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Cloud Infrastructure

OCI-Classic to OCI IaaS Migration
IaaS Migration Tools
Level 300

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OCI-Classic to OCI IaaS Migration - Objectives

After completing this lesson, you should be able to:

- Discover resources in your OCI-Classic Compute, Object Storage Classic and Load Balancing Classic account using the Network and resource discovery tool

- Migrate Block Storage volumes and Virtual Machines (VMs) from OCI-Classic to OCI using the migration tool
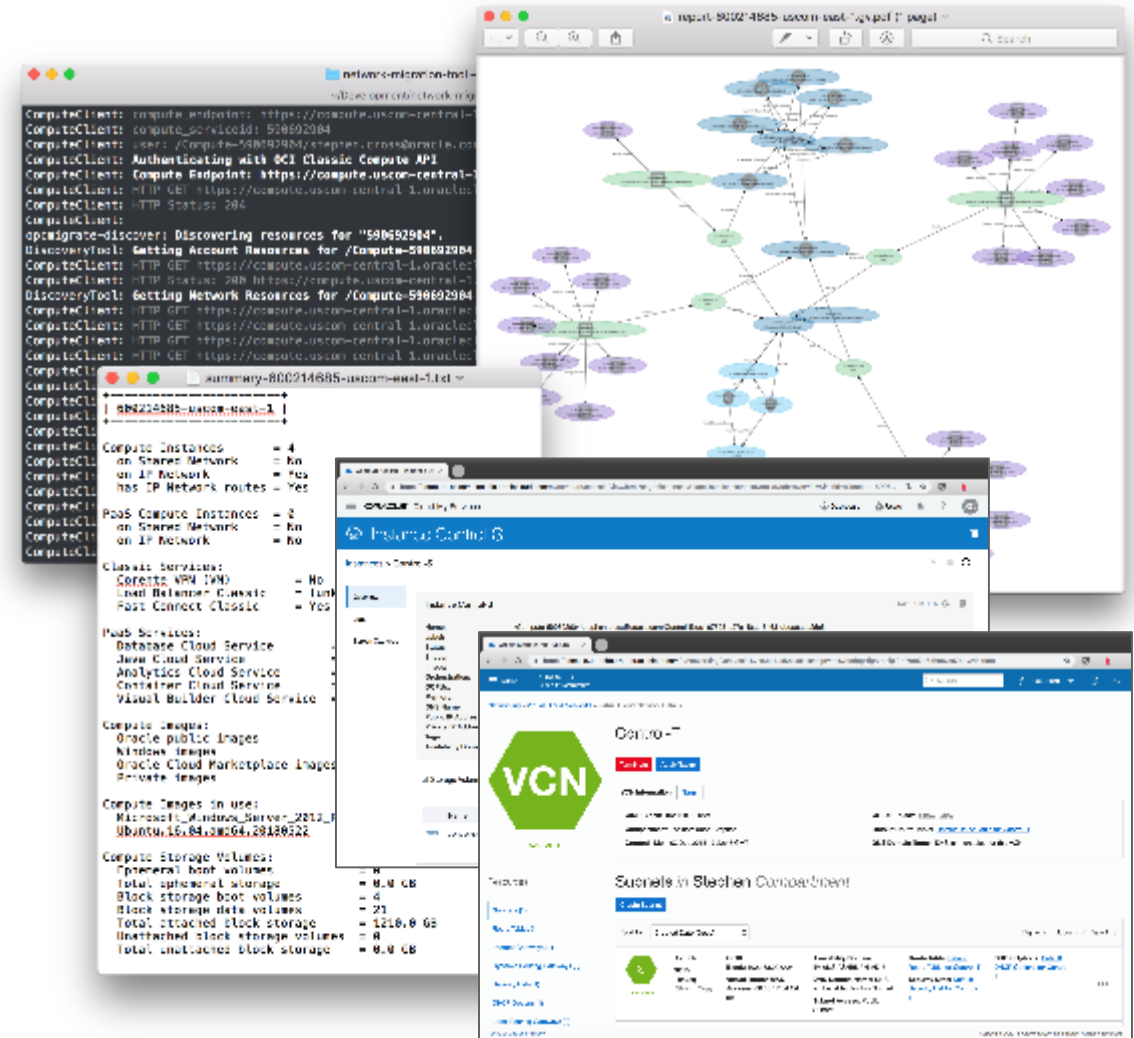
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Technical Migration Tools

OCI-Classic to OCI Discovery and Translation Tool

- OCI Classic resource and service Discovery, Analysis, and Reporting

- Mapping of Compute Classic Network configuration and Security Rules to OCI VCN

- Export of Compute Classic Instance and Storage Volumes details for migration

- Generation of Terraform scripts for VCN creation and launching migrated instances

OCI-Classic to OCI VM Migration Tool

- Workload migration of VMs and attached storage volumes from Compute Classic to OCI

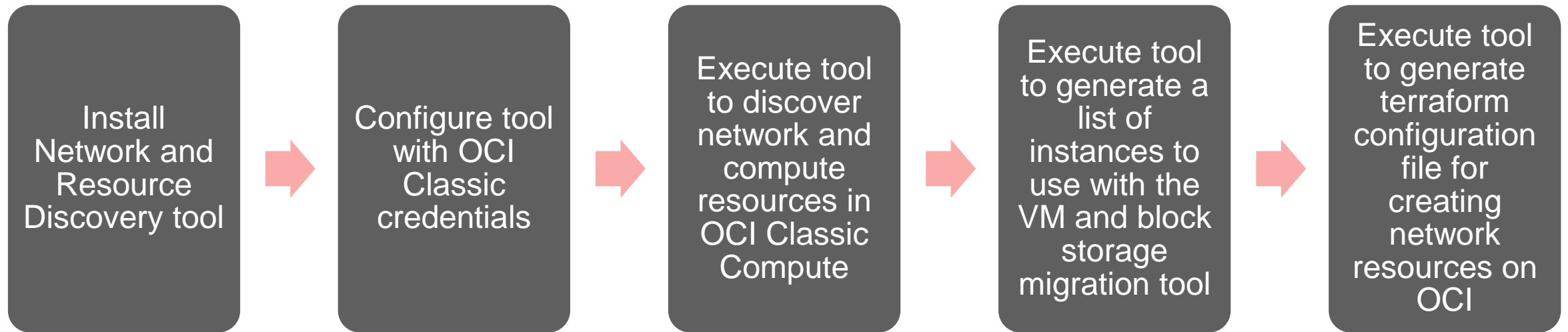- Injection of migration scripts into source instances

Discovery and Translation Tool

- The network and resource discovery tool allows you to generate reports of your object storage account as well as the networking objects, virtual machine instances, and load balancers in your Oracle Cloud Infrastructure Compute Classic and Load Balancing Classic account.

- You can use the output generated by this tool to analyze the networking objects that you'll need to set up in your Oracle Cloud Infrastructure tenancy and to identify the virtual machine instances and block storage volumes that you want to migrate.

- You can select an output format that works best for your requirements and you can also filter the output using various commands and options provided by this tool.

- You can generate reports in the following formats: JSON, Graph, Spreadsheet and Terraform

Discovery and Translation Tool
Discovery and Translation process overview

Install Network and Resource Discovery tool

→

Configure tool with OCI Classic credentials

→

Execute tool to discover network and compute resources in OCI Classic Compute

→

Execute tool to generate a list of instances to use with the VM and block storage migration tool

→

Execute tool to generate terraform configuration file for creating network resources on OCI

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Discovery and Translation Tool
Considerations for using the Network and Resource Discovery Tool

Before you run the network and resource discovery tool, consider the following suggestions.

