

IBM System x3650 M3 storage system



Executive summary

After performing all tests, the IBM System x3650 M3 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 IBM System x3650 M3 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 IBM System x3650 M3 suitable for an HA cluster:

- Hardware RAID5, RAID10, RAID50 for greater node availability and increased performance.
- Two 1GbE interfaces allow node replication and data access simultaneously.
- Eight fast and reliable SAS drives.

✓ NAS filer

The following features make the IBM System x3650 M3 a good NAS filer solution:

- Eight SAS drives for failure-free work and fast random data access.
- Hardware RAID5, and RAID50 for fault tolerance and the most efficient use of available disk space.
- Two 1GbE interfaces for an independent connection to different networks or link aggregation for improved throughput.

✓ Storage for database

The following features make the IBM System x3650 M3 great storage for a database:

- Eight fast and reliable SAS drives.
- Two 1GbE interfaces, which can be aggregated for improved fault tolerance and increased performance.
- A server platform with fast CPUs for high performance.

Certification notes

We recommend using 802.3ad or Balance-alb bonding modes for link aggregation.

IBM System x3650 M3 hardware components	4
IBM System x3650 M3 photos	5
Auxiliary systems hardware components.....	6
Administration functionality	7
Network functionality	8
Network test topology	8
802.3ad bonding mode test	9
Balance-alb bonding mode test	10
Balance-rr bonding mode test	11
RAID functionality	12
RAID test topology.....	12
Hardware RAID0 test	13
Hardware RAID5 test	14
Hardware RAID10 test.....	15
Hardware RAID50 test.....	16
NAS functionality	17
NAS test topology.....	17
SMB test	18
iSCSI functionality	19
iSCSI Initiator test topology.....	19
iSCSI Target test topology	19
iSCSI Initiator test	20
iSCSI Target test	21

IBM System x3650 M3 hardware components

Technical specifications about the certified system are listed below:

Model	IBM System x3650 M3
Operating system	Open-E DSS V6 build 5845
Enclosure/chassis	IBM System x3650 M3
CPU	2x Intel Xeon E5620 2.40GHz
Motherboard	IBM 7945D2G (i5520)
Memory	2x 4GB Hynix DDR3 PC3-10600 HMT151R7TFR4C
Network	1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)
HW RAID	IBM ServeRAID M5015 SAS/SATA Controller
Hard disk drives	8x 300GB SAS Seagate Savvio 10K.3 ST9300603SS

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

All components were detected and properly recognized.



