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Cloud Platform

Oracle Autonomous Database

Unleash the Potential of your Data

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Chapter 1:

The World's Most Intelligent Database Just Got Smarter

Long the stuff of self-aware robots and other speculative science fiction scenarios, artificial intelligence (AI) has entered the mainstream. Today's adaptive intelligent systems bring a high degree of automation to everyday activities—from self-driving cars to self-aware firewalls that identify hackers before they can breach your network. The most advanced AI systems use machine learning algorithms to analyze current conditions and learn from experience, getting progressively smarter over time. They rely on analytics to discover pertinent patterns in immense volumes of data, yielding insights that were formerly only accessible to highly trained data scientists.

As machine learning systems get more capable, they are entering every corner of the information technology (IT) industry. The biggest development—the one that stands to change nearly everything—is the advent of artificial intelligence within Oracle Database, the world's most popular data management system.

The world has depended on Oracle's flagship database to power critical business processes for many years, from creating financial reports to running electric grids to automating supply chains. Oracle Database is also the foundation of digital business activities such as ecommerce, mobile computing, and social media. Data is the unifying thread, the all-pervasive fabric for cutting-edge applications in the realms of big data, artificial intelligence, and Internet of Things (IoT). Now, these mission-critical data management systems are gaining a high degree of self-awareness as Oracle rolls out the world's first autonomous database.

This ebook examines how an intelligent data management cloud can transform your IT operation—and your entire business—as the linchpin of a larger digital transformation initiative. You'll learn how Oracle Autonomous Database can accelerate your journey to the cloud and simplify your IT operation. More specifically, find out how organizations of all sizes can boost innovation, minimize costs, and create new business models that leverage cloud-based information. Along the way, hear from Oracle executives, industry experts, IT consultants, and organizations like yours as we illustrate the power and potential of this new incarnation of the world's most popular database.

Oracle Autonomous Database Cloud uses machine learning technology to **minimize labor**, **eliminate human error**, and **enable unprecedented availability**, **performance** and **security**.

Introducing Oracle Autonomous Database

Hailed by Oracle CTO and Chairman Larry Ellison as one of the most important product introductions in Oracle's history, Oracle Autonomous Database is powered by machine learning technology that enables the database to take care of itself, minimizing human intervention and eliminating manual, error-prone tasks. This self-driving database liberates database administrators (DBAs) from routine maintenance chores and helps to reduce security risks, so they can focus on innovative, high-level work. Adaptive machine learning algorithms automatically patch, tune, back up, and upgrade the system—all the time, while the system is running—ensuring maximum availability.

Elasticity for Your Database

Amazon may have popularized the concept of infrastructure elasticity with its elastic compute cloud (EC2), but Amazon can't bring this same degree of elasticity to database workloads. As Andy Mendelsohn, Oracle executive vice president, points out, you can use EC2 to grow and shrink compute resources, but Amazon's simple, open source databases don't allow the same degree of elasticity as Oracle Autonomous Database Cloud. "Oracle lets you expand from 8 cores to 16 cores to scale up for an expected surge in ecommerce traffic, or to accommodate the financial close cycle, then back down to 8 cores once activity slows down," he explains. "Oracle Autonomous Database does this instantly by using Oracle RAC technology to scale the database across clusters of servers very quickly, so there is no need to move data around. Amazon, by contrast, has to move data to bigger systems, a process that can take hours or even days."

> "Inherent elasticity enables Oracle Database to instantly expand or shrink computing and storage resources."
>
> **—Andy Mendelsohn, Executive Vice President, Oracle**

