Re-architecting storage infrastructure

…for the future of the enterprise

The Register®

PURESTORAGE®

Who’s on the panel

Iain Thompson

– The Register

Roland Dreier

– Pure Storage

Agenda

Application storage challenges

What is NVMe and NVMe-oF?

Rethinking Data Centre infrastructure

Where to go from here

The Demands of the Modern Enterprise

"53% OF MOBILE USERS LEAVE A SITE THAT TAKES OVER 3 SECONDS TO LOAD"

"79% OF WEB SHOPPERS WHO HAVE TROUBLE WITH WEB SITE PERFORMANCE SAY THEY WON'T RETURN TO THE SITE TO BUY AGAIN"

"1 SECOND OF LOAD LAG TIME WOULD COST AMAZON $1.6 BILLION IN SALES PER YEAR"

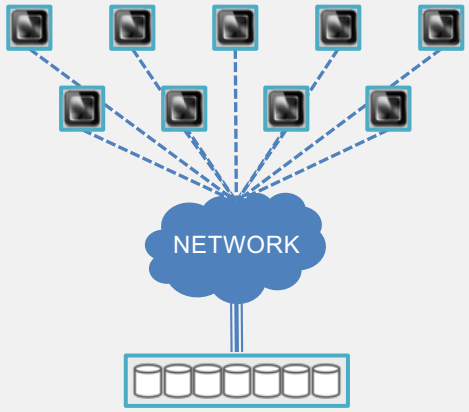
Application differences can create silos

WIDE RANGE OF IO PROFILES LEAD TO DIFFERENT DEPLOYMENT ARCHITECTURES

	TRANSACTIONAL DATABASE	VIRTUALIZED PRIVATE CLOUD	SCALE-OUT DATABASES	ANALYTICS / DATA WAREHOUSE	BIG DATA / AI / ML	TEST / DEVELOPMENT
	ORACLE, Microsoft SQL Server, SAP, Epic, MariaDB	vmware, Microsoft Hyper-V	cassandra, mongoDB.	kafka, HIVE, teradata.	APACHE Spark, hadoop	
IO PROFILE	RANDOM	RANDOM & SEQUENTIAL	RANDOM	SEQUENTIAL	RANDOM & SEQUENTIAL	RANDOM
IO SIZE	SMALL	SMALL TO LARGE	SMALL & MEDIUM	LARGE	LARGE	SMALL & LARGE
TYPICAL ARCHITECTURE	SAN	SAN	DAS	DAS /SAN / CLOUD	DAS	DAS / CLOUD

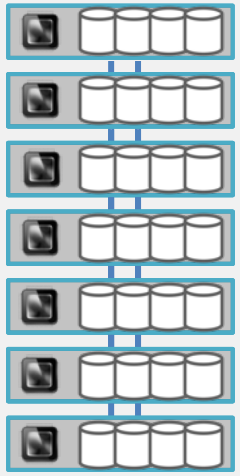
But each architecture has trade-offs

NETWORKED
(SAN / NAS)



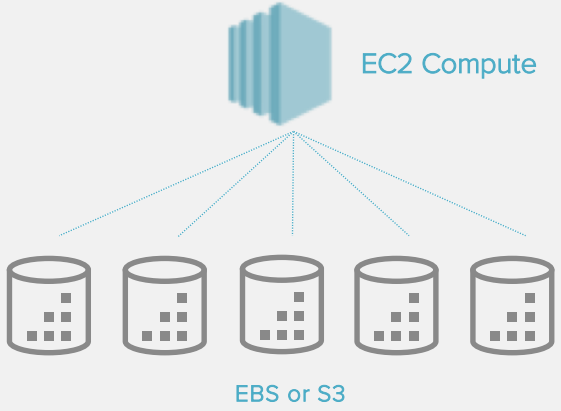
- ✓ SHARED
- ✓ RELIABLE
- ✓ RICH SOFTWARE
- X EXPENSIVE
- X COMPLEX
- X CUSTOM HW

