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Oracle emphasizes autonomy with its newest Exadata X9M generation

Omdia view

Summary

Oracle recently delivered a major upgrade to its family of Exadata platforms, the X9M generation, promising a significant boost in performance over earlier product iterations. What makes this release special, however, isn't just speed but also a unique ability to run disparate Oracle Database workloads across multiple deployment scenarios without compromising functionality, performance, security, and management requirements.

The move to the cloud begins and ends on-premises

In the enterprise, speed reigns supreme. IT practitioners must bring innovative opportunities to market as rapidly as possible and to do so in a cost effective manner that does not compromise functionality, performance, security, and management requirements. Complexity works as the enemy of innovation and opportunity. Like an unseen Minotaur lurking at the center of a maze of technological choices, complexity can slow project development efforts—or worse bring running projects to a grinding halt. Fortunately, the rise of the cloud-native software architectures running atop increasingly affordable hyperscale cloud platforms have greatly mitigated the risk of complexity by simplifying, and in many ways, abstracting away underlying infrastructure intricacies.

It is this architectural simplicity that currently fuels the ongoing move to the cloud for IT practitioners, particularly those responsible for artificial intelligence (AI), data, and analytics workloads. When Omdia asked IT practitioners to describe the portion of their active workloads running in the cloud, the largest workload percentage (37.16%) belonged to big data analytics and data science tools—even outpacing traditionally cloud-friendly use cases, commerce and collaboration (See Omdia's *IoT, Cloud, and 5G – IT Enterprise Insights 2022*).

Why move AI, data, and analytics workloads to the cloud? Beyond the obvious economies of scale, performance, availability, and security that come with even a partially shared infrastructure, the cloud promises increased flexibility to support database usage expansion and contraction, both planned and unplanned. It also affords many practitioners the opportunity to consolidate both databases and their attendant infrastructure. Unfortunately, very few companies find themselves in a position to completely move their AI, data, and analytics workloads to the public cloud. Many companies, especially those in need of highly performant deployments and those operating within highly regulated industries, will always remain at least partially dedicated to on-premises infrastructure investments.

In response to this requirement, most cloud, infrastructure, and database vendors are actively inching closer toward a fully unified software environment that enables IT practitioners to build solutions capable of running across both cloud and on-premises using the same software if not the same infrastructure and management capabilities. There are a number of approaches to on-premises cloud deployments. There are solutions that provide complete architectural equivalency between cloud and premises. This is the approach used by Oracle Exadata Cloud@Customer and AWS Outposts. There are those that deploy two different versions of the same software, one running as a public cloud service and the other running on the customer's hardware of choice. This is the general approach seen with Google Anthos and Microsoft Azure Stack. And lastly, there are solutions that package on-premises hardware to provide cloud-like functionality, as with HP GreenLake and Dell APEX.

In general, these solutions strive to feature a consistent storage and compute infrastructure beneath a single database architecture, though the extent of this consistency varies greatly from vendor to vendor. The specter of complexity remains. The software may work relatively the same across cloud and premises, but licensing, provisioning, managing, and executing software as well as the hardware infrastructure across the two remain worlds apart—particularly when it comes to database workloads themselves. It is this dichotomy that Oracle addresses through its Exadata family of converged hardware and software engineered systems that run the company's flagship database, Oracle Autonomous Database, as well as Oracle Database 19c/21c.

Oracle Exadata X9M for infrastructure unification

For Oracle, a company steeped in supporting highly performant data and analytics workloads on-premises, closing this hybrid cloud gap has served as a priority dating back to 2015 when the company started using its already well-established line of Exadata Engineered Systems that are vertically integrated hardware and software solutions for Oracle Database, as the foundation for its public cloud, delivering the Exadata platform as a managed cloud service on-premises as Exadata Cloud@Customer and as Exadata Cloud Service on Oracle Cloud Infrastructure (OCI). Since then, the Exadata platform has undergone several substantial hardware and software revisions, culminating in the recent introduction of Oracle Exadata X9M in late September 2021.

Built on a scale-out architecture based on Intel x86 64-bit hardware as before, the new Exadata X9M family supports Oracle Database workloads, primarily on-line transactional data processing, analytics, and associated compute resources. There are two primary Exadata offerings: Oracle Exadata Database Machine X9M, which runs on-premises as a traditional engineered system; and Exadata Cloud@Customer X9M, which functions as a managed cloud service but is deployed on-premises in customer's data centers or colocation deployments.

