STORAGE DEVELOPER CONFERENCE
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BY Developers FOR Developers
A SNIA Event

Persistent Memory in New Forms and Architectures With CXL

Presented by : Pekon Gupta, SMART Modular Technologies

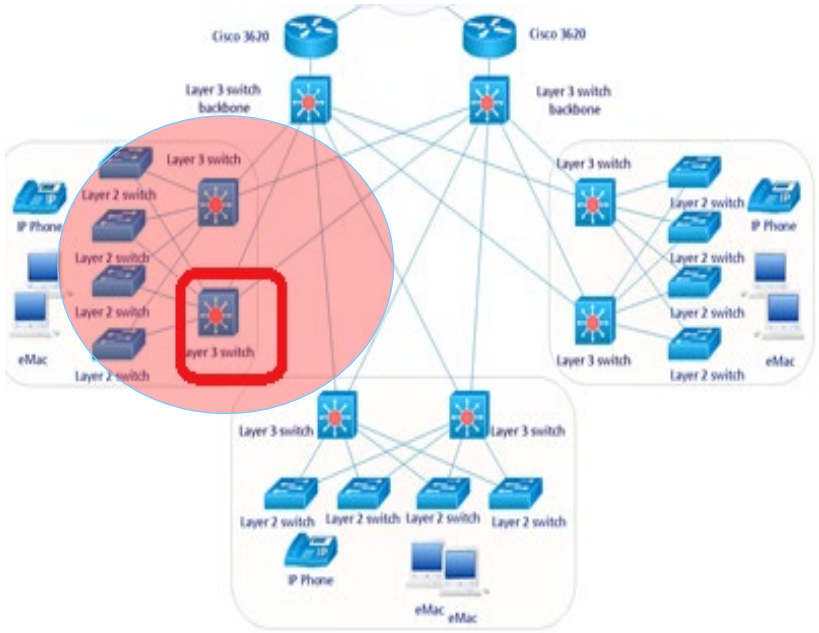
Reducing System Downtime

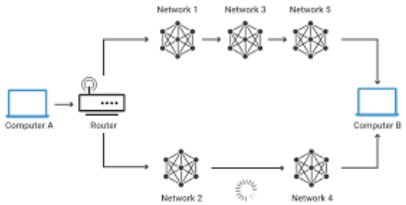
Incident → Detection → Containment → Recovery → Test and Repair

Malicious hack

Network Outage

Buggy code or misconfiguration





System back Online

- Limiting the Blast Radius
- Rollback or stage intermediate transaction
- Distribute load

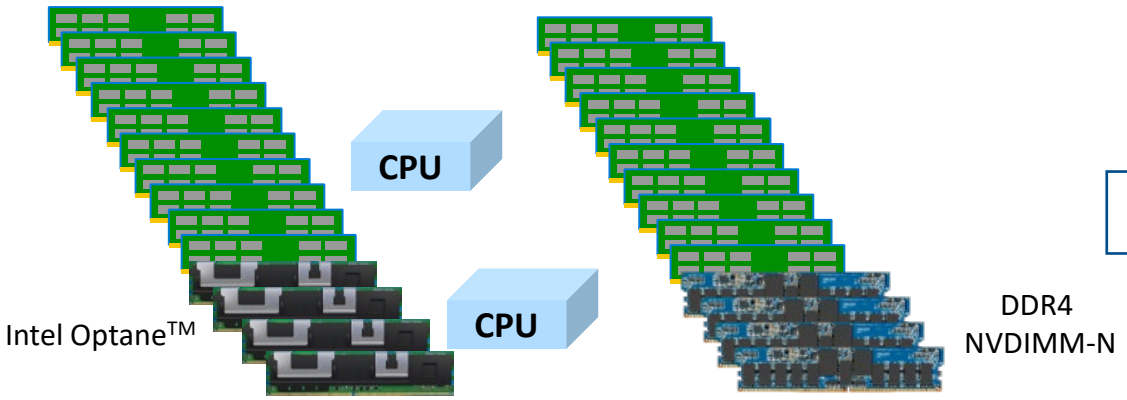
- Record real-time Error logs and security events.
- Preserve transactions in flight.
- Retrieve back up.

