



CLOUD WARS White Paper

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Oracle's Next-Gen Exadata X9M Crushes the Competition—in the Cloud and On-Premises

As data becomes more ubiquitous, complex, and valuable, CXOs are making data management and the ability to reach data-driven business decisions top-level strategic priorities because they know that these capabilities are essential to thriving in the digital economy.

Of course, midsize and large organizations have long been very familiar with data management and its constituent pieces: databases, data stores, data lakes, servers, storage, integration, security, and more.

But very few business and IT leaders on the face of the Earth have seen anything like the incredible disruption that's swept the business-technology world over the past 20 months. The pandemic-driven expansion of the digital economy has made one thing very clear: the data-management solutions and approaches of the past are simply incapable of meeting future digital demands.

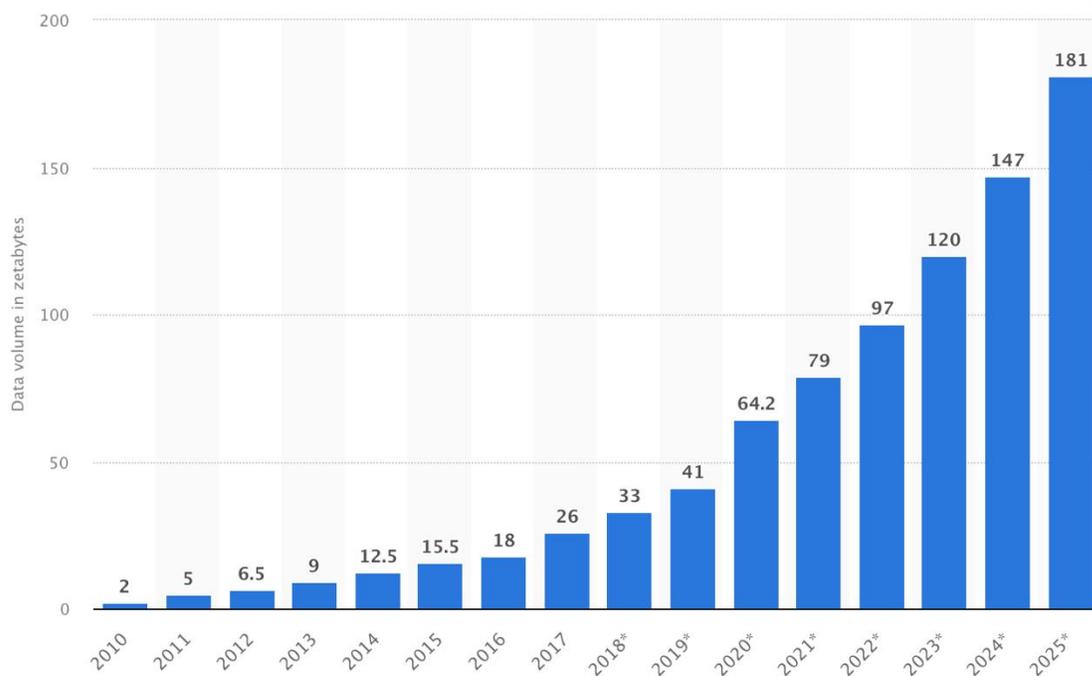
And while it's unquestionably true that the volumes, variety, and velocity of data have been surging, that tells only part of the story. For a variety of reasons, the data-management challenge today is wildly more complex than it's ever been before:

- data volumes are doubling every few years, as [shown in the graphic below from Statista.com](#), so the sheer challenge of scaling up storage and management solutions remains daunting;
- cybersecurity attacks on databases have become more sophisticated, more damaging, and more frequent;
- in the midst of these hair-on-fire requirements, IT teams have simultaneously had to devise ways to give more people from across the

organization secure access to data, enable the integration of more types of data, and provide the means for real-time data analysis;

- analytical and visualization tools must be made readily available to give a large fraction of a workforce the opportunity to access, evaluate, manipulate, consider, and act upon that data;
- data sovereignty and privacy have become high-profile issues that increase the magnitude of the challenges IT teams are facing;
- data has become such a vital asset within companies that it can't just be locked away where no one—including the bad actors—can get at it; and
- data's now the most valuable raw material on Earth, which means it must not only be guarded with the greatest vigilance but it also must be made easily available to qualified employees responsible for turning it into new revenue-generating products and services.

