SPC Benchmark 1™
Executive Summary

Huawei Technologies Co., Ltd.
Huawei OceanStor Dorado2100 G2

SPC-1 V1.14

Submitted for Review: May 22, 2013
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EXECUTIVE SUMMARY

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Revision Information and Key Dates

| Revision Information and Key Dates |  
| SPC-1 Specification revision number | V1.14  
| SPC-1 Workload Generator revision number | V2.3.0  
| Date Results were first used publicly | May 22, 2013  
| Date the FDR was submitted to the SPC | May 22, 2013  
| Date the Priced Storage Configuration is available for shipment to customers | currently available  
| Date the TSC completed audit certification | May 20, 2013 |

Tested Storage Product (TSP) Description

Huawei OceanStor Dorado2100 G2 (the Dorado2100 G2 for short) is a SAN-based solid state storage product designed for the enterprise-level high-performance storage market. The Dorado2100 G2 uses a full-SSD architecture and employs advanced cache management and I/O scheduling mechanisms. It offers an ideal choice for various storage scenarios that are performance-demanding such as database, VDI, and high-performance computing.
Summary of Results

<table>
<thead>
<tr>
<th>Metric</th>
<th>Reported Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPC-1 IOPS™</td>
<td>400,587.11</td>
</tr>
<tr>
<td>SPC-1 Price-Performance™</td>
<td>$0.57/SPC-1 IOPS™</td>
</tr>
<tr>
<td>Total ASU Capacity</td>
<td>3,801.046 GB</td>
</tr>
<tr>
<td>Data Protection Level</td>
<td>Protected 2 (Mirroring)</td>
</tr>
<tr>
<td>Total Price</td>
<td>$227,062.00</td>
</tr>
<tr>
<td>Currency Used</td>
<td>U.S. Dollars</td>
</tr>
<tr>
<td>Target Country for availability, sales and support</td>
<td>USA</td>
</tr>
</tbody>
</table>

SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point.

SPC-1 Price-Performance™ is the ratio of Total Price to SPC-1 IOPS™.

Total ASU (Application Storage Unit) Capacity represents the total storage capacity available to be read and written in the course of executing the SPC-1 benchmark.

A Data Protection Level of Protected 2 using Mirroring configures two or more identical copies of user data.

Protected 2: The single point of failure of any component in the configuration will not result in permanent loss of access to or integrity of the SPC-1 Data Repository.

Total Price includes the cost of the Priced Storage Configuration plus three years of hardware maintenance and software support as detailed on page 8.

Currency Used is formal name for the currency used in calculating the Total Price and SPC-1 Price-Performance™. That currency may be the local currency of the Target Country or the currency of a difference country (non-local currency).

The Target Country is the country in which the Priced Storage Configuration is available for sale and in which the required hardware maintenance and software support is provided either directly from the Test Sponsor or indirectly via a third-party supplier.
Storage Capacities, Relationships, and Utilization

The following four charts and table document the various storage capacities, used in this benchmark, and their relationships, as well as the storage utilization values required to be reported.

![Storage Capacities Diagram](image-url)
Configured Storage Capacity: 9,888.615 GB

- Data Protection Capacity: 4,744.796 GB (47.98%)
- Available Data Capacity: 4,744.796 GB (47.98%)
- Mirror copy of Available Data Capacity

Addressable Storage Capacity: 3,801.046 GB

- Addressable Storage Capacity: 3,801.046 GB (38.44%)
- Unused Available Data Capacity: 943.750 GB (9.54%)
- Unused Configured Storage Capacity: 1,887.500 GB (Unused Data Protection Capacity + Unused Available Data Capacity)

Addressable Storage Capacity: 3,801.046 GB

- 1 Logical Volume of 1,710.417 GB (ASU-1)
- 1 Logical Volume of 1,710.417 GB (ASU-2)
- 1 Logical Volume of 380.150 GB (ASU-3)

Total ASU Capacity: 3,801.046 GB (100.00%)

