



# 3D-XPoint™ in 2022

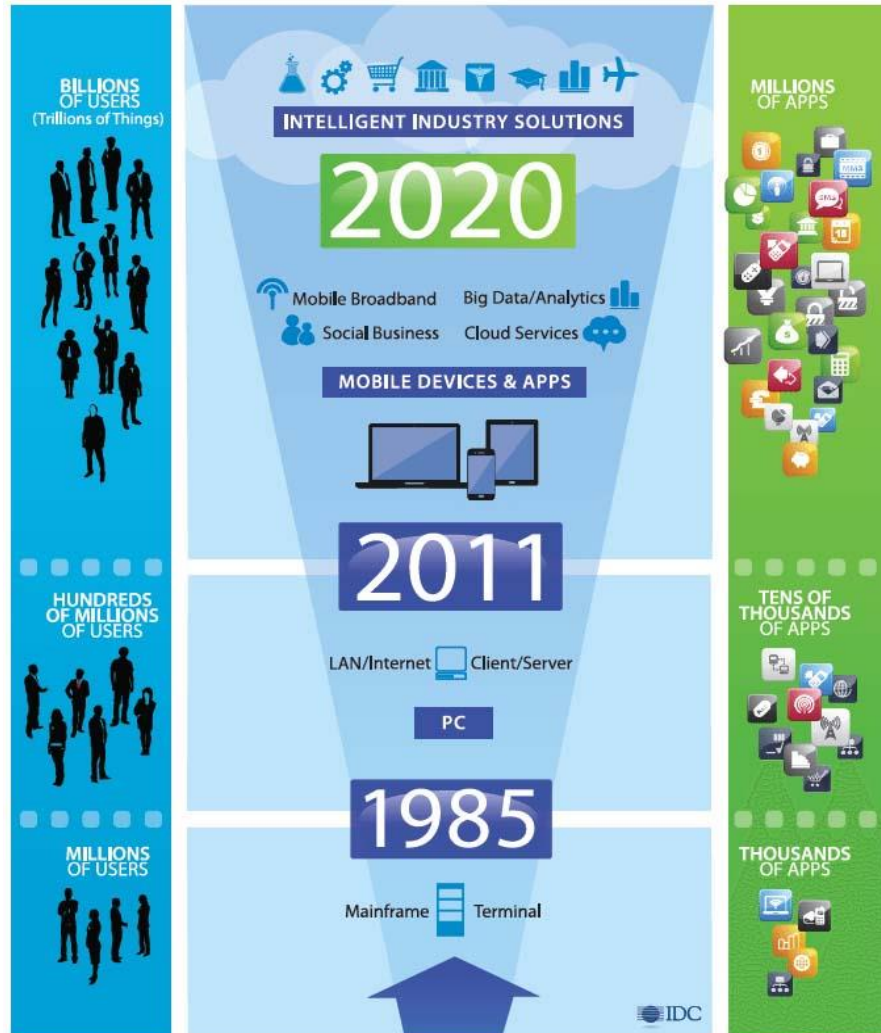
Bob Hansen – V.P. Systems Architecture



# The Migration of Storage Intelligence

## THE 3rd PLATFORM

Defining the integration and intersection of mobile, cloud, social, and big data



### • 3rd Platform Storage

- Millions of developers (open source)
- Storage aware applications (and OS)
  - Architected for Scale out – not scale up
  - In-memory data base, native tiering
  - Server is the critical component
- Very High Performance persistent storage
  - NVMe
  - Flash now, Storage Class Memory soon
- Very intelligent storage devices
  - > 500K lines of code in an NVMe controller
- Direct attached storage >= networked

### • 2nd Platform Storage

- Simple storage drivers, SCSI, smarter devices
- Network attached storage (SAN)
- Array Controller centric intelligence
  - > 25M lines of code in storage controller SW release