As with earlier iterations of the Exadata platform, Oracle Exadata X9M targets customers seeking to optimize the performance and availability of Oracle Database solutions across a wide range of workloads

and cloud and on-premises deployment scenarios. In particular, Oracle Exadata X9M promises to solve several common AI, data, and analytics problems in the enterprise:

- Data integration and management challenges associated with large numbers of databases and application workloads.
- Database migration costs, complexities, and risk when moving from on-premises to cloud or in maintaining a hybrid cloud and on-premises deployment.
- Application connectivity, availability, performance, latency, and throughput issues for both transactional and analytics workloads stemming from the proliferation of data sources and data volumes.
- In addition, it solves the overall cost and manageability of large environments by supporting denser consolidation with better performance, more cores, and more storage.

In short, the Exadata family of products focus on latency, throughput, availability, convergence, and automation, the latter of which we will focus on later in this report. In practical terms, Oracle Exadata systems help users consolidate their database assets within a single, high performance hardware platform, a platform geared toward optimizing compute, storage, system software, and networking capabilities for analytical and transactional workloads across both cloud and on-premises.

Oracle Exadata X9M, by the numbers

As with most engineered systems (both converged and hyperconverged) the Exadata family of products address customer challenges through pure performance. Compared with the previous release, Oracle Exadata X8M, Oracle Exadata X9M amps up available input/output operations per second (IOPS) by 72% in support of transactional database workloads. With 33% more Intel Ice Lake CPU cores, 33% more memory for virtual machines (VMs) and transaction caching with up to 1.5 terabytes of Intel Optane persistent memory per storage server, delivering 27.6 million read IOPS with less than 19 microsecond IO transaction latency. These same enhancements also serve analytics and consolidation workloads by providing users with 64% more memory bandwidth, 33% more cores available for parallel analytical query processing, up to 25.6 terabytes of flash per storage server, enabling the Exadata X9M to break the 1TB per second throughput barrier, the only system in the industry to do this. Furthermore, transactional and analytical performance of Exadata X9M scale linearly as racks are added. And Oracle has increased disk capacity from 14 terabytes per disk (in Exadata X8M) to 18 terabytes per disk with the release of Exadata X9M.

Taken together, Oracle reports that these improvements deliver reduction in cost for transactional workloads by as much as 42% and as much as 47% for analytical workloads. It's important to note that Oracle supports such substantial savings not through pure performance but by the fact that it has not raised prices for Oracle Exadata X9M over the previous Exadata release. It is this commitment to improving the price/performance ratio that has earned Oracle Exadata a significant following among Fortune Global 100 companis—87%, in fact—in support of database workloads that demand a great deal from the underlying infrastructure,. Customers including Deutsche Bank, Samsung, NTT DoCoMo, Equinix, Swisscom, Halliburton, and Cerner have put Exadata to work in delivering critical financial trading and ecommerce solutions, building petabyte data warehouses, hosting complex business applications, and consolidating hundreds of Oracle databases.

The absence of infrastructure is the best infrastructure

Resolving performance issues in an affordable manner promises to give Oracle a significant leg up over its hyperscale competitors, particularly in delivering performance at the edge and within the on-premises data center. With Oracle Exadata Cloud@Customer X9M, the company has taken direct aim at AWS' Outposts service running RDS (but not Aurora and Redshift), promising to outgun AWS in terms of lowering latency and maximizing throughput for SQL queries (Note that Oracle offers the same database services on-premises and in the cloud while Amazon offers a small subset of its cloud database services on Outposts). However, performance alone does not guarantee success in the enterprise. The Minotaur at the center of the infrastructure labyrinth has two horns after all. If one horn is for performance, then the other is for complexity. Performance is a must in delivering business-critical applications, and Exadata X9M clearly does that. However, it is in the removal of complexity where Oracle Exadata X9M wields the most potential competitively -- not just through database consolidation or infrastructure equality between on-premises and cloud, but through autonomy.

