Tailoring Flash Storage to Different Needs

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AData Technology

Agenda

- Flash storage architecture trends
- Understanding performance and variation factors
- Conclusions

Systems are converging

- One is trying to adopt advantages of the other

Lighter, Instant

Faster, More capable

Storages are converging

- One is trying to adopt advantages of the other

SSD
cache

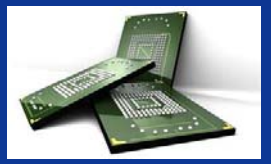
Instant, Greener

Hybrid-HDD

UFS (5Gbps)

Faster, Bigger

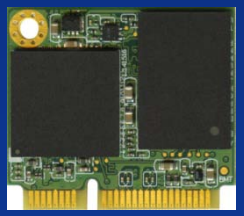
eMMC



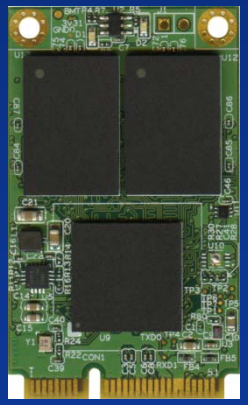
AData : Flash Storage Leader

- SATA3 has gotten rave reviews from media
- Industry-leading offerings in form-factor and capacities

SATA-3

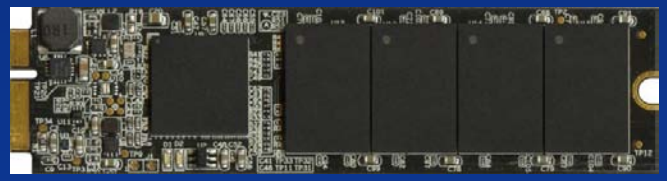


SATA-2 M-SATA (30/60GB)



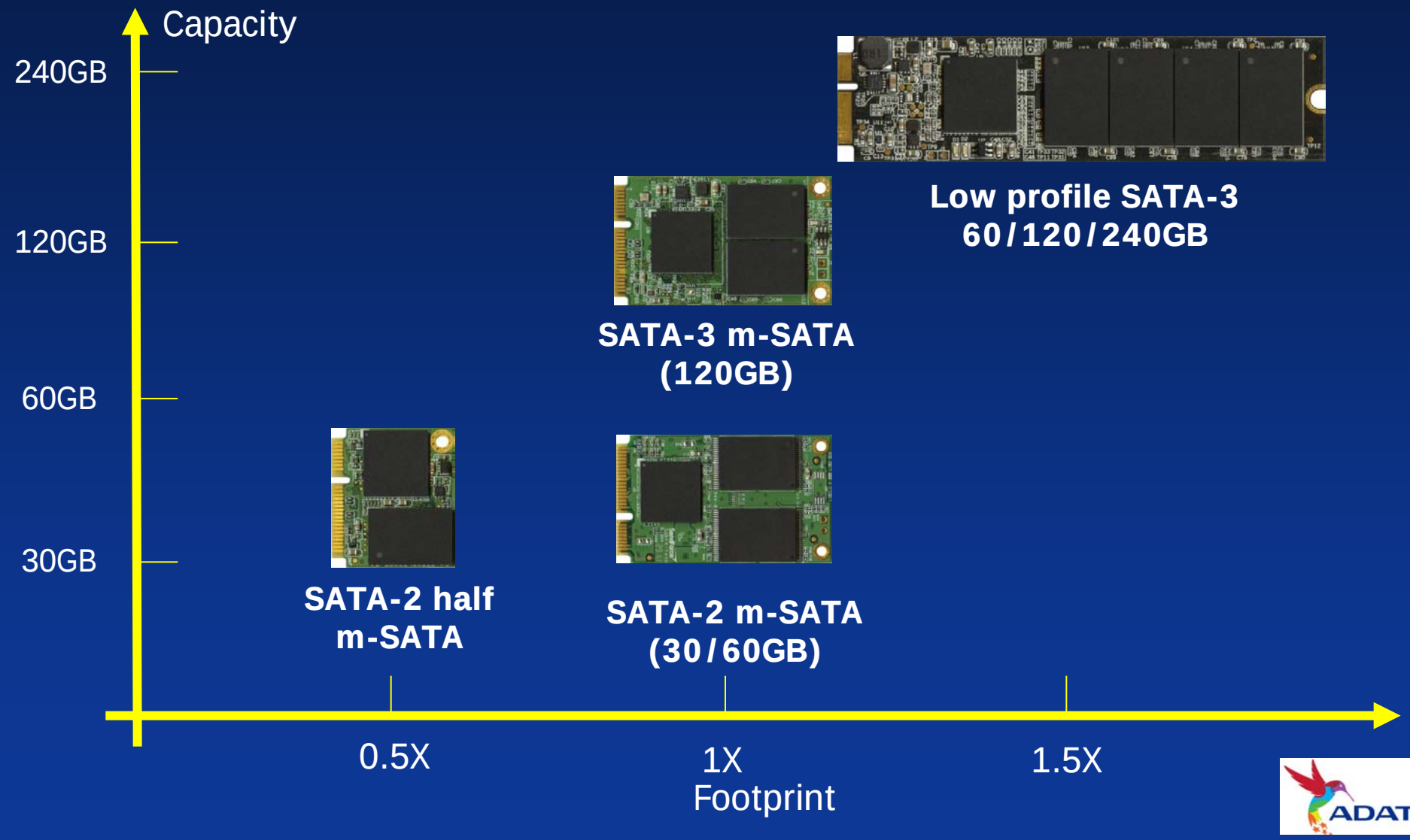
SATA-2 M-SATA (30/60GB)

