



Cache Data Protection “It’s Changing”

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Forward-Looking Statements

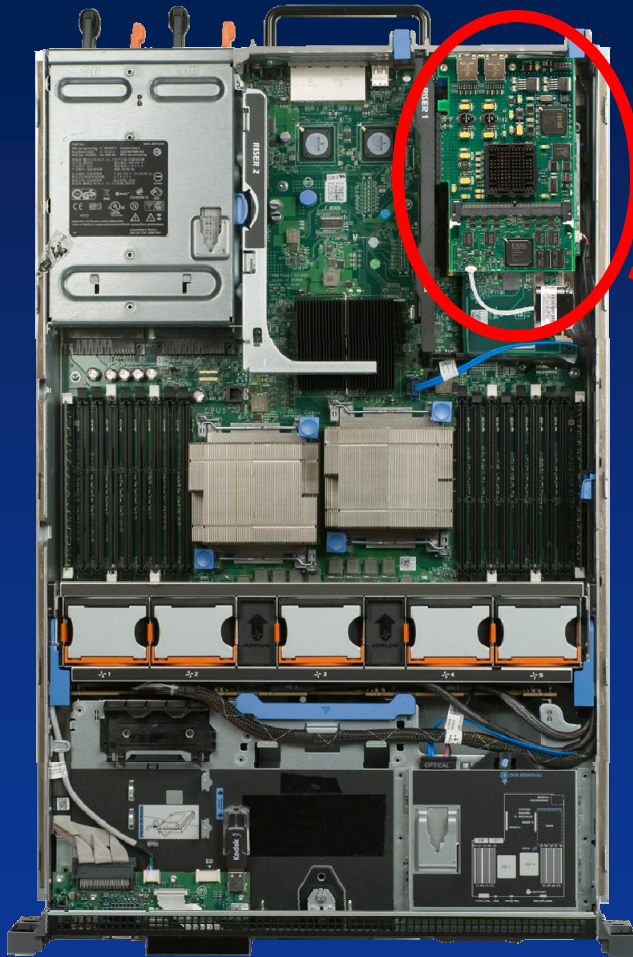
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The logo for the Flash Memory Summit features a stylized yellow sunburst with multiple rays. The word "Flash" is in red, "Memory" is in blue, and "SUMMIT" is in white on a blue rectangular background.

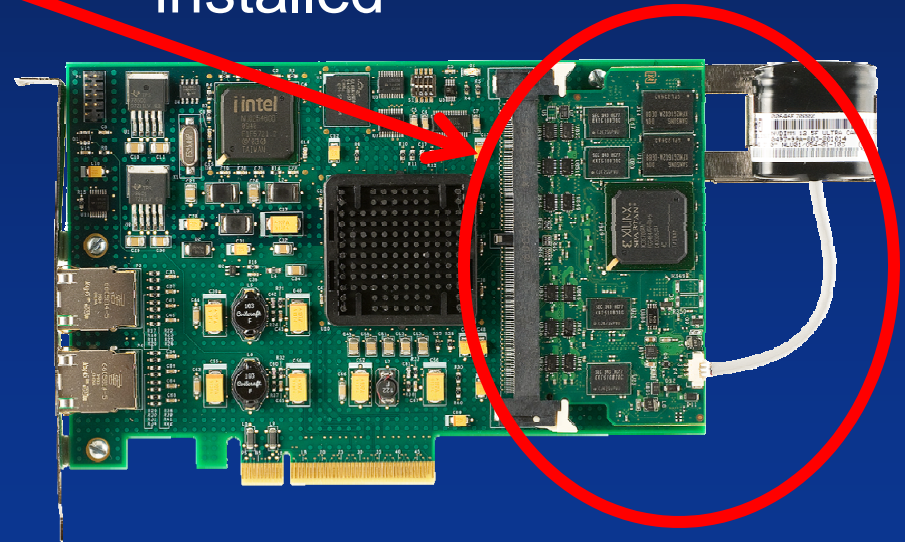
Flash Memory Summit Agenda

- The “What & Where” of Cache Protection Modules
- System Challenge Today
- Solution & Performance
- Technology & Cost Comparison
- The Change
- Conclusion

