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OCP SUMMIT

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Executive Track

Bringing Intelligence to Storage with SmartSSD

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Moving Data is Easier than Before or not

1956

5MB on a trailer

2016

100PB in a truck

Future

10EB+ where???

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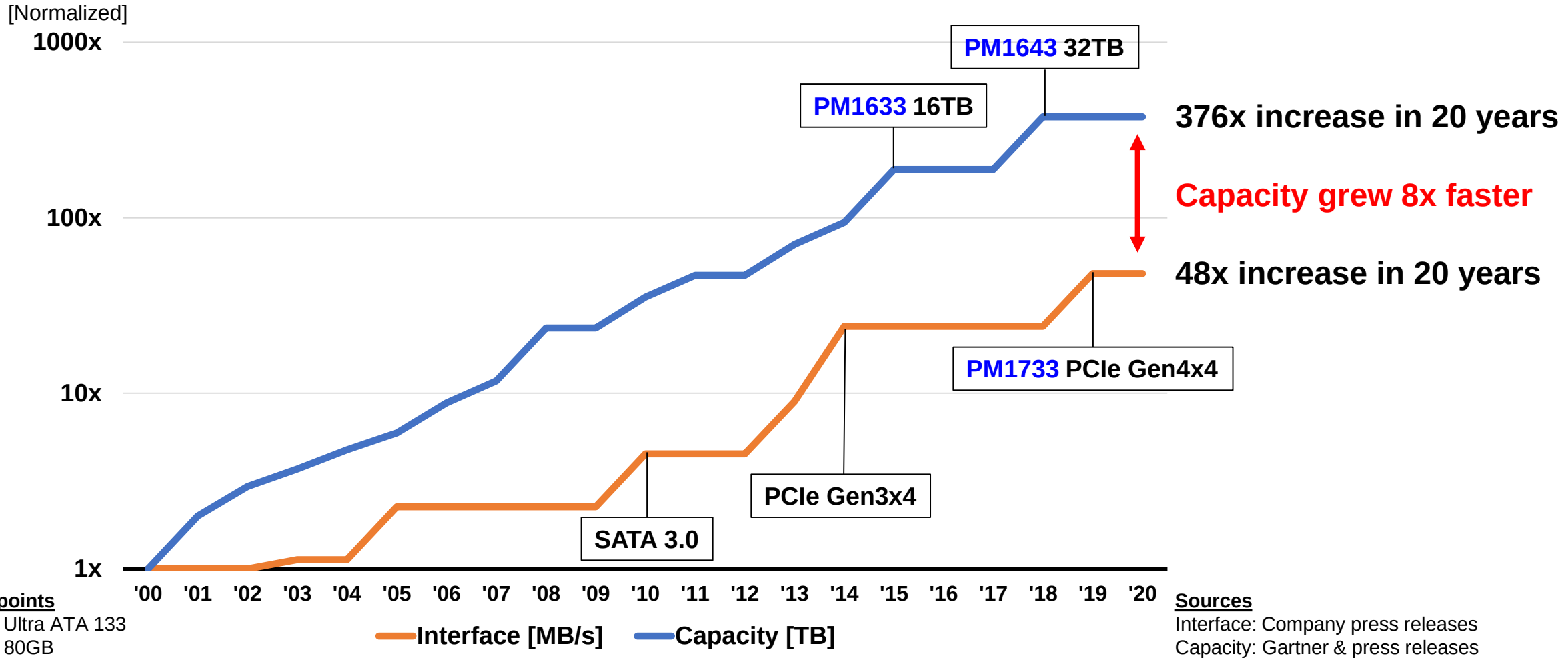
Bandwidth is Not Catching Up



Starting points
Interface: Ultra ATA 133
Capacity: 80GB

Sources
Interface: Company press releases
Capacity: Gartner & press releases

SmartSSD: Computational Storage

Today's Architectures

Heavyweight compute in CPU

CPU

- ✗ CPU performance bottleneck
- ✗ IO Bandwidth bottleneck (U.2, CPU PCIe Lanes)

