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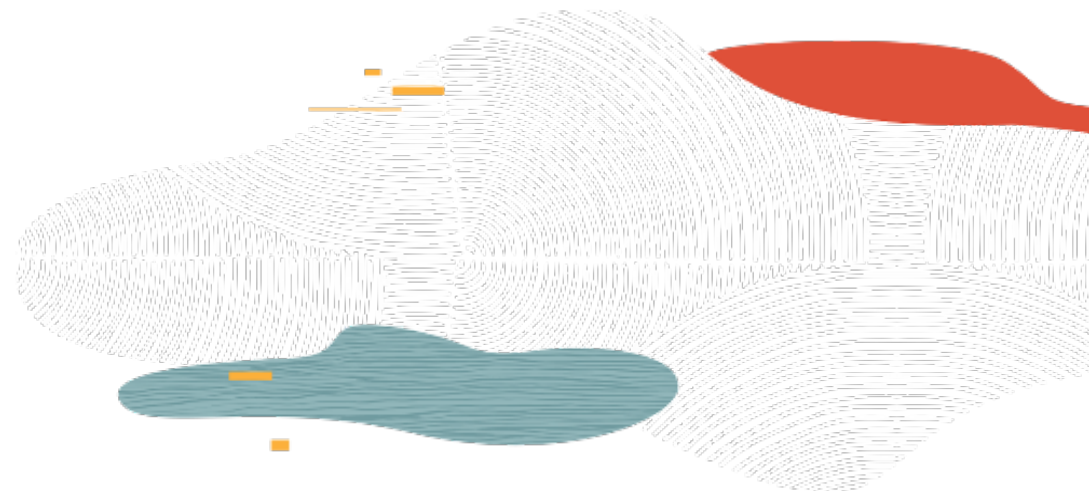
Compute

L100

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Oracle Cloud Infrastructure

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Safe harbor statement

The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions.

The development, release, timing, and pricing of any features or functionality described for Oracle's products may change and remains at the sole discretion of Oracle Corporation.

Objectives

After completing this lesson, you should be able to:

- Describe Instance Configuration and Pool
- Create an Autoscaling Policy
- Describe Instance Console Connections
- Describe Bring your Own Image
- Describe Bring your own Hypervisor

Bare Metal, VM and Dedicated Hosts

Bare Metal (BM)

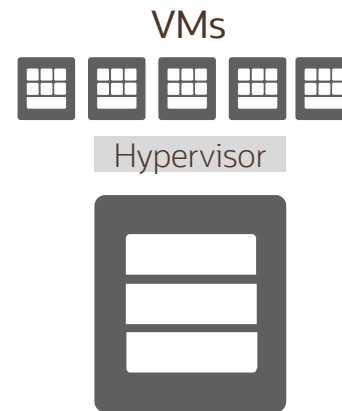
Direct Hardware Access –
customers get the full Bare
Metal server
(single-tenant model)



Bare Metal Server

Virtual Machine (VM)

A hypervisor to virtualize the
underlying Bare Metal server
into smaller VMs
(multi-tenant model)



Bare Metal Server

Dedicated VM Hosts (DVH)

Run your VMs instances
on dedicated servers that are a
single tenant and not shared with
other customers



Bare Metal Server

VM compute instances runs on the same hardware as a Bare Metal instances, leveraging the same cloud-optimized hardware, firmware, software stack, and networking infrastructure

Bare Metal

Direct Hardware Access with all the Security, Capabilities, Elasticity and Scalability of Oracle Cloud Infrastructure



Workloads that are Performance-intensive



Workloads that are not virtualized



Workloads that require a specific hypervisor



Workloads that require BYO Licensing

Bare Metal Instances

Shape	Instance type	OCPU	RAM (GB)	Local Disk (TB)	Network Bandwidth	Max vNICs (Linux)	Max vNICs (Win)
BM.Standard2.52	X7 Standard compute	52	768	Block Storage only	2 x 25 Gbps	52	27
BM.DenseIO2.52	X7 Dense I/O compute	52	768	51.2 TB NVMe SSD	2 x 25 Gbps	52	27
BM.Standard.E2.64	E1 AMD Standard compute	64	512	Block Storage only	2 x 25 Gbps	75	76
BM.HPC2.36	X7 High Frequency	36	384	6.7 TB NVMe SSD	1 x 100 Gbps RDMA	50	1
BM.GPU2.2	2xP100 NVIDIA GPUs	28	192	Block Storage only	2 x 25 Gbps	28	15
BM.GPU3.8	8xV100 NVIDIA GPUs	52	768	Block Storage only	2 x 25 Gbps	52	27
BM.Standard1.36	X5 Standard compute	36	256	Block Storage only	10 Gbps	36	1
BM.DenseIO1.36	X5 Dense I/O compute	36	512	28.8 TB NVMe SSD	10 Gbps	36	1
BM.Standard.B1.44	X6 standard compute	44	512	Block Storage only	25 Gbps	44	NA

