EUROstor GmbH ES-8724DSS system

Executive summary

After performing all tests, the EUROstor GmbH ES-8724DSS has been officially certified according to the Open-E Hardware Certification Program Guide 2.1.

During the tests, it was found that the system is functional and efficient. With the Open-E DSS V7 operating system installed, the EUROstor GmbH ES-8724DSS 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 EUROstor GmbH ES-8724DSS good iSCSI storage:

➢ Hardware RAID5, RAID6, RAID50 or RAID60 for high performance and data safety.

➢ Twenty two high capacity SAS drives with SSD cache ensure lot of fast storage space.

➢ Four 1GbE and four 10GbE interfaces for fast MPIO connections and flexible network topology.

➢ Redundant power supply for system reliability.

✓ **NAS filer**

    The following features make EUROstor GmbH ES-8724DSS a great NAS filer solution:

➢ Twenty two high capacity SAS drives and high RAID levels ensure a lot of safe storage space.

➢ Four 1GbE and four 10GbE interfaces for an independent connections to different networks or link aggregation for improved throughput.

➢ SSD cache for faster access to frequently used files

✓ **Storage for virtualization**

    For this application the following can be used:

➢ Hardware RAID5, RAID6, RAID10, RAID50 or RAID60 for high performance and data safety.

➢ Four 1GbE interfaces for flexible network topology or fast MPIO connections.

➢ Four 10GbE interfaces for efficient network connections to virtualization platforms.

➢ SSD cache for I/O bottlenecks elimination and increased virtual machine density.

Certification notes

It is recommended to use Balance-alb bonding mode for 1GbE NICs

EUROstor GmbH ES-8724DSS hardware components

Technical specifications about the certified system are listed below:

Model	EUROstor ES-8724DSS
Operating system	Open-E DSS V7 build 10529
Enclosure/chassis	EUROstor ES-8724DSS
CPU	Intel® Xeon® Processor E5-2609 v2 2.50GHz
Motherboard	Supermicro X9DR3-LN4F+
Memory	4x 4GB Hynix ECC-REG HMT351R7CFR8C-PB
Network	2x Intel® Ethernet Converged Network Adapter X520-DA2
Network	Intel® Ethernet Controller I350-AM4
HW RAID	LSI MegaRAID SAS 9280-4i4e
Hard disk drives	2x 480GB Samsung Enterprise SSD (MZ7WD480HAGM)
Hard disk drives	22x 2TB Toshiba MG03SCA200

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

EUROstor GmbH ES-8724DSS photos

FIGURE 1: *Front photo*
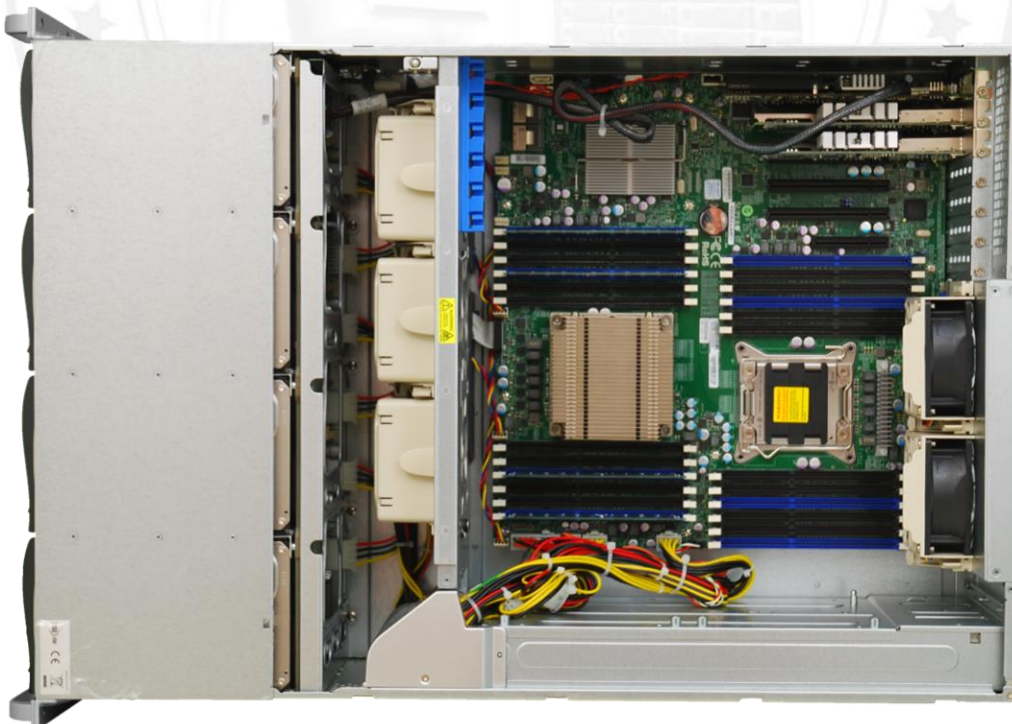

FIGURE 2: *Rear photo*

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 2012 R2
Enclosure/chassis	Inter-Tech IPC 4088 4HE
Motherboard	Asus P8B-E/4L
CPU	Intel Xeon E3-1230 3.20 GHz
Memory	3x 4GB DDR3 Kingston KVR1333D3E9S/4G
Network	4x Intel® 82574L Gigabit Ethernet Controller
Network	Intel® Ethernet Converged Network Adapter X520-SR2
Hard disk drives	1TB Hitachi Ultrastar A7K2000 HUA722010CLA330

TABLE 2: Hardware components of first Workstation with MS Windows

Model	Custom
Operating system	MS Windows Server 2012 R2
Enclosure/chassis	Inter-Tech IPC 4088 4HE
Motherboard	Asus P8B-E/4L
CPU	Intel Xeon E3-1230 3.20 GHz
Memory	3x 4GB DDR3 Kingston KVR1333D3E9S/4G
Network	4x Intel® 82574L Gigabit Ethernet Controller
Network	Intel® Ethernet Converged Network Adapter X520-SR2
Hard disk drives	1TB Hitachi Ultrastar A7K2000 HUA722010CLA330

TABLE 3: Hardware components of second Workstation with MS Windows

Model	EUROstor ES-8724DSS
Operating system	Open-E DSS V7 build 10529
Enclosure/chassis	EuroSTOR ES-8724XDL
CPU	Intel® Xeon® Processor E5-2609 v2 2.50GHz
Motherboard	Supermicro X9DR3-LN4F+
Memory	4x 4GB Hynix ECC-REG HMT351R7CFR8C-PB
Network	2x Intel® Ethernet Converged Network Adapter X520-DA2
Network	Intel® Ethernet Controller I350-AM4
HW RAID	LSI MegaRaid SAS 9280-4i4e
Hard disk drives	2x 480GB Samsung Enterprise SSD (MZ7WD480HAGM)
Hard disk drives	22x 2TB Toshiba MG03SCA200

