SDC 18
SNIA INDIA
May 24-25, 2018
Bangalore, India
STORAGE DEVELOPER CONFERENCE

# Introduction to NVMe-oF (Software Abstraction)

**Suman Debnath**
**Toshiba**

# Agenda

- NVMe SSD Overview
- NVMe-oF Overview
- A typical NVMe-oF System Architecture
- Software Storage Abstraction Overview
- Abstraction Configuration for NVMe-oF Subsystem

# SSD Overview

| | |
|---|---|
| Faster | • IOPS and throughput; applications perform better |
| Quicker | • Low latency, being directly connected to the CPU |
| Design | • Command set created from the ground up for SSDs<br>• NVMeoF as native fabric |
| Consistency | • Better performance consistency than SAS or SATA |
| Flexibility | • More form factors, power, # lanes, connectivity, client and enterprise |

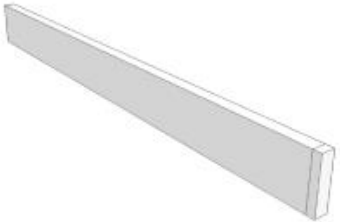
**2.5" SFF**

**Add In Card**

FHFL/FHHL/HHHL

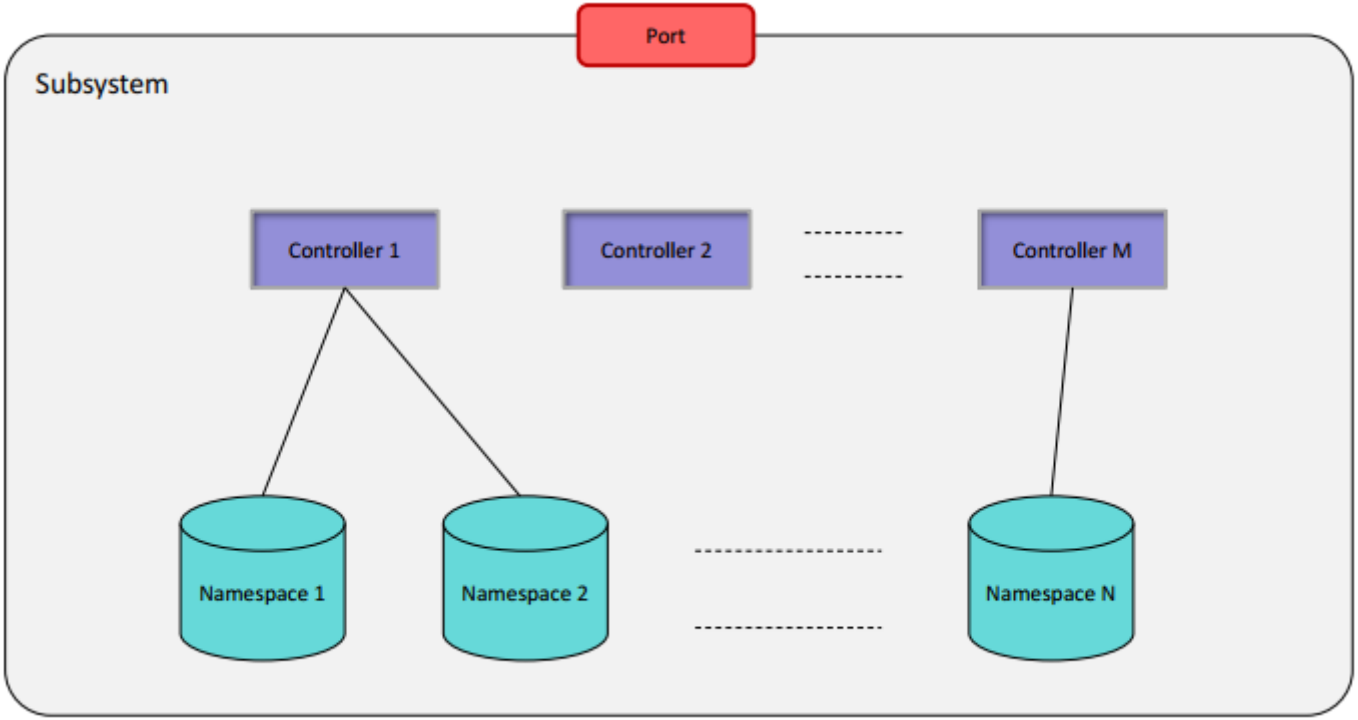
**M.2**

**Ruler/NGSFF**



SDC 18 SNIA INDIA

# Subsystem-Controller-Namespaces

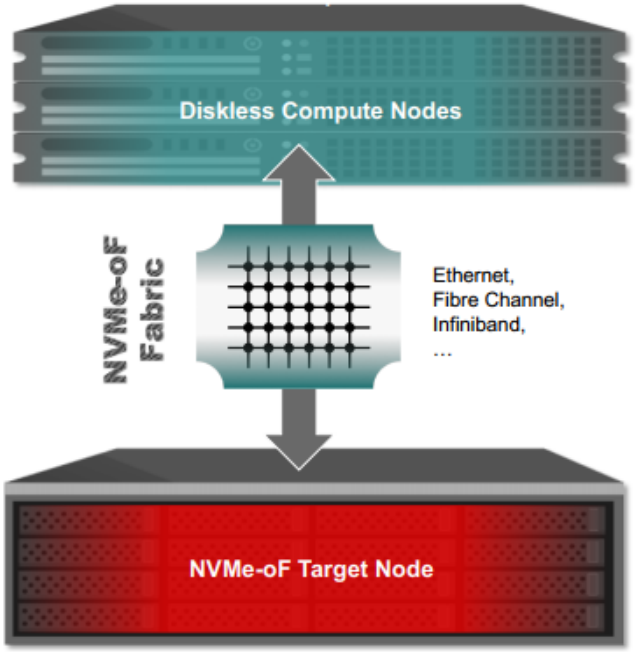


# What is NVMeoF?

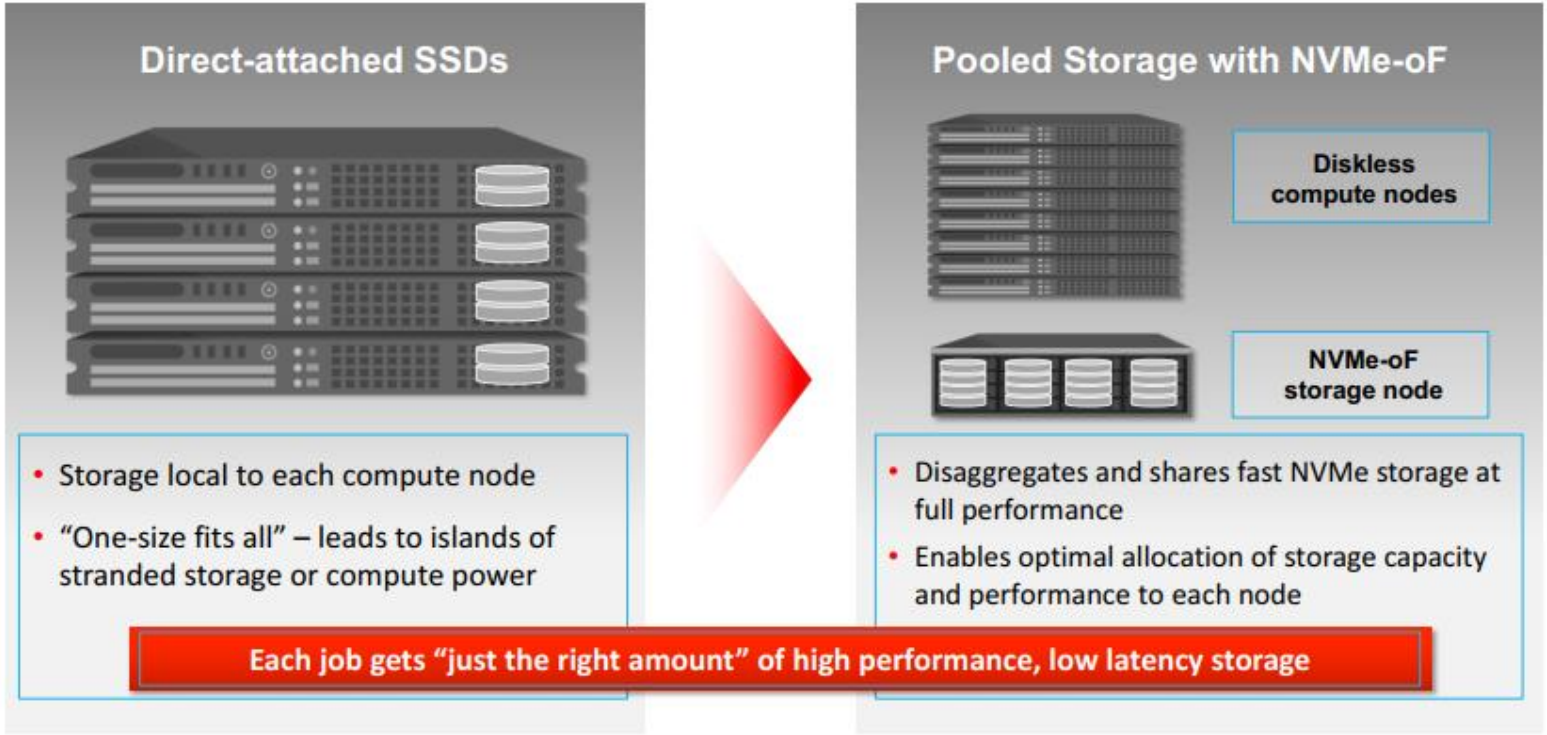
Connects compute nodes to NVMe storage across the datacenter network

Preserves the performance and low latency of *native* NVMe

Uses remote direct memory access (RDMA), with bindings for several transport protocols



# Why is NVMeoF important to the Datacenter?




SDC 18
SNIA INDIA

# Super Fast Block Storage, Disaggregated and Abstracted


**FAST**
Near local NVMe throughput and latency

**EFFICIENT**
Allocate required capacity and grow on-demand. No stranded storage

**OPTIMAL SSD UTILIZATION**
Share high capacity SSDs between multiple servers for optimal Watt/TB & optimal rack utilization

