



Intel SR2612URR storage system



Executive summary

After performing all tests the Intel SR2612URR system has been officially certified according to the Open-E Hardware Certification Program. During the tests it was found that the system is very functional and efficient.

Under the Open-E DSS V6 operating system, Intel SR2612URR is stable and performs well.

In general, the system is well equipped and can be used for many different applications, but the following are worthy of recommendation:

✓ HA cluster

For this application two identical systems are required. The following features can be used:

- HW RAID5 or RAID6 for high performance and data safety
- 12 high class SATA Drives for failure-free work and high capacity
- 10GbE interfaces for efficient network connection between nodes

✓ NAS filer

For this application the following can be used:

- HW RAID5 or RAID6 for high performance and data safety
- 12 high class SATA Drives for failure-free work and high capacity
- Many network interfaces for access from many separated subnetworks

✓ Storage for virtualization

For this application the following can be used:

- HW RAID5 or RAID6 for high performance and data safety
- 10GbE interfaces for efficient network connections
- Fast iSCSI MPIO for connection to the virtualization system

Certification notes

It's not recommended to use Balance-rr bonding mode with 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES). The Balance-alb or 802.3ad bonding mode should be used instead.



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Intel SR2612URR hardware components

Below is listed technical information about the certified system.

Model	Intel SR2612URR
Operating system	Open-E DSS V6 build 5845
Enclosure/chassis	Intel Server Chassis SR2612
CPU	2x Intel Xeon E5620 2.40GHz
Motherboard	Intel Server Board S5520UR
Memory	6x 4GB DDR3 ECC-REG Samsung M393B5270CH0-CH9
Network	Intel dual port (i82575EB)
Network	Intel Ethernet Server Adapter X520-SR2 (i82599ES)
HBA	Qlogic QLE2562
HW RAID	LSI MegaRAID SAS 9260-8i
Hard disk drives	12x 3000GB Hitachi Ultrastar HUA723030ALA640

TABLE 1: Hardware components list of Certified System with Open-E DSS V6

All components were detected and properly recognized.



Intel SR2612URR photos



FIGURE 1: Front photo



FIGURE 2: Rear photo

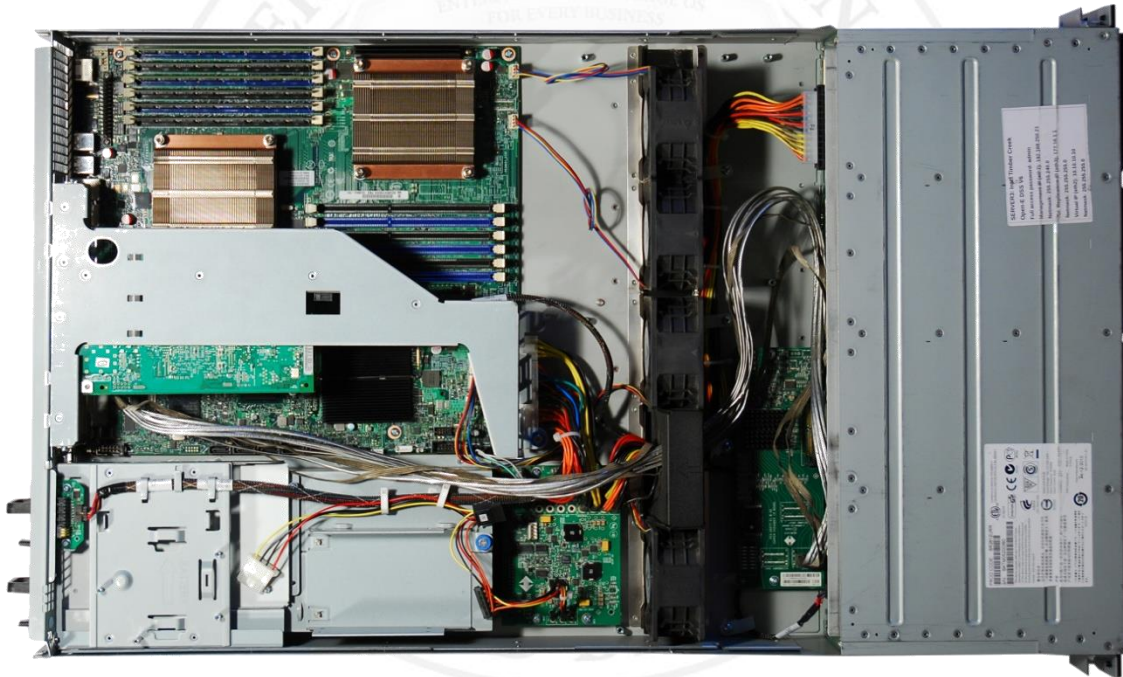


FIGURE 3: Top photo

Auxiliary systems hardware components

Auxiliary system with MS Windows or Open-E DSS V6 installed on it, used in Open-E hardware certification process.

Model	Custom
Operating system	MS Windows Server 2008 R2
Enclosure/chassis	lpc-4u-600
Motherboard	Supermicro X7DVL-E
CPU	Intel Xeon E5405 2.0GHz
Memory	8x 1GB DDR2 667 ECC FB-DIMM Kingston KVR667D2D8F5K2/2G
Network controller	Intel PRO/1000EB Dual Port Adapter (i80003ES2LAN)
Network controller	Intel Ethernet Server Adapter X520-DA2 (i82599ES)
Fibre Channel HBA	Emulex LightPulse LPe1250-E
Hard disk drives	1x 2TB Samsung SpinPoint F4EG HD204UI

TABLE 2: Hardware components of first Workstation with MS Windows

Model	Custom
Operating system	MS Windows Server 2008 R2
Enclosure/chassis	lpc-4u-600
Motherboard	Tyan Tempest i5400PW (S5397)
CPU	Intel Xeon E5405 2.0GHz
Memory	8x 1GB DDR2 667 ECC FB-DIMM Kingston KVR667D2D8F5K2/2G
Network controller	Intel PRO/1000EB Dual Port Adapter (i80003ES2LAN)
Network controller	Intel Ethernet Server Adapter X520-DA2 (i82599ES)
Fibre Channel HBA	Emulex LightPulse LPe1250-E
Hard disk drives	1x 2TB Samsung SpinPoint F4EG HD204UI

TABLE 3: Hardware components of second Workstation with MS Windows

Model	Custom
Operating system	Open-E DSS V6 build 5845
Enclosure/chassis	lpc-4u-600
Motherboard	Supermicro X8DTH-IF
CPU	Intel Xeon E5630 2.53GHz
Memory	3x 4GB DDR3 ECC-REG Samsung M393B5270CH0-CH9
Network controller	Intel dual port (on-board) (i82575EB)
Network controller	Intel PRO/1000 PT Quad LP Server Adapter (i82571GB)
Network controller	Intel Ethernet Server Adapter X520-DA2 (i82599ES)
Fibre Channel HBA	Qlogic QLE2562
HW RAID controller	Areca ARC-1680ix-12
Hard disk drives	12x 2TB Hitachi Ultrastar 7K3000 HUS723020ALS640

TABLE 4: Hardware components of Workstation with Open-E DSS V6

Model	Supermicro SSE-G24-TF4
Description	24-ports 1GbE and 4-ports 10GbE switch

TABLE 5: Network switch details

Model	Qlogic Sanbox SB5800V-08A8
Description	8-ports 8Gb Fibre Channel switch

TABLE 6: Fibre Channel switch details

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

In order to monitor the server please use external IPMI client.



Network functionality

Tests performed in this section check the functionality, performance, and stability of the network solutions available in the Open-E DSS V6 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.