- This tool doesn't modify any resources in the source environment. However, it is recommended that you run this tool as a user with the minimum required read-only access. The recommended user privileges are:

  - Compute Classic: Compute.Compute_Monitor

  - Load Balancer Classic: LBAAS_READONLYGROUP

  - Storage Classic: Storage_ReadOnlyGroup

- This tool generates a Terraform configuration file that can be used to create your network resources in a single availability domain on Oracle Cloud Infrastructure. Using this tool to create resources across multiple availability domains in the target environment isn't supported.

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Discovery and Translation Tool
Prepare to use the Network and Resource Discovery Tool

Set up your profile

The network and resource discovery tool connects to your source environment using connection information that you provide in a profile file. The information you provide in the profile file includes the user name, or identity for each service in the source environment, as well as the service end point and region.

1. You'll need the user name and API end point for each service. Look up service-specific details in your Oracle Cloud Dashboard.

2. Use the following template to create your profile file. Replace the sample values with values specific to each service.

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OCI-Classic to OCI Discovery and Translation Tool
Prepare to use the Network and Resource Discovery Tool

```
{
  "global": {
    "format": "text",
    "debug-request": false
  },
  "compute": {
    "user": "/Compute-example/user@example.com",
    "endpoint": "compute.uscom-central-1.oraclecloud.com"
  },
  "lbaas": {
    "user": "user@example.com",
    "endpoint": "lbaas-00000000000000000000000000000000.balancer.oraclecloud.com",
    "region": "uscom-central-1"
  },
```

```
  "paas": {
    "user": "user@example.com",
    "identity_id": "idcs-00000000000000000000000000000000",
    "endpoint": "psm.us.oraclecloud.com",
    "region": "uscom-central-1"
  },
  "object_storage": {
    "auth-endpoint": "uscom-central-1.storage.oraclecloud.com/auth/v1.0",
    "user": "Storage-example:user@example.com",
    "endpoint": "uscom-central-1.storage.oraclecloud.com/v1/Storage-example"
  }
}
```

Passwords aren't specified in the profile file for security reasons.
You'll be prompted to provide the password for each service when you run the tool.

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OCI-Classic to OCI Discovery and Translation Tool
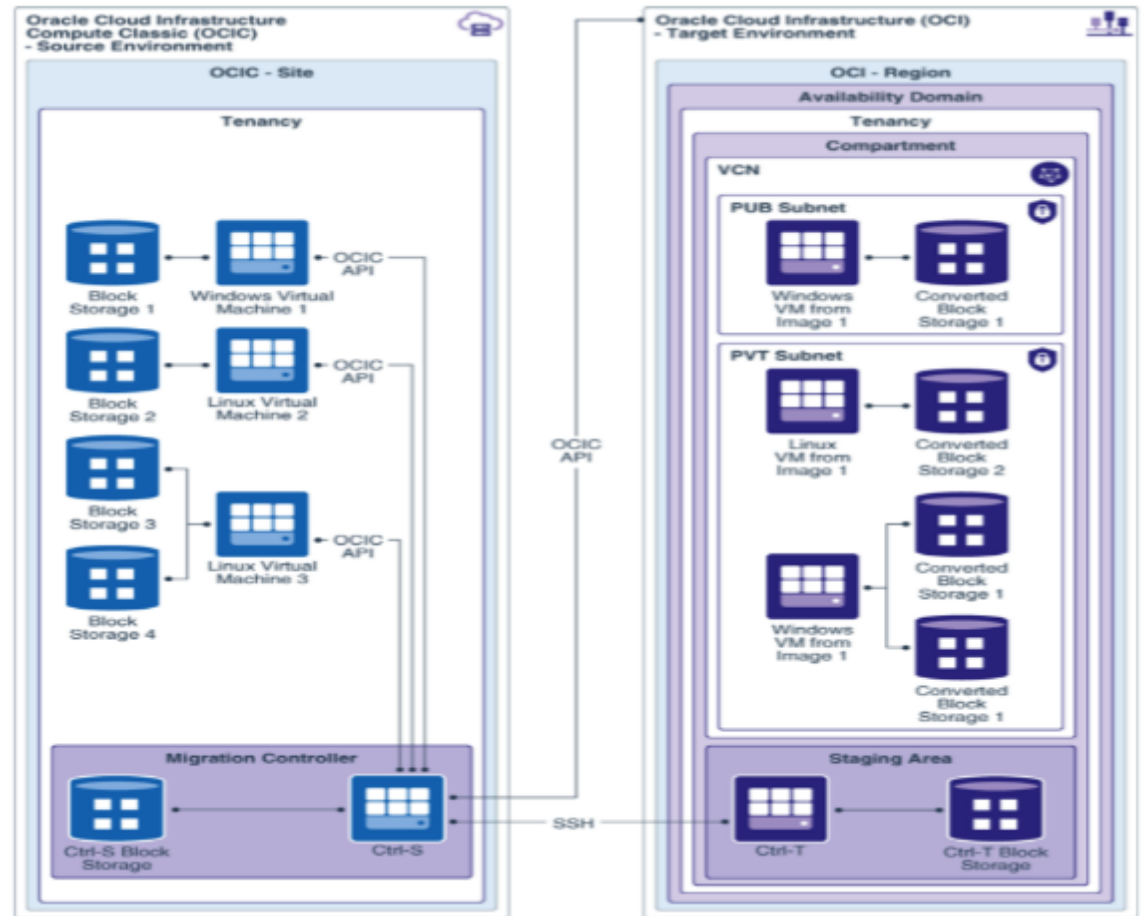Prepare to use the Network and Resource Discovery Tool

3. If required, you can create multiple profiles in the ~/.opc/profiles directory. Use the **--profile** option to specify the profile you want to use when you run the tool. If no profile is specified, the default profile is used.

```
[opc@koala2 profiles]$ pwd
/home/opc/.opc/profiles
[opc@koala2 profiles]$ ls -ltr
total 4
-rw-rw-r--. 1 opc opc 836 Feb 11 17:08 default
[opc@koala2 profiles]$ 
```

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Network and Resource Discovery Tool Demo

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Migrate Virtual Machines and Block Storage to OCI

This architecture shows resources in your Oracle Cloud Infrastructure Compute Classic account being migrated to your Oracle Cloud Infrastructure tenancy using the VM and block storage migration tool.

Migrate Virtual Machines and Block Storage to OCI

Migration Overview

Create OCI object storage bucket and Pre-authenticated request URL for access

Use the instances.json file generated in the resource discovery step

| Launch Migration Controller Instance Ctrl-S (in OCI-C) | → | Configure Ctrl-S instance with information required to access the target OCI environment | → | Configure Ctrl-S instance with source environment information | → | Create or select an OCI compartment and VCN/subnet for the Ctrl-T deployment | → | Migration controller instance Ctrl-T is launched in target OCI environment | → | VMs and block storage volumes are migrated from OCI-C to OCI |

Execute "opcmigrate migrate instance service setup" and "opcmigrate migrate instance source setup"

Execute "opcmigrate migrate instance ctlt setup"

Execute "opcmigrate migrate instance job run"

Migrate Virtual Machines and Block Storage to OCI

Considerations for Migration

Before you start your migration, consider the following factors that could have an impact on your migration process: proof-of-concept, boot volume size, etc.

Required services and roles

This solution requires the following services and roles:

- Oracle Cloud Infrastructure Compute Classic: You'll need the Compute_Operations role to create the migration controller instance and to create snapshots of the boot and block volumes.

- Oracle Cloud Infrastructure: Ensure that you have policies in place that allow you to read the required OCIDs from the Web Console. You'll also need to create an API user, who must belong to a group that has policies in place to create the required resources.

