open-e JovianDSS

Toshiba MG11SCA24TE SAS HDD

Certification Report

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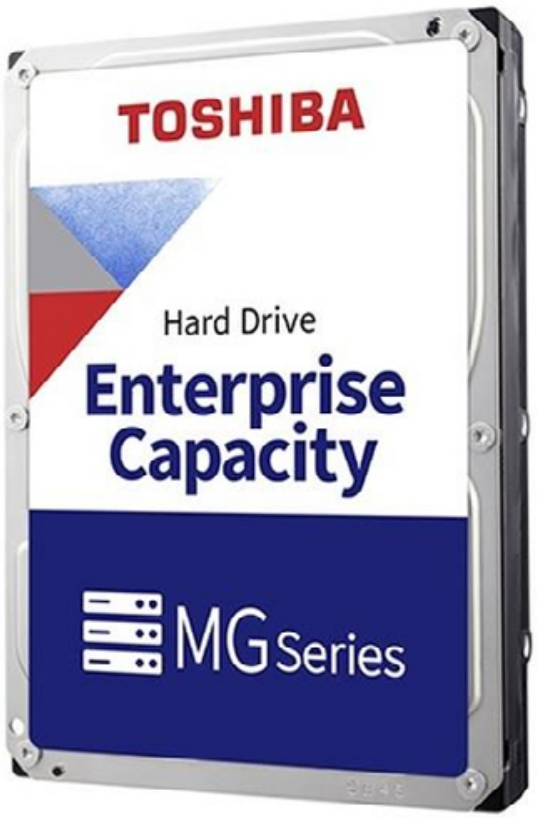


Table of contents

Toshiba MG11SCA24TE SAS HDD Certification Report

1. INTRODUCTION

The document presents a detailed certification analysis of the Toshiba MG11SCA24TE hard disk drive, focusing on its performance and compatibility with the Open-E JovianDSS software platform. The drive offers an impressive 24 terabytes of data storage using Conventional Magnetic Recording (CMR) technology. With a speed of 7200 RPM and an annual workload rating of up to 550 TB, it is optimized for applications requiring efficient handling of large data volumes. Its 3.5-inch form factor and helium-sealed design also enable seamless integration into existing data storage arrays, reducing space requirements and simplifying management in large-scale cloud deployments.

Open-E JovianDSS is a software platform that provides data storage solutions for various industries and markets. It is based on the **ZFS file system and supports features such as data deduplication, compression, snapshots, replication, and High Availability clustering**. It is compatible with any hardware and hypervisor, offering flexible pricing and excellent support.

Offering support for File, Object, and Block storage, the Toshiba MG11SCA24TE provides exceptional versatility, making it **ideal for demanding business-critical server and data storage deployments**. Its combination of high storage capacity, broad application compatibility, and robust data reliability establishes it as a top-tier solution.

Recognizing the Toshiba MG11SCA24TE's substantial capacity, **Open-E** conducted **thorough certification tests to validate its compatibility and reliability as a data storage drive.** These tests cover Single-Node and High Availability cluster environments.

The following role was considered during the Open-E certification process:

- **data storage drive**

2. DEVICE UNDER TEST DESCRIPTION

Table 1. Toshiba MG11SCA24TE 24 TB (MG11SCA24TE)

Product name	Toshiba MG11SCA24TE
Model name	MG11SCA24TE
Storage capacity	24 TB
Form factor	HDD 3.5”
Interface	SAS
SED	No
Rotational speed	7200
Memory disk buffer size	1GiB
Power consumption	8.11W
Mean Time To Failure (MTTF)	2,500,000 hours
Workload Rate Limit	550 TB/year
Firmware Version	0102

3. TESTING ENVIRONMENT DESCRIPTION

Table 2 provides a detailed list of the hardware specifications for the environments used during the certification testing. Table 3 shows the general configuration settings for Fio, which was the tool for performance benchmarking.

