

How does a Client SSD Controller Fit the Bill in Hyperscale Applications?

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What can happen in

60 seconds?



2013

VS.

2014



~~X~~ 136,319,444
12,013,889 emails sent



~~X~~ 4,190,000
4,110,000 Google search queries



~~X~~ 600,000
461,805 Facebook logins



~~X~~ 306
103 hours of video contents uploaded



~~X~~ 80,000
66,200 Amazon sales



~~X~~ 433,000
341,000 tweets sent



~~X~~ 67,000
38,000 photos uploaded

Data Volume shapes storage industry, creating more expectations for solid **Solid State Disk**.

Consumer Applications



Support high capacity



Maximize read/write performance



Minimize power consumption



Enhance data protection design

Hyperscale Applications



Now, what are
hyperscale applications
looking for in

SSD ?



HIGH PERFORMANCE



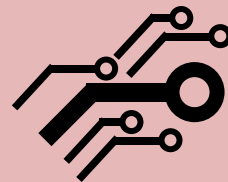
Multi-core design is essential.

ERROR CORRECTION DESIGN: RAID ECC RECOVERY



Layer and layer of correction schemes to fight against any errors that may have been caused by NAND flash.

pFAIL CIRCUIT



END TO END DATA PROTECTION



Data needs to be protected all the way.

BCH vs. LDPC



ECC capability matters.

HIGH CAPACITY



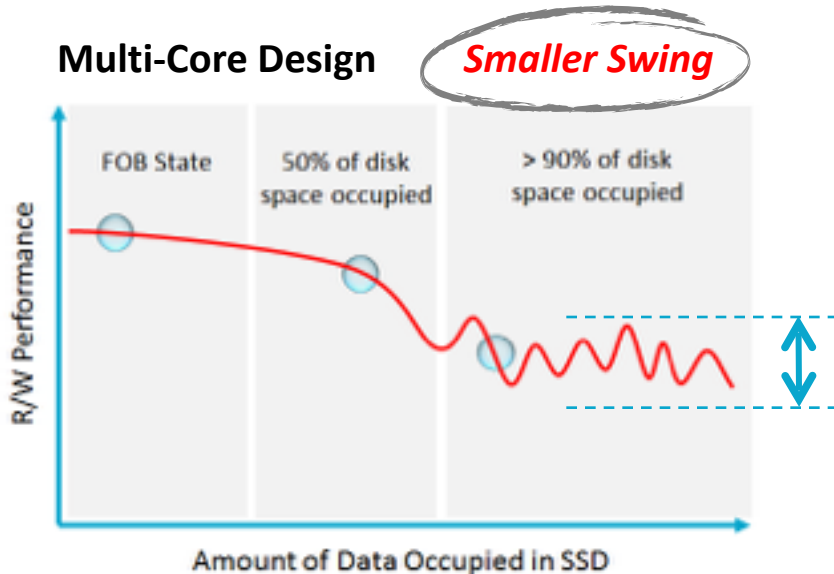
The greater; the better!

DESIGN BETTER SSD



Design to Maximize Performance

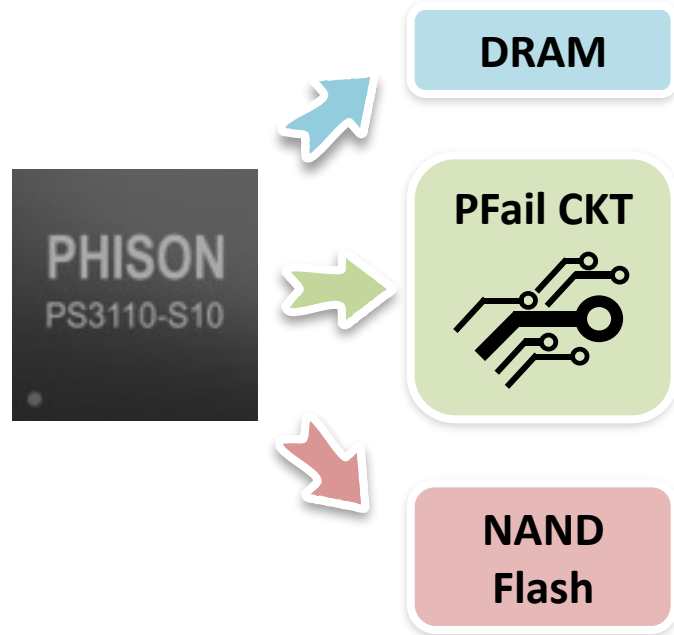
Multi-core is essential for delivering a sustaining performance.



