



ATTO ExpressNVM™
Smart NVMe Switch Host Adapter
ENVM-S48F-000
Certification Report

Release date: 2024.06.17



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1. INTRODUCTION

This report presents a comprehensive analysis of **the integration between the ATTO ExpressNVM™ Smart NVMe Switch Host Adapter and the Open-E JovianDSS software platform**. The primary objective is to evaluate and document the compatibility, performance, and reliability of the ATTO NVMe Adapter when utilized in conjunction with Open-E JovianDSS, under diverse operational conditions, scenarios, and applications.

The ATTO ExpressNVM™ Smart NVMe Switch Host Adapter is designed to create shareable NVMe data storage pools with exceptional performance. It provides enterprise-level management and configuration capabilities, enabling integrators to develop scalable, high-capacity, and dense storage solutions that can be efficiently managed across distributed storage networks. This makes it **good choice for data-intensive environments such as high-performance computing, enterprise data storage, and data centers**.

Open-E JovianDSS is a versatile software platform based on Linux, and the ZFS file system, offering advanced features such as data deduplication, compression, encryption, snapshots, replication, and High Availability clustering. It supports any hardware and operating system, providing flexible pricing and excellent support, making it a robust solution for various industries and markets.

The certification tests conducted by Open-E were predicated on the premise that the ATTO ExpressNVM™ Smart NVMe Switch Host Adapter would excel in high-speed data storage applications due to its strong performance attributes. **The scope of the certification encompassed a series of functional and performance tests on High-Availability data storage cluster, ensuring the adapter's compatibility and reliability across different operational conditions.**

2. DEVICE UNDER TEST DESCRIPTION

Table 1. ATTO ExpressNVMe Adapter

Product name	ATTO ExpressNVMe Adapter
Model name	ENVM-S48F-000
Interface	PCIe Gen4
Firmware	2023_10_04

3. TEST ENVIRONMENT DESCRIPTION

Table 2a/2b 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 2a. Node A hardware specification

System name	DELL PowerEdge R750
Motherboard	DELL 0WMWCR
CPU	2x Intel Xeon Gold 6330 @ 2.00GHz
RAM	128GB - 4x Micron 32GB 3200 MHz
Storage controller	ATTO ExpressNVMe
Drives	4x Western Digital Ultrastar DC SN650 (WUS5EA176ESP5E3) 7.68TB 4x Kioxia CM7-R (KCMY1RUG1T92) 1.92TB
System	Open-E JovianDSS up30r2 b55016

Table 2b. Node B hardware specification

System name	DELL PowerEdge R7515
Motherboard	Dell 0R4CNN
CPU	1x AMD EPYC 7302P @ 3.0GHz
RAM	128GB - 4x Micron 32GB 3200 MHz
Storage controller	ATTO ExpressNVM
Drives	4x Western Digital Ultrastar DC SN650 (WUS5EA176ESP5E3) 7.68TB 4x Kioxia CM7-R (KCMY1RUG1T92) 1.92TB
System	Open-E JovianDSS up30r2 b55016

Table 3. Fio test tool configuration

Version	3.31
Test size	200GB
Block size	4kB (random workload); 1MB (sequential workload)
Ramp time	30s
Runtime	90s
IOengine	libaio
Direct IO	Yes

4. FUNCTIONALITY TEST

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

Table 4. Functional test results

Functional aspect	Result
Open-E JovianDSS system compatibility	passed
Data consistency compatibility	passed
ZFS compatibility	passed
S.M.A.R.T compatibility	passed
Trim compatibility	passed
System stability	passed
Drive failure simulation with the replacement	passed
Hot-Plug Support	passed
Disk activity and health monitoring	passed

5. HIGH AVAILABILITY NON-SHARED STORAGE CLUSTER TESTS

Open-E performed various compatibility tests to ensure the proper operation of the **ATTO NVMe Adapter** 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.

Tested functionality	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
Automatic Failover triggered after I/O failure	passed
Failover operations under heavy load (stress test)	passed

6. PERFORMANCE TESTS

The test cases over ethernet are described in Table 7. Open-E applied every combination of thread numbers and queue depths to the Fio test tool in all instances. All tests were performed with external client machine over 2x 10GbE network.

