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Modern Cloud  
Development

# Oracle Cloud Infrastructure: Architecture and Use Cases

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Oracle Cloud Infrastructure is a set of cloud services that enable you to build and run a wide range of applications in a highly-available environment. This technical paper showcases the depth and breadth of the Oracle Cloud Infrastructure platform and how it is designed to help developers create the next-generation of applications.

## Introduction

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 is the first cloud platform to implement off-box network virtualization, which takes network and IO virtualization out of the software stack and puts it in the network. As a result, customers can provision truly elastic, self-service, pay-as-you-go, dedicated physical servers with a full software-defined layer 3 network topology. In addition, as shown below in figure 1, off-box

network virtualization enables running bare metal host side-by-side with any class of systems—from Virtual Machines (VMs) to Engineered Systems like Exadata all using the same set of APIs. This implies that you can leverage Exadata hardware capabilities (such as PCI-based flash and InfiniBand network) and unique software intelligence (such as smart scan, flash cache, and columnar compression) for your workloads, while leveraging the cloud-native security and governance capabilities of a layer 3 virtual cloud network.

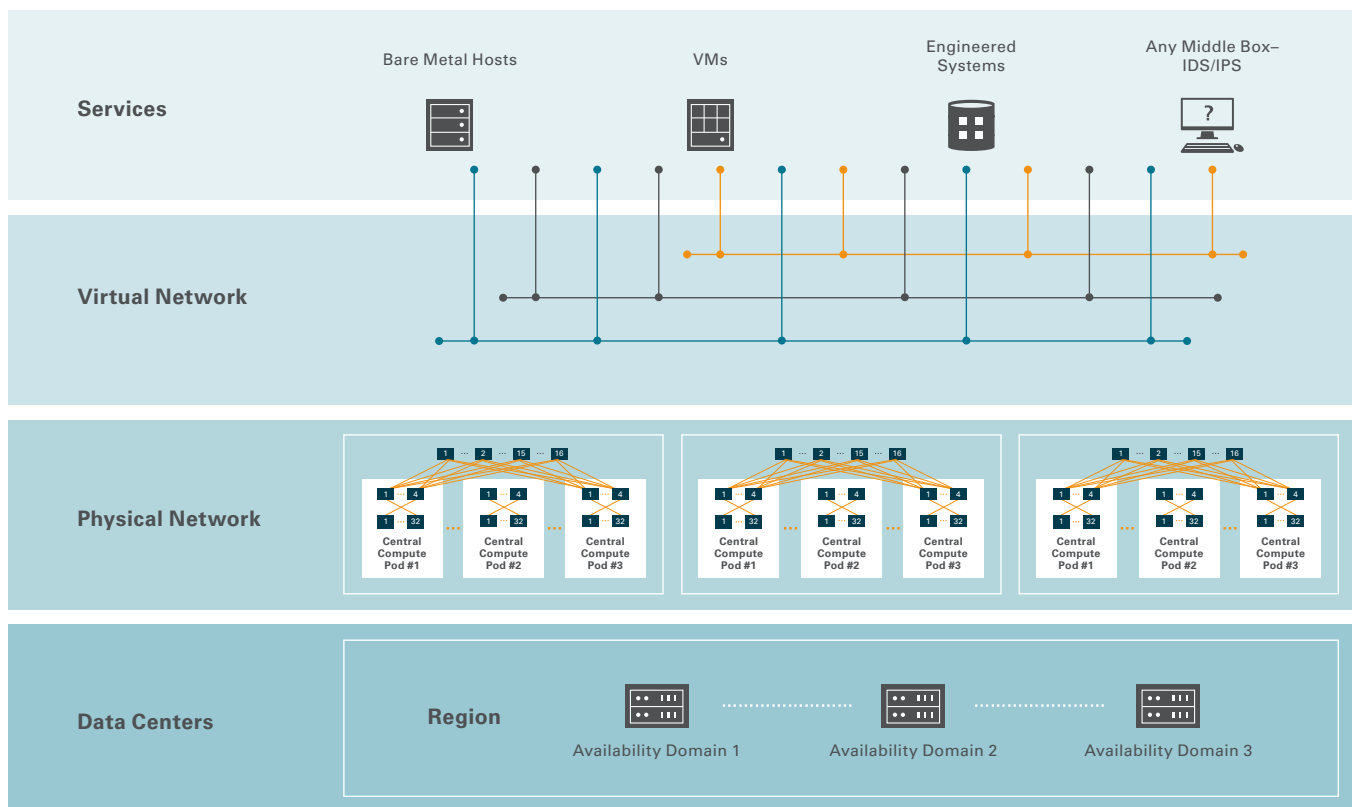


Figure 1: Oracle Cloud Infrastructure off-box network virtualization

