ICO Open-E Rack 2221 (yst8)

Executive summary

After performing all tests, the ICO Open-E-Rack 2221 system has been officially certified according to the Open-E Hardware Certification Program.
Tests results show that the system is functional and efficient.
With the Open-E DSS V6 operating system installed, the ICO Open-E-Rack 2221 is stable and performs well.
In general, the system can be used for many different applications, but the following are recommended:

✓ **Storage for database**

The following features make ICO Open-E-Rack 2221 a great storage for database:

- Hardware RAID5, RAID50, RAID6, RAID60 and RAID10 for fast and reliable database storage.
- Eight SAS drives for reliability and fast database access.
- Four 1GbE interfaces, which can be aggregated, for improved fault tolerance and increased performance.

✓ **iSCSI storage**

The following features make ICO Open-E-Rack 2221 great iSCSI target solution:

- Four 1GbE interfaces for a fast MPIO network connection to a target.
- Hardware RAID5, RAID50, RAID6, RAID60 and RAID10 for high performance and data safety.
- Eight fast and reliable SAS drives.

✓ **NAS filer**

The following features make ICO Open-E-Rack 2221 a good NAS filer:

- Eight SAS Drives for failure-free, fast and random data access.
- Four network interfaces allow connections from separated networks.
- Hardware RAID5, RAID50, RAID6, RAID60 and RAID10 for a secure and reliable NAS storage.

✓ **HA cluster**

For this setup two identical systems are required. The following features make ICO Open-E-Rack great for an HA cluster:

- Four 1GbE interfaces allow fast node replication and fast data access simultaneously.
- Hardware RAID5, RAID50, RAID6, RAID60 and RAID10 for greater node availability.

Certification notes

Balance-alb bonding is recommended for link aggregation.

ICO Open-E-Rack 2221 (yst8) hardware components

The technical specification of the certified system is listed below.

Model	ICO Open-E-Rack 2221 (yst8)
Operating system	Open-E DSS V6 build 5845
Enclosure/chassis	Chenbro RM23424H-001
CPU	Intel Xeon E3-1220 3.10GHz S1155
Motherboard	Intel Beartooth Pass S1200BTL
Memory	2x 2GB Kingston DDR3 FSB1333 (KVR1333D3E9S/2GI)
Network	Intel Gigabit Ethernet Adapter based on 82574L
Network	Intel Gigabit Ethernet Adapter based on 82579LM
Network	Intel Gigabit Ethernet Dual Network Card I350-T2
HW RAID	LSI 9260CV-4i 4 Port 6Gb/s
Hard disk drives	8x Seagate Savvio 10K.5, 2,5" 300GB (ST9300605SS)

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

All components were detected and properly recognized.

