White Paper

Getting the Best of Cloud in the Corporate Datacenter: Oracle Exadata Cloud@Customer

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April 2020

IN THIS WHITE PAPER

This White Paper reviews the major improvements and new capabilities enabled by Oracle Exadata Cloud@Customer introduced at Oracle OpenWorld in September 2019. This new version ensures that Oracle Exadata customers have access to the latest technology changes that increase transaction throughput and query performance of the Oracle Database. It also introduces a new cloud-based common control plane foundation from Gen 2 Oracle Cloud Infrastructure (OCI) that enables customers to significantly expand their use of Exadata platforms across their businesses while greatly reducing the operational and asset management burdens. It enables customers to realize the management and economic benefits inherent in cloud while meeting strict data sovereignty and on-premises security requirements by locating the cloud service in the customer's datacenter and behind the customer's firewall.

Oracle is closely linking on premises and cloud by delivering architectural identicality across environments with the Exadata platform as the foundational element. In addition to Exadata Cloud@Customer, Exadata systems are deployed in the Oracle Cloud for all Oracle Database Cloud Services, including Exadata Database Cloud Service, Autonomous Transaction Processing, and Autonomous Data Warehouse as well as powering all of Oracle's SaaS applications.

IDC believes that the consistent use of modern cloud-based infrastructures such as Oracle Exadata Cloud@Customer and intelligent data services like Oracle Autonomous Database make it possible to quickly and efficiently support new application creation and expansion while enabling closer links between existing on-premises applications and new cloud-based applications and data sets – all while speeding time to access for new technologies, reducing up-front capital and ongoing operational costs, and extending the usefulness of data.

SITUATION OVERVIEW: SHIFT TO CLOUD-BASED IT

The use of technology is now embedded and pervasive in nearly every aspect of business and personal lives. The technologies and the processes that organizations deploy are so tightly linked to their customers and markets that the boundary between the organization's internal operations and the external ecosystem (e.g., customers, markets, competitors, partners, and regulators) is rapidly disappearing. Data – its generation, storage, delivery, concentration, and exploration – is at the center of this major shift in how organizations connect with customers in new ways, develop new revenue sources, and improve operational efficiency.

The diversified technology, workload, and data portfolios that underpin modern digital business services along with the acceleration in the rate of change required to sustain digital services are among the greatest source of stress for today's CIOs and their teams at the center of this transformation. The demands of gathering, storing, protecting, and rapidly leveraging what many describe as a deluge of data are a challenge for all IT organizations across all industries. When it comes to the infrastructure required to use and analyze all that data, IT teams:

- Are often prevented from taking full advantage of new technologies due to organizational inertia and traditional procurement/asset amortization practices
- Continually struggle to ensure that systems, often built as DIY projects, are available and performant, secure, and up to date due to staff resource limitations to continually tune and patch components from multiple suppliers
- Are being asked to deliver new capacity and capability in "cloudlike" service models and time frames in their own datacenters

While many IT organizations will struggle to simply survive the ongoing data deluge by focusing on containment and control, leading IT organizations are taking advantage of solutions such as Oracle Exadata Cloud@Customer that improve business agility, enable faster adoption of new technologies, and dramatically reduce the costs of deploying and maintaining data-centric services across the entire organization. With these solutions, organizations can:

- Leverage infrastructure that is always available, performant, secure, ready to meet expanding workloads, and able to handle new real-time, data-driven workload requirements.
- Ensure the proper use and custodianship of data from customers and about customers across clouds and in their own datacenters to meet regulatory requirements.
- Reduce the up-front capital and ongoing operational investments required to ensure that their database and analytic systems are always leveraging the latest technology and are always up to date.

Oracle Database is available on premises and in the cloud. By offering architectural identicality across both environments, Oracle is providing customers with the complete solution — from the database to the cloud services to the infrastructure. Oracle provides a single point of contact that helps eliminate the finger-pointing that can often occur when customers encounter issues that cross multiple on-premises and cloud supplier solutions.

