

BLOG POST

Oracle Brings the Autonomous Database to Every Data Center

Oracle Innovation Makes It Possible to Run Autonomous Database and Exadata Database Service Concurrently on the Same Infrastructure



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INTRODUCTION

Oracle has seen tremendous success with its Exadata Cloud@Customer offering. Enterprises like the simplicity and innovative approach of running the latest Oracle Database system in their own data center—managed by Oracle. However, until now, Oracle customers had to choose what to run on Oracle Exadata Cloud@Customer—either Exadata Database Service or Oracle Autonomous Database Service. With the launch of its Multi-VM Autonomous Database on Exadata Cloud@Customer, Oracle has removed the need to make that pivotal decision.

Business Themes



New C-Suite



Data to Decisions



Technology Optimization



Digital Safety & Privacy

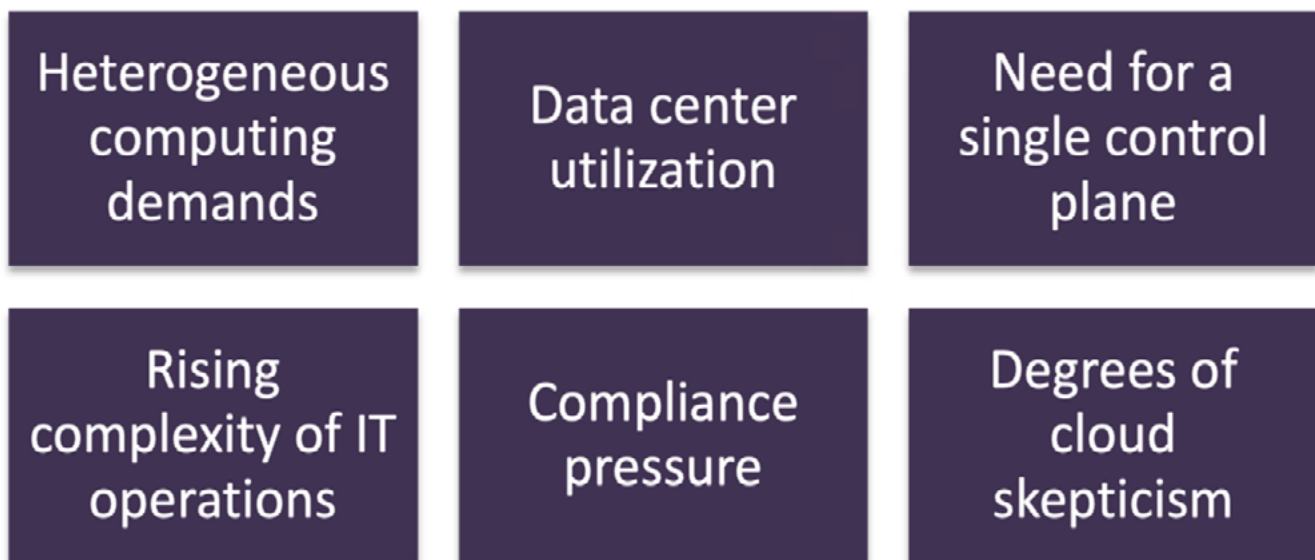
WHAT ARE THE KEY TRENDS?

Data has been at the center of the move to a digital economy and is very much the currency that guarantees the success of digital transformation projects that enterprises are pursuing when building next-generation applications (see Figure 1). The following six trends are drivers for a next-generation compute platform such as Oracle Exadata Cloud@Customer.

1. Growing Heterogeneous Computing Demands

CxOs are confronted with rapidly changing computing demands. Beyond the challenge of satisfying the business need for big data, the computing requirements that CIOs must meet range from support for machine learning to speech recognition for internal and external digital assistant/chatbot solutions, all the way to the edge of the enterprise. New computing platforms have entered the data center—for instance, with the advent of large GPU racks to run machine learning. An unprecedented platform diversity manifests itself at the edge of the enterprise to support the Internet of Things (IoT). And the pace of change is not slowing down, as shown by new demands for additional workforce support (e.g., augmented/mixed/virtual reality) and new user experience support (e.g., holographic displays).