Revenue Loss

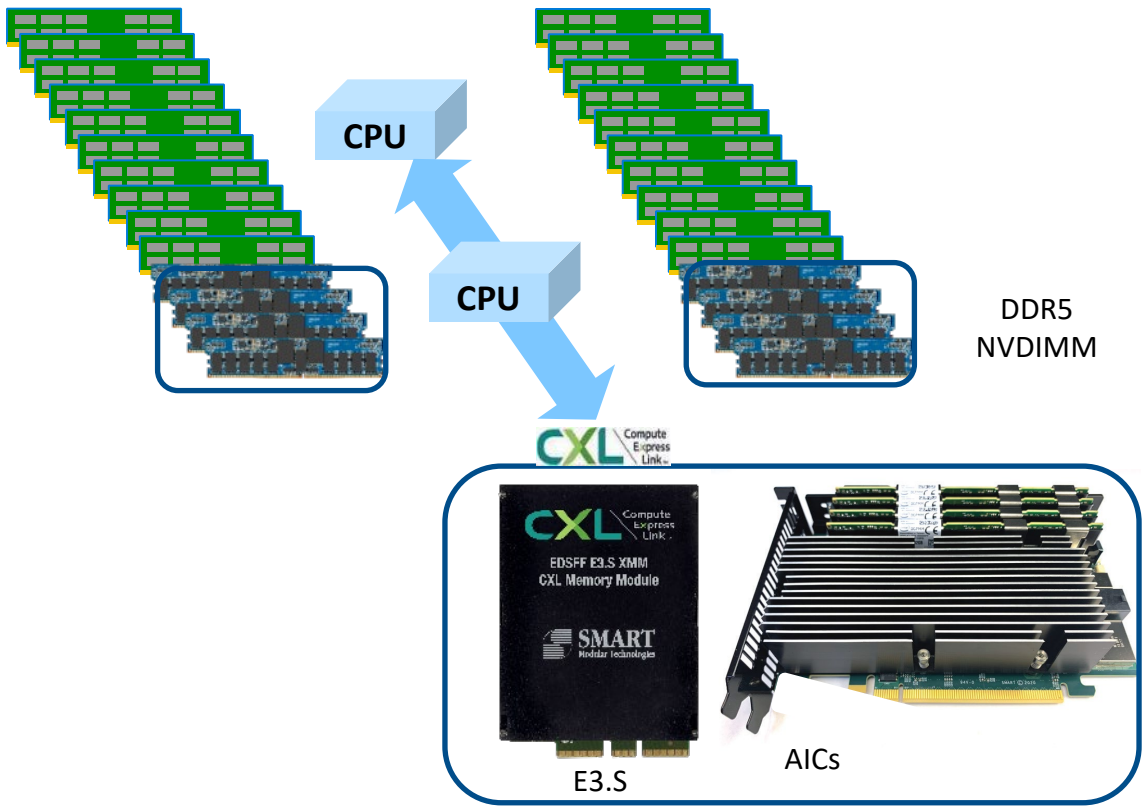
Source; The GigaSpaces Technologies Blog, Insights into In-Memory Computing and Real-time Analytics

Persistent Memory beyond Intel Optane™

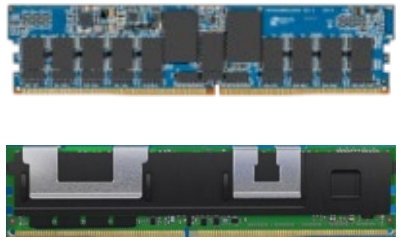
Current Generation



Next Generation



Form-factors for Persistent Memory



Persistent Memory in DIMM form-factor

- Low latency as directly attached to processor bus
- CPU and Platform dependent.
- Memory capacity limited by Thermal and PCB.
- May bring down the performance of entire DDR channel if not running at speed with other DIMM.

Persistent Memory in EDSFF (E1.S or E3.S)

