

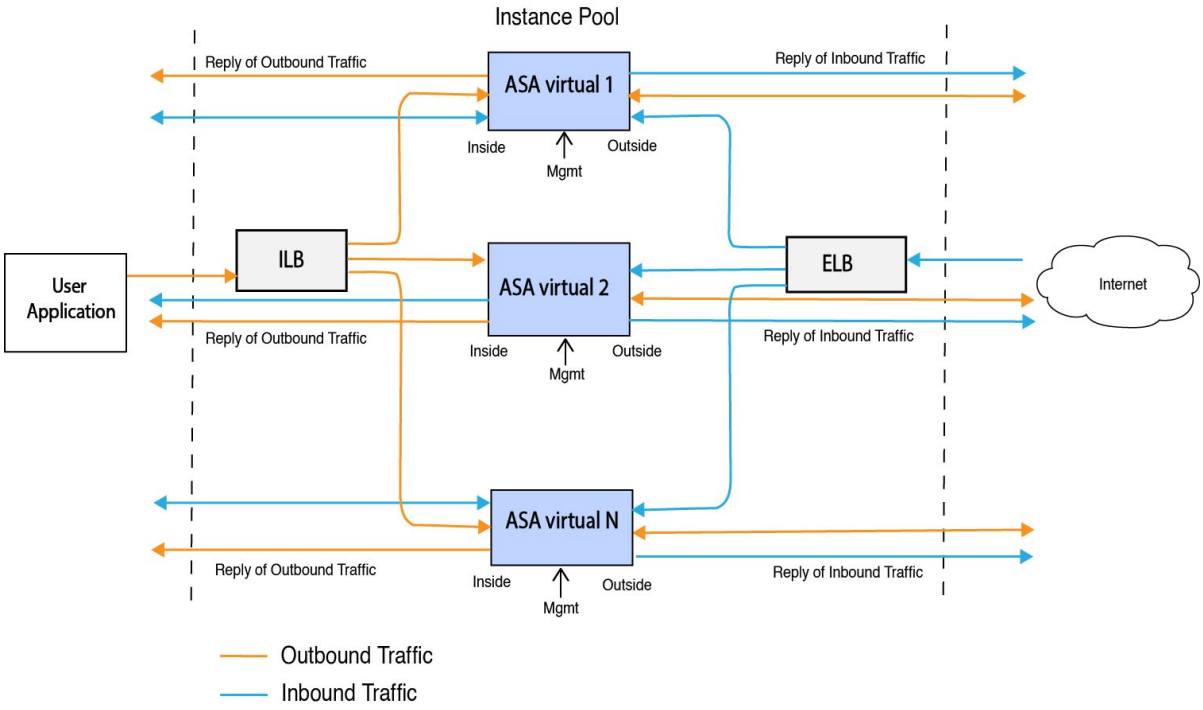
Deploy the ASA Virtual Auto Scale Solution on OCI

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Use Case

The use case for this ASA Virtual – OCI Autoscale solution is shown in the Use Case diagram. Internet-facing load balancer has public ip address with ports enabled using Listener and Target Group combination.

Figure 1: Use Case Diagram



Port based bi-furcation can be implemented for network traffic. This can be achieved through NAT rules. This configuration example is explained in the following sections.

Prerequisites

Permission and Policies

Following are the OCI permissions and policies that you require to implement the solution:

1. **Users and Group**

Note You must be an OCI User or a Tenancy Administrator to create the Users and Groups.

Create Oracle Cloud Infrastructure user accounts and a group to which the user accounts belong. If the relevant group with user accounts exist, you need not create them. For instructions on creating users and groups, see Creating Groups and Users.

2. **Group Policies**

You need to create the policies and then map them to the group. To create the policies, go to **OCI** > **Identity & Security** > **Policies** > **Create Policy**. Create and add the following policies to the desired group:

- Allow group <*Group_Name*> to use metrics in compartment <*Compartment_Name*>

- Allow group <*Group_Name*> to manage alarms in compartment <*Compartment_Name*>
- Allow group <*Group_Name*> to manage ons-topics in compartment <*Compartment_Name*>
- Allow group <*Group_Name*> to inspect metrics in compartment <*Compartment_Name*>
- Allow group <*Group_Name*> to read metrics in compartment <*Compartment_Name*>
- Allow group <*Group_Name*> to use tag-namespaces in compartment <*Compartment_Name*>
- Allow group <*Group_Name*> to read log-groups in compartment <*Compartment_Name*>
- Allow group <*Group_Name*> to use instance-pools compartment <*Compartment_Name*>
- Allow group <*Group_Name*> to use cloud-shell in tenancy
- Allow group <*Group_Name*> to read objectstorage-namespace in tenancy
- Allow group <*Group_Name*> to manage repos in tenancy

Note You can create policies at tenancy level as well. It is at your discretion how you want to provide all the permissions.