SATA-3 M-SATA (120GB)



Low profile SATA-3

Different Needs by Different Solutions



Instant-on Ultrabook: Computex 2011

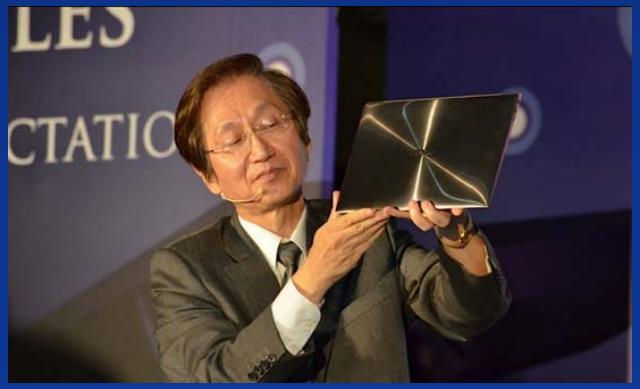
- "Marry the performance and capabilities of today's laptops with tablet-like features and deliver a highly responsive experience."

ASUS UX21

Intel Core i7, Sandy Bridge

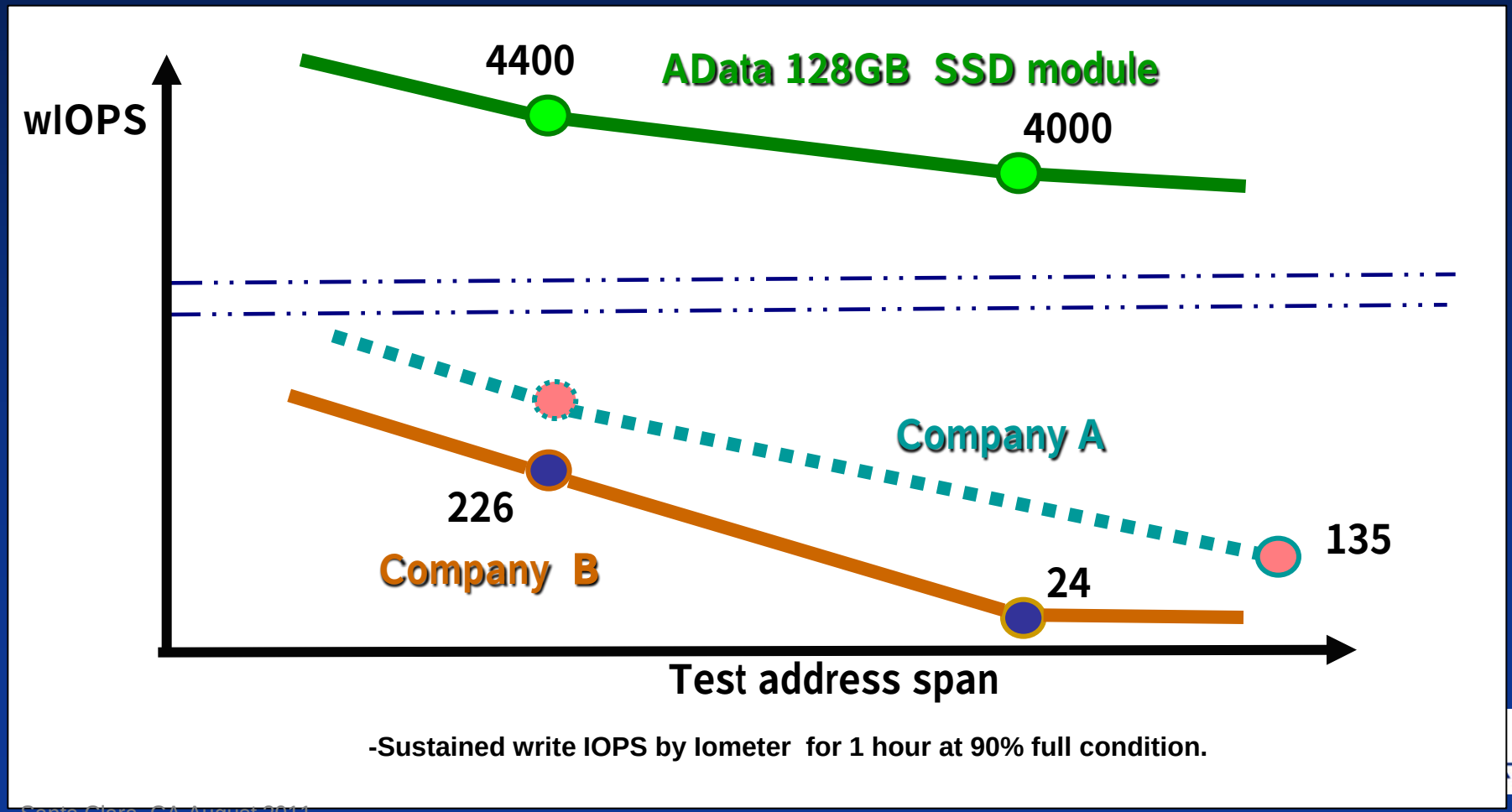
SSD: ADATA XM11 (SATA6Gb/s)

17mm thick, 1.1KG



Wide Fluctuations in Write IOPS

- Performance varies wild by pre-conditioning. Right understanding is the key



-Sustained write IOPS by Iometer for 1 hour at 90% full condition.