Statista.com: [Volumes of data created, captured, copied, and consumed worldwide from 2010 to 2025 \(in zettabytes\)](#)



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Clearly, the challenge of optimizing the use of data is no longer confined to IT. And in the same way, the challenge of optimizing IT environments to fully leverage the business value of that data can no longer be confined to traditional

data-management tools and approaches. Companies that want to grow and thrive in the digital economy of today and beyond must be willing to adopt new technologies and operating models to turn their data from a series of “challenges” into a massive competitive advantage.

All of these dynamics played big parts in the decision by Oracle founder Larry Ellison to acquire Sun Microsystems in 2010. As a number of big tech vendors were moving away from or out of the hardware business, Ellison took a decidedly different tack by imagining that in a world of exploding volumes of data and information, hardware and software would have to be rigorously engineered to work together to handle those unprecedented requirements. In Ellison’s mind, the old model of IT—generic hardware paired with generic software—would quickly be overwhelmed by the torrents of data about to be unleashed in the digital age.

Ellison’s vision came alive in the form of Oracle’s Exadata engineered systems, an IT-architecture breakthrough that created the world’s fastest, most-scalable, and most available “database machine” by tightly integrating and optimizing the database software, server, storage and networking into a purpose-built system. With many thousands of database customers across the globe, Oracle has unmatched insight into the related challenges its customers face as they try to scale up to meet the demands of the digital world. Building on those insights, Exadata systems are designed to meet customers’ most challenging and timely needs:

Exadata X9M Solves Common Customer Database Problems

Customer Problems	Underlying Issue
Applications slow down as data increases	Low IOPS
Lengthy transactions reduce productivity and customer satisfaction	High Latency
Analytics with large amounts of data are too slow	Low Throughput
Applications can't always access their databases	Low Availability
Enterprise database and infrastructure sprawl	No Convergence
Databases can't seamlessly move between on-premises and cloud	No Cloud Identity
Databases require too much management	Insufficient Automation
Databases cost too much	Poor Utilization Efficiency

Scaling of database size and performance is a major issue everywhere!

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Today, 12 years after Ellison's initial vision of creating highly engineered systems optimized for the performance of Oracle Databases and workloads, Oracle is releasing its eleventh generation: Exadata X9M, the best optimized platform for Oracle Database, period, hands down, no debate. With Exadata X9M, not only is the fastest platform for Oracle Database getting faster and cheaper, but it's being simultaneously released as both a public Cloud@Customer data center solution and an on-premises solution that allows customers to decide how to best address their individual requirements:

- Exadata Cloud@Customer X9M is a public cloud in-your-data-center solution that is managed by Oracle; and
- Exadata Database Machine X9M is a customer-managed solution for on-premise workloads.

Oracle's vision for the Exadata X9M portfolio is to help customers scale the size and performance of their databases to meet the demands of the high-volume, high-velocity, and always-on digital economy. As part of Exadata X9M's value proposition, Oracle is quite explicit on spelling out that the X9M family will deliver without compromise "extreme performance and availability, lowest cost, and deployed anywhere" so that customers can gain control of their explosive data estates. Those are bold claims, but Oracle has the details to support them.

"In today's environment, it is important for customers to have confidence that their systems have the scale-out performance and capacity, reliability, and availability to handle even the most-challenging workloads," said Subban Raghunathan, vice-president of product management for Exadata. "And because we can engineer the whole stack and have designed it for optimal performance, customers can be confident that our automated management capabilities will keep everything secure and up to date. Plus, since the Exadata architecture is exactly the same in the cloud as it is on-premises, customers can also be confident that their IT environments are now future-proof," concluded Raghunathan.

For OLTP, the Exadata X9M offers dramatically higher performance than its X8M predecessor, enabling customers to run new workloads at lower per-transaction costs:

- Up to 27.6 million SQL IOPS per rack. This 70% increase enables new transactional and hybrid database use cases, particularly for those requiring extreme transaction rates or real-time data integration.
- 42% lower cost per SQL IOPS, which makes Exadata X9M more affordable for mid-sized customers with transaction-intensive workloads.

For analytics, Exadata X9M offers:

- Up to 1TB/second of SQL throughput per rack. Think about that: you can now scan 1 terabyte a second. Imagine what this will mean for predictive analytics, trading and fraud detection, just to name a few. This 87% improvement is also vital for organizations that need to analyze real-time data flows in IoT or financial-services environments as well as for those that want to use machine-learning, spatial, and graph analytics to identify new features in ever-increasing volumes of multi-source data.
- 47% lower scan costs, which enable the use of analytics for new applications and by smaller organizations.

