ODCC

2018 Open Data Center Summit

2018 开放数据中心峰会

聚合行业力量 共建产业生态

New storage technology in storage system

演讲人： 何兴 - Samsung

Content

1.Optimized solution for unstructured data – **Key Value SSD**

2. New form factor to deliver maximum capacity – **NF1**

3. Extremely low latency for Data Centers – **Z SSD**

Content

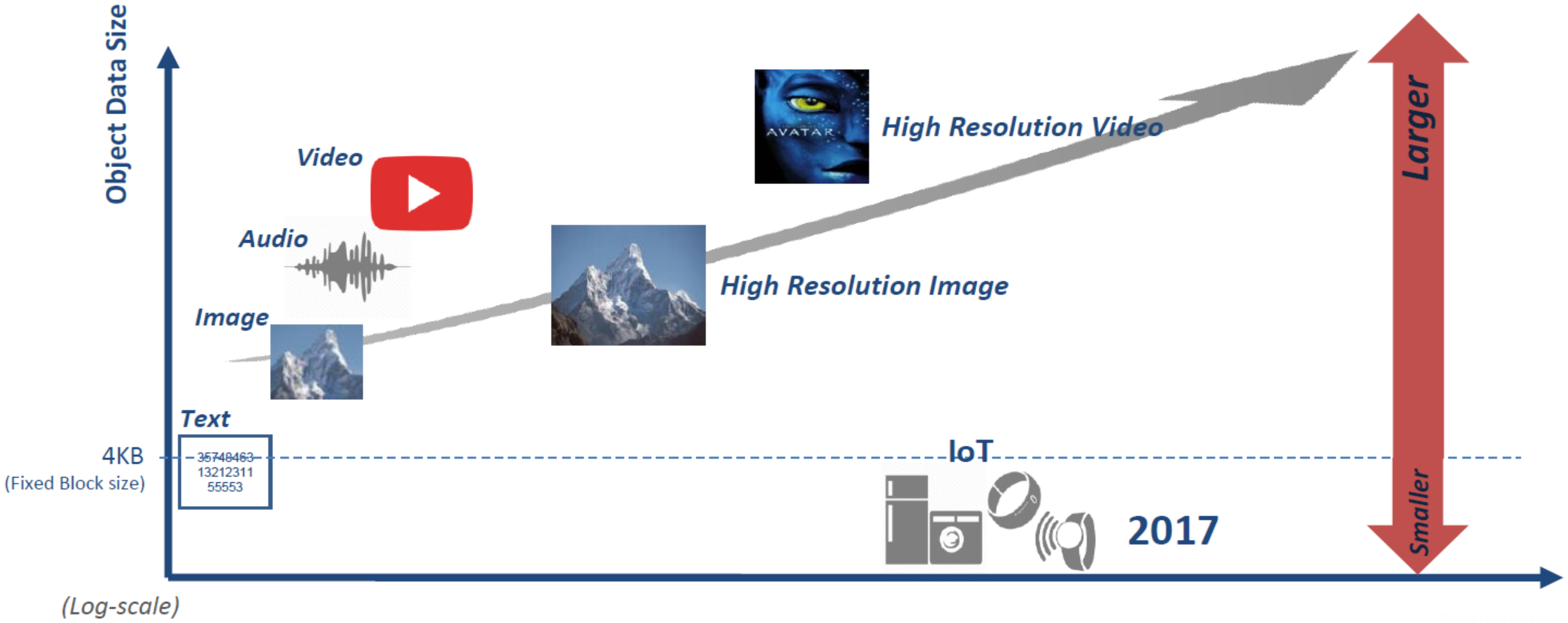
1.Optimized solution for – **Key Value SSD**

2. New form factor to deliver maximum capacity – **NF1**

3. Extremely low latency for Data Centers – **Z SSD**

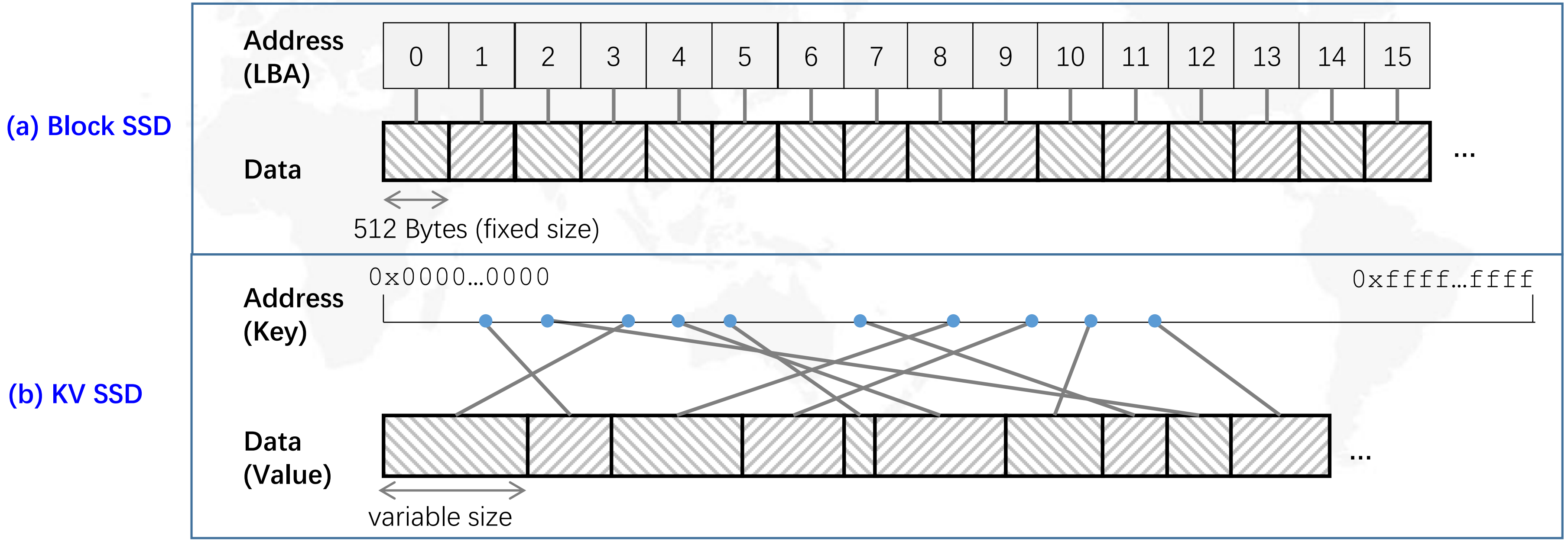
Complex data size need new data processing method