Where Cache Modules Fit

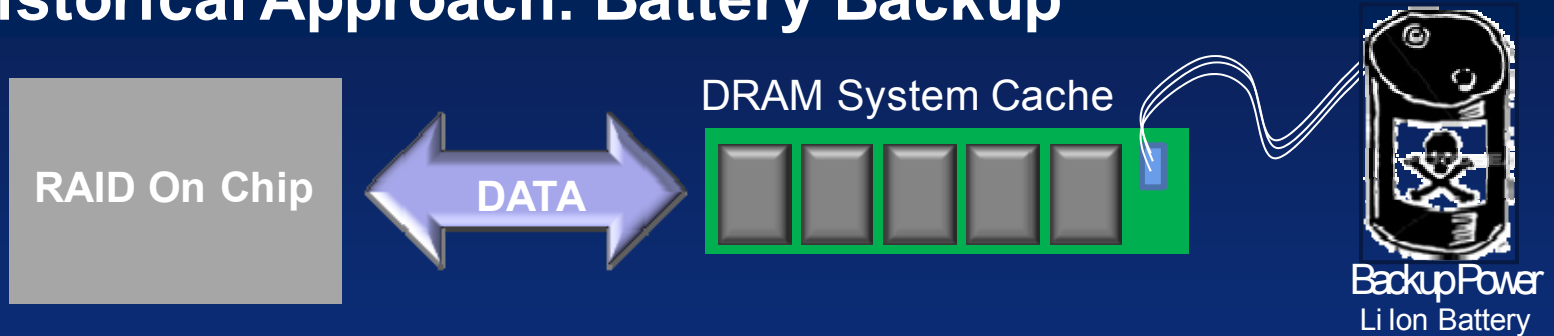


- RAID Controller Card with Cache Module installed



Rack Server

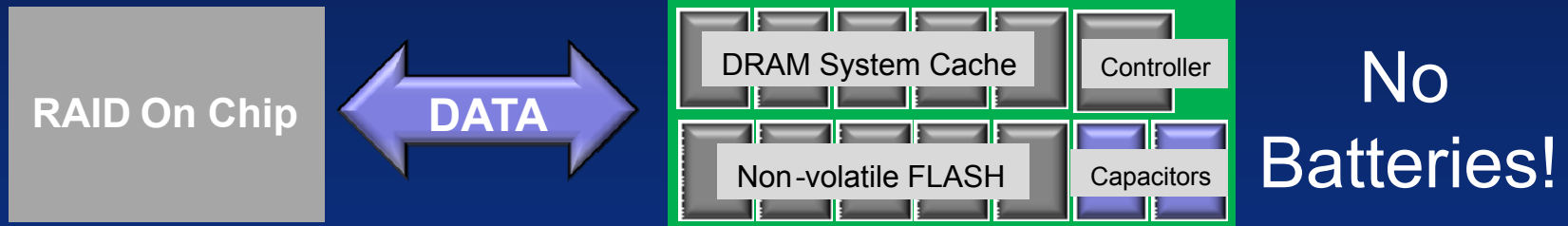
Historical Approach: Battery Backup



- Rethinking cache protection architecture to:
 - Preserve cache indefinitely during power failure
 - Eliminate battery
 - Reduce maintenance & battery replacement costs
 - Become environmentally friendly

