Flash Memory Summit

Computational Storage:
Acceleration Through Intelligence & Agility

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Flash Memory Summit 2018
Santa Clara, CA

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SSD
What's the Big Deal?
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Alibaba Cloud

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70%

of Alibaba Cloud's clients encounter:

High Cost

- Exorbitant licensing fees
- Expensive migrations

Data Islanding

- Can't store tons of data in the same place
- Difficult for different applications to share

Data Explosion

- Sheer volume of data taxing to process

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MARKET PROBLEM

High Cost

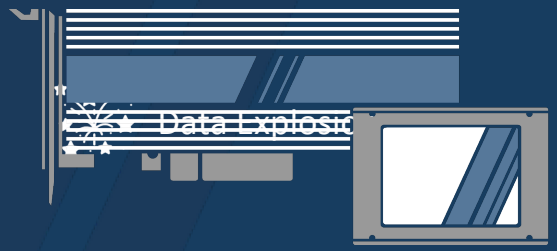
Alibaba Cloud OPPORTUNITY

Cloud Scale Economics

Unified Storage Data Islanding

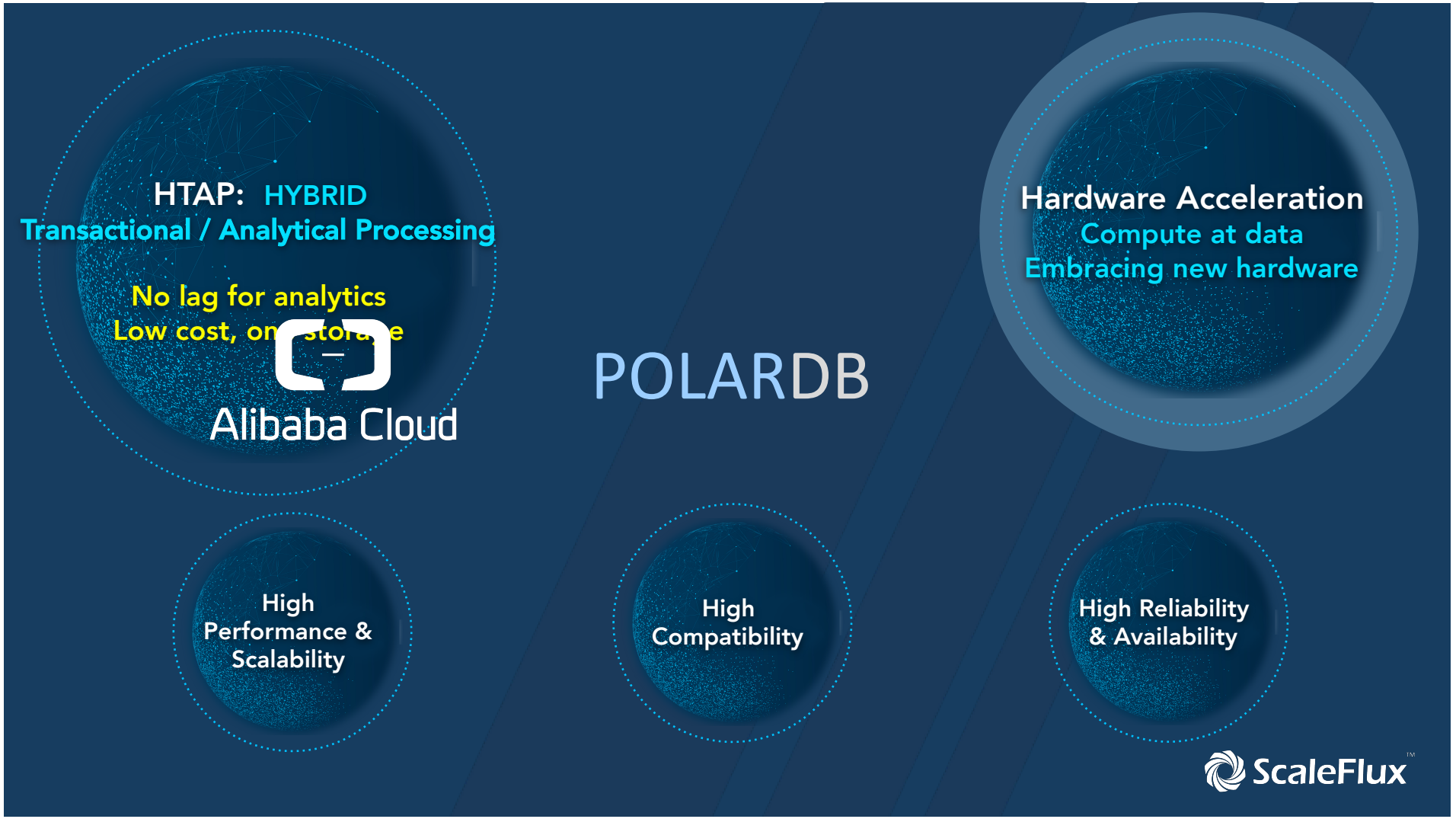
Real-time Analytics

ScaleFlux SOLUTION

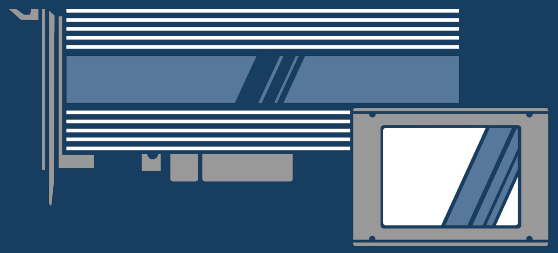


Computational Storage

ScaleFlux


HTAP: HYBRID
Transactional / Analytical Processing
No lag for analytics
Low cost, on
Alibaba Cloud
POLARDB
Hardware Acceleration
Compute at data
Embracing new hardware
High Performance & Scalability