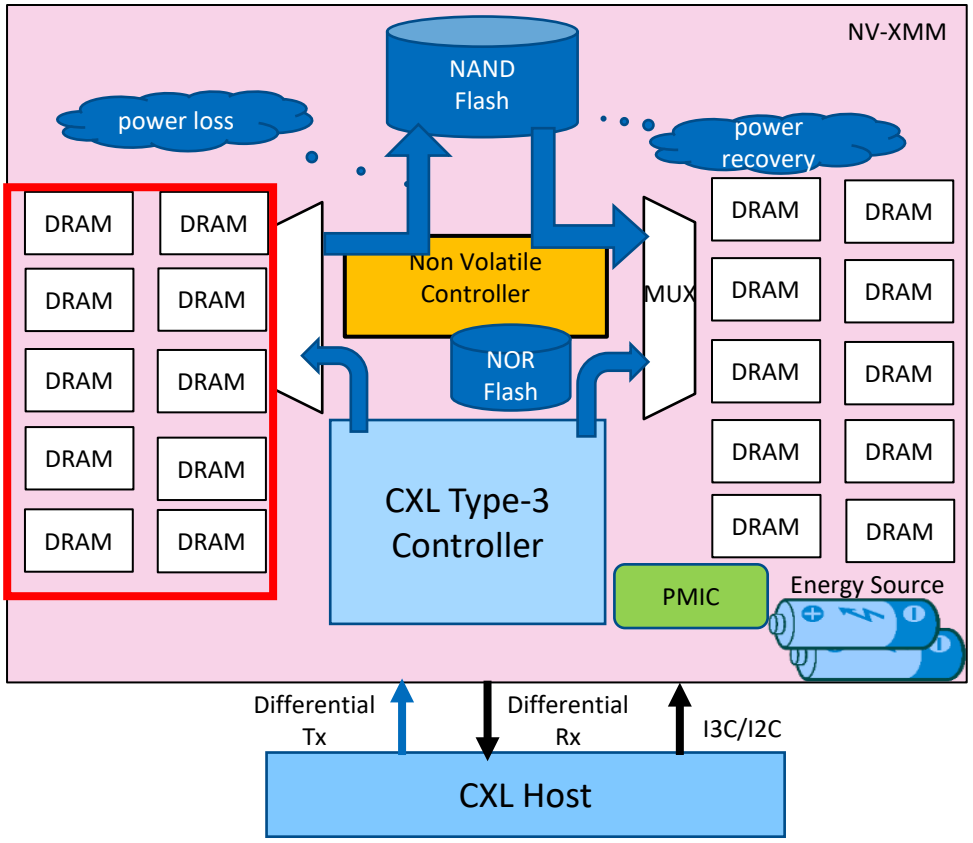
- CPU and Platform Agnostic
- Scalable and Hot pluggable. Improves serviceability
- Capacity limited by Thermal and PCB space constrains

Persistent Memory in PCIe CEM form-factor

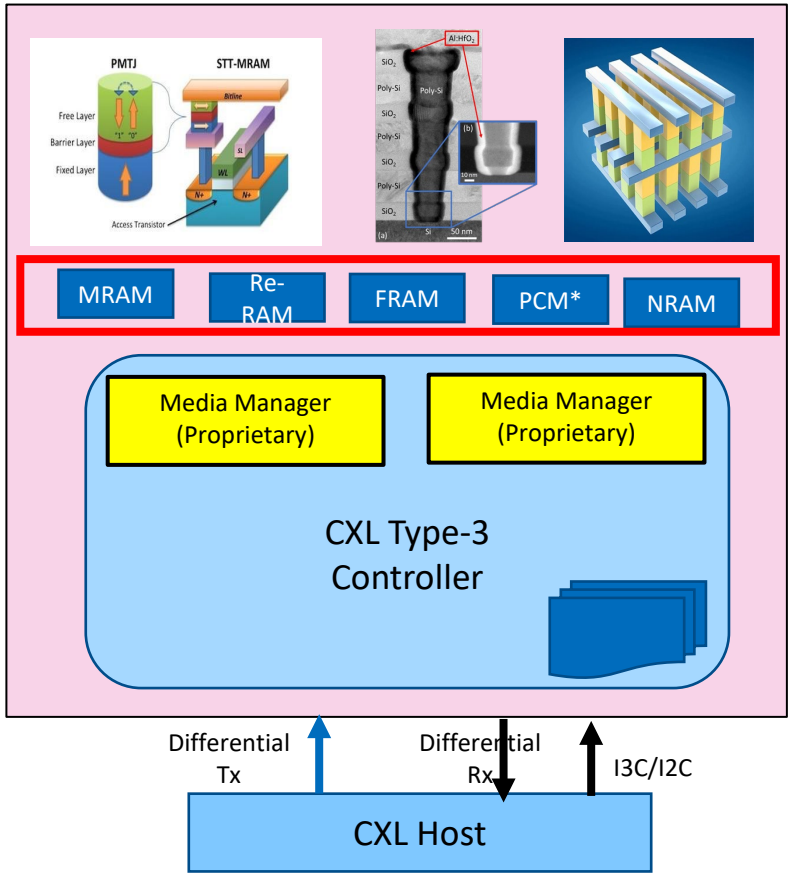
- CPU and Platform Agnostic
- Very High Memory capacity. (In Tera Bytes)
- Enables multi sourcing of DIMM and Technology.
- Limited serviceability. Hot Plugging not supported