Migrate Virtual Machines and Block Storage to OCI

Plan for the migration

Before you start the migration, you should:

- Collect information about the source instances that you want to migrate.
- Generate and have available the required SSH and PEM keys to access the source and target environments.
- Configure the source environment.
- Set up the network in the target OCI environment
- Collect information from the target environment:
    - Tenancy Oracle Cloud ID (OCID).
    - User OCID
    - Compartment OCID
    - OCI API PEM key fingerprint
    - Subnet OCID of the Virtual Cloud Network (VCN)

Complete the Prerequisites

Before you begin your migration, complete the prerequisites

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Migrate Virtual Machines and Block Storage to OCI

Launch the Migration Controller Instance (Control-S) in the Source Environment
In your Oracle Cloud Infrastructure Compute Classic account, create the source controller (Control-S) instance with the following configuration.

- You can use the web console or any other interface to create an instance with the following specifications:
  - **Image**: OL_7.5_UEKR4_x86_64_MIGRATION. This image is available under **Oracle Images** on the console.
  - **Shape:** General Purpose oc7 (16 OCPUs, 120-GB RAM) or any other shape with a sufficient number of OCPUs
  - **SSH Key:** Associate an SSH public key with the Control-S instance. You'll use the corresponding private key to connect to the Control-S instance. This key isn't the same as the SSH key pair used to access Linux source instances from Control-S

Migrate Virtual Machines and Block Storage to OCI

- ➤ **Network:** Shared network with a persistent public IP address.
    1. Attached "default" security list that allows SSH inbound.
    2. Also ensure that security rules are in place to allow SSH outbound, SMB inbound, and HTTPS outbound traffic.
    3. The Control-S instance must be able to connect via SSH to the source VMs and must be in the same identity domain and site.

- ➤ **Storage:** One of the following:
    1. A boot volume of 2 TB, if the total size of all boot and attached volumes to be migrated is 1.2 TB or less.
    2. A boot volume of 128 GB and additional storage 1.5 times the size of all boot and attached volumes to be migrated, mounted on /images. **Note:** Limit on Oracle Cloud Infrastructure Classic limits are 2 TB per block volume. To extend, use LVM with multiple 2TB block volumes. Ensure that you format and mount this additional storage under /images.

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Migrate Virtual Machines and Block Storage to OCI

Configure the Migration Controller Instance (Control-S)

Once the Control-S instance has started, connect to the instance using SSH. All of the tools required for the migration are already on the machine, but additional configuration is required to provide details of the source and target environments.

1. Download the latest code and configuration files. (execute "./mig install" on the server)
2. All of the configuration settings are in a file called secret.yml. You can use the sample file available at /home/opc/ansible/secret.yml.sample to create your secret.yml file. Enter the details of your OCI Compute Classic account and your OCI OCIDs. Also provide a list of instances to be migrated.

```
# OCI info
compartment_id: ocid1.compartment.oc1..aaaaaaaa...
user_id: ocid1.user.oc1..aaaaaaaa...
fingerprint: a0:a0:a0:a0:a0...
tenancy_id: ocid1.tenancy.oc1..aaaaaaaa...
region: us-ashburn-1
availability_domain: kWVD:US-ASHBURN-AD-3
# version and shape used to the Control-T instance


# 'Oracle Linux' is the only supported operating_system


oracle_linux_version: '7.6'
shape: 'VM.Standard2.1'
```

Migrate Virtual Machines and Block Storage to OCI

Configure the Migration Controller Instance (Control-S)

```
# subnet must be from the availability_domain you specified
subnet_id: ocid1.subnet.oc1.iad.aaaaaaaa...
# optional passphrase if used for OCI PEM file
pass_phrase:
# PAR is used to upload info to ocic-oci-sig bucket when the instance comes up on OCI target side
ocic_oci_sig_par: PAR URL HERE

# OCI-C info
# specify your endpoint here
opc_profile_endpoint: compute.uscom-central-1.oraclecloud.com # or another one
opc_password: YOUR PASSWORD HERE
container: /Compute-tenancy/user@email.com

# Control-S Instance settings
# instance name is composed of the label and UUID, for example, ctls_instance/fd2cd6d5-4b53-4275-a18f-c245b3e002c7
ctlsInstanceName: CTLS_INSTANCE_NAME_HERE
targetControllerName: "{{container}}/{{ctlsInstanceName}}" # don't change this line
targetControllerCores: 3 # change depending on server capacity
targetControllerAvailableDiskSlots: 3 # change depending on capacity
targetControllerAvailableStorageInGB: 2048
workerThreadCount: 10 # The number of worker threads working on volume migration

# List of instances to be migrated.
- { name: "{{container}}/INSTANCE_NAME_HERE", os: "linux", osKernelVersion: "4.1.12", osSku: "", attached_only: "false", specified_volumes_only: [], "shutdown_policy": "wait", "specified_launch_mode": "PARAVIRTUALIZED"}
 - { name: "{{container}}/INSTANCE_NAME_HERE", os: "linux", osKernelVersion: "", osSku: "", attached_only: "true", specified_volumes_only: [], "shutdown_policy": "ignore", "specified_launch_mode": "PARAVIRTUALIZED" }
 - { name: "{{container}}/INSTANCE_NAME_HERE", os: "windows", osKernelVersion: "", osSku: "Server 2012 Datacenter", attached_only: "false", specified_volumes_only: [], "shutdown_policy": "shutdown", "specified_launch_mode": "EMULATED" }
```

Migrate Virtual Machines and Block Storage to OCI

The entries in the list of instances specify which instances should be included in the migration job.
Provide the required information about each of the VMs that you want to migrate.

- Specify the name of the instances that you want to migrate. Instance names look like this:
  tf_instance/dfdbf849-368c-4fb3-a01b-90a88803ba4f
- Specify the Oracle Cloud Infrastructure Compute Classic container for each instance. Container is a combination of /domain/email_login and looks like this: /Compute-590693805/jack.jones@example.com
- Specify the following attributes for Linux instances:
  - Specify the full name of the instance
  - Set the os to linux.
  - Leave the osSku field blank.
  - Specify the osKernelVersion. This value is required for deciding whether an image will be imported in emulated mode or paravirtualized mode.
- Specify the following required attributes for Windows instances:
  - Specify the full name of the instance
  - Set the os to windows.

If the specified_launch_mode field is used for Linux instances, the virtualization mode specified there is used and the virtualization mode derived from osKernelVersion is ignored.

Migrate Virtual Machines and Block Storage to OCI

- Fill in the osSku field.
- Specify the OS kernel version for an instance, if required, by specifying osKernelVersion. This is useful if you have:
    - VMs created from custom images
    - Bootable volumes restored from snapshots
    - VMs created using Oracle Cloud Infrastructure Compute Classic images, where the guest OS has been updated after launching the instance
- To specify that you want to skip migrating the boot volume of an instance, set attached_only to true.
- To migrate the attached storage volumes, specify the volume names for specified_volumes_only. If this list is empty, all volumes are migrated.
- Use shutdown_policy to specify if the instances to be migrated should be shut down during migrations, and if so, how. Valid values for this field are ignore, shutdown, and wait (the default).
- Use specified_launch_mode to specify the launch mode for the migrated image. The valid values are PARAVIRTUALIZED and EMULATED.
- Use the volumes parameter to specify the unattached storage volumes that you want to migrate. You can use this list to specify storage volumes restored from colocated snapshots as well.

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Migrate Virtual Machines and Block Storage to OCI

3. Apply the configuration to the system by executing "opcmigrate migrate instance service setup" on the server

4. Copy the PEM key required for the OCI API connection to the file /home/opc/.oci/oci_api_key.pem on Control-S. Modify permissions on the key file to restrict access.