- ASU-1 Capacity: 1,710.471 GB (45.00%)
- 1 Logical Volume of 1,710.417 GB

- ASU-2 Capacity: 1,710.471 GB (45.00%)
- 1 Logical Volume of 1,710.417 GB

- ASU-3 Capacity: 380.105 GB (10.00%)
- 1 Logical Volume of 380.150 GB
**Total Unused Storage Capacity Ratio and Detail**

- **Physical Storage Capacity:** 10,002.419 GB
- **Physical Storage Capacity Used:** 8,083.79 GB (80.82%)
- **Total Unused Storage Capacity:** 1,918.626 GB (19.18%)
- **Unused Physical Capacity:** 31.126 GB
- **Unused Configured Capacity:** 1,887.500 GB (includes 943.750 GB of Unused Data Protection)
- **Unused Addressable Storage Capacity:** 0.000 GB

### SPC-1 Storage Capacity Utilization

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Application Utilization</td>
<td>38.00%</td>
</tr>
<tr>
<td>Protected Application Utilization</td>
<td>75.97%</td>
</tr>
<tr>
<td>Unused Storage Ratio</td>
<td>23.17%</td>
</tr>
</tbody>
</table>

**Application Utilization:** Total ASU Capacity (3,801.046 GB) divided by Physical Storage Capacity (10,002.419 GB)

**Protected Application Utilization:** Total ASU Capacity (3,801.046 GB) plus total Data Protection Capacity (4,741.644 GB) minus unused Data Protection Capacity (943.750 GB) divided by Physical Storage Capacity (10,002.419 GB)

**Unused Storage Ratio:** Total Unused Capacity (GB) divided by Physical Storage Capacity (10,002.419 GB) and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 22-23 in the Full Disclosure Report.
### Response Time – Throughput Curve

The Response Time-Throughput Curve illustrates the Average Response Time (milliseconds) and I/O Request Throughput at 100%, 95%, 90%, 80%, 50%, and 10% of the workload level used to generate the SPC-1 IOPSTM metric.

The Average Response Time measured at any of the above load points cannot exceed 30 milliseconds or the benchmark measurement is invalid.

![Ramp Phase Response Time / Throughput Curve](image)

#### Response Time – Throughput Data

<table>
<thead>
<tr>
<th>I/O Request Throughput</th>
<th>10% Load</th>
<th>50% Load</th>
<th>80% Load</th>
<th>90% Load</th>
<th>95% Load</th>
<th>100% Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Response Time (ms):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All ASUs</td>
<td>0.38</td>
<td>0.49</td>
<td>0.60</td>
<td>0.67</td>
<td>0.71</td>
<td>0.75</td>
</tr>
<tr>
<td>ASU-1</td>
<td>0.37</td>
<td>0.49</td>
<td>0.60</td>
<td>0.67</td>
<td>0.71</td>
<td>0.74</td>
</tr>
<tr>
<td>ASU-2</td>
<td>0.42</td>
<td>0.55</td>
<td>0.68</td>
<td>0.76</td>
<td>0.80</td>
<td>0.84</td>
</tr>
<tr>
<td>ASU-3</td>
<td>0.38</td>
<td>0.48</td>
<td>0.58</td>
<td>0.65</td>
<td>0.69</td>
<td>0.74</td>
</tr>
<tr>
<td>Reads</td>
<td>0.41</td>
<td>0.54</td>
<td>0.67</td>
<td>0.74</td>
<td>0.78</td>
<td>0.82</td>
</tr>
<tr>
<td>Writes</td>
<td>0.36</td>
<td>0.46</td>
<td>0.56</td>
<td>0.63</td>
<td>0.67</td>
<td>0.71</td>
</tr>
</tbody>
</table>
Differences between the Tested Storage Configuration (TSC) and Priced Storage Configuration

There were no differences between the TSC and Priced Storage Configuration.