Figure 1. The Six Drivers for Next-Generation Compute Platforms



Source: Constellation Research

2. The Effort to Maximize Data Center Utilization

As workloads move from enterprise data centers to public cloud vendors, CIOs struggle to reach the level of utilization they intended when originally planning and investing in their data centers. One part of the challenge is the business practice of letting individual company divisions choose their own automation tools, resulting in a lower degree of predictability for available workloads in on-premises data centers. An additional hurdle for CIOs is that physical infrastructure requests are moving more slowly and have a much-longer-lasting financial impact. Data center utilization can quickly change from full capacity to two-thirds utilization. Dropping a single server-refresh cycle will create that scenario, which CxOs experience as they move workloads to the public cloud.

3. The Need for a Single Control Plane

The era of CxOs' simply accepting that new products bring a new control plane is history. CxOs operating next-generation applications¹ must run them as efficiently as possible, via a single control plane. This not only allows for more efficiency in managing infrastructure but also is the best way to effectively manage a heterogeneous landscape. Ramping down and ramping up resources as demand requires cannot be done from a zoo of instrumentation. At the same time, it is essential to automate resource scaling so that humans can focus on delivering value instead of spending time and energy on operational tasks.

4. Rising Complexity of IT Operations

The cloud has not fulfilled its promise to simplify IT for most organizations, because they are operating on a fluid automation plane that includes the public cloud (often multicloud) and on-premises computing resources. Business priorities, timing, and write-down cycles all determine the specific time when a workload may be moved to the public cloud or whether it should remain on-premises. Changes in executive management often result in a shifting workload mix (for instance, due to software-as-a-service [SaaS] portfolio changes) that affects the overall computing mix. A greater diversity in workloads and new next-gen application use cases create more heterogeneity and increase the complexity of IT operations.

5. Onslaught of Compliance Pressure

Enterprises are confronted with a rise in compliance requirements that, due to the operation of larger software portfolios, affect more of the computing and storage infrastructure than ever. Data privacy and data residency regulations often require enterprises to move workloads to different physical locations and sometimes from the cloud back to on-premises environments. Enterprises had not even recovered from addressing the European Union's General Data Protection Regulation (GDPR) requirements when the California Consumer Privacy Act took effect, and they see more data residency rules coming their way. The rate of regulation will only increase, making CxOs desire a more fluid way to move workloads.

6. Increasing Degrees of Cloud Skepticism

Although many next-generation application use cases are best (and sometimes only) operated in the cloud, there is still a degree of skepticism about computing in the public cloud. It ranges from rational challenges (such as whether infrastructure-as-a-service [IaaS] vendor data instances are available inside a necessary jurisdiction) to reasonable challenges (hardware write-downs and connections to existing on-premises computing resources, such as mainframes) to less rational concerns (for instance, regarding data security). Nonetheless, it means that CIOs need to implement and operate their critical workloads in local data centers for at least the next decade.

WHAT IS ORACLE MULTI-VM AUTONOMOUS DATABASE ON EXADATA CLOUD@CUSTOMER?

