Flash Memory Summit

Data-Driven Applications Gravitate to Computational Storage

Thad Omura

EVP of Marketing & Operations, ScaleFlux™

Flash Memory Summit 2019
Santa Clara, CA

ScaleFlux™

The Answer to All Your Questions is…

ScaleFlux™

Question:

What transformative technology are you going to learn about right now?

ScaleFlux™

ScaleFlux™

AEROSPIKE 2x

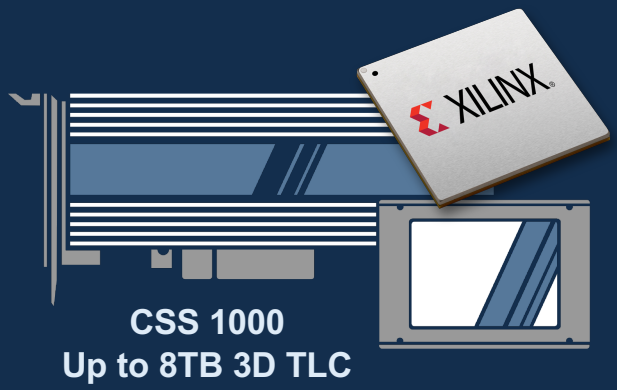
MySQL 2x

OpenZFS 5x

Hadoop MapReduce 1.6x

APACHE HBASE 2.6x

- PCIe Standard Form Factors & Power
- Open Channel-like Block Storage
  - High throughput, low latency
  - Workload tuning
  - I/O optimization: Atomic Writes & Streams
- HW ***Adaptable*** Compute Engines
  - Existing APIs for GZIP & EC



ScaleFlux™

Big Data ⟷ Fast Data

ScaleFlux™

Fast Data

First Name	Last Name	Email	Country	IP address
Dalton	Kramer	dalton@email.com	France	211.91.226.108
Gita	Tetterton	gita@email.com	USA	222.153.179.100
Weston	Jurgens	weston@email.com	Spain	203.123.236.1
Brad	Chupp	brad@email.com	France	202.183.111.122
Marybeth	Baumann	marybeth@email.com	Italy	214.132.168.129
Allyson	Feder	allyson@email.com	Italy	182.108.190.85
Lucile	Folks	lucile@email.com	Greece	18.64.161.62
Mickey	Rusk	mickey@email.com	Canada	40.18.115.207
Clarine	Esslinger	clarine@email.com	Greece	185.134.23.86
Kimberly	Penny	kimberly@email.com	France	34.72.165.11
Colleen	Kellough	colleen@email.com	USA	73.51.152.185
Nettie	Edmonds	nettie@email.com	Spain	94.133.138.234
Duncan	Rickenbacker	duncan@email.com	France	211.91.226.108
Marchelle	Diedrich	marchelle@email.com	Italy	222.153.179.100
Mariano	Murrell	mariano@email.com	Italy	203.123.236.1

Big Data

Last Name	Country	IP address
Kramer	France	211.91.226.108
Tetterton	USA	222.153.179.100
Jurgens	Spain	203.123.236.1
Chupp	France	202.183.111.122
Baumann	Italy	214.132.168.129
Feder	Italy	182.108.190.85
Folks	Greece	18.64.161.62
Rusk	Canada	40.18.115.207
Esslinger	Greece	185.134.23.86
Penny	France	34.72.165.11
Kellough	USA	73.51.152.185
Edmonds	Spain	94.133.138.234
Rickenbacker	France	211.91.226.108
Diedrich	Italy	222.153.179.100
Murrell	Italy	203.123.236.1

Indexes

.
.
.

