Research Report:

ORACLE DATABASE@AZURE: BRINGING ORACLE DATABASE AND EXADATA TO MICROSOFT AZURE

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In an era where cloud computing is not just a luxury but a necessity for organizations aiming to thrive in a digital-first world, the recent collaboration between Oracle and Microsoft marks a pivotal moment.

This partnership, culminating in the launch of Oracle Database@Azure, is more than just a fusion of services; it's a testament to the evolving landscape of cloud technology and the increasing importance of helping customers address their multi-cloud strategies while eliminating their most significant challenges in adopting multicloud architectures, including disjointed management, siloed tools, and a complex purchasing process.

Oracle Database@Azure delivers what enterprises demand: the world's leading relational database offered natively on the cloud of their choice—Microsoft Azure, which is used by 95% of the Global Fortune 500[1].
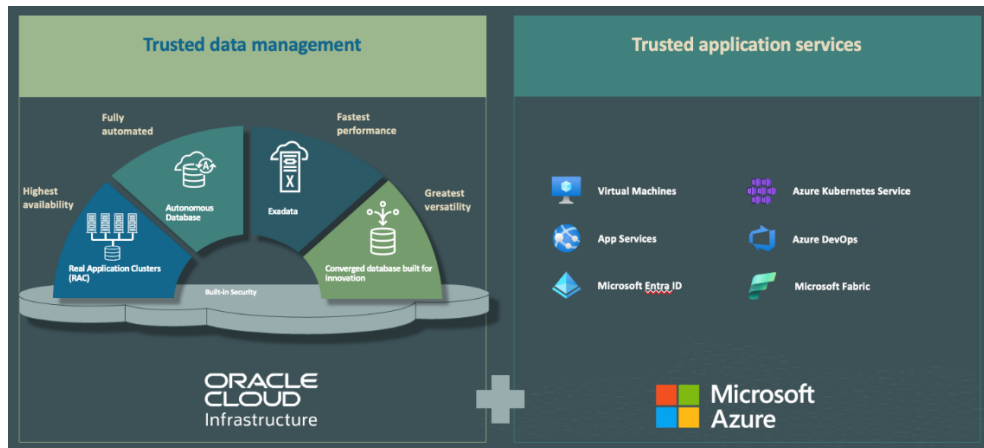
Figure 1: Oracle Cloud and Microsoft Azure

The collaboration is powerful, bringing together the best of what Oracle and Microsoft offer. Oracle Database@Azure delivers Oracle's unmatched database performance, scalability, and availability, along with the security, flexibility, and top-tier services of Microsoft Azure.

Oracle Database@Azure enhances the cloud experience for customers by providing:

- Seamless access to Oracle databases from Microsoft applications.

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[1] https://azure.microsoft.com/en-us/resources/cloud-computing-dictionary/what-is-azure

- A streamlined, secure, and low-latency environment within Azure data centers.

- Oracle databases run on Oracle Exadata for high performance, scalability, and availability.

- The ability to create new cloud-native applications using OCI and Azure technologies.

- Enhanced options for migrating Oracle databases to the cloud.

- Confidence in the joint expertise and support of Oracle and Microsoft.

With this collaboration, Microsoft Azure becomes the only cloud provider besides Oracle itself capable of running Oracle's database services with the performance, reliability, and security of Oracle Exadata and OCI, offering customers a robust multi-cloud solution.

The new offering seamlessly integrates into Azure, addressing challenges associated with managing multiple cloud environments and providing a unified experience for deploying and managing Oracle Database instances within Azure. Oracle operates and manages Exadata infrastructure and OCI services globally, running within Microsoft's data centers.

Furthermore, the partnership simplifies the purchasing and contracting processes. Customers can use their existing Azure agreements and Oracle Database licenses, including the "Bring Your Own License" (BYOL) option and the Oracle Support Rewards program. Overall, this partnership makes it more attractive and easier for organizations to move critical applications to the cloud.

WHAT IS ORACLE EXADATA?

Before delving into the benefits that Oracle Database@Azure brings to enterprise cloud customers, it's essential to understand the Exadata platform, which is a critical component of the offering.