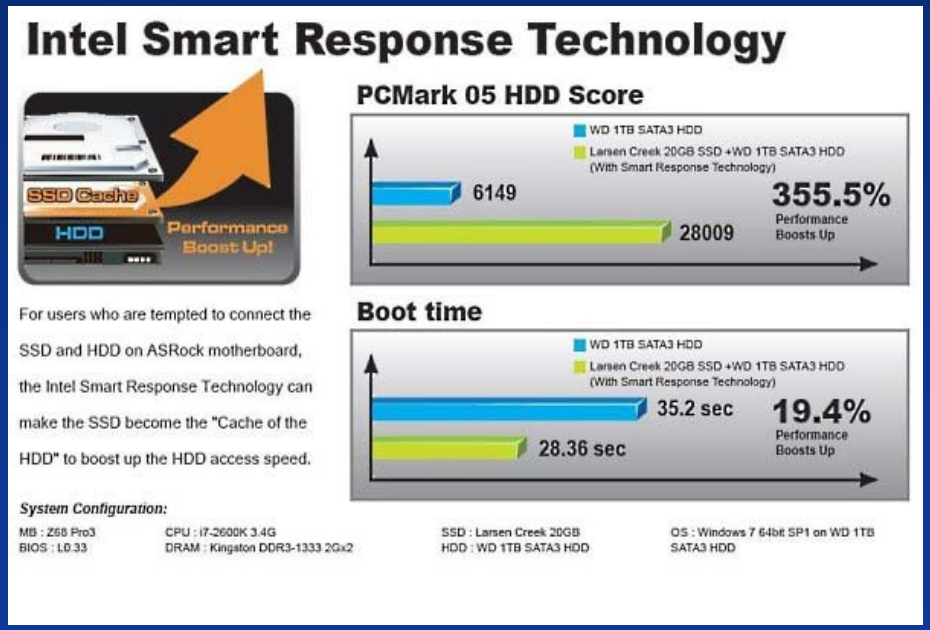
User Experience Alignments

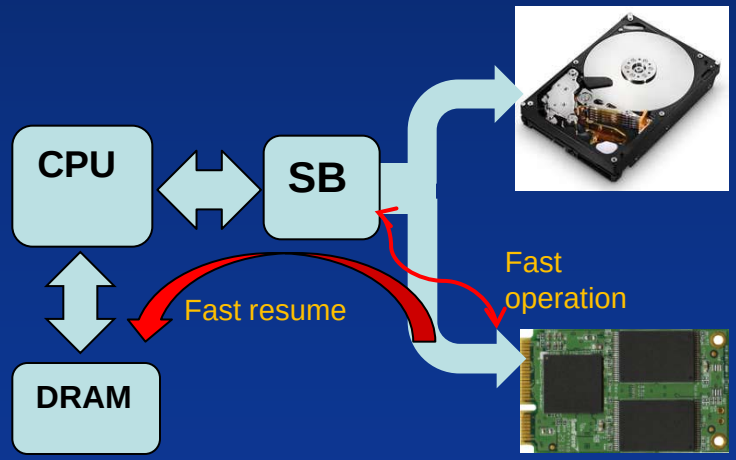
- Benchmarking performance in line with user experience

Item name	Description		AData 64GB SSD	Company B SSD
Boot time	Windows 7 boot up		5.0 sec.	14.5 sec.
S4-Hibernate	Entry and exit time of Windows 7 S4 function	Suspend(sec)	2.9 sec.	4.7 sec.
		Resume(sec)	1.5 sec.	3.6 sec.
S5-Shutdown	Shutdown of Windows 7		3.8 sec.	31.1 sec.
Large file copy	Copy 4GB file		54 sec.	171 Sec.
Small file copy	Copy 4MB files (total 616MB) and 4KB files (total 100MB		4MB : 10 sec. 4KB : 19 sec.	4MB : 49 Sec. 4KB : 126 Sec.

Intel Smart Response

- Near-SSD performance for nominal use
- Fast resume from cold
- Lower power and more responsive
- RAID-write into cache SSD puts strain on endurance