Large data transfer

PCI EXPRESS

FPGA / GPU

SSDs

TBs, PBs, EBs dataset

Storage and Data Acceleration

CPU

- ✓ Reduced CPU Load
- ✓ Near Data Processing
- ✓ Concurrent processing and transfer bandwidth

Minimize Data Movement

PCI EXPRESS

SSD Controller

Accelerator

NAND

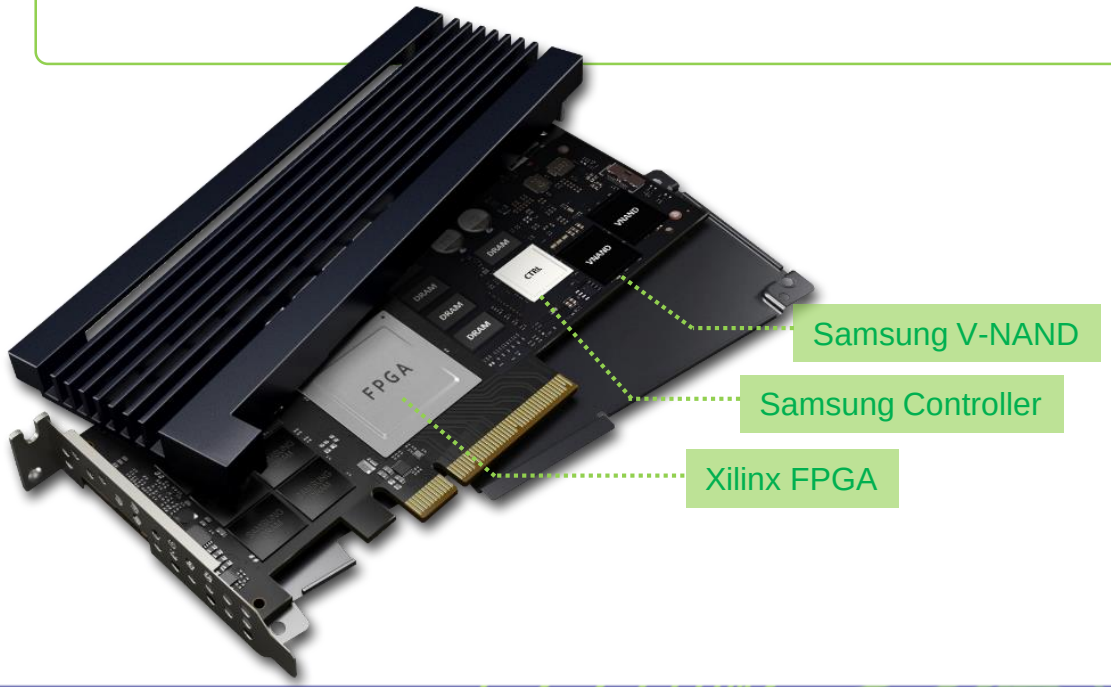
Proving the SmartSSD Concept

PM983F AIC

PoC using PCIe add-in card

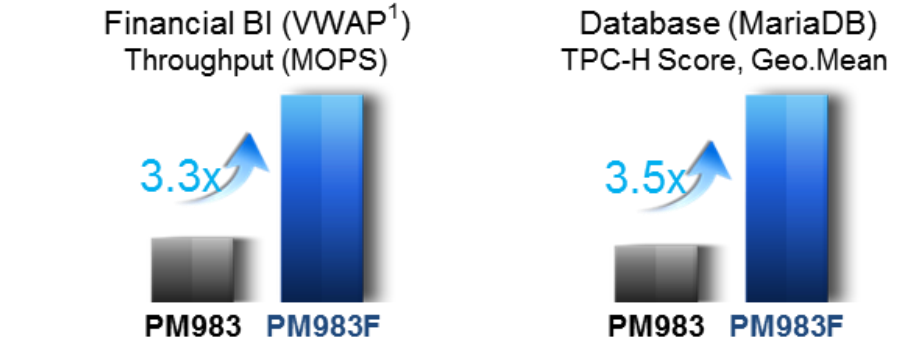
Successfully integrated with Spark/Bigstream