- Compute Standard E2 is based of AMD EPYC™ processor
- 2 x 25 Gbps implies two NIC cards with 25 Gbps bandwidth
- Network bandwidth is based on expected bandwidth for traffic within a VCN

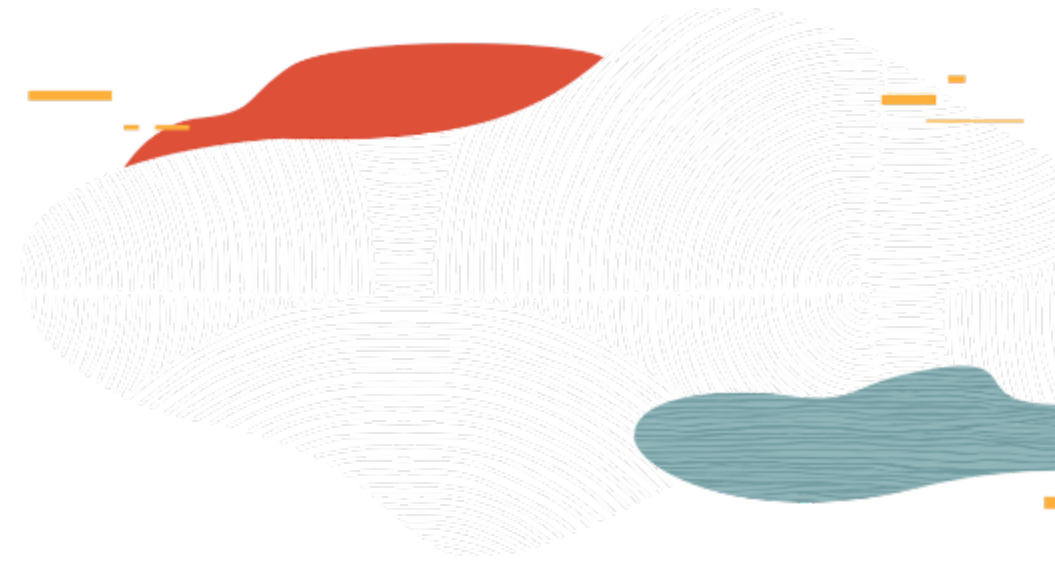
Use cases for AMD EPYC based instances

- AMD EPYC Bare Metal server (64 cores, 512 GB RAM, 2 x 25 Gbps bandwidth, 75 vNICs) available at \$0.03 core/hour, 66% cheaper than other options
- AMD EPYC based instances ideal for maximizing price performance
- Supported for Oracle applications, including E-Business Suite, JD Edwards, and PeopleSoft
- Certified to run Cloudera, Hortonworks, MapR, and Transwarp
- On a 10-TB full TeraSort benchmark, including TeraGen, TeraSort and TeraValidate, the AMD EPYC based instance demonstrated a 40 percent reduction in cost / OCPU v/s x86 alternatives with only a very slight increase in run times
- On a 4-node, 14M cell Fluent CFD simulation of an aircraft wing, the AMD EPYC based instance demonstrated a 30 percent reduction in cost along with a slight reduction in overall run times as compared to an x86 alternative

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Images

Import/Export and BYOI



Oracle provided Images

A template of a virtual hard drive that determines the operating system and other software for an instance. Images can be Oracle-provided, Custom, or BYOI

Oracle provides several pre-built images for Oracle Linux, Microsoft Windows, Ubuntu and CentOS