How Oracle Database Evolved to Become Self-Driving

Read the article →

An Autonomous Database for Every Workload

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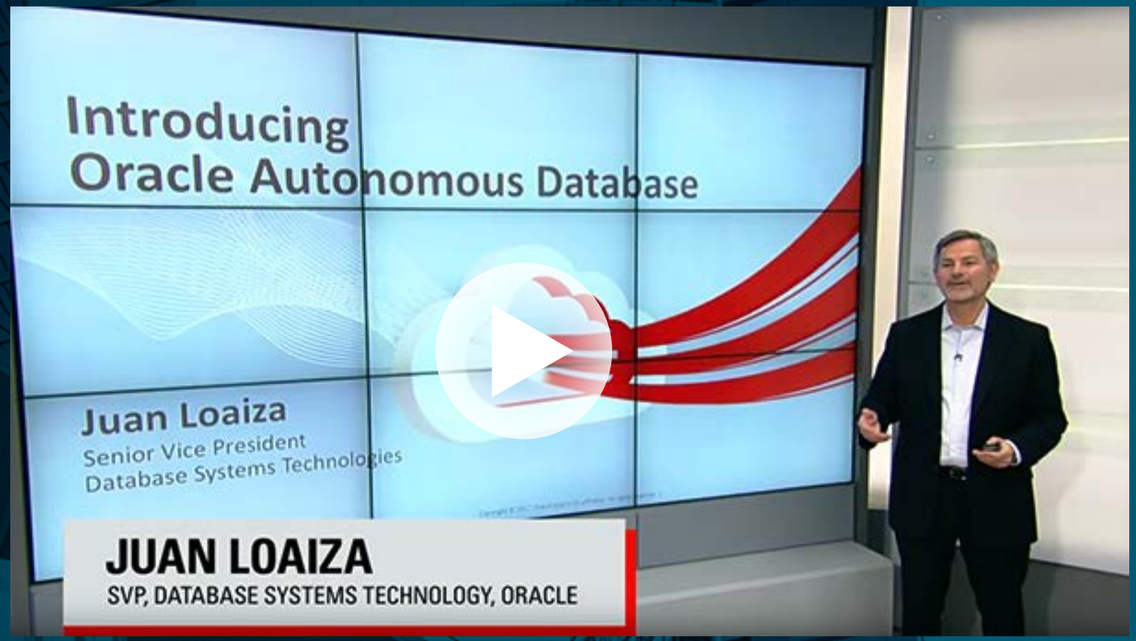
An Autonomous Database for Every Workload

Oracle Autonomous Database Cloud is the foundation for many other database cloud services to come.

- **Oracle Autonomous Data Warehouse Cloud** is designed for data warehouse and analytics workloads. According to Oracle customer benchmark studies, it promises up to 14x greater performance than Amazon Redshift, and the ability to deploy a data warehouse in 15 seconds.[1]

- **Oracle Autonomous Database Cloud** (available now) is an online transaction processing version of the database, which promises four times faster in-memory OLTP access.



Oracle SVP Juan Loaiza: Introducing Oracle Autonomous Database

Watch the video →

1 oracle.com/database/autonomous-database/index.html?bcid=5599577320001&shareURL=https://video.oracle.com/detail/video/5599577320001

Chapter 2:

Building on a Rich History of Automation

Oracle has been simplifying the management, tuning, and administration of Oracle Database for decades, and many of the sophisticated technologies designed to streamline activities for DBAs are now fully automated. For example, with Oracle Autonomous Data Warehouse Cloud, you can deploy a data warehouse in just 15 seconds.

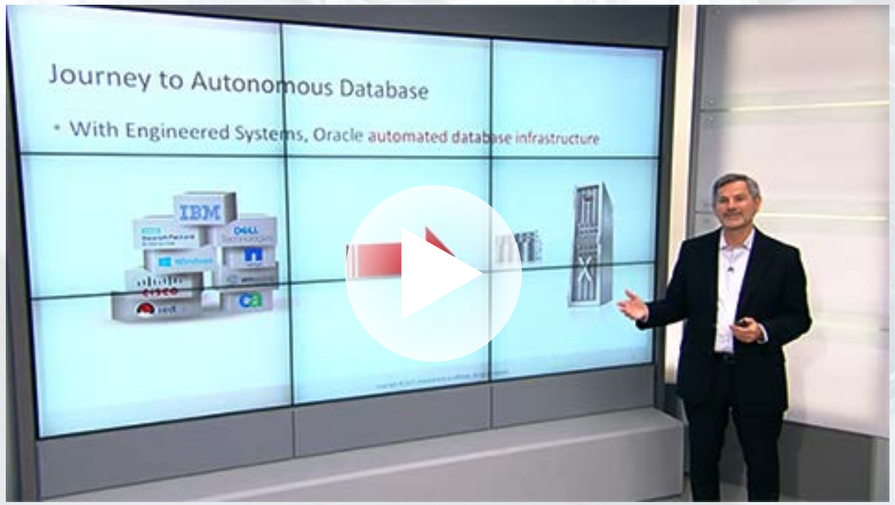
Furthermore, Oracle customer benchmark studies demonstrate performance of up to 14 times faster than Amazon Redshift. Scaling compute or storage resources can be done independently while the database is running. You only pay for what you use, without any delay.

