Achieving Security-Efficiency Balance with Remote SSD Management in the Post-Pandemic Era

Frank Henville
Technical Manager

Agenda

- **Post-Pandemic Era: Experiencing the New Normal**
- **Innovative Technology Developments**

    - Apacer's Remote Device Management Solution

    - Evolution of PCIe and BiCS Flash

    - SLC-liteX: 3D NAND Flash Optimization

    - DDR5 Solution

Agenda

- **Post-Pandemic Era: Experiencing the New Normal**
- **Innovative Technology Developments**

   - Apacer's Remote Device Management Solution

   - Evolution of PCIe and BiCS Flash
   - SLC-liteX: 3D NAND Flash Optimization
   - DDR5 Solution

Experiencing the New Normal

The Growing Challenges in the Post-Pandemic Era

Blended working

Unable to visit the
scene immediately

Clustering reduction

Restricted deployment
of manpower

**Growing number of
edge devices**

Increased cost for maintenance

Demand Trend

Increasing Needs for

1. More **efficient** smart remote management and maintenance

2. Digital transformation by introducing **cloud-based operation**

3. Improving **edge security** and ransomware protection

The Risk is Real – Malicious Hacker Attacks

System operation or the **data transmission** process might be maliciously attacked by hackers, causing unexpected losses.

Surveillance

Retail

Oil Platforms

Smart Factories

Rail Systems

Hospitals
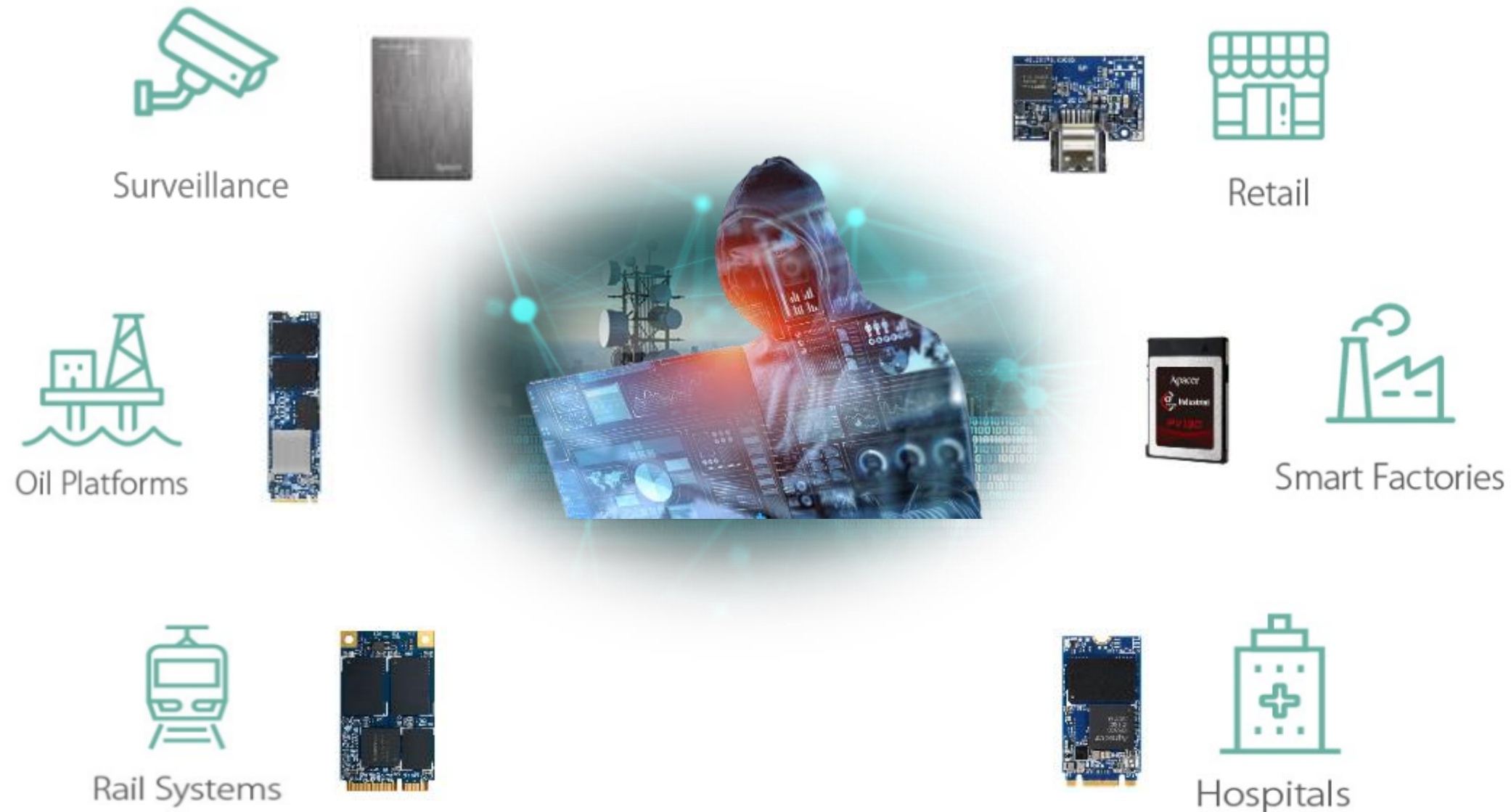
The Risk is Real – Environment Effects

Storage might become **unstable or damaged** after longtime exposure in outdoor or extreme environments, since **90% of SSDs** are still not monitored.

Surveillance

Retail

Oil Platforms
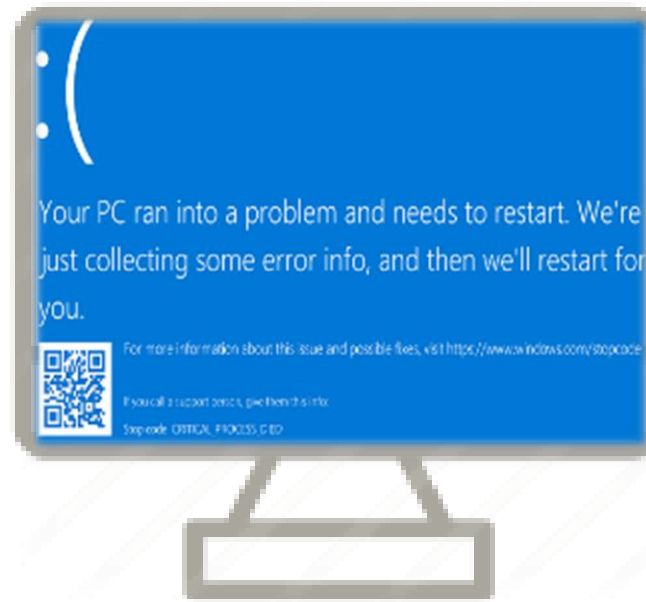
Smart Factories

Rail Systems

Hospitals
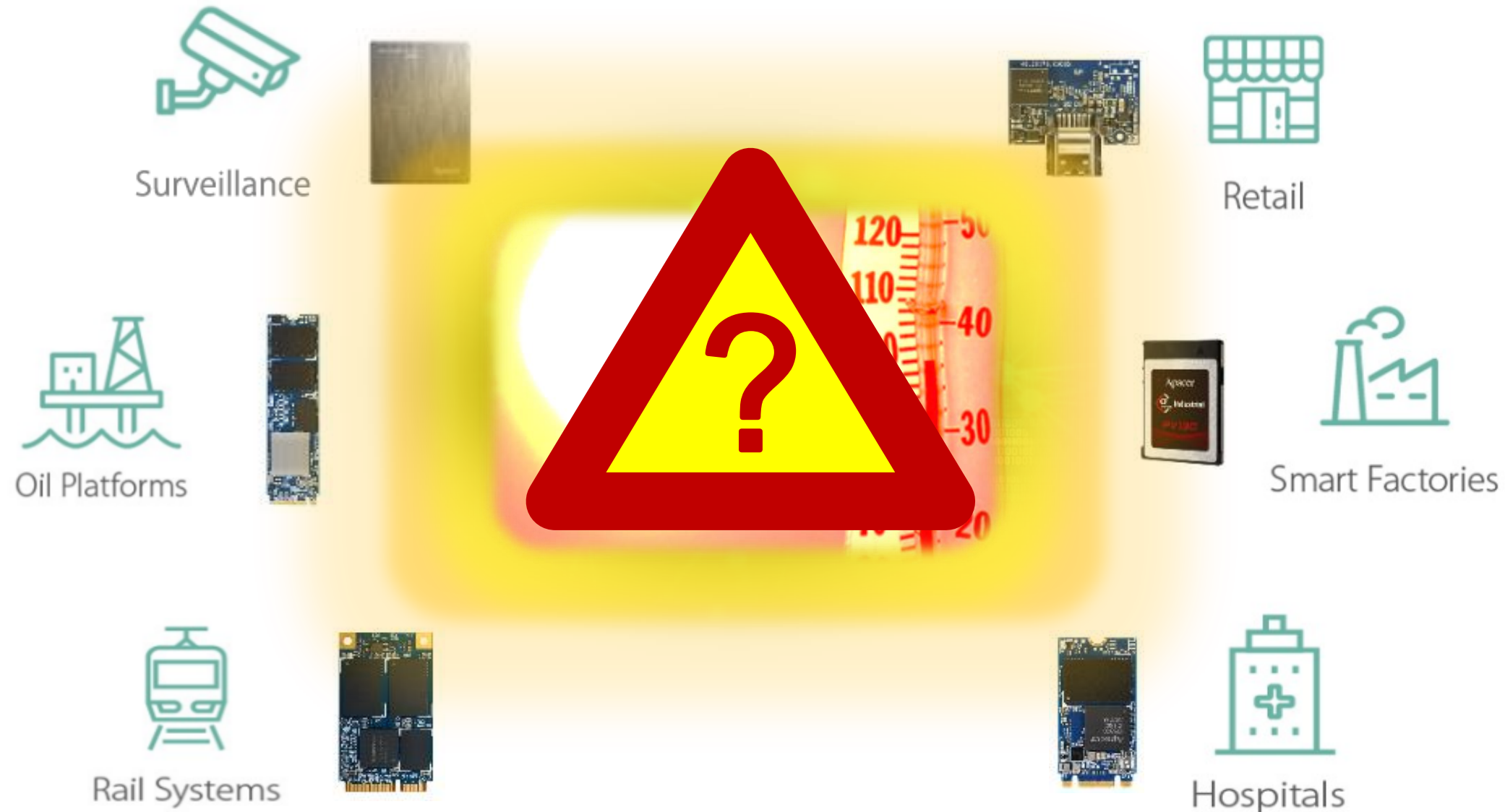
The Risk is Real – Downtime and Losses

Companies must pay attention to the **business risks and losses** that may be caused by **malicious hacker attacks** or **unexpected system downtime**.

