# Happyware HW-OPE2123-R1 storage system

# Executive summary

After performing all tests, the Happyware HW-OPE2123-R1 system has been officially certified according to the Open-E Hardware Certification Program.

During the tests, it was found that the system is functional and efficient. With the Open-E DSS V7 operating system installed, the Happyware HW-OPE2123-R1 is stable and performs well.

In general, the system can be used for many different applications, but the following are recommended:

- ✓ **iSCSI storage**

  The following features make Happyware HW-OPE2123-R1 good iSCSI storage:

  - Hardware RAID5, RAID6, RAID50 or RAID60 for high performance and data safety.
  - Six 10GbE interfaces for fast MPIO connection.
  - Redundant power supply for system reliability.

- ✓ **NAS filer**

  The following features make Happyware HW-OPE2123-R1 a good NAS filer solution:

  - Ten high class SAS hard drives provide fast data access to stored files.
  - Hardware RAID5, RAID6, RAID50 and RAID60 for fault tolerance and the most efficient use of available disk space.
  - Six 10GbE interfaces for independent connection to different networks or link aggregation for improved throughput.
  - SSD cache created from two SSD drives for faster access to frequently used files.

- ✓ **Storage for Virtualization**

  For this application the following can be used:

  - Hardware RAID5, RAID6, RAID50 or RAID60 for high performance and data safety.
  - Six 10GbE interfaces for efficient network connections to virtualization systems.
  - Redundant power supply for system reliability.
  - SSD cache created from two SSD drives for I/O bottlenecks elimination and increased virtual machine density.

# Certification notes

Certification was performed according to the Open-E Hardware Certification Program Guide 2.0.

System was certified with Software Update 70021 applied.

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# Happyware HW-OPE2123-R1 hardware components

Technical specifications about the certified system are listed below:

| | |
|---|---|
| **Model** | Happyware HW-OPE2123-R1 |
| **Operating system** | Open-E DSS V7 build 7356 |
| **Enclosure/chassis** | Supermicro SuperChassis 826BE16-R1K28LPB |
| **CPU** | 2x Intel Xeon E5-2603 1.80GHz |
| **Motherboard** | Supermicro X9DRD-iF |
| **Memory** | 4x 4GB DDR3 ECC-REG ATP AL12M72E4BJH9S |
| **Network** | 2x Emulex OneConnect OCE11102-NM |
| **Network** | 2x Intel Gigabit Server Adapter I350 (on-board) |
| **HW RAID** | LSI MegaRAID SAS 9266-4i |
| **Hard disk drives** | 10x 300GB Hitachi Ultrastar HUS156030VLS600 |
| **Hard disk drives** | 2x 60GB Intel SSD 520 Series SSDSC2CW060A3 |

*TABLE 1: Hardware components list of Certified System with Open-E DSS V7*

# Happyware HW-OPE2123-R1 photos

*FIGURE 1: Front photo*

*FIGURE 2: Rear photo*

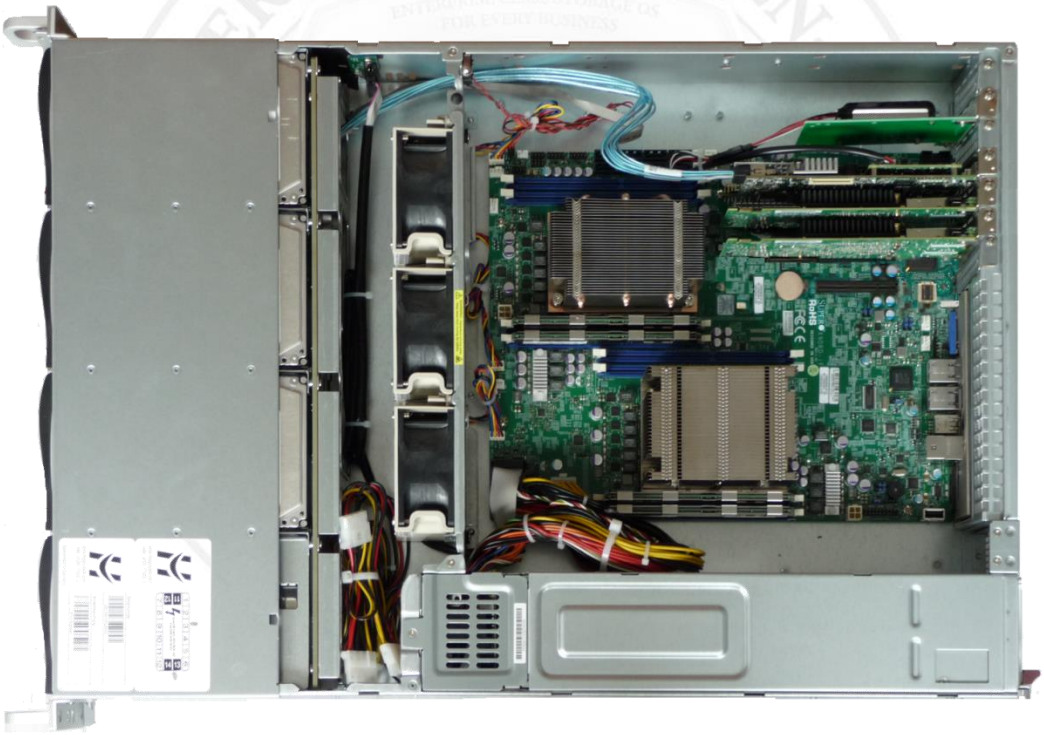

*FIGURE 3: Top photo*

# Auxiliary systems hardware components

Auxiliary systems with MS Windows or Open-E DSS V7 installed, used in Open-E Hardware Certification Process.

| | |
|---|---|
| **Model** | Custom |
| **Operating system** | MS Windows Server 2008 R2 |
| **Enclosure/chassis** | Intel Tech 19" IPC - 4088 4U |
| **Motherboard** | Asus Workstation P8B-E / 4L |
| **CPU** | Intel Xeon E-5630 2.53GHz |
| **Memory** | 4x 4GB ECC-REG Samsung M39B5270CH0-CH9 |
| **Network** | Intel Ethernet Converged Network Adapter X520-SR2 |
| **Network** | Intel PRO/1000 PT Dual Port Server Adapter (i82561EB) |
| **HW RAID** | LSI MegaRAID SAS 9280-4i4e |
| **Hard disk drives** | 4x 750GB Seagate Barracuda ST3750330NS |

*TABLE 2: Hardware components of first Workstation with MS Windows*

| | |
|---|---|
| **Model** | Custom |
| **Operating system** | MS Windows Server 2008 R2 |
| **Enclosure/chassis** | Intel Tech 19" IPC - 4088 4U |
| **Motherboard** | Asus Workstation P8B-E / 4L |
| **CPU** | Intel Xeon E-5630 2.53GHz |
| **Memory** | 4x 4GB ECC-REG Samsung M39B5270CH0-CH9 |
| **Network** | Intel Ethernet Converged Network Adapter X520-SR2 |
| **Network** | Intel PRO/1000 PT Dual Port Server Adapter (i82561EB) |
| **HW RAID** | LSI MegaRAID SAS 9280-4i4e |
| **Hard disk drives** | 4x 750GB Seagate Barracuda ST3750330NS |

*TABLE 3: Hardware components of second Workstation with MS Windows*

| | |
|---|---|
| **Model** | Happyware HW-OPE2123-R1 |
| **Operating system** | Open-E DSS V7 build 7356 |
| **Enclosure/chassis** | Supermicro SuperChassis 826BE16-R1K28LPB |
| **CPU** | 2x Intel Xeon E5-2603 1.80GHz |
| **Motherboard** | Supermicro X9DRD-iF |
| **Memory** | 4x 4GB DDR3 ECC-REG ATP AL12M72E4BJH9S |
| **Network** | 2x Emulex OneConnect OCE11102-NM |
| **Network** | Intel Gigabit Server Adapter I350 (on-board) |
| **HW RAID** | LSI MegaRAID SAS 9266-4i |
| **Hard disk drives** | 2x 60GB Intel SSD 520 Series SSDSC2CW060A3 |
| **Hard disk drives** | 10x 300GB HGST Ultrastar HUS156030VLS600 |
| **Model** | Happyware HW-OPE2123-R1 |

*TABLE 4: Hardware components of Workstation with Open-E DSS V7*

| | |
|---|---|
| **Model** | Supermicro SSE-G24-TG4 |
| **Description** | 24-ports 1GbE and 4-ports 10GbE switch |

***TABLE 5:*** *Network switch details for 1GbE connections*

# Administration functionality

The following functionality has been tested.

| | |
|---|---|
| **Drive identifier** | OK |
| **Power button** | OK |
| **Front and rear LEDs** | OK |

*TABLE 6: Administration functionality test results*

# Network functionality

Tests performed in this section check the functionality, performance and stability of the network solutions available in the Open-E DSS V7 product on the certified system.