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 and 10 GbE 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
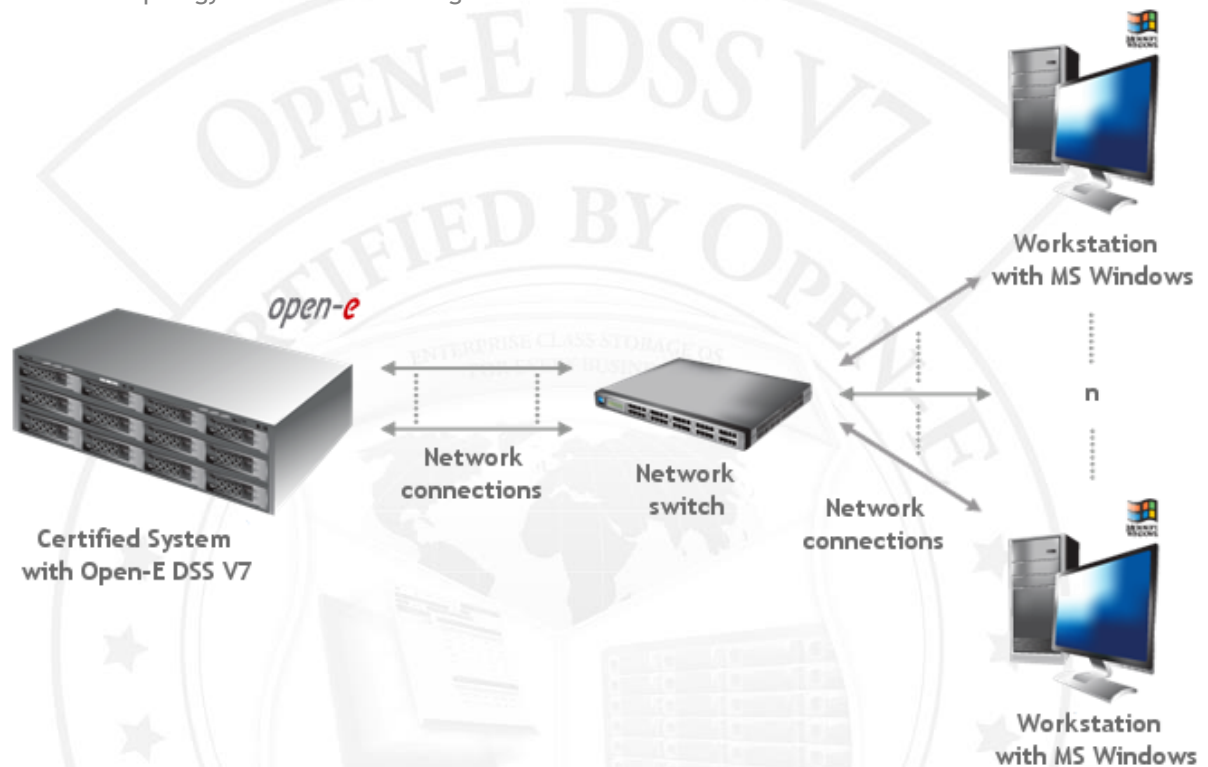
Network topology for Network testing is shown below.

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 Intel® Ethernet Controller I350-AM4

802.3ad bonding mode performance test results			
NIC model	Intel® Ethernet Controller I350-AM4		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1st Workstation	107.34	56.49	passed
2nd Workstation	109.09	56.17	passed
3rd Workstation	107.08	62.62	passed
4th Workstation	108.80	49.78	passed

TABLE 7: *802.3ad bonding mode performance test results table for Intel® Ethernet Controller I350-AM4*
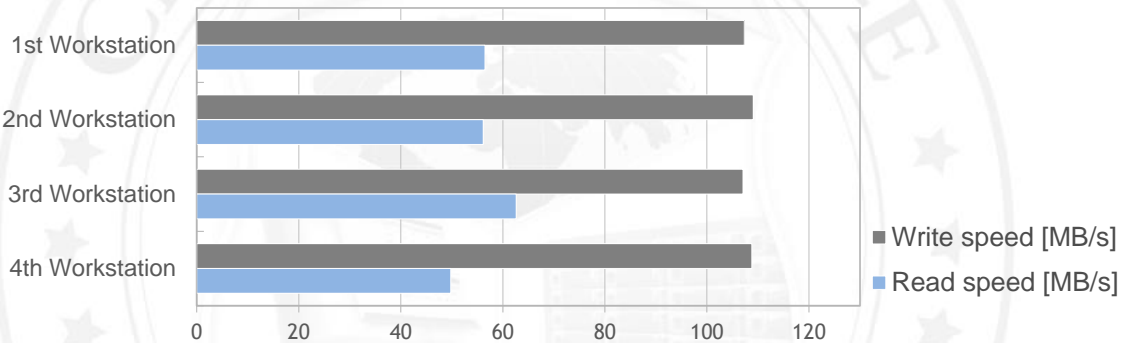

FIGURE 5: *802.3ad bonding mode performance test results chart for Intel® Ethernet Controller I350-AM4*

3. Test results for 802.3ad bonding mode test performed on Intel® Ethernet Converged Network Adapter X520-DA2

802.3ad bonding mode performance test results			
NIC model	Intel® Ethernet Converged Network Adapter X520-DA2		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1st Workstation	639.34	539.09	passed
2nd Workstation	454.20	557.55	passed

TABLE 8: 802.3ad bonding mode performance test results table for Intel® Ethernet Converged Network Adapter X520-DA2
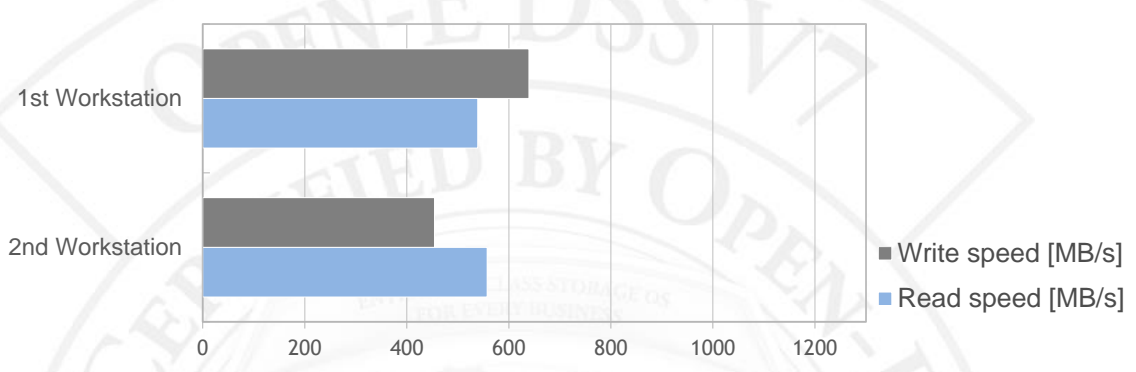

FIGURE 6: 802.3ad bonding mode performance test results chart for Intel® Ethernet Converged Network Adapter X520-DA2

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 Intel® Ethernet Controller I350-AM4

Balance-alb bonding mode performance test results			
NIC model	Intel® Ethernet Controller I350-AM4		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1st Workstation	109.22	111.88	passed
2nd Workstation	109.06	111.87	passed
3rd Workstation	108.77	111.94	passed
4th Workstation	108.94	111.94	passed