3. **Permission for Oracle Functions**

   To enable a Oracle-Function to access another Oracle Cloud Infrastructure resource, include the function in a dynamic group, and then create a policy to grant the dynamic group access to that resource.

4. **Create Dynamic Group**

   To create dynamic groups, go to **OCI** > **Identity & Security** > **Dynamic Group** > **Create Dynamic Group**

   Specify the following rule while creating the dynamic group:

   ```
   ALL {resource.type = 'fnfunc', resource.compartment.id = '<Your_Compartment_OCID>'}
   ```

   For more details on dynamic groups, see:

   - https://docs.oracle.com/en-us/iaas/Content/Functions/Tasks/functionsaccessingociresources.htm
   - https://docs.oracle.com/en-us/iaas/Content/Identity/Tasks/managingdynamicgroups.htm

5. **Create Policy for Dynamic Group**

   To add policy, go to **OCI** > **Identity & Security** > **Policies** > **Create Policy**. Add the following policy to the group:

   ```
   Allow dynamic-group <Dynamic_Group_Name> to manage all-resources in compartment
   <Compartment_OCID>
   ```

Download files from GitHub

– OCI Autoscale solution is delivered as a repository. You can pull or download the files from the repository.

Python3 Environment

A *make.py* file can be found in the cloned repository. This program compresses the oracle functions and template files into a Zip file; copy them to a target folder. In order to do these tasks, the Python 3 environment should be configured.

Note This python script can be used only on Linux environment.

Infrastructure Configuration

The following must be configured:

1. **VCN**

   Create VCN as required for your application. Create VCN with the Internet Gateway having at least one of the subnet attached with route to internet.

   For information on creating VCN, see https://docs.oracle.com/en-us/iaas/Content/GSG/Tasks/creatingnetwork.htm.

2. **Application Subnets**

   For information on creating subnet, see https://docs.oracle.com/en-us/iaas/Content/Network/Tasks/managingVCNs_topic-Overview_of_VCNs_and_Subnets.htm#.

3. **Outside Subnet**

   Subnet should have route with '0.0.0.0/0' to Internet Gateway. This subnet contains the Outside interface of Cisco and the Internet-facing Load balancer. Ensure that the NAT Gateway is added for outbound traffic.

   For more information, see the following documents:

   - https://docs.oracle.com/en-us/iaas/Content/Network/Tasks/managingIGs.htm
   - https://docs.oracle.com/en-us/iaas/Content/Network/Tasks/NATgateway.htm#To_create_a_NAT_gateway

4. **Inside Subnet**

   This is similar to the Application Subnets, with or without NAT/Internet gateway.

Note For health probes, you can reach the metadata server (169.254.169.254) through Port 80.

5. **Management Subnet**

   Management subnet should be public so that it supports SSH accessibility to the .

6. **Security Groups- Network Security Group for Instance**
7. **Object Storage Namespace**

This object storage namespace is used for hosting static website, having configuration.txt file. You must create a pre-authenticated requests for the configuration.txt file. This pre-authenticated URL is used during the template deployment.

Note Ensure that the following configurations that are uploaded are accessible by the instances through HTTP URL.

When is booted, it executes the following command`$ copy /noconfirm <configuration.txt file's pre-authenticated request URL > disk0:Connfiguration.txt`

This command enables launch to be configured with configuration.txt file.

Encrypt Password

Note For more information on this procedure, see Create Vaults and Secrets.

Password for is used to configure all the instances being used while autoscaling and it is used to

Therefore, you need to save and process the password every now and then. Owing to the frequent changes and vulnerability, editing or saving the password in the plain-text format is not allowed. Password must be in an encrypted format only.

To obtain password in encrypted form:

Procedure

Step 1 Create Vault.

OCI Vault provides services to create and save master encryption keys safely, and methods for encryption and decryption in using them. So Vault should be created (if not having already) in the same compartment as the rest of the autoscale solution.

Go to **OCI** > **Identity & Security** > **Vault** > **Choose or Create New Vault**

.

Step 2 Create Master Encryption Key.

One master encryption key is needed to encrypt the plain text password.

