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**SUPERCLUSTER**

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# Oracle SuperCluster:
# The High Performance Engineered System for Data Center Transformation

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## Executive Overview

In increasingly competitive global markets, CIOs and IT departments are seeking to improve operational efficiencies in order to gain a competitive advantage over their industry peers. By leveraging cloud infrastructures, on-demand services, and the ability to more rapidly deploy and manage business applications, corporations can extract cost out of IT while dramatically improving the performance and service levels of their offerings. In general, businesses are looking for increased agility and flexibility at a lower cost for their data centers. They are looking to improve service levels for internal and external consumers of IT at lower capital and operating expenditures, and believe that moving toward cloud offerings will help them reach those objectives.

Oracle's engineered systems are designed, tested, and integrated to allow customers to derive value by deploying fully integrated stacks without the complexity, time, and cost of assembling point products. The Oracle SuperCluster is an engineered system that delivers extreme levels of efficiency, cost savings and performance for the consolidation of mission critical applications and the rapid deployment of cloud services. Oracle SuperCluster impacts all tiers of the data center, and enables businesses to reduce their operating expenses, including costs to assemble, test, deploy, maintain, upgrade and debug their infrastructure. In summary, Oracle SuperCluster offers customers a fully virtualized and integrated system to run all enterprise applications with dramatic improvement in price/performance, delivering significant Total Cost of Ownership (TCO) benefits. This paper will explore in greater detail how Oracle SuperCluster offers higher service levels for applications and enables customers to run cloud services right "out of the box," including Database Clouds.

# Introduction

Oracle SuperCluster is a complete enterprise cloud platform for database and application consolidation.  Customers can benefit from accelerating the performance of Oracle Databases, middleware, and business applications on an integrated platform while speeding time to deployment and ensuring high levels of reliability and uptime. Oracle SuperCluster (Figure 1) sets the standard for business application solution deployments: maximizing customer value in a complete and tested offering.
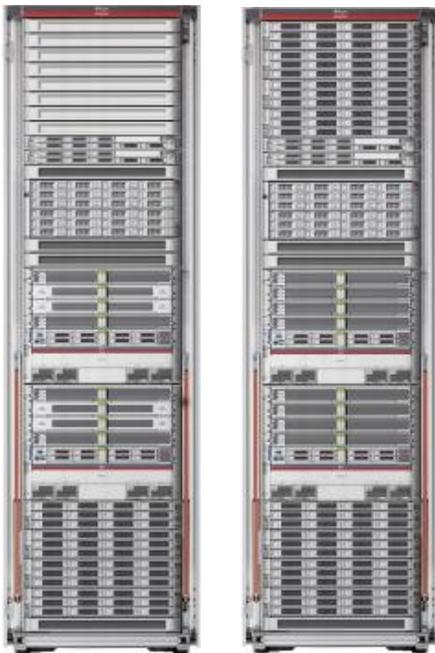


Figure 1. Oracle SuperCluster T5-8 in Half Rack and Full Rack configurations

The Oracle SuperCluster engineered system integrates Oracle SPARC hardware, the Oracle Solaris operating system, virtualization, storage, networking and systems management into a unified platform that delivers extreme business results.

The Oracle SuperCluster engineered system integrates the following Oracle technologies:

- SPARC T5-8 and SPARC M6-32 servers

- Oracle Solaris 11 and Oracle Solaris 10 operating systems

- Oracle VM Server for SPARC virtualization

- Oracle Solaris Zones

- Oracle Exadata Storage Servers and Exadata Storage Server Software

- Oracle ZFS Storage Appliance

- InfiniBand QDR networking

- Oracle Enterprise Manager Ops Center 12$c$

- Oracle Exalogic Elastic Cloud Software (Optional)

- Oracle Solaris Cluster (Optional)

Together, these components enable customers to quickly deploy apps-to-disk solutions that provide the highest performance, security, and manageability with the lowest TCO. Oracle SuperCluster offers lightning-fast improvements of up to 10x on data compression, queries, OLTP response times, and Java middleware performance. Delivered tested and ready to run, these systems can be deployed in days, not months, and include special enhancements unique to this Oracle product offering that cannot be replicated by other vendors or assembled separately by customers. To date, Oracle has helped customers realize the value of SuperCluster by moving off IBM and HP systems and can assist customers with migrations to this integrated solution that drives down capital and operating expenditures.