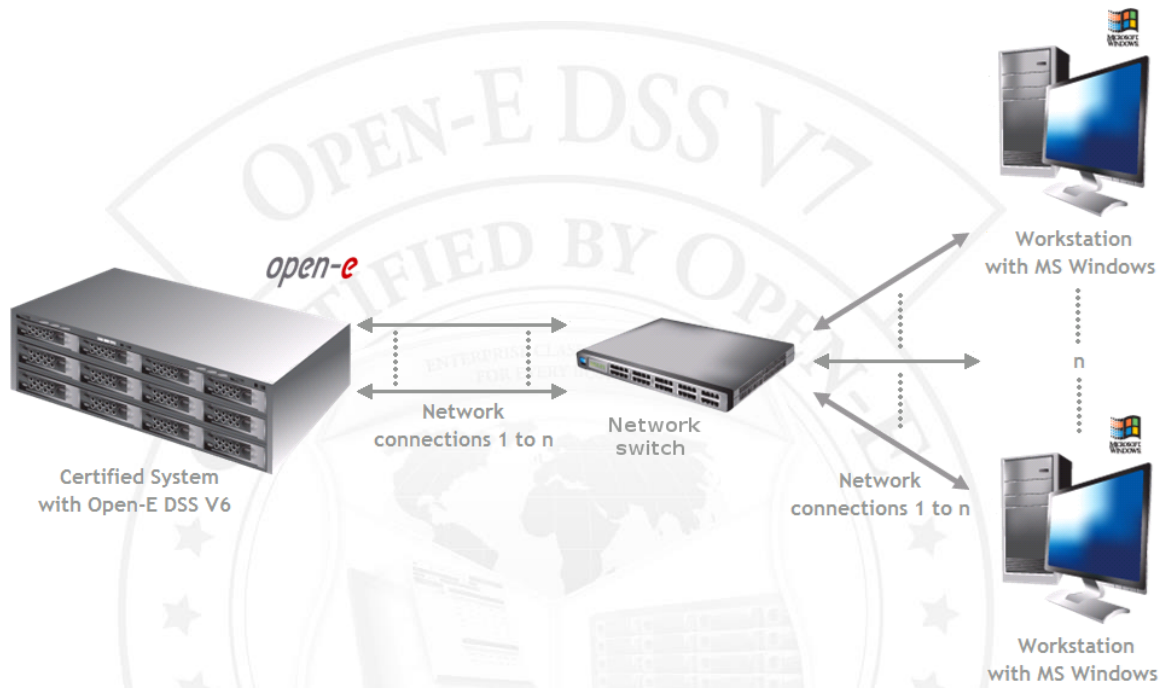


FIGURE 4: Network topology for Network testing

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 1GbE Intel dual port (on-board) (i82575EB)

802.3ad bonding mode performance test results			
NIC model	1GbE Intel dual port (on-board) (i82575EB)		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
1 st Workstation	112.93	112.35	passed
2 nd Workstation	112.88	112.10	passed

TABLE 8: 802.3ad bonding mode performance test results table for 1GbE Intel dual port (on-board) (i82575EB)

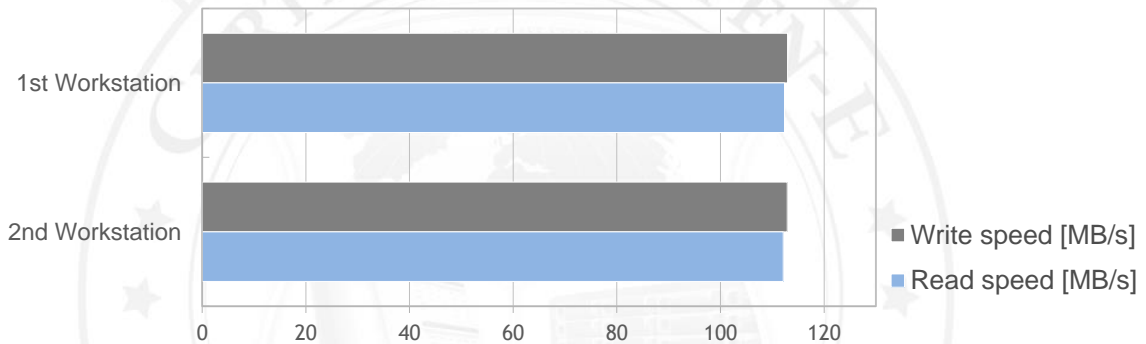


FIGURE 5: 802.3ad bonding mode performance test results chart for 1GbE Intel dual port (on-board) (i82575EB)

3. Test results for 802.3ad bonding mode test performed on 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

802.3ad bonding mode performance test results			
NIC model	10GbE Intel X520-SR2 (i82599ES)		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
1 st Workstation	383.49	429.65	passed
2 nd Workstation	970.82	481.75	passed

TABLE 9: 802.3ad bonding mode performance test results table for 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

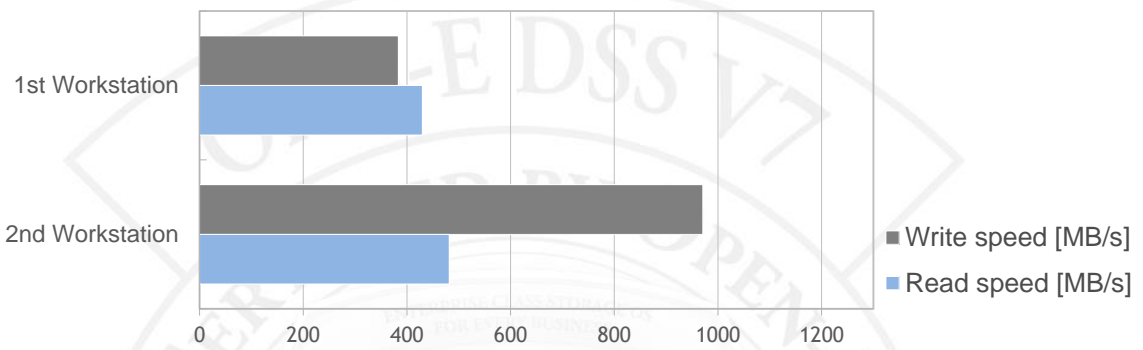
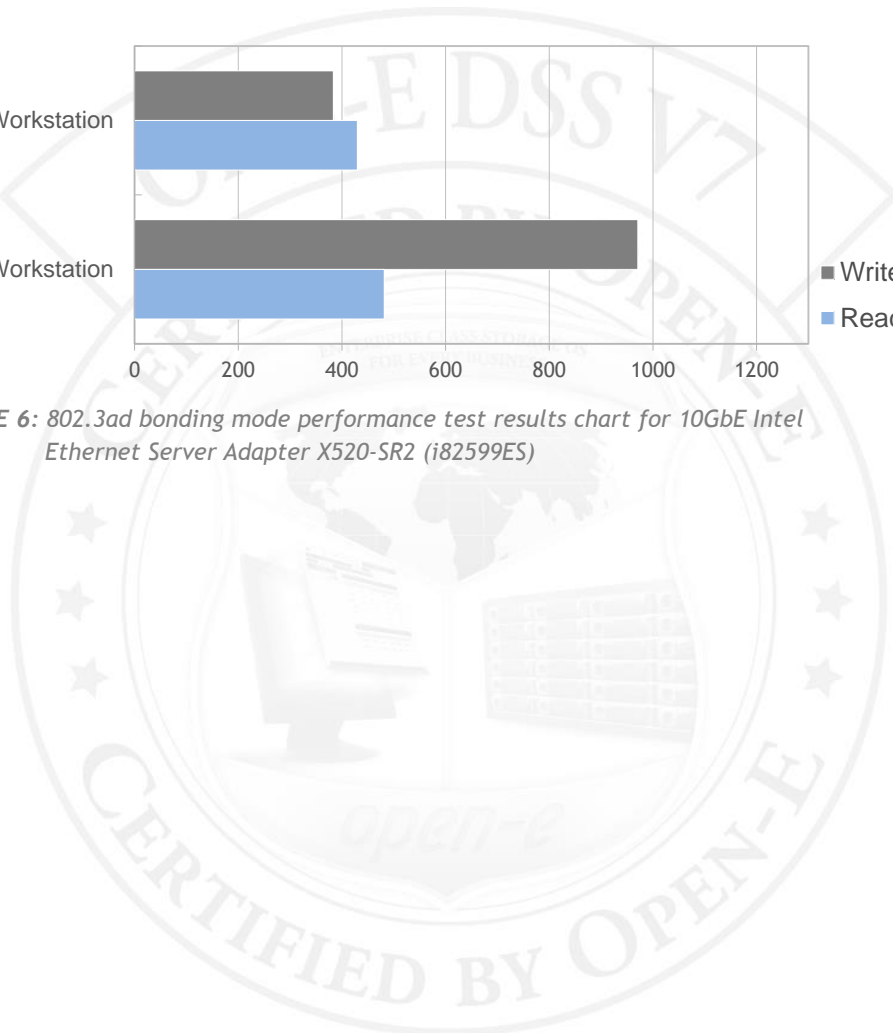


