

Network Appliance FAS3070 and EMC CLARiiON CX3-80: Comparison of Performance and Usability

Test report prepared under contract from Network Appliance

Executive summary

Network Appliance™ commissioned VeriTest, a service of Lionbridge Technologies Inc., to compare the performance and usability of the NetApp® FAS3070 and the EMC® CLARiiON®CX3-80.

Our performance tests measured performance over a fibre channel (FC) SAN using an OLTP workload. We first evaluated the maximum aggregate system performance, and then evaluated the performance that could be delivered for a single workload.

Our usability tests measured the elapsed time required to perform common administrative tasks associated with storage provisioning, data backup/restoration, and cloning.

All testing was performed in FC-SAN configurations for dual-controller systems, using best practices published by each vendor. Please refer to the Testing Methodology section of this report for complete details on how we conducted both the usability and performance testing on the FAS3070 and CX3-80. Please refer to the Test Results section of this report for full details of the results of the testing.

Performance Tests – Summary Results

Our first performance test was designed to measure the maximum aggregate performance available for a consolidated storage environment with OLTP applications including Microsoft® Exchange, Oracle® databases, and SQL Server databases. We configured both the FAS3070 and CX3-80 with 200 15K RPM

Key findings

- ❑ During performance tests using 200 disk drives, we found that the FAS3070 configured with dual parity RAID-DP™ delivered 10 percent higher aggregate performance and 8 percent lower average latency compared to the CX3-80 configured with RAID 5.
- ❑ Using a provisioned 400GB LUN and the FCP protocol, we found that the FAS3070 configured with RAID-DP generated 6.8 times the performance and 85 percent lower average latency compared to the CX3-80 when using RAID 1/0. When the same test was conducted after provisioning the 400GB LUN on a MetaLUN, we found that the FAS3070 configured with RAID-DP generated 1.95 times the performance and 49 percent lower average latency compared to the CX3-80
- ❑ Using the snapshot capability with the CX3-80 during performance testing resulted in a sustained, 50 percent drop in overall performance. We found no sustained degradation in overall performance as a result of using the Snapshot™ technology available on the FAS3070.
- ❑ Provisioning our enterprise class OLTP database on the CX3-80 required 39 percent more physical disks compared to the FAS3070. Using NetApp FlexVol™ technology allowed us to provision an enterprise class OLTP database using a total of 56 physical disks compared to 78 disks to provision the same database on the CX3-80.
- ❑ In our test configurations, we found it required significantly less time to complete a series of typical provisioning and administrative tasks on the FAS3070 compared to the CX3-80. For example, it required over 27 minutes to create a clone of a 400GB LUN on the CX3-80 compared to only 7 seconds on the FAS3070.

disks to measure the performance over FC-SAN. For all of our performance tests, we utilized IOMeter to generate an OLTP workload consisting of 60% random read and 40% random write operations, all using an 8KB request size over FCP.

For this test, the FAS3070 was configured with dual-parity RAID-DP (NetApp's implementation of RAID 6), and the CX3-80 was configured with single-parity RAID 5. We used four dual processor host systems running Windows® Server 2003 Enterprise Edition to generate the load across both storage processors using all 8 FC ports available on both the FAS3070 and CX3-80. In this test, we found the FAS3070 delivered approximately 10 percent higher performance (31,109 IOPS vs. 28,352 IOPS) and 8 percent lower average latency (66 ms vs. 72 ms) compared to the CX3-80.

Figure 1 provides the results of another series of tests that measured the performance that can be achieved with a single application by simulating the load of an OLTP database against one of the available storage processors. On both the FAS3070 and CX3-80, we used a 400GB OLTP database LUN representing the Oracle OLTP production database created during the enterprise class database provisioning exercise (8 disks and RAID 1/0). We subjected the LUN to the OLTP workload described above using a single Windows host system and one FCP connection. In this test, we found that the FAS3070 generated 6.8 times the performance (14,114 IOPS vs. 2,069 IOPS) and 85 percent lower average latency (18 ms vs. 124 ms) compared to the CX3-80.