"Oracle SuperCluster was the ideal solution to consolidate database, application, and web of KED's over 20 complex business systems including HP. After consolidation, we were able to dramatically reduce our TCO in terms of floor space, power, and enjoyed excellent performance and increased work efficiency, laying the foundation for revenue creation."

**Nomoon Myung, IT Service Center Director, Korea Enterprise Data**

## Value of Oracle SuperCluster

Oracle SuperCluster is well suited for multi-tier application deployments and data center consolidation. The integrated approach of the Oracle SuperCluster solution will appeal to organizations seeking to reduce cost of operations, improve service delivery levels, and drive out complexity in the datacenter. Oracle SuperCluster enables customers to deploy cloud and virtualization technologies with a solution that integrates seamlessly into existing data centers. Existing applications can transition smoothly to Oracle SuperCluster and customers can grow and expand capacity as their compute requirements grow. Customers with existing applications running on Oracle Solaris 10, Oracle Solaris 9, and Oracle Solaris 8 can continue to run Oracle SuperCluster, meaning that over 11,000 ISV applications can run on this platform. Further, Oracle continues to develop Oracle Optimized Solutions and use cases around Oracle SuperCluster so that customers can gain a better understanding of the best and most optimal ways to incorporate the solution into their data center operations. To date, a wide range of enterprise applications including Oracle E-Business Suite, Oracle PeopleSoft, SAP, and Java Middleware applications, such as Oracle WebLogic Server, have been demonstrated to run better and more cost effectively on Oracle SuperCluster. The key business benefits of Oracle SuperCluster are described in the subsections that follow.

### Extreme Efficiency for Consolidation

**Faster Time to Service Delivery**

Oracle's integrated approach with Oracle SuperCluster allows customers to install and run applications and business services much faster than acquiring, assembling and cabling all the pieces together separately. Each Oracle SuperCluster engineered system is the same, allowing an integrated stack to be delivered tested and ready to run and deploy in a matter of days or weeks, as opposed to months. Customers receive the identical configuration that is used by Oracle engineering and there are no unique configuration issues or complex options to troubleshoot. Therefore, Oracle SuperCluster arrives not only as a highly optimized, integrated platform to run existing database, middleware, and customer applications, but it is also easily supportable because all systems are the same. This high degree of integration means no errors in cabling, no issues in hardware compatibility, and built-in redundancy for network, storage, server and connectivity.

Connectivity to other systems and storage in the customer's existing data center can be achieved over the integrated 10GbE Ethernet NICs included in each SPARC server compute node. This allows for a gradual migration to Oracle engineered systems by supporting connectivity to existing SAN storage.

Optional Fibre Channel connectivity is available to facilitate migration of data from legacy storage subsystems to the Oracle Exadata Storage Servers integrated with the Oracle SuperCluster.

**Seamless Upgrade Path to Expand as Requirements Grow**

Customers deploying enterprise solutions are frequently looking for the ability to expand and increase computational power in the future without disrupting current operations. For years, Oracle Sun enterprise-class servers have provided the capability to upgrade compute and memory capacity within the chassis as business needs dictate. Oracle SuperCluster has taken a similar approach, enabling customers to initially invest in a half-rack configuration and expand to a full-rack with additional compute nodes and storage servers when desired, or incrementally add up to 4 Exadata Storage Servers for extra storage capacity.  Additionally, multiple Oracle SuperCluster systems can be cabled together and connected to Exadata Storage Expansion systems for larger deployments.

