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Autonomous Database

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Discover the business
value of autonomous



Deploy a data warehouse
in seconds



Explore autonomous
use cases



Lawrence Miller, CISSP

Oracle Special Edition

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Autonomous Database For Dummies®, Oracle Special Edition

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Introduction

Emerging technologies and automation permeate every aspect of our work and lives today. The real opportunity of these technologies — which include artificial intelligence (AI), machine learning, the Internet of Things (IoT), and human interfaces — is to enable us to embrace innovation on a scale never seen before. These technologies help us reimagine what's possible in work and in life — from self-driving cars and personalized medicine to precision agriculture and smart cities that are changing the way we experience our world.

Autonomous opens a new world of opportunities for enterprises. It allows them to move from operations to innovation. It enables new ways to develop and deliver apps and services. Enterprises can harness the abundance of data to gain predictive insights into their businesses and ultimately drive better outcomes for their customers. They can see the signals sooner and adapt faster. And finally, they can run their organizations smarter, more efficiently, and more securely through automation.

About This Book

Autonomous Database For Dummies consists of five chapters that

- » Describe emerging technology trends and the business value of autonomous (Chapter 1)
- » Explore Oracle's Cloud platform and infrastructure (Chapter 2)
- » Introduce Oracle's Autonomous Data Warehouse Cloud and Autonomous Transaction Processing (Chapter 3)
- » Examine Autonomous Database use cases and real-world success stories (Chapter 4)
- » Outline why you should choose Oracle Autonomous Database for your enterprise (Chapter 5)

Foolish Assumptions

It's been said that most assumptions have outlived their usefulness, but I assume a few things nonetheless!

I assume you work as a line of business (LOB) manager, a business analyst, a senior information technology (IT) manager, a database developer or administrator, or in a similar role and you're looking for solutions to help your enterprise leverage emerging technologies and automation to unlock new opportunities.

I also assume that you have at least some familiarity with cloud and database technologies but you aren't necessarily a technical reader. As such, this book isn't overly technical and doesn't require an in-depth knowledge of programming languages or science-fiction/fantasy movies — I even spell out the techie acronyms for you!

If these assumptions describe you, then this book is for you.

Icons Used in This Book

Throughout this book, I occasionally use icons to call out important information. Here's what to expect.



REMEMBER

This icon points out information you should commit to your nonvolatile memory, your gray matter, or your noggin!



TECHNICAL
STUFF

If you seek to attain the seventh level of NERD-vana, perk up! This icon explains the jargon beneath the jargon!



TIP

Tips are always appreciated, never expected — and I sure hope you'll appreciate these tips. This icon points out useful nuggets of information.



WARNING

This icon points out the stuff your mother warned you about. Okay, probably not. But you should take heed nonetheless!

Beyond the Book

Although this book is chock-full of information, there's only so much I can cover in 64 pages! So, if you find yourself at the end of this book thinking, "Gosh, this was an amazing book — where can I learn more?" just go to www.oracle.com/database/autonomous-database.

Where to Go from Here

If you don't know where you're going, any chapter will get you there — but Chapter 1 might be a good place to start! However, if you see a particular topic that piques your interest, feel free to jump ahead to that chapter. Each chapter is written to stand on its own, so feel free to start reading anywhere and skip around to your heart's content! Read this book in any order that suits you (but I don't recommend upside down or backward).

IN THIS CHAPTER

- » Enabling greater innovation with autonomous technologies
- » Balancing opportunities and challenges to achieve digital transformation

Chapter 1

Why Autonomous?

In this chapter, you learn how autonomous technologies benefit businesses today, and how emerging technology trends are driving new opportunities and challenges.

Recognizing the Business Value of Autonomous

Relational databases have made tremendous improvements in performance, availability, and security over the past couple of decades. They can run up to 100 times faster; can be configured for zero data loss; and have

hardened security capabilities that can protect against malicious internal and external threats. These attributes have been enhanced by cloud databases and infrastructure services that deliver elastic scalability and provisioning for real-time agility and growth. Database workloads that were deemed too large or “mission critical” to run outside corporate data centers just a few years ago now run in public clouds. In addition, capabilities such as database resource deployment, monitoring, and management can also be automated, leading to greater operational efficiencies and cost savings.

So, what’s missing? The degree of manual intervention required to manage today’s cloud databases and all these attributes inhibits true Database as a Service (DBaaS) — as a utility, or “driverless” offering, if you will. As a result, enterprises are unable to realize the full operational and financial benefits of the cloud.



