



APY ServerNova Qx rackable 3U storage system



Executive summary

After performing all tests, the APY ServerNova Qx rackable 3U 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 APY ServerNova Qx rackable 3U 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 APY ServerNova Qx rackable 3U good iSCSI storage:

- Hardware RAID5, RAID6, RAID50 or RAID60 for high performance and data safety.
- Twelve high capacity SATA drives with SSD cache ensure lot of fast storage space.
- 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 APY ServerNova Qx rackable 3U a great NAS filer solution:

- Twelve high capacity hard drives and high RAID levels ensure a lot of safe storage space.
- Four 1GbE and two 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, RAID50 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 2.1.



APY ServerNova Qx rackable 3U hardware components..... 4

APY ServerNova Qx rackable 3U photos 5

Auxiliary systems hardware components..... 6

Administration functionality 7

Network functionality 8

 Network test topology 8

 802.3ad bonding mode test 9

 Balance-alb bonding mode test 11

 Balance-rr bonding mode test 13

 Single NIC performance test 15

RAID functionality 17

 RAID test topology..... 17

 Hardware RAID0 test..... 18

 Hardware RAID5 test..... 19

 Hardware RAID6 test..... 20

 Hardware RAID10 test..... 21

 Hardware RAID50 test..... 22

 Hardware RAID60 test..... 23

NAS functionality 24

 NAS test topology..... 24

 SMB test 25

iSCSI functionality 26

 iSCSI Initiator test topology..... 26

 iSCSI Target test topology 26

 iSCSI Initiator test 27

 iSCSI Target test 28

SSD Cache performance 29

 SSD Cache test topology..... 29

 SSD Cache with real life pattern test 30

 SSD Cache with random read/write pattern test..... 31

APY ServerNova Qx rackable 3U hardware components

Technical specifications about the certified system are listed below:

Model	APY ServerNova Qx rackable 3U
Operating system	Open-E DSS V7 build 7637
Enclosure/chassis	AIC RSC-3EH
CPU	Intel Xeon E5-1620 3.6GHz
Motherboard	Supermicro X9SRI-F
Memory	4x 4GB Super-talent DDR3-1600 ECC/REG W16RB4G8H
Network	2x Intel Ethernet Server Adapter I350 (on-board)
Network	2x Intel Ethernet Server Adapter X520-DA2
HW RAID	LSI MegaRaid SAS 9280-16i4e
Boot media drive	innolite SATADOM D150QV
Hard disk drives	4x 180GB Intel SSD 520 Series SSDSC2CW180A3
Hard disk drives	12x 3TB Seagate Constellation ES.2 ST33000650SS

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



APY ServerNova Qx rackable 3U photos



FIGURE 1: Front photo

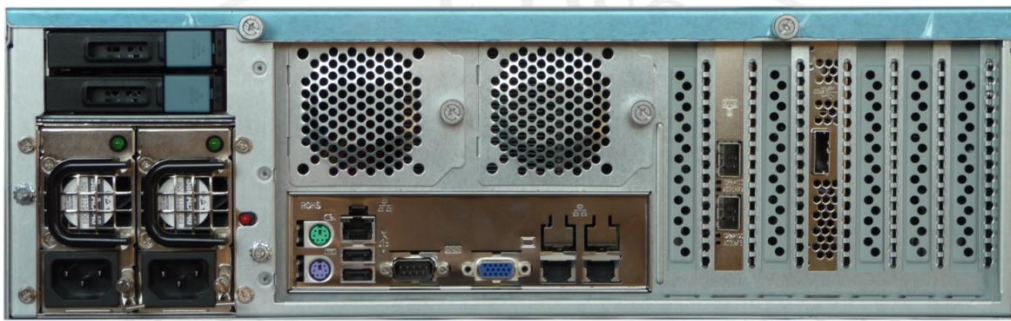


FIGURE 2: Rear photo



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	4GB Kingston KVR1333D3E9S/4G DDR3
Network	Intel 82574L Gigabit Ethernet Controller (on-board)
Network	Intel Ethernet Server Adapter X520-SR2
Network	Intel Ethernet Server Adapter X540-T2
HW RAID	Intel RAID Controller RS2WC080
Hard disk drives	Hitachi Deskstar 7K1000.C HDS721050CLA362 500GB

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	4GB Kingston KVR1333D3E9S/4G DDR3
Network	Intel 82574L Gigabit Ethernet Controller (on-board)
Network	Intel Ethernet Server Adapter X540-T2
HW RAID	Intel RAID Controller RS2WC080
Hard disk drives	Hitachi Deskstar 7K1000.C HDS721050CLA362 500GB

TABLE 3: Hardware components of second Workstation with MS Windows

Model	APY ServerNova Qx rackable 3U
Operating system	Open-E DSS V7 build 7637
Enclosure/chassis	AIC RSC-3EH
CPU	Intel Xeon E5-1620 3.6GHz
Motherboard	Supermicro X9SRI-F
Memory	4x 4GB Super-talent DDR3-1600 ECC/REG W16RB4G8H
Network	2x Intel Ethernet Server Adapter I350 (on-board)
Network	2x Intel Ethernet Server Adapter X520-DA2
HW RAID	LSI MegaRaid SAS 9280-16i4e
Hard disk drives	4x 256GB Samsung SSD MZ-7PD256
Hard disk drives	12x 3TB Seagate Constellation ES.2 ST33000650SS

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

Model	Switch 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.

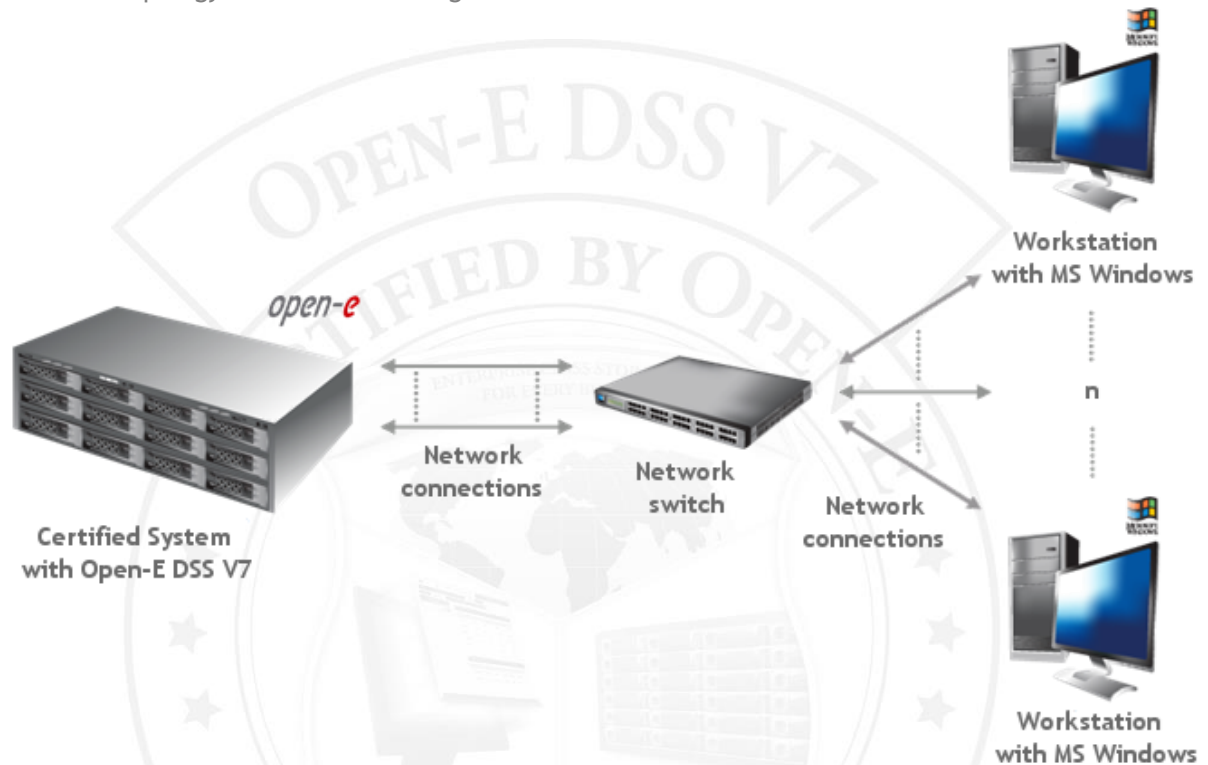


FIGURE 4: Network topology for Network testing

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 Intel Ethernet Server Adapter X520-DA2

