

Accelerating Oracle® Applications with IntelliFlash™ Arrays

Highlights

- Crush database latency at a lower cost than traditional storage
- Instantly provision volumes tuned for Oracle databases with application-aware provisioning
- Thin provision volumes and compress databases in line to significantly reduce your storage footprint by up to 75% depending on workload
- Run applications and manage files on a single array
- Create application-consistent snapshots to prevent data loss and ensure recovery
- Quickly recover from a site disaster with remote replication
- Create multiple read/write clones without negatively impacting performance

Accelerate Database Throughput and Response Times While Reducing Your Storage Footprint

Data is an asset to your business. Therefore, you need to rethink how your Oracle application data is being operationalized, captured, preserved, accessed, and transformed to deliver more transactions and better insights to your business – whenever, wherever, and however you need it.

Western Digital's IntelliFlash arrays enable Oracle databases and applications to thrive by accelerating transactions and simplifying workflows. With its ability to provide performance, economics, and flexibility at scale, IntelliFlash brings you a wide product portfolio with comprehensive data services and data management capabilities.

Make your Oracle databases come alive with IntelliFlash!

Run Your Oracle Applications near the Speed of Memory

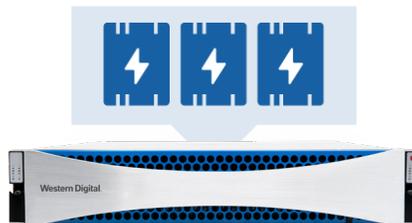
With our patented meta data acceleration technique, whether it's real-time processing, machine learning, data analytics or business intelligence, IntelliFlash arrays dramatically reduce transaction wait times by orders of magnitude – empowering you to transform your infrastructure and set new business targets.

Your business depends on Oracle databases for data warehousing, analytics, and online transaction (OLTP) workloads. It's essential that you deliver consistently high levels of performance and availability. But that can be difficult without the right storage infrastructure. As a result, revenue and productivity can suffer.

Western Digital IntelliFlash arrays offer a comprehensive portfolio of all-flash and hybrid flash storage solutions that deliver high I/O per second (IOPS) at sustained low latency at a price that will fit most budgets. Each array includes a comprehensive set of data protection and management capabilities and can seamlessly support different storage media (NVMe flash, performance flash, dense flash, and hard drives) powered by the IntelliFlash Operating Environment. Dial up or down the amount of flash storage to meet your performance needs. Get the lightning-fast performance of flash with the cost-effective economics of disk.

All Flash Arrays

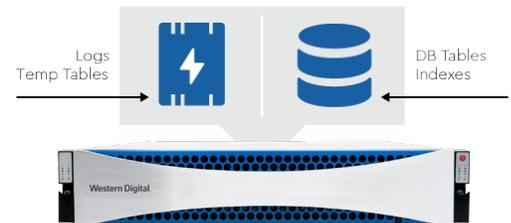
Very High Performance
Low Latency



- All-flash arrays for sustained low latency
- 48 TB[‡] of all-flash (raw) in 2 rack units
- 336TB (raw) in 10 rack units
- Sub-millisecond latency

Hybrid Arrays

High Performance
High Capacity



- All-flash and hybrid flash arrays for most Oracle workloads
- Pin redo logs and temp tables in all-flash storage pool
- Run rest of the DB in hybrid storage pool
- Cost-effective performance and capacity

Reduce Your Storage Footprint

Compress your databases by 1.5x – 2x and maintain multiple copies of your data without taking up additional storage space.

Selectable inline compression and deduplication capabilities can dramatically reduce the overall storage footprint of your Oracle databases while helping to improve performance. Data blocks are compressed and redundant data blocks are removed before they are committed to persistent storage. You can select the compression rate and turn on/off deduplication at the LUN/file share/project level to strike the perfect balance between performance and capacity.

However, in conjunction with our metadata and write acceleration capabilities, our data reduction implementation becomes a performance multiplier as the number of writes to and reads from the capacity tier are significantly reduced. The deduplication reference table comfortably resides in dedicated SSDs for the fastest possible processing.

And since this all occurs inline, data will appear to the requestor as if it were in its original state (uncompressed and hydrated).

In-line compression



- Reduce DB Storage consumption by >30%
- Block-level compression
- Performance multiplier
- Selectable at LUN/File-share level

In-line de-duplication



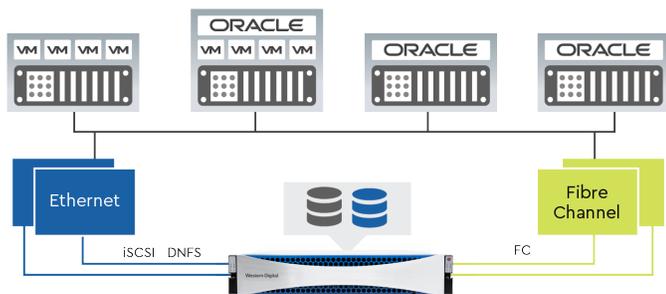
- Reduce space consumption for online backup images by up to 90%
- Block level deduplication
- Selectable LUN file-share level
- Dedupe both SSD and HDD

Maximize Storage Efficiency

Maximize storage efficiency by not over-allocating capacity. Thin provisioning on IntelliFlash arrays automatically allocates physical storage as data is being written. Any allocated space that hasn't been consumed remains available for other applications.