For situations where customers are not ready to upgrade or migrate to Oracle Database 11*g* Enterprise Edition, the Oracle SuperCluster has the capability of incorporating fibre channel cards in the compute nodes to attach to existing storage and SAN infrastructures. This functionality can also be useful for moving data over to the Oracle SuperCluster when leveraging Oracle Database 11*g* with the Oracle Exadata Storage Servers for high performance database operation. However, Oracle SuperCluster does allow the ability to run other databases, including 3rd party products where it would be necessary to attach to those SAN environments for a longer period of time. The only caveat would be that performance would not be accelerated through the Oracle Exadata Storage Servers in the solution. Still, this can be a useful strategy for customers that are on a path to upgrade older Oracle Database instances to Oracle Database 11g and want to take advantage of the consolidation benefits and higher performance afforded by Oracle SuperCluster while completing the Oracle Database 11*g* upgrade.

**Extreme Efficiency for Cloud Services**

Oracle SuperCluster helps customers rapidly deliver Cloud Services "out of the box" and transition smoothly from decentralized siloed IT models into a highly efficient and flexible service delivery model. Oracle Optimized Solutions offerings like the Database-as-a-service Cloud provide the template that customers can leverage to reduce operating costs on aging assets while delivering a more flexible service environment to internal application users.  Customers can quickly deploy enterprise cloud services with 24x7 availability, secure multi-tenancy, and a radically simplified management, patching, and support model.  The result is an agile database environment that is better able to support business needs by enabling higher end-user productivity, increased utilization, and reduced IT costs.

Customers using Oracle SuperCluster for Cloud Services benefit from cloud governance and control using quote, retirement policies, and showback to allow end user organizations to understand their usage and make informed decisions.  Additionally, the use of Oracle VM Server for SPARC virtualization enables provisioning of databases and applications across a range of performance, capacity and availability attributes to cost effectively manage SLAs.  Databases can dynamically grow and shrink with evolving business needs and databases can be deployed 5x faster than a do-it-yourself approach, resulting in faster time to value and better return on investment.  Oracle's Cloud Services

offerings on Oracle SuperCluster deliver up to 4x better price performance than competitive solutions, lowering operating costs for increased profit margins.

## Extreme Cost Savings

**Reduced Cost of Deployment, Acquisition and Operation**

Oracle's engineered systems strategy is to deliver pre-integrated ready-to-run systems that reduce the cost and complexity of IT infrastructures. As a single-vendor stack, Oracle SuperCluster simplifies and reduces the costs associated with purchasing, deploying, and supporting IT environments. One of the biggest areas of cost savings associated with Oracle SuperCluster and engineered systems in general is derived from the ability of an IT organization to move applications and begin operating in a matter of days rather than weeks or months. Systems are tested by Oracle engineering before and after shipping and include a forty page test plan to ensure a seamless and easy process to rapidly deploy cloud services and consolidate Oracle Database and other business applications.  Customers already using Oracle SuperCluster talk about how it took them just three to five days to start using the solution versus the weeks and months required to unpack, rack, cable, test, configure and tune shipments of traditional servers. Further, customers can move into full production in just weeks from the time that the system is then up and running.  That time translates into cost savings and the ability for IT personnel to focus on other critical business problems or the next application implementation.

Additional cost savings in implementing Oracle SuperCluster come from Total Cost of Ownership (TCO) savings including both lower cost of acquisition and decreased operational costs. Reducing the quantity of server assets to run database/middleware and applications onto a single, unified and high-performance platform eliminates monthly spending on maintenance, power, cooling and space. Storage costs can also be significantly reduced when leveraging the storage available in Oracle SuperCluster with Oracle Exadata Storage Servers. Oracle Exadata Hybrid Columnar Compression and Advanced Compression in the database mean less data to store and ultimately less data to backup. Customers can reduce or eliminate the need to continuously add more and more expensive SAN-based storage, as storage is included in Oracle SuperCluster. Fewer systems and less storage to maintain also equates to a reduction in IT administrators required to maintain an environment. These assets can be repurposed to attack other key IT problems or work to provide further automation and cost savings in the data center. Another area of savings comes from the ability to save on the cost of licensing software. Oracle SPARC servers offer an advantageous Oracle software licensing multiplier compared to competing CPU architectures, and with Oracle SuperCluster, customers have the option to license only the amount of database that they are using.  Finally, Oracle SuperCluster helps customers realize cost savings by reducing risk. Oracle removes many variables around supporting heterogeneous deployments (patching, drivers, etc.) by delivering a unified, pre-engineered and pre-tested solution. The movement into cloud computing models of operation creates an opportunity for massive standardization, with self-service, metering, and charge-back capabilities. Oracle SuperCluster addresses the need for standardization and allows companies to show that IT services can deliver real monetary value to user departments.

