Software Composable SSD Architecture Design for Enterprise Applications

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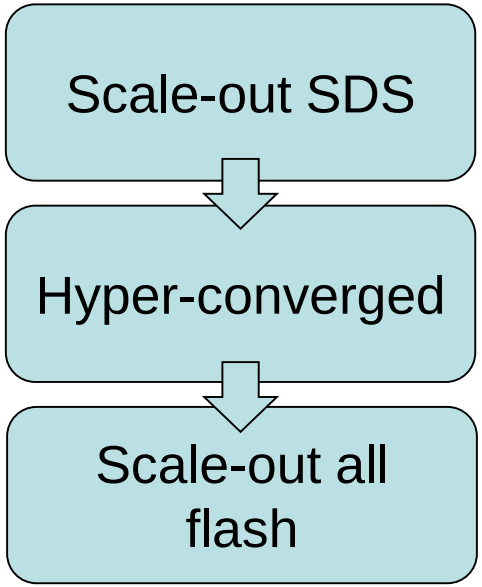
Who are We and What Have We Done



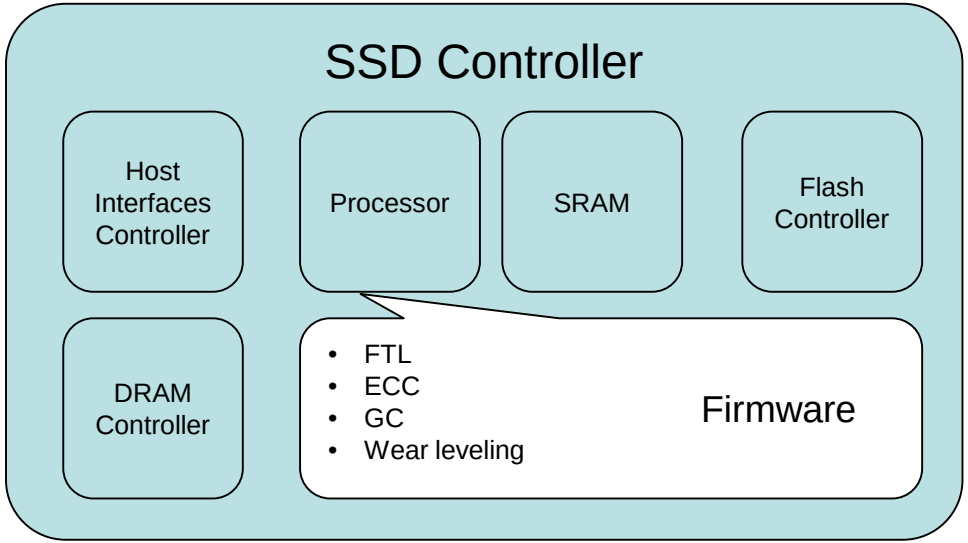
- Bigtera is an innovator of Enterprise **Software Defined Storage (SDS)** solutions
- Part of Silicon Motion Technology (NASDAQ: SIMO)
- Scale-out architecture
- Unified storage protocol – SAN/NAS/Object
- Software-defined composible infrastructure to provision storage base on various workloads
- Consolidate legacy storage and seamless migrate data

Challenge of SDS and SCI

- Various workloads with different SLA
  - Performance – IOPS, throughput(different IO pattern)
  - Latency
  - Protocols – block(NVMeoF, iSCSI, FC), file(NFS/CIFS) or object
  - SLA
    - Data protection – RAID5, 6, data protection cross rack, cross datacenters
    - Data services – compress, deduplication