System Error

System Crash

Trojan Ransomware

Apacer

Customer's Concerns

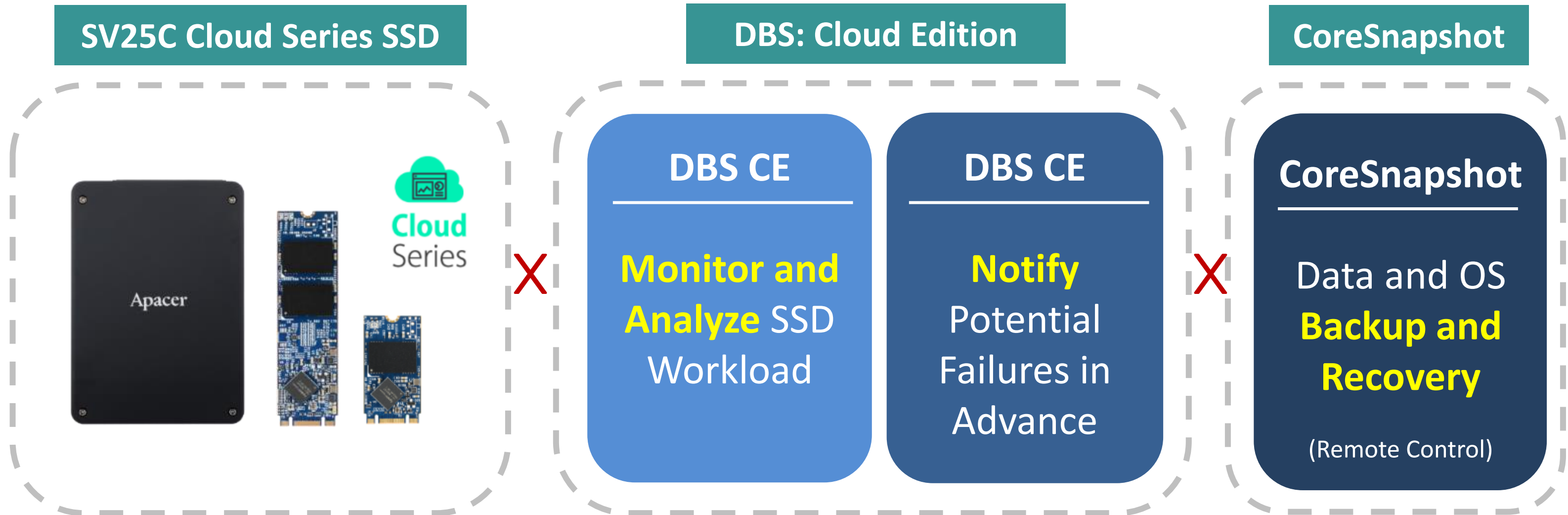**Security Susceptibility**

Reputation Damage

Business Loss

How Can We Prevent These?

Agenda

- Post-Pandemic Era: Experiencing the New Normal
- **Innovative Technology Developments**

  - **Apacer's Remote Device Management Solution**

  - Evolution of PCIe and BiCS Flash
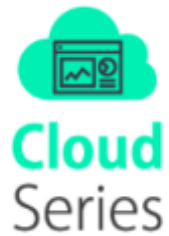 - SLC-liteX: 3D NAND Flash Optimization
  - DDR5 Solution

Cloud Co-op Partners – Cloud Portal

Cooperating with partners to provide multiple management platforms and cloud security services.

Remote Device Management Solution

SV25C Cloud Series SSD

DBS: Cloud Edition

CoreSnapshot

DBS CE

Monitor and Analyze SSD Workload

X

DBS CE

Notify Potential Failures in Advance

X

CoreSnapshot

Data and OS **Backup and Recovery**

(Remote Control)

* DBS: Double-barreled Solution

Remote Device Management Solution: Monitoring and Analyzing

SV25C Cloud Series SSD

DBS: Cloud Edition

CoreSnapshot

DBS CE

Monitor and Analyze SSD Workload

DBS CE

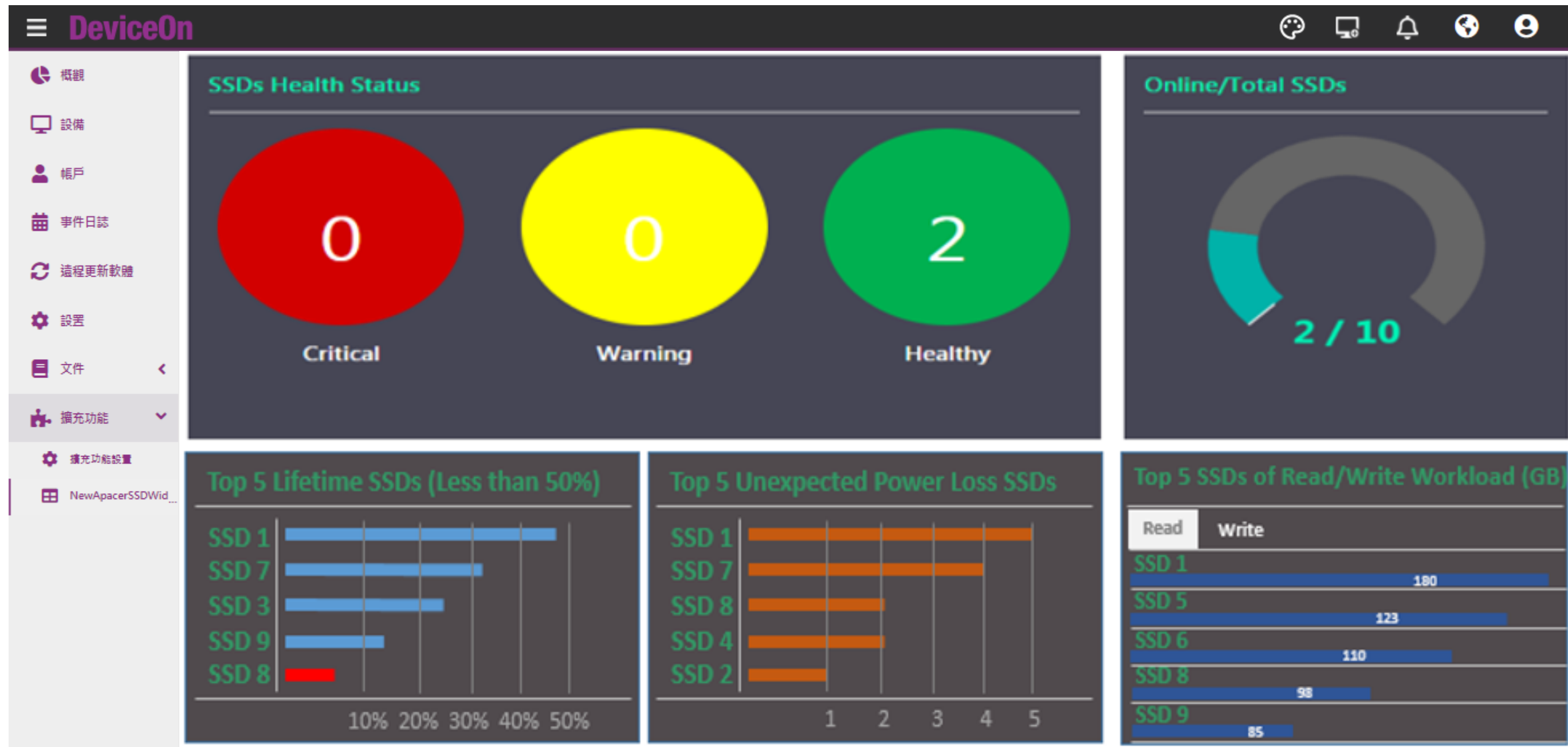**Notify** Potential Failures in Advance

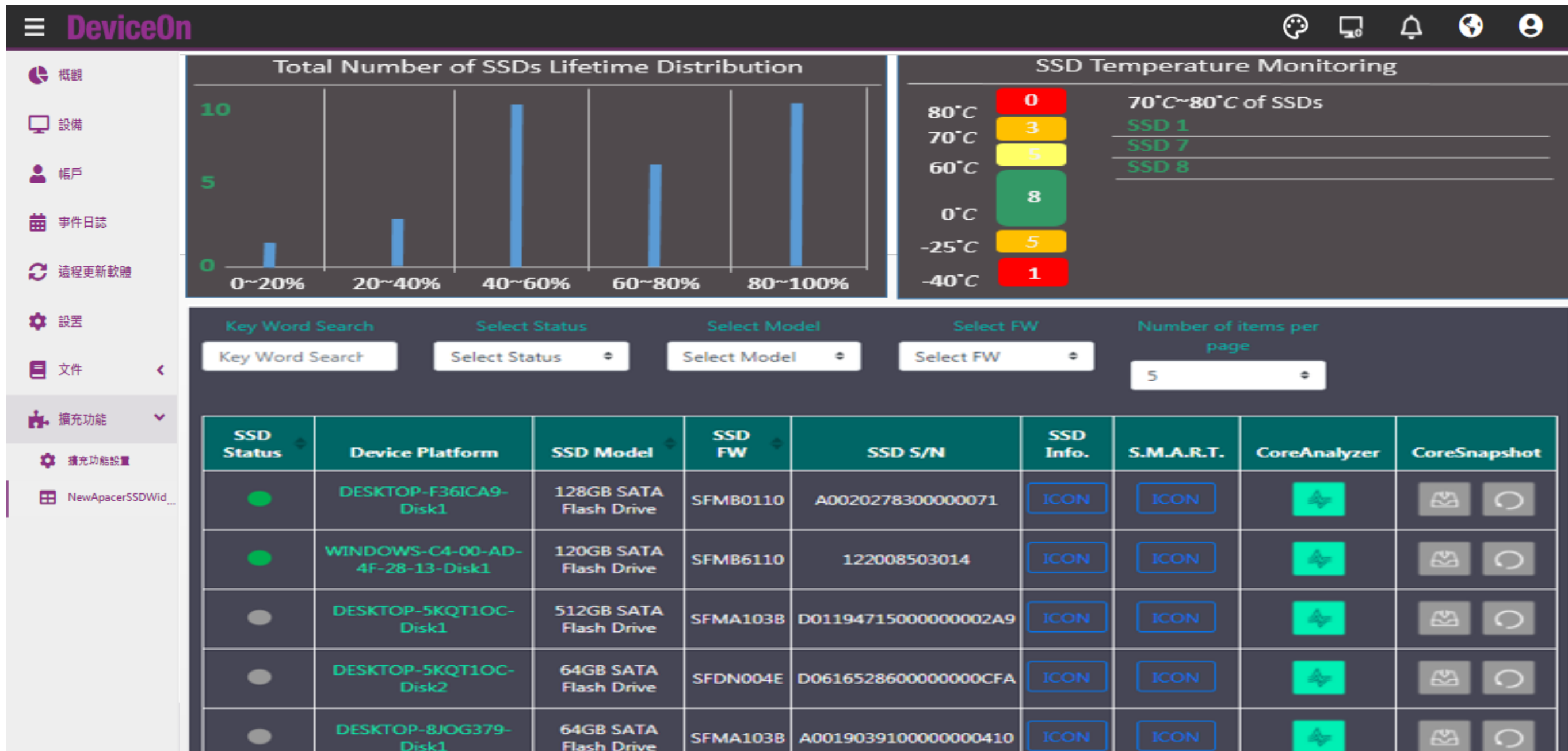**CoreSnapshot**

Data and OS **Backup and Recovery**

(Remote Control)