The tests rely on configuring the iSCSI targets and copying the data from many *Workstations with MS Windows* through various network connections with big block size using appropriate testing tools.

## Network test topology

Network topology for Network testing is shown below.

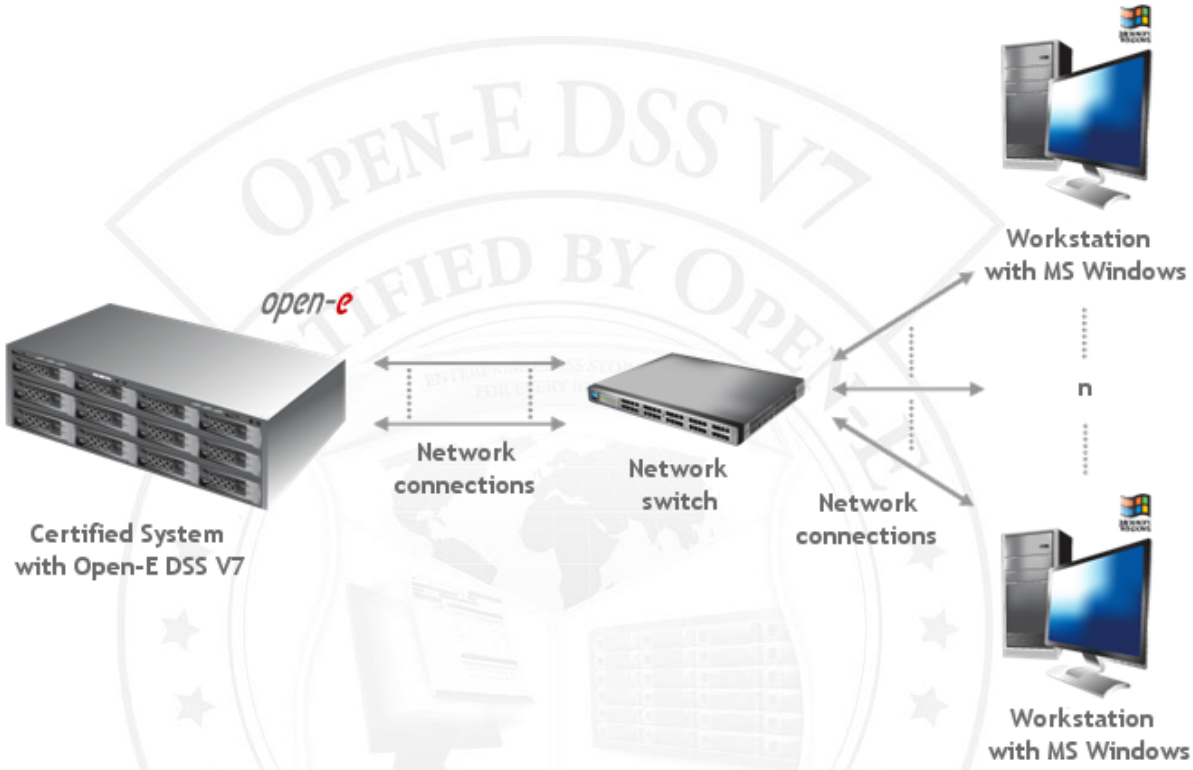


*FIGURE 4: Network topology for Network testing*

# 802.3ad bonding mode test

## 1. Test description

The test relies on configuring the iSCSI targets and copying the data from many *Workstations with MS Windows* through an 802.3ad bonding mode network connection with a 4MB block size using the Iometer testing tool.

## 2. Test results for 802.3ad bonding mode test performed on Emulex OneConnect OCE11102-NM

| 802.3ad bonding mode performance test results | | | |
|---|---|---|---|
| **NIC model** | Emulex OneConnect OCE11102-NM | | |
| **Workstations with MS Windows** | **Write speed [MB/s]** | **Read speed [MB/s]** | **Performance test results** |
| **1st Workstation** | 813.09 | 524.34 | passed |
| **2nd Workstation** | 764.91 | 528.59 | passed |

*TABLE 7: 802.3ad bonding mode performance test results table for Emulex OneConnect OCE11102-NM*

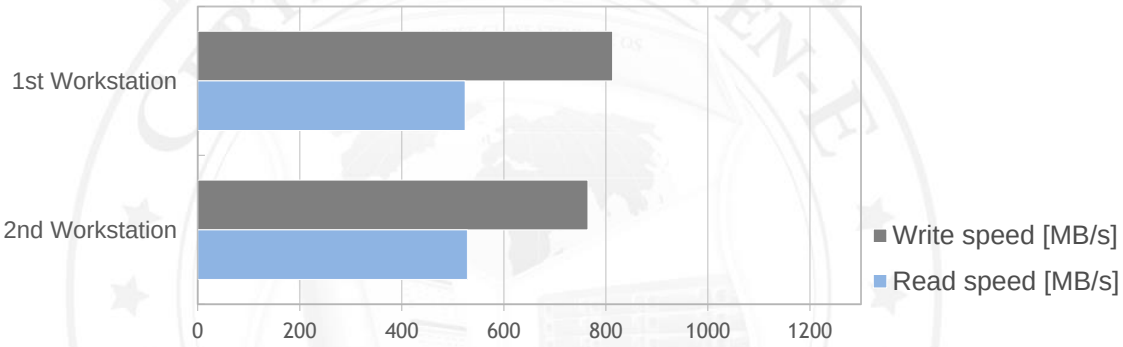


*FIGURE 5: 802.3ad bonding mode performance test results chart for Emulex OneConnect OCE11102-NM*

## 3. Test results for 802.3ad bonding mode test performed on Intel Gigabit Server Adapter I350 (on-board)

| 802.3ad bonding mode performance test results | | | |
|---|---|---|---|
| NIC model | Intel Gigabit Server Adapter I350 (on-board) | | |
| Workstations with MS Windows | Write speed [MB/s] | Read speed [MB/s] | Performance test results |
| 1st Workstation | 112.11 | 112.03 | passed |
| 2nd Workstation | 111.94 | 112.02 | passed |

*TABLE 8: 802.3ad bonding mode performance test results table for Intel Gigabit Server Adapter I350 (on-board)*

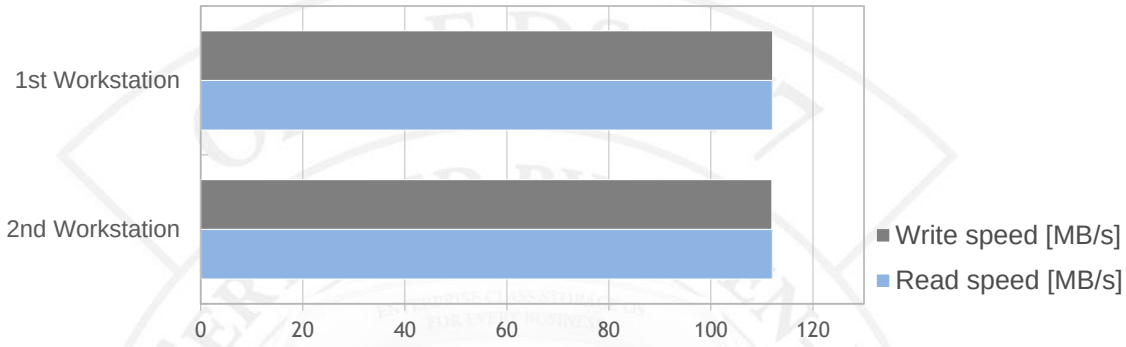


*FIGURE 6: 802.3ad bonding mode performance test results chart for I Intel Gigabit Server Adapter I350 (on-board)*

# Balance-alb bonding mode test

## 1. Test description

The test relies on configuring the iSCSI targets and copying the data from many *Workstations with MS Windows* through a Balance-alb bonding mode network connection with a 4MB block size using the Iometer testing tool.