Consolidate Workloads with Multi-Protocol Support

IT organizations often deploy multiple storage arrays to meet the protocol needs and workload characteristics of specific databases. IntelliFlash arrays natively support both block and file protocols,



enabling you to host Oracle databases and your other workloads on a single array. Supported block protocols include iSCSI and Fibre Channel. You can configure different block sizes for each database or even for different LUNs within the same database, which is considered a key requirement for Oracle DBAs. Supported file protocols include NFS, CIFS and SMB 3.0. You can even use Oracle Direct NFS (dNFS) by exporting NFSv3 and v4 shares. Any or all protocols can be used simultaneously over a variety of storage ports.

As you provision storage, you can choose the granularity of the block size and other parameters at the database or individual LUN level. You can also ask the array to do it for you within the user interface. IntelliFlash arrays include application-aware provisioning. Simply select the use-case (database, server virtualization, or VDI), and the array will instantly select the appropriate configuration (block size, compression algorithm, deduplication settings, etc.)

Help Ensure the Availability and Protection of Your Business-Critical Data

Prevent data loss due to corruption and help ensure your data is available 24x7. When deploying Oracle databases on IntelliFlash arrays, you'll benefit from the resilience, end-to-end data integrity, and high-availability provided by the IntelliFlash Operating Environment.

With our arrays, there is no single point of failure. All media are dual-ported and accessible through a pair of highly-available, redundant controllers. The controllers are configured in an active/active mode and can be configured for simultaneous data access. Capacity expansion, system upgrades, and media swaps can be performed with zero downtime and minimal performance impact.

To protect against silent data corruption, our arrays perform a checksum process to match data blocks as writes and reads happen and automatically fix corrupt blocks.

IntelliFlash arrays offer built-in data protection capabilities so you can take point-in-time, application-consistent snapshots of your Oracle databases. The snapshots are space-efficient and incur no performance overhead. For disaster recovery, you can replicate snapshots to a remote site. Restoring a database is nearly instantaneous from either a local or remote snapshot.

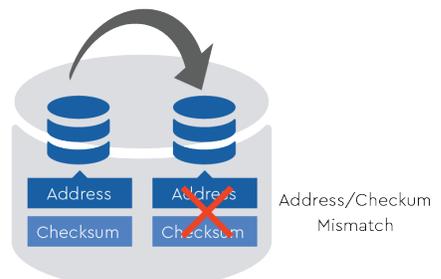
Thin Snapshots



Quick DB Recovery



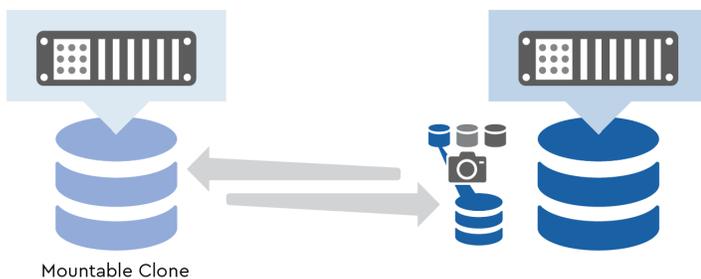
Update From Mirrored Copy



Accelerate Deployment of Oracle-based Applications

Development, test, and quality assurance (QA) teams often need copies of production databases for a variety of tasks. In these situations, it's necessary to create copies of production databases to ensure that online data is not impacted by dev/test work. However, this can consume a lot of storage space.

IntelliFlash arrays enable you to create multiple read/write clones of the production databases without consuming additional storage space or incurring a performance hit during creation. As with our snapshots, only the changed blocks are stored, resulting in significantly reduced storage consumption.



Scale Performance and/or Capacity as Needed

As your database storage needs grow, you can add the most cost-effective media that will maintain your existing performance levels. You can add expansion shelves with NVMe flash, performance flash, dense flash, and/or hard drives as dictated by your performance requirements. Competing solutions often require all flash-all the time. Or they simply try to use flash drives in a legacy system built for spinning media.

Getting Started

IntelliFlash arrays are the ideal storage solution for your Oracle environment as they deliver sustained performance and resiliency while lowering your storage infrastructure costs. To get you started, Western Digital has developed and validated a reference architecture for running Oracle databases using Cisco USC® servers and IntelliFlash arrays.

As an Oracle Gold Partner, Western Digital works closely with Oracle to ensure its IntelliFlash arrays are optimized for Oracle environments. IntelliFlash arrays have been rigorously tested and certified with Oracle VM. They have also been validated in Oracle Linux® environments with Unbreakable Enterprise Kernel (UEK) in single instance and Oracle Real Application Clusters (RAC) deployments.

IntelliFlash arrays deliver incredibly high performance while maximizing efficiency not only for IT, but for your business, by keeping your storage costs in check and making your data come alive. For more information on how IntelliFlash arrays can turbo-charge operational data and activate latent data by making your data come alive, visit westerndigital.com/intelliflash

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