TABLE 9: *Balance-alb bonding mode performance test results table for Intel® Ethernet Controller I350-AM4*
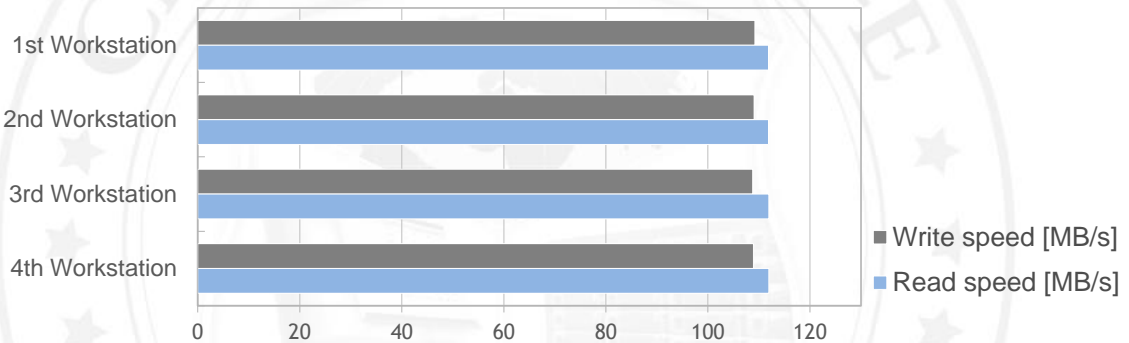

FIGURE 7: *Balance-alb bonding mode performance test results chart for Intel® Ethernet Controller I350-AM4*

3. Test results for Balance-alb bonding mode test performed on Intel® Ethernet Converged Network Adapter X520-DA2

Balance-alb bonding mode performance test results			
NIC model	Intel® Ethernet Converged Network Adapter X520-DA2		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1st Workstation	460.31	688.32	passed
2nd Workstation	747.32	660.14	passed

TABLE 10: Balance-alb bonding mode performance test results table for Intel® Ethernet Converged Network Adapter X520-DA2
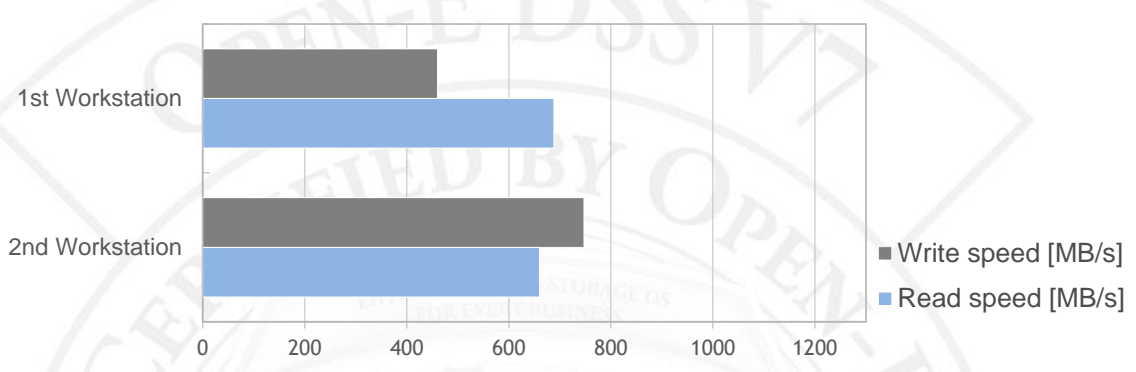

FIGURE 8: Balance-alb bonding mode performance test results chart for Intel® Ethernet Converged Network Adapter X520-DA2

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 Intel® Ethernet Controller I350-AM4

Balance-rr bonding mode performance test results			
NIC model	Intel® Ethernet Controller I350-AM4		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1st Workstation	24.58	67.58	passed
2nd Workstation	55.77	70.47	passed
3rd Workstation	87.84	70.68	passed
4th Workstation	55.57	70.02	passed

TABLE 11: *Balance-rr bonding mode performance test results table for Intel® Ethernet Controller I350-AM4*
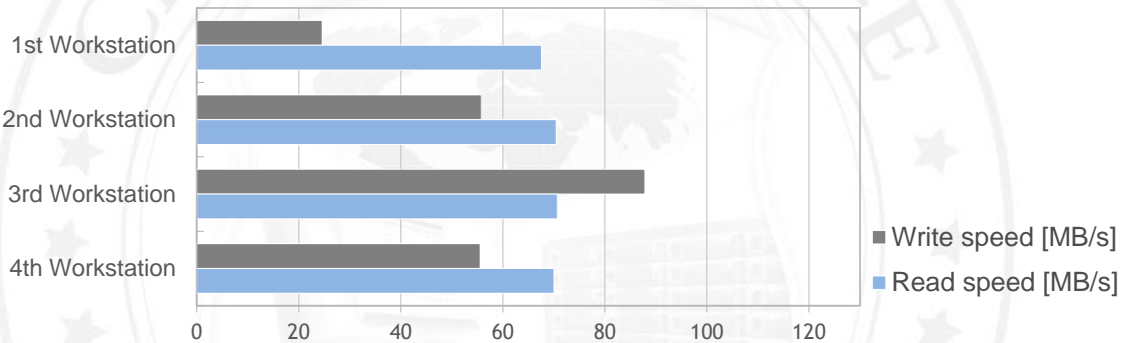

FIGURE 9: *Balance-rr bonding mode performance test results chart for Intel® Ethernet Controller I350-AM4*

3. Test results for Balance-rr bonding mode test performed on Intel® Ethernet Converged Network Adapter X520-DA2

Balance-rr bonding mode performance test results			
NIC model	Intel® Ethernet Converged Network Adapter X520-DA2		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1st Workstation	507.68	362.14	passed
2nd Workstation	741.69	371.55	passed

TABLE 12: Balance-rr bonding mode performance test results table for Intel® Ethernet Converged Network Adapter X520-DA2
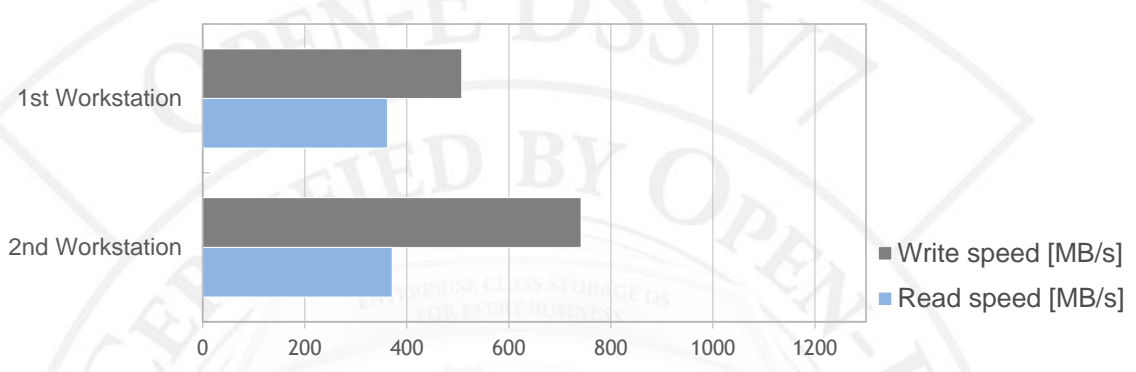