Prepare your Linux Source Instances for Migration

You need to configure your source instances so that they can be re-initialized correctly in the target environment.
You can configure your instances either by using tools provided on the Control-S instance or manually using custom tooling or fleet managers.

Migrate Virtual Machines and Block Storage to OCI

To prepare the source instances using a script on the Control-S instance:

1. Ensure that you have SSH access from Control-S to each Linux source instance. Copy the private SSH key for each Source instance to the Control-S instance and remember to modify permissions on the key file to restrict access.

2. Verify that all volume mounts are set to _netdev and nofail in the /etc/fstab file, so that when you launch VMs in Oracle Cloud Infrastructure for the first time when volumes aren't mounted, the instance can start successfully.

3. Make a note of the IP address, sudo user, and the path to the SSH private key for each Linux source instance. If you used the network and resource discovery tool to identify resources in your source environment, you can find this information in the instances.json file generated by that tool.

4. On Control-S, create or update the /home/opc/ansible/hosts.yml file. You can use the provided hosts.yml.sample file to create your hosts.yml file.

Migrate Virtual Machines and Block Storage to OCI

```
source:
  hosts:
    1.1.1.1:
      label: label_here
      remote_user: opc
      ansible_ssh_private_key_file: ~/.ssh/private_key_here
      ansible_python_interpreter: /usr/bin/python3
    2.2.2.2:
      label: label_here
      remote_user: opc
      ansible_ssh_private_key_file: ~/.ssh/private_key_here
      ansible_python_interpreter: /usr/bin/python3/boot/initramfs-<kernel_version>.img
```

In this hosts.yml file, 1.1.1.1 and 2.2.2.2 represent the IP address of each source instance. The label for each source instance must be unique. You can find the instance label in the Oracle Cloud Infrastructure Compute Classic web console.

5. On Control-S, run the following command to configure your Linux source instances: "opcmigrate migrate instance source setup"

Review the output from this command. In addition to other tasks, this script checks the Linux kernel to determine whether it is eligible for para-virtualization after migration and whether the necessary kernel modules are available. The output recommends the missing kernel modules to be added. Ensure that you back up the boot image file before running any dracut command modifying the image.

Migrate Virtual Machines and Block Storage to OCI

Prepare your Windows Source Instances for Migration

Use the script provided in Control-S to set up your Windows instances for migration. For each Windows instance that you want to migrate, do the following.

1. Ensure that you have RDP access to each instance as the Administrator.
2. Use RDP to log in to the instance as the Administrator.
3. Copy the file /home/opc/src/windows_migrate.ps1 from Control-S server to each source instance.
4. On each source instance, navigate to the folder where you've saved the file and run windows_migrate.ps1

Launch the Migration Controller Instance (Control-T) in the Target Environment

Use the setup script provided in Control-S to launch the migration controller in the target environment

- Log in to the Control-S server and run the following command: "opcmigrate migrate instance ctlt setup"

Migrate Virtual Machines and Block Storage to OCI

Migrate the Specified VMs and Block Volumes

When you've prepared the source instances and completed configuring the migration controller instances in the source and target environments, you're ready to start the migration.

Migration is kicked off by executing " opcmigrate migrate instance job run".

The migration tool then starts the migration process for the boot and attached block volumes specified in the secret.yml configuration file.

If you want to run multiple jobs in parallel, specify a job file for each job.

opcmigrate migrate instance job run --job_file <full_path/job_file_name>

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Migrate Virtual Machines and Block Storage to OCI

Monitor the Migration
- To monitor the status of all migration jobs:

    opcmigrate migrate instance job list

- To monitor the status of a specified migration job:

    opcmigrate migrate instance job status <job_name>

- To monitor the status of the migration service, run:

    opcmigrate migrate instance service status

Interrupt or resume a migration job
- To interrupt the migration service, log in to Control-S and run:

    opcmigrate migrate instance service stop

- If a migration job fails, then, to resume only the specified migration job, log in to Control-S and run:

    opcmigrate migrate instance job resume <job_name>

- To restart the migration service after it has been stopped, log in to Control-S and run:

    opcmigrate migrate instance service start

Migrate Virtual Machines and Block Storage to OCI

Boot volume migration
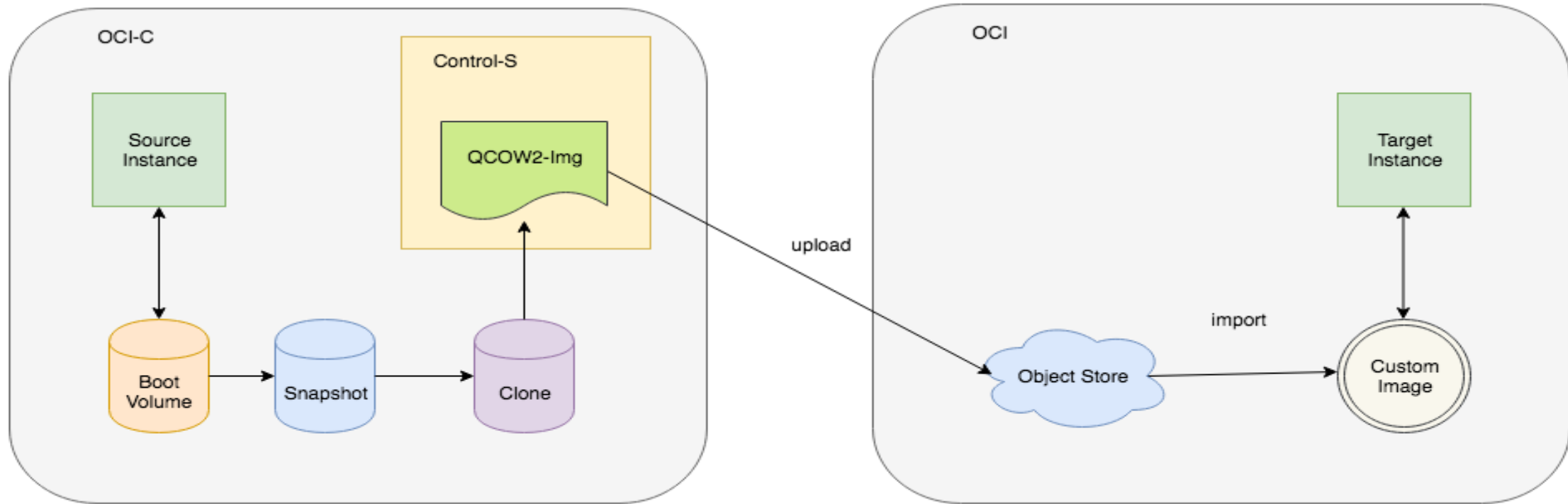
Migrate Virtual Machines and Block Storage to OCI

