

Armari BrontaStor 822R storage system



Executive summary

After performing all tests, the Armari BrontaStor 822R 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 Armari BrontaStor 822R 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 Armari BrontaStor 822R good iSCSI storage:

- Hardware RAID5, RAID50, RAID6 or RAID60 for high performance and data safety.
- Four 1GbE and two 10GbE interfaces for fast MPIO connection and flexible network topology.
- Redundant power supply for system reliability.

✓ NAS filer

The following features make Armari BrontaStor 822R a great NAS filer solution:

- Hardware RAID5, RAID50, RAID6 or RAID60 for fault tolerance and the most efficient use of available disk space.
- Four 1GbE and two 10GbE interfaces for a 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, RAID50, RAID6 or RAID60 for high performance and data safety.
- Four 1GbE interfaces for flexible network topology or fast MPIO connection.
- Two 10GbE interfaces for efficient network connections to virtualization platforms.
- SSD cache 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.

Armarii BrontaStor 822R was certified with Small Update 70216, which fixes problems related to built-in LCD.

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Armari BrontaStor 822R hardware components

Technical specifications about the certified system are listed below:

Model	Armari BrontaStor 822R
Operating system	Open-E DSS V7 build 7637
Enclosure/chassis	Armari Brontastor 822R
CPU	Intel Xeon E3-1240 v2 3.40GHz
Motherboard	Intel Server Board S1200BTSR
Memory	4x 8GB DDR3 ECC Samsung M391B1G73BH0-CK0
Network	Intel Ethernet Converged Network Adapter X540-T2
Network	Intel Gigabit Server Adapter (i82579LM) (on-board)
Network	Intel Gigabit Server Adapter (i82574L) (on-board)
Network	Intel PRO/1000 PT Dual Port Server Adapter (i82571EB)
HW RAID	Intel RS25AB080 RAID Controller
Hard disk drives	1x 20GB Intel SSD 313 SLC
Hard disk drives	7x 3TB Seagate Constellation CS ST3000NC002
Hard disk drives	1x 200GB Intel SSD DC S3700 Series

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



Armari BrontaStor 822R 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 Processor E5630 2.53GHz
Memory	4x 4GB DDR3 ECC-REG Samsung M39B5270CH0-CH9
Network	Intel Ethernet Converged Network Adapter X520-SR2
Network	Intel PRO/1000 PT Dual Port Server Adapter (i82571EB)
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 Processor E5630 2.53GHz
Memory	4x 4GB DDR3 ECC-REG Samsung M39B5270CH0-CH9
Network	Intel Ethernet Converged Network Adapter X520-SR2
Network	Intel PRO/1000 PT Dual Port Server Adapter (i82571EB)
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	Armari BrontaStor 822R
Operating system	Open-E DSS V7 build 7637
Enclosure/chassis	Armari Brontastor 822R
CPU	Intel Xeon E3-1240 v2 3.4GHz
Motherboard	Intel Server Board S1200BTSR
Memory	4x 8GB DDR3 ECC Samsung M391B1G73BH0-CK0
Network	Intel Ethernet Converged Network Adapter X540-T2
Network	Intel PRO/1000 PT Dual Port Server Adapter (i82571EB)
HW RAID	Intel RS25AB080 RAID Controller
Hard disk drives	1x 20GB Intel SSD 313 SLC
Hard disk drives	1x 3TB Seagate Constellation CS ST3000NC002
Hard disk drives	1x 200GB Intel SSD DC S3700 Series

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

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

TABLE 5: Network switch details for 1GbE connections

Model	NETGEAR XS708E
Description	8-ports 10GbE managed switch (copper)

TABLE 6: 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 7: 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.