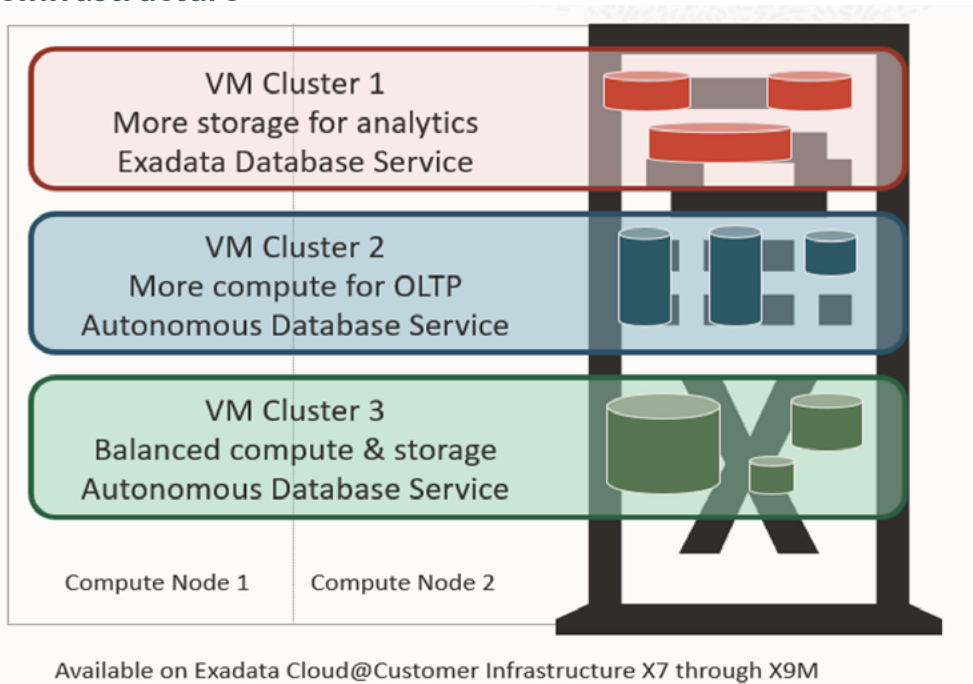
To address the challenges of the rising complexity of IT operations, Oracle has delivered its Autonomous Database for over four years now. Complex software running autonomously is a breakthrough not only from an operational cost perspective but also from a security and availability perspective.

At its core, the innovation enabling the Multi-VM Autonomous Database is the ability to run Autonomous Database on multiple virtual machine clusters (hence multi-VM) on Exadata Cloud@Customer. Each VM cluster is an isolated subset of an Exadata's compute, network, and storage capacity that can be separately allocated, updated, and managed with its own set of governance parameters.

Practically, this enables organizations to:

- 1. Define specialized VMs.** Customers can configure and size each VM cluster for its purpose and workload—e.g., for online transaction processing (OLTP), online analytical processing (OLAP), dev/test, and other workload use cases. The benefit for enterprises is that computing resources can be specialized (compute, storage, network, service-level agreements [SLAs], access, etc.) for the specific workload.
- 2. Provide flexible VMs.** Upon its creation, a VM can be specified for use as either an Autonomous Database or an Exadata Database Service. This gives enterprises the flexibility to choose what they want to operate.
- 3. Deliver database consolidation out-of-the-box.** A VM cluster can support multiple databases, thus furthering database consolidation. This is a key cost-saving strategy for many enterprises.
- 4. Add more VMs as resources are available.** As long as the underlying Exadata system has resources available, they can be used to define more VMs. This ensures that no hardware is idling for enterprises.
- 5. Scale consumption for each VM cluster.** To ensure that a VM cluster is not overusing hardware resources, databases running in these clusters can scale independently. For Autonomous Database, this scaling up/down is automatic without downtime.
- 6. Provide an unlimited number of VMs.** As many VM clusters can be created as the underlying hardware supports, giving enterprises the full flexibility they need for their next-generation workloads.

Figure 2. How Multi-VMs Can Be Configured for Different Workloads on the Same Exadata Infrastructure



Source: Oracle

WHY DOES IT MATTER?

Figure 3 illustrates the following value drivers for Multi-VM Autonomous Database on Exadata Cloud@Customer:

- **High flexibility.** Oracle gives customers the flexibility to use the Exadata platform at its best, tailored to their specific workload needs. Being able to choose between Exadata Database Service and Oracle Autonomous Database is of tremendous value for CxOs.
- **Private DBaaS becoming real.** Database as a service (DBaaS) is something CxOs have been requesting for quite a while. And although DBaaS has been available in the cloud for some time, it now comes to on-premises environments as well with Multi-VM Autonomous Database—effectively enabling a private DBaaS and self-service databases for developers.