Priced Storage Configuration Pricing

<table>
<thead>
<tr>
<th>PART #</th>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>Net Price</th>
<th>Ext</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dorado2100 G2 Main Equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Storage Processor Enclosure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STTZ03STTS</td>
<td>OceanStor Dorado2100 G2 High Performance Solid State Storage System-5.0TB(AC,25<em>200GB SLC SSD,600K IOPS,48Gbps Bandwidth,8</em>8G FC Port,w ith HW Solid-state Storage System Software,SPESS01C0225)</td>
<td>1</td>
<td>$89,446.00</td>
<td>$89,446.00</td>
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<tr>
<td></td>
<td>Disk Enclosure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STTZ05DAE25</td>
<td>High Performance Solid State Storage System Disk Enclosure-5.0TB(2U,AC,25*200GB SLC,w ith HW SAS in Band Management Software,DAE1252SU2)</td>
<td>1</td>
<td>$80,640.00</td>
<td>$80,640.00</td>
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<tr>
<td></td>
<td>Installation Material</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SS-OP-D-LC-M-3</td>
<td>Patchcord,DL/CP-DL/CP,Multi-mode,2mm Parallel,3m</td>
<td>8</td>
<td>$13.00</td>
<td>$104.00</td>
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<tr>
<td></td>
<td>mini-SAS-3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Outsourcing Cable,External Mini SAS Cable,3.0m,External Mini SAS 26 Pin Plug,28AWG*8P BLACK(S),External Mini SAS 26 Pin Plug,Key2,4,6</td>
<td>1</td>
<td>$74.00</td>
<td>$74.00</td>
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<tr>
<td></td>
<td>Software</td>
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<tr>
<td></td>
<td>LIC-Dorado-ISM02</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Product Support Service</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0235G7ES_88134ULJ_1</td>
<td>OceanStor Dorado2100 G2 High Performance Solid State Storage System-5.0TB(AC,25<em>200GB SLC SSD,600K IOPS,48Gbps Bandwidth,8</em>8G FC Port,w ith HW Solid-state Storage System Software,SPESS01C0225)_Warranty Upgrade To Hi-Care Onsite Premier 24x7x4H Engineer Onsite Service_3 Year(s)</td>
<td>1</td>
<td>$26,297.00</td>
<td>$26,297.00</td>
</tr>
<tr>
<td>0235G7EW_88134ULJ_1</td>
<td>High Performance Solid State Storage System Disk Enclosure-5.0TB(2U,AC,25*200GB SLC,w ith HW SAS in Band Management Software,DAE1252SU2)_Warranty Upgrade To Hi-Care Onsite Premier 24x7x4H Engineer Onsite Service_3 Year(s)</td>
<td>1</td>
<td>$23,709.00</td>
<td>$23,709.00</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td></td>
<td>$227,062.00</td>
<td></td>
</tr>
</tbody>
</table>

The above pricing includes hardware maintenance and software support for three years, 7 days per week, 24 hours per day. The hardware maintenance and software support provides the following:

- Acknowledgement of new and existing problems with four (4) hours.
- Onsite presence of a qualified maintenance engineer or provision of a customer replaceable part within four (4) hours of the above acknowledgement for any hardware failure that results in an inoperative Priced Storage Configuration that can be remedied by the repair or replacement of a Priced Storage Configuration component.

Huawei Technologies Co., Ltd. only sells its products to third-party resellers, who in turn, sell those products to U.S. customers. The above pricing, which also includes the required three-year maintenance and support, was obtained from one of those third-party resellers. See page 71 (Appendix F: Third-Party Quotations) of the Full Disclosure Report for a copy of the third-party reseller quotation.
Priced Storage Configuration Components

<table>
<thead>
<tr>
<th>Priced Storage Configuration:</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 – QLogic dual-port QLE2562 FC HBAs</td>
</tr>
</tbody>
</table>

Huawei OceanStor Dorado2100 G2
dual-controllers – Active Active

- 48 GB memory/cache (24 GB per controller)
- 8 – 8 Gbps FC front-end ports (4 per controller)
- 4 – 6 Gbps SAS backend ports (2 per controller)
- 25 – 200 GB SSD disk drives

1 – Disk Enclosure
- 25 – 200 GB SSD disk drives

50 – 200 GB SSD disk drives
- 25 – disk drives in the controller enclosure
- 25 – disk drives in the disk enclosure