# Oracle Cloud Infrastructure Benefits

## Simple, yet powerful APIs

These intuitive APIs along with Oracle Cloud Infrastructure command-line interface and common libraries in Java, Python and Ruby let you manage large-scale workloads and automate everything. In addition, Oracle Cloud Infrastructure has leading integration with providers such as [Terraform](#) and [Docker](#), and support [metadata](#) and [cloud-init](#) capabilities.

## Single or multi-tenant with same set of APIs

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 (due to cost constraints or otherwise), but deploy with dedicated physical hosts or vice-versa: you don't need to change your app as the single and multi-tenant models share the same cloud-optimized hardware, firmware, software stack, and networking infrastructure and all it takes is a couple of clicks (in the GUI console or API calls).

## Performance-first approach

Oracle Cloud Infrastructure leverages Oracle's X86 systems and is built for extreme performance with NVMe flash drives and super-fast SSD block volumes. Bare Metal instances provide up to 28.8TB of raw NVMe flash drive capable of millions of read and write transactions per second. Oracle Cloud Infrastructure is designed to support any app that requires lots of dedicated computing cores, cheap, big storage and millions of I/O, high throughput and lower latency.

## Simple pricing

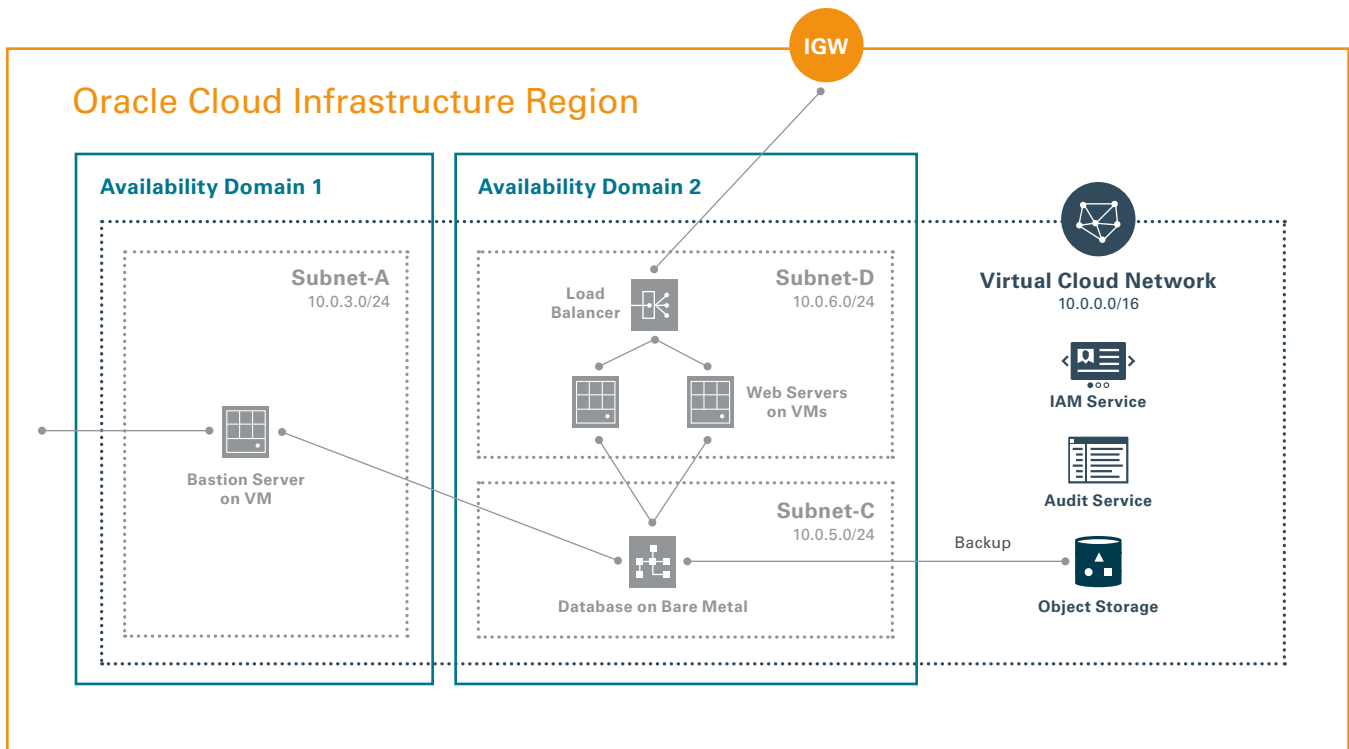
All of Oracle Cloud Infrastructure services are [billed](#) on an hourly basis so that you can scale up or down and only pay for the resources you consume (monthly/annual commitment pricing is available as well). With Oracle Cloud Infrastructure, you don't have to worry about your app becoming popular, as we don't charge for bandwidth for up to 10TB/month and beyond that charge a fraction (1¢/GB/month) of what other cloud providers charge!