FIGURE 10: Balance-rr bonding mode performance test results chart for Intel® Ethernet Converged Network Adapter X520-DA2

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 Intel® Ethernet Controller I350-AM4

Single NIC performance test results			
NIC model	Intel® Ethernet Controller I350-AM4		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1st Workstation	108.49	112.05	passed

TABLE 13: Single NIC performance test results table for Intel® Ethernet Controller I350-AM4
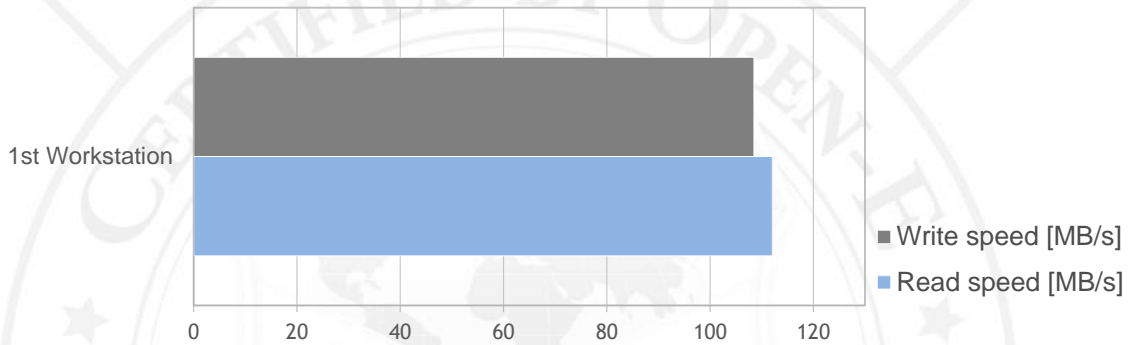

FIGURE 11: Single NIC performance test results chart for Intel® Ethernet Controller I350-AM4

3. Test results for single NIC test performed on Intel® Ethernet Converged Network Adapter X520-DA2

Single NIC performance test results			
NIC model	Intel® Ethernet Converged Network Adapter X520-DA2		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1st Workstation	810.80	697.57	passed

TABLE 14: *Single NIC performance test results table for Intel® Ethernet Converged Network Adapter X520-DA2*
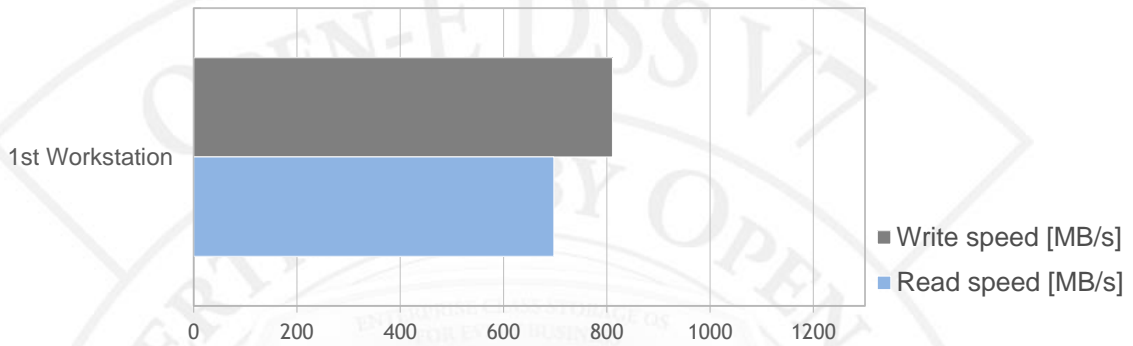

FIGURE 12: *Single NIC performance test results chart for Intel® Ethernet Converged Network Adapter X520-DA2*

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

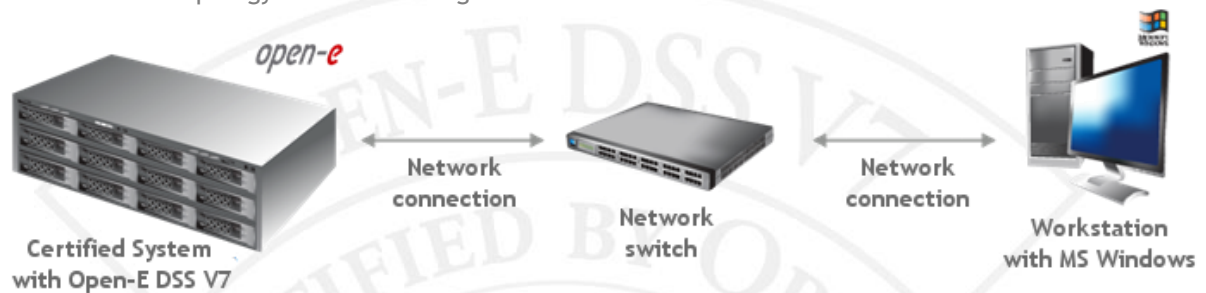Network test topology for RAID testing is shown below

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 Intel® Ethernet Converged Network Adapter X520-DA2

RAID0 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	56.12	68.78	passed
32	361.14	438.41	passed
64	495.40	542.58	passed
128	610.04	663.47	passed
256	765.12	824.15	passed
512	869.31	836.19	passed
1024	870.53	911.22	passed
4096	961.30	1000.16	passed

TABLE 15: RAID0 performance test results table and Intel® Ethernet Converged Network Adapter X520-DA2
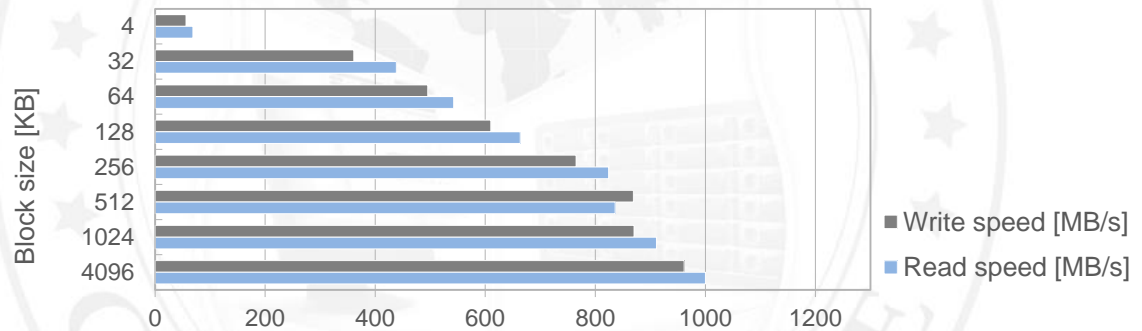

FIGURE 14: RAID0 performance test results chart and Intel® Ethernet Converged Network Adapter X520-DA2

