Rackserver S3316O storage system

Executive summary

After performing all tests, the Rackserver S3316O 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 V6 operation system installed, the Rackserver S3316O is stable and performs well.
In general, the system can be used for many different applications, but the following are recommended:

✓ **HA cluster**

For this setup, two identical systems are required. The following features make the Rackserver S3316O suitable for an HA cluster:

- Hardware RAID5, RAID6, RAID10, RAID50, RAID60 for greater node availability and increased performance
- Four 1GbE interfaces allow node replication and data access simultaneously. Links may be aggregated for improved throughput and fault tolerance
- Redundant power supply for system reliability

✓ **iSCSI Storage**

The following features make the Rackserver S3316O great iSCSI storage:

- Four 1GbE interfaces for fast MPIO connection
- Hardware RAID5, RAID50, RAID6, RAID60 and RAID10 for high performance and data safety
- Sixteen SATA drives provide plenty of space for stored data

✓ **Storage for CCTV**

The following features make the Rackserver S3316O a good choice for CCTV storage server:

- Sixteen SATA high-capacity drives provide enough storage space for recorded videos
- Four 1GbE interfaces for multiple connections to independent networks
- Hardware RAID5, RAID6, RAID50, RAID60 for fault tolerance and the best use of available disk space
- Redundant power supply for system reliability

Certification notes

It's recommended using 802.3ad instead of Balance-alb or Balance-rr bonding mode for link aggregation.

Rackserver S3316O hardware components

Technical specifications about the certified system are listed below:

Model	Rackserver S3316O
Operating system	Open-E DSS V6 build 5845
Enclosure/chassis	Chenbro RM31616M2-E
CPU	Intel Xeon E5620 2.40GHz
Motherboard	Tyan S7012WGM4NR
Memory	3x 2GB DDR3 1333 ECC-REG Kingston KVR1333D3S8R9S/2G
Network	Intel Gigabit ET Dual Port Server Adapter (i82576) (on board)
Network	2x Intel Gigabit Ethernet Server Adapter (i82574L) (on board)
HW RAID	Adaptec ASR-51645
Hard disk drives	16x 1TB WD Caviar RE4 WD1003FBYX

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

All components were detected and properly recognized.

Rackserver S3316O photos

FIGURE 1: Front photo

FIGURE 2: Rear photo

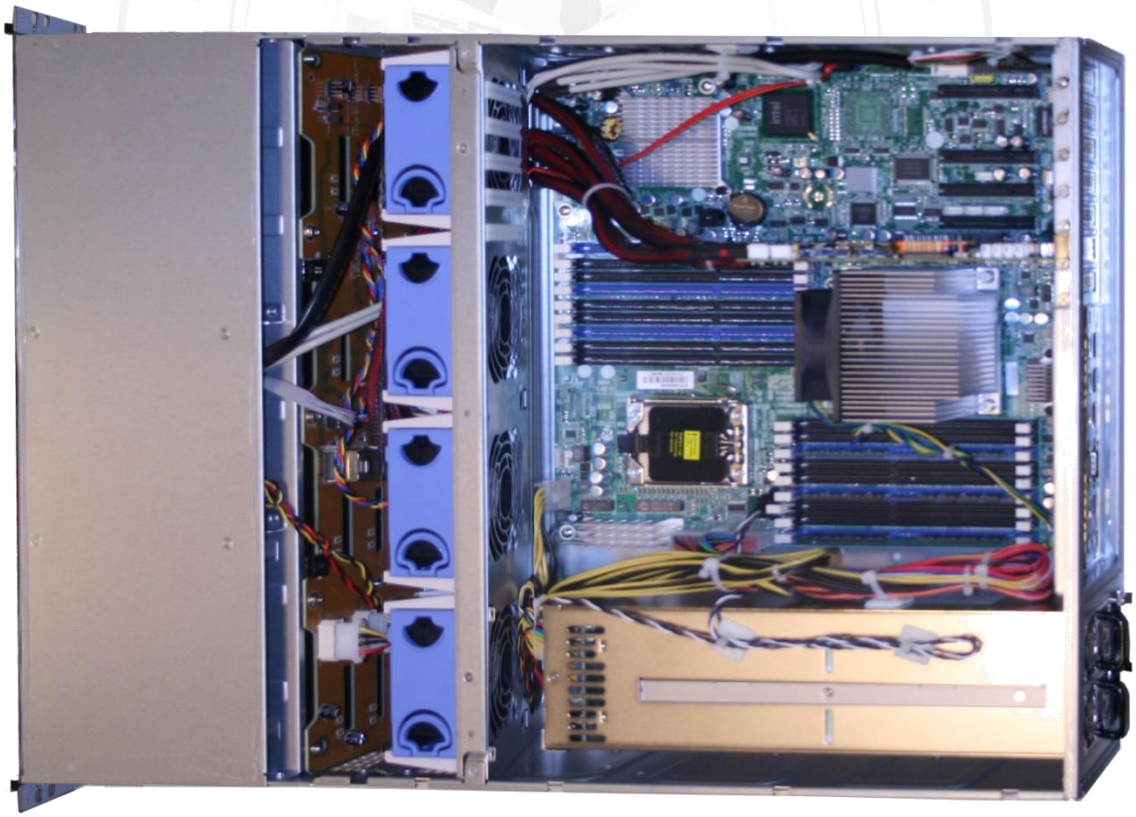

FIGURE 3: Top photo

Auxiliary systems hardware components

Auxiliary systems with MS Windows or Open-E DSS V6 installed, used in Open-E Hardware Certification Process.

