



# Phase Change Memory System Level Applications

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# Memory Comparisons

	DRAM	SLC	MLC	PCM
Non-volatile	No	Yes	Yes	Yes
Read Performance	Very High	High	High	Very High
Write Performance	Very High	High	Low	Medium
Density	Medium	High	Very High	Medium
Cost	Very High	High	Low	Very High
Reliability	Very High	High	High	High
Endurance	Very High	Medium	Low	High
Power	Very High	Medium	Medium	High

# Usage Model Directions

- Niche: NV SRAM replacement
- Complement: Embedded Cache (Drive, RAID)
- Alternative: Low latency Drives/Memory
- Replacement: SSS Drives/ NV Memory

	<b>Speed</b>	<b>Cost</b>	<b>Density</b>	<b>Endurance</b>	<b>Power</b>
Niche	Very High	< Medium	Low	Very High	Low-Medium
Complement	Very High	< Medium	Low-Medium	Very High	Low-Medium
Alternative	Very High	< Low-Medium	Medium	Very High	Low
Replacement	Medium- Very High	< Very Low	High- Very High	High- Very High	Low- Very Low

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# System-Level Traffic Profiles

- **OLTP**
  - Performance: ~70% Reads, Random, Small Block
  - Capacity: 100GB to 10TB
  - Reliability: Very High
- **OLAP**
  - Performance: >90% Reads, Random, Large Block
  - Capacity: 100GB to 10PB
  - Reliability: High
- **Caching**
  - Performance: Workload (Application) dependent
  - Capacity: Fraction of workload requirement
  - Reliability: Medium

# System-Level PCM Guidance

- **OLTP**
  - Performance: Faster Writes, Read-to-Write Asymmetry 1:2
  - Capacity: >>Higher
  - Reliability: Maintain
  - Power: << Lower
- **OLAP**
  - Performance: Maintain
  - Capacity: >>>Higher
  - Reliability: Maintain
  - Power: << Lower
- **Caching**
  - Performance: Faster Writes, Read-to-Write Asymmetry 1:2
  - Capacity: >Higher
  - Reliability: Maintain
  - Power: << Lower