Data volume migration
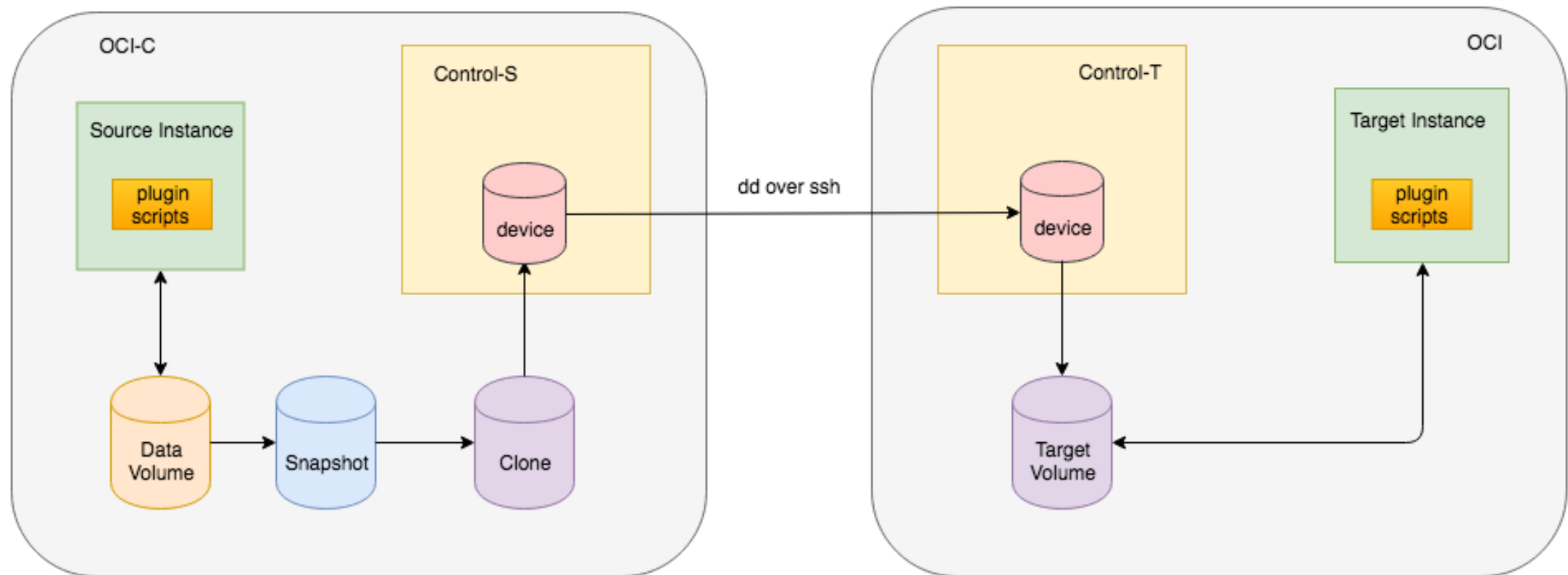
Migrate Virtual Machines and Block Storage to OCI

Launch VMs in the Target Environment
The migration tool doesn't launch VMs in the target environment. You must create the required VMs yourself using any of the documented methods to access Oracle Cloud Infrastructure.

Use the custom images created by the migration tool to launch your VMs. Ensure that you create the VMs in the same Availability Domain that you migrated them to. If you change the Availability Domain while launching the VM, you won't be able to attach block volumes to the VM.

Mount the Attached Block Storage on Compute Instances in the Target Environment
After you launch VMs using the OCI console, attach the required storage volumes to each VM.

1. To mount the attached storage volumes on each migrated instance, log in to Control-S and run:
   opcmigrate migrate instance attachment_ready <instance_ocid>

2. Confirm that this process has completed successfully. View the log file
   /ocic_oci_mig/inject_script_logfile.log. You should see the following message at the end of the file.
   cleanup the cron job for inject_script.sh
   This message indicates that volumes have been successfully mounted.

Migrate Virtual Machines and Block Storage to OCI

3. Alternatively, run the scripts on the boot volume of the migrated instance to mount the block volumes. Log in to the migrated instance and run the following commands:

    cd /ocic_oci_mig

    sudo ./iscsiattach.sh

    sudo python ./process_manifest.py

4. After these scripts complete, reboot the instance. When the instance restarts, use the lsblk command or view the /etc/fstab file to verify that the attached block volumes are mounted.

5. If you are using a custom configuration that depends on the disk device names, you may need to perform some manual configuration. For example, the migrated instance's LVM filter will be automatically modified to accept all devices named /dev/sd*. If you are using a custom LVM filter configuration, you may need to manually edit the filter and/or global_filter entries in /etc/lvm/lvm.conf to accept only the appropriate devices.

Migrate Virtual Machines and Block Storage to OCI

Validate the Target Environment

Validate Your VMs and Block Storage in the Target Environment
After you have launched each of your migrated VMs, log in to each VM to ensure that you have access to the system and to verify that all the required block volumes are attached and mounted as expected.

Validate Your Windows Licenses in the Target Environment
After launching your Windows VMs, check your Windows license.
- Log in to each Windows VM using RDP. In PowerShell or a command prompt window, enter:

  slmgr /dli

  The Windows Script Host dialog box appears. Verify that the new KMS address 169.254.169.253 is displayed and that the License status is Licensed.

Validate the Network setup
When your instances are running, verify that network access to each instance is both permitted and restricted as intended.

Migration Tool Demo

Summary

You should now be able to:

- Discover resources in your OCI-Classic Compute, Object Storage Classic and Load Balancing Classic account using the Network and resource discovery tool

- Migrate Block Storage volumes and Virtual Machines (VMs) from OCI-Classic to OCI using the migration tool

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Additional Information

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Considerations for Block Storage and VM Migration

Before you start your migration, consider the following factors that could have an impact on your migration process.

- Perform a proof-of-concept migration with VMs running applications that are as close to the configurations as possible.

- Quiesce applications on your source VMs and don't make any changes on the source VMs while migration is in progress.

- The maximum size of the boot volumes of VMs that can be imported is approximately 1 TB – assuming the boot volume has 60% used space and 50% compression ratio.

- A block storage volume in Oracle Cloud Infrastructure Compute Classic can have a maximum of five colocated snapshots. If a storage volume has more than five snapshots, the tool generates an error and fails.

- A single Control-S instance can migrate up to eight storage volumes at a time. To migrate a larger number of volumes, you can launch multiple Control-S instances.

- The steps to migrate data for all the storage volumes are carried out in parallel. So the overall time taken for the migration depends mainly on the size of the largest storage volume that needs to be migrated.

- In a single run of the migration tool, you can migrate VMs and storage volumes in a single identity domain and site. To migrate VMs and storage volumes in different sites or identity domains, set up and run the tool multiple times.

- You can create and specify multiple job files on a migration controller instance. These jobs use the same source and target environments; only the list instances and storage volumes specified for migration is different.

- Up to four migration jobs can be run in parallel. If you submit more than four jobs, the other jobs are queued until some jobs finish.

- When possible, the private IP addresses of the target instances should be the same as the private IP addresses of the source instances. This should be taken into consideration when setting up the network in your Oracle Cloud Infrastructure tenancy before you start migrating VMs and block volumes. In some cases, you might not be able to re-create the Oracle Cloud Infrastructure Compute Classic private IP addresses in your Oracle Cloud Infrastructure VCNs. In these cases, you might need to change application configurations to make things work.

- Incremental update, to capture data written to storage volumes in Oracle Cloud Infrastructure Compute Classic while the migration is in progress, is not supported.

