

# SYS-Line fms-computer.com TurboRACK i5241-R2 system



## Executive summary

After performing all tests, the Certification Document SYS-Line fms-computer.com TurboRACK i5241-R2 system 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 SYS-Line fms-computer.com TurboRACK i5241-R2 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 SYS-Line fms-computer.com TurboRACK i5241-R2 good iSCSI storage:

- Hardware RAID5, RAID6, RAID50 or RAID60 for high performance and data safety.
- Twenty high capacity SATA drives with SSD cache ensure lot of fast storage space.
- Four 1GbE and four 10GbE interfaces for fast MPIO connection and flexible network topology.
- Redundant power supply for system reliability.

### ✓ NAS filer

The following features make SYS-Line fms-computer.com TurboRACK i5241-R2 a great NAS filer solution:

- Twenty high capacity hard drives and high RAID levels ensure a lot of safe storage space.
- Four 1GbE and four 10GbE interfaces for an independent connection 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 connection.
- 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

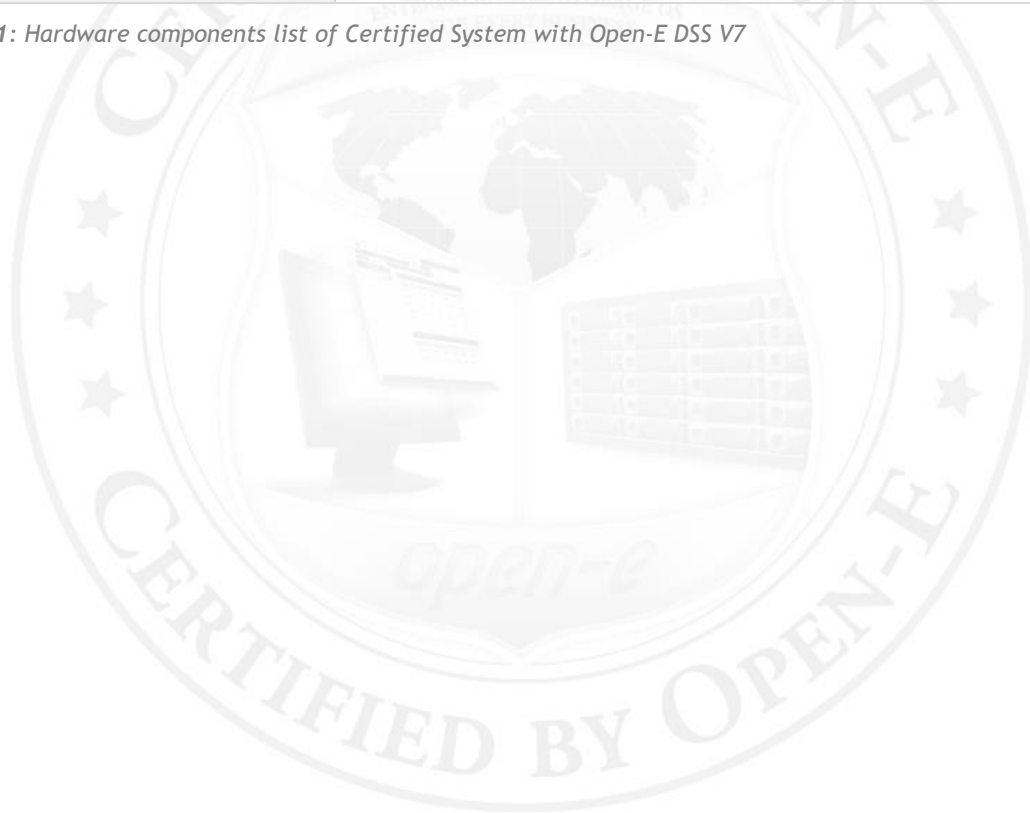
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## SYS-Line fms-computer.com TurboRACK i5241-R2 hardware components

Technical specifications about the certified system are listed below:

<b>Model</b>	SYS-Line fms-computer.com TurboRACK i5241-R2
<b>Operating system</b>	Open-E DSS V7 build 10529
<b>Enclosure/chassis</b>	Supermicro SuperChassis 216E16-R1200LPB
<b>CPU</b>	2x Intel Xeon E5-2609 v2 2.50GHz
<b>Motherboard</b>	Supermicro X9DRi-LN4F+
<b>Memory</b>	8x 8GB DDR3 ECC-REG Samsung M393B1K70DH0-YK0
<b>Network</b>	4x Intel Gigabit Server Adapter I350 (on-board)
<b>Network</b>	2x Intel Ethernet Converged Network Adapter X540-T2
<b>HW RAID</b>	LSI MegaRAID SAS 9271-4i
<b>HW RAID</b>	LSI SAS 9207-8e
<b>Hard disk drives</b>	20x 1TB Seagate Constellation.2 ST91000640SS
<b>Hard disk drives</b>	4x 240GB Intel Solid-State Drive DC S3500 Series