- More data processing complexity due to various object data size
- Continuously large on media data size creating new data sizes from new applications



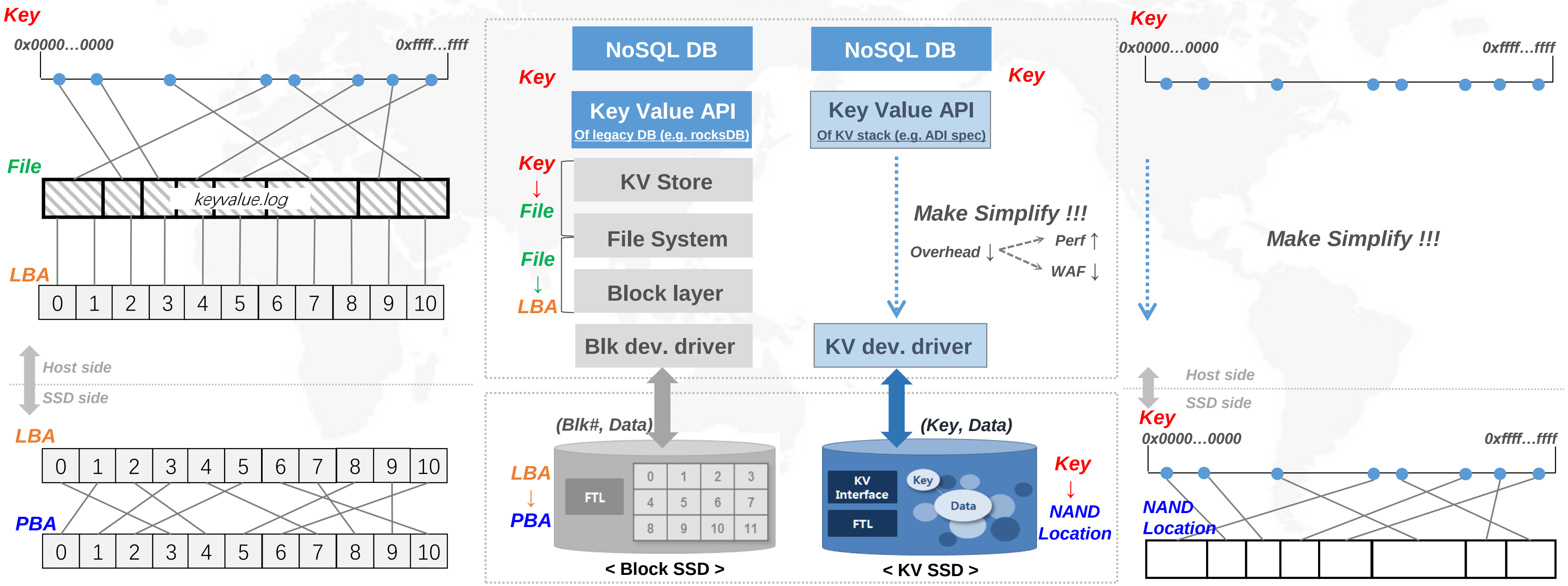
What is Key Value SSD

- **It supports a Key-Value I/F which consists of Key(Index: address) and Value(variable length data)**
  - Write = Put(Key, Value);   Read: value = Get(key)
- **Unstructured data(Photo, Video, Document,…) can be best expressed as Key-Value pair**