Go to **OCI** > **Identity & Security** > **Vault** > **Choose or Create Key**

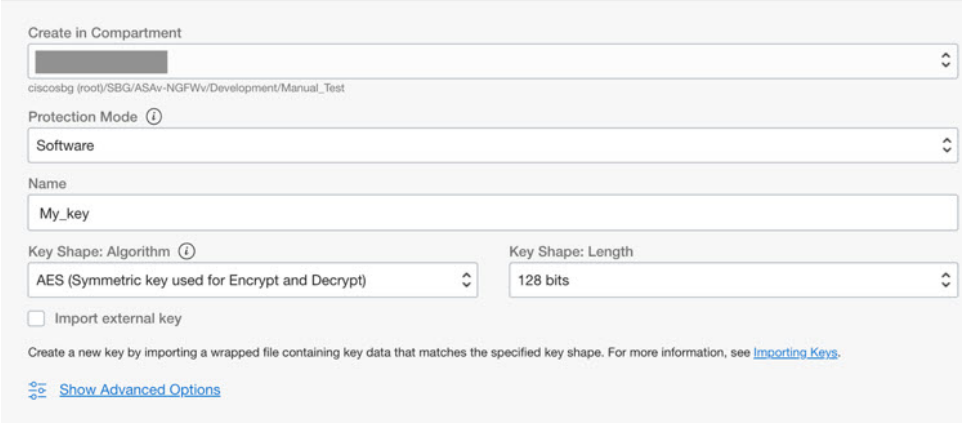
Choose any of the keys from any of the given algorithm with any bit of length.

a. AES – 128, 192, 256

b. RSA – 2048, 3072, 4096

c. ECDSA – 256, 384, 521

Figure 2: Create Key



Step 3 Create encrypted password.

a. Go to **OCI** > **Open CloudShell (OCI Cloud Terminal)**

b. Execute following command by replacing <*Password*> as your password.

```
echo -n '<Password>' | base64
```

c. From the selected Vault, copy cryptographic endpoint and master encryption key OCID. Replace the following values, and then execute the encrypt command:

- KEY_OCID with Your key's OCID
- Cryptographic_Endpoint_URL with Your vault's cryptographic endpoint URL
- Password with Your password

Encrypt Command

```
oci kms crypto encrypt --key-id Key_OCID --endpoint

Cryptographic_Endpoint_URL --plaintext <base64-value-of-password>
```

d. Copy ciphertext from output of the above command and use it as required.

Preparation of the ASA Configuration File

Ensure that the Application is either deployed or its deployment plan is available.

Procedure

Step 1 Collect the following input parameters before deployment:

Parameter	Data Type	Description
tenancy_ocid	String	OCID of the tenancy to which your account belongs. To know how to find your tenancy OCID, see here. The tenancy OCID looks something like this - `ocid1.tenancy.oc1..<unique_ID>`
compartment_id	String	The OCID of the compartment in which to create the resources. Example: `ocid1.compartment.oc1..<unique_ID>`
compartment_name	String	Name of the compartment
region	String	The unique identifier of the region in which you want the resources to be created. Example: `us-phoenix-1, us-ashburn-1`
lb_size	String	A template that determines the total pre-provisioned bandwidth (ingress plus egress) of the external and internal load balancer. Supported values: 100Mbps, 10Mbps, 10Mbps-Micro, 400Mbps, 8000Mbps Example: 100Mbps
availability_domain	Comma separated value	Example: Tpeb:PHX-AD-1 **Note** Execute **oci iam availability-domain list** command in the Cloud Shell to get the availability domain names.
min_and_max_instance_count	comma separated value	The minimum and the maximum number of instances that you would want to retain in the instance pool. Example: 1,5
autoscale_group_prefix	String	The prefix to be used to name all the resources that are created using the template. For example, if the resource prefix is given as 'autoscale', all the resources are named as follows - autoscale_resource1, autoscale_resource2 etc.

Parameter	Data Type	Description
asav_config_file_url	URL	The URL of the configuration file uploaded to the object storage to be used to configure the ASA Virtual. **Note** Pre-Authenticated Request URL of the configuration file has to be given Example: https://objectstorage.<region-name>.oraclecloud.com/<object-storage-name>/oci-asav-configuration.txt
mgmt_subnet_ocid	String	OCID of the Management subnet that is to be used.
inside_subnet_ocid	String	OCID of the Inside subnet that is to be used.
outside_subnet_ocid	String	OCID of the Outside subnet that is to be used.
mgmt_nsg_ocid	String	OCID of the Management subnet network security group that is to be used.
inside_nsg_ocid	String	OCID of the Inside subnet network security group that is to be used.
outside_nsg_ocid	String	OCID of the Outside subnet network security group that is to be used.
elb_listener_port	comma separated Values	List of the communication ports for the external load balancer listener. Example: 80
ilb_listener_port	comma separated Values	List of the communication ports for the internal load balancer listener. Example: 80
health_check_port	String	The backend server port of load balancer against which the health check is executed. Example: 8080