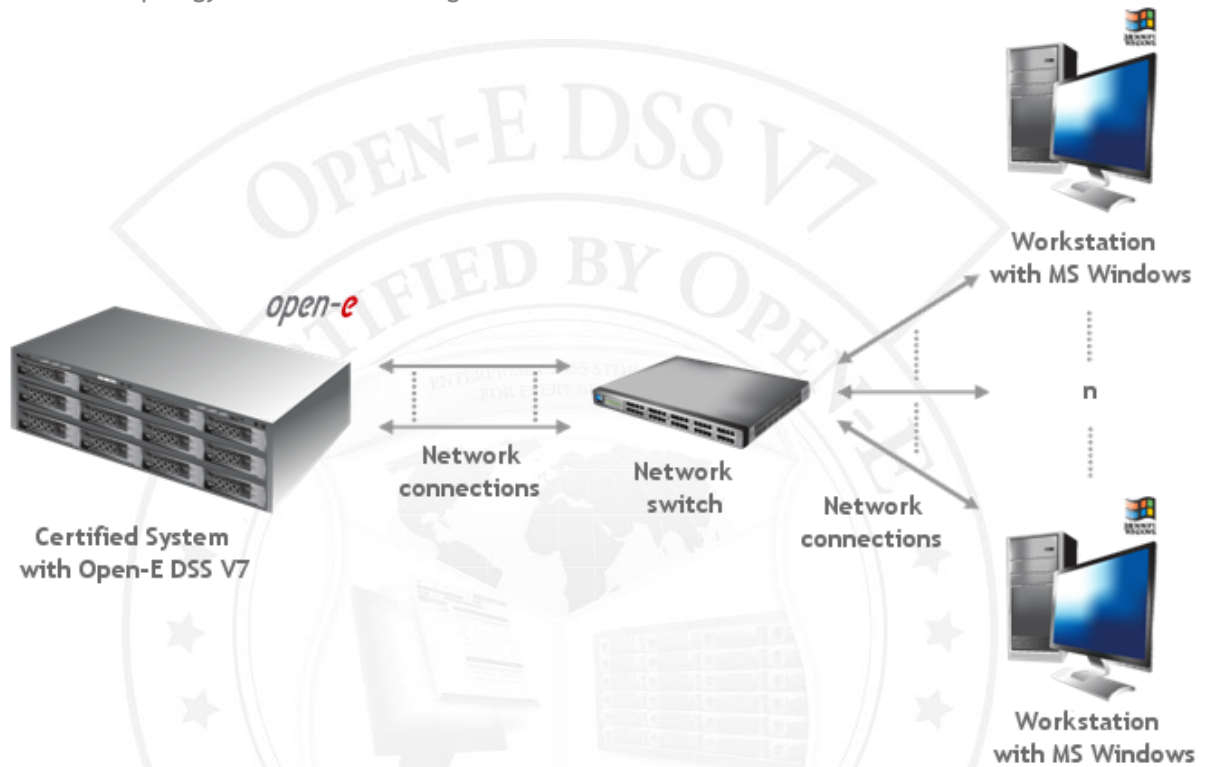


FIGURE 4: Network topology for Network testing

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 Converged Network Adapter X540-T2

802.3ad 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 st Workstation	526.34	317.35	passed
2 nd Workstation	523.63	385.26	passed

TABLE 8: 802.3ad bonding mode performance test results table for Intel Ethernet Converged Network Adapter X540-T2

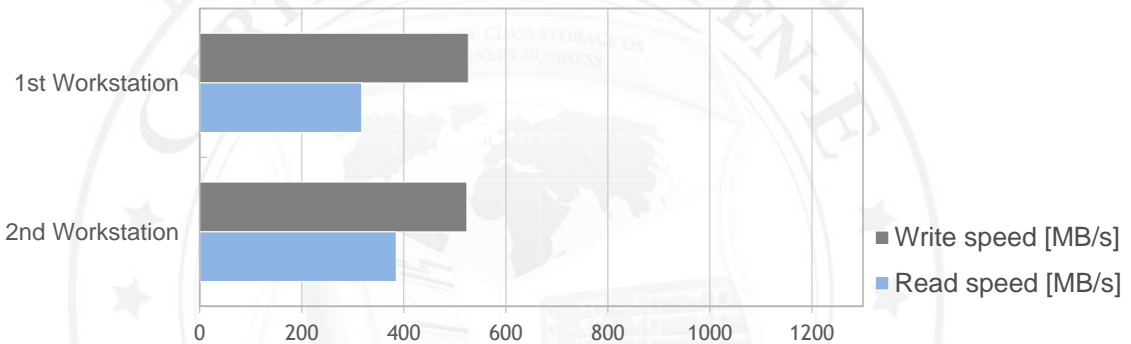


FIGURE 5: 802.3ad bonding mode performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

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 Converged Network Adapter X540-T2

Balance-alb bonding mode performance test results			
NIC model	Intel Ethernet Converged Network Adapter 40-T2		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1 st Workstation	783.43	485.38	passed
2 nd Workstation	820.79	459.78	passed

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

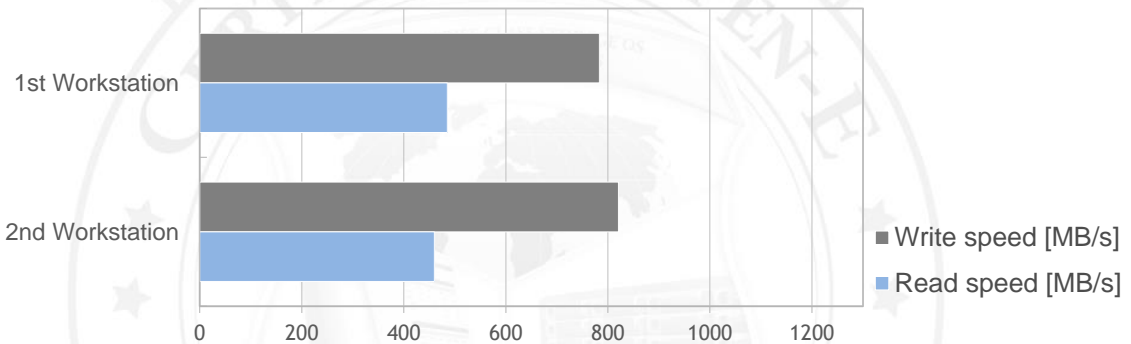


FIGURE 6: Balance-alb bonding mode performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

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 lometer testing tool.