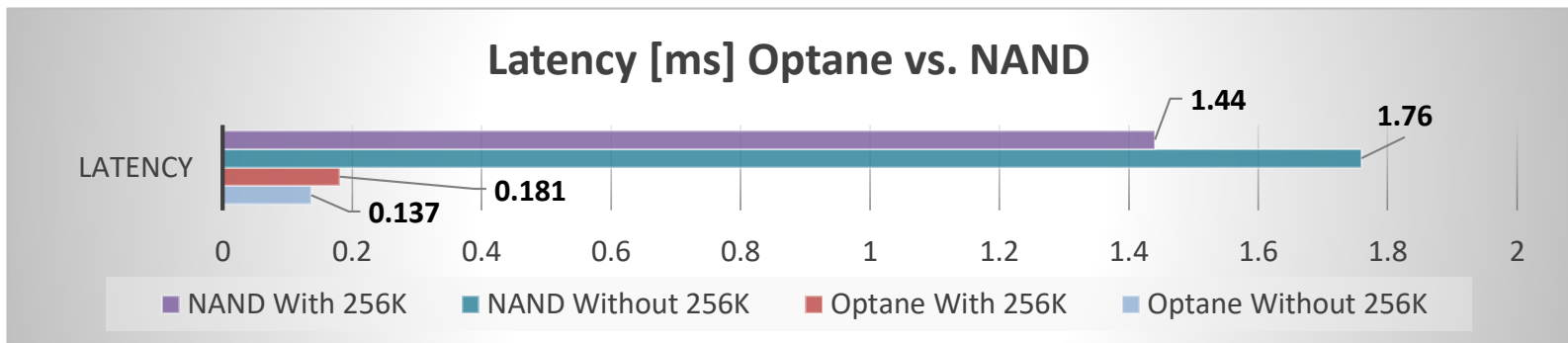
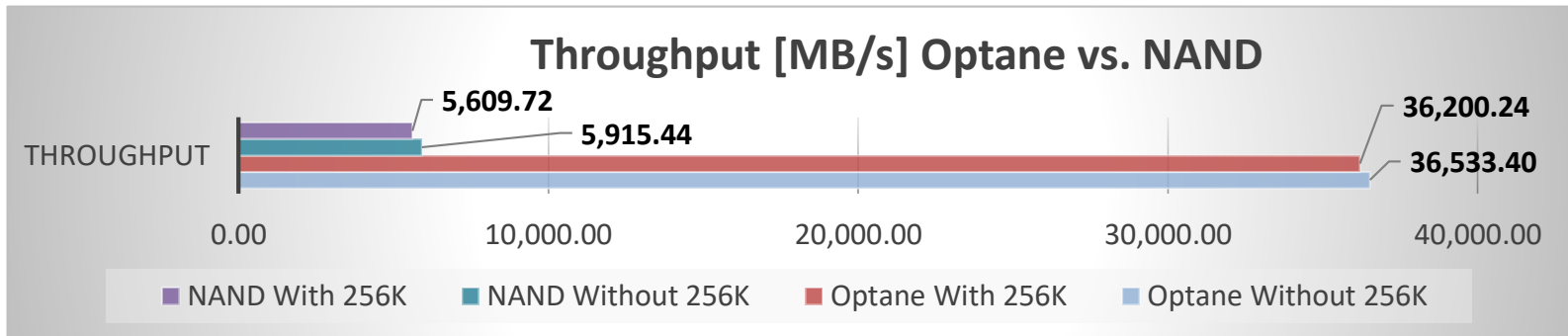
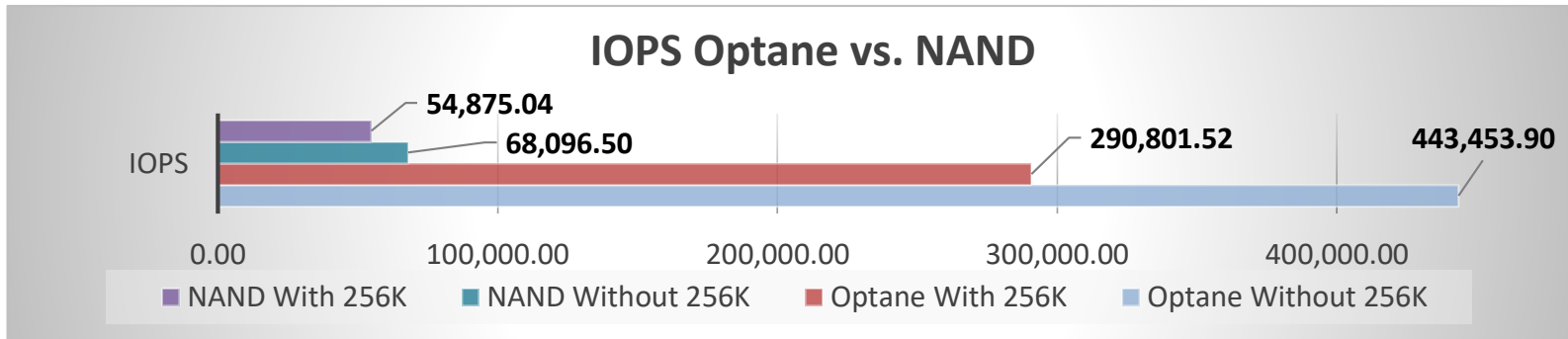
### • 1st Platform Storage

