

Cloud **Essentials**

# Run Critical Databases in the Cloud

Oracle has the most complete data management portfolio for any enterprise workload.

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Cloud computing is transforming business practices and simplifying data center operations. However, when it comes to moving critical database assets to the cloud, many IT leaders are cautious—and rightly so. They have seen the limitations of popular commodity cloud solutions, which mostly consist of fragmented hardware and software offerings that must be manually configured. IT pros must build their own platforms on top of the service provider's commodity infrastructure, migrate their data, and then figure out how to keep everything in sync with the apps and data still maintained on premise.

Oracle Autonomous Database provides enterprise-level scalability, security, performance, and automation—at a level that often exceeds what you can achieve in your own data center. You can subscribe to complete database platforms with a few clicks, eliminating the need to provision, build, and manage in-house databases and storage systems. With pay-as-you-grow configurations—all managed by Oracle experts—your organization will obtain operational flexibility with zero up-front capital expenses. It's a great way to lower operational costs because you pay only for what you use.

Read on to discover what a powerful cloud database can do for your business.



# Migrating to a Cloud Computing Model

Modern businesses depend on their data more than ever before. That data is coming at an alarming rate, placing crushing demands on data marts, enterprise data warehouses, and analytics systems.

Some businesses look to the cloud to help solve these scalability issues. However, most cloud providers simply move familiar data management problems to a new infrastructure, and it's up to you to keep the entire platform running efficiently. Industry research firm IDC found that as much as 75 percent of the total cost of database management can be attributed to labor.<sup>1</sup>

Developing new applications using a cloud model can boost efficiency and reduce costs, but how do you achieve results that completely transform your business? The key to achieving this type of IT transformation is to move both existing and new applications to the cloud. To that end, Oracle's complete cloud offering delivers a comprehensive data ecosystem in which a broad set of related

cloud services work together automatically—and in many cases, autonomously.

Oracle Cloud and Oracle Autonomous Database run on Oracle Cloud Infrastructure, a second-generation cloud offering that runs enterprise applications and databases with exceptional performance, scalability and security. For example, Oracle Cloud Infrastructure allows customers to independently scale compute and storage resources without restarts, instantly meeting the needs of any size business.

All Oracle Cloud database offerings are 100 percent compatible with Oracle Database instances that have been deployed on premise, ensuring a smooth transition to the cloud and a flexible hybrid management strategy. You can migrate your databases to Oracle Cloud with a single click, then monitor the environment in the same way that you monitor your on-premise databases—all from a single console. You can do it yourself or you can let Oracle handle everything for you, including backups, software patches, and upgrades.

<sup>1</sup> Carl W. Olofson and David Schubmehl, "Oracle's Autonomous Database: AI-Based Automation for Database Management and Operations," IDC report, February 18, 2018, oracle.com/us/products/database/idc-oracles-autonomous-database-4497146.pdf.



# The World's First and Only Autonomous Database

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Oracle Autonomous Database represents four decades of innovation with machine learning (ML) technology. This revolutionary database management system is available in two unique offerings.

- **Oracle Autonomous Data Warehouse** allows you to deploy new data marts, data lakes, and data warehouses to the cloud—or move existing ones from your data center to the cloud.
- **Oracle Autonomous Transaction Processing** is designed for high-performance, mission-critical databases, mixed workloads and OLTP workloads.

Both offerings are powered by Oracle Exadata, a high-performance database platform engineered for exceptional scalability, availability, and performance. Oracle automates patching, upgrades, and tuning—including performing all routine maintenance tasks while the database management system is running, without human intervention. Manually managed databases simply can't compete. Oracle Autonomous Database leads the industry in price, performance, availability, and security.

## Self-driving.

Oracle Autonomous Database eliminates human error when provisioning, securing, monitoring, backing up, recovering, troubleshooting, and tuning your database. In addition to reducing the need for manual input, it cuts costs and allows your IT staff to concentrate on higher-value tasks. And with adaptive machine-learning algorithms, the database can automatically tune itself—allowing you to submit queries, visualize data, and share results without getting bogged down by mundane data management tasks.