802.3ad bonding mode performance test results			
NIC model	Intel Ethernet Server Adapter X520-DA2		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1 st Workstation	469.23	418.32	passed
2 nd Workstation	612.35	447.74	passed

TABLE 7: 802.3ad bonding mode performance test results table for Intel Ethernet Server Adapter X520-DA2

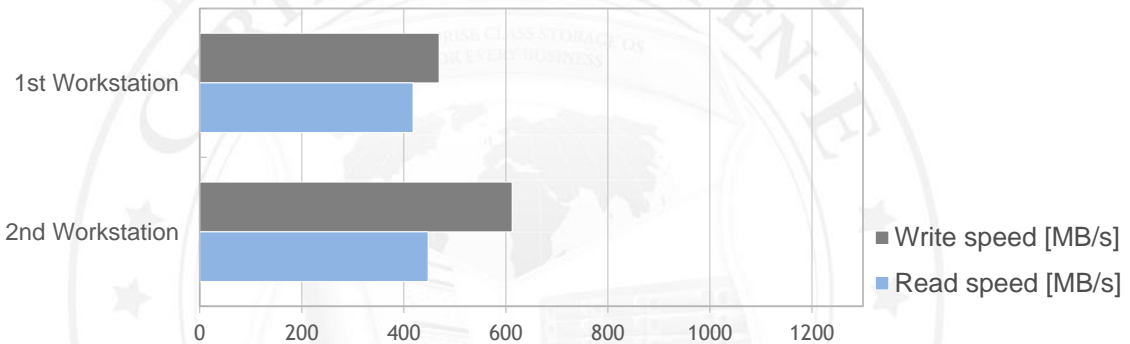


FIGURE 5: 802.3ad bonding mode performance test results chart for Intel Ethernet Server Adapter X520-DA2

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

802.3ad bonding mode performance test results			
NIC model	Intel Ethernet Server Adapter I350 (on-board)		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1 st Workstation	109.61	112.00	passed
2 nd Workstation	109.05	112.00	passed

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

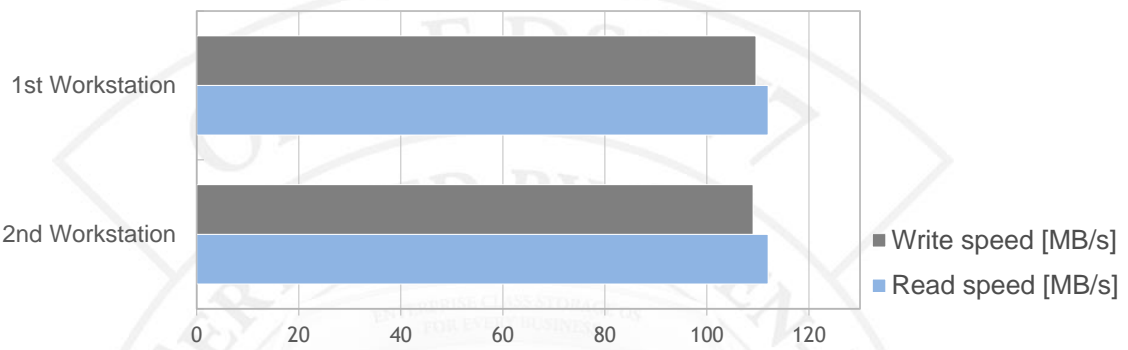
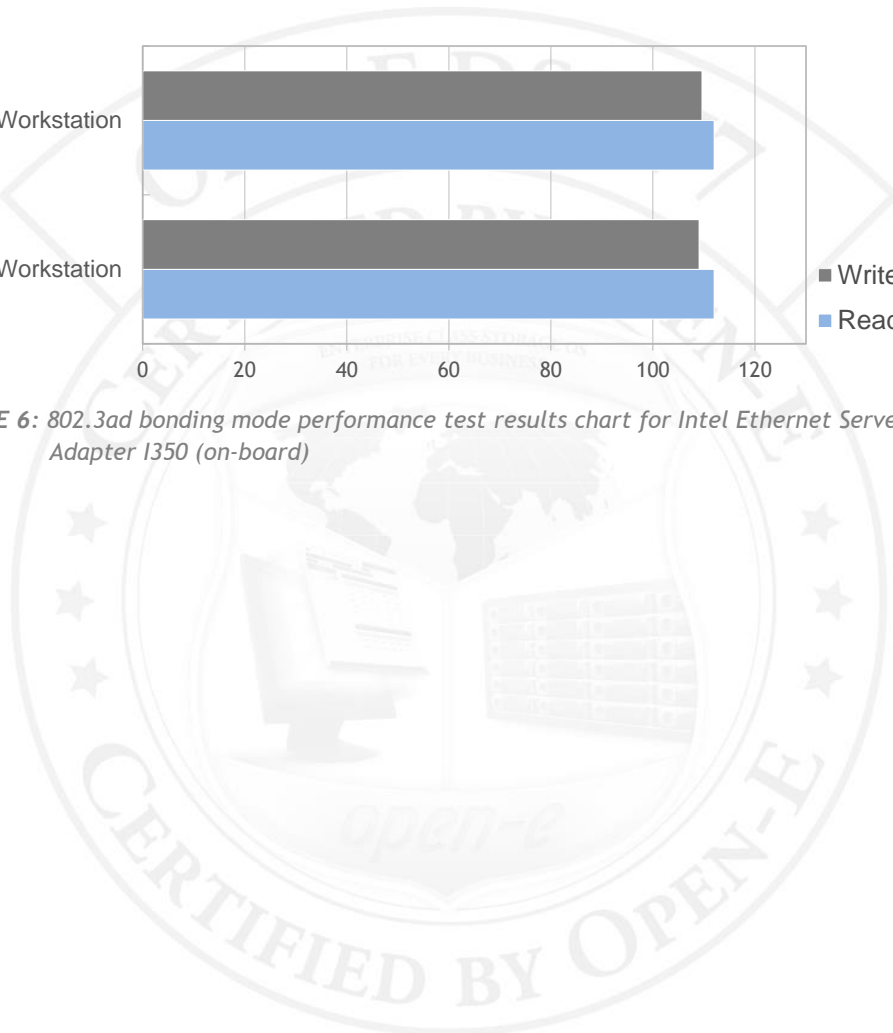


FIGURE 6: 802.3ad bonding mode performance test results chart for Intel Ethernet Server Adapter I350 (on-board)



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 Ethernet Server Adapter X520-DA2

Balance-alb bonding mode performance test results			
NIC model	Intel Ethernet Server Adapter X520-DA2		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1 st Workstation	562.61	458.96	passed
2 nd Workstation	664.98	476.33	passed

TABLE 9: Balance-alb bonding mode performance test results table for Intel Ethernet Server Adapter X520-DA2

