

AUTONOMOUS DATABASE IN THE ORACLE GEN2 CLOUD



ORACLE'S RECENT GEN2 CLOUD ANNOUNCEMENT includes a unique new set of *cloud Autonomous Database services delivered at the customer's location*. These are fully automated, self-managing cloud database services running on a new generation of extremely high performance Exadata database machines. *Oracle Gen2 Exadata Cloud@Customer merits a close look, especially from customers seeking cloud benefits but facing demanding data sovereignty, database compliance, security, performance, latency or availability requirements.* ●

MANY CUSTOMERS STRUGGLE with the database deployment decision: do we put the database in the public cloud, so as to minimize demands on our data center resources and staff? Or do we keep it on premises, to simplify approvals for compliance and security?

For over three years, Oracle has provided its database both in the public cloud and on prem, along with a third, distinctive deployment option: *Oracle Cloud@Customer*. **With Oracle Cloud@Customer, Oracle installs one or more self-contained Oracle systems (hardware and software) on the customer's premises, making them operate just as they would in the Oracle Public Cloud.**

Now Oracle has announced three unique new database capabilities, along with other new services and options, for its new **Gen2 Exadata Cloud@Customer**:

1. Autonomous Database,
2. Autonomous Data Guard; and,
3. Exadata Database Machine X8M, the latest generation.

Autonomous Database (ADB) on Exadata Cloud@Customer. With ADB, machine learning software and other automation replaces most labor by system administrators and database administrators. An Oracle ADB requires the customer to perform little or no physical design, no tuning, no software maintenance and no backup. Instead these tasks are performed automatically mainly by machine learning functions that Oracle has built into its database and cloud software. The customer's labor costs and skill requirements are dramatically reduced and human error is removed from many aspects of database creation; maintenance; operation; and, security. Because Oracle, via its machine learning software, manages ADB on *Exadata Cloud@Customer*, the customer is relieved of any requirement to provision hardware or software. Processing capacity for the database (e.g., the number of virtual processors assigned) scales automatically as needed, according to Oracle. The entire process of creating, managing and operating a database is greatly simplified, costs are in general



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Purpose and Methodology for this Report

This *WinterCorp Research Note* covers the recent announcement of *Gen2 Oracle Cloud@Customer* and its implications for database customers. In developing this report, WinterCorp drew on its own independent research and experience, interviewed Oracle employees, attended Oracle events and analyzed Oracle documentation and literature. Oracle was provided an opportunity to comment on the paper with respect to facts, in its capacity as the sponsor of this research. WinterCorp has final editorial control over the content of this publication and is solely responsible for any opinions expressed.



reduced substantially, agility is increased and real elasticity is delivered. The author has experimented hands on with ADB and found these benefits to be real and substantial.¹

ADB was introduced in 2018 in the Oracle Public Cloud. With Oracle's recent announcement, ADB becomes available on customer premises, via *Gen2 Exadata Cloud@Customer*. This, also, is unique in the industry. Now a customer can leverage ADB while still enjoying the compliance, security and performance benefits of on-site operation.

While ADB is a relatively young product, which will no doubt mature further over a period of years, it is in production use now on many Oracle Databases in Oracle's public cloud delivering on its promise of greatly reduced DBA effort for a wide range of situations.

Autonomous Data Guard. For more than ten years, Oracle has offered Data Guard, an add-on to the enterprise edition of Oracle Database for increased database availability. With Data Guard a standby copy of the database is maintained on a different server, usually at a remote location. Though it can be configured different ways, the standby copy is typically updated moments after each transaction is completed in the primary database. In the event of a failure, processing fails over to the standby copy, typically within seconds. Database users are not aware that the failover has occurred, as the standby database can be configured to have all of the data and services available in the primary database.

Because the standby copy of the data runs on a completely separate copy of the hardware and software, it provides continuous availability of the database through a wide range of failures. With this architecture, the entire primary data center could be lost to a disaster and the standby copy would still be available and would contain the results of any transactions committed to the primary database prior to the onset of the disaster.

While Data Guard has long been available and does its job, it requires skill and attention to configure, manage and operate properly. Human error is always a concern in such failover facilities, since they are actually in use only occasionally (and rarely tested), but they must function correctly at the precise moment that disaster strikes.

The special value of **Autonomous** Data Guard is that it removes this possibility of customer human error. Once Autonomous Data Guard is set up, its management and maintenance is completely automatic.

As the head of my own small business, I can tell you that this is exactly what I want. I want to set up disaster recovery and then not have to think much about it. But, I want to be sure I can rely on it, should there be a fire, a storm or some other disaster in my building. I don't want this to be the responsibility of someone in my company that also has to do a lot of other things. I like very much that the service is fully automated, self-managing and overseen by people dedicated to making this work for many databases at many companies, every day, so that they get this right from top to bottom, over and over again.