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



## SYS-Line fms-computer.com TurboRACK i5241-R2 photos



FIGURE 1: Front photo



FIGURE 2: Rear photo

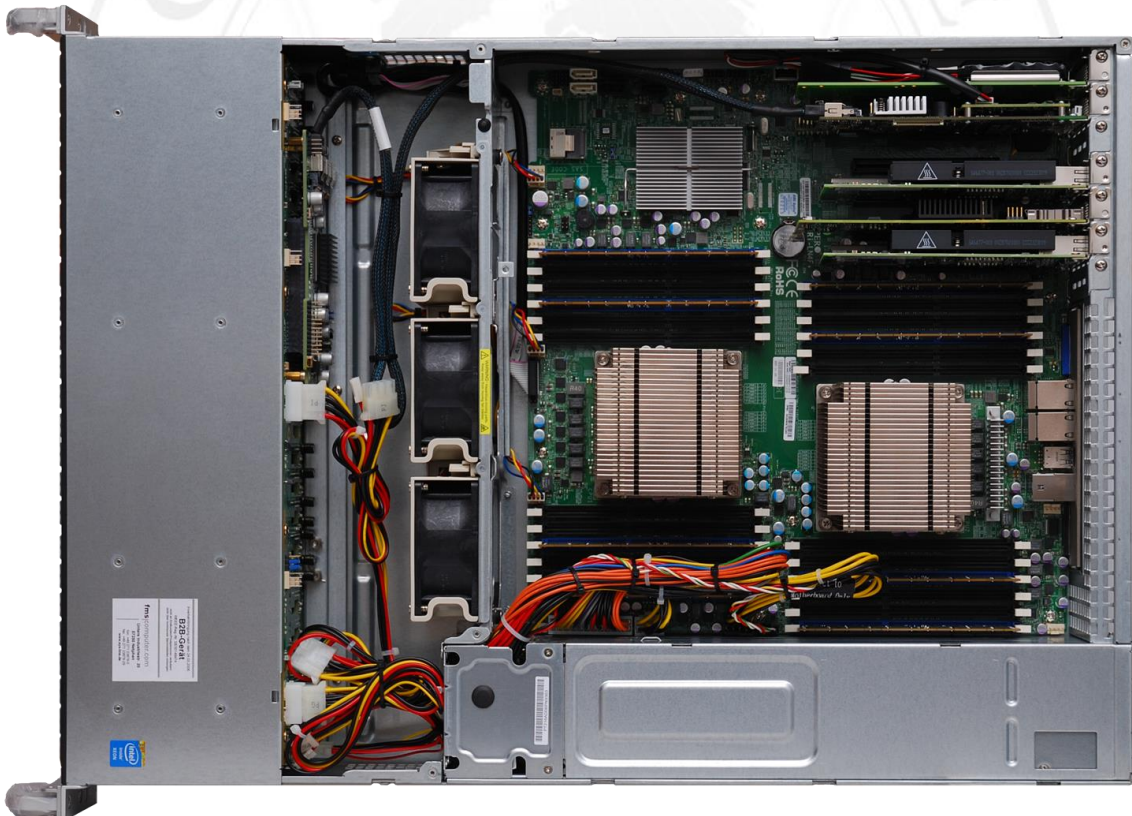


FIGURE 3: Top photo

## 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	Inter-Tech IPC 4088 4HE
Motherboard	Asus P8B-E/4L
CPU	Intel Xeon E3-1230 3.20 GHz
Memory	3x 4BG DDR3 Kingston KVR1333D3E9S/4G
Network	4x Intel 82574L Gigabit Ethernet Controller (on-board)
Network	2x Intel Ethernet Server Adapter X540-T2
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 2008 R2
Enclosure/chassis	Inter-Tech IPC 4088 4HE
Motherboard	Asus P8B-E/4L
CPU	Intel Xeon E3-1230 3.20 GHz
Memory	3x 4BG DDR3 Kingston KVR1333D3E9S/4G
Network	4x Intel 82574L Gigabit Ethernet Controller (on-board)
Network	2x Intel Ethernet Server Adapter X540-T2
Hard disk drives	1TB Hitachi Ultrastar A7K2000 HUA722010CLA330

TABLE 3: Hardware components of second Workstation with MS Windows

Model	SYS-Line fms-computer.com TurboRACK i5241-R2
Operating system	Open-E DSS V7 build 10529
Enclosure/chassis	Supermicro SuperChassis 216E16-R1200LPB
CPU	2x Intel Xeon E5-2609 v2 2.50GHz
Motherboard	Supermicro X9DRi-LN4F+
Memory	8x 8GB DDR3 ECC-REG Samsung M393B1K70DH0-YK0
Network	4x Intel Gigabit Server Adapter I350 (on-board)
Network	2x Intel Ethernet Converged Network Adapter X540-T2
HW RAID	LSI MegaRAID SAS 9271-4i
HW RAID	LSI SAS 9207-8e
Hard disk drives	20x 1TB Seagate Constellation.2 ST91000640SS
Hard disk drives	4x 240GB Intel Solid-State Drive DC S3500 Series

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

Model	Netgear ProSafe Plus XS708E
Description	8 ports 10GbE cooper with one 10GbE shared fiber port

TABLE 5: Network switch details for 10GbE 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.

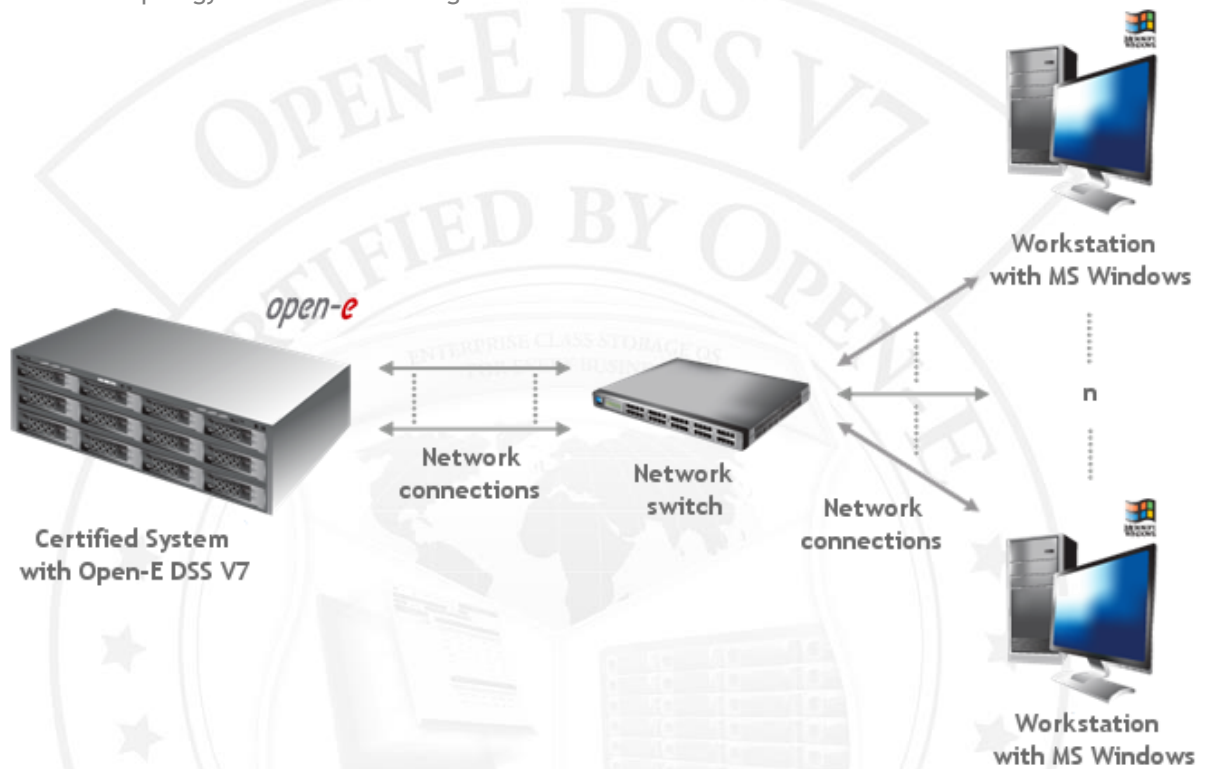


FIGURE 4: Network topology for Network testing



## 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 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
1 <sup>st</sup> Workstation	109.59	59.29	passed
2 <sup>nd</sup> Workstation	110.23	54.27	passed
3 <sup>rd</sup> Workstation	80.93	81.27	passed
4 <sup>th</sup> Workstation	112.15	89.30	passed