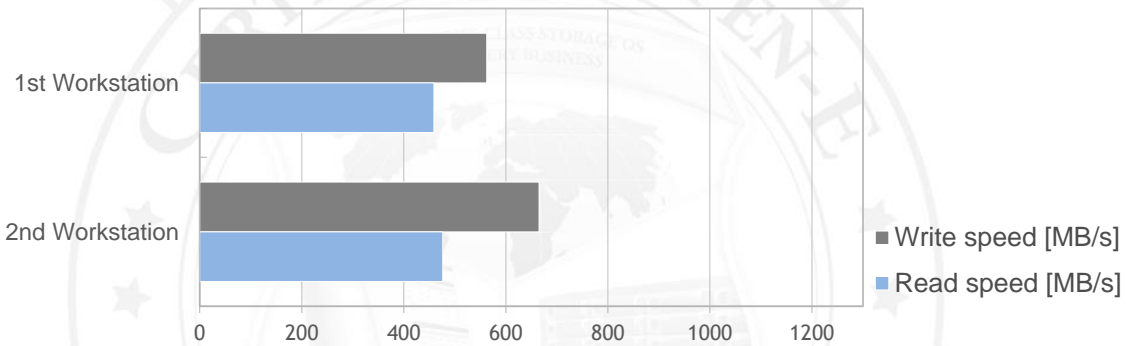


FIGURE 7: Balance-alb bonding mode performance test results chart for Intel Ethernet Server Adapter X520-DA2

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

Balance-alb bonding mode performance test results			
NIC model	Intel Ethernet Server Adapter I350 (on-board)		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1 st Workstation	109.94	111.75	passed
2 nd Workstation	110.72	111.76	passed

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

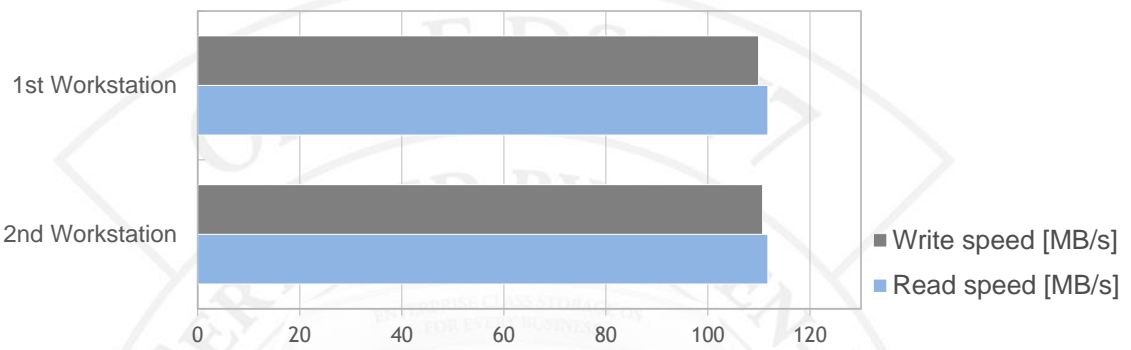
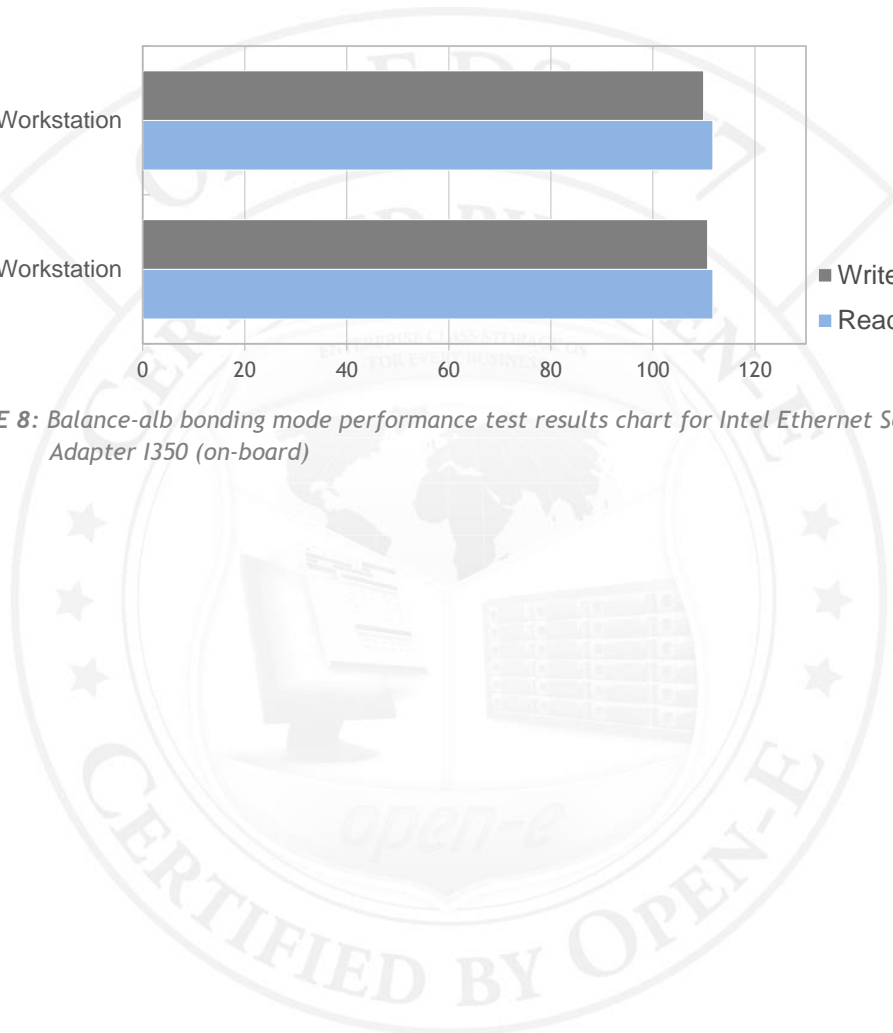


FIGURE 8: Balance-alb bonding mode performance test results chart for Intel Ethernet Server Adapter I350 (on-board)



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 lometer testing tool.

2. Test results for Balance-rr bonding mode test performed on Intel Ethernet Server Adapter X520-DA2

Balance-rr bonding mode performance test results			
NIC model	Intel Ethernet Server Adapter X520-DA2		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1 st Workstation	643.65	244.41	passed
2 nd Workstation	651.53	240.88	passed

TABLE 11: Balance-rr bonding mode performance test results table for Intel Ethernet Server Adapter X520-DA2

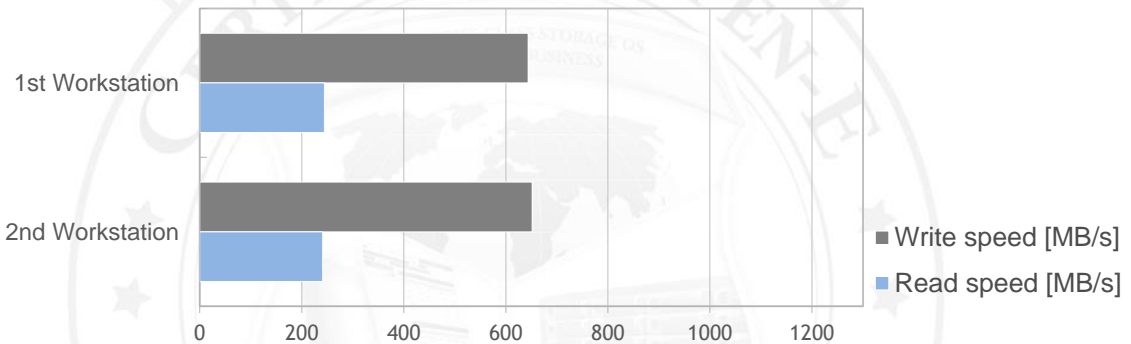


FIGURE 9: Balance-rr bonding mode performance test results chart for Intel Ethernet Server Adapter X520-DA2