Easily ported several data-intensive workloads

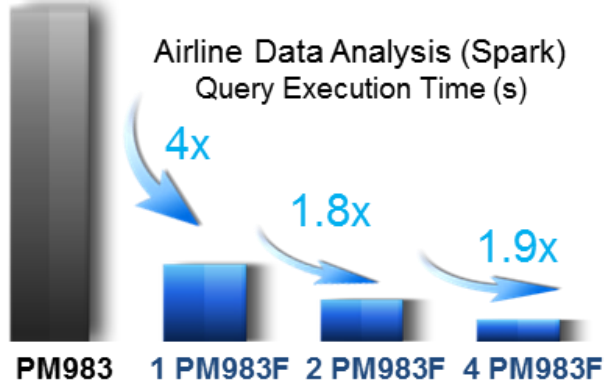


PM983F Results

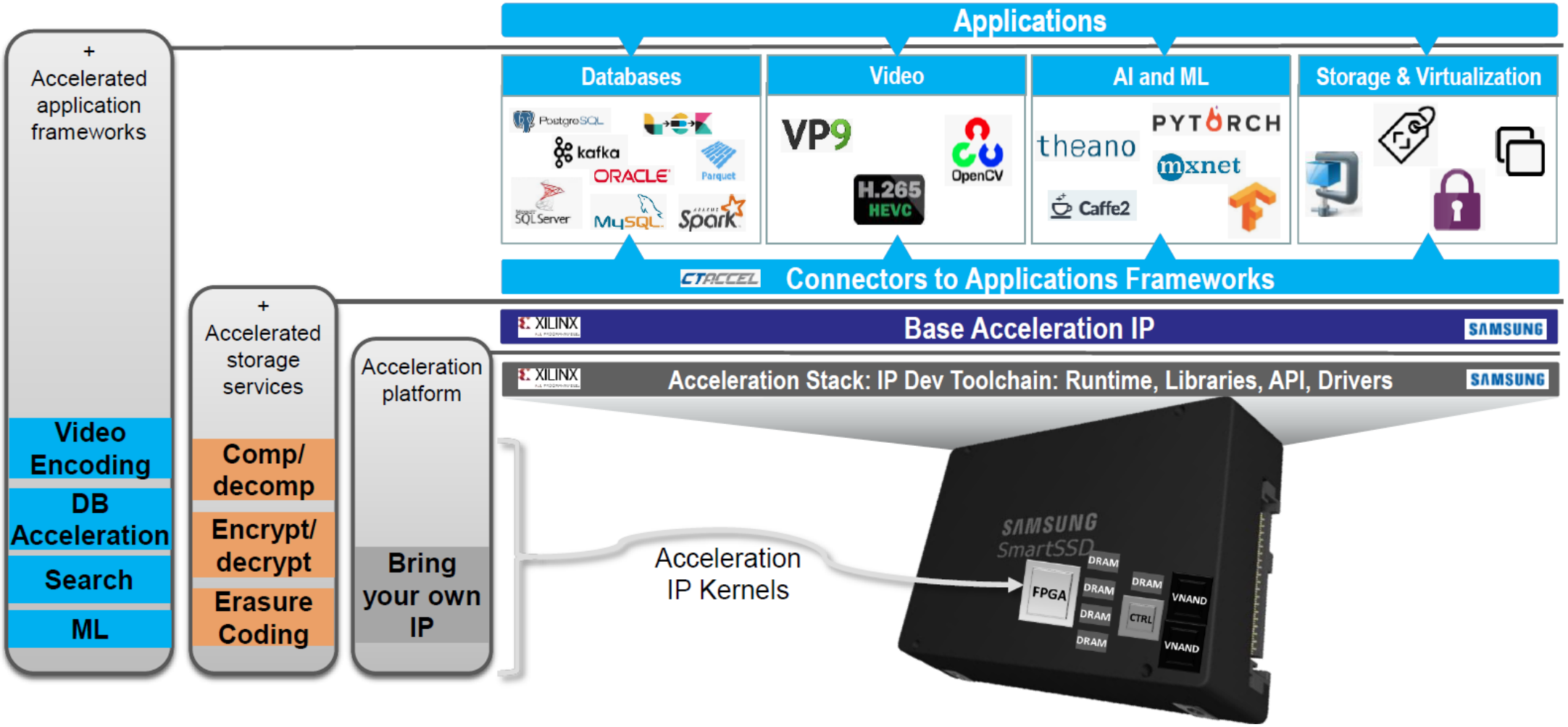
For I/O-bound workloads, SmartSSD showed 3x to 4x better performance, with scalability