TABLE 7: 802.3ad bonding mode performance test results table for Intel Gigabit Server Adapter I350 (on-board)

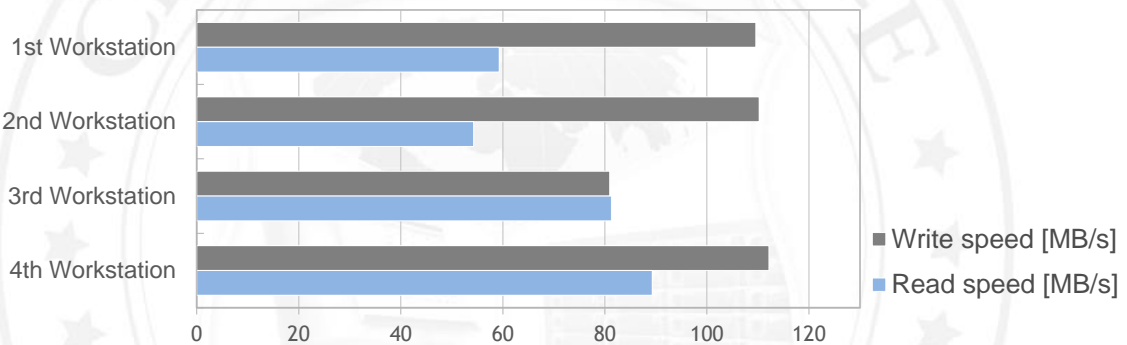


FIGURE 5: 802.3ad bonding mode performance test results chart for Intel Gigabit Server Adapter I350 (on-board)

## 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 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
1 <sup>st</sup> Workstation	110.60	111.88	passed
2 <sup>nd</sup> Workstation	70.08	111.81	passed
3 <sup>rd</sup> Workstation	111.58	111.73	passed
4 <sup>th</sup> Workstation	69.94	111.59	passed

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

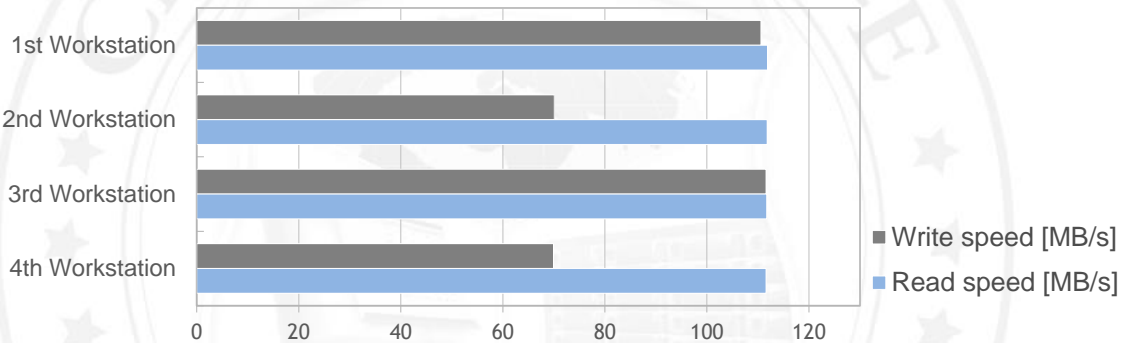


FIGURE 6: Balance-alb bonding mode performance test results chart for Intel Gigabit Server Adapter I350 (on-board)

### 3. Test results for Balance-alb bonding mode test performed on Intel Ethernet Converged Network Adapter X540-T2

Balance-alb bonding mode performance test results			
NIC model	Intel Ethernet Converged Network Adapter X540-T2		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1 <sup>st</sup> Workstation	371.64	335.26	passed
2 <sup>nd</sup> Workstation	388.42	337.19	passed
3 <sup>rd</sup> Workstation	384.10	312.82	passed
4 <sup>th</sup> Workstation	386.80	299.40	passed

TABLE 9: Balance-alb bonding mode performance test results table for Intel Ethernet Converged Network Adapter X540-T2

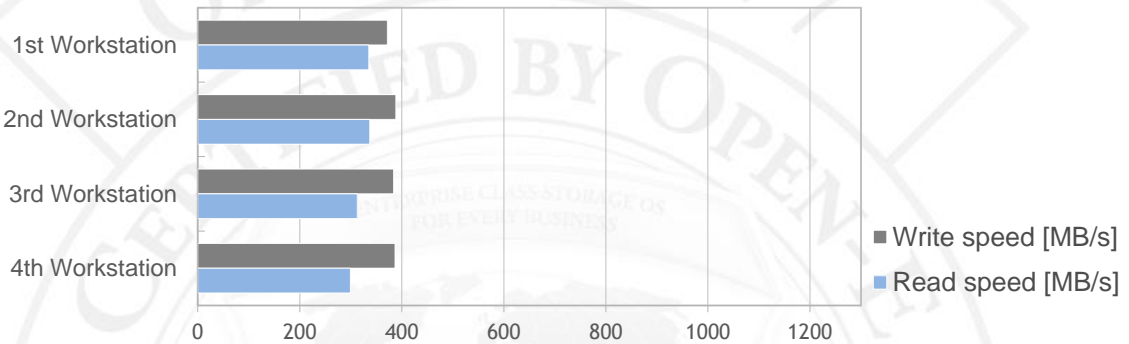


FIGURE 7: Balance-alb bonding mode performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

## 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 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
1 <sup>st</sup> Workstation	110.49	66.70	passed
2 <sup>nd</sup> Workstation	111.49	93.56	passed
3 <sup>rd</sup> Workstation	110.72	85.77	passed
4 <sup>th</sup> Workstation	111.30	94.88	passed

