

An Oracle White Paper
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Oracle Database Cloud Service

Executive Overview

The Oracle Database Cloud Service provides a unique combination of the simplicity and ease of use promised by Cloud computing and the power, productivity and robustness which are the hallmarks of Oracle technology.

The Oracle Database Cloud Service is built on Oracle Database technology, running on the Oracle Exadata Database Machine, the best performing database platform in the world. The Database Cloud Service has three main components – RESTful Web service access, which allows access to the data in your Database Cloud Service through simple URIs, Oracle Application Express, for creating and deploying all varieties of applications in a browser-based environment, and a set of business productivity applications that can be installed with just a few clicks.

These components deliver a set of key benefits –

- Simplicity – in provisioning, development, deployment and pricing
- Portability – to any platform that supports the Oracle Database, in a public or private Cloud
- Enterprise strength – through the power of proven Oracle technology and
- Productivity – for your IT staff and business users

The Oracle Database Cloud Service supports the Oracle Java Cloud Service, providing the full power of Oracle SQL and PL/SQL for Java application deployment in the Cloud.

The Oracle Database Cloud Service gives you the benefits of the Cloud and the robustness of Oracle, integrated into a single easy-to-use offering.

This white paper provides an overview of the Oracle Database Cloud Service.

Introduction to the Oracle Database Cloud Service

Cloud computing is a model of computing that offers several significant advantages -

- **Ubiquity** – Cloud computing is available everywhere through the Internet. A wide variety of platforms, from desktops to tablets to mobile devices, can access Cloud computing resources.
- **Elastic** – Cloud computing resources can expand and contract as needed, with a pay-as-you-go model which increases cost efficiency.
- **No acquisition cost** – Cloud computing is deployed as a subscription service, which means no acquisition costs for hardware or software.
- **Low ongoing costs** – Most standard maintenance operations are handled by the Cloud provider, reducing the amount of time required within your business for maintaining a computing stack.
- **Simplicity** – Computing infrastructure, which normally requires frequent attention, disappears into the Cloud, allowing for simple provisioning, modification and maintenance of IT environments. In addition, combining an entire computing stack into a single Cloud offering reduces the complexity of costing.
- **Increased access to information** – Although this benefit is sometimes not specifically called out for Cloud computing, increased access to information and empowerment of users is the key to the qualitative benefits provided by the Cloud. Users are able to produce more value from their data based on increased flexible access to that data, allowing the data to be combined with their domain expertise to produce real and important business benefits

The Oracle Database Cloud Service delivers all of these advantages.

- You can get access to your Oracle Database Cloud Service through any browser on any platform.
- The Oracle Database Cloud Service comes in several sizes, based on a simple storage and transfer metrics.
- There is no initial cost to acquire an Oracle Database Cloud Service.
- The Oracle Database Cloud Service has a single subscription cost, which includes all standard maintenance operations and Oracle Support.
- You can provision a complete Database Cloud Service environment in a few minutes and immediately start to be productive. The Oracle Database Cloud Service includes simple administrative tools that allow you to monitor usage, add and drop users, and modify your subscription package with a simple interface.
- The Database Cloud Service includes a wide variety of end user tools, including development wizards and flexible interactive reporting. Most importantly, the Database Cloud Service offers rapid application

development and instant deployment, which allows developers and users to work together in real time to create optimal solutions for business needs.

In addition, the Oracle Database Cloud delivers three overall benefits.

- First, the Database Cloud Service gives you the ability to quickly develop data-based applications, and refine these applications into truly mission critical systems.
- Secondly, the Oracle Database Cloud Service, available as a part of the Oracle Cloud, is completely transportable. The Database Cloud Service is built entirely on Oracle Database technology, so you can store your data and run your applications anywhere an Oracle Database runs – in the Cloud, in your data center, or even on your laptop.
- Finally, the Oracle Database technology used for the Database Cloud Service is the standard for scalability, robustness and enterprise strength. You can trust the Oracle Database Cloud Service, based on years of proven capabilities.

Key components

The Oracle Database Service is composed of several components which provide functionality and benefits.