Figure 3. Six Market Value Drivers of Multi-VM Autonomous Database on Exadata Cloud@Customer



Source: Constellation Research

- **Higher developer productivity.** Developers need access to databases to develop, test, and scale next-generation applications. Managing and operating these databases comes with substantial cost, not just operationally but also from a security/compliance perspective. All of this can now be addressed with the Multi-VM Autonomous Database support on Oracle Exadata Cloud@Customer for developer velocity.
- **Lower TCO.** When enterprises can reduce manual labor and oversight, they save on highly paid resources and typically reorient those resources to higher-level and higher-value tasks. With Autonomous Database now running on VM clusters on Exadata Cloud@Customer, all of these benefits are within reach for CxOs.
- **Data sovereignty addressed.** Data is governed by a lot of statutory and regulatory mandates and processes, which are a headache for CxOs needing to ensure compliance for their respective enterprises. Being able to provision databases easily into environments that meet these statutory requirements makes compliance achievable and affordable.

- **Faster cloud adoption.** Every Autonomous Database running on Exadata Cloud@Customer can be moved easily to Oracle Cloud Infrastructure (OCI), should enterprises want to do that. As such, the ability to create an Autonomous Database on virtualized Exadata resources in their data center and later move it to the cloud when the rest of the application stack is ready is a key enabler for future-proofing database workloads.

ADVICE FOR CXOS

Constellation has the following recommendations for CxOs regarding the new Multi-VM Autonomous Database on Exadata Cloud@Customer offering:

1. **Understand the database workload needs of your enterprise.** IT investments are critical for enterprises and need to be made with the outcome in mind. Plan which workloads are needed, when and where, and on which platforms. And with the Oracle next-generation computing platform having the highest Identity² architecture on-premises and in the cloud, customers are free to move Autonomous Database to wherever it makes the most business sense at any time.
2. **Do not overlook cost savings.** The level of consolidation enabled by Multi-VM Autonomous Database on Exadata Cloud@Customer offers substantial cost savings. Pair that with additional personnel savings from Exadata Cloud@Customer, and the adoption of this new offering quickly becomes a no-brainer.
3. **Get ready for the cloud.** Being able to run workloads on-premises that are cloud-ready at the same time is a key step for future-proofing applications as well as workloads. And the autonomous services of Oracle Database provide an instant efficiency gain as well.
4. **Free is hard to argue with.** Oracle provides Multi-VM Autonomous Database capabilities on Exadata Cloud@Customer at no additional up-front cost—an ROI/TCO consideration that is very attractive to any enterprise—and the over-the-wire upgrade is automatic, with no installation required.
5. **Conduct a cost/benefit analysis as an Oracle prospect.** Enterprises have limited options when it comes to choosing database offerings from a single vendor. Oracle is extending its database franchise

with this new offering, making it cost-effective beyond the largest enterprises. Oracle's competitors have not responded to the innovation of the Autonomous Database.

- 6. Consider this offering for next-generation applications.** Enterprises need to build next-generation applications that reflect the new best practices in the era of Infinite Computing. These applications must run in the cloud, but there are many reasons that enterprises may want to start with them on-premises. Being able to cloud-proof them from the get-go is very attractive for CxOs.
- 7. Practice commercial prudence.** As always, CxOs need to practice commercial prudence when it comes to platform decisions. One-time costs, ongoing costs, capex versus opex, and lock-in effects are the key areas to consider before making platform decisions. Database platform decisions are no exception to the need for commercial prudence in all phases of purchase, adoption, and the usage cycle.

MY POV

Enterprises need to constantly rethink their data strategies. The ability to operate on-premises while benefiting from a cloud model remains crucial for enterprises, as the success of Oracle Exadata Cloud@Customer has already shown. And being able to run a modern technology stack managed by the technology vendor is hard to resist for CxOs, given the many benefits associated with such a setup.

It is good to see that Oracle Exadata Cloud@Customer users no longer face the all-consuming dilemma of using either Exadata Database Service or Autonomous Database Service. Oracle's innovation enabling the ability to create and operate multiple VM clusters for Autonomous Database on Exadata Cloud@Customer has eliminated the need for that decision. It is great to see that Oracle customers can now fully utilize their Exadata Cloud@Customer on-premises infrastructure investments and cost-effectively experience the most modern database offering in the market—while future-proofing their database workloads for potential cloud usage in the near or more distant future.

