



Oracle Cloud Infrastructure Platform Overview



Improve performance and security, while reducing costs for your enterprise and performance-intensive applications

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PURPOSE STATEMENT

This document provides an overview of features and enhancements included in release Oracle Cloud Infrastructure. It is intended solely to help you assess the business benefits of upgrading to Oracle Cloud Infrastructure and to plan your I.T. projects.

DISCLAIMER

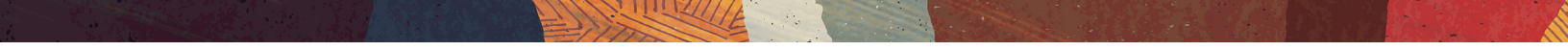
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Due to the nature of the product architecture, it may not be possible to safely include all features described in this document without risking significant destabilization of the code.

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ABOUT THIS WHITE PAPER

Oracle Cloud Infrastructure (OCI) is a deep and broad platform of cloud services that enable you to build and run a wide range of applications in a scalable, secure, highly available, fault-tolerant and high-performance environment. This whitepaper introduces Oracle Cloud Infrastructure, highlights some common solutions, and describes the benefits of running your applications on Oracle Cloud.

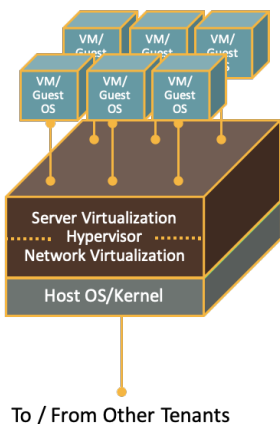


INTRODUCTION

Oracle Cloud Infrastructure launched in late 2016 with a single region and a few core services across compute, storage, database and networking. Since then, Oracle Cloud has expanded to more than 50 services available in 21 cloud regions worldwide with a plan to reach 36 total regions by the end of 2020. In 2019 alone, Oracle Cloud Infrastructure launched more than 200 new services, features, and enhancements.

Oracle Cloud Infrastructure combines the elasticity and utility of public cloud with the granular control, security, and predictability of on-premises infrastructure to deliver high-performance and cost-effective infrastructure services. Oracle Cloud Infrastructure was the first major cloud provider to implement “off-box” or isolated network virtualization, which takes network and IO virtualization out of the server stack and puts it in the network. As a result, customers can provision self-service, dedicated hosts with no hypervisor overhead, noisy neighbors, or shared resources with a full software-defined layer 3 network topology. In addition, off-box network virtualization enables running bare-metal hosts side-by-side with any class of systems – from Virtual Machines (VMs) to containers to optimized database systems like Oracle Exadata – all using the same set of APIs. With Oracle Cloud, customers can leverage unique Exadata capabilities (millions of IOPS, IO prioritization, columnar compression etc.) together with the cloud-native security and governance capabilities of a layer 3 virtual cloud network.

Host server virtualization *Most prevalent today*



Isolated network virtualization *Oracle Cloud Infrastructure all regions*

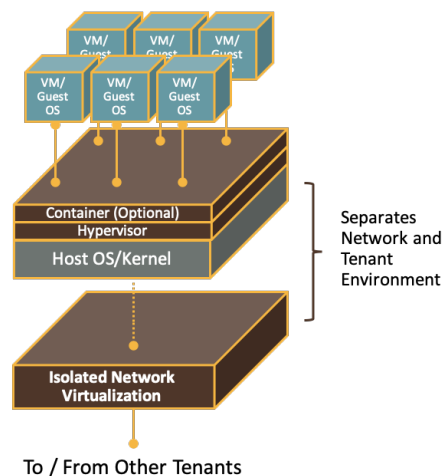


Figure 1: Oracle Cloud Infrastructure Off-Box Network Virtualization

ORACLE CLOUD INFRASTRUCTURE BENEFITS

Superior Performance

Oracle Cloud Infrastructure leverages the latest CPUs, GPUs, off-box networking, and NVMe SSD based storage services. For example, bare-metal instances provide industry-leading 51.2 TB of NVMe solid-state storage capable of millions of read and write transactions per second. Unlike most cloud providers, Oracle’s cloud networking services are not over-subscribed, so each tenant gets predictable high-performance and low latency. Based on third party testing, [Oracle’s compute and storage](#)

[offer 2-5 times the I/O performance of comparable on-premises or AWS products](#), with consistent low latency, low jitter and higher bandwidth. Oracle Cloud Infrastructure is designed for applications that require consistent performance, including raw processing through CPUs or GPUs, millions of storage IOPS, high throughput, and low latency. Great performance translates into faster results for end customers and greater productivity.