Oracle Database

The Oracle Database has been the standard for enterprise databases for more than two decades. With the Oracle Database Cloud Service, you get the full power of this legendary platform. You can use the same SQL for data interaction that is used for hundreds of thousands of enterprise applications. You can use PL/SQL, the procedural extensions for the Oracle Database, which has been the foundation of application development for more than 20 years. All the optimizations and data structures which make the Oracle Database the most robust database in the world are available in your Database Cloud Service.

The Database Cloud Service is used by the Java Cloud Service for all data operations. This support allows you to deploy Java applications with the Java Cloud Service without limiting your use of the enterprise-strength Oracle Database.

The Oracle Database Cloud Service uses a shared schema architecture, which allows this full transparency while still providing efficient use of database resources. The Oracle Database is, at its core, a multi-user system for sharing data, so the Oracle Database Cloud Service simply uses the capabilities built up for the Oracle Database to share resources among multiple Database Cloud Service customers.

Oracle Exadata

The Oracle Database Cloud Service runs on Oracle Exadata hardware – the most advanced database platform in the world today. Oracle Exadata uses a variety of techniques and technology to dramatically improve the

operation of the most time-consuming database operations. You get all the benefits of Oracle Exadata with your Oracle Database Cloud Service. These performance enhancements are delivered transparently, so you get the best of both worlds – terrific performance without having to master complex tuning or development strategies.

RESTful Web services

RESTful Web services are services which adhere to an architecture which implements interactions with data sources through the use of URIs. RESTful Web services are one of the standard methods for accessing data in the Cloud.

The Oracle Database Cloud Service includes the ability to use RESTful Web services to access data in your Oracle Database. The Database Cloud Service includes a RESTful Web service wizard, which makes it easy for you to create services which implement any SQL statement or PL/SQL procedure to supply data to applications.

The RESTful Web service wizard lets you simply define a few attributes for a service and then use the full power of SQL and PL/SQL to perform database operations. By default, the wizard returns data in JSON format, although you can use PL/SQL to format data in any way. In addition, the wizard gives you the option of some more complex formats, such as the ability to return of data from a result set with embedded links to a more detailed view of the data in the complete row, without any additional coding.

The support of RESTful Web services in the Oracle Database Cloud Service make it easy to use the data in your Oracle Database in virtually any development tool, including dynamic languages.

Oracle Application Express (APEX)

Oracle Application Express, commonly referred to as APEX, is a robust rapid application development that has been included with the Oracle Database for more than 7 years. APEX gives developers the ability to create applications in minutes. Once development is complete, the applications are instantly available, allowing for a process of interactive development where developers work with users to quickly create and refine applications to achieve business goals.

The process of application creation with Oracle Application Express can take advantage of a wealth of wizards, which simplify and accelerate development. You can also extend APEX applications to meet your specific business needs with PL/SQL, so the range of functionality you can implement is virtually unlimited.

These features mean that Oracle Application Express provides both extremely high levels of productivity for creating standard applications and the ability to create sophisticated mission critical applications. There are more than 200,000 Oracle Application Express developers across the world, creating thousands of production applications. There are thousands of Oracle Application Express applications in production throughout the world,

scaling to support user communities of more than 200,000 users and millions of page views a day for some individual application installations.

Oracle Application Express includes a range of user productivity features, such as interactive reports, which let business users shape the analysis and presentation of their data without having to involve development or IT staff. End users can also create websheets, which act like data-driven wikis, giving them full control of their business applications.

Oracle Application Express also includes capabilities for managing your data structures and user communities, as well as functionality to help teams of developers manage their projects and communications.

In addition, the simplicity of the Oracle Cloud means lower costs for your own IT staff. Universal access to the components of the Oracle Cloud through a browser dramatically simplifies the maintenance overhead for your Cloud-based solutions. Applications delivered through the Oracle Cloud can be accessed from a wide variety of client platforms, including Windows, Apple or mobile devices.

Oracle Application Express and your Oracle Application Express applications are built on technology that resides within an Oracle Database, so all your applications can be easily run on any Oracle platform – from the Oracle Database Cloud Service to your in-house data center to Oracle Database XE on your laptop.

Built-in applications

The Oracle Database Cloud Service includes a set of business productivity applications which can be installed with just a few clicks. These applications are full production versions designed to provide real functionality, such as project management, shared calendars and shared checklist management.