* DBS: Double-barreled Solution

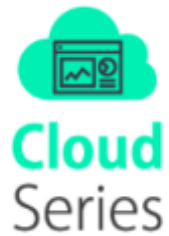# Monitor and Analyze SSD Workload

Monitor and Analyze SSD Workload

Monitor and Analyze SSD Workload

Remote Device Management Solution: Notification

SV25C Cloud Series SSD

Cloud Series

DBS: Cloud Edition

DBS CE

Monitor and Analyze SSD Workload

DBS CE

Notify Potential Failures in Advance

CoreSnapshot

CoreSnapshot

Data and OS **Backup and Recovery**

(Remote Control)

* DBS: Double-barreled Solution

Notify Potential Failures in Advance

Alert

- Health Status
- Mode Change
- SSD Cannot Be Detected
- Low Disk Space

Notice

- Backup Completed
- Recovery Completed
- SSD Never Backed Up

Active Alert/Notice

LINE
Line

E-Mail

Notify Potential Failures in Advance

Alert / Notice Example

Line

E-Mail

LINE Notify

DBS Cloud Notify: Device: AOPEN device #2_david test

Model: DE5500

Serial Number: 91700000000005050JEA3

Group: Apacer

Occur Time: 2020/06/08 09:34:44 (UTC)

Alert: Warning! (Erase count has reached 95%)

Agent Version: 2.14.2003

Source: Apacer Storage Plugin V.1.0 / Cloud SSD

Details: The end of the lifespan of the SSD is approaching, please BACKUP your data immediately.
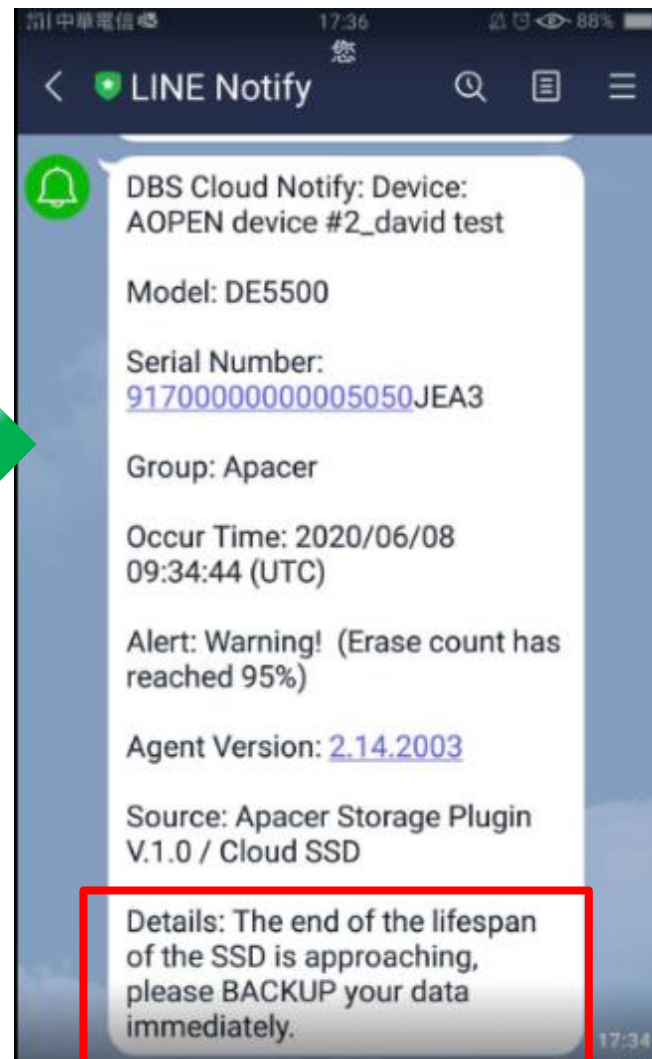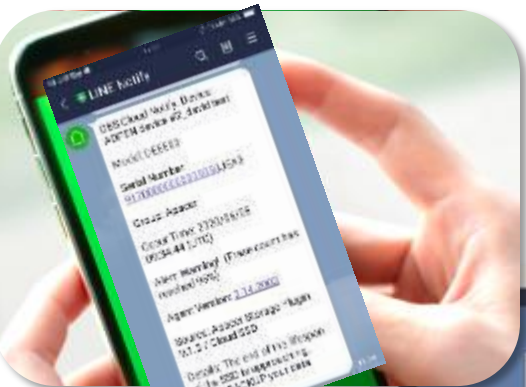
E-Mail

From: Apacer_alertcenter@apacer.com
Sent: Monday, June 1, 2020 4:52 PM
To: | Engineer_center@apacer.com
Subject: [Alert] lifeTime2 → AOPEN device #2_david test(91700000000005050JEA3)

Device: AOPEN device #2_david test

Model: DE5500

Serial Number: 91700000000005050JEA3

Group: Apacer

Occur Time: 2020/06/01 08:51:56 (UTC)

Alert: SSD Warning

Agent Version: 2.14.2003

Source: Apacer Storage Plugin V.1.0 / Cloud SSD

Details: Erase count has reached 95%, please BACKUP your data immediately.

Remote Device Management Solution: Backup and Recovery

SV25C Cloud Series SSD

DBS: Cloud Edition

CoreSnapshot

Cloud Series

DBS CE
Monitor and Analyze SSD Workload

DBS CE
Notify Potential Failures in Advance

CoreSnapshot
Data and OS **Backup and Recovery**

(Remote Control)

* DBS: Double-barreled Solution

Vertical Market Pain Points : B.S.O.D (Blue Screen Of Death)

Digital Signage

Transportation

ATM

Ordering Machine

Exterior Signage

Gaming Machine

Vending Machine

POS / Kiosk

Vertical Market Pain Points : B.S.O.D (Blue Screen Of Death)

30s = USD 5.6 million

How to solve B.S.O.D. immediately ?

System Disaster AED: CoreSnapshot Technology

Rapidly Backup and Recover Data and OS in 1 Second

CoreSnapshot
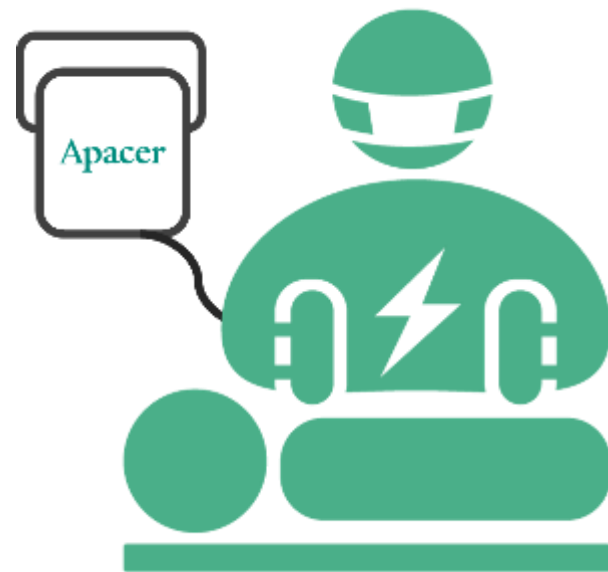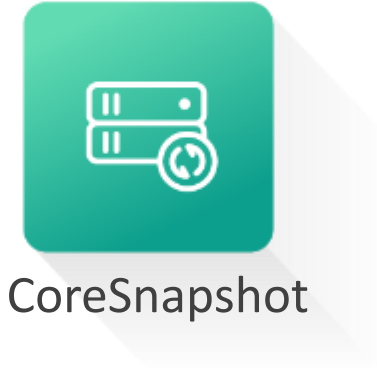
System Disaster's Savior

Compatibility
Highly compatible with **all operating systems**

Whole Disk
Backup and recovery **not only OS** but **full SSD**

Backup & Recovery in **1 Second**
Rapidly backup full SSD and instantly recover it **in 1 second**

Scenario: POS & Unmanned Store

Issue: Software crash

Waiting line......

