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## Oracle Exadata Raises The Bar On Database Appliances

Improves Online Transaction Processing And Data Warehouse Performance And Delivers A Consolidation Platform

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### EXECUTIVE SUMMARY

Forrester recently interviewed 16 Oracle customers who use Oracle Exadata to find out about their implementations. Most customers stated that Oracle Exadata exceeded performance and high-availability requirements to support their mission-critical applications. Unlike other database appliances from Teradata, IBM Netezza, and Microsoft SQL Server Parallel Data Warehouse (PDW), Oracle Exadata supports data warehousing and online transaction processing (OLTP) applications in a single appliance. In addition, Oracle Exadata runs packaged applications such as Oracle E-Business Suite (EBS), SAP, Oracle PeopleSoft, and Oracle Siebel applications without modifications. Oracle Exadata's hardware and software components are integrated to improve performance and achieve high availability for OLTP and data warehousing. In addition, Oracle Exadata can consolidate many databases to lower cost and improve manageability. Forrester estimates that more than 250 customers are currently using Oracle Exadata in production, and this is likely to triple in the next 12 to 18 months.

### DATABASE APPLIANCES ARE POISED FOR STRONG GROWTH

Most enterprises struggle with performance for critical OLTP and data warehouse (DW) applications largely because of increased data volumes and workload. According to Forrester's November 2010 Global Database Management Systems Online Survey, 65% of enterprises find delivering performance a top database management challenge. With large and complex databases, tuning and optimizing disk I/O, memory, processors, and networks can be very challenging. Database appliances optimize software and hardware to deliver the best possible performance, allowing administrators to focus more time on business requirements rather than on technology issues. In addition, appliances can reduce database administration requirements by 20% or more through automation, optimization, and consolidation. Forrester estimates that 15% of enterprises use a database appliance today, and this is likely to double over the next three years.

### Oracle Exadata Has Become A Key Differentiator For Oracle

Unlike traditional database appliances from vendors such as Teradata, IBM Netezza, EMC Greenplum, and Microsoft PDW that focus primarily on data warehousing, Oracle Exadata supports both OLTP databases and DWs. Forrester estimates that 25% of Oracle customers currently use Oracle Exadata for OLTP, 50% for DWs, and 25% for mixed workloads. Oracle Exadata is a preconfigured database machine that includes memory, disk drives, network bandwidth, and flash cache. A full Oracle Exadata X2-2 rack comprises 5.3 TB Oracle Exadata Smart Flash Cache storage and 336 TB of raw disk storage with high-capacity SAS drives across 14 storage servers and eight Oracle Database 11g nodes — each with two Intel Hexa-core

Xeon X5670 Westmere processors, and has 768 GB of total memory. Forrester estimates that more than 35% of all Oracle Exadata shipments are quarter-rack configurations, which include two Oracle Database 11g nodes and three storage servers. Oracle also sells Oracle Exadata Database Machine X2-8, which supports larger OLTP and DW applications. The X2-8 has two database servers and 14 storage servers. Each X2-8 database server has 8 x eight-core Intel Xeon X7560 processors. The two X2-8 database servers have a total of 128 compute cores and 2 TB of memory. The 14 storage servers have 5.3 TB Exadata Smart Flash Cache storage and 168 compute cores and InfiniBand switches.

Oracle Exadata offers several benefits including:

- **Consolidation of databases to support a private cloud strategy.** Oracle Exadata can consolidate many databases onto a single rack to lower IT cost by sharing system resources such as storage, memory, and processors. In addition, Oracle Exadata helps improve manageability, availability, and security of consolidated databases.
- **Support for any type of database workload.** Oracle Exadata can support any type of database workload, ranging from data warehousing, data marts, and operational data stores to analytical and transactional applications. Some Oracle customers are running mixed workloads on the same Oracle Exadata machine; others are dedicating it for specific needs.
- **Dramatically improved performance.** Oracle claims a single Oracle Exadata rack can execute 1.5 million random I/O per second, supporting the largest business applications. Based on customer interviews, most are seeing a 5x to 40x performance improvements for data warehousing and OLTP applications without any additional tuning or optimization.
- **Improved manageability of databases.** Forrester finds that most customers are benefitting from improved manageability compared with traditional database platforms. Some claim a 20% lower administration requirement with Oracle Exadata especially around tuning, backup, and consolidation.
- **The ability to scale to support more throughput.** Oracle delivers a scalable Exadata platform that starts out as small as a quarter rack and grows to a full eight-rack configuration comprising 1,024 compute (not counting storage CPUs) cores and 2.6 PB of storage. Customers can start with a quarter rack and then buy the quarter-to-half upgrade kit to upgrade to a half rack as well as half-to-full upgrade kit to upgrade to a full rack.