## Self-securing.

Devastating security lapses can occur if patches are not applied in a timely manner. Oracle Autonomous Database patches itself to avoid human errors or omissions. It automatically applies the latest security patches, reducing vulnerability and minimizing application downtime. Always-on encryption lets you control your own keys to further enhance security. Oracle Data Safe, now included with Autonomous Database, mitigates risk from risky users, sensitive data and misconfigurations.

## Self-repairing.

Oracle Autonomous Database automatically recovers from any physical failures—at both the server and data center levels. In addition, by applying software updates across multiple nodes within a cluster, it ensures your applications remain online. With Artificial Intelligence diagnostics, Oracle Autonomous Database detects errors by continually gathering statistics, analyzing the root cause of problems, and resolving them quickly. It uses AI to deliver unprecedented reliability, performance, and elasticity for deployments.



# The Value of Database Automation

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Oracle Autonomous Database uses machine learning (ML) technology to optimize the database for each workload, including establishing the correct data formats and indexes for analytics. It continuously monitors workload performance and can even simulate the overall benefit of each proposed optimization before implementing it.

Its unique capabilities include the following:

- **Comprehensive data management** with support for both structured and unstructured data, as well as for mixed workloads such as online transaction processing (OLTP) and analytics
- **Unmatched performance** for database workloads, which can be deployed on Oracle Database Exadata Cloud Service for extreme performance—ideal for big data and Internet of Things applications
- **Easy migrations** with no code changes to your applications when you move them to the cloud, which preserves investments and eliminates costly recoding efforts
- **Familiar management tools** that deliver comprehensive visibility for software, databases, and applications
- **Industry-leading innovations** such as pluggable databases for portability, in-memory technology for performance, and engineered systems optimized for mission-critical workloads
- **Deployment choice** to migrate workloads among private clouds, Oracle's public cloud, and Oracle Cloud at Customer hybrid environments—with the same products, architecture, and skills across all environments
- **Exceptional protection** with Oracle defense-in-depth security, including encryption of data at-rest and in-transit to keep your information safe as well as Oracle Data Safe
- **Autonomous operation** including patching, upgrades, and tuning, with all routine database maintenance tasks performed while the database management system is running—and without human intervention

# Shielding Sensitive Data and Ensuring Constant Uptime

For most businesses, success depends on maintaining system uptime. This requires a cloud architecture that can handle every threat that arises, from software and hardware failures to natural disasters and cyber attacks. However, despite the capabilities and convenience of cloud computing, these online systems have expanded the potential attack surface and introduced new risks, a situation that is exacerbated by today's highly mobile workforce.

As cyberthreats become more frequent and sophisticated, it is critical for businesses to ensure the resilience of their data and systems. Yet due to a significant shortage of cybersecurity expertise, it's difficult to find enough security operations professionals to protect these systems. It's an expensive problem: According to *Security Today*, the average cost of a data breach in 2018 was US\$3.86 million, up 6.4 percent from the previous year, and the average cost of each stolen record containing sensitive and confidential information was US\$148—a 4.8 percent increase from the previous year.<sup>2</sup>

Autonomous technologies allow you to discover

data breaches more quickly and often avert them entirely, reducing risks by using machines to fight machines. Oracle Autonomous Database uses AI and machine learning technology to automate your cyberdefenses. In addition, Oracle automatically applies patches across the entire stack of software that supports your applications, even while those apps are running—increasing uptime and minimizing the risk of human error.

All Oracle Database access is monitored, recorded, and can be audited at any time. The data is encrypted—both in transit and while at rest. Oracle also makes it easy to redact sensitive application-layer data, restrict privileged-user capabilities, mask data in nonproduction environments, and monitor all user activities. Administrative access to your Oracle Database environment includes multiple security zones to restrict access on a need-to-know basis for all IT staff. Oracle Data Safe adds security and compliance solutions to mitigate risks that have traditionally been considered the customers' responsibility, including risky users, sensitive data and misconfigurations. Data Safe provides security risk assessments, user risk assessments, database activity auditing, sensitive data discovery and data masking all in a simple, unified security control center.