Image	Name
Oracle Linux	Oracle-Linux-7.x-<date>-<number>, Oracle-Linux-6.x-<date>-<number>
CentOS 7	CentOS-7-x-<date>-<number>, CentOS-6.x-<date>-<number>
Ubuntu 16.04 LTS	Canonical-Ubuntu-16.x-<date>-<number>, Canonical-Ubuntu-14.x-<date>-<number>
Windows Server 2012 R2	Windows-Server-2012-R2-<edition>-<gen>.<date>-<number>
Windows Server 2008 R2 - VM	Windows-Server-2008-R2-Standard-Edition-VM-<date>-<number>
Windows Server 2016	Windows-Server-2016-Datacenter-Edition-Gen2.<date>-<number>

Oracle Provided Images

Linux Images

- User name opc created automatically for instances created from Oracle Linux/CentOS
- User name ubuntu created automatically for instances created from Ubuntu image
- These users have sudo privileges and are configured for remote access over the SSH v2
- Default set of firewall rules allow only SSH access (port 22)
- Provide a startup script using cloud-init

Windows Images

- User name opc created automatically with an OTP (one time password)
- Include the Windows Update utility to get the latest Windows updates from Microsoft

Custom Images

- Create a custom image of an instance's boot disk and use it to launch other instances
- Instances you launch from your custom image include customizations, configuration, and software installed when you created the image
- During the process, instance shuts down and remains unavailable for several minutes. The instance restarts when the process completes
- Custom images do not include the data from any attached block volumes
- A custom image **cannot exceed 300 GB**
- **Windows custom images cannot be exported or downloaded out of the tenancy**

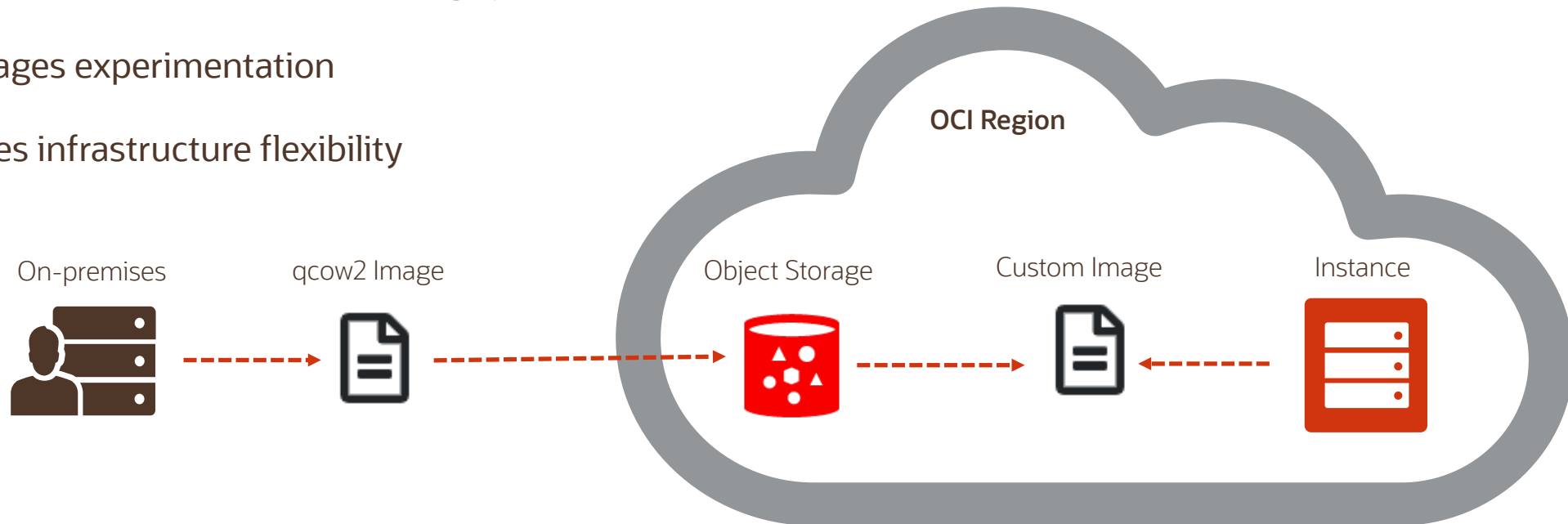
Image Import/Export

- Compute service enables you to share custom images across tenancies and regions using image import/export
- Image import/export uses OCI Object Storage service
- You can import Linux and Windows Operating System
- Supports:
 - **Emulation Mode:**
 - Virtual machines I/O devices (disk, network), CPU, and memory are implemented in software
 - Emulated VM can support almost any x86 operating system. These VMs are slow
 - **Paravirtualized:**
 - Virtual Machine includes a driver specifically designed to enable virtualization
 - **Native Mode:** same as Hardware Virtualized Machine (HVM), offers maximum performance with modern OS's
- You can also find more information about custom images here:
https://cloud.oracle.com/iaas/whitepapers/deploying_custom_os_images.pdf