Customer's Concern:

- Business shutdown & loss
- Needs long time & manpower to re-build
- Customers' compliance

Solution :

CoreSnapshot

1 Second
Solve all concerns

Through

Software   SDK in AP   Cloud
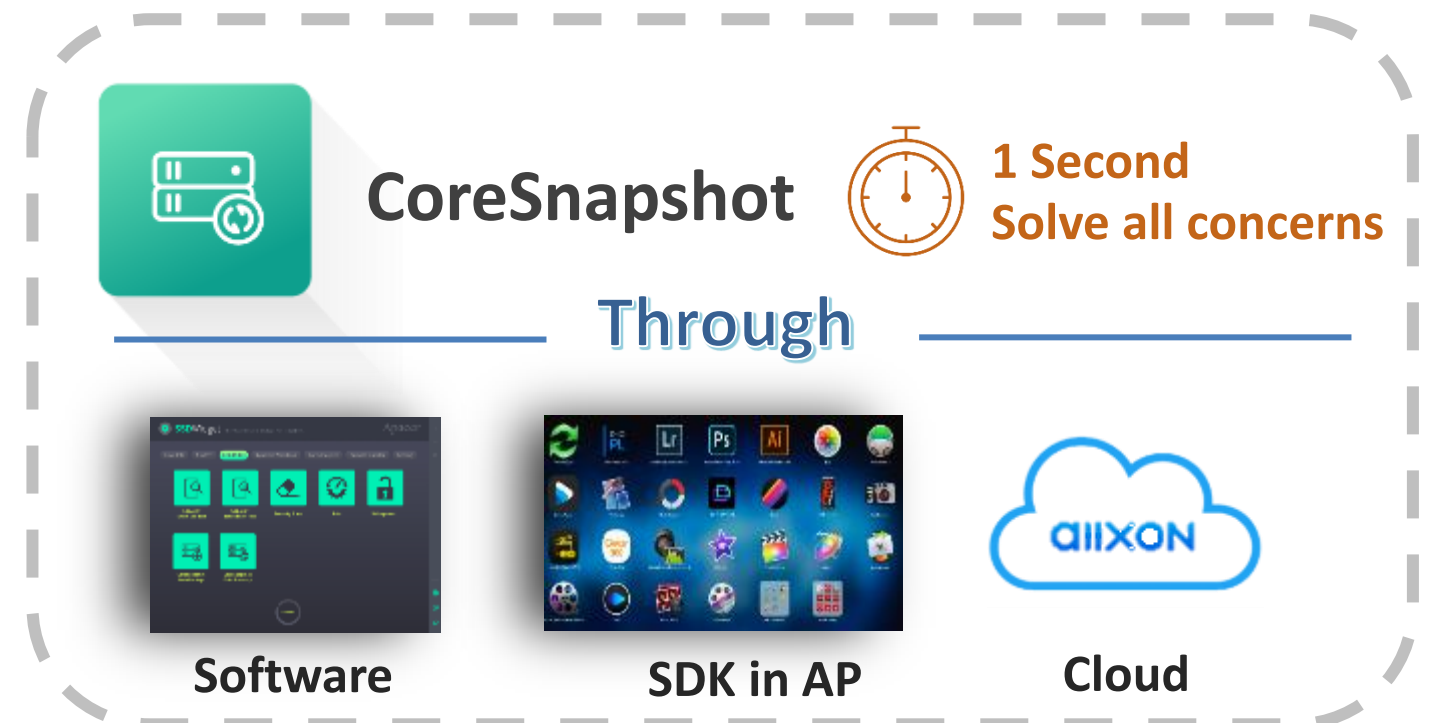
Scenario: Robot & Factory Automation

Issue : O.S. crash & line down

Solution

CoreSnapshot

1 Second Trigger
1 Second Recovery

Cloud

IPC Device
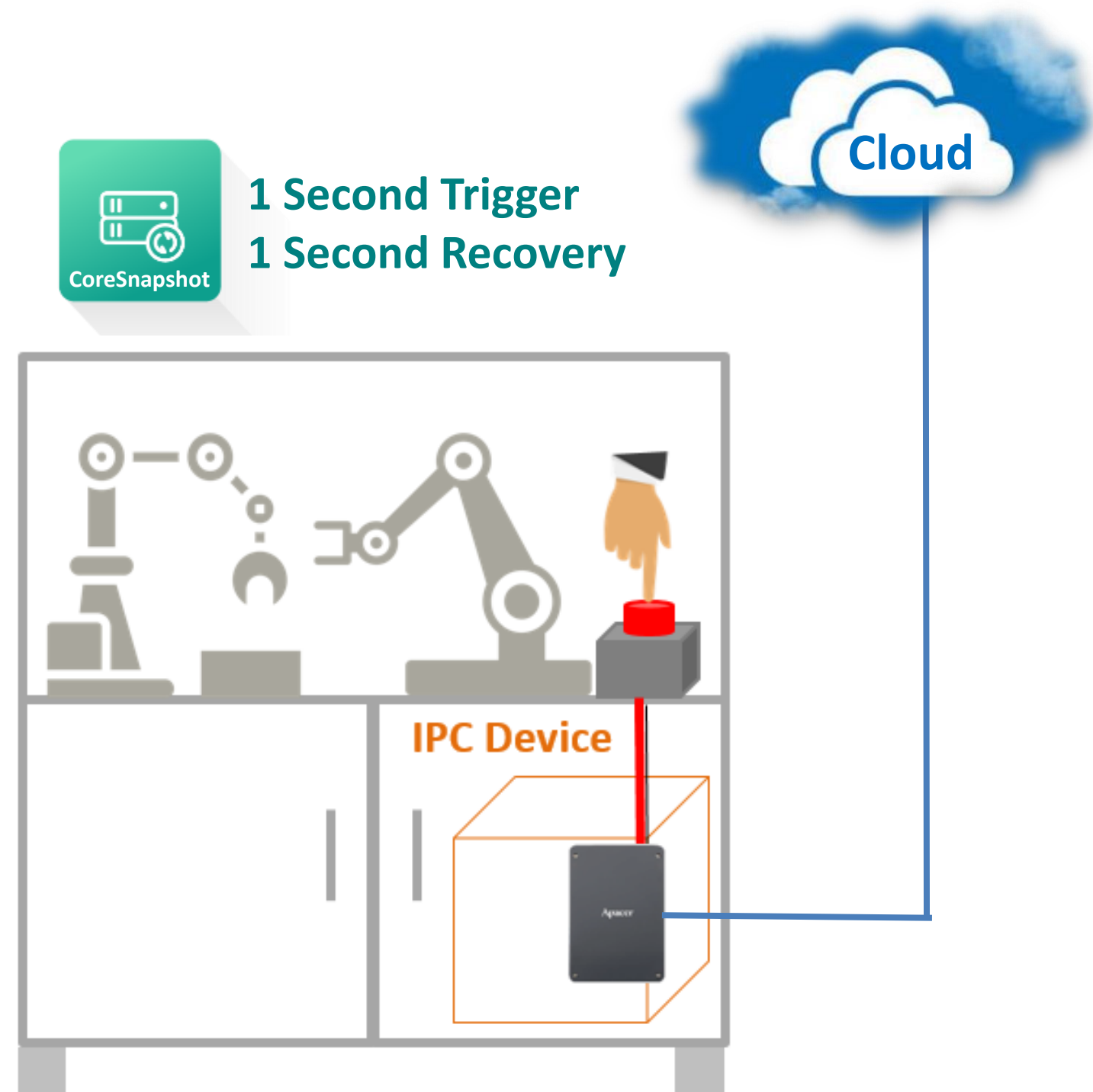
Scenario: Battery Charging Station

Issue : O.S. error

Customer's Concern:

- Takes time to reach the station if it happened in a remote area
- Manpower support cost
- Customer's compliance

Solution :

CoreSnapshot

1 Second
Solve all concerns

Through

SSD

GPIO

Cloud

Scenario: Long Haul Bus

Issue: Infotainment system crash

Customer's Concern:

- Can only repair after arrival at bus station
- Repair period business losses
- Customers' dissatisfaction

Solution :

CoreSnapshot

**1 Second
Solve all concerns**

Through

SSD

allxon

GPIO

Cloud
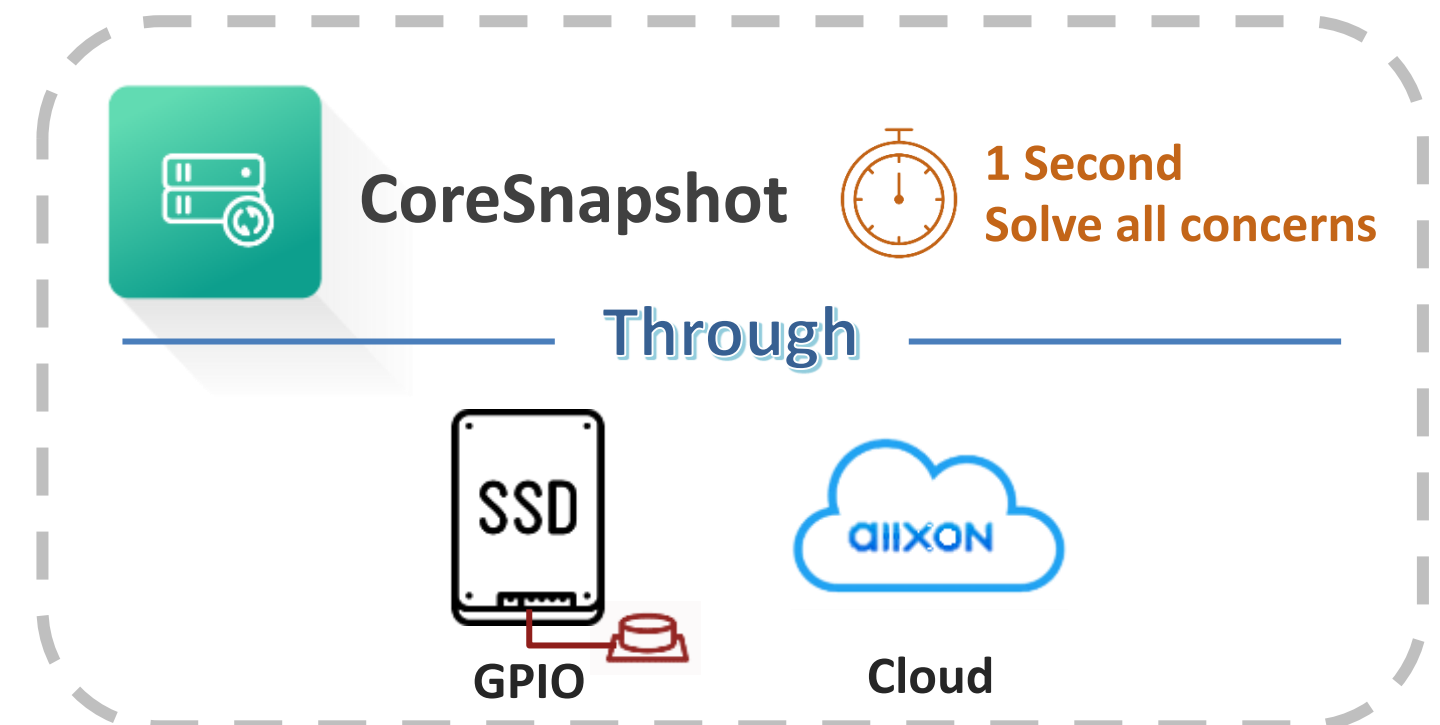
Scenario: Automatic Parking Cashier

