



An Oracle White Paper
September 2010

Trust Your Enterprise Deployments to the Oracle Product Stack:

The integrated platform that's been developed, tested
and certified to get the job done

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Introduction

Enterprise applications are the lifeblood of the organization. Indeed, companies of every size use Oracle's complete, open, and integrated enterprise applications to manage processes and resources, enhance customer relationships, adhere to regulatory requirements, reduce risk, and achieve superior results. Capabilities that were not particularly important a short time ago are now considered indispensable. For example, email, Web tools, and ordering systems are services that have moved from interesting to important to mission-critical over the last few years—and today problems with these services can bring a company's operation to a standstill.

Many of these applications and services are available over the corporate intranet and internet so that executives, employees, partners, and customers can interact, make decisions, and keep the business running. With more collaboration happening on a daily basis, and data volumes skyrocketing, organizations are being forced to rethink how they create, manage, extend, and ultimately deliver enterprise applications and information technology (IT) services with greater functionality and reliability. Now, it is more vital than ever that systems are designed and deployed rapidly and that they are virtually bulletproof to ongoing changes and updates.

Getting applications and services up and running—and keeping them that way—can be a time-consuming and challenging task. Many businesses attempt to create IT solutions utilizing a combination of independently developed and separately acquired products—sometimes called the *best-of-class* method. Although the benefits of using the latest top software for each application and service are apparent, these aggregated infrastructures frequently result in high-cost deployments and complicated systems that fail to provide the desired results. Moreover, new regulations dictating that systems must be upgraded and patched more frequently are introducing additional risks into IT operations. Clearly, a new approach is needed. Oracle's integrated technology stack is a suite of hardware and software that is designed, integrated, and tested to work together to make it easier and faster to develop, deploy, and manage enterprise solutions.

A Complete Hardware and Software Stack

Many IT organizations spend considerable time and budget trying to figure out whether or not applications work well together on a particular platform, with the necessary infrastructure, and at the appropriate patch level. Once this has been determined, they must then spend the time to integrate all these components into a production system. There is another way—Oracle's integrated product stack approach. (See Figure 1.)



Figure 1. Oracle's hardware and software stack is optimized for creating and running comprehensive enterprise solutions

Unlike vendors that simply offer a slice of what businesses need and leave integration efforts to others, Oracle offers enterprise database and applications software integrated with the underlying infrastructure to provide a full-featured, robust solution operating with maximum performance. Oracle's end-to-end solution stack includes Oracle's innovative servers and storage systems, the industry's only end-to-end virtualization portfolio, robust Oracle Solaris and Oracle Enterprise Linux operating environments, Oracle Database, middleware, premier enterprise applications, and industry-leading management tools. For years, Oracle has strived to integrate, test, and certify these technologies to work together to deliver the functionality, performance, security, and reliability companies can depend on to get the job done.

Proven and Tested to Work Right Out of the Box

Stability and robust functionality in the underlying IT infrastructure are key to the efficiency and performance of applications and services. Consequently, Oracle is resolutely focused on integrating the entire solution stack to work seamlessly as a single system. The company is committed to a sustained

program of extensive testing to ensure the stack is comprehensive and secure to meet the needs of today's dynamic enterprises. Oracle performs this testing on a range of systems and compute farms in several labs around the world.

Offering components in every layer of the solution stack, Oracle is the only company that can test the entire environment—from functional and compatibility tests, to validating entire configurations—and ensure solutions based on Oracle products deliver the performance and reliability enterprises need right out of the box. *Full Stack Tests* verify that the entire stack of hardware and software in various configurations functions and performs properly. *Patch System Tests* ensure that modifications and upgrades to any of the elements of the stack can be applied trouble-free, enabling IT staff to safely keep the systems current and running at peak efficiency.

Full Stack Testing

Validating the proper operation of solutions comprised of elements from each layer of the stack is essential to confirm that the software functions and performs as designed in real-world environments. Oracle Technology Integrated Stack Testing (OTIST) confirms that hardware and software components in typical enterprise configurations interoperate and perform well together. Select combinations of applications and platforms are tested to create reference configurations. Oracle fully qualifies each combination by testing the software and hardware stack as a unified solution, thereby reducing user testing time and deployment costs. Using these reference configurations, business managers have a pre-tested, viable starting point for a system architecture.