IBM System x3650 M3 photos

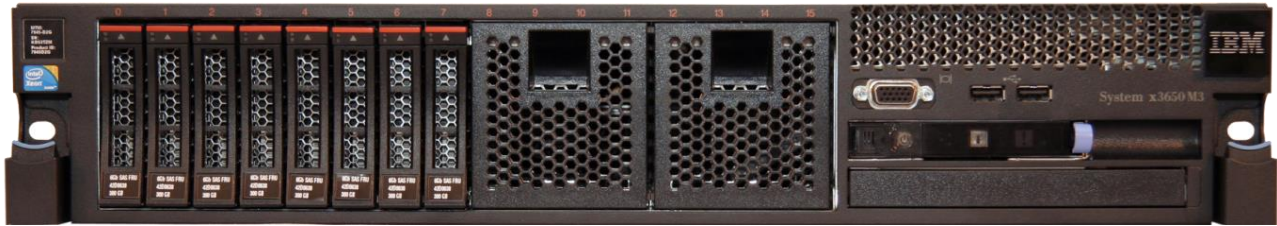


FIGURE 1: Front photo



FIGURE 2: Rear photo

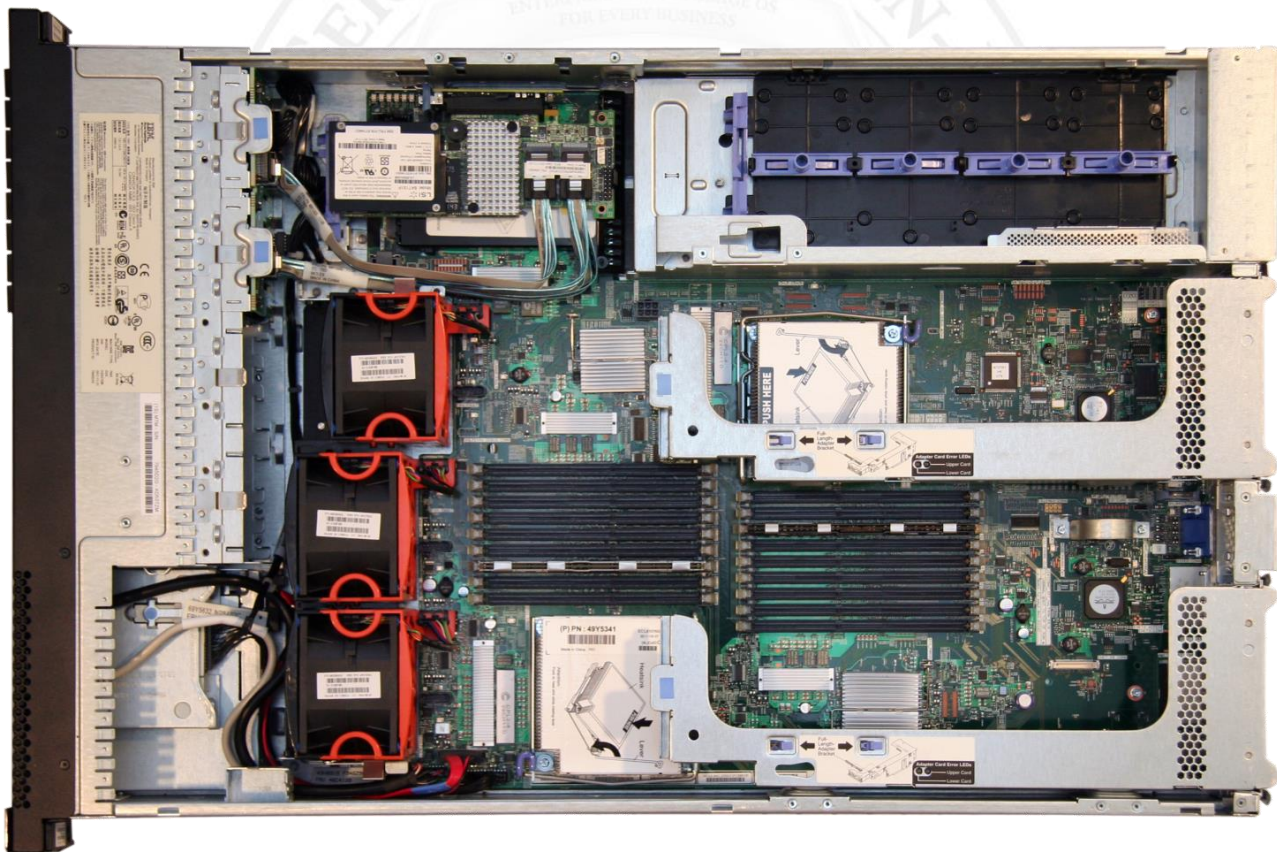


FIGURE 3: Top photo

Auxiliary systems hardware components

Auxiliary system with MS Windows or Open-E DSS V6 installed, 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	1GbE Intel PRO/1000PT Dual Port Adapter (i82571EB)
Network	1GbE Broadcom NetXtreme II (BCM5716)
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	1GbE Intel PRO/1000PT Dual Port Adapter (i82571EB)
Network	1GbE Broadcom NetXtreme II (BCM5716)
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	1GbE Intel PRO/1000 PT Quad LP Server Adapter (i82571GB)
Network	1GbE Broadcom NetXtreme II (BCM5716)
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-TG4
Description	24-ports 1GbE and 4-ports 10GbE switch

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.