Issue: O.S. crash

Customer's Concern:
- Takes time to reach the station if it happened in a remote area
- Manpower maintenance cost
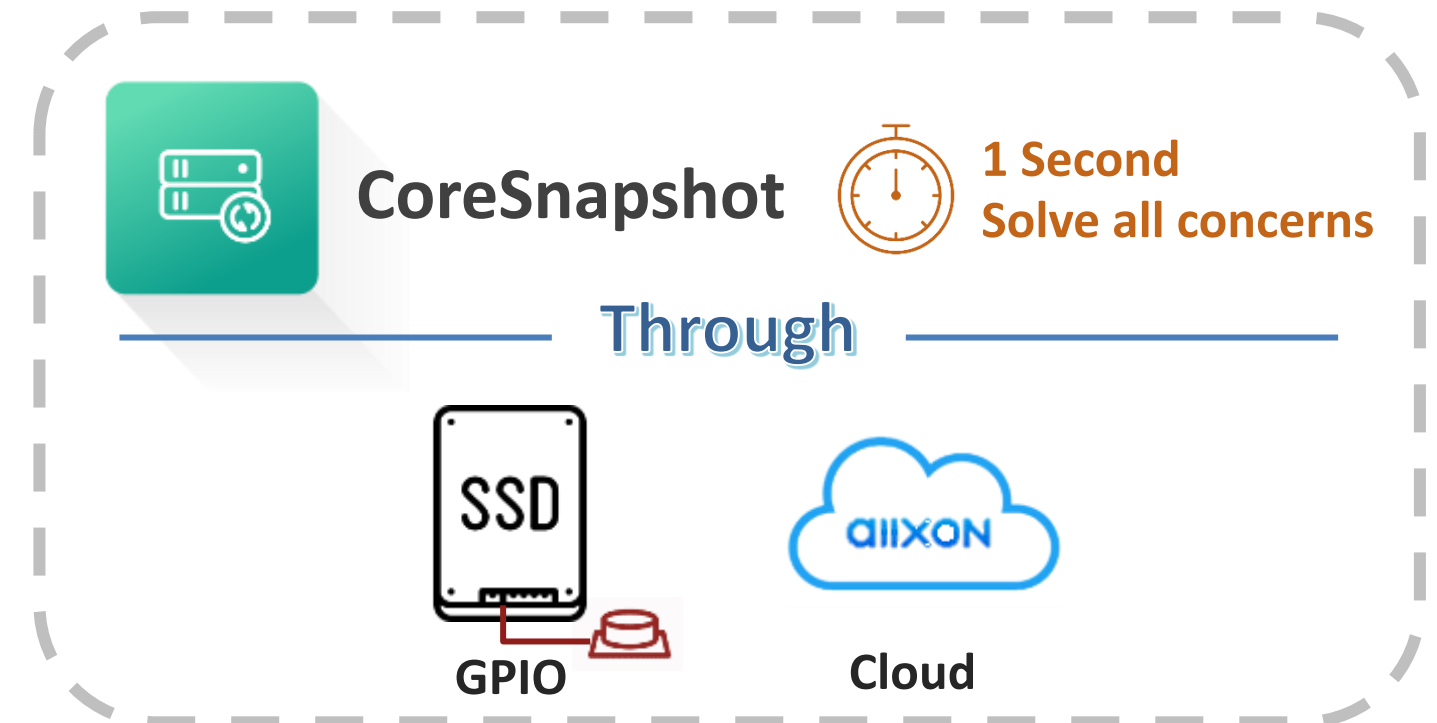- Customers' compliance

Solution :

CoreSnapshot

1 Second Solve all concerns

Through

SSD

GPIO

allxON
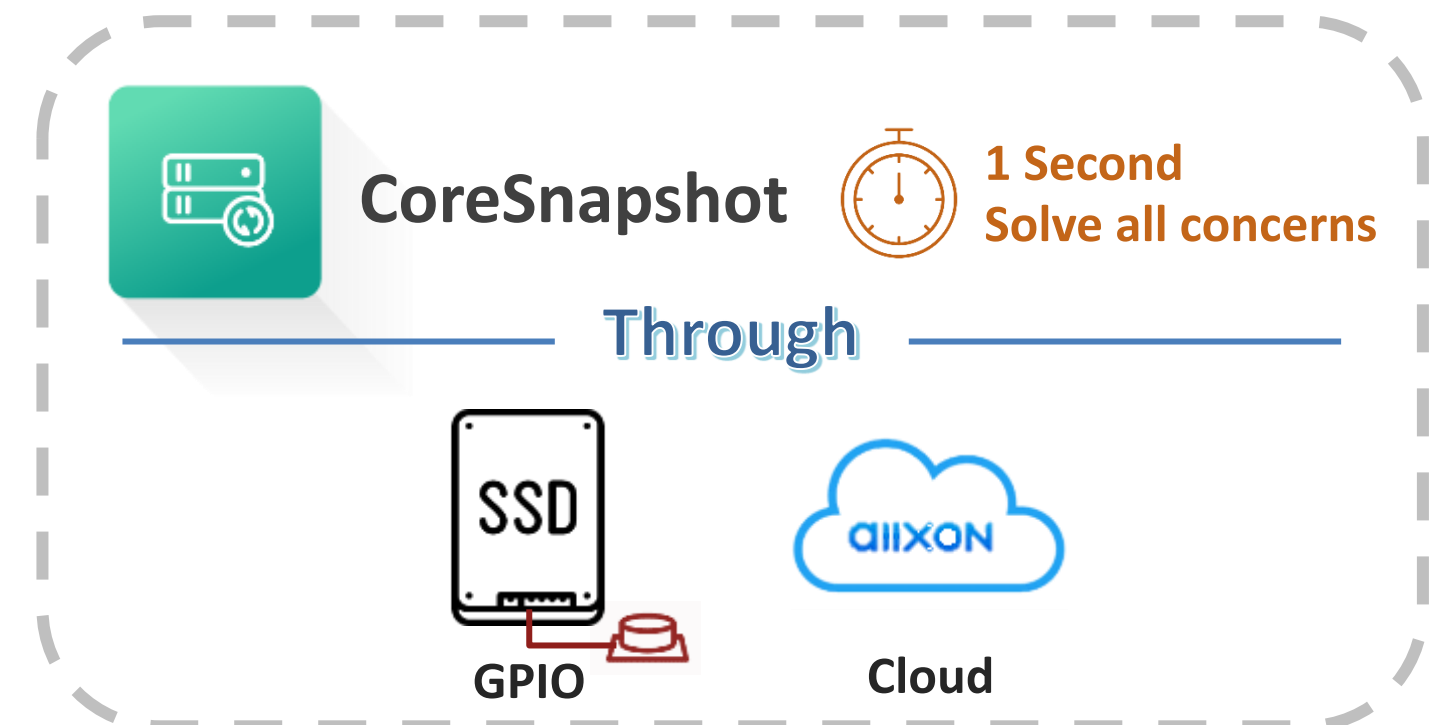
Cloud

Scenario: Defense Radar System

Issue: O.S. crash

Customer's Concern:
- Loss of important data
- Wastes time to wait for repairing
- Exposure to danger

Solution :

CoreSnapshot

1 Second
Solve all concerns

Supported Models

2.5"　　　M.2 2280　M.2 2242
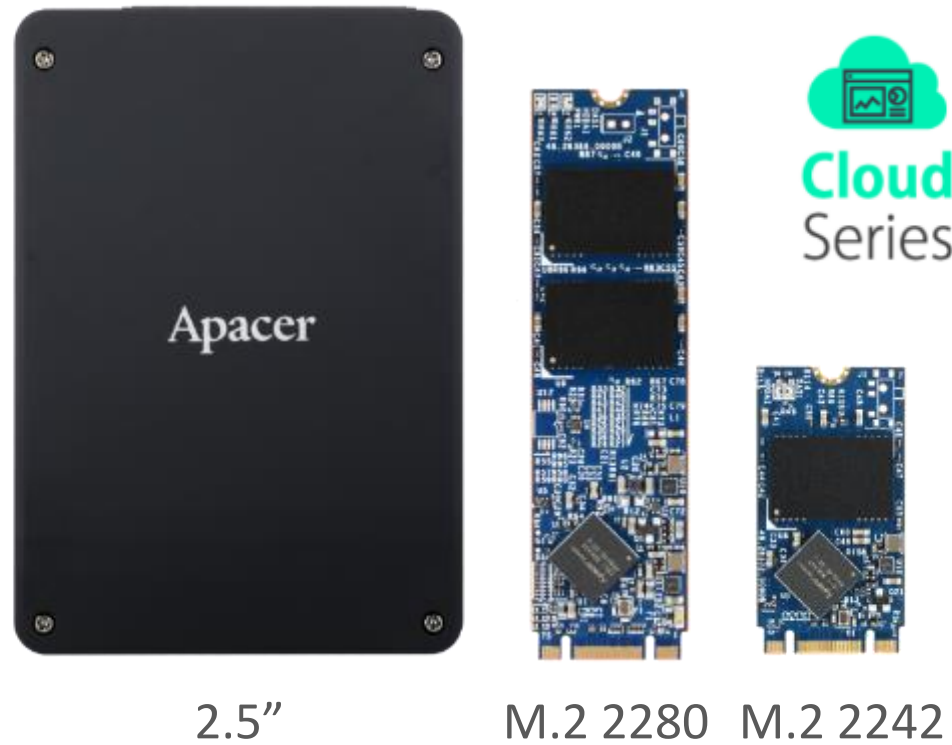
SV25C Cloud Series SSD

Specification	
Interface	**SATA 3 (6Gb/s)**
Capacity	**30GB ~ 480GB**
NAND Support	**3D TLC**
External DRAM	**No**
R/W Speed (MB/sec)	**Up to 560 / 520**
IOPS (4K random write)	**74K**
Wide Temp (-40°C~ 85°C)	**Yes**

Product Features：

- **Cloud Edition (optional)**
- Support LDPC ECC
- Global Wear Leveling technology
- S.M.A.R.T. support
- End-to-End Data Protection
- **Double-barreled Solution**
- TRIM Support
- **AES-256 support**

- DataRAID™
- DataDefender™
- Over-Provisioning

Agenda

- **Post-Pandemic Era: Experiencing the New Normal**
- **Innovative Technology Developments**

  - Apacer's Remote Device Management Solution
  - **Evolution of PCIe and BiCS Flash**
  - SLC-liteX: 3D NAND Flash Optimization
  - DDR5 Solution

SSD: Evolution of PCIe

Better performance

Released: 2010
Transfer rate: 8.0 GT/s

Throughput / Lane
X1: 0.985 GB/s
X2: 1.969 GB/s
X4: 3.938 GB/s
X8: 7.877 GB/s
X16: 15.754 GB/s

Released: 2017
Transfer rate: 16.0 GT/s

Throughput / Lane
X1: 1.969 GB/s
X2: 3.938 GB/s
X4: 7.877 GB/s
X8: 15.754 GB/s
X16: 31.508 GB/s

Released: 2019
Transfer rate: 32.0 GT/s

Throughput / Lane
X1: 3.938 GB/s
X2: 7.877 GB/s
X4: 15.754 GB/s
X8: 31.508 GB/s
X16: 63.015 GB/s