Oracle Exadata is a scale-out system powered by AMD EPYC™ processors that combines compute, storage, networking, and system software. It's purpose-built to run Oracle Database, including Oracle Autonomous Database, with higher performance, scalability, and availability than any other system in the market. Exadata delivers these capabilities for all workloads, including OLTP, data warehousing, analytics, and machine learning.
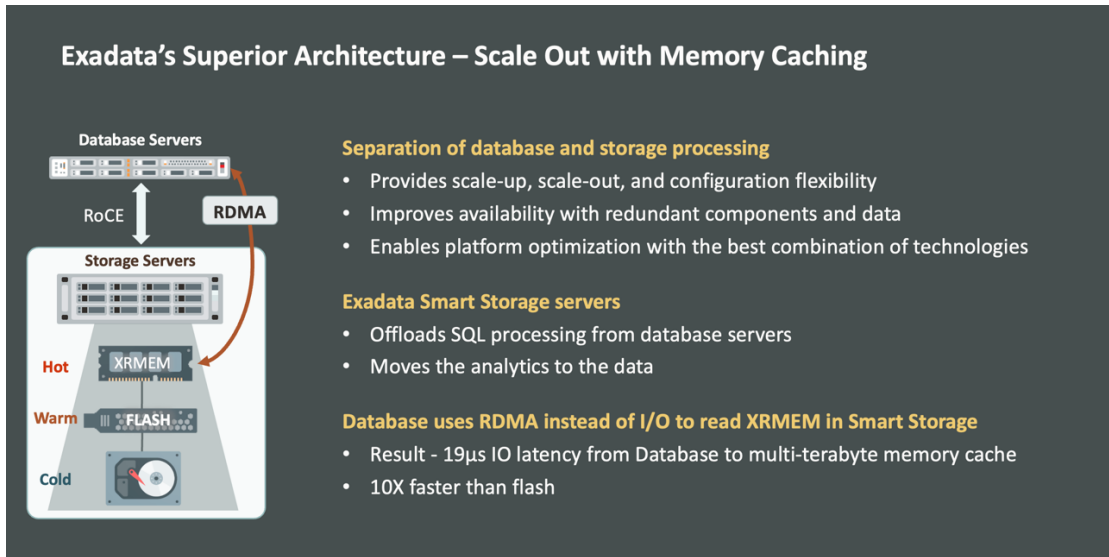
Figure 2: Oracle Exadata Architecture (source: Oracle)

Oracle Exadata provides several critical benefits:

- **Integrated System**: Exadata is a pre-configured combination of hardware and software that includes servers, storage, networking, and software. It's designed to simplify IT infrastructure by providing a single system that is optimized for running Oracle Database.

- **High Performance**: Exadata delivers exceptional performance, particularly when handling large databases, complex queries, and analytics. It uses a range of technologies, including Oracle Real Application Clusters, smart storage, columnar compression, and smart flash caching, to boost database performance.

- **Smart Storage**: One of Exadata's unique features is its smart storage servers. They offload data-intensive operations from the database servers via direct memory access over a high-speed internal fabric, significantly improving query performance.

- **Automatically Tiered Caching**: Exadata combines traditional disk storage, flash, and memory to provide high storage performance. Data is automatically cached in flash or memory on smart storage servers based on access frequency. The caches are directly accessed by Exadata's database servers with minimal overhead, allowing for faster data retrieval with latencies of under 19 microseconds.

- **Database In-Memory**: Exadata supports Oracle's Database In-Memory technology, which accelerates analytics by storing data in a columnar format in memory. Exadata implements advanced capabilities extending Database In-Memory to use smart storage capabilities to increase in-memory capacity and efficiency.

- **Scalability**: Exadata is highly scalable from a database server and storage perspective. Organizations can select configurations that suit the size and diversity of their consolidated database workloads. The system can be scaled by independently adding more database servers or storage to the configuration and only using the required database processing resources.

- **Hybrid Columnar Compression**: This feature allows for more efficient data storage within the database, reducing storage costs and improving query performance.

- **Robust Security**: Exadata includes various features to ensure the security of stored data, including encryption, key management, and compliance with security standards.

- **Automated Management and Updates**: Oracle provides tools for the automated management of Exadata systems, including indexing, patching, and updates, to ensure that the system runs optimally and securely.

Oracle Exadata is often used for mission-critical, data-intensive applications where high performance, scalability, and reliability are essential. It's commonly found in finance, healthcare, telecommunications, and e-commerce industries—wherever the need for rapid data processing and minimal downtime is critical.

ORACLE DATABASE@AZURE

Addressing the importance of multi-cloud strategies and the need for customers to access best-in-class services seamlessly across different cloud providers, this collaboration between OCI and Microsoft Azure enables customers to easily use Oracle Database services within the Azure environment.

- **Oracle Exadata Database Service**: This is a high-performance database service, powered by Exadata's RDMA-enabled ultra-low-latency cluster network connectivity and intelligent storage with database-aware software optimizations. It offers the full performance, scale, security, availability, and automation features of OCI Oracle Database services.