### IBM, Microsoft, And Teradata Only Support Data Warehousing

Oracle is the only vendor that offers a database appliance to support both data warehousing and OLTP workloads. However, we believe that other database management system (DBMS) vendors will follow suit to deliver OLTP appliances in the near future; but, for now, the leading DW appliance vendors are making their own moves:

- **IBM is gearing up appliances with its recent Netezza acquisition.** Although, IBM has offered balanced configuration units (BCUs) for data warehousing for years, it didn't offer a specialized server to support DWs similar to Teradata, EMC Greenplum, or Oracle Exadata. However, with the acquisition of Netezza, IBM now delivers an appliance solution that is likely to put pressure on Oracle's Exadata, Teradata, and Microsoft SQL Server PDW. IBM is ramping up its marketing efforts and is offering significant discounts to lure customers. In addition, we believe that IBM will roll out an OLTP database appliance based on DB2 and the Netezza platform over the next 12 to 24 months.
- **Microsoft is ramping up its appliance offering with SQL Server PDW and partners.** Microsoft, through its acquisition of DATAlegro, now offers a scalable DW solution called SQL Server PDW along with its partners Bull, Dell, EMC, HP, and IBM. Although SQL Server PDW is a good start for Microsoft to address large DWs, there are currently not too many DW deployments that are larger than 20 TB in production. But this is likely to increase as adoption picks up. Forrester believes that Microsoft along with its partners will offer an OLTP appliance in the coming years.
- **Teradata offers a strong DW appliance but none for OLTP.** Although Teradata has a strong adoption in the DW appliance market, it doesn't offer an OLTP appliance. According to Forrester interviews, most enterprises that use Teradata like its integrated appliance solution that scales extremely well to address high-end data warehousing market. Forrester doesn't see Teradata entering the OLTP appliance market any time soon because it lacks the technology and expertise needed to play in this market.
- **SAP offers a credible DW appliance.** Sybase Analytic Appliance — which includes Sybase IQ Analytics Server, Sybase ETL, Sybase PowerDesigner, and Sybase Appliance management console — is preloaded and configured on an IBM Power Series machine. Sybase IQ has also partnered with HP to offer a reference architecture in which HP hardware is optimized for data-intensive business intelligence (BI) workloads.<sup>1</sup> SAP also offers a business warehouse (BW) accelerator. Although, SAP has primarily focused on a DW appliance, with the acquisition of Sybase, it could enter the OLTP appliance market, partnering with HP or IBM.

### Exadata Case Study: Australian Financial Group Consolidates Its Oracle Databases

Established in 1994, Australian Financial Group (AFG) is one of the largest providers of mortgage broker services in Australia, offering more than 800 financial products. With more than 2,200 active members throughout Australia, AFG processes more than \$2 billion mortgage financing every month. Forrester spoke with Holden Lai, IT manager at AFG, to find out about its Oracle Exadata implementation.

Lai claimed that AFG was running a mission-critical Siebel customer relationship management (CRM) application that would've eventually faced performance issues because brokers were moving from a mobile to web client, resulting in an increased workload for the database, application, and

web servers. Instead of adding more storage and memory to the existing database infrastructure (SUN Fire T2000 on a T1 processor with eight cores and 32 threads and Oracle 10.2.0.4 on Solaris), AFG elected to run Siebel on a quarter Oracle Exadata rack running Oracle 11.2. AFG used Real Application Testing (RAT) and SQL Performance Analyzer (SPA) to ensure that the Oracle Exadata upgrade was tested thoroughly to ensure acceptable performance. Lai claimed that Oracle Exadata:

- **Delivers improved performance.** Broker commission payment processing that took more than 37 hours, now took less than 9 hours running on Oracle Exadata. AFG reported that performance improved 8x on average for the Siebel application at the database level without any major tuning with Exadata. According to Lai, “Our users told us that there was a notable performance improvement.”
- **Provides database consolidation opportunities.** AFG has run Siebel since the first week of July 2010, Oracle Business Intelligence Enterprise Edition (OBIEE) since mid-July 2010, and Oracle EBS since September 2010 on Oracle Exadata in production. Lai claimed, “Oracle Exadata quarter rack has only been less than 10% busy with Siebel, OBIEE, and Oracle E-Business Suite applications, which creates a huge opportunity to store many more applications without impacting performance.” AFG plans to consolidate more applications in the future. This will include Oracle Fusion Incentive Compensation, Hyperion, and Oracle Enterprise Content Management (ECM).
- **Shares system resources intelligently.** Lai claimed that with Oracle Exadata, you can easily prioritize resources allocated to databases and workloads. Although AFG wasn’t experiencing resource issues, it wanted to ensure that as workload increased, it gave priority to its top databases.
- **Requires little additional training.** Lai pointed out that very little training was required for Oracle Exadata. “Oracle training team gives us a day training on Exadata which included storage and system administration, which was good enough for us to manage the appliance,” Lai said.
- **Provides very good support.** AFG had no issues migrating from an older release to Oracle Database 11g Release 2 on Exadata, which took three months. Lai claimed that Oracle advised his team on the initial planning and testing of Siebel, and AFG did not require any additional support.
- **Is highly available.** Lai said that AFG found the Oracle Exadata platform to be very stable and reliable. AFG performed several successful failover tests to ensure continuous availability of the Siebel application.

### Exadata Case Study: Sogeti Overcomes Oracle E-Business Suite App Performance Issues

Sogeti USA is a provider of IT services to businesses and public sector organizations. Operating in 23 US locations, Sogeti helps customers develop, implement, and manage practical IT solutions to help run their business better. Forrester spoke with Manohar Reddy, IT manager at Sogeti, to learn about its experience with Oracle Exadata.

Sogeti had critical performance issues with its Oracle EBS that ran on a SUN SPARC Enterprise T5240 Server on Solaris with six processors (dual core) and 6 GB of RAM for the database server to support more than 3,000 users. The application response times affected business operations, including the company's global offices in India. Furthermore, users couldn't access the system when batch jobs ran for 2 to 3 hours because it used to consume most of the system's resources. To solve the performance problem, Sogeti looked at various options and chose the Oracle Exadata half rack with four database nodes, with 2.8 TB of memory and 50 TB of storage. Sogeti went live on Oracle Exadata V2 in July 2010. Overall, Sogeti runs database instances on a single Oracle Exadata half rack. The Oracle EBS Exadata database is front-ended by two application servers running on SUN T5240 with 8 GB of RAM, which remains the same as the previous implementation used. Reddy claimed that Oracle Exadata:

- **Delivers improved performance.** Performance improved dramatically for both batch and OLTP workloads on the Oracle EBS application. Today, at peak times, there are more than 1,000 concurrent users using the Oracle EBS to support projects, employees, and field operations. Batch processing that previously took 70 to 80 minutes on average shrank to 10 minutes with Oracle Exadata. Some other batch jobs that ran 30 minutes were down to 5 to 10 minutes. In addition, cloning the database from production to test, which previously took 8 to 9 hours, can now be done in less than 30 minutes.
- **Is easy to migrate.** Sogeti was previously running Oracle Database 10g on Solaris SUN Server and migrated to Oracle Database 11g Release 2 on Oracle Exadata; Oracle Linux with the Oracle Application version remained the same at 11.5.10. Sogeti used the traditional export and import Oracle utility to migrate, which it completed over a weekend. Sogeti claimed that there were no major issues or tuning efforts required to achieve better performance on Oracle Exadata.
- **Has capacity to spare.** Unlike previously when the Oracle EBS system ran close to 100% CPU utilization, Sogeti sees only 5% to 10% utilization among the six database instances with Oracle Exadata. According to Reddy, "We have seen a vast improvement in our performance and system utilization efficiencies that previously were unachievable." Unlike other Oracle Exadata implementations, Sogeti chose to run Oracle EBS production and test instances on the same Exadata appliance. Reddy pointed out, "We wanted to leverage the entire appliance for Oracle EBS. Therefore, having test and production instances on the same appliance helped us to optimize the Exadata resources more efficiently. Each of the instances has a different data and software location on the storage, so they don't interface with each other." Sogeti plans to move the production DW, which is about 1 TB, on the same half-rack Exadata appliance.
- **Improves productivity.** Reddy claimed that Oracle Exadata improved Sogeti's administrative productivity. Although Sogeti was unable to provide us with any quantifiable numbers with regards to productivity gains, it claimed to have reduced database administration requirements when comparing Oracle Exadata with its older system. Sogeti had plans to hire more personnel for the administration of its Oracle EBS application environment, but now will defer them because of improved manageability.