DIRECT-ATTACHED
(DAS)



- ✓ FAST
- ✓ SIMPLE
- ✓ CHEAP
- X UNRELIABLE
- X NO DATA SERVICES
- X INEFFICIENT SCALING

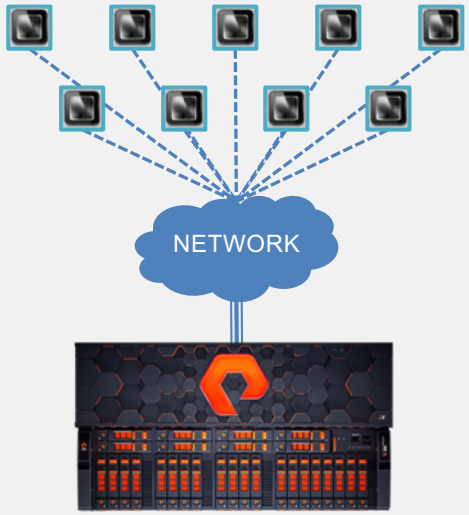
PUBLIC CLOUD



- ✓ AGILE
- ✓ SIMPLE
- ✓ SCALABLE
- X LIMITED DATA SERVICES
- X LIMITED RESILIENCY
- X SECURITY / PRIVACY

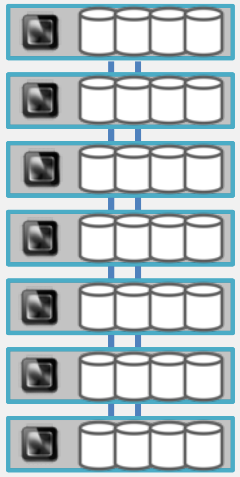
Pure Storage focus areas

NETWORKED
(SAN / NAS)



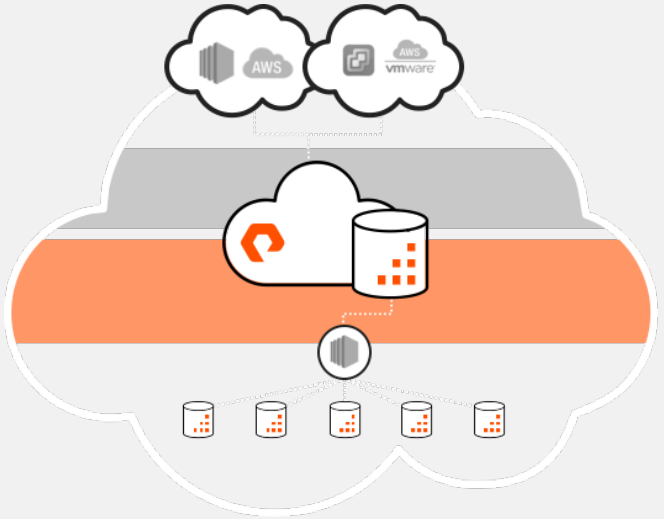
- ✓ SHARED
- ✓ RELIABLE
- ✓ RICH SOFTWARE
- ✓ CONSISTENT PERFORMANCE
- ✓ SIMPLIFIED OPERATIONS
- ✓ COST EFFICIENT

DIRECT-ATTACHED
(DAS)