Juan Loaiza, Oracle senior vice president, sums up the benefits: “It requires less labor, it is more reliable and secure, and it is much easier for developers to provision a database for analytic or OLTP application workloads,” he says.

Database administration is now integrated with complete infrastructure and cloud automation for operations personnel. “Customers can rely on automation and hand over management to Oracle Cloud Operations,” Loaiza adds.

Oracle SVP Juan Loaiza reveals how Oracle Autonomous Database delivers full end-to-end automation for mission-critical workloads, including automation in provisioning, patching, securing, monitoring, optimizing, and more.

- **Self driving**—you define service levels, the database makes it happen
- **Self-securing**—automatic protection from external attacks and insider threats
- **Self-repairing**—automatic protection from any type of downtime



Webcast: “Essential Ingredients of an Autonomous Database”

Watch the webcast →

What Is a Self-Driving Database?

Let's take a closer look at the many ways in which this new database management system eliminates complexity, reduces human error, and alleviates manual management tasks.

Tunes Itself

Oracle Autonomous Database incorporates machine learning and artificial intelligence to prevent application outages and automate many mundane tasks that are currently handled by database administrators. It builds on years of progress with self-tuning technologies such as Oracle Exadata storage indexes and flash cache, along with powerful query optimization, automatic memory management, and automatic storage management. Now, those advanced capabilities happen as a matter of course. You don't need to create indexes, partitions, or materialized views to optimize your workload, and all necessary statistics are collected automatically.

Monitors Itself

You'll never run up against capacity limits or resource bottlenecks within key components such as CPU, storage, and network throughput—all those knobs and dials that formerly had to be tuned and monitored to maintain optimal performance. Now, automatic resource management prevents users and applications from monopolizing resources.

A Cluster Health Monitor uses machine learning algorithms to monitor activity, recognize anomalous events, and take corrective action when necessary. That means you'll spend less time worrying about keeping your information systems online, optimized, and up to date.

Automated Full Lifecycle

Patches Itself

At some organizations, hugely damaging security lapses occur because patches are not applied in a timely manner. Oracle Autonomous Database detects available patches and automatically applies them to avoid errors or human omissions. No human intervention is needed.

Simplify your IT infrastructure and minimize capital investments by utilizing cloud services for **infrastructure**, **data management**, **applications**, and **business intelligence**.

Provisions Itself

Traditional database deployments need to provision for the peak possible workload and add a substantial margin of safety on top of that. But peak workloads tend to occur infrequently, leaving most of this costly capacity idle the majority of the time. Oracle Autonomous Database gives you capacity when you need it, and lets you shut it down when you don't. You simply push a button to provision a mission-critical database, and you only pay for the resources that you use at any given time. It's a highly efficient model that avoids the burden of having to maintain extra capacity.

With Oracle Autonomous Database Cloud, resources can be consumed for the duration of a project, and then be automatically deprovisioned—a highly efficient model that gives you capacity when you need it. You can provision and configure an Oracle Database instance in less than an hour. After that, new database instances can be provisioned in minutes. You simply stipulate how many CPUs you want and how many terabytes of data you would like to provision. Oracle Autonomous Database automatically marshals the necessary hardware and software to create a network for each customer or workgroup.

Scales Itself

Both computing and storage capacity are instantly elastic. That means you can scale up or down instantly, with no downtime. Independent scaling of compute and storage resources allows you to add or remove CPUs or entire compute nodes and storage servers online—unlike Amazon Web Services, which requires simultaneous scaling of compute and storage capacity. The Oracle system instantly auto-scales itself, eliminating overprovisioning and reducing costs. If you need less, you can scale down or shut down the service to save money—and then restart on demand when necessary.

Secures Itself

With Oracle Autonomous Database, security updates are applied automatically, and data is encrypted automatically—leaving nothing to chance. Native encryption prevents access from outside the database, while Oracle Database Vault prevents administrators from seeing user data and data masking conceals sensitive data from testers. Automated security protects your data from external attacks as well as from malicious internal users. (see chapter 3 for more information on Oracle database security.)

Optimizes Itself

Oracle automates performance management such as elastic scaling, monitoring, tuning, and optimizing the database. You will no longer waste resources by buying extra servers to accommodate occasional bursts of activity. You can subscribe to the exact amount of resources you need, and never pay for more than you use. That's the beauty of the cloud, and Oracle's elastic infrastructure lets you scale up or down at will, matching user demand with a scalable supply. It also automatically diagnoses performance and optimizes itself with tuning automation algorithms, including sophisticated SQL tuning technology to evaluate SQL plans and queries. Automated change management continually assesses changes and upgrades to make sure they don't adversely impact database workloads.

Embedded diagnostic tools handle errors across all layers of the stack. The database collects relevant diagnostic data, uploads information to Oracle support, and runs machine learning algorithms to match known causes to known solutions for rapid resolution. It's more secure and reliable—and it frees DBAs from generic operational tasks.

Backs Itself Up

Today's enterprise applications work around the clock, yet the vital records they keep are typically backed up only once a day—a risky situation that can result in data loss if there's an outage or other mishap. It's an approach that no longer works for the modern enterprise. Who wants to explain to a customer, or the head of finance, that you've lost even one bit of their data?

Each night, Oracle Autonomous Database automatically backs up data to Oracle Database Backup Cloud Service, ensuring data safety and availability while delivering cloud-ready scalability. For IT teams, this shift from full backups to continuous data protection eliminates hours of tedious work. Automating essential data protection tasks enables IT pros to focus on other important responsibilities.

Continuous Protection: A New, More Advanced Backup Strategy for Your Data

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Oracle Database Backup Service is Easy

Watch the video →

Continuous Protection: A New, More Advanced Backup Strategy for Your Data

Oracle Database Backup Service is a secure, scalable, on-demand storage solution that's simple to deploy and makes it easy to back up Oracle databases to Oracle Cloud.

- An Oracle cloud solution that protects your critical Oracle databases, without multi-vendor support complexity
- Continuous incremental backup automatically captures real-time database changes—without impacting production performance
- On-demand, elastic storage. No CAPEX or on-premises secondary storage to manage
- Provides complete data protection management for all databases, with backups encrypted at the source and securely transferred and stored in the cloud

Chapter 3:

Database Security

How to Automatically Protect Against Cybersecurity Threats

Even elite enterprise security teams are challenged by the intensity and ingenuity of today's cyberattacks. To survive, IT teams must adopt technologies that inherently deliver much higher levels of security than in the past. Granting access to IT resources is rarely a black-and-white decision. Security teams must assess risk continuously to discern between friend and foe. This involves making sense of alerts regarding a huge variety of systems, applications, and datasets—everything from system and application logs, user session activity, and how sensitive IT resources are being accessed to how security configurations are being changed.

Oracle Autonomous Database Cloud Service simplifies database administration and tuning tasks, including automatically maintaining security configurations. Oracle Autonomous Database can adapt to changing conditions, driven by machine learning technology that automatically detects and fixes problems without human agents—a capability known as adaptive response.

The system gets smarter over time: The more data it studies, the more users it gets to know, the more applications that come under its purview, the better it can understand rogue or suspicious behavior when it occurs.

Oracle facilitates rapid detection, investigation, and remediation of a broad range of security threats based on algorithms that can identify patterns in the data. The system can even make predictions about the likelihood of future breaches based on historical activity. Bolstered by machine learning algorithms, it learns what constitutes typical behavior for each application. It defines a baseline for user behavior, against which deviations can be measured.

For example, if a user exhibits behavior outside of the established expectations, that behavior can be flagged as an anomaly—such as if an HR professional suddenly accesses data in the accounting system—indicating a potential hijacked account or insider threat. This adaptable system continually learns new things such as where employees work, what devices they use, and how their personal computing environments change day to day. An AI algorithm processes the data to identify patterns, create audit reports, and detect security risk indicators based on predefined threat models, baseline risk indicators, abnormal events, and suspicious user activity. These automated capabilities bring greater visibility and intelligence to cybersecurity activities.

> We need new systems. It can't be our people versus their computers. We're going to lose that war. It's got to be our computers versus their computers. And make no mistake: It's a war."
>
> **—Larry Ellison, CTO and Chairman, Oracle**

Oracle Autonomous Database works in harmony with other security technologies to protect against threats and maintain up-to-date security configurations. For example, when Oracle's cloud-based cybersecurity applications alert the database of vulnerabilities, the database can patch itself on the fly. It can also detect anomalous SQL queries by parsing SQL statements to establish whitelist baselines by user, group, database, and application. It evaluates new SQL queries against this baseline to spot potential threats, raise threat scores, and take action to protect sensitive data.

Chapter 4:

New Opportunities for Database Administrators

Energize Your Career for the Cloud Era

As manual database management chores become a thing of the past, do DBAs still have an important role to play within the IT enterprise?

Penny Avril, vice president of product management for Oracle Database, says the answer is a resounding yes: The database may be minding itself, but somebody still needs to decide which data is mission-critical, which parts of the database must be instantly restored in the event of a mishap, and which users are allowed to see what data. Tomorrow's database administrators will invariably spend more time on high-level activities including database design, schema design, analytics, and the setting of policies about database use.

Think about the DBA title without the B, Avril suggests. Data administrators and data architects (DAs) aren't just charged with keeping data in a database. They must also understand the importance of that data to key business stakeholders and are assuming more important roles in driving their businesses forward.[1]

In other words, their jobs are no longer predicated on keeping databases up and running. They are responsible for data modeling, data security, and performance monitoring—essential capabilities that will help them gain greater visibility within the business as their roles grow in importance. "It's more about managing data, new sources, and new volumes of data and moving away from the mechanics of keeping data alive," she sums up.

Avril offers specific suggestions on how DBAs can prepare themselves for the inevitable transition to the new world of cloud-based, self-managing databases, such as bolstering their skills in the areas of data modeling, performance management, and security configurations. "DBAs have the opportunity to move from being data custodians to taking on a more strategic role in their organizations," she says.

DBAs remain important, but they must embrace a changing role. It begins with understanding the importance of data to key business stakeholders. "It's more about managing data, new sources, and new volumes of data and moving away from the mechanics of keeping data alive," she sums up.

Take a Break from Routine Maintenance

Learn more →

1 dbta.com/BigDataQuarterly/Articles/The-Changing-Role-of-the-DBA-QandA-with-Oracles-Penny-Avril-120343.aspx

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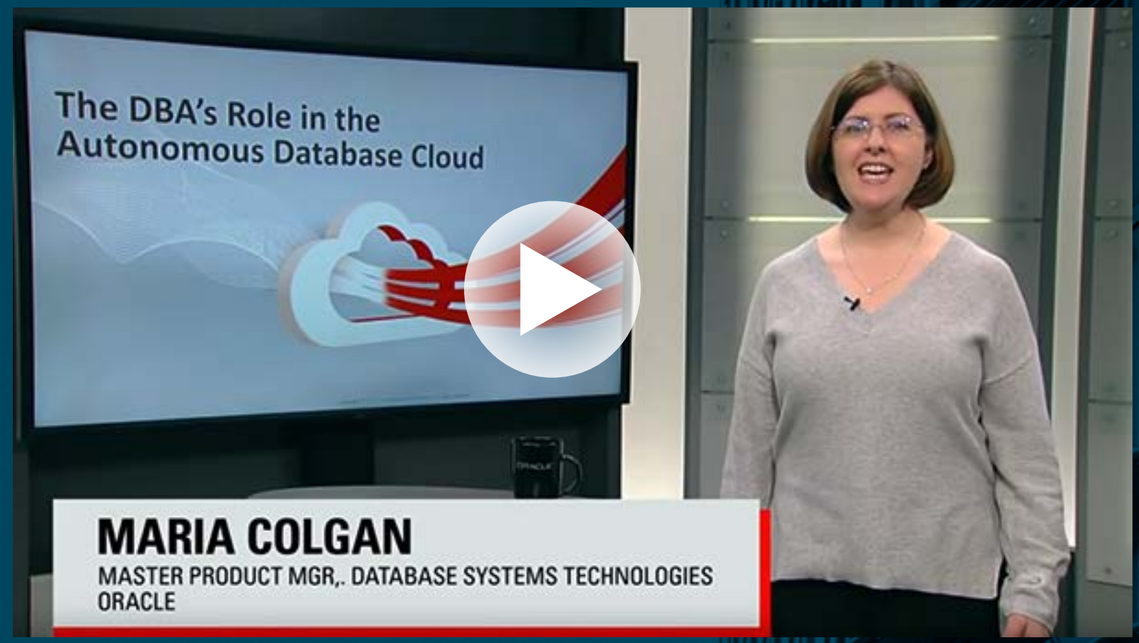
Take a Break from Routine Maintenance

Embedded intelligence in Oracle's self-driving database relieves DBAs of routine tasks—every minute of every day.

- Configuration and tuning of systems, network, and storage
- Database provisioning, patching
- Database backups, H/A, disaster recovery
- Database optimization



Oracle Autonomous Database: The Role of the DBA

Watch the video →

Three Ways to Energize your Career

Read the article →

Chapter 5:

The Right Stuff for Analytics and OLTP

What's motivating business leaders to embrace automation?

Data is growing at an exponential rate, presenting companies with new types of information management challenges. Today's CIOs must figure out how to mitigate rising IT costs, manage growing volumes of data, and comply with strict service-level agreements governing the performance, reliability, and availability of critical information systems. Analytics are essential to move the business forward, yet 60 percent of respondents to a recent Oracle survey said that their data warehouses were too complex to manage, and 33 percent said new database solutions were too slow to deploy, and 19 percent said they were unable to integrate varying data types.

Nitin Vengurlekar, chief architect and chief technology officer at Viscosity, favors Oracle Autonomous Database for data warehouse workloads due to its fully managed, preoptimized configuration. "It's preintegrated with machine learning to perform automatic caching, adaptive caching, and adaptive indexing," he explains.

This gives customers all the benefits of running a data warehouse on Oracle Exadata, including columnar compression. "If you need additional horsepower, you can add more CPUs to grow capacity for the data warehouse," he adds.

Video: Simplicity, Automation, Flexibility, and Performance. Viscosity, an Oracle partner.

Watch the video →

With Oracle's new autonomous database, creating a data warehouse is a simple "load-and-go" process. It's easy to migrate existing on-premises data warehouses to the cloud—or create a new data warehouse altogether. Users simply specify tables, load data, and then run their workloads in a matter of seconds. All data is automatically compressed and encrypted. You can take advantage of a wide range of platform services for business intelligence, as well as use Oracle's cloud-based integration services to accommodate third-party analytics.

Calculate your savings with the Oracle Autonomous Data Warehouse Cloud TCO Calculator

Access the calculator →

60 percent of respondents to a recent CIO Report survey said that their data warehouses were too complex to manage, **33 percent** said existing data warehouse solutions were too slow to deploy, and **19 percent** said they were unable to integrate and manage all of their varying data types.

Video: The Future of Data Management is Autonomous
Monica Kumar, Vice President of Oracle Cloud Platform Product Marketing

Watch the video →

Chapter 6:

Bring Your Own License

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** allows 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 allows you to apply your on-premises 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.

Cloud or On-premises? Oracle Says Both, Serves Up Hybrid Strategy

Read the article →

Oracle Autonomous Database Strategy

Read the report →

"Oracle's strategy rests on the idea of a consistent experience between on-premises and the cloud—that is, all the features, performance, security, access and so forth postulated for Oracle's on-premises offerings

—451 Research

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Oracle Autonomous Database

Fast

Anchored by the high-performance Oracle Exadata platform, Oracle Autonomous Data Warehouse Cloud can run analytic workloads up to 100 times faster than with the commodity infrastructure popular with other cloud providers.

Easy

To create a data warehouse, you simply specify tables, load data, and run your workloads in a matter of seconds. All management tasks are fully automated, including all database-tuning chores. Data is automatically compressed and encrypted.

Elastic

Computing and storage capacity are instantly elastic. You can expand or shrink both types of resource independently, with no downtime.

Oracle Autonomous Database

Learn →

Oracle Cloud

Visit →

Oracle Cloud Free Trial

Try →

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