Migration Tools - Installation

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Installation – Migration Tools Image
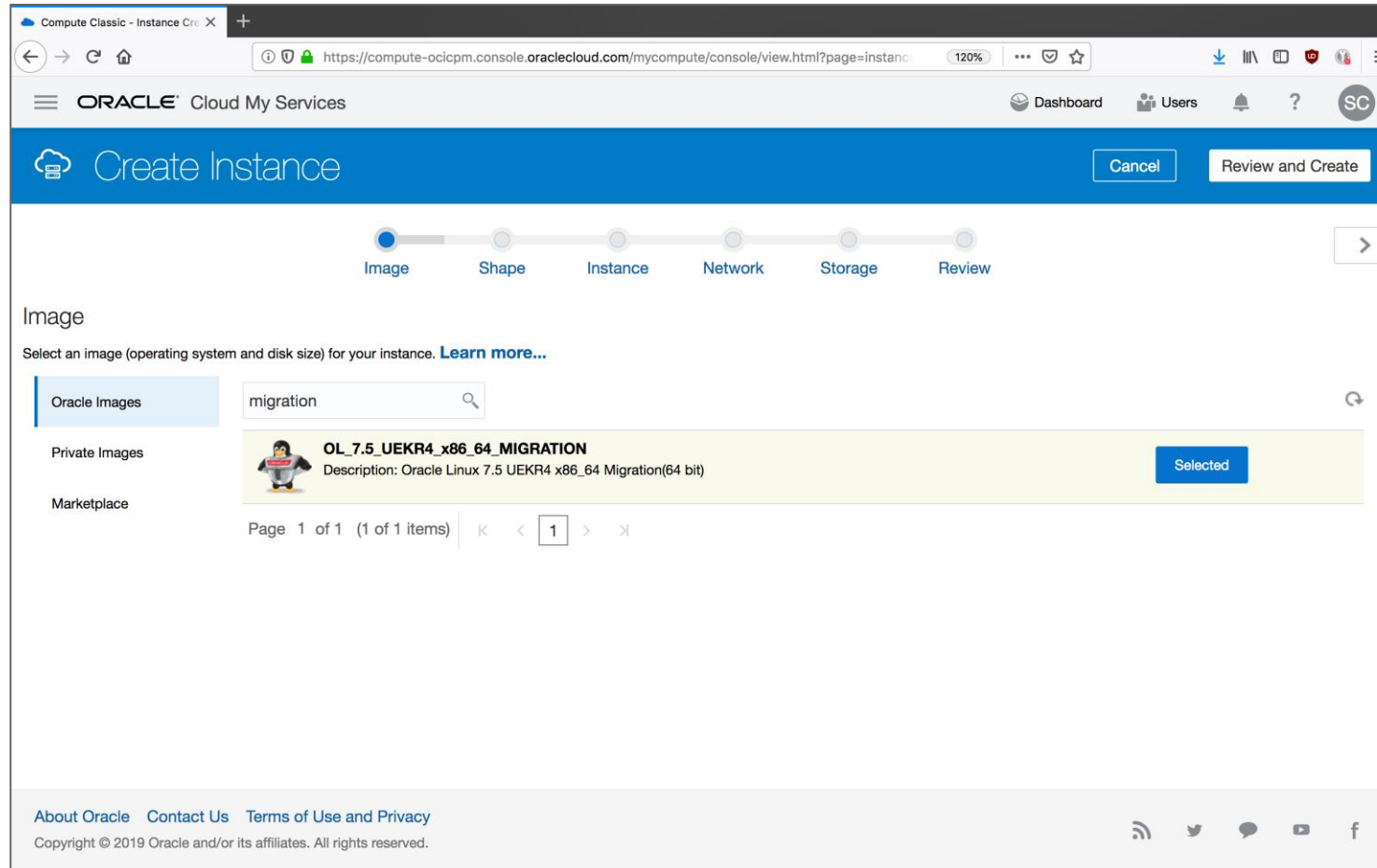
Migrations Tools Image available in the Oracle Images list of Oracle Cloud Infrastructure Compute Classic Console

Migration Tools - Features

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Discovery

uscom-central-1

```
$ opcmigrate --profile central discover
Password: ********
Storing resources to resources-central.json
```
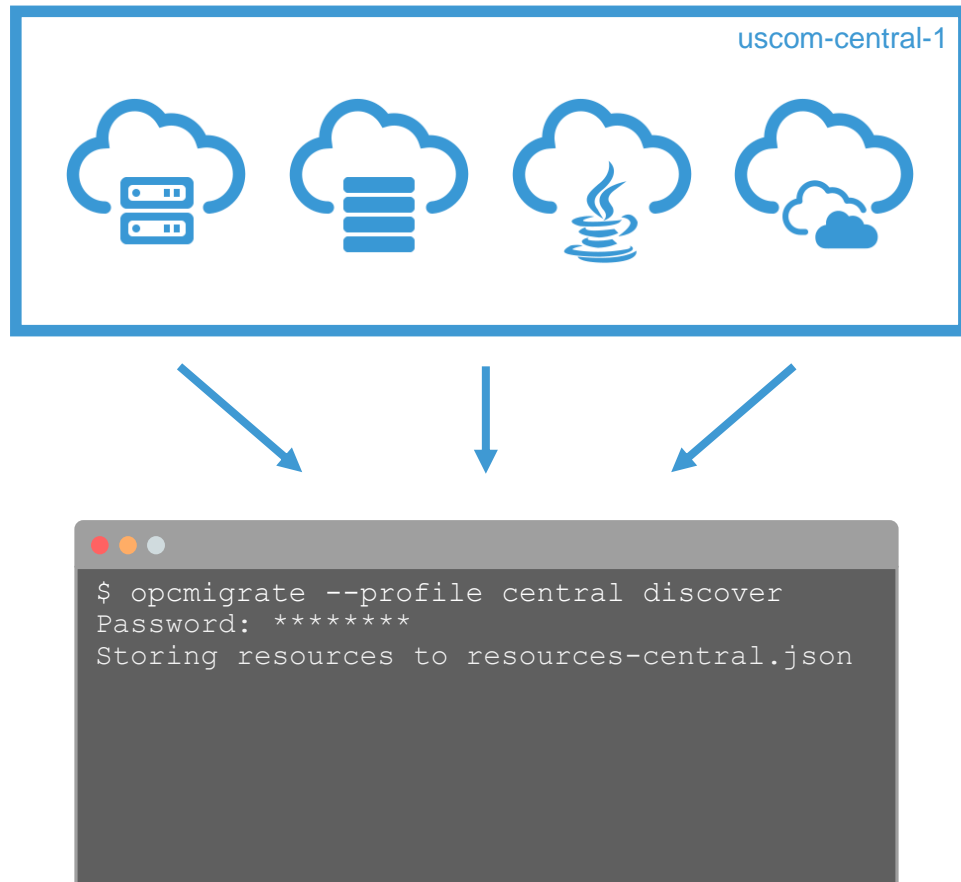
Discovers all Classic **Compute** and **PaaS** service resources deployed in a **single region** for a customer tenancy

Uses the public REST APIs, no impact to running workloads

Stores a local snapshot of all resource details for subsequent processing

Run multiple discoveries to capture different regions

Reporting

```
$ opcmigrate --profile central summary

Compute Instances              = 33 (169 OCPUs)
  on Shared Network            = Yes
  on IP Network                = Yes

Orchestrations
  Orchestations v1             = No
  Orchestations v2             = Yes
  Shutdown instances           = Yes (7)

PaaS Compute Instances         = 3 (4 OCPUs)
  on Shared Network            = No
  on IP Network                = Yes

Classic Services:
  Corente VPN (VM)             = Yes
  Load Balancer Classic        = Yes
  Fast Connect Classic         = No

PaaS Services:
  Database Cloud Service       = Yes (2)
  Java Cloud Service           = Yes (1)
  SOA Cloud Service            = No (0)
```

The **summary** report provides an aggregate overview of the Classic resources and services discovered in the tenancy/region, including:

- Instance and OCPU counts

- Classic Services: LBaaS, VPNaaS, etc.

- PaaS Services: DBCS, JCS, SOACS, etc.