* VWAP: Volume Weighted Average Price



SmartSSD Platform & Ecosystem



Scaling out, not sprawling out

Dense Spark Nodes

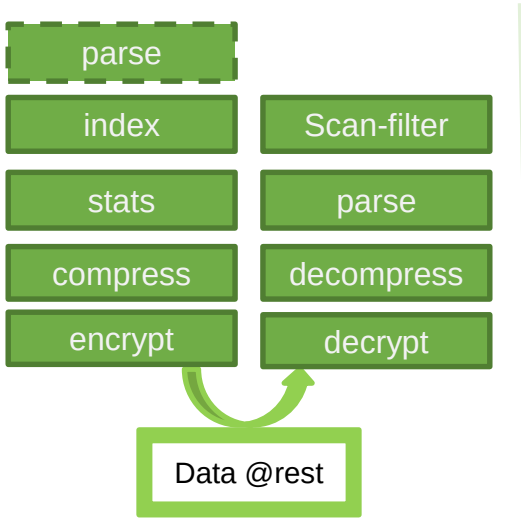
I/O bound tasks

- Scan-filter (*ad hoc condition*)
- Aggregate (*custom average*)
- Map/Tag (*newly trained detector*)

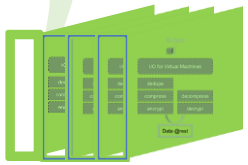
2 choices:

A. Funnel data out of SSDs into CPU/GPU/FPGA
   only to discard most of it, reduce it down to a scalar, or worse still write it all back only slightly modified

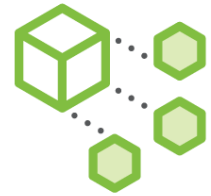
B. Process near the data
   locally, concurrently, without funneling



Pack an entire DB storage engine into each drive



Save expensive server CPUs for monetizable DWUs, DTUS



Reference Architecture

Unlimited Concurrency

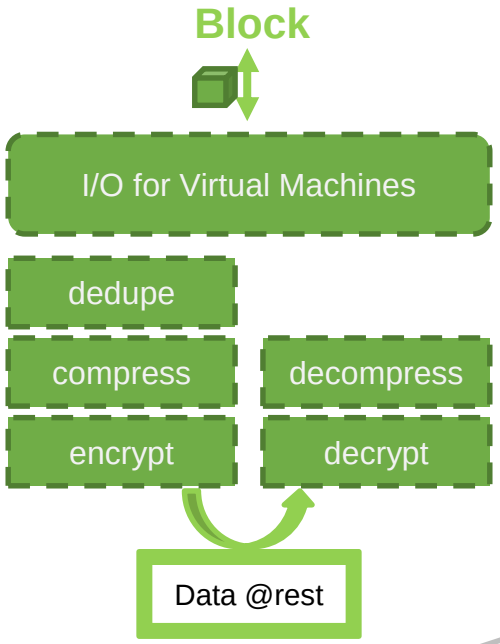
Dense Storage Nodes

Density not frontend-limited

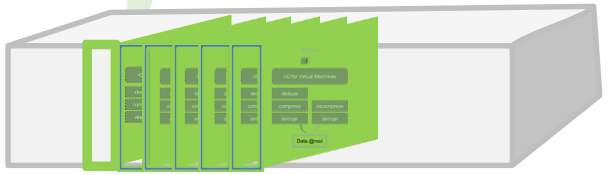
- Not just compression and encryption
- Offload entire threads

