With a new Exadata service, Oracle cranks up the volume on its public cloud database capabilities

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Omdia view

Summary

With the release of Oracle Exadata Cloud Service X8M on Oracle Cloud Infrastructure (OCI), Oracle has significantly amplified its ability to run large- and elastic-scale database workloads in the public cloud. Available at no extra cost to existing customers across more than 27 geographic regions, this updated Exadata cloud service creates some interesting synergies for Oracle in supporting hybrid cloud and/or on-premises scenarios. However, its true value will rest in reinforcing what Oracle already does so well—consolidating and scaling numerous databases within a single, highly performant hardware footprint.

The importance of being highly performant

The significant economies of scale and seemingly boundless flexibility of the public cloud makes it easy to undervalue the hardware that powers even the most basic business application. Storage and compute scalability are just a mouse click away, or even automatic thanks to the use of artificial intelligence (AI) in automating real-time performance demands, and high availability (HA) that works in the background without supervision means that built-in user, data, and network security have become standard fare with cloud implementations. And most important of all, utility pricing plans have freed cloud users from having to pay for unused hardware resources.

Even so, hardware still matters, even in a marketplace dominated by cloud-native ideals of hardware abstraction through virtualization and containerization. The actual economics of cloud scalability depend heavily on two things: the raw performance of the underlying hardware, and the ability of the overlying software to optimally utilize that performance. If these two requirements aren't met and don't harmonize one with the other, performance can suffer, and money spent on hardware can go to waste.

This is particularly true for large-scale and performance-hungry online transactional processing (OLTP) databases responsible for safely registering a high volume of continuous transactions and safely storing those within petabyte-scale relational data structures. Getting things right performance-wise often demands that customers take hardware matters into their own hands with self-assembled or hyperconverged hardware sitting on-premises or hosted in a jointly managed colocation cloud facility. For the vertical industries like banking and finance, therefore, which must contend not only with high-performance demands but also with heavy legislative oversight, the public cloud and its many benefits simply do not figure into the OLTP database equation.

Bringing on-premises performance to the cloud

Oracle hopes to change all of that with its continued investment in the Exadata platform, transforming what was initially an on-premises purpose-built database machine into a universal data and analytics platform running in harmony both on-premises and across cloud deployment options, including Cloud@Customer

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and Dedicated Region Cloud@Customer. In summer 2019, the company took an important step in this direction with the release of Oracle Exadata Database Machine X8M. Note that the "M" stands for memory. This "box" introduced a number of memory and networking architectural upgrades over the earlier X8 InfiniBand-based model such as the introduction of persistent memory and 100 gigabit remote direct memory access (RDMA) running over Converged Ethernet (RoCE) as a replacement for InfiniBand. With these upgrades, Oracle promises customers a significant performance boost, delivering up to 12 M SQL read IOPS and 1 TB/s of in-memory analytics, and SQL read latencies to less than 19 microseconds.

Now Oracle has deployed this same upgraded Exadata hardware across its global assembly of data centers (spanning 27+ regions), branding it as Oracle Exadata Cloud Service X8M on OCI, and making it available to all paying Exadata Cloud Service customers at no additional charge. From Oracle's perspective, this move is important because it now gives the vendor a single, high-performance database platform that's available on-premises as a converged system (Exadata Database Machine), on-premises but managed by Oracle (Exadata Cloud@Customer or Dedicated Region Cloud@Customer), and now on the public cloud as a part of Oracle Exadata Cloud Service.

For Oracle, this hybrid cloud system parity presents some interesting opportunities. First, Oracle can enjoy some of its own economies of scale in terms of lessening the cost of maintaining its own infrastructure. Second, Oracle can more aggressively engineer its software to take advantage of the hardware advances found within the X8M architecture. These economies and efficiencies directly benefit Oracle customers. With a homogeneous architecture, Oracle can more readily build-in further autonomy into its platform as it has done with the Oracle Autonomous Database, which liberates customers from having to manage software updates/patches. It can even auto-tune database performance, optimizing database indexes or looking for and fixing unduly slow SQL queries, for instance.

In terms of performance, as mentioned earlier, Oracle's new persistent memory capability completely bypasses operating system (OS), input/output (I/O), and network software, promising much higher database transaction rates and much lower I/O latency, particularly when compared with orthodox public cloud database architectures. This can open new doors for Oracle in supporting highly performant OLTP workloads like algorithmic financial trading via the cloud. Likewise, customers running Oracle's new RoCE capability can expect to see some significant performance improvements for large analytics data processing and delivery use cases.