Parameter	Data Type	Description
instance_shape	String	The shape of the instance to be created. The shape determines the number of CPUs, amount of memory, and other resources allocated to the instance. Supported shapes :"VM.Standard2.4" & "VM.Standard2.8"
lb_bs_policy	String	The load balancer policy to be used for the internal and external load balancer's backend set. To know more about how load balancer policies work, see here. Supported values: "ROUND_ROBIN", "LEAST_CONNECTIONS", "IP_HASH"
image_name	String	The name of the marketplace image to be used for creating the instance configuration. Default value : "Cisco ASA virtual firewall (ASAv)" **Note** If the user wants to deploy custom image, user has to configure the custom_image_ocid parameter.
image_version	String	The Version of the ASA Virtual image available in OCI Marketplace to be used. Currently, 9.15.1.15 and 9.16.1 versions are available. Default value : "Cisco ASA virtual firewall (ASAv)"
scaling_thresholds	Comma separated value	The CPU usage thresholds to be used for scale-in and scale-out. Specify the scale-in and scale-out threshold values as comma separated input. Example : 15,50 where, 15 is the scale-in threshold and 50 is the scale-out threshold.
custom_image_ocid	String	OCID of the custom image to be used to create instance configuration if the marketplace image is not to be used. **Note** custom_image_ocid is optional parameter

Parameter	Data Type	Description
asav_password	String	The password for ASA Virtual in the encrypted form, to SSH into the ASA Virtual for configuration. Use configuration guide for the instructions on how to encrypt password or see here.
cryptographic_endpoint	String	Cryptographic endpoint is a URL, that is used for decrypting password. It can be found in the Vault.
master_encryption_key_id	String	The OCID of key with which the password was encrypted. It can be found in the Vault.
Profile Name		It is the User's profile name in OCI. It can be found under profile section of the user. Example: oracleidentitycloudservice/<user>@<mail>.com
Object Storage Namespace		It is unique identifier created at the time of Tenancy creation. You can find this value in **OCI** > **Administration** > **Tenancy Details**
Authorization Token		This is used as password for docker login which authorizes to push Oracle-Functions into the OCI container registry. To procure the token, go to **OCI** > **Identity** > **Users** > **User Details** > **Auth Tokens** > **Generate Token**.

Step 2 Configure Objects, Licensing, NAT rule for Load Balancer health probes and Access Policies.

```
! Default route via outside
route outside 0.0.0.0 0.0.0.0 <Outside Subnet gateway> 2

! Health Check Configuration
object network metadata-server
host 169.254.169.254
object service health-check-port
service tcp destination eq <health-check-port>
object service http-port
service tcp destination eq <traffic port>
route inside 169.254.169.254 255.255.255.255 <Inside Subnet GW> 1

! Health check NAT
nat (outside,inside) source static any interface destination static interface metadata-server service
 health-check-port http-port
nat (inside,outside) source static any interface destination static interface metadata-server service
 health-check-port http-port
```

```
! Outbound NAT
object network inside-subnet
subnet <Inside Subnet> <Inside Subnet Gateway>
object network external-server
host <External Server IP>
nat (inside,outside) source static inside-subnet interface destination static interface external-server


! Inbound NAT
object network outside-subnet
subnet <Outside Subnet> <Outside Subnet GW>
object network http-server-80
host <Application VM IP>
nat (outside,inside) source static outside-subnet interface destination static interface http-server-80


!
dns domain-lookup outside
DNS server-group DefaultDNS

! License Configuration
call-home
profile license
destination transport-method http
destination address http <URL>
debug menu license 25 production
license smart
feature tier standard
throughput level <Entitlement>
licence smart register idtoken <License token> force
!
```

These health probe connections and data plane configuration should be allowed on Access policy.

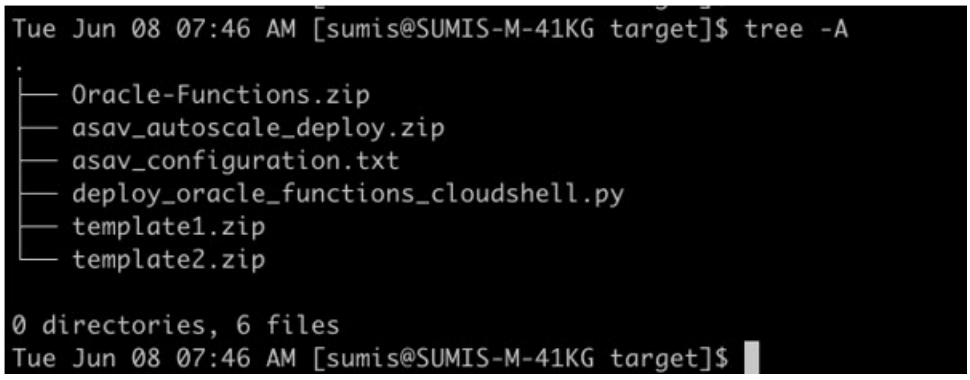
Step 3 Update *configuration.txt* file with the configuration details.

