

EMC SCALEIO

An Ideal Storage Foundation for Oracle RAC



Oracle Real Application Clusters (RAC) is one of the most prevalent distributed database management systems on the market today. Oracle RAC is a high-end product used for business-critical applications by many customers, including large enterprises, governments, education, healthcare, military and more. Providing an adequate infrastructure for Oracle RAC is a major priority for datacenter operators. Oracle recommends and sells an Oracle RAC platform named Oracle Exadata. Exadata is a high-performance database system that runs Oracle RAC on a pre-configured, integrated hardware-and-software platform. Exadata is a closed "black-box" system by design and does not allow customers any flexibility in terms of hardware or software beyond what Oracle ships pre-installed on the system. Furthermore, an Exadata system can only scale in large, predefined CAPEX increments, which greatly limits options for optimizing the system for specific customer workloads and needs.

EMC ScaleIO™ offers a cost-efficient, blazing-fast and scalable Oracle RAC alternative to Exadata. ScaleIO is software that creates a server-based SAN from local application server storage to deliver elastic and scalable performance and capacity on demand. ScaleIO converges storage and compute resources, scaling to thousands of nodes. ScaleIO combines HDDs, SSDs, and PCIe flash cards to create a virtual pool of storage with varying performance tiers. As storage and compute resources change, ScaleIO software automatically rebalances the storage distribution to optimize performance and capacity usage. ScaleIO is hardware-agnostic and is installed on physical and/or virtual application servers.

EASE OF DATABASE MIGRATION AND CONTROLLED COSTS

The ScaleIO architecture has been customer-tested with proven results that are superior to Exadata across the board in the areas of performance, cost, elasticity, versatility, manageability, and scalability. For customers considering a switch from legacy systems to Exadata, ScaleIO offers the benefit of utilizing existing servers in the datacenter and the ability to migrate existing databases without any database schema changes. Database schema changes are needed in order to take advantage of Exadata-specific database features. Unlike Exadata, which requires a "forklift" upgrade, ScaleIO can be installed on existing hardware, protecting investments in the data center ("brownfield deployment"). ScaleIO creates a platform for high-performance parallel database operation on commodity hardware, with an enterprise-grade feature set, at a much lower cost.

MASSIVELY PARALLEL SCALE-OUT ARCHITECTURE

ScaleIO is based on a scale-out block I/O architecture. As the number of nodes grows and data size increases, performance of the system scales linearly. When the deployed system grows in size and the requirements for processing power and storage capacity grow, nodes (and disks) can be added "on the fly," with no complex

HANDOUT

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upgrade procedures or interruption to normal business operations. Data is evenly distributed and automatically rebalanced in the background over the entire cluster, enhancing parallel I/O operations performance.

Oracle RAC operates best on shared super-fast block storage. This makes the ScaleIO multi-node converged cluster an ideal platform. The compute/storage converged nodes run both the Oracle RAC and ScaleIO software and provide a well-balanced parallel processing environment for both the database and storage. This architecture is better suited for high-performance, large-scale RAC deployments than the Exadata platform, as proven by lab test results.

ELASTICITY CONTRIBUTES TO FLEXIBLE GROWTH

Exadata is rigid. Customers are required to grow the configuration in large hardware CAPEX increments. The investment in such upgrades and the complexity of the process require customers to deliberately forecast and purchase much larger systems than they actually need in preparation for future growth. This approach translates to poor resource utilization and high cost, causing the business to acquire unused processing and storage capacity (as well as embedded Oracle licensing).

This costly approach is eliminated with ScaleIO where capacity is grown on demand and in hardware increments that the customer chooses. While Exadata requires customers to undergo a "forklift" upgrade when present system capacity is exhausted, ScaleIO facilitates growth in reasonable, flexible increments (for processing and/or storage) and never requires scheduled maintenance, downtime or data migration. ScaleIO is elastic. Capacity can be added, removed or shifted as the needs of the application change.

SELF-HEALING, SELF-MANAGED SYSTEM FOR EASY MANAGEMENT

ScaleIO is very easy to manage and administer. The system is capable of sensing changes in the deployment (errors or intentional modifications) and responds to them automatically, without human intervention. In particular, when capacity is added or removed (including in the case of disk failure), ScaleIO detects the change and automatically rearranges the data on the cluster so that it is evenly balanced, protected and optimized. Normal business operation is never stopped and unscheduled outages are avoided.

OPEN ARCHITECTURE AND COMMODITY HARDWARE

When deploying Exadata, customers are committed to a set of devices preselected by Oracle. This requirement represents a long-term commitment to Oracle as the sole supplier of all the components in the deployment. In addition, the Exadata license restricts customers to select applications, leaving them at a risk of support loss when installing any non-Oracle approved software.