FIGURE 6: 802.3ad bonding mode performance test results chart for 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)



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 1GbE Intel dual port (on-board) (i82575EB)

802.3ad bonding mode performance test results			
NIC model	1GbE Intel dual port (on-board) (i82575EB)		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
1 st Workstation	113.06	111.75	passed
2 nd Workstation	112.92	111.87	passed

TABLE 10: Balance-alb bonding mode performance test results table for 1GbE Intel dual port (on-board) (i82575EB)

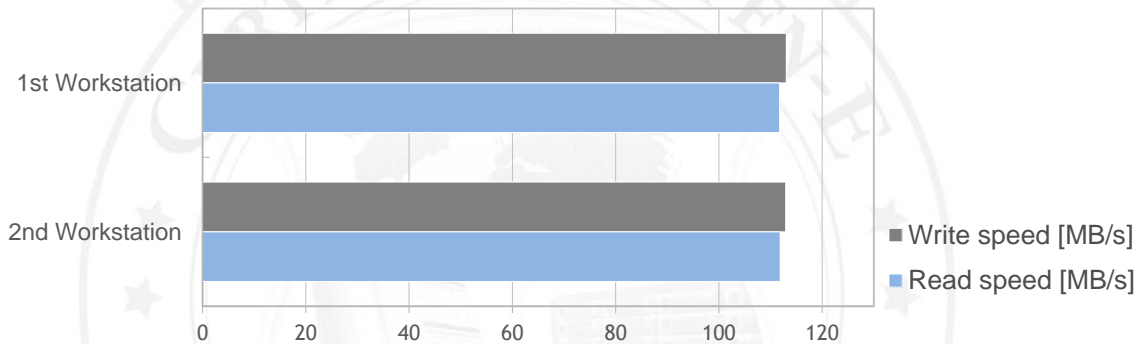


FIGURE 7: Balance-alb bonding mode performance test results chart for 1GbE Intel dual port (on-board) (i82575EB)

3. Test results for Balance-alb bonding mode test performed on 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

Balance-alb bonding mode performance test results			
NIC model	10GbE Intel X520-SR2 (i82599ES)		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
1 st Workstation	585.76	454.29	passed
2 nd Workstation	580.60	488.58	passed

TABLE 11: Balance-alb bonding mode performance test results table for 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

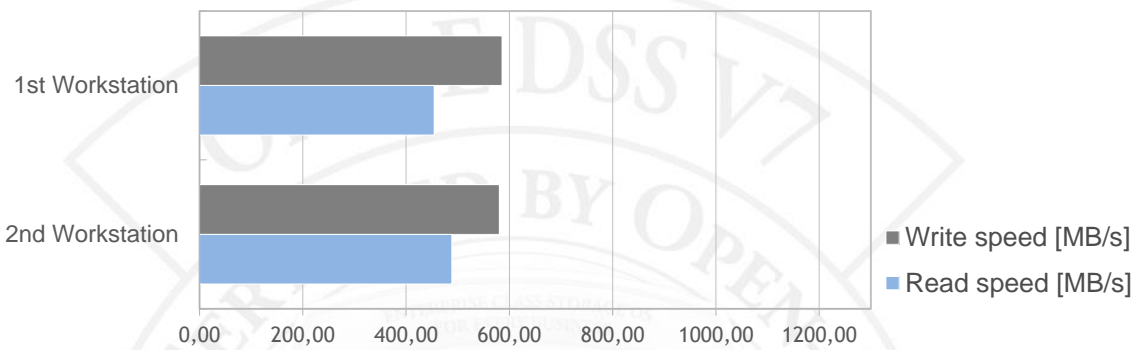
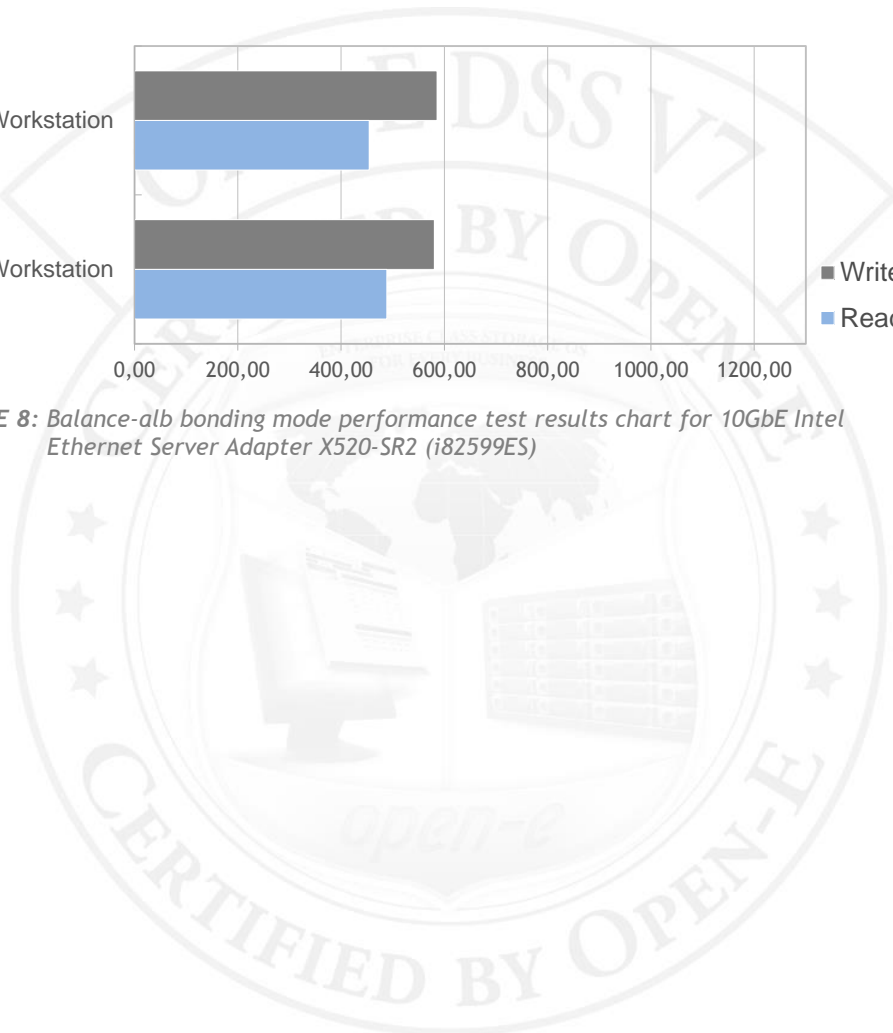