WARNING

Automatic and *autonomous* are not the same thing. A process for database backup, failover, or resizing that can be accomplished automatically is still not autonomous if a database administrator must respond to an alert, make decisions, and click a few buttons (or type a few commands) in order to initiate the automated activity. In contrast, an autonomous database combines the dynamic agility of the cloud with the intelligent responsiveness of applied, adaptive machine learning.

The design goal is to minimize or eliminate human labor — and associated human error — and ensure data safety and optimal performance.

Businesses will find that autonomous capabilities can further help IT staff improve efficiencies by enabling them to focus on higher-value activities in lieu of mundane, time-consuming tasks. This is significant considering that 75 percent of IT management budgets are spent on manual database management. An autonomous database can help organizations transform IT operations into a modern cloud model that simplifies processes, reduces inefficiencies, lowers operating expenses, eliminates costly downtime, and ultimately enables them to innovate more while using fewer resources.



TIP

By 2020, Oracle predicts that more than 80 percent of application infrastructure operations will be managed autonomously.

Understanding Emerging Technology Trends

Machine learning and artificial intelligence (AI) are fundamentally altering enterprise computing by transforming how organizations receive, manage, and secure business data.



TIP

By 2020, Oracle predicts that 90 percent of every application and service will incorporate machine learning at some level — and that more than half of all enterprise data will be managed autonomously.

Autonomous technologies, enabled by machine learning and AI, are beginning to reshape how we think about — and interact with — the world around us. The opportunities that the cloud presents are real and provide the building blocks for companies to pioneer groundbreaking innovations and disrupt entire industries.

However, as with all opportunities, challenges exist. Perhaps one of the most important challenges today is security. As we become more connected, cyberthreats are becoming more pervasive. With a larger attack surface, new threats are becoming increasingly difficult to detect and prevent. Nation states and organized criminals are using many of these same emerging technologies to wage cyberwarfare against enterprises. Security teams at organizations of every size are struggling to keep pace with these persistent attacks.

Here are a few examples of the challenges that enterprises are facing today:

- » **Patching:** Whether it's because they don't have the resources or because they have difficulty

scheduling the necessary downtime, most companies simply can't install security patches fast enough. According to a Verizon study, 85 percent of successful breaches exploited vulnerabilities for which patches were available up to a year before the attack occurred.

- » **Talent:** There simply isn't enough cybersecurity talent to handle the problem. Current estimates suggest there will be 3.5 million open cybersecurity jobs by 2021. Ultimately, autonomous technologies are needed to successfully address the growing threat landscape.
- » **Alert overload:** On average, approximately 17,000 alerts are generated every week in an enterprise IT environment and only 19 percent of these alerts are reliable. Worse yet, only 4 percent of alerts are actually investigated. It's critical for companies to be able to separate the signal from all the noise — to understand and respond to the real threats.

So, how can we reconcile these competing forces of addressing these threats while at the same time transforming the enterprise to enable innovation and take advantage of these opportunities? To do that, companies need a platform that's autonomous — that leverages the power of AI and machine learning. With autonomous technologies, we can fight back against cybercriminals,

reducing risk by using machines to fight machines. And at the same time, we can use them to drive real innovation and real change for our businesses. Using the power of autonomous, enterprises now have the means to unlock their potential like never before.

IN THIS CHAPTER

- » Building a high-performance foundation
- » Automating security and management
- » Boosting developer productivity
- » Connecting data and processes
- » Gaining better insights
- » Introducing Oracle Autonomous Database

Chapter 2

Looking at Oracle's Cloud Platform and Infrastructure

In this chapter, you learn about Oracle's Cloud Platform and Infrastructure offerings, as well as Oracle's open, standards-based tooling that spans security and

management, app development and mobility, integration, analytics and big data, and data management.

Oracle Cloud Infrastructure

Workloads such as data warehousing, analytics, and transaction processing run best on an infrastructure designed to provide low latency, high availability, resiliency, and consistent performance. These are the key core tenets of Oracle Cloud Infrastructure (OCI), which is the foundation that supports Oracle Autonomous Database. OCI offers native support and integrated console access to Oracle's Autonomous Data Warehouse (ADW) and Autonomous Transaction Processing (ATP) services, discussed later in this chapter and in Chapter 3. Additionally, many of Oracle's Cloud Platform services — such as Integration Cloud and Analytics Cloud, to name a couple — are also supported on the OCI platform. These services provide a fully integrated cloud, helping to streamline and simplify your move to the cloud.

OCI serves as the foundational layer for the Oracle Cloud Platform. OCI is specifically architected to provide the performance predictability, security, governance, and transparency required for enterprise workloads. OCI supports traditional, mission-critical, performance-intensive and high-performance computing (HPC) workloads typically found in on-premises environments, as well as cloud-native, AI, and mobile apps and workloads.