Table 2. Per-Node hardware specification

System name	Supermicro SuperServer 6028U-TR4T+
Motherboard	Supermicro X9DRD-7LN4F(-JBOD)/X9DRD-EF
CPU	2x Intel(R) Xeon(R) CPU E5-2620 v2 @ 2.10GHz
RAM	128GB - 16x Kingston 8 GB 1600 MHz
Storage controller	HBA Broadcom (LSI) SAS 9400-8i8e SAS 12Gb/s
Drives	4x Toshiba MG11SCA24TE 1x NVMe Intel Optane SSD P1600X Series
System	Open-E JovianDSS up31 58473

Table 3. Fio test tool configuration

Version	3.28
Test size	200GB
Block size	4KB (random workload); 1MB (sequential workload)
Ramp time	30s
Runtime	90s
IOengine	libaio
Direct IO	Yes

4. FUNCTIONALITY TESTS

Open-E performed functional testing, shown in Table 4.

Table 4. Functional test results

Functional aspect	Result
Open-E JovianDSS system compatibility	passed
Stripe compatibility	passed
Mirror compatibility	passed
RAID-Z1 compatibility	passed
RAID-Z2 compatibility	passed
System stability	passed
Drive failure simulation with the replacement	passed
Hot-Plug Support	passed
Disk activity and health monitoring	passed
Disk write-back cache management	passed
LED's management functionality	passed

5. HA NON-SHARED STORAGE CLUSTER TESTS

Open-E performed various compatibility tests to ensure the proper operation of the Toshiba MG11SCA24TE HDDs in the Open-E JovianDSS High Availability Non-Shared Storage Cluster environment.

All the essential and critical Non-Shared Storage Cluster Mechanisms with the tested devices were tested. Table 5 shows the list of checked functionalities.

Table 5. Results for the HA Non-Shared Storage Cluster compatibility test.

Functional aspect	Result
Manual Failover	passed
Remote disk support	passed
Automatic Failover triggered after network failure	passed
Automatic Failover triggered after system shutdown	passed
Automatic Failover triggered after system reboot	passed
Automatic Failover triggered after system power-off	passed
Failover operations under heavy load (stress test)	passed

6. HA SHARED STORAGE CLUSTER TESTS

Open-E performed various compatibility tests to ensure the proper operation of the Toshiba MG11SCA24TE HDDs in the Open-E JovianDSS High Availability Shared Storage Cluster environment.

All the essential and critical shared storage cluster mechanisms with the tested devices were tested. Table 6 shows the list of checked functionalities.

Table 6. Results for the HA Shared Storage Cluster compatibility test.

Functional aspect	Result
Manual Failover	passed
Automatic Failover triggered after network failure	passed
Automatic Failover triggered after system shutdown	passed
Automatic Failover triggered after system reboot	passed
Automatic Failover triggered after system power-off	passed
Failover operations under heavy load (stress test)	passed

7. PERFORMANCE TESTS

The test cases are described in Table 7. Open-E applied every combination of thread numbers (1, 4, 8, 16) and queue depths (1, 16, 64, 128) to the Fio test tool in all instances. All tests were performed locally on the Open-E JovianDSS system.

Table 7. Test cases description

Test case	IO pattern	Read to write %	Block size
Mixed	random	70/30	4 kB
Random read	random	100/0	4 kB
Random write	random	0/100	4 kB
Sequential read	sequential	100/0	1 MB
Sequential write	sequential	0/100	1 MB

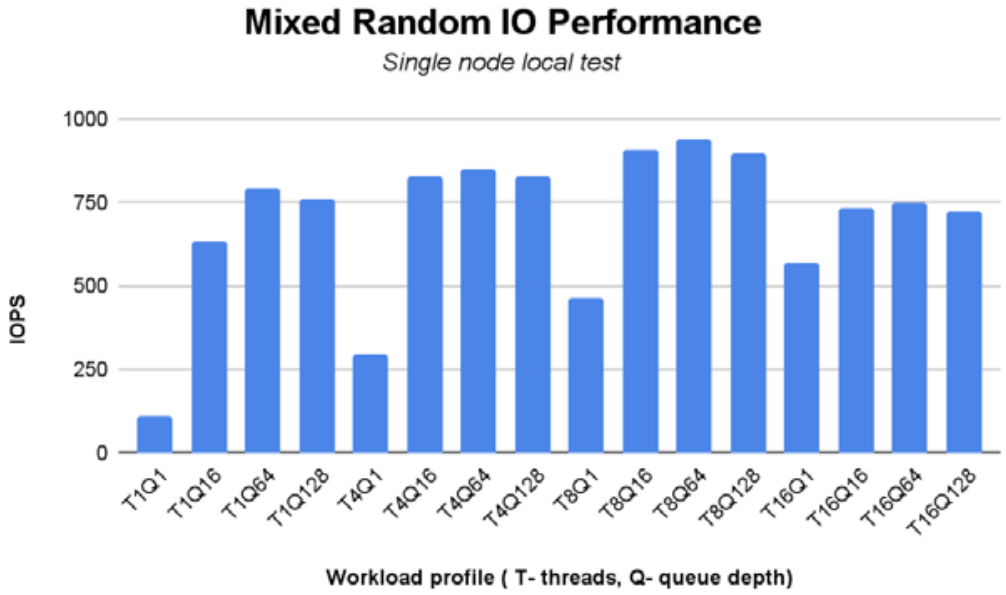
The table 8 below presents the ZFS configuration used for testing.

