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SOLUTION OVERVIEW

EMC Enterprise Flash Drives for Oracle

The Big Picture

- EMC was the first company to release storage platforms that support Enterprise Flash technology
- Enterprise Flash drives (EFDs) improve performance dramatically through removing the long delays of retrieving data from hard disk drives (HDDs) when it is not in database or storage cache
- Flash drives also help reduce power requirements and floor space through consolidating many hard disk drives to fewer Enterprise Flash drives
- EMC has done extensive testing with Oracle to identify latency-sensitive workload types and application profiles which will benefit from predictable performance delivered by EMC Enterprise Flash drives

Increase Oracle Database performance with EMC Enterprise Flash drives

Enterprise Flash drives are up to 30x faster than hard disk drives

EMC® Enterprise Flash drives (EFDs) store data using Flash memory and contain no moving parts. As a result, retrieving Oracle application data from EFDs is dramatically faster as seek times associated with traditional, spinning Fibre Channel disk are drastically reduced. EFDs appear as standard Fibre Channel drives to EMC storage platforms and offer several key advantages:

- Quicker response time for latency-sensitive applications
- More energy efficient because there are no spinning disks
- Hyper-consolidation is achieved through removing the need for short-stroked spindles, improving overall disk utilization and reducing the drive footprint in your data center

Enterprise Flash drives offer a new Tier 0 class of high-performance storage for your Oracle applications. Recommended approaches to leveraging EFDs in your Oracle environment include:

1. **Identify which Oracle Database workloads benefit most from EFDs**—In general, EFDs will benefit almost any workload that depends on disk IO, however, they perform best with random read workloads common in many OLTP applications. EFDs will benefit sequential read workloads as well over HDDs, but to a lesser degree. Note that many DSS workloads tend to become random by the time they reach the storage (due to high user and query concurrency) and while traditional HDD throughput is heavily reduced under mixed workload, EFDs will maintain their throughput.
2. **Identify which portion(s) of each database to place on EFDs**—For applications that are extremely latency sensitive, it may make sense to place the entire database on EFDs. However, when you only want to place a portion of the database on EFDs, consider certain portions such as tablespaces, materialized views, indices, and temp files.
3. **Incorporate EFDs as part of an information lifecycle management (ILM) strategy**—Leverage Oracle Partitioning to place the most active database partitions on EFDs. As these partitions become less active, migrate them to Tier 1, 2, or 3 storage using EMC or Oracle software to make room for the new active partitions on the EFD (see Figure 1).

It is important to remember that there are many layers of the Oracle data path which can impact performance beyond just the disks. Therefore, when incorporating EFDs, it is important to make sure that there is enough CPU power, connectivity, and IO concurrency to benefit from the new Tier 0 capabilities.

Leverage the Oracle Automated Workload Repository (AWR) report

IT workloads will differ between groups, as will the applicability of EFDs for the business. One effective way to evaluate the benefit of applying EFDs to Oracle Database applications across the enterprise is to analyze the Oracle AWR report.

The Oracle AWR report can be used to identify the databases with user I/O WAIT events. EFDs can reduce these WAIT events significantly, improving database performance at the same time. Typical areas to look for in the AWR are:

- Load profile section for the physical I/O activity
- Top-five WAIT events section for any I/O WAIT events
- Tablespace I/O section to identify the hot tablespaces with higher latency
- Bufferpool advisory section to determine if the physical I/O can be reduced by increasing SGA

As part of an ILM strategy, IT organizations can intelligently identify, classify, and place various Oracle Database applications on the appropriate tiers of storage, including Enterprise Flash drives, FC drives, SATA drives, and tape.

Figure 1 outlines a simplified example of Oracle on EMC storage ILM deployment for a customer order-entry application.

PARTITION 1	PARTITION 2	PARTITION 3	PARTITION 4
Current data demanding the highest performance and availability.	Less current data demanding high performance and availability.	Older data for fulfillments and batch processing. Less critical for business.	Oldest data marked for archiving and compliance. Not critical for running business.

Figure 1. Customer Order Table

Source: "*Leveraging EMC Symmetrix DMX-4 Flash Drives with Oracle Databases,*" white paper

Learn more about how you can leverage Enterprise Flash drives in your Oracle environment

EMC has written white papers for Enterprise Flash drive use cases in Oracle environments based on their extensive testing and performance characterization. In addition to a deeper discussion on the topics introduced in this overview, you can learn how to use Oracle tools to identify databases that can benefit from EFDs in the following papers:

- White Paper: *Implementing EMC Symmetrix DMX-4 Flash Drives with Oracle Databases—Applied Technology*

  http://www.emc.com/collateral/hardware/white-papers/h5699-implement-dmx-flash-with-oracle-wp.pdf

- White Paper: *Leveraging EMC CLARiiON CX4 with Enterprise Flash Drives for Oracle Database Deployments—Applied Technology*

  http://www.emc.com/collateral/hardware/white-papers/h5967-leveraging-clariion-cx4-oracle-deploy-wp.pdf

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