The systems used in OTIST are comprised of different Oracle Server hardware platforms, various enterprise storage solutions, and major Oracle software packages. Configurations include Oracle's Sun SPARC Enterprise M-Series servers, Sun SPARC Enterprise T-Series servers, Sun Fire x86-based servers, as well as multinode Real Application Clusters (RAC). Software includes the Oracle 11g R2 and 11g R1 Databases, Java EE Application Server, Oracle WebLogic Application Server, Oracle VM Server, Oracle's PeopleSoft Enterprise Campus, and Siebel Customer Relationship Management software, as well as other popular Oracle packages. A important aspect of this testing is the inclusion of emerging products such as high-speed network interfaces and innovative storage technologies that many users are considering.

OTIST ensures the integrated elements of the Oracle technology stack meet functionality, availability, and performance standards when subjected to fault and error events, and typical IT production events. Some of the key areas tested during OTIST include the following:

- **Upgrades.** Validates quality and performance following the installation of major and minor upgrades and patches to all software layers of the stack, including the installation of Oracle Solaris kernel and recommended patch clusters using Oracle Solaris Live Upgrade for upgrading to the next major operating system release.
- **Stress.** Establishes baseline quality and performance levels for each configuration using a series of performance load tests.
- **Faults.** Validates error diagnosis, reporting, and recovery of correctable faults, and validates diagnosis, reporting, and handling of uncorrectable errors. For systems with redundant components,

such as Oracle RAC, the testing verifies that the surviving nodes continue to run as expected without service interruption.

- **Interoperability.** Ensures hardware and software components in typical enterprise configurations operate together without problems.

By referring to the specifics of these full-stack test configurations, IT managers planning to develop new systems can access detailed information about the viability of Oracle products in their environment and learn how best to deploy them. Managers can determine the appropriate hardware platforms for their solution, the software versions to use, and whether virtualization technologies have been certified with the configuration. They can also learn about optimal configuration settings, the software updates that have been certified, and the risk of installing patches into existing production systems.

Patch System Testing

Many companies deploy legacy applications on multiple platforms, each running a different operating system, OS version, or patch level. For these IT organizations, it's important to ensure that all the enterprise applications function and perform properly with the platforms. Oracle Solaris Patch System Testing (PST) verifies that nothing breaks and key applications and infrastructure are working after a system patch is installed. PST certifies every patch to Oracle Solaris and Oracle SunCluster before they leave the factory, simplifying system management, increasing system availability, and helping assure customers that individual patches won't impact software already installed.

Two major test suites are performed as part of the PST on a wide variety of systems at multiple different patch levels. The Oracle Certification Environment (OCE) test suite and the Oracle Automated Stress Test (OAST) check the quality, robustness, and performance of systems in the following major functional areas:

- Operating system certification
- Clusterware validation
- Third-party cluster file system validation
- Virtualization technology validation
- Interconnect protocol validation

The PST team performs automated install and backout testing and comprehensive system testing including load and stress testing and performance regression testing. The OCE suite—designed to certify the operation of the Oracle Database 11g R2—contains up to 7,000 tests. The PST team performs regression tests on the majority of system functions over the course of several days. OAST performs a stress test on Oracle Database 11g R2 by running a simulated OLTP workload on the database for 24 hours. The test configures the database and the number of virtual clients based on the platform it is running on, checking that the newly installed patches do not adversely affect the systems operation or performance while running a real-world solution.

The combination of OCE and OAST reinforce IT managers' confidence to upgrade and maintain systems at the top level without fear that any of the fixes might adversely affect systems. While Oracle tests all software prior to release, it's impossible to test all configuration permutations, including third-party and home grown applications. Therefore, Oracle recommends that users test new patches in their specific environment prior to live deployment.

Running Oracle on Oracle

Oracle understands how critical it is to operate businesses on a solid and secure IT infrastructure. It is essential that our products enable us to design and deploy IT services as quickly and trouble-free as possible. Oracle is expanding the use of Oracle Solaris platforms throughout the company. Due to the exhaustive testing done on the product stack, Oracle is able to tune and optimize the user experience by resolving real-life deployment issues in-house.