ORACLE ACCELERATES CLOUD TRANSFORMATIONS WITH EXADATA CLOUD AT CUSTOMER

Oracle initially introduced Exadata in October 2008 as an integrated compute and storage hardware system designed specifically to support the Oracle Database. In 2015 and then again in 2016, as part of the company's commitment to support its customers' desire to make greater use of cloud-based IT resources, Oracle introduced two new ways for customers to access Exadata resources:

- A database service running on Exadata in Oracle Cloud (Oracle's public cloud) (2015)
- A dedicated as-a-service cloud solution (Exadata Cloud at Customer) that brings cloud consumption and operations to customers in their own local datacenters (2016)

Exadata Cloud@Customer, the most recently introduced version, is one of Oracle's most strategic products. Customers can leverage this offering to address:

- Data residency, data sovereignty, or corporate policy requirements
- Performance SLAs for on-premises applications that are tightly integrated with Oracle Database
- Low-latency requirements for applications that cannot move to the cloud
- The risk of moving several integrated workloads to the cloud at the same time

As Exadata Cloud at Customer is architecturally identical with Exadata systems deployed in the Oracle Public Cloud, customers have the flexibility of developing, deploying, and managing workloads on a single platform while being able to migrate between Exadata Cloud Services, Exadata Cloud at Customer, or even Exadata on premises with no changes to applications or data sets. End users also have access to the full range of Oracle Database options and Exadata Database Machine features including hybrid columnar compression, columnar flash cache, storage indexes, automatic indexing, AI-based root cause analysis, and I/O and network resource management.

Key Exadata Cloud at Customer Characteristics and Benefits

All services delivered to a customer location as part of Exadata Cloud at Customer's portfolio are managed from a shared Cloud Control Plane located in the Oracle Cloud. For Exadata Cloud at Customer deployments, customers can choose from four configurations of the Oracle Exadata hardware: base system (one-eighth rack), quarter rack, half rack, and full rack. These systems integrate Exadata database servers, intelligent storage servers, and high-speed networking with high-availability Oracle Cloud Control Plane servers that enable platform management from Oracle Cloud and ensure continuous operations should links to the cloud temporarily become unavailable.

As part of its cloud capabilities, Exadata Cloud at Customer users can scale up or scale down via metered usage of compute capacity. They can dynamically add or reduce the number of Oracle Compute Units (or OCPUs, a CPU capacity equivalent to one physical core of an Intel Xeon processor with Hyper-Threading enabled). After minimal fixed monthly payments for a base level of Exadata infrastructure usage, payments for OCPUs are consumption based (i.e., customers pay for what they use) billed on an hourly basis. This subscription covers all required hardware, software, and services (management and support) to meet agreed-upon performance, capacity, and availability requirements.

The OCPU subscriptions are available in two flavors: an "all options" version that includes Oracle Database Enterprise Edition and all its options and a "bring your own license" (BYOL) version that enables customers to use previously purchased database licenses and options. These subscriptions can be mixed and matched on a single Exadata Cloud@Customer installation so customers can maximize their innovation capabilities and minimize their costs at the same time. A typical as-a-service contract lasts four years, after which time the contract can be extended or new equipment can be deployed as a refresh and a new contract is initiated.

While customers don't own/control the underlying hardware, they retain full control of their data and databases. Customers are required to secure their data with encryption, which Oracle includes at no extra cost, and maintain their own encryption keys so nobody else has access to their data. Customers also gain full access to Oracle Cloud Database Service offerings (the same as those running in Oracle's public cloud datacenters), but on Exadata assets deployed on premises behind their corporate firewall. Customers are responsible for providing and maintaining the datacenter infrastructure (power, cooling, and intra- and inter-datacenter network links), though Oracle will work

with the customer to acquire appropriate space/connectivity in a colocation facility if that is preferred. Oracle does the heavy lifting of delivering, deploying, and managing all Oracle Exadata infrastructure at customer datacenters, including ongoing hardware support/optimization and firmware/software patching. Customers manage virtual database servers and the associated Oracle Database software via Oracle-provided automation.