ICO Open-E-Rack 2221 (yst8) photos

FIGURE 1: Front photo

FIGURE 2: Rear photo

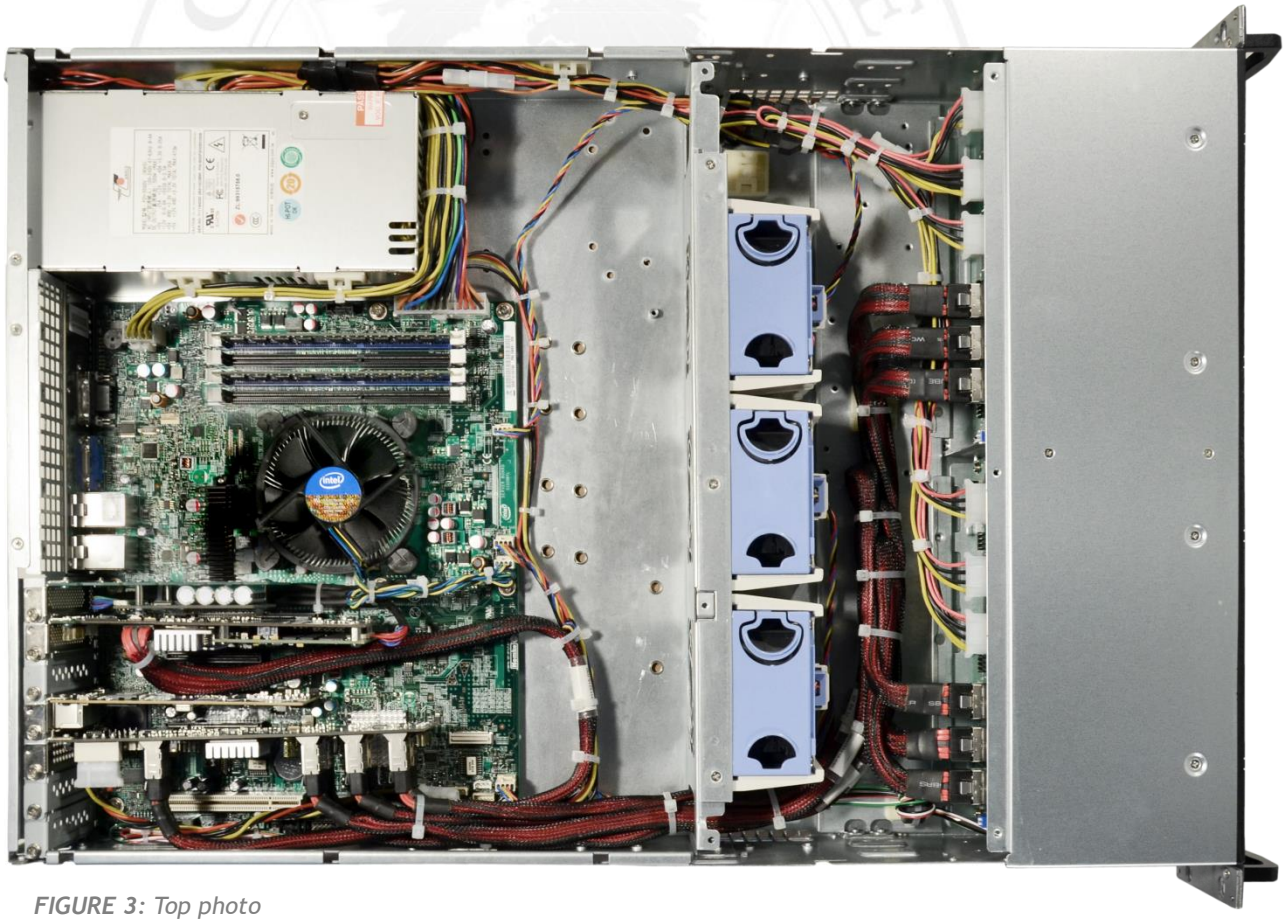

FIGURE 3: Top photo

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	Chenbro PC61761H-001
Motherboard	Intel Beartooth Pass SE S1155 (S1200BTS)
CPU	Intel Xeon E3-1220 3.10GHz S1155
Memory	2x Hynix 2GB DDR3 FSB1333 (HMT125U7BFR8C-H9)
Network controller	Intel Gigabit Ethernet Adapter based on 82574L
Network controller	Intel Gigabit Ethernet Adapter based on 82574LM
Hard disk drives	Western Digital 500GB RE4 24x7 64MB

TABLE 2: Hardware components of first Workstation with MS Windows

Model	Custom
Operating system	MS Windows Server 2008 R2
Enclosure/chassis	Chenbro PC61761H-001
Motherboard	Intel Beartooth Pass SE S1155 (S1200BTS)
CPU	Intel Xeon E3-1220 3.10GHz S1155
Memory	2x Hynix 2GB DDR3 FSB1333 (HMT125U7BFR8C-H9)
Network controller	Intel Gigabit Ethernet Adapter based on 82574L
Network controller	Intel Gigabit Ethernet Adapter based on 82574LM
Hard disk drives	Western Digital 500GB RE4 24x7 64MB

TABLE 3: Hardware components of second Workstation with MS Windows

Model	Custom
Operating system	Open-E DSS V6 build 5845
Enclosure/chassis	Chenbro PC61761H-001
Motherboard	Intel Beartooth Pass SE S1155(S1200BTS)
CPU	Intel Xeon E3-1220 3.10GHz 4/4 S1155
Memory	2x Hynix 2GB DDR3 FSB1333 (HMT125U7BFR8C-H9)
Network controller	Intel Gigabit Ethernet Adapter based on 82574L
Network controller	Intel Gigabit Ethernet Adapter based on 82579LM
Network controller	Intel PCI-E GNWK Server 2x RJ-45
HW RAID controller	Areca ARC-1680ix-12
Hard disk drives	2x Western Digital 500GB RE4 24x7 64MB (WD5003ABYX)

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

Model	3COM 4519G (3CRS45G-48-91)
Description	48-ports 1GbE

TABLE 5: Network switch details

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

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.

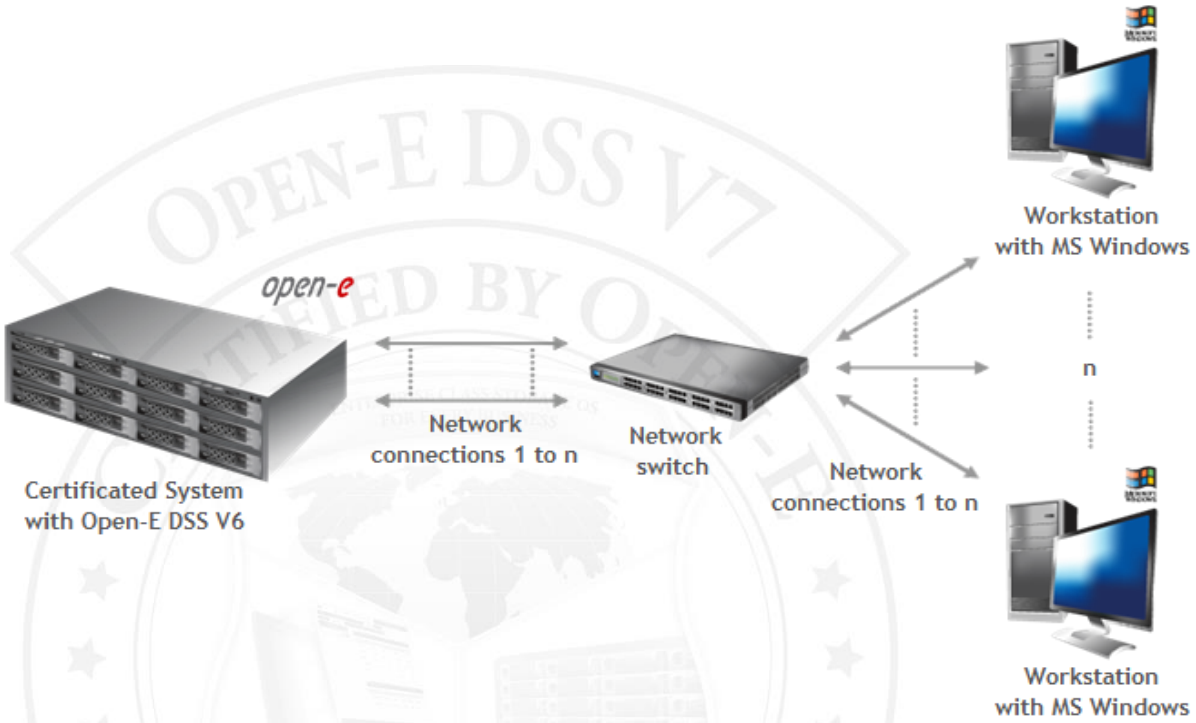

FIGURE 4: Network topology for Network testing

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 Intel Dual Network Card I350-T2 (on board).

