Benefits of Deploying a Cloud to Deliver Database as a Service
Oracle Optimized Solution for Enterprise Database Cloud on SPARC SuperCluster
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Introduction

The National Institute of Standards and Technology (NIST) defines cloud computing as “a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.” For enterprises, cloud computing offers the promise of more closely aligning IT with business requirements. The ability to provide on-demand services, achieve elasticity, consolidate resources to improve utilization, track actual costs, and recover zombie assets all help to deliver on this promise.

Many people assume that cloud computing equates to server virtualization, but in fact it extends well beyond these capabilities, including higher level services like database and application services, user self-provisioning, and consolidated management, maintenance, and monitoring of the entire environment. The success of deploying a cloud-based model depends greatly on an architecture that can effectively address operational issues. According to a commissioned study on cloud initiatives conducted by Forrester Consulting on behalf of Oracle, companies that transition to a cloud model must focus on achieving operational simplicity:

“...organizations that resort to a complex maze of disparate tools and technologies — often provided by different vendors — often struggle to achieve their business objectives, as it results in an even more complex environment, causing further integration pains and operational challenges.” – Forrester Consulting, Enterprise Cloud: Lessons Learned From Early Adopters: An Analysis of the Experiences of IT Decision-Makers Involved in Cloud Projects, September 2012

As a leader in developing data-driven business solutions, Oracle understands how cloud deployments can enable IT to better align with business objectives through improvements in agility, quality of service, and cost savings. Oracle offers a number of cloud solutions that provide an integrated approach and comprehensive management to help enterprises transition to a cloud paradigm while avoiding the pitfalls highlighted in Forrester’s research.

This paper explores the benefits of the Oracle Optimized Solution for Enterprise Database Cloud—an Oracle solution designed specifically for quickly deploying a Database as a Service (DBaaS) cloud environment. While this document targets organizations that are deploying a private enterprise cloud (one built for internal use), the solution equally applies to service providers that are constructing cloud environments to host services on behalf of other businesses. A separate paper, “Accelerating Deployment of Enterprise Database Cloud Using an Oracle Optimized Solution,” describes the architecture and technical merits of the solution.

Why Implement an Enterprise Database Cloud?

The foundation of many applications is the underlying database that organizes, stores, retrieves, and protects application data. Throughout the application lifecycle—whether deploying new applications, enhancing existing ones, or testing updates—there is almost always the need to create, reconfigure, tune, and ultimately delete databases. If there are no available servers in the data center when a new database is required, IT must procure hardware platforms and integrate networking and storage components, designing in redundancy and room for growth. After installing and configuring hardware systems and components, administrators must then install, patch, and tune operating systems to support the necessary database and application infrastructure. Oracle Database and Oracle Real Applications Cluster (RAC) software releases must be
installed and configured before database administrators can finally load data and enable access. The entire process can take days, weeks, and even months, negatively impacting user productivity and delaying the pursuit of strategic business goals.

Over time as applications and supporting databases are implemented, the IT landscape can become dotted with multiple deployment silos, often over-configured to address peak workloads or recurring spikes in demand. Beyond the costs of acquiring hardware, software, storage and networking, there are ongoing maintenance and support costs that can proliferate as these server and storage components multiply and the complexity of the landscape increases. As a result of server sprawl and over-provisioning, traditional database deployments typically exhibit underutilized systems and evidence of cost inefficiencies.

Shifting to a cloud-based delivery model dramatically changes database rollout and management, and by extension, the associated applications and business processes that leverage databases. Implementing a DBaaS cloud transitions organizations to an approach in which users can easily provision, consume, and comprehend the costs of services they use, allowing Line of Business managers to predict IT budget requirements for new projects more accurately. Figure 1 illustrates the steps in a traditional deployment model and contrasts this IT-driven process to the user-driven database cloud model.

Figure 1. Traditional database provisioning can take days or weeks compared to only minutes for users to self-provision.

Enterprises that deploy an enterprise database cloud typically benefit from:

- On-demand, self-service database provisioning, often using just a few intuitive browser screens for database creation. Provisioning is frequently reduced from days or weeks to minutes, as illustrated in Figure 1.