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

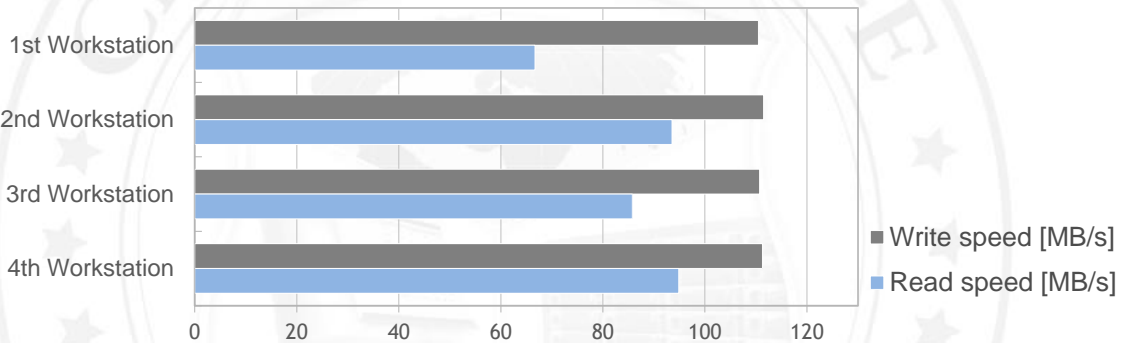


FIGURE 8: Balance-rr bonding mode performance test results chart for Intel Gigabit Server Adapter I350 (on-board)

### 3. Test results for Balance-rr bonding mode test performed on Intel Ethernet Converged Network Adapter X540-T2

Balance-rr bonding mode performance test results			
NIC model	Intel Ethernet Converged Network Adapter X540-T2		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1 <sup>st</sup> Workstation	300.54	308.32	passed
2 <sup>nd</sup> Workstation	355.29	333.51	passed
3 <sup>rd</sup> Workstation	501.05	301.29	passed
4 <sup>th</sup> Workstation	482.22	201.21	passed

TABLE 11: Balance-rr bonding mode performance test results table for Intel Ethernet Converged Network Adapter X540-T2

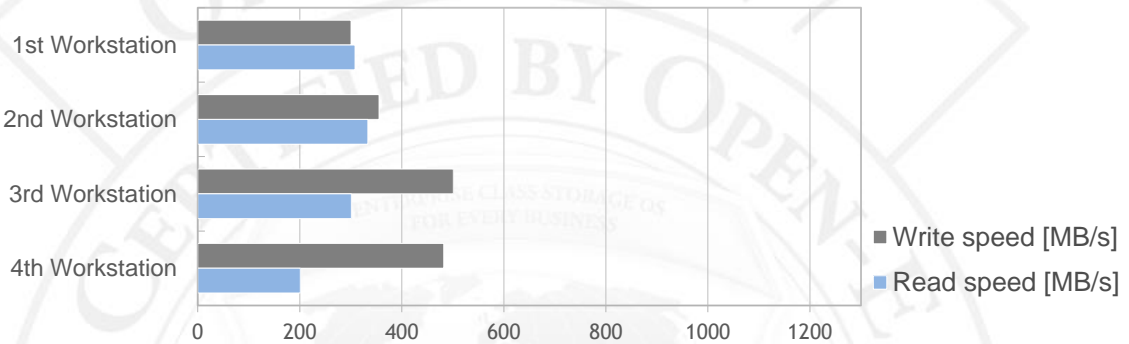


FIGURE 9: Balance-rr bonding mode performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

## 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 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
1 <sup>st</sup> Workstation	109.83	112.03	passed

TABLE 12: Single NIC performance test results table for Intel Gigabit Server Adapter I350 (on-board)

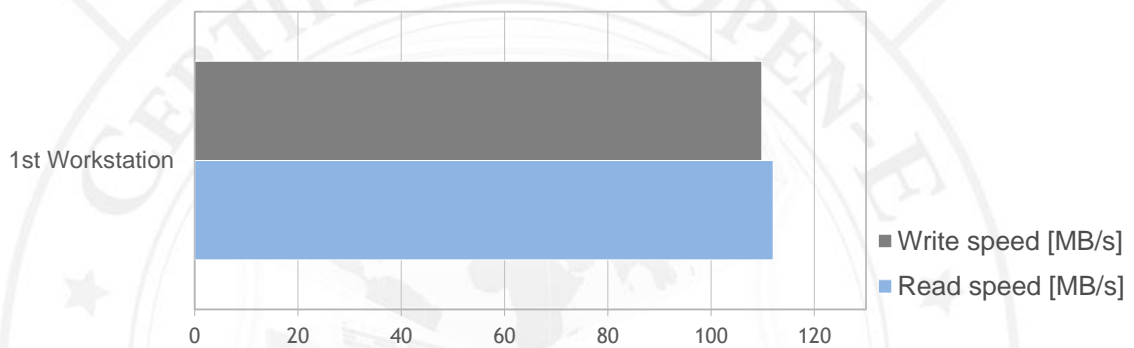


FIGURE 10: Single NIC performance test results chart for Intel Gigabit Server Adapter I350 (on-board)

### 3. Test results for single NIC test performed on Intel Ethernet Converged Network Adapter X540-T2

Single NIC performance test results			
NIC model	Intel Ethernet Converged Network Adapter X540-T2		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1 <sup>st</sup> Workstation	848.73	412.55	passed

TABLE 13: Single NIC performance test results table for Intel Ethernet Converged Network Adapter X540-T2

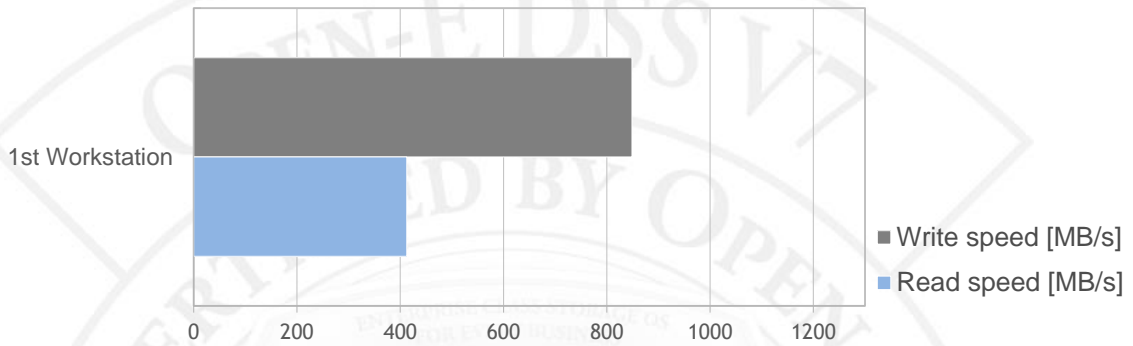


FIGURE 11: Single NIC performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