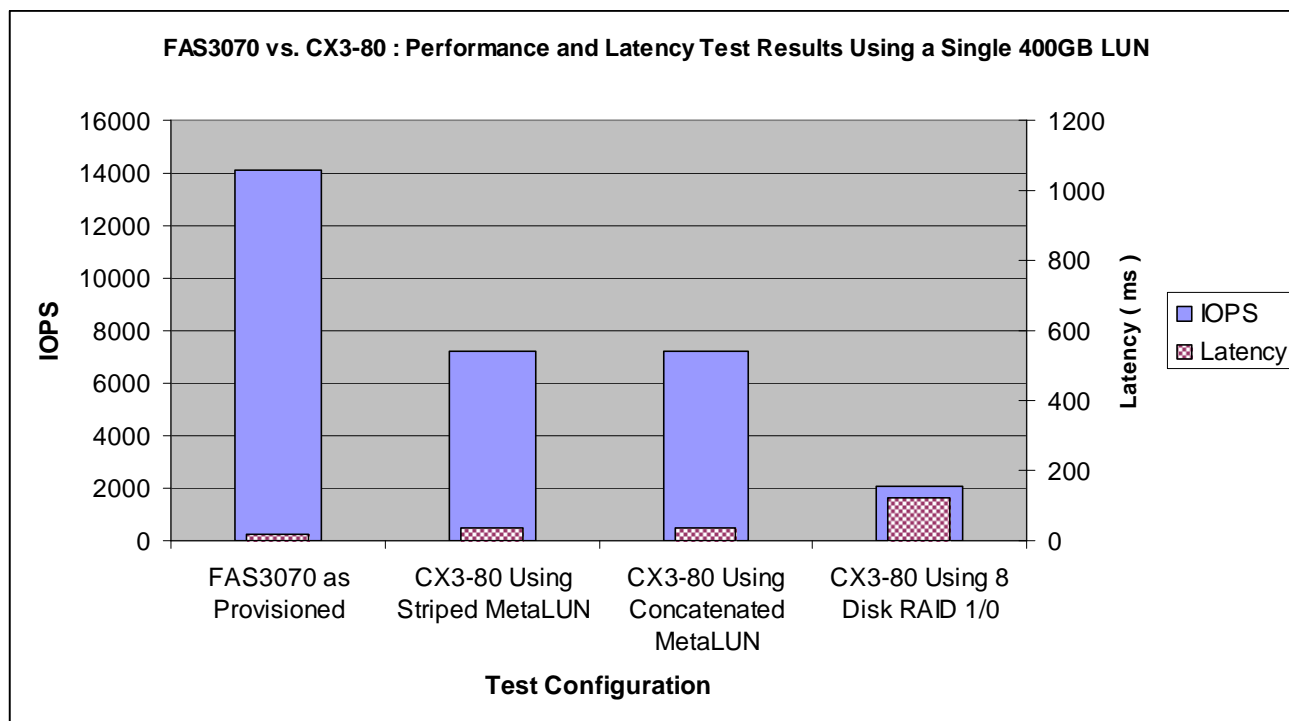


Figure 1: Test Results for Provisioned Performance Using Provisioned 400GB OLTP LUN

On the CX3-80, we redeployed the above 400GB LUN on a series of MetaLUNs. A MetaLUN is a group of identical smaller LUNs bound together in order to provide storage consisting of a larger number of physical drives. EMC recommends using MetaLUNs to support applications generating larger numbers of IOPS as a result of OLTP workloads. The goal of the test was to measure the performance improvement afforded by using a MetaLUN when subjected to an OLTP workload.