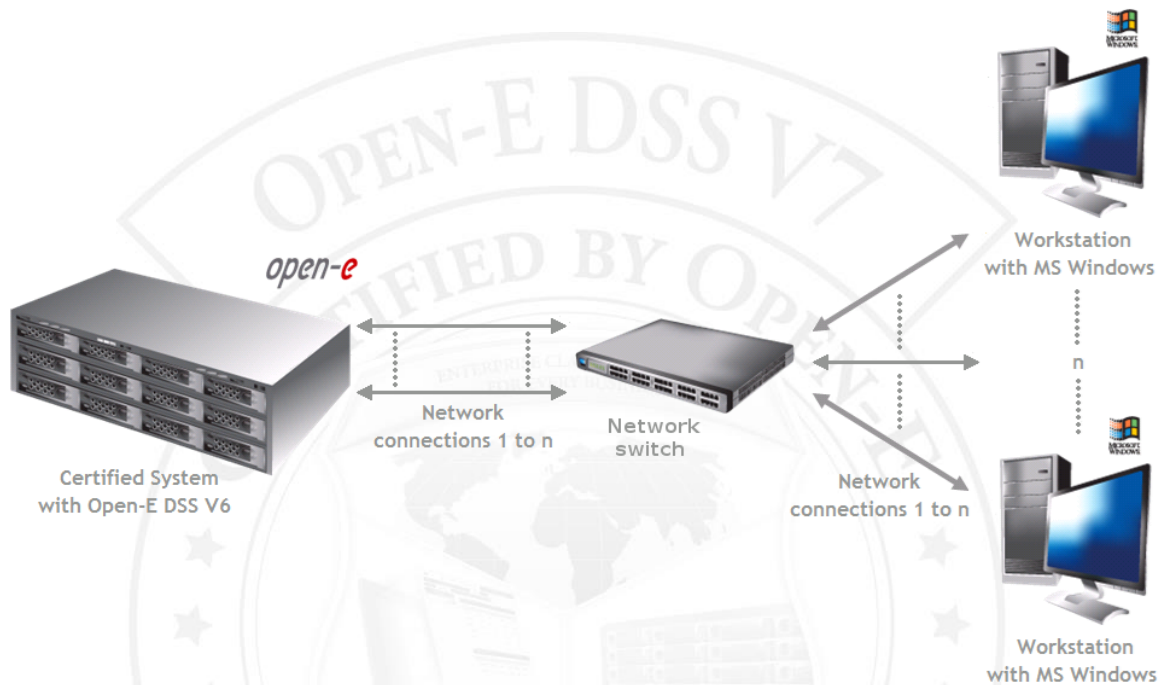


FIGURE 4: Network topology for Network testing

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 lometer testing tool.

2. Test results for 802.3ad bonding mode test performed on 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

802.3ad bonding mode performance test results			
NIC model	1GbE Broadcom NetXtreme II dual port (BCM5716)		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1 st Workstation	112.89	112.88	passed
2 nd Workstation	113.08	113.03	passed

TABLE 7: 802.3ad bonding mode performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

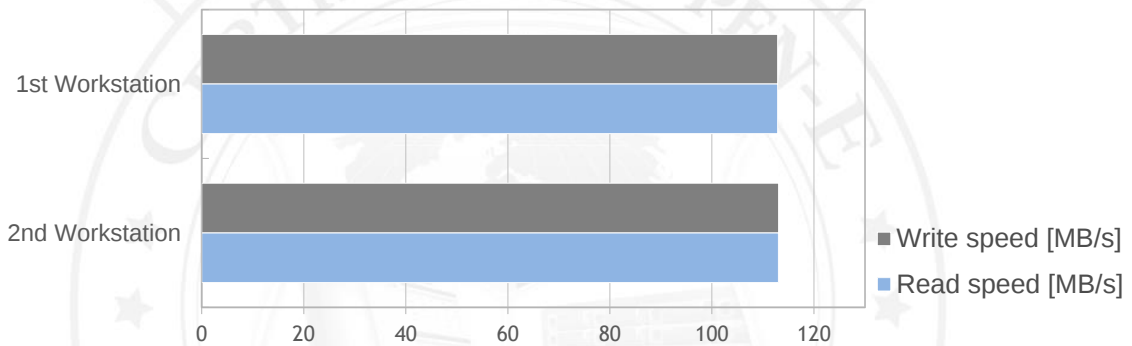


FIGURE 5: 802.3ad bonding mode performance test results chart for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

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 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

Balance-alb bonding mode performance test results			
NIC model	1GbE Broadcom NetXtreme II dual port (BCM5716)		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1 st Workstation	113.07	112.05	passed
2 nd Workstation	112.94	112.13	passed

TABLE 8: Balance-alb bonding mode performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