High Compatibility
High Reliability & Availability
ScaleFlux

Computational Storage Provides the Solution



Real-time analytical processing from transactional data

- Intelligent data management
- Parallelize Compute at Data
- Programmable hardware

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10X Transactional-Analytical Processing, **Half** the Flash Capacity

GM at Alibaba Cloud **Database**

"By bringing compute to the data, ScaleFlux is **transforming** the way we are architecting our **Flash storage infrastructure**.

We're looking to fully utilize the values of Computational Storage in order to cost-effectively scale **real-time analytics** across exploding transactional data sets, all the while delivering the most responsive, cloud-native user experience."

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How?

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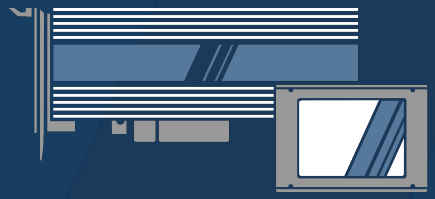
Cohesive Application to Storage Acceleration



Open Channel
Flash Management

Computation
Acceleration

Solution
Agility

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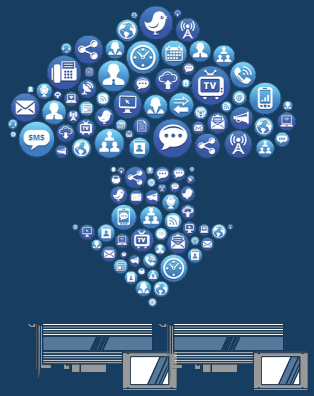
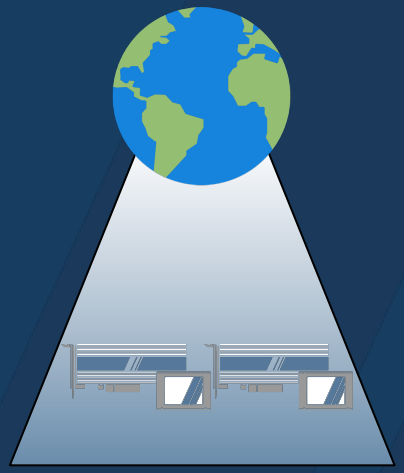
Open Channel (Host) Flash Management