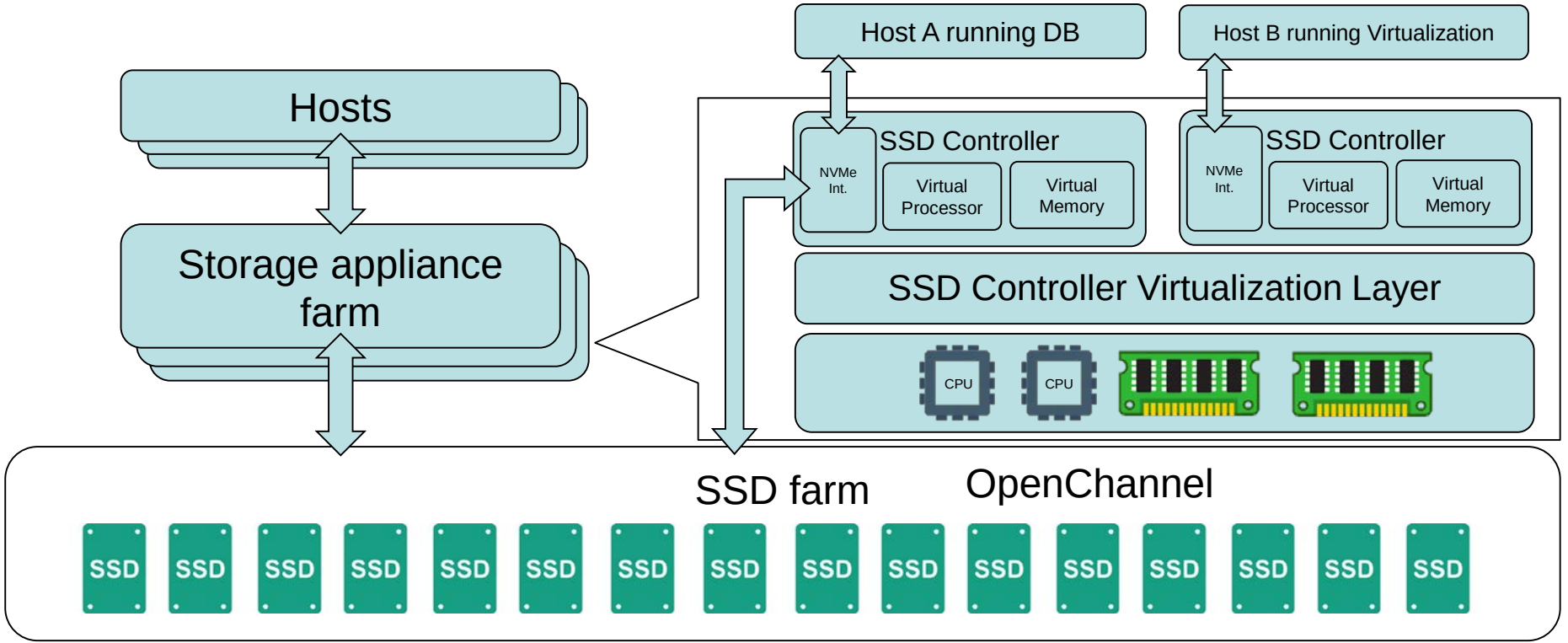
How Do We Design SCI Architecture for Various Applications?

How SSD Controller Works For Different Applications?

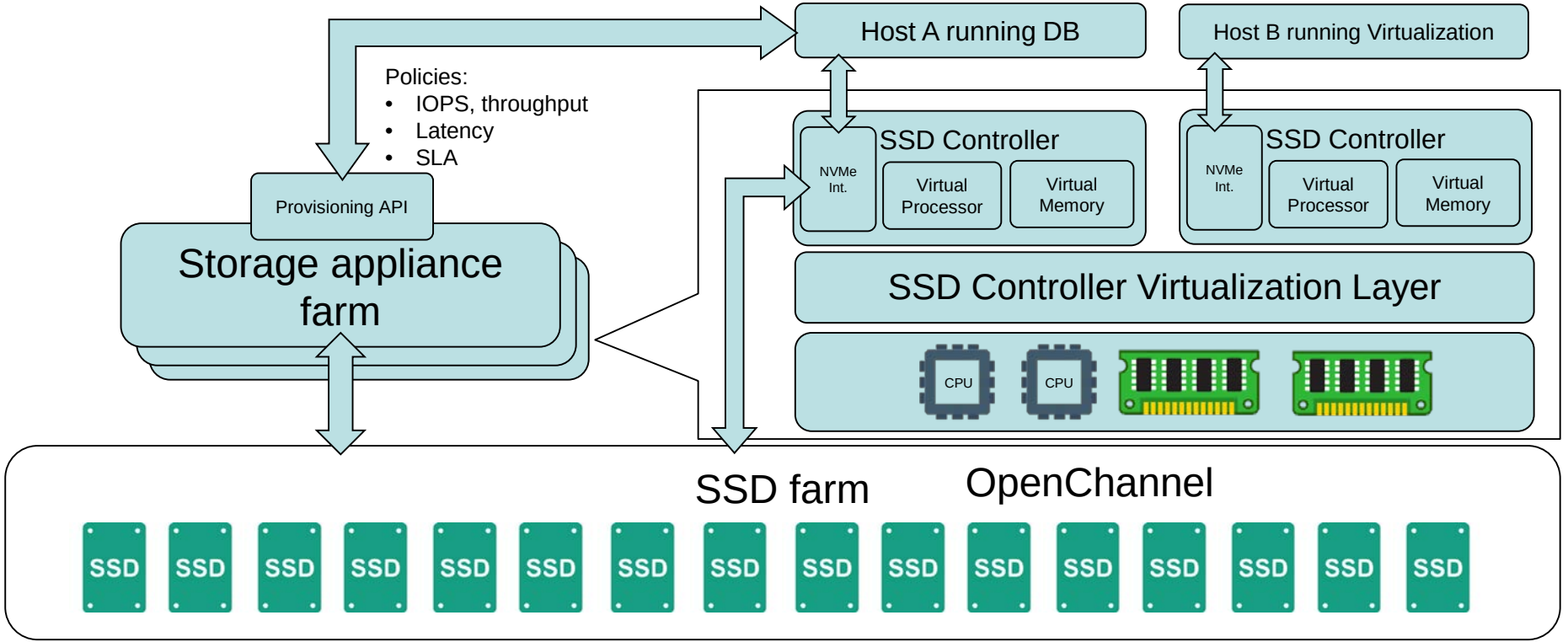


Can We Create a Virtual SSD by Combining a Virtual SSD controller and NAND?