Oracle Exadata Cloud Service X8M introduced a few additional architectural enhancements that will benefit customers doing data and analytics at scale. An update to Oracle Real Application Clusters (RAC) technology allows customers to transparently scale out database servers across multiple machines, regardless of what kind of workload that database is running. And with the addition of fully-active Oracle Data Guard services in X8M, customers can offload SQL read processing to a replica database while also using that replica for disaster recovery (DR), even across regions.

What's in it for Oracle and its customers?

Why should Oracle invest in a highly commodified and converged architecture with X8M and then give it away to existing Exadata Cloud Service customers running on OCI? Oracle has a lot riding on the heart that beats at the center of every Exadata box—the Oracle Database. While the rest of the data and analytics market has chosen to dive down the rabbit hole of highly specialized databases—documents, key values, wide, columnar, time series, graph, etc.—Oracle has committed to a single, converged database design that can accommodate these specializations beyond its roots in relational, OLTP workloads.

Information Classification: General

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The trick, however, is to embrace disparate database modalities while still delivering a highly performant data platform that's relatively easy to use and manage. It can be quite difficult to coax a relational database to handle spatial data for geolocation, JavaScript Object Notation (JSON) documents for mobile apps, time series data for IoT devices integration, and in-memory data for real-time data science processing. It's even harder to do so at a significant scale. Oracle, therefore, needs to invest in innovative hardware like Oracle Exadata Cloud Service X8M as a means of proving to customers that its converged database approach can handle any and all workloads now and in the future.

Given that Oracle already serves 28 of the Fortune Global 100 on its public cloud, the company's investment in its public cloud architecture seems like a no brainer. Even if most of the large-scale databases owned by those customers reside on-premises today, Oracle's work to bring on-premises scale to the public cloud helps the company position Exadata Cloud Service X8M on OCI as a futureproof investment for its customers. Those customers can start to synergize workloads between cloud and on-premises environments now, and plan for future expansion online with the knowledge that their investments today will be preserved over time. Case in point: existing customer applications running on previous Exadata hardware can run on X8M without any modification.

In terms of immediate benefits conferred by the X8M architecture, the creation of more "headroom" is one of the most interesting aspects. The way Oracle licenses and provisions Exadata Cloud Service on OCI, customers end up with some significant wiggle and expansion room in terms of both storage and processing resources. According to Oracle, most Exadata customers are running perhaps hundreds of cores at the upper end of the spectrum. Its new architecture, comparatively, allows for the allocation of thousands of cores. On the storage front, the previous X8 model allowed for 600 terabytes of storage for a full rack. With X8M, that number has been increased file-fold, moving from 600TB to 3,200TB.

Software maximums are up as well with X8M now able to handle 2.5PB uncompressed databases (25PB compressed). This is significant, as one of the main use cases for Oracle Database in general and Exadata in particular is database consolidation. Many Oracle Exadata customers routinely run between 50 and 100 databases on a single Exadata platform as a means of simplifying and reducing data center infrastructure complexities and cost while gaining agility. The same thought process applies to workloads like dev/test and DR, which when run online can deliver tremendous cost savings. With a homogeneous architecture between cloud and on-premises deployments, Oracle is in a sense upping the value of these well-trodden use cases.

By pushing the boundaries of what's possible on its public cloud platform, Oracle is in effect creating new opportunities for existing customers to not just move select workloads to the cloud, but to also explore new opportunities. With X8M's Data Guard, queryable DR capabilities, and read replica support, customers can now more readily consider splitting transactional and analytic work, with pure OLTP transactions remaining on-premises but analytic operations moving to the cloud, all using the same data and same database engine. This is a hybrid architecture not uncommon to analytics-intensive markets such as healthcare. It allows for more performant and timely analytics without putting any undue stress on the core OLTP database itself.

It's simple cloud economics

Oracle's new Exadata X8M architecture does more than merely prove that Oracle can engineer performance; it serves as a signpost for existing Oracle on-premises customers, pointing to some very welcome enhancements that meet customers where they are now and where they can go in the future. But what about new customers? Will X8M help Oracle attract new customers, particularly those interested in jumping headlong into cloud-native data lakes and data warehouses, as just two examples? The good news

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for Oracle is that a significant number of Exadata Cloud Service customers are new to the Exadata platform (50% according to Oracle), which stands as a solid indicator that they are sticking with Oracle, taking their databases to Oracle Cloud Infrastructure when they decide to move to the cloud.