Released: 2021 (planned)
Transfer rate: 64.0 GT/s

Throughput / Lane
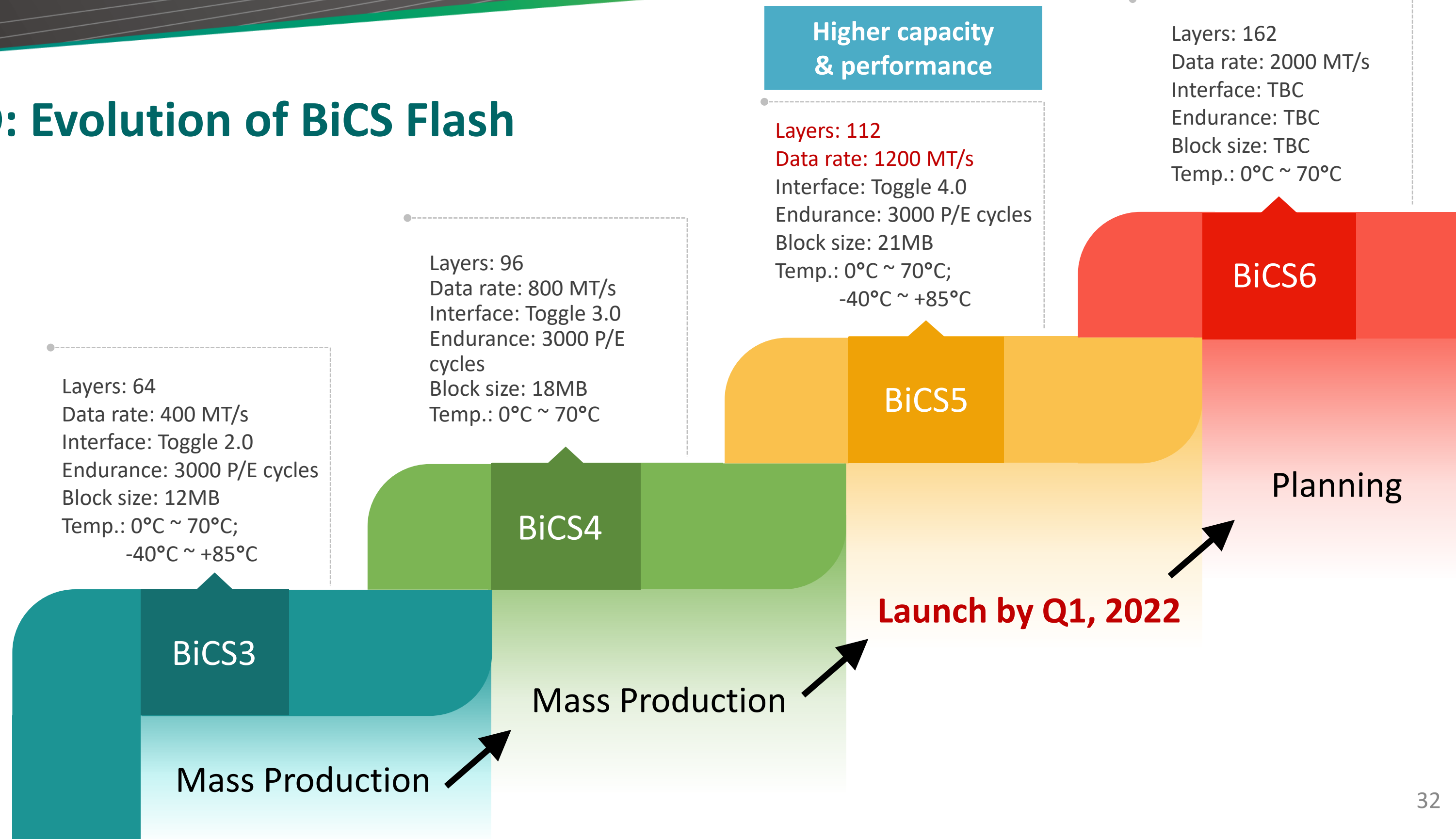X1: 7.877 GB/s
X2: 15.754 GB/s
X4: 31.508 GB/s
X8: 63.015 GB/s
X16: 126.031 GB/s

PCIe 3.0

PCIe 4.0

PCIe 5.0

PCIe 6.0

Mass Production

Launch by Q4, 2021

Planning

Planning

31

SSD: Evolution of BiCS Flash

Higher capacity & performance

Layers: 64
Data rate: 400 MT/s
Interface: Toggle 2.0
Endurance: 3000 P/E cycles
Block size: 12MB
Temp.: 0°C ~ 70°C;
　　　-40°C ~ +85°C

Layers: 96
Data rate: 800 MT/s
Interface: Toggle 3.0
Endurance: 3000 P/E cycles
Block size: 18MB
Temp.: 0°C ~ 70°C

Layers: 112
Data rate: 1200 MT/s
Interface: Toggle 4.0
Endurance: 3000 P/E cycles
Block size: 21MB
Temp.: 0°C ~ 70°C;
　　　-40°C ~ +85°C

Layers: 162
Data rate: 2000 MT/s
Interface: TBC
Endurance: TBC
Block size: TBC
Temp.: 0°C ~ 70°C

BiCS3

BiCS4

BiCS5

BiCS6

Mass Production

Mass Production
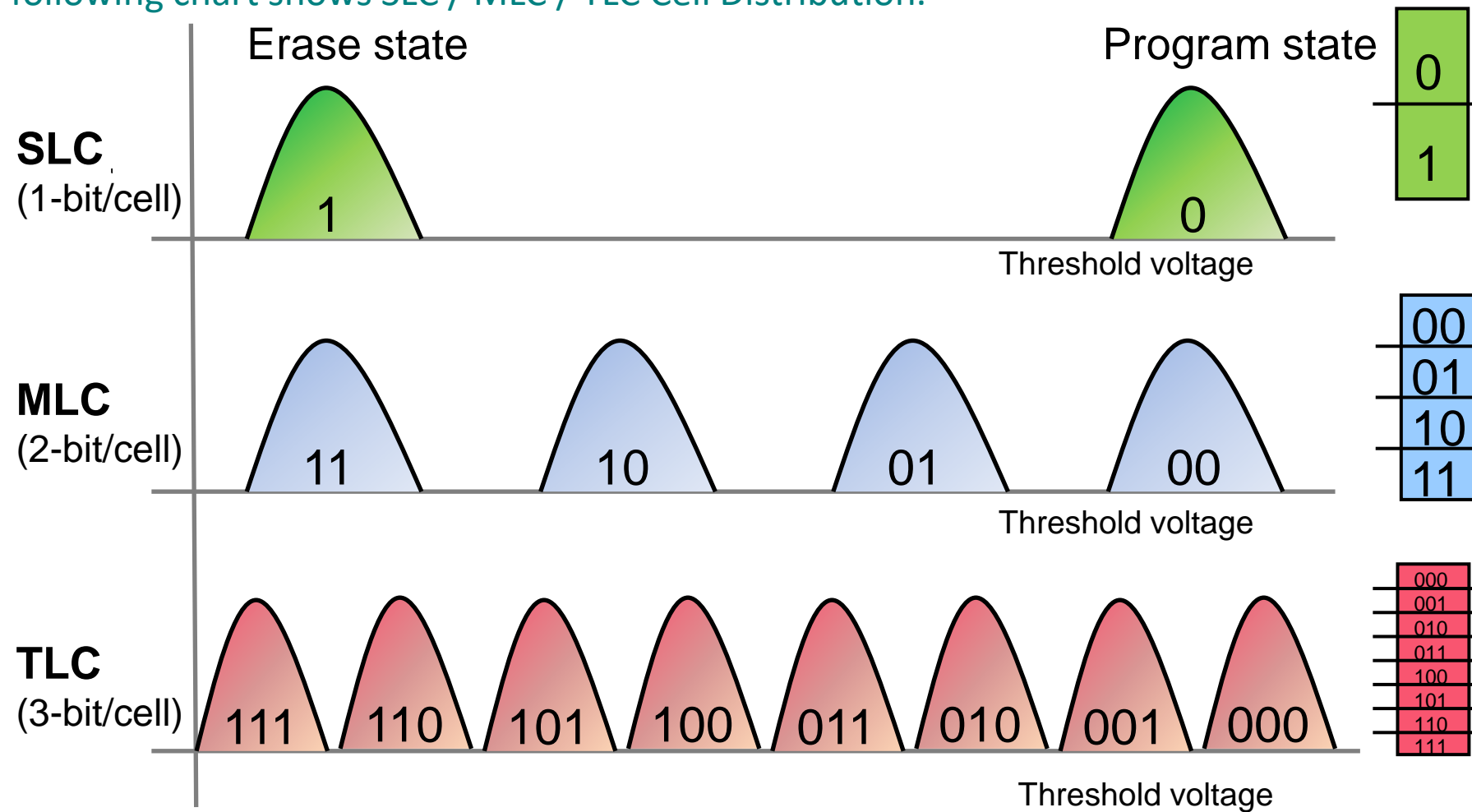
Launch by Q1, 2022

Planning

Agenda

- **Post-Pandemic Era: Experiencing the New Normal**
- **Innovative Technology Developments**

  - Apacer's Remote Device Management Solution
  - Evolution of PCIe and BiCS Flash
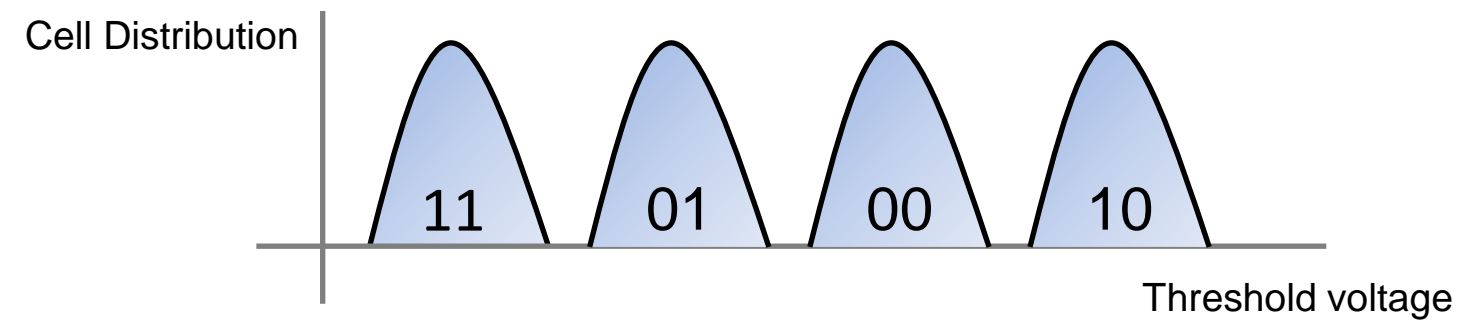 - **SLC-liteX: 3D NAND Flash Optimization**
  - DDR5 Solution