Step 4 Upload *configuration.txt* file to the user created object storage space and create the pre-authenticated request for the uploaded file.

Note
Ensure that pre-authenticated request URL of configuration.txt is used in the stack deployment.

Step 5 Create Zip files.

A *make.py* file can be found in the cloned repository. Execute the `python3 make.py build` command to create the zip files. The target folder has the following files.



Note

If you are deploying the autoscale solution using cloud shell, update the *easy_deploy/deployment_parameters.json* file before executing the `python3 make.py build`. For updating, refer Collection of input parameters and Deploy Oracle-Function Deployment.

Deploy the Auto Scale Solution

After completing the pre-requisite steps for deployment, start creating the OCI stack. You can perform a manual deployment or perform . Deployment scripts and templates for your version are available in the repository.

Manual Deployment

End-to-end Autoscale solution deployment consist of three steps: Deploy Terraform Template-1 Stack, Deploy Oracle Functions, and then Deploy Terraform Template-2.

Deploy Terraform Template-1 Stack

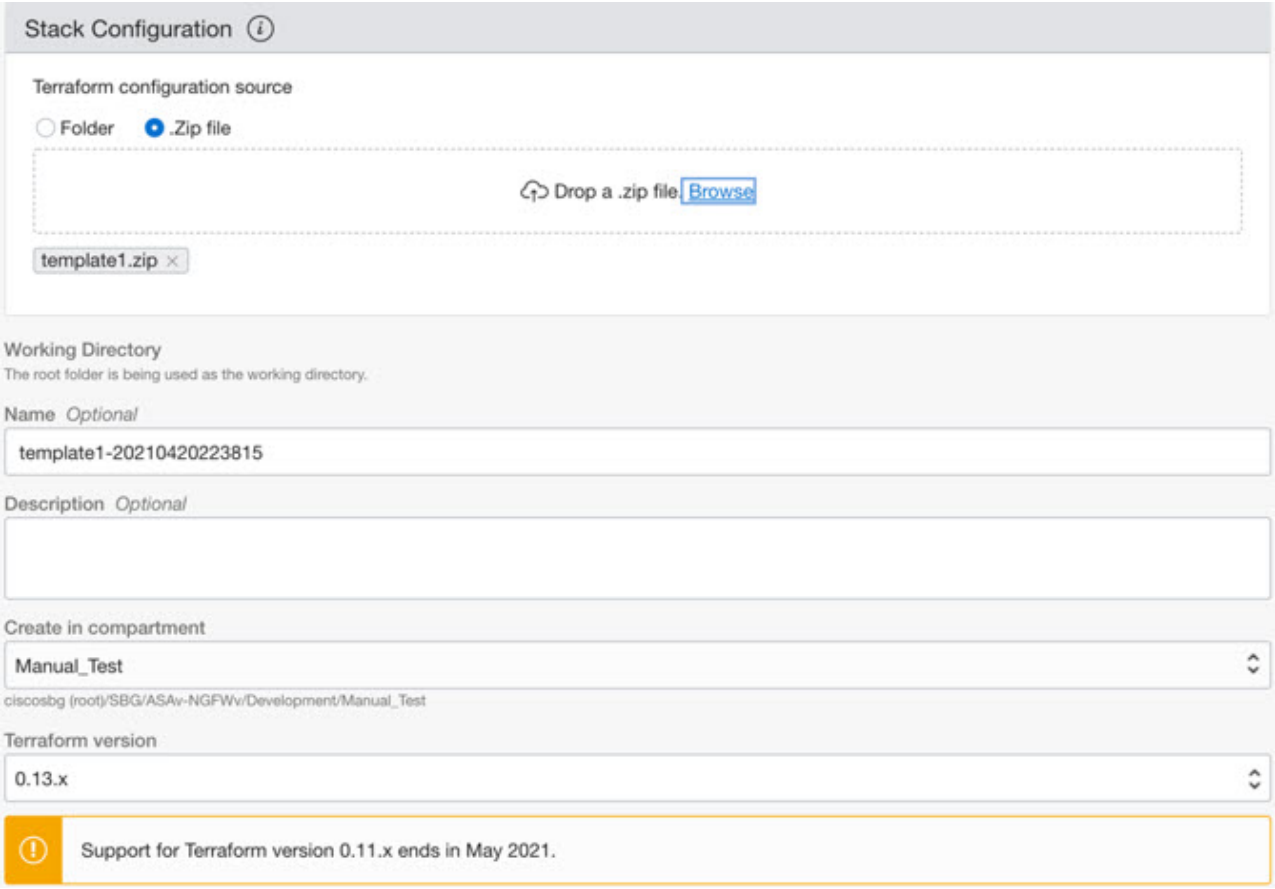
Procedure

Step 1 Log into the OCI portal.