- Predefined database service templates or configuration definitions that allocate resources (from a consolidated and shared resource pool) to meet quality of service goals.
• Fine-grained metering of database and resource usage that enables reporting of costs for a variety of metrics. Organizations can report back to users the cost of the services that they consume or implement a full chargeback model in which users or departments pay for specific services they use.

• Implementation of standard technologies and best practices to reduce costs and increase reliability.

These advantages contribute to lower operating costs, along with better and more flexible services. As a result, it reduces the tendency for parts of the business to “go it alone” and create independent environments that don’t use standardized IT practices or scale well into the future.

Advantages of the Oracle Optimized Solution for Enterprise Database Cloud

The Oracle Optimized Solution for Enterprise Database Cloud provides a rapid and compelling solution to deploy a database cloud. The solution uses the Oracle SPARC SuperCluster, an engineered system that incorporates enhancements for Oracle Database deployments, and an existing or newly installed implementation of Oracle Enterprise Manager 12c, which supplies functionality for self-service database provisioning and cloud management via its Cloud Control feature. Together, the SPARC SuperCluster and Oracle Enterprise Manager 12c bring the following significant advantages to DBaaS cloud deployments.

Rapid Deployment of Database Cloud

As an engineered system, the SPARC SuperCluster reduces the effort required to plan, architect, build, optimize, and test a database cloud environment, greatly shortening the time it takes to deploy a cloud services delivery model into production. The SPARC SuperCluster is a high-performance and high-capacity system that is optimized, pre-built, and ready to configure for database services. Table 1 highlights how using this Oracle engineered system reduces the level of administrative effort and eliminates many time-consuming steps that are otherwise necessary to construct a database cloud infrastructure from scratch.

<table>
<thead>
<tr>
<th>EXAMPLE “FROM-SCRATCH” DATABASE CLOUD</th>
<th>ORACLE OPTIMIZED SOLUTION FOR ENTERPRISE DATABASE CLOUD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware and Virtual Server Setup</td>
<td>Hardware and Virtual Server Setup</td>
</tr>
<tr>
<td>1. Configure hardware, networks, storage from scratch</td>
<td>□ Done! Hardware pre-installed and configured</td>
</tr>
<tr>
<td>2. Configure domains (e.g., Oracle VM Server for SPARC)</td>
<td>□ Done! Oracle VM Server for SPARC domains configured</td>
</tr>
<tr>
<td>3. Install operating system and patches (e.g., Oracle Solaris 11)</td>
<td>□ Done! Oracle Solaris 11 installed and configured</td>
</tr>
<tr>
<td>4. Create virtual servers (e.g., Oracle Solaris Zones) to support databases</td>
<td>© Supplied scripts create Oracle Solaris Zones to meet configuration requirements</td>
</tr>
<tr>
<td>Storage Setup</td>
<td>Storage Setup</td>
</tr>
<tr>
<td>1. Allocate storage and optimize it to meet data security requirements and required database performance</td>
<td>□ Done! Oracle Automatic Storage Management provisioned on Oracle Exadata storage cells for optimal database performance</td>
</tr>
<tr>
<td>2. Design and build in redundancy for network fabrics and for storage devices</td>
<td>□ Done! All SPARC SuperCluster storage and InfiniBand networks are preconfigured for high availability</td>
</tr>
<tr>
<td>Software Setup</td>
<td>Software Setup</td>
</tr>
<tr>
<td>1. Install and configure management software (e.g., Oracle Enterprise Manager 12c)</td>
<td>□ Only Oracle Enterprise Manager 12c discovery required</td>
</tr>
<tr>
<td>2. Use Oracle Enterprise Manager 12c to install Oracle Database 11g and Oracle Real Application Clusters (RAC) software</td>
<td>© Supplied scripts provision Oracle Database 11g and install Oracle Real Application Clusters (RAC) software</td>
</tr>
</tbody>
</table>
The SPARC SuperCluster allows enterprises to leverage a database cloud architecture and operating model that Oracle has already developed and tested, rather than requiring them to build the architecture from scratch. This is particularly valuable to organizations that are new to a cloud services paradigm.