Data Placement



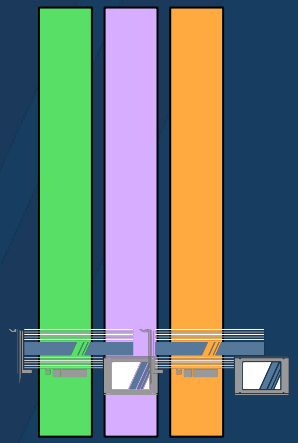
✓ Controllable
✓ Application Awareness

Global View



✓ Reduce Overprovision
✓ Minimize Write Amplification

Multi-Tenant



✓ Isolation
✓ Consistent

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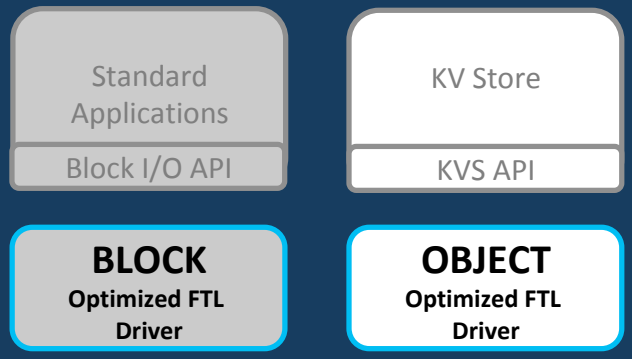
Value Example: KV Store



KV Tailored FTL

Compatible Hardware

Fast Integration

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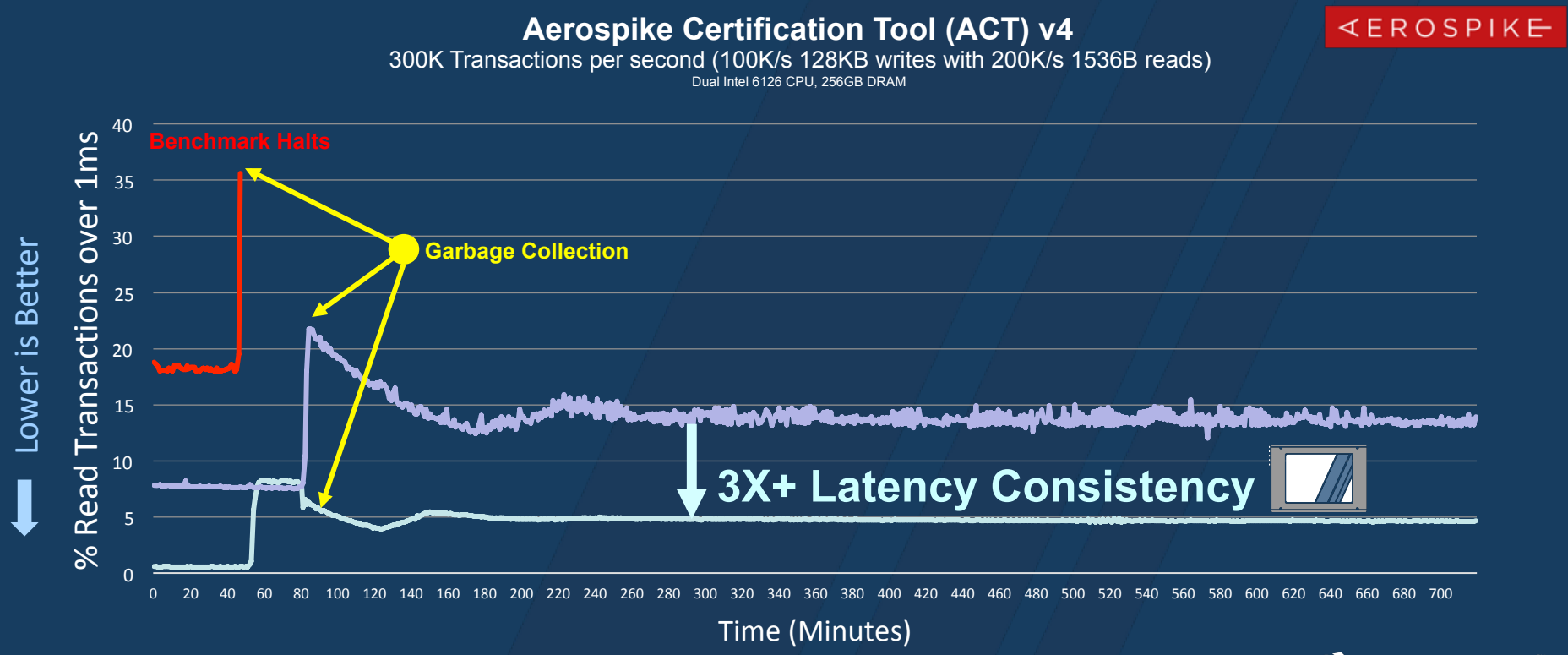
Optimize Application QoS, not just at SSD Level