## 2. Test results for Balance-alb bonding mode test performed on Emulex OneConnect OCE11102-NM

| Balance-alb bonding mode performance test results | | | |
|---|---|---|---|
| NIC model | Emulex OneConnect OCE11102-NM | | |
| Workstations with MS Windows | Write speed [MB/s] | Read speed [MB/s] | Performance test results |
| 1st Workstation | 819.93 | 566.20 | passed |
| 2nd Workstation | 746.34 | 586.96 | passed |

**TABLE 9:** Balance-alb bonding mode performance test *results table for Emulex OneConnect OCE11102-NM*

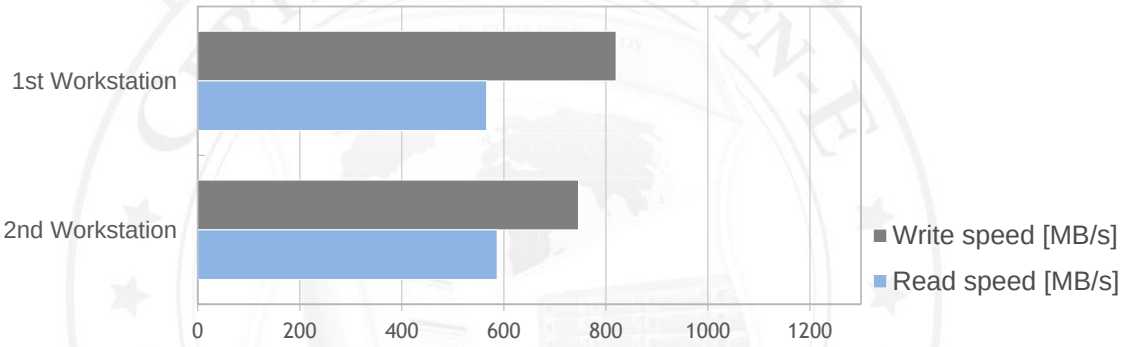


***FIGURE 7:*** *Balance-alb bonding mode performance test results chart for Emulex OneConnect OCE11102-NM*

## 3. Test results for Balance-alb bonding mode test performed on Intel Gigabit Server Adapter I350 (on-board)

| Balance-alb bonding mode performance test results | | | |
|---|---|---|---|
| NIC model | Intel Gigabit Server Adapter I350 (on-board) | | |
| Workstations with MS Windows | Write speed [MB/s] | Read speed [MB/s] | Performance test results |
| 1st Workstation | 111.73 | 70.70 | passed |
| 2nd Workstation | 111.14 | 111.08 | passed |

*TABLE 10: Balance-alb bonding mode performance test results table for Intel Gigabit Server Adapter I350 (on-board)*

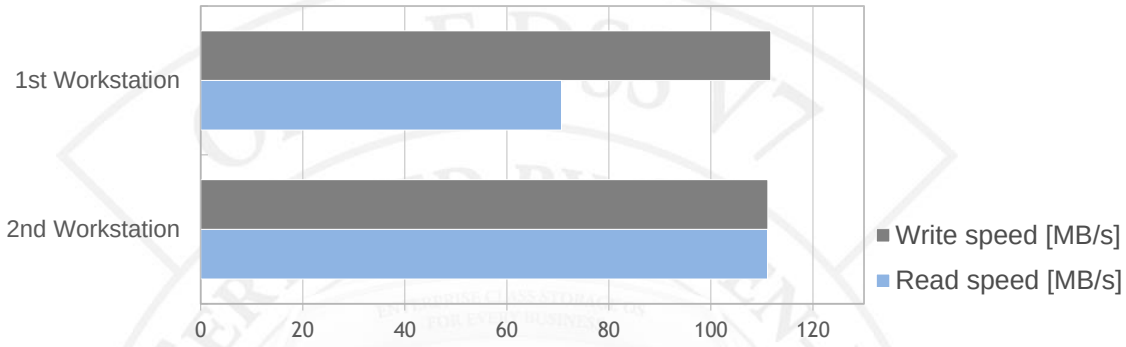


*FIGURE 8: Balance-alb bonding mode performance test results chart for Intel Gigabit Server Adapter I350 (on-board)*

# Balance-rr bonding mode test

## 1. Test description

The test relies on configuring the iSCSI targets and copying the data from many *Workstations with MS Windows* through a Balance-rr bonding mode network connection with a 4MB block size using the Iometer testing tool.

## 2. Test results for Balance-rr bonding mode test performed on Emulex OneConnect OCE11102-NM

| Balance-rr bonding mode performance test results | | | |
|---|---|---|---|
| **NIC model** | Emulex OneConnect OCE11102-NM | | |
| **Workstations with MS Windows** | **Write speed [MB/s]** | **Read speed [MB/s]** | **Performance test results** |
| **1st Workstation** | 756.38 | 280.42 | passed |
| **2nd Workstation** | 805.64 | 276.97 | passed |

*TABLE 11: Balance-rr bonding mode performance test results table for Emulex OneConnect OCE11102-NM*

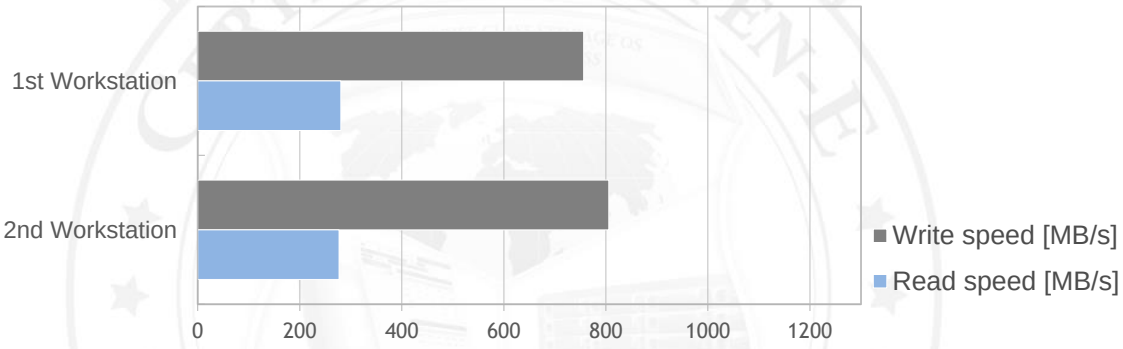


*FIGURE 9: Balance-rr bonding mode performance test results chart for Emulex OneConnect OCE11102-NM*

## 3. Test results for Balance-rr bonding mode test performed on Intel Gigabit Server Adapter I350 (on-board)

| Balance-rr bonding mode performance test results | | | |
|---|---|---|---|
| NIC model | Intel Gigabit Server Adapter I350 (on-board) | | |
| Workstations with MS Windows | Write speed [MB/s] | Read speed [MB/s] | Performance test results |
| 1st Workstation | 111.83 | 103.10 | passed |
| 2nd Workstation | 111.34 | 65.65 | passed |

