macle GmbH GRAFENTHAL R2208 S2 Storage system

Executive summary

After performing all tests, the macle GmbH GRAFENTHAL R2208 S2 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 macle GmbH GRAFENTHAL R2208 S2 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 the macle GmbH GRAFENTHAL R2208 S2 great storage for databases:

  - **Two 1GbE interfaces for database connection.**
  - **Hardware RAID10 for high performance, best I/Ops ratio and data safety.**
  - **Eight SSD drives ensure fast random data access and reliability.**

- ✓ **NAS filer**

  For this application the following can be used:

  - **Eight SSD drives provide a good amount of I/OPS for user files access.**
  - **Hardware RAID5 for fault tolerance and the most efficient use of available disk space or RAID10 for increased IOPS.**
  - **Two 1GbE interfaces for independent connection to different networks or link aggregation for improved throughput.**

- ✓ **iSCSI storage**

  The following features make macle GmbH GRAFENTHAL R2208 S2 good iSCSI storage:

  - **Eight SSD drives provide high performance and random data access to storage.**
  - **Two 1GbE interfaces for fast MPIO connection and flexible network topology.**
  - **Redundant power supply for system reliability.**

Certification notes

For link aggregation, it is recommended to use balance-alb bonding mode.

macle GmbH GRAFENTHAL R2208 S2 hardware components

Technical specifications about the certified system are listed below:

Model	macle GmbH GRAFENTHAL R2208 S2
Operating system	Open-E DSS V7 build 16323
Enclosure/chassis	Grafenthal R2208 S2
CPU	Intel® Xeon® Processor E5-2620 v3 2.40GHz
Motherboard	Inspur M3250
Memory	2x 8GB Crucial CT8G4RFS4213 DDR4 ECC REG
Network	Intel® Ethernet Controller I350-AM2
HW RAID	LSI MegaRaid SAS 9361-8i
Hard disk drives	8x 256GB Toshiba THNSNJ256GCSU

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

macle GmbH GRAFENTHAL R2208 S2 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	macle GmbH GRAFENTHAL T1004
Operating system	MS Windows Server 2012 R2
Enclosure/chassis	GRAFENTHAL Compact Performance Server
Motherboard	ASROCK E3C226D2I
CPU	Intel® Xeon® Processor E3-1220 V3 3.10GHz
Memory	8GB Crucial CT8G4RFS4213 DDR4 ECC REG
Network	2x Intel® Ethernet Controller I210-AT
Hard disk drives	1TB HGST HTS721010A9E630

TABLE 2: Hardware components of first Workstation with MS Windows

Model	macle GmbH GRAFENTHAL T1004
Operating system	MS Windows Server 2012 R2
Enclosure/chassis	GRAFENTHAL Compact Performance Server
Motherboard	ASROCK E3C226D2I
CPU	Intel® Xeon® Processor E3-1220 V3 3.10GHz
Memory	8GB Crucial CT8G4RFS4213 DDR4 ECC REG
Network	2x Intel® Ethernet Controller I210-AT
Hard disk drives	1TB HGST HTS721010A9E630

TABLE 3: Hardware components of second Workstation with MS Windows

Model	macle GmbH GRAFENTHAL R2208 S2
Operating system	Open-E DSS V7 build 16323
Enclosure/chassis	Grafenthal R2208 S2
CPU	Intel® Xeon® Processor E5-2620 v3 2.40GHz
Motherboard	Inspur M3250
Memory	2x 8GB Crucial CT8G4RFS4213 DDR4 ECC REG
Network	Intel® Ethernet Controller I350-AM2
HW RAID	LSI MegaRaid SAS 9361-8i
Hard disk drives	8x 256GB Toshiba THNSNJ256GCSU

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

Model	Netgear ProSafe Plus XS708E
Description	8x 100/1000/10000 Mbps ports with 1 combo port supporting 10GbE SFP

TABLE 5: Network switch details for connection with 1GbE

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.