2. 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 st Workstation	551.89	213.46	passed
2 nd Workstation	554.74	222.87	passed

TABLE 10: Balance-rr bonding mode performance test results table for Intel Ethernet Converged Network Adapter X540-T2

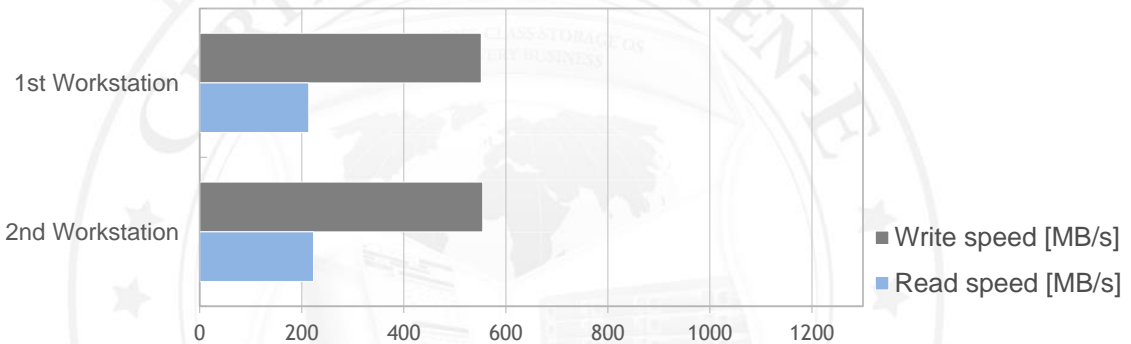


FIGURE 7: Balance-rr bonding mode performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

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 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 st Workstation	664.07	434.41	passed

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

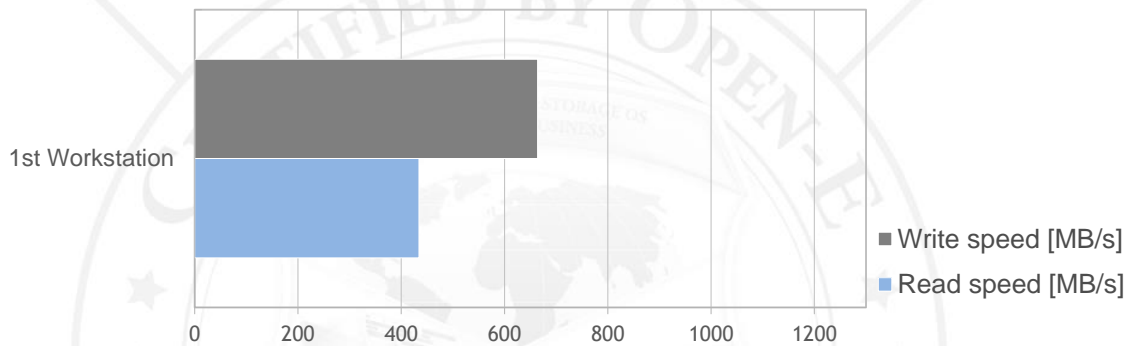


FIGURE 8: Single NIC performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

3. Test results for single NIC test performed on Intel PRO/1000 PT Dual Port Server Adapter (i82571EB)

Single NIC performance test results			
NIC model	Intel PRO/1000 PT Dual Port Adapter (i82571EB)		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1 st Workstation	102.45	105.23	passed

TABLE 12: Single NIC performance test results table for Intel PRO/1000 PT Dual Port Server Adapter (i82571EB)

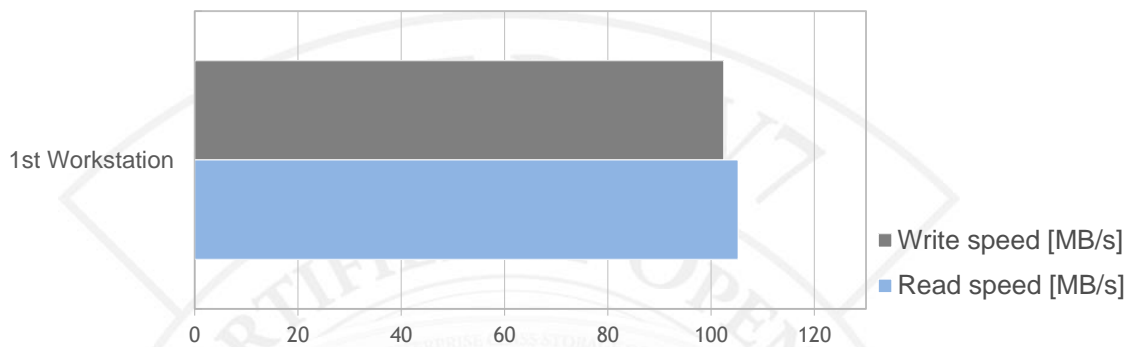


FIGURE 9: Single NIC performance test results chart for Intel PRO/1000 PT Dual Port Server Adapter (i82571EB)



4. Test results for single NIC test performed on Intel Gigabit Server Adapter (i82579LM) (on-board)

Single NIC performance test results			
NIC model	Intel Gigabit Server Adapter (i82579LM) (on-board)		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1 st Workstation	108.85	111.07	passed

TABLE 13: Single NIC performance test results table for Intel Gigabit Server Adapter (i82579LM) (on-board)