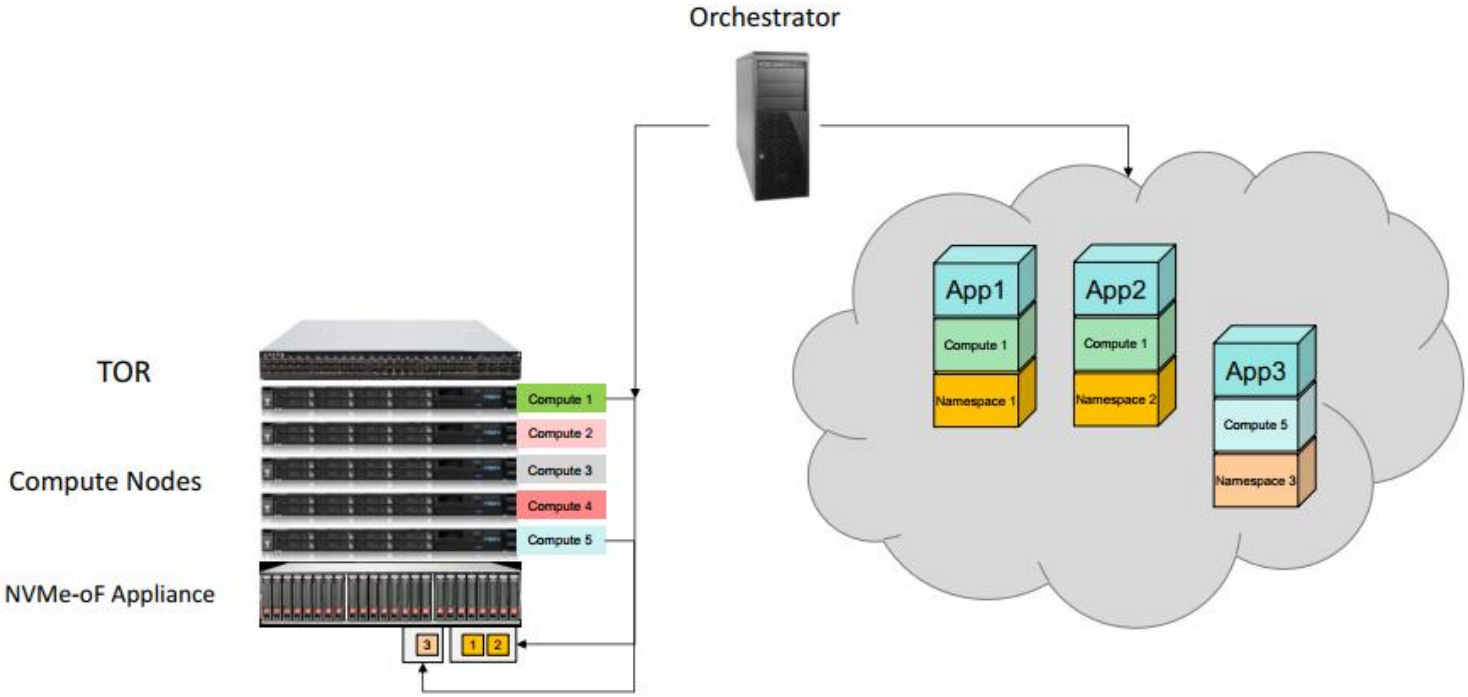
**FLEXIBLE**
Namespace abstraction hides physical drive complexity

**MANAGEABLE**
Connectors to fast-evolving orchestration, provisioning and telemetry tools

**SAFE**
Balanced SSD wear management

SDC 18
SNIA INDIA

# Orchestrating Virtual Environment

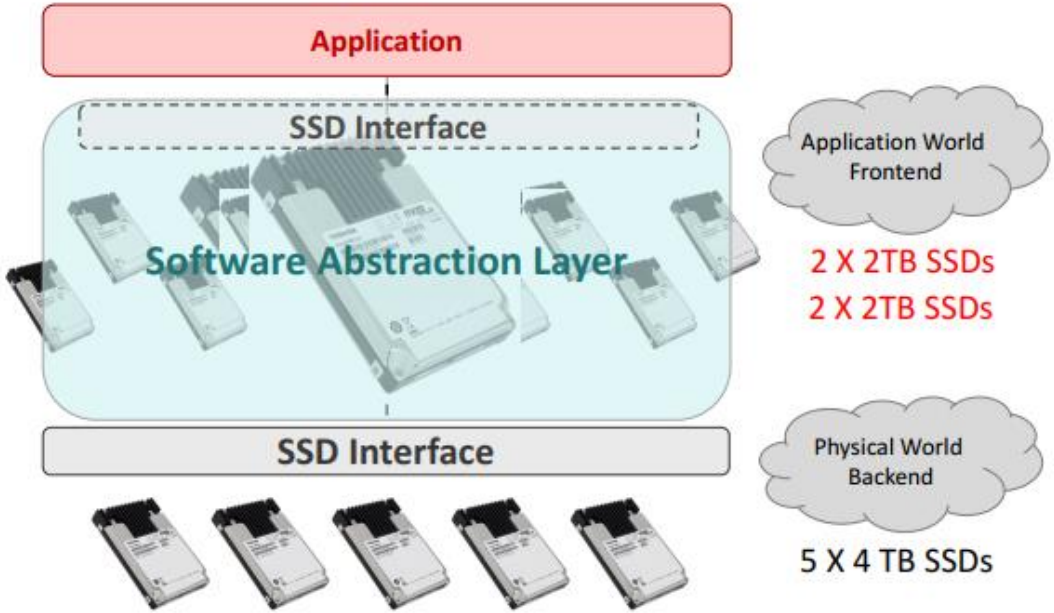


# What is Storage Software Abstraction?

Add additional SW layer between the application and the SSD driver:

This layer decides which commands to implement or manipulate and which commands are forwarded to the SSD driver as is

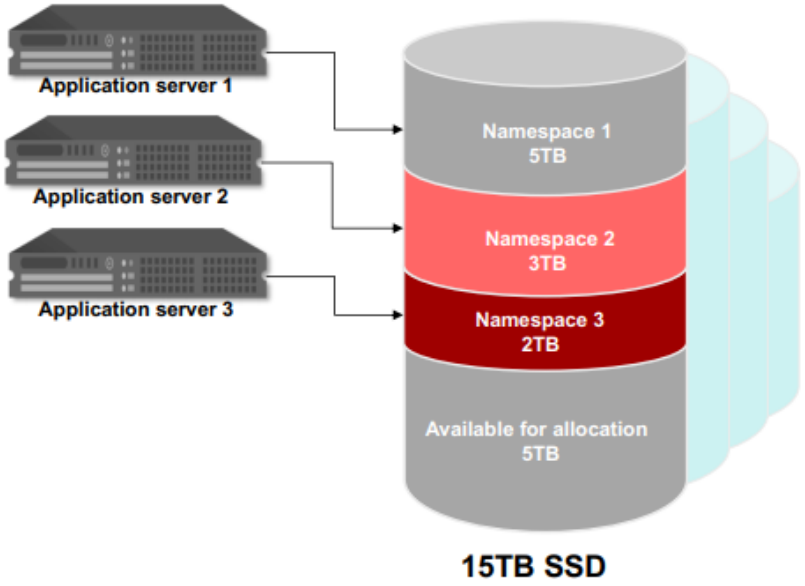
This layer exposes SSDs in a completely different manner than the underlying physical SSDs