**Simplified Operation With Unified Management and Patching**

One of the most critical aspects of successfully deploying and operating IT assets is systems management. Many customers are looking to begin building out internal private cloud deployments and Oracle SuperCluster fits perfectly into that strategy, as it is much easier and cost-effective to manage than traditional servers. Oracle SuperCluster includes Oracle Enterprise Manager Ops Center, which enables customers to provide comprehensive management for all hardware components and virtualization technologies in the stack. Oracle Enterprise Manager Ops Center (Figure 2) saves time and reduces complexity by allowing customers to manage the application stack in the same manner regardless of whether applications are deployed on physical or virtual machines. This facilitates consistent management practices and tools as well as improved management efficiency and a reduction in risk of operator error by trying to coordinate between multiple, disparate tools.
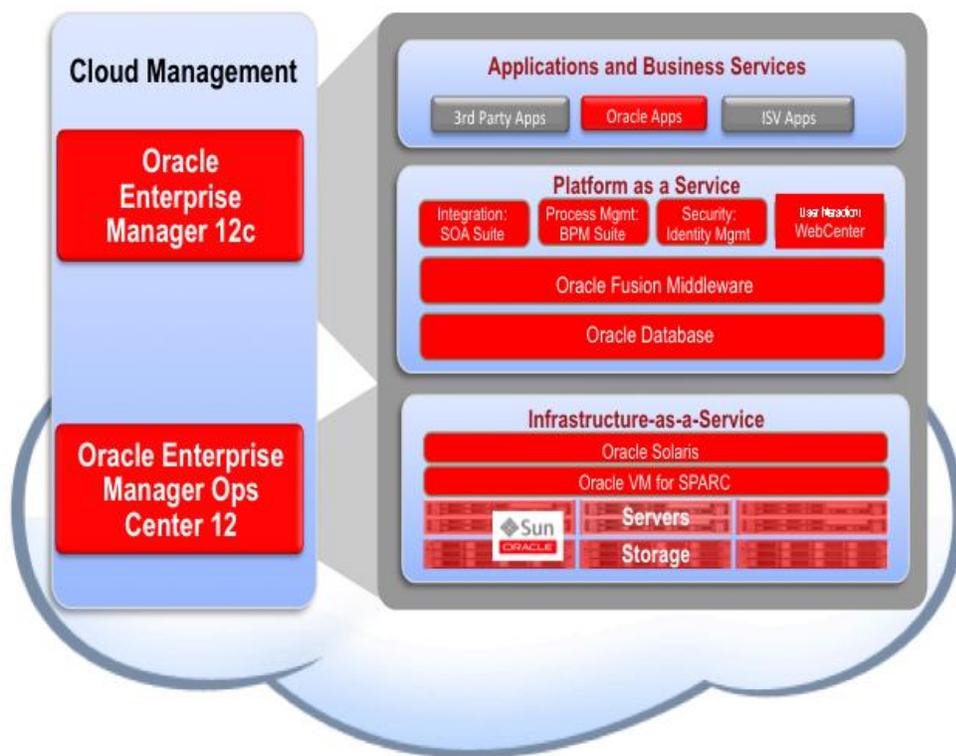


Figure 2. Oracle Enterprise Manager Ops Center simplifies management across physical and virtual machines.

Oracle Enterprise Manager Ops Center also provides the basic elements necessary for managing the lifecycle across the entire hardware infrastructure of Oracle SuperCluster. Customers can perform regular maintenance activities such as health checks, proactive support, and resource monitoring and measurement. Additionally, Oracle Enterprise Manager Ops Center provides powerful capabilities to manage virtual environments. Technologies such as Oracle VM Server for SPARC, Oracle Solaris Zones, and an intuitive GUI interface enable improved management of virtual machines.