802.3ad bonding mode performance test results			
NIC model	Intel Dual Network Card I350-T2		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
1st Workstation	112	56	passed
2nd Workstation	112	57	passed

TABLE 7: 802.3ad bonding mode performance test results table for Intel Dual Network Card I350-T2 (on board).

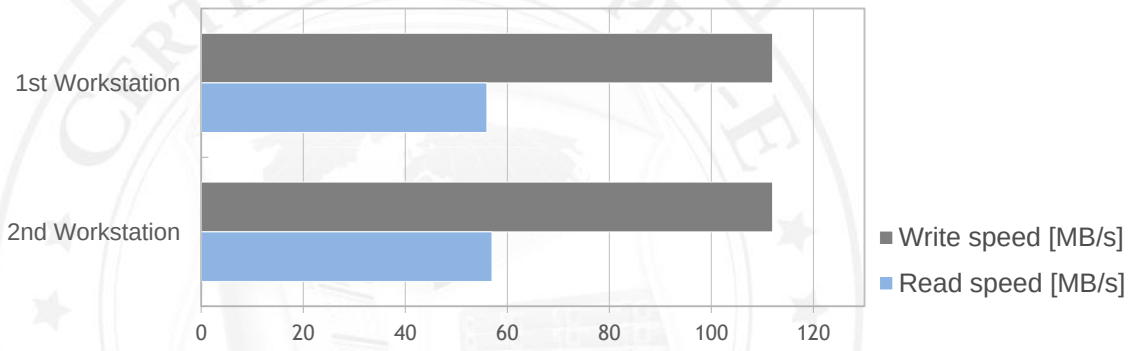

FIGURE 5: 802.3ad bonding mode performance test results chart for Intel Dual Network Card I350-T2 (on board).

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 Dual Network Card I350-T2 (on board).

Balance-alb bonding mode performance test results			
NIC model	Intel Dual Network Card I350-T2		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
1st Workstation	108	94	passed
2nd Workstation	109	100	passed

TABLE 8: Balance-alb bonding mode performance test results table for Intel Dual Network Card I350-T2 (on board).

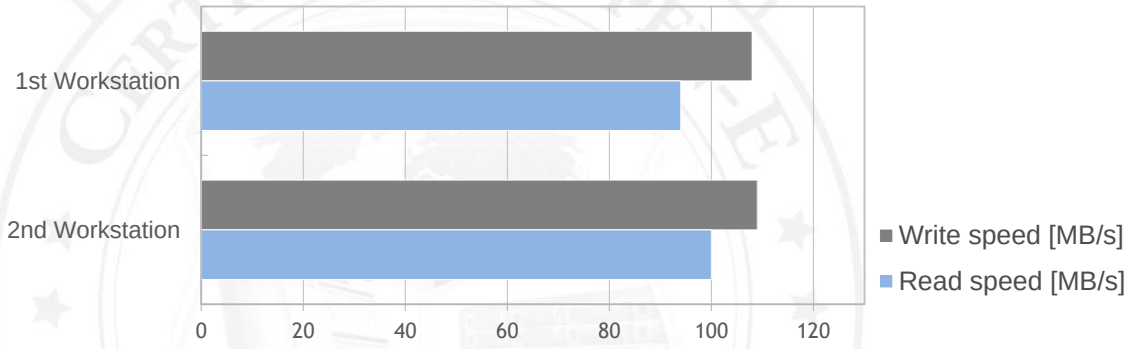

FIGURE 6: Balance-alb bonding mode performance test results chart for Intel Dual Network Card I350-T2 (on board).

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 Dual Network Card I350-T2 (on board).

Balance-rr bonding mode performance test results			
NIC model	Intel Dual Network Card I350-T2		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
1st Workstation	112	111	passed
2nd Workstation	112	111	passed

TABLE 9: Balance-rr bonding mode performance test results table for Intel Dual Network Card I350-T2 (on board).

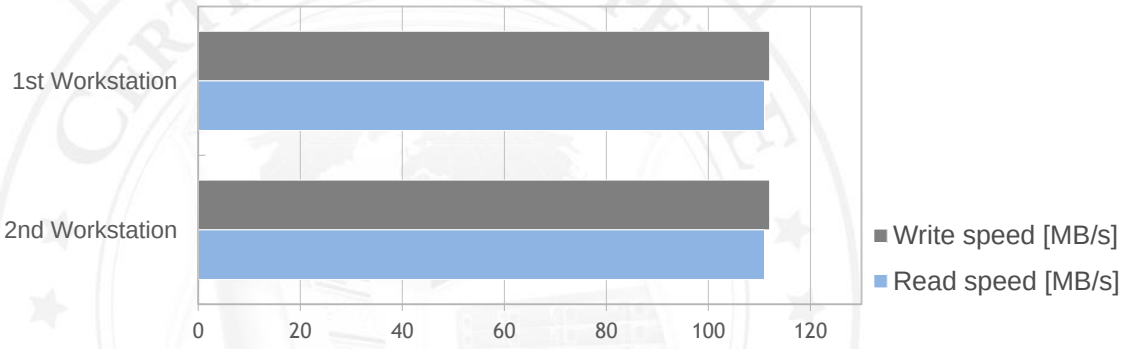

FIGURE 7: Balance-rr bonding mode performance test results chart for Intel Dual Network Card I350-T2 (on board).