- Block Storage usage

- Object Storage usage

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Reporting

```
$ opcmigrate --profile central validate

• GUIDANCE: Database Cloud Service APPDB01 Single Instance
  Database. Refer to
  https://docs.oracle.com/en/cloud/paas/database-dbaas-
  cloud/csdbr/index.html for options to migrate single
  instance Database Cloud Service instance to OCI

• WARNING: Instance /example/user1/ApplicationVM/46f00111-
  f87e-40e7-ba69-54a3caabe6ed with Boot Volume > 1TB

  OCI currently supports maximum bootable image import
  size of 300 GB when compressed. Boot volumes of greater
  than 1 TB may not compress enough during export to be
  importable into OCI. See
  https://docs.cloud.oracle.com/iaas/Content/Compute/Refer
  ences/customimagesparavirtualizedmode.htm#require

• WARNING: IP Network /Compute-example/ipnet01 has
  instances in multiple VNIC Sets

  VNIC level Security Rules across different VNIC Sets
  cannot be securely mapped to a single OCI Subnet. Using
  the `--with-security-rule-union` option will generate an
  aggregate set of security rules from all VNIC Sets
  across all interfaces in the IP Network.
```

The **validation** report provides an **assessment** of the discovered resources and services to identify potential migration issues

Identifies common Classic to OCI migration issues including:

- Large boot volumes sizes
- Instances with multiple vNICs
- Instance shape conversions
- Network security rule mapping

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Reporting

```
$ opcmigrate --profile central network

Shared Network Security Lists:

seclist: /Compute-example/user1/seclist1
  Compute Instances:
    instance: /Compute-example/user1/vm1
    instance: /Compute-example/user1/vm7
  Security Rules:
    PERMIT icmp
      src: seclist:/Compute-example/user1/seclist2
        /Compute-example/user1/vm2
        /Compute-example/user1/vm5
      dst: seclist:/Compute-example/user1/seclist1
    PERMIT tcp port 3389
      src: seciplist:/oracle/public/public-internet
        ['0.0.0.0/0']
      dst: seclist:/Compute-example/user1/seclist1
    PERMIT tcp port 5985-5986
      src: seciplist:/oracle/public/public-internet
        ['0.0.0.0/0']
      dst: seclist:/Compute-example/user1/seclist1

seclist: /Compute-example/user1/seclist2
  Compute Instances:
```

The **network** report provides details of the security lists and security rules applied to each instance

View security rule groupings by instance, network, acl, and vnicset

Assists with manual network redesign when not performing the automated translation

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Reporting


```
$ opcmigrate --profile central report
Generating Excel report-central.xlsx
```


The **report** option creates an Excel spreadsheet with a complete export of the discovered resource and all attributes in a tabular format

Includes a summary of all resources and resource counts

⚠ The generated report can contain sensitive data, handle accordingly

Graphing


```
$ opcmigrate --profile central graph
Generating graph report-central.gv.pdf
```
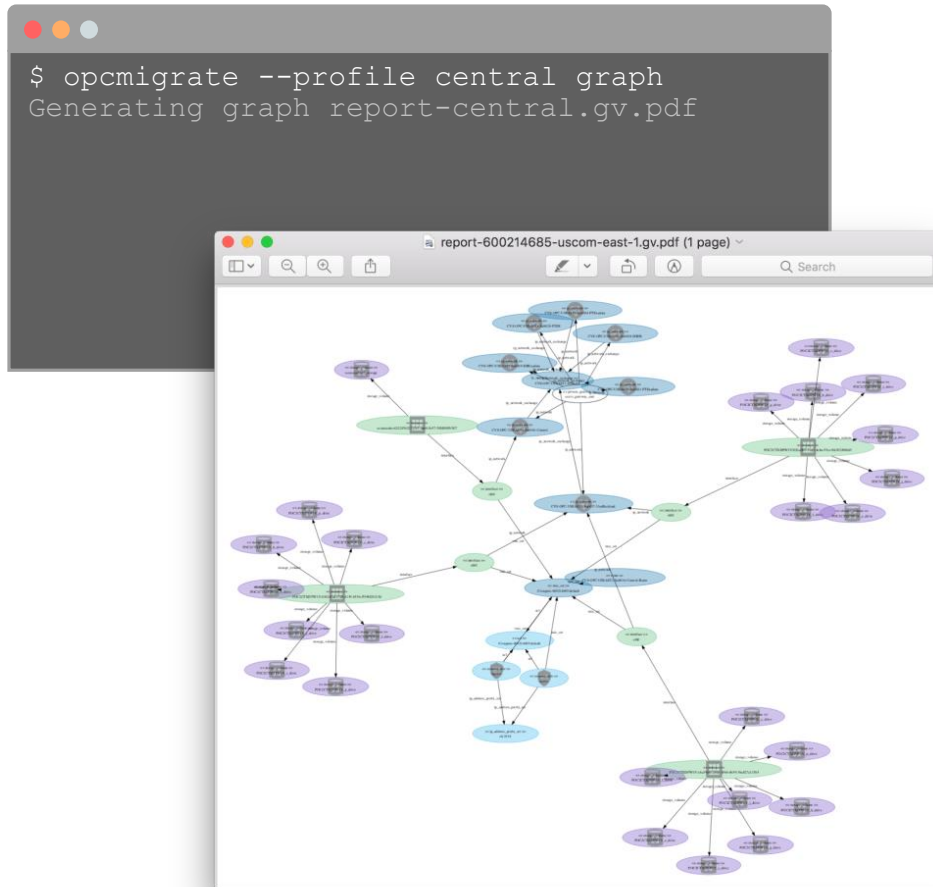
The **graph** command generates a relationship graph of all resources and relationships

Filters and layout options can be applied to constrain the resources shown

Visualizing the resources and resource relationship aids the identification and planning of which resources to migrate

Migration Plan

```
$ opcmigrate --profile central plan create \
    --focus instance
    --output central.plan
Generating graph report-central.gv.pdf
```
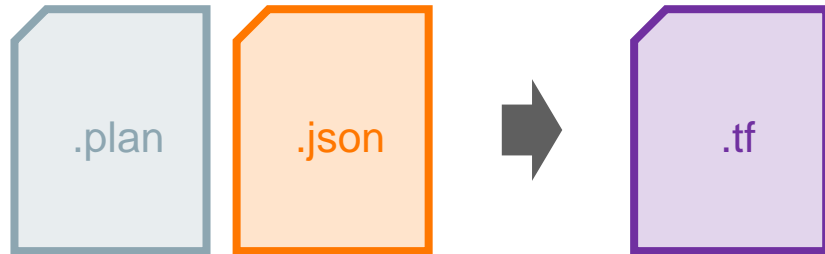
.plan

The **plan** command creates a migration plan for a filtered selection of resources

Using the same focus, include and exclude options as the graph command a subset of the environment can be included in the plan for migration

Manually edit the generated plan to change migration options per resource

Terraform Generation for Networks and Instances

```
$ opcmigrate --profile central generate \
    --plan central.plan \
    --with-security-rule-union \
    --output main.tf
```

.plan   .json   →   .tf

The **generate** option creates a Terraform configuration file for the resources selected in the migration plan, converting the OCI Classic resources to the equivalent OCI resource configurations

Terraform generated for:

- OCI provider configuration
- VCNs, Subnets & Security Lists
- Block Volumes
- Compute and Database Instances