Two areas where extensive Oracle Solaris deployments are continuing are in the Global IT (GIT) and Product Development IT (PDIT) departments. GIT is expanding the migration of Oracle's business back-end to Oracle's Sun technologies, including deploying more early releases of the software. PDIT is expanding their delivery capability of Oracle Sun products to the product developments groups. This brings Oracle Solaris to the front line of deploying new hardware and software and validates Oracle's deployment best practices.

Oracle Solaris 10—the Heart of the Stack

In today's fast-moving multinational economy, users can access applications and services from any location, at any time of day or night. Securely keeping those services up and running requires a solid foundation. The foundation of Oracle's enterprise technology stack is the Oracle Solaris operating system—the most robust, reliable, secure, and innovative enterprise operating system available to IT organizations running Oracle enterprise applications. With a single source base for SPARC® processor- and x86-based systems, Oracle Solaris combines key computing elements—operating system, networking, storage management, and user environment—into a stable, high-performance foundation that companies can depend on to deliver infrastructure solutions.

Incorporating innovative features, such as virtualization technology, broad hardware applicability, advanced storage management, rich security capabilities, extensive debugging and analysis tools, and more, Oracle Solaris is designed to deliver the power, flexibility, and availability necessary for small-scale to enterprise-wide computing. (See Figure 2.)

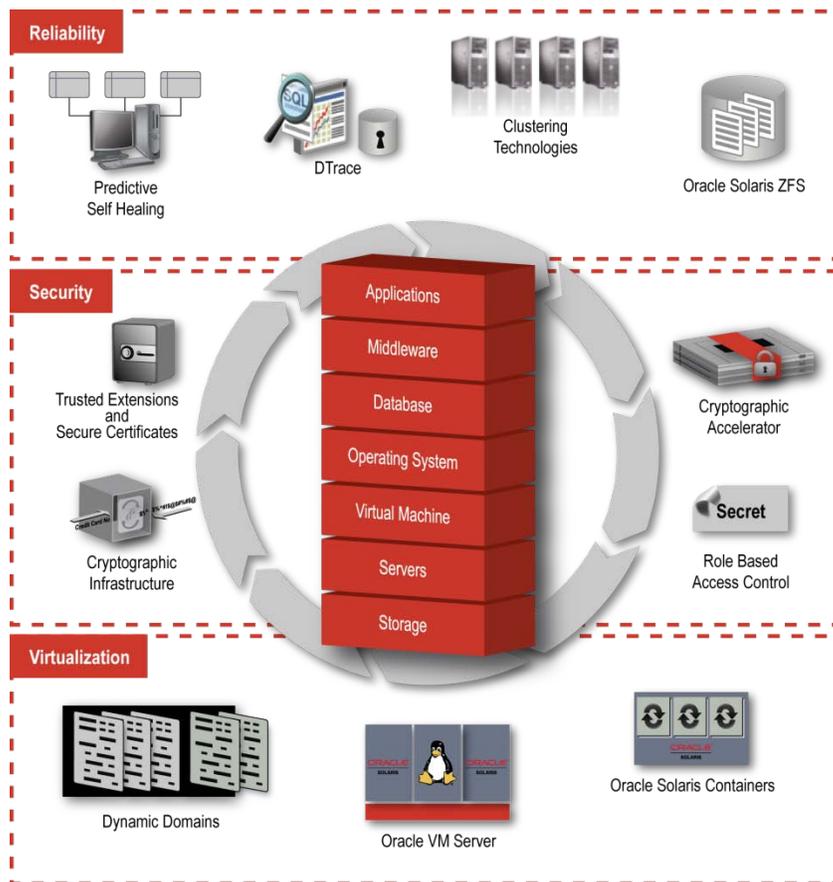


Figure 2. The advanced features of Oracle Solaris help optimize database environments

High-performance platform support

Oracle Solaris is supported on numerous SPARC® and x86-based systems, ranging from single-board blade servers to large-scale symmetric multiprocessing (SMP) servers—from all the major computer vendors. The OS is optimized to leverage the compute, networking, and security features of today's state-of-the-art processors, helping meet the demands of complex, multitier applications requiring enterprise-class performance and availability.