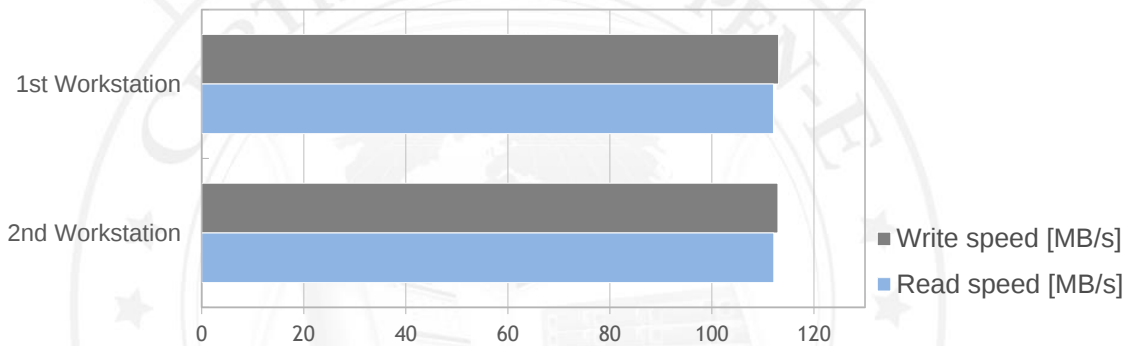


FIGURE 6: Balance-alb bonding mode performance test results chart for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

Balance-rr bonding mode test

1. Test description

The test relies on configuring the iSCSI targets and copying the data from many *Workstations with MS Windows* through a Balance-rr bonding mode network connection with a 4MB block size using the lometer testing tool.

2. Test results for Balance-rr bonding mode test performed on 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

Balance-rr bonding mode performance test results			
NIC model	1GbE Broadcom NetXtreme II dual port (BCM5716)		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance test results
1 st Workstation	108.62	92.23	passed
2 nd Workstation	108.55	77.63	passed

TABLE 9: Balance-rr bonding mode performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

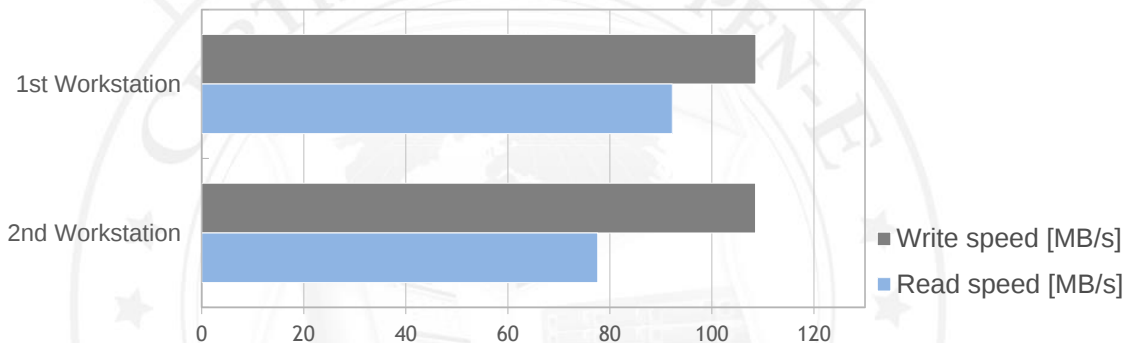


FIGURE 7: Balance-rr bonding mode performance test results chart for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

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, 5, 10 and 50 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

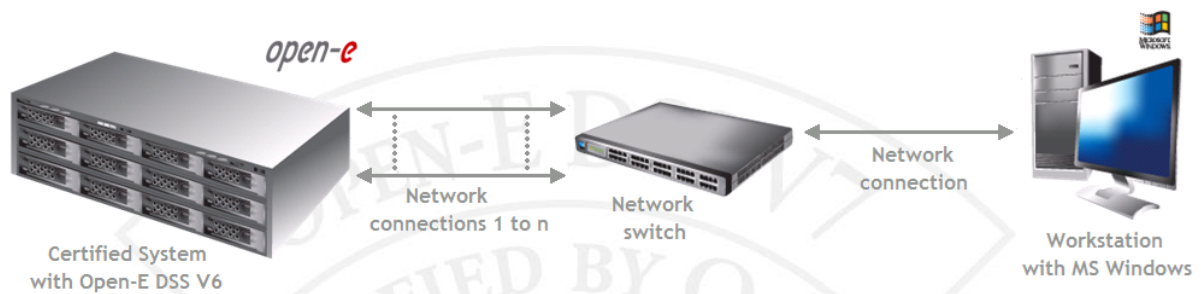


FIGURE 8: Network test topology for RAID testing

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 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

