Flash Changes Database & Cloud Application Design Forever

David Floyer

Wikibon

Forum H-22: Flash and Cloud Computing

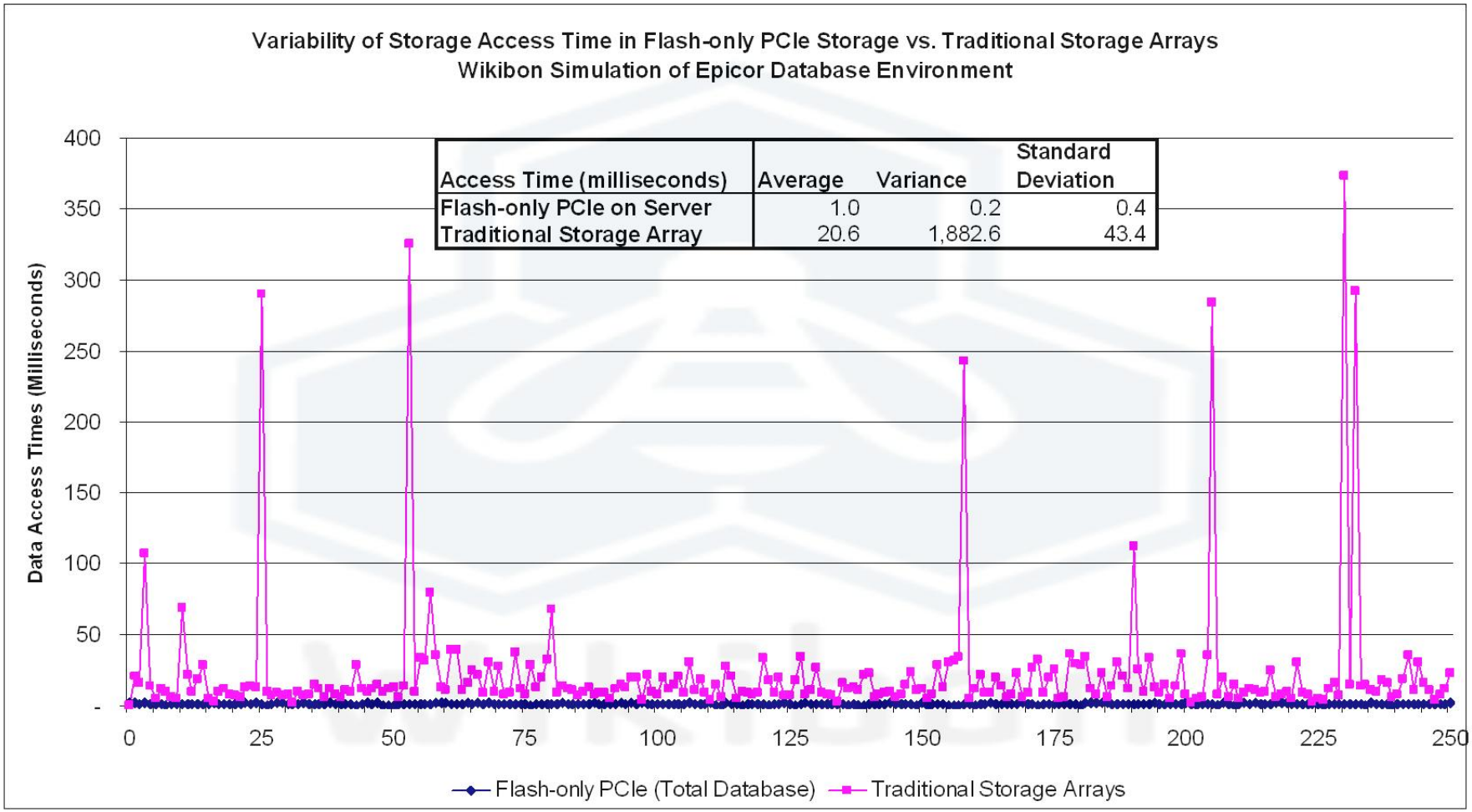
Agenda

- Design & Architectures Problems
- How Flash Helps
- Flash Topologies & Standards
- Flash-aware Architectures
- Should we wait for Flash Replacement?
- Business Benefits
- Summary