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

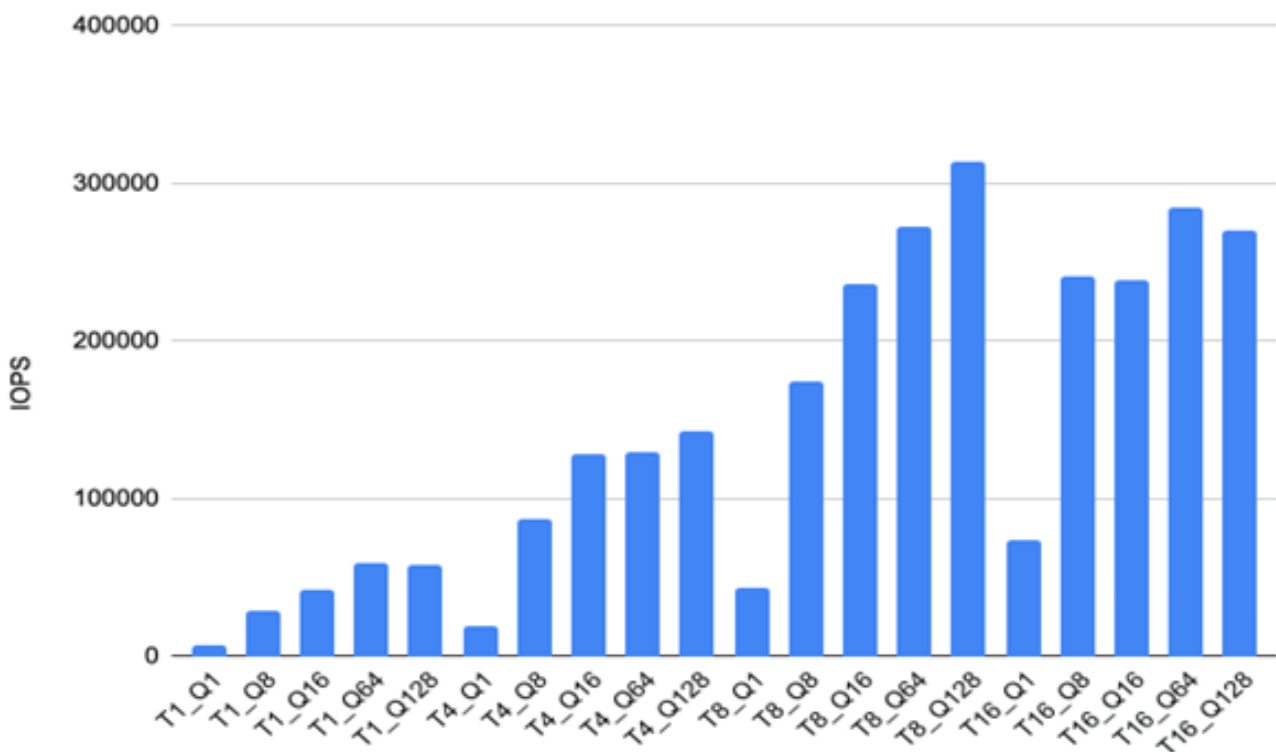
Zpool configuration	Mirror
Write log	No
Read Cache	No
Zvol size	200 GB
Sync	Always
Provisioning	Thin
Compression	lz4
Zvol initialization	Zvol was initialized by writing data to it before tests began.