RAID0 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	63.40	95.73	passed
32	102.69	103.67	passed
64	107.99	108.63	passed
128	109.04	110.03	passed
256	111.97	112.85	passed
512	112.34	112.91	passed
1024	112.32	112.88	passed
4096	112.19	112.73	passed

TABLE 10: RAID0 performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

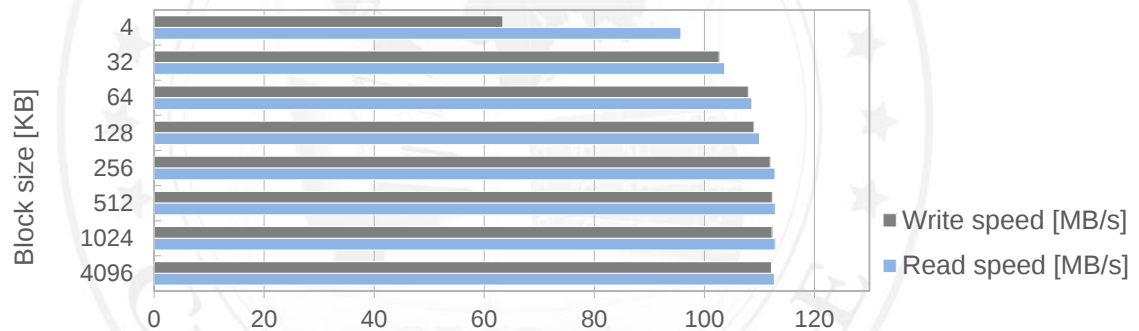


FIGURE 9: RAID0 performance test results chart for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

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 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

RAID5 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	52.30	95.23	passed
32	97.85	104.63	passed
64	102.59	108.73	passed
128	103.87	110.67	passed
256	107.79	112.86	passed
512	108.09	112.91	passed
1024	107.80	112.88	passed
4096	107.52	112.77	passed

TABLE 11: RAID5 performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

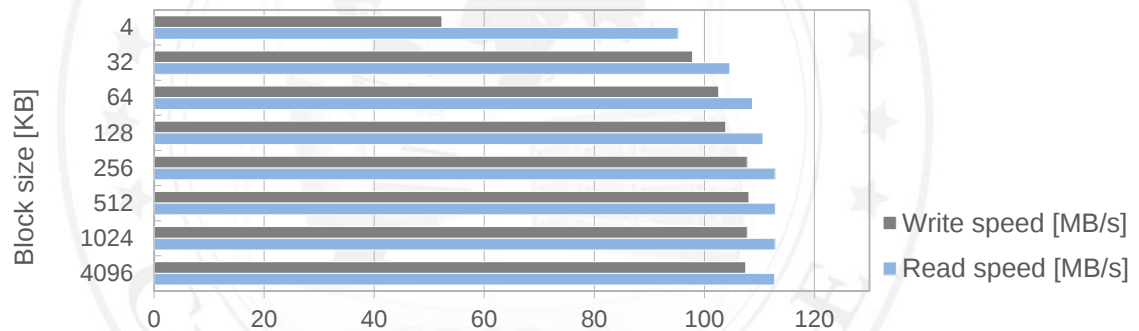


FIGURE 10: RAID5 performance test results chart for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

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 lometer testing tool.

2. Test results for RAID10 and 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

RAID10 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	57.33	95.80	passed
32	102.68	104.32	passed
64	107.86	108.56	passed
128	109.12	110.34	passed
256	111.98	112.85	passed
512	112.37	112.92	passed
1024	112.32	112.88	passed
4096	112.19	112.77	passed