Scaling to high device counts

A. Processing capacity
   Enough processing and memory in each device to handle its own work of compaction and dedup
B. Data Bandwidth
   Each device has internal data path to processing
   Net data processing bandwidth scales linearly



Pack a whole processing stack into each drive

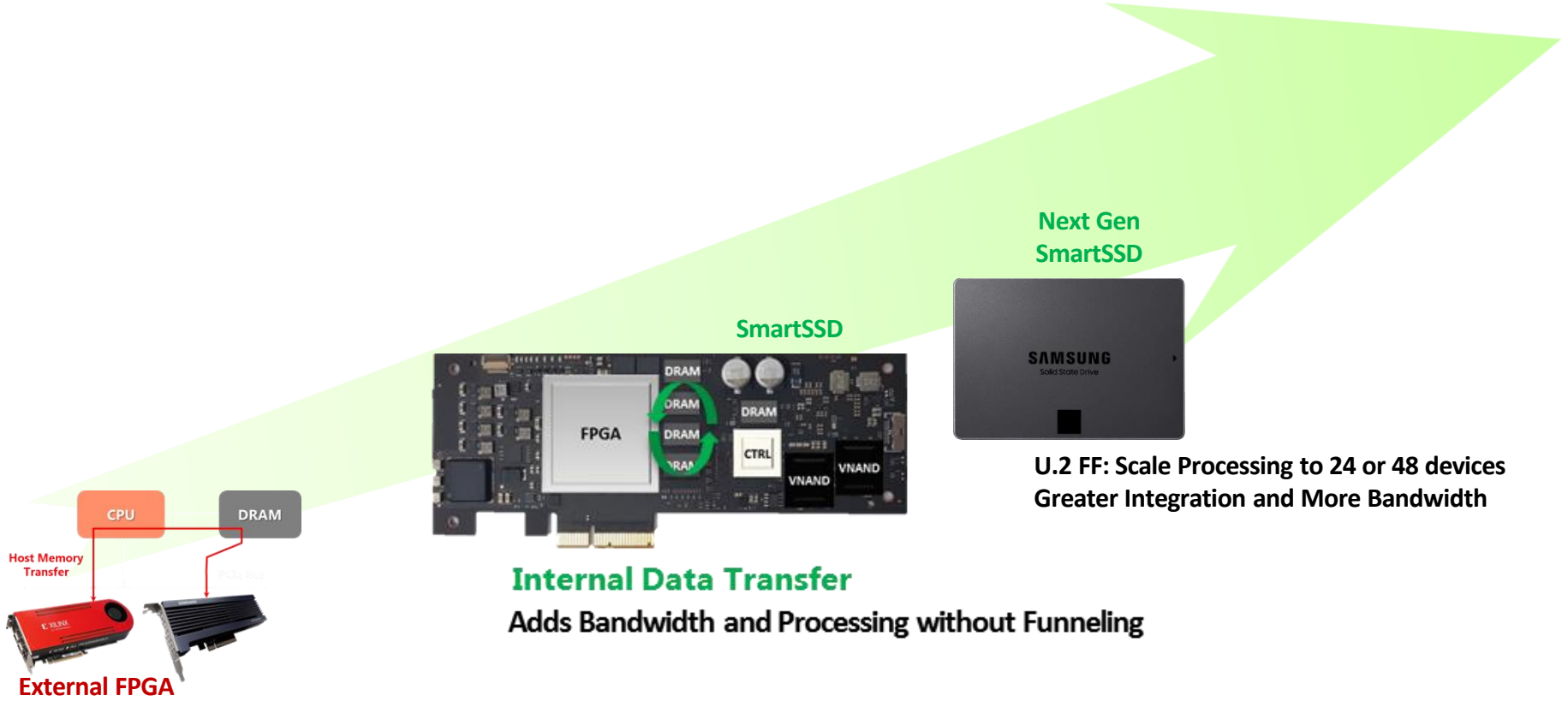


Then scale #devices to keep up with amount of data

Reference Architecture

SmartSSD Technology Roadmap

Roadmap to smaller FF (U.2) and greater integration with SSD controller



U.2 FF: Scale Processing to 24 or 48 devices
Greater Integration and More Bandwidth