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

RANDOM READ

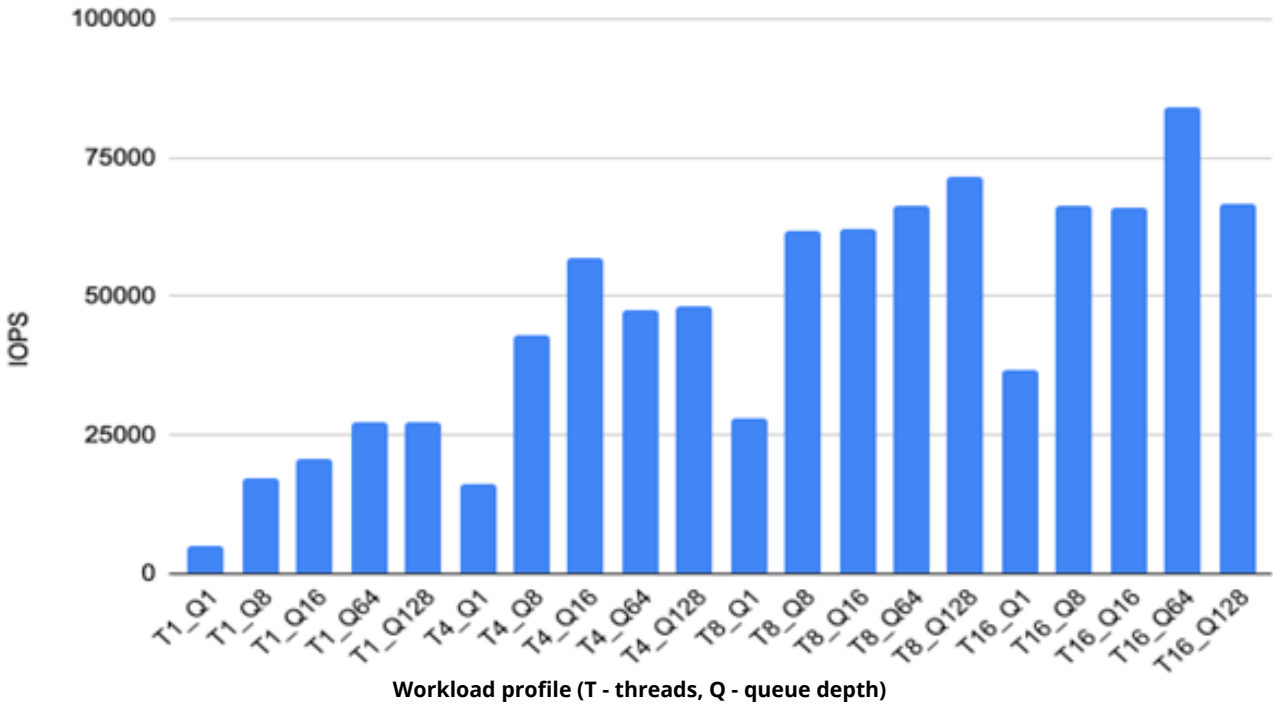
HA Cluster iSCSI storage



Workload profile (T - threads, Q - queue depth)