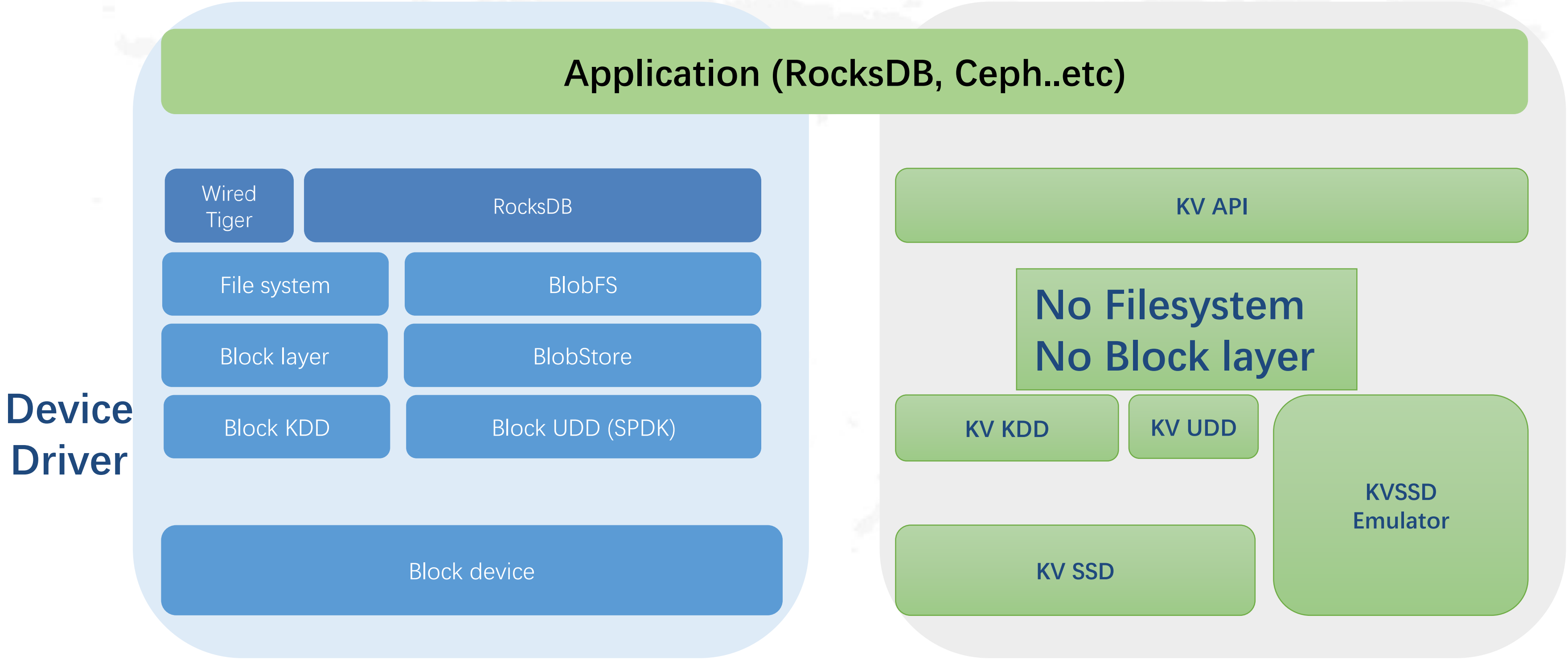
KV SSD benefit in terms of S/W stack

- Simplify Mapping(Remove BLK IF) → Overhead↓ → Performance↑ & WAF↓
- Relieving mapping overhead saves host resources(CPU & Memory)



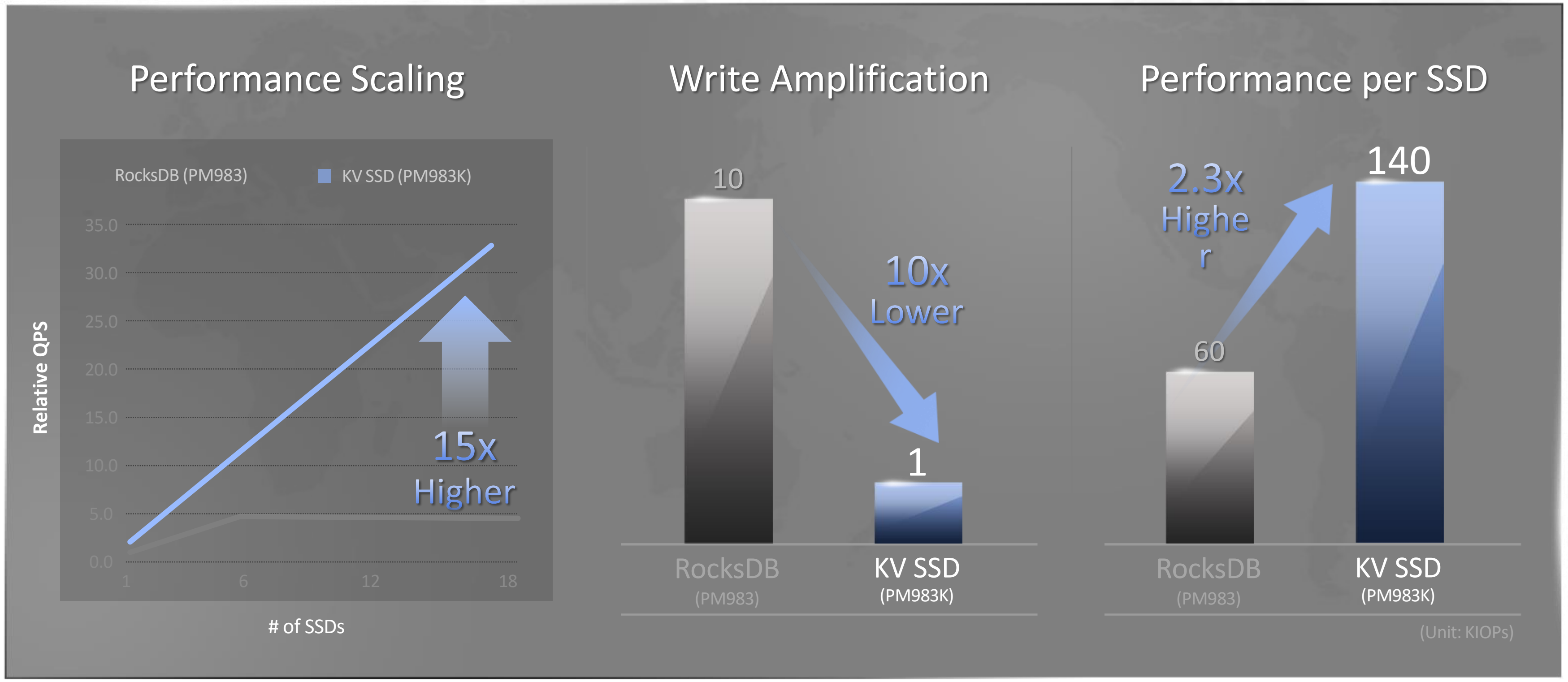
KV SSD Host S/W stack

- **Eliminate the File System and block layer overhead compare with block SSD**
- **Support both user space driver and kernel device driver mode for better compatibility**



