

White Paper

Bringing Oracle Autonomous Database into the Datacenter with Oracle Cloud@Customer

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IN THIS WHITE PAPER

A major challenge for modern enterprises is that of database maintenance and administration; that of tuning the database, making decisions about data placement and indexing, updating the software, and applying patches. These activities consume a tremendous amount of staff time, and some, such as security patching, are so disruptive that they can't be performed as often as would be optimal. Increasingly, managed cloud database providers are offering many if not all of these services as part of their packages. Oracle's very comprehensive offering, covering all the bases listed above, is called Oracle Autonomous Database, and has enjoyed great success.

But many enterprises are not ready to move critical database workloads to the cloud. In some cases, this is because of legal, contractual, or regulatory constraints, and in others it is because the databases involved are too intimately associated with other systems that are running in the datacenter on the premises (on-prem). This white paper looks at the issue of deploying a self-managing database system, and considers a product from Oracle that overcomes the basic problem of delivering a self-managing, self-administering database on-prem. Oracle Autonomous Database is now available as an on-prem service through either Oracle Autonomous database on Exadata Cloud@Customer or on Dedicated Region Cloud@Customer.

SITUATION OVERVIEW

Making a self-managing database run on-prem in a customer datacenter on customer selected and configured servers and storage is a nearly impossible proposition. This is because in order to provide complete support for automated database tuning and administration, the service must have complete control not only of the database itself, but of the hardware on which it runs. This is a problem for enterprises that must maintain databases on-prem. Such enterprises have applications that are operationally interdependent, and may transmit their data to various targets, including other applications and data warehouses. It is simply impractical to move all those applications to the cloud at once, yet moving them piecemeal can present operational challenges, as they need to be in constant communication. There are also cases where customers cannot move data to a public cloud due to data sovereignty/data residency, legal, or business policy requirements—and, as such, keeping data within their datacenters and/or a local public cloud region is a must.

One way to deliver a self-managing database on-prem is to take a cloud on-prem approach; setting up an environment in the datacenter that matches that of the public cloud environment, and delivering a

self-managing database in that environment. Ideally, for those who need to keep all their data on-prem for now, but plan to move some data transparently from an on-prem cloud infrastructure to an identical one in a local public cloud, a facility should deliver identical cloud services on-prem and in the public cloud environment.

Any approach that involves some third party solution to this problem for Oracle Database is problematic. Running Oracle Database in a generic cloud environment is sub-optimal, because it lacks the specific characteristics needed for robust performance, security, and ease-of-management. If the on-prem databases are running on Oracle Exadata Database Machine currently, the benefits of that platform—which is designed to deliver optimal performance, net incremental capabilities pertaining to machine learning, and extremely high data compression rates—are lost in moving to a generic cloud platform. For all the reasons mentioned above, a step-wise migration may be difficult, but if Oracle Database is involved, it may be impossible. Of course, migrating databases to Oracle Autonomous Database in the Oracle Cloud easily overcomes the generic cloud issue, because they run on the same Exadata architecture as on-prem but in the Oracle Cloud instead. However, as mentioned previously, not everyone can move to the public cloud. For these customers, there is now another option.

Oracle Autonomous Database on Oracle Exadata Cloud@Customer

Oracle can now deliver a fully self-managed database, Oracle Autonomous Database, on-prem, thanks to Oracle Exadata Cloud@Customer

Oracle Exadata Cloud@Customer

With Oracle Cloud@Customer, an integrated set of hardware and software is delivered to the customer's datacenter, which is set up by Oracle engineers and remotely managed by OCI staff. It delivers the benefits of cloud operation in the datacenter, and allows for a gradual migration of Oracle Database applications from the datacenter-native environment to the OCI environment. Software and system maintenance are handled by Oracle, and its operation is identical to OCI in an Oracle Cloud datacenter, so when the time comes to move the operation there, the shift will be entirely transparent.

Oracle currently offers two versions of Cloud@Customer: Exadata Cloud@Customer and Dedicated Region Cloud@Customer. Both offer complete support for Autonomous Database and run on Exadata X8M.

Oracle Exadata Database Machine X8M

Oracle Exadata X8M is the foundation for Exadata in the Cloud. It is the best platform for Oracle Database, co-engineered with Oracle Database at the source-code level, resulting in over 60 net incremental, business-enabling capabilities. Exadata X8M includes a number of enhancements over prior versions of Exadata, most notably the use of Intel Optane Persistent Memory (PMEM) and a faster network fabric to enhance performance in two ways:

1. PMEM replaces flash for transaction log storage, enabling as much as a 10x performance boost in log writes, which accelerates transaction rates, and
2. RDMA (remote direct memory access) over Converged Ethernet (RoCE), a high bandwidth, low latency 100Gbs network fabric to enable direct data transfers between database servers and a persistent memory caching tier in the storage servers, bypassing conventional network and IO stacks, reducing latency by 10x.

3. In addition, Exadata Cloud@Customer X8M has almost twice the DRAM memory of earlier versions, enabling denser Oracle Database consolidation than was previously possible.