With the new levels of performance and price-performance offered by the new Exadata X9M Cloud@Customer and on-premises systems, customers of earlier Exadata systems will find it easy to adopt the new platform, and Oracle Database customers that are not yet using Exadata will increasingly want to do so. Exadata X9M represents a significant opportunity for Oracle to not only refresh its Exadata installed base but also to gain material market share versus both cloud and on-premises competitors. You can find out more on that in [Larry Ellison's Trojan Horse: Oracle Exadata in 86% of Fortune Global 100](#).

Exadata Vision

Extreme Performance and Availability, Lowest Cost, Available Everywhere



Ideal Database Hardware –

Scale-out, database optimized compute, networking, and storage

Database Aware System Software –

Unique algorithms vastly improve **OLTP, Analytics, and Consolidation**

Automated Management –

Fully automated and optimized end-to-end

Identical Capabilities

On Premises
Cloud@Customer
Oracle Cloud

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Giving customers choice, and simplifying the process

Recently, Oracle has been emphasizing the twin themes of customer choice and ease-of-implementation. These come together in Oracle's vision for Exadata, with

customers being able to deploy ideal database hardware, database-aware system software, and automated management in the cloud or on-premises. Customers are able to configure systems to match their specific consolidated workload needs, and can choose whether to manage the system on-premises themselves, use an Oracle-managed cloud service in their data center, or deploy in the Oracle Cloud.

By making Exadata X9M architecturally identical across cloud and on-premises environments, Oracle allows organizations to seamlessly move workloads back and forth as needed and eliminate the spending of vast amounts of time and money to integrate and synchronize mismatched solutions across those environments.

For customers that want the advantages of the cloud but need it in an on-premises format, Exadata Cloud@Customer X9M offers “the world’s fastest on-premises cloud database system” at the same price as the previous Exadata Cloud@Customer X8M model, according to Oracle vice-president of product management Bob Thome.

Plus, the database in that “world’s fastest on-premises database system” can either be a standard Oracle Database or the cloud-native Oracle Autonomous Database, which is the only self-monitoring, self-patching, and self-improving database on the market today. Once again, Oracle is providing customers with choices that are not available on other platforms.

Exadata Cloud@Customer X9M versus AWS Outposts with RDS

	Oracle Advantage	Exadata Cloud@Customer X9M	RDS on AWS Outposts (unchanged since July 2020)
Minimum SQL read latency	50x faster	<19 μs	1,000 μs
Maximum SQL read IOPS (Aggregate for RDS)	23x faster	22.4 M	0.96 M
Maximum SQL throughput (Aggregate for RDS)	18x faster	540 GB/S	28.5 GB/S
Maximum database size (Uncompressed)	9x larger	615 TB	64 TB
Maximum data warehouse size (Compressed)	24x larger	6 PB	256 TB
Time in production	5x longer	4.5 Years	21 months
Same as the public cloud		✓	Subset
Online scaling with no application downtime		✓	✗
No downtime for maintenance and upgrades		✓	✗
DB acceleration with PMEM		✓	✗



As a result of the extensive efforts that Oracle has put into optimizing the performance of Exadata X9M, the new Cloud@Customer version blows away the results of Amazon's comparable offering, AWS Outposts with RDS. As you'll see in the table below, Exadata Cloud@Customer X9M delivers up to 50X better performance and functionality than the AWS configuration.

Compared to Amazon RDS using flash storage, Exadata Cloud@Customer X9M delivers 50X better latency; versus Microsoft Azure SQL using flash storage, Exadata Cloud@Customer X9M delivers 100X better latency. For analytics, Exadata Cloud@Customer X9M delivers 25X faster throughput than Microsoft Azure SQL and 72X faster throughput than Amazon RDS. Note that these comparisons are with AWS and Azure cloud, not on-premises AWS Outposts or Azure Stack. The advantages for Exadata Cloud@Customer X9M versus those platforms are much greater, as noted above.

Like other leading cloud database providers, Oracle clearly recognizes that the vast majority of organizations will standardize on a hybrid IT model featuring public cloud, private cloud, on-premises systems, and edge technologies. By enabling customers to leverage the same Exadata architecture in all environments, Oracle offers a compelling value proposition to IT leaders eager to find a technically elegant approach to quickly weaving those various environments into a fully interoperable whole.

But the appeal of Exadata X9M Cloud@Customer goes well beyond that important issue of cross-platform compatibility. Look at the significant performance advantages over AWS Outposts with RDS shown in the table above, and it's easy to see that Exadata X9M's superiority transcends fractional margins such as "25% faster" or "38% larger" and leaps instead to big multiples. For example, Exadata X9M Cloud@Customer can handle a maximum uncompressed database size that is 9X bigger than the maximum AWS can handle, and for compressed databases typically found in data warehouses that margin jumps to 24X—something that comes in rather handy when trying to tame a data explosion.