mSATA Performance Benchmarking

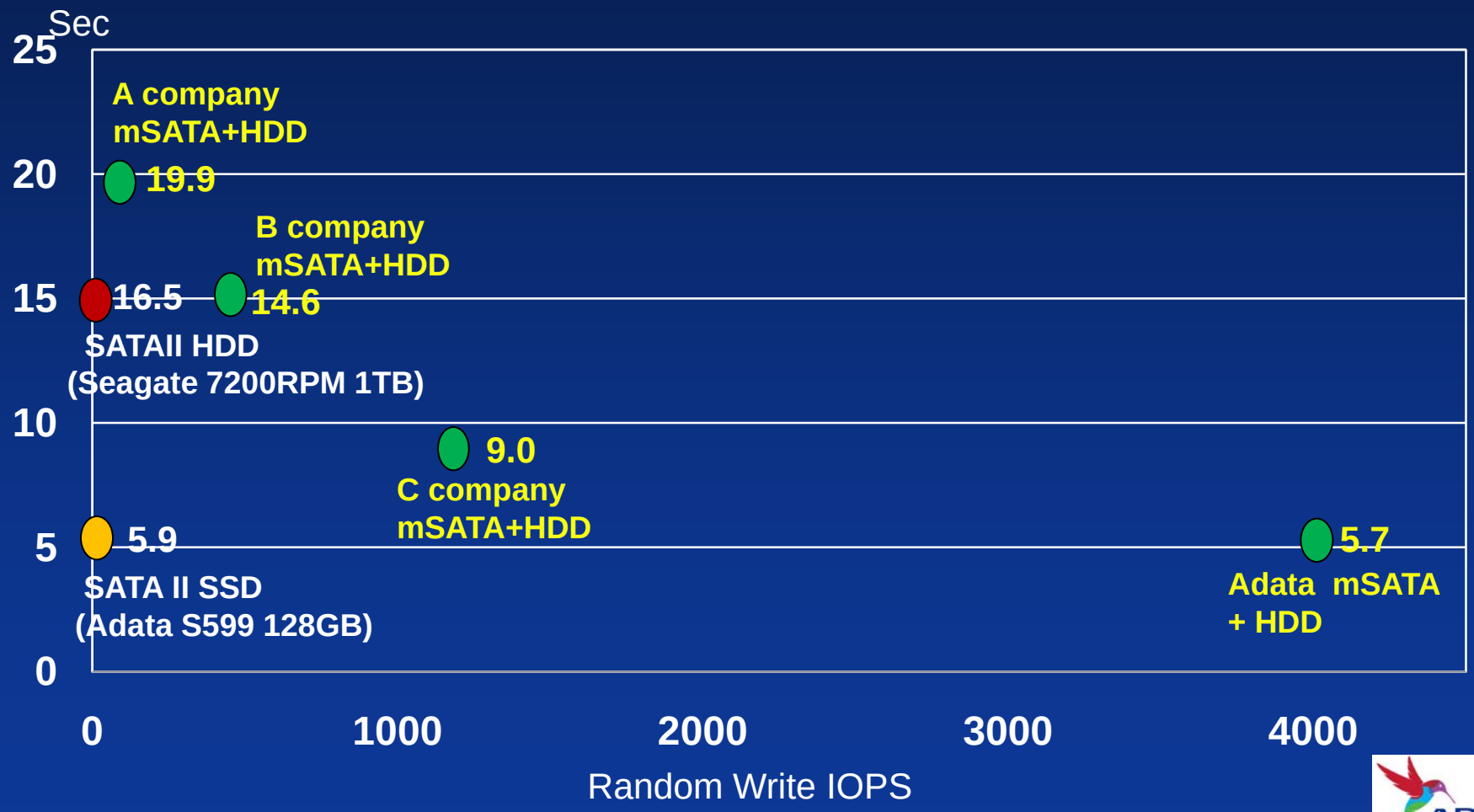
- Items other than wIOPS is comparable
- Sequential write of Adata is far lower

	Adata mSATA	A company mSATA	B company mSATA	C company mSATA
Iometer wIOPS (32 outstanding IOs)	4050	15	460	1200
Iometer rIOPS (32 outstanding IOs)	4700	4950	2700	5650
Crystal seq. write	35 MB/s	35 MB/s	100 MB/s	90 MB/s
Crystal seq. read	215 MB/s	145 MB/s	160 MB/s	250 MB/s