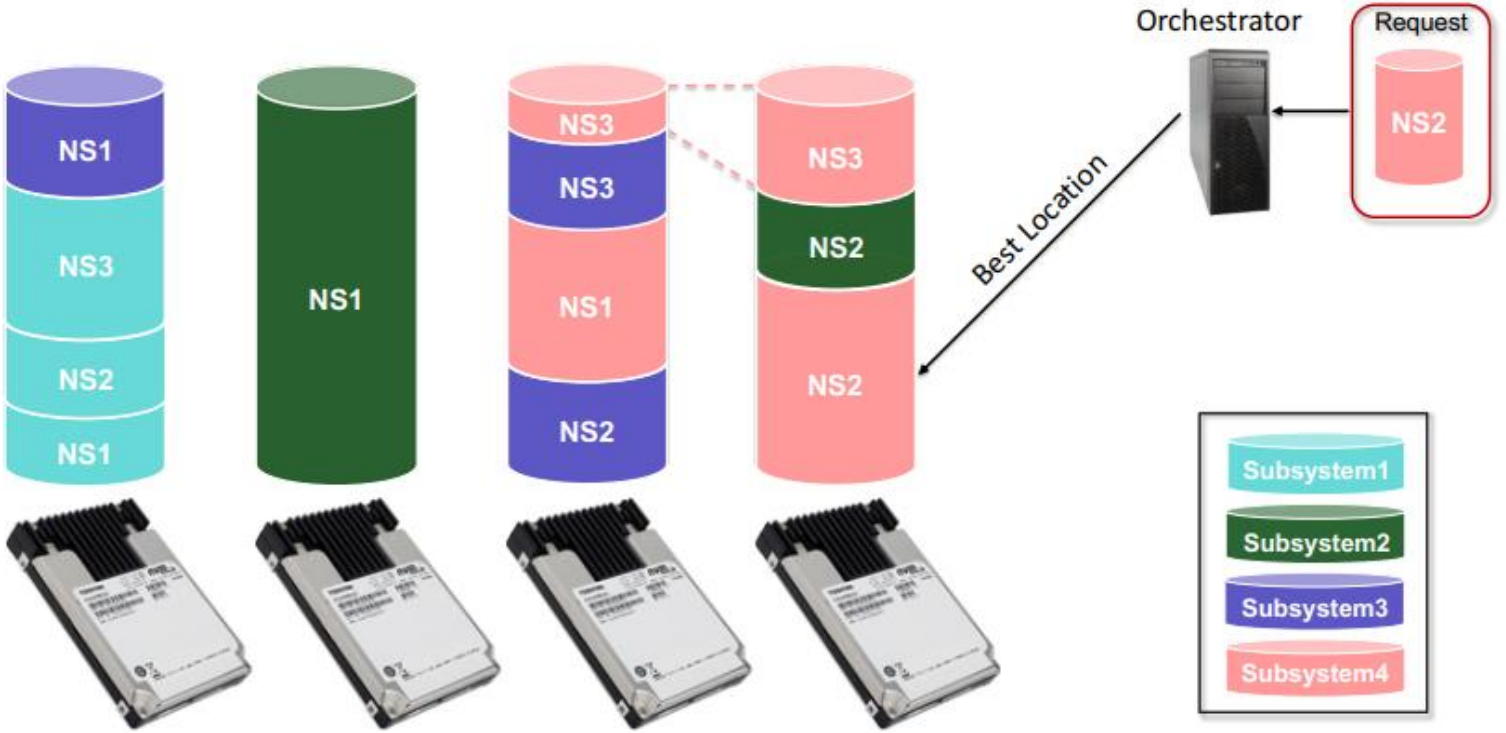

SDC 18 SNIA INDIA

# Software Abstraction Advantage

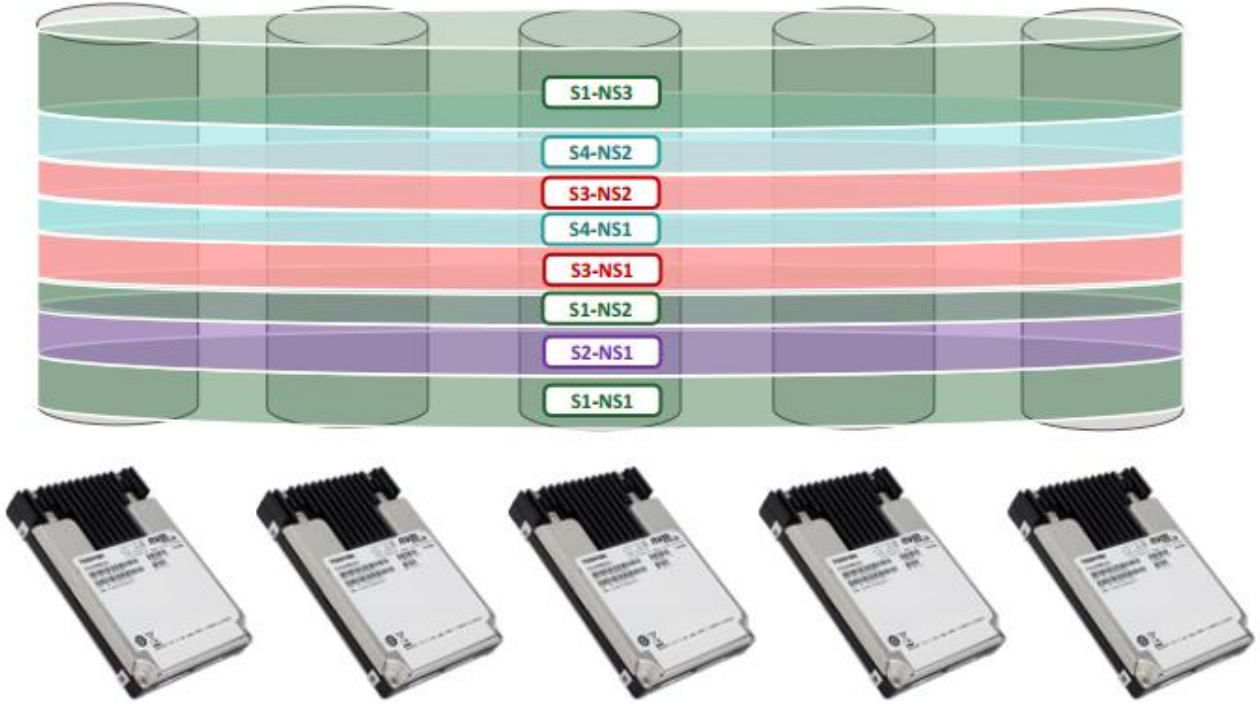
- Flexible capacity allocation for different compute nodes enables optimizing large SSD's utilization
- The largest capacity SSDs improve Watt/TB and deliver better space utilization in the rack
- Ability to expose different storage layouts to different hosts upon demand
- Can implement storage features that are not implemented by the SSDs FW
- Increase namespaces per SSD:
  Unlimited provisioning flexibility