The region is displayed in the upper right corner of your screen. Make sure you are in the intended region.

Step 2 Choose **Developer Service** > **Resource Manager** > **Stack** > **Create Stack**

Choose **My Configuration**, and then select the *Terraform template1.zip* file in the target folder as Terraform Configuration Source as shown in the figure below.



Step 3 In the **Transform version** drop-down list, select 0.13.x or 0.14.x.

Step 4 In the next step, enter all the details as collected in .

Note
Enter valid input parameters, otherwise stack deployment may fail in further steps.

Step 5 In the next step, choose **Terraform Actions** > **Apply**.

Post successful deployment, proceed to deploy the Oracle functions.

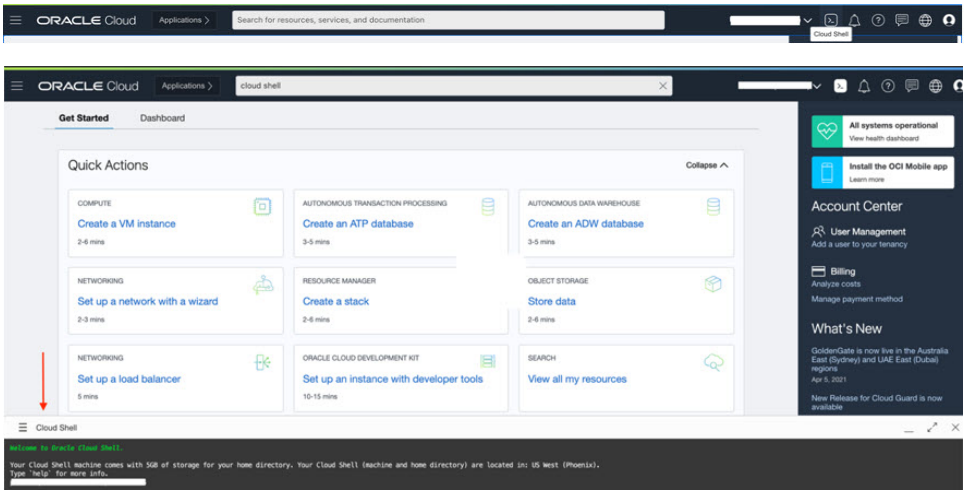
Deploy Oracle Functions

Note *This step must be performed only after successful Terraform Template-1 deployment.*

In OCI, Oracle Functions are uploaded as Docker Images, which are saved into the OCI container registry. Oracle Functions are needed to be pushed into one of the OCI Application (created in Terraform Template-1) at the time of deployment.

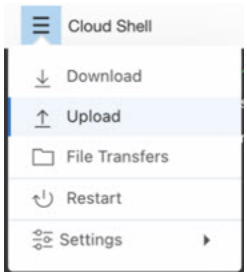
Procedure

Step 1 Open OCI Cloud Shell.

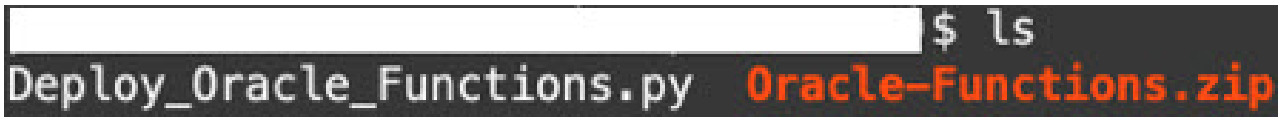


Step 2 Upload *deploy_oracle_functions_cloudshell.py* and *Oracle-Functions.zip*.

From the Cloud Shell's hamburger menu, choose **Upload**.



Step 3 Verify files using the **ls** command.