- ✓ FAST
- ✓ SIMPLE
- ✓ CHEAP
- ✗ UNRELIABLE
- ✗ NO DATA SERVICES
- ✗ INEFFICIENT SCALING

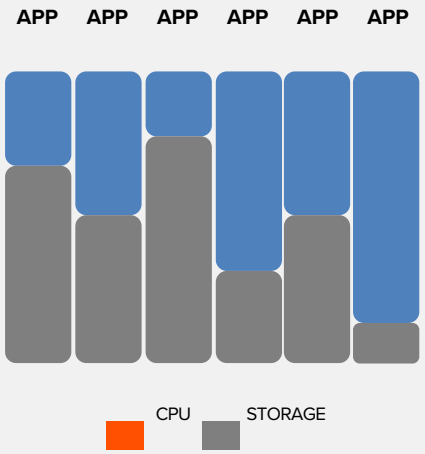
PUBLIC CLOUD



- ✓ AGILE
- ✓ SIMPLE
- ✓ SCALABLE
- ✓ ENTERPRISE DATA SERVICES
- ✓ HYBRID BC / DR
- ✓ ENCRYPTION

The challenge of DAS

INFLEXIBLE ARCHITECTURE



CANNOT SCALE STORAGE AND COMPUTE SEPARATELY

INEFFICIENT CONSOLIDATION

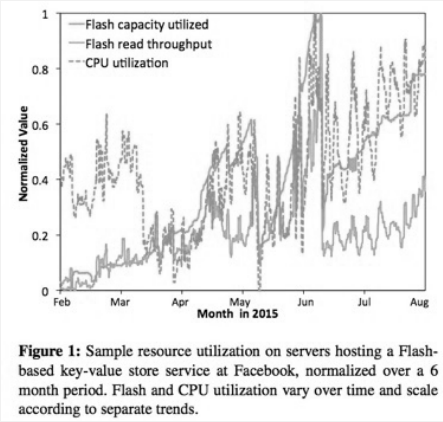
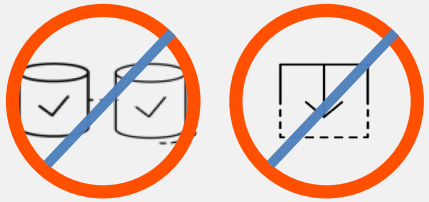


Figure 1: Sample resource utilization on servers hosting a Flash-based key-value store service at Facebook, normalized over a 6 month period. Flash and CPU utilization vary over time and scale according to separate trends.