Low Latency, subset dataset

Transactional Database

Batch, full dataset

Analytical Database

ScaleFlux™

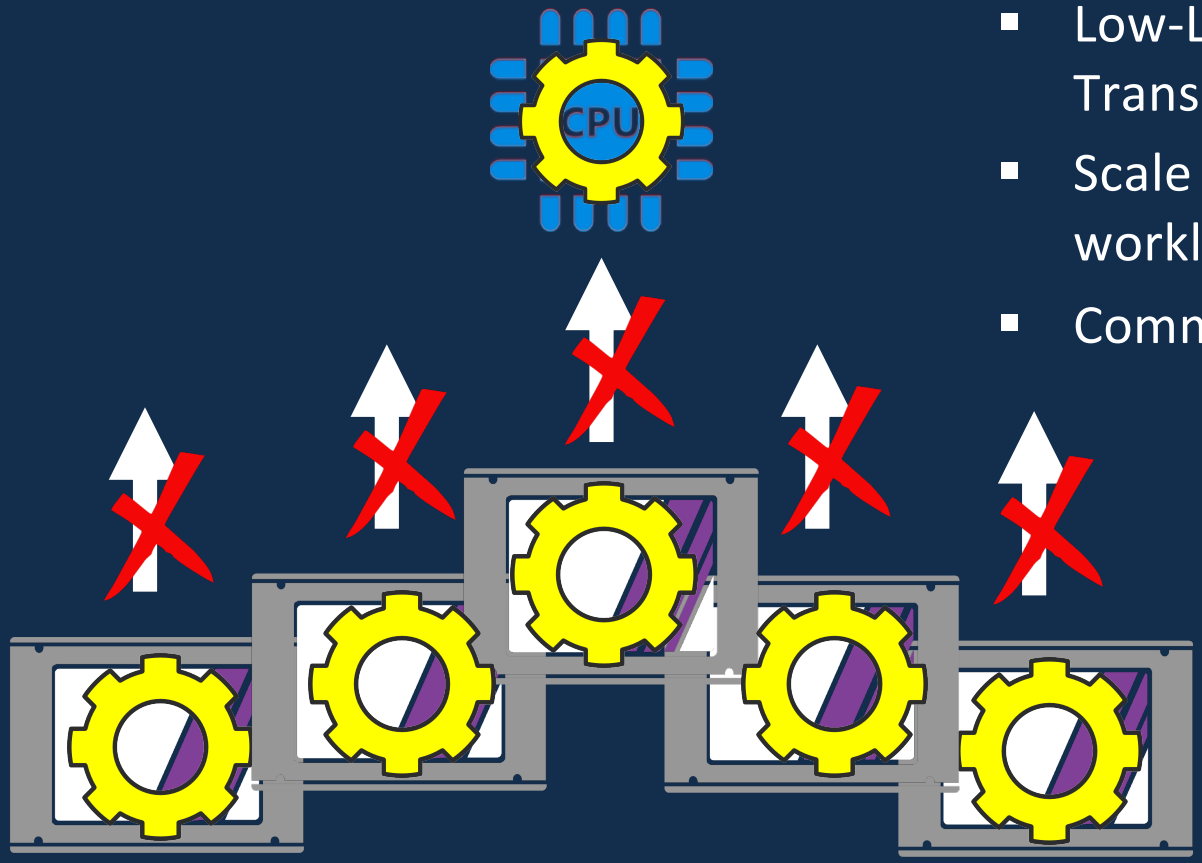
Question:

What Storage Solution Unifies Fast & Big Data?