Oracle Autonomous Database

Oracle Autonomous Database (OADB), is available in both flavors—Oracle Autonomous Data Warehouse and Oracle Autonomous Transaction Processing— exclusively as a cloud service. Autonomous means that in addition to OCI staff managing the system, the database automates many management tasks using machine learning, including provisioning, tuning, encryption, patching, scaling, and backup/recovery. As such, the databases under OADB control will run optimally with no DBA effort required. This means that DBAs can concentrate on ensuring that the schema is optimally defined, that both developers and data analysts are writing effective and efficient SQL, and ensuring that the databases are addressing the business needs of the enterprise. Also, given the ease with which test databases can be set up and run, developers can be more productive, focusing on doing what they do best—developing applications, instead of allocating databases or waiting for them to be provisioned.

Oracle Autonomous Database on Exadata Cloud@Customer

Exadata Cloud@Customer is deployed as an Exadata system, or an integrated set of Exadata systems, designed to operate under OCI control, fully integrated with OCI. It is remotely managed by Oracle. For customers currently using traditional Exadata deployments on-prem, migrating databases to Autonomous Database on Exadata Cloud@Customer is straight forward, using Oracle Enterprise Manager's migration workbench that automates migration of traditional databases to OADB. With Exadata Cloud@Customer, Oracle, rather than the datacenter staff, that maintains the system; applying patches and software upgrades, tuning the system, and doing the other things to optimize its overall operation. All this is done with Oracle Database Vault active, so Oracle staff never see the enterprise's data. On top of this, OADB delivers self-driving automation in provisioning, tuning, encryption, patching, elastic scaling, and backup/recovery while the database continues to run. Beyond that, customers also take advantage of the pay-per-use subscription model. Samsung, one of the world's largest electronics conglomerates, stated that the company currently has over 300 Oracle Exadatas installed, and recently added Exadata Cloud@Customer, and is adding Autonomous Database for the full on-premises cloud experience.

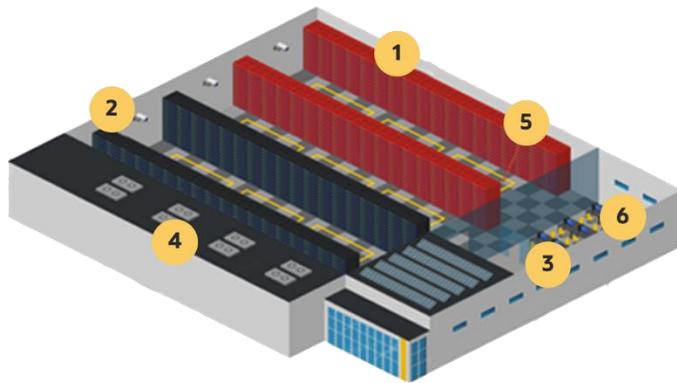
Oracle Autonomous Database on Dedicated Region Cloud@Customer

The other variant of Oracle Cloud@Customer is Dedicated Region Cloud@Customer. This capability places all Oracle public cloud services on-prem—over 50 services and counting. It has all the capabilities of Oracle Cloud Infrastructure (OCI), but operates in the customer's datacenter, so that it can be connected directly to applications, databases, and systems that reside in the customer's datacenter. Just like the standard Oracle Cloud, Dedicated Region offers complete support for Autonomous Database running on Exadata X8M systems in the region. Also similar to OCI in an Oracle Cloud region, Dedicated Region Cloud@Customer supports a complete suite of other services including Oracle Container Engine for Kubernetes, API Gateway, Events Service, and Oracle Streaming Service with full compatibility with Apache Kafka, as well as Oracle SaaS products like Fusion ERP-Financials, HCM, & SCM. In that regard Dedicated Region Cloud@Customer is a superset of all Oracle Cloud Services on-prem, with the Exadata Cloud variants being the core database engines available as standalone offerings as well. Nomura Research Institute, one of the largest financial research organizations in the world, recently deployed a Dedicated Region

Cloud@Customer in Japan, running on numerous Exadatas powering business-critical Oracle Databases for its global business operations.

FIGURE 1

Oracle Dedicated Region Cloud@Customer



1. Racks physically secured, and managed by Oracle
2. Customer racks
3. Oracle operations personnel
4. Customer DC power, cooling
5. Oracle secure space
6. Customer DC personnel
7. Physical Access Cages

Source: Oracle, 2020

Full OCI Power and Elasticity On-Prem

Anything the user can do on OCI can be done with Dedicated Region Cloud@Customer, with the same administrative services and the same elastic scaling features. Just as with OCI in Oracle's datacenters, the user pays a subscription fee for the service and a pay-per-use fee based on the number of OCPUs used. Oracle's pricing and SLAs are the same as in the Oracle public cloud. Operations are handled by Oracle staff, aided by machine learning-driven autonomous capabilities at various levels of the environment.