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 Gigabit Ethernet Adapter based on 82574L (on-board)

Single NIC performance test results			
NIC model	Intel Ethernet Server Adapter based on 82574L		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
1st Workstation	110.00	103.00	passed

TABLE 10: Single NIC test results table for Intel Gigabit Ethernet Server Adapter based on 82574L (on-board)

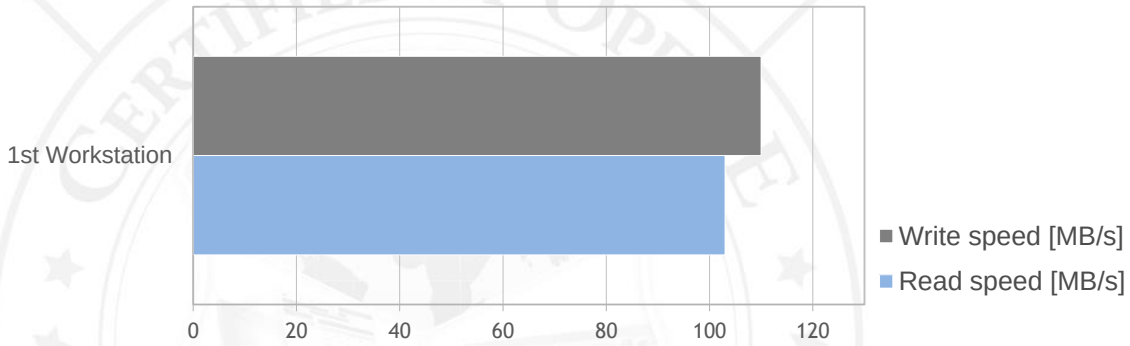

FIGURE 8: Single NIC performance test results chart for Gigabit Ethernet Server Adapter based on 82574L (on-board)

3. Test results for single NIC test performed on Intel Gigabit Ethernet Adapter based on 82579LM (on-board)

Single NIC performance test results			
NIC model	Intel Ethernet Server Adapter based on 82579LM		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
1st Workstation	110.00	101.00	passed

TABLE 11: Single NIC test results table for Intel Gigabit Ethernet Server Adapter based on 82579LM (on-board)

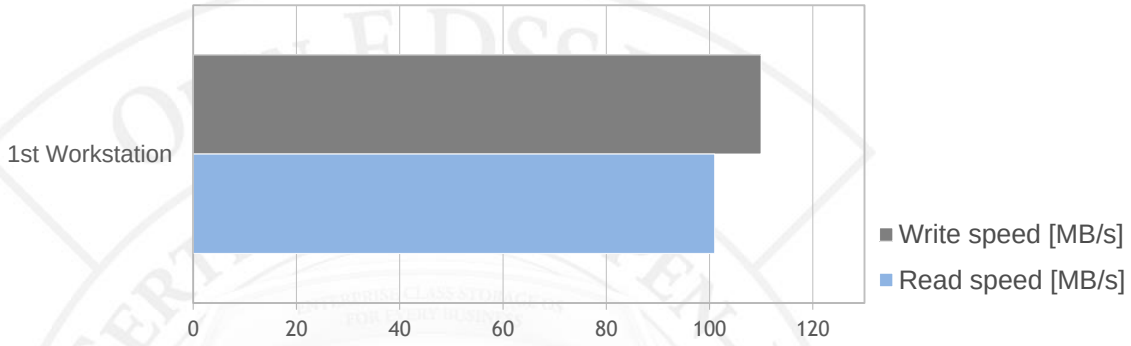

FIGURE 9: Single NIC performance test results chart for Gigabit Ethernet Server Adapter based on 82579LM (on-board)

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 level 0, 00, 1, 5, 6, 10, 50 and 60, 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

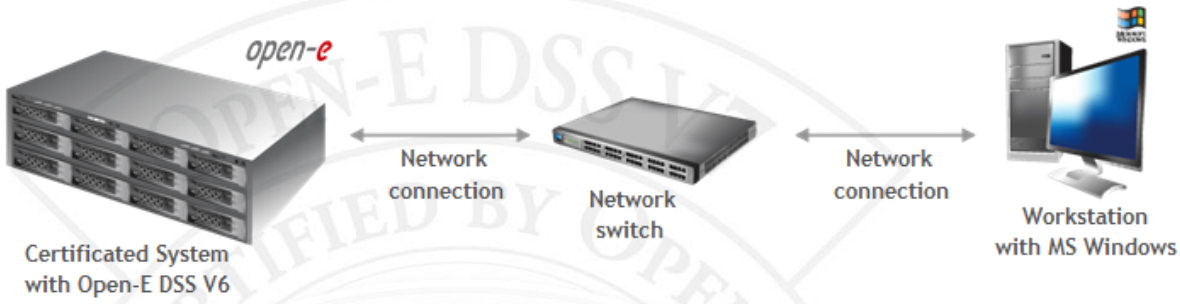

FIGURE 10: Network test topology for RAID testing

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 Dual Network Card I350-T2 (on board).

RAID0 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	41	27	passed
32	110	110	passed
64	111	111	passed
128	111	111	passed
256	112	112	passed
512	112	112	passed
1024	112	112	passed
4096	112	112	passed

TABLE 12: RAID0 performance test results table with Intel Dual Network Card I350-T2 (on board).

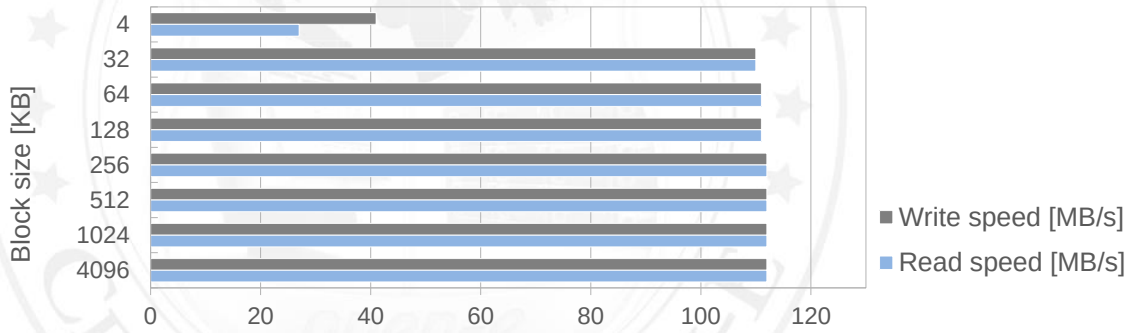

FIGURE 11: RAID0 performance test results chart with Intel Dual Network Card I350-T2 (on board).

