Low-cost Flash in high demand

Cloud workloads

- Many write-once-read-many workloads
- Data is often immutable
- Don’t need the write endurance of high-end Flash

Examples:
- Data Warehousing / Analytics
- Active Archives
- Social

Focus on density, cost, and read performance:
- Read performance: high-IOPS & bandwidth, low latency
- Low cost: consumer-level
- Enterprise-grade performance and high availability
- High data ingest rate that is non-disruptive to Reads

Existing I/O stacks and architectures are not a good fit
- A Workload-Optimized solution is needed

Software Log-Structured Array

Key Ideas:
1. Use high-density, low-endurance Flash
2. Move complexity from hardware to software
3. Optimize end-to-end for low Write Amplification and data durability
4. Employ data reduction to further reduce cost per GB
5. Natively support Object Storage

Conclusions
- Use commodity Flash in the cloud
- Shift complexity from hardware to software
- SALSA: a storage virtualization stack for Flash
- Workaround TL un-predictability
- Elevate the performance of commodity Flash

Optimize end-to-end for low Write Amplification
- Pretty protection without the RMW penalty
- Stream separation and heat segregation
- Workload consolidation and QoS

Next steps:
- Integrate with Open-Channel SSDs
- Automate profiling and configuration for SSDs