Bring your own Image (BYOI)

The Bring Your Own Image (BYOI) feature enables you to bring your own versions of operating systems to the cloud as long as the underlying hardware supports it. The BYOI can help with the following scenarios:

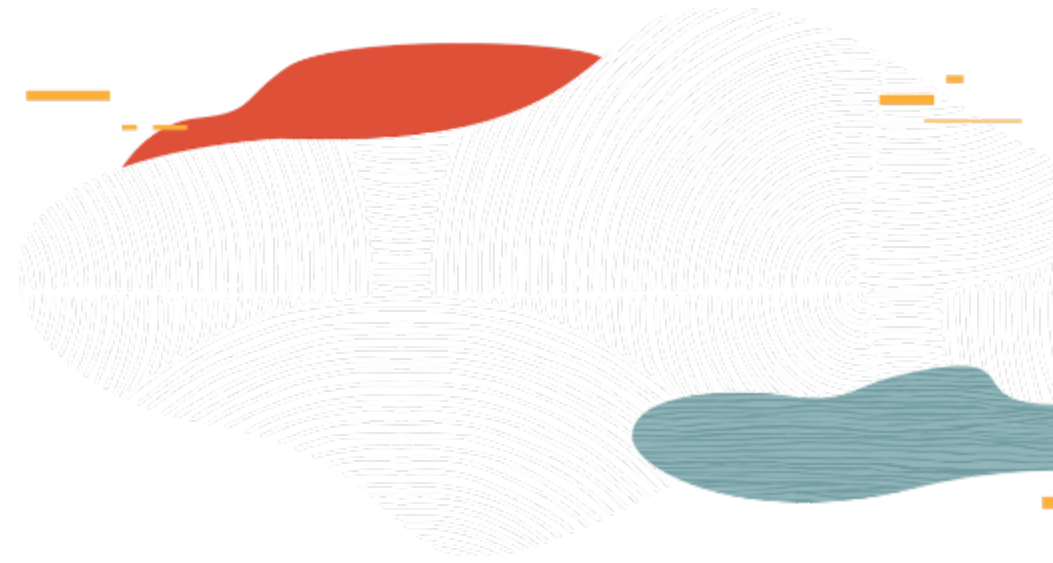
- Enables lift-and-shift cloud migration projects
- Supports both old and new operating systems
- Encourages experimentation
- Increases infrastructure flexibility



NOTE: You must comply with all licensing requirements when you upload and start instances based on OS images that you supply.

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Boot Volume



Boot Volumes

- A compute instance is launched using OS image stored on a remote boot volume
- Boot volume is created automated and associated with an instance until you terminate the instance
- Boot volumes are encrypted, have faster performance, lower launch times, and higher durability for BM and VM instances
- Compute instance can be scaled to a larger shape by using boot volumes
- You can preserve the boot volume when you terminate a compute instance
- Boot volumes are only terminated when you manually delete them
- Boot volumes cannot be detached from a running instance
- Possible to take a manual backup, assign backup policy or create clone of boot volumes

Custom Boot Volumes

- You have the option of specifying a custom boot volume size
- In order to take advantage of the larger size, you must first extend the root (Linux-based images) or system (Windows-based images) partition

BOOT VOLUME SIZE (IN GB)

Selected image's default boot volume size: 46.6 GB

CUSTOM BOOT VOLUME SIZE

100

Volume performance varies with volume size. Size must be an integer between selected image's default boot volume size. ([Learn more](#))

Linux default size is 46.6 GB

BOOT VOLUME SIZE (IN GB)

Selected image's default boot volume size: 256.0 GB

CUSTOM BOOT VOLUME SIZE

500

Volume performance varies with volume size. Size must be an integer between selected image's default boot volume size. ([Learn more](#))