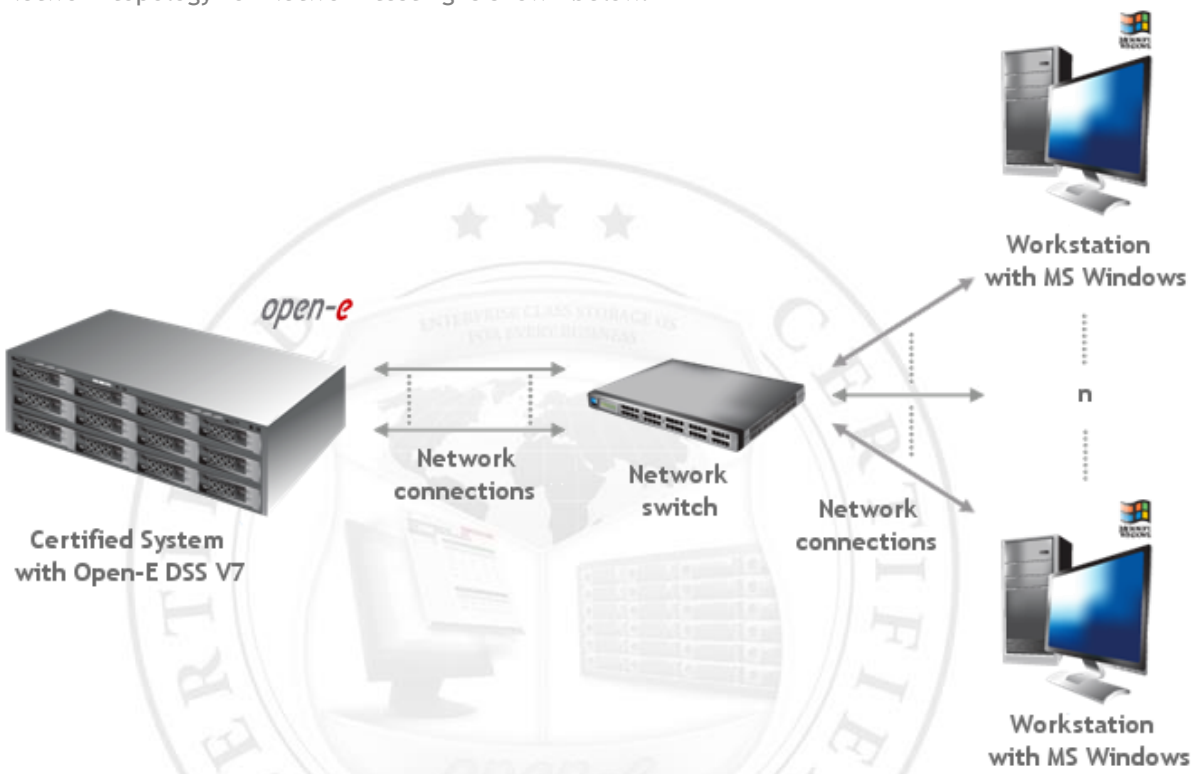

FIGURE 4: Network topology for Network testing

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 Controller I350-AM2

802.3ad bonding mode performance test results			
NIC model	Intel® Ethernet Controller I350-AM2		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1st Workstation	58.61	60.77	passed
2nd Workstation	56.00	61.26	passed

TABLE 7: 802.3ad bonding mode performance test results table for Intel® Ethernet Controller I350-AM2