Step 4 Run `python3 Deploy_Oracle_Functions.py -h`. The `deploy_oracle_functions_cloudshell.py` script requires some input parameters whose details can be found using help argument, as shown in figure below.

```
                                $ python3 Deploy_Oracle_Functions.py -h
usage: Deploy_Oracle_Functions.py [-h] -a  -r  -p  -c  -o  -t

*** Script to deploy Oracle Function for OCI ASAv Autoscale Solution ***

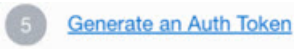
Instruction to find values of required arguments:
Application Name: Name of Application created by first Terraform Template
Region Identifier: OCI -> Administration -> Region Management
Profile Name: OCI -> Profile
Compartment OCID: OCI -> Identity -> Compartment -> Compartment Details
Object Storage Namespace: OCI -> Administration -> Tenancy Details
Authorization Token: OCI -> Identity -> Users -> User Details -> Auth Tokens -> Generate Token

optional arguments:
  -h, --help  show this help message and exit
  -a          Name of Application in OCI to which functions will be deployed
  -r          Region Identifier
  -p          Profile Name of User
  -c          Compartment OCID
  -o          Object Storage Namespace
  -t          Authorization Token for Docker Login (*Please Put in Quotes)
```

To run the script pass the following arguments:

Table 1: Arguments and Details

Argument	Particulars
Application Name	It is the name of OCI Application created by Terraform Template-1 deployment. Its value is obtained by combining **"autoscale_group_prefix"** given in Template-1 and suffix **"_application".**
Region Identifier	Region identifier is the region codeword fixed in the OCI for different regions. Example: 'us-phoenix-1' for Phoenix or "ap-melbourne-1" for Melbourne. To get the list of all region with their region identifiers, go to **OCI** > **Administration** > **Region Management**.
Profile Name	It is simple User's profile name in OCI. Example: *oracleidentitycloudservice/<user>@<mail>.com* The name can be found under profile section of the user.
Compartment OCID	It is the compartment's OCID (Oracle Cloud Identifier). Compartment OCID where user have the OCI Application. Go to **OCI** > **Identity** > **Compartment** > **Compartment Details**.
Object Storage Namespace	It is unique identifier created at the time of Tenancy creation. Go to **OCI** > **Administration** > **Tenancy Details**.

Argument	Particulars
Authorization Token	This is used as password for docker login which authorizes it to push Oracle-Functions into the OCI container registry. Specify the token in quotes in the deployment script. Go to **OCI** > **Identity** > **Users** > **User Details** > **Auth Tokens** > **Generate Token**. For some reason, if you are not able to see User Details then click **Developer services** > **Functions**. Go to the application created by Terraform Template-1. Click **Getting Started**, and choose Cloud Shell Setup and among the steps you will find the link to generate auth token as shown below. 

Step 5 Run the `python3 Deploy_Oracle_Functions.py` command by passing valid input arguments. It will take some time to deploy all the functions. You can then remove the file and close the Cloud Shell.

Deploy Terraform Template-2

Template 2 deploys the resources related to alarm creation, including alarms, ONS topics for invoking function. The deployment of template 2 is similar to Terraform Template-1 deployment.

Procedure

Step 1 Log into the OCI portal.

The region is displayed in the upper right corner of your screen. Make sure you are in the intended region.

Step 2 Choose **Developer Service** > **Resource Manager** > **Stack** > **Create Stack**.

Select *Terraform template template2.zip* in the target folder as source of Terraform configuration.

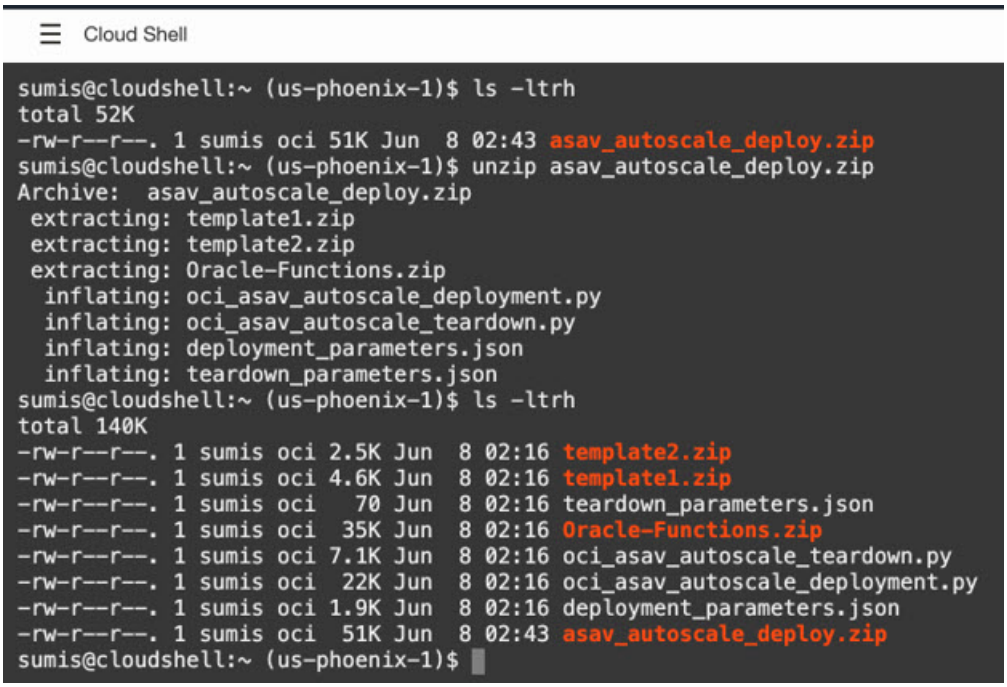
Step 3 In next step, click **Terraform Actions** > **Apply**.