# Common Use Cases for Oracle Cloud Infrastructure

## Web application hosting

Creating scalable and highly-available web apps can be complex and time-consuming. Moreover, it is really 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 provide a robust, scalable, highly-available and cost-effective infrastructure platform for hosting your most demanding web applications. The reference architecture in figure 2 shows a scalable and highly-available web app running on Oracle Cloud Infrastructure.



**Figure 2:** Scalable, highly-available web app on Oracle Cloud Infrastructure

## High-performance computing (HPC) in the Cloud

Oracle Cloud Infrastructure is a natural fit for many high-performance and I/O intensive computing workloads such as scientific computing, simulation, and research projects. These workloads involve huge data sets that need to be analyzed using large-scale compute jobs, which demand high performance, throughput and lower variability. Typical multi-tenant clouds have hypervisor overhead and performance variability (often referred to as noisy neighbors)—with Oracle Cloud Infrastructure single-tenant

model, there is no overhead of any sorts and no noisy neighbors. Additionally, there is a long provisioning cycle for HPC cluster acquisitions in on-premises environments—with Oracle Cloud Infrastructure you can spin up instances in minutes. Moreover, these instances come with 10 Gbps network throughput which help move massive amounts of data quickly. 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. The reference architecture below shows a typical HPC workload running on Oracle Cloud Infrastructure.