To run these workloads optimally, OCI provides the following:

- » **High availability:** OCI regions generally contain three availability domains (ADs). These ADs are stand-alone data centers located about 19 miles (30 kilometers) from each other and connected by high-bandwidth private networking.
- » **Massive scalability:** Oracle Databases scale up to 424 terabytes of usable capacity and millions of IOPS per instance. Large local NVMe drives and block volumes reaching just over one petabyte per instance provide the perfect environment for large data lakes.
- » **Layers of resilience:** Oracle offers multiple layers of availability and protection, including unique capabilities like Oracle Real Application Clusters (RAC) for Oracle Database. Policy-based backups for object and block storage, with automatic replication of encrypted objects across multiple fault domains, provides high durability and data security, while active monitoring and self-healing ensures that data remains healthy.
- » **Fast connectivity:** Private Virtual Cloud Networks (VCNs) and 25 gigabit per second (Gbps) networking ensure predictable, low latency between hosts. OCI extends this concept to connectivity between ADs as well. Finally, enterprises can connect to OCI

via FastConnect, which provides a dedicated, high-speed connection and overcomes the challenges typically associated with traffic running over the public Internet.

Security

Emerging technologies — like cloud, artificial intelligence (AI), and the Internet of Things (IoT) — enable organizations to innovate, drive productivity, and reduce costs, but they also increase risk due to data sprawl, expanded attack surfaces, performance degradation, and outages, among others. Cyber-criminals use these same technologies to attack organizations with increasing sophistication on a massive scale. Security teams are overwhelmed and struggle to keep pace. They rely on manual processes that introduce human error and take an inordinate amount of time to accurately detect and respond to threats. And there simply isn't enough cybersecurity talent to adequately address the problem. Current estimates suggest there will be 3.5 million open cybersecurity jobs by 2021. Even if these open positions could be filled, organizations can't throw enough people at this problem. Humans, no matter how many or how skilled, simply can't handle this onslaught.

App Development with Autonomous Database

Developers can build applications using Java and Oracle Database, as well as open-source and third-party components. Oracle Cloud offers developers flexibility and choice, portability, compatibility, and interoperability with other technologies, including the following:

- » Popular programming languages such as Java, Node.js/JavaScript, PHP, Python, Ruby, C#, .NET, and more
- » Multiple databases, including SQL, NoSQL, and In-Memory
- » Container management with Kubernetes
- » Multiple operating systems, such as Linux (Oracle, SUSE, Ubuntu, CentOS, Debian), Windows, and Solaris
- » Choice of infrastructure (containers, VMs, bare metal)



TIP

With Oracle, enterprises have the flexibility to run their applications in the cloud, on-premises, or on Oracle Cloud, depending on their business needs.

Integration Cloud Digital transformation scales better, faster, and more securely with a hybrid integration platform. When businesses run enterprise applications in the cloud, connecting data and processes between them and on-premises systems is critical.

Oracle Integration Cloud (OIC) is a hybrid integration platform that helps customers transform from on-premises to the cloud with Oracle Autonomous Database. OIC is designed for business analysts, enterprise architects, and IT specialists with good application knowledge who are looking to design more and code less. OIC comes with prebuilt adapters, integration flows, and process templates to accelerate connectivity between SaaS and on-premises applications.

Analytics Cloud

Analytics permeates every aspect of our lives. No matter what question you're asking — whether it's about employees and finances, or what customers like and dislike and how that influences their behavior — analytics gives you the answers and helps you make informed decisions. Traditionally, however, analytics has been limited because it was human-driven and labor-intensive, requiring specific skills. Oracle Analytics Cloud fundamentally changes that.

Oracle Analytics Cloud combines machine learning and AI with data to enhance human interactions, eliminate mundane tasks, reduce bias in analysis, and enrich your decision-making and predictive ability. Analytics reveals hidden patterns and makes actionable insights more accessible by empowering everyone to use data to drive every process, direct every interaction, and inform every decision so that you can achieve the outcomes you envision.

Three primary design objectives guide Oracle's analytics cloud strategy:

- » **Expanding insights consumption:** To drive broad consumption, Oracle makes it easy for everyone to interact with information so that you can engage, analyze, and act in a way that is natural — asking questions in plain language, searching for answers, and receiving insights as narration. Cut through information overload with relevant, personalized insights, delivered proactively to you in the context that makes the most sense.
- » **Powering deeper insights:** Systems must provide autonomous capabilities that help you dig deeper into your information, explaining drivers of performance, uncovering hidden patterns, and helping you get more from your data. Use these insights to model new scenarios, make intelligent

decisions, and amplify insights through collaboration and social sharing.