No such restrictions exist with ScaleIO. ScaleIO does not depend on a particular brand/model of server, network or storage component; it is completely hardware agnostic. ScaleIO can be installed on a variety of machines from all major vendors and works seamlessly with all major types of storage, including HDD, SSD, and PCIe flash cards. ScaleIO runs over commodity Ethernet switches and does not require specialized Ethernet or other networking hardware. A mixed population of servers and disks can be incorporated into a ScaleIO deployment.

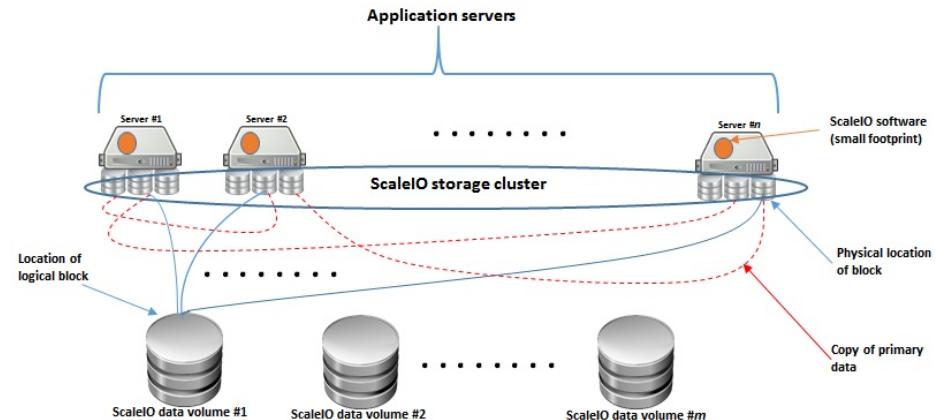
LOW TCO

ScaleIO is inexpensive to own and operate. With flexible deployment, the ability to leverage existing data center servers, ease of management and low cost/benefit ratios, ScaleIO's overall TCO remains low and affordable. The fundamental design of the ScaleIO high-performance database reference architecture guarantees that these rates remain stable and predictable, regardless of system size and growth rates.

SCALEIO ARCHITECTURE

ScaleIO uses application servers to form a storage cluster that consists of a collection of all the local disks on the servers. Data blocks are stored and logical volumes are distributed throughout the cluster. A single node or disk failure will not cause a volume to become inaccessible. Upon physical failure of a node or a disk, ScaleIO automatically rearranges the data by rebuilding and rebalancing the data on the remaining nodes.

The ScaleIO architecture commoditizes distributed storage and enables delivery of high performance to applications. This architecture allows for seamless, low-level aggregation of many disks across many servers in order to consolidate their IOPS and throughput.



ARCHITECTURE FEATURES

- Data is automatically striped across every available block device.
- High Scalability—When disks and servers are added, data is automatically rebalanced to improve performance without impacting applications.
- Excellent Performance—As data is spread evenly over the whole cluster, I/O operations are performed in parallel, facilitating maximum performance, which scales as the linearly as cluster grows.
- Self-managed, auto-optimized—There is no need for complex volume management.
- Resilience—ScaleIO is a fault-tolerant, highly available system. Faults are handled automatically without impacting I/O services.
- Elasticity—ScaleIO facilitates growth in small or large increments on demand. Capacity can be added or removed at any time with no impact on users.

SCALEIO VS. EXADATA

	EMC SCALEIO	ORACLE EXADATA
Growth	Ability to add resources as needed; Facilitates flexible growth at flexible increments without scheduled maintenance, downtime or data migration	Involves large CAPEX increments (1/4 to full rack); Requires "forklift" upgrades when capacity is exhausted
Flexibility	Elastic; Capacity can be added, removed or transitioned as the needs of the application change	Rigid
Scalability	Can scale to thousands of nodes if needed	Limited performance
Manageability	Can categorize and consolidate applications based on business characteristics (performance, criticality, etc.)	All applications "under one roof" and controlled through Oracle resource manager causing management overhead
Integration	Seamless integration into existing ecosystem; Not limited to running Oracle	Cannot load third-party management agents on Exadata due to warranty and support contract restrictions
Cost	Low in both CAPEX and OPEX; Servers can be repurposed as needed, creating investment protection	Very high

The requirements of high-performance database processing coupled with the needs for flexible storage make ScaleIO an optimal solution over Oracle Exadata. Instead of opting for an expensive solution with vendor lock-in, ScaleIO grows flexibly with your database performance requirements allowing you to maintain low costs over time.

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