Oracle and its main on-premises rivals (HPE, Dell Technologies, and IBM) are under a tremendous amount of pressure from cloud data platform vendors (AWS, Microsoft, and Google) as well as pure-play cloud-native datastore players like Snowflake and Cloudera. These vendors are actively working to extend from on-premises to cloud or from cloud to on-premises, depending on their background. But in both cases, the goal is the same: create for customers a value proposition that blends flexible economics with platform agility—all without sacrificing performance, capability, or requiring application changes.

Seeking to shrug off the historic perception of a vendor keen to couple a sizable price tag with sizable performance, Oracle's current approach with the public cloud and with Oracle Exadata Cloud Service X8M on OCI itself emphasizes flexibility and price performance. As mentioned above, the basic (smallest) available X8M configuration leaves a lot of headroom for growth in terms of available cores. Almost a blend of multitenancy and managed hosted services, Oracle Exadata Cloud Service X8M leaves unused cores completely available to the customer subscribing to that base configuration. They are not available to any other customers (i.e., no noisy neighbors).

Further, customers only pay for the cores they use. And they do so according to a very granular utility pricing model that emphasizes cost control with database licenses only applying to database servers, full control of virtual machine cluster sizes, and continuous up/down scaling by Oracle Compute Units (OCPUs), not calculated by day or month but instead by one second billing in one minute minimum increments. Moreover, customers can completely control how the servers scale and how their individual implementations run (database versions, upgrade/patch cycles, etc.). If, however, customers want to relinquish some control of the database itself, they are welcome to take advantage of Oracle Autonomous Database, which will be available on the X8M platform in the near future.

Certainly, there is no free lunch, and whether in use or not, the available resources allocated to a given customer figure into the overall price tag. But Oracle believes its blend of scale, manageability, security, and control will find a ready home with customers seeking to bridge the divide between on-premises control and public cloud Agility, particularly for those customers struggling to remain Agile while managing sizable database workloads on-premises. With Exadata X8M, as a highly performant foundation for the database cloud service, customers should be able to reduce costs compared to competitive offerings as they complete jobs faster, use fewer OCPUs, and scale up or down incrementally without downtime.

Overall, Omdia believes the harmony between Exadata Cloud Service and Exadata on-premises is worth every penny to customers, especially those fully invested in Oracle Database technologies. Other cloud providers may be able to support an extremely wide array of databases, but those implementations tend to have on-premises versions that look nothing like their public cloud versions, which causes anxiety and management challenges, not to mention data security and mobility issues. Oracle directly counters those issues with this release. But there is plenty of room for growth.

At present, while Oracle presses unity between cloud and premises, it has not yet blended the two into a fully integrated, fluid whole in terms of enabling discrete workloads to automatically flow between the two worlds according to customer criteria and priorities. Those workloads can readily move from one to the other, but only as manually directed by administrators, as with the DR/analytics use case mentioned above. This leaves a tremendous amount of room for Oracle to showcase the full potential of market-leading Autonomous Database capabilities (e.g., Oracle Autonomous Data Warehouse, Autonomous Transaction

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Processing, and Autonomous JSON Database), automatically fine tuning memory, storage, and transaction regardless of where the underlying hardware resource resides.

Even without this level of automation, Oracle is in a unique position compared with pure cloud-native competitors, as Exadata Cloud Service X8M on OCI strengthens Oracle along four dimensions:

- Performance: X8M's new memory and 100Gbs RoCE architecture delivers a high degree of I/O, OLTP & analytics performance.

- Scale: X8M can grow to thousands of cores, terabytes of persistent memory and storage to hold multi-petabyte data warehouses.

- Elasticity: With X8M, customers can expand compute or storage independently online to create a high-performance OLTP system or a high-capacity data warehouse. They can also expand to run both OLTP and data warehousing on Oracle's converged database.

- Low cost: X8M's high performance, scale, and online elasticity, combined with the company's pay-per-use by the second licensing, can significantly lower overall cloud costs because jobs can complete faster and require less hardware.

The bottom line? For current Oracle Database users moving to the cloud, Exadata Cloud Service X8M is an easy decision, given the harmony between cloud and on-premises. For non-Oracle customers, the high performance, unbounded scale, online elasticity, low cost with pay per use, and the ease of management of Oracle's converged database should prove to be a strong value proposition for Exadata Cloud Service X8M vs. similar cloud database services from Google, Amazon, SAP, Microsoft, and others.

Appendix

Further reading

"Oracle spins up an autonomous JSON document database," (August 2020)

2020 Trends to Watch: Analytics and Data Management, (February 2020)

Author

Bradley Shimmin, Chief Analyst, AI Platforms, Analytics, and Data Management

askananalyst@omdia.com

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askananalyst@omdia.com