TABLE 12: RAID10 performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

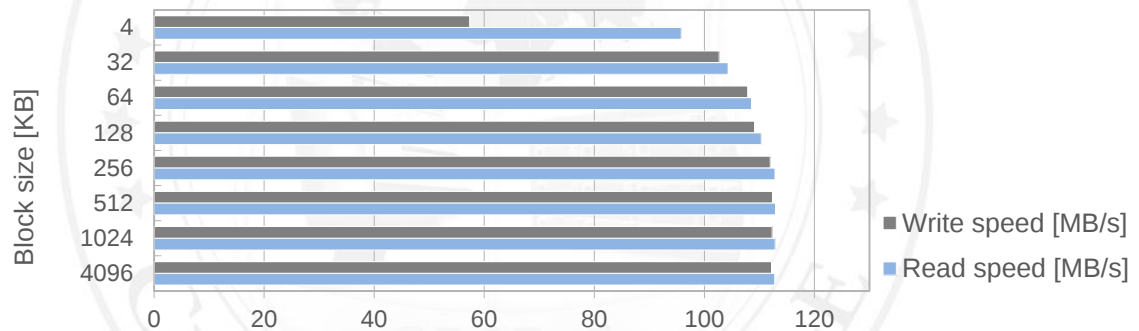


FIGURE 11: RAID10 performance test results chart for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

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 lometer testing tool.

2. Test results for RAID50 and 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

RAID50 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	63.79	94.64	passed
32	102.87	104.81	passed
64	107.91	108.55	passed
128	108.93	110.34	passed
256	112.06	112.88	passed
512	112.37	112.90	passed
1024	112.34	112.88	passed
4096	112.21	112.78	passed

TABLE 13: RAID50 performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

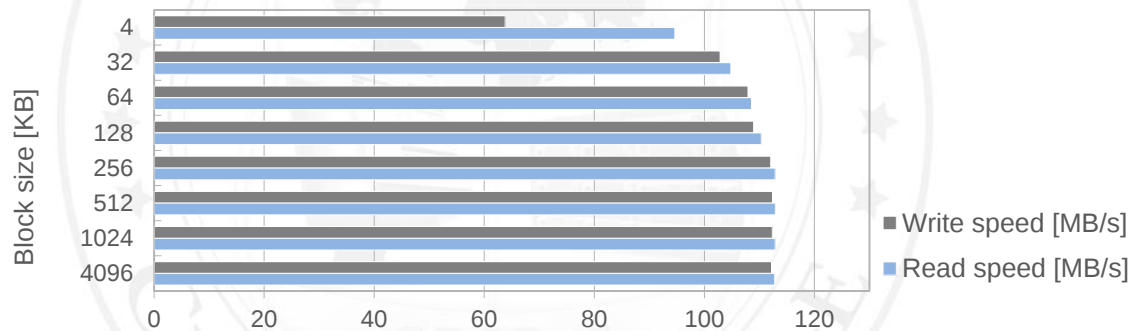


FIGURE 12: RAID50 performance test results chart for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

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 lometer testing tool.

NAS test topology

Network topology for NAS testing is shown below.

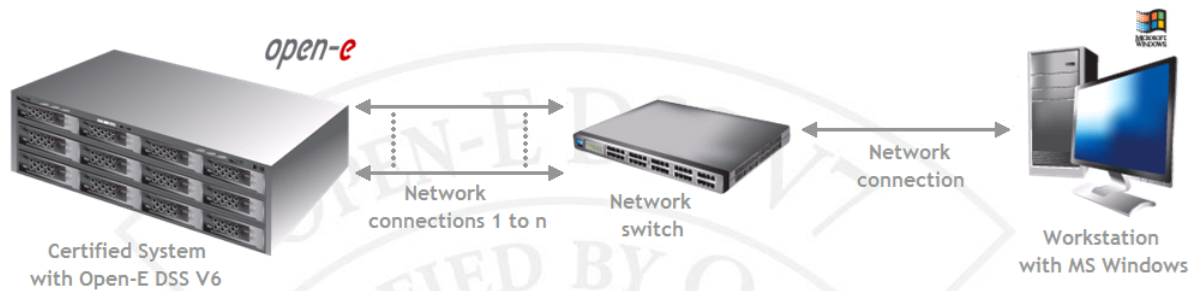


FIGURE 13: Network topology for NAS testing

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 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

SMB performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	84.09	98.86	passed
32	111.94	112.58	passed
64	112.29	111.97	passed
128	112.19	112.51	passed
256	112.24	112.31	passed
512	112.30	112.27	passed
1024	112.27	112.36	passed
4096	112.14	112.20	passed