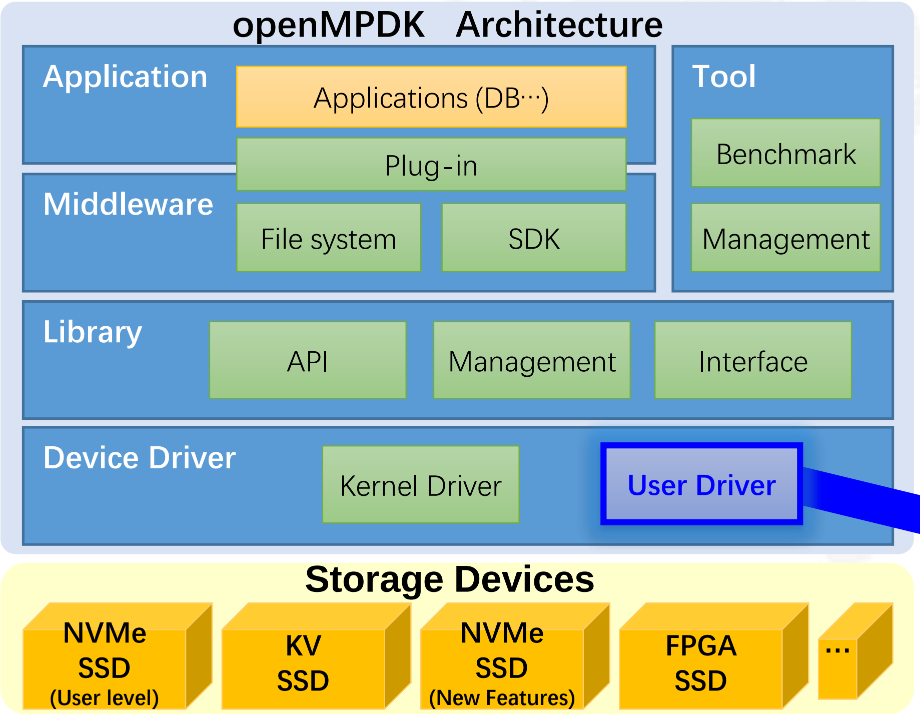
Benefit with KV SSD (RocksDB case)

- KV SSD can bring benefit in performance and write amplification in RocksDB case
- Performance can be increase linearly with SSD number increase with KV SSD



Samsung openMPDK open source platform

- Samsung provided openMPDK open source platform to provide full storage S/W solution
- KV SSD host S/W solution can be found in openMPDK in Github (https://github.com/OpenMPDK)



1st MPDK Release (May 11th 2018)

Samsung already developed NVMe driver for user space application.

Visit to the openMPDK web site and Join !

https://github.com/OpenMPDK

1.Optimized solution for – **Key Value SSD**

2. New form factor to deliver maximum capacity – **NF1**

3. Extremely low latency for Data Centers – **Z SSD**

■ Low Latency differentiation

Enterprise Server Trend

Small Form factor

(1U Server)

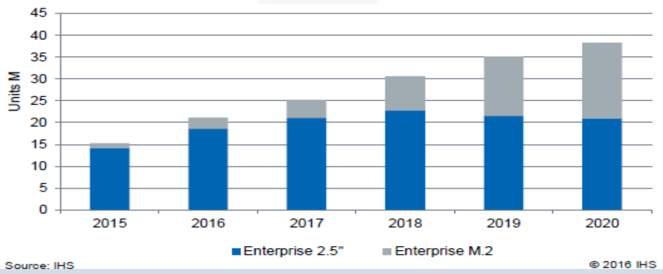
(Blade Server)

High Capacity

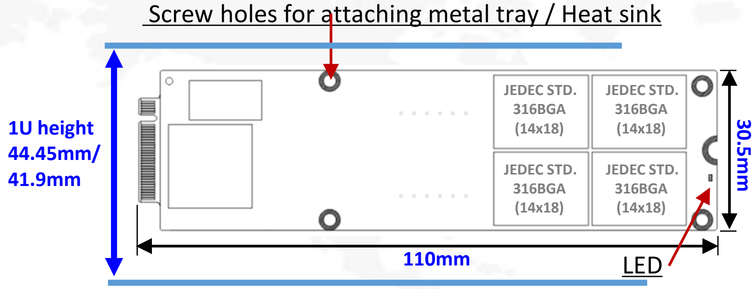
(All Flash Array)

SSD Form Factor Trend

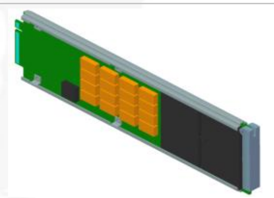
→ **Small FF** will become a popular form factor for enterprise



Samsung's Proposal



- 30.5 x 110mm, Max. 4.38mmT
- Up to 16TB (w/ 512Gb new package 12.7x13.1)
- Hot-Plug / Front loading
- PCIe Dual-Port x2 Lane option
  (PCIe Single-Port x4 Lane)
- Power disable (Power reset)
- 12V, Max. 16W

