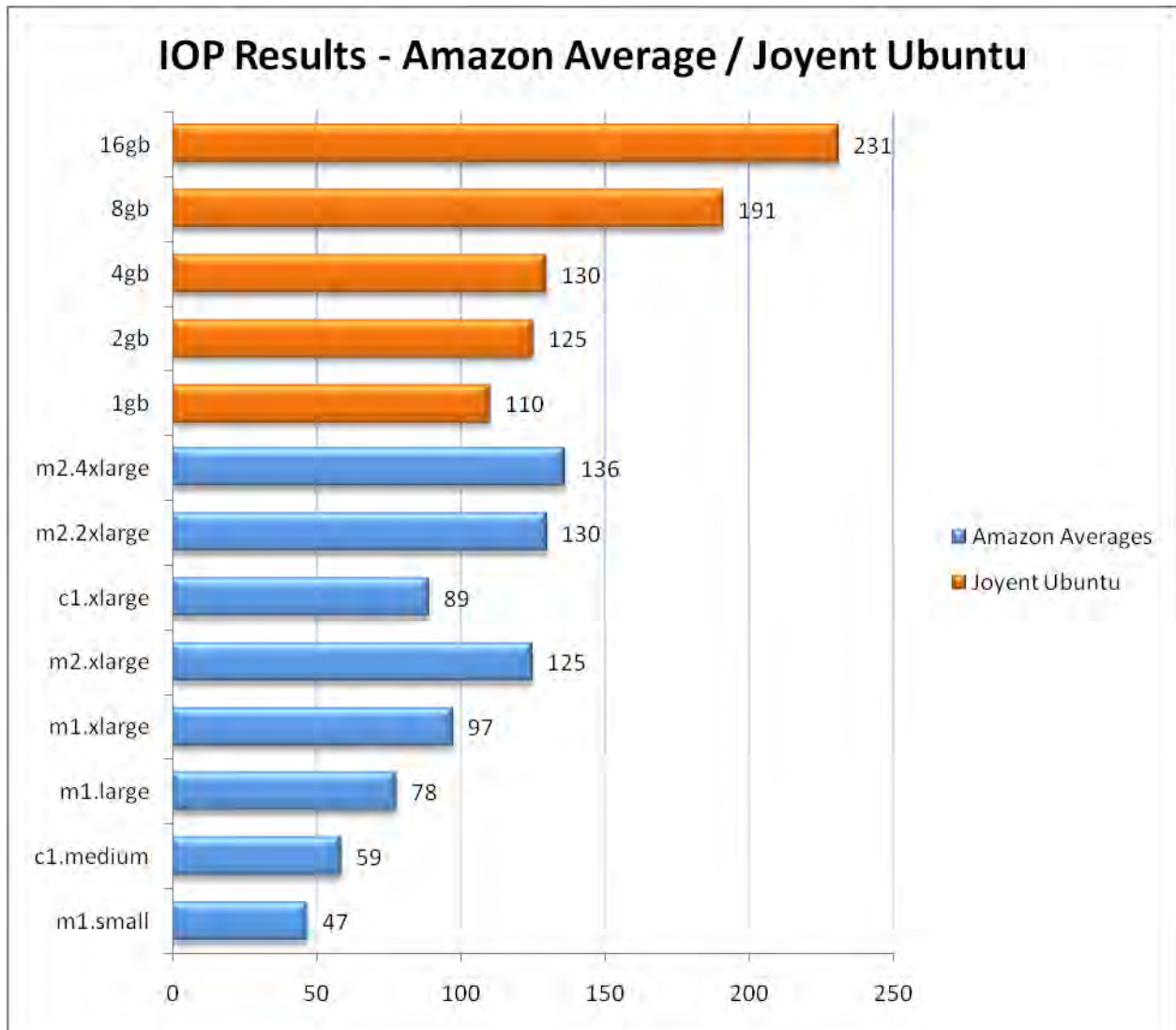
Our calculations for IOP are the same used by CloudHarmony with the only difference being the tests are run with Phoronix 2.6.1. This version was used for comparison against the previous benchmarking efforts on the Joyent SmartMachines running an OpenSolaris based operating system.