Persistent Memory Architectures with CXL

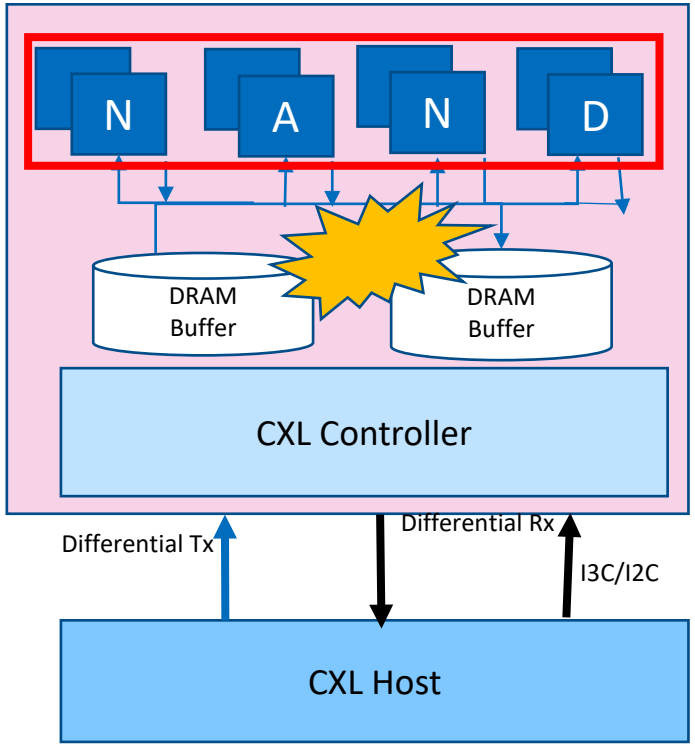
DRAM backed by NAND
(like NVDIMM-N)



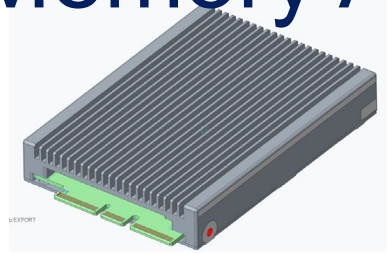
Non-volatile media based
(like NVDIMM-P or Intel Optane™ DIMM)

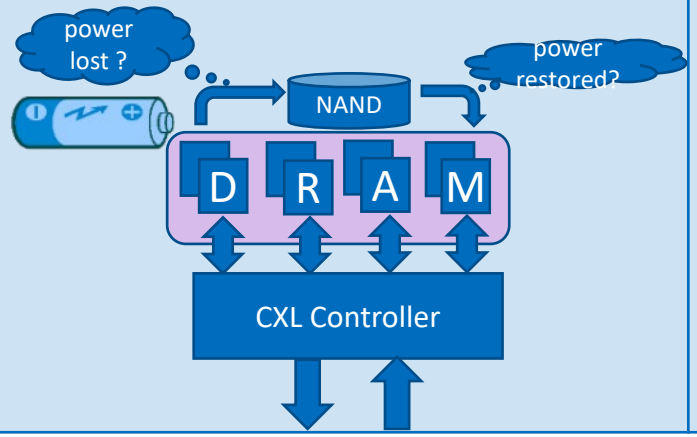
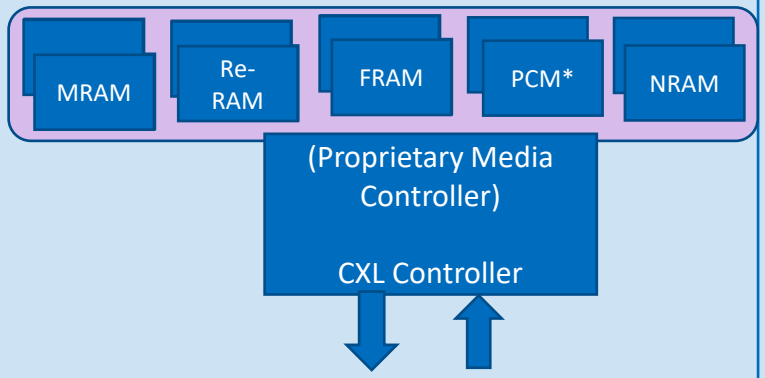
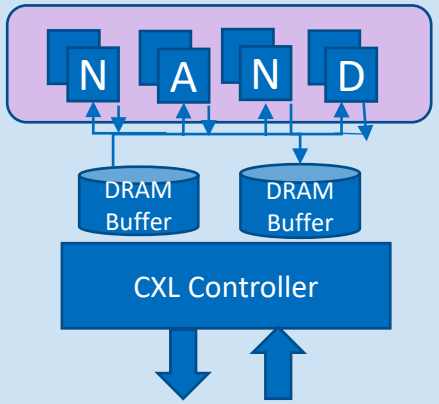