STRANDED CPU / STORAGE

MINIMAL DATA SERVICES



NO SNAPS / REPLICATION
NO GLOBAL DEDUPLICATION
NO THIN PROVISIONING

INCREASED COMPLEXITY

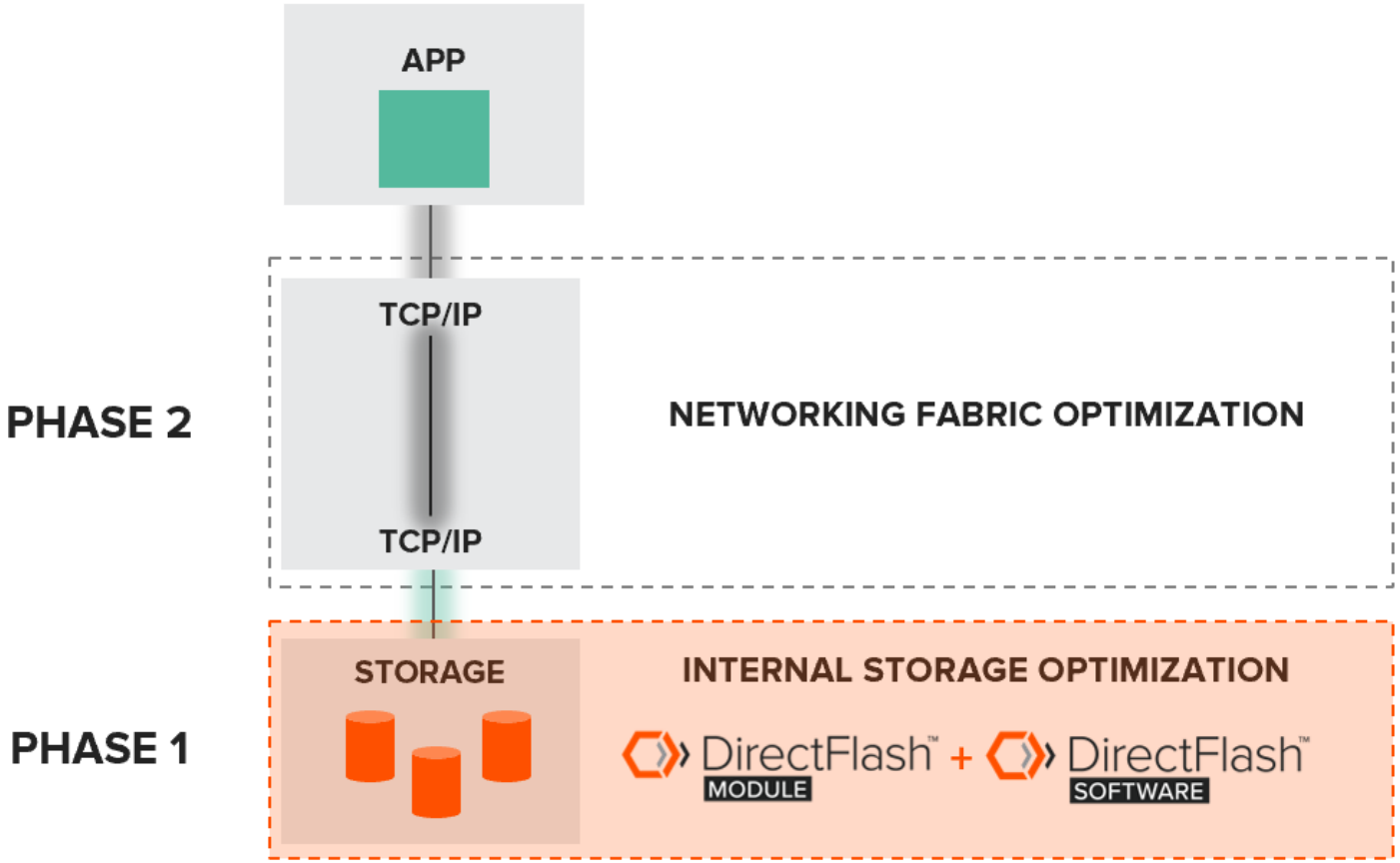
>_REST_A
>_REST_B
>_REST_C

DISRUPTIVE UPGRADES
COMPLEX MANAGEMENT

What is NVMe? NVMe-oF? How can it help?