Test Results

Overall, the Joyent Ubuntu servers showed a large performance increase over that of Amazon EC2. The baseline for Storm on Demand has been excluded from the graphs due to it's unrealistic comparison between dedicated raw hardware disk IO and disk virtualization of other cloud servers. Needless to say, the Storm on Demand server scored the highest out of any server benchmarked at 692 IOP. The

score from Storm on Demand was expected due to the unique platform, and was also needed to form a baseline higher than all other servers under test.

The following graphs show the test results for Amazon EC2 and the Joyent Ubuntu Servers. For accurate comparison between server resources, the 8GB and c1.xlarge have similar 8 CPU cores with the only difference of 7GB Ram for c1.xlarge. It should be noted that the graph shows an average of all IOP scores from the different Amazon regions for ease of comparison.

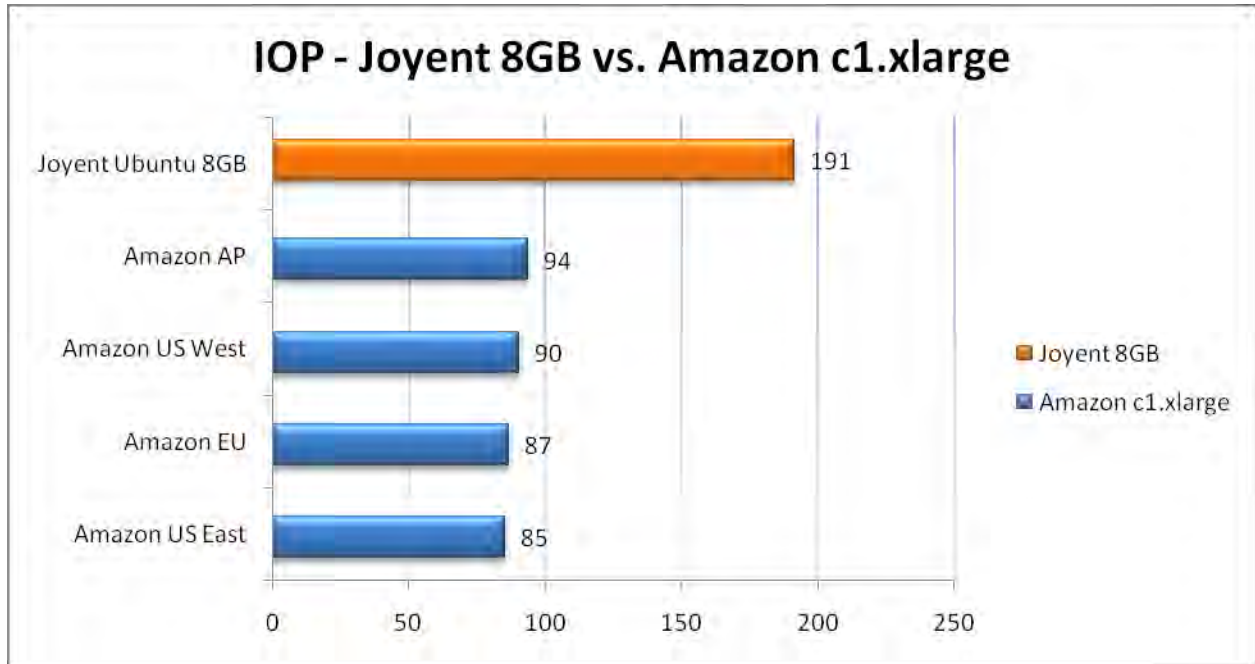


Conclusion

The results show an improvement over Amazon for Disk IO. These figures are not quite as drastic as the other Memory and CPU benchmarks, but Joyent Ubuntu still outperforms the Amazon EC2 instances. Both Amazon and Joyent showed a linear increase of scores based on the server's available virtual resources.

For a more accurate comparison between servers of similar type, we used the Amazon EC2 c1.xlarge instance and Joyent Ubuntu 8GB server. Both servers have

similar RAM – 7GB versus 8GB – and the same available 8 CPU cores. The exact underlying disk hardware for each server is the only unknown for these benchmarks.



Averaging the Amazon results puts the c1.xlarge instance score at 89 IOP, while the Joyent Ubuntu 8GB server is an amazing 191 for this server size. The major difference between the two servers could be due to Joyent’s underlying hard drive and hardware configurations.