Model	Custom
Operating system	MS Windows Server 2008 R2
Enclosure/chassis	Jou Jye Nu-9138
Motherboard	MSI MS-9656
CPU	Intel Core2Duo E6420 2.13GHz
Memory	2x 2GB DDR2 ECC
Network	Intel Gigabit Network Adapter (i82566DM) (on board)
Network	Intel Gigabit Network Adapter (i82573L) (on board)
Hard disk drives	2x 300GB Seagate Barracuda 7200.8 ST3300831AS

TABLE 2: Hardware components of first Workstation with MS Windows

Model	Custom
Operating system	MS Windows Server 2008 R2
Enclosure/chassis	Chenbro RM215-08
Motherboard	Tyan S7012GM4NR
CPU	Intel Xeon E5606 2.13GHz
Memory	4x 4GB DDR3 1333 ECC-REG Kingston KVR1333D3D8R9S/4G
Network	Intel Gigabit ET Dual Port Server Adapter (i82576) (on board)
Network	2x Intel Gigabit Ethernet Server Adapter (i82574L) (on board)
Hard disk drives	1x 500GB WD Caviar RE4 WD5003ABYX

TABLE 3: Hardware components of second Workstation with MS Windows

Model	Custom
Operating system	Open-E DSS V6 build 5794
Enclosure/chassis	Chenbro RM215-08
Motherboard	Tyan S7012GM4NR
CPU	Intel Xeon E5606 2.13GHz
Memory	4x 4GB DDR3 1333 ECC-REG Kingston KVR1333D3D8R9S/4G
Network	Intel Gigabit ET Dual Port Server Adapter (i82576) (on board)
Network	2x Intel Gigabit Ethernet Server Adapter (i82574L) (on board)
HW RAID controller	Adaptec ASR-5805
Hard disk drives	4x 500GB Seagate Barracuda 7200.12 ST500DM002

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

Model	HP ProCurve 2810-48G (J9022A)
Description	48-ports 1GbE managed, LACP-capable, network switch

TABLE 5: Details of first Network switch

Model	Edimax ES-524G+
Description	24-ports 1GbE managed network switch

TABLE 6: *Details of second Network switch*

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 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.

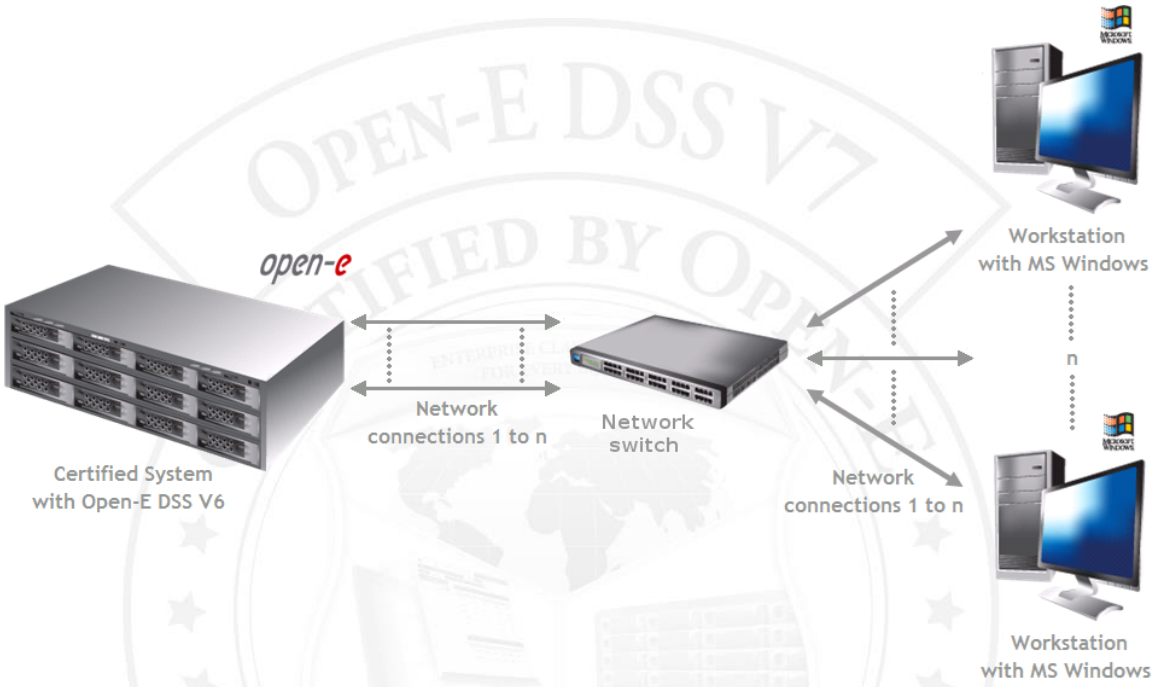

FIGURE 4: Network topology for Network testing

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 Intel Gigabit ET Dual Port Server Adapter (i82576) (on board)

802.3ad bonding mode performance test results			
NIC model	Intel Gigabit ET Dual Port Server Adapter (i82576)		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1st Workstation	108.79	112.43	passed
2nd Workstation	108.93	112.03	passed

TABLE 8: 802.3ad bonding mode performance test results table for Intel Gigabit ET Dual Port Server Adapter (i82576) (on board)

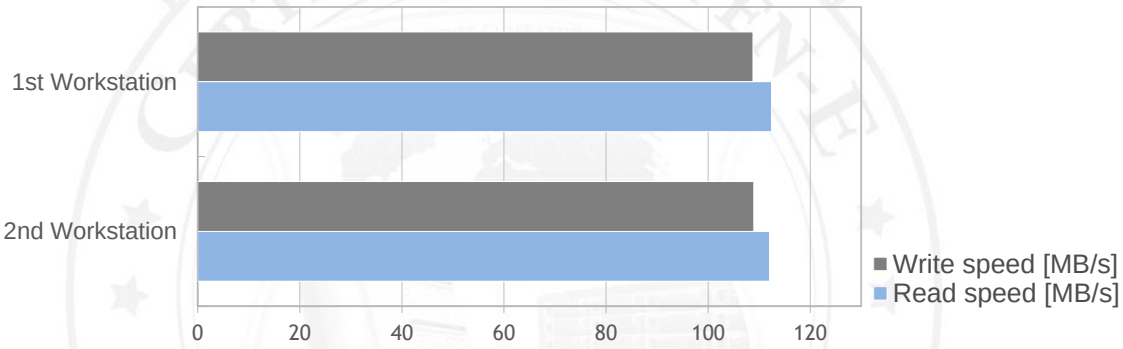

FIGURE 5: 802.3ad bonding mode performance test results chart for Intel Gigabit ET Dual Port Server Adapter (i82576) (on board)