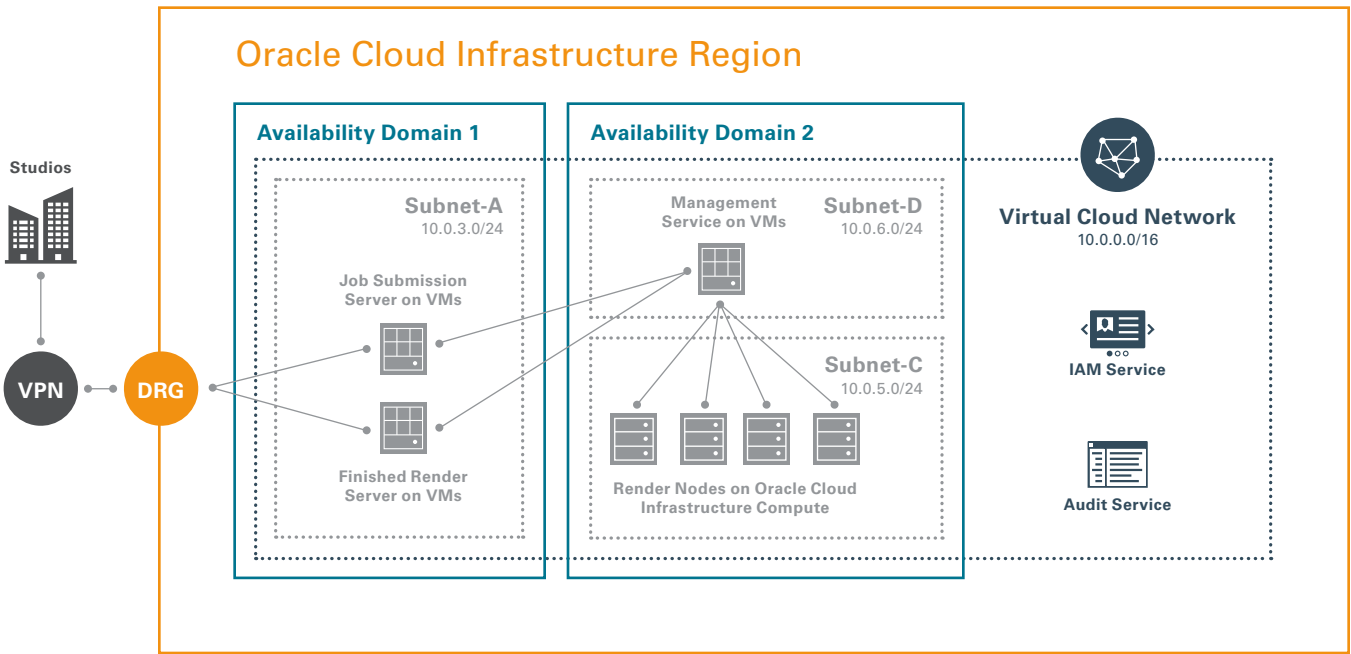


Figure 3: HPC app on Oracle Cloud Infrastructure

## 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 and run other popular frameworks such as Apache Spark. With the Oracle Cloud Infrastructure [HDFS](#)

[connector](#), your Hadoop application can read and write data to and from the Oracle Cloud Infrastructure Object Storage. We also have leading integration with partner such as [Qubole](#) to deliver unprecedented performance for big data workloads. The reference architecture below shows an Apache Spark framework implemented on Oracle Cloud Infrastructure .

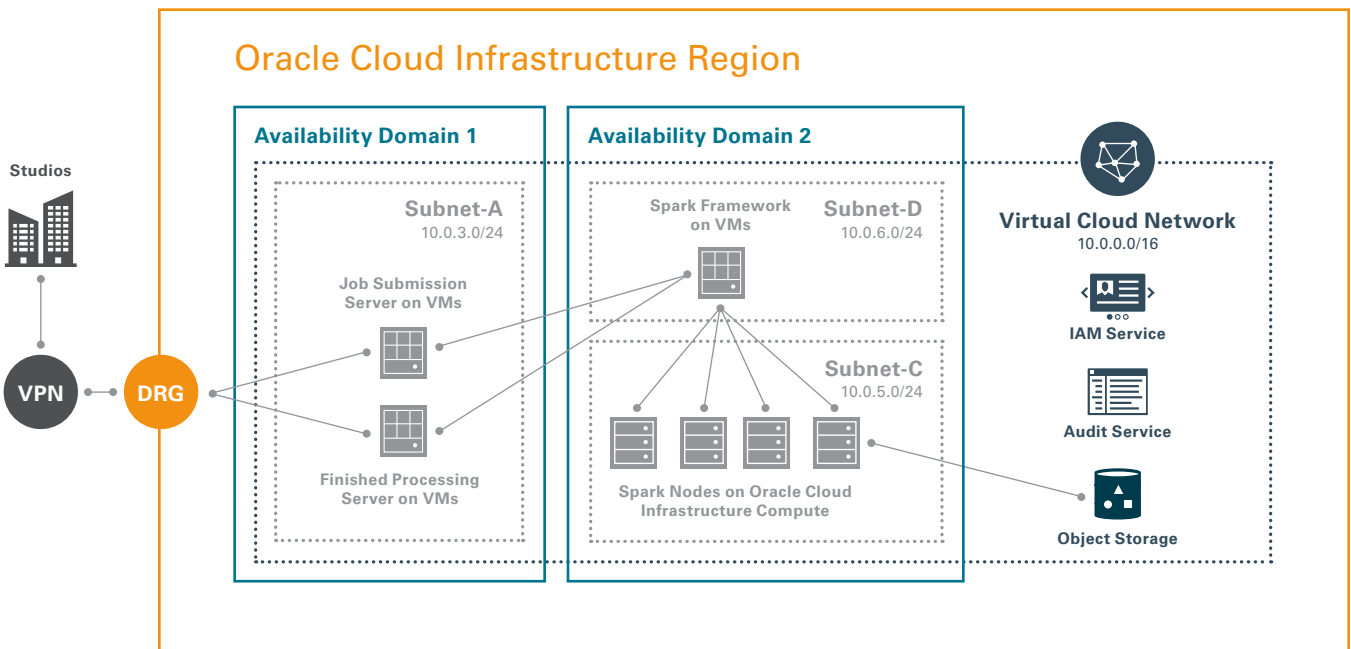


Figure 4: Big Data app running Apache Spark on Oracle Cloud Infrastructure

## Traditional database applications

Many existing enterprise applications leverage a backend Oracle database such as RAC with major advantages in three areas: scalability, high-availability and 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 the 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 Oracle Cloud Infrastructure Database to create a 2-node managed RAC instance which provide all the benefits of RAC but removes the pain-points associated with running RAC on-premises. The reference architecture below shows a 2-node RAC on Oracle Cloud Infrastructure.

