RIDE SHARING YOUR CLOUD DATA CENTER

Realize Better Resource Utilization with NVMe-oF™

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idle 350+ days/year

Black Friday, Cyber Monday, etc.

100% utilized 24/7

Machine Learning Team

Online Marketplace Team
What’s wrong with my cloud data center?

PROBLEM 1
stranded flash & IOPS

PROBLEM 2
stranded compute

DAS
direct-attached flash
How much SSD capacity per node?

Too much wastes flash. Too little wastes CPU.

One size does not fit all.
Unique resource mixes: CPU intensity, flash capacity, IOPS, memory

Tough to optimize node configurations
Application Silos with DAS Strands Resources

Challenges:

1. Variable resource needs ⇒ stranded flash
2. Reserve capacity for demand peaks ⇒ stranded compute
Benefits:

- Storage can now be provisioned optimally for every application
- Eliminates stranded flash
- Significant improvement in bin-packing loss (stranded compute)
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PROBLEM 2
stranded compute

PROBLEM 3
lost operational agility & revenue
All applications can now be scaled out quickly – even stateful ones

- “Borrow” compute resources from lower priority applications during demand peaks
- Possible only if any application can run on any node – unrestricted by data locality
What Flash-enabled Agility Looks Like in Your Data Center

30-60% fewer compute nodes for the same workload
Eurosys 2015: “Large-scale cluster management at Google with Borg”
– Google –

$8M fewer SSDs for the same workload
– Internal Toshiba Analysis –

Provides optimal platforms for more applications with fewer node types

Flexible, fast response to changing business conditions
Shared Accelerated Storage Solves DAS Problems

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stranded flash & IOPS

PROBLEM 2
stranded compute

PROBLEM 3
lost operational agility & revenue

SOLUTION
shared accelerated storage
Shared Accelerated Storage Solves DAS Problems

**PROBLEM 1**
BUY FEWER SSDs
stranded flash & IOPS

**PROBLEM 2**
BUY FEWER SERVERS
stranded compute

**PROBLEM 3**
BETTER AGILITY
lost operational agility & revenue

**SOLUTION**
Kumoscale™
shared accelerated storage
Technology Advancements Making Shared Accelerated Storage for Cloud Now Possible

- High bandwidth, low latency networks
- Mature orchestration frameworks
- Bigger, faster & more cost-effective NVMe™ SSDs
- NVMe-oF™ protocol

**WHY NOW?**

- Maximum data center efficiency

**Shared Accelerated Storage Software**
Toshiba KumoScale™ Shared Accelerated Storage Software

- Fabric Module (front end)
- NVMe Module (back end)
- Network Driver
- NVMe Driver
- NVMe-oF Network
- NVMe SSDs

Virtualization / Abstraction

Management Engine

- Kubernetes®
- Lenovo XClarity®
- OpenStack®
- Intel® RSD
- RESTful API
KumoScale Software Key Benefits

**Fast**
- <20 µS latency adder
- 8,000,000+ 4K RR IOPS

**Flexible**
- 4,000+ namespaces
- 384 TB SSD capacity

**Future-Proof**
- Popular cloud frameworks
- Broad ecosystem support

**Optimized**
- 100% elastic
- Zero stranded capacity

Based on internal Toshiba testing
Thank You!

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