Hardware RAID1 test

1. Test description

The test relies on creation of the RAID1 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 RAID1 and Intel Dual Network Card I350-T2 (on board).

RAID1 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	41	27	passed
32	108	111	passed
64	110	111	passed
128	110	112	passed
256	112	111	passed
512	112	112	passed
1024	112	112	passed
4096	112	112	passed

TABLE 13: RAID1 performance test results table with Intel Dual Network Card I350-T2 (on board).

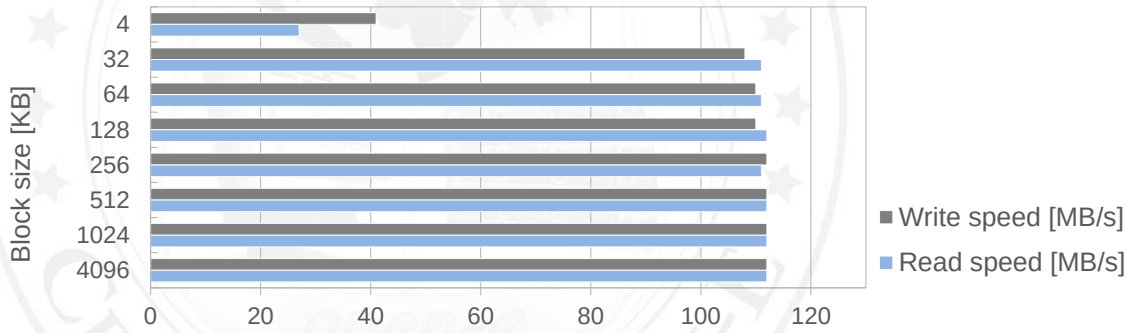

FIGURE12: RAID1 performance test results chart with Intel Dual Network Card I350-T2 (on board).

Hardware RAID00 test

1. Test description

The test relies on creation of the RAID00 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 RAID00 and Intel Dual Network Card I350-T2 (on board).

RAID00 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	41	27	passed
32	110	110	passed
64	111	111	passed
128	111	111	passed
256	111	111	passed
512	112	112	passed
1024	112	112	passed
4096	112	112	passed

TABLE 14: RAID00 performance test results table with Intel Dual Network Card I350-T2 (on board).

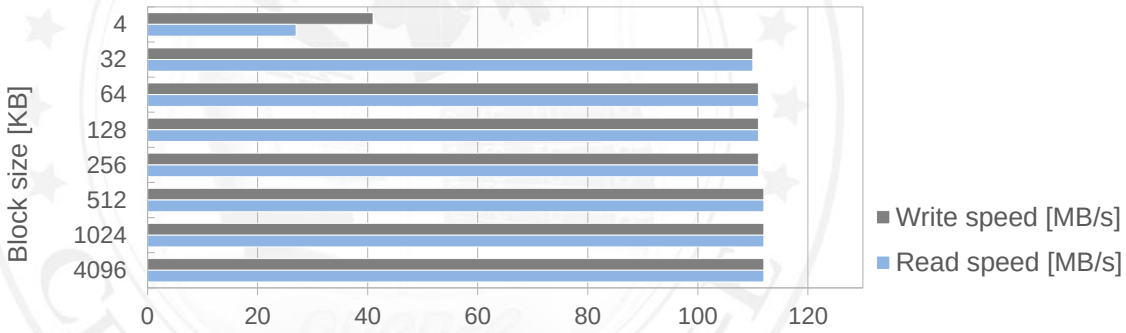

FIGURE 13: RAID00 performance test results chart with Intel Dual Network Card I350-T2 (on board).

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 Dual Network Card I350-T2 (on board).

RAID5 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	39	27	passed
32	108	111	passed
64	110	111	passed
128	110	111	passed
256	111	112	passed
512	112	112	passed
1024	112	111	passed
4096	112	112	passed

TABLE 15: RAID5 performance test results table with Intel Dual Network Card I350-T2 (on board).

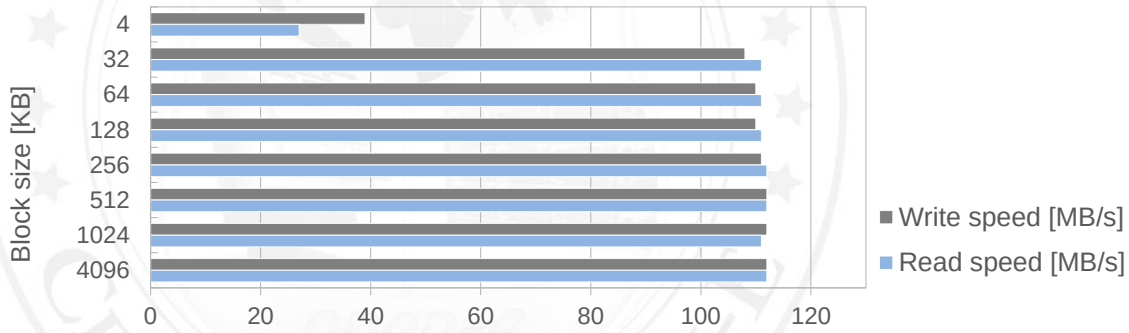

FIGURE 14: RAID5 performance test results chart with Intel Dual Network Card I350-T2 (on board).