Software Architecture Design for SCI



How It Works


Host A running DB
Host B running Virtualization
Policies:
• IOPS, throughput
• Latency
• SLA
Provisioning API
Storage appliance farm
NVMe Int.
SSD Controller
Virtual Processor
Virtual Memory
NVMe Int.
SSD Controller
Virtual Processor
Virtual Memory
SSD Controller Virtualization Layer
CPU
CPU
SSD farm
OpenChannel
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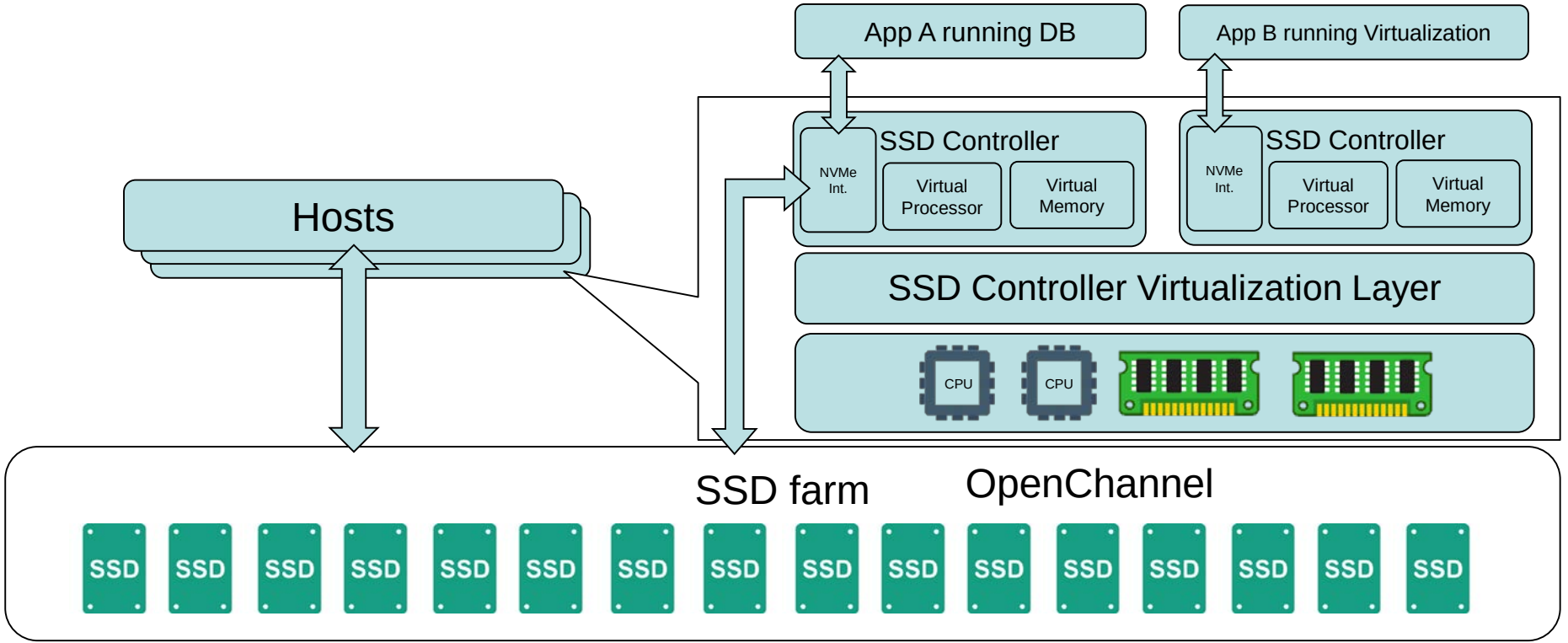
Software Architecture Design for SCI



Design Highlight – Virtualization Layer

- Very thin, lightweight virtualization layer to do SSD controller virtualization
- Resources(CPU, DRAM and SCM) can be dynamically adjusted
- Virtual controller management to monitor resources v.s policies

Design Highlight – Policy Engine

- User can provision a virtual SSD by defining a policy(performance, latency, data security)
- Provision engine will create a virtual controller and assigned proper SSD to make a virtual SSD
- Each virtual controller will have different computing power and memory size depends on the policy settings
- Communicate with virtual controller management to dynamically adjust the resource to meet the policy

Design Highlight – Open Channel

- RAID protection, FTL,GC and wear leveling are running in virtual controller
- Using open channel SSD to reduce the unnecessary write amplify

Thank You