- **Oracle Autonomous Database**: Running on the same Exadata infrastructure, it brings the same core benefits and adds ML-based automation features for routine database tasks, enabling customers to focus more on application development.

- **Azure-Native Customer Experience**: Oracle Database@Azure services are hosted within Azure data centers. This provides an Azure-native experience with direct private network connectivity from Oracle Database services in Azure to Azure's network.

- **Ease of Use and Integration**: Azure customers can use their Microsoft Entra ID credentials to deploy and manage Oracle Database@Azure services through the Azure portal and developer tools. In addition, consistency with on-premises deployments of Oracle Database and Oracle Exadata reduce the need to re-architect or refactor applications.

- **Deployment Process**: Customers can create an Autonomous Database or Exadata Database Service instance via the Azure console or API/SDK and then a subnet in their Azure Virtual Network (VNET) for access over a private connection from other Azure resources.

- **Architecture**: Oracle Database@Azure is built using OCI resources inside Azure data centers and connected for Oracle administration to a specific OCI region. These sites contain the same Exadata infrastructure, run the same Oracle Database services, and cost the same as on OCI.

This includes the physical network stack, Gen 2 Virtual Network service, off-box virtualization, and Exadata-internal RDMA cluster network.

- **Private Network Connectivity**: A key feature is the direct private network link between the OCI resources in the Azure data center and the Azure network. This ensures low network latency and security as the database traffic does not leave the Azure data center.

- **Invisible Backend Infrastructure**: For Azure customers, the OCI Virtual Cloud Network (VCN) and subnet are invisible, simplifying the user experience and reducing complexity.

- **Simplified Purchasing and Unified Support:** Purchasing is simplified through the Azure Marketplace, with options for customers to leverage existing Oracle and Microsoft licenses and discount programs. Oracle and Microsoft also offer unified customer support for this service.

- **Simple Commercial Relationship**. Oracle Database@Azure billing is integrated with the customer's existing Azure commercial relationship, including the drawdown of their Microsoft Azure Consumption Commitment. On the Oracle side, customers can use existing licenses, including unlimited license agreement entitlements, and earn Support Reward Credits based on their cloud consumption, enabling them to reduce the cost of licensed software support.
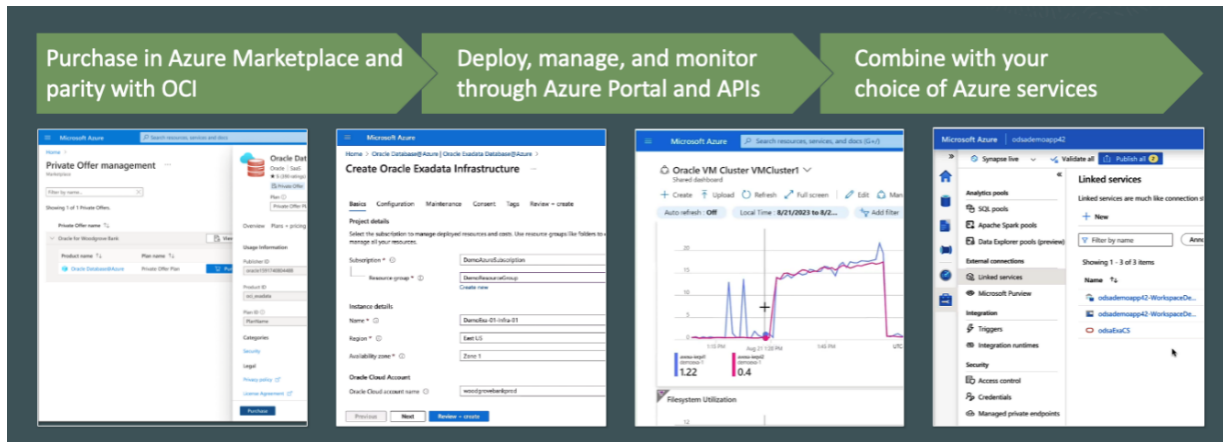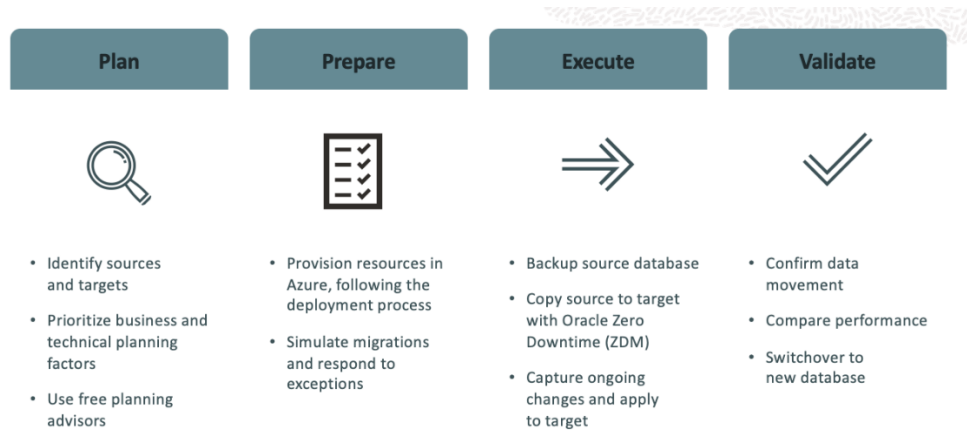