ScaleFlux™

Computational Storage Unifies Fast & Big Data

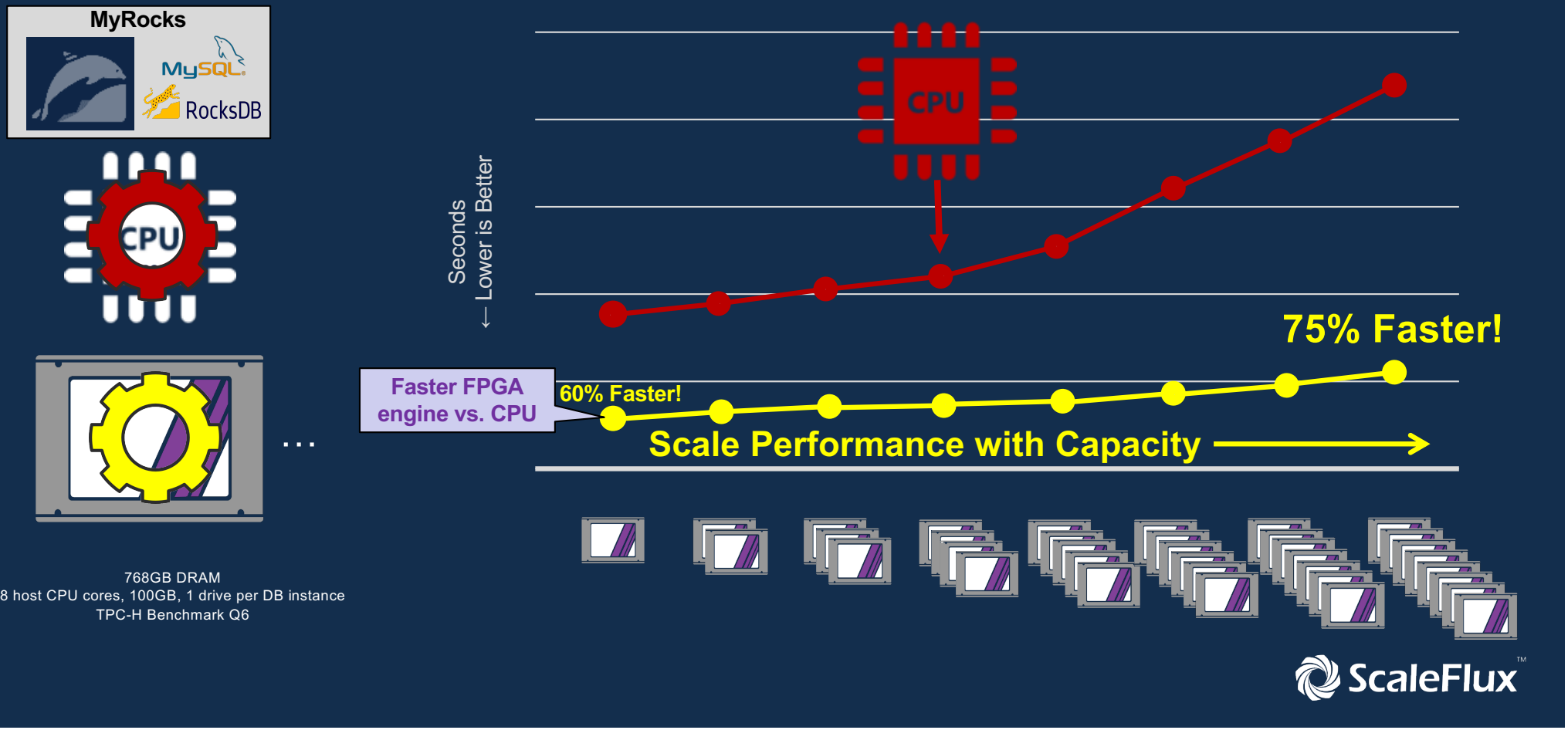
Intensive Compute
Extract/Transform
Record Filtering



- Low-Latency **FAST** Data Transactions
- Scale **BIG** Data analytics workloads with capacity
- Commodity infrastructure

ScaleFlux™

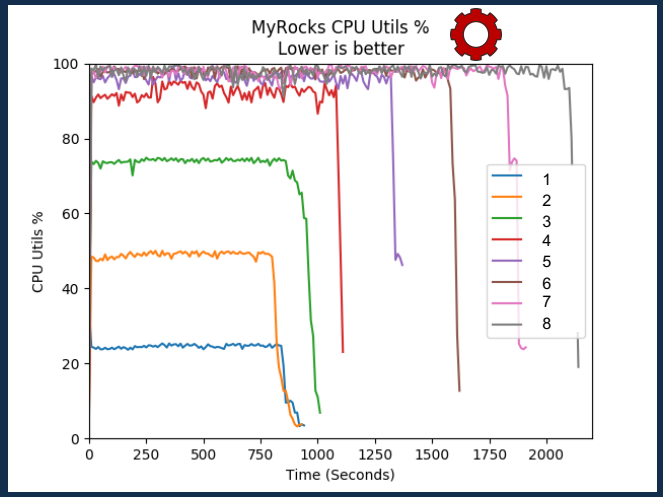
Analytical Queries on Transactional Data