Beyond Oracle Enterprise Manager Ops Center, customers will gain operational efficiencies though the unified patching and upgrading processes that are offered with Oracle SuperCluster. Unlike traditional server environments that require complex and frequently time-consuming patching and upgrade maintenance windows, Oracle SuperCluster is designed to offer a more seamless and integrated process around software and system updates. Embedded hardware diagnostic capabilities provide 'phone home' automated service requests. The standard and pre-tested configuration also enables proactive advice from Oracle Advanced Customer Services (ACS). Customers can mitigate risk and free up resources by removing the guesswork out of managing critical software updates, essential patches, feature enhancements, and new releases, as these are automated in Oracle SuperCluster. Upgrades and enhancements will be delivered pre-tested so customers can operate comfortably knowing that the entire system is managed and patched from a central point of service accountability.

**Improved Levels of Security Without Extra Cost**

With attempted electronic intrusion and theft at an all-time high, secure communications and data protection has never been more important. The SPARC servers used in Oracle SuperCluster support many more cryptographic operations per second compared to competing systems with dedicated cryptographic accelerator cards – all with minimal impact to system overhead. With cryptographic accelerators embedded into each SPARC processor, hardware encryption comes at no additional cost and enables IT organizations to run transactions more securely without a performance penalty or the added cost and complexity of acquiring additional hardware to perform encryption.

Oracle SuperCluster also includes superior security features at the operating system level to help administrators implement strong security policies. Oracle Solaris combines multiple security technologies, allowing it to monitor file integrity, verify user and process rights, and retain an audit trail of all system events. Protection against inappropriate use of network resources is provided through its secure default networking configuration, which disables many unused network services to reduce exposure to attack. Oracle Solaris also offers unique user and process rights management technology that reduces risks by granting users and applications only the minimum capabilities needed to perform their duties. No application changes are required to take advantage of these enhancements. For data security, system administrators can also detect possible attacks on their systems by monitoring for changes to file information. Oracle Solaris utilizes binaries that are digitally signed, so that administrators can easily track changes.

## Extreme Performance for Business Applications

**Engineered for Extreme Performance**

Customers are looking for scalable platforms with the flexibility to adjust to workload needs and deliver high performance for the consolidation of applications running on older hardware. Oracle's approach with engineered systems such as Oracle Exadata and Oracle Exalogic has been proven to deliver massive boosts in performance for database and middleware applications. Oracle SuperCluster combines the software from the Oracle Exadata and Oracle Exalogic solutions to offer the same level of performance improvement of up to 10x for Oracle Real Application Clusters (Oracle RAC) and Java

middleware. In addition, Oracle SuperCluster leverages SPARC servers and an InfiniBand unified server and storage network that enables users to experience a significant increase in performance and response times.

Oracle's SPARC servers have garnered performance benchmark world records. World record benchmark performance in database, middleware and every major application category demonstrates that SPARC servers in Oracle SuperCluster are capable of delivering accelerated performance and improved cost/performance across a broad range of workloads. In addition, Oracle's InfiniBand switches that are integrated into the Oracle SuperCluster deliver up to 5x to 8x the performance of standard networks, meaning data in the Oracle SuperCluster moves much faster than in traditional deployments.  The integration of Oracle SPARC servers, storage and networking products has been refined by hundreds of engineer years to ensure that Oracle SuperCluster delivers extreme performance right out of the box.

The real value in Oracle SuperCluster comes from the integration of the Oracle Exadata and Oracle Exalogic software stacks that have already demonstrated game-changing performance in Oracle's other engineered systems. With the integration of Oracle Exadata Storage, a full rack Oracle SuperCluster offers significant IOPS of storage performance and rapid query throughput, enabling databases and data warehouses to run faster and deliver quicker results than other platforms. Additionally, the optional Oracle Exalogic software has shown the capability to accelerate Java performance by up to 10x versus competing platforms.

The combination of all these elements into a single integrated and versatile package delivers outstanding results. Compared to an IBM Power 795 high-end system and IBM storage, the Oracle SuperCluster delivers 4x to 8x the price/performance, demonstrating the value of integrating software, server, and storage components.