Other Open Channel Management Values

Easily Tunable

3D NAND TLC to QLC+

Simple NVM integration

Next: Industry standardization

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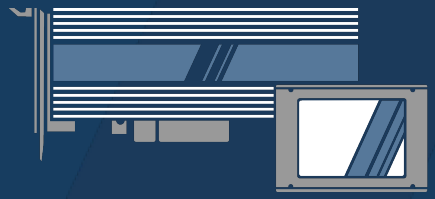
Cohesive Application to Storage Acceleration



Open Channel
Flash Management

Computation
Acceleration

Solution
Agility

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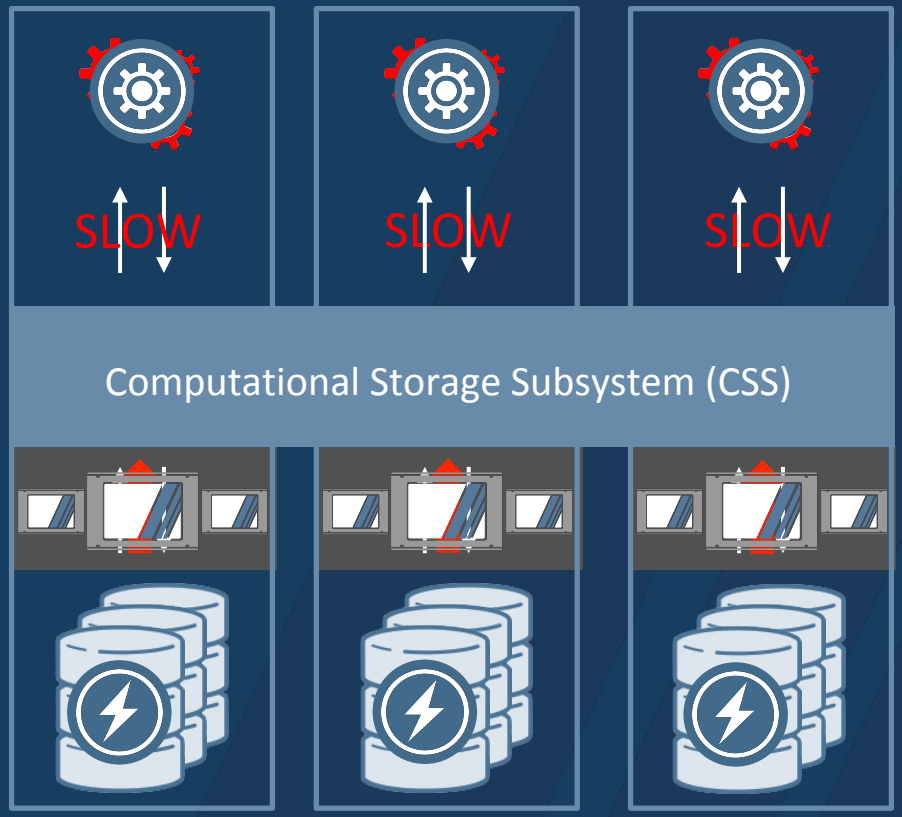
Acceleration

Performance & Scalability

Intense Compute
(compression, fuzzy search)



Limited I/O and
Memory Capacity

...