With Exadata Cloud@Customer X9M, customers can run not just Oracle Database 19c/21c but also Oracle Autonomous Database, the company's converged (e.g., capable of running transactional, analytical, time-series, graph, and other disparate workloads), cloud-native, AI-infused database that's built to basically run itself. Both databases provide the same basic functionality (and are completely cross-compatible), but with Oracle Autonomous Database running within Exadata Cloud@Customer X9M, on-premises enterprise customers have at their fingertips a private cloud with dedicated infrastructure that also provides functionality only found within fully managed cloud services running in a fully shared, public cloud environment. Chief among many capabilities native to Oracle Autonomous Database include:

- Automated Database provisioning, tuning, and scaling of resources in support of specific workloads. That is, resources are spun up and down automatically as needed.
- Automated installation of database security patches and updates coupled with continuous, end-to-end encryption for data-at-rest and in motion.
- Preventative and proactive protection against performance issues, outages and downtime, both planned and unplanned.
- Automatic threat detection and threat remediation, solving potential breaches before humans even figure out they happened

Across these and many other capabilities found within Oracle Autonomous Database, Oracle leverages AI as a means of both automating processes and augmenting decisions that would normally fall to database administrators, optimizing ongoing SQL query performance automatically, for example. Coupling such autonomy with pay-per-use economics, where customers only pay for the virtual CPU (vCPU) resources they consume, and it's easy to envision a future for Oracle customers where the underlying infrastructure literally vanishes from view and concern, leaving only the care and feeding of the software and data running on that infrastructure.

Addressing mission-critical infrastructure concerns

This isn't the first time the company has made Oracle Autonomous Database available to Exadata customers on-premises. Oracle Exadata X8M customers had the same opportunity. However, when Oracle delivered Exadata Cloud@Customer X8M, it took the company nine months to add support for Oracle Autonomous Database. With Exadata X9M, customers can gain access to this service from day one. This

move isn't just about choosing between autonomous and non-autonomous databases. For Oracle this move is about emphasizing that it can deliver its state-of-the-art database software as a central aspect of its state-of-the-art hardware and do so in the location where customers need it most.

Oracle's shift in prioritization toward cloud-native capabilities on-premises is also reflected in the company's recent release of Zero Data Loss Recovery Appliance X9M, a backup and recovery appliance running on Exadata hardware. Oracle is also introducing new Cyber Vault capabilities for reliably recovering from malware and ransomware attacks. The new Recovery Appliance version increases storage capacity by 30% and lowers entry-level pricing by 50%. Oracle Database and Oracle Autonomous Database both integrate with this appliance to provide hands-free protection against unanticipated data loss issues like ransomware attacks. Customers can also perform cross-region disaster recovery operations using Oracle Autonomous Data Guard and set up data replication and streaming services for real-time analytics using Oracle GoldenGate as a part of this solution.

This commitment is a huge deal for companies that must remain on-premises due to strict data sovereignty regulations, security concerns, or legacy infrastructure and performance constraints. By coupling the best of the public cloud with the best of converged hardware behind its customers' data center firewalls, Oracle has created a unique approach to the hybrid-cloud conundrum, one that promises to simplify disparate Oracle Database workloads across multiple deployment scenarios without compromise with architectural identicality on-premises and the public cloud.

Is Oracle's approach the only way for companies to simplify their hybrid infrastructure investments? Certainly not. Thanks to the dominance of containerization and the rich Kubernetes-led orchestration ecosystem, companies have the ability to create a single business architecture capable of handling disparate workloads and deployment scenarios. Such self-assembled platforms are of course comparatively do-it-yourself by design than Oracle Exadata X9M and can be built to house relatively the same specification of hardware. However, what Oracle and to a lesser degree its hyperscalar and hardware competitors are building is a synthesis of hardware and software where the whole is greater than the sum of its parts. For Oracle, this manifests as a purpose-built infrastructure powered by AI-fueled optimization and automation that can greatly accelerate time-to -value for customers through simplicity and cost efficiency that does not compromise functionality, performance, security, and management requirements. At this point, Oracle's early, pioneering work to deliver its database as a cloud service on Exadata over half a decade ago has placed the company in a leadership position with respect to real-world experience and production deployments in industry-hardened environments.

Appendix

Further reading

IoT, Cloud, and 5G – IT Enterprise Insights 2022 (October 2021)

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