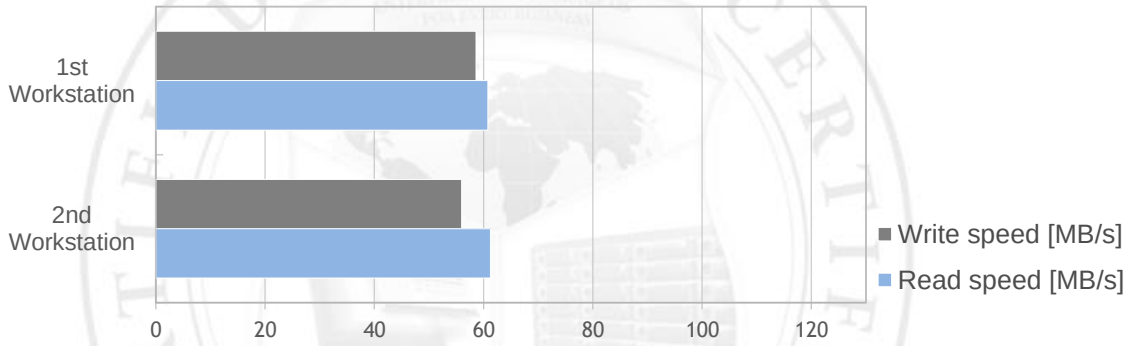

FIGURE 5: 802.3ad bonding mode performance test results chart for Intel® Ethernet Controller I350-AM2

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 Controller I350-AM2

Balance-alb bonding mode performance test results			
NIC model	Intel® Ethernet Controller I350-AM2		
Workstations with MS Windows	**Write speed [MB/s]**	**Read speed [MB/s]**	**Performance test results**
1st Workstation	112.96	112.90	passed
2nd Workstation	112.99	112.92	passed

TABLE 8: Balance-alb bonding mode performance test results table for Intel® Ethernet Controller I350-AM2

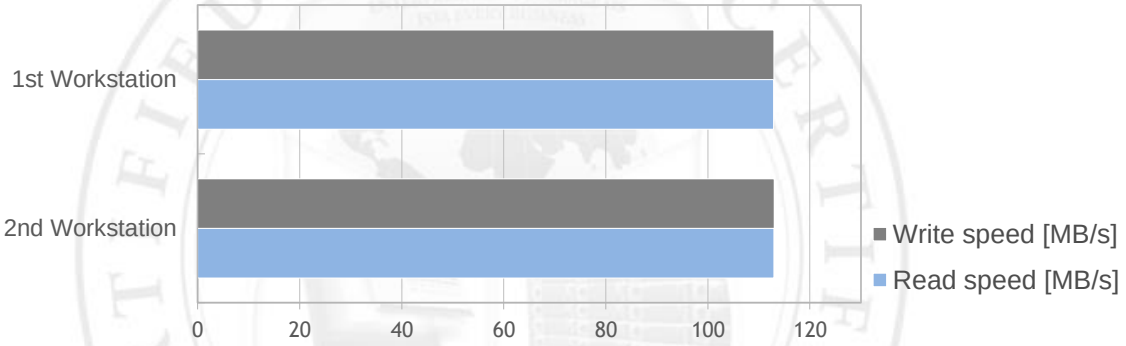

FIGURE 6: Balance-alb bonding mode performance test results chart for Intel® Ethernet Controller I350-AM2

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® Ethernet Controller I350-AM2

Balance-rr bonding mode performance test results			
NIC model	Intel® Ethernet Controller I350-AM2		
Workstations with MS Windows	**Write speed [MB/s]**	**Read speed [MB/s]**	**Performance test results**
1st Workstation	54.68	102.87	passed
2nd Workstation	53.77	99.95	passed

TABLE 9: Balance-rr bonding mode performance test results table for Intel® Ethernet Controller I350-AM2

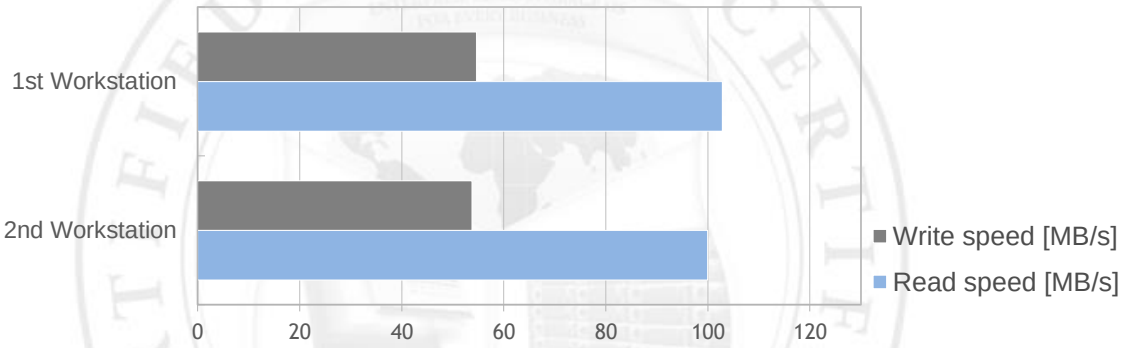

FIGURE 7: Balance-rr bonding mode performance test results chart for Intel® Ethernet Controller I350-AM2