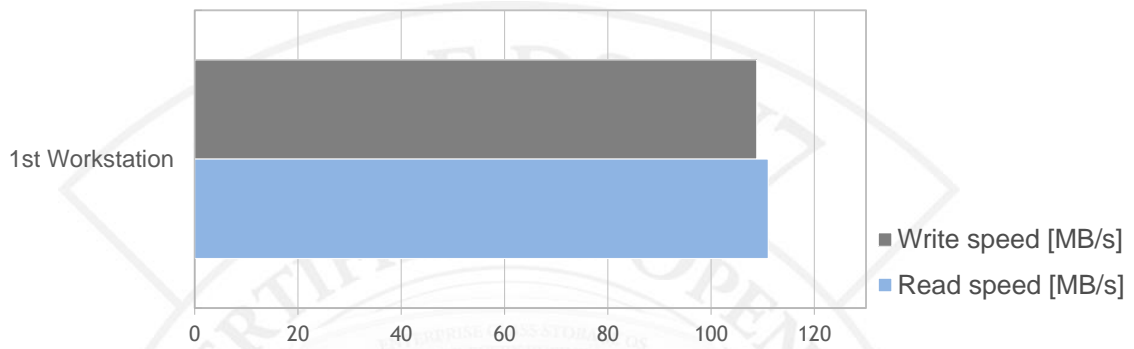
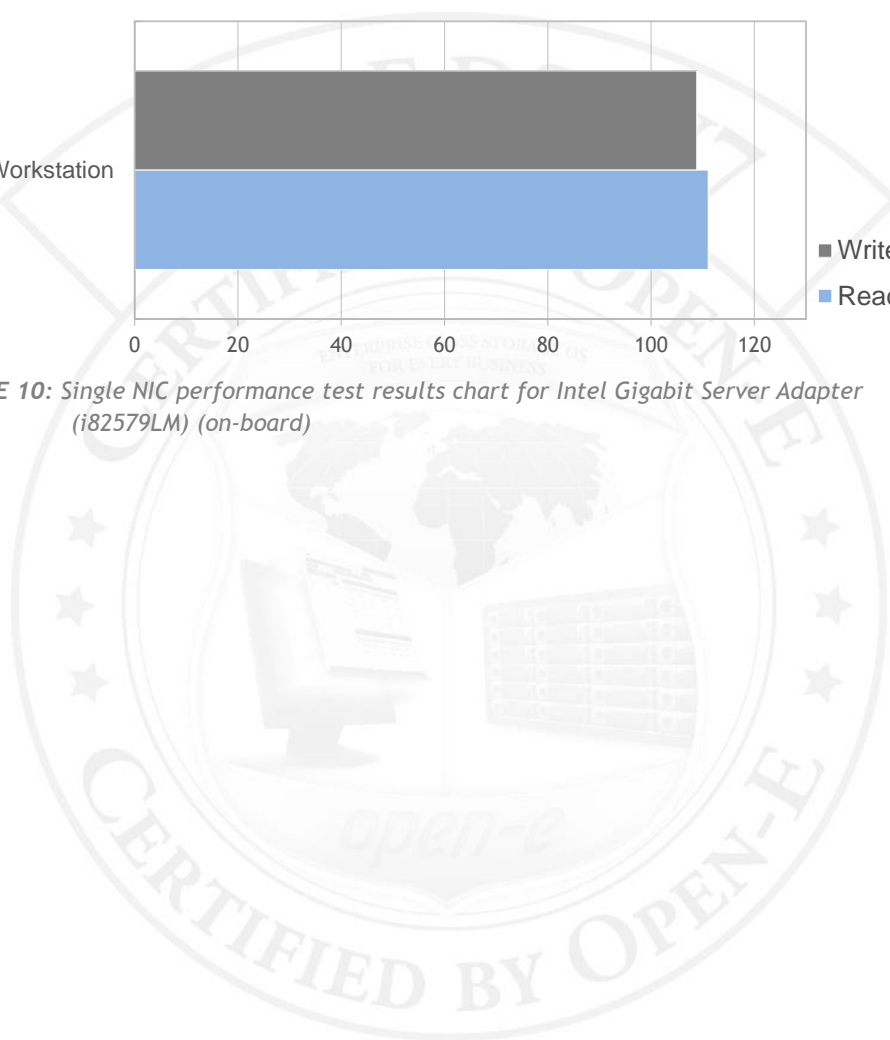


FIGURE 10: Single NIC performance test results chart for Intel Gigabit Server Adapter (i82579LM) (on-board)



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, 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

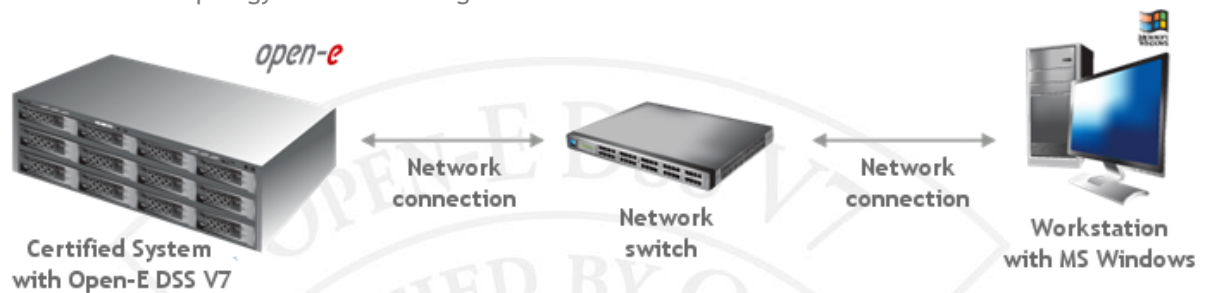


FIGURE 11: Network test topology for RAID testing

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	36.52	17.14	passed
32	238.44	105.40	passed
64	407.56	221.38	passed
128	534.75	260.34	passed
256	665.66	307.58	passed
512	677.64	387.85	passed
1024	504.48	365.66	passed
4096	502.50	578.43	passed