## 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 lometer testing tool.

### RAID test topology

Network test topology for RAID testing is shown below

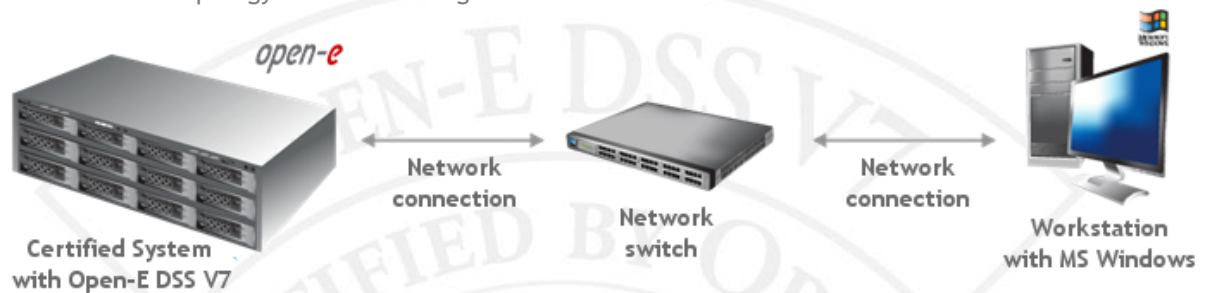


FIGURE 12: Network test topology for RAID testing



## 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 lometer testing tool.

### 2. Test results for RAID0 and Intel Ethernet Converged Network Adapter X540-T2

RAID0 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	50.38	63.05	passed
32	316.70	398.28	passed
64	416.74	505.84	passed
128	533.30	653.31	passed
256	762.74	418.24	passed
512	693.76	441.76	passed
1024	714.65	505.59	passed
4096	780.49	524.18	passed

TABLE 14: RAID0 performance test results table for Intel Ethernet Converged Network Adapter X540-T2

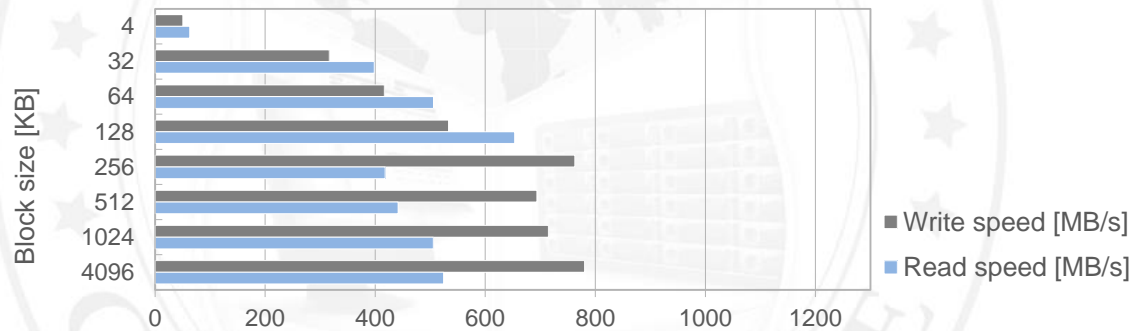


FIGURE 13: RAID0 performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

## 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 lometer testing tool.

### 2. Test results for RAID5 and Intel Ethernet Converged Network Adapter X540-T2

RAID5 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	48.65	59.64	passed
32	308.52	394.66	passed
64	412.97	509.79	passed
128	533.78	390.35	passed
256	706.10	423.62	passed
512	634.40	441.51	passed
1024	700.63	508.59	passed
4096	748.64	520.22	passed

TABLE 15: RAID5 performance test results table for Intel Ethernet Converged Network Adapter X540-T2

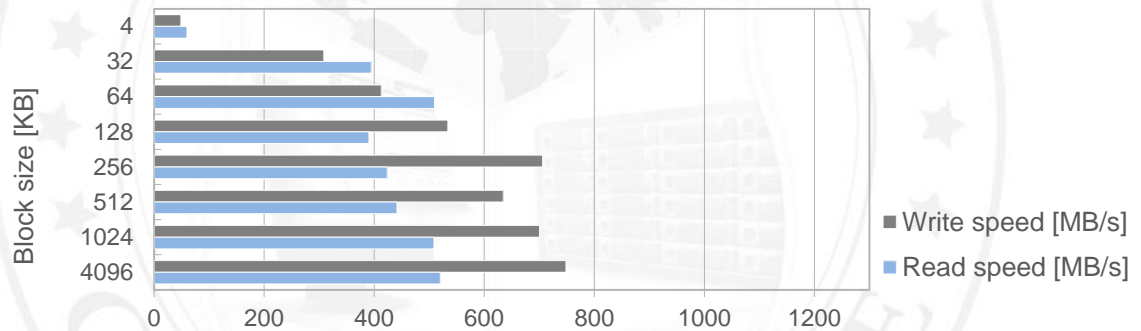


FIGURE 14: RAID5 performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

## 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 lometer testing tool.

### 2. Test results for RAID6 and Intel Ethernet Converged Network Adapter X540-T2

RAID6 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	71.22	67.78	passed
32	358.48	415.49	passed
64	489.11	525.09	passed
128	592.79	668.80	passed
256	791.56	260.42	passed
512	691.18	323.68	passed
1024	682.85	402.00	passed
4096	838.98	411.11	passed

TABLE 16: RAID6 performance test results table for Intel Ethernet Converged Network Adapter X540-T2

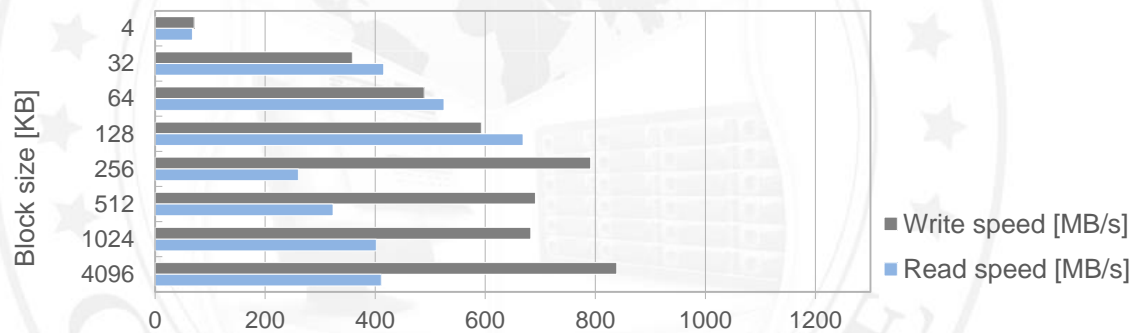


FIGURE 15: RAID6 performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

## 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 lometer testing tool.

### 2. Test results for RAID10 and Intel Ethernet Converged Network Adapter X540-T2

RAID10 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	69.67	63.73	passed
32	354.07	226.88	passed
64	477.67	356.32	passed
128	541.54	465.30	passed
256	794.10	257.03	passed
512	701.74	297.71	passed
1024	826.47	405.99	passed
4096	709.68	425.05	passed