- Reduce Data Movement
- Accelerate Computation
- Parallelize Processing

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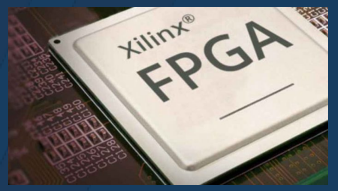
Tradeoffs and Design Consideration

Compute Functions

- Data intensive, fixed function
- 5-100x speed up vs. CPU



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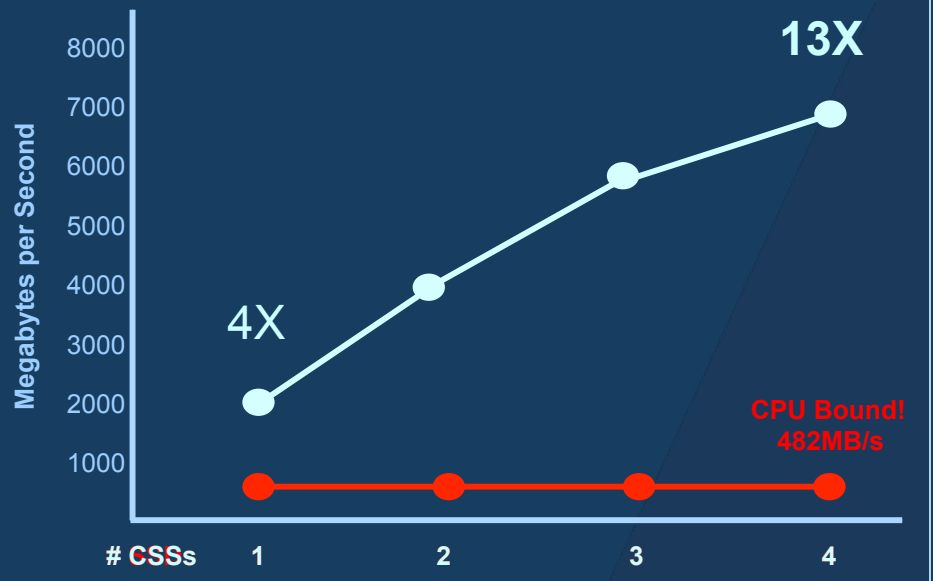
Parallelizing Computational Storage

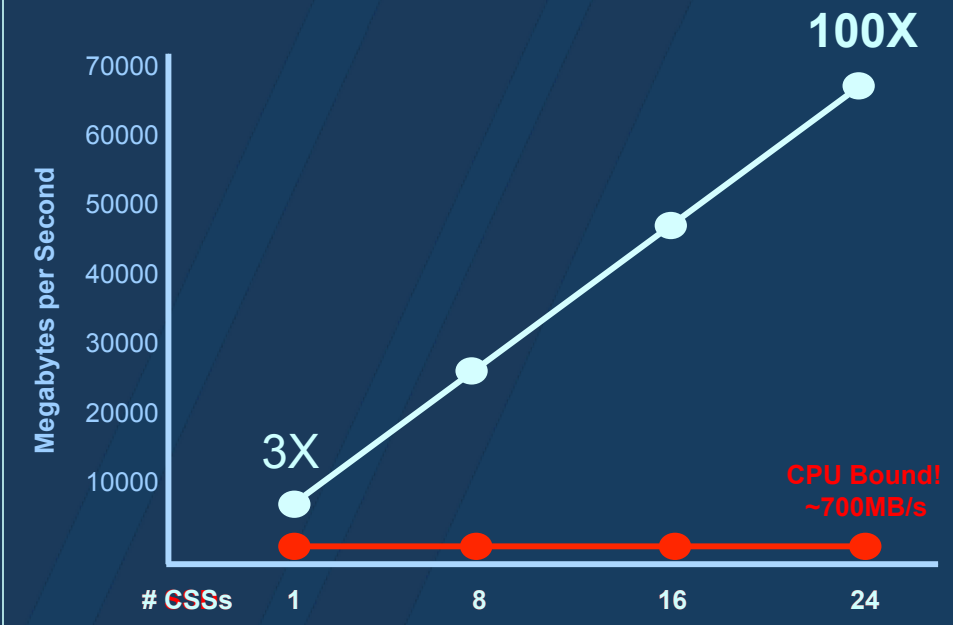
GZIP Compression

(CPU zlib vs. ScaleFlux css_zlib, corpus.cantebury E5-2667v4)