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 Dual Network Card I350-T2 (on board).

RAID6 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	41	27	passed
32	109	110	passed
64	110	111	passed
128	110	111	passed
256	112	111	passed
512	112	112	passed
1024	112	112	passed
4096	112	112	passed

TABLE 16: RAID6 performance test results table with Intel Dual Network Card I350-T2 (on board).

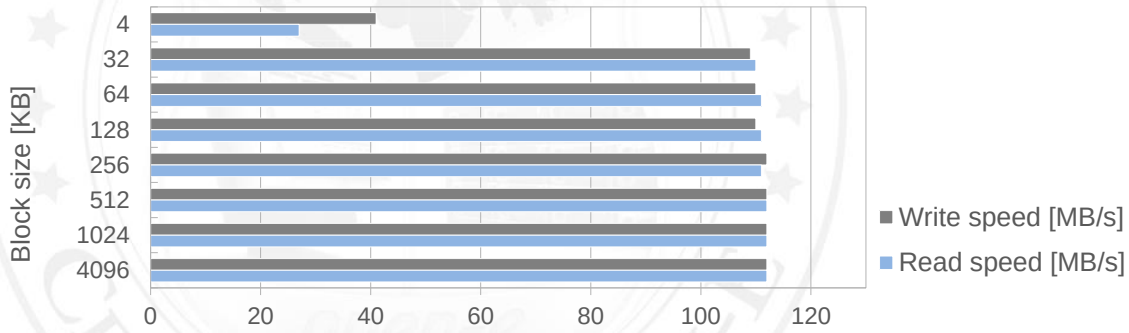

FIGURE 15: RAID6 performance test results chart with Intel Dual Network Card I350-T2 (on board).

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 Dual Network Card I350-T2 (on board).

RAID10 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	40	27	passed
32	109	110	passed
64	110	111	passed
128	110	112	passed
256	112	111	passed
512	112	112	passed
1024	112	112	passed
4096	112	112	passed

TABLE 17: RAID10 performance test results table with Intel Dual Network Card I350-T2 (on board).

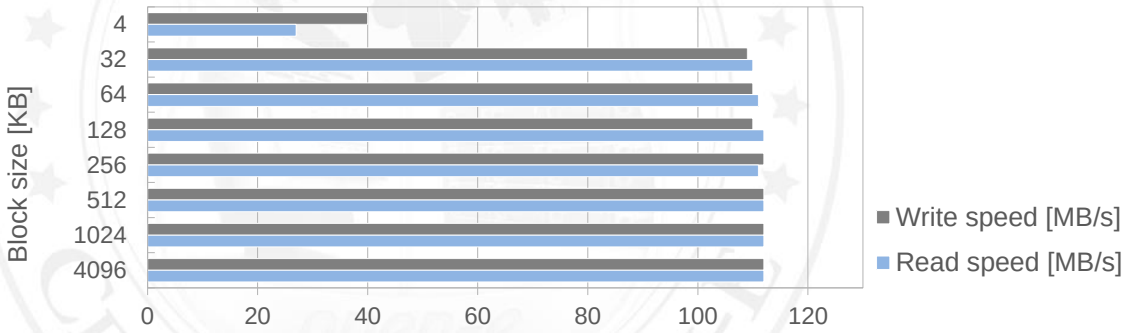

FIGURE 16: RAID10 performance test results chart with Intel Dual Network Card I350-T2 (on board).

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 Dual Network Card I350-T2 (on board).

RAID50 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	41	28	passed
32	109	110	passed
64	110	111	passed
128	111	112	passed
256	112	111	passed
512	112	112	passed
1024	112	112	passed
4096	112	112	passed

TABLE 18: RAID50 performance test results table with Intel Dual Network Card I350-T2 (on board).

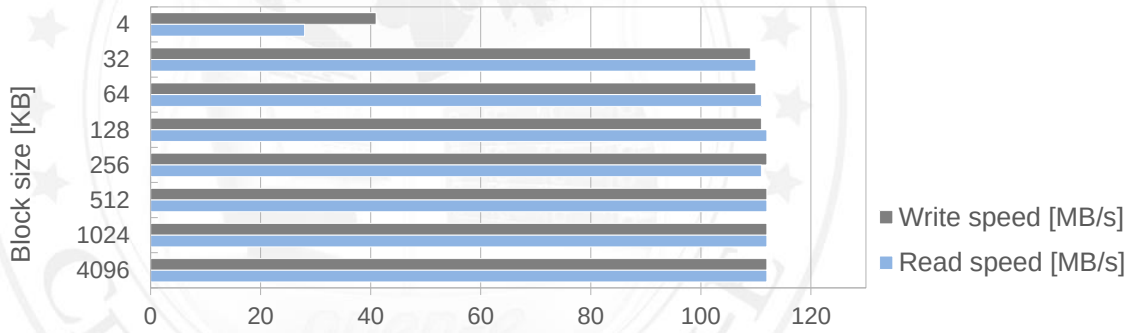

FIGURE 17: RAID50 performance test results chart with Intel Dual Network Card I350-T2 (on board).

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 Iometer testing tool.

2. Test results for RAID60 and Intel Dual Network Card I350-T2 (on board).

RAID60 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	41	27	passed
32	109	110	passed
64	110	111	passed
128	110	111	passed
256	112	111	passed
512	112	112	passed
1024	112	112	passed
4096	112	112	passed

TABLE 19: RAID60 performance test results table with Intel Dual Network Card I350-T2 (on board).