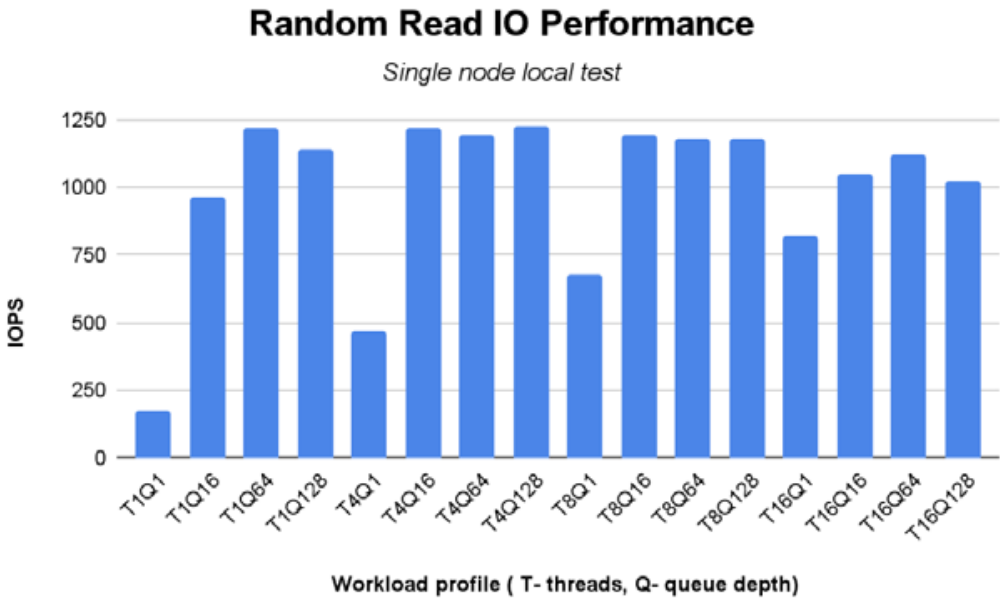
Table 8. Tested pool configuration

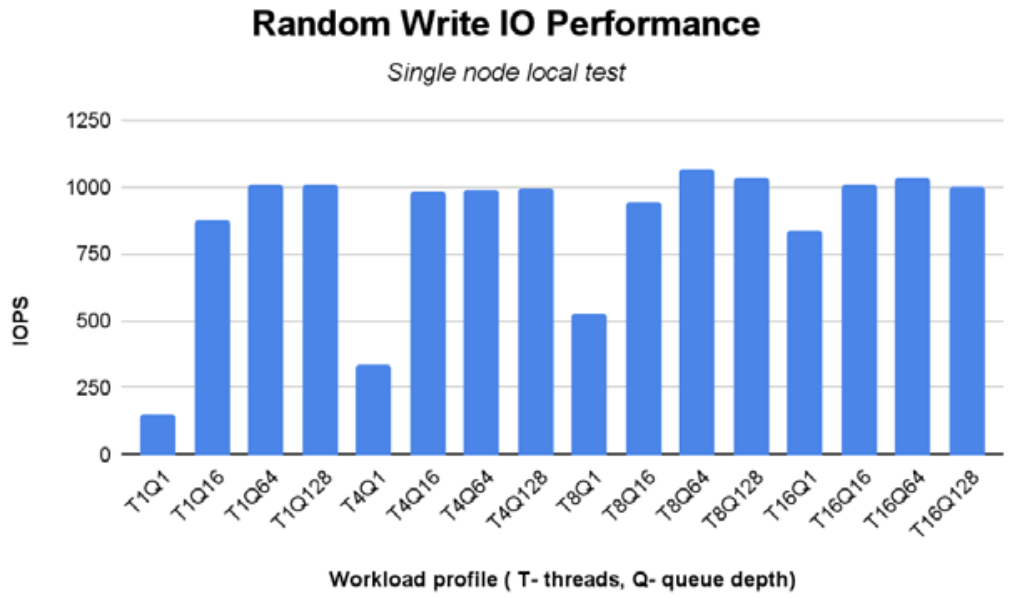
Zpool configuration	RAID-Z2
Write log	Yes (NVMe Intel Optane SSD P1600X Series)
Zvol size	200 GB
Sync	Always
Provisioning	Thin
Compression	lz4
Volblocksize	64KB (random workload); 1MB (sequentialworkload)
Zvol initialization:	Zvol was initialized by writing data to it before tests began.