*TABLE 12: Balance-rr bonding mode performance test results table for Intel Gigabit Server Adapter I350 (on-board)*

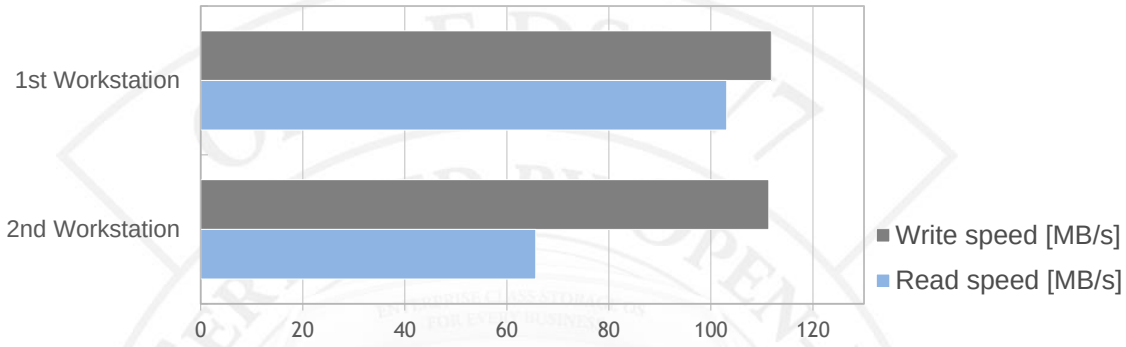


*FIGURE 10: Balance-rr bonding mode performance test results chart for Intel Gigabit Server Adapter I350 (on-board)*

# Single NIC performance test

## 1. Test description

The test relies on configuring the iSCSI targets and copying the data from *Workstations with MS Windows* through single NIC with a 4MB block size using the Iometer testing tool.

## 2. Test results for single NIC test performed on Emulex OneConnect OCE11102-NM

| Single NIC performance test results | | | |
|---|---|---|---|
| **NIC model** | Emulex OneConnect OCE11102-NM | | |
| **Workstations with MS Windows** | **Write speed [MB/s]** | **Read speed [MB/s]** | **Performance test results** |
| **1st Workstation** | 1015.09 | 551.69 | passed |

*TABLE 13: Single NIC performance test results table for Emulex OneConnect OCE11102-NM*

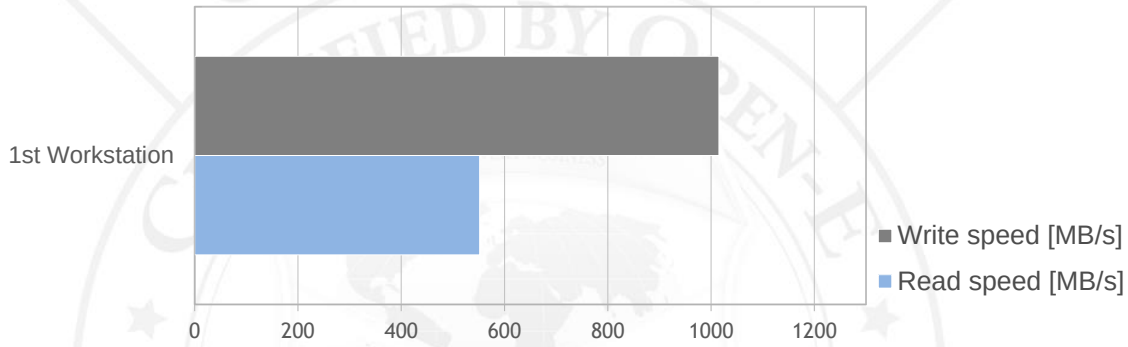


*FIGURE 11: Single NIC performance test results chart for Emulex OneConnect OCE11102-NM*

## 3. Test results for single NIC test performed on Intel Gigabit Server Adapter I350 (on-board)

| Single NIC performance test results | | | |
|---|---|---|---|
| NIC model | Intel Gigabit Server Adapter I350 (on-board) | | |
| Workstations with MS Windows | Write speed [MB/s] | Read speed [MB/s] | Performance test results |
| 1st Workstation | 110.64 | 112.00 | passed |

*TABLE 14: Single NIC performance test results table for Intel Gigabit Server Adapter I350 (on-board)*

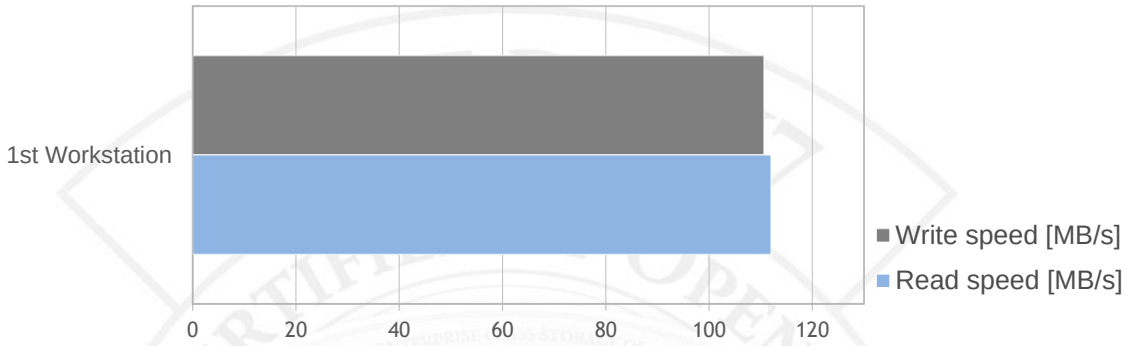


*FIGURE 12: Single NIC performance test results chart for Intel Gigabit Server Adapter I350 (on-board)*

# RAID functionality

Tests performed in this section check the functionality, performance and stability of Open-E DSS V7 storage devices on the certified system.

Tests in this section rely on the creation of the RAID units on 0, 5, 6, 10, 50 and 60 levels, configuring the iSCSI target and copying the data from a *Workstation with MS Windows* via network connection with various block sizes using the Iometer testing tool.

## RAID test topology

Network test topology for RAID testing is shown below

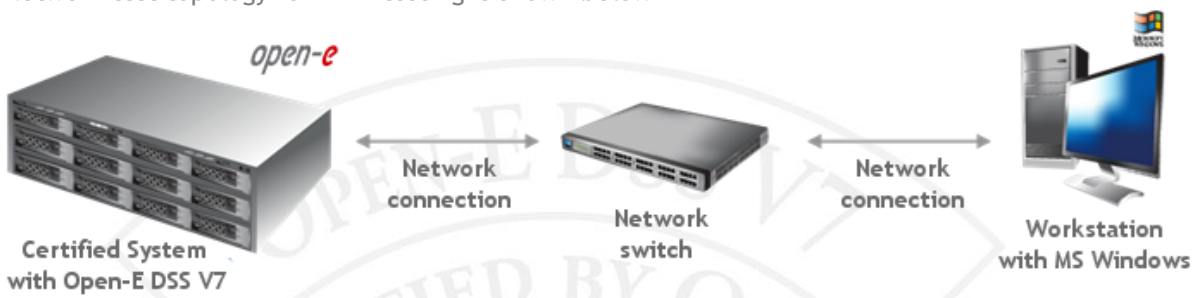


*FIGURE 13: Network test topology for RAID testing*

# Hardware RAID0 test

## 1. Test description

The test relies on creation of the RAID0 unit on all hard disk drives, configuring the iSCSI target and copying the data from a *Workstation with MS Windows* via network connection with various block sizes using the Iometer testing tool.