- Quad- vs. Octa-core controller implementations
- Each CPU is designed to carry out specific tasks.
- Sustaining performance also includes promising QoS.
- Multi-core design increases complexity of firmware architecture.

Design to Fight Against Power Loss

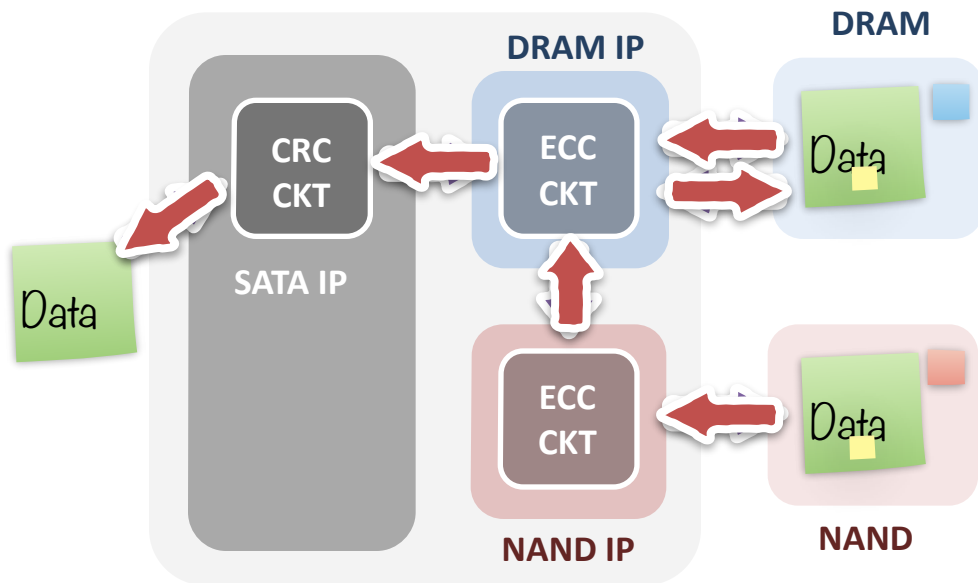
PFail Design: Data is guaranteed safe in any power cycle event.



- During power failure, user data in an external memory must be programmed to NAND in a short period of time.
- The design needs to consider all possible corner cases from hardware and firmware perspectives.
- Characterization of on-board power segments.

Data Reliability: E2E Data Protection

Data is always protected during read/write operations.



- Different parities will be tagged to data during its travelling path.
- Data protection with E2E parity
- RAM protection with RAM parity
- Flash protection with ECC parity

■ E2E Parity ■ RAM Parity ■ ECC Parity

➡ Write ➡ Read

Data Reliability: Flash ECC Schemes

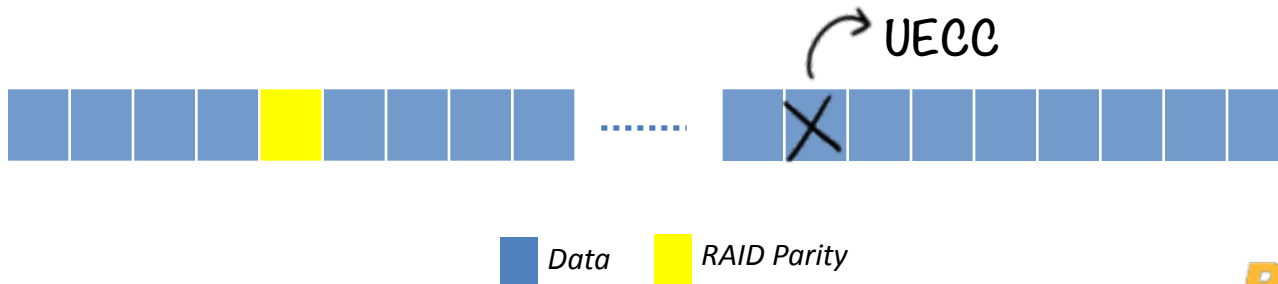
Which correction scheme suits better for hyperscale applications?