Figure 3: Easy Deployment & Management (source: Oracle)

EASE OF MIGRATION AND DEPLOYMENT

Migrating on-premises workloads to Oracle Database@Azure can be efficiently executed using proven database migration strategies and the Oracle Zero Downtime Migration (ZDM) tool.

The migration process typically involves a few basic steps:

1. **Develop the Migration Plan**: Formulate a detailed database migration plan, considering all necessary steps and potential challenges.

2. **Prepare Teams and Provision Resources**: Ready the business and IT teams for the migration process and set up the required cloud resources in Oracle Database@Azure.

3. **Migrate Using Oracle Zero Downtime Migration (ZDM)**: Use the ZDM tool to minimize service disruption.

4. **Validate and Go Live**: After migration, thoroughly validate the database and associated applications before fully transitioning to live operation in the cloud.

Plan	Prepare	Execute	Validate
• Identify sources and targets • Prioritize business and technical planning factors • Use free planning advisors	• Provision resources in Azure, following the deployment process • Simulate migrations and respond to exceptions	• Backup source database • Copy source to target with Oracle Zero Downtime (ZDM) • Capture ongoing changes and apply to target	• Confirm data movement • Compare performance • Switchover to new database

Figure 4: Ease of Deployment (source: Oracle)

Oracle provides a range of migration technologies and strategies through ZDM, catering to different types of migration needs, from physical to logical and offline to online. It enables businesses to transition their on-premises databases to Oracle Database@Azure smoothly and effectively.

FLEXIBLE MANAGEMENT AND AUTOMATION

Oracle Database@Azure offers a versatile range of management interfaces for the Exadata Database Service, catering to different user preferences and operational needs.

These management interfaces include:

- **Cloud Console Interfaces**: These user-friendly interfaces allow graphical configuration and operations through a web browser, which is ideal for one-time actions.

- **REST APIs for Automation**: REST APIs are available for repetitive tasks such as provisioning and patching databases. These APIs operate over HTTPS without special software on the local system, allowing tasks to be automated via the browser interface.

- **Command Line Interface (CLI)**: All interfaces are accessible via CLI, which is helpful for scripting and building custom tooling. This flexibility supports a range of operational tasks and custom requirements.

- **Software Development Kit (SDK)**: An SDK facilitates integration with common programming languages such as Java, Python, Ruby, and Go, broadening the scope of customization and integration.

- **Infrastructure as Code**: Oracle provides interfaces for Terraform and Ansible for users who prefer to manage their infrastructure as code, enabling efficient and automated infrastructure management. A single Terraform recipe can be used to orchestrate the Exadata Infrastructure, VM Cluster, and the provisioning and management of Pluggable Databases (PDBs) and Container Databases (CDBs).

- **Cloud Automation**: Oracle's cloud automation simplifies various lifecycle and management tasks. These include scaling the number of servers and compute resources consumption, creating databases, scheduling maintenance, updating and upgrading systems, backup and recovery operations, and setting up disaster recovery protections through Data Guard. This automation capability is extensive, though not exhaustive.

- **End-to-end Provisioning with Azure and OCI Tools**: Users can leverage Azure and OCI cloud-native automation tools to provision the entire Exadata Infrastructure, including Cluster VMs and databases.

Oracle Database@Azure offers a comprehensive, flexible, and automated approach to database management. This addresses a wide range of user preferences and operational requirements, from manual, one-time actions to sophisticated, automated, and code-based management strategies.