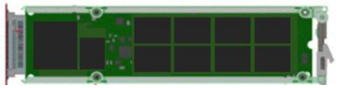


<NGSFF with metal guides & lever>

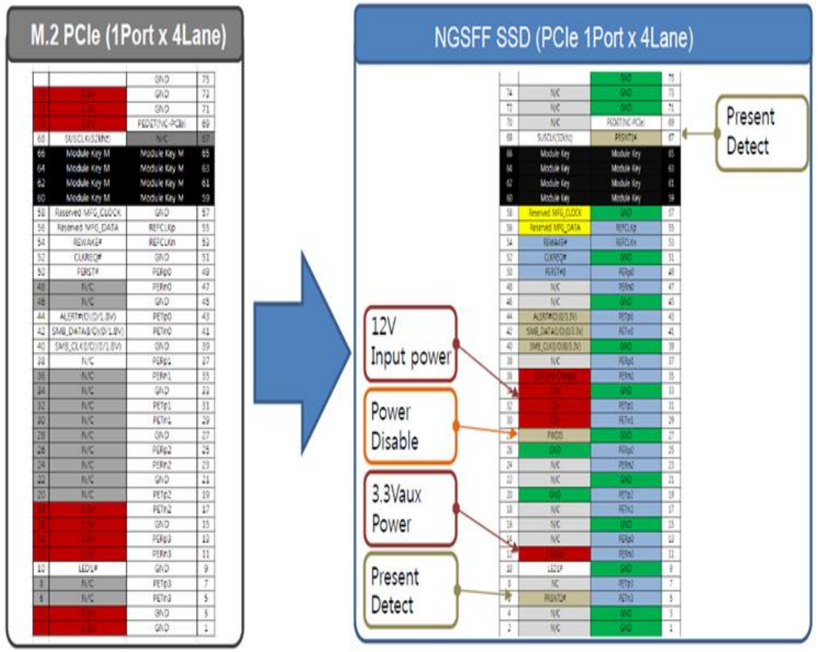
Comparison between NF1 and M.2

■ NF1 utilize M.2 connector for easy migration

Form Factor Comparison

Items	M.2	NGSFF
Features	 PCB: 22x110x3.8mm	 PCB : 30.5x110x4.3mm
Connector	M.2 Socket 3 (M Key)	M.2 Socket 3 (M Key)
Capacity	Up to 4TB	Up to 16TB
Ext. Voltage	3.3V	12V
Max. PWR	8.25W	16W
Hot Plug	Not Support	Support
PWR Disable	Not Support	Support
Dual Port	Not Support	Support
LED	DAS Host Side only	DAS Host & SSD Side , Service Action LED (Fault)

Pin outs Comparison

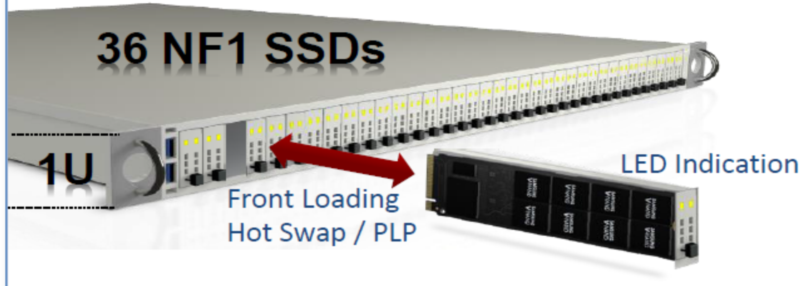


Key Features & Benefit of NF1 SSD

- **Vertically plugging and front-loading feature**
- **Hot swap and Power Loss Protection, LED indication of SSD state**

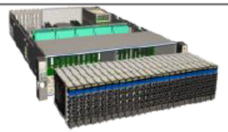
NF1 Systems

Samsung Reference Platform : Mission Peak



Supermicro SSG-1029P-NMR36L

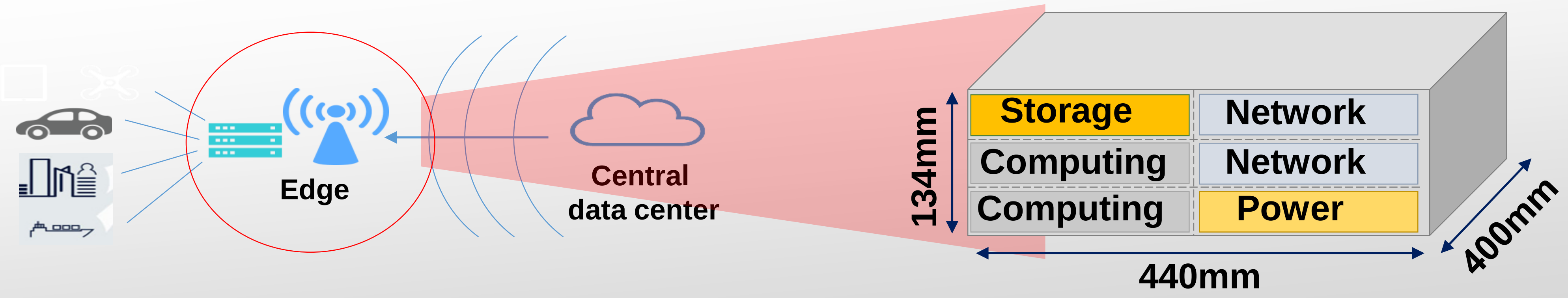
**** 5X more Storage in 1U***
**** 2X more IOPS in 1U***
**** Low Power consumption***

SEC Ref. System	Mission Peak (2017)	Sierra (2016)
Rack Space	**1U**	2U
SSD F/F	**NF1**	U.2 15mmT
No. of SSDs	**36**	24
Drive Capacity	**16TB**	8TB
Total Capacity	**576TB**	192TB
SSD Power/unit	**10W**	24W
Total Storage Power	**396W**	576W
R/R IOPS	**10M IOPS**	5MIOPS
		

■ Edge server in Telco

- Ultra small footprint for Small Edge Server in Telco
- High performance and Low Latency
- Easy Replacement
- Low Power

[Edge server in Telco]