**Highest Service Levels for Mission-Critical Applications**

Oracle SuperCluster includes built-in hardware redundancy, multiple I/O paths and advanced clustering technologies, providing mission-critical levels of availability for database and other 'always-on' business applications. These features address customer uptime requirements through hardware availability delivered via hot-swap capabilities and system partitioning options as well as through the predictive self-healing and fault management capabilities of Oracle Solaris. To address higher uptime requirements, Oracle SuperCluster features built-in availability at each level of the stack, including clustering capabilities. SPARC systems running the Oracle Solaris operating system have a solid reputation for reliability and include hot-swap and hot-plug components at the hardware layer and a layer of fault management provided by the operating system.  The entire system is tested with a variety of applications on an ongoing basis and patch sets are tested prior to release to customers.  All of these features and activities dramatically reduce the need for planned downtimes and lower the occurrence of unplanned downtime for the platform.

Use of Oracle Solaris Cluster enables greater levels of availability along with disaster recovery across all software tiers in traditional and virtualized data centers. Oracle Solaris Cluster is the clustering solution designed for Oracle Solaris and optimized to leverage the Oracle SuperCluster redundancy and reliability features. It provides built-in support for a large portfolio of applications and databases, with

a wide range of options for virtualized deployment based on Oracle VM Server for SPARC and Oracle Solaris Zones in Oracle SuperCluster configurations.

Oracle SuperCluster provides the perfect environment for deploying high availability clustering: pre-integrated hardware cluster and pre-tested platform: no errors in cabling, no issues in hardware compatibility. It includes built-in redundancy for network, storage, server and connectivity, seamless integration, and thorough testing with operating system and clustering software. Together Oracle SuperCluster and Oracle Solaris Cluster deliver the highest service level for mission-critical applications across all tiers of the data center.

Oracle Solaris Cluster is the only HA solution that integrates with Oracle Solaris at the kernel level. The resulting instant and load-resilient system failure detection allows recovery to start within a second. Oracle Solaris Cluster monitors the server nodes, storage, network components, operating system, virtual machines and applications running in Oracle SuperCluster. Its policy-based application-specific recovery actions can significantly reduce end-to-end services recovery time. This deep integration of Oracle Solaris Cluster with the Oracle SuperCluster engineered system delivers multi-node high availability and is extensively tested by Oracle to reinforce reliability and minimize downtime.

## Oracle SuperCluster Use Cases and TCO

This section highlights use cases for Oracle SuperCluster and explores some of the price/performance advantages for customers to consider when evaluating Oracle SuperCluster relative to other offerings. Oracle has already replaced many competing platforms with Oracle SuperCluster and is ready to assist customers with migrations. Across all use cases highlighted, the biggest benefit customers have experienced is the rapid time from initial system configuration to production. Several customers were running live in production in less than 1 month.

The use cases discussed below include:

- Oracle SuperCluster as the lowest cost and best price/performance platform to consolidate HP and IBM legacy platforms

- Oracle SuperCluster for high performance for broad enterprise application deployments

- Oracle SuperCluster as an optimal platform for consolidation of SPARC servers

### Use Case #1: Competitive Displacement of HP and IBM Systems

This use case recommends the Oracle SuperCluster engineered system as the lowest-cost platform for customers to consolidate existing HP and IBM servers running database, middleware and business applications. Many customers running these competitive systems are seeking to refresh their environment with more cost-effective platforms that are integrated, enable more control, and offer cloud-like operational models. Oracle SuperCluster presents a way to cost-effectively migrate off competitive platforms to a private cloud service offering while saving money in acquisition costs and

also achieving high levels of reliability through clustering functionality. Additionally, the versatile nature of Oracle SuperCluster means that it can accommodate not just the database or middleware layers, but also drive high performance for the Oracle or third party applications that may be hosted on those machines.

As an example, a large Pharmaceutical Manufacturer and Distributor in Latin America was seeking a consolidation solution for their implementation of Oracle JD Edwards EnterpriseOne SP12 and Oracle Database 9iR2 in a mixed system environment consisting of IBM UNIX servers, x86 systems and EMC storage. Oracle SuperCluster was presented as the optimal engineered system from Oracle to enable this customer to add additional workloads to their software stack while consolidating away from their existing mixed set of servers.