All of these applications share the user identity pool for the overall Database Cloud Service, so you do not have to define and maintain users for each individual application. All of these applications share the same privilege levels of administrator, developer and user, which grant differential access to functionality and features. All of these applications can be installed or removed through the same simple administrative interface.

In addition to these pre-packaged business applications, the Oracle Database Cloud Service will support third party applications which share the same infrastructure and user pool. All third party applications will go through a validation process to insure the safety of the application and the protection of user data in the Oracle Database Cloud Service environment.

Tools and utilities

The Oracle Database Cloud Service includes a variety of tools and utilities which make it easy for you to use the environment. The Database Cloud Service includes browser-based tools for monitoring and modifying all your

Services from a central management page. You can create users across all your services with a simplified interface to Oracle's Identity Management solution. You can even upgrade your service from this environment for more storage and data transfer with a few clicks.

Each individual Service also has a browser-based management console to provide a more detailed look at resource utilization and to install or remove business applications with a few simple clicks. The Oracle Application Express environment contains a set of administration applications which let administrators shape and monitor the environment. You can assign administrative responsibility for a one or more services to an individual, giving you complete delegation capabilities to match your organization.

The Database Cloud Service includes two utilities to manage the underlying Oracle Database and its structures. SQL Workshop is a browser-based component of the Oracle Application Express environment which give you the ability to browse and manage all your Oracle objects, run SQL or PL/SQL code, run scripts and even build queries through a graphical interface. SQL Developer gives you the ability to interact with your data and data structures as well as import and export data.

Key attributes

The Oracle Database Cloud Service uses the features and functionality of Oracle technology to provide a number of key benefits for Cloud users.

Portability

There is no question that the Cloud offers a very attractive value proposition of no initial capital expenditure, low ongoing pay-as-you-go cost model, and rapid provisioning. Although the Cloud is highly appropriate for many scenarios, including development environments, test environments and production environments, there are frequently situations where a public Cloud will not be acceptable, due to organizational or business reasons.

Some Cloud vendors only offer their solutions as part of a public Cloud. This limitation not only reduces the scenarios when you can use their public Cloud offerings, but do not provide any protection for your investment if you should desire to leave their environment for any reason.

The Oracle Database Cloud Service is built on the Oracle Database, and is completely portable to any platform that supports an Oracle Database. If you need a mixed environment, with development and deployment spread across public and private Clouds, you will not have any issues with using the Oracle Database Cloud Service as part of this target environment. Most importantly, if changing conditions force you to move your target platform, the Oracle Database Cloud Service will allow you to take your data and applications with you.

Performance

Performance metrics for Cloud-based services have a different evaluation scale, since the overall time added for a request must include the potentially variable time needed for transmission of the request and its response.

Depending on Internet traffic and a variety of other factors, the overall elapsed time for a request can easily vary by seconds. However, the core performance of the underlying database is still a major factor in overall performance, since this operation is be the key component of overall response time.

The Oracle Database has been delivering outstanding performance for decades, for all sizes and varieties of workloads. Most Oracle performance features are implemented transparently, so you get the benefits of these features without having to use any specific implementation techniques or tactics. Although there are dozens of performance-centric features in the Oracle Database, a few of the most noteworthy are –

- Multi-version Read Consistency (MVRC) – Multi-version Read Consistency is a locking strategy that prevents database writers from blocking read operations, and database readers from blocking write operations. Elimination of this type of contention removes one of the key performance roadblocks in a multi-user world of data usage, as well as insuring a consistent view of data at a single point in time.
- World class query optimizer – The Oracle optimizer has been refined over decades to deliver optimal performance for all types of queries, from simple reads and writes to highly complex analytic and data warehouse-style queries, ensuring maximum performance for your data requests.
- Multiple types of indexes – The Oracle Database supports multiple types of indexes, so you can choose an index type which can most benefit your particular use case.
- Materialized views – Materialized views provide pre-computed aggregates, eliminating the need for the Oracle Database to perform these calculations at runtime. The Oracle Database will even transparently use materialized views to satisfy queries, allowing you to benefit from this feature without modifying your SQL.