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 Controller I350-AM2

Single NIC performance test results			
NIC model	Intel® Ethernet Controller I350-AM2		
Workstations with MS Windows	**Write speed [MB/s]**	**Read speed [MB/s]**	**Performance test results**
1st Workstation	112.99	112.89	passed

TABLE 10: Single NIC performance test results table for Intel® Ethernet Controller I350-AM2

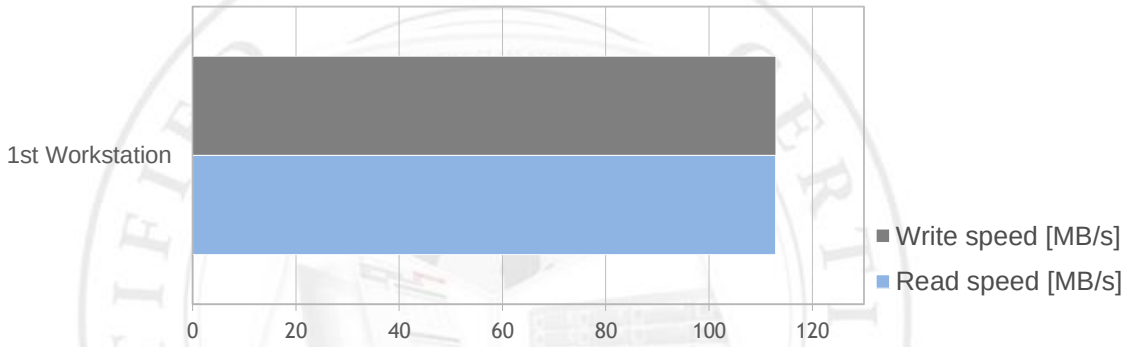

FIGURE 8: Single NIC performance test results chart for Intel® Ethernet Controller I350-AM2

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, 1, 5, and 10 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

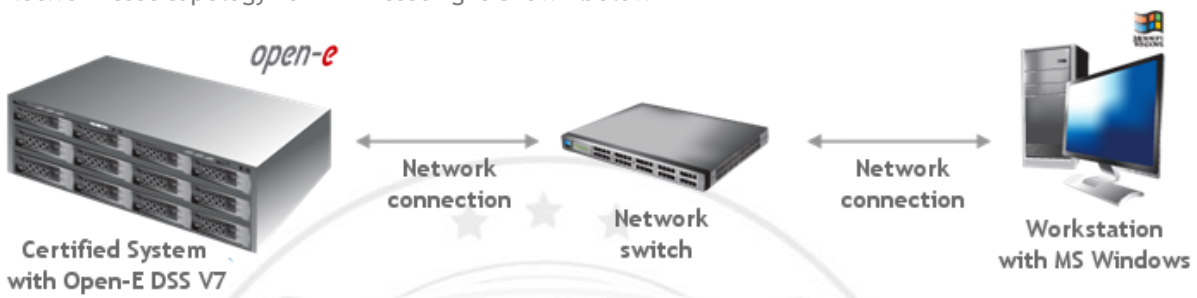

FIGURE 9: Network test topology for RAID testing

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 Controller I350-AM2

RAID0 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	36.29	36.19	passed
32	112.75	112.66	passed
64	112.95	112.90	passed
128	112.96	112.91	passed
256	112.99	112.91	passed
512	112.98	112.92	passed
1024	112.98	112.90	passed
4096	112.93	112.84	passed

TABLE 11: RAID0 performance test results table for Intel® Ethernet Controller I350-AM2