3. Test results for 802.3ad bonding mode test performed on Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

802.3ad bonding mode performance test results			
NIC model	Intel Gigabit Ethernet Server Adapter (i82574L)		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1st Workstation	109.84	106.23	passed
2nd Workstation	108.08	106.83	passed

TABLE 9: 802.3ad bonding mode performance test results table for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

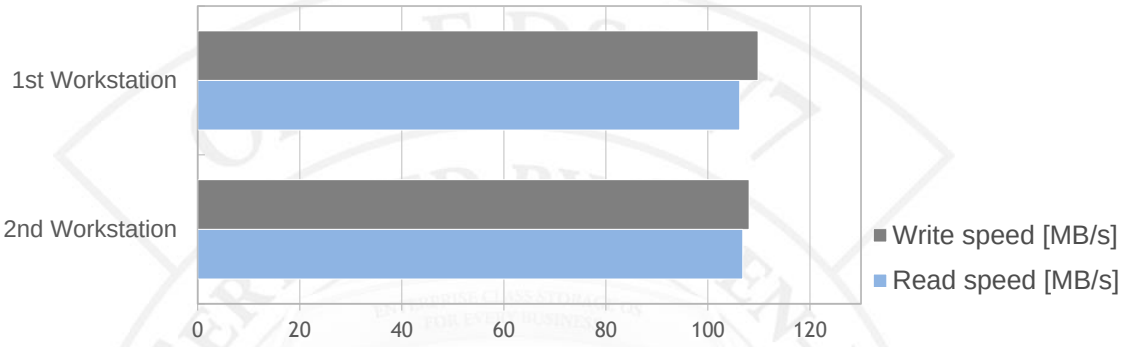

FIGURE 6: 802.3ad bonding mode performance test results chart for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

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 ET Dual Port Server Adapter (i82576) (on board)

Balance-alb bonding mode performance test results			
NIC model	Intel Gigabit ET Dual Port Server Adapter (i82576)		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1st Workstation	49.38	90.45	passed
2nd Workstation	112.61	112.38	passed

TABLE 10: Balance-alb bonding mode performance test results table for Intel Gigabit ET Dual Port Server Adapter (i82576) (on board)

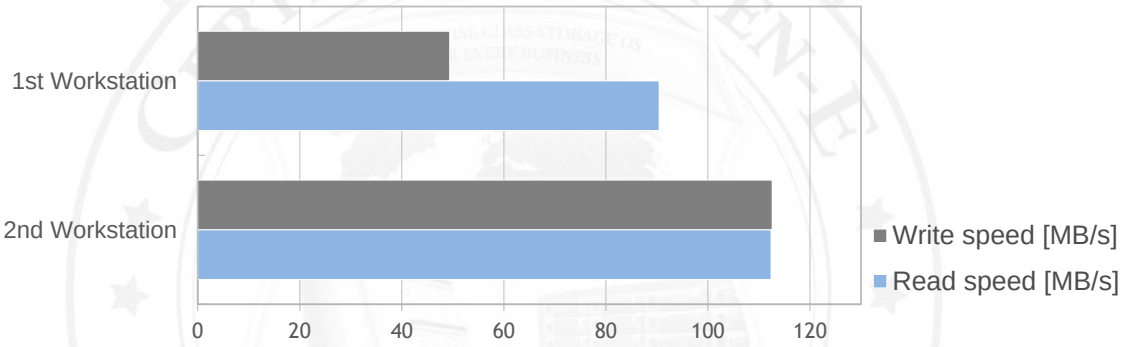

FIGURE 7: Balance-alb bonding mode performance test results chart for Intel Gigabit ET Dual Port Server Adapter (i82576) (on board)

3. Test results for Balance-alb bonding mode test performed on Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

Balance-alb bonding mode performance test results			
NIC model	Intel Gigabit Ethernet Server Adapter (i82574L)		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1st Workstation	52.14	89.78	passed
2nd Workstation	108.26	105.28	passed

TABLE 11: Balance-alb bonding mode performance test results table for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

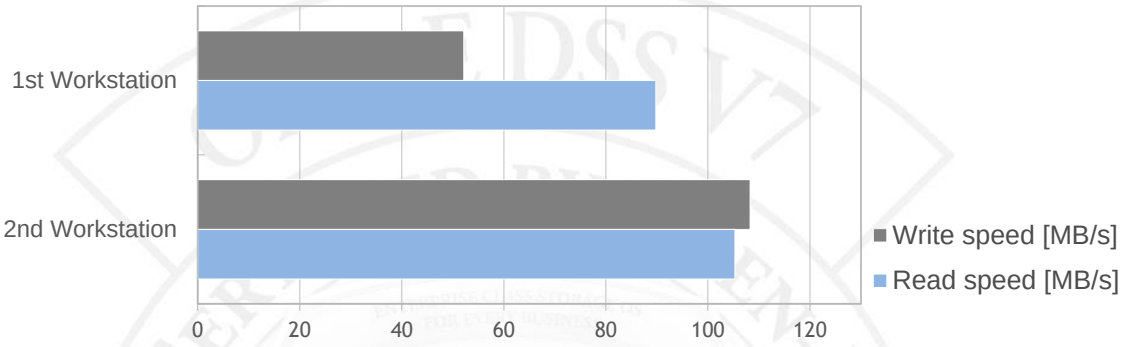

FIGURE 8: Balance-alb bonding mode performance test results chart for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

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 Iometer testing tool.