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

Balance-rr bonding mode performance test results			
NIC model	Intel Ethernet Server Adapter I350 (on-board)		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1 st Workstation	111.90	94.41	passed
2 nd Workstation	112.00	92.01	passed

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

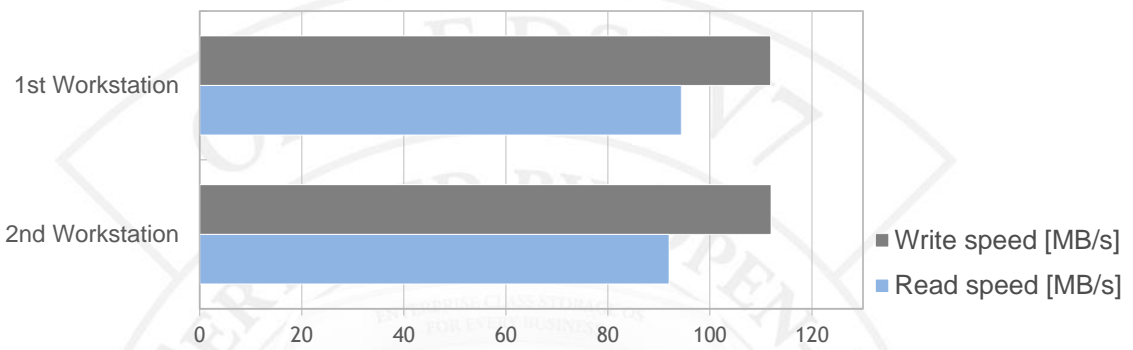
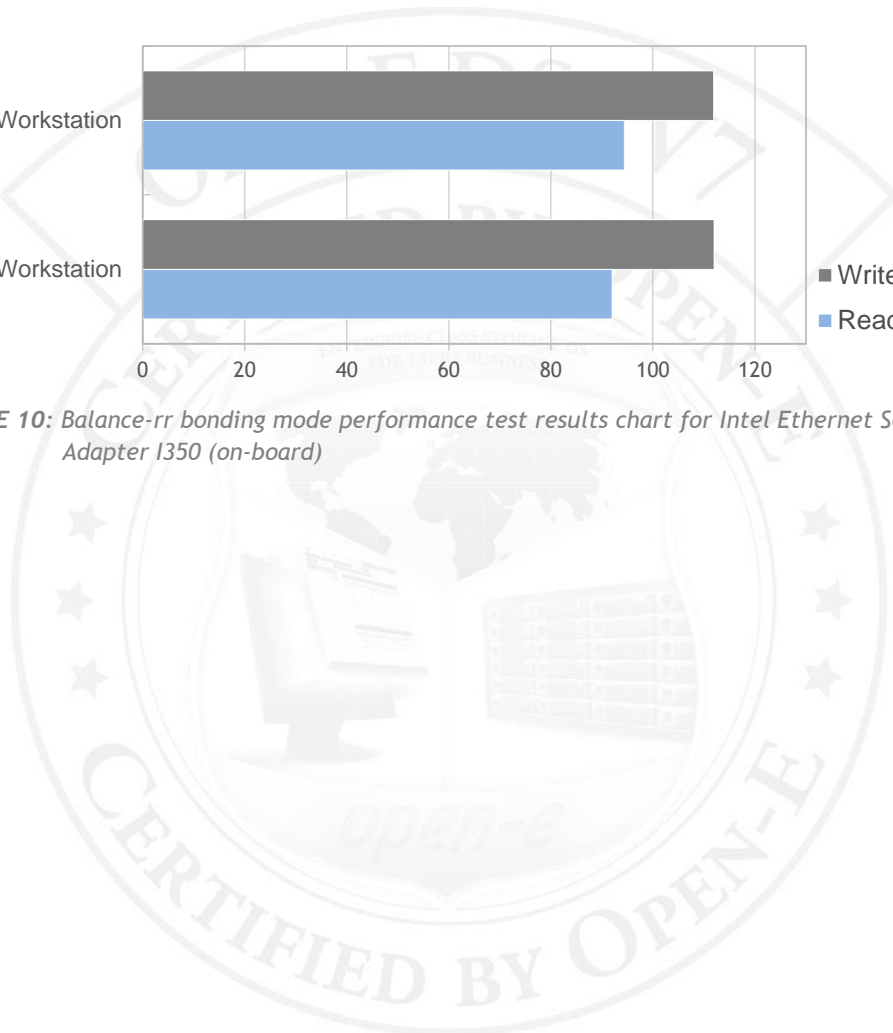


FIGURE 10: Balance-rr bonding mode performance test results chart for Intel Ethernet Server Adapter I350 (on-board)



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 Intel Ethernet Server Adapter X520-DA2

Single NIC performance test results			
NIC model	Intel Ethernet Server Adapter X520-DA2		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1 st Workstation	696.79	522.34	passed

TABLE 13: Single NIC performance test results table for Intel Ethernet Server Adapter X520-DA2

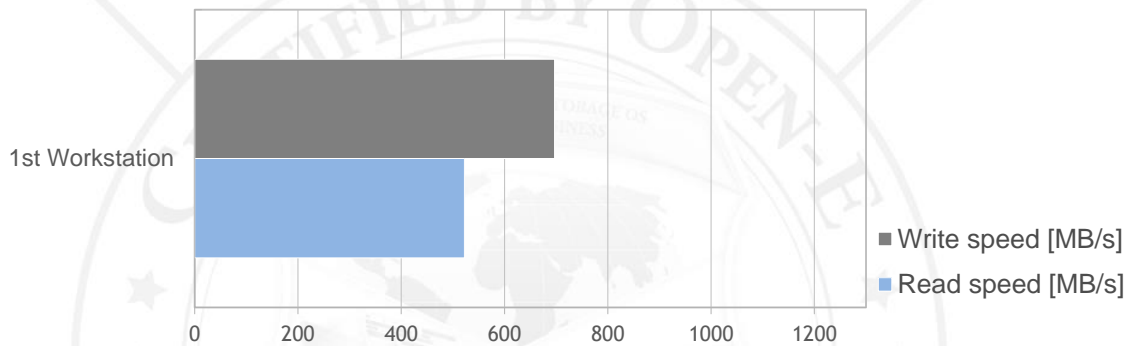


FIGURE 11: Single NIC performance test results chart for Intel Ethernet Server Adapter X520-DA2

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

Single NIC performance test results			
NIC model	Intel Ethernet Server Adapter I350 (on-board)		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1 st Workstation	107.96	111.98	passed