- Direct Connect, Dumb Storage Hardware
- Software (OS) centric storage management and control

# 3rd Platform Storage Drivers

- Millions of developers (open source)
- Storage aware applications and SDS
  - Architected for Scale out – not scale up
  - In-memory data base, native tiering
  - Server is the critical component
- Very High Density 3D NAND
  - 30TB SSDs this year – 720TB in 2 Rack Units (standard SFF SSD)
  - New High density form factors - > 1TB in 1 Rack Unity
- Very High Performance persistent storage
  - NVMe
  - Flash and ***Storage Class Memory***
- Very intelligent storage devices
  - >500K lines of code in an NVMe controller
- Very High Performance Storage Network

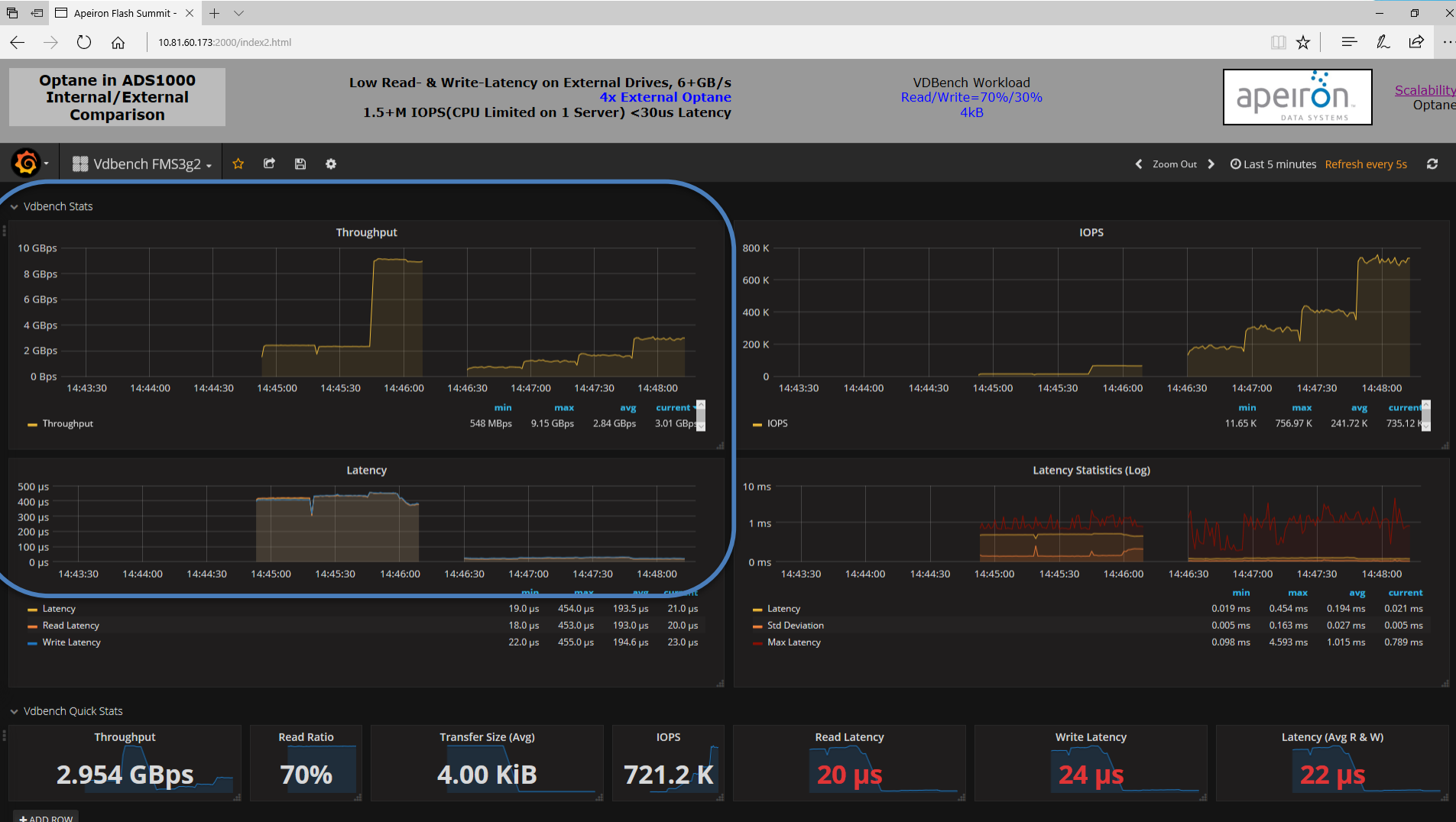
# 3D-XPoint™ vs. NAND



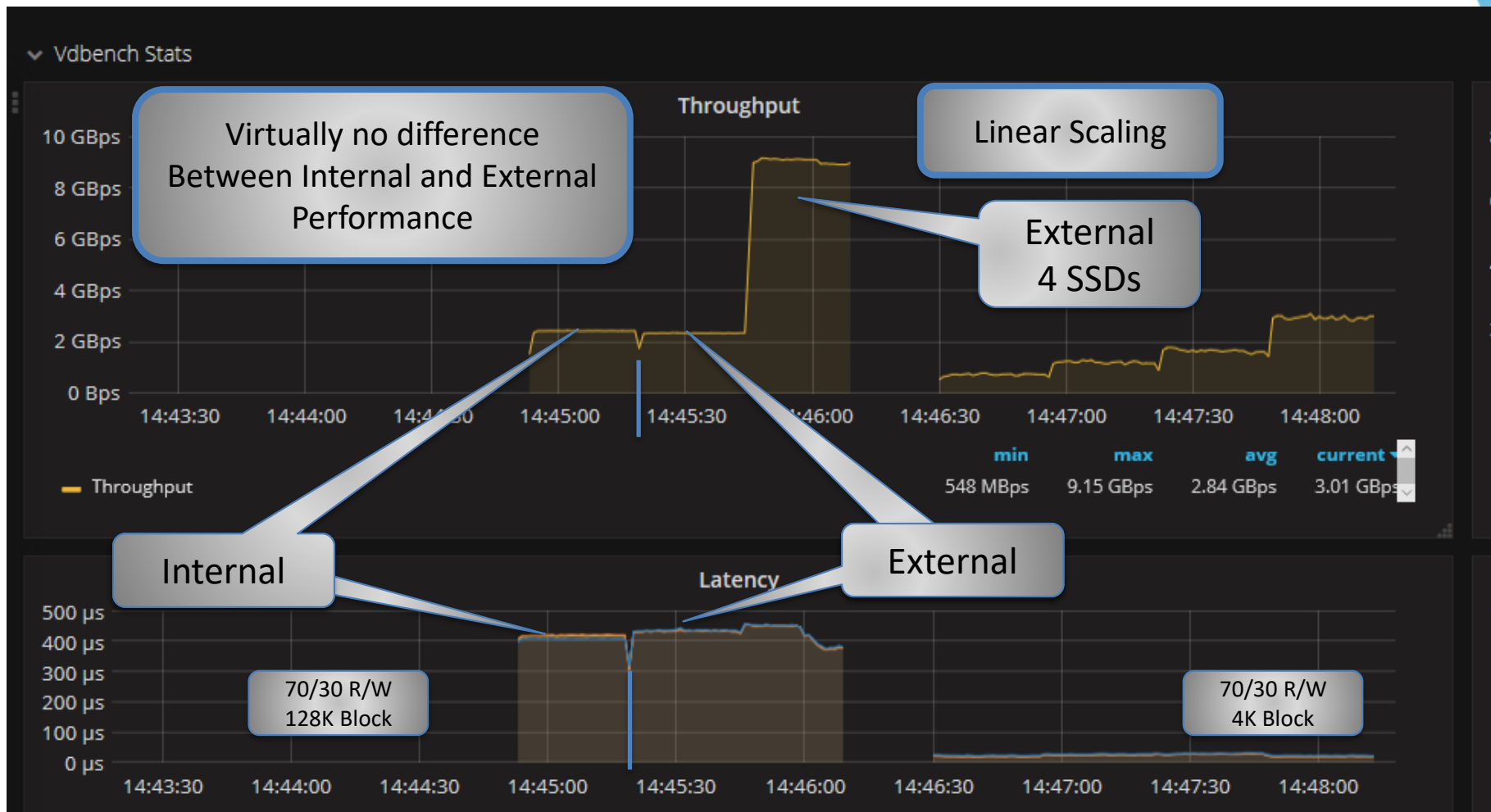
70/30 Read/Write  
256K Block Size or mix of 152K, 52K and 4K Blocks