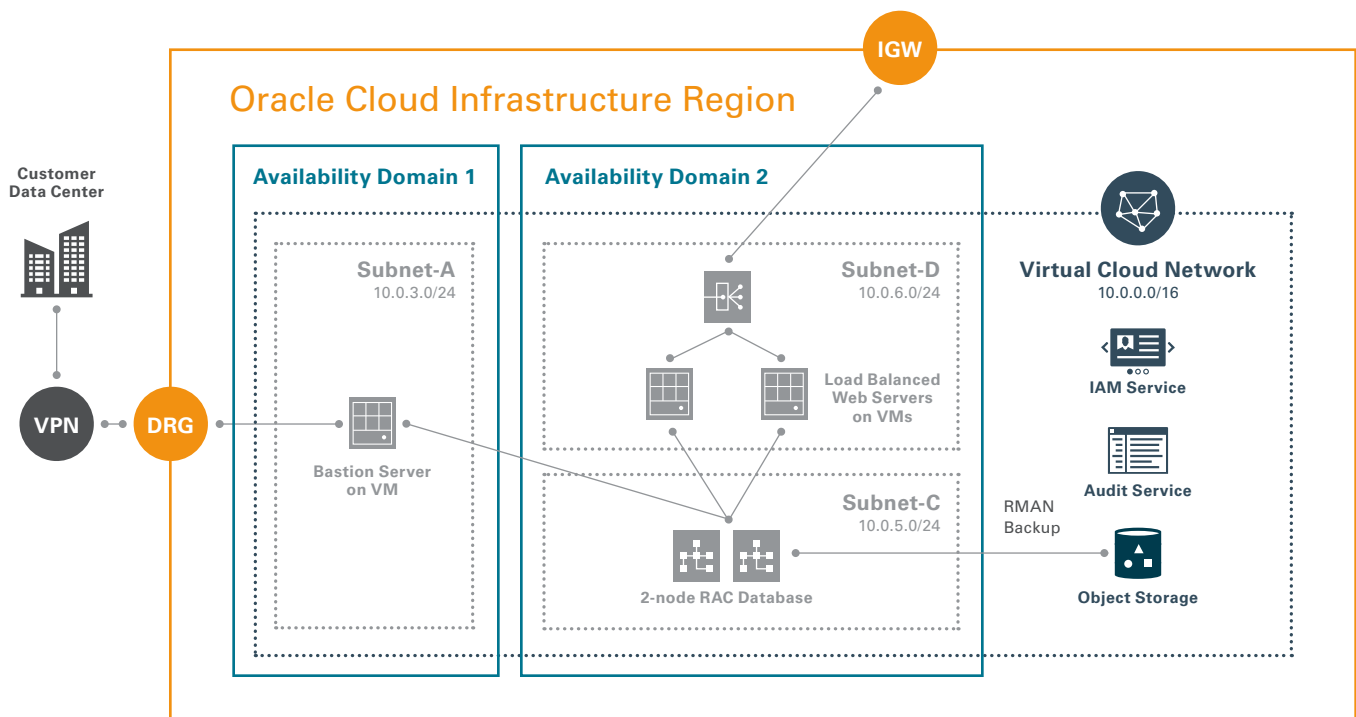


Figure 5: 2-node Real Application Cluster (RAC) on Oracle Cloud Infrastructure

## Services Overview

An overview of Oracle Cloud Infrastructure services is provided below—

- [Oracle Cloud Infrastructure Identity and Access Management \(IAM\)](#) service lets you control who has access to your cloud resources. Using the IAM service, you can control what type of access a group of users have and to which specific resources. Oracle Cloud Infrastructure 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 physical 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 minutes<sup>1</sup>. Since Oracle Cloud Infrastructure compute enables running bare metal host side-by-

<sup>1</sup>Typically less than 5 minutes for Linux instances

side VMs or Engineered Systems, you can move your application between a VM and bare metal instance seamlessly—this isn't possible with most on-premises and other public cloud environments.