## 2. Test results for RAID0 and Emulex OneConnect OCE11102-NM

| RAID0 performance test results | | | |
|---|---|---|---|
| Block size [KB] | Write speed [MB/s] | Read speed [MB/s] | Performance test results |
| 4 | 15.66 | 41.19 | passed |
| 32 | 60.61 | 275.88 | passed |
| 64 | 155.34 | 410.09 | passed |
| 128 | 268.23 | 455.16 | passed |
| 256 | 384.08 | 501.40 | passed |
| 512 | 446.57 | 527.26 | passed |
| 1024 | 352.03 | 587.74 | passed |
| 4096 | 577.32 | 666.95 | passed |

*TABLE 15: RAID0 performance test results table for Emulex OneConnect OCE11102-NM*

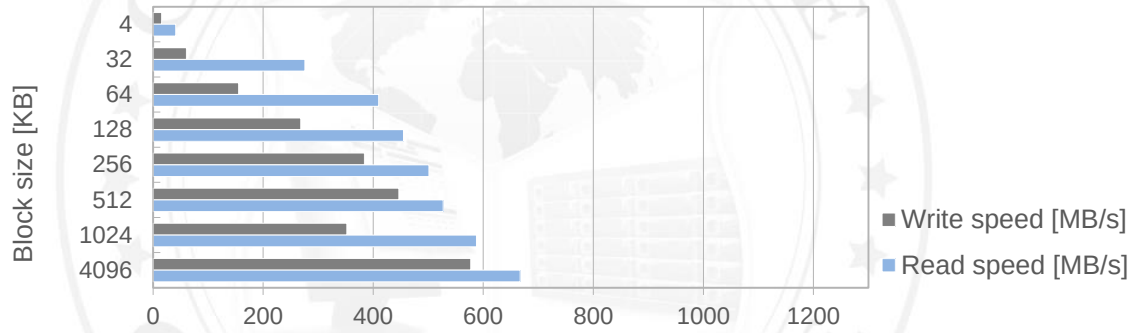


*FIGURE 14: RAID0 performance test results chart for Emulex OneConnect OCE11102-NM*

# Hardware RAID5 test

## 1. Test description

The test relies on creation of the RAID5 unit on all hard disk drives, configuring the iSCSI target and copying the data from a *Workstation with MS Windows* via network connection with various block sizes using the Iometer testing tool.

## 2. Test results for RAID5 and Emulex OneConnect OCE11102-NM

| RAID5 performance test results | | | |
|---|---|---|---|
| Block size [KB] | Write speed [MB/s] | Read speed [MB/s] | Performance test results |
| 4 | 13.23 | 34.35 | passed |
| 32 | 56.23 | 252.93 | passed |
| 64 | 132.59 | 378.39 | passed |
| 128 | 227.92 | 460.44 | passed |
| 256 | 333.06 | 525.45 | passed |
| 512 | 365.81 | 547.12 | passed |
| 1024 | 347.21 | 606.74 | passed |
| 4096 | 567.18 | 633.19 | passed |

*TABLE 16: RAID5 performance test results table for Emulex OneConnect OCE11102-NM*

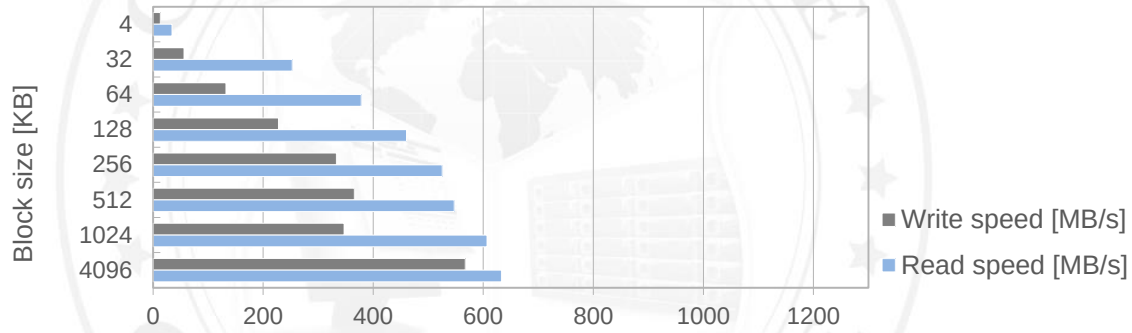


*FIGURE 15: RAID5 performance test results chart for Emulex OneConnect OCE11102-NM*

# Hardware RAID6 test

## 1. Test description

The test relies on creation of the RAID6 unit on all hard disk drives, configuring the iSCSI target and copying the data from a *Workstation with MS Windows* via network connection with various block sizes using the Iometer testing tool.

## 2. Test results for RAID6 and Emulex OneConnect OCE11102-NM

| RAID6 performance test results | | | |
|---|---|---|---|
| Block size [KB] | Write speed [MB/s] | Read speed [MB/s] | Performance test results |
| 4 | 16,41 | 51,96 | passed |
| 32 | 75,40 | 315,02 | passed |
| 64 | 162,50 | 425,43 | passed |
| 128 | 282,46 | 468,25 | passed |
| 256 | 425,35 | 541,49 | passed |
| 512 | 420,40 | 581,28 | passed |
| 1024 | 399,17 | 623,69 | passed |
| 4096 | 585,36 | 622,45 | passed |

*TABLE 17: RAID6 performance test results table for Emulex OneConnect OCE11102-NM*

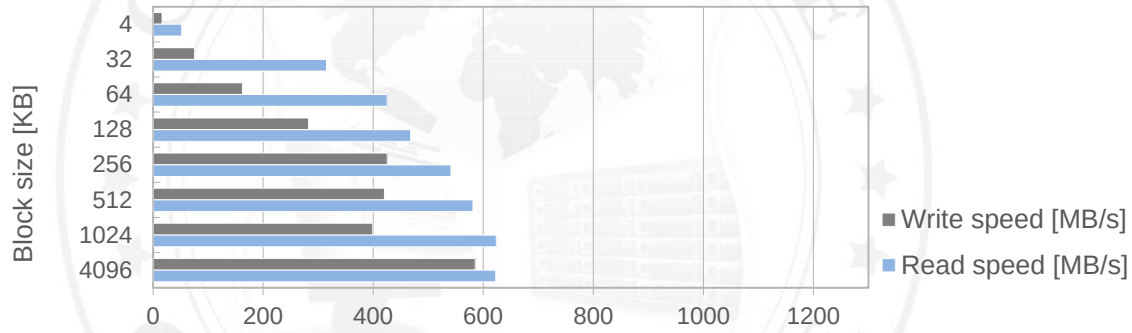


*FIGURE 16: RAID6 performance test results chart for Emulex OneConnect OCE11102-NM*

# Hardware RAID10 test

## 3. Test description

The test relies on creation of the RAID10 unit on all hard disk drives, configuring the iSCSI target and copying the data from a *Workstation with MS Windows* via network connection with various block sizes using the Iometer testing tool.