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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 Intel® Ethernet Converged Network Adapter X520-DA2

RAID5 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	58.92	72.63	passed
32	288.80	443.73	passed
64	363.96	547.79	passed
128	478.11	680.72	passed
256	579.40	731.97	passed
512	568.89	764.38	passed
1024	578.58	714.27	passed
4096	566.00	745.13	passed

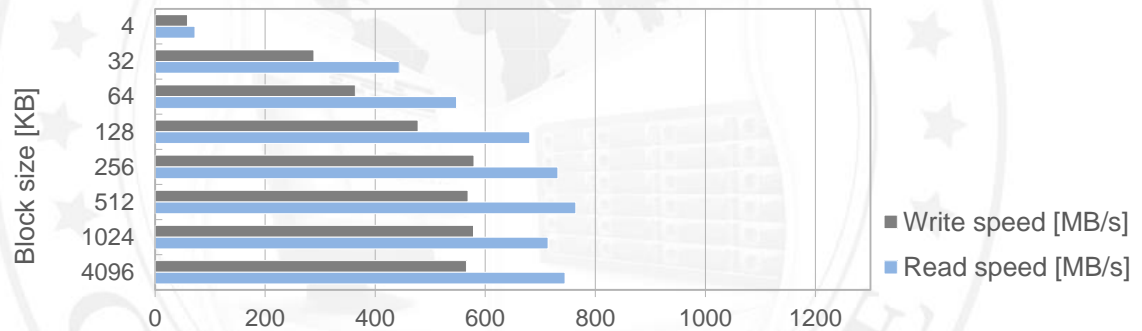*TABLE 16: RAID5 performance test results table and Intel® Ethernet Converged Network Adapter X520-DA2*

FIGURE 15: RAID5 performance test results chart and Intel® Ethernet Converged Network Adapter X520-DA2

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 Intel® Ethernet Converged Network Adapter X520-DA2

RAID6 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	57.04	69.88	passed
32	323.08	434.36	passed
64	429.34	535.79	passed
128	456.46	674.49	passed
256	514.57	848.20	passed
512	488.95	903.70	passed
1024	575.93	1028.87	passed
4096	764.11	1057.61	passed

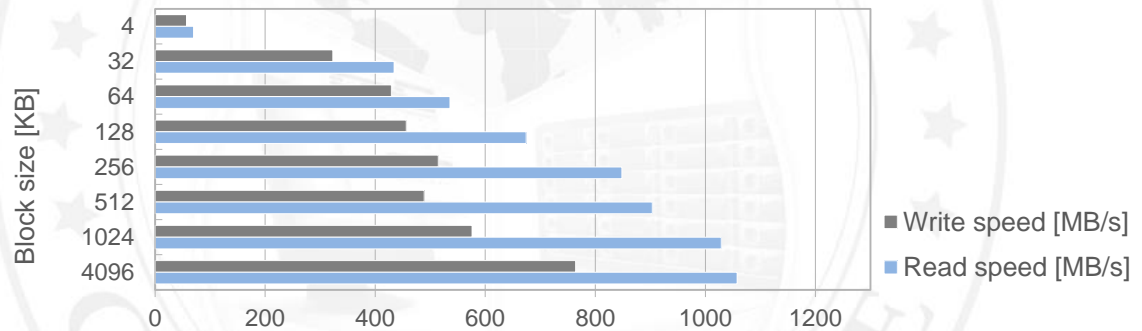*TABLE 17: RAID6 performance test results table and Intel® Ethernet Converged Network Adapter X520-DA2*

FIGURE 16: RAID6 performance test results chart and Intel® Ethernet Converged Network Adapter X520-DA2

Hardware RAID10 test

1. 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.

2. Test results for RAID10 and Intel® Ethernet Converged Network Adapter X520-DA2

RAID10 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	51.34	66.23	passed
32	342.15	436.63	passed
64	466.36	539.16	passed
128	491.24	663.47	passed
256	646.72	831.67	passed
512	611.62	895.23	passed
1024	847.36	985.12	passed
4096	912.07	942.63	passed

TABLE 18: RAID10 performance test results table and Intel® Ethernet Converged Network Adapter X520-DA2
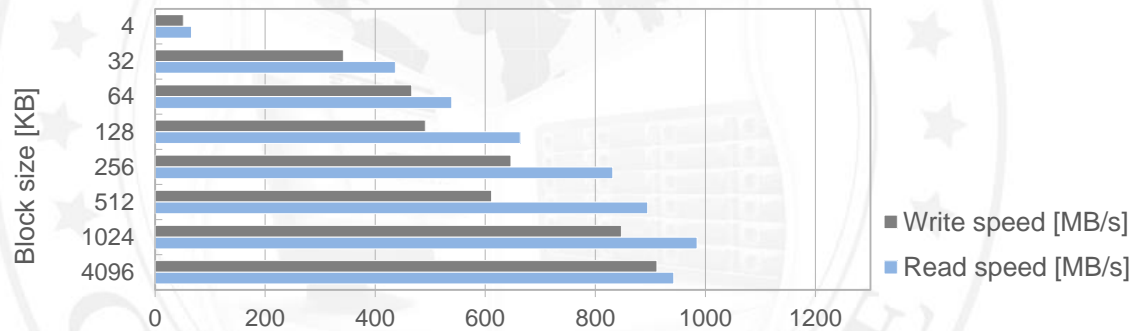

FIGURE 17: RAID10 performance test results chart and Intel® Ethernet Converged Network Adapter X520-DA2

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 Intel® Ethernet Converged Network Adapter X520-DA2

RAID50 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	58.67	70.99	passed
32	320.15	438.02	passed
64	534.05	538.47	passed
128	707.72	657.11	passed
256	1041.36	717.54	passed
512	1001.26	753.92	passed
1024	1035.44	736.26	passed
4096	1022.17	725.77	passed

TABLE 19: *RAID50 performance test results table and Intel® Ethernet Converged Network Adapter X520-DA2*
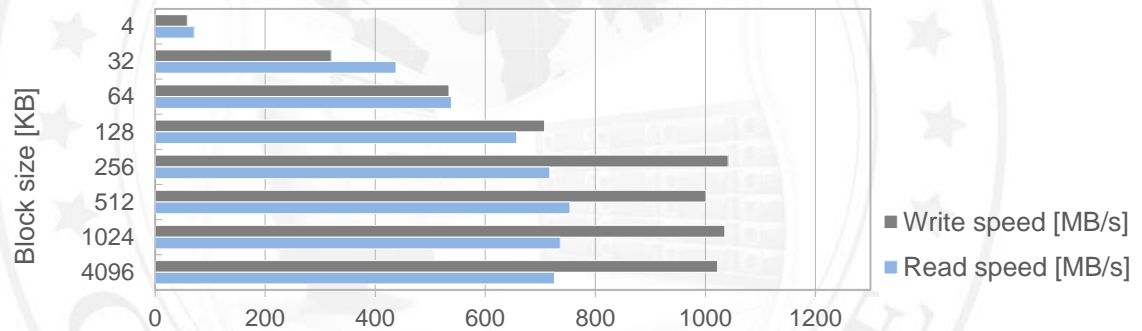