RELATED RESEARCH

For the Market Overview, see: Holger Mueller, “Next-Gen Computing: The Enterprise Computing Model for the 2020s,” Constellation Research, September 14, 2018. <https://www.constellationr.com/research/next-gen-computing-enterprise-computing-model-2020s>

For a Constellation ShortList™ on IaaS vendors, see: Holger Mueller, “Constellation ShortList™ Global IaaS for Next-Gen Applications,” Constellation Research, February 16, 2022. <https://www.constellationr.com/research/constellation-shortlist-global-iaas-next-gen-applications-1>

Holger Mueller, “The Era of Infinite Computing Triggers Next-Generation Applications,” Constellation Research, June 1, 2018. <https://www.constellationr.com/research/era-infinite-computing-triggers-next-generation-applications>

For the people-leader perspective on the skills shortage and the need for enterprise acceleration, see: Holger Mueller, “Why People Leaders Must Embrace Enterprise Acceleration,” Constellation Research, July 3, 2018. <https://www.constellationr.com/research/why-people-leaders-must-embrace-enterprise-acceleration>

For more best-practice considerations for PaaS offerings, see: Holger Mueller, “As PaaS Turns Strategic, So Do Implementation Considerations,” Constellation Research, May 9, 2018. <https://www.constellationr.com/research/paas-turns-strategic-so-do-implementation-considerations>

For more on next-gen applications and PaaS offerings, see: Holger Mueller, “Why Next-Gen Apps Start with a Next-Gen Platform as a Service,” Constellation Research, April 5, 2018. <https://www.constellationr.com/research/why-next-gen-apps-start-next-gen-platform-service>

Also, for more on PaaS tool suites, see: Holger Mueller, “Constellation ShortList™ PaaS Tool Suites for Next Gen Apps,” Constellation Research, February 9, 2022. <https://www.constellationr.com/research/constellation-shortlist-paas-tool-suites-next-gen-apps-5>

For additional IaaS and PaaS selection criteria, see: R “Ray” Wang and Holger Mueller, “Key Questions for Every Public Cloud IaaS/PaaS Decision Matrix,” Constellation Research, January 24, 2018. <https://www.constellationr.com/research/key-questions-every-public-cloud-iaaspaas-decision-matrix>

For an example of digital transformation, see: Holger Mueller, “Lufthansa Digitally Transforms the Workplace for Flight Managers,” Constellation Research, February 27, 2018. <https://www.constellationr.com/research/lufthansa-digitally-transforms-workplace-flight-managers>

Finally, check the Constellation Research website at www.constellationr.com for more Offering Overviews for the vendors covered in “Market Overview—Next-Gen Computing: The Enterprise Computing Model for the 2020s.”

For information on enterprise application platforms, see: Holger Mueller, “Constellation ShortList™ Enterprise Application Platforms,” Constellation Research, February 9, 2022. <https://www.constellationr.com/research/constellation-shortlist-enterprise-application-platforms>

For more on next-gen databases, see: Holger Mueller, “Constellation ShortList™ Next-Gen Databases: RDBMS for On-Premises,” Constellation Research, February 9, 2022. <https://www.constellationr.com/research/constellation-shortlist-next-gen-databases-rdbms-premises-4>

For more information on next-gen computing platforms, see: Holger Mueller, “Constellation ShortList™ Next-Generation Computing Platforms,” Constellation Research, February 9, 2022s. <https://www.constellationr.com/research/constellation-shortlist-next-generation-computing-platforms-2>

ORACLE-RELATED RESEARCH

For the Constellation Shortlist for next-generation computing platforms, see: Holger Mueller, “Constellation ShortList™ Next-Generation Computing Platforms,” February 9, 2022. <https://www.constellationr.com/research/constellation-shortlist-next-generation-computing-platforms-3>

For the Constellation Shortlist on RDBMS on-premises, see: Holger Mueller, “Constellation ShortList™ Next-Gen Databases: RDBMS for On-Premises,” Constellation Research, February 9, 2022. <https://www.constellationr.com/research/constellation-shortlist-next-gen-databases-rdbms-premises-5>