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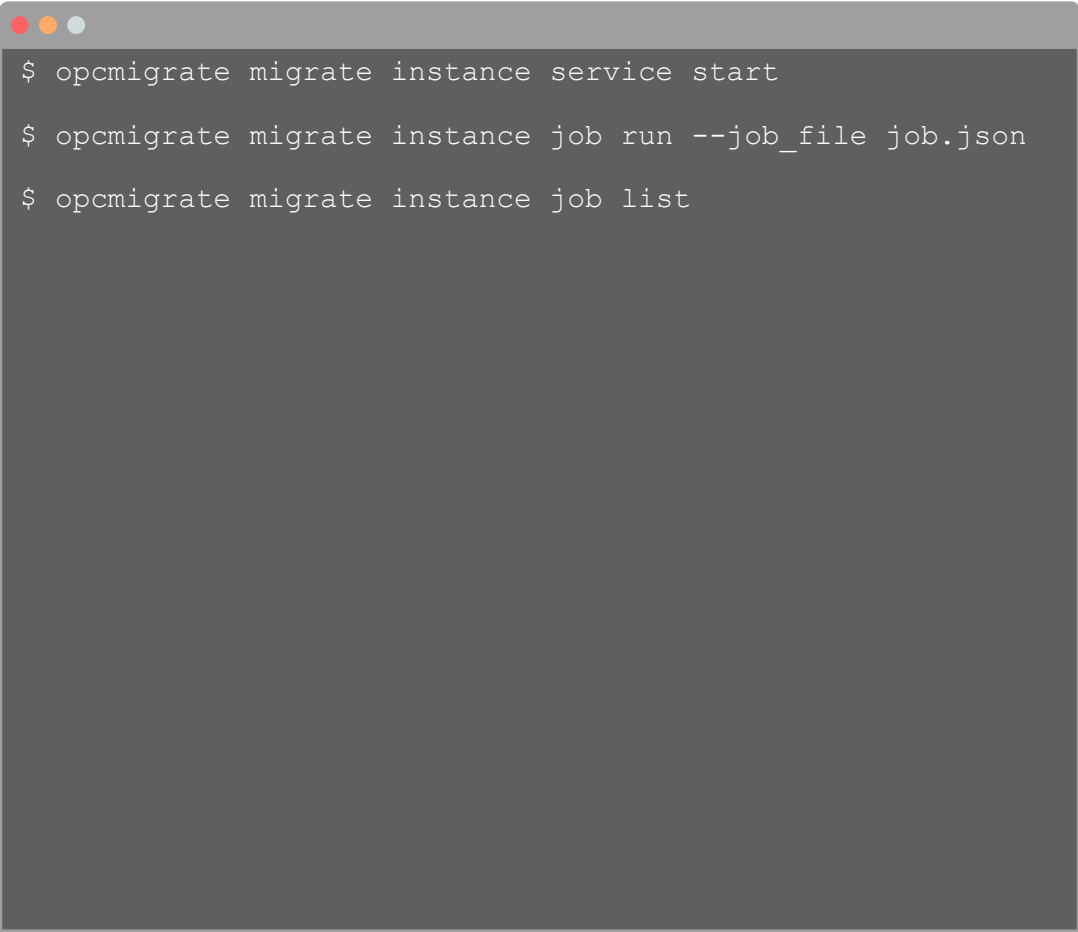# Instance Export for VM and Block Volume Migration

```
$ opcmigrate instances-export \
    --file resources-central.json \
    --plan central.plan \
    --format yaml

instances:
- {attached_only: 'false', name: /Compute-
example/user/vm1/7a3024fd-6659-4cf0-84c5-162617513388,
  os: linux, osSku: ''}
- {attached_only: 'false', name: / Compute-
example/user/vm2/7c403721-c041-45df-8362-95a122410558,
  os: linux, osSku: ''}
```

Generates list of instances to migrate based on the migration plan

Automatically determines the Windows os and osSku from the source image

- *Oracle provided Window image only*

VM Migration

```
$ opcmigrate migrate instance service start

$ opcmigrate migrate instance job run --job_file job.json

$ opcmigrate migrate instance job list
```

Migrates the Boot and attached Storage Volumes for an instance.

Image preparation required prior to migration

Uses co-located snapshots to data consistency

Migrate multiple instances and volumes as part of a single migration job

Schedule multiple migration jobs to batch migration operations

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Block Volume Backup and Restore

```
$ opcmigrate migrate rsm setup

$ opcmigrate migrate rsm restore \
    a062780beac07fd8a8353b281a967e76363fd732f0fb-uscom \
    "My Volume" \
    ocid1.compartment.oc1..aaaaaaaao35jm5krun6lgbdr5oq \
    ilMx:US-ASHBURN-AD-1


$ opcmigrate migrate rsm status <job_id>
```
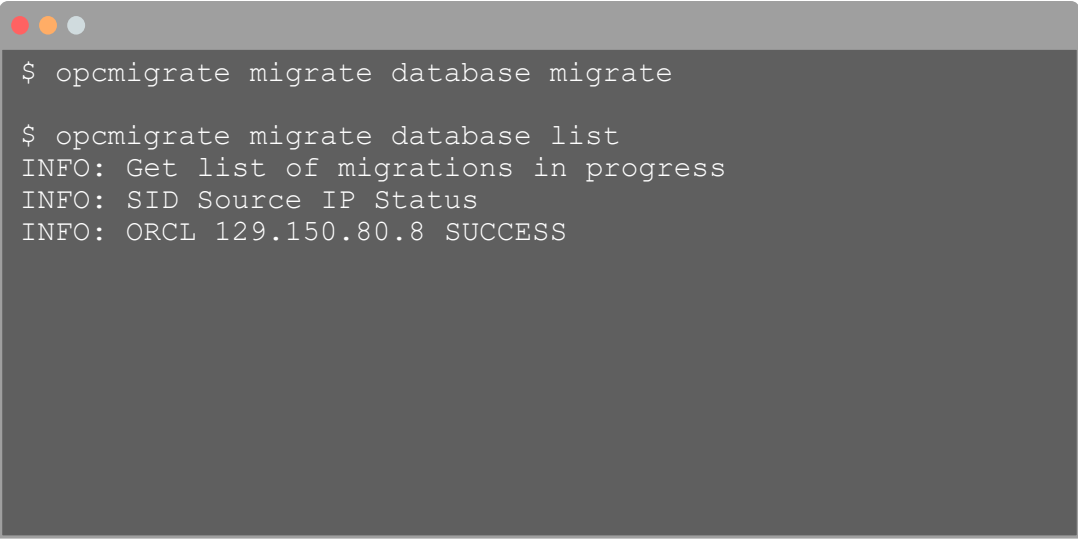
Migrates (non-collocated) Block Volume Snapshots from OCI-Classic Object storage to OCI

Database Backup Migration

```
"database": {
  "orcl-db1": {
    "source_ip": "129.150.80.8",
    "sid": "ORCL"
    "credentials": "AAAAB3NzaC1yc2EAQEA1xecb6089kq=="
  }
}
```

Add the Database access credentials to **~/.opc/profile**

Creates an RMAN backup of the database instance and uploads to Oracle Cloud Infrastructure Object Storage

```
$ opcmigrate migrate database migrate

$ opcmigrate migrate database list
INFO: Get list of migrations in progress
INFO: SID Source IP Status
INFO: ORCL 129.150.80.8 SUCCESS
```

Special considerations for migration

All flavors of Linux VMs running in Oracle Cloud Infrastructure Classic can be migrated. For Windows, VMs running Windows Server 2008, 2012, 2012 R2, or 2016 can be migrated.

You can't use the tool for the following types of migration:

- Application-aware migration - the migration tool will not be aware of application dependencies between VMs. The application administrator should manage dependencies and migrate all the VMs used by the application

- Object storage migration. Use rclone or CloudBerry to migrate data from Oracle Cloud Infrastructure Object Storage Classic to Oracle Cloud Infrastructure Object Storage.

- PaaS migration. Re-create the PaaS instances on Oracle Cloud Infrastructure and redeploy the applications.

- Oracle Database migration. Use native tools like RMAN, Data Pump, and GoldenGate or GoldenGate Cloud Service to migrate when possible.

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