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

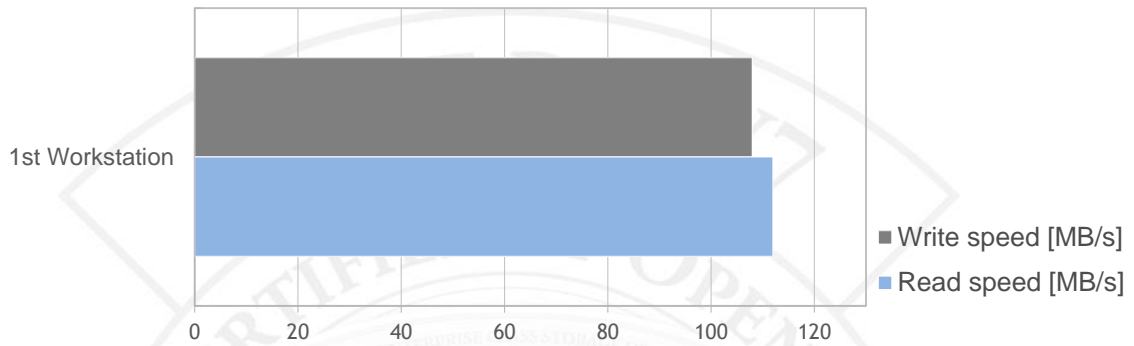
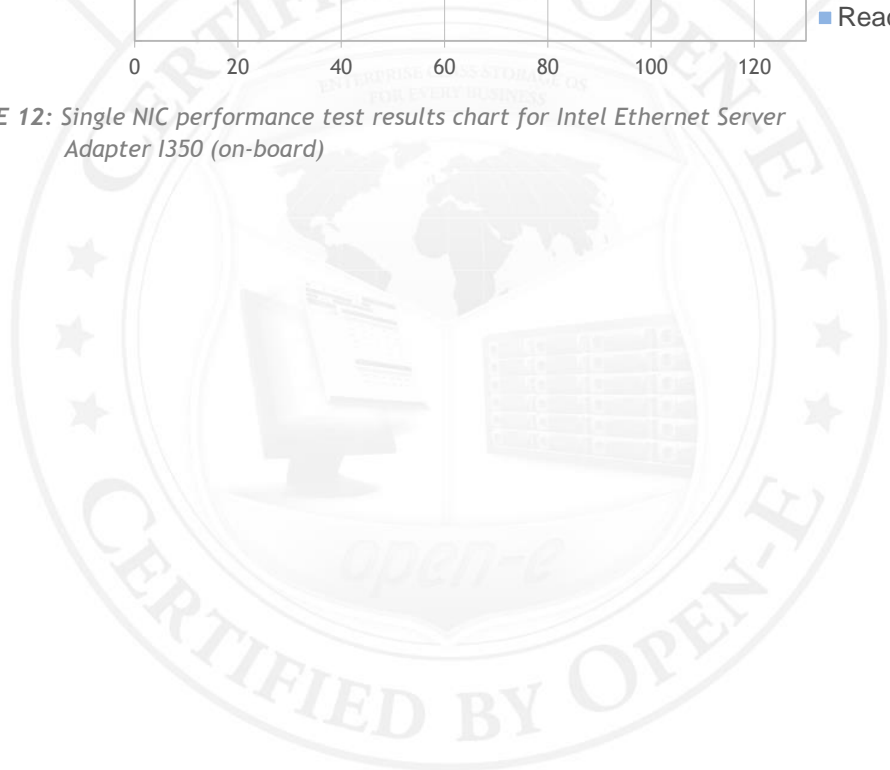


FIGURE 12: Single NIC performance test results chart for Intel Ethernet Server Adapter I350 (on-board)



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 lometer testing tool.

RAID test topology

Network test topology for RAID testing is shown below

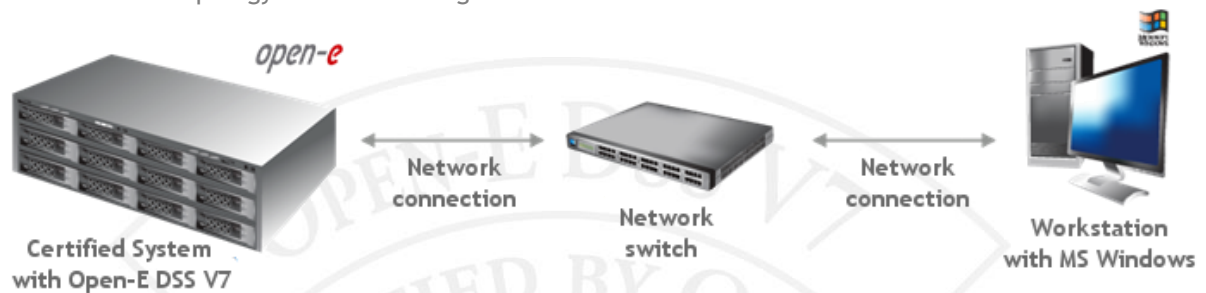


FIGURE 13: Network test topology for RAID testing

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 Server Adapter X520-DA2

RAID0 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	72.19	84.34	passed
32	346.53	380.11	passed
64	443.98	443.55	passed
128	476.49	553.24	passed
256	675.56	704.91	passed
512	659.23	538.44	passed
1024	669.46	539.31	passed
4096	699.28	536.45	passed

TABLE 15: RAID0 performance test results table for Intel Ethernet Server Adapter X520-DA2

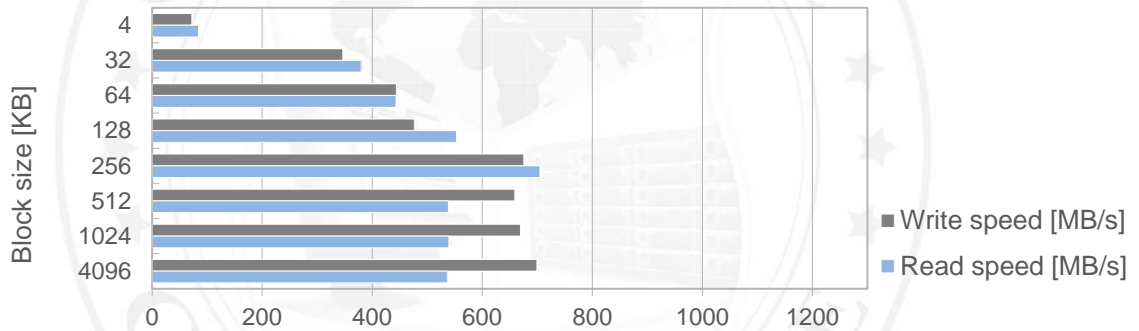


FIGURE 14: RAID0 performance test results chart for Intel Ethernet Server Adapter X520-DA2

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 Server Adapter X520-DA2

RAID5 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	74.75	91.33	passed
32	346.85	417.12	passed
64	426.55	442.47	passed
128	545.51	542.82	passed
256	670.40	698.62	passed
512	677.16	543.07	passed
1024	664.24	544.69	passed
4096	663.32	544.15	passed

TABLE 16: RAID5 performance test results table for Intel Ethernet Server Adapter X520-DA2

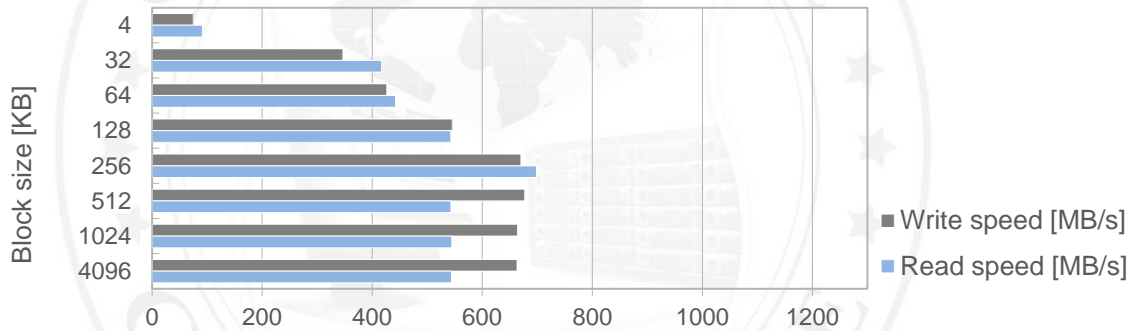


FIGURE 15: RAID5 performance test results chart for Intel Ethernet Server Adapter X520-DA2

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 Server Adapter X520-DA2

RAID6 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	73.98	87.63	passed
32	352.65	376.15	passed
64	459.95	432.73	passed
128	549.02	399.21	passed
256	700.69	549.67	passed
512	714.07	498.71	passed
1024	710.64	528.98	passed
4096	709.25	511.06	passed

TABLE 17: RAID6 performance test results table for Intel Ethernet Server Adapter X520-DA2