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

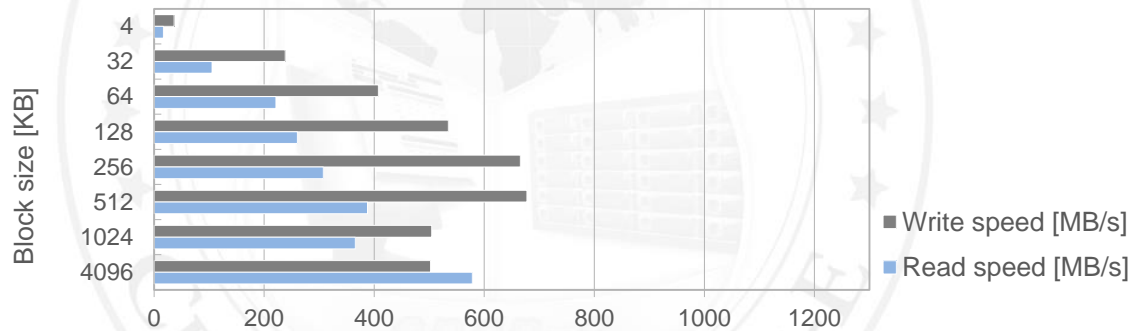


FIGURE 12: RAID0 performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

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	40.82	22.00	passed
32	250.58	55.04	passed
64	355.42	120.11	passed
128	478.48	331.25	passed
256	623.73	435.60	passed
512	569.63	498.86	passed
1024	507.92	527.57	passed
4096	514.99	544.17	passed

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

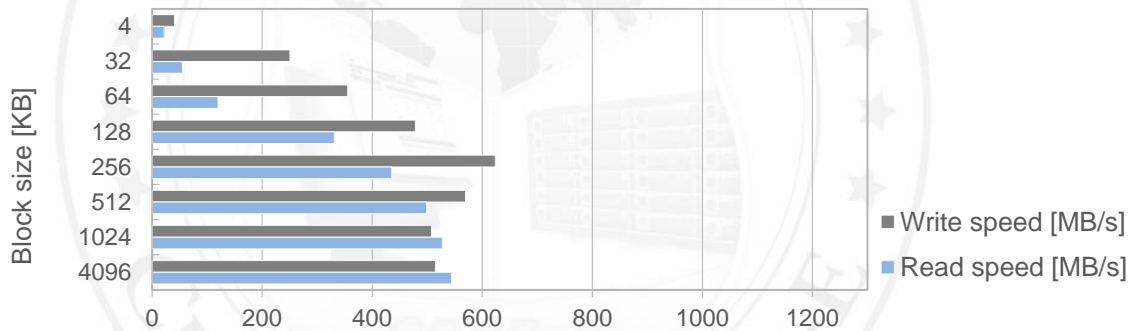


FIGURE 13: RAID5 performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

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	25.11	42.56	passed
32	167.96	235.88	passed
64	289.04	402.52	passed
128	393.56	526.9	passed
256	519.26	648.92	passed
512	590.57	687.32	passed
1024	587.99	509.10	passed
4096	590.06	513.69	passed

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

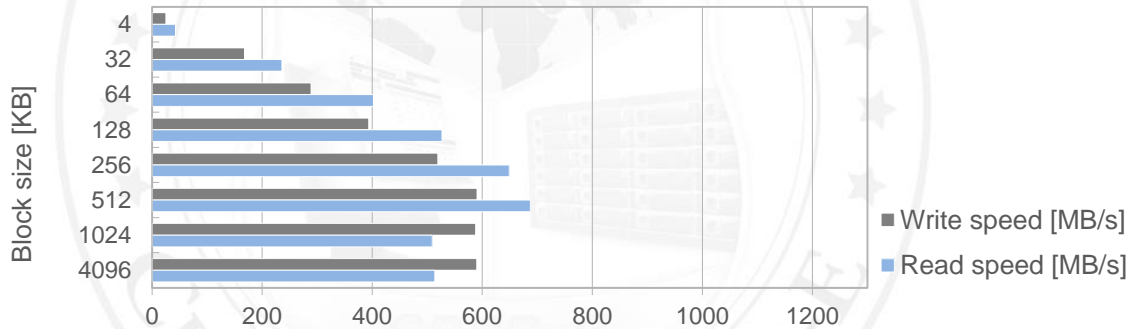


FIGURE 14: RAID6 performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

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	24.15	50.92	passed
32	161.35	234.93	passed
64	284.77	401.09	passed
128	392.09	533.96	passed
256	515.09	654.85	passed
512	579.82	679.08	passed
1024	578.86	508.27	passed
4096	579.65	521.49	passed

TABLE 17: RAID50 performance test results table for Intel Ethernet Converged Network Adapter X540-T2

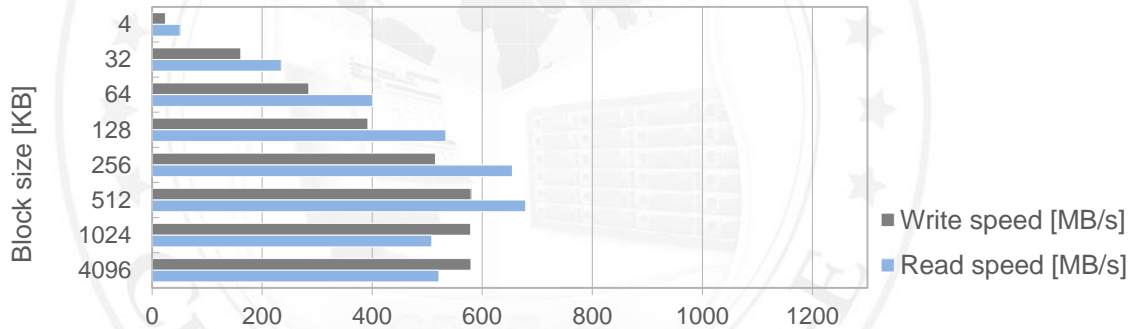


FIGURE 15: RAID50 performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

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	25.30	42.15	passed
32	168.05	247.25	passed
64	282.36	405.87	passed
128	386.37	542.25	passed
256	516.35	667.21	passed
512	592.98	688.96	passed
1024	577.24	519.16	passed
4096	547.52	511.06	passed