Oracle as the owner/operator of the Exadata Cloud at Customer infrastructure needs physical or remote access to the hardware platform when required, but it primarily monitors, manages, and continually updates hardware, firmware, and database software/services via the shared control plane. Services offerings provided by Oracle as part of Exadata Cloud@Customer include cloud account management, cloud services entitlement and metering, identity management, monitoring service, and regions management.

Oracle has been deploying Exadata Cloud at Customer in production environments for many years and has gained knowledge and expertise that allow it to proactively address many of the complexities and issues found in enterprise datacenters of the world's largest corporations. Organizations leveraging Oracle Exadata Cloud@Customer gain several inherent benefits:

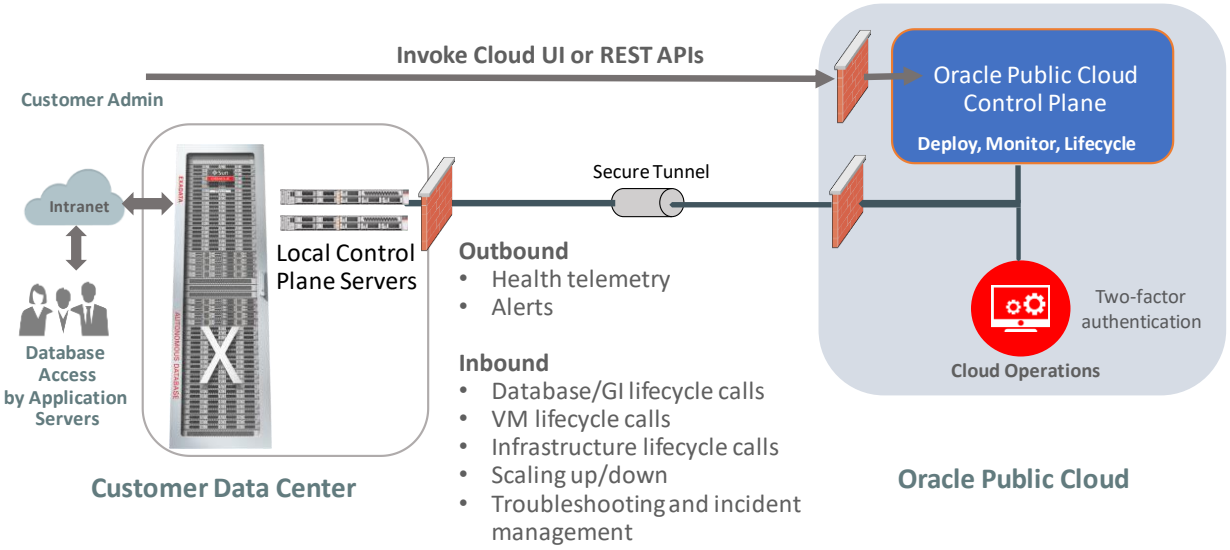
- Exadata Cloud at Customer utilizes a subscription-based payment model; customers don't overpay for resources they don't use while having the flexibility to scale up or down resource utilization without incurring penalty for overutilization or underutilization.
- Oracle operates the Exadata Cloud at Customer infrastructure, so customers don't need to invest resources in systems management and maintenance.
- Customers also avoid the need to take on additional head count as "dedicated cloud operators."
- Oracle provides sophisticated automation to eliminate the burden of the remaining customer-owned management tasks, such as database and OS patching.
- Exadata Cloud at Customer is deployed on the customer's premises, so end users have all the security provided by their own firewall settings and don't need to deal with the potential technical/security risks or with the regulatory noncompliance risks sometimes associated with transferring and keeping data in a public cloud of any type.

Gen 2 Cloud at Customer Enhancements

In September 2019, Oracle introduced the new Exadata Cloud@Customer offering, Oracle's most advanced Oracle Database platform available as a cloud-operated service in customers' datacenters. The most significant enhancement is the introduction of the Gen 2 Oracle Cloud Infrastructure control plane to the Exadata Cloud at Customer platform. Oracle uses its Gen 2 OCI Cloud Control Plane to manage all infrastructure within the Oracle Cloud itself, as well as dedicated clouds it operates for government agencies. Now, customers using the Exadata Cloud Service on the Oracle Cloud and Exadata Cloud@Customer have a consistent user/administrator experience, with the same web UI, command line interface (CLI), and REST APIs in both services (see Figure 1).