Advanced Solution: Flash Backup using Ultracapacitors

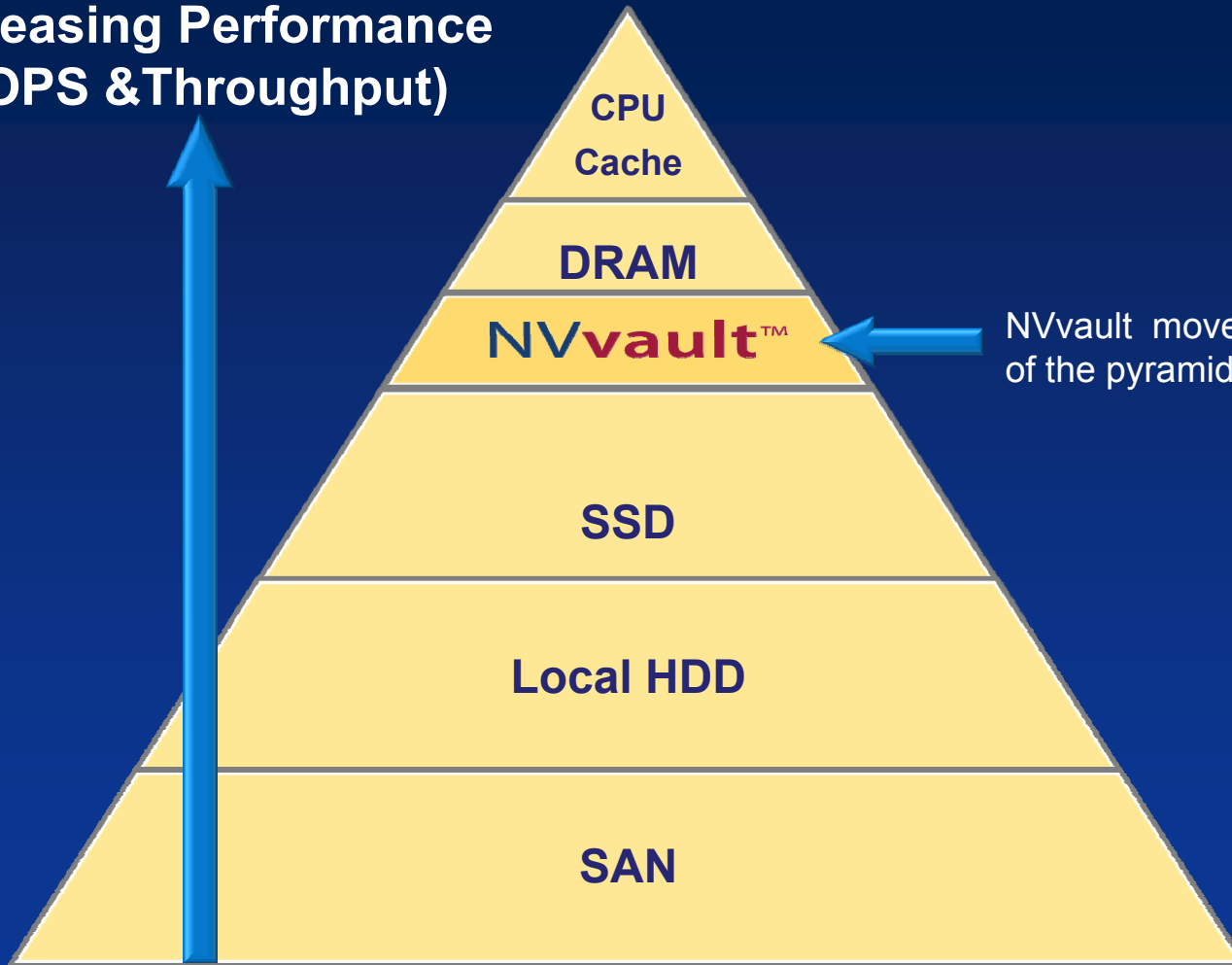
NVvault™ – Cache to FLASH



Item	Flash w/ Ultracapacitors	Battery
Data retention	10 years	24 – 96 hours
Replacement costs	None	Annual costs (~\$70 – \$80)
OEM support	No truck rolls or techs needed	Truck rolls & tech time (~\$200 – \$1000 / roll)
Environmentally Friendly	Yes, RoHS 6/6 compliant	No

Let's Take a Step Back... Change?

Increasing Performance
(IOPS & Throughput)



