What’s the Big Deal?
Sheer volume of data taxing to process

Data Explosion
- Can’t store tons of data in the same place
- Difficult for different applications to share
- Sheer volume of data taxing to process

High Cost
- Exorbitant licensing fees
- Expensive migrations

70% of Alibaba Cloud’s clients encounter:

Data Islanding

70%
MARKET PROBLEM

High Cost

OPPORTUNITY

Cloud Scale Economics
Unified Storage
Real-time Analytics

SOLUTION

Computational Storage

Alibaba Cloud

Real-time Analytics

ScaleFlux
Computational Storage Provides the Solution

- Real-time analytical processing from transactional data
  - Intelligent data management
  - Hardware accelerated, parallelized database compute at data
  - Programmable FPGA hardware to evolve functions with customer demands
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.

“GM at Alibaba Cloud Database

10X Transactional-Analytical Processing, Half the Flash Capacity

"
How?
Cohesive Application to Storage Acceleration

- Open Channel Flash Management
- Computation Acceleration
- Solution Agility
Open Channel (Host) Flash Management

Data Placement
- Controllable
- Application Awareness

Global View
- Reduce Overprovision
- Minimize Write Amplification

Multi-Tenant
- Isolation
- Consistent

- ✓ Isolation
- ✓ Consistent

- ✓ Controllable
- ✓ Application Awareness

- ✓ Reduces Overprovision
- ✓ Minimizes Write Amplification

- ✓ Isolated
- ✓ Consistent
In-System FPGA (HW) & SW Update for NEW Features

ATOMIC WRITES

Typical Large Write Guarantee

- Page A
- Page B
- Page C

Double Write Buffer

- Page A
- Page B
- Page C

Database Table

- Page A
- Page B
- Page C

Guarantee larger write units are persisted to memory

2X Flash Endurance!

MULTI-STREAMS

Database Logs

- Single Stream

Analytic Data

- Multi-Stream

Files

- Large Sequential Long Term Storage

Performance & Endurance

- Efficient management of different data types

Guaranteed larger write units are persisted to memory
Production Workload Optimization: Customer Case Study

4 Week Turnaround to tune and test optimized Flash I/O
Minimize both 1ms and 8ms (tail latencies)

Flexible hardware and software platform for application tuning
Significant impact on latency sensitive applications
Customer now using ScaleFlux for lowest latency Flash NoSQL database solution
Fast Transition to Latest 3D NAND TLC to QLC+

Simple Storage Class Memory Integration

Next: Industry standardization
Cohesive Application to Storage Acceleration

- Open Channel Flash Management
- Computation Acceleration
- Solution Agility
Acceleration

Intense Compute (compression, fuzzy search)

Limited I/O and Memory Capacity

Computational Storage Subsystem (CSS)

Reduce Data Movement
Accelerate Computation
Parallelize Processing

Performance & Scalability
Compute Functions

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

**GZIP Compression**
(CPU zlib vs. ScaleFlux css_zlib, corpus.cantebury E5-2667v4)
- Megabytes per Second
- 482MB/s CPU Bound!
- 17X

**Fuzzy Search**
(POC Unindexed Text Data, Edit Distance = 8, E5-2637v3)
- Megabytes per Second
- 3X
- 100X CPU Bound! ~700MB/s

ScaleFlux™
Identifying the 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
Cohesive Application to Storage Acceleration

- Open Channel Flash Management
- Computation Acceleration
- Solution Agility
Agility is Important

**ENGAGEMENT**
Demand to POC < 6 months

**FLASH LIFECYCLES**
Reducing to 12 months

**HW AGILITY**
Update after deployment
Solution Agility Across Whole Stack

Applications
- Database
- Big Data
- Content Delivery
- AI/ML

Distributed File Systems
- (HDFS, Ceph, …)

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

Open Channel Flash Management
- Computational Storage Driver

Compute Libraries / APIs

Simple Interface
- Easy Integration

Controllable Data Placement
- Performance/QoS (latency)

Programmable HW engines

AIC or U.2

PCIe

FPGA
- Re-programmable
  Compute Engines
Fast TTM for Turnkey Apps

Available Through:

- **2.7x** Transactions per Second
  - ACT

- **2.6x** Operations per Second
  - YCSB Load

- **1.6x** Jobs Completed
  - Teragen & Terasort (vs HDD)

**Available Through:**
- DELL
- EMC
- Inspur
- Packet
- ScaleFlux

**EROSPIKE**

**APACHE HBASE**

**Hadoop MapReduce**
Turnkey Compute & Storage Acceleration

*24 Mapper/Reducers per Datanode *9 = 216 total
Better performance on CSS reported with lower Mapper/Reducers possible
Delighted Customers
“…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…”
The pioneer in deploying Computational Storage at scale

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

Thank You!
Come visit us in the Exhibits!

www.scaleflux.com