	BCH	LDPC
Decoding Algorithm	Algebraic	Probability
Correction Strength	Guaranteed	Not Guaranteed
Soft Bit Decoding	Difficult	Easy
Decoding Performance	Sustained	Sustained → Drop
Cost (Gate Count)	Low	High
Power Consumption	Low	High

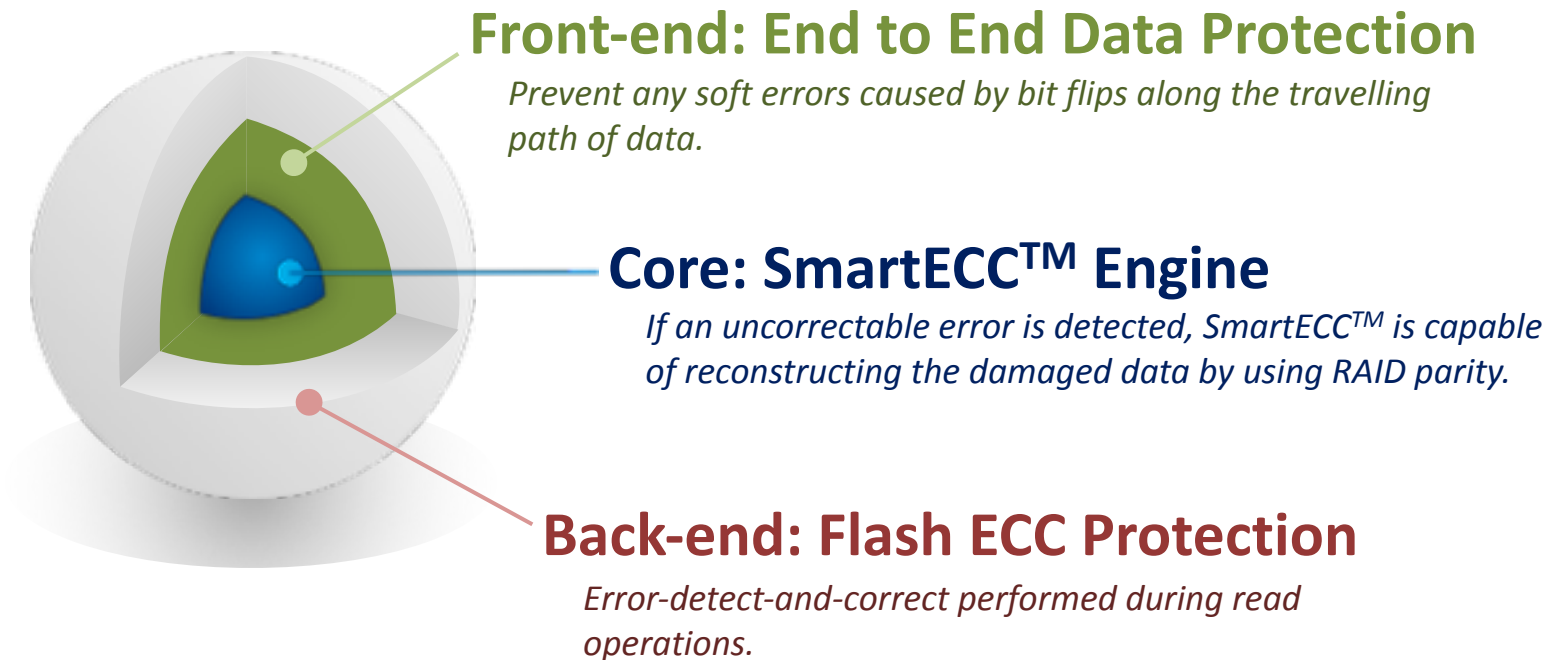
Additional ECC to Recover Erroneous Data

RAID ECC (SmartECC™) for data reconstruction

- When an uncorrectable ECC occurs, RAID ECC will be responsible to recover error bits based on additional parities (“RAID Parity”) stored previously.
- Recovery scale: Block level vs. Die level
- RAID ECC consumes additional drive capacity in order to achieve different levels of data reconstruction.