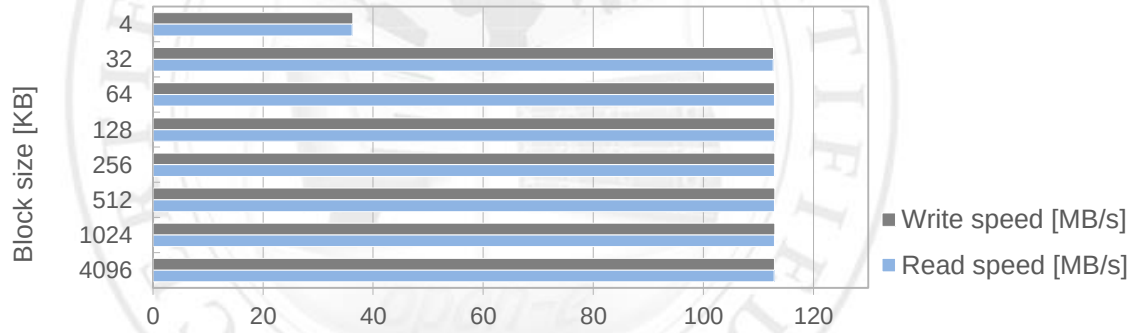

FIGURE 10: RAID0 performance test results chart for Intel® Ethernet Controller I350-AM2

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® Ethernet Controller I350-AM2

RAID1 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	44.76	36.77	passed
32	112.74	112.41	passed
64	112.96	112.70	passed
128	112.96	112.74	passed
256	113.00	112.75	passed
512	112.99	112.73	passed
1024	112.98	112.79	passed
4096	112.90	112.73	passed

TABLE 12: RAID1 performance test results table for Intel® Ethernet Controller I350-AM2

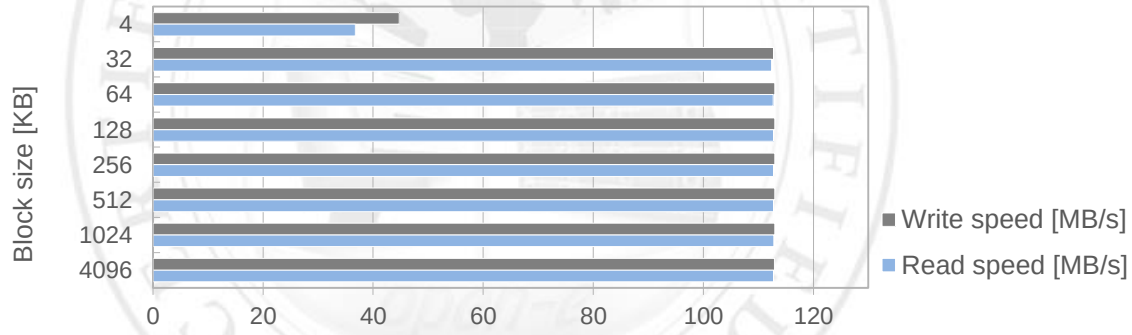

FIGURE 11: RAID1 performance test results chart for Intel® Ethernet Controller I350-AM2

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 Controller I350-AM2

RAID5 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	41.44	37.54	passed
32	112.75	112.51	passed
64	112.96	112.77	passed
128	112.96	112.84	passed
256	113.00	112.86	passed
512	112.99	112.89	passed
1024	112.98	112.88	passed
4096	112.93	112.84	passed

TABLE 13: RAID5 performance test results table for Intel® Ethernet Controller I350-AM2