Introduction to NAND Flash Optimization

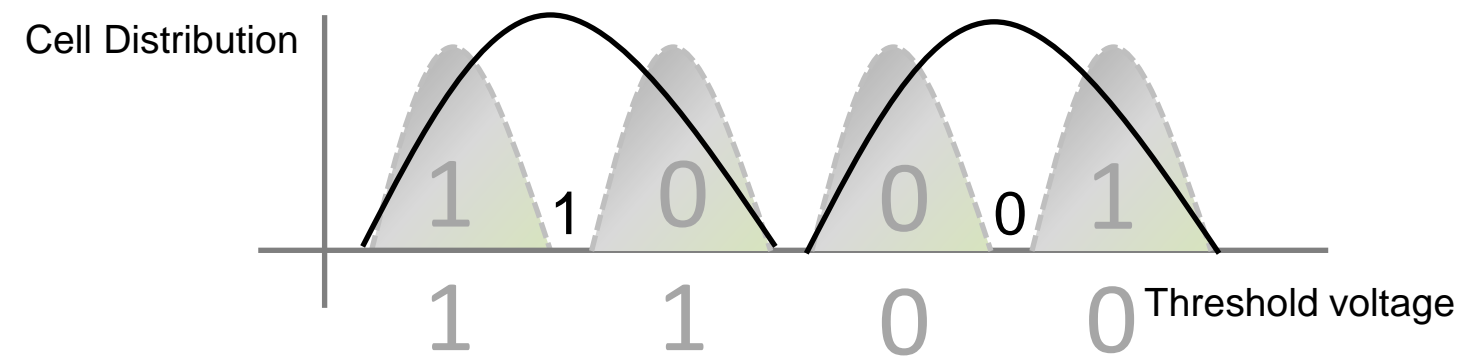The following chart shows SLC / MLC / TLC Cell Distribution.

SLC-lite: The Balanced Solution

How MLC works: programming both LSB (least significant bit) and MSB (most significant bit)

By only programming the LSB, MLC will behave similarly to SLC. **This is SLC-lite.**

MLC-liteX

3D TLC (3-bit/cell)

111 110 100 101 001 000 010 011

Threshold voltage

3D MLC-liteX

11 10 00 01

Threshold voltage

SLC-liteX

3D TLC (3-bit/cell)

111　110　100　101　001　000　010　011

Threshold voltage

3D SLC-liteX

1　　　0

Threshold voltage
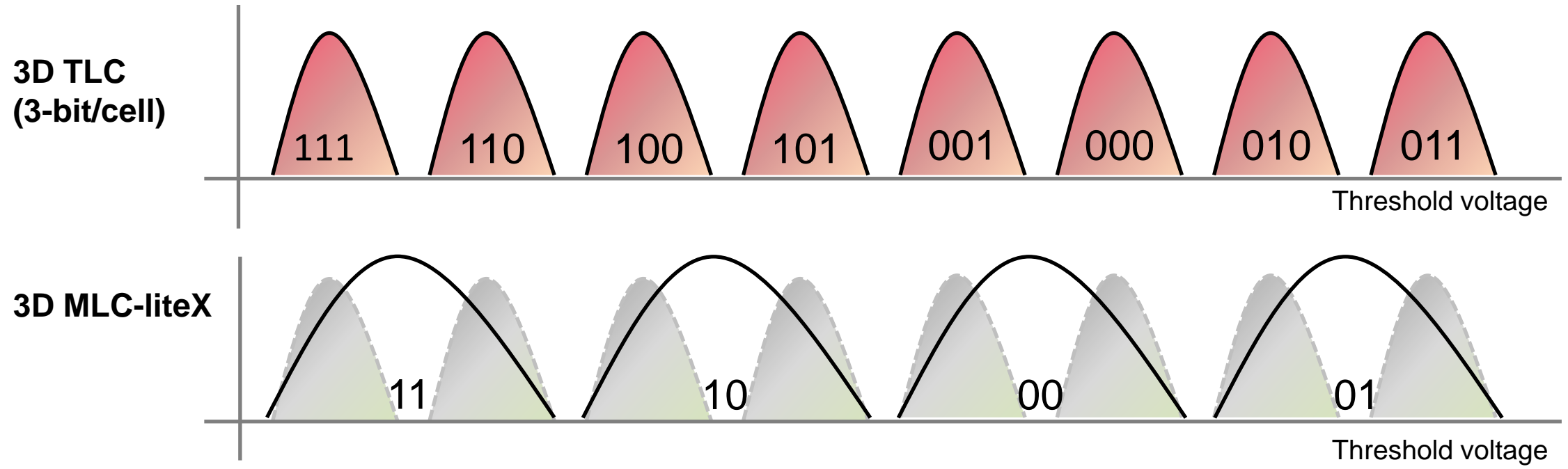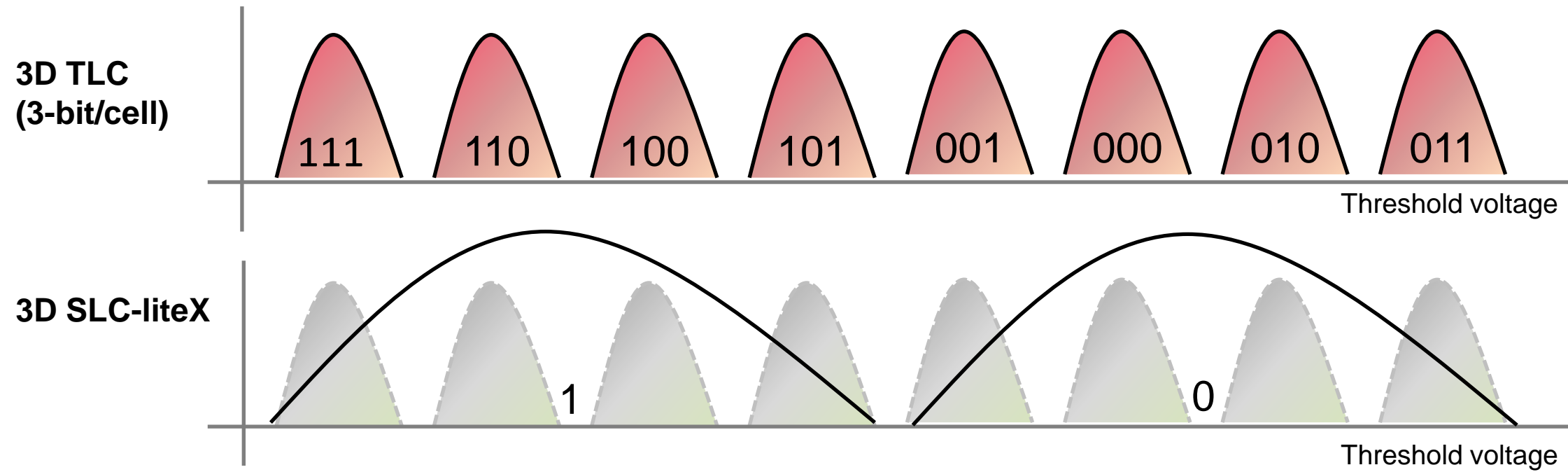
How SLC-liteX Reaches 100,000 P/E Cycles

Over 33 times

100,000 P/E cycles

SLC-liteX

3,000 P/E cycles
3D TLC NAND Flash

NAND Flash

High quality selected NAND

Page (LSB) → SLC Mode

Firmware structure optimized

Early Stage | Mid Stage | Later Stage

Hard Decode → Soft Decode → RAID Decode

Error handling algorithm
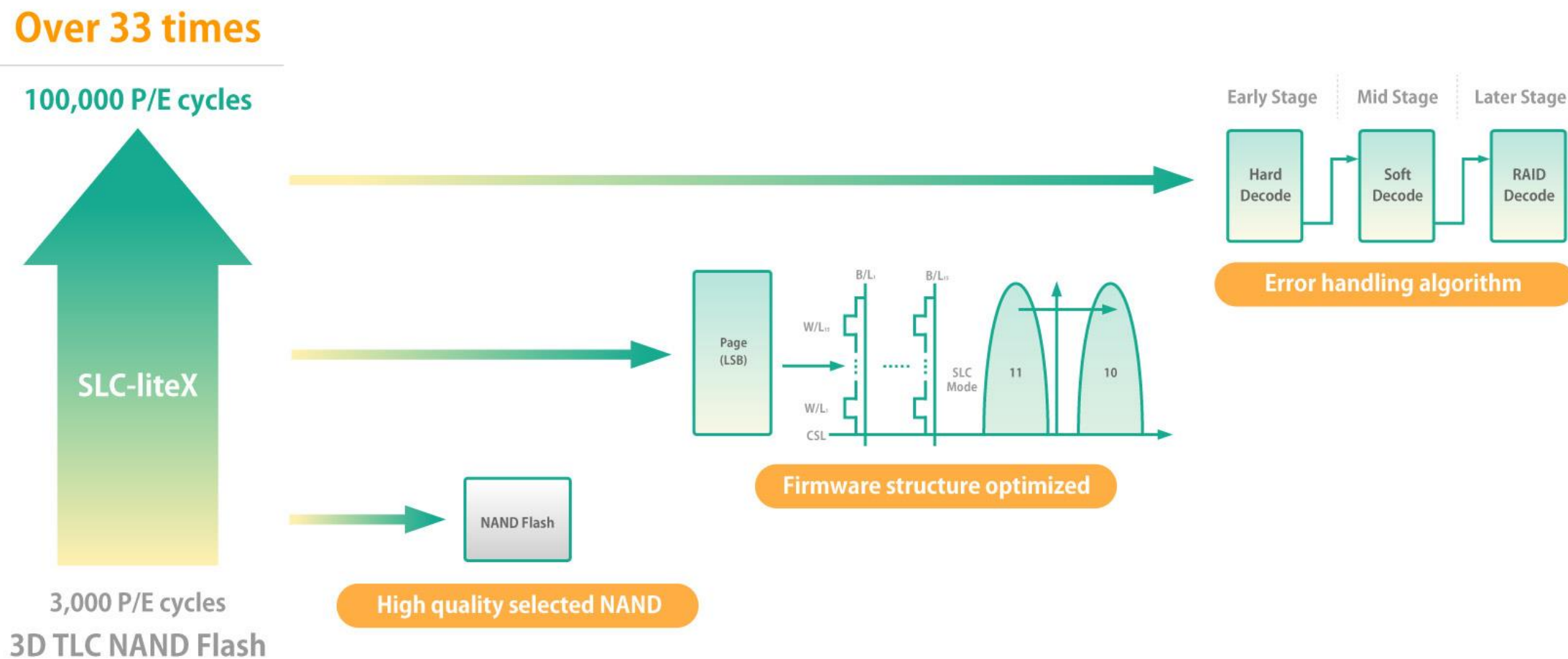
Comparison of Optimization Formats

	3D TLC	MLC-liteX	SLC-liteX
Bits per cell	3	2	1
P/E Count	3,000	10,000	**100,000**
Reliability	Good	Better	Excellent
Cost	$	$$	$$$
Capacity	★★★	★★	★

100K P/E cycles are available for SATA and PCIe models.