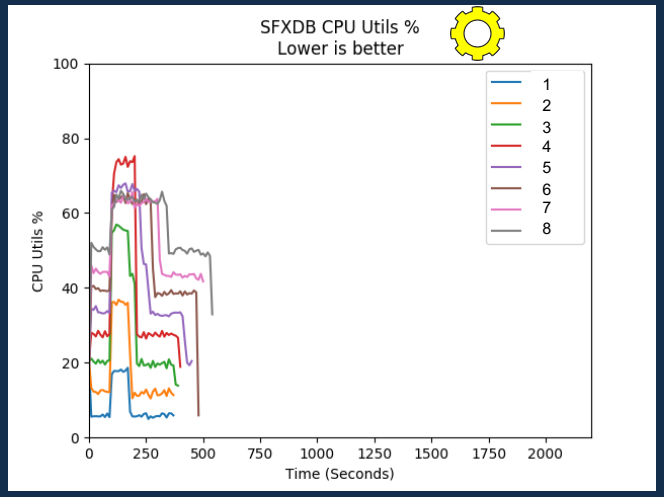


CPU

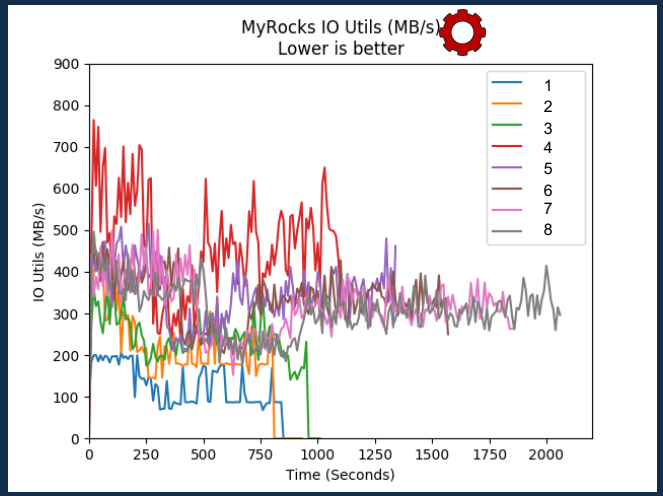
Computational Storage

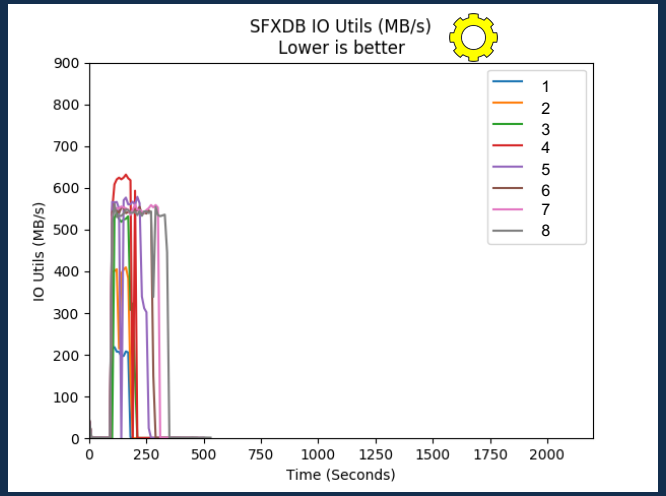
Compute





I/O





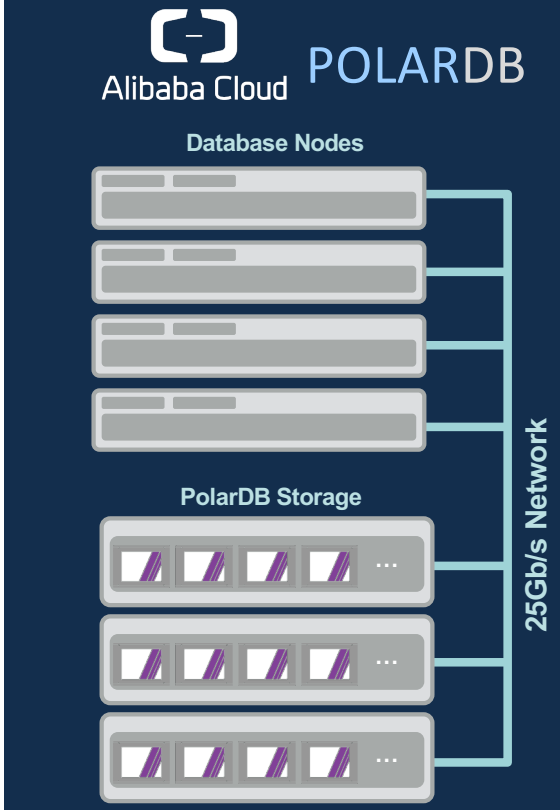
ScaleFlux™

POLARDB

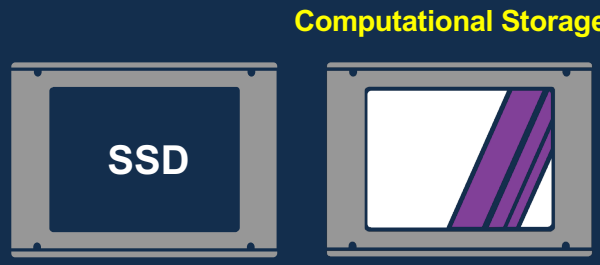
- Cloud native database with distributed storage
- HTAP: Hybrid Transactional-Analytical Processing
  - No lag for analytics
  - Reduced storage capacity required vs. traditional architectures
- Embrace Computational Storage
  - Best price/performance, new class of analytical responsiveness
  - Commodity server/storage infrastructure

ScaleFlux™

Computational Storage Value @ Cloud Scale



4 database + 3 storage nodes cluster
Commodity HW w/ Computational Storage



Scan Throughput	8GB/s	24GB/s
Query Latency	→	Up to 70% Reduction

TCO:
Scale CPU & Memory 3X more Efficiently

Performance:
Best User Experience