Internal Data Transfer

Adds Bandwidth and Processing without Funneling

External FPGA

Moves Data out of SSD via CPU & Memory

Limited scalability: Funnels 3 SSDs ➔ 1 FPGA

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SmartSSD Acceleration Use Cases

Financial Services
Fraud Detection

Video Transcoding

Life Sciences
and genomics

Immediate insights
from Data lakes

Instantaneous and multi-rules
Fuzzy search

Real-time Log Analytics

Speedup Complex
Ad-hoc queries

The only limit is your imagination

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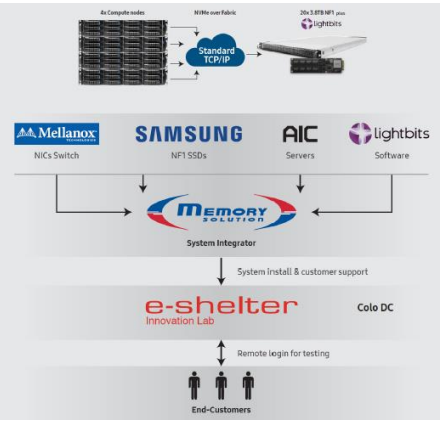
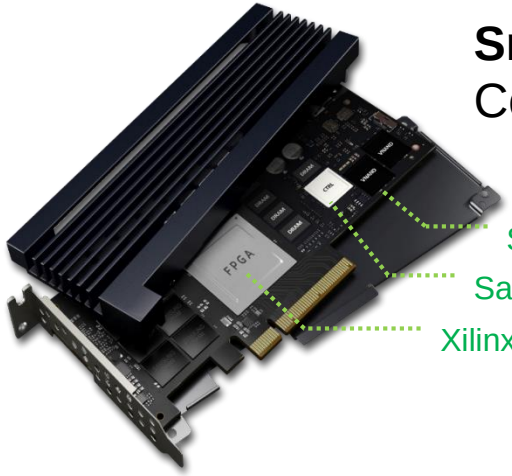
Come see us at booth B7!

PM1733/35
First PCIe Gen4 SSD
Now available!

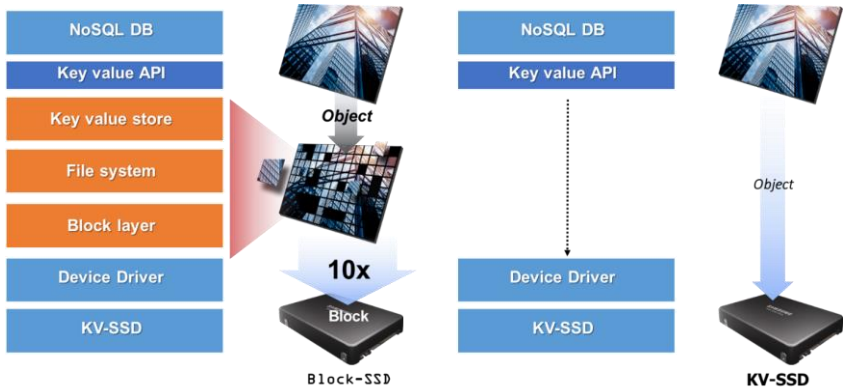
NVMe over TCP
Remote PoC testbed

with lightbits





SmartSSD
Computational Storage

Samsung V-NAND
Samsung Controller
Xilinx FPGA

Key-Value SSD *for DB acceleration*