TABLE 18: RAID60 performance test results table for Intel Ethernet Converged Network Adapter X540-T2

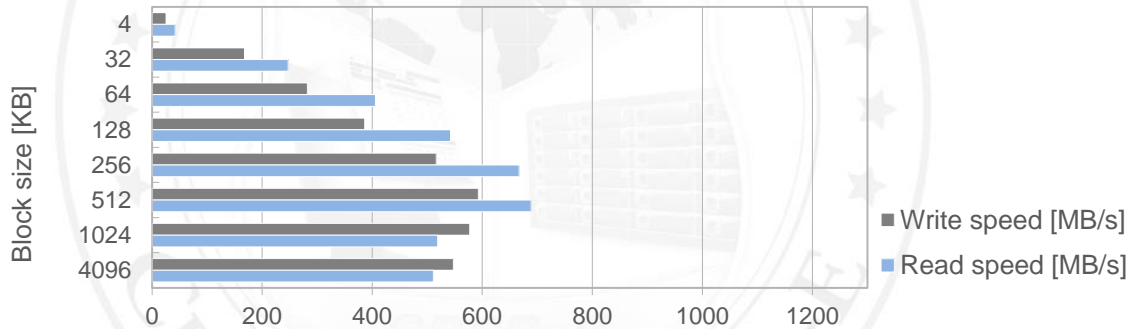


FIGURE 16: RAID60 performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

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.

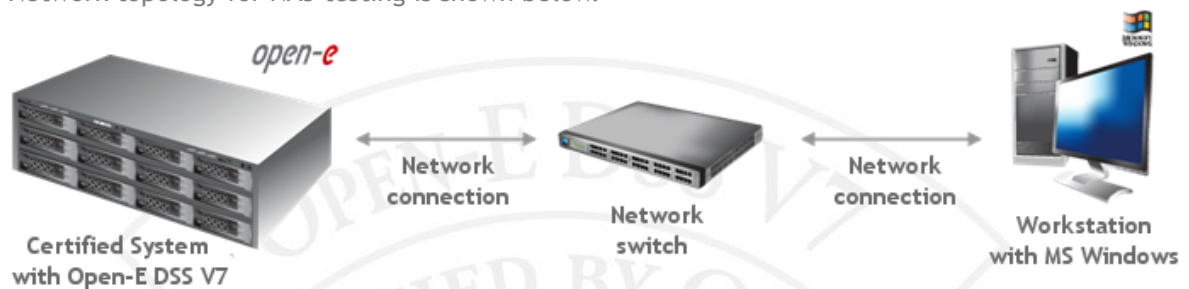


FIGURE 17: Network topology for NAS testing

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 lometer 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	61.53	60.94	passed
32	431.01	401.72	passed
64	632.65	409.23	passed
128	829.15	424.14	passed
256	833.14	472.97	passed
512	832.66	499.38	passed
1024	860.01	472.65	passed
4096	909.75	481.71	passed

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

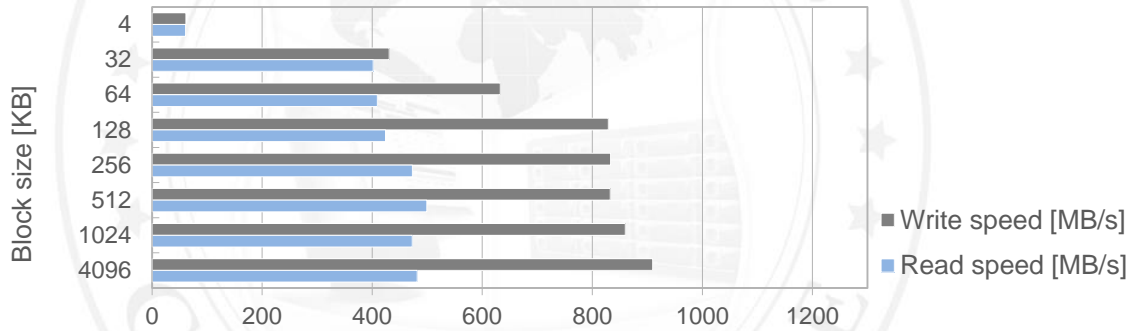


FIGURE 18: SMB performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

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.