## RECOMMENDATIONS

### ORACLE EXADATA SHOULD BE PART OF YOUR DATABASE STRATEGY

Oracle customers looking for extreme performance, improved database availability, or a consolidation platform should consider Oracle Exadata. Because Oracle Exadata comprises standard Oracle Database 11g software, the migration risk of moving to Oracle Exadata is low. In addition, Oracle has additional components and hardware redundancy to ensure higher levels of availability. Enterprises looking at Oracle Exadata should:

- **Understand the overall cost.** Enterprises should understand the overall cost, including long-term costs. Estimated prices for Oracle Exadata are: \$300,000 for the quarter rack, \$500,000 for the half rack, and \$1 million for the top-of-the-line full rack. The Oracle Exadata price does not often include Oracle database or Oracle Real Application Cluster (RAC) licenses. However, Oracle does allow customers to migrate their existing database licenses to the Exadata environment. Therefore, understand the total cost of ownership over a period of four years.
- **Start small and grow.** Oracle offers three configurations for Oracle Exadata — a quarter, half, and full rack. These options give customers the flexibility to start small and grow, choosing the option that best fits their requirements. We find that many enterprises start out with two quarter Oracle Exadata racks, one for production and the other for nonproduction environment such as test and development of applications.
- **Consolidate databases more easily.** For enterprises that have hundreds and thousands of Oracle databases, Oracle Exadata may be a viable platform to consolidate databases to optimize system resources and lower IT cost.
- **Reduce manageability effort.** A key advantage of Oracle Exadata like any other appliance is the streamlined management of tuning, backup and recovery, optimization, availability, and security. Firms will manage one appliance rather than multiple servers. Oracle Exadata comes with a balanced number of processors, cache, and storage to prioritize and manage performance.
- **Consider it for a nonproduction environment as well.** Besides production environments, some Oracle customers use Oracle Exadata for nonproduction environments such as test, development, and staging to better provision database instances easily. Oracle Exadata can support many small to moderate-size database; creating a new database instance often takes minutes because of already preconfigured storage, servers, and memory.
- **Test applications, especially large and complex ones.** Although Oracle Exadata is likely to improve performance because of flash cache, faster processors, and optimized storage, consider running an internal benchmark to gauge your performance levels, especially for very large and complex applications that run into tens of terabytes of database size or support more than 1,000 concurrent users.

- **Face no major migration issues.** Oracle Exadata doesn't require any major migration effort when moving from Oracle Database 11g Release 2, but it would require a typical migration effort from older versions. Typically, most enterprises use the Oracle export and import utility or cross-platform transportable tablespaces to unload and load data when migrating to Exadata. Because Oracle Exadata mostly uses standard Oracle features such as Oracle RAC, Automatic Storage Management (ASM), and Advanced Compression, migrations are usually not a major concern.

## WHAT IT MEANS

### ORACLE LEADS WITH EXADATA BUT OTHER VENDORS ARE LIKELY TO CATCH UP

Although Oracle has the lead for now with Oracle Exadata, which does both OLTP and DW workloads, IBM and Microsoft are likely to deliver similar offerings over the next 12 to 24 months. Before looking to migrate to an Oracle database mainly because of the Exadata platform, check with your current DBMS vendor to determine its appliance road map.

## ENDNOTES

- <sup>1</sup> For more details on data-intensive BI workloads, see the February 10, 2011, "[The Forrester Wave™: Enterprise Data Warehousing Platforms, Q1 2011](#)" report.