Finally, the Oracle Database Cloud Service runs on the Oracle Exadata Database Machine, which sets a new standard for database performance. Unique technologies such as Smart Scan and storage indexes provide unparalleled performance for large queries, and the addition of processing power and memory in the Exadata Storage Servers provides an added boost for performance.

No other database in the world can match this combination of performance features, and no other Cloud-based database service provides all these features in a single offering.

Availability

One of the chief benefits of Cloud computing is the universal access provided by the cloud, but this access is completely dependent on the availability of the cloud service itself. The Oracle Database Cloud Service uses a variety of proven features which are a part of the Oracle Database and the Exadata platform –

- To protect against all failures, the Database Cloud Service includes backup procedures which conform to strict industry best practices. These best practices for protecting your data are implemented transparently, without any intervention or effort on your part¹.
- To protect against disk failures, the Oracle Database Cloud Service uses triple mirroring of all data. This data mirroring automatically provides access to a copy of your data, even if two disk drives fail simultaneously.
- To protect against server failures, the Database Cloud Service uses Oracle Active Data Guard, which uses a standby database in a separate physical machine.
- To protect against node or instance failures, the Oracle Database Cloud Service uses Real Application Clusters, which automatically fails over to another instance in the event of a failure. Oracle Clusterware monitors the health of each node and its instance and implements failover operations transparently, without the need for any operator intervention.
- The Oracle Database even provides flashback capabilities, which allow you to see your data as it existed in the past, allowing you to rapidly recovery from user errors, such as inappropriate data deletion.

The entire Oracle Database Cloud Service is built with Oracle's Maximum Availability Architecture and its best practices, the industry leading architecture for high availability.

Security

Data security is one of the key concerns for any public cloud. The Oracle Database Cloud Service is built on the foundation of the Oracle Database, time tested for data security and integrity through decades of use and dozens of successful security validations.

The Database Cloud Service uses shared schemas to isolate data in a Service. Schemas have been used to isolate user data in Oracle Databases for decades, and the Oracle Database Cloud Service has been built from the ground up to prevent willful or accidental schema violations with best practices and limitations.

The overall Database Cloud Service and its components are protected in a number of important dimensions

- The Oracle Cloud infrastructure has protections at several levels, including Apache and WebLogic, against Denial of Service attacks.
- The Oracle Application Express development and deployment environment has many features to protect the integrity of Oracle Application Express applications, including
 - The use of bind variables throughout the environment to prevent SQL injection
 - The ability to turn on Session State Protection, which prevents URL tampering

¹ You also have the ability to download your entire database and your applications through the included utility at any time.

- Item types to protect against client-side modification (Protected and Hidden), cross site scripting (Display as Text), and functions to allow for easy validation that incoming strings are Web-safe and do not contain characters used in malicious scripting attacks
- The ability to set password policies, including the use of strong passwords

In addition, the data stored in the Database Cloud Service is protected with Oracle's unique Transparent Data Encryption (TDE), which encrypts data whenever it is stored in the database or in backup files. TDE protects data from malicious use, even in backups, while not requiring any modification in SQL or PL/SQL code.

Key benefits

The Oracle Database Cloud Service is a rich Cloud-based offering with a broad range of features and functionality. At the highest level, the benefits provided by the Database Cloud Service fall into four main categories -

- **Simplicity** – The Database Cloud Service is simple to provision, simple to administer and simple to use to develop and deploy all types of applications. This simplicity of use is complemented by a simple pricing structure, based on only two metrics of storage and data transfer.
- **Portability** – The Oracle Database Cloud Service is built and deployed with standard Oracle technology that can be easily moved to any platform that supports an Oracle Database – in the Oracle Cloud, your own organization or an individual laptop. This portability means that you are not trapped into a single proprietary platform – you can develop and deploy to suit your business needs.
- **Enterprise strength** – The Oracle Database Cloud Service is built on Oracle technology, the standard for enterprise strength for decades. For the Oracle Database Cloud Service, simplicity does not limit capability, flexibility or functionality.
- **Productivity** – The key benefit of Cloud computing is empowerment, which allows your organization to use its IT resources more effectively. The entire Database Cloud Service powers your productivity, from your developers to your administrators to your business experts. Everyone benefits from the richness of the Oracle Database Cloud Service.



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