2. Test results for Balance-rr bonding mode test performed on Intel Gigabit ET Dual Port Server Adapter (i82576) (on board)

Balance-rr bonding mode performance test results			
NIC model	Intel Gigabit ET Dual Port Server Adapter (i82576)		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1st Workstation	47.17	80.06	passed
2nd Workstation	47.40	108.32	passed

TABLE 12: Balance-rr bonding mode performance test results table for Intel Gigabit ET Dual Port Server Adapter (i82576) (on board)

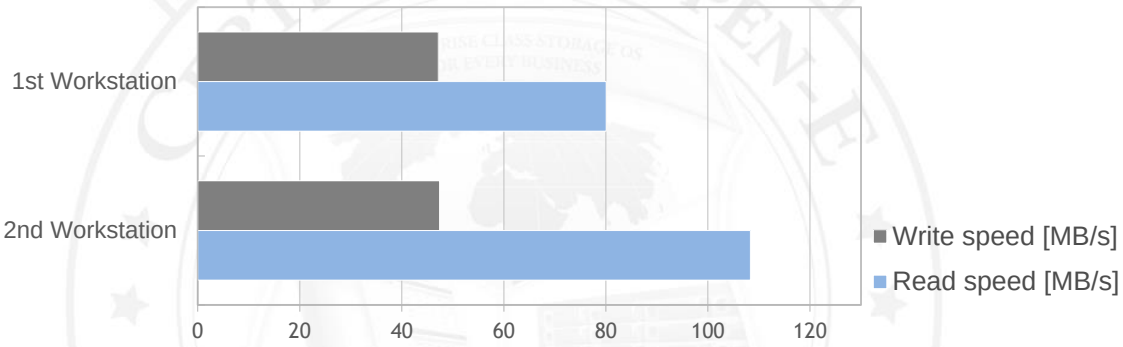

FIGURE 9: Balance-alb bonding mode performance test results chart for Intel Gigabit ET Dual Port Server Adapter (i82576) (on board)

3. Test results for Balance-rr bonding mode test performed on Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

Balance-rr bonding mode performance test results			
NIC model	Intel Gigabit Ethernet Server Adapter (i82574L)		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1st Workstation	53.37	84.67	passed
2nd Workstation	95.29	93.31	passed

TABLE 13: Balance-rr bonding mode performance test results table for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

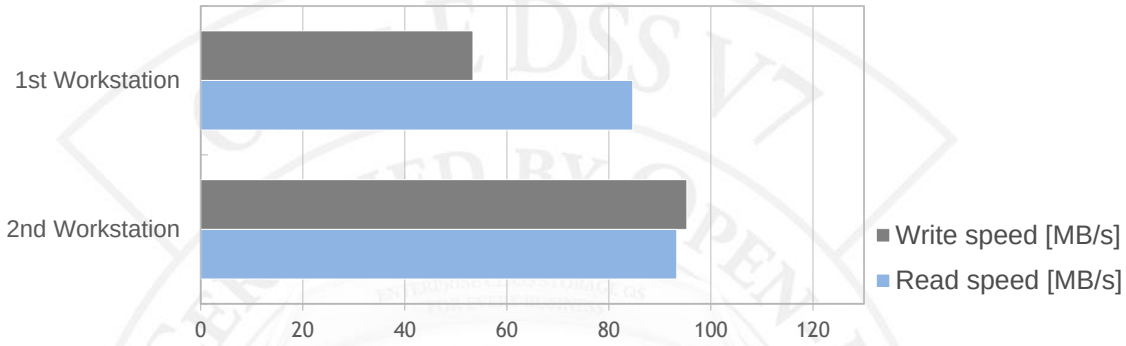

FIGURE 10: Balance-alb bonding mode performance test results chart for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

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, 1E, 5, 5EE, 6, 10, 50 and 60 levels, configuring the iSCSI target and copying the data from a *Workstation with MS Windows* via network connection with various block sizes using the Iometer testing tool.

RAID test topology

Network test topology for RAID testing is shown below

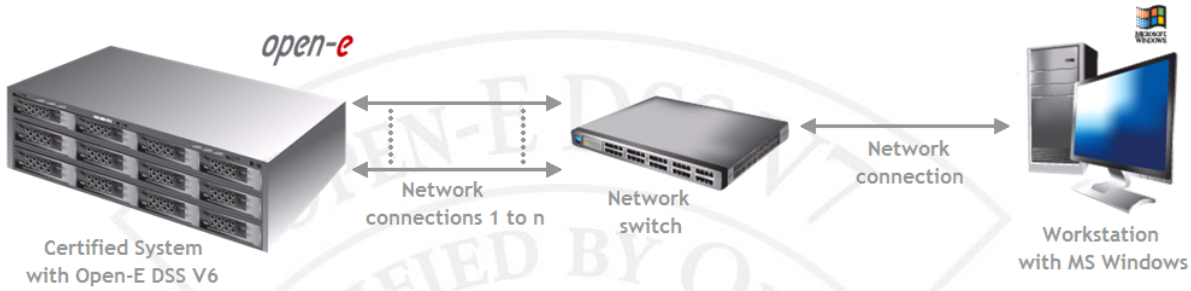

FIGURE 11: Network test topology for RAID testing

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 Iometer testing tool.