With Oracle SuperCluster, this customer experienced a 34x improvement in batch processing with Oracle Database 11*g* Release 2 connected to Oracle ZFS Storage Appliance in the Oracle SuperCluster. Oracle Database batch reporting improved by up to 153x and sales order processing resulted in a 2.5x improvement. The Oracle SuperCluster domain configuration was engineered specifically for their architecture, allocating the optimal CPU and memory resources for the Oracle Database domain and for JD Edwards. The customer benefitted from the rapid deployment time that Oracle SuperCluster affords, and expect a reduction in operating costs over time due to the transition to centralized management of an integrated solution with a single point of technical support for all components.

## Use Case #2: High Performance Applications Engine

As demonstrated previously in this white paper, Oracle SuperCluster incorporates many technologies that allow Oracle Database, Oracle Fusion Middleware and business applications to be accelerated in performance. From a business perspective, this equates to faster time to results, better decision-making and improved SLAs to internal and external stakeholders. The second use case for Oracle SuperCluster shows how it can be a super-fast engineered system for new application deployments spanning multiple tiers of the datacenter.

A large global technology manufacturing company evaluated Oracle SuperCluster as a new hosting environment for Oracle Database 11g, Oracle E-Business Suite, and Oracle Fusion Middleware. The customer evaluated Oracle SuperCluster performance to define the Proof of Value (POV) of a migration to Oracle Database 11*g* Release 2. Overall, performance testing showed an average performance improvement of 3x and a maximum of 5x versus the current environment. Oracle SuperCluster enabled this customer to achieve the objective of delivering higher performance for applications and database while simplifying their legacy systems with one platform that can integrate the database and applications tiers together.

## Use Case #3: SPARC and Solaris Application Consolidation

SPARC systems running Oracle Solaris have a massive installed base. To date, there are hundreds of thousands of installed SPARC systems running Oracle Solaris. For systems that are over 3 years old, there is an opportunity to drive operating cost savings while preserving investments and skillsets around the Oracle Solaris operating system. Oracle SuperCluster presents the most efficient way to transition from SPARC server assets and gain massive increases in performance while reducing cost

associated with deployment and maintenance. Oracle estimates that on average, a Oracle SuperCluster consolidation of older SPARC and Oracle Solaris assets enables customers to realize up to 5x improved TCO over a 5-year duration.

A large Telecommunications and Media corporation evaluated Oracle SuperCluster as a consolidation platform for their database and telecommunications applications running on SPARC servers. Oracle SuperCluster provided them the ability to combine their Oracle Database 11*g* Enterprise Edition installation with Common Core Calling Environment workloads. The single platform can now be centrally managed and allows for future growth and expansion via further consolidation. Their performance testing results demonstrated a 10x compression improvement and a 7x performance gain with compressed data for Oracle Database (OLTP). Additionally, Oracle RMAN helped increase I/O throughput by 5x and backups took only 1/5th the time. Finally, queries showed a 60x-90x improvement over their current servers.

## Conclusion

With the Oracle SuperCluster engineered systems, Oracle continues to demonstrate the power and potential of harnessing an entire stack of hardware and software products to deliver exceptional customer value and cost savings through a comprehensive, tightly integrated solution.

As demonstrated above, Oracle SuperCluster is an ideal consolidation solution for enterprises plagued by aging, legacy platforms as well as new application deployments where enterprises are looking to move towards private cloud models. Regardless of the situation, customers stand to benefit from huge gains in performance that will enhance and revolutionize the way they conduct business on a daily basis. Improved TCO via reduced acquisition and operating costs can be realized rapidly with Oracle SuperCluster by leveraging support from a single point of contact, lower cost of acquisition and software support, and a future-proof system that can be upgraded with minimal disruption to daily business operations.

Oracle SuperCluster is a powerful Oracle engineered system that delivers unmatched efficiency, cost savings and performance in a complete and tested package that offers rapid deployment and simple administration.

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