Superior Economics

Oracle Cloud Infrastructure's Compute offerings are roughly 50% less than comparable AWS or Azure offerings. Oracle's block storage and database storage can be exponentially less expensive than other cloud providers when performance is required. We do not charge for outbound bandwidth for up to 10TB per month and beyond that charge a fraction of other cloud providers. Our lower product costs translate into 20-60% lower TCO across a range of workloads versus comparable on-premises or AWS infrastructure. Of course, all of Oracle Cloud Infrastructure services are billed on an hourly basis so that you can scale up or down and only pay for the resources you consume (annual commitment pricing is available as well via Oracle's Universal Credits program).

Security First

Oracle Cloud Infrastructure starts with a zero-trust architecture. This means that not only are tenants isolated from one another, but tenants are also isolated from Oracle and vice versa (the isolated network virtualization mentioned earlier plays a role in this clean separation). Above Oracle Cloud's core infrastructure are layer upon layer of defenses including encryption everywhere, least-privilege identity and access management, and granular resource and network control all the way out to the edge. Oracle Cloud also has strict code security development and deployment processes, a full compliance team that is constantly auditing new regions and services, and a round-the-clock Security Operations Center to guard against threats. The combination of architecture, technology, and process provides a more secure environment than most on-premises facilities, as well as other public clouds.

Simple, yet powerful APIs and Developer Tools

The Oracle Cloud Infrastructure APIs are REST APIs that use HTTPS requests and responses. This intuitive API along with a command-line interface and common SDKs in Java, Python, Ruby, and Go let you manage large-scale workloads and automate everything. In addition, Oracle Cloud Infrastructure has native support for [Terraform](#) orchestration and [cloud-init](#) capabilities. Oracle Cloud Infrastructure lets you provision and manage single-tenant, dedicated physical hosts or multi-tenant VMs using the same set of APIs. Oracle Cloud Infrastructure empowers you to develop and test your application with VMs, but deploy with dedicated physical hosts or vice-versa: you do not need to change your app as the single and multi-tenant models share the same cloud-optimized hardware, firmware, software stack, and networking infrastructure. This unique capability is not available with any other public clouds today.

APPLICATIONS BEST-SUITED FOR RUNNING ON ORACLE CLOUD INFRASTRUCTURE

Enterprise Database Applications

Many existing enterprise applications, including Oracle applications like E-Business Suite, third party applications like Manhattan Associates, and custom applications, leverage a backend Oracle Database. Oracle Database offers major advantages in three areas: performance, high-availability, and rich functionality.

Oracle Real Application Clusters (RAC) is the feature of the Oracle Database that enables multiple clustered instances of Oracle to simultaneously access a single shared database. Oracle RAC uses Oracle Clusterware for the infrastructure to bind the interconnected servers so they appear as a single system to end users and applications, and a dedicated, high-speed, low latency, private network known as cluster interconnect to synchronize activity and share information between instances. Creating an on-premises RAC infrastructure can be expensive, time-consuming and error-prone. Developers can instead leverage the fully managed Oracle Cloud Infrastructure DB Systems to create a 2-node managed RAC instance (or Exadata service to create quarter, half, or full-rack Exadata systems with RAC) which provide all the benefits of RAC but removes the pain-points associated with creating and managing RAC on-premises. The reference architecture below shows a 2-node RAC on Oracle Cloud Infrastructure. Currently, no other public cloud support a fully managed RAC database.