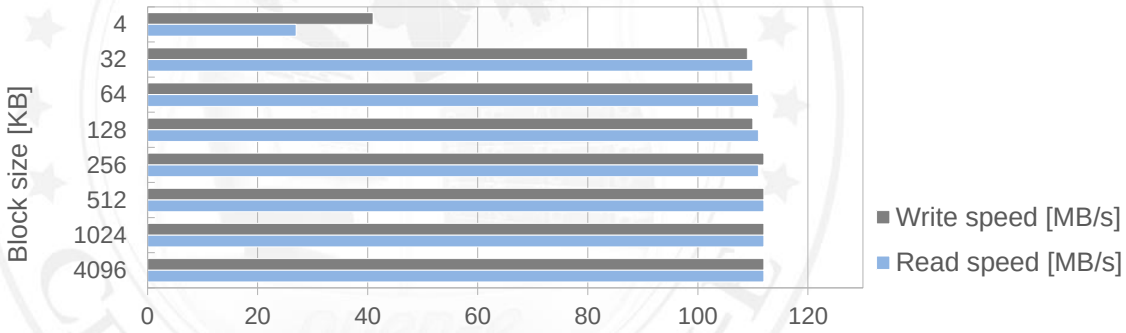

FIGURE 18: RAID60 performance test results chart with Intel Dual Network Card I350-T2 (on board).

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.

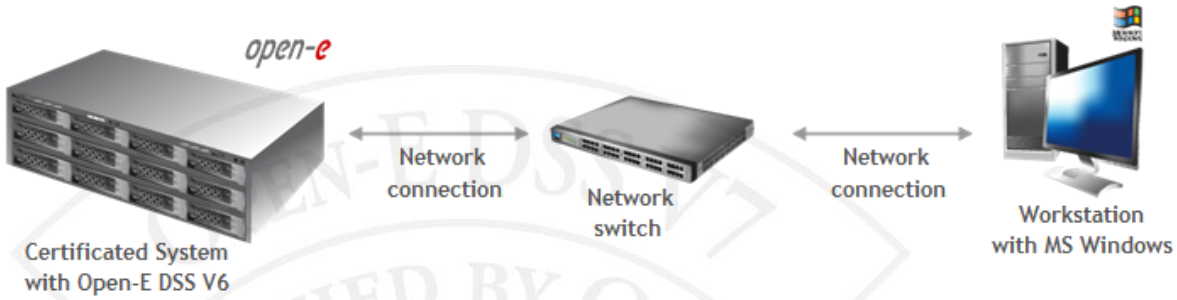

FIGURE 19: Network topology for NAS testing

SMB test

1. Test description

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

2. Test results for SMB and Intel Dual Network Card I350-T2 (on board).

SMB performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	57	40	passed
32	112	111	passed
64	112	109	passed
128	112	106	passed
256	112	111	passed
512	112	111	passed
1024	112	111	passed
4096	112	111	passed

TABLE 20: SMB performance test results table with Intel Dual Network Card I350-T2 (on board).

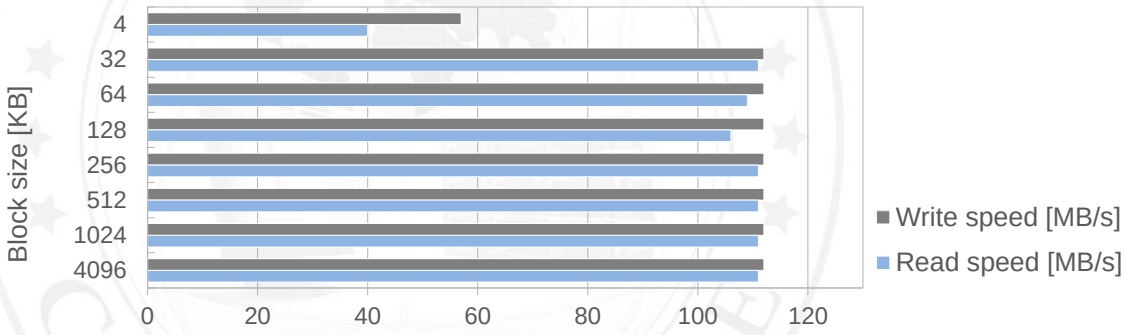

FIGURE 20: SMB performance test results chart with Intel Dual Network Card I350-T2 (on board).

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.

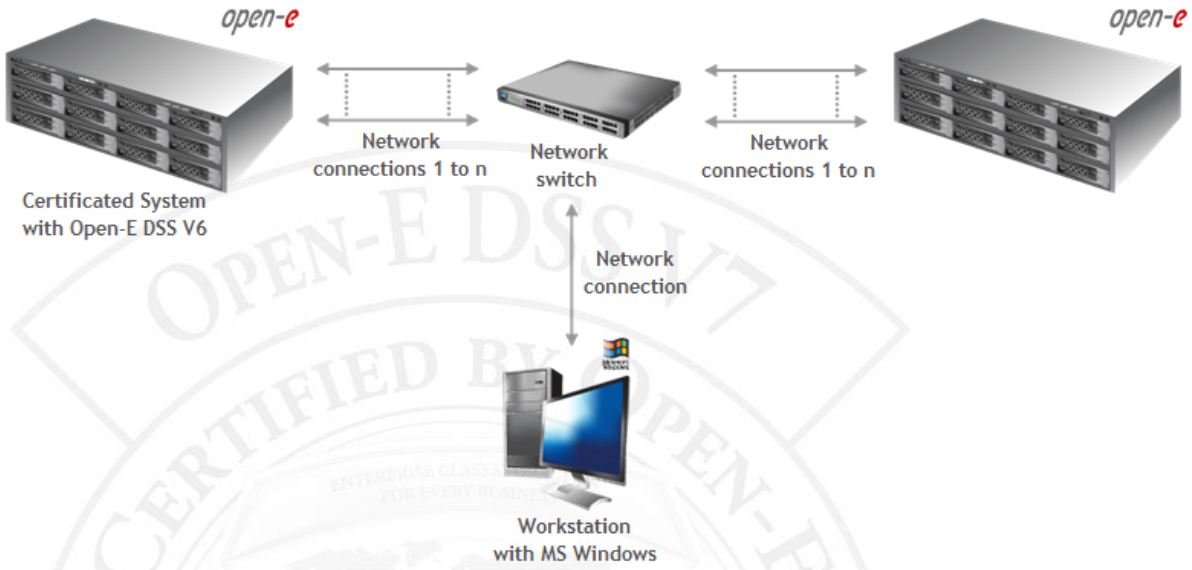

FIGURE 21: Network topology for iSCSI Initiator testing

iSCSI Target test topology

Network topology for iSCSI Target testing is shown below.