2. Test results for RAID0 and Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

RAID0 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	24.73	28.01	passed
32	71.66	91.63	passed
64	99.18	106.02	passed
128	103.76	106.23	passed
256	105.66	107.93	passed
512	107.75	109.37	passed
1024	110.45	112.29	passed
4096	111.78	112.97	passed

TABLE 14: RAID0 performance test results table for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

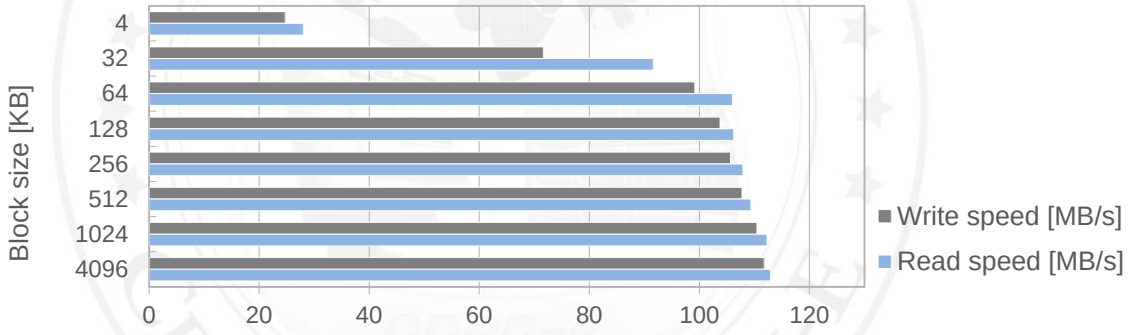

FIGURE 12: RAID0 performance test results chart for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

Hardware RAID1E test

1. Test description

The test relies on creation of the RAID1E 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 RAID1E and Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

RAID1E performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	25.01	28.26	passed
32	76.37	96.32	passed
64	99.69	109.28	passed
128	107.06	110.34	passed
256	108.54	110.91	passed
512	111.04	112.36	passed
1024	111.50	112.59	passed
4096	111.95	113.11	passed

TABLE 15: RAID1E performance test results table for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

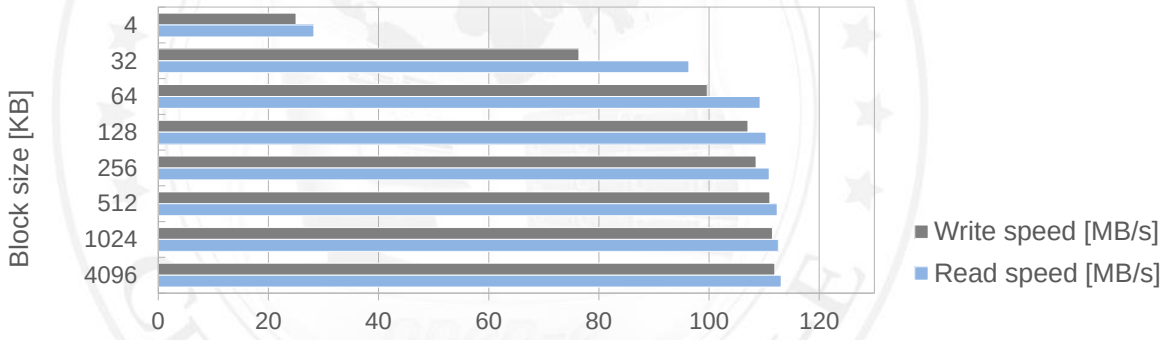

FIGURE 13: RAID1E performance test results chart for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

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 Gigabit Ethernet Server Adapter (i82574L) (on board)

RAID5 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	23.57	27.57	passed
32	71.13	92.38	passed
64	96.88	105.72	passed
128	103.08	106.46	passed
256	104.99	107.23	passed
512	107.68	109.50	passed
1024	109.67	120.00	passed
4096	111.56	112.87	passed

TABLE 16: RAID5 performance test results table for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

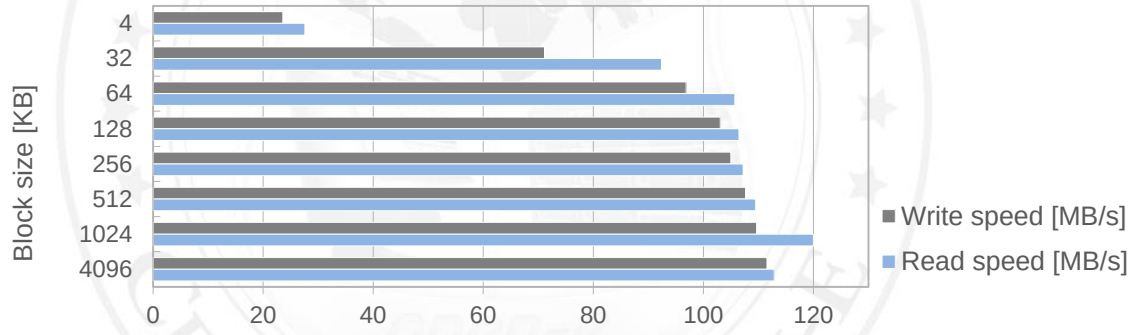

FIGURE 14: RAID5 performance test results chart for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

Hardware RAID5EE test

1. Test description

The test relies on creation of the RAID5EE 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 RAID5EE and Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

RAID5EE performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	24.84	28.38	passed
32	75.44	92.02	passed
64	99.51	106.03	passed
128	106.18	106.36	passed
256	107.47	108.52	passed
512	109.11	110.29	passed
1024	110.80	112.57	passed
4096	112.27	113.04	passed

TABLE 17: RAID5EE performance test results table for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

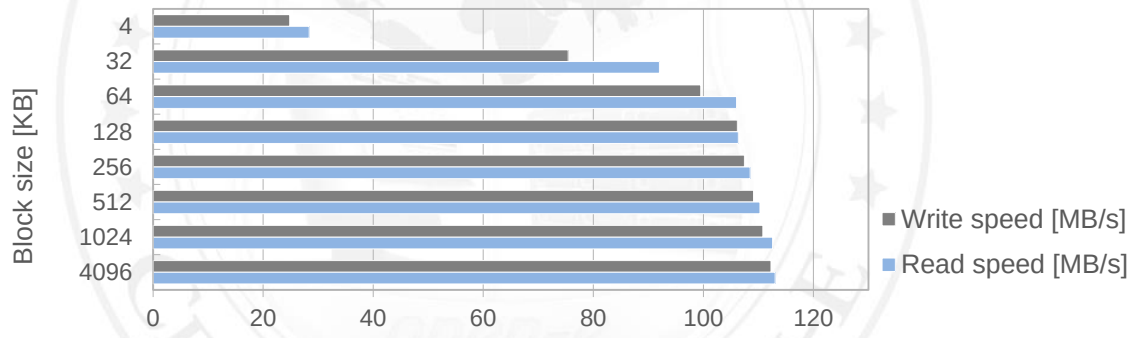

FIGURE 15: RAID5EE performance test results chart for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