## 4. Test results for RAID10 and Emulex OneConnect OCE11102-NM

| RAID10 performance test results | | | |
|---|---|---|---|
| Block size [KB] | Write speed [MB/s] | Read speed [MB/s] | Performance test results |
| 4 | 13,68 | 49,51 | passed |
| 32 | 56,45 | 313,61 | passed |
| 64 | 137,14 | 463,75 | passed |
| 128 | 223,99 | 533,39 | passed |
| 256 | 311,88 | 549,42 | passed |
| 512 | 189,09 | 577,15 | passed |
| 1024 | 363,30 | 644,04 | passed |
| 4096 | 530,37 | 623,19 | passed |

*TABLE 18: RAID10 performance test results table for Emulex OneConnect OCE11102-NM*

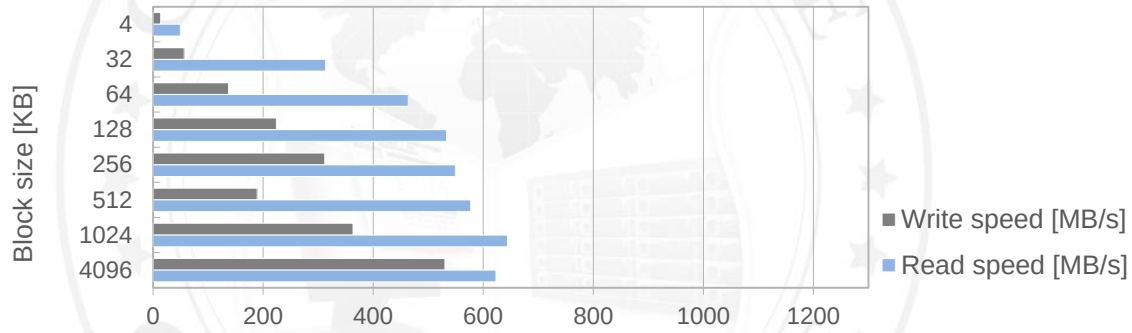


*FIGURE 17: RAID10 performance test results chart for Emulex OneConnect OCE11102-NM*

# Hardware RAID50 test

## 1. Test description

The test relies on creation of the RAID50 unit on all hard disk drives, configuring the iSCSI target and copying the data from a *Workstation with MS Windows* via network connection with various block sizes using the Iometer testing tool.

## 2. Test results for RAID50 and Emulex OneConnect OCE11102-NM

| RAID50 performance test results | | | |
|---|---|---|---|
| Block size [KB] | Write speed [MB/s] | Read speed [MB/s] | Performance test results |
| 4 | 9,46 | 44,07 | passed |
| 32 | 45,79 | 288,18 | passed |
| 64 | 88,22 | 382,05 | passed |
| 128 | 151,61 | 437,52 | passed |
| 256 | 241,54 | 498,49 | passed |
| 512 | 259,37 | 536,74 | passed |
| 1024 | 338,26 | 589,45 | passed |
| 4096 | 562,48 | 633,16 | passed |

*TABLE 19: RAID50 performance test results table for Emulex OneConnect OCE11102-NM*

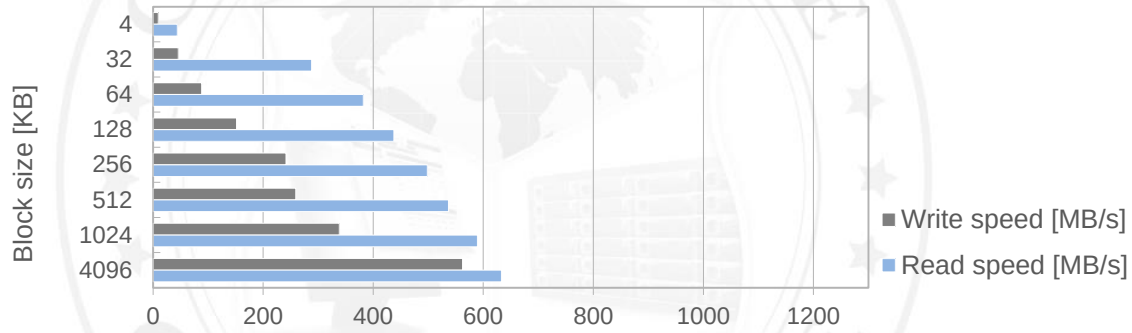


*FIGURE 18: RAID50 performance test results chart for Emulex OneConnect OCE11102-NM*

# Hardware RAID60 test

## 1. Test description

The test relies on creation of the RAID60 unit on all hard disk drives, configuring the iSCSI target and copying the data from a *Workstation with MS Windows* via network connection with various block sizes using the Iometer testing tool.

## 2. Test results for RAID60 and Emulex OneConnect OCE11102-NM

| RAID60 performance test results | | | |
|---|---|---|---|
| Block size [KB] | Write speed [MB/s] | Read speed [MB/s] | Performance test results |
| 4 | 12,65 | 49,04 | passed |
| 32 | 60,11 | 300,82 | passed |
| 64 | 142,65 | 395,11 | passed |
| 128 | 244,05 | 467,15 | passed |
| 256 | 319,32 | 512,49 | passed |
| 512 | 367,30 | 551,79 | passed |
| 1024 | 385,91 | 575,22 | passed |
| 4096 | 587,60 | 646,10 | passed |

*TABLE 20: RAID60 performance test results table for Emulex OneConnect OCE11102-NM*

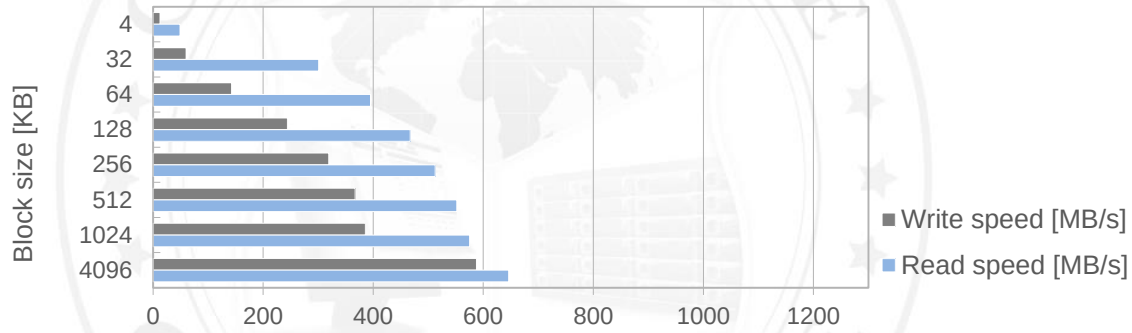


*FIGURE 19: RAID60 performance test results chart for Emulex OneConnect OCE11102-NM*

# NAS functionality

Tests performed in this section check the functionality, performance and stability of the NAS protocols in the Open-E DSS V7 product on the certified system.

The tests rely on creating NAS shares and copying the data from a *Workstation with MS Windows* via network connection with various block sizes using the Iometer testing tool.

## NAS test topology

Network topology for NAS testing is shown below.

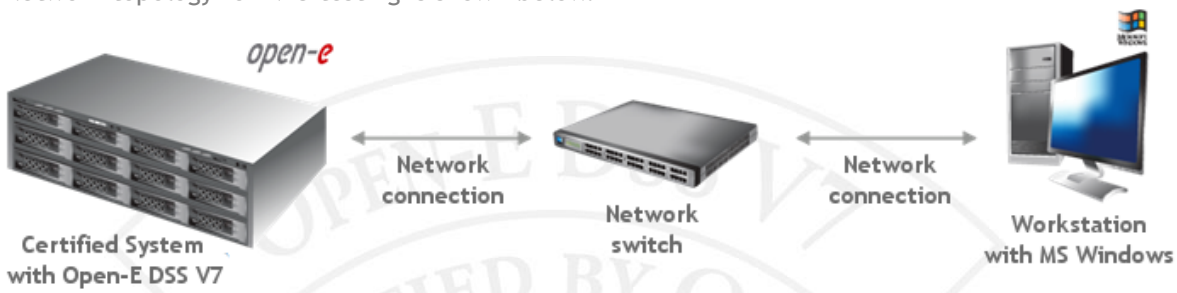


*FIGURE 20: Network topology for NAS testing*

# SMB test

## 1. Test description

The tests rely on creating NAS shares and copying the data from a *Workstation with MS Windows* via network connection with various block sizes using the Iometer testing tool.