<sup>2</sup> Sydny Shepard, "The Average Cost of a Data Breach," *Security Today* magazine, July 17, 2018, [securitytoday.com/articles/2018/07/17/the-average-cost-of-a-data-breach.aspx](http://securitytoday.com/articles/2018/07/17/the-average-cost-of-a-data-breach.aspx).

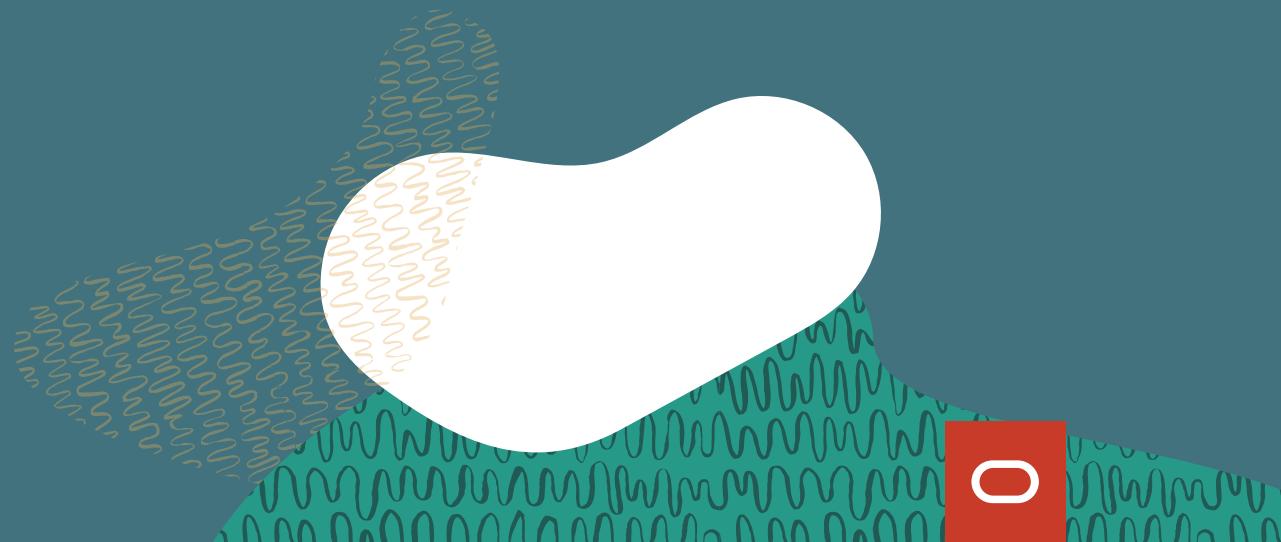
<sup>3</sup> "Gartner Forecasts Worldwide Public Cloud Revenue to Grow 17.5 Percent in 2019," press release, April 2, 2019, on Gartner website, [gartner.com/en/newsroom/press-releases/2019-04-02-gartner-forecasts-worldwide-public-cloud-revenue-to-g](http://gartner.com/en/newsroom/press-releases/2019-04-02-gartner-forecasts-worldwide-public-cloud-revenue-to-g).

## Cloud security for the entire lifecycle of data.

- Data is encrypted by default in the cloud (in transit and at rest)
- Data is classified for risk
- Data is masked for Dev/Test activities

## Did you know?

Through 2022, Gartner projects that the cloud services industry will grow nearly three times as fast as the IT services industry as a whole.<sup>3</sup>





## Intelligent Business Analytics Require Automation

Traditionally, database administrators viewed each database deployment as unique. They were responsible for building, securing, repairing, tuning, and maintaining database assets. These endless cycles of maintenance required lots of skilled personnel, raising overall costs.

Oracle Autonomous Database automates this lifecycle so you can innovate more, spend less, and keep your data secure.

For example, Oracle Autonomous Data Warehouse gives you an easier way to store, access, and manage your analytics data. The self-tuning capabilities are preconfigured for automated patches and upgrades, helping you eliminate manual, error-prone management processes. The database detects available patches and automatically applies them, without human intervention.