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 Gigabit Ethernet Server Adapter (i82574L) (on board)

RAID6 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	26.68	31,55	passed
32	80,35	96,31	passed
64	103,37	109,96	passed
128	109,44	111,13	passed
256	111.22	112.12	passed
512	111.91	112.66	passed
1024	112.30	112.51	passed
4096	112.32	112.39	passed

TABLE 18: RAID6 performance test results table for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

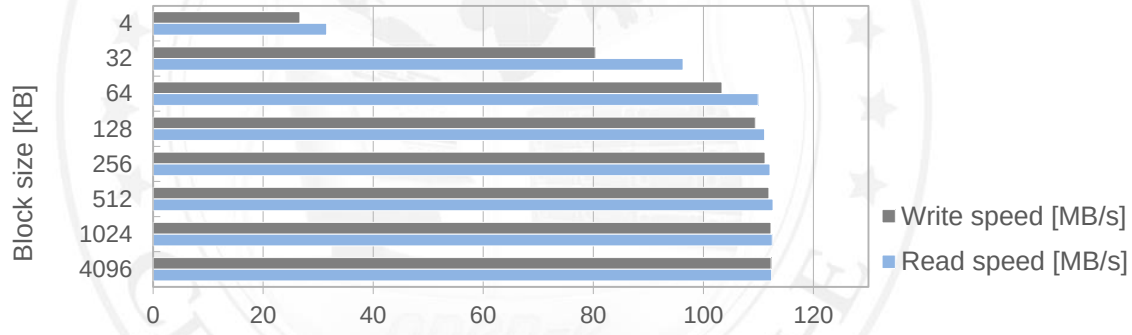

FIGURE 16: RAID6 performance test results chart for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

Hardware RAID10 test

1. Test description

The test relies on creation of the RAID10 unit on all hard disk drives, configuring the iSCSI target and copying the data from a *Workstation with MS Windows* via network connection with various block sizes using the Iometer testing tool.

2. Test results for RAID10 and Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

RAID10 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	19.93	29.93	passed
32	73.79	90.00	passed
64	98.41	107.00	passed
128	104.30	107.72	passed
256	106.33	108.97	passed
512	108.65	110.04	passed
1024	110.06	112.71	passed
4096	110.82	113.15	passed

TABLE 19: RAID10 performance test results table for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

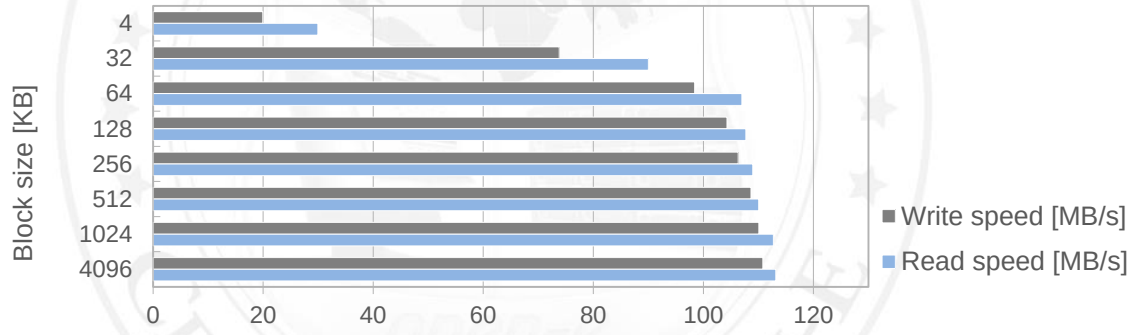

FIGURE 17: RAID10 performance test results chart for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

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 Gigabit Ethernet Server Adapter (i82574L) (on board)

RAID50 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	25.77	27.78	passed
32	75.93	97.32	passed
64	99.29	107.96	passed
128	106.95	108.63	passed
256	107.68	109.91	passed
512	109.93	111.62	passed
1024	111.28	112.81	passed
4096	112.02	113.20	passed

TABLE 20: RAID50 performance test results table for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

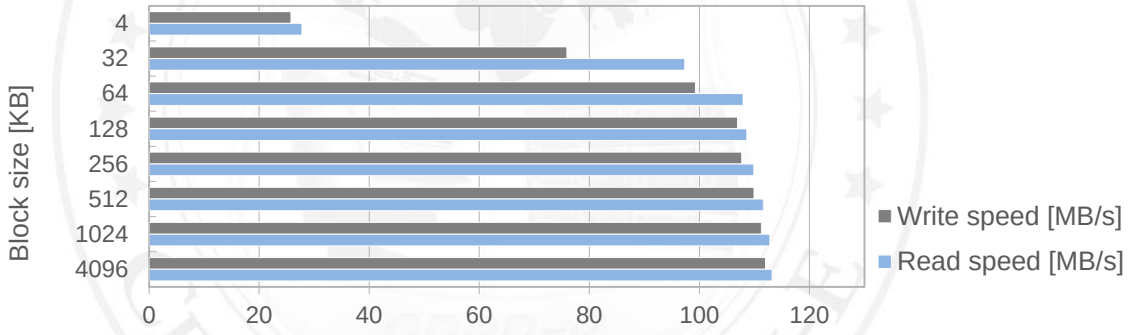

FIGURE 18: RAID50 performance test results chart for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

Hardware RAID60 test

3. Test description

The test relies on creation of the RAID60 unit on all hard disk drives, configuring the iSCSI target and copying the data from a *Workstation with MS Windows* via network connection with various block sizes using the Iometer testing tool.