**Standardization of Database Services**

The combination of SPARC SuperCluster and Oracle Enterprise Manager Cloud Control 12c enables standardized database services that feature consistent availability, scalability, performance, and chargeback attributes. After the infrastructure is installed, on-site staff use provided scripts to configure Oracle Solaris Zones on database domains to achieve the isolation of database workloads. In addition, administrators define a set of database service templates for use by self-service users of the database cloud.

After the solution is installed and properly configured, a user can select a pre-defined service template and the management infrastructure then automatically provisions a database instance—an approach that ensures the consistency of delivered services and frees up IT staff from time-consuming and repetitive administrative tasks. The cloud deployment model allows development teams to receive access to services rapidly and easily while making sure delivered services conform to organizational standards for software stacks and hardware configurations. This improves supportability, reduces variation, and regulates the use of enterprise best practices to protect data integrity, increase availability, reduce administrative overhead, and minimize human error. IT staff can also more precisely manage resource allocations, enforcing quotas to control system and storage utilization so that business-critical databases get the resources that they demand.

**Rapid Database Provisioning and Improved Agility**

Once the database cloud is set up and ready for use, self-service users request and receive database services in a fraction of the time otherwise required, enhancing productivity, business agility, and quality of service. In a traditional model, a service request typically follows a number of steps that require extensive planning and manual setup. If the request occurs when resources are not readily available, IT may need to purchase and provision new assets, which introduces significant additional delays. Self-service provisioning eliminates the need for parts of the business to install their own databases that might deviate from IT standards for hardware, operating systems, database, and patch levels and increase overall risk and costs.

**Flexibility to Support Varying Database Workloads**

At the center of the Oracle Optimized Solution for Enterprise Database Cloud, the SPARC SuperCluster features configuration flexibility to meet a wide spectrum of database needs. Because of this flexibility, a single system architecture can supply different degrees of availability and performance to address different enterprise workload requirements, including:

- Flexible resource allocation requirements, including varying allocations of compute threads, memory resources, network bandwidth, and storage capacities.

- Database availability characteristics, including Oracle single instance, Oracle RAC 2-node, and Oracle RAC 4-node configurations.

- Temporary needs like those associated with development, testing, quality assurance, training, or similar functions. Once databases that support these workloads are no longer needed, they can be automatically deleted, making those system resources available to support other database service requests.
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- Intermittent spikes in database workloads, such as those that occur for seasonal transactions or at certain business intervals. The solution allows database environments to expand and contract by dynamically or even by programatically allocating additional resources during these business cycles. With a traditional deployment of separate database servers, all servers need to be sized to support peak workload needs. In contrast, the database cloud solution allows sizing for typical workloads with a much smaller amount of excess capacity held in reserve and allocated to meet periodic or occasional demand.

Access to different configuration choices is readily available to end users through service templates and self-provisioning. The elastic nature of a database cloud allows the required services to be available on short notice, aligning IT functionality more closely with changing business requirements.

Lower Costs through Consolidation

Consolidation is a natural outcome of making the transition to an enterprise database cloud. Typical IT environments contain separate systems running Oracle Databases, each dedicated to different business initiatives, projects, or departments, with development (DEV), quality assurance (QAS), and production instances (PRD) often required for each. The result can be a complex, cumbersome landscape characterized by low utilization.

By taking advantage of integrated virtualization technologies in the solution, a variety of DEV, QAS, and PRD database instances can be safely co-located. Consolidation on the SPARC SuperCluster eliminates the need to deploy, manage and support separate dedicated hardware and software environments for each project's development, testing, production, and failover environments. Consolidation helps to reduce total cost of ownership (TCO) through more effective management of capital acquisitions, improved utilization, and streamlined management. However, the benefits of deploying the Oracle Optimized Solution for Enterprise Database Cloud go far beyond consolidation and lower TCO—the solution simplifies the complexities of managing a cloud infrastructure and provisioning database instances within it, reducing the time it takes to deploy database services and improving the quality of service.

Reduced Risk and Service Continuity

The Oracle Optimized Solution for Enterprise Database Cloud takes the guesswork and risk out of deploying a database cloud environment. It is a comprehensive solution that is optimized, tested, and validated to reduce the risk of deployment problems, interoperability issues, and unplanned downtime.

