

# OPTIMIZING PERFORMANCE IN ORACLE® DATABASE AND ORACLE RAC WITH FLASH MEMORY

## SOLUTION BRIEF

Oracle Database and Oracle RAC are the lifeblood of many businesses. As some of the most mature, scalable, and robust relational databases available, they can be found in everything from ten-person small businesses to the largest multinational corporations on the planet. Workloads and datasets always seem to be increasing, requiring large spends on additional servers, storage, and licenses to meet performance expectations. Consider HGST- and SanDisk-brand SSDs to keep Oracle Database and Oracle RAC performing at top speed and maximize your return on server and license investments.

SanDisk- and HGST-brand NVMe™-compliant SSD flash technologies address multiple Oracle Database performance challenges: OLTP, operational data stores, data warehousing, OLAP, and backups. HGST's SAS SSDs can address those same issues in Oracle Real Application Clusters (RAC).

### What SanDisk- and HGST-brand drives can do for your business

- Maximize your use of existing Oracle RAC and Oracle Database licenses
- Keep background processes from interfering with real-time applications
- Speed up OLTP transaction processing, simply

### Oracle Database Benefits from NVMe™ Flash

It may be time to consider adding SSD technology to your Oracle Database instances. Specifically, you should look at NVMe-based flash technology, such as Skyhawk™ SSDs from the SanDisk brand, or HGST's Ultrastar® SN200 Series SSDs. These devices bring high-speed storage capacity into the server—directly attached to the CPU and the application workloads—to fast-track Oracle Database performance.

NVMe SSDs can supply the performance boost your business needs to support higher transaction volumes and process data faster. Because your servers can do more work in less time, you may be able to consolidate the number of servers in your data center or delay additional, costly rollouts. The result is a more efficient and more productive environment with a substantially better cost structure. You can expect big productivity gains—the kind that help your business make better decisions faster, expedite transactions, and speed response times.

NVMe SSDs from the HGST and SanDisk brands can attack the major pain points associated with both Online Transaction Processing (OLTP) and Online Analytical Processing (OLAP) applications. By providing tens to hundreds of thousands of IOPS to an Oracle Database instance, with a single SSD you can remove the typical Input/Output per Second (IOPS) bottlenecks in an Oracle Database, such as the management of redo logs or undo tablespaces.

With multiple gigabytes-per-second (GBPS) of bandwidth, HGST's Ultrastar® SN200 series can address your top throughput issues in data warehousing

and analytics applications on Oracle. Streaming tasks that would normally require dozens of high performance HDDs can be tackled with many fewer NVMe SSDs, saving massive amounts of space and power in the process.

### Speed Oracle RAC with SAS SSDs

Oracle RAC is a large-scale, high-performance clustered database that generally requires shared storage to function. That is, all database servers in the cluster must be able to access the same shared pool of storage. This storage can reside on a SAN, a NAS, or a shared SAS JBOD, but not on a server's local CPU bus, so NVMe SSDs cannot help here. However, by using HGST's Ultrastar® SS200 SAS SSD in a multipath JBOD, Oracle RAC can benefit from high performance flash storage. Even better, because Oracle RAC databases are often in the 100s-of-terabyte (TB) range, using a JBOD means the capacity of many dozens of SAS SSDs can be combined for use by Oracle RAC.

### Overcoming Oracle Performance Issues

SanDisk- and HGST-brand NVMe SSD products address multiple Oracle Database performance challenges: OLTP, OLAP, operational data stores, data warehousing, and backups. HGST-brand SAS SSDs can address these same issues in Oracle RAC clusters.

### Pain Point: Slow Transactions, Missed Opportunities

For OLTP applications—such as recording online orders, doing stock trades, or tracking inventory in a factory—the speed of database operations often defines the speed of the transactions being processed. Latency is key in these

applications and can dramatically impact the bottom line of an organization. For example, a slow checkout operation on a website may convince customers to purchase elsewhere; a stock trade window missed by milliseconds can cost thousands of dollars; and an assembly line can come to a grinding halt waiting on an inventory update. Scaling up the CPU in an Oracle Database or scaling out the number of instances in an Oracle RAC cluster can only improve this somewhat. Often the greatest impact to individual transaction latency is the time it takes to record the transaction on stable storage. In these cases, a front-loading 2.5" NVMe SSD for Oracle Database instances or a 2.5" SAS SSD for Oracle RAC can reduce this transaction recording time to the sub-millisecond range.

**Pain Point: RMAN Backups Slowing Down Oracle Database**

Even with sophisticated RAID and replication configurations in ASM, backup is one of the most important jobs of a database administrator. Unfortunately, running the Oracle RMAN backup task can significantly impact real-time applications users. The exceptional bandwidth afforded by an NVMe SSD, such as HGST's Ultrastar® SN200 or the Skyhawk™ Ultra from the SanDisk brand, can reduce or even eliminate this bottleneck in single-

instance Oracle Database applications. These SSDs can supply from one to over three GBPS of large block transfers, ideal for RMAN backups that scan the database from start to finish. Because they are available in an industry-standard, 2.5" front-loading form factor, maintaining and replacing these SSDs is as easy as with existing hard drive-based storage.

**Pain Point: Background Processing Impacting Foreground Oracle RAC Performance**

As most Oracle RAC configurations are already deployed on a high-end shared storage subsystem, housekeeping tasks such as RMAN backups are not normally a problem for administrators. Instead, additional tasks are often addressed, such as daily and monthly reporting, data mining, and others that are important enough to run on the Oracle RAC cluster but that are not time-critical. Unfortunately, these non-critical applications can put a massive load on the Oracle RAC storage subsystem, causing delays in response for real-time OLTP and OLAP applications. In these cases, the latest HGST-brand 12Gb/s SAS SSDs such as the Ultrastar® SS200 can provide over a gigabyte of bandwidth per drive, allowing for ample bandwidth to be shared between the background and foreground jobs.

**Pain Point: Software Costs for Database Instances**

For enterprise software such as Oracle Database or Oracle RAC, the costs of software licenses often overshadow the costs of the associated server and storage hardware. It makes sense to optimize the storage and processing power of each of these licenses to maximize a company's benefit. By deploying local flash storage for Oracle Database or shared flash storage for Oracle RAC, I/O bottlenecks can be minimized. This enables the enterprise to more fully utilize any needed licenses.

**Summary**

SanDisk- and HGST-brand SSDs can drive performance improvements in Oracle deployments and make existing processes faster and less intrusive. Not only can these SSDs reduce top-line costs by maximizing the use of existing Oracle Database and Oracle RAC licenses, they can open new business opportunities and help ensure existing ones are not lost due to slow database operations.

	SanDisk SSD	HGST SSD	HGST SSD
Pain Point	Skyhawk™ NVMe	Ultrastar® SS200 SAS	Ultrastar® SN200 NVMe
Slow transactions, missed opportunities	★★	★	★★★
RMAN backups slowing down Oracle database	★★		★★★
Background processing impacting foreground Oracle RAC performance		★★★	
Software costs for database instances	★★★	★★★	★★★

Legend: ★ Good    ★★ Better    ★★★ Best

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