Next Generation Storage Solution Using NVMeoF & NF1 Form Factor SSDs

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Data Growth versus Storage Media

Source: IDC, Samsung estimate
To manage data overload, IT Industry needs...

Ultra Low Latency

SPEED

But storage infra relies on obsolete standards

3.5" HDD
Since 1983

2.5" SSD
Since 1988

Serial ATA
Since 2003

Serial Attached SCSI
Since 2004
SATA
- One lane
- 30km/h speed limit
- Red light after 32 cars

SAS
- One lane
- 60km/h speed limit
- Red light after 254 cars

NVMe
- 65,536 lanes
- 120km/h speed limit
- Red light after 64K cars

Direct CPU Connection
- SATA (6Gbps) to HBA
- SAS (12Gbps) to HBA

Optimized Software Stack
- NVMe: -33%
- SATA
- SAS

Graph showing performance comparison with different interfaces.
End-to-End NVMe over Fabrics
- Eliminates protocol translation overhead

Storage Array

Optimized Host
NVMe over Eth
NVMe over FC
NVMe over IB

Front-End

Special Host
NVMe over PCIe

Back-End

NVMe Host
NVMe over PCIe

RDMA: Ultra-Low Latency
- Eliminates CPU/kernel overhead

APP
TCP/IP
RoCE
NIC
CPU Kernel
DAS | Limited Scalability
---|---
SAN | Expensive & Complex
NAS | Limited Performance
NVMe over Fabrics can be everywhere
Legacy Storage Server Architecture is Inefficient

Conventional NVMe-ofF Server
High BOM from non-storage components

Tomorrow’s NVMe-ofF Solution
JBOF architecture with storage array features
Painpoints of Existing Storage Form Factors

2.5”
- Compatible with HDD infra
- Low storage density
- Thermals not optimal

M.2
- More space efficient vs 2.5”
- Limited capacity points
- No dual-port & hot-plug

EDSFF
- Increased storage density
- Complexity: 3 form factors
- No SATA & SAS support
Introducing NF1 Form Factor

- High capacity & small form factor SSD for Data Center & Enterprise Servers

**Slim Form Factor**
- 30.5 x 110mm, max. 4.38mm T
- M.2 connector for easy migration

**Maximum Capacity**
- 16 NAND packages, same as U.2 7mm
- 16TB available today, 32TB in the future

**Future-Proof Design**
- Supports all 3 interfaces (PCIe, SAS & SATA)
- Max 16W power (12V) – ready for PCIe Gen4

**Key Features**
- Dual-port support for mission critical use
- Hot-plug & front-loading supported
Why NF1 is an Ideal Fit for OCP

- **Efficiency**: Reduce W/TB All-in-one spec
- **Scale**: Front-loading LED indicator
- **Openness**: Submitted to JEDEC process for Standardization
- **Impact**: Improves TCO
“Mission Peak“ – NF1 NVMe Storage Server

- NF1 NVMe SSD reference design developed in partnership with AIC

**Key Features**
- 1U EIA-310D (19”), 800mm deep
- 24x DIMM slots (DDR4)
- Dual Intel™ Xeon™ / Skylake
- Advanced Thermal Solution
- 2x redundant hot plug power supplies
- 36x NF1 drives (capacity up to 550TB usable)
- 3x 100GbE network connectivity
- Power 1200W
- 2x PEX9797 switches connected to drives
Mission Peak – NF1 NVMe Storage Server

10M Random Read IOPS delivered inbox

8.5M Random Read IOPS over NVMe-oF

Mission Peak with NVMe-oF enables near-DAS Performance at Scale
“Mission Peak” – PoC as a Service

Efficient Provisioning

- Mellanox
- Samsung
- AIC
- E8 storage

System Integrator

- System install & customer support
- Remote login for testing

End-Customers

Fully Functional

- 4x Compute nodes
- NVMe over Fabric
- 20x 3.8TB NF1

Mission Peak PoC Performance

- 4KB random read: 2M IOPS
- 4KB random write: 260K IOPS
- 64KB sequential read: 18GB/s
- 64KB sequential write: 13GB/s
- Read latency (QD1): 70μs
- Write latency (QD1): 56μs
The Shortcut to your PoC

Traditional PoC:
1. Loan or purchase samples: 4-10 weeks
2. Integrate & test system: 2-4 weeks
3. Install & run PoC: 2-6 weeks
Total: 8-18 weeks

PoC as a Service:
1. Vendors manage, integrate, install & test everything beforehand
2. Customer runs PoC remotely: 1-2 weeks

4 ~ 6 months vs. Only ~ 2 weeks
Samsung NF1 & Mission Peak
The Next Generation of compact All NVMe Flash Storage

Visit us at A22 to see live demo...
...and sign up for remote PoC!