Customers like [Alliance Data Systems](#) saved over \$1 million in their first year of running Oracle on-premises applications in the Oracle Cloud. Other customers like [TruGreen](#) saw application performance increase 4-5 times over their on-premises environment.

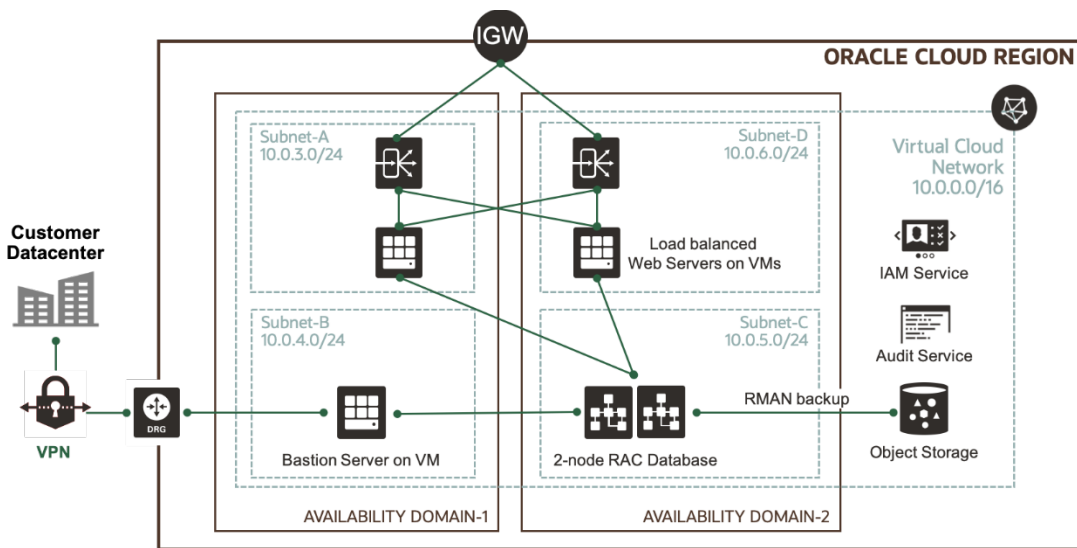


Figure 2: 2-node Real Application Cluster (RAC) on Oracle Cloud Infrastructure

High Performance Computing (HPC) Workloads

Oracle Cloud Infrastructure is a natural fit for many high-performance and I/O intensive computing workloads such as product simulations, risk modeling, and digital twins. These workloads involve huge data sets that need to be analyzed using large-scale compute jobs, which demand high performance, high throughput, and low variability. Typical multi-tenant clouds have hypervisor overhead and performance variability (often referred to as noisy neighbors). With Oracle's single-tenant model, there is no overhead and no noisy neighbors. Additionally, there is typically a long provisioning cycle for acquiring and setting up an HPC cluster in on-premises environments – with Oracle Cloud, you can spin up more powerful HPC instances in minutes. Moreover, bare-metal instances come with 25 Gbps network throughput (and dual 25 Gbps NICs) which help move massive amounts of data quickly. Oracle also offers HPC-specific instances with higher clock speeds and RDMA-based cluster networking. This provides even higher bandwidth (100 Gbps) and even lower latency (1.5 μ s) for HPC workloads that rely on MPI (message passing interface).

Superior performance and ability to provision truly elastic bare metal servers in minutes make Oracle Cloud Infrastructure platform an ideal choice for running HPC workloads. Customers like [Yellow Dog](#) have seen 10 times greater HPC performance on the Oracle Cloud versus on-premises or other cloud providers. The reference architecture below shows a typical HPC workload running on Oracle Cloud Infrastructure.