"ScaleFlux Computational Storage is required to delivery consistent transactional processing performance with analytical workloads on the same data." – Alibaba RDS

ScaleFlux™

Question:

What storage solution offers a new paradigm to scale compute resources with workload capacity?

ScaleFlux™

New Paradigm for Infrastructure Scaling

- Scale performance with capacity @ cloud scale
- Enable a new class of service
  - Optimize latency, eliminate stale data analysis
- Infrastructure scaling TCO benefits
- Parallelize intense compute @ data

ScaleFlux™

Compute Acceleration Along the Whole Stack

IN STORAGE ANALYTICAL DB

DATA PATH COMPRESSION/ DECOMPRESSION

Database, AI/ML, Genomics,

Compression (GZIP)
Erasure Coding (RS)
Security (AES)
Authentication (SHA)
Error Checking (CRC)
Deduplication
...

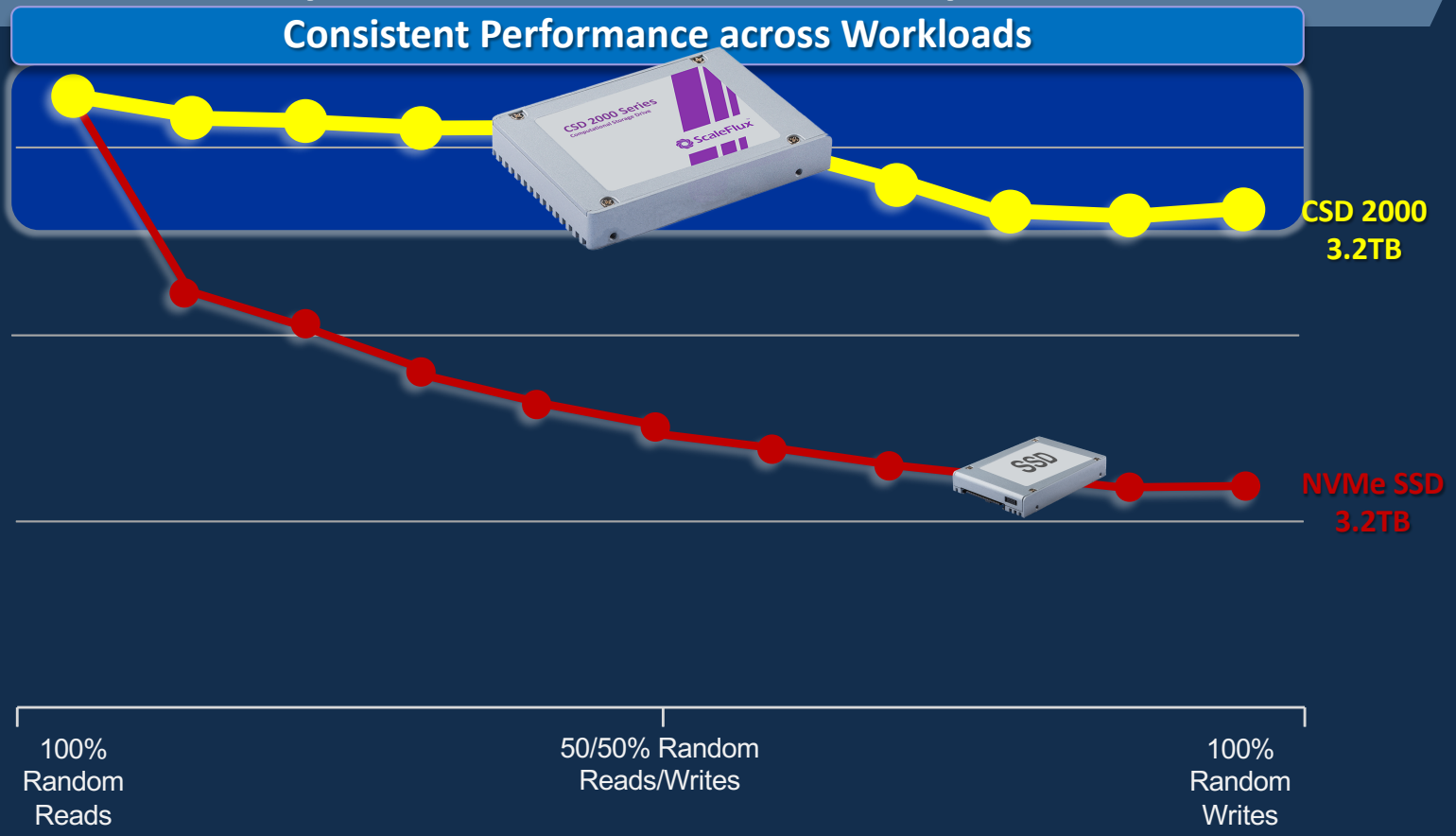
Industry's Most Advanced Computational Storage Drive