Windows default size is 256GB

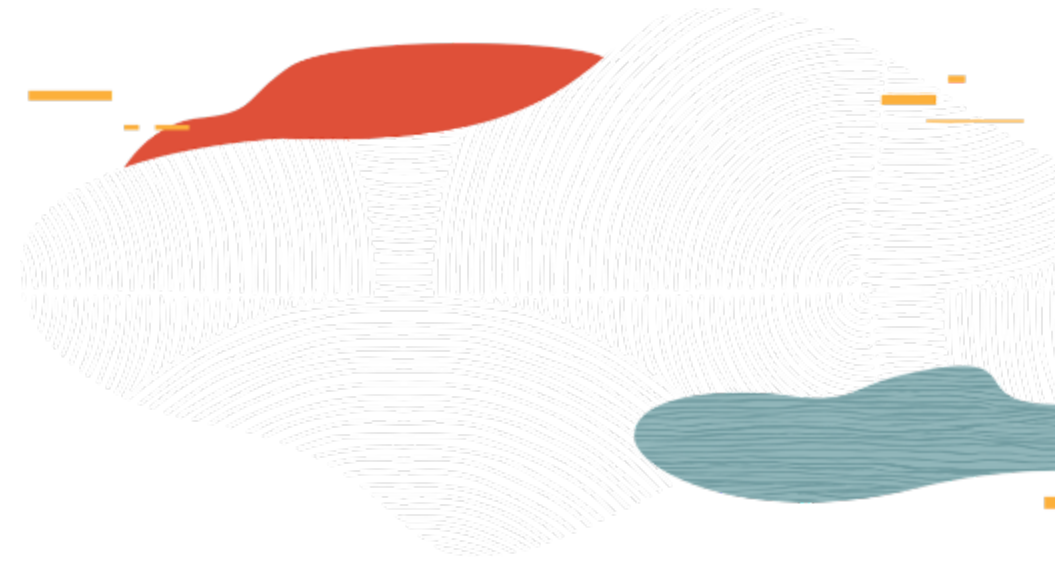
Custom Image v/s Boot Volume Backup

Custom Images

Pros	Cons
You can export a custom image across regions and tenancies	Instance shuts down and remains unavailable for several minutes until the process finished
No cost associated to store your custom images	Limit of 25 custom images per compartment

Boot volume Backup

Pros	Cons
It doesn't require a downtime	Cost associated with the amount of Object Storage used to store your backup
Preserve the entire state of your running operating system as a backup	Creating a boot volume backup while instance is running creates a crash-consistent backup



Instance Configurations, Pools, Autoscaling

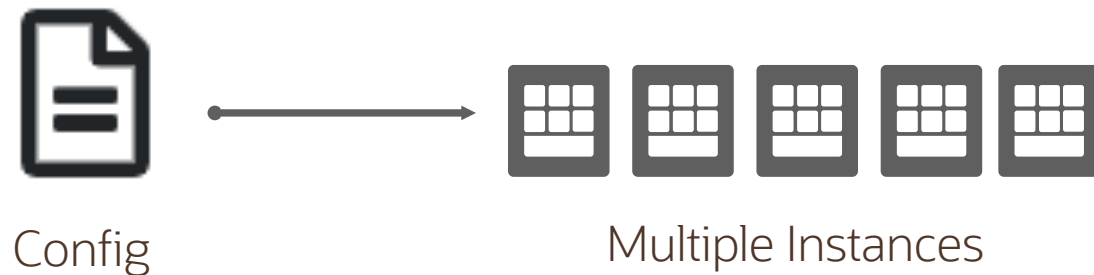
Instance Configuration and Pool

Instance Configurations



- OS image, metadata, shape
- vNICs, Storage, subnets

Instance Configurations



- Different Availability Domains
- Manage all together (stop, start, terminate)
- Attach to a Load Balancer