Design & Architecture Problems

- DRAM non-persistent, Write-time to acknowledgement key problem
  - Elapsed Time milliseconds (20-200ms)
  - Variance very high (for Databases)
- Limits Design for Transactional Applications
  - 100DB calls/transaction
- Limits Scope of Analytic Systems (DRAM?)
- Modular Systems, difficult to deploy, business fits to application

Design & Architecture Problems



How Flash Helps Existing Apps

- Speeds them up: milliseconds to micrososeconds
- Wikibon Case Study: Revere * (200 person)
  - Before: Only Call Center in Prime-time
  - After: All departments could operated in Prime-time
  - Business benefit: 20% growth with no additional people, $1 Million to the bottom line
  - Cost: 1 Fusion-io card
  - ROI: almost infinite, with <3 month break-even

* Reference: http://wikibon.org/wiki/v/Case_Study:_The_Hunting_of_the_RARC

How Flash Helps New Apps

- Completely New Architecture, New Databases
- Cloud-based Developers First
- Aerospike – AppNexus 35 billion Auctions/day
  - Flash-aware Flash-first design
  - Real-time Analytic tables – back-end Deep Analytics
  - Not possible with traditional databases/app design

Flash Topologies & Standards

- Network: 20 vendors & growing
  - Millisecond to High Microsecond RT
- PCIe: Fusion-io and many more
- Flash Memory DIMM: Diablo & LSI
- For New Large-scale Cloud Apps, PCIe & Flash Memory DIMMs only option
  - Flash as an extension of Memory
  - Very close to Processors
  - Microsecond to High-Nanosecond Atomic writes
  - Demand Paging is back!
  - KV Assists (for non-SQL databases)
  - Support for MySQL with Red Hat and MariaDB
- Standards working through T10 (Fusion-io contributions) & NVMe

Should We Wait for Flash Replacement

- No!
- MRAM in low Production
- RRAM promising, but years aware (if ever)
- Replacement will be driven by Consumer benefits, not IT benefits

Business Benefits (1)

- Instead of waiting milliseconds (10^{-3}) to write state data to disk, the application can write it in microseconds (10^{-6}) or even faster;
- Instead of limiting applications to sips of data (say a max of 100 DB calls/transaction), applications can process buckets full of big data at a time (1,000s of DB calls);
- Instead of processing a thin stream of industrial data, applications can ingest a fire-hose of industrial big data and store and react in real time;
- Instead of breaking large applications up into loosely connected modular databases, databases can be centralized with enterprise-wide multi-functional capabilities able to execute in parallel;

Business Benefits (2)

- Instead of ISVs using traditional SQL shared-data databases for applications (where the cost of the underlying databases is higher than the ISV application), ISVs will have a broad choice of low-cost simpler flash-aware SQL and NoSQL databases that will be optimized for the application;
- Instead of competing against established ISVs, innovative ISVs and/or cloud service providers can break new ground with real-time intra &inter-enterprise applications -- e.g., supply chain optimization within industries;
- Instead of fitting companies to complex enterprise applications, innovative ISVs and/or cloud service providers can fit flexible applications to the company and be up and running in weeks rather than years;
- Instead of spending billions try to integrate 3-letter government entity IT systems and departmental processes, common very large database services can allow government entities to utilize systems and organize/re-organize at will.

Conclusion

- Business Benefits of Flash-aware Databases and Applications will drive innovation, and increase total IT Spend
- Future Topologies within Mega-datacenters, with Cloud Service Providers the new ISVs
- David Floyer
- David.Floyer@Wikibon.org
- Slides will be available as part of the conference proceedings, look on web site
- Lots of Research on Wikibon