In a global economy that is increasingly dependent on data to spur growth and innovation to drive superior customer experiences, Oracle's family of Exadata X9M systems gives organizations levels of database performance, scalability, security, and price that no other technology provider can match in either cloud or on-premises deployments. Not only is it faster and more scalable than AWS Outposts running RDS, the Exadata Cloud@Customer X9M public cloud in-your-datacenter solution offers key advantages over the previous X8M generation so

customers can reduce their infrastructure footprint with database consolidation and reduce data-management costs:

- Up to 80% faster analytics scan rates and 44% lower costs for analytics and in-database machine learning;
- Up to 87% faster SQL IOPS rates and 46% lower costs for transactional databases;
- Up to 28% larger databases and 45% lower costs for data-intensive workloads with larger storage servers and elastic storage expansion; and
- Increased security with Operator Access Control that allows customers to control when Oracle Cloud@Customer operators can access the infrastructure, what they can and for how long, as well as providing full session logging and instant-termination capabilities.

Exadata Cloud@Customer X9M allows organizations to simplify the management of their IT environments and benefit from cloud economics while securing their data in their data center. Exadata Cloud@Customer X9M's substantially greater capabilities are light-years ahead of the competition, while its full compatibility with existing on-premises and cloud Oracle Database environments make it the logical stepping stone for enterprises that have not yet moved crucial databases and applications to the public cloud.

Major enhancements for advanced database protection

The final element in this unprecedented expansion of the Exadata lineup of extreme-performance data-management solutions is Oracle's Zero Data Loss Recovery Appliance X9M (Recovery Appliance X9M).

Oracle has reduced the price of the entry-level model by 50% while keeping the price the same as Recovery Appliance X8M for all other configurations. It is also pumping a wide-ranging set of enhancements—particularly security—into this latest generation. Those improvements include more backup capacity, the ability to do backup and recovery from anywhere, and cybersecurity innovations to meet the soaring cyber threats of today including malware and ransomware. The Recovery Appliance X9M allows customers to protect more databases, with a longer retention period and lower costs with the following new capabilities:

- 30% increase in backup capacity:
 - 18 TB drives replacing 14 TB drives used in the prior X8M version;
 - a full rack supports more than 1 PB of physical capacity, 13 TB of effective backup capacity, and a 24 TB/hour restore rate;

- Archive to Cloud with long-term retention in OCI or local ZFS Storage Appliances;
- Backup and Recovery Anywhere with database-aware failover and synchronization between Recovery Appliances;
- Cyber Vault Architecture for malware and ransomware protection; and
- A 50% price reduction for base Recovery Appliance configurations.

The combination of a 30% increase in capacity and a 50% price reduction for entry-level systems lowers the introductory price-per-terabyte of protection by more than 60%, which is a boon to midsized organizations afraid of losing critical data. In addition, new capabilities help protect critical customer data against outages and attack, and allow organizations to implement Oracle Maximum Availability Architecture (MAA) best practices that are engineered into the Recovery Appliance without having to increase their internal IT resources.

Conclusion

Oracle has been the world leader in both relational and open source database technologies for four decades, and in an industry known for having feisty innovators topple the incumbent leaders every 5 years or so, that is an extraordinary accomplishment. That accomplishment has been primarily the result of relentless innovation and improvement and increasingly focused customer alignment—all of which have combined to keep Oracle from becoming the latest chapter in [The Innovator's Dilemma](#) phenomenon. We have seen so many prominent companies stumble and fall because their incumbent success prevented them from being able to respond to new challenges, new competitors, and new marketplace realities.

The Exadata family—and in particular the new Exadata X9M generation—gives business customers across every industry levels of performance, continuity, technological advances, and economic value that have no comparison in systems available today from cloud or on-premises vendors. With the Exadata X9M generation, customers can forge ahead into the digital economy with data-management capabilities that will help them not just survive but thrive today and in the future.

For on-premises hardware vendors touting their abilities to run Oracle databases—companies such as HPE, Dell, and others—the Exadata X9M represents an extraordinary competitive challenge. And for cloud vendors, whether public clouds or on-premises clouds, Oracle's latest achievements with Exadata X9M underscore the value of Oracle's 40 years of on-premises experience and expertise plus its

massive and relentless commitment to the latest technologies. Cloud-native capabilities are wonderful—but as Exadata X9M clearly shows, they're not nearly enough to enable organizations to become thriving players in the digital economy.

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