The solution's SPARC SuperCluster system features full built-in redundancy—from compute nodes to storage, network switches to network interface cards (NICs), and power distribution units (PDUs) to power supplies—to provide continuous availability for mission-critical databases. Oracle RAC enables transparent database deployment across all servers in the SPARC SuperCluster system, providing database fault tolerance in the event of hardware failures or planned outages.
Understanding the Oracle Optimized Solution for Enterprise Database Cloud

Deploying a database cloud introduces new and powerful capabilities that radically simplify and enhance how database infrastructure is provisioned and managed. To deliver these capabilities, the Oracle Optimized Solution architecture brings together Oracle Enterprise Manager Cloud Control 12c and the Oracle SPARC SuperCluster system (Figure 2). The solution takes advantage of the comprehensive management tools in the full Oracle Enterprise Manager 12c product family, including the Cloud Management Pack for Oracle Database. Oracle Enterprise Manager 12c provisions and manages database services, while the SPARC SuperCluster provides a high-performance platform for running Oracle Database instances.

![Oracle Optimized Solution for Enterprise Database Cloud](image)

Figure 2. Major components in the Oracle Optimized Solution for Enterprise Database Cloud.

This combination creates a complete cloud lifecycle management solution that allows administrators to set up, manage, monitor, support, and retire database services, supporting management activities that extend from applications to disk.

Comprehensive Service and Support

Oracle offers a complete portfolio of services to help businesses get the most from their investments and successfully implement this Oracle Optimized Solution for Enterprise Database Cloud. The Oracle SPARC SuperCluster Start-Up Pack helps site administrators and management develop and optimize a deployment plan. Additional SPARC SuperCluster services offerings are available to address the full lifecycle of this engineered system and the Oracle Optimized Solution for Enterprise Database Cloud.

Oracle’s support services provide a single point-of-service accountability so that deployments can benefit from consistent, integrated support for the complete Oracle solution stack. Oracle Premier Support provides complete system coverage, 24/7 access to Oracle system specialists, essential product updates, rapid-response hardware service, and a gateway for personalized, proactive IT support. Oracle Platinum Services is a special entitlement available to those Oracle Premier Support customers that run certified configurations on Oracle engineered systems like the SPARC SuperCluster. The program allows these customers to access additional, valuable support services under existing support agreements without incurring additional cost.
In addition to the core support services provided under Oracle Premier Support, qualifying Oracle Platinum Services customers also receive:

- 24/7 Oracle remote fault monitoring for around-the-clock fault reporting
- Industry-leading response and restore times, including 5-minute fault notification, 15-minute restoration, and rapid escalation to Oracle development teams
- 30-minute joint debugging sessions with Oracle development engineers
- Patch deployments four times per year

In addition to start-up services and 24/7 global support for both software and hardware, Oracle provides unrivaled technical expertise in its world-class services and consulting organizations, helping companies to optimize solutions and more closely align IT services with business objectives.

Summary

The complexity and inefficiencies of data center landscapes are an ongoing challenge for data-driven businesses. The pre-engineered Oracle Optimized Solution for Enterprise Database Cloud allows IT staff to transition quickly to a cloud paradigm, helping IT to consolidate systems to achieve efficiencies, accelerate database deployment, and become more agile and responsive to business needs. Allowing consumers to provision their own databases (within bounds set by quotas and service policies) improves productivity for both administrators and users.

By taking advantage of this Oracle Optimized Solution architecture and its end-to-end management capabilities, IT can bring together multiple database workloads on a high-performance, highly scalable, highly available system with a compact data center footprint. Development, test, and production databases can be safely consolidated and yet remain isolated from one another, while enhancing the overall quality of service for database applications.

The Oracle Optimized Solution for Enterprise Database Cloud creates a pre-validated infrastructure, allowing enterprises to move to a database cloud service delivery model and realize the benefits of intuitive cloud management, fast database performance and provisioning, workload scalability, and fewer day-to-day management headaches. The end result is that IT can smoothly transition to a database cloud model and deliver readily available, reliable, and secure database services—where and when they’re needed in support of strategic business objectives.
For More Information

For more information on Oracle’s technology stack and the deploying an Oracle Optimized Solution for Enterprise Database Cloud on SPARC SuperCluster, see the references in Table 1.

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Hardware and Software, Engineered to Work Together