## 2. Test results for SMB and Emulex OneConnect OCE11102-NM

| SMB performance test results | | | |
|---|---|---|---|
| Block size [KB] | Write speed [MB/s] | Read speed [MB/s] | Performance test results |
| 4 | 78,15 | 62,63 | passed |
| 32 | 428,10 | 429,16 | passed |
| 64 | 616,31 | 445,51 | passed |
| 128 | 674,96 | 539,53 | passed |
| 256 | 672,64 | 590,44 | passed |
| 512 | 660,85 | 613,58 | passed |
| 1024 | 654,68 | 610,28 | passed |
| 4096 | 628,18 | 616,95 | passed |

*TABLE 21: SMB performance test results table for Emulex OneConnect OCE11102-NM*

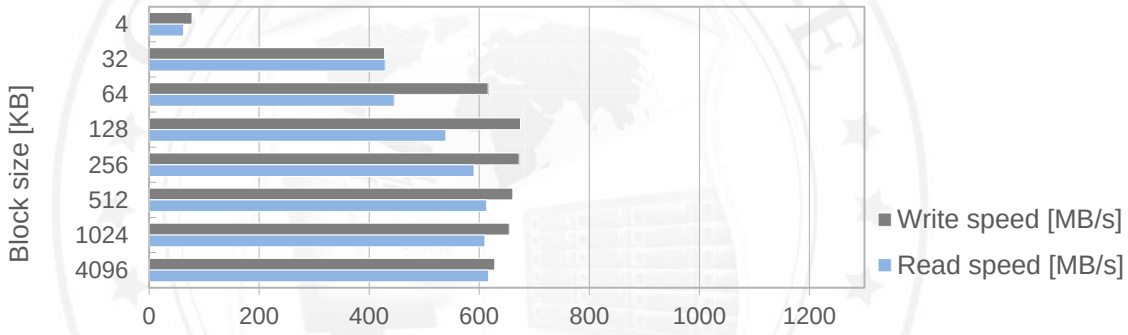


*FIGURE 21: SMB performance test results chart for Emulex OneConnect OCE11102-NM*

# iSCSI functionality

Tests performed in this section check the functionality, performance and stability of the iSCSI protocol in the Open-E DSS V7 product on the certified system.

## iSCSI Initiator test topology

Network topology for iSCSI Initiator testing is shown below.

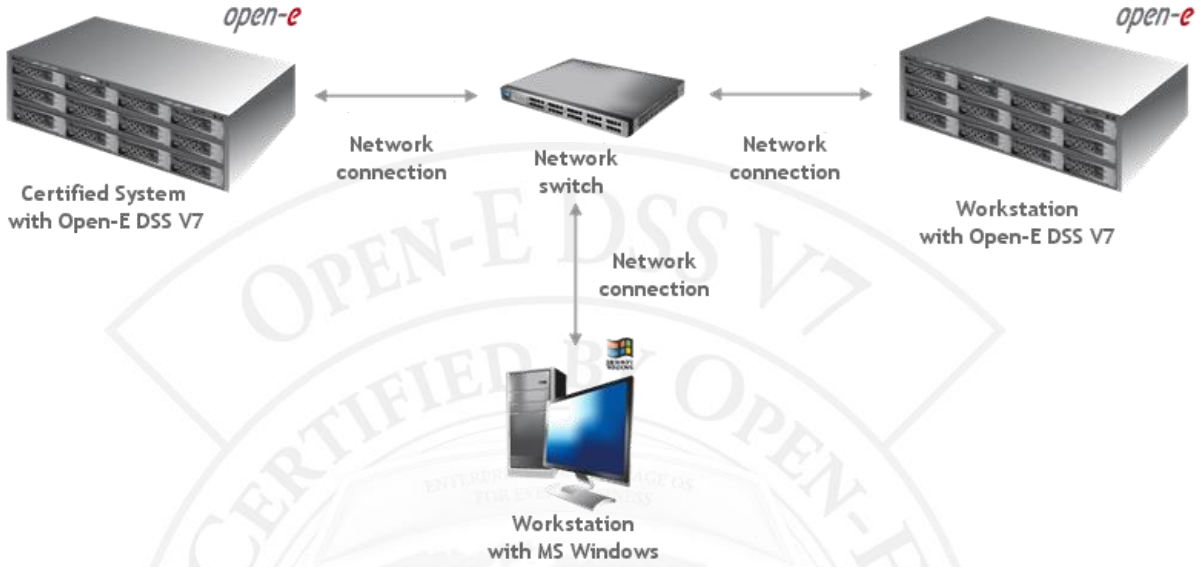


*FIGURE 22: Network topology for iSCSI Initiator testing*

## iSCSI Target test topology

Network topology for iSCSI Target testing is shown below.

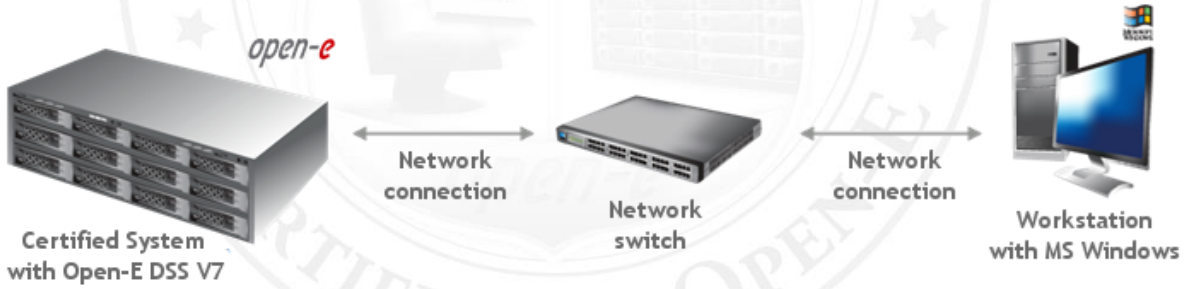


*FIGURE 23: Network topology for iSCSI Target testing*

# iSCSI Initiator test

## 1. Test description

The test relies on using the storage connected via the built-in iSCSI Initiator for NAS volumes, creating SMB shares on these NAS volumes and copying data from a *Workstation with MS Windows* to them with various block sizes using the Iometer testing tool.

## 2. Test results for iSCSI Initiator and Emulex OneConnect OCE11102-NM

| iSCSI Initiator performance test results | | | |
|---|---|---|---|
| Block size [KB] | Write speed [MB/s] | Read speed [MB/s] | Performance test results |
| 4 | 72,33 | 62,51 | passed |
| 32 | 438,36 | 270,14 | passed |
| 64 | 508,38 | 332,74 | passed |
| 128 | 500,13 | 342,80 | passed |
| 256 | 513,03 | 487,81 | passed |
| 512 | 512,47 | 509,08 | passed |
| 1024 | 510,29 | 572,83 | passed |
| 4096 | 438,24 | 568,26 | passed |

*TABLE 22: iSCSI Initiator performance test results table for Emulex OneConnect OCE11102-NM*

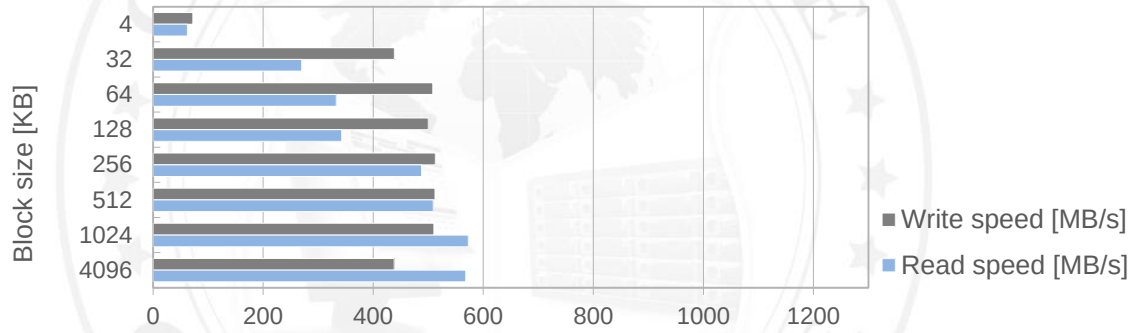


*FIGURE 24: iSCSI Initiator performance test results chart for Emulex OneConnect OCE11102-NM*

# iSCSI Target test

## 1. Test description

The test relies on creating the iSCSI target on the certified system and copying the data from a *Workstation with MS Windows* to it with various block sizes using the Iometer tool.