TABLE 14: SMB performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

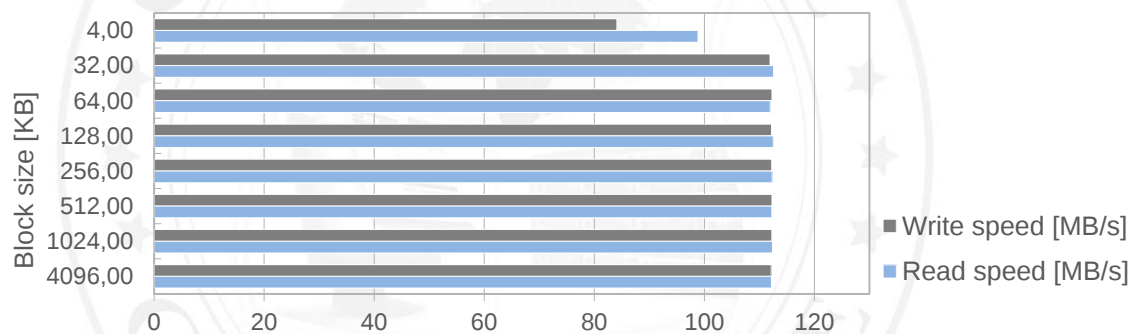


FIGURE 14: SMB performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

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.

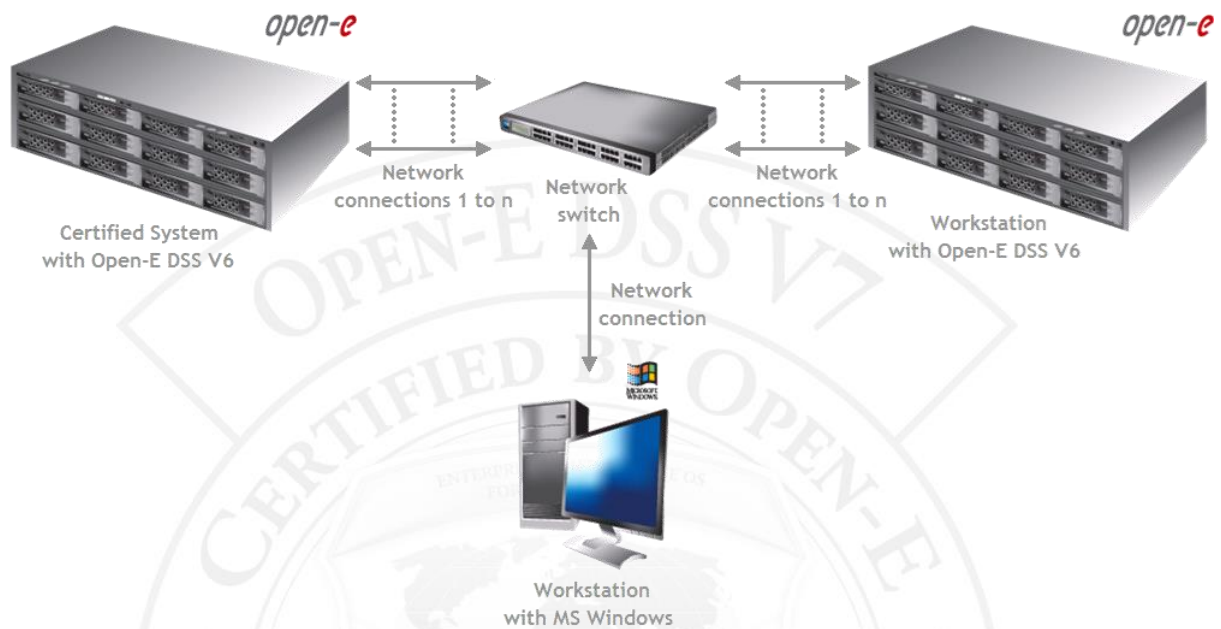


FIGURE 15: Network topology for iSCSI Initiator testing

iSCSI Target test topology

Network topology for iSCSI Target testing is shown below.