For more on Oracle Exadata, see: Holger Mueller, “Oracle Exadata X9M and Oracle Exadata Cloud@Customer X9M Enable Rapid Enterprise Acceleration,” Constellation Research, September 29, 2021. <https://www.constellationr.com/research/oracle-exadata-x9m-and-oracle-exadata-cloudcustomer-x9m-enable-rapid-enterprise>

For more on the Oracle MySQL introduction, see: Holger Mueller, “There Is a HeatWave for Databases: Oracle MySQL Database Service Merges OLTP and OLAP,” Constellation Research, June 3, 2021. <https://www.constellationr.com/research/there-heatwave-databases-oracle-mysql-database-service-merges-oltp-and-olap>

For more on Oracle MySQL, see: Holger Mueller, “Oracle Switches to Autopilot, Turns Up the Heat With MySQL Database Service,” Constellation Research, September 16, 2021. <https://www.constellationr.com/research/oracle-switches-autopilot-turns-heat-mysql-database-service>

For information on Oracle Application Express (Oracle APEX), see: Holger Mueller, “Oracle Makes Its Great Database Even Better—and Adds Low Code to It,” Constellation Research, February 10, 2021. <https://www.constellationr.com/research/oracle-makes-its-great-database-even-better-and-adds-low-code-it>

For information on logging and observability, see: Holger Mueller, “Oracle Brings Holistic Observability to the Enterprise,” Constellation Research, November 19, 2020. <https://www.constellationr.com/research/oracle-brings-holistic-observability-enterprise>

For information on Oracle Exadata Cloud Service, see: Holger Mueller, "Oracle Exadata Cloud Service X8M Brings Leading Elasticity to Enterprise Needs," Constellation Research, October 19, 2020. <https://www.constellationr.com/research/oracle-exadata-cloud-service-x8m-brings-leading-elasticity-enterprise-needs>

For information on Oracle in DevOps, see: Holger Mueller, "Oracle Boosts DevOps Velocity With Oracle Linux Automation Manager," Constellation Research, December 13, 2021. <https://www.constellationr.com/research/oracle-boosts-devops-velocity-oracle-linux-automation-manager>

For information on Oracle's new JSON capabilities, see: Holger Mueller, "New Offering Launch - Oracle Boosts Developer Velocity with Autonomous JSON Database," Constellation Research, August 13, 2020. <https://www.constellationr.com/blog-news/new-offering-launch-oracle-boosts-developer-velocity-autonomous-json-database>

For information on Oracle Dedicated Region and Oracle Autonomous Database, see: Holger Mueller, "Oracle Raises the Stakes in the Next-Gen Compute Platform Market," Constellation Research, July 22, 2020. <https://www.constellationr.com/research/oracle-raises-stakes-next-gen-compute-platform-market>

For more information on Oracle Database at Deutsche Bank, see: Holger Mueller, "Oracle Affirms Its Strategic Role in Banking," Constellation Research, July 20, 2021. <https://www.constellationr.com/research/oracle-affirms-its-strategic-role-banking>

ENDNOTES

¹ Holger Mueller, "The Era of Infinite Computing Triggers Next-Generation Applications," Constellation Research, June 1, 2018. <https://www.constellationr.com/research/era-infinite-computing-triggers-next-generation-applications>

² The term Identicality was defined by the author in the Market Overview (Holger Mueller, "Next-Gen Computing: The Enterprise Computing Model for the 2020s," Constellation Research, September 14, 2018. <https://www.constellationr.com/research/next-gen-computing-enterprise-computing-model-2020s>) and refers to the identical technology stack's being available between the public cloud and the on-premises offering of a vendor's next-gen computing offering.

ANALYST BIO

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Holger Mueller is a vice president and principal analyst at Constellation Research. He provides guidance for the fundamental enablers of the cloud, IaaS, and PaaS, with forays up the tech stack into big data, analytics, and SaaS. Mueller provides strategy and counsel to key clients, including chief information officers, chief technology officers, chief product officers, investment analysts, venture capitalists, sell-side firms, and technology buyers.

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