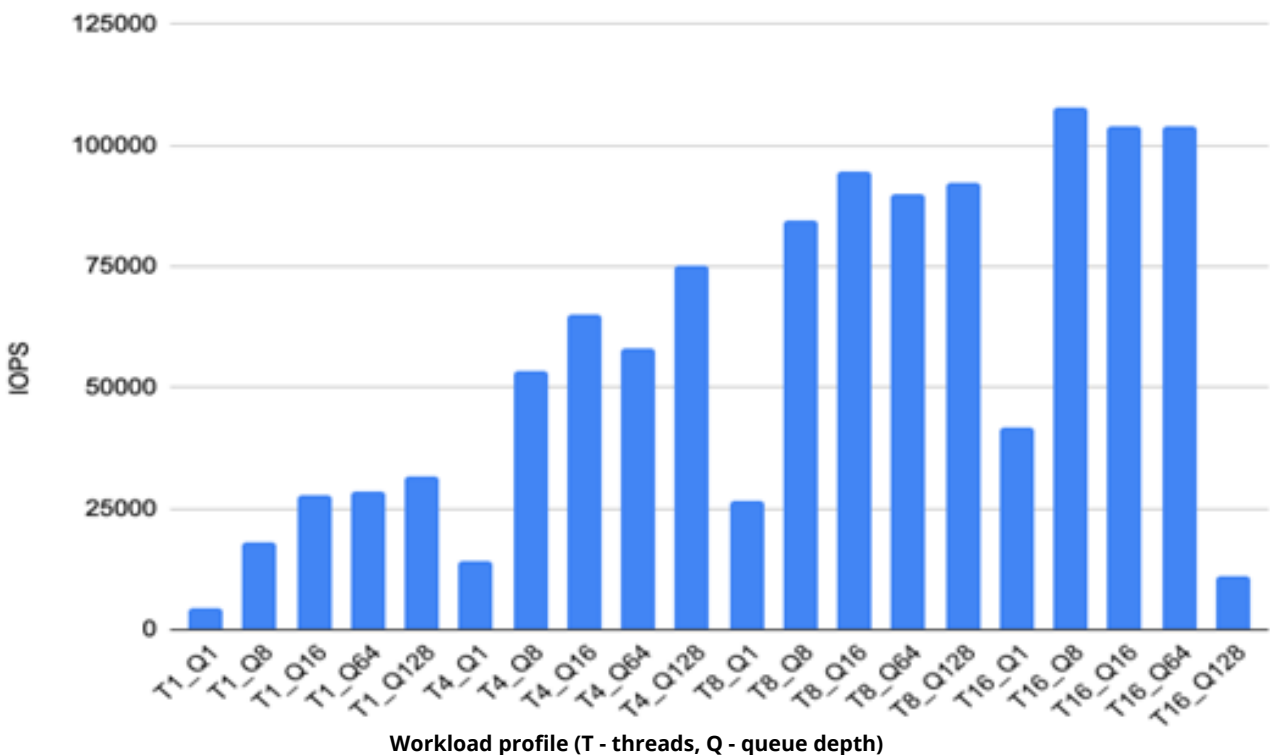
RANDOM WRITE

HA Cluster iSCSI storage



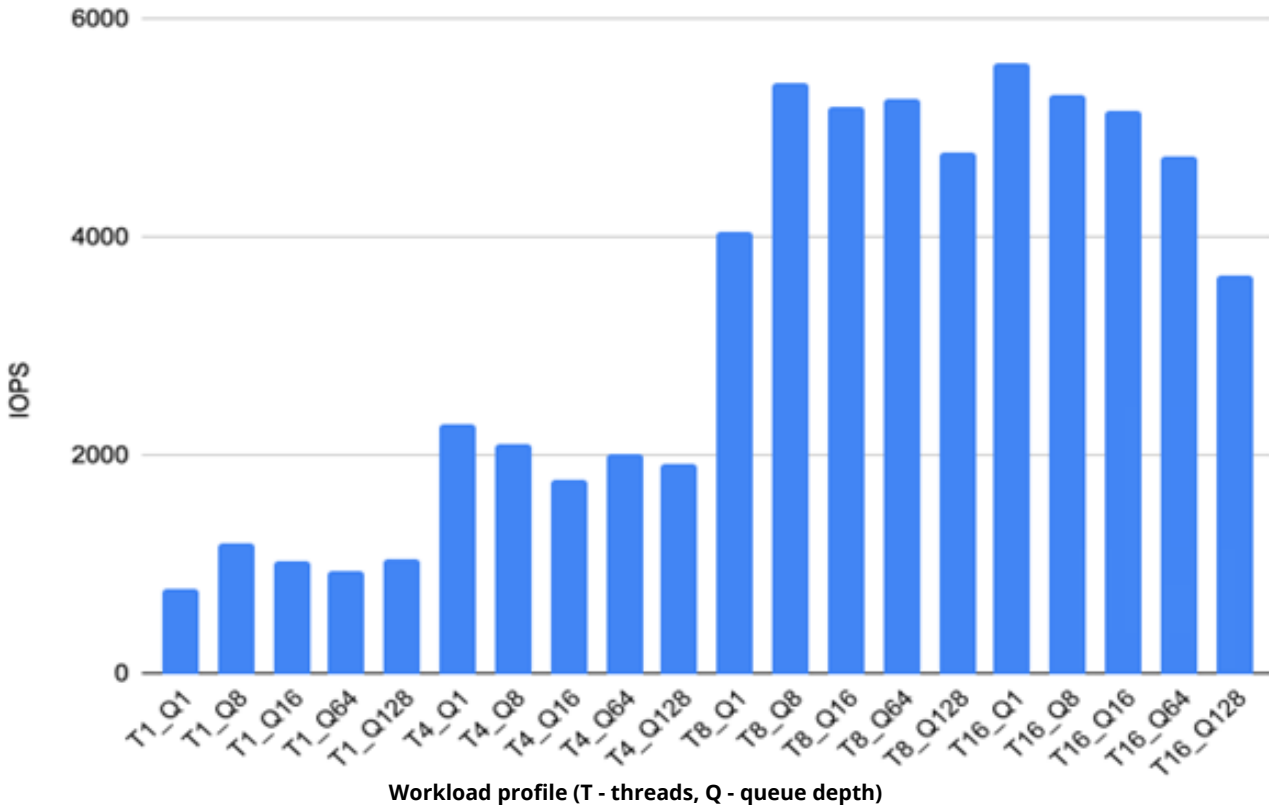
MIXED RANDOM

HA Cluster iSCSI storage



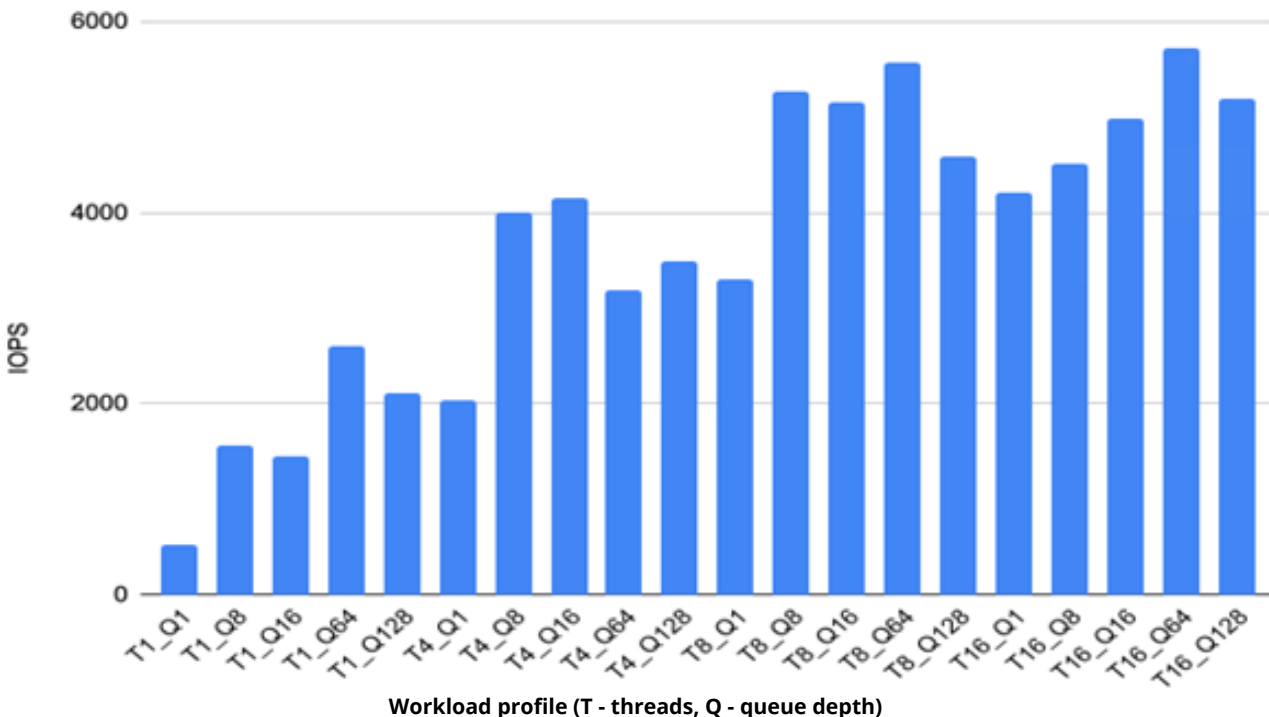
SEQ READ

HA Cluster iSCSI storage



SEQ WRITE

HA Cluster iSCSI storage



7. TEST CONCLUSIONS

The certification tests conducted on the ATTO ExpressNVM™ Smart NVMe Switch Host Adapter in conjunction with the Open-E JovianDSS software platform have yielded positive results, confirming the compatibility and reliability of the hardware-software integration.

- **Compatibility:** The ATTO ExpressNVM™ Smart NVMe Switch Host Adapter demonstrated seamless integration with the Open-E JovianDSS software platform. The hardware was fully compatible with various features of JovianDSS, including data deduplication, compression, snapshots, replication, and High Availability clustering.
- **Performance:** Under various operational conditions and scenarios, the ATTO NVMe Adapter consistently delivered high performance. The tests showed that the adapter supports scalable, high-capacity storage solutions with excellent data transfer speeds and low latency, making it suitable for data-intensive applications such as high-performance computing, enterprise storage, and data centers.
- **Reliability:** The adapter exhibited robust performance in High-Availability data storage cluster. It maintained stable operations without significant issues or failures throughout the testing period, ensuring reliable performance under diverse operational conditions.

In conclusion, the ATTO ExpressNVM™ Smart NVMe Switch Host Adapter is a highly compatible, reliable, and high-performing hardware solution when integrated with the Open-E JovianDSS software platform. It is well-suited for demanding data storage environments and offers substantial benefits in terms of performance, scalability, and management. This certification underscores the potential of this hardware-software combination to meet the needs of modern data-intensive applications.

Based on the test results and the adapter specifications, Open-E recommends using the certified model in:

- High-Performance Computing Environments
- Enterprise Storage Solutions
- Data Centers
- High-Speed Data Storage Applications
- Business-Critical Servers
- Virtualization

After passing the certification tests, **Open-E added the ATTO NVMe Adapter** to the Hardware Certification List and granted it the “Certified by Open-E” status.