Fuzzy Search

(POC Unindexed Text Data, Edit Distance = 8, E5-2637v3)



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Identify Right Workloads

INFRASTRUCTURE

STORAGE

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

PLATFORM

DATABASE, ANALYTICS

KV-Store
Transactional-Analytical
SQL Processing
Big Data Analytics

APPLICATION

AI, Genomics, CDN, Search

Media Scaling & Transcoding
Neural Networks
Fuzzy Search
Filtering, Matching

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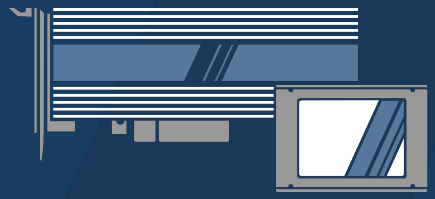
Cohesive Application to Storage Acceleration



Open Channel
Flash Management

Computation
Acceleration

Solution
Agility

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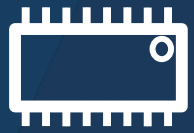
Agility is Important

ENGAGEMENT

Demand to POC < 6 months

+



FLASH LIFECYCLES

Reducing to 12 months

+

HW AGILITY

Update after deployment

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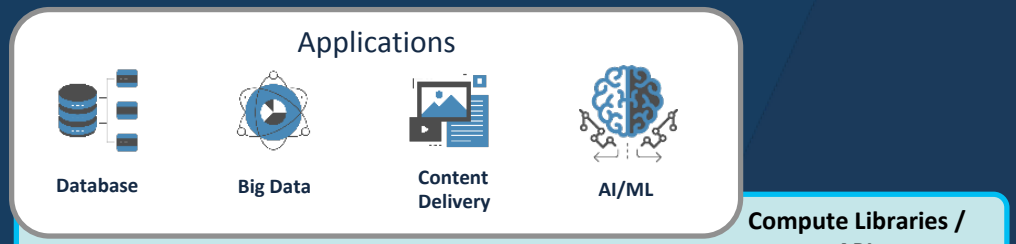
Solution Agility Across Whole Stack



Compute Libraries / APIs

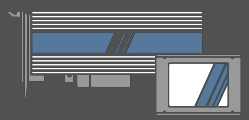
Distributed File Systems
(HDFS, Ceph, …)

Virtual File System (VFS)
File System (Ext4, XFS, ZFS …)

Open Channel Flash Management
Computational Storage Driver

PCIe

AIC or U.2



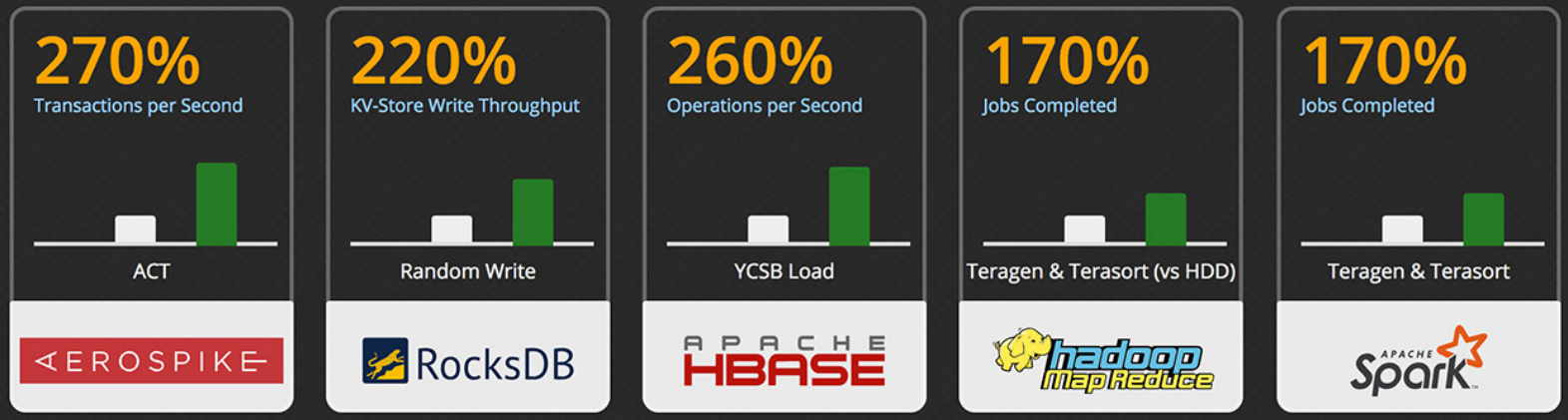
FPGA
Re-programmable
Compute Engines

Simple Interface
Easy Integration

Controllable Data Placement
Performance/QoS (latency)