4. Test results for RAID60 and Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

RAID60 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	26.28	31.76	passed
32	78.21	96.93	passed
64	103.77	108.65	passed
128	109.57	109.83	passed
256	110.18	110.30	passed
512	111.57	110.91	passed
1024	111.72	111.10	passed
4096	112.31	111.52	passed

TABLE 21: RAID60 performance test results table for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

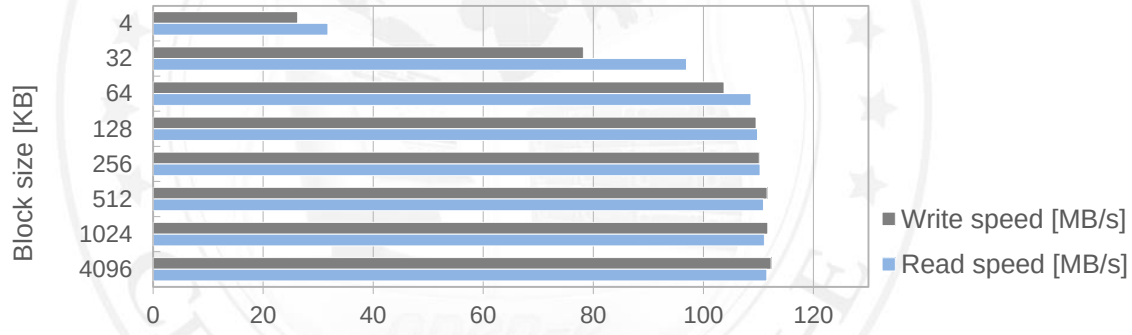

FIGURE 19: RAID60 performance test results chart for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

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 network connection with various block sizes using the Iometer testing tool.

NAS test topology

Network topology for NAS testing is shown below.

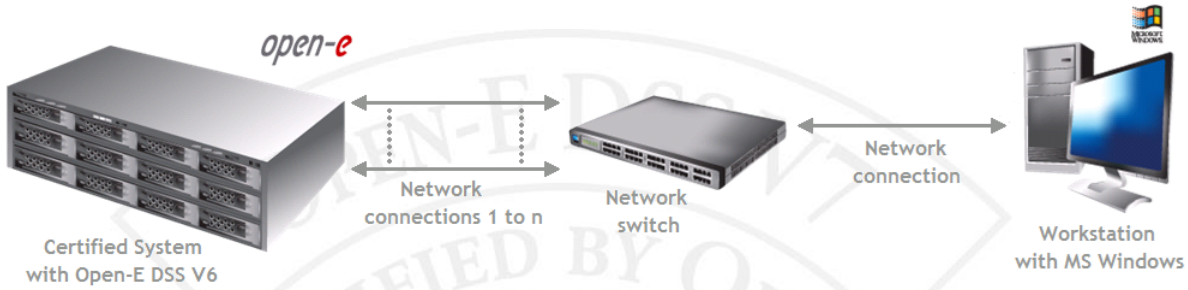

FIGURE 20: Network topology for NAS testing

SMB test

1. Test description

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

2. Test results for SMB and Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

SMB performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	36.01	37,10	passed
32	90,37	96,22	passed
64	109,99	86,91	passed
128	109.74	97.77	passed
256	110.53	105.77	passed
512	111.11	110.11	passed
1024	111.65	108.13	passed
4096	111.51	110,83	passed

TABLE 22: SMB performance test results table for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

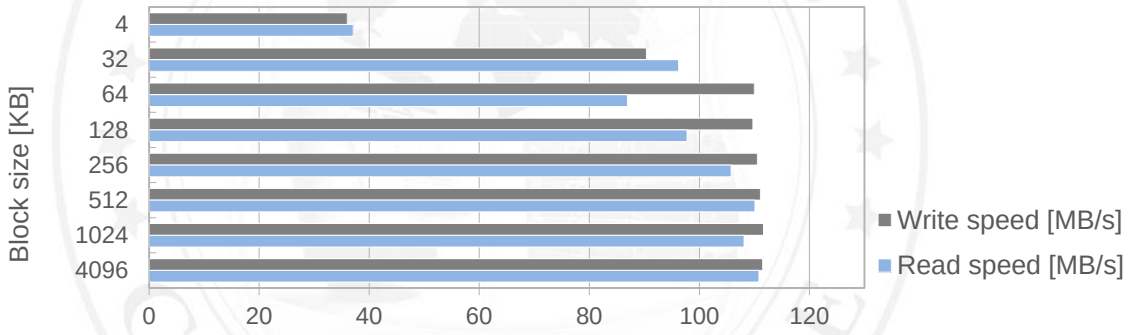

FIGURE 21: SMB performance test results chart for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

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.