## 2. Test results for iSCSI Target and Emulex OneConnect OCE11102-NM

| iSCSI Target performance test results | | | |
|---|---|---|---|
| Block size [KB] | Write speed [MB/s] | Read speed [MB/s] | Performance test results |
| 4 | 15,13 | 35,23 | passed |
| 32 | 70,19 | 289,71 | passed |
| 64 | 206,67 | 434,19 | passed |
| 128 | 341,11 | 499,32 | passed |
| 256 | 285,51 | 373,80 | passed |
| 512 | 301,24 | 563,94 | passed |
| 1024 | 435,93 | 622,49 | passed |
| 4096 | 580,19 | 594,12 | passed |

*TABLE 23: iSCSI Target performance test results table for Emulex OneConnect OCE11102-NM*

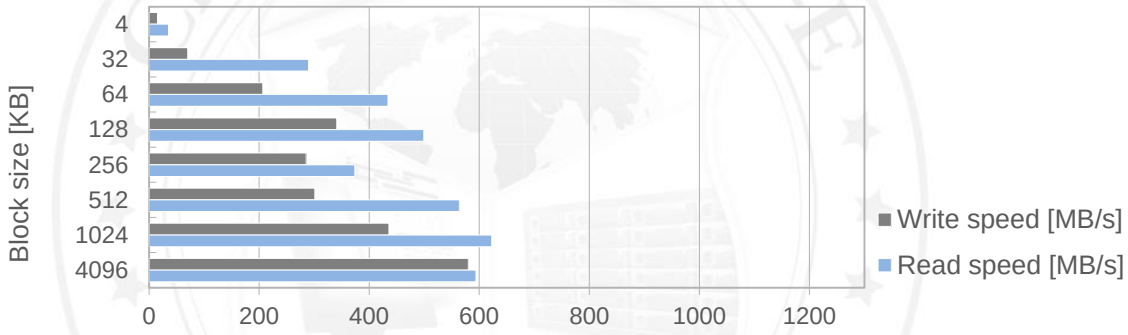


*FIGURE 25: iSCSI Target performance test results chart for Emulex OneConnect OCE11102-NM*

# SSD Cache performance

Tests performed in this section check the performance of SSD cache in the Open-E DSS V7 product on the certified system.

## SSD Cache test topology

Network topology for SSD Cache testing is shown below.

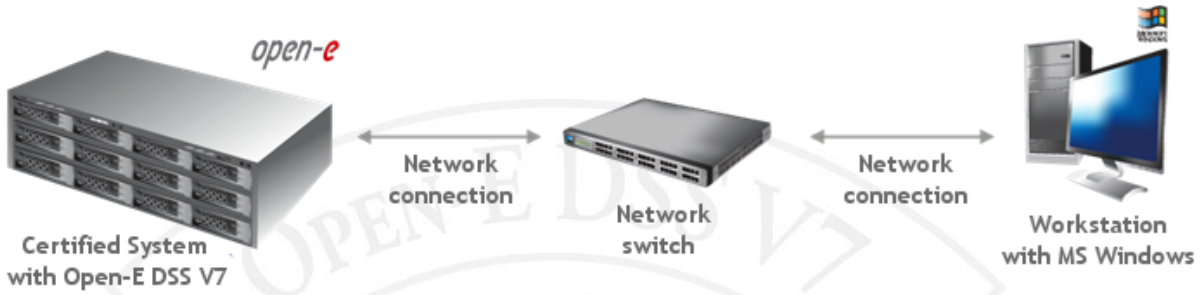


*FIGURE 26: Network topology for SSD Cache testing*

# SSD Cache with real life pattern test

## 1. Test description

The test relies on creating the iSCSI target on the certified system, writing (35%) and reading (65%) random data from a *Workstation with MS Windows* to it with various block sizes using the Iometer tool.

## 2. Test results for SSD Cache with real life pattern and Emulex OneConnect OCE11102-NM

| SSD Cache with real life pattern test results | | |
|---|---|---|
| Block size [KB] | Performance [IOPS] | Performance test results |
| 1 | 12361 | passed |
| 2 | 12548 | passed |
| 4 | 11223 | passed |

*TABLE 24: SSD Cache with real life pattern test results table for Emulex OneConnect OCE11102-NM*

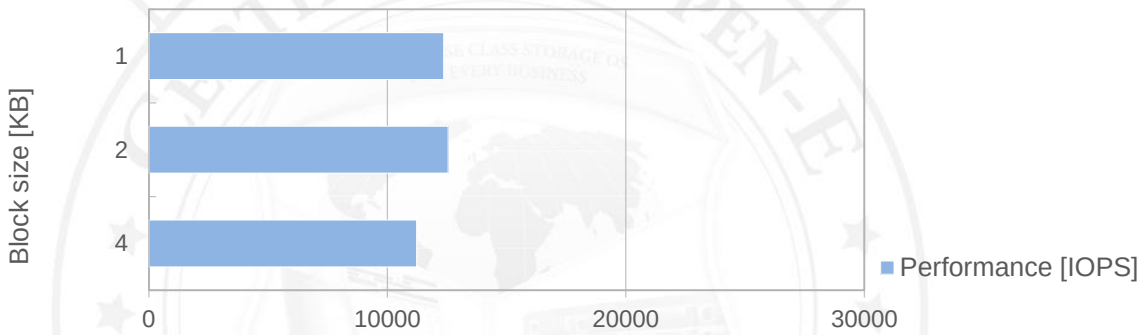


*FIGURE 27: SSD Cache with real life pattern test results chart for Emulex OneConnect OCE11102-NM*

# SSD Cache with random read/write pattern test

## 3. Test description

The test relies on creating the iSCSI target on the certified system and copying random data from a *Workstation with MS Windows* to it with various block sizes using the Iometer tool.

## 4. Test results for SSD cache with random read/write pattern and Emulex OneConnect OCE11102-NM

| SSD cache with random read/write pattern test results | | | |
|---|---|---|---|
| Block size [KB] | Write speed [IOPS] | Read speed [IOPS] | Performance test results |
| 1 | 19383.44 | 17520.68 | passed |
| 2 | 20166.83 | 19268.79 | passed |
| 4 | 20356.45 | 19194.28 | passed |

*TABLE 25: SSD cache with random read/write pattern test results table for Emulex OneConnect OCE11102-NM*

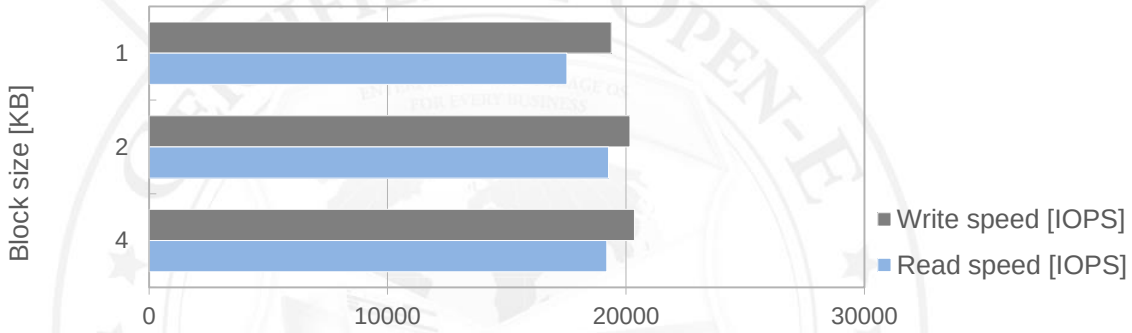


*FIGURE 28: SSD cache with random read/write pattern test results chart for Emulex OneConnect OCE11102-NM*