FIGURE 8: Balance-alb bonding mode performance test results chart for 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)



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 1GbE Intel dual port (on-board) (i82575EB)

802.3ad bonding mode performance test results			
NIC model	1GbE Intel dual port (on-board) (i82575EB)		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
1 st Workstation	34.45	79.40	passed
2 nd Workstation	25.46	78.83	passed

TABLE 12: Balance-rr bonding mode performance test results table for 1GbE Intel dual port (on-board) (i82575EB)

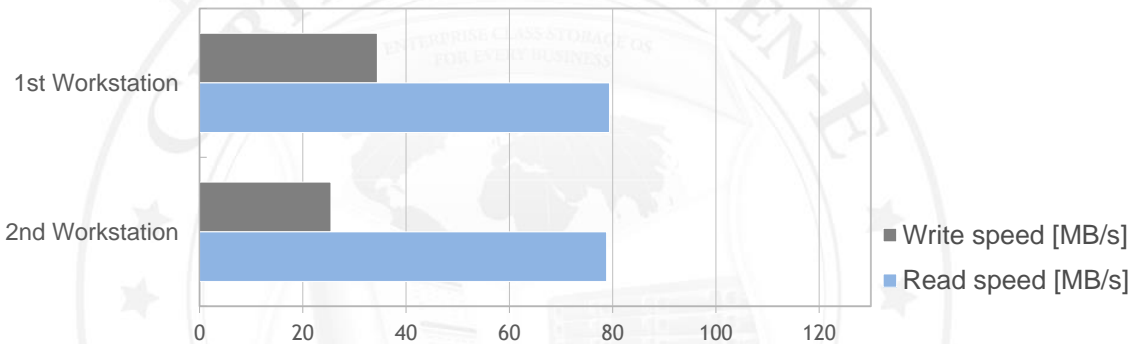


FIGURE 9: Balance-rr bonding mode performance test results chart for 1GbE Intel dual port (on-board) (i82575EB)

3. Test results for Balance-rr bonding mode test performed on 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

Balance-rr bonding mode performance test results			
NIC model	10GbE Intel X520-SR2 (i82599ES)		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
1 st Workstation	56.68	360.64	failed
2 nd Workstation	57.86	405.37	failed

TABLE 13: Balance-rr bonding mode performance test results table for 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

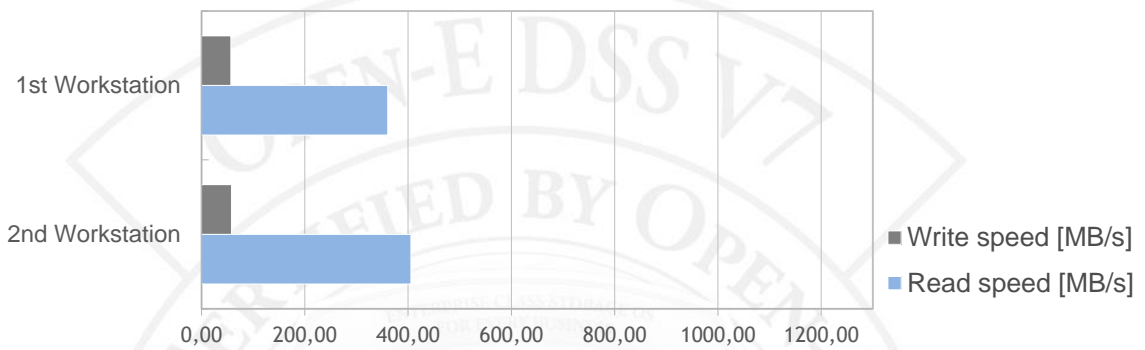


FIGURE 10: Balance-rr bonding mode performance test results chart for 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

It's not recommended to use Balance-rr bonding mode with 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES). The Balance-alb or 802.3ad bonding mode should be used instead.

RAID functionality

Tests performed in this section check the functionality, performance, and stability of Open-E DSS V6 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 level, configuring the iSCSI target and copying the data from a *Workstation with MS Windows* via a 10GbE network connection with various block sizes using the lometer testing tool.

RAID test topology

Network test topology for RAID testing is shown below

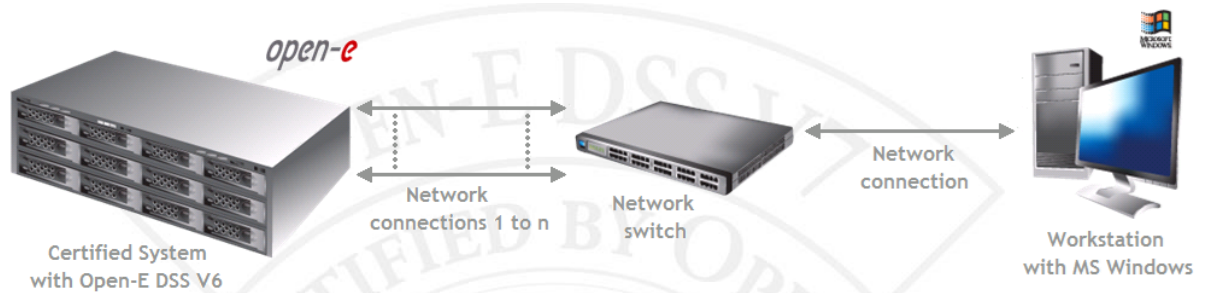


FIGURE 11: Network test topology for RAID testing

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 a 10GbE network connection with various block sizes using the lometer testing tool.

2. Test results for RAID0 and 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

RAID0 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	66.67	57.97	passed
32	441.79	428.38	passed
64	696.01	499.73	passed
128	764.72	680.20	passed
256	948.28	612.41	passed
512	957.14	556.31	passed
1024	969.95	693.17	passed
4096	1011.20	705.69	passed

TABLE 14: RAID0 performance test results table with 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

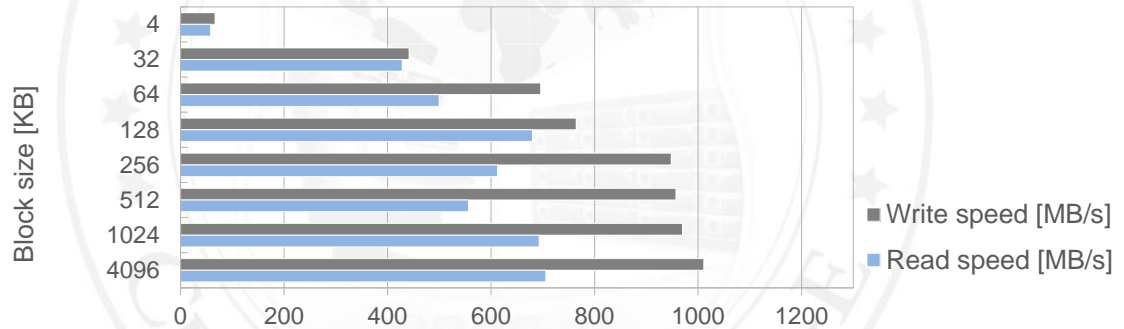


FIGURE 12: RAID0 performance test results chart with 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

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 a 10GbE network connection with various block sizes using the lometer testing tool.