HIGHLY AVAILABILITY AND DISASTER RECOVERY

Oracle Database@Azure supports the database and transaction processing needs of the most demanding enterprises, requiring that the solution be highly available and fault resilient.

Figure 6: Range of HA & DR Options (source: Oracle)

Oracle and Microsoft together allow for a wide range of proven high availability (HA) architectures to suit different resiliency requirements, with the flexibility to tailor HA strategies based on business needs:

- **Local Clustering**: This option protects against instance failures. It's suitable for scenarios where the main concern is ensuring continuous operation in the face of local hardware or software faults.

- **Remote Replication for Disaster Recovery (DR)**: This setup involves remote replication to safeguard against more extensive system failures or disasters. It's ideal for scenarios where maintaining operations during regional disruptions is critical.

- **Business Critical Architecture**: This architecture has two variations:

  o One involves a remote standby across the region using Data Guard asynchronous replication.

  o The other includes both local and remote standby, employing Active Data Guard and Data Guard for data replication.

- **Mission-Critical Architecture**: Recommended for enterprise applications that cannot afford downtime, including during outages and maintenance. This setup includes a local standby and a fully redundant remote standby.

- **Automation with Oracle Data Guard Fast-Start Failover**: This feature automates database failover, reducing recovery time without requiring manual steps. It enhances reliability and reduces downtime in failover scenarios.

- **Cross-Region Replication with Oracle GoldenGate**: The database is replicated across Azure regions using Oracle GoldenGate, which offers distinct advantages for accessibility and readiness.

- **Fault-tolerant Exadata infrastructure:** With completely redundant hardware and software and AI-based fault detection that helps identify and mitigate potential problems before they affect operations, Exadata provides the highest possible levels of availability.

Oracle Database@Azure provides a range of high-availability options tailored for different levels of criticality, from local clustering to instance failures to advanced setups such as GoldenGate for mission-critical applications that require immediate failover capabilities and zero data loss.

The solution offers sufficient flexibility to allow enterprises to tailor an HA strategy to the business's unique needs.

KEY TAKEAWAYS

Oracle Database@Azure is a groundbreaking partnership between Oracle and Microsoft that brings the world's most powerful database machine natively into Microsoft's enterprise-ready Azure cloud. This collaboration helps eliminate customers' most significant challenges in adopting multicloud architectures, including disjointed management, siloed tools, and a complex purchasing process.

Oracle Database@Azure offers all the performance, scale, and workload availability advantages of the Oracle Database services running on Exadata, including Real Application Clusters and built-in security features.

At the same time, Oracle Database@Azure seamlessly integrates with Azure services, including Power BI for analytics and the Azure OpenAI Service for generative AI applications, enabling a broad range of cloud-based AI solutions backed by Oracle's AI-ready database technology.

This comes together to deliver tangible benefits to enterprise users:

- **Multicloud Flexibility**: This platform exemplifies the effectiveness of a multicloud approach. It grants organizations the agility to use Oracle's database services within Azure's cloud environment, leading to more cohesive and streamlined IT operations.

- **Enhanced Performance and Security**: The offering provides high performance and robust security, which is crucial for enterprises managing sensitive data and applications, especially when data security and processing speed are paramount.

- **Ease of Migration and Integration**: A notable feature of Oracle Database@Azure is the simplified process of migrating Oracle workloads from on-premises to Azure, making it a transformative solution for businesses aiming to shift to the cloud without the usual complexities.

- **Future-Proofing Enterprises**: Combining Oracle's database expertise with Azure's cloud capabilities equips businesses to stay competitive in a rapidly changing digital landscape, future-proofing enterprises on their cloud journey.

- **Broadening Horizons for Innovation**: Oracle Database@Azure catalyzes innovation by allowing businesses to leverage the joint strengths of Oracle and Azure to foster unprecedented growth, efficiency, and transformation.

The companies are just getting started. Following its initial launch in the Azure US East region, Oracle Database@Azure is now available in Frankfurt, Germany, and set to expand to several other regions globally in 2024, including Australia, France, Canada, Brazil, Japan, India, Italy, Sweden, Southeast Asia, the United Arab Emirates, the UK, and additional US regions.

Oracle Database@Azure changes the cloud landscape, bringing the power of the world's most versatile database and advanced database machine directly to Microsoft's enterprise-ready Azure cloud. This is the future of cloud computing, where collaboration and cross-platform integration are essential to fulfilling the sophisticated demands of modern businesses.

As we venture into this new era, Oracle Database@Azure emerges as a new standard of innovation, adaptability, and strategic insight in the cloud domain with the first true multicloud solution.