Oracle's Sun SPARC Enterprise® M-series servers include Oracle's highest performance and largest multiprocessor enterprise server delivering massive scalability, up to 64 processors (256 cores) and 4 TB of system memory to handle the largest workloads. In addition, Oracle's Sun SPARC T-series servers with chip multithreading (CMT) technology deliver new levels of performance for throughput-oriented applications while fundamentally changing datacenter economics in terms of space and power efficiency.

Reliability and availability

A key feature in Oracle Solaris is Predictive Self Healing—a technology that helps increase system and service availability by automatically detecting, diagnosing, and isolating hardware and software faults. This capability automatically aids recovery from not only system faults, but also the impact of application failures, through automatic component retirement and software restart, leading to increased system and service availability. Rather than providing a stream of error messages that can be difficult to decipher, Oracle Solaris Predictive Self Healing automatically initiates appropriate responses such as dynamically taking a CPU, a region of memory, or an I/O device offline before the component can cause a system failure.

For even higher levels of availability, Oracle Solaris Cluster is a solution that meets the challenges of delivering 24 x 7 availability and maintaining continuous business operations. It delivers up to 99.999% availability plus up to 15 times faster failure detection and 2 times faster recovery than HA systems from other vendors providing continuous business operations regardless of local or global disasters or planned or unplanned outages.

Virtualization

Oracle offers an entire portfolio of virtualization technologies and platforms. Oracle's Sun SPARC Enterprise M-Series servers are able to support as many as 24 electrically-isolated Dynamic Domains. Enabling the ultimate in massive server consolidation as well as application isolation, these hard partitions support multiple OS instances without the overhead of a hypervisor. Unlike domain capabilities from other vendors, Dynamic Domains can be reconfigured while the system is operating—one system board (socket) at a time.

In addition, Oracle offers a choice of finer-grained, more flexible virtualization alternatives that help reduce the number of OS instances and increase asset sharing among multiple applications. With Oracle Solaris virtualization, applications share a common infrastructure, lowering the number of resources required, simplifying administration, and reducing the total cost of ownership (TCO). Oracle Solaris Containers provides an OS-level virtualization capability that allows multiple applications to securely share the same OS instance—with very low overhead. The software virtualizes a single kernel instance, enabling thousands of independently managed entities that combine asset management and software partitioning for a solution that works on every server running Oracle Solaris. With Oracle Solaris Containers, users can consolidate large numbers of standalone servers resulting in substantial savings in capital and operational costs.

Storage management

A scalable high-performance file system, Oracle Solaris ZFS offers a dramatic advance in data management with an innovative approach to data integrity, near zero administration, and an efficient integration of file system and volume management capabilities. The key concept of Oracle Solaris ZFS is the virtual storage pool which decouples the file system from physical storage, allowing for much more efficient use of storage devices. Space is shared dynamically between multiple file systems from a single storage pool, and is parceled out of the pool as file systems request it. Not only can Oracle

Solaris ZFS manage traditional disk storage, it also seamlessly integrates enterprise solid state drives (SSDs) to improve application performance and operating efficiency.

Networking

Oracle Solaris significantly improves network performance without requiring changes to existing applications. It speeds application performance via the Network Layer 7 Cache and enhanced TCP/IP and UDP/IP performance. The latest networking technologies, such as 10 Gigabit Ethernet and hardware offloading, are all supported out of the box. In addition, Oracle Solaris supports current IPv6 specifications, high availability, streaming, and Voice over IP (VoIP) networking through extended routing and protocol support—meeting the business-critical needs of a growing customer base.

Security.

The leading-edge security features in Oracle Solaris help reduce the risk of intrusions, secure applications and data, assign the minimum set of privileges and roles needed by users and applications, and control access to data based on its sensitivity label. User management and process rights management capabilities and Oracle Solaris Containers work together to enable the hosting of hundreds of applications and multiple users on the same system. Administrators can use features such as Secure by Default to minimize and harden Oracle Solaris even more. In addition, Oracle Solaris with Trusted Extensions provides true multilevel security for the first time in a commercial-grade OS. Furthermore, the cryptographic framework provides a mechanism and an API whereby both kernel- and user-based cryptographic functions can be executed by the same optimized encryption software or transparently use hardware accelerators configured on the system. The framework brings the power of advanced, streamlined encryption algorithms and hardware acceleration to enterprise applications.