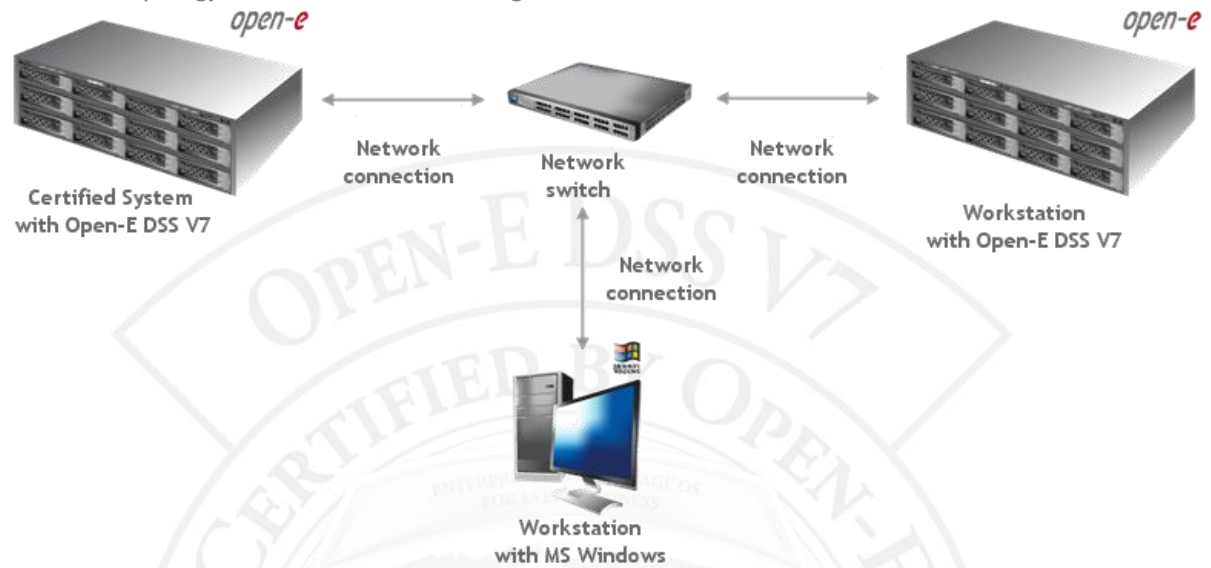


FIGURE 19: Network topology for iSCSI Initiator testing

iSCSI Target test topology

Network topology for iSCSI Target testing is shown below.

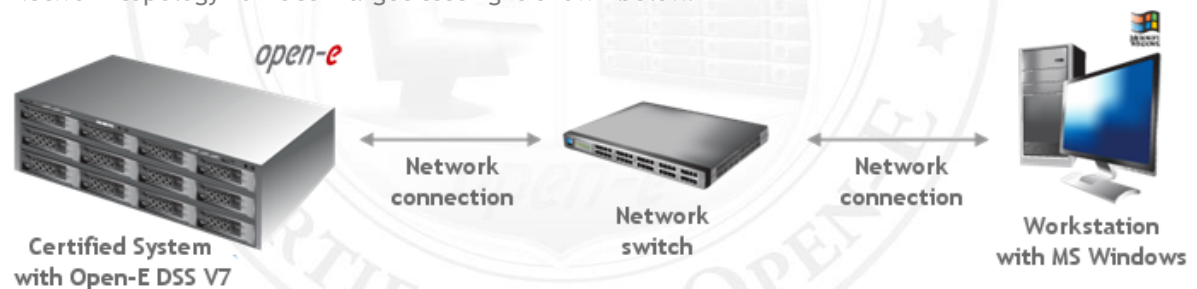


FIGURE 20: Network topology for iSCSI Target testing

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 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	63.13	63.75	passed
32	459.69	458.21	passed
64	765.00	435.65	passed
128	1092.76	488.27	passed
256	1116.55	507.03	passed
512	1094.74	522.49	passed
1024	1098.55	514.82	passed
4096	1067.92	516.57	passed

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

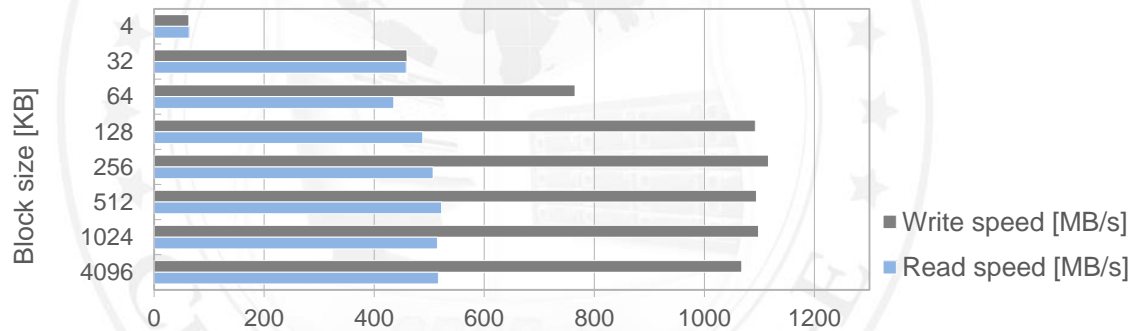


FIGURE 21: iSCSI Initiator performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

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	20.96	37.19	passed
32	66.21	221.01	passed
64	151.44	401.25	passed
128	273.53	526.38	passed
256	387.50	654.12	passed
512	446.52	678.37	passed
1024	467.46	509.93	passed
4096	488.21	520.51	passed