For this test on the CX3-80, we created a total of four identical 8-disk RAID 1/0 groups and used them to create a single MetaLUN containing a total of 32 physical disks. We created MetaLUNs using both the stripe and concatenation methods. We then ran the identical OLTP workload used to generate the results described above. As figure 1 above shows, adding 24 more disk drives in the MetaLUN significantly improved the

overall performance on the CX3-80. In these cases, we found the performance generated on the FAS3070 was approximately 1.95 times the performance and 49 percent lower average latency (18 ms vs. 35 ms) compared to the CX3-80 when using either a concatenated or striped MetaLUN.

For the final performance tests, we measured the impact on overall performance when using the snapshot capabilities of both the FAS3070 and CX3-80. The first test evaluated performance impacts associated with generating a single snapshot, and the second test evaluated impacts for a series of snapshots. Both tests were run over a 70 minute period. For both of these tests, we used IOMeter to generate the same OLTP workload as discussed above for the test cases using the single 400GB OLTP database LUN

We set the run time in the IOMeter test script to 70 minutes and let the test run continuously. For both the FAS3070 and CX3-80, we allowed the IOMeter test script to run for 10 minutes and then created a single snapshot copy of the provisioned 400GB OLTP production database LUN. During the second test we created a series of 30 snapshots of the OLTP database LUN at two minute intervals on the FAS3070, and a series of 8 snapshots of the OLTP database on the CX3-80 at 5 minute intervals. During these tests, we found that the CX3-80 supported a maximum of 8 simultaneous snapshot copies.

Figure 2 shows the results of the snapshot performance testing when taking a single snapshot. These results compare the relative performance impact when creating a snapshot when compared to overall performance when no snapshots are taken. A value of 100 indicates that there was no difference between the performance recorded during the testing when taking a snapshot and when not conducting the snapshot process. Data points less than 100 indicate the percentage of performance degradation between the baseline configuration when no snapshots were performed and the configuration where we conducted snapshots.