2. Test results for RAID5 and 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

RAID5 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	57.10	61.54	passed
32	396.42	423.66	passed
64	646.26	506.97	passed
128	750.75	668.02	passed
256	960.25	613.65	passed
512	958.90	628.98	passed
1024	938.67	643.80	passed
4096	948.93	566.11	passed

TABLE 15: RAID5 performance test results table with 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

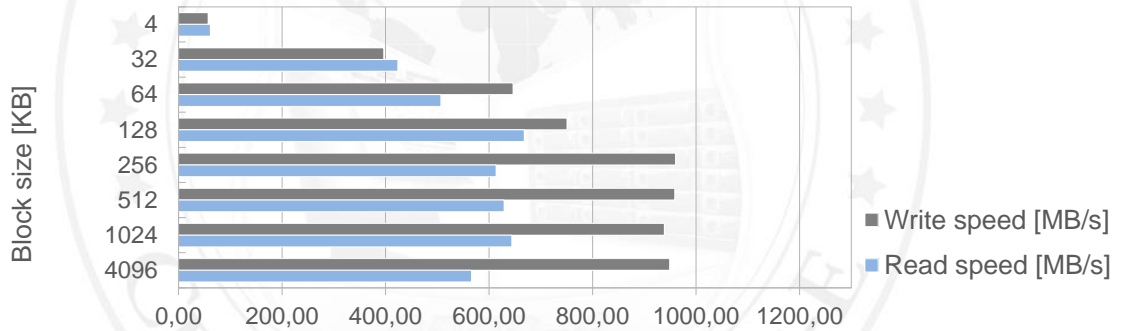


FIGURE 13: RAID5 performance test results chart with 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

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 a 10GbE network connection with various block sizes using the lometer testing tool.

2. Test results for RAID6 and 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

RAID6 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	67.02	55.49	passed
32	423.39	438.35	passed
64	690.52	493.21	passed
128	742.11	669.68	passed
256	922.08	602.92	passed
512	934.03	620.11	passed
1024	956.82	591.15	passed
4096	976.54	528.29	passed

TABLE 16: RAID6 performance test results table with 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

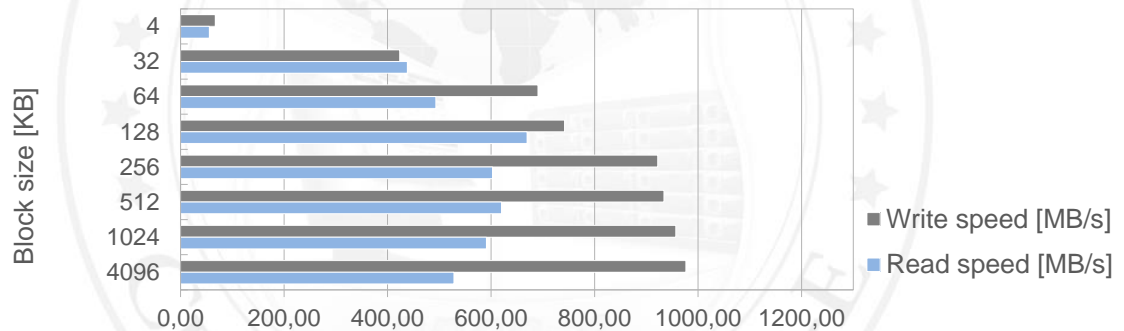


FIGURE 14: RAID6 performance test results chart with 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

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 a 10GbE network connection with various block sizes using the lometer testing tool.

2. Test results for RAID10 and 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

RAID10 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	68.62	63.64	passed
32	421.25	443.23	passed
64	677.23	504.26	passed
128	769.26	684.40	passed
256	999.42	564.55	passed
512	762.59	547.11	passed
1024	665.47	589.97	passed
4096	956.61	668.39	passed

TABLE 17: RAID10 performance test results table with 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

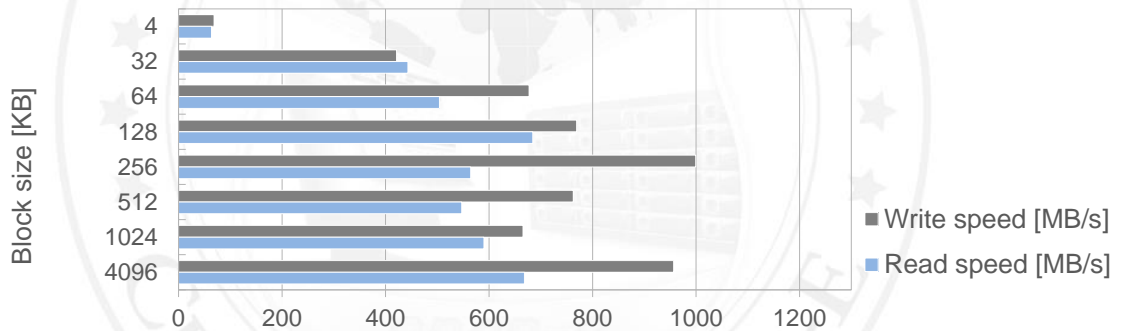


FIGURE 15: RAID10 performance test results chart with 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

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 a 10GbE network connection with various block sizes using the lometer testing tool.

2. Test results for RAID50 and 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

RAID50 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	56.31	61.81	passed
32	372.44	435.93	passed
64	622.98	499.85	passed
128	696.77	677.09	passed
256	899.34	572.51	passed
512	930.77	627.12	passed
1024	919.55	527.51	passed
4096	915.70	538.78	passed

TABLE 18: RAID50 performance test results table with 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

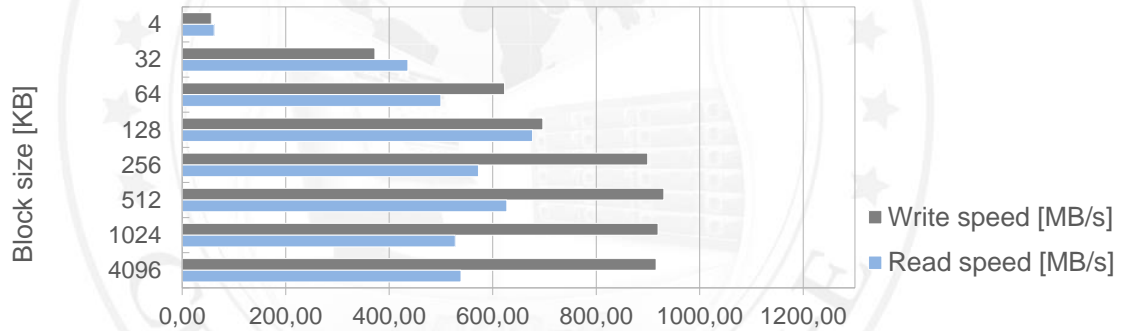


FIGURE 16: RAID50 performance test results chart with 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

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 a 10GbE network connection with various block sizes using the lometer testing tool.

2. Test results for RAID60 and 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

RAID60 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	67.07	58.26	passed
32	416.38	433.47	passed
64	667.35	506.07	passed
128	760.83	659.46	passed
256	900.22	599.05	passed
512	909.16	549.18	passed
1024	820.41	572.42	passed
4096	1002.31	527.67	passed

TABLE 19: RAID60 performance test results table with 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

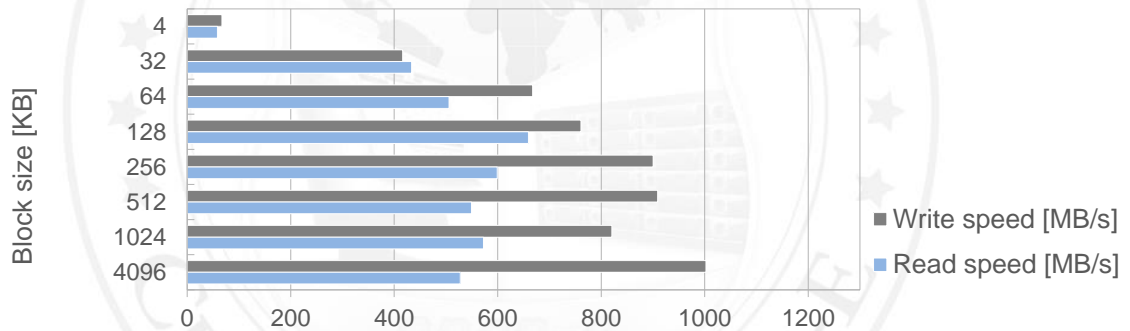


FIGURE 17: RAID60 performance test results chart with 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

NAS functionality

Tests performed in this section check the functionality, performance and stability of the NAS protocols in the Open-E DSS V6 product on the certified system.