You can deploy a data warehouse in the cloud in 15 minutes, then expand or shrink computing and storage resources independently, with no downtime. You can also access cloud-based business intelligence and data integration services. Provisioning, patching, software updates, performance tuning, backups, and security patches are performed automatically.



# Automated Database Provisioning

## A six-step process.



- 1** Choose Autonomous Data Warehouse or Autonomous Transaction Processing.



- 2** Specify the name of the database.



- 3** Select how many CPU cores you need for your service.



- 4** Select the storage capacity.



- 5** Set up administrator credentials.



- 6** Specify whether you want to use existing licenses or subscribe to new database licenses.

## Rapid Provisioning Processes

Provisioning an on-premise database is often a lengthy process, including finding space in the data center, procuring hardware resources, setting up storage volumes, allocating memory, configuring database instances, and much more. Oracle simplifies the provisioning process via a cloud portal interface and APIs that integrate with any management or orchestration tool. You can have a fully configured Oracle Autonomous Database instance up and running in less than five minutes. After that, new database instances can be provisioned in minutes. This highly efficient model avoids the burden of having to maintain extra capacity.

### Did you know?

A full 71 percent of *AI leader* organizations have experienced revenue growth of more than 10 percent in the past two years, versus only 33 percent of *AI laggards*.<sup>4</sup>

<sup>4</sup> Harvard Business Review, "The Rise of Intelligent Automation: Turning Complexity into Profit," HBR Pulse Survey, oracle.com/a/ocom/docs/artificial-intelligence/hbr-pulse-survey.pdf.





## Autonomous Database Use Cases

You can migrate any OLTP or data warehouse workload to Oracle Autonomous Database and scale it as needed. There are several popular use cases.

### Application development and testing.

DevTest is one of the leading use cases for the public cloud. Many companies form DevOps teams in which developers collaborate with operations personnel to create, test, troubleshoot, and improve applications as part of a continuous flow.

These no-cost tools enable you to develop applications on top of Oracle Autonomous Database:

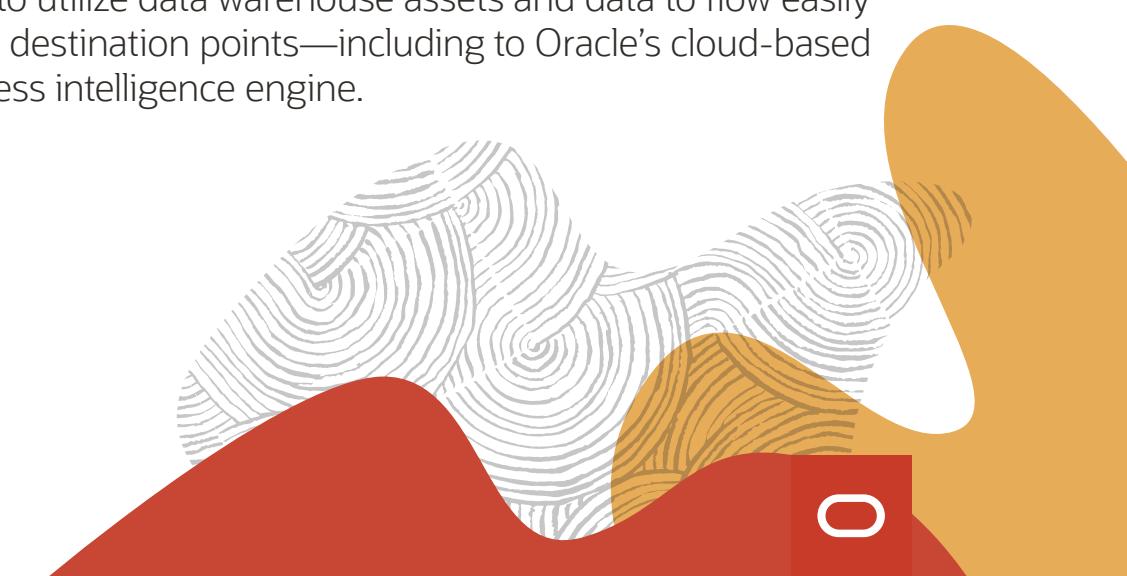
- Oracle Application Express (APEX) enables fast, low-code application development
- Oracle REST Data Services provides a seamless interface between Oracle Autonomous Database and any technology that can interact with RESTful services
- Oracle SQL Developer Web is available directly from the Oracle Autonomous Database service console
- Oracle Developer Cloud Service enables agile development methodologies and DevOps automation