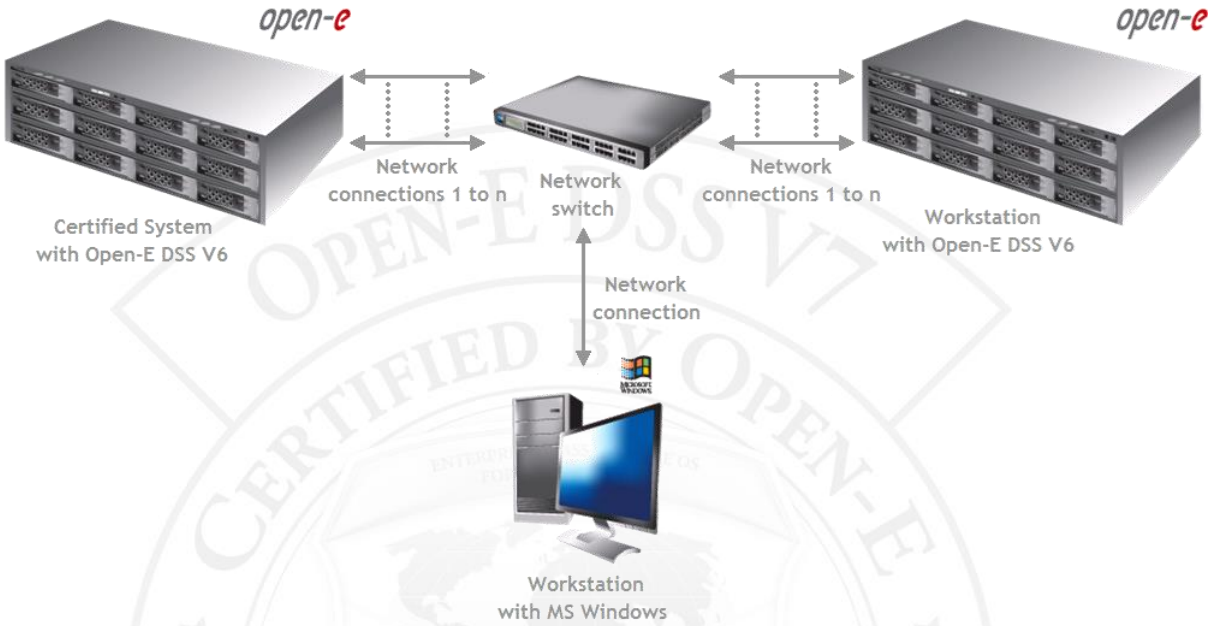

FIGURE 22: Network topology for iSCSI Initiator testing

iSCSI Target test topology

Network topology for iSCSI Target testing is shown below.

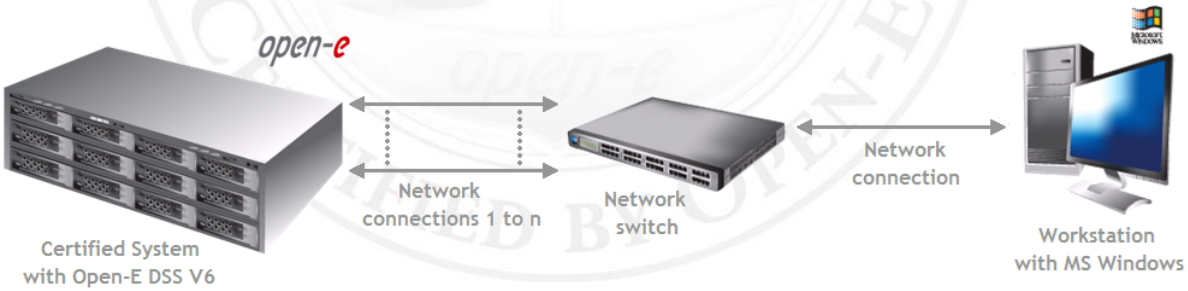

FIGURE 23: Network topology for iSCSI Target testing

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 Iometer testing tool.
Tests were performed using network connection.

2. Test results for iSCSI Initiator and Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

iSCSI Initiator performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	26.80	27.60	passed
32	70.60	81.00	passed
64	87.30	61.40	passed
128	97.90	87.80	passed
256	106.70	97.00	passed
512	106.10	102.40	passed
1024	109.30	101.80	passed
4096	109.00	102.90	passed

TABLE 23: iSCSI Initiator performance test results table for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

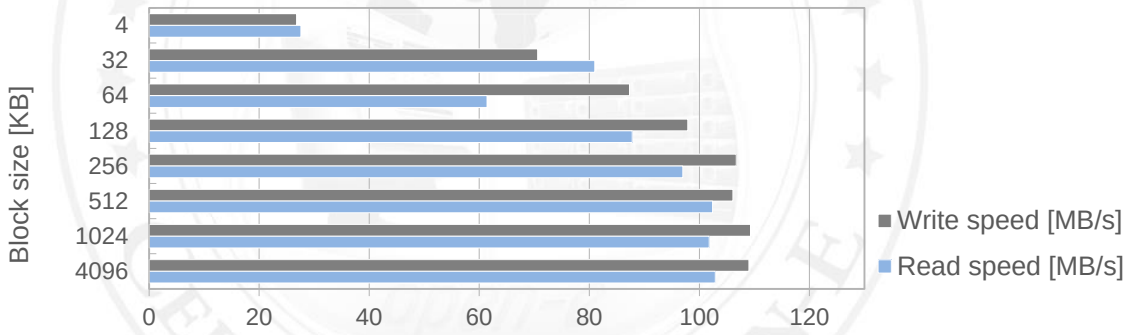

FIGURE 24: iSCSI Initiator performance test results chart for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

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. Tests were performed using network connection.

2. Test results for iSCSI Target and Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

iSCSI Target performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	20.98	31.72	passed
32	79.02	94.46	passed
64	102.62	109.18	passed
128	108.07	109.39	passed
256	109.25	111.02	passed
512	110.63	111.99	passed
1024	111.82	112.76	passed
4096	111.65	113.10	passed

TABLE 24: iSCSI Target performance test results table for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)

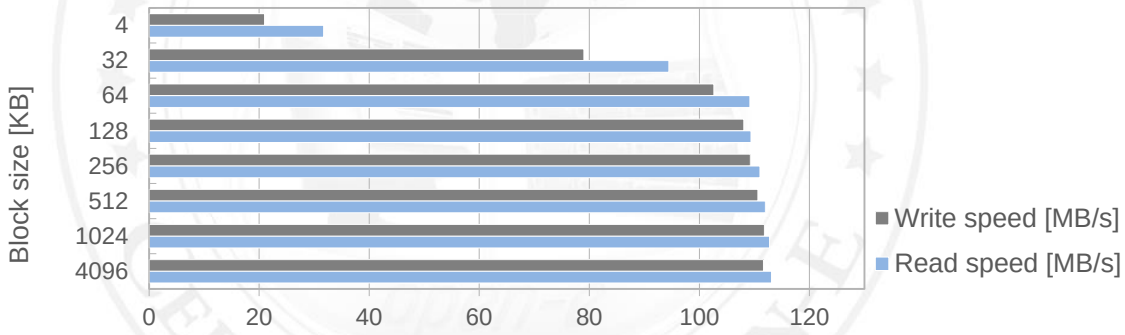

FIGURE 25: iSCSI Target performance test results chart for Intel Gigabit Ethernet Server Adapter (i82574L) (on board)