TABLE 17: RAID10 performance test results table for Intel Ethernet Converged Network Adapter X540-T2

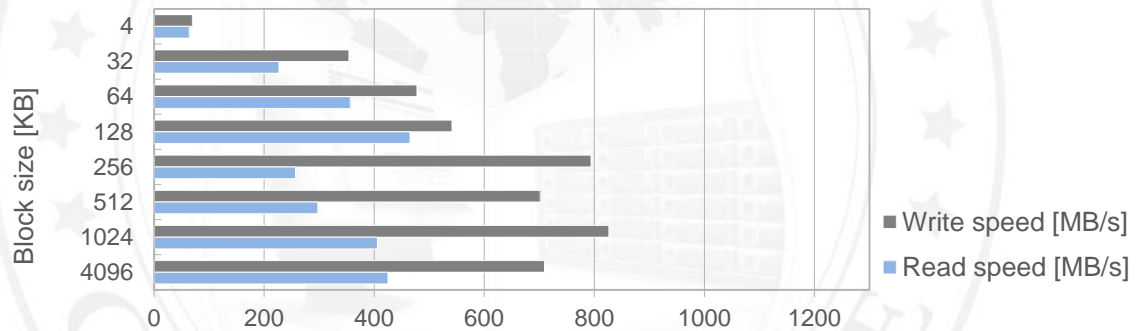


FIGURE 16: RAID10 performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

## 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 lometer testing tool.

### 2. Test results for RAID50 and Intel Ethernet Converged Network Adapter X540-T2

RAID50 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	49.14	59.54	passed
32	302.71	396.71	passed
64	399.66	504.85	passed
128	496.96	387.45	passed
256	575.43	408.44	passed
512	587.77	435.23	passed
1024	705.47	487.86	passed
4096	783.38	502.21	passed

TABLE 18: RAID50 performance test results table for Intel Ethernet Converged Network Adapter X540-T2

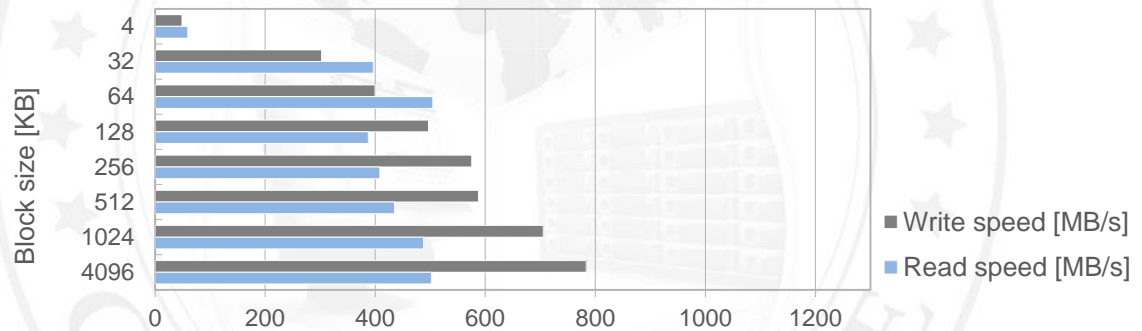


FIGURE 17: RAID50 performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

## 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 lometer testing tool.

### 2. Test results for RAID60 and Intel Ethernet Converged Network Adapter X540-T2

RAID60 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	73.66	71.70	passed
32	381.62	417.87	passed
64	516.31	515.73	passed
128	645.26	320.36	passed
256	840.88	360.75	passed
512	846.81	363.46	passed
1024	804.24	406.49	passed
4096	806.98	404.06	passed

TABLE 19: RAID60 performance test results table for Intel Ethernet Converged Network Adapter X540-T2

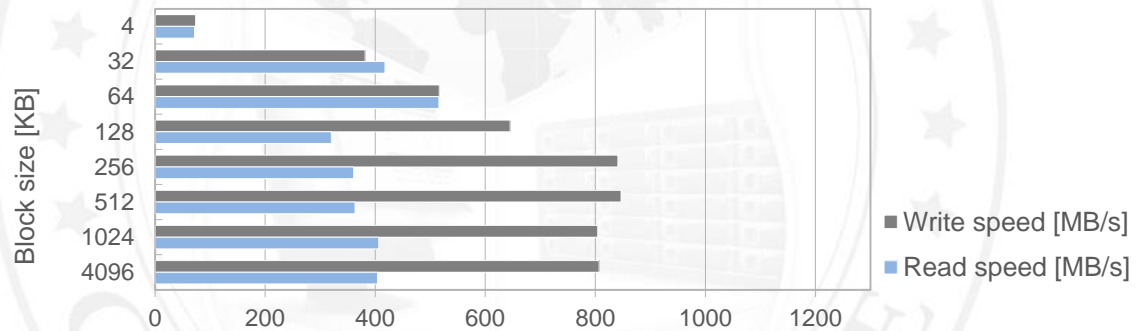


FIGURE 18: RAID60 performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

## 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.

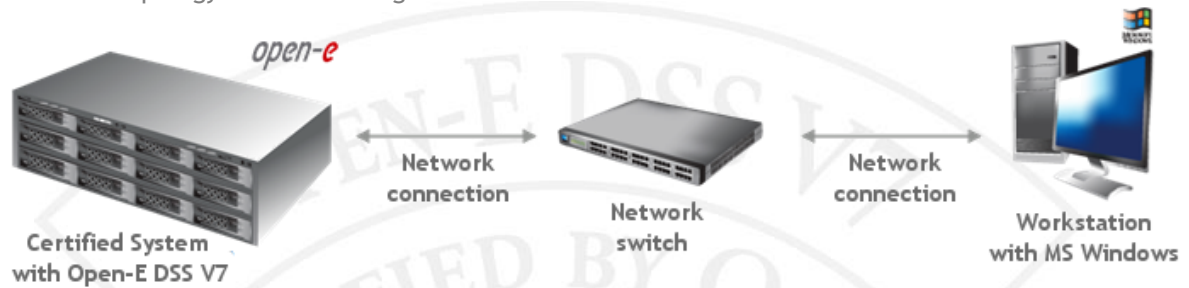


FIGURE 19: Network topology for NAS testing

## 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 X540-T2

SMB performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	123.52	109.65	passed
32	827.09	808.07	passed
64	1117.90	601.41	passed
128	1118.12	659.20	passed
256	1117.83	629.95	passed
512	1117.74	582.74	passed
1024	1117.12	612.46	passed
4096	1117.37	611.42	passed