The tests rely on creating NAS shares and copying the data from a *Workstation with MS Windows* via a 10GbE network connection with various block sizes using the lometer testing tool.

NAS test topology

Network topology for NAS testing is shown below.

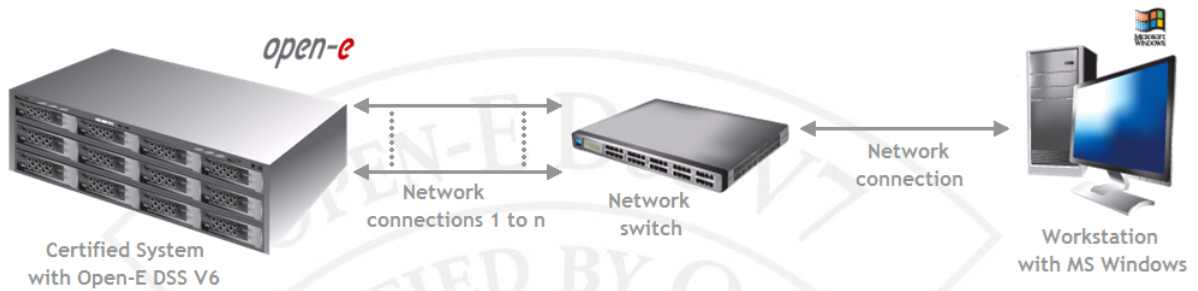
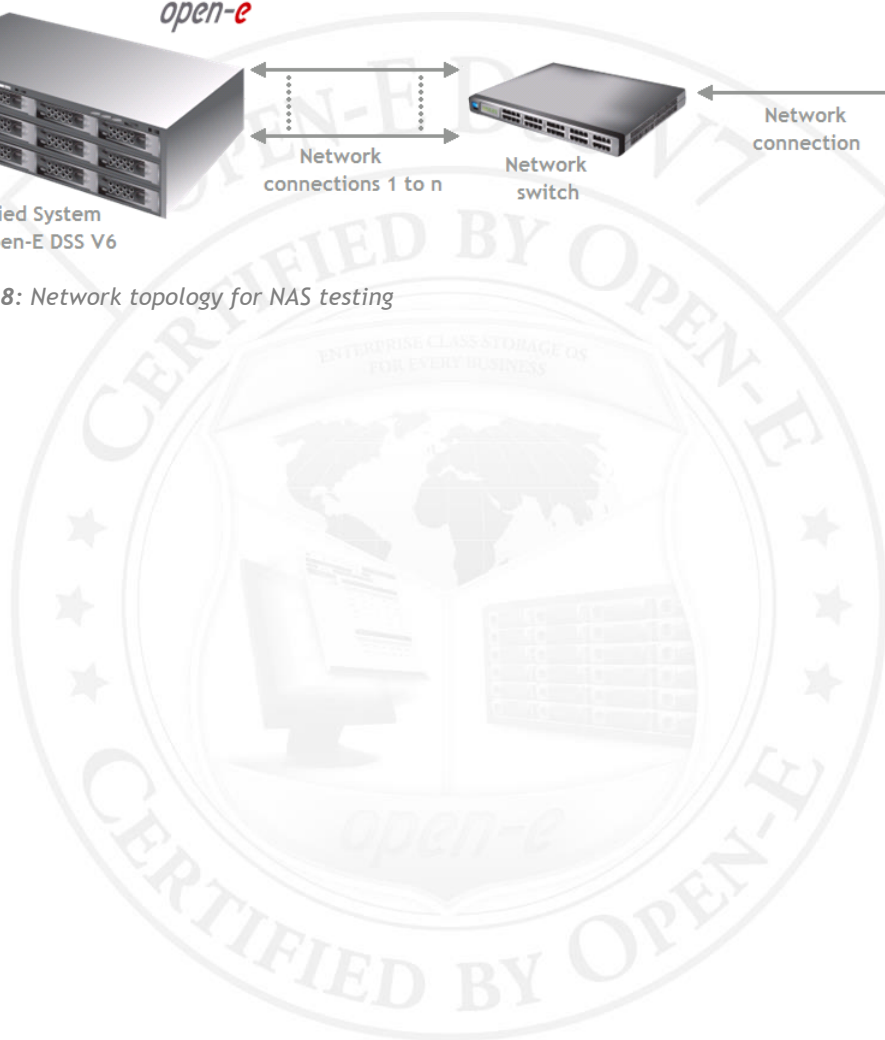


FIGURE 18: Network topology for NAS testing



SMB test

1. Test description

The tests rely on creating NAS shares and copying the data from a *Workstation with MS Windows* via a 10GbE network connection with various block sizes using the lometer testing tool.

2. Test results for SMB and 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

SMB performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	82.03	83.91	passed
32	696.68	422.94	passed
64	736.34	441.00	passed
128	736.22	523.61	passed
256	756.29	579.36	passed
512	741.05	596.82	passed
1024	747.53	597.08	passed
4096	731.46	593.81	passed

TABLE 20: SMB performance test results table with 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

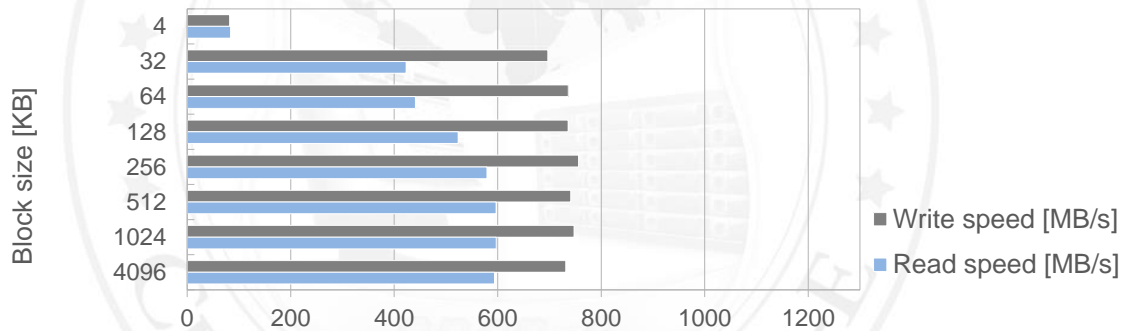


FIGURE 19: SMB performance test results chart with 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

iSCSI functionality

Tests performed in this section check the functionality, performance, and stability of the iSCSI protocol in the Open-E DSS V6 product on the certified system.

iSCSI Initiator test topology

Network topology for iSCSI Initiator testing is shown below.

