System Design Catalysts for SSDs in Embedded Applications

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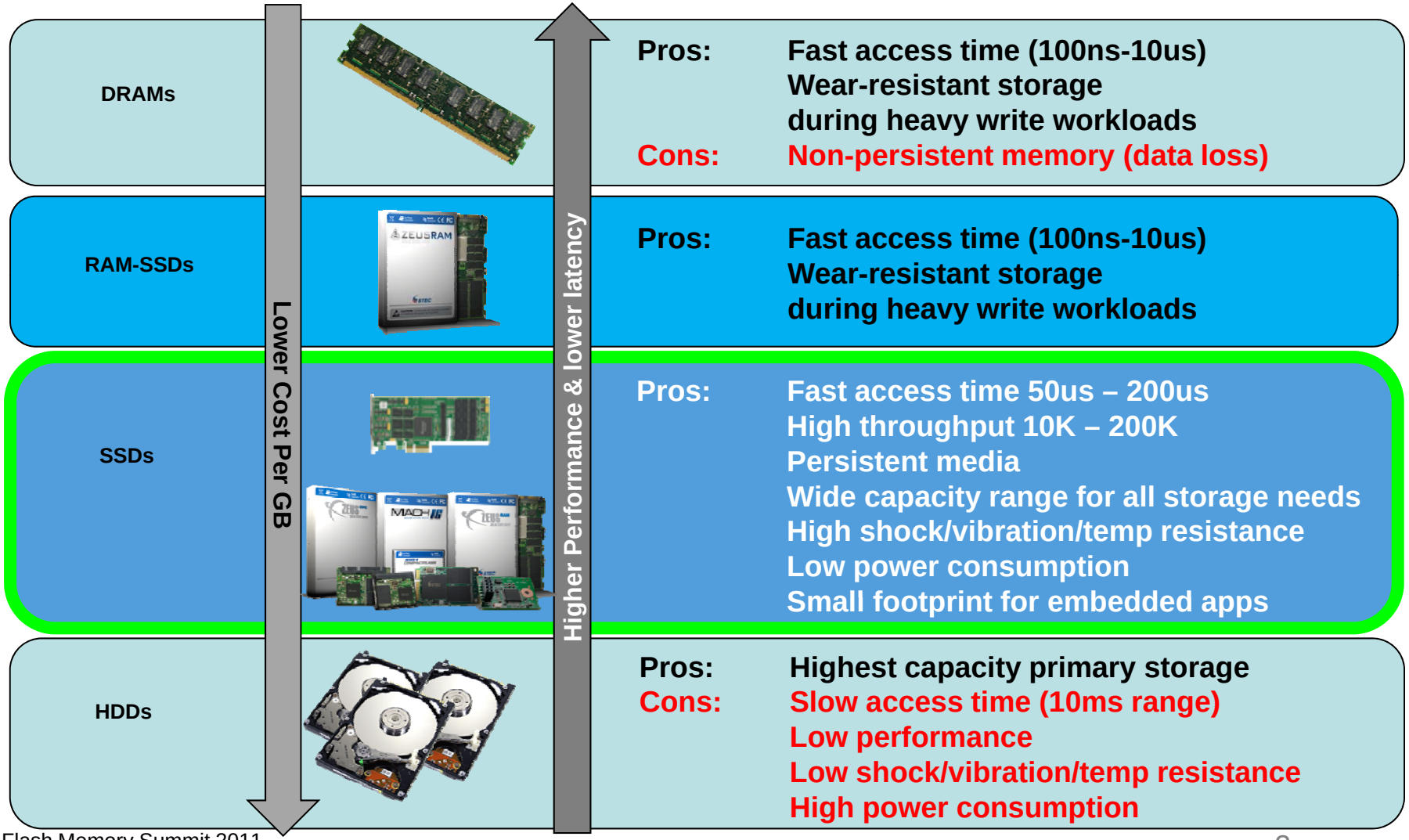
Current Storage Hierarchy



What is an *Embedded* SSD?