Advantages of Using MLC-liteX and SLC-liteX

Endurance

3,000 — 3D TLC
10,000 — MLC-liteX
100,000 — SLC-liteX
3-33x up

Cost

SLC
SLC-liteX
MLC-liteX
86-92% down
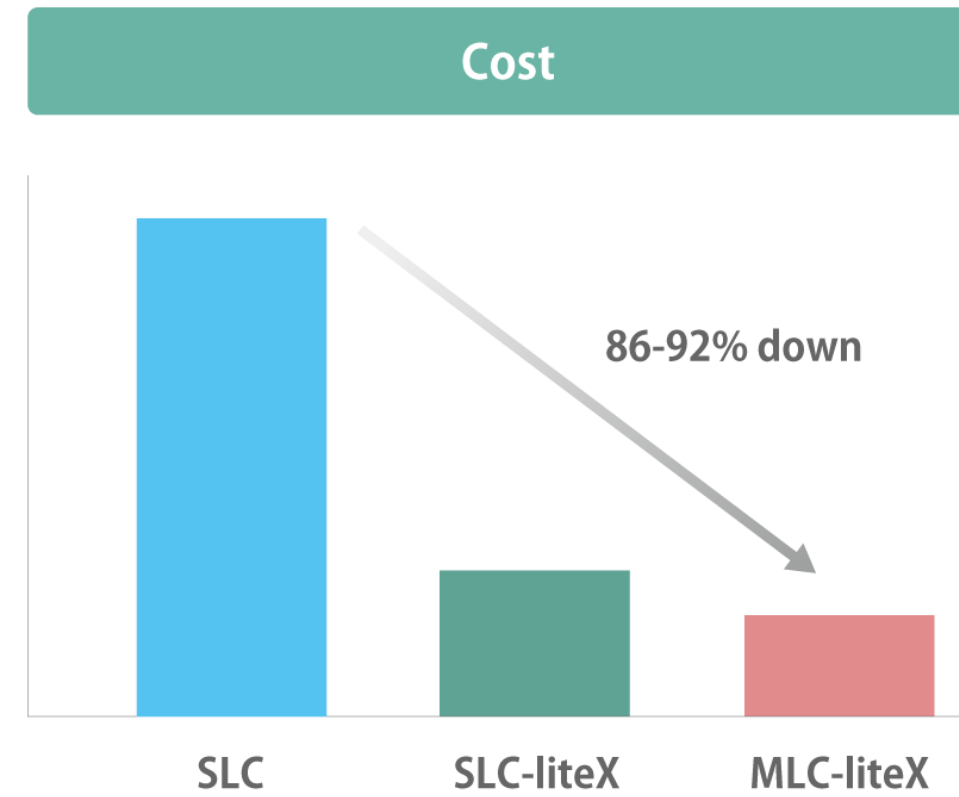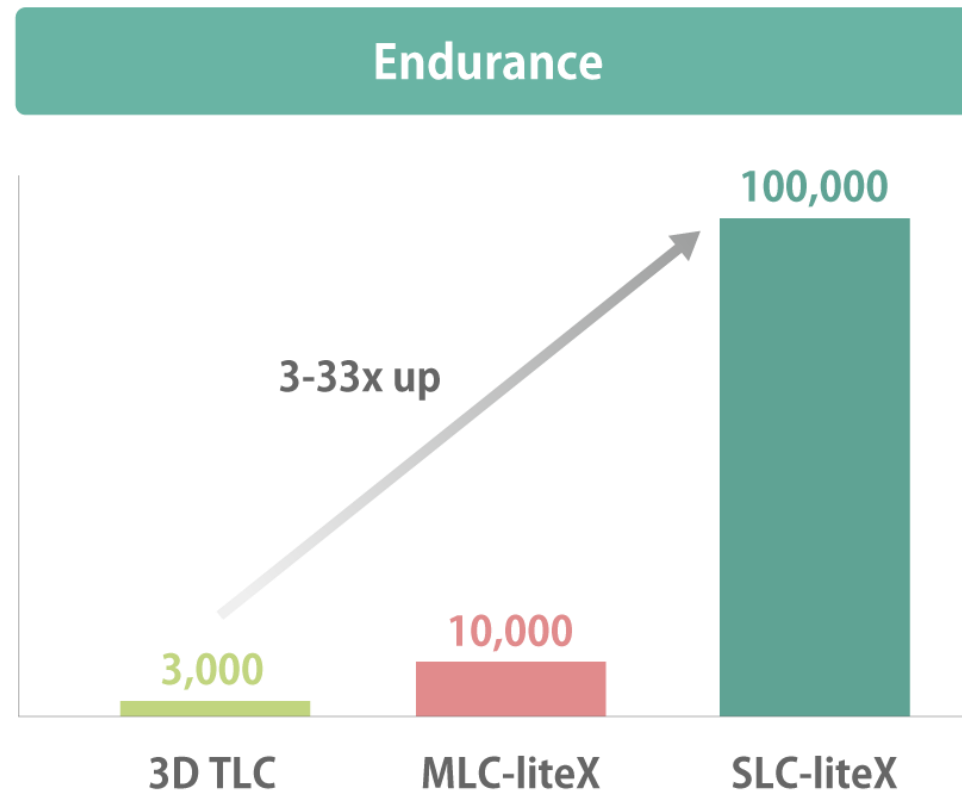
SLC-liteX and MLC-liteX SSD Solutions

Industrial Applications

NVR	IPC	Gaming	Networking

SLC-liteX Product series

Form Factor	2.5''	M.2 2280	M.2 2242	MO-300	MO-300B	CFast	Module 7Pin
Model Name	SH250-25	SH250-M280	SH250-M242	SH250-300	SH250-300B	SH250-CFast	SH250-7LP2
Interface	SATA 3.2 (6Gb/s)	SATA 3.2 (6Gb/s)	SATA 3.2 (6Gb/s)	SATA 3.2 (6Gb/s)	SATA 3.2 (6Gb/s)	SATA 3.2 (6Gb/s)	SATA 3.2 (6Gb/s)
Capacity	10GB~320GB	10GB~320GB	10GB~160GB	10GB~160GB	10GB~80GB	10GB~160GB	20GB~80GB
Seq. R/W Perf. (MB/sec)	560/520	560/520	560/520	560/520	560/510	560/515	560/510
Operation Temperature (˚C)	0 ~ +70/ -40 ~ + 85	0 ~ +70/ -40 ~ + 85	0 ~ +70/ -40 ~ + 85	0 ~ +70/ -40 ~ + 85	0 ~ +70/ -40 ~ + 85	0 ~ +70/ -40 ~ + 85	0 ~ +70/ -40 ~ + 85

Above models support **100K** P/E cycles and are available from the end of March 2022.

MLC-liteX products are available upon request.

All images shown are for illustration purposes only, and are not shown at actual size.

42

SLC-liteX Product series

Form Factor	2.5"	M.2 2280	MO-300	M.2 2280
Model Name	SH24D-25	SH24D-M280	SH24D-300	PH920-M280
Interface	SATA 3.2 (6Gb/s)	SATA 3.2 (6Gb/s)	SATA 3.2 (6Gb/s)	PCIe Gen3 x4
Capacity	160GB~640GB	160GB~640GB	160GB~640GB	160GB~640GB
Seq. R/W Perf. (MB/sec)	560/490	560/490	560/490	1740/1530
Operation Temperature (℃)	0 ~ +70/ -40 ~ + 85	0 ~ +70/ -40 ~ + 85	0 ~ +70/ -40 ~ + 85	0 ~ +70/ -40 ~ + 85

Above models support **100K** P/E cycles. PH920-M280 is available from the end of March 2022.

MLC-liteX products are available upon request.

All images shown are for illustration purposes only, and are not shown at actual size.

Agenda

- **Post-Pandemic Era: Experiencing the New Normal**
- **Innovative Technology Developments**

- Apacer's Remote Device Management Solution

- Evolution of PCIe and BiCS Flash

- SLC-liteX: 3D NAND Flash Optimization

- **DDR5 Solution**

DRAM: Migration to DDR5 and Key Benefits

DRAM: Migration to DDR5 and Key Benefits

	DDR4	DDR5	DDR5 Benefits
Max Data Rate	1600~3200 MT/s	3200~6400 MT/s	Higher bandwidth
Voltage (Vdd)	1.2V	1.1V	Low power
Max Die Density	16Gb	64Gb	Higher density
Max UDIMM Size	32GB	128GB	Higher capacity
Channels	1	2	Better efficiency and reliability
Power Management	On motherboard	On-DIMM PMIC	Better power efficiency & scalability
On-die ECC	None	Yes	Strengthens on-chip RAS

Apacer

Ultimate Speed

DDR5 RDIMM Industrial Memory Module

Optimizes the Workload Performance of Next-generation Servers

DDR5 SODIMM Industrial Memory Module

Accelerating the Innovation of Next-generation Industrial Applications

DDR5 Industrial DRAM Solutions: Supported Platforms

- Industry's **Most Complete** Industrial DDR5 Product Line: Including **UDIMM, SODIMM, RDIMM**
- Launching in the Second Quarter of 2022

CPU Brand	intel		AMD	
Application	Desktop	Server	Desktop	Server
Generation	12th Gen Intel Core	4th Gen Intel Xeon Scalable Processor		4th Gen AMD EPYC Processor
CPU Code Name	Alder Lake-S	Sapphire Rapids-SP		Genoa
Chipset/Platform	600 series chipset	Eagle Stream		Zen4
Plan Launch Date	Q4'21	Q2'22		2022
Process Node	10nm	10nm++		5nm
Memory Support	DDR4-3200 DDR5-4800	DDR5-4800		DDR5-4800

Thank you!

industrial.apacer.com/