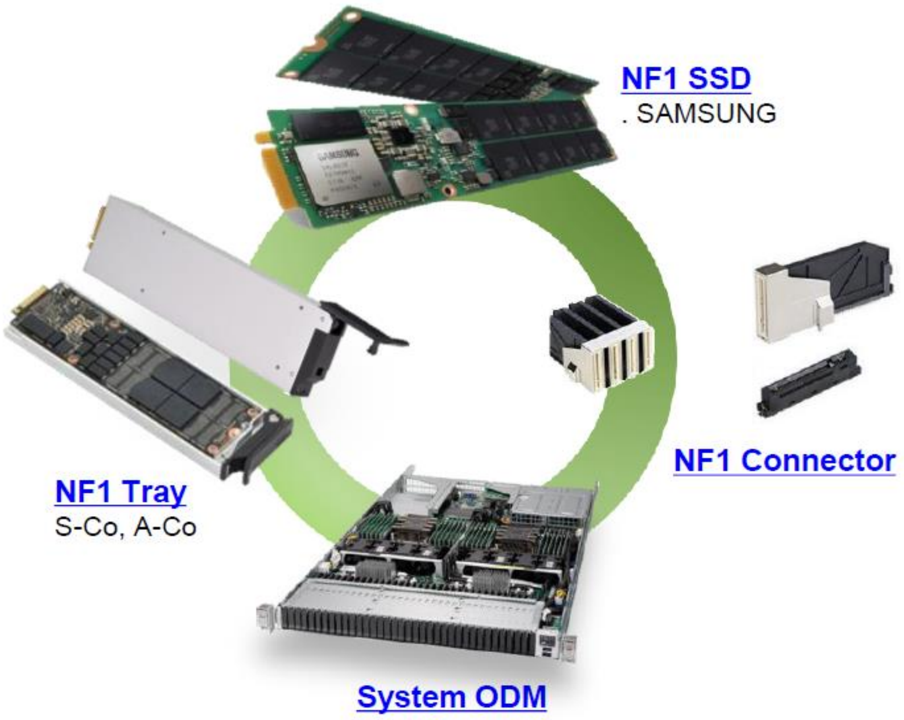


NF1 SSD development and Eco Readiness

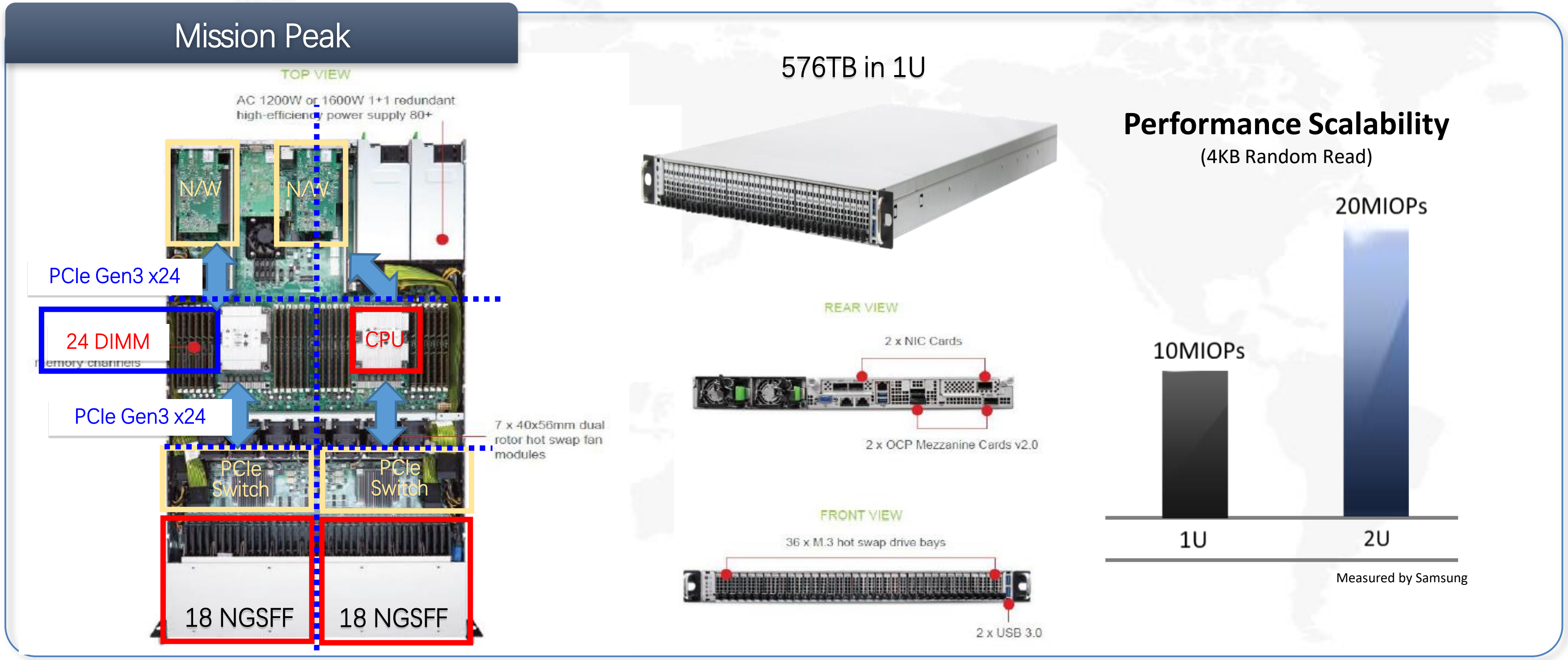
Development Schedule

Line up	DC NF1	EP NF1
Model	PM983	TBD
Density	3.84~15.36TB	Max.16TB
Seq. R/W(128KB)	3.2GB/s, 2.0GB/s	3.2GB/s, 2.0GB/s
Rand. R/W(4KB)	550K, 55K IOPS	TBD
Dual-Port	Not-Support	Support
Power Consumption	Max. 10W	Max. 14W
Input Power	12V	12V
Key Feature	Hot Swap, PLP, LED indication	Hot Swap, PLP, LED indication
CS	3.84TB (April) 7.68/15.36TB (July)	TBD (Dec.)