Tuning and optimization.

Oracle Solaris DTrace makes it fast and easy to safely identify performance bottlenecks on production systems. System administrators can use this feature to troubleshoot even the most difficult problems. Developers can use it to optimize applications to yield significant performance gains. What's more, IT staff can use the dynamic instrumentation and tracing capabilities in Oracle Solaris to monitor and troubleshoot the entire software stack. Oracle Solaris DTrace can be safely used on production systems—without modifying applications. It is a powerful tool that gives a comprehensive view of the entire system, from kernel to application. This level of insight reduces the time for diagnosing problems from days and weeks to minutes and hours, and ultimately reduces the time required to fix those problems

Application binary compatibility.

Oracle Solaris delivers binary compatibility from release to release and source compatibility between SPARC and x86 processors—backed up with the Oracle Solaris Binary Application Guarantee. And for the ultimate ease in conversion, use Oracle Solaris 8 and Oracle Solaris 9 Containers on Oracle Solaris 10, providing a *physical to virtual* way to quickly and easily run existing application environments on the latest systems.

One-Stop Support

Currently, Oracle spends over US\$3 billion annually for in-house research and development to ensure innovation and continuous improvement across the industry's most robust portfolio of complete, open, and integrated products. Against this backdrop, Oracle Support presents the most comprehensive support offering in the industry. As the recognized industry leader in support excellence, Oracle's award-winning team is focused on providing users with comprehensive, innovative, global, and proactive services.

With Oracle Support Services, users receive highly personalized, preventive services for the complete Oracle technology stack. No matter where companies are in the Oracle solution lifecycle—planning, implementing, upgrading, or production—Oracle Support Services help accelerate the value of Oracle solutions and maintain an agile, dependable IT infrastructure that lets users respond quickly to changing business priorities. With Oracle Support as a trusted advisor, businesses can get even more value from investments made in IT.

With experts that others turn to for leading practices in Oracle software implementations, Oracle knows how to best deploy enterprise solutions and optimize investments in Oracle products. Services teams and tools are tightly integrated across consulting, development, support, education, and global delivery, giving companies a single vendor to turn to should issues arise. With deep know-how in deploying, managing, and optimizing every layer of the hardware and software stack, Oracle Support Services deliver the expert knowledge needed to help companies improve performance, increase availability, and reduce implementation and deployment times.

Summary

In today's cost-sensitive, competitive environment, some companies struggle to survive, while others are using this opportunity to focus on cautiously planning for the future. Companies that gear up for tomorrow—while taking care of their current investments—will be in the best position to grow when normal economic conditions resume. Successful businesses know they must stay flexible and be prepared to take advantage of new opportunities. At the same time, they need to protect and maintain their technology investments under increasingly complex conditions.

With shrinking budgets and frozen headcount, today's IT and business line managers must be able to respond to a rapidly changing environment with comprehensive and indestructible IT solutions. They don't have the time or resources to research, evaluate, and integrate a full package from the plethora of available products. By leveraging the design and testing invested in the Oracle technology stack, managers can build a complete solution with confidence that it has been developed, integrated, and tested to work together.

For More Information

Information on the products and technologies discussed in this paper can be found at the following sources.

TABLE 1. LIST OF SOURCES FOR ADDITIONAL INFORMATION

TOPIC	SOURCE
Oracle Certification Environment Program	www.oracle.com/technetwork/testcontent/oce-fact-sheet-083596.html
Oracle Integrated Stack Testing white paper	www.oracle.com/technetwork/server-storage/solaris/documentation/integratedstacktesting-168417.pdf
Oracle Solaris operating system	www.oracle.com/solaris
Oracle Sun Servers	www.oracle.com/servers
Oracle Solaris: Virtualization	www.oracle.com/virtualization
Oracle Solaris: Reliability	www.oracle.com/us/products/servers-storage/solaris/reliability-066071.html
Oracle Solaris: Security	www.oracle.com/security
Oracle Solaris Training and Certification	www.oracle.com/us/education/selectcountry-new-079003.html
Oracle Services	www.oracle.com/services



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