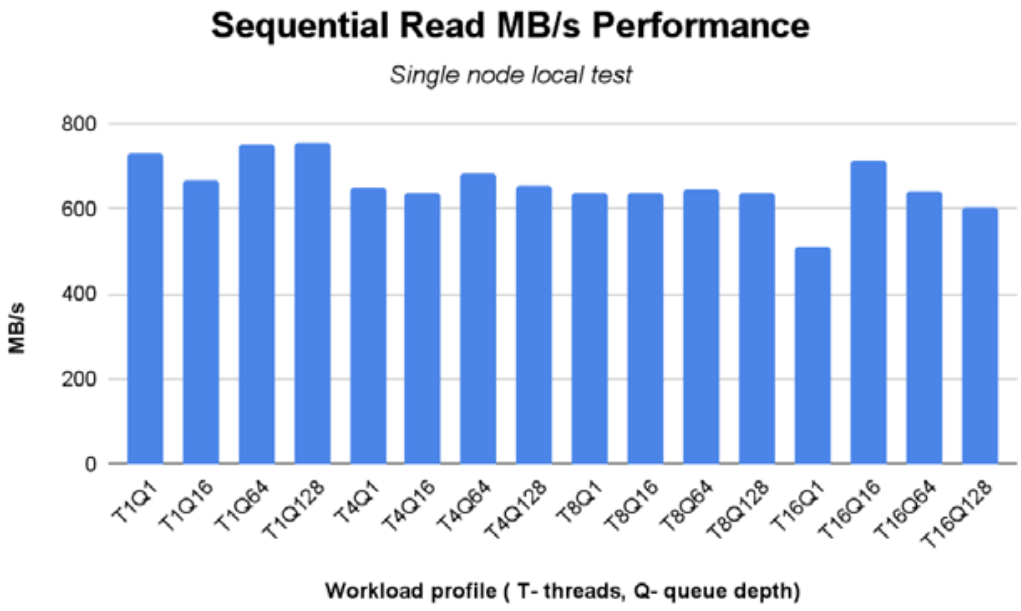
The charts below present the following performance results:

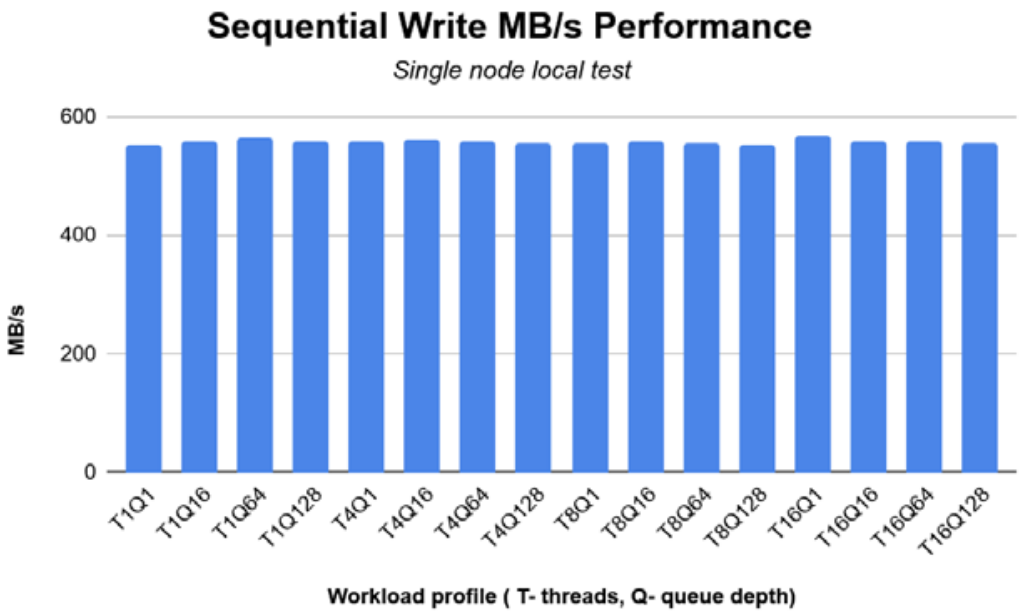
- **Mixed Random IO Performance**
- **Random Read IO Performance**
- **Random Write IO Performance**
- **Sequential Read MB/s Performance**
- **Sequential Write MB/s Performance**