Programmable HW engines

Fast TTM for Turnkey Apps



vs. NVMe

Available Through:

DELL EMC

inspur

packet

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Delighted Customers

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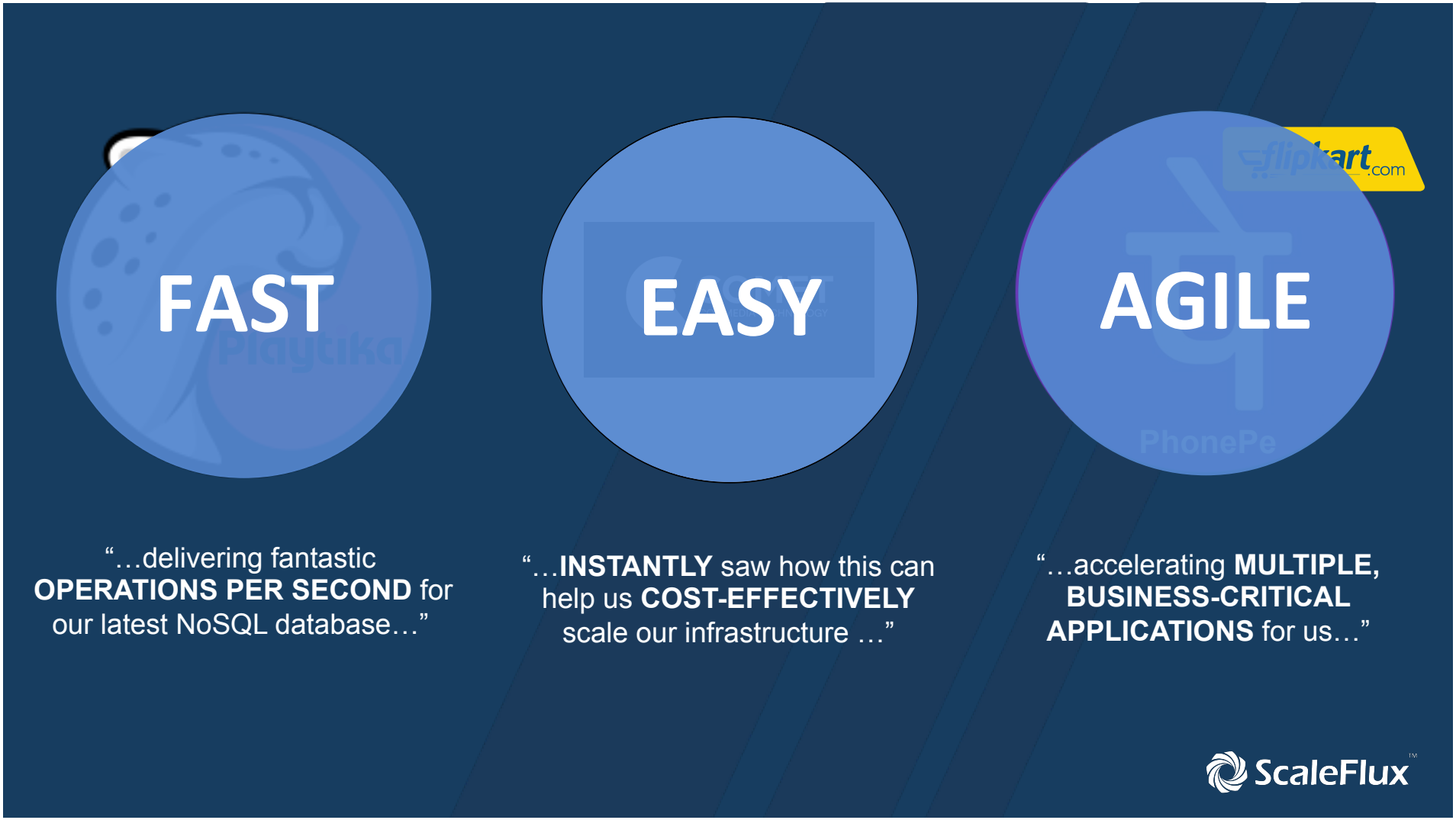
FAST
EASY
AGILE
"…delivering fantastic **OPERATIONS PER SECOND** for our latest NoSQL database…"
"…**INSTANTLY** saw how this can help us **COST-EFFECTIVELY** scale our infrastructure …"
"…accelerating **MULTIPLE, BUSINESS-CRITICAL APPLICATIONS** for us…"
