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About Seagate Technologies:

Seagate is the leading expert in scalable storage solutions, developing amazing products that enable people and businesses around the world to create, share and preserve their most critical memories and business data. Seagate has been at the cutting edge of storage solutions for over 38 years, starting with the development of the 5 megabyte ST506 5 ¼” disk drive released in 1980 to a 60 terabyte Solid State Drive (SSD) announced in 2016. Seagate is also renowned for its cutting-edge SAN solutions intended to solve today’s most challenging storage problems where performance, availability, cost, and ease of use are paramount.

The Seagate RealStor RAID storage array is NEBS Level 3 and MIL STD 810 G compliant for meeting stringent telecommunications and military requirements for shock and vibration. The Seagate RealStor 6000 series used in the Milestone Certification Tests can scale to 448 terabytes in a single array and reach 1.9 petabytes with additional expansion shelves. Performance of up to 250,000 IOPS per disk is possible along with 12 gigabytes per second sequential reads and 5.7 gigabytes per second sequential writes. The Seagate RealStor chassis supports a hybrid solution of HDD and SSD devices to provide tiered storage for demanding environments.

About Milestone Systems:

Founded in 1998, Milestone Systems is a global industry leader in open platform IP video management software. The XProtect platform delivers powerful surveillance that is reliable, easy to manage, and proven in scores of customer installations. As of 2016, Milestone has more than 150,000 installations around the world in support of education, government, finance, healthcare, manufacturing and retail industries. Visit www.milestonesys.com for more information.
Summary

This report summarizes the results of benchmark tests completed by Seagate Labs in partnership with Milestone Systems. Test results confirmed that Seagate’s solution easily exceeded performance certification requirements.

- **Performance and Reliability:**
  - Seagate RealStor storage platforms can support over 8,000 megabits per second of video storage with little to no frame loss!
  - Tests conducted using 736 cameras configured to 1080p High Definition at 30 frames per second with H.264 compression.

- **Scalability and Availability:** Seagate RealStor storage platforms can provide RAID 6 with significantly reduced parity calculation overhead and increased performance!

- **Robustness:** Even with the demands of high definition video and high camera count, the Seagate RealStor Storage Platform delivers a high-performance solution with less than 30% storage processor utilization!

With successful certification, Seagate storage solutions ensures outstanding performance and reliability consistent with Milestone Systems design recommendations.

Seagate and Milestone Solution Architecture

The Seagate Labs test bed consisted of a suite of servers from major server vendors, each configured with dual 8 core Intel Xeon E5620 @ 2.4GHz processors, 12GB of RAM, and typically 146GB of SAS storage while running a VMware vSphere ESXi virtualized environment.

Data Protection Methodology

Storage consisted of one Seagate RealStor Storage Platform configured with 110 SAS 7,200 rpm drives, providing a total user space of 424 terabytes, and scalable to 1.9 petabytes of storage with additional expansion arrays.

The goal of this test environment was to record as much data to the Seagate RealStor SAN solution as possible given hardware availability during the test phase.

With 64 cameras on a single XProtect Recording server, this scenario created an ingest camera bandwidth to the Seagate SAN of over 700 Mbps per server. With 12 XProtect Recording Servers, all recording to the same SAN, we can see that this solution supported an extremely high data load of high quality camera streams despite the relatively modest number of cameras per server.

Camera Configuration

Cameras were configured at 30FPS, H.264, 1080p High Definition (HD) resolution with license plate recognition quality, and with approximately 12 Mbps (1.5 MB/sec) bit rate from each stream.

It represents optimal video content clarity in use cases where high definition with standard compression is required, such as casinos and big-box retail outlets where fraud and theft is a concern.

The test bed topology is as follows:
Test Summary

Certification test data is shown in the following tables. These tables detail the number of cameras supported by each virtualized recording server, the 35% or less CPU usage of each recording server, the read and write speeds in bytes/sec, and the stream size per recording server. Results confirmed that, with high frame rates, there was little to no frame loss.

Table 1a: Test Performance

<table>
<thead>
<tr>
<th>Recording servers</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cameras</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>32</td>
</tr>
<tr>
<td>Lost Frame %</td>
<td>0.00%</td>
<td>0.10%</td>
<td>0.01%</td>
<td>0.00%</td>
<td>0.06%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Stream Size (Mbps)</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Rec. Server CPU %</td>
<td>12%</td>
<td>35%</td>
<td>24%</td>
<td>11%</td>
<td>18%</td>
<td>4%</td>
<td>29%</td>
</tr>
<tr>
<td>Write (Bytes/Sec)</td>
<td>94</td>
<td>94</td>
<td>94</td>
<td>94</td>
<td>94</td>
<td>94</td>
<td>47</td>
</tr>
</tbody>
</table>

Table 1b: Test Performance

<table>
<thead>
<tr>
<th>Recording servers</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>TOTAL</th>
<th>AVERAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cameras</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>736</td>
<td>61</td>
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<tr>
<td>Lost Frame %</td>
<td>0.02%</td>
<td>0.02%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.20%</td>
<td>0.02%</td>
</tr>
<tr>
<td>Stream Size (Mbps)</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>N/A</td>
<td>12</td>
</tr>
<tr>
<td>Rec. Server CPU %</td>
<td>32%</td>
<td>35%</td>
<td>2%</td>
<td>2%</td>
<td>10%</td>
<td>N/A</td>
<td>18%</td>
</tr>
<tr>
<td>Write (Bytes/Sec)</td>
<td>94</td>
<td>94</td>
<td>94</td>
<td>94</td>
<td>94</td>
<td>1084</td>
<td>90</td>
</tr>
</tbody>
</table>
Certified Products

- RealStor RAID storage platform, certified for use with the entire XProtect product line
- Milestone XProtect Corporate 2016 R3

Key Findings

Based on conclusive test results, Seagate Technology’s RealStor Storage Platform is a highly qualified and scalable storage solution for Milestone Systems’ video surveillance installations because it reliably meets large video storage requirements with no performance impact. The test data confirms that certification requirements were easily met, and the system under test exceeded competitive results. The storage solution stored sizeable amounts of high definition, high frame-rate, H.264-compressed video with little to no frame loss and without stressing the system.

Test results exceeded performance benchmarks because the Seagate RealStor storage platform proved capable of supporting over 1GByte/sec (8,000 megabits per second) throughput with less than 1% frame loss and with under 30% storage processor load and recording server loads.

In this scenario, a single recording server can support a minimum of 64 cameras at approximately 100MBps throughput. With 12 recording servers, the Seagate RealStor Storage Platform supported 736 cameras at roughly 8,600 Mbps.

These test results coupled by Seagate’s ability to provide a complete solution, including Seagate drives, drive controllers, and enclosures with multiple I/O options, sets it apart from the competition. With this system, integrators and end-users can have complete confidence that high availability, reliability, and performance will be delivered in a comprehensive, standards-based solution.