Mixed Random IO Performance
Single node local test
IOPS
1000
750
500
250
0
T1Q1
T1Q16
T1Q64
T1Q128
T4Q1
T4Q16
T4Q64
T4Q128
T8Q1
T8Q16
T8Q64
T8Q128
T16Q1
T16Q16
T16Q64
T16Q128
Workload profile (T- threads, Q- queue depth)


Random Read IO Performance
Single node local test
IOPS
1250
1000
750
500
250
0
T1Q1
T1Q16
T1Q64
T1Q128
T4Q1
T4Q16
T4Q64
T4Q128
T8Q1
T8Q16
T8Q64
T8Q128
T16Q1
T16Q16
T16Q64
T16Q128
Workload profile (T- threads, Q- queue depth)


Random Write IO Performance
Single node local test
IOPS
1250
1000
750
500
250
0
T1Q1
T1Q16
T1Q64
T1Q128
T4Q1
T4Q16
T4Q64
T4Q128
T8Q1
T8Q16
T8Q64
T8Q128
T16Q1
T16Q16
T16Q64
T16Q128
Workload profile (T- threads, Q- queue depth)


Sequential Read MB/s Performance
Single node local test
MB/s
800
600
400
200
0
T1Q1
T1Q16
T1Q64
T1Q128
T4Q1
T4Q16
T4Q64
T4Q128
T8Q1
T8Q16
T8Q64
T8Q128
T16Q1
T16Q16
T16Q64
T16Q128
Workload profile (T- threads, Q- queue depth)


Sequential Write MB/s Performance
Single node local test
600
400
200
0
MB/s
T1Q1
T1Q16
T1Q64
T1Q128
T4Q1
T4Q16
T4Q64
T4Q128
T8Q1
T8Q16
T8Q64
T8Q128
T16Q1
T16Q16
T16Q64
T16Q128
Workload profile (T- threads, Q- queue depth)

8. TEST CONCLUSIONS

A rigorous testing process confirms the **Toshiba MG11SCA24TE HDD** as a high-performance, reliable data storage solution for demanding enterprise environments. The drive consistently delivered optimal speed and endurance, validating its suitability for applications requiring high data integrity and availability.

Our comprehensive evaluation, encompassing stress testing, sustained read/write operations, and long-term reliability assessments, **demonstrated the MG11SCA24TE's ability to handle intensive workloads within Open-E JovianDSS Single-Node and High-Availability configurations**.

Due to its capacity and proven reliability, the Toshiba MG11SCA24TE is a versatile solution, ready to deal with a wide range of applications, including:

- Data Center Applications
- Big Data
- Video Surveillance
- Capacity-Optimized Cloud-scale and Rack-Scale Storage Systems
- Compliance Data Archives and Data Life-Cycle Management Storage Systems
- Data Back-up Infrastructure

After successfully passing all certification tests, the Toshiba MG11SCA24TE has been added to the Open-E Hardware Certification List and has been awarded the "Certified by Open-E" status.

9. DISCLAIMER

Due to the large capacity of the single HDD disk and its performance, which leads to a longer replacement time in case of failure, we recommend using data groups with at least two disks of redundancy. For this purpose, the best group is the RAID-Z2, which we tested above, or at least a 3-way mirror if you use mirror groups.