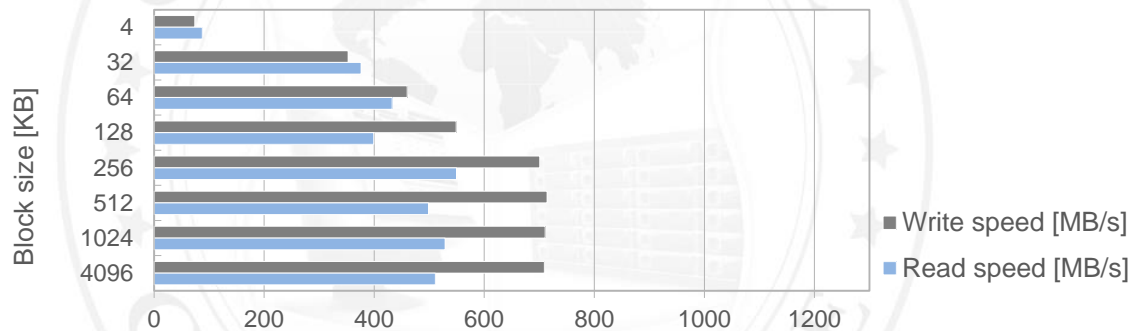


FIGURE 16: RAID6 performance test results chart for Intel Ethernet Server Adapter X520-DA2

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 lometer testing tool.

4. Test results for RAID10 and Intel Ethernet Server Adapter X520-DA2

RAID10 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	69.34	86.90	passed
32	269.67	362.81	passed
64	320.97	210.50	passed
128	413.70	282.75	passed
256	508.98	397.36	passed
512	538.14	400.90	passed
1024	608.29	402.86	passed
4096	635.28	489.89	passed

TABLE 18: RAID10 performance test results table for Intel Ethernet Server Adapter X520-DA2

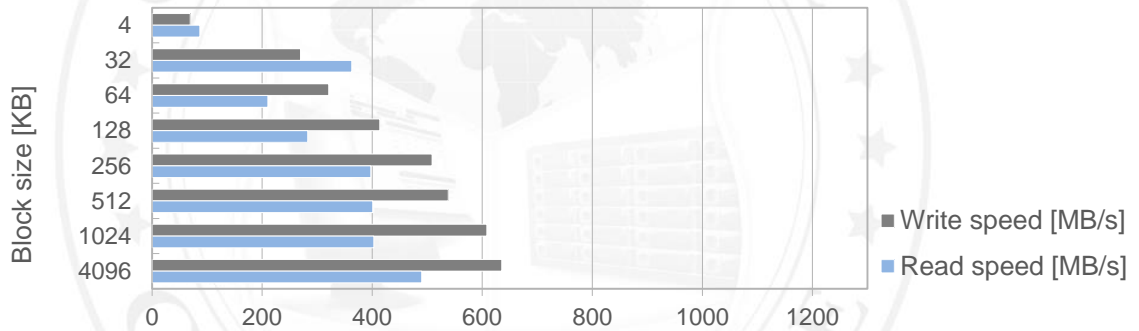


FIGURE 17: RAID10 performance test results chart for Intel Ethernet Server Adapter X520-DA2

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 Server Adapter X520-DA2

RAID50 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	74.15	87.47	passed
32	357.02	396.25	passed
64	464.23	518.07	passed
128	562.21	366.85	passed
256	698.48	447.93	passed
512	722.89	497.94	passed
1024	709.63	478.30	passed
4096	718.11	503.85	passed

TABLE 19: RAID50 performance test results table for Intel Ethernet Server Adapter X520-DA2

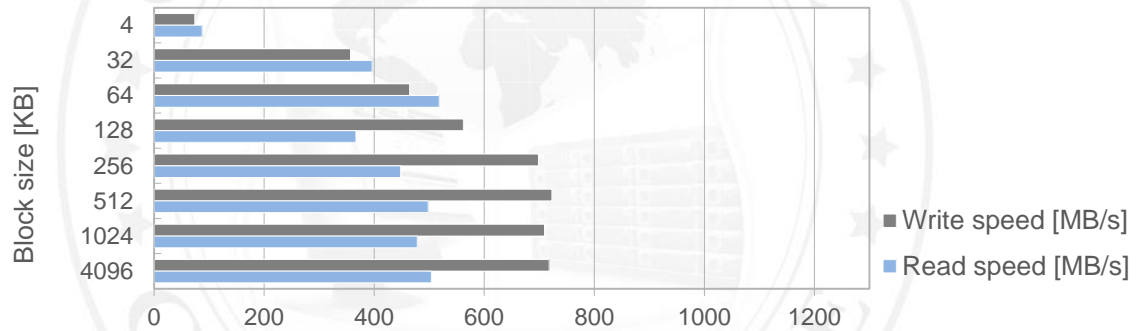


FIGURE 18: RAID50 performance test results chart for Intel Ethernet Server Adapter X520-DA2

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 lometer testing tool.

2. Test results for RAID60 Intel Ethernet Server Adapter X520-DA2

RAID60 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	76.66	93.17	passed
32	350.78	400.54	passed
64	432.78	452.29	passed
128	539.96	272.87	passed
256	654.09	403.44	passed
512	625.24	460.59	passed
1024	644.06	472.84	passed
4096	672.54	507.82	passed

TABLE 20: RAID60 performance test results table for Intel Ethernet Server Adapter X520-DA2

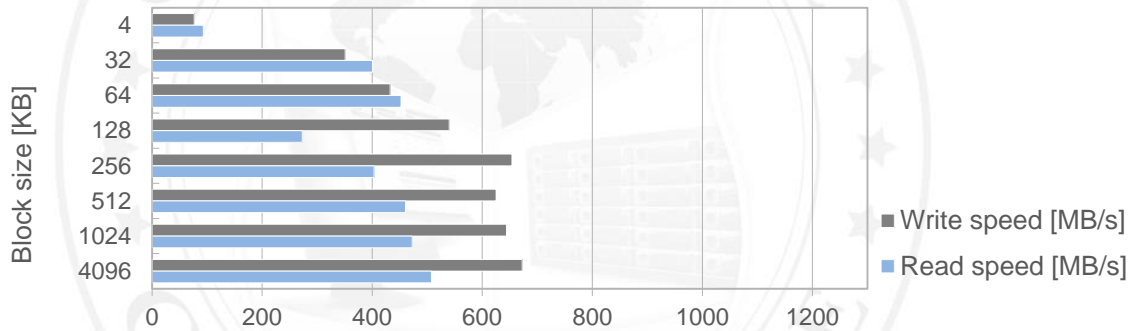


FIGURE 19: RAID60 performance test results chart for Intel Ethernet Server Adapter X520-DA2

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 lometer testing tool.

NAS test topology

Network topology for NAS testing is shown below.

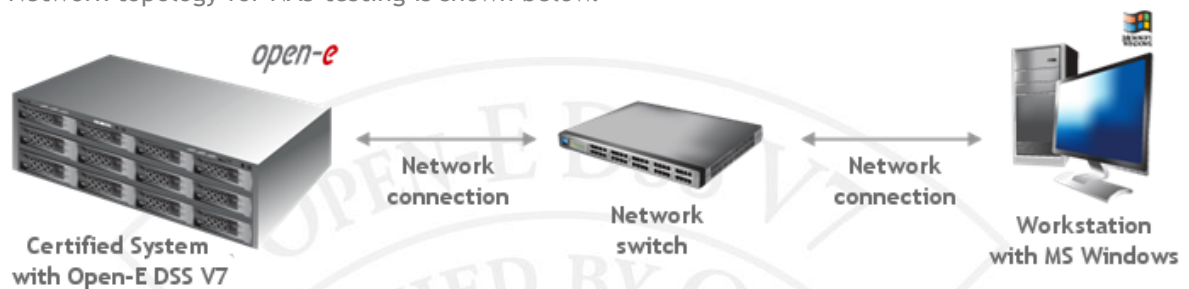


FIGURE 20: Network topology for NAS testing

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 lometer testing tool.