TABLE 20: SMB performance test results table for Intel Ethernet Converged Network Adapter X540-T2

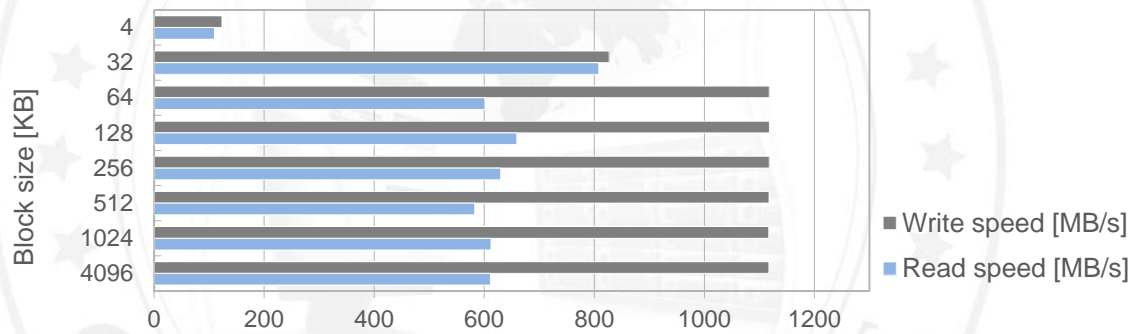


FIGURE 20: SMB performance test results chart for Intel Ethernet Converged Network Adapter X540-T2



## 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.

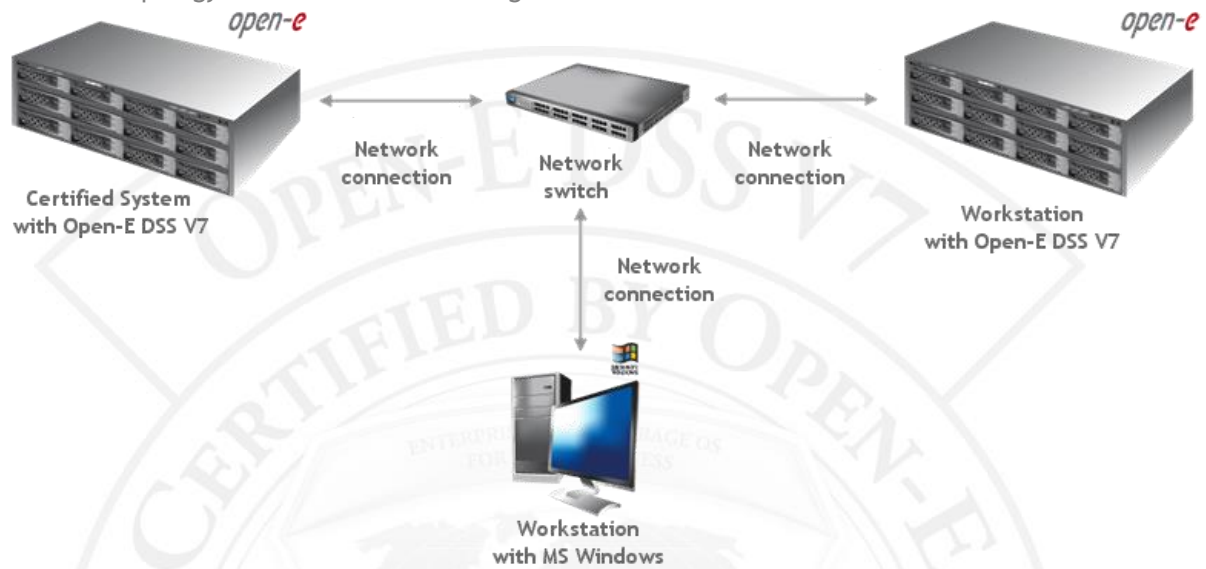


FIGURE 21: Network topology for iSCSI Initiator testing

### iSCSI Target test topology

Network topology for iSCSI Target testing is shown below.



FIGURE 22: 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 lometer testing tool.

### 2. Test results for iSCSI Initiator and Intel Ethernet Converged Network Adapter X540-T2

iSCSI Initiator performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	108.55	115.71	passed
32	712.39	631.55	passed
64	1064.81	493.25	passed
128	1127.28	525.52	passed
256	1129.10	515.89	passed
512	1030.76	501.50	passed
1024	1103.04	495.66	passed
4096	1095.01	497.55	passed

TABLE 21: iSCSI Initiator performance test results table for Intel Ethernet Converged Network Adapter X540-T2

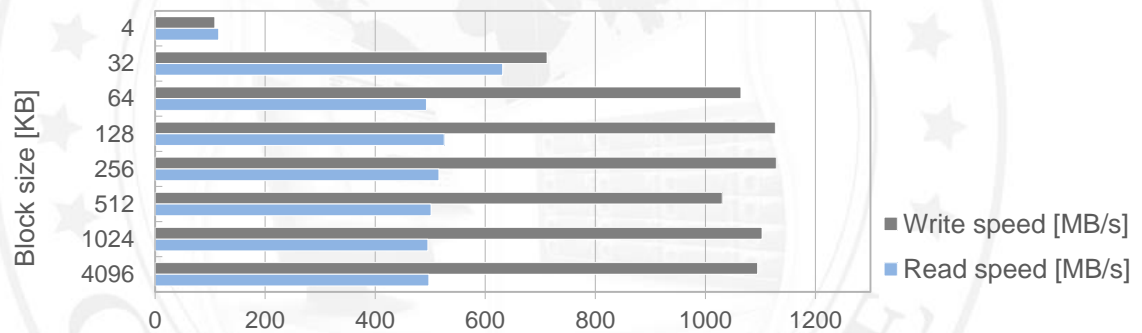


FIGURE 23: iSCSI Initiator performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