Instance Configuration and Pool – Use Cases

Instance Configurations

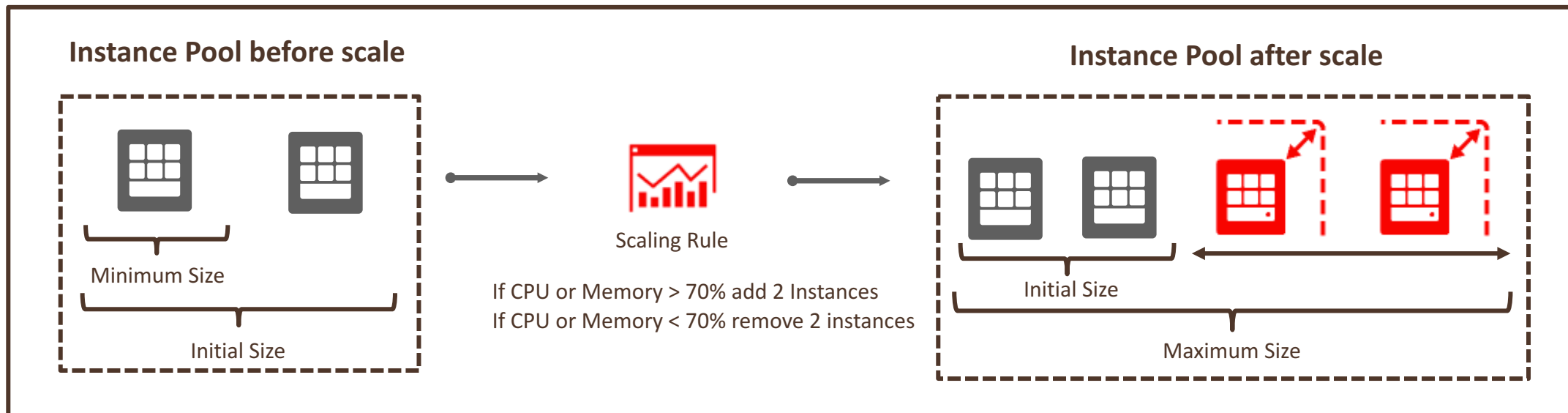
- Clone an instance and save to a configuration file
- Create standardized baseline instance templates
- Easily deploy instances from CLI with a single configuration file
- Automate the provisioning of many instances, its resources and handle the attachments

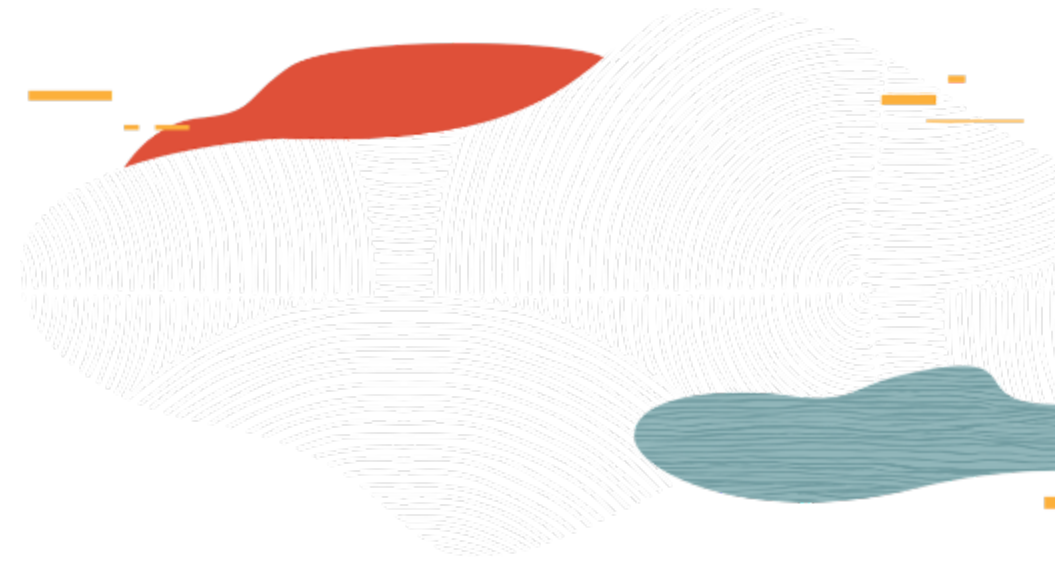
Instance Pools

- Centrally manage a group of instance workloads that are all configured with a consistent configuration
- Update a large number of instances with a single instance configuration change
- Maintain high availability and distribute instances across availability domains within a region
- Scale out instances on-demand by increasing the instance size of the pool

Autoscaling Configurations

- Autoscaling enables you to automatically adjust the number of Compute instances in an instance pool based on performance metrics such as CPU or Memory utilization.
- When an instance pool scales in, instances are terminated in this order: the number of instances is balanced across availability domains, and then balanced across fault domains. Finally, within a fault domain, the oldest instance is terminated first.