MODERN STANDARDS FOR CONNECTING & ACCESSING FLASH WITHIN A STORAGE ARRAY AND ACROSS THE NETWORK

Phase 1: Optimizing App Access to Flash



FlashArray Benefits with DirectFlash, NVMe

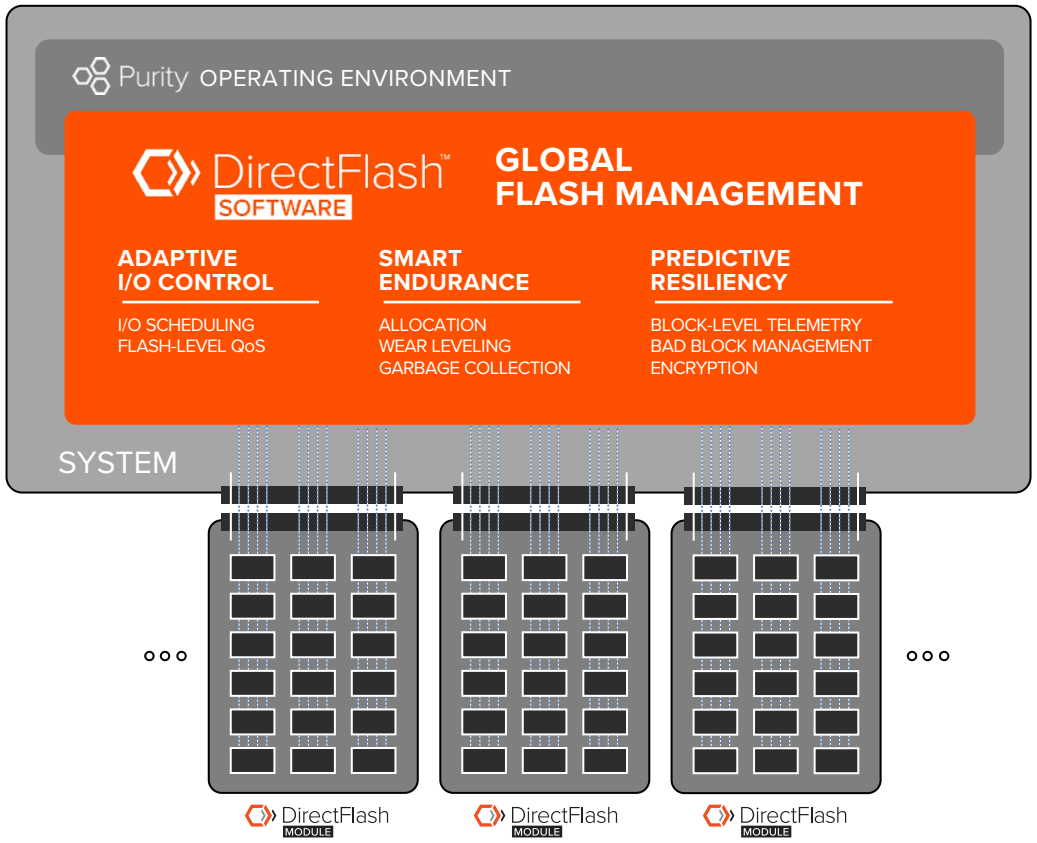
4X

INCREASE IN IOPS PER GB

2X

TBs PER RU

SAS vs DIRECTFLASH with NVMe



Up to

20%

CAPACITY EFFICIENCY

3X

INCREASED WRITE BANDWIDTH

NVMe Application Benefits

(SAS vs NVMe with DIRECTFLASH)