# Storage Networking Performance

See it live in Booth 422



# Ideal Storage Network Performance with Optane 3D-XPoint™



# Storage Architecture in 2022

- Scale-out applications with SDS dominate
  - Traditional controller based storage arrays are dead!
- Many choices for storage performance / cost
- 3D NAND
  - Performance tier for less demanding applications
  - Wide spread replacement of HDDs by NAND
    - 3D NAND = lower cost (TCO) and high density (including rack space)
- Performance Tier => Storage Class Memory
  - 3D-XPoint™ and MRAM(?)
- Simple, Very High Performance Storage Networking
  - Optane and NAND on single storage network
  - Performance must be << storage class memory

# ADS1000 Scale-out NVMe Solution Unmatched Performance, Scalability and Efficiency



24 NVMe 2.5" SSD

720TB  
Sep '17



Front

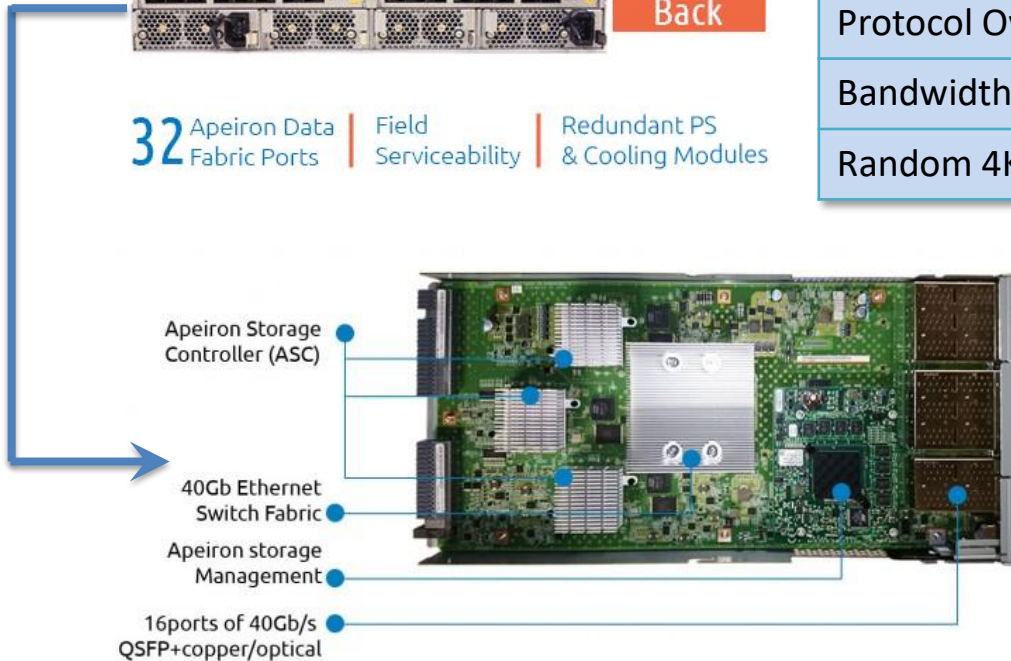
Fully integrated switch fabric



Back

32 Apeiron Data Fabric Ports | Field Serviceability | Redundant PS & Cooling Modules

ADS1000 Performance (2U)	
Capacity	38/76/154/184/360TB
Latency (NAND LIMITATION)	100µs
Protocol Overhead	<3µs (roundtrip)
Bandwidth sustained	72 GB/s (drive limited)
Random 4K reads	<b>18.4 M IOPS</b>



x2 ADS40G-HBA | 40 GbE Data Fabric ports | Dual 10 GBaseT port







Thank You  
Come See Us – Booth 422

[bob@apeirondata.com](mailto:bob@apeirondata.com)

