

# Unleash Oracle Performance with Flash Storage

## WebTech Q&A Session, April 17, 2014

- 1. Did you benchmark mixed I/O patterns? Read, write? Sequential, random?**  
No. The current version of the benchmark suite does not support these I/O patterns.
- 2. In which areas would you say flash has the biggest impact on database performance?**  
Flash has a very positive impact to the performance of all kinds of database operations: OLTP, Data Warehouse, and Analytic applications.
- 3. What advice do you give clients when implementing flash storage?**  
We have seen from experience at several customer sites that dedicated flash storage delivers better performance for database applications than auto-tiering technologies.
- 4. Do you believe it is best to put an entire database on flash or only specific files?**  
For critical databases, we recommend putting ALL database files on flash. This guarantees best transaction performance.
- 5. How do companies justify the cost of flash storage?**  
Many of our customers are replacing existing disk-based storage systems because they want to fix an I/O bottleneck. They find justification in 3 areas: cost per I/O, reduced CAPEX, and reduced OPEX. Flash can outperform disk with much less media, which lowers the price per transaction. Hitachi Accelerated Flash is denser than most hard disk or solid-state disk systems, so you can buy less storage. And the corresponding reduction in space, power and cooling lowers the operation cost of the platform.
- 6. While IOPs and throughput are measurements of storage performance, what about latency with the all-flash array?**  
We also measured the I/O response time within Oracle, including latency, service time and wait time. I/O response time varies based on load.

**7. Was Oracle ASM part of this test?**

Yes.

**8. Is there a comparison benchmark set that shows contrast between the all-flash array and Hitachi Unified Storage VM using SSD devices?**

We did not perform that test within the Benchmark benchmark.

**9. In the test, what was the mix of flash, SAS, NL-SAS within the Hitachi Dynamic Tiering pools?**

The pools were comprised of only Hitachi Accelerated Flash storage.

**10. What kind of server was used for this test? What was the configuration of the server? What Operating System was used? Was Extended SGA (System Global Area) used? Was flash cache used? Pools?**

A white paper describes the configuration, and you can find it [here](#). We do not separate table and index data. No extended SGA. No database flash cache.

**11. Were you using a PCIe card such as Fusion-io in the server for SGA in the testing?**

We benchmarked an external Fibre Channel-attached HUS VM all-flash system. There is a separate benchmark with PCI attached FusionIO cards available on the benchmark page titled "[Oracle on server internal PCI attached Flash](#)".

**12. Could you share the SQL statements for select and update?**

Here is the SQL statement generating the I/O load (STO performance tests):

```
'SELECT /*+ FIRST_ROWS(10) */ c01, gid, c05, c24 FROM ' || p_table || ' WHERE c05 = :l_skyc05'
```

Here the SQL statement generating the transaction load (DBX performance tests):

```
'SELECT /*+ FIRST_ROWS(1) */ c01, gid, c05, c24 FROM ' || p_table || ' WHERE c01 = :l_pkyc01'
```

```
'UPDATE /*+ FIRST_ROWS(1) */ ' || p_table || ' SET c10 = :a_update, c12 = :a_update, c16 = :a_update, c24 = :a_update ' || ' WHERE c01 = :l_pkyc01'
```

The SQL statements are simple. There are a lot of techniques used within the benchmark suite to generate contention-free, high-random I/O rates.