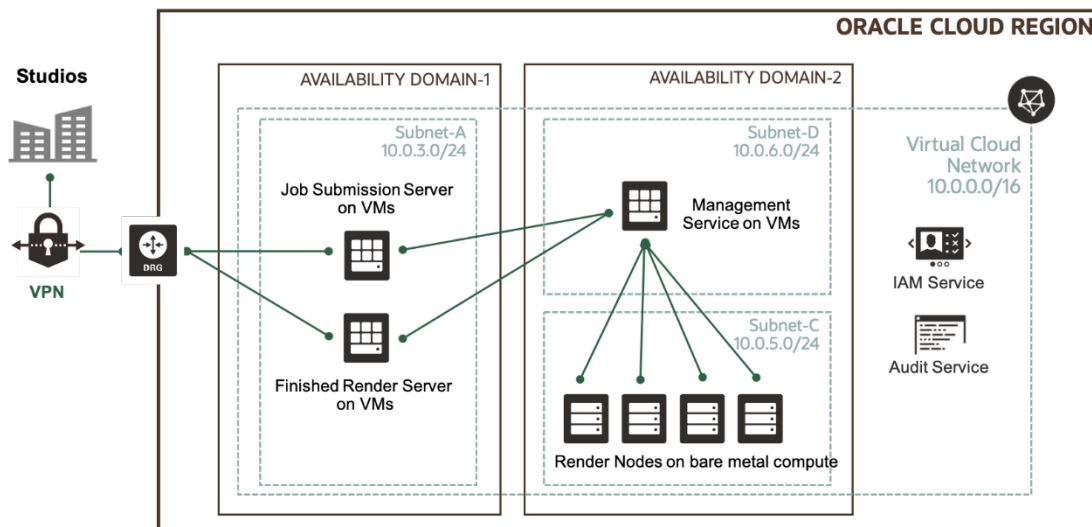


Figure 1: High Performance Computing application on Oracle Cloud

Big Data Workloads

With Oracle Cloud Infrastructure, you can build any Big Data application and support any volume of data. You can provision a Hadoop framework in minutes, scale your Hadoop cluster, or run other popular frameworks such as Apache Spark. With the Oracle's [HDFS connector](#), your Hadoop application can read and write data to and from the Oracle Cloud Infrastructure Object Storage Service. You also have the flexibility to architect with large amounts of NVMe solid state storage local to the processors, through block interfaces (iSCSI), or through file interfaces (NFS).

Customers like [Cisco Tetration](#) have seen [big data performance improvements of 2-3 times](#) over running the same software on-premises or in other cloud providers. The reference architecture below shows Cloudera implemented on Oracle Cloud Infrastructure.