2. Test results for SMB Intel Ethernet Server Adapter X520-DA2

SMB performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	133.57	120.87	passed
32	763.27	712.42	passed
64	1113.82	546.26	passed
128	1126.27	573.30	passed
256	1121.82	541.97	passed
512	1117.16	529.39	passed
1024	1120.80	528.81	passed
4096	1129.15	531.40	passed

TABLE 21: SMB performance test results table for Intel Ethernet Server Adapter X520-DA2

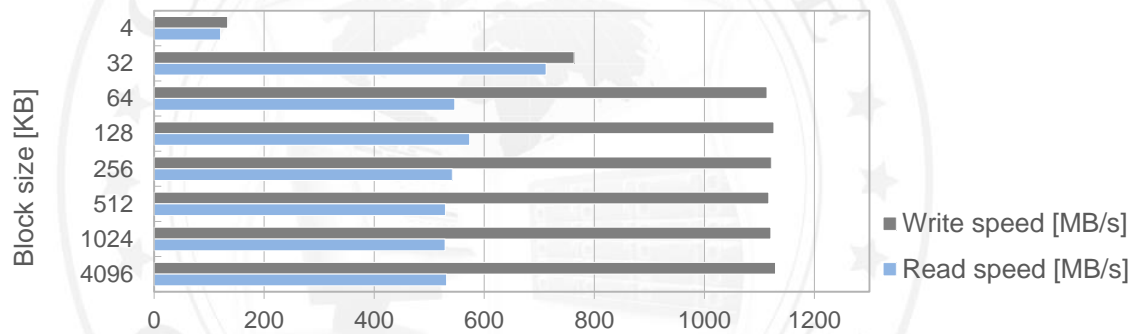


FIGURE 21: SMB performance test results chart for Intel Ethernet Server Adapter X520-DA2

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.

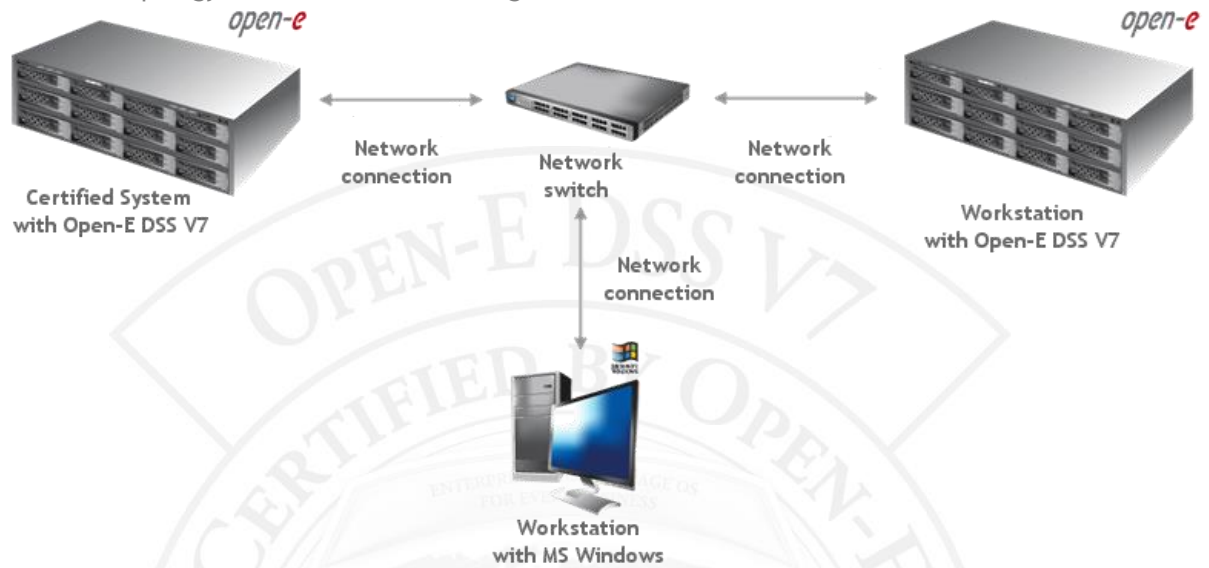


FIGURE 22: Network topology for iSCSI Initiator testing

iSCSI Target test topology

Network topology for iSCSI Target testing is shown below.

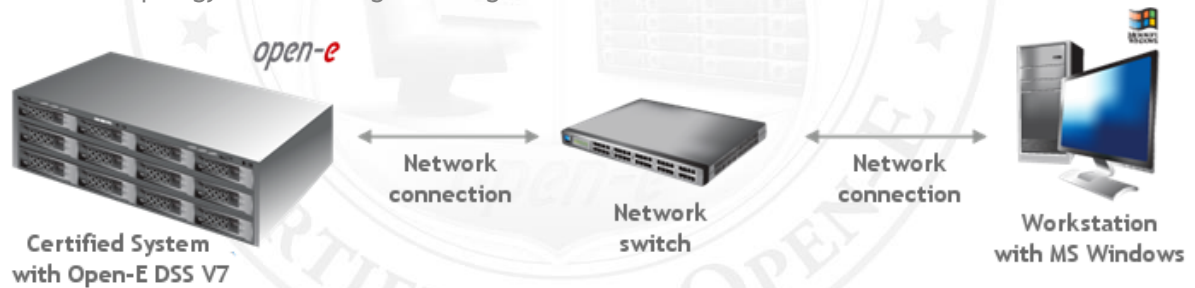


FIGURE 23: Network topology for iSCSI Target testing

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 Intel Ethernet Server Adapter X520-DA2

iSCSI Initiator performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	128.81	119.97	passed
32	715.09	665.02	passed
64	1044.44	537.99	passed
128	1026.44	546.04	passed
256	1036.11	523.31	passed
512	1047.04	516.69	passed
1024	1044.12	513.78	passed
4096	1045.16	513.29	passed

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

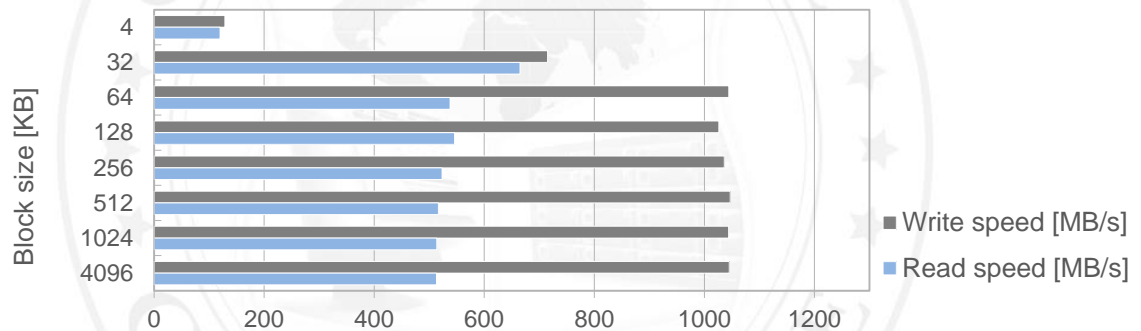


FIGURE 24: iSCSI Initiator performance test results chart for Intel Ethernet Server Adapter X520-DA2

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 *lometer* tool.