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

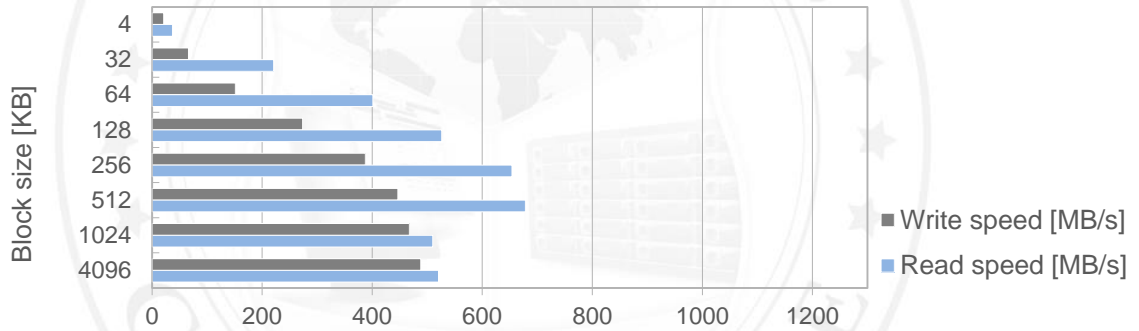


FIGURE 22: iSCSI Target performance test results chart for Intel Ethernet Converged Network Adapter X540-T2

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.

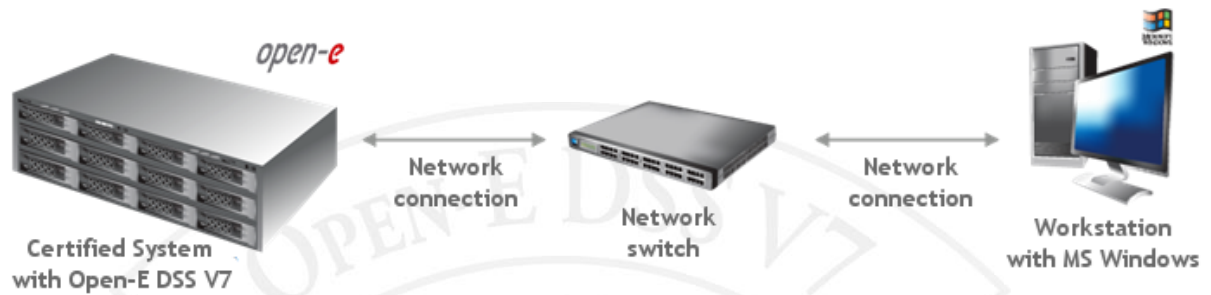


FIGURE 23: Network topology for SSD Cache testing

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	17840	passed
2	16404	passed
4	13410	passed

TABLE 22: SSD Cache with real life pattern test results table for Intel Ethernet Converged Network Adapter X540-T2

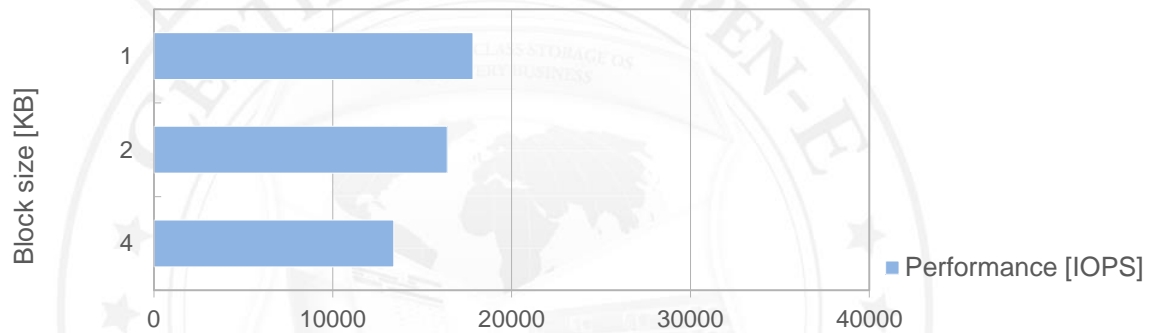


FIGURE 24: SSD Cache with real life pattern test results chart for Intel Ethernet Converged Network Adapter X540-T2

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	15806	25018	passed
2	15213	23535	passed
4	14590	18625	passed

TABLE 23: SSD cache with random read/write pattern test results table for Intel Ethernet Converged Network Adapter X540-T2

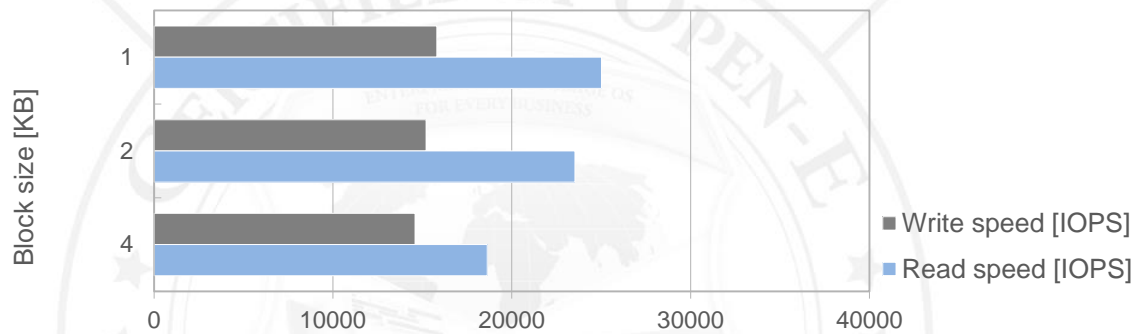


FIGURE 25: SSD cache with random read/write pattern test results chart for Intel Ethernet Converged Network Adapter X540-T2