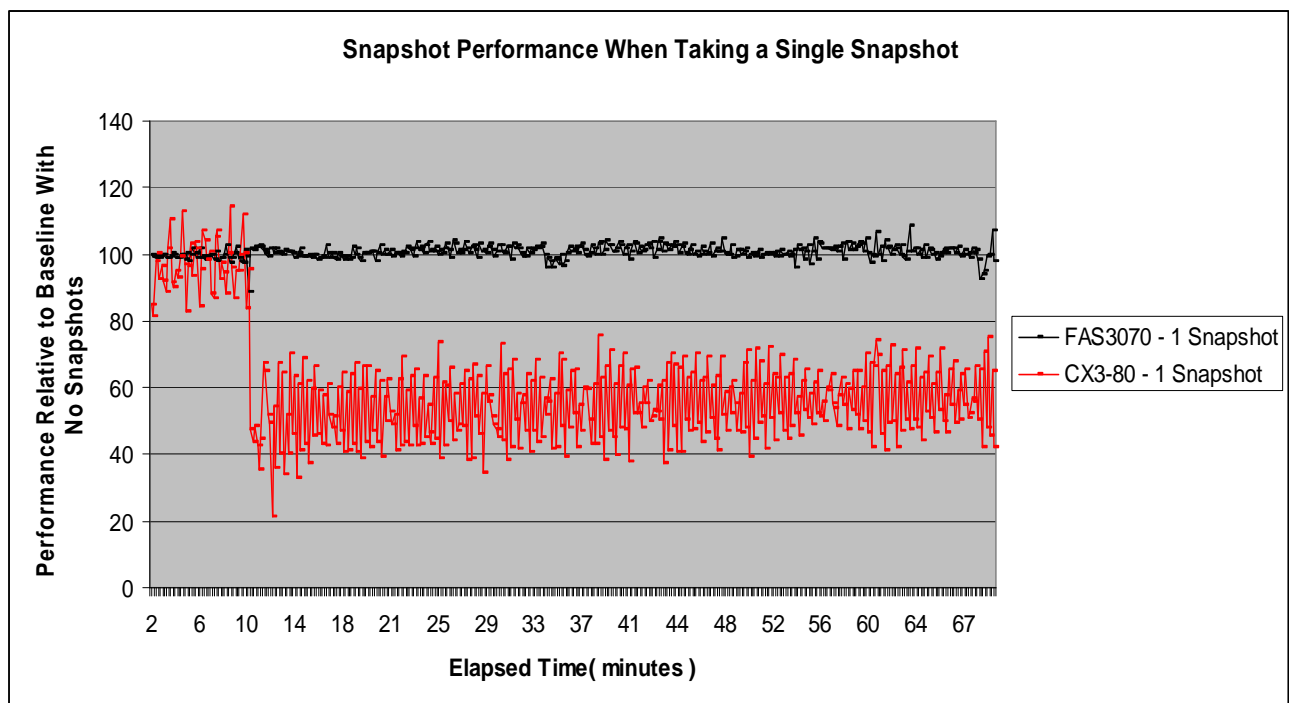


Figure 2: Results for Snapshot Performance Tests Using Provisioned 400GB OLTP LUN

In our test configurations, we found that creating a single snapshot copy had no sustained impact on the overall performance FAS3070 over the course of the test. On the CX3-80, creating a single snapshot 10 minutes into the test period caused the overall performance level to drop approximately 50 percent, and to improve marginally during the remainder of the test period. Similar results were observed for the multi-snapshot tests, and details are provided in the Test Results section of this document.

Usability Tests – Summary Results

The first usability test case consisted of designing and provisioning a sample corporate enterprise class database configuration consisting of multiple applications and databases with the goal of determining the number of physical disks required to provide storage for the RAID groups and LUNs comprising that database configuration. This database configuration consisted of 20 LUNs comprising just over 3.4TB of physical storage.

Using NetApp FlexVol technology, we provisioned the database on the FAS3070 using a total of 56 physical disks. Using a combination of RAID 1/0 and RAID 5, provisioning the same enterprise class database on the CX3-80 required a total of 78 physical disks. This resulted in 39 percent more disks being required on the CX3-80 compared to the FAS3070.

After creating the database LUNs for the enterprise class database, we used them to conduct a series of tests to measure the number of steps and the time required to conduct a series of common provisioning tasks on both the FAS3070 and CX3-80. These tasks included, but were not limited to, creating and expanding LUNs, creating LUN clones as well as creating and restoring snapshots. For each of these test cases, we measured the number of steps and elapsed time required to complete the specific task.

Figure 3 shows the elapsed time required to complete the specific provisioning tasks as well as the percentage difference in time required to complete the specific task between the FAS3070 and CX3-80. In general, we found that the number of steps required to perform the tests was comparable between the FAS3070 and the CX3-80. However, we found performing these tasks on the FAS3070 required significantly less time compared to the CX3-80. Please refer to Appendix A of this report for complete details of the steps required to complete each task in Figure 3.

Usability/Provisioning Test Case	FAS3070 - Elapsed Time (hr:min:sec)	CX3-80 - Elapsed Time (hr:min:sec)	Difference
Measure Time Required to Create RAID Groups, Volumes and LUNS (including transitioning time)	0:15:35	0:38:15	2.5X
Measure Time Required to Create MetaLUNs on the CX3-80	N/A	00:07:00 (striped MetaLUN) 00:06:50 (concatenated MetaLUN)	N/A
Measure Time Required to Extend the Size of the Oracle OLTP Database	0:00:21	3:14:12 (striped) 00:00:24 (concatenated)	>500X 1.1X
Measure Time Required to Create Snapshot Copies (per snapshot)	0:00:05	0:00:07	1.4X
Measure Time Required to Restore Snapshot Copies (per snapshot)	0:00:18	0:01:30	5X
Measure Time Required to Clone LUNs	0:00:07	0:27:13	233X

Figure 3. Usability and Provisioning Test Results Summary