ORACLE

2.9X

FASTER ORACLE DATA WAREHOUSE DSS WRITE BANDWIDTH

SAP HANA

3.7X

FASTER DELTA MERGE WRITE BANDWIDTH

SAP® Certified Hardware for SAP HANA®

40%

LOWER LOG-WRITE LATENCY

Epic

HEALTHCARE EMR APPLICATION

45%

LOWER READ LATENCY

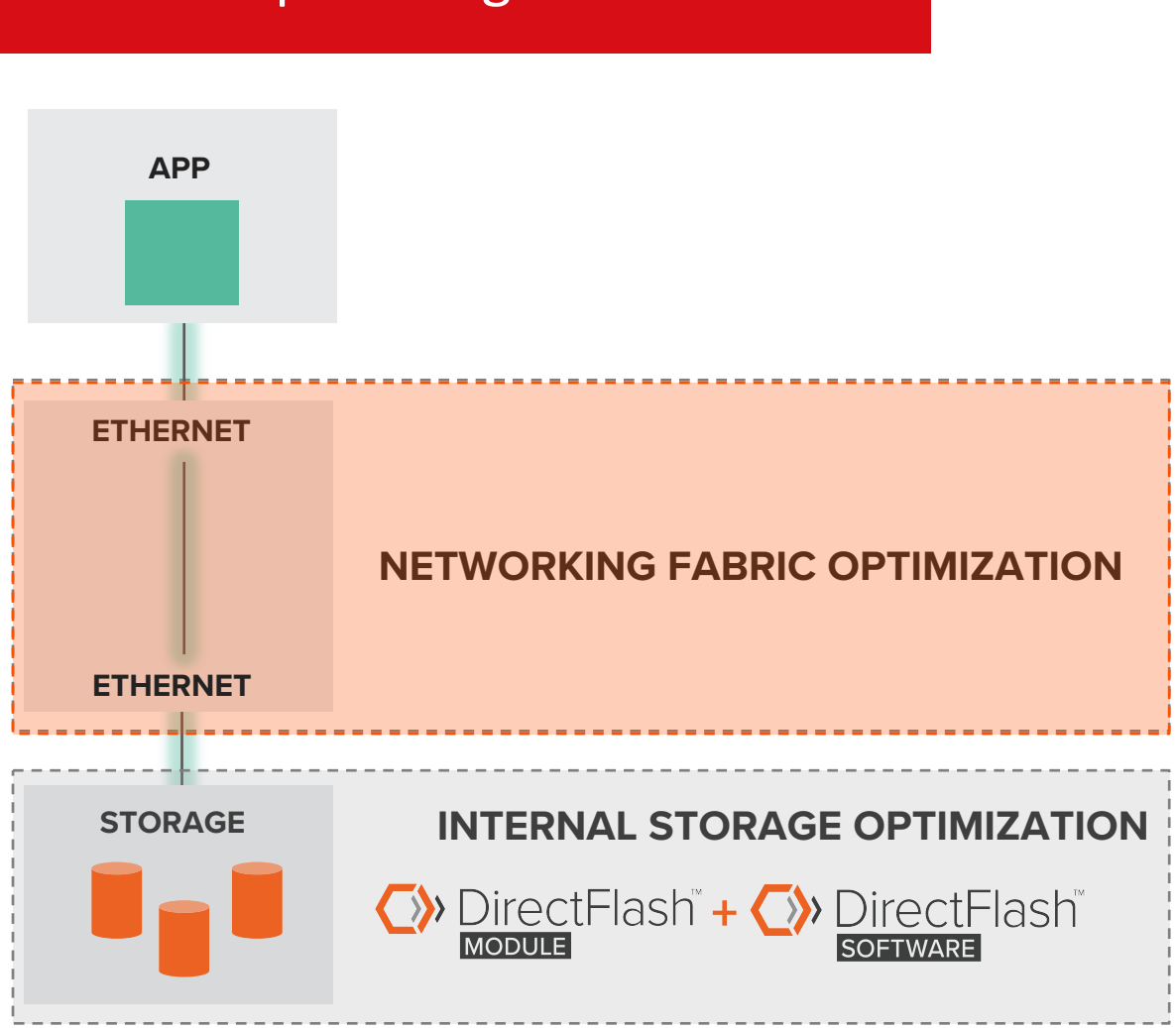
27%

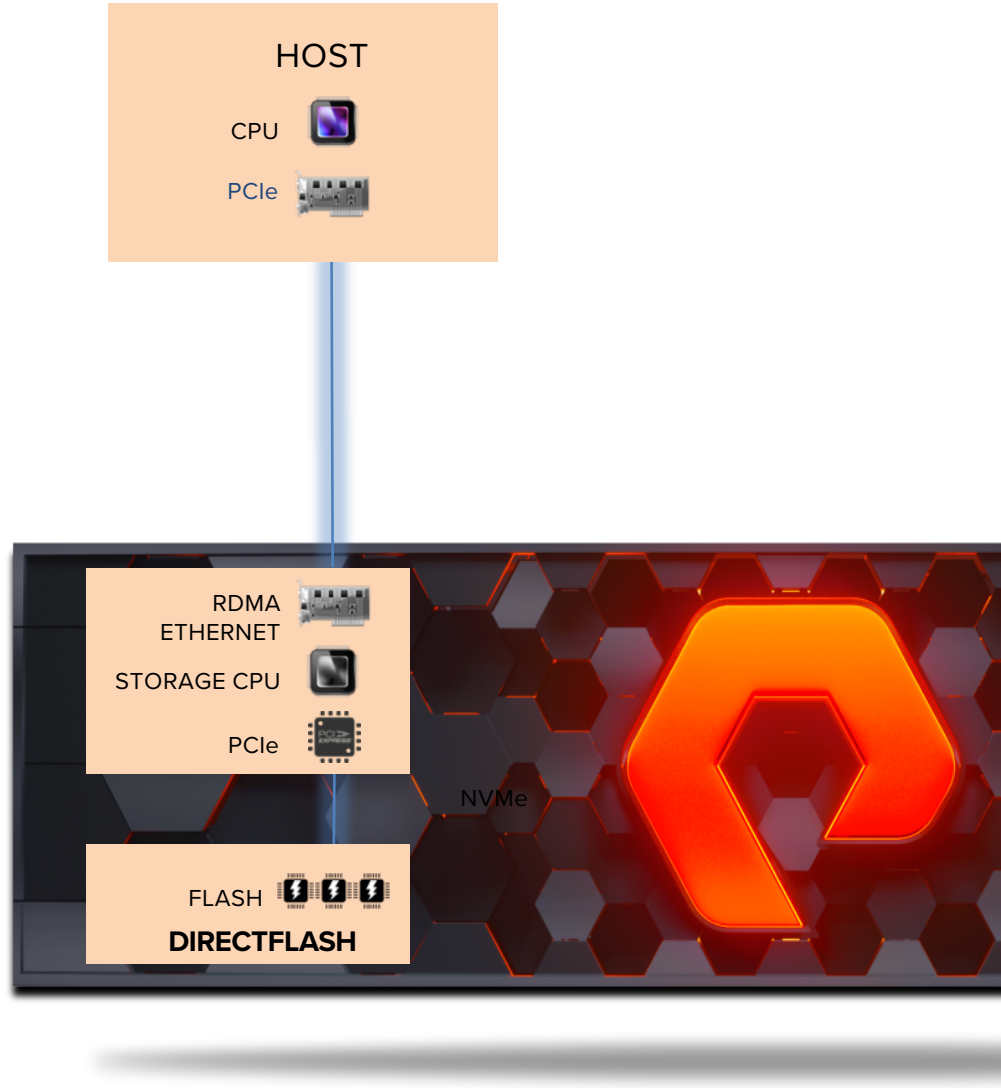
HIGHER EPIC IOPS

Phase 2: Optimizing network fabric

PHASE 2

PHASE 1





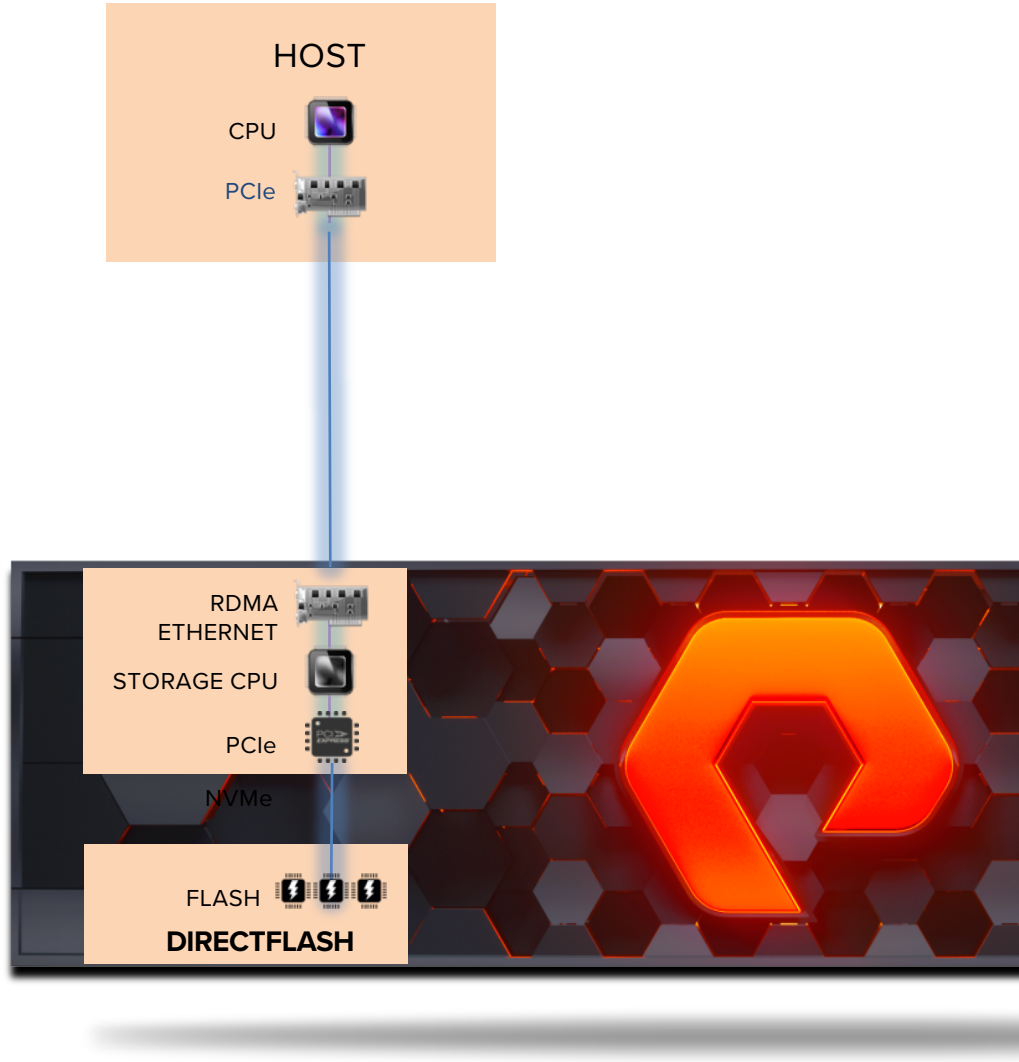
NVMe-oF Performance Benefits

END-TO-END NVMe PERFORMANCE
WITH ENTERPRISE CLASS DATA SERVICES

UP TO
50%
LATENCY REDUCTION
COMPARED TO ISCSI

UP TO
20%
LATENCY REDUCTION
COMPARED TO FC

UP TO
25%