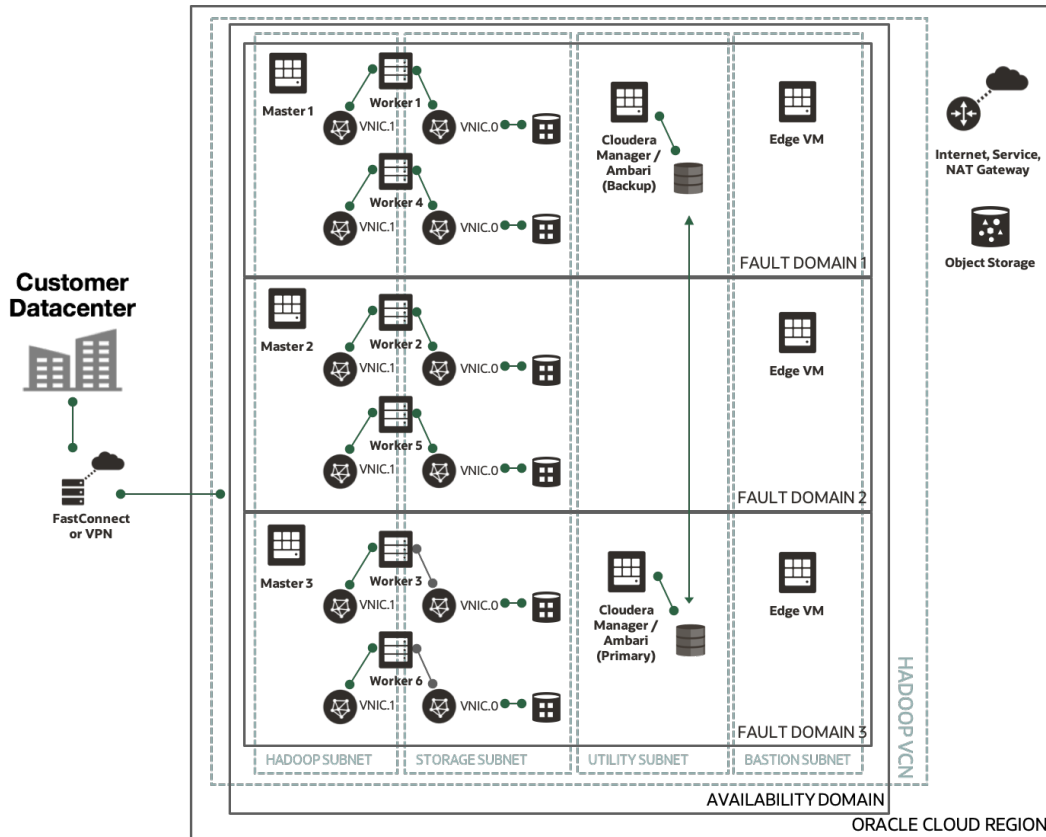


Figure 2: Big Data up running Cloudera on Oracle Cloud Infrastructure

Web and Cloud-Native Applications

Creating scalable and highly available web apps can be complex and time-consuming. Moreover, it is hard to predict traffic patterns in advance for web apps, which often results in capacity over provisioning and low utilization of expensive on-premises hardware and data center resources. Oracle Cloud Infrastructure provides a robust, scalable, highly available and cost-effective infrastructure platform for hosting your most demanding web applications. This includes applications running on bare metal, VMs, or containers. The reference architecture below shows a scalable and highly available web app running on Oracle Cloud Infrastructure.

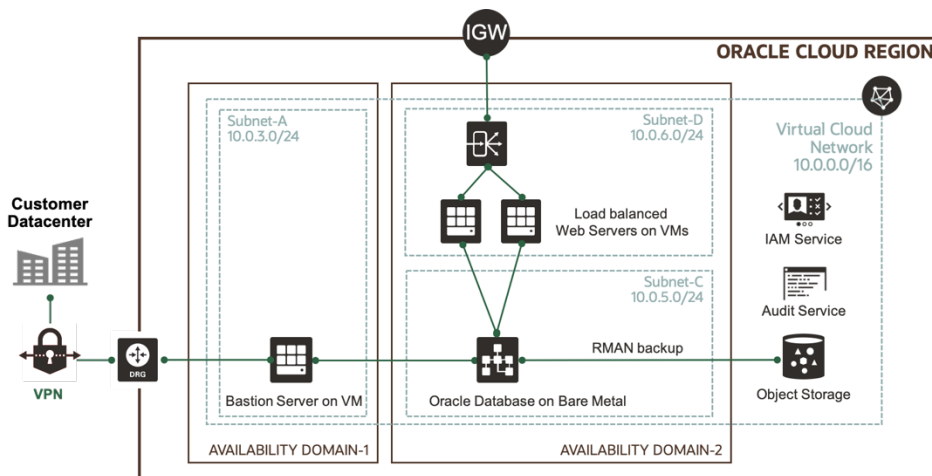


Figure 3: Scalable, highly available web app on Oracle Cloud Infrastructure

ORACLE CLOUD INFRASTRUCTURE CORE SERVICES OVERVIEW

Oracle Cloud Infrastructure offers over 50 cloud services, so we will cover only the core ones.