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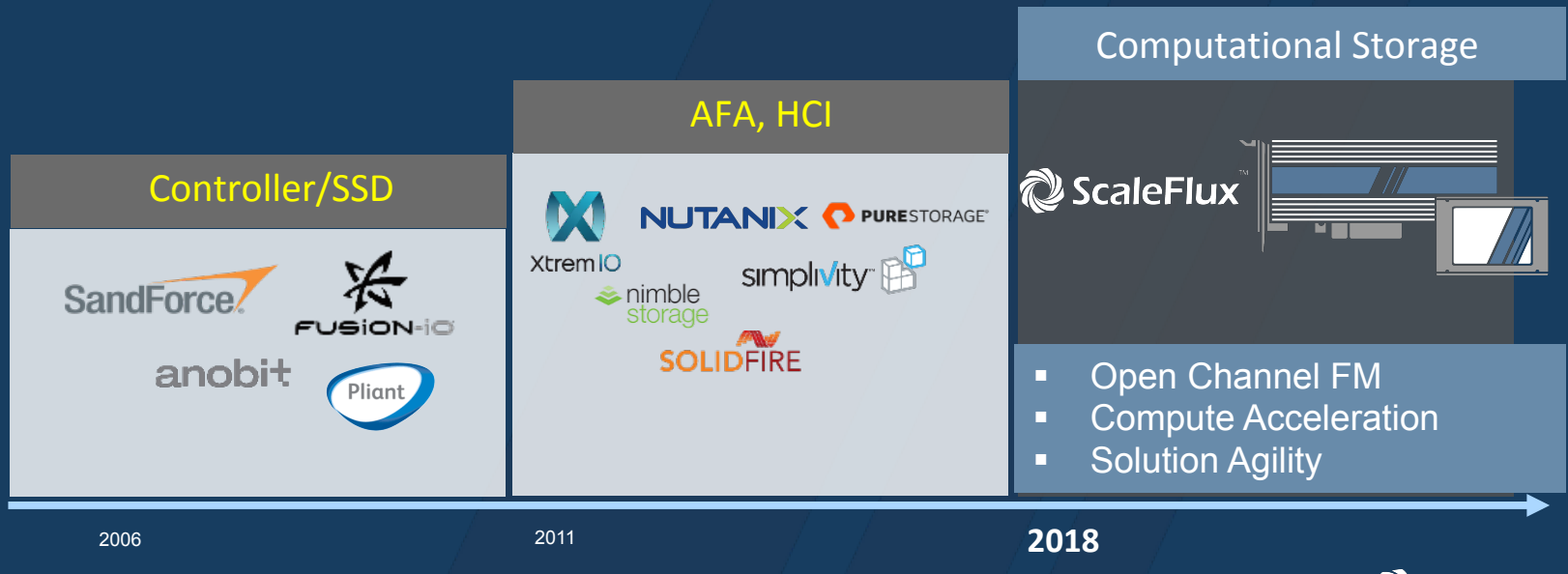
Ride the Computational Storage Wave!



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ScaleFlux™

The pioneer in deploying Computational Storage at scale

- HQ in San Jose, Offices in China
- Shipping Computational Storage worldwide

Thank You!

Come visit us at Booth #113

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BACKUP

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