Platform : Win7, Intel Core i7, Gigabyte Z68AP, DDR3 1333

Win7 Boot Time Comparison

- Strong correlation between boot time and wIOPS

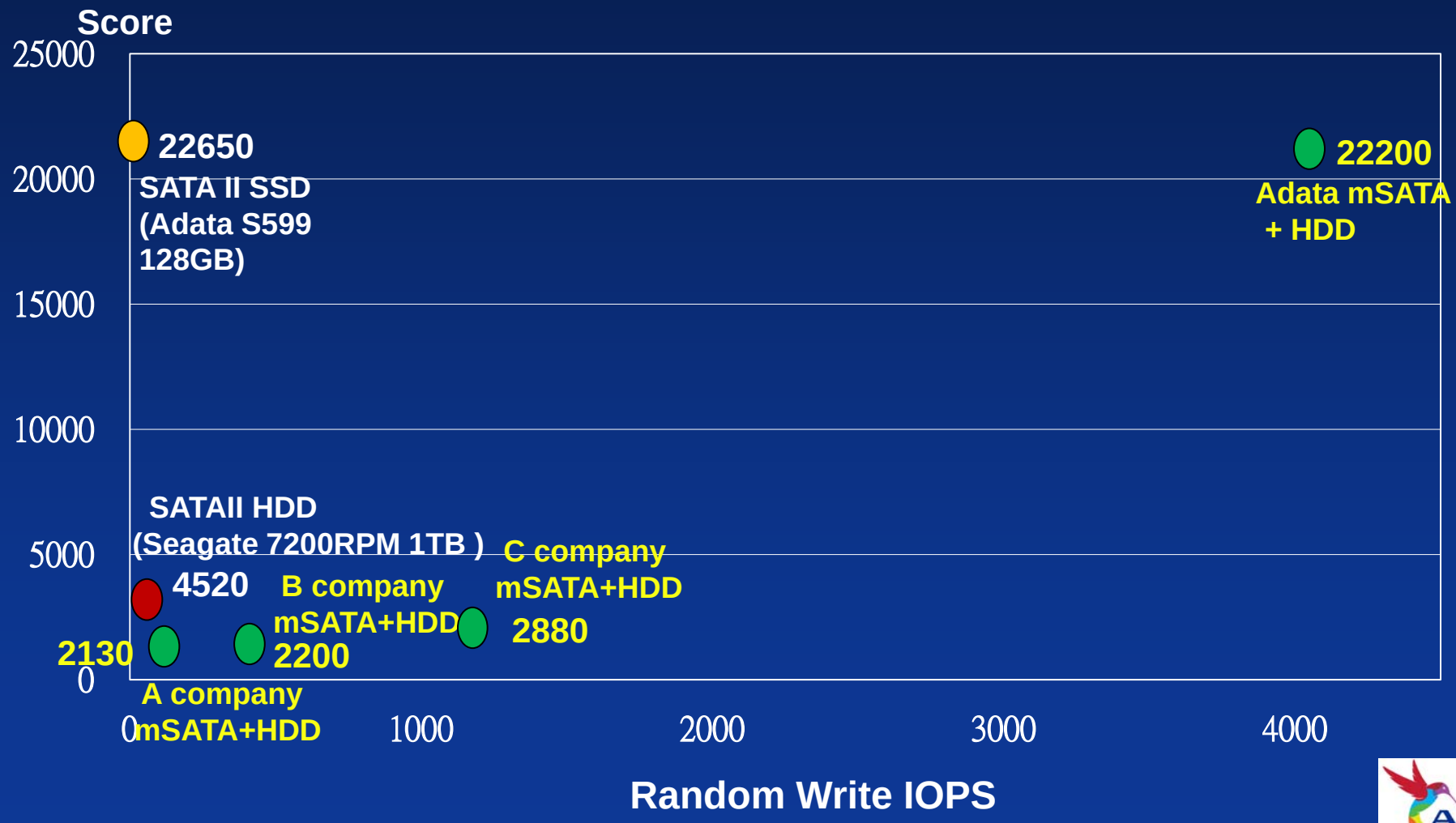


SRT Script Run Time

- Performance improves with wIOPS over 4K

PC-Mark Vantage Disk

- Performance boost seen with over 4K wIOPS



wIOPS is the Key of m-SATA Cache

- Random write plays the key role in performance enhancement with SSD cache performance
- IOPS over 4K is seen as minimum criteria
- Low SSD cache does not improve and in fact degrades overall user experience
- Cache policy of FFS driver is believed to lead to heavy random writes