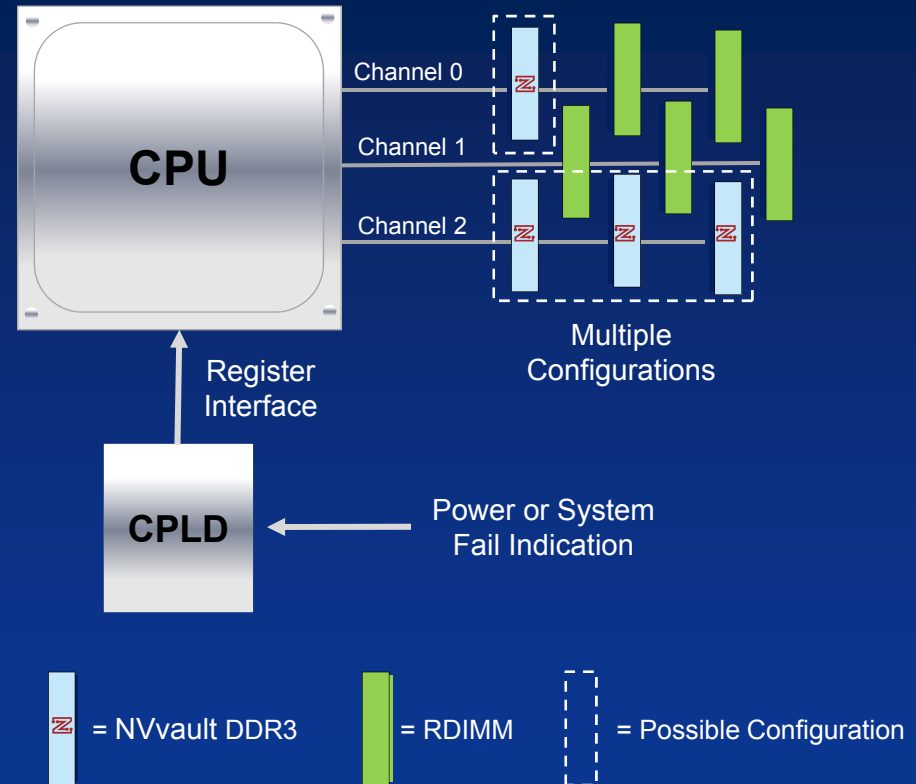
NVvault moves closer to the top of the pyramid. Why the change?

NVDIMM Application

Benefits of NVDIMM:

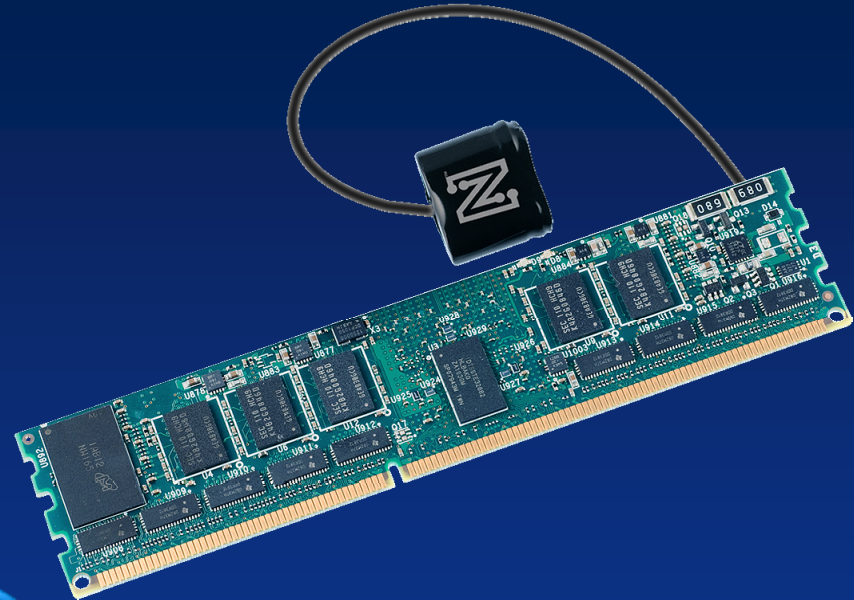
- Memory bus access
- High scalability (no limits)
- Extremely high throughput
- Low latency read/write transactions

NVDIMM Maximizes Scaling
 ↑ Capacity ↑ Speed ↓ Cost



NVvault DDR3 Flash-Based, Battery-Free, RDIMM Cache Solution!

Netlist
2nd Generation
NVDIMM



Benefits of Ultracapacitors:

- No truck rolls or battery replacements
- No battery disposal costs
- No server performance hit (IOPS)
- No unnecessary planned or unplanned downtime



Estimated Savings:
Over \$550 / year / system

Flash + Ultracaps = ↓ TCO



THANK YOU

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