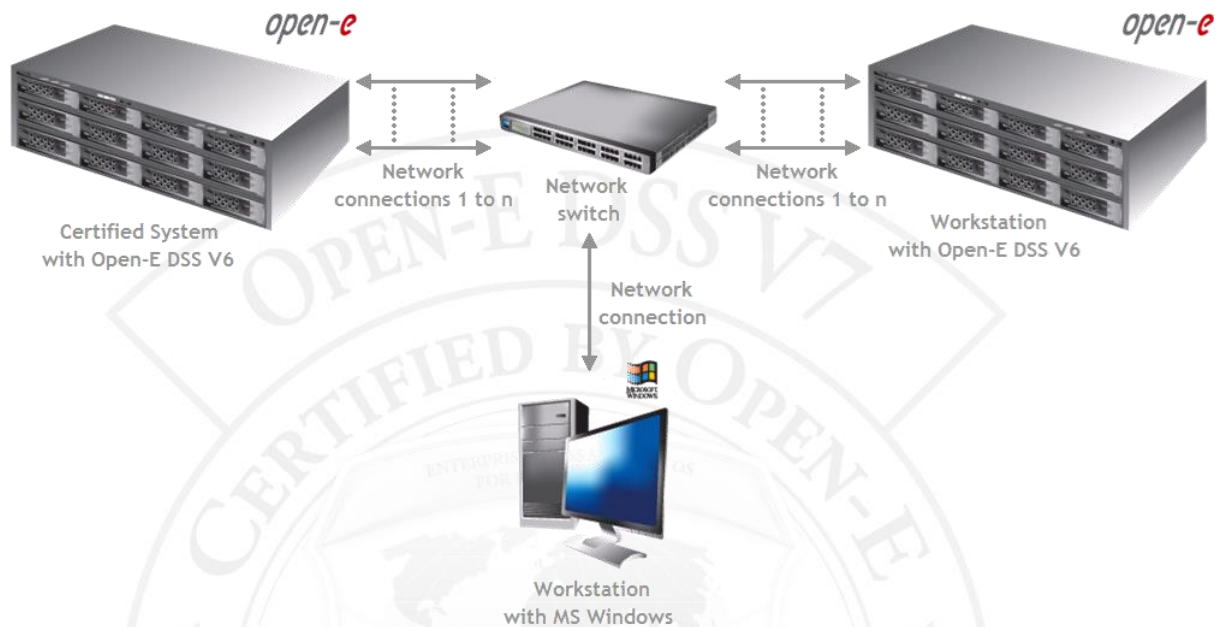


FIGURE 20: Network topology for iSCSI Initiator testing

iSCSI Target test topology

Network topology for iSCSI Target testing is shown below.

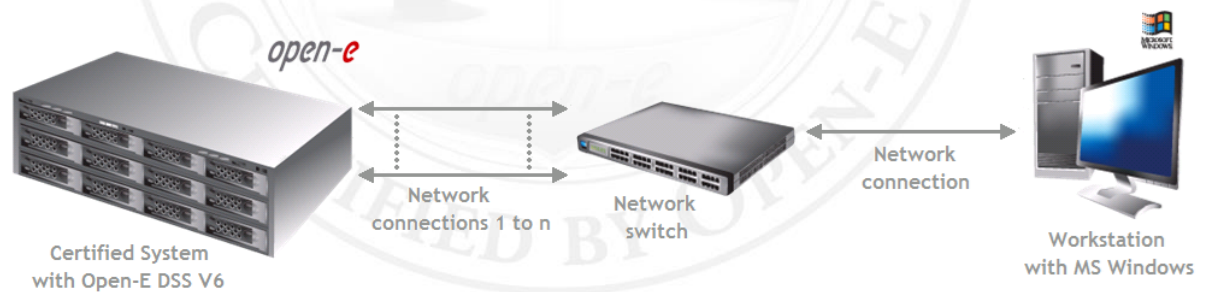


FIGURE 21: Network topology for iSCSI Target testing

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. Tests were performed using a 10GbE network connection.

2. Test results for iSCSI Initiator and 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

iSCSI Initiator performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	86.31	82.12	passed
32	581.73	420.65	passed
64	749.67	448.49	passed
128	814.67	548.08	passed
256	810.36	581.44	passed
512	798.08	575.17	passed
1024	817.11	510.35	passed
4096	867.84	510.1	passed

TABLE 21: iSCSI Initiator performance test results table with 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

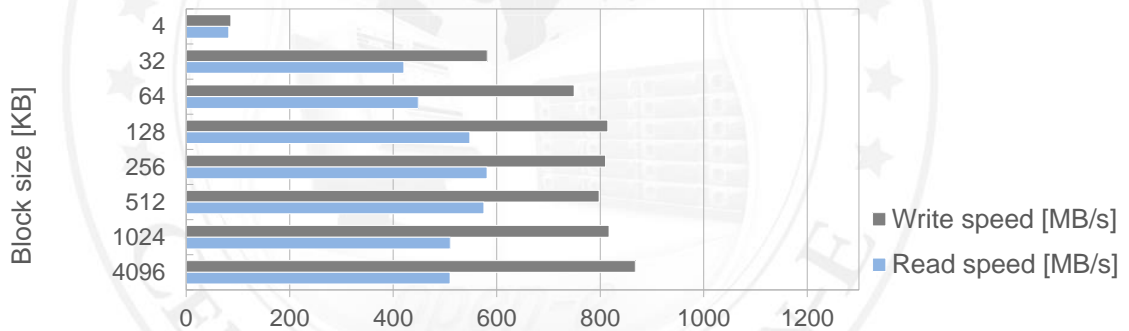


FIGURE 22: iSCSI Initiator performance test results chart with 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

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. Tests were performed using a 10GbE network connection.

2. Test results for iSCSI Target and 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

iSCSI Target performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	64.34	55.92	passed
32	443.66	429.15	passed
64	702.13	508.52	passed
128	761.44	683.82	passed
256	951.14	616.25	passed
512	959.55	549.84	passed
1024	973.41	697.86	passed
4096	1013.72	702.51	passed

TABLE 22: iSCSI Target performance test results table with 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

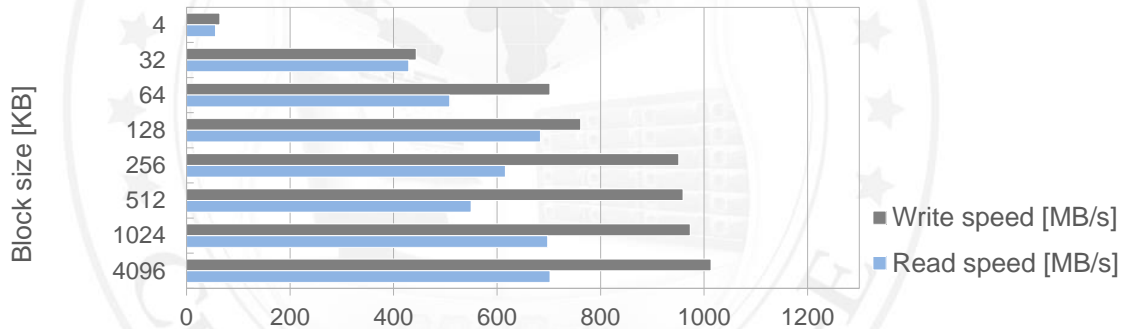


FIGURE 23: iSCSI Target performance test results chart with 10GbE Intel Ethernet Server Adapter X520-SR2 (i82599ES)

Fibre Channel functionality

Tests performed in this section check the functionality, performance, and stability of the Fibre Channel protocol in the Open-E DSS V6 product on the certified system.

Fibre Channel Initiator test topology

Network topology for Fibre Channel Initiator testing is shown below.