Application & Storage Acceleration

- ✓ **Fixed algorithms**
- ✓ **Bit-wise compare/manipulate**
- ✓ **Required across all data**

ScaleFlux™

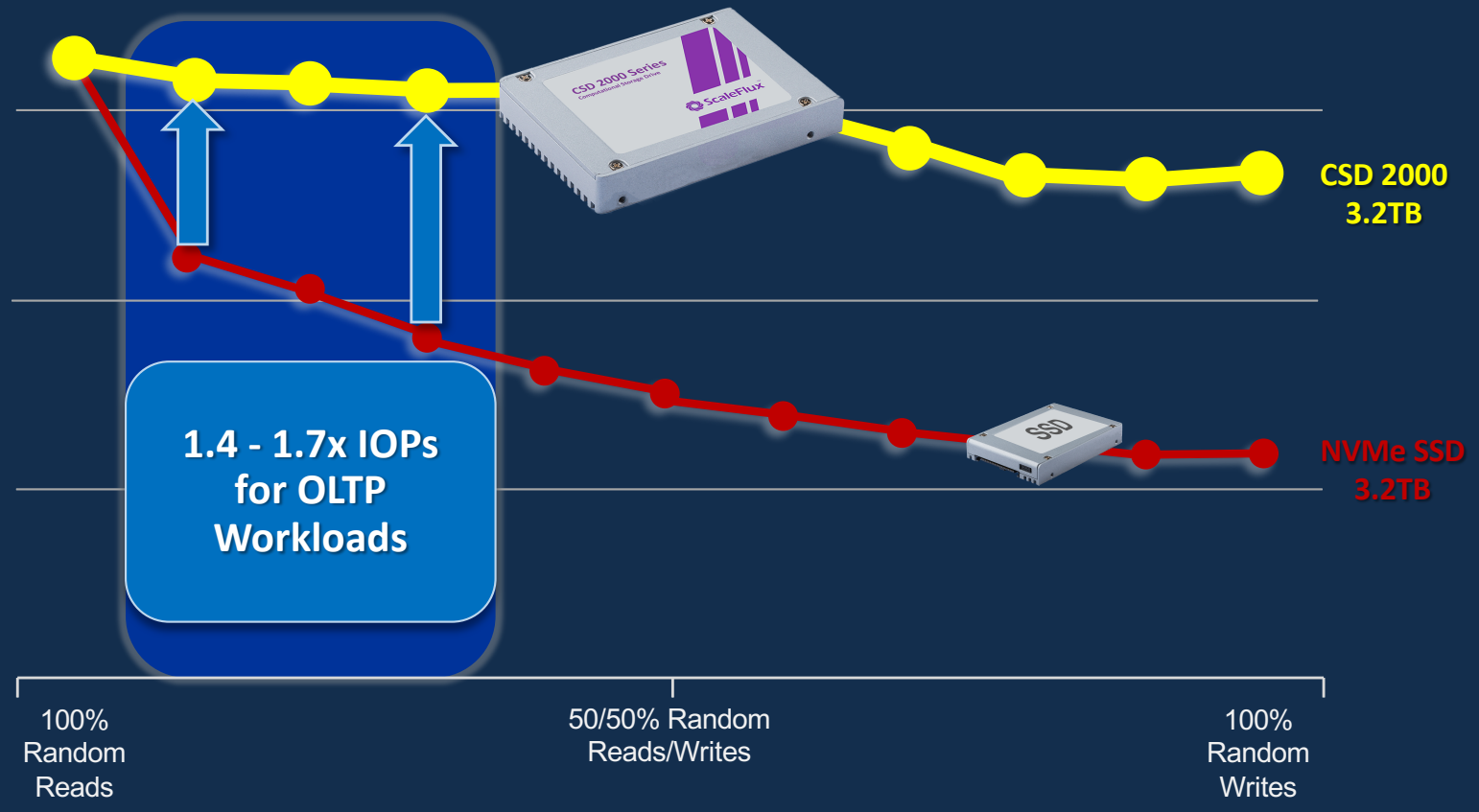
Data Path Compression & Decompression



(Random, 2.5:1 compressible, FIO, 4KB I/Os, 8 Jobs, 32 QD)

ScaleFlux™

Data Path Compression & Decompression



(Random, 2.5:1 compressible, FIO, 4KB I/Os, 8 Jobs, 32 QD)

ScaleFlux™

Data Path Compression & Decompression

CSD 2000
3.2TB

NVMe SSD
3.2TB

1.4 - 1.7x IOPs for OLTP Databases

Consistent performance across workloads

Penalty Free! (zero CPU overhead, zero app latency…)