- » **Accelerating time to action:** It's critical to remove constraints on time and scale. You must condense the time it takes to go from raw data to insight to action. Many previous systems were designed for a limited set of use cases, and computing infrastructure was complex and costly to change. Oracle's strategy is to create one platform for a broad range of business use cases, all integrated into a common data and analytics metaphor.

Oracle Analytics Cloud combines embedded machine learning and AI to automate the analysis process. This changes the way information is analyzed, providing organizations with faster self-service visualization and analysis. From data visualization and Essbase scenario modeling to enterprise reporting, adaptive intelligence, and predictive analysis for answering "what-if" questions, enterprises can accelerate analysis with automated recommendations for visualizations, single-click forecasting, clustering, and voice-enabled querying.

Oracle Analytics Cloud, combined with Autonomous Database, delivers faster and deeper predictive analytics for faster business decisions.

Autonomous Database

Oracle has redefined data management with the world's first autonomous database. An autonomous database is a cloud database that uses machine learning to eliminate the human labor associated with database tuning, security, backups, updates, and other routine management tasks traditionally performed by database administrators (DBAs).

Oracle Autonomous Database eliminates complexity, human error, and manual management, helping to ensure higher reliability, security, and more operational efficiency at the lowest cost. Oracle Autonomous Database has three core attributes that leverage the power of AI and machine learning:

- » **Self-driving** to automatically provision, secure, monitor, back up, recover, tune, troubleshoot, and upgrade databases, as well as instantly grow and shrink compute or storage without downtime.
- » **Self-securing** with adaptive AI-enabled threat detection and remediation, automatic data encryption, and installation of security patches with no downtime.
- » **Self-repairing** to maximize uptime and productivity with 99.995 percent availability (less than 2.5 minutes of planned and unplanned downtime per month).

Oracle Autonomous Database is composed of the following two cloud services:

- » **Autonomous Data Warehouse (ADW):** ADW uses adaptive machine learning to deliver unprecedented simplicity, performance, and highly elastic data management that enables data warehouse deployment in seconds.
- » **Autonomous Transaction Processing (ATP):** ATP uses machine learning and automation to eliminate human labor, human error, and manual tuning, delivering unprecedented cost saving, security, availability, and productivity. ATP supports a complex mix of high-performance transactions, reporting, batch, Internet of Things (IoT), and machine learning in a single database, allowing much simpler application development and deployment and enabling real-time analytics, personalization, and fraud detection.

You learn more about Oracle Autonomous Database, including ADW and ATP, in Chapter 3.

- » Looking at Oracle Autonomous Database
- » Exploring Autonomous Data Warehouse
- » Discovering Autonomous Transaction Processing

Chapter **3**

Introducing Oracle Autonomous Database

In this chapter, you learn about Oracle Autonomous Database, which is currently offered in two cloud services to meet your organization's data management needs: Autonomous Data Warehouse (ADW) and Autonomous Transaction Processing (ATP).

Oracle Autonomous Database

Like an autonomous vehicle, Oracle Autonomous Database provides a level of performance and reliability that manually managed databases can't deliver. Compared to a manually managed database, the Autonomous Database costs less to run, performs better, is more available, and eliminates human error.

Oracle Autonomous Database represents an entirely new category of software based on machine learning that dramatically transforms how companies innovate by simplifying processes, boosting efficiencies, and freeing IT resources to focus on innovation. Oracle Cloud puts these emerging technologies to work by allowing customers to establish new IT capabilities quickly, affordably, and securely, and it leverages the power of machine learning.

Oracle's complete, integrated cloud platform includes intelligent solutions that span the Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS) layers. Oracle also extends automation into the platform, making it available for any developer to build upon. The goal is to make cloud technologies simpler to access, easier to create, and more efficient to secure, manage, and run — so you can achieve real business outcomes (see Figure 3-1).

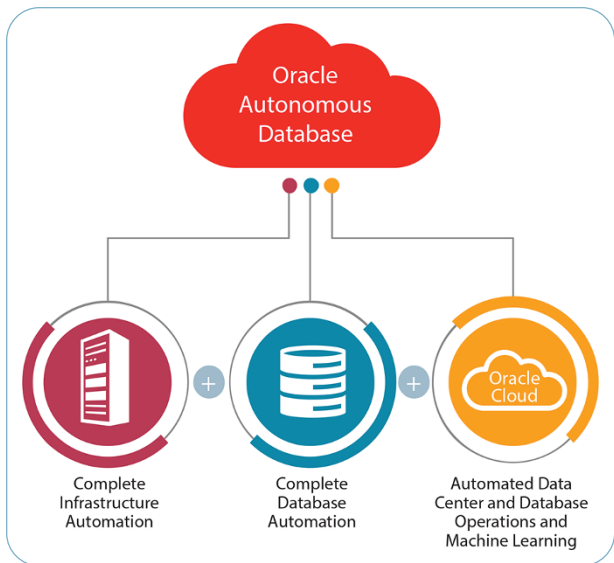


FIGURE 3-1: Oracle Autonomous Database — intelligence at every layer.

