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FIBRENETIX
LITEPAPER #23

Seagate 20TB Exos

SAN and DAS
performance and rebuild testing
under extreme load

TRIED AND TESTED: THE 20TB EXOS

The new 20TB Exos from Seagate give an 11% storage boost, but just how well do they perform in the real world?

WE TEST EVERYTHING WE SELL



Over 70% of the components in a FibreNetix solution are manufactured by us, in Denmark.

Of the remaining 30%, all of them have been Tried and Tested in our Lab. It's part of the quality promise we make to our customers.

THE BEST JUST GOT 11% BIGGER

FibreNetix Video Surveillance Solutions cost less to run, use less power and generate less CO₂ than any of our competitors. And, as of today, they come with an 11% bump in video storage thanks to Seagate's brand new 20TB Exos. That's great news—if you can be certain that there's no drop in performance or reliability.

BIGGER IS BETTER. BUT...

As disks grow in size, when a disk failure occurs, the time it takes to safely rebuild the data from the Parity Disk gets longer, especially under load. That's an issue for Video Surveillance where data integrity is vital. So just how much longer do the new disks take to rebuild, when coupled with FibreNetix hardware-only data controllers?

MORE AND MORE STORAGE

CCTV solutions regularly require Petabytes of data. And this demand for storage is accelerating, driven by Solutions that require:

More Cameras: A smart city or airport may need up to 10,000 cameras

Higher Resolution: New video apps require HD or higher resolutions

Longer Retention Period: The legal requirement to hold the data from 30 to 180 days (in the Middle East, for example)

THE TESTS

TWO STORAGE ARCHITECTURES

FibreNetix offers both SAN and DAS-based storage architectures, so it was vital we tested both, using the industry standard RAID-6 type.

THREE RAID VOLUME CONFIGURATIONS

We chose a standard 6+2 HDDs RAID configuration - giving a **raw storage capacity** of 160TB. Then we tested the **usable capacity** split 3 ways ; as one volume of 120TB, as two volumes of 60TB and finally split into 4x separate 30TB volumes.

TWO REAL WORLD SCENARIOS

It was important to perform all the tests in two real world scenarios:

Load testing – where we mimicked 400 concurrent camera streams, with 6-hour retention for over 1,000 hours of tests.

Failure testing – to simulate disk failures and measure rebuild times.

THE RESULTS?

Sadly we can't share the detailed report as this is confidential, however we can report that the new HDDs 'showed expected performance' and that for a full 120TB capacity array, it takes just 13 minutes to rebuild 1 TB. And at full busy disk activity, this rises to just 31 minutes.

WHAT THIS MEANS AND WHY IT'S IMPORTANT

The new drives give an 11% hike in storage capacity, with no reduction in speed, resilience or larger than expected increase in rebuild time.

In fact, these times are up to 30% less than our competitors.

Which means they are perfect for large Video Surveillance projects where data integrity is vital.

METHODOLOGY AND TEST SCENARIOS

We designed and ran 12 tests to prove that these 11% larger drives are as fast and reliable in real world Video Surveillance conditions as Seagate's smaller drives

In over 1,000 hours of testing our team, led by Nishiya Aboobucker, set up and ran 12 different test scenarios.

The scenarios were designed to test the performance of the drives in :

1. The two most common storage architectures—DAS and SAN.
2. Three different volume sizes: RAID volumes were divided as 120TB, 2 x 60TB and 4 x 30TB.
3. Two distinct real world situations: performance under maximum load (stress test) and under failure (rebuild test).

A. STORAGE ARCHITECTURE

In a video surveillance solution, the choice of Storage Architecture is determined by both cost and scalability. Fibrenetix supplies solutions in both architectures for customers with different needs.

DAS Architecture (Direct-Attached Storage)

We recommend DAS where customers need simple storage solutions and have budget constraints. It is the go-to solution for small or medium sized locations, such as in small retail stores or restaurants.

DAS is easy to set up, has low cost and has a high performance.

SAN Architecture (Storage Area Network)

Generally used for Virtualization and Database Management Systems, SAN is the preferred architecture for high-speed transactional environments like VMS databases. These become necessary with larger number of cameras in multiple locations, such as an arena, shopping mall or hotel.

SAN has improved performance, greater scalability and improved data availability

THE QUESTION TO ANSWER

Does the storage architecture impact the performance of the disks?

B. RAID VOLUMES CONFIGURATION

For both architectures, the volume sets were configured in RAID 6, which is the most common RAID type used in the Video Surveillance industry.

The complete Storage capacity of 160TB - called Raw Storage - is made up by combining eight 20TB Hard Drives.

Those 8 drives were configured in 3 different volume sizes to see if the way volumes are split in the RAID array is affected while rebuild happens.

- 120TB: Full Capacity Volume
- 60TB | 60TB
- 30TB | 30TB | 30TB | 30TB

THE QUESTION TO ANSWER

Does the way the volumes are split in the RAID array affect the speed or the order in which the data is rebuilt during a rebuild?

C. TESTED UNDER REAL WORLD CONDITIONS

Two types of tests were performed:

Performance Test: Loading the system with 400 concurrent camera streams with 6 hour data retention over 24 continuous hours.