Benefits of Oracle Cloud@Customer

The following are key benefits of these two offerings: Oracle Exadata Cloud@Customer, and Dedicated Region Cloud@Customer:

- Includes the enhancements of Oracle Exadata X8M: better vertical scalability, lower latency, higher transaction throughput and faster query speeds due to PMEM and RoCE than in prior versions of Exadata—and compared to any other x86 server in the market.
- Includes the self-driving Oracle Autonomous Database, which automates many tasks, such as configuration, tuning, encryption, scaling and backups to save staff time and deliver better quality databases, with advanced security and intrusion detection.
- Auto-scaling with no downtime.
- Automatic application of patches, including security patches, which are normally put off in on-prem, locally managed databases.

- Supports any sized Oracle Database—no database is too large.
- Dedicated Oracle system operators at no additional cost, unlike other cloud providers.
- Single vendor accountability and support avoids multi-vendor finger pointing.
- An environment that is 100% identical to Oracle Cloud Infrastructure, so there is no need to deal with different infrastructure and software on-prem.
- Ability to seamlessly move workloads between the Cloud@Customer and the Oracle Cloud region.

Additional Benefits of Oracle Dedicated Region Cloud@Customer

- All the functionality of OCI delivered in the customer's datacenter.
- 50+ services available, including SaaS applications.
- Same pricing and SLAs as Oracle public cloud.

FUTURE OUTLOOK

IDC research shows a slowing of cloud migration projects due to the effects of the COVID-19 pandemic, the effort required, and cost concerns. This slowing should not impede eventual plans but may raise the perceived value of migrations that involve less effort and upfront costs. At the same time, IDC has identified a long-term trend that larger enterprises are committed to a stepped migration strategy, implementing first as a cloud configuration in the on-prem datacenter, then moving to the public cloud. Moving Oracle databases and applications to Autonomous Database on Cloud@Customer deployment options satisfies both of these initiatives.

In fact, complications involving staff safety may actually accelerate adoption of systems such as Autonomous Database on Cloud@Customer, due to its self-managing nature which requires lower staff involvement. This is in line with a trend that favors self-managing systems and public cloud environments that can extend to local datacenters.

CHALLENGES/OPPORTUNITIES

Other cloud providers and DBMS vendors are attempting on-prem cloud services. Those services are, in general, more limited, less mature, or part of a program that concentrates on a specific cloud platform. As a result, they all lack most of the on-prem features of Oracle's Cloud@Customer offerings and do not, as of this writing, align to the Oracle Autonomous Database feature set. In fact, no other provider yet offers autonomous capabilities or a full public cloud on-prem that Oracle currently offers. More importantly, there are no known fully automated, fully managed Oracle Database offerings available for on-prem deployment other than Autonomous Database on Oracle Exadata Cloud@Customer. Nonetheless, it seems likely that other DBMS providers and public cloud providers will develop more competitive solutions, so Oracle must continue to stay ahead of the curve.

CONCLUSION

IDC has identified a long-term trend that shows larger enterprises with complex data management needs building environments that reduce their TCO and prepare them for either public cloud deployment, or a blended deployment on-prem and in the public cloud, ideally with the same or nearly

the same architecture. Oracle has developed a means of doing this using Autonomous Database on Oracle Exadata Cloud@Customer or Oracle Dedicated Region Cloud@Customer, that accomplishes this common environment, fully supported by Oracle. The user has complete control over how much processing should remain on-prem, how much goes to the Oracle Cloud, and gets seamless integration between the two, while still enjoying the high performance of Exadata and the self-healing, self-managing capabilities of Oracle Autonomous Database.

Oracle Database currently drives a wide range of ISV and home grown applications, delivered by Oracle and by third parties. Enterprises depend on these applications to run all aspects of their business, from finance to manufacturing, HR, orders, procurement, operations and more. All of these types of business-critical applications can run on Autonomous Database on Exadata Cloud@Customer and Dedicated Region Cloud@Customer. The only option for enterprises seeking to completely automate the database administration for these myriads of applications is Oracle Autonomous Database, and the only way to do so on-prem is with Oracle Cloud@Customer. With an architecture that automatically scales to match changing workloads, customers benefit from instantaneous CPU and IO adjustments; the ability for databases to turn off when not in use, with true pay-per-use.

Additionally, Oracle Cloud@Customer enables organizations to transform from custom-built and managed infrastructure and databases to a modern Database Cloud on Exadata, providing the flexibility to refocus talent from maintenance to adding business value.

Of course, all Oracle Database options such as RAC, Data Guard, Multitenant, Data Safe and more are included as part of the company's Cloud@Customer offerings.

Enterprises need to consider the following when looking at on-prem cloud offerings and considering Oracle:

- What is the cost of disruption, including re-writing database and applications, if one moves to a completely different environment and architecture for the databases than the one that has a proven capability in the datacenter?
- Oracle brings to the cloud over 40 years of on-prem enterprise-class datacenter experience, from the database, to servers to backup and recovery.
- Oracle offers all of its cloud services on-prem; can other options under consideration say the same?
- Oracle offers full support for the Cloud@Customer operation; there is no additional cost or staff time required.
- Oracle brings SaaS on-prem—a powerful incentive to consider Oracle Dedicated Region Cloud@Customer.

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