2. Test results for iSCSI Target Intel Ethernet Server Adapter X520-DA2

iSCSI Target performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	72.98	85.10	passed
32	337.67	404.64	passed
64	424.21	524.05	passed
128	539.00	386.39	passed
256	636.31	432.32	passed
512	609.12	468.91	passed
1024	680.52	572.04	passed
4096	711.95	528.30	passed

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

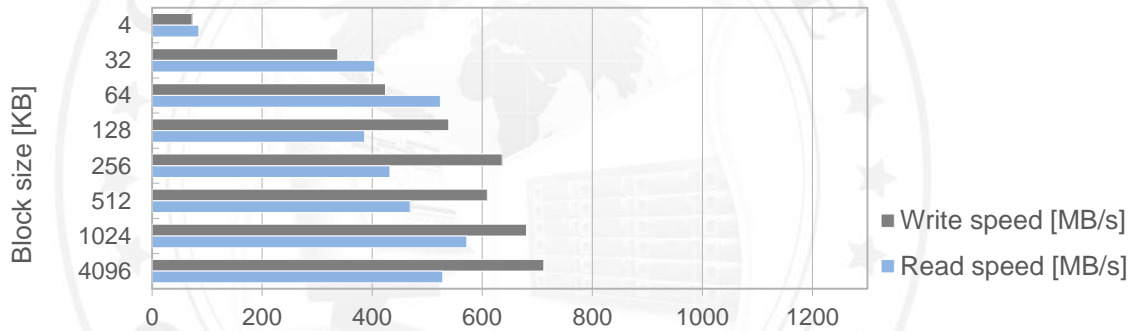


FIGURE 25: iSCSI Target performance test results chart for Intel Ethernet Server Adapter X520-DA2

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.

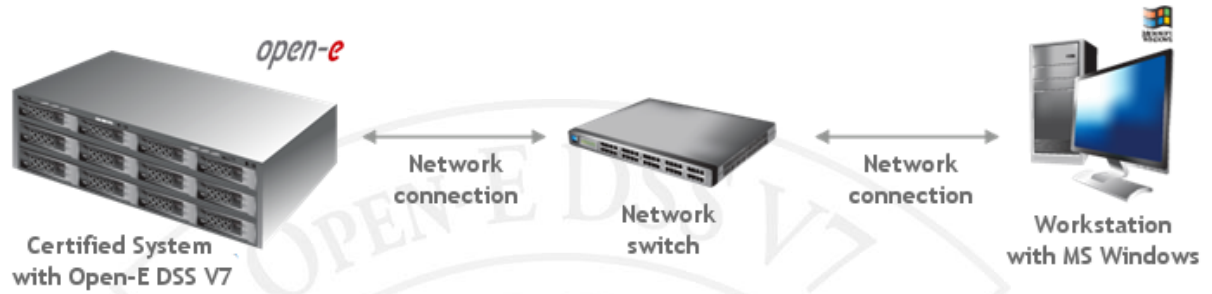
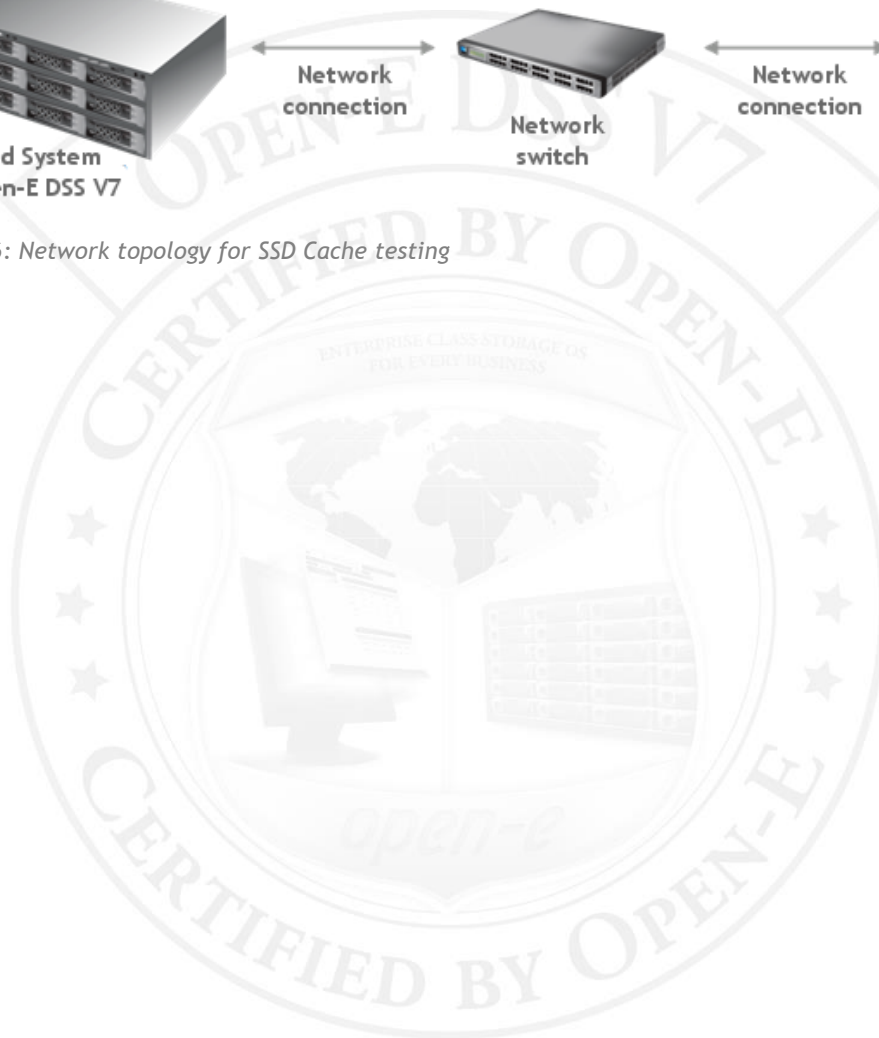


FIGURE 26: Network topology for SSD Cache testing



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 lometer tool.

2. Test results for SSD Cache with real life pattern and Intel Ethernet Server Adapter X520-DA2

SSD Cache with real life pattern test results		
Block size [KB]	Performance [IOPS]	Performance test results
1	5223.02	passed
2	5658.33	passed
4	4805.76	passed

TABLE 24: SSD Cache with real life pattern test results table for Intel Ethernet Server Adapter X520-DA2



FIGURE 27: SSD Cache with real life pattern test results chart for Intel Ethernet Server Adapter X520-DA2

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 Intel Ethernet Server 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	15632.39	18991.13	passed
2	15164.86	19205.30	passed
4	14467.10	18557.38	passed

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

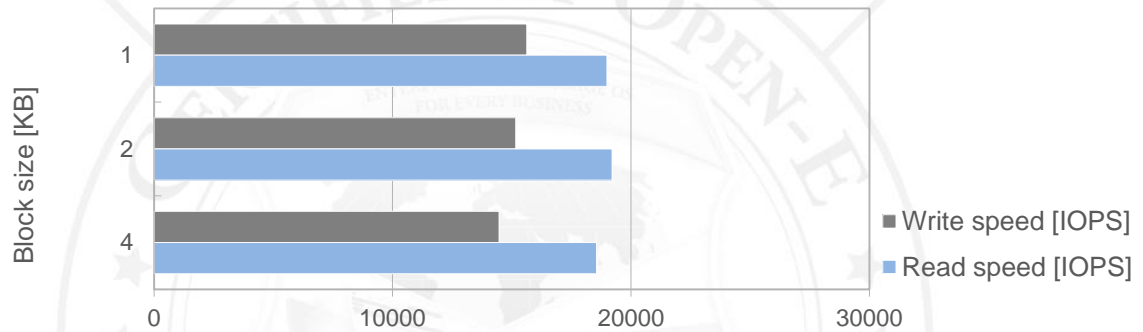


FIGURE 28: SSD cache with random read/write pattern test results chart for Intel Ethernet Server Adapter X520-DA2