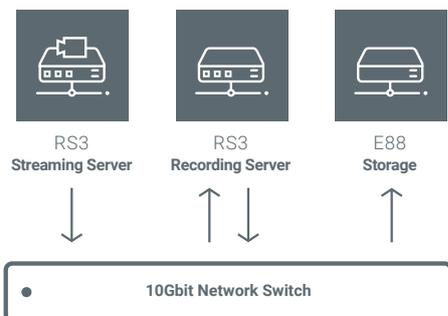
Rebuild Test: Simulating a catastrophic drive failure we benchmark the time taken to rebuild the data—at idle and under load.

To really simulate real world conditions, both tests were carried out at Idle and under full load:

- Busy Disk Activity
- No Disk Activity

THE SAN ENVIRONMENT TEST

SAN Architecture – Physical Configuration



DATA THROUGHPUT

400
CONCURRENT
CAMERAS

Full HD
VIDEO
RESOLUTION

6h
DATA
RETENTION

PERFORMANCE TEST

Performance Test #PT1: RAID 6 with 8 x 20TB Hard Drives forming 120TB Volume, recording continuously 400 Camera streams with a retention period of 6 hours for a period of 24 hours shows all the parameters are within the threshold limit.

Performance Test #PT2: The read/write speeds in sequential and random positions with varying numbers of queues and threads to the logical disk shows acceptable results.

TEST DETAILS

VMS used:	Milestone XProtect Corporate 2020 R3
TECHNICAL CONFIGURATION	
Server	1U Fibrenetix RS3 Storage Video Server
CPU:	Dual Intel E5 – 2609 v4 1.70 GHz
Windows Edition and Build:	Windows Storage Server 2016 Standard
Memory:	16 GB
Network Adaptor	2 x Intel® I210 Gigabit Network Connection 2 x Intel® X540-T2 Ethernet Converged 10G Network Adaptor
STORAGE CONFIGURATION	
Live Storage:	RAID 6, SAS 8 Disks x 20TB
Storage Hardware:	Fibrenetix E88 iSCSI RAID Controller Storage 3U, 16Bay, Dual Controller

PERFORMANCE RESULTS

The 20TB HDD shows expected performance in standard operation.

REBUILD TEST

Busy Disk Activity: It takes approximately 31 minutes to rebuild 1TB.

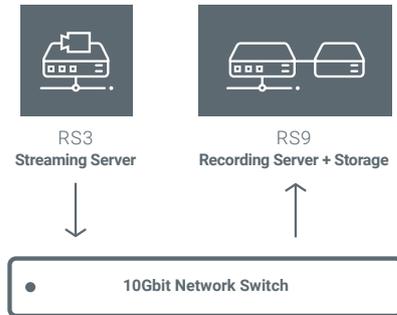
No Disk Activity: As expected, when there is no disk activity the rebuild time is significantly less than when the disk is busy; less than half in fact. For a full 120TB capacity, 1TB takes approximately 13 minutes to rebuild. Even when the complete storage capacity is split into several volumes, we notice that the total rebuild time remains identical.

REBUILD RESULTS

This test highlights a consistency of performance in Fibrenetix SAN solutions.

THE DAS ENVIRONMENT TEST

DAS Architecture – Physical Configuration



DATA THROUGHPUT

300
CONCURRENT
CAMERAS

Full HD
VIDEO
RESOLUTION

6h
DATA
RETENTION

PERFORMANCE TEST

Performance Test #PT1: In the DAS Architecture – with management and recording server as an all-in-one solution, in RAID 6 with 8 x 20TB Hard Drives forming a 120TB Volume, recording continuously 300 concurrent camera streams with a retention period of 6 hours for a period of 24 hours shows all the parameters are within the threshold limit.

Performance Test #PT2: The read/write speeds in sequential and random positions with varying numbers of queues and threads to the logical disk shows excellent results.

TEST DETAILS

VMS used:	Milestone XProtect Corporate 2020 R3
TECHNICAL CONFIGURATION	
Server	Fibrenetix RS9 Storage Video Server
CPU:	Dual Intel Xeon Bronze 3106 CPU @1.70Ghz
Windows Edition and Build:	Windows Storage Server 2016 Standard
Memory:	32 GB
Network Adaptor	2 x Intel® I210 Gigabit Network Connection 2 x Intel® X540-T2 Ethernet Converged 10G Network Adaptor
STORAGE CONFIGURATION	
Live Storage:	RAID 6, SAS 8 Disks x 20TB
Storage Hardware:	Fibrenetix RAID Controller card

PERFORMANCE RESULTS

The 20TB HDD shows expected performance in standard operation

REBUILD TEST

Result Busy Disk Activity: It takes approximately 24 minutes to rebuild 1TB.

No Disk Activity: The time to rebuild the disk is much less while idle, than when the disk is busy. For a full 120TB capacity, 1TB takes approximately 13 minutes to rebuild. When the complete storage capacity is split in several volume, we notice that the total rebuild time is identical.

REBUILD RESULTS

This test highlights a consistency of performance in Fibrenetix DAS solutions.



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