Oracle Autonomous Database is designed on three principles (described in the following sections): self-driving, self-securing, and self-repairing.

Self-driving

You tell the Autonomous Database the service level to achieve, and it handles the rest. The Autonomous Database

eliminates human labor to provision, secure, monitor, back up, recover, troubleshoot, and tune databases. This greatly reduces database maintenance tasks, reducing costs and freeing scarce administrator resources to work on higher-value tasks.



TECHNICAL
STUFF

Because the Autonomous Database is based on the extremely feature-rich and proven Oracle Database, on the Exadata platform, it is able to run both online transaction processing (OLTP) and analytic workloads up to 100 times faster. It includes many performance-enhancing Exadata features such as smart flash cache, automatic columnar format in flash cache, smart scan, Exafusion communication over the super-fast InfiniBand network, and automatic storage indexes.

In addition, when it comes time to upgrade or patch, the Autonomous Database can replay the real production workload on a test database to make sure the upgrade does not have any unexpected side effects on a mission-critical system.

Autonomous Database automatically tunes itself using machine learning algorithms, including automatically creating any indexes needed to accelerate applications. Users get the ultimate simplicity of a “load and go” architecture in which they can simply load their data and

run SQL without worrying about creating and tuning their database access structures.

Self-securing

The Autonomous Database is more secure than a manually operated database because it protects itself instead of having to wait for an available administrator. This applies to defenses against both external and internal attacks.

Security patches are automatically applied every quarter. This is much sooner than most manually operated Oracle databases, narrowing an unnecessary window of vulnerability. Patching can also occur off-cycle if a zero-day exploit is discovered. By applying patches in a rolling fashion across the nodes of a cluster, the Autonomous Database secures itself without application downtime.

Patching is just part of the picture. The database also protects itself with always-on encryption. Customers can control their own keys to further improve security.

Self-repairing

The Autonomous Database is more reliable than a manually operated database. At startup, it automatically establishes a triple-mirrored scale-out configuration in one regional cloud data center, with an optional full standby copy in another region. The Autonomous Database

automatically recovers from any physical failures whether at the server or data center level. It has the capability to rewind data to a point in time in the past to back out user errors. By applying software updates in a rolling fashion across nodes of the cluster, it keeps the application online during updates of the database, clusterware, operating system (OS), virtual machine (VM), hypervisor, or firmware.

If the database detects an impending error, it gathers statistics and feeds them to artificial intelligence (AI) diagnostics to determine the root cause. Oracle infrastructure and Autonomous Database are both designed to deliver 99.995 percent availability, so customers are assured that they can run their businesses uninterrupted. As a final safety net, the Autonomous Database runs nightly backups for you.

Autonomous Data Warehouse (ADW)

The velocity and volume of incoming data is placing crushing demands on traditional data marts, enterprise data warehouses, and analytic systems. Many organizations are proving the value of data warehouses in the cloud through “sandbox” environments, line-of-business data marts,

and database backups. More advanced monetization use cases include high-performance data management projects, data warehouses coupled with cloud computing analytics, and big data cloud implementation (see Figure 3-2).

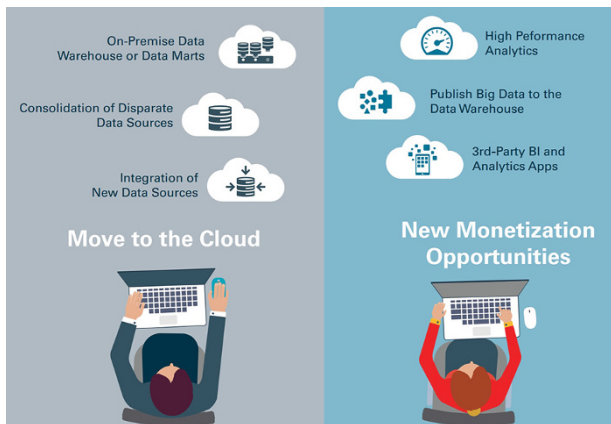


FIGURE 3-2: Common use cases enabled by Oracle ADW.