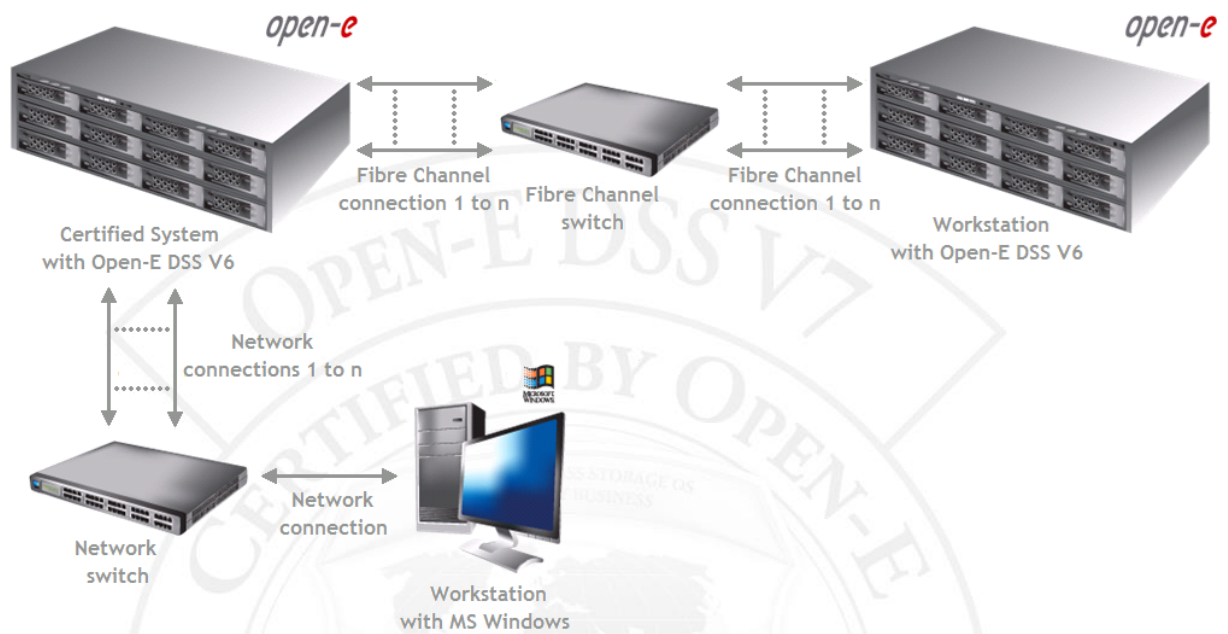


FIGURE 24: Network topology for Fibre Channel Initiator testing

Fibre Channel Target test topology

Network topology for Fibre Channel Target testing is shown below.

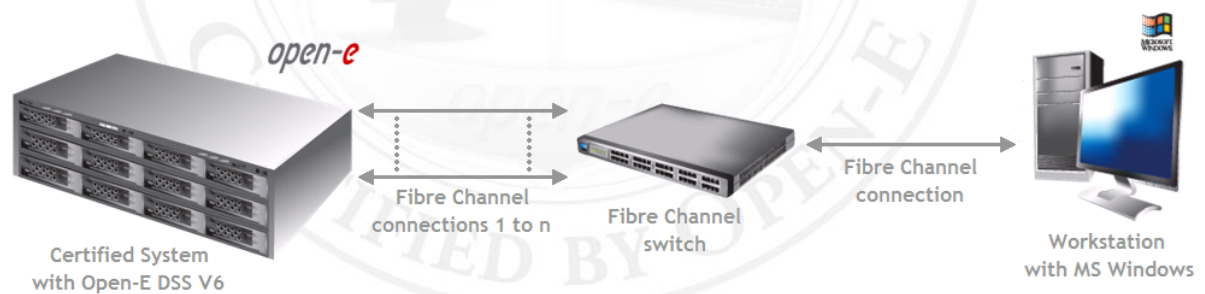


FIGURE 25: Network topology for Fibre Channel Target testing

Fibre Channel Initiator test

1. Test description

The test relies on creating the Fibre Channel Target on a *Workstation with Open-E DSS V6*, connecting to the target using a *Certified System with Open-E DSS V6* Fibre Channel Initiator, and copying the data to the previously exported Fibre Channel LUNs using the lometer through the SMB protocol using a *Workstation with MS Windows* on the certified system.

All the tests were performed using 10GbE network and 8Gb Fibre Channel connections.

2. Test results for Fibre Channel Initiator and Qlogic QLE2562 HBA Adapter

Fibre Channel Initiator performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	85.90	82.77	passed
32	587.06	425.10	passed
64	759.48	443.42	passed
128	764.86	534.76	passed
256	869.06	585.09	passed
512	919.20	604.95	passed
1024	845.01	594.77	passed
4096	744.75	583.87	passed

TABLE 23: Fibre Channel Initiator performance test results table for Qlogic QLE2562 HBA Adapter

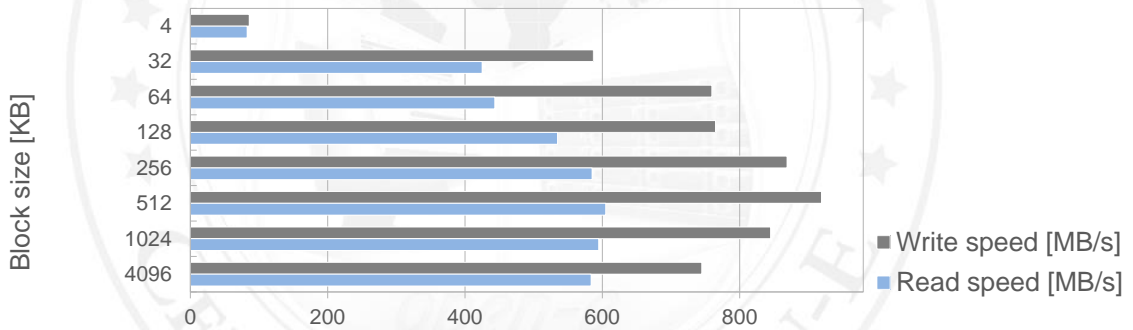


FIGURE 26: Fibre Channel Initiator performance test results chart for Qlogic QLE2562 HBA Adapter

Fibre Channel Target test

1. Test description

The test relies on creating the Fibre Channel Target on a *Certified System with Open-E DSS V6*, connecting to the target using a *Workstation with MS Windows* with a Fibre Channel Controller in the initiator mode, and copying the data to the connected LUN using the lometer.

All the tests were performed using an 8Gb Fibre Channel connection.

2. Test results for Fibre Channel Target and Qlogic QLE2562 HBA Adapter

Fibre Channel Target performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	207.55	298.31	passed
32	666.03	706.85	passed
64	745.10	746.00	passed
128	762.11	762.71	passed
256	773.69	773.88	passed
512	780.23	780.39	passed
1024	781.77	781.16	passed
4096	781.86	782.49	passed

TABLE 24: Fibre Channel Target performance test results table for Qlogic QLE2562 HBA Adapter

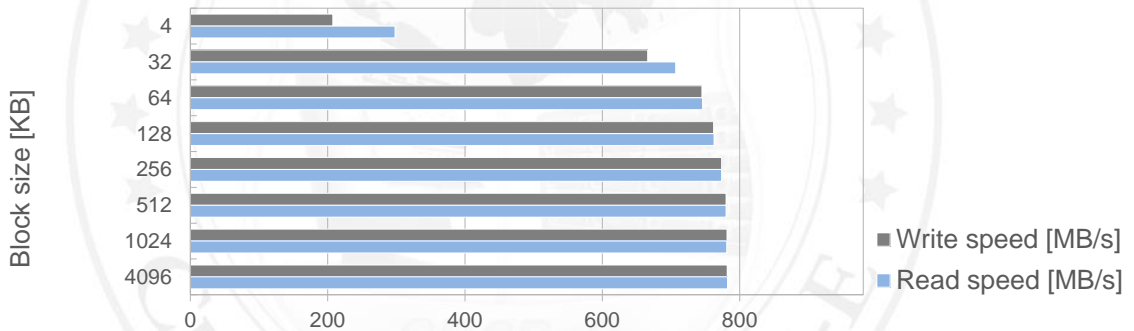


FIGURE 27: Fibre Channel Target performance test results chart for Qlogic QLE2562 HBA Adapter