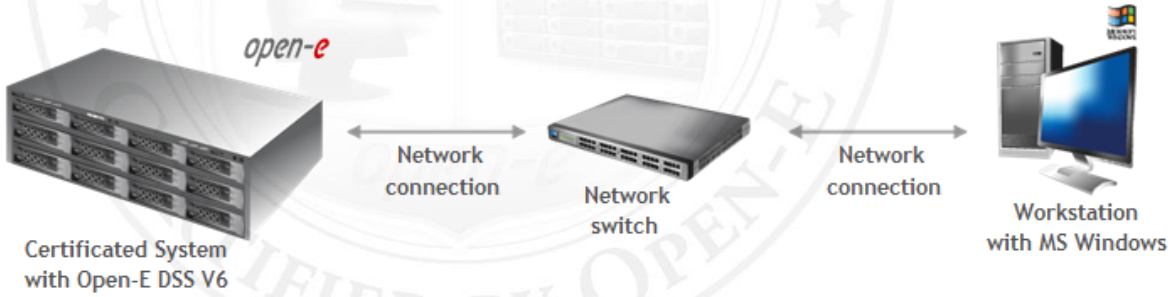

FIGURE 22: Network topology for iSCSI Target testing

iSCSI Initiator test

1. Test description

The test relies on using the storage, connected via the built-in iSCSI Initiator, for NAS volumes, creating SMB shares on these NAS volumes and copying data from a Workstation with MS Windows to them with various block sizes using the Iometer testing tool.
Tests were performed using network connection.

2. Test results for iSCSI Initiator and Intel Dual Network Card I350-T2 (on board).

iSCSI Initiator performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	41	57	passed
32	109	112	passed
64	111	95	passed
128	111	110	passed
256	111	112	passed
512	112	112	passed
1024	112	112	passed
4096	112	112	passed

TABLE 21: iSCSI Initiator performance test results table with Intel Dual Network Card I350-T2 (on board).

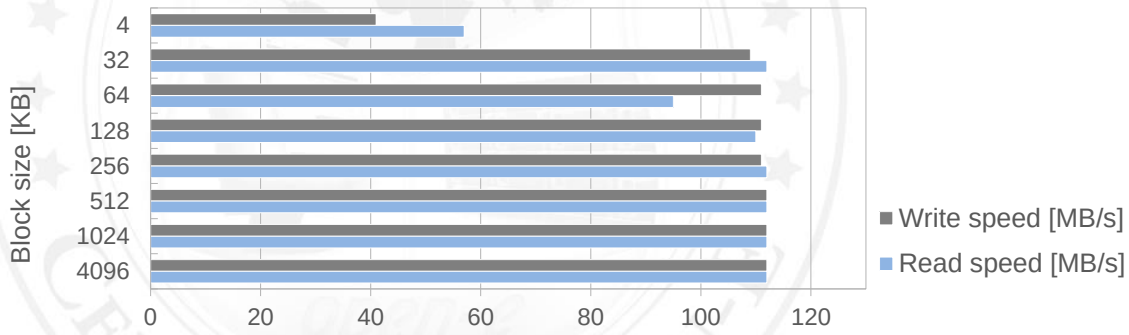

FIGURE 23: iSCSI Initiator performance test results chart with Intel Dual Network Card I350-T2 (on board).

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 Dual Network Card I350-T2 (on board).

iSCSI Target performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	41	27	passed
32	109	111	passed
64	111	112	passed
128	111	112	passed
256	112	112	passed
512	112	112	passed
1024	112	112	passed
4096	112	112	passed

TABLE 22: iSCSI Target performance test results table with Intel Dual Network Card I350-T2 (on board).

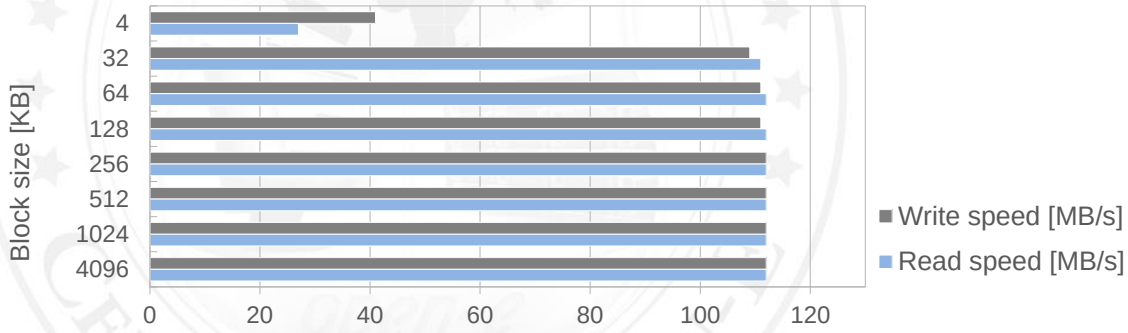

FIGURE 24: iSCSI Target performance test results chart with Intel Dual Network Card I350-T2 (on board).