FIGURE 18: *RAID50 performance test results chart and Intel® Ethernet Converged Network Adapter X520-DA2*

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 Intel® Ethernet Converged Network Adapter X520-DA2

RAID60 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	58.69	71.41	passed
32	278.41	440.12	passed
64	352.25	536.28	passed
128	467.00	663.02	passed
256	594.60	724.07	passed
512	586.57	841.06	passed
1024	591.75	971.20	passed
4096	586.10	708.70	passed

TABLE 20: *RAID60 performance test results table and Intel® Ethernet Converged Network Adapter X520-DA2*
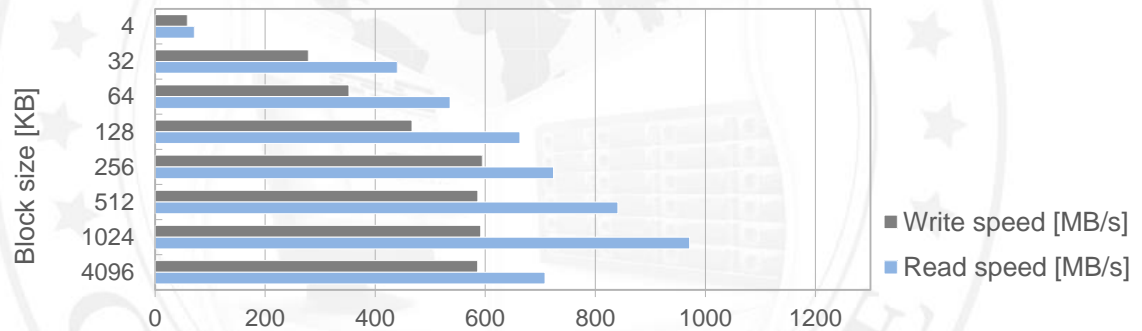

FIGURE 19: *RAID60 performance test results chart and Intel® Ethernet Converged Network Adapter X520-DA2*

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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
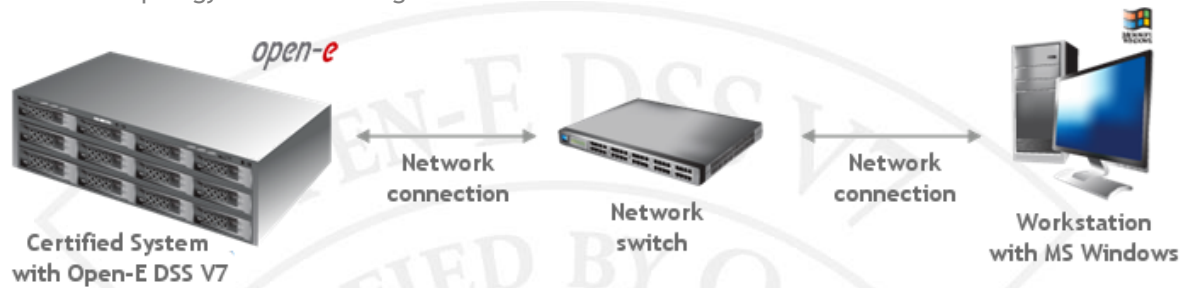
Network topology for NAS testing is shown below.

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 Intel® Ethernet Converged Network Adapter X520-DA2

SMB performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	117.43	120.55	passed
32	618.27	708.16	passed
64	934.40	509.79	passed
128	944.07	551.78	passed
256	1122.86	528.40	passed
512	1121.70	508.82	passed
1024	1126.94	495.86	passed
4096	1120.51	517.10	passed

TABLE 21: SMB performance test results table for Intel® Ethernet Converged Network Adapter X520-DA2

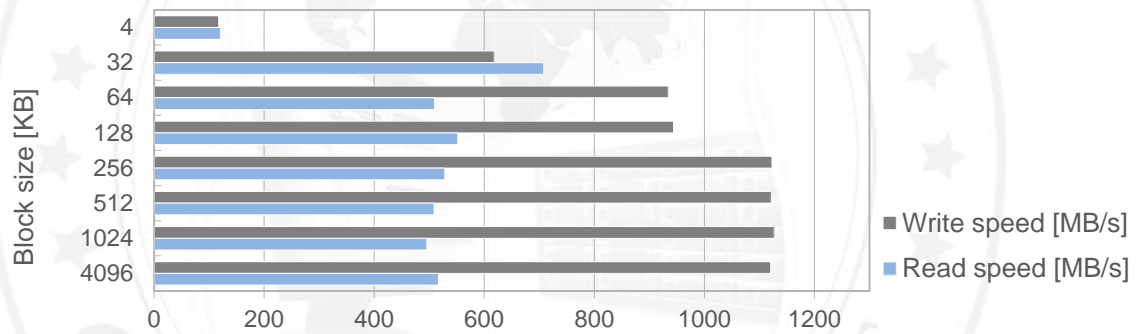FIGURE 21: SMB performance test results chart for Intel® Ethernet Converged Network Adapter X520-DA2

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

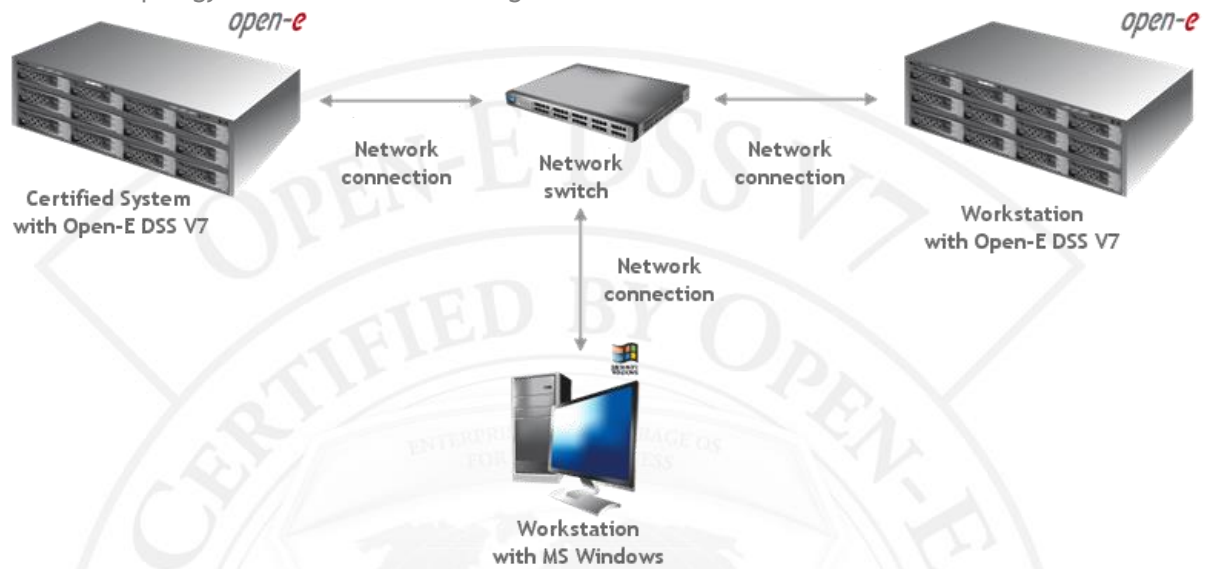Network topology for iSCSI Initiator testing is shown below.