100% Random Reads

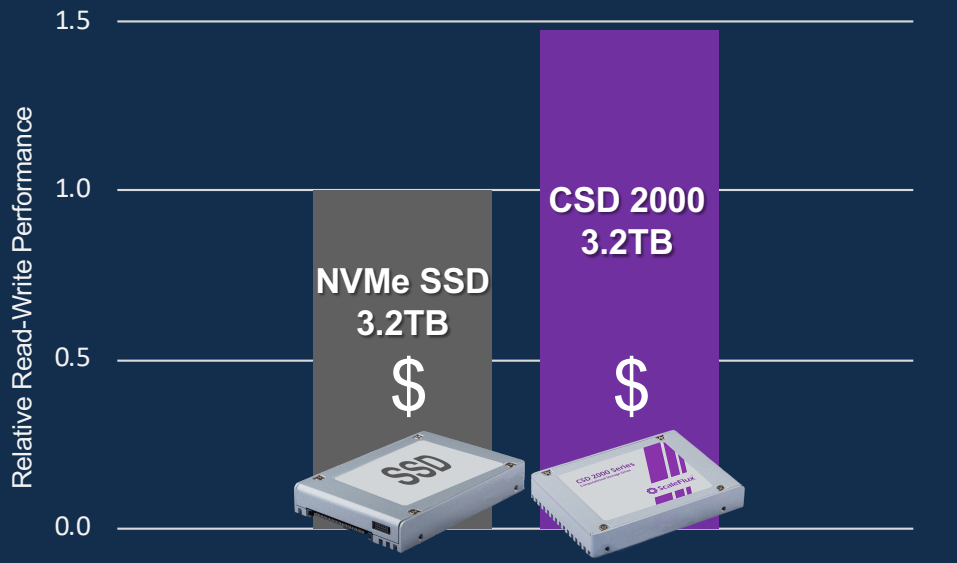
50/50% Random Reads/Writes

100% Random Writes

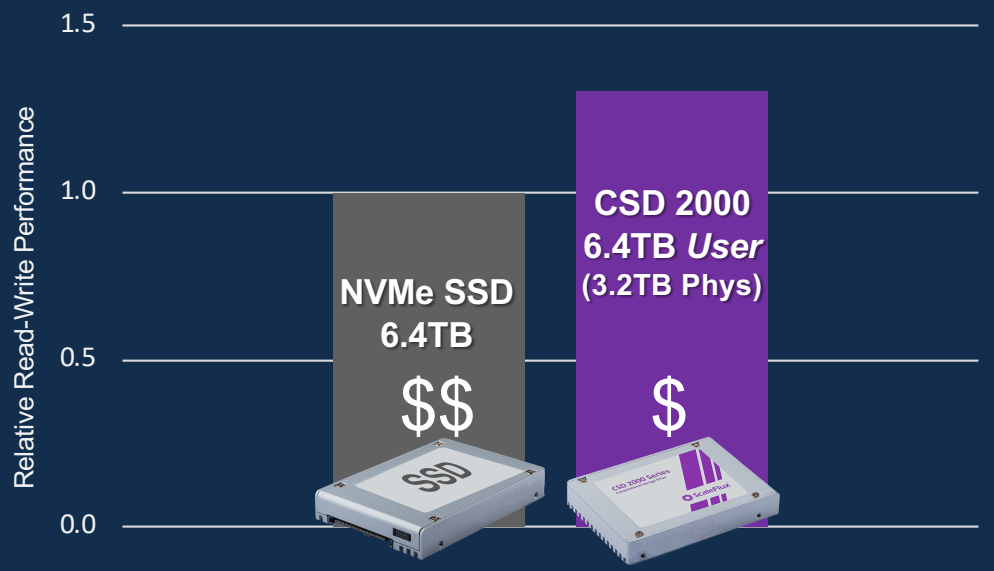
(Random, 2.5:1 compressible, FIO, 4KB I/Os, 8 Jobs, 32 QD)

ScaleFlux™

OLTP Optimized



~50% More Performance



~25% More Performance, <u>Half the Spend</u>

Sysbench with MySQL, InnoDB, 50M records, 64 Threads, 1hr Test run, Read-Write test
Perf Opt Mode: 2.4TB Raw Files Size; 0.9TB Compressed. Cost Opt Mode: 4.8TB Raw File Size, 1.6TB Compressed

ScaleFlux™

Question:

What storage solution cohesively opens APPLICATION and INFRASTUCTURE computing bottlenecks?

ScaleFlux™

Responsive Performance

OLTP and Mixed R/W

Unify Fast & Big Data

Minimize Data Movement

Affordable Scaling

Reduce $/GB

Performance w/ Capacity

Commodity Infrastructure

Agile Infrastructure

Transparent Benefits

In-System HW Updatable

Application Tuning

ScaleFlux™

A Growing Ecosystem of Innovative Systems

DELL EMC

Extreme Scale Infrastructure (ESI)