- **Oracle Cloud Infrastructure Network** lets you create and manage a software-defined network that Oracle Cloud Infrastructure 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 Block Volume** 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 migrated across compute instances, and to host large databases.
- **Oracle Cloud Infrastructure Database** lets you easily build, scale, and secure Oracle databases with license-included pricing. You create databases on DB Systems, which are bare metal servers with local NVMe flash storage. With Oracle Cloud Infrastructure Database, 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 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.

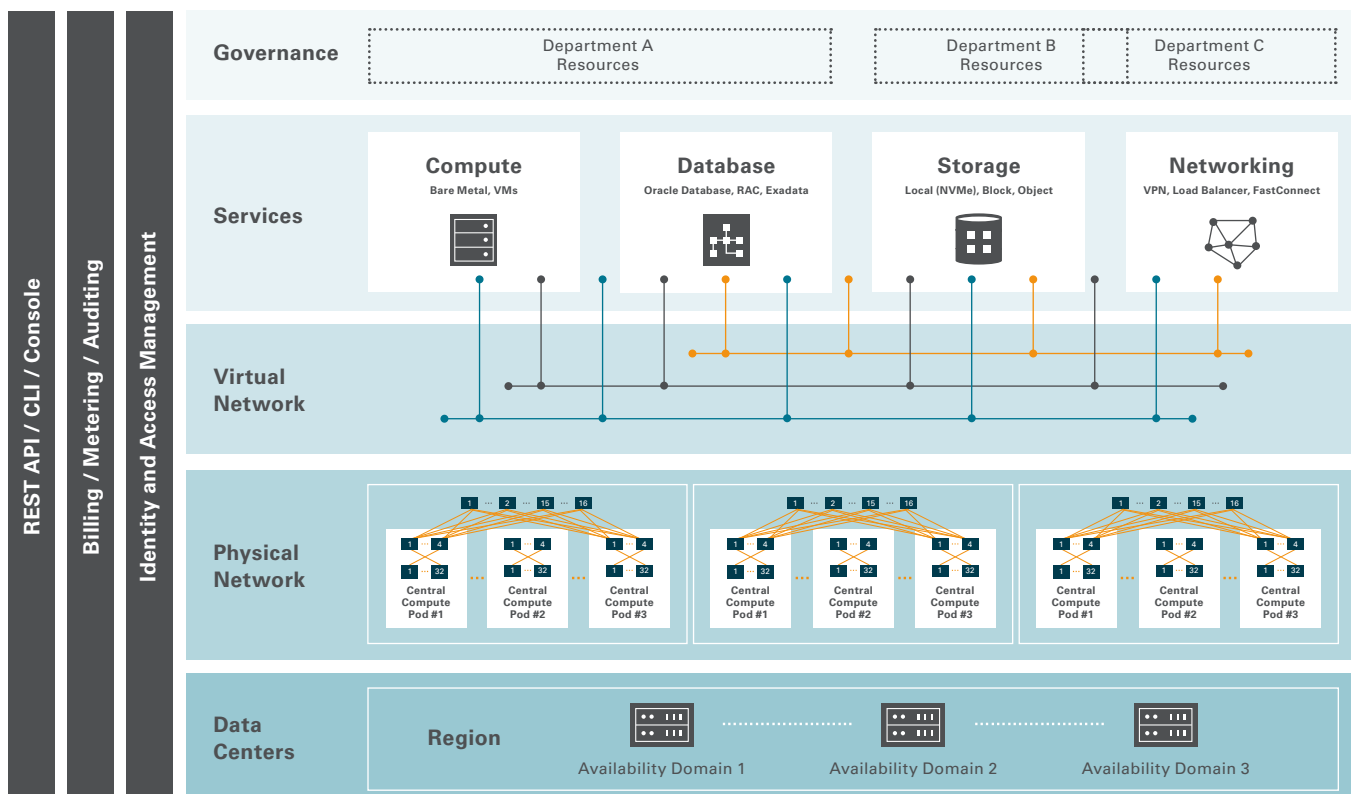


Figure 6: Oracle Cloud Infrastructure and architecture

- [Oracle Cloud Infrastructure Object Storage](#) provides high throughput storage for unstructured data. Object storage enables near infinite storage capacity for large amounts of analytic data, or rich content like images and videos.

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
- [Get started with APIs](#)
- [FAQs](#)

# Try Oracle Cloud for Free

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