FIGURE 22: Network topology for iSCSI Initiator testing

iSCSI Target test topology

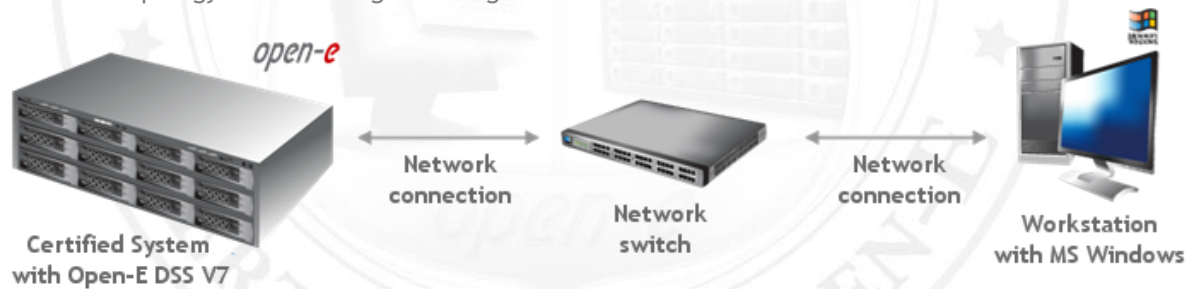Network topology for iSCSI Target testing is shown below.

FIGURE 23: Network topology for iSCSI Target testing

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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 Intel® Ethernet Converged Network Adapter X520-DA2

iSCSI Initiator performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	43.91	51.60	passed
32	190.85	326.63	passed
64	248.62	450.98	passed
128	225.46	496.08	passed
256	246.86	551.23	passed
512	364.14	488.50	passed
1024	474.83	495.60	passed
4096	540.48	494.20	passed

TABLE 22: iSCSI Initiator performance test results table for Intel® Ethernet Converged Network Adapter X520-DA2
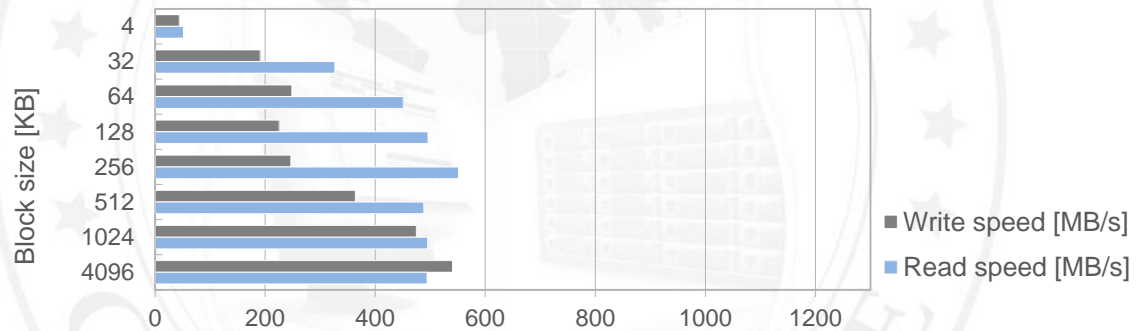

FIGURE 24: iSCSI Initiator performance test results chart for Intel® Ethernet Converged Network Adapter X520-DA2

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 Intel® Ethernet Converged Network Adapter X520-DA2

iSCSI Target performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	56.50	67.77	passed
32	344.00	435.27	passed
64	498.34	537.29	passed
128	634.62	679.62	passed
256	777.78	862.09	passed
512	854.81	893.79	passed
1024	906.89	923.24	passed
4096	930.77	994.84	passed

TABLE 23: iSCSI Target performance test results table for Intel® Ethernet Converged Network Adapter X520-DA2
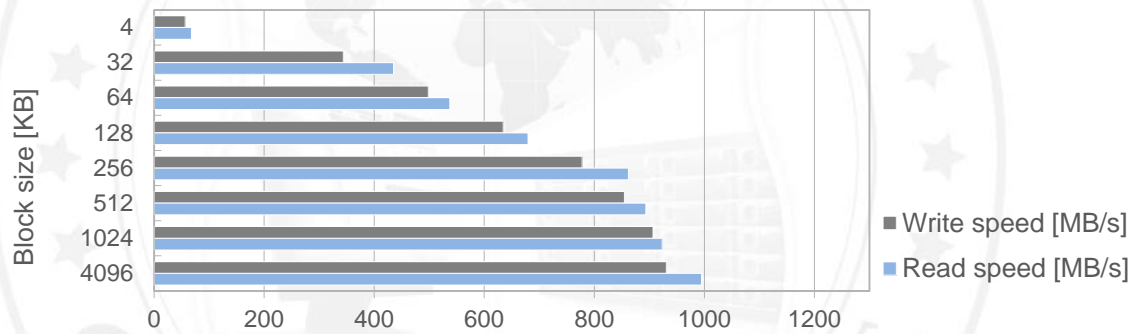

FIGURE 25: iSCSI Target performance test results chart for Intel® Ethernet Converged Network Adapter X520-DA2