Exadata X8M. Exadata, an integrated hardware/software system engineered specifically to run Oracle Database at the source-code level, has delivered

¹ **Autonomous Data Warehouse, Oracle's Self-Driving Database**, WinterCorp Research Note, www.wintercorp.com/publications

excellent performance, price/performance and availability for years. Introduced in 2008, Exadata has been enhanced every year or two to incorporate new and better hardware as it becomes available as well as enhanced software functions. By engineering the full stack of hardware and software to work together, Exadata has been able to deliver much higher levels of performance than were previously possible with Oracle Database. For example, Exadata has enabled Oracle to deliver much higher I/O bandwidth; to introduce higher levels of parallelism in the storage layer; and, to ensure that the system as a whole is balanced with respect to processor, memory, storage bandwidth and network bandwidth. Exadata has also been a vehicle for the intensive exploitation of solid state data storage, enabling higher levels of performance for transaction processing.

With its recent announcement, Exadata X8M became the system that powers *Exadata Cloud@Customer*. As well as the upgrades in performance and capacity that customers have come to expect with Exadata, X8M has a couple of new hardware features that are significant for Oracle Database performance. These are PMEM and RoCE.

PMEM is persistent memory: main memory (DRAM) that retains its contents through power cycles. Such PMEM offers significantly lower latencies (<19 microseconds) even than solid state disk.

RoCE stands for RDMA over Converged Ethernet, which enables fast access directly to memory over an Ethernet network. Thus database server A within an Exadata system can access data stored in the memory of another server, server B, without going through the processors of server B. Layers of hardware and software are thus bypassed to yield much more efficient access to data. Database reads are up to 10x faster, and log file writes are 8x faster.

Both of these hardware advances promise much faster access to data for query and transaction processing when running the Oracle Autonomous Database on-premises.

Gen2 Oracle Cloud@Customer X8M. Oracle has more than 1,000 customers who have *Cloud@Customer* systems in production. The recent announcement expands the value of that offering in several ways; here I am focusing exclusively on the database aspects.

Cloud@Customer is particularly valuable because it combines the benefits of cloud with the benefits that customers get by keeping data on their premises. •

Improved Performance. *Oracle Exadata Cloud@Customer* is now built on Exadata X8M, which extends all the benefits of RoCE and PMEM to *Exadata Cloud@Customer*.

Compliance and Security. *Oracle Cloud@Customer* can enable organizations to comply with data sovereignty requirements, privacy requirements and other regulatory requirements that may be impossible or impractical (e.g., subject to unacceptable approval costs and delays) in the public cloud — while still getting the cost savings, simplicity and agility of the public cloud. Oracle also enables customers to use their on-premises backup devices such as the company's Zero Data Loss Recovery Appliance to backup *Exadata Cloud@Customer*. This is a distinct differentiator, as AWS Outposts requires all backups to be sent to an AWS public cloud region, which could negate data sovereignty, compliance and security advantages.

Extreme Performance. *Oracle Cloud@Customer* also provides physical co-location with other customer systems. For example, some systems must react to an external event in milliseconds. *Oracle Cloud@Customer* makes it possible to put the database in a physical location that will minimize any communication delays, meeting requirements that are impossible with other cloud databases, which are remote from the customer's location.

Autonomous Database (ADB). With the announcement of Autonomous Database on *Exadata Cloud@Customer*, Oracle enables its customers to leverage the same machine learning and automation that was previously reserved for its flagship public cloud database, now available in the customer's premises. This is another Oracle first that yields substantial savings by reducing much of the manual labor involved in setting up, tuning, patching, and updating Oracle Database. Compared to other on-premise database cloud services, Oracle is significantly ahead of both AWS *Outpost* and Microsoft *Azure Stack Hub*.²

² *Managed Deployment Options are Growing*, WinterCorp Research Note, www.wintercorp.com/publications

About WinterCorp

WinterCorp is an independent consulting firm expert in the strategy, architecture and scalability of the modern analytic data ecosystem.

Since our founding in 1992, we have architected and engineered solutions to some of the toughest and most demanding analytic data challenges, worldwide.

We help customers define their data-related business interests; develop their data strategies and architectures; select their data platforms; and, engineer their solutions to optimize business value.

Our customers, with our help, create and implement cloud, multi-cloud and hybrid cloud architectures; they create the data foundation needed for data science, artificial intelligence and machine learning.

Our customers get business results with analytics in which their return is often ten or more times their investment.

When needed, we create and conduct benchmarks, proofs-of-concept, pilot programs and system engineering studies that help our clients manage profound technical risks, control costs and reach business goals.

With our in-depth knowledge and experience, we deliver unmatched insight into the issues that impede scalability and into the technologies and practices that enable business success.



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www.wintercorp.com

TYNGSBORO, MA

617-695-1800

Recommendation



CUSTOMERS WITH: (a) sensitive data that raises compliance, privacy or data sovereignty issues in the public cloud; and/or, (b) mission-critical database requirements for high performance, high data availability, high security — are advised to **take a close look at Gen2 Exadata Oracle Cloud@Customer. As well as a distinctive approach that is uniquely well suited to such requirements, Oracle now provides Autonomous Database and Autonomous Data Guard on the customer's premises delivered with the principal benefits of public cloud, including increased agility, elasticity, cost savings and reduced skill requirements. •**