## 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 X540-T2

iSCSI Target performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	49.90	62.03	passed
32	316.04	397.62	passed
64	410.15	507.92	passed
128	555.51	539.43	passed
256	772.29	392.07	passed
512	759.60	440.14	passed
1024	699.99	514.11	passed
4096	723.16	540.44	passed

TABLE 22: iSCSI Target performance test results table for Intel Ethernet Converged Network Adapter X540-T2

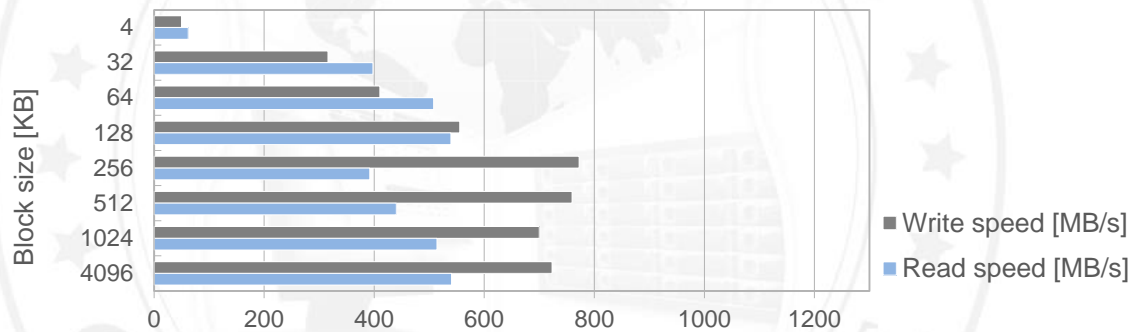


FIGURE 24: iSCSI Target performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

## 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.

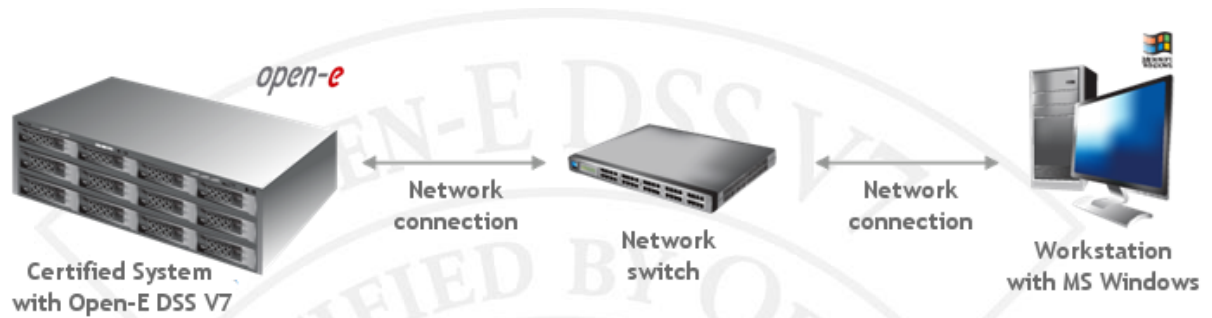


FIGURE 25: Network topology for SSD Cache testing

## 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 lometer tool.

### 2. Test results for SSD Cache with real life pattern and Intel Ethernet Converged Network Adapter X540-T2

SSD Cache with real life pattern test results		
Block size [KB]	Performance [IOPS]	Performance test results
1	17358.56	passed
2	17869.67	passed
4	14714.80	passed

TABLE 23: SSD Cache with real life pattern test results table for Intel Ethernet Converged Network Adapter X540-T2

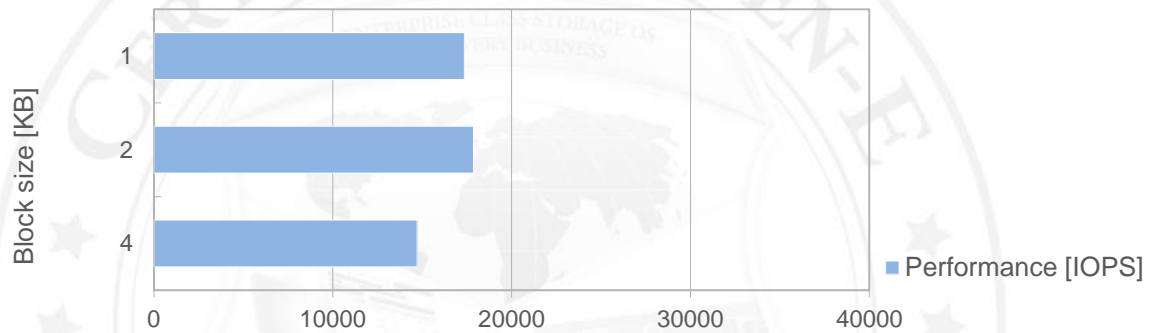


FIGURE 26: SSD Cache with real life pattern test results chart for Intel Ethernet Converged Network Adapter X540-T2

## 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 X540-T2

SSD cache with random read/write pattern test results			
Block size [KB]	Write speed [IOPS]	Read speed [IOPS]	Performance test results
1	19307.82	30141.45	passed
2	17414.09	28491.60	passed
4	16576.87	23008.71	passed

TABLE 24: SSD cache with random read/write pattern test results table for Intel Ethernet Converged Network Adapter X540-T2

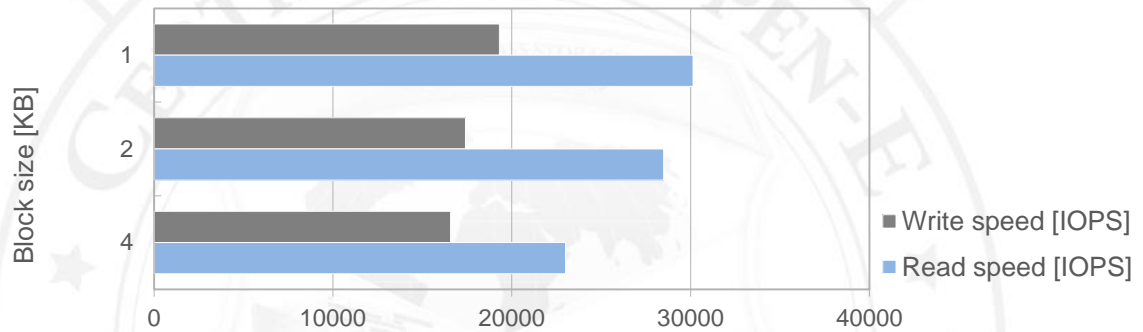


FIGURE 27: SSD cache with random read/write pattern test results chart for Intel Ethernet Converged Network Adapter X540-T2