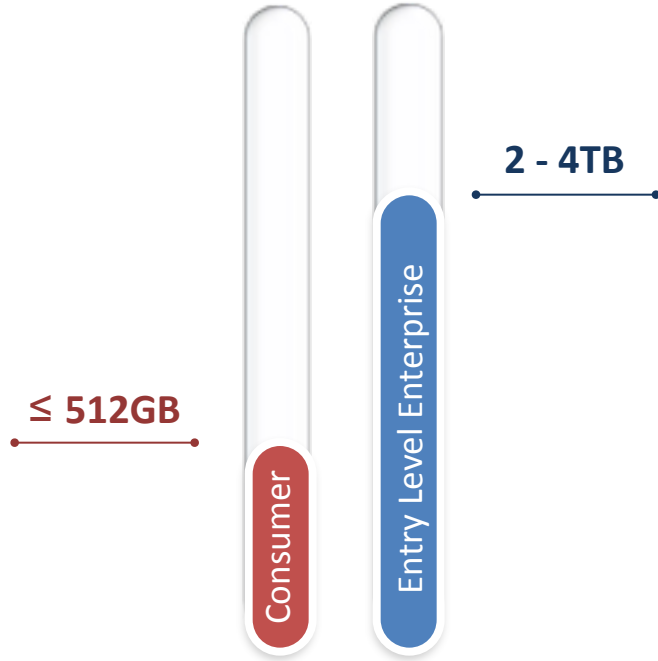


Triple Layers of Data Protection



Design to Maximize SSD Capacity

When it comes to capacity, more means better.



- Higher capacity means more memory components required in a compact board design.
- Flash controller still needs to maintain high performance with maximum capacity.
- High capacity also introduces additional complexity to firmware architecture.

**Client
Controller**

+

**Enterprise
Features**



Hyperscale



It all comes from a client SSD controller.

But what differentiates entry-level from consumer SSD?



To record any activity during drive lifetime so that when any fault occurs, it can be analyzed.

To fight against data retention of flash by refreshing data at real time or idle state.

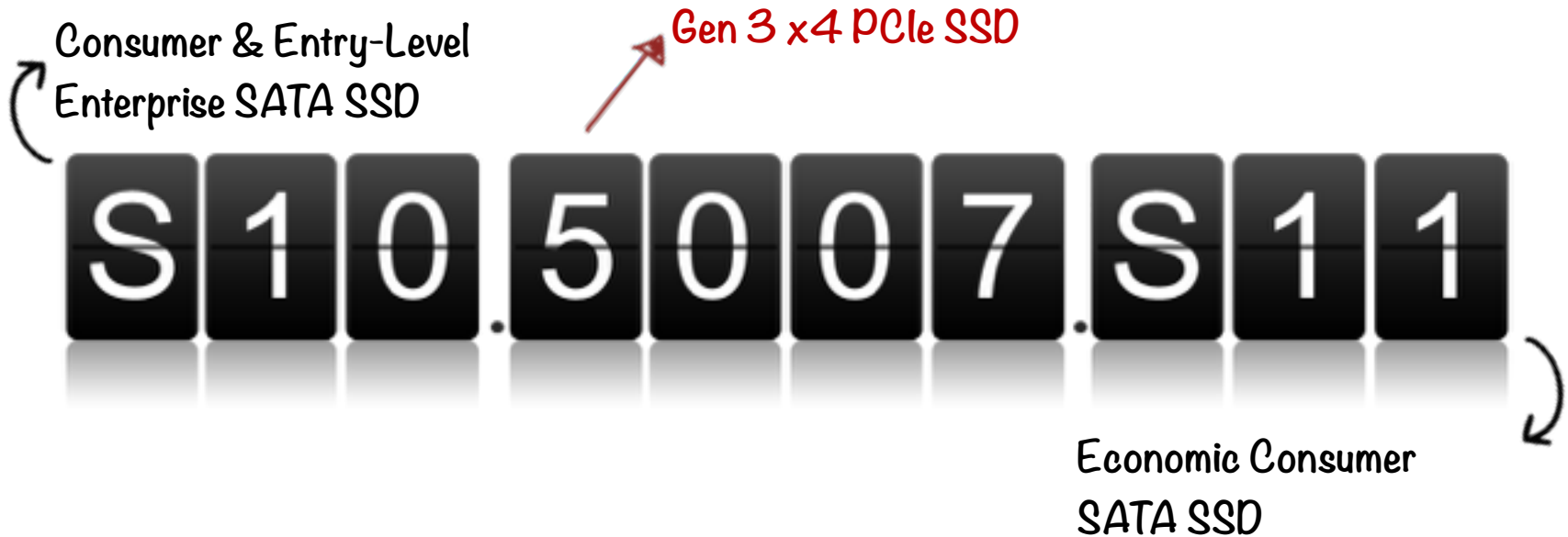


Throttling operation to be implemented for reducing power consumption.

AES and TCG is a common requirement for entry-level SSD.



For more information on Phison SSD, please visit us
at **Booth #712 & #714.**



PHISON

Knows What You Need

**THANK YOU FOR YOUR TIME &
ATTENTION!**