Instance Metadata and Lifecycle

Instance Metadata

- Instance Metadata includes its OCID, name, compartment, shape, region, AD, creation date, state, image, and any custom metadata such as an SSH public key
- Service runs on every instance and is an HTTP endpoint listening on 169.254.169.254
- Get instance metadata by logging in to the instance and using the metadata service
- Oracle provided Linux instances
 - `curl http://169.254.169.254/opc/v1/instance/`
 - `curl http://169.254.169.254/opc/v1/instance/metadata/`
 - `curl http://169.254.169.254/opc/v1/instance/metadata/<key-name>/`
- Add and update custom metadata for an instance using CLI or SDK

Instance Life Cycle

- Start – Restarts a stopped instance. After the instance is restarted, the Stop action is enabled
- Stop – Shuts down the instance. After the instance is powered off, the Start action is enabled
- Reboot – Shuts down the instance, and then restarts it
- Terminate – Permanently delete instances that you no longer need.
 - Instance's public and private IP addresses are released and become available for other instances
 - By default, the instance's boot volume is deleted, however you can preserve the boot volume and attach it to a different instance as a data volume, or use it to launch a new instance
- Resource Billing
 - Standard shapes, billing pauses in a STOP state
 - Dense I/O shapes, billing continues even in STOP state
 - GPU shapes, billing continues in STOP state
 - HPC shapes, billing continues in STOP state

Summary

- OCI Compute Service offers Bare Metal, Virtual Machine and Dedicated Hosts instances
- Bare Metal instances provide direct hardware access and highest level of performance and isolation
- Support a wide variety of shapes with industry leading price/performance
- Supports both x7 and AMD EPYC based instances with industry leading price/performance
- Image options - Oracle-provided images, BYOI, custom images, image import/export
- Advanced features include instance configuration, Pools and Autoscaling

Oracle Cloud always free tier:

oracle.com/cloud/free/

OCI training and certification:

<https://www.oracle.com/cloud/iaas/training/>

<https://www.oracle.com/cloud/iaas/training/certification.html>

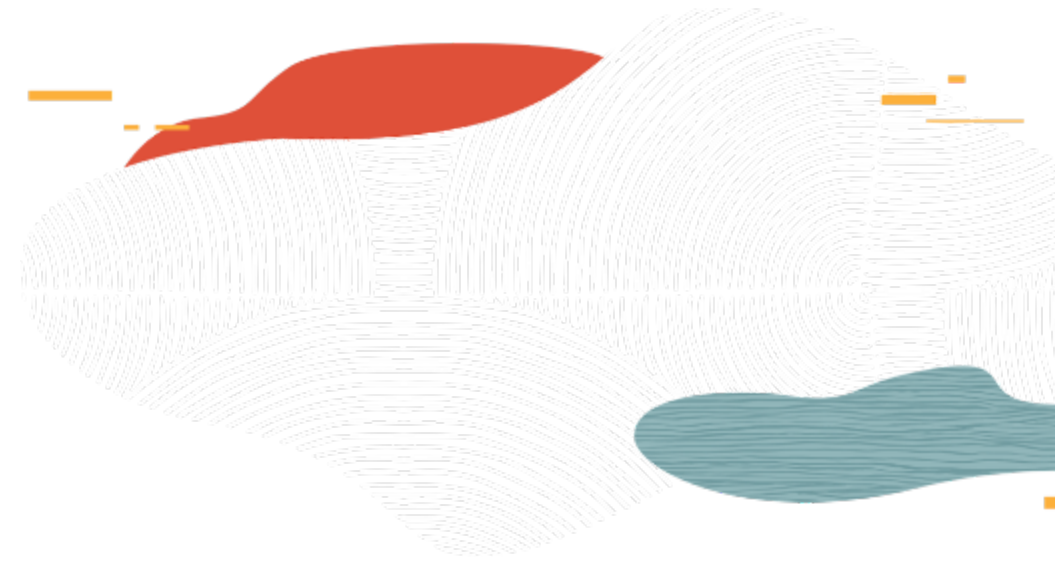
education.oracle.com/oracle-certification-path/pFamily_647

OCI hands-on labs:

ocitraining.qcloudable.com/provider/oracle

Oracle learning library videos on YouTube:

youtube.com/user/OracleLearning



Thank you