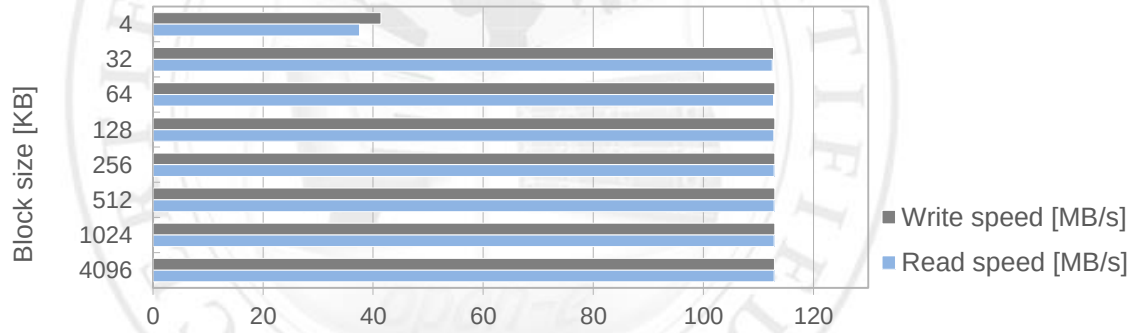

FIGURE 12: RAID5 performance test results chart for Intel® Ethernet Controller I350-AM2

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® Ethernet Controller I350-AM2

RAID10 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	36.07	37.14	passed
32	112.70	112.67	passed
64	112.96	112.91	passed
128	112.96	112.92	passed
256	113.00	112.85	passed
512	112.99	112.95	passed
1024	112.98	112.92	passed
4096	112.90	112.88	passed

TABLE 14: RAID10 performance test results table for Intel® Ethernet Controller I350-AM2

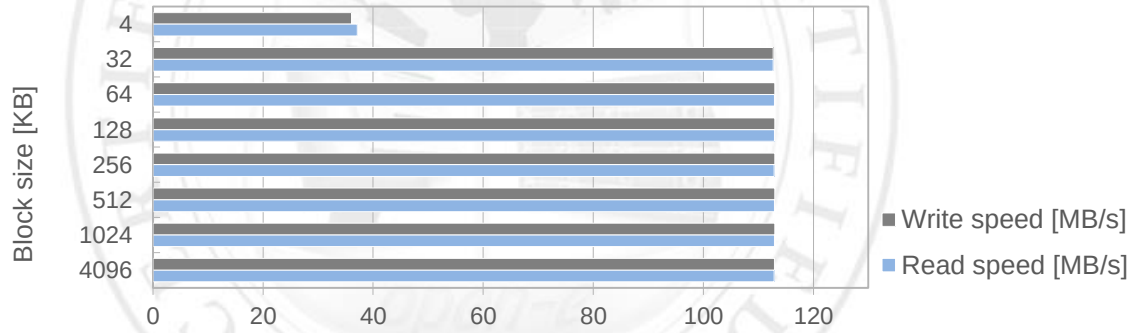

FIGURE 13: RAID10 performance test results chart for Intel® Ethernet Controller I350-AM2

NAS functionality

Tests performed in this section check the functionality, performance and stability of the NAS protocols in the Open-E DSS V7 product on the certified system.

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

NAS test topology

Network topology for NAS testing is shown below.

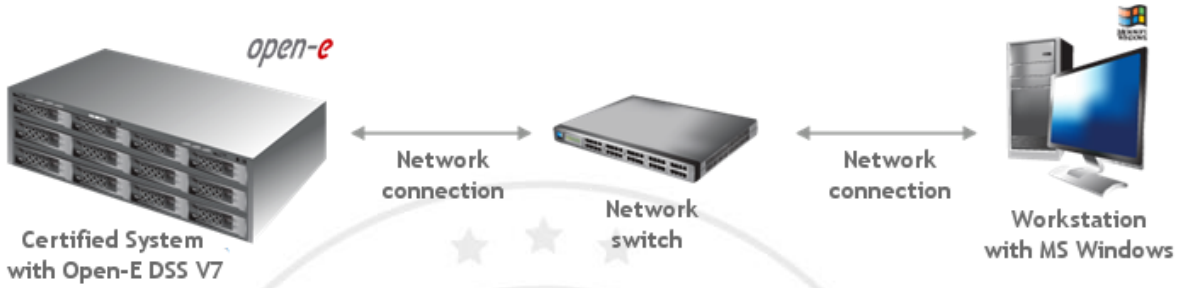

FIGURE 14: Network topology for NAS testing

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® Ethernet Controller I350-AM2