### Sandbox environments.

Some Oracle Database customers use Oracle Autonomous Database as a staging ground to practice upgrade procedures or try out new database features, such as transportable table spaces and pluggable databases. If you make a mistake, you can easily delete the database instance and start over.

### Data warehouses.

Oracle Autonomous Database is ideal for data warehouse workloads, especially when a diverse or geographically dispersed workgroup needs to access analytics services. It reduces the cost and complexity of managing the infrastructure, allowing analysts to focus on extracting value from their data. Once your data warehouse is in the cloud, people can access it from anywhere, allowing your entire team to utilize data warehouse assets and data to flow easily to key destination points—including to Oracle's cloud-based business intelligence engine.



## High-Performance Data Management

For high-performance data warehouses and OLTP applications, consider Oracle Autonomous Transaction Processing. Designed for high-performance, mission-critical databases and mixed workloads, this OLTP service delivers extreme performance for instant analytics.

### Backup and disaster recovery services.

Oracle Database Backup Cloud includes enterprise-grade data encryption, compression, and protection for automated backup of your cloud data. You can also use Oracle Cloud to establish an offsite disaster recovery service, complete with Oracle Data Guard and Oracle Active Data Guard. Many customers use their backups as standby databases for reporting and analytics.

## Migrating Existing Workloads to the Cloud



Enterprise data warehousing



Sandbox Environment



Line-of-business data marts



Backup and disaster Recovery to the Cloud

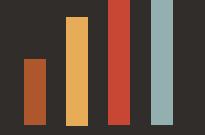


Migrate existing applications to Autonomous Database

## Discovering New Monetization Opportunities



Data warehousing and cloud compute analytics



High-performance data management



Expansion of data warehouse to Oracle Big Data Cloud

## Your Automated Future

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AI technology is fundamentally altering enterprise computing by changing how organizations receive, manage, and secure business data. By 2025, Oracle predicts that 90 percent of all applications and services will incorporate AI at some level—and more than half of all enterprise data will be managed autonomously.

Oracle Autonomous Database represents an entirely new category of software based on machine learning that allows you to focus on your core business, worry less about day-to-day operations, and create opportunities for innovation. Oracle Cloud puts these emerging technologies to work by enabling customers to establish new IT capabilities quickly, affordably, and securely.

### Intelligence at every layer.

Oracle's complete, integrated cloud platform includes intelligent solutions that span the SaaS, PaaS, and IaaS layers. For example, Oracle embeds AI across its business applications to enable new, intelligent experiences. Oracle also extends ML into Oracle Autonomous Database—the world's first and only self-driving database. It's all deployed on a next-generation cloud infrastructure that provides the foundation for intelligent cloud services. Oracle is the only company delivering a complete and integrated set of cloud services, and the only company building intelligent solutions at every layer.

## Bring Your Own License

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Oracle recently introduced two new programs to make it easier to buy and consume cloud services, helping you get more value from your hardware and software investments.

- **Oracle Universal Credit Pricing** enables you to access current and future Oracle Cloud Platform and Oracle Cloud Infrastructure services under a single umbrella contract.
- **Oracle's Bring Your Own License** program enables you to apply your on-premise software licenses to equivalent Oracle services in the cloud.

These popular programs alleviate cloud adoption challenges by simplifying the way your organization purchases and consumes cloud services.

Discover the many advantages of moving your data management activities to the cloud and learn what sets Oracle apart from other DBaaS providers.

## Cloud Essentials

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Learn more about [Oracle Autonomous Database](#), or check out our blog to see what your peers have to say about Oracle DBaaS.

Try Oracle Cloud today.  
Go to [oracle.com/cloud/free](http://oracle.com/cloud/free).

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