CXL based SSD
(like NVDIMM-F)



Comparing Persistent Memory Architectures



	DRAM backed by NAND (like NVDIMM-N)	Non-Volatile Media based (like Intel Optane™ Pmem DIMM)	CXL based SSD (like NVDIMM-F)
Architecture		 * PCM: Phase Change Memory	
Common Features	Persistent, Supports Memory semantics, Cache level granular access		
Differ. Features	✓ Latency: DRAM like (RTT < 100ns) ✓ Reliability: High endurance (Active writes hit DRAM, Flash used only for backup X Capacity: Limited by Backup power X Cost: Driven by additional components	X Latency: High (RTT ~ 200ns). X Reliability: Low. Limited by endurance of media ✓ Capacity: High (100s of GB) ✓ Cost: Optimized for high density.	X Latency: SSD like (after DRAM buffer is used) X Reliability: Low. (frequent writes increase Write Amp) ✓ Capacity: Very High (in TB) ✓ Cost: Determined by DRAM:NAND Ratio

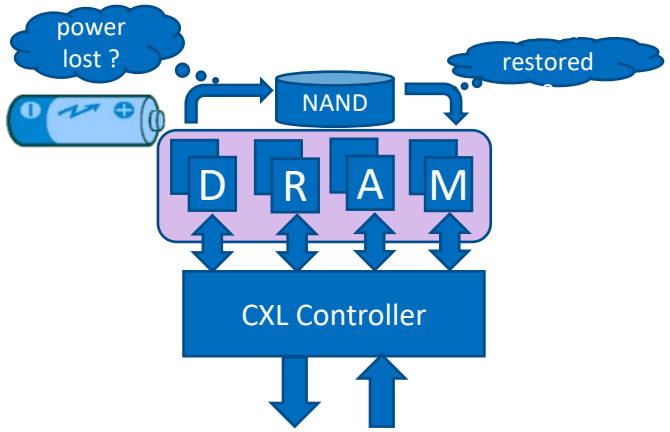
Increasing Capacity

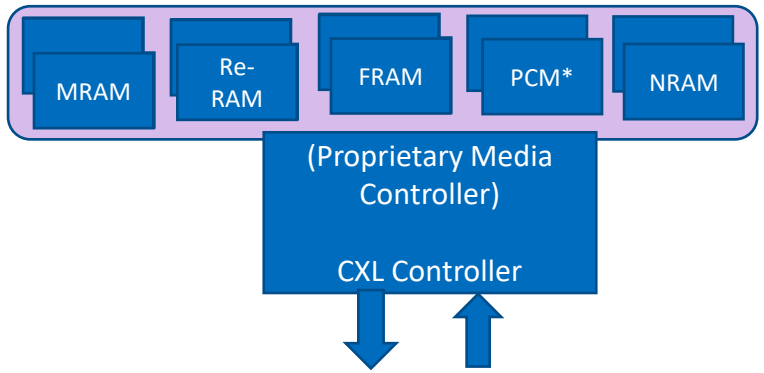
Increasing Latency

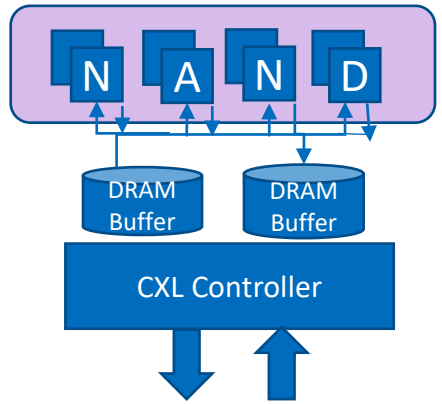
Take-away

- Persistent Memory reduces blast radius and Time to recovery.

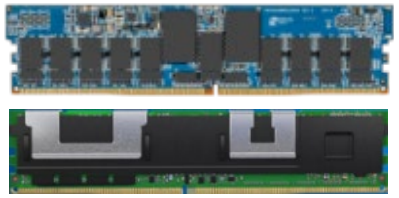
- Select right Persistent Memory architecture to strike balance between Latency, Cost and Capacity.

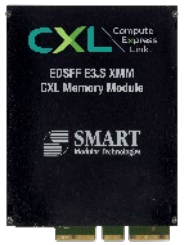






- CXL™ is enabling Persistent Memory in new form-factors





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