Large Scale Customers

PowerEdge R640 (Intel Skylake)
PowerEdge R6415 (AMD Epyc)

MIDDLE CANYON

swarm compose docker STORIDGE™ Automated PYTORCH portainer.io kubernetes APACHE kafka A distributed streaming platform hadoop influxdb ØMQ APACHE mxnet Solr mongoDB.

Nvidia T4
BCOM/MLNX SmartNICs
9x 7.68TB ScaleFlux CSDs

Klondike 2020

Real-time AI/ML Streaming Workloads with Computational Storage

ScaleFlux™

Computational Storage Proliferation

Expanding Apps

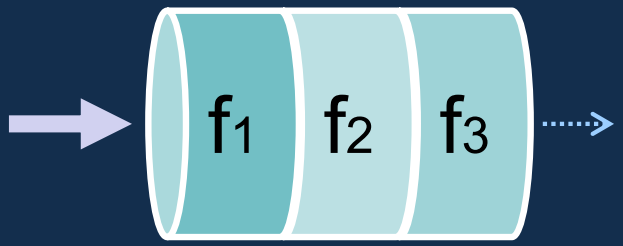
Transparent Benefit
Ease of Use

Standardization

SNIA®

Identification
Activating Computation

Pipeline Compute



Application + Infrastructure
Multiply benefit

ScaleFlux™

The Rise of Computational Storage

Unify Fast & Big Data

New paradigm to scale performance with capacity

Growing ecosystem & shipping in volume

ScaleFlux™

ScaleFlux™

Deploying Computational Storage at Scale

Thank You!

Come visit us at Booth #113

www.scaleflux.com

ScaleFlux™