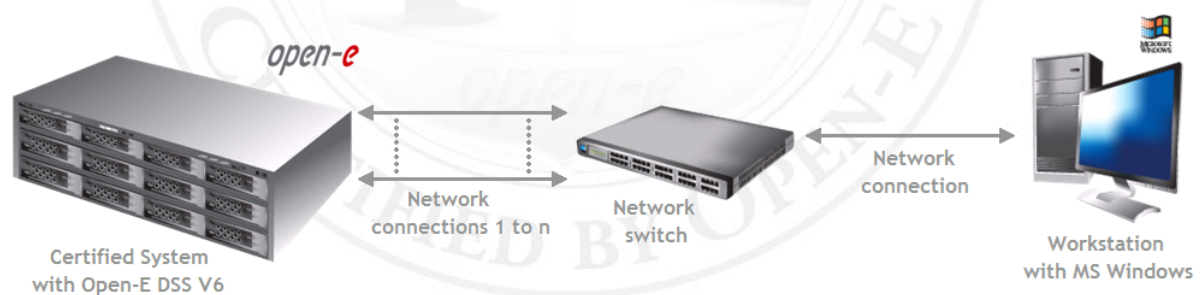


FIGURE 16: Network topology for iSCSI Target testing

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 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

iSCSI Initiator performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	66.90	76.47	passed
32	112.55	112.58	passed
64	112.77	101.33	passed
128	112.74	112.69	passed
256	112.73	112.70	passed
512	112.89	112.76	passed
1024	112.72	112.87	passed
4096	112.75	112.53	passed

TABLE 15: iSCSI Initiator performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

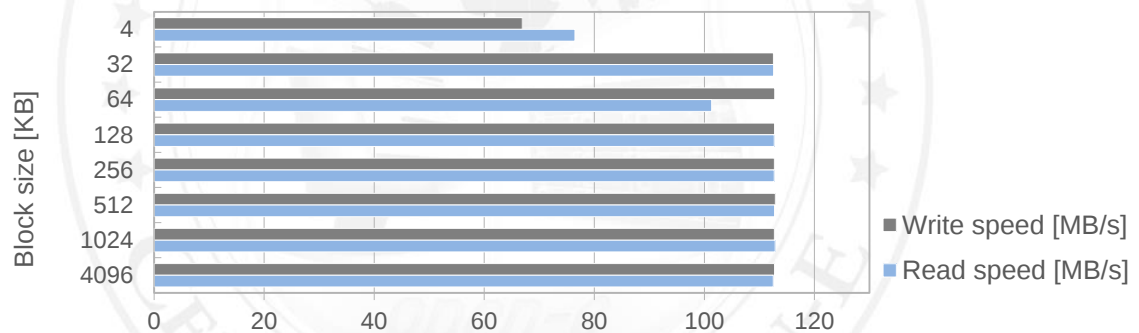


FIGURE 17: iSCSI Initiator performance test results chart for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

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 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

iSCSI Target performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance test results
4	64.10	96.89	passed
32	102.29	103.53	passed
64	107.67	108.92	passed
128	109.53	110.91	passed
256	111.11	111.89	passed
512	111.19	111.62	passed
1024	111.59	111.43	passed
4096	111.32	111.23	passed

TABLE 16: iSCSI Target performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

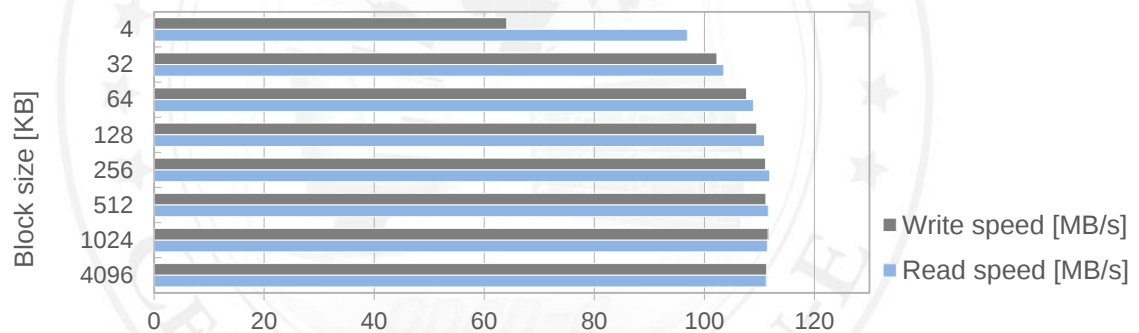


FIGURE 18: iSCSI Target performance test results chart for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)