Eco Readiness



■ Mission Peak - Peta-Byte Flash System with 2U height



1.Optimized solution for – **Key Value SSD**

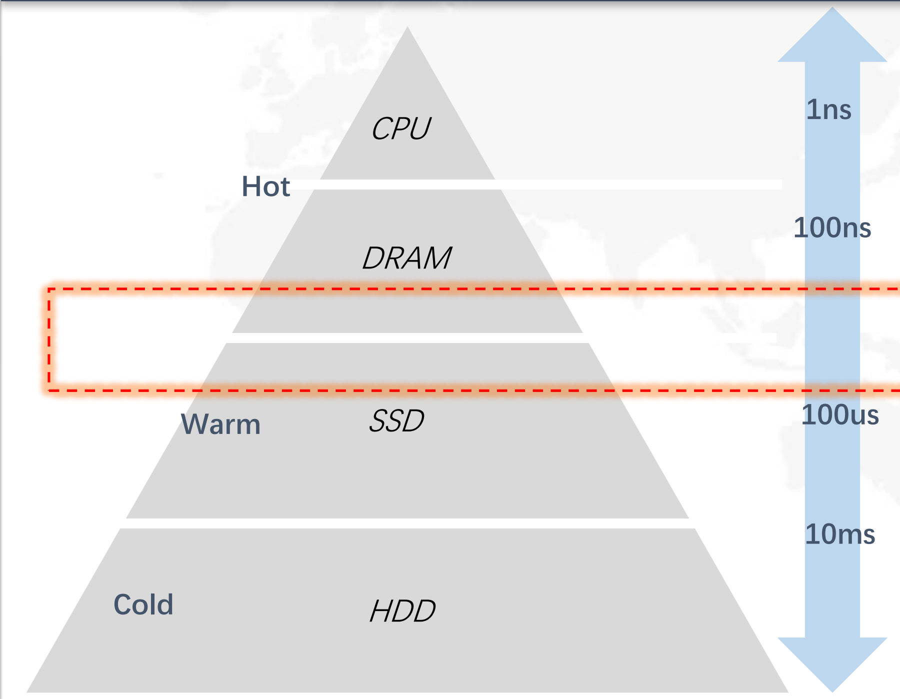
2. New form factor to deliver maximum capacity **– NF1**

3. Extremely low latency for Data Centers – **Z SSD**

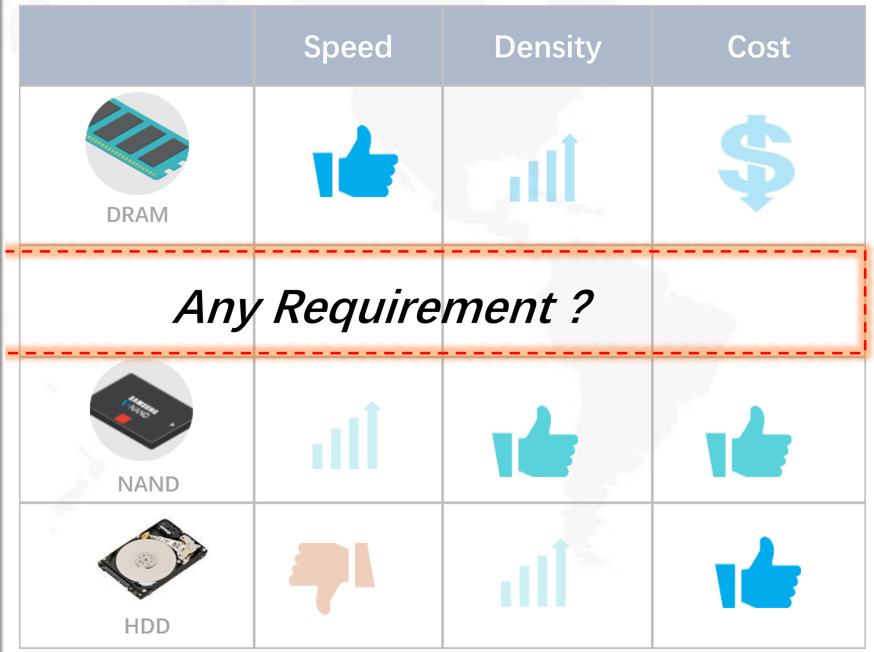
Ultra Low Latency SSD

- There is huge latency gap between DRAM and SSD which need a solution
- Z-SSD is suitable solution to fill the latency gap between DRAM and SSD