HOST CPU OFFLOAD



NVME OVER FABRICS via RDMA over CONVERGED ETHERNET
PURITY 5.2 + FLASHARRAY//X + RDMA ENABLED CARD

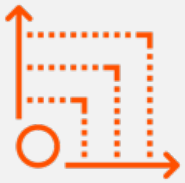
NVMe-oF DirectFlash Benefits vs DAS

END-TO-END NVMe PERFORMANCE

DAS LATENCY

NVMe CONCURRENCY

CONSISTENT PERFORMANCE



EFFICIENCY AT SCALE

SCALE CPU & STORAGE SEPARATELY

ENTERPRISE DATA SERVICES

INCREASED CPU/ STORAGE DENSITY PER RACK

OPERATIONAL GAINS

SIMPLE SETUP, SEAMLESS SCALE

SNAPSHOTS FOR INSTANT SCALE

CLOUD DATA MOBILITY

Rethinking Data Center Infrastructure:
DAS Consolidation

DIRECT ATTACHED STORAGE

2-4X CPU DENSITY
4-10X CAPACITY DENSITY
25% CPU OFFLOAD
INCREASED EFFICIENCY = LOWER COSTS
FULL DATA SERVICES

DirectFlash™ FABRIC

Pure Storage DirectFlash Fabric Roadmap

DIRECT ATTACHED STORAGE / iSCSI

RDMA over
CONVERGED ETHERNET
GA: JANUARY 16, 2019

ENTERPRISE APPLICATIONS

NVMe over
FIBRE CHANNEL
2020

ALL APPLICATIONS

NVMe over
TCP (ETHERNET)
2020

Summary

NVMe and NVMe-oF = FASTER APPS AND DATA SERVICES

250µs LATENCY = DAS PERFORMANCE

MORE CORES = MORE RESULTS

INCREASED EFFICIENCY = LOWER COSTS

Further Reading

eBook: NVMe over Fabrics for Noobs

http://reg.cx/2TZb

Blog: Pure Delivers NVMe-oF with DirectFlash Fabric

http://reg.cx/2TZc

Web: Pure Storage FlashArray//X

http://reg.cx/2TZd