Deploy Autoscale Using Cloud Shell

To avoid the deployment overhead, you can invoke the easy, end-to-end deployment script to deploy the autoscale solution (terraform template1, template2 and oracle functions).

Procedure

Step 1 Upload the *asav_autoscale_deploy.zip* file in the target folder to the cloud shell and extract the files.



Step 2 Make sure you have updated the input parameters in the *deployment_parameters.json* before executing the python3 `make.py` build command.

Step 3 To start the autoscale solution deployment, run the `python3 oci_asav_autoscale_deployment.py` command on the cloud shell.

It will take approximately 10-15 minutes for the solution deployment to complete.

If there is any error during the solution deployment, error log is saved.

Validate Deployment

Validate if all resources are deployed and the Oracle Functions are connected with Alarm & Events. By default, instance pool has minimum and maximum number of instances as zero. You can edit the instance pool in OCI UI with the minimum and maximum number that you want. This will trigger new instances.

We recommend that you launch only one instance and check for its workflow, validate its behaviour to ensure that it is working as it is expected. Post this validation, you can deploy the actual requirements of .

Note Specify the minimum number of instances as **Scale-In protected** to avoid their removal by OCI scaling policies.

Upgrade

Upgrade Autoscale Stack

No support for upgrade in this release. Stacks should be re-deployed.

Upgrade VMs

No support for upgrade for VMs in this release. The Stack should be re-deployed with the required image.

Instance Pool

1. To change minimum and maximum number of instances in the Instance Pool:

   Click **Developer Services** > **Function** > **Application Name(created by Terraform Template 1)** > **Configuration**.

   Change the min_instance_count and max_instance_count respectively.

2. Deletion/Termination of Instance is not equal to Scale-in. If any instance in the Instance Pool is deleted/terminated due to external action and not the scale-in action, instance pool automatically initiates a new instance to recover.

3. Max_instance _count defines threshold limit for Scale-out action, but it can be surpassed by changing the instance count of the Instance Pool through the UI. Ensure that the instance count from UI is less than max_instance_count set in OCI Application. Else, increase the threshold accordingly.

4. Reducing the count of instances in Instance Pool directly from the application does not perform the clean-up actions set programmatically. Due to which backends will not be drained and removed from both the load balancers, if has license, it will be lost.

5. Due to some reasons, if instance is unhealthy, not responding and unreachable through SSH for some definite period of time, instance is removed from the instance pool forcefully, any license may be lost.

Oracle Functions

- Oracle Functions are actually docker images. These images are saved into root directory of OCI Container registry. These images should not be deleted as it will also delete the function that are used in the Autoscale solution.
- OCI Application created by Terraform template-1, contains crucial environmental variables, which are required by Oracle Functions to work properly. Neither the value nor the format of these environment variables should be changed, unless it is mandated. Any changes made are reflected with new instances only.

Load Balancer Backend Sets

In OCI, Load Balancer attachment to instance pool is only supported using primary interface that is configured as management interface in . Hence, inside interface is connected to Internal Load Balancer’s backend set; outside interface is connected to External load balancer’s backend set. These IPs are not automatically added or removed from backend set. The Autoscale solution programmatically handles both of this task. But in case of any external action, maintenance or troubleshooting, there could be situation demanding manual effort to operate on them.

As per requirements, more ports can be opened on Load Balancer using listener and backend sets. Upcoming instances IPs are automatically added to the backend set, however already existing instances IPs should be manually added.

Adding Listener in Load Balancer

To add some port as listener in Load Balancer, go to **OCI** > **Networking** > **Load Balancer** > **Listener** > **Create Listener**.

Register a backend to Backend Set

In order to register an instance to Load Balancer, instance Outside interface IP should be configured as a backend in the Backend Set of External Load Balancer. Inside interface IP should be configured as backend in Backend set of Internal Load Balancer. Ensure that the port you are using has been added into the listener.

Delete Autoscale Configuration from OCI

Stacks deployed using terraform can be deleted in the same manner, using Resource Manager in OCI. Deletion of stack removes all the resources created by it and all the information associated with these resources are removed permanently.

Note In case of stack deletion, it is recommended to make the Minimum number of instances in Instance pool to 0, wait for instances to be terminated. This will help removal of all instances and won't leave