SMB performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	63.35	63.58	passed
32	112.65	112.68	passed
64	112.90	104.24	passed
128	112.82	110.96	passed
256	112.85	112.77	passed
512	112.88	112.78	passed
1024	112.88	112.66	passed
4096	112.79	112.76	passed

TABLE 15: SMB performance test results table for Intel® Ethernet Controller I350-AM2

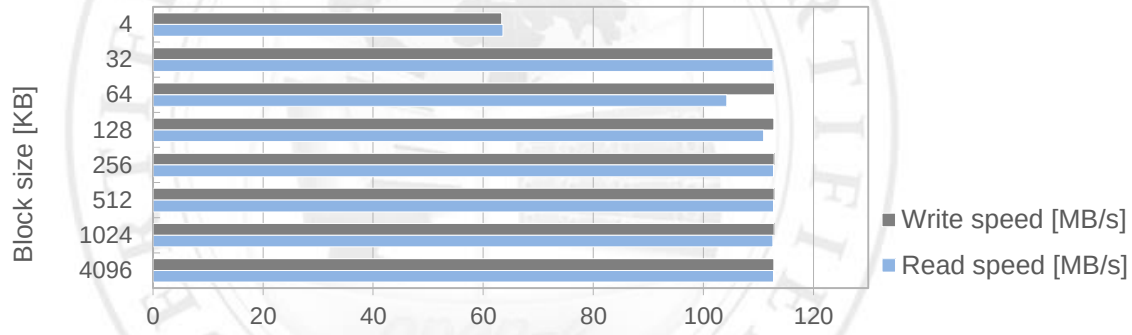

FIGURE 15: SMB performance test results chart for Intel® Ethernet Controller I350-AM2

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.

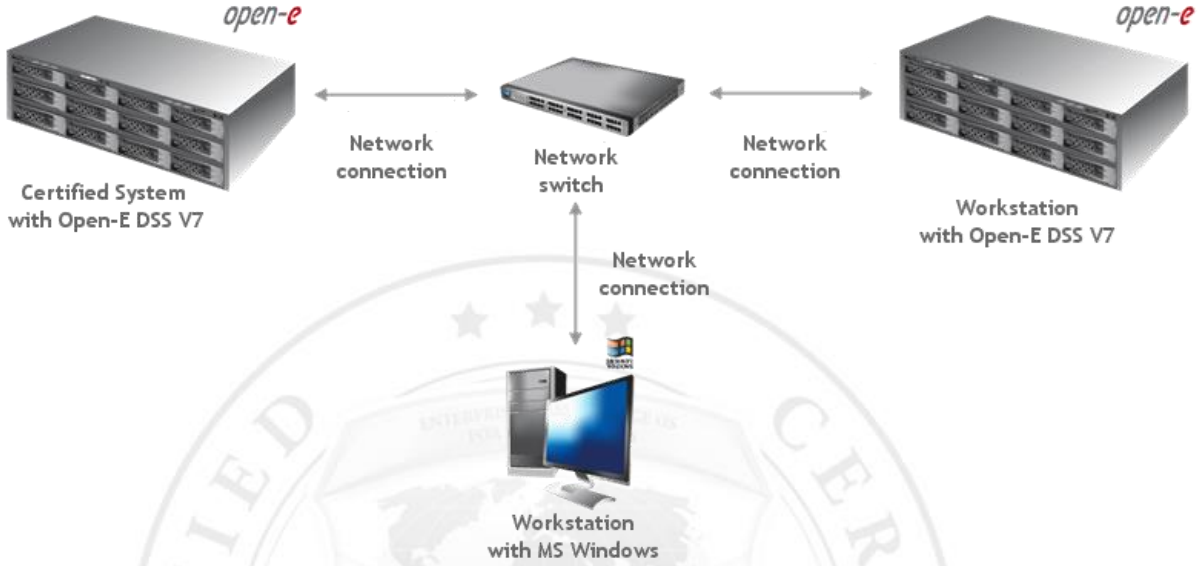

FIGURE 16: Network topology for iSCSI Initiator testing

iSCSI Target test topology

Network topology for iSCSI Target testing is shown below.