- **Identity and Access Management (IAM)** service lets you control what type of access a group of users have and to which specific resources. Oracle offers better and easier governance with capabilities such as compartments (logical isolation of resources for usage and billing) and policies with simple SQL like syntax that is easier to create and manage.
- **Oracle Cloud Infrastructure Compute** lets you provision and manage single-tenant servers (dedicated servers also referred to as bare-metal) or multi-tenant VMs using the same set of APIs. You can spin-up truly elastic, self-service, pay-by-the-hour bare-metal servers in minutes¹. Oracle offers Intel and AMD based CPUs, and Nvidia based GPUs.
- **Oracle Cloud Infrastructure Container Engine for Kubernetes** is a fully managed, scalable, and highly available service to deploy containerized applications to the cloud. Use Container Engine when your development team wants to reliably build, deploy, and manage cloud-native applications. You specify the compute resources that your applications require, and the Container Engine provisions them on Oracle Cloud Infrastructure in an existing OCI tenancy.
- **Oracle Cloud Infrastructure Functions** service helps you build and deploy serverless applications and functions in multiple languages, including Java, Python, Node, Go, and Ruby.
- **Oracle Cloud Infrastructure Networking** lets you create and manage a software-defined network that OCI refers to as a Virtual Cloud Network (VCN). A VCN is a virtual version of a traditional on-premises network, where customers can choose their own RFC 1918 IP addresses and similar to traditional on-premises networks, a VCN has subnets, route tables, gateways and firewall rules to support routing of public and private traffic.
- **Oracle Cloud Infrastructure Load Balancing** allows you to create a highly available load balancer within your virtual cloud network (VCN) so that you can distribute internet traffic to your compute instances within the VCN.
- **Oracle Cloud Infrastructure Block Volumes** provides high-performance network storage capacity that supports a broad range of I/O intensive workloads. You can use block volumes to expand the storage capacity of your compute instances, to provide durable and persistent data storage that can be used with different compute instances, and even across multiple compute instances (multi-attach).

¹ Typically less than 5 minutes for Linux instances

- **Oracle Cloud Infrastructure Object Storage** provides high throughput storage for unstructured data. Object storage enables near infinite storage capacity for large amounts of data (for applications like Spark), or rich content like images and videos.
- **Oracle Autonomous Database** offers fully automated databases optimized for either transaction processing or data warehousing. These databases provide higher security and optimal experience by self-patching, self-tuning, and auto-scaling. Oracle Autonomous Database also offers shared or dedicated deployment options. The dedicated option essentially isolates the underlying infrastructure resources to a single tenant.
- **Oracle Cloud Infrastructure Database and Exadata Cloud** lets you easily build, scale, and secure Oracle databases with license-included or Bring Your Own License (BYOL) pricing. You create databases on VMs, bare-metal instances, or Exadata instances. With OCI Database Service, you can then use your existing tools, RMAN, and the database CLI to manage your databases in the cloud the same way you manage them on-premises.
- **Oracle Cloud Infrastructure Audit** provides visibility into activities related to your resources and tenancy. Audit log events can be used for security audits, to track usage of and changes to Oracle Cloud Infrastructure resources, and to help ensure compliance with standards or regulations.
- **Oracle Cloud Infrastructure Key Management** service provides centralized management of data encryption. You can use Key Management to create or import master encryption keys, generate data encryption keys, rotate keys, enable or disable keys for use in cryptographic operations, assign keys to resources, and use keys for encryption and decryption.

You can access Oracle Cloud Infrastructure through an intuitive graphical user interface, REST [APIs](#), [SDKs](#) or a command-line interface ([CLI](#)).

GETTING STARTED

- Sign up for Oracle Cloud Infrastructure, <https://www.oracle.com/free>
- Read more about Oracle Cloud Infrastructure Services, <https://docs.cloud.oracle.com/iaas/Content/GSG/Concepts/baremetalintro.htm>
- Launch your first Linux or Windows instance, <https://docs.cloud.oracle.com/iaas/Content/Compute/Tasks/launchinginstance.htm>
- Learn more about Oracle Cloud Infrastructure SDKs, <https://docs.cloud.oracle.com/iaas/Content/API/Concepts/sdks.htm>
- Create your first Oracle Cloud Infrastructure API, <https://docs.cloud.oracle.com/iaas/Content/API/Concepts/usingapi.htm>

CONCLUSION

Oracle Cloud Infrastructure provides a robust, scalable, secure, highly available and cost-effective cloud platform to meet the needs of the modern enterprise. The technologies provided by Oracle Cloud Infrastructure give developers and IT broad support for migrating existing workloads as well as creating new cloud-native applications.

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