Lower power than HDD or “full-size” SSD

Support smaller capacities than “full-size” SSD

Support/Testing for embedded operating systems

Meet criteria for Enterprise or Industrial SSD

Typically smaller than traditional 2.5-inch drive

Embedded SSD Size Comparisons

2.5” Hard Disk Drive

Embedded SSD Target Applications

High transaction applications

Space-constrained systems where 2.5”/1.8” drives won’t fit

Systems with **low power** requirements

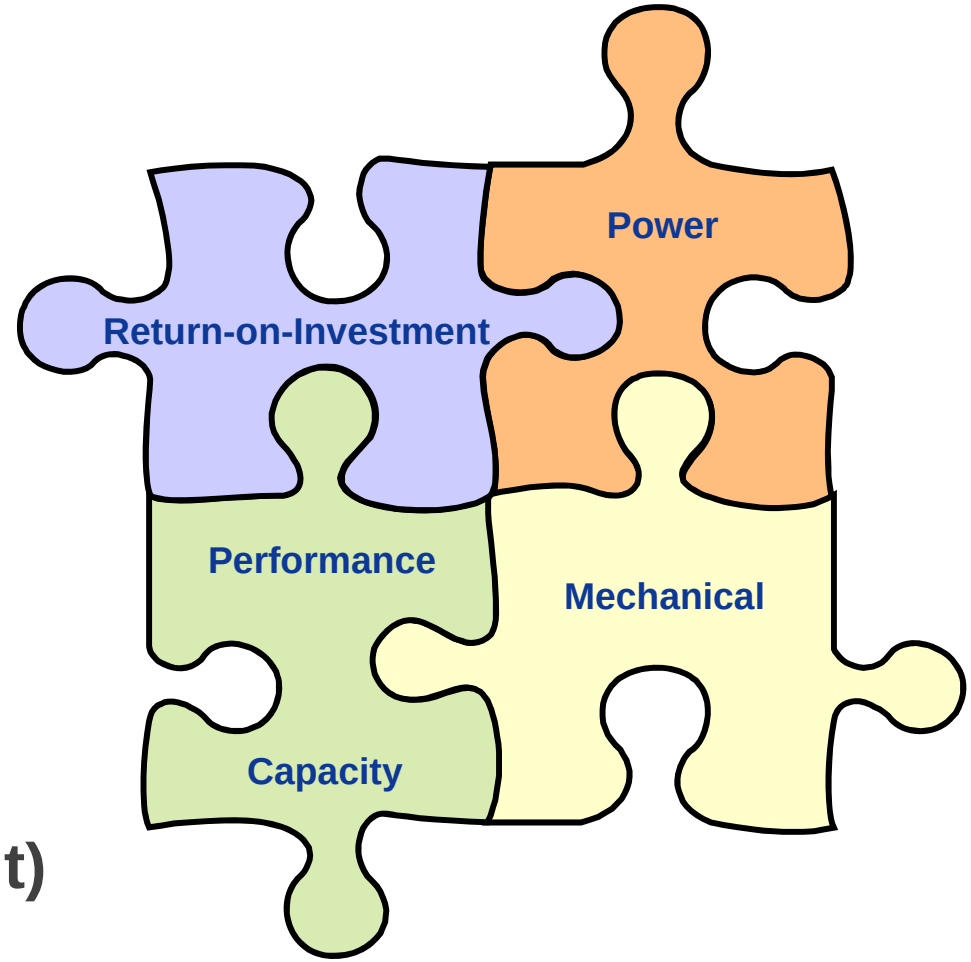
Ruggedized applications

Lower capacity requirements (e.g. 2/4/8/16GB)

Typical Embedded Applications

Embedded Design Considerations

- **Size/Weight**
- **Power**
- **Performance**
- **Capacity**
- **Host Interface/Protocol**
- **Environmental**
- **Cost (return on investment)**



Storage Comparisons

Comparing Embedded SSDs to traditional HDDs and "full-size" SSDs nets cost advantages in specific embedded applications

Specification	2.5" HDD	Embedded SSD	2.5" SSD
Dimensions (mm)	100.2 x 69.8 x 9.5	54 x 39 x 4	100.2 x 69.8 x 9.5
Typical Capacity	200GB	16GB	50GB
Typical Throughput (random)	1MB/sec	30MB/sec	100MB/sec
Typical IOPs (random)	100	10,000	30,000
Typical Power Consumption	10W	2.5W	4W
Cost per GB / Total Cost	$0.25 / $50	$10 / $160	$8 / $400
Cost per IOPs (cost / IOPs)	$0.50	$0.02	$0.02
Cost per MB/sec (cost / throughput)	$50	$5	$4
Annual Power Costs ($0.12/kWh) *	$10.50	$2.60	$4.20

** Energy cost formula: wattage x hours used ÷ 1000 x price per kWh = cost of electricity*

Embedded SSD ROI Model

EXAMPLE:

16GB Slim SATA vs. 160GB 2.5” SATA HDD in random read test:

- IOPs: 8,000 vs. 100
- Throughput: 33MB/s vs. 450KB/s
- Power: 100mA vs 550mA
- Average 7 secs faster boot time
- ~60% smaller, ~90% lighter

Slim SATA better in every metric leading to higher productivity and greater ROI

	Slim SATA (16GB)	2.5” HDD (160GB)
Cost per GB	$10	$0.28
Cost per IOPs	$0.02	$0.44
Cost per MB/s	$4.85	$19.33
Assuming $0.10/GB in productivity (revenue):		
GBs read in 1 hour	118.8	1.6
Productivity	$11.88	$0.16
ROI (cost / return)	**7.4%**	0.37%

Embedded SSD vs. HDD - Ruggedness

16GB Slim SATA vs. 2.5” 5400rpm SATA HDD in shock, vibration, temperature, etc.:

	Slim SATA	**2.5” HDD**
Shock:	1000G	350G
Vibration:	20G	0.004G
Altitude:	80,000 ft	10,000 ft
Temperature:	-40°C to 85°C	0°C to 60°C
Humidity:	5%-95%	8%-95%
MTBF:	2,000K hrs	300K hrs

Slim SATA better in every metric leading to higher reliability and productivity and greater ROI

What's Next?

Visit booth# **300** for a demo and more information

"Run the numbers" and see how Embedded SSDs can benefit your application

Make a list of key criteria – e.g. technology, support, etc. – do the research, and compare options

Drop us a line at: EmbeddedSSD@stec-inc.com with any questions

THANK YOU!