FIGURE 17: Network topology for iSCSI Target testing

iSCSI Initiator test

1. Test description

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

2. Test results for iSCSI Initiator and Intel® Ethernet Controller I350-AM2

iSCSI Initiator performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	43.35	36.62	passed
32	112.75	112.65	passed
64	112.96	112.90	passed
128	112.96	112.91	passed
256	113.00	112.91	passed
512	112.99	112.92	passed
1024	112.98	112.90	passed
4096	112.90	112.84	passed

TABLE 16: iSCSI Initiator performance test results table for Intel® Ethernet Controller I350-AM2

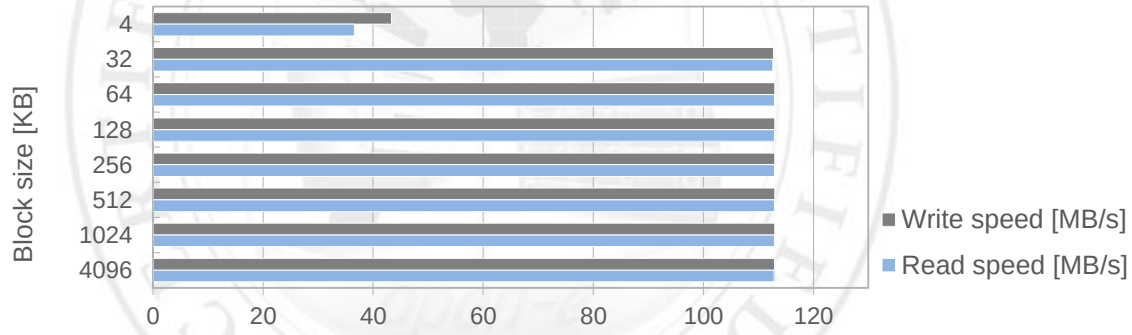

FIGURE 18: iSCSI Initiator performance test results chart for Intel® Ethernet Controller I350-AM2

iSCSI Target test

1. Test description

The test relies on creating the iSCSI target on the certified system and copying the data from a *Workstation with MS Windows* to it with various block sizes using the Iometer tool.

2. Test results for iSCSI Target and Intel® Ethernet Controller I350-AM2

iSCSI Target performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	63.31	63.66	passed
32	112.66	112.69	passed
64	112.90	107.90	passed
128	112.84	110.22	passed
256	112.85	112.77	passed
512	112.87	112.79	passed
1024	112.89	112.36	passed
4096	112.84	112.79	passed

TABLE 17: iSCSI Target performance test results table for Intel® Ethernet Controller I350-AM2

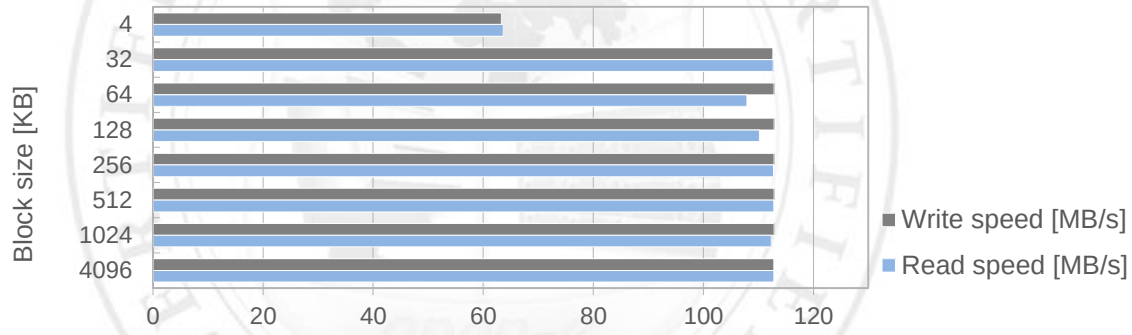

FIGURE 19: iSCSI Target performance test results chart for Intel® Ethernet Controller I350-AM2