System Hierarchy with Latency

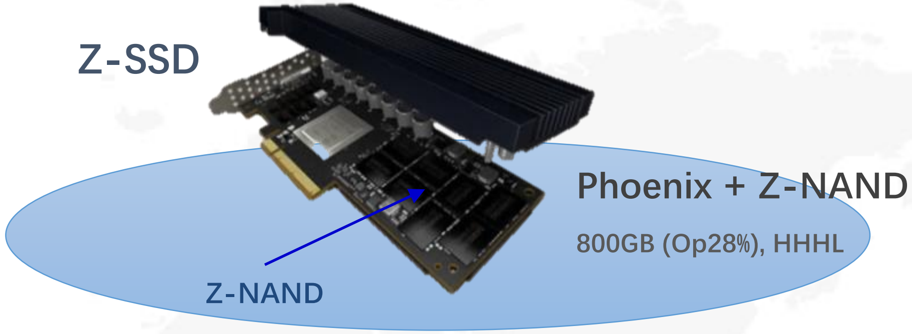


Memory/Storage Solution

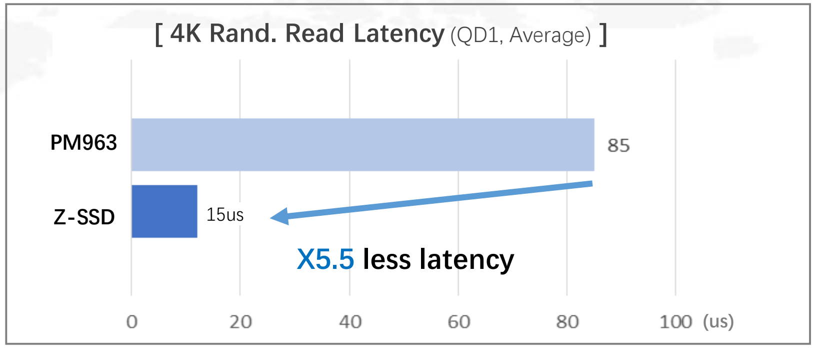


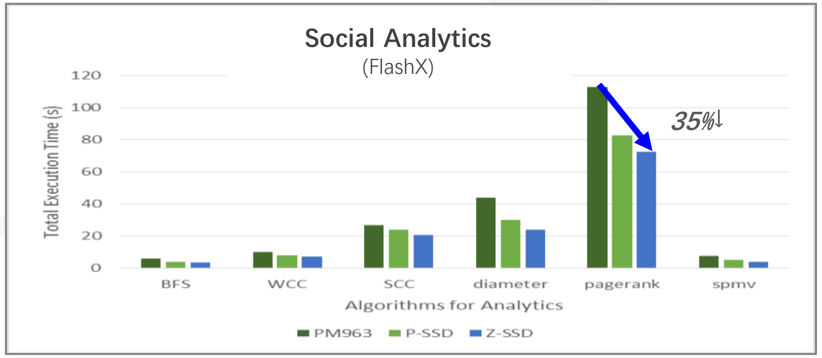
Z-SSD characteristics

- Samsung Z-SSD is using Samsung proven V-NAND technology (Z-NAND)
- Deliver extremely low latency and higher DWPD for data centers



Form factor	HHHL
Interface	PCIe Gen3 x4
NAND	1st Gen Z-NAND
Port	Single
Seq.R / Seq.W	3.2 GB/s / 3.0GB/s
Ran.R / Ran.W	750K IOPs / 170K IOPs
Ran.R (QD=1)	15us
DWPD	30 DWPD

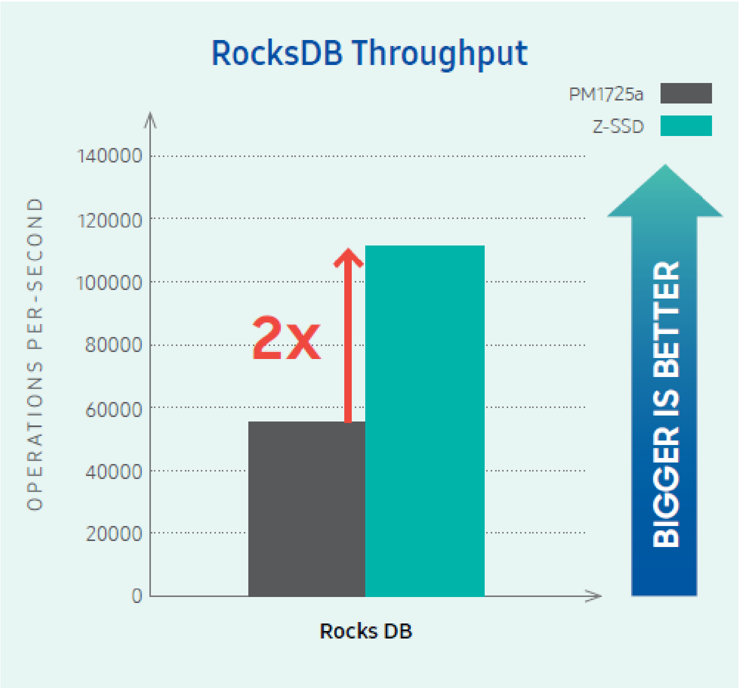


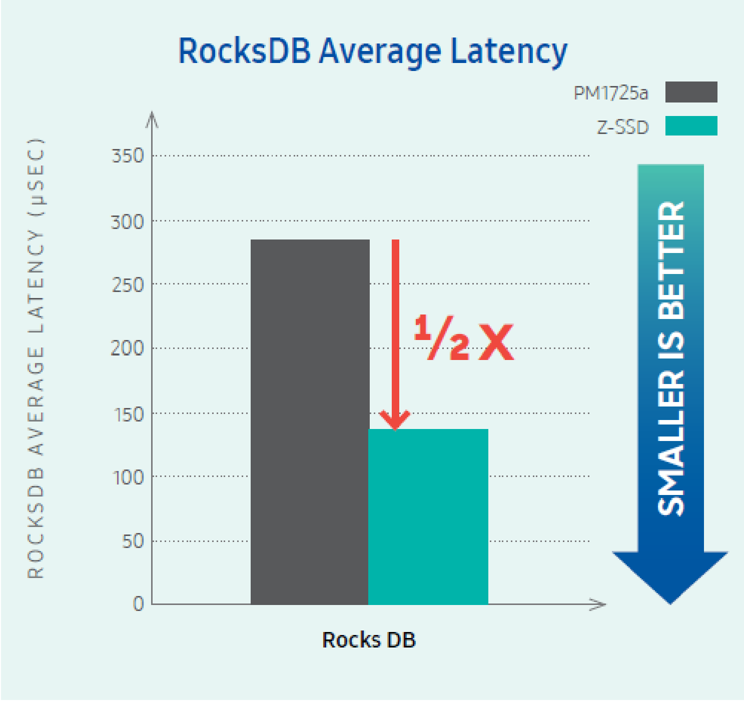


* Lower is Better

Testing result with RocksDB

- Z-SSD shows great advantage in RocksDB case in terms of Throughput and Latency





Z-SSD benchmark result in ODCC lab

■ Testing Environment

Server	Lenovo HR630X
CPU	CPU Model: Intel(R)6134, CPU Frequency: 1200.000, CPU Cores: 8, CPU Count: 2
Memory	196GB
OS	CentOS 7.5.1804
Kernel	3.10.0-862.el7.x86_64

■ Testing Result

Block Size	RW Type	ODCC result
4KB	Random read (IOPS)	851.3K
4KB	Random write (IOPS)	153K
128KB	Sequential read (MB/s)	3373
128KB	Sequential write (MB/s)	2849.6

THANKS!