eMMC Application vs. Flash Technology

Use scenarios


Navigation


HD phone & recording


3D Gaming


Multimedia


Gaming


Weather


Social Networking

Internet Surfing


e-mail


Reading

MLC

TLC


High-end smart phone


Entertainment Tablet

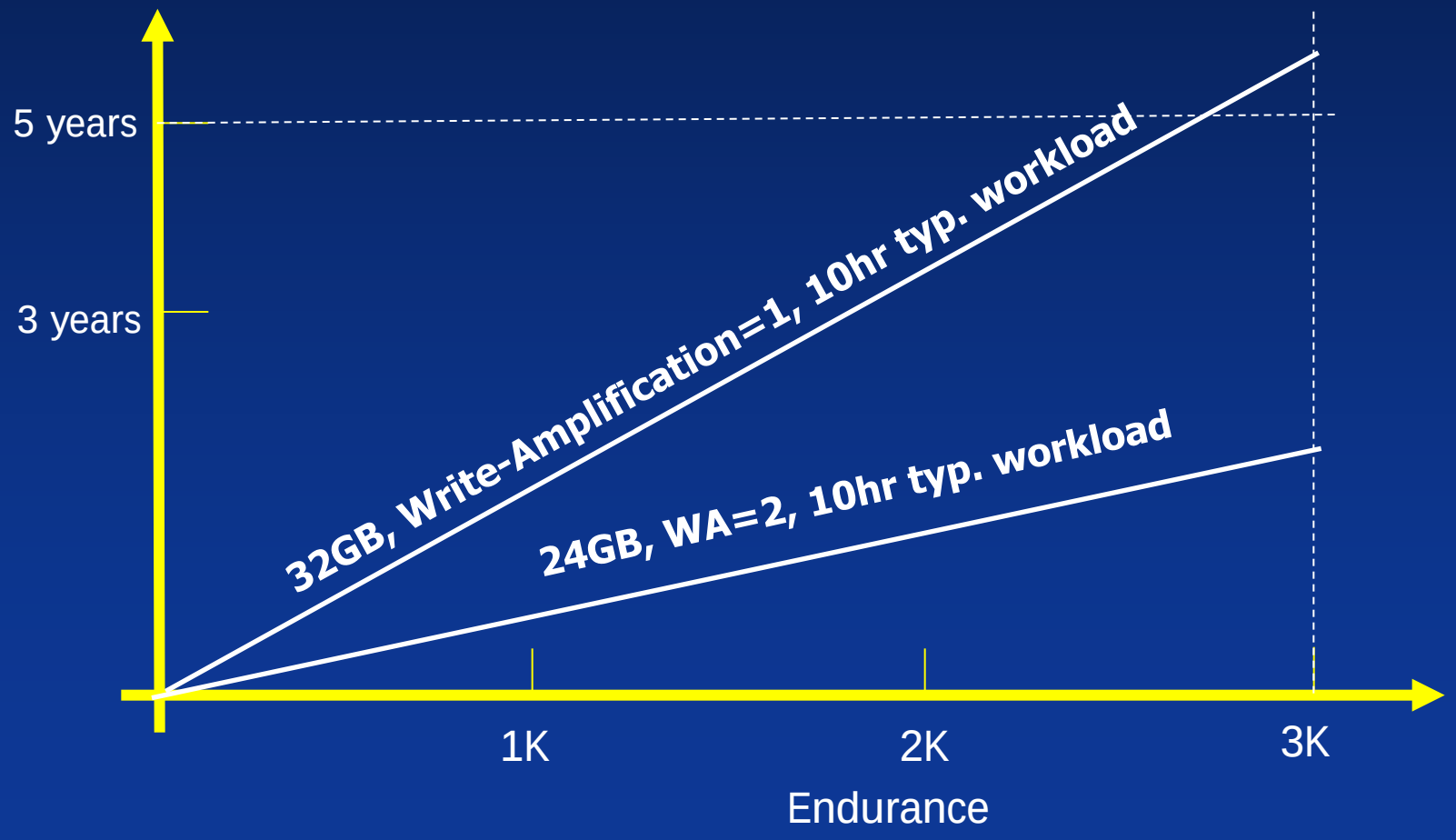

Budget smart phone


eReader

Write work-load

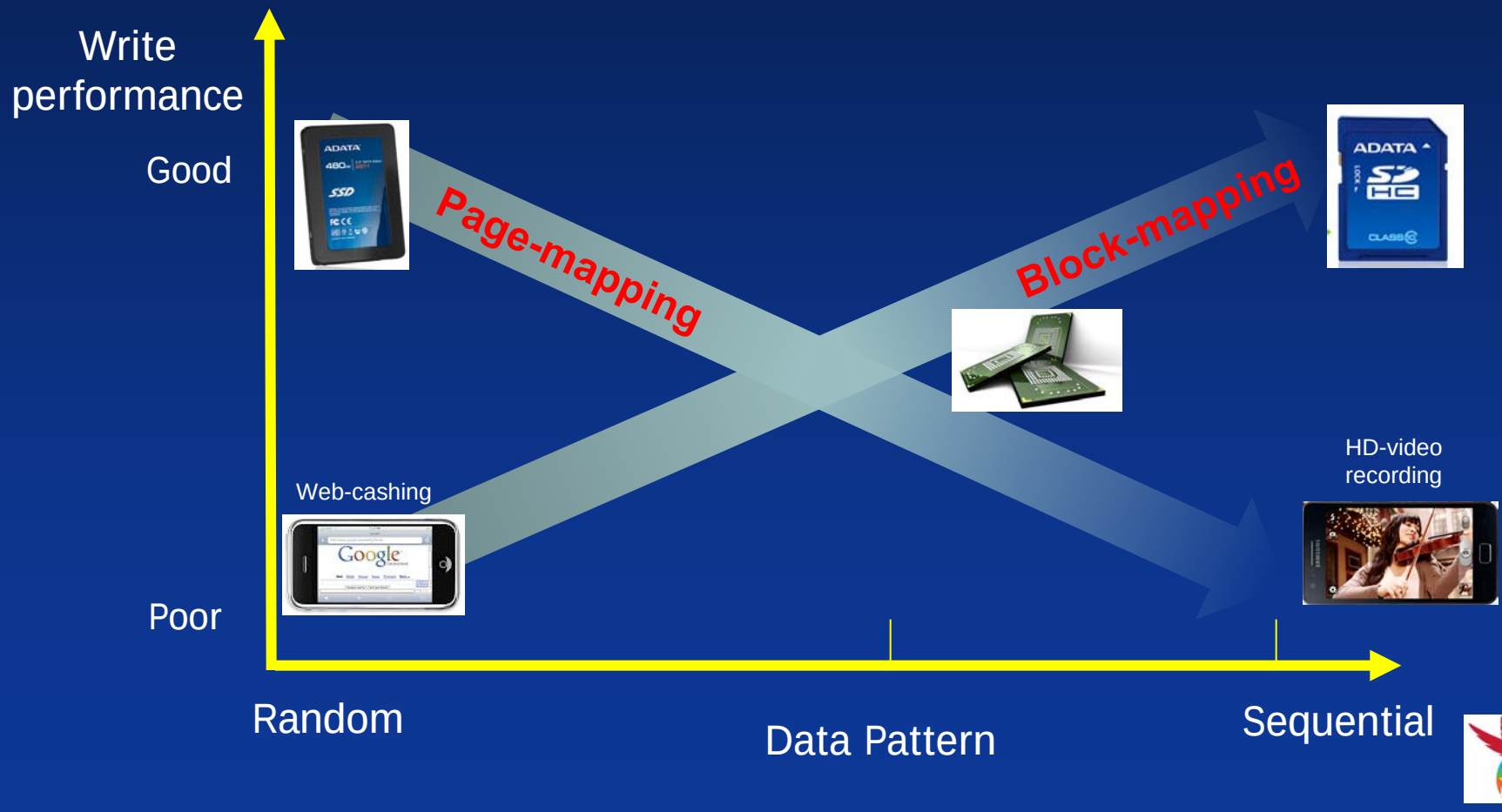
Multiple Factors for Reliability Estimate

- Data pattern, application scenario and write-amplification need to be factored



Multiple Factors for Reliability Estimate

- Controller technology architectures have pros and cons



Conclusions

- Good write IOPS of mSATA SSD cache delivers near-SSD user experience. But wide variation of performance from multiple vendors can disappoint end-users and kill the market
- AData encourages industry-wide performance grading and wants set the minimum bar for predictable performance enhancements
- Flash solution knowledge in system behavior, storage architecture and Flash reliability is critical to providing right solutions to diverse applications

Thank You !