# Abstracted Storage Pool



# Storage Abstraction – Striped Configuration



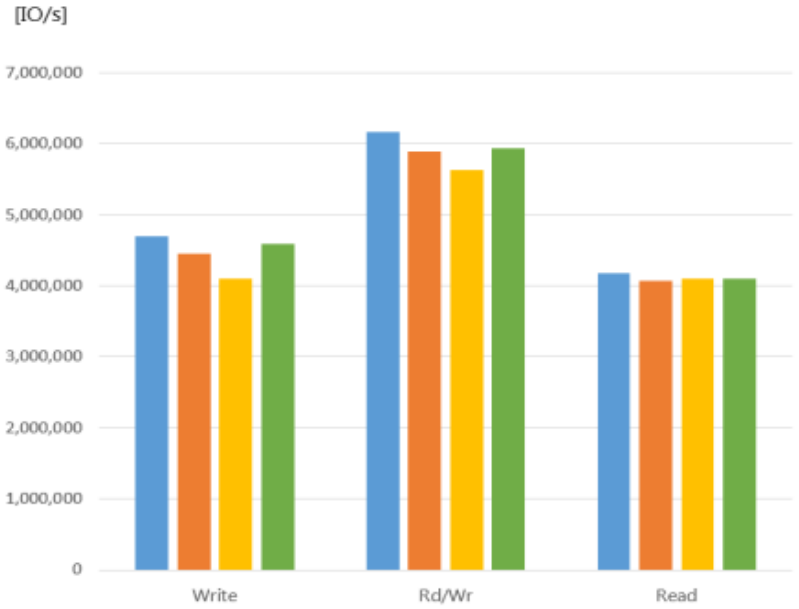

SDC 18
SNIA INDIA

# Striped Abstraction Advantages

Increased performance – IOs are sent in parallel to and from all SSDs:
Higher IO/s and lower latency

Balanced wear leveling by design

# Abstraction doesn’t mean performance degradation




IO/s on different abstraction configurations, 4K command size

24 Directly Attached NVMe SSDs
24 NVMe-oF Subsystems w/o Abstraction
2 Striped Nvme-oF Subsystems over 12 NVMe SSDs each
24 Abstracted NVMe-oF Subsystems

Tested on a Toshiba NVMe-oF Solution with 24 NVMe SSDs and 2 X 100GB NICs

SDC 18
SNIA INDIA

# Thank You