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
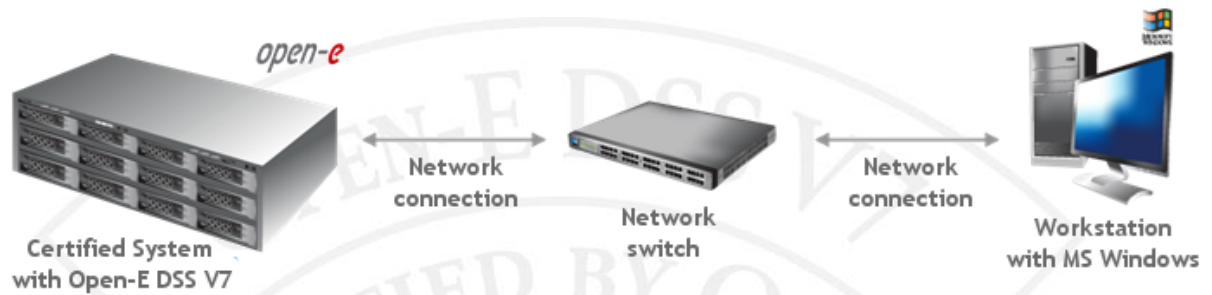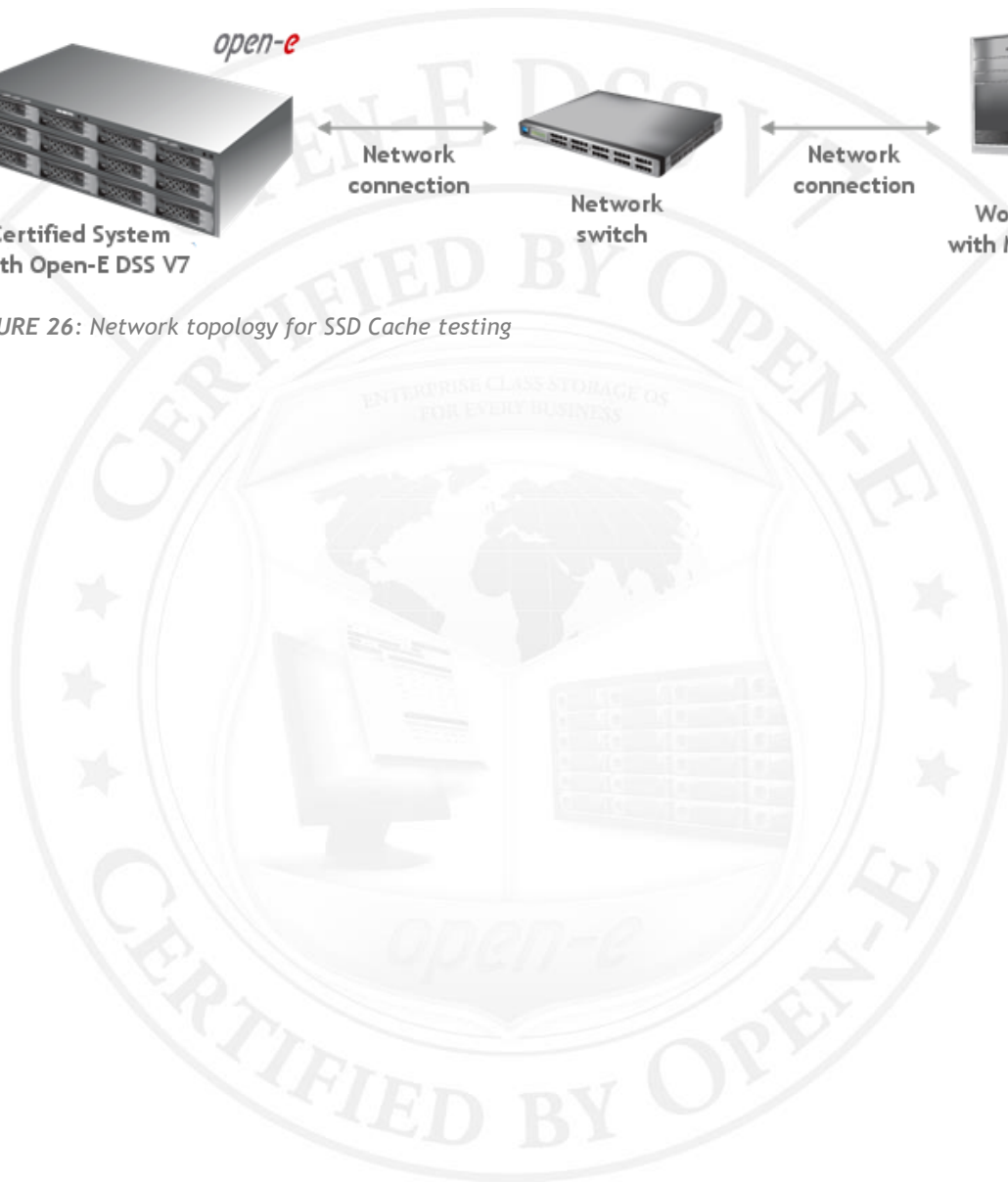
Network topology for SSD Cache testing is shown below.

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 Intel® Ethernet Converged Network Adapter X520-DA2

SSD Cache with real life pattern test results		
Block size [KB]	Performance [IOPS]	Performance test results
1	5649.46	passed
2	13529.09	passed
4	12221.38	passed

TABLE 24: *SSD Cache with real life pattern test results table for Intel® Ethernet Converged Network Adapter X520-DA2*
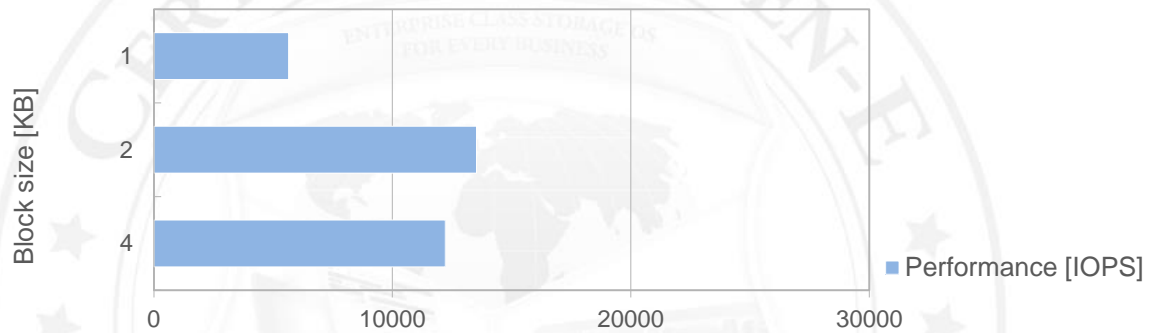

FIGURE 27: *SSD Cache with real life pattern test results chart for Intel® Ethernet Converged Network Adapter X520-DA2*

SSD Cache with random read/write pattern test

1. 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.

2. Test results for SSD cache with random read/write pattern and Intel® Ethernet Converged Network Adapter X520-DA2

SSD cache with random read/write pattern test results			
Block size [KB]	**Write speed [IOPS]**	**Read speed [IOPS]**	**Performance test results**
1	16148.24	26470.64	passed
2	15233.27	25419.70	passed
4	14821.57	21344.52	passed

TABLE 25: *SSD cache with random read/write pattern test results table for Intel® Ethernet Converged Network Adapter X520-DA2*
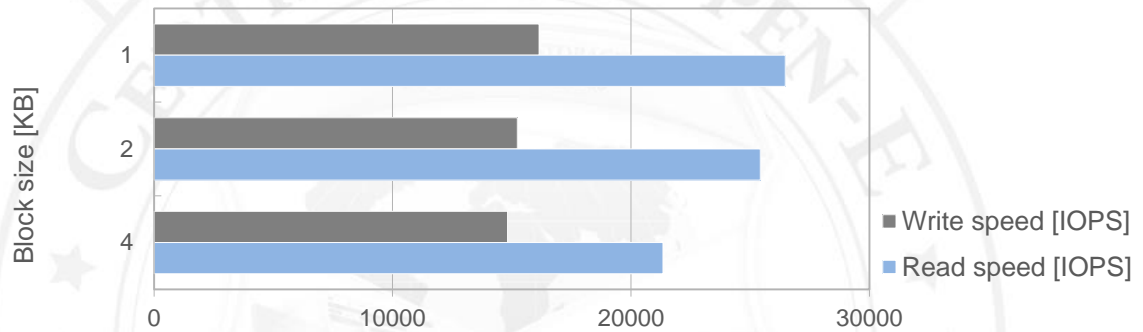

FIGURE 28: *SSD cache with random read/write pattern test results chart for Intel® Ethernet Converged Network Adapter X520-DA2*