FIGURE 1

Exadata Cloud@Customer — Management Flow with Control Plane



Source: Oracle, 2020

The new control plane simplifies Exadata Cloud@Customer deployments, accelerating time to value for customers, and makes it possible for customers to consistently manage fleets of Exadata Cloud@Customer systems deployed across multiple locations while also enabling consistent life-cycle management operations for the Oracle Databases running on the platform. Customers connect to the Cloud Control Plane through a secure link and can perform user administration and create/delete database, backup, restore, patching, auditing, and OCPU scaling tasks. The OCI Control Plane also tracks actual system usage, enabling billing only for capacity actually used.

The Cloud Control Plane also introduces a sophisticated identity management system that lets multiple departments or groups in an organization share Oracle Cloud Infrastructure resources. This capability provides an effective mechanism to organize and control access to resources like Exadata Cloud@Customer across units, resulting in more effective utilization of data and resources.

Challenges/Opportunities for Oracle

Oracle was one of the pioneers in delivering on-premises local cloud-as-a-service (LCaaS) solutions. Prior to the September 2019 launch of Exadata Cloud@Customer, Oracle had already deployed Cloud at Customer service nodes in hundreds of customer locations. One of the key advantages for existing Oracle customers is that the on-premises LCaaS solution delivers the same database services, which minimizes administrator learning curves and addresses the lack of data portability between on-premises and cloud-based databases that can slow business initiatives.

Oracle Exadata Cloud@Customer leverages the latest compute, memory, storage, and network hardware foundations, providing significant performance enhancements, but may have power, cooling, and network connection speed requirements that may not be available in some existing enterprise datacenters. To ensure that customer expectations are met, Oracle provides site assessment and

remediation services for its Exadata Cloud@Customer racks for timely deployment as well as to maintain the services' capacity and expansion capabilities.

As Oracle is taking responsibility for monitoring, patching, and updating the hardware and infrastructure software, it must have the ability to remotely monitor/manage the system in many enterprises' internal datacenters. The introduction of the Gen 2 OCI Cloud Control Plane significantly improves remote operational scalability and efficiency, but Oracle still needs to work closely with customers' network security teams to ensure that the necessary connectivity is secure and delivered promptly to enable full use of these new control plane capabilities.

ESSENTIAL GUIDANCE

CIOs should consider how much on-premises expertise their LCaaS provider has before making any multiyear contractual commitments. Also, a key step for any organization with aggressive digital transformation agendas is making "data" the cornerstone for enterprise IT organizations. For CIOs and their IT teams, deploying infrastructure that enables the optimal collection, storage, distribution, protection, and analysis of and reaction to data is critical. In some cases, this data may be in central cloud environments, but for many organizations, latency, availability, and governance needs require the use of leading-edge technology in corporate datacenters.

The most consistent and recurring barriers to effective delivery of the leading-edge infrastructure needed to address data needs in corporate datacenters are:

- The time and resources required to ensure existing assets are always up to date when it comes to software and firmware patches
- The technical debt accrued from the up-front purchase of new infrastructure that prevents quick adoption of new state-of-the-art technologies

IDC believes that solutions such as Oracle Exadata Cloud@Customer play a key role in helping businesses thrive in a world where data drives business transformation. The IT team must develop and continuously refine best practices for its infrastructure (across cloud and internal locations) including robust service evaluation, governance, and performance monitoring practices. IT leaders must also assess themselves and their teams with respect to what it will take to develop a world-class digital organization and/or when it becomes prudent to leverage partners such as Oracle with defined offerings such as Oracle Exadata Cloud@Customer that can speed the move to the next stage of data-driven innovation. Organizations that thrive in this new environment are those that master the ability to turn data into a wellspring of innovation.

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