Oracle ADW is the industry's first solution for delivering data warehousing with unmatched reliability and ease. This fully autonomous database cloud service is self-tuning and preconfigured for automated patching and upgrades and eliminates manual error-prone human management processing.

Oracle ADW is integrated with Oracle Analytics Cloud. Customer benefits of this combination include

- » **Complete solution for analytics:** A single platform that empowers your entire organization to ask any question of any data type. With Oracle ADW, you can load and analyze data in the cloud in a few clicks, allowing you to quickly extract data insights and make critical decisions in real time.
- » **Reduced cost and risk:** Customers moving from Amazon's Redshift to Oracle's Autonomous Database can expect to cut their costs in half, while benefiting from a higher database availability.
- » **Easy migration:** Oracle makes it easy to migrate your data warehouse or data marts to ADW Cloud. Oracle SQL Developer easily migrates data into the cloud in just a few clicks. Cloud-ready migration workbench tools support all major database providers, including Redshift.
- » **Preservation of your existing investment:** On-premises Oracle data management workloads are 100 percent compatible with Oracle Cloud, ensuring customers can leverage existing investments and skills. With AWS Redshift, customers must completely rework their code and realign their applications.

Oracle Autonomous Transaction Processing (ATP)

Oracle Autonomous Transaction Processing (ATP) is one of a growing family of cloud services built on the self-driving, self-securing, and self-repairing Oracle Autonomous Database. ATP uses machine learning and automation to eliminate human labor, human error, and manual tuning, delivering unprecedented cost savings, security, availability, and production. ATP supports a complex mix of high-performance transactions, reporting, batch, Internet of Things (IoT), and machine learning in a single database, allowing much simpler application development and deployment and enabling real-time analytics, personalization, and fraud detection.

Customer benefits of Oracle ATP include

- » **Accelerating innovation:** Developers become more agile by instantly creating and effortlessly using databases that require no manual tuning. Integrated machine learning algorithms enable the development of applications that perform real-time predictions such as personalized shopping and fraud detection. Eliminating manual database maintenance allows database administrators to focus on getting more value from data. The simplicity of upgrading existing databases to the

autonomous cloud enables IT to transform to a modern, agile cloud model.

- Deploy new applications in minutes versus months.
- Orchestrate your infrastructure and database in seconds.

» **Reducing risks:** Automatic application of the latest security updates with no downtime eliminates cyberattack vulnerabilities. Protection from all types of failures, including system failures, regional outages, and user errors, delivers 99.995 percent availability, or less than 2.5 minutes of downtime a month, including maintenance. Database Vault prevents administrators from snooping on user data.

- Database-aware replication prevents corruption.
- Machine learning technology detects and prevents cyberattacks.

» **Lowering costs:** Putting your transaction processing workloads in Oracle Cloud ensures limitless performance. You can instantly and transparently scale up or scale out as demand increases, making it easy to accommodate peak processing workloads. Elastic and independent scaling of compute and storage resources controls costs and enables

true pay-per-use. You can deploy new apps in minutes versus months. But the real cost savings come from a reduction in human labor, allowing your team to improve productivity by focusing on innovation rather than administration.

- Complete automation of database and infrastructure operations cuts administrative costs up to 80 percent.
- Cut your Amazon bill in half when you run the same database workload on Oracle ATP Cloud as compared to running on Amazon AWS.
- Oracle's Bring Your Own License program allows you to apply your on-premises software licenses to equivalent Oracle services in the cloud.

IN THIS CHAPTER

- » Focusing on innovation
- » Reducing cost and time-to-market
- » Scaling automatically and on-demand

Chapter 4

Exploring Use Cases and Customer Success Stories

In this chapter, you look at Oracle Autonomous Database use cases and Oracle customer success stories.

Less Administration, More Innovation

Most IT departments spend nearly 70 percent of their time maintaining existing information systems, leaving little time to focus on innovation. Oracle Autonomous Database intelligently handles routine maintenance tasks like provisioning, patching, and tuning, freeing IT teams to tackle high-value projects for the business, such as obtaining new insights from the data.

QUALITY METRICS PARTNERS

In the healthcare sector, Quality Metrics Partners (QMP) has flipped the conventional notion of scale on its proverbial head by using autonomous database technology to outflank its competitors — and disrupt an entire industry.

Initially, QMP built its diagnostic testing business the old-fashioned way, establishing a handful of laboratories to deliver traditional services such as diagnostic screening, medication monitoring, pharmacogenomics (how genes affect responses to drugs), and molecular pathogen testing. Next, QMP began offering analytic services to hospitals,

clinics, and other laboratories throughout the United States. The turning point came when QMP realized it could extract more value by analyzing deidentified patient data in aggregate than it could from processing individual lab results.

QMP built a healthcare technology platform called CAREiQ using Oracle ADW, which has allowed QMP to scale seamlessly and grow much faster than its competitors. Autonomous technology from Oracle vastly improves QMP's foundational mission of providing excellent care for patients — and better insights to the providers who serve them. The QMP platform facilitates faster lab results delivery and helps physicians discover patterns in the data that can assist with their diagnoses and their detection of disease markers.

“Thanks to autonomous tools from Oracle, managing aggregate data became an important facet to our business, along with managing individual patient results. With our Oracle-based CAREiQ platform, we have reduced the turn-around time for delivering lab results from two weeks to 48 hours, and often to same-day results,” says Michael Morales, founder and CEO of QMP. “That is a key factor in staying competitive in the market. And it can be a life-or-death situation for patients with disease states that require fast diagnosis.”

Reduce Costs, Speed Time-to-Market

Oracle Autonomous Database is delivered via a pay-per-use model, which can cut runtime costs by as much as 90 percent. By provisioning a new database in seconds, you can accelerate time-to-innovation, time-to-market, and time-to-action. This service scales to fit your capacity requirements, so you can get new projects off the ground quickly, dial them down as necessary, and only pay for what you use.

DATA INTENSITY

Data Intensity delivers innovative solutions and services tailored to help customers succeed in a multi-cloud hybrid world. With Oracle ADW and Oracle Analytics Cloud, Data Intensity has experienced ten times faster time to provision and four to five times higher performance than from its bare-metal on-premises systems.

Data Intensity is running on a single Oracle Compute Unit (OCPU) on both the Oracle Analytics Cloud and Oracle ADW, with hundreds of gigabytes of data loaded. Data Intensity had twice the amount of system resources running

on-premises than it does on Oracle Cloud, yet Autonomous Database is four to five times faster.

More important than performance for Data Intensity is the long-term manageability of Autonomous in terms of tuning and patching. With Autonomous, Data Intensity can also expand its user base at a much lower total cost of ownership (TCO). To deploy on-premises, it was looking at hundreds of thousands of dollars in new license fees, but with Autonomous it can deploy at no additional cost.

Data Intensity's users are looking at what other data sources they can pull from and starting to think creatively about how to use their data to make intelligent business decisions.

Scale Fast — Automatically

Oracle Autonomous Database provides enterprises with the full benefits of the cloud, including the capability to instantly and automatically scale up or down to meet business demands. Adaptive machine learning technology automatically tunes, upgrades, and patches the database while it's running, even as workloads increase and decrease. That means your organization will always have the database capacity it needs to stay on the forefront of innovation, and your workloads will run optimally.

DROP TANK

Drop Tank, a leading loyalty technology and rewards company, is using Oracle ADW to fuel its loyalty solutions for gas station operators. Removing the time-consuming process to provision, secure, monitor, and tune its databases, Drop Tank is able to automate data management with high-availability, performance, and security features, enabling IT staff to innovate in more business-critical areas that drive growth and create powerful partnerships with gas station operators.

Partnering with major fuel providers such as Marathon Petroleum, as well as gas station and convenience-store brands, Drop Tank deploys loyalty systems that not only drop the price of fuel for members, but also help capture and unlock customer insights through a wide range of data services. As the demand to expand its business and add more sites to its loyalty network grew, Drop Tank needed a more efficient, secure way to capture, analyze, and manage data collection for more than 3,500 retail locations, all with different systems running their operations. With Oracle Cloud Infrastructure as its underlying platform and Oracle ADW to store data and provide analytics, Drop Tank gathers

insights that help gas station operators and consumer packaged goods companies identify trends and make more intelligent decisions on future promotions and sales strategies.

“As our loyalty programs began to evolve and reach more consumers, we needed a more efficient way to seamlessly manage and scale to enable more partners to leverage our network,” said Timothy Miller, vice president of technology at Drop Tank. “By choosing Oracle Autonomous Data Warehouse, we can automatically set load marks and scale, making it easy to support new campaigns without having to worry about time-consuming exercises like indexing, patching, and tuning.”

Oracle ADW enables Drop Tank to easily scale to address new business needs, such as the introduction of a new rewards campaign within just hours of notice. Drop Tank has been able to grow its business to support 30 times more retail locations over the past four years and manage its business-critical workloads from any participating location. With Oracle ADW, Drop Tank expects to handle a 50-times increase in sales transactions through the end of 2019.

Chapter **5**

Ten Reasons for Choosing Oracle Autonomous Database

In this chapter, I outline ten reasons you should choose Oracle Autonomous Database for your organization.

Oracle Leadership in Automation and Emerging Technologies

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 database administrators (DBAs) are now fully automated.

The Autonomous Database is a recent offering from Oracle; however, the journey toward automation and self-driving capabilities began over 20 years ago, with the introduction of Oracle Database 9i.

Many sophisticated automation capabilities were introduced and have since evolved, including space and memory management, workload monitoring, and database tuning, all of which are used in the Autonomous Database. In addition to automated database management, Oracle has spent the last decade developing the ideal automated database infrastructure, namely the Exadata Cloud Infrastructure, the only preconfigured, pretested and preoptimized platform specifically for Oracle Database.

Optimized Cloud Infrastructure

Oracle Cloud Infrastructure (OCI) serves as the foundational infrastructure layer for Oracle Autonomous Database and across all apps and platform services. It is specifically architected to provide the performance predictability, security, governance, and transparency required for enterprise workloads.

OCI supports traditional, mission-critical, performance-intensive, and high-performance computing (HPC) workloads usually found in on-premises environments, along with cloud-native and mobile apps.



TIP

Workloads such as data warehousing and transaction processing will run best on an infrastructure designed to provide low latency, high availability, resiliency, and consistent performance. These are the core tenets of OCI.

Easy On-Ramp to Cloud

For IT leaders who want to move enterprise IT to a cloud foundation, the Autonomous Database offers the smoothest and easiest transition. The Autonomous Database offers familiar tooling and maximum compatibility with Oracle Database to help customers easily move their existing apps

to this new cloud-data management platform without recoding.



REMEMBER

With Autonomous Database, major cost savings and agility improvements come quickly, not after years to decades of application rewrites.

In-Depth Security

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



TIP

With machine learning, 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, and 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.

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 artificial intelligence (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.

Real-Time Analytics

Data is growing at an exponential rate, presenting companies with new types of information management challenges. 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, 33 percent said new database solutions were too slow to deploy, and 19 percent said they were unable to integrate varying data types.



Oracle Autonomous Database is pre-integrated with machine learning to perform automatic caching, adaptive caching, and adaptive indexing. This gives customers all the benefits of running a data warehouse on Oracle Exadata, including columnar compression.

With Oracle 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.

Innovate rather than Administrate

As manual database management chores become a thing of the past with Oracle Autonomous Database, DBAs will invariably spend more time on high-value activities such as database design, schema design, analytics, and setting policies for database use.

DBAs will become *data modernization engineers* and *data architects*. They must understand the importance of the

data to key business stakeholders and assume more important roles in driving their businesses forward. They will be responsible for data modeling, data security, and performance monitoring — essential capabilities that will help them gain greater insights within the business as their roles grow in importance.

Easy to Try, Buy, and Consume

You can try Oracle Autonomous Database with \$300 of free credits good for up to 3,300 free hours of Oracle Cloud usage on all eligible Cloud Platform and Infrastructure services for 30 days. Go to <https://cloud.oracle.com/try-autonomous-database> and get started with Oracle Autonomous Database.

Oracle offers two programs to make it easier for you 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.

Familiar Tools and Easy Upgrade

Oracle Cloud offers automated cloud migration tooling and at the same time ensures compatibility of on-premise workloads for cloud deployment. This rapid upgrade enables Oracle customers to save time, cut costs, preserve existing investment, and stay focused on business.

Low Cost, Simple Pricing

Intelligent data management delivers more scalability, simplicity, and security to enable companies to make faster decisions and derive more value from their data. Calculate the value of automation in three quick steps and see how much you can save with the Oracle Autonomous Data Warehouse Cloud. Get your personalized report at www.oracle.com/goto/tco-databasecloud.

Proven

Oracle has a proven track record of innovation and customer success. In Chapter 4, you can read about Oracle customer success stories with Oracle Autonomous Database, or go to www.oracle.com/database to learn more.

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Discover the power of autonomous data management

Oracle's Autonomous Database marks the culmination of four decades of technology innovation with the integration of new emerging technologies. Powered by machine learning and artificial intelligence, and built on Oracle Cloud Infrastructure, Autonomous Database is a self-driving, self-securing, and self-repairing database that reshapes Oracle customers' IT approach, allowing them to free their budgets, reallocate their resources, and reduce risk while focusing on business growth and the next wave of innovation.

Inside...

- Leverage machine learning and AI
- Automatically tune databases
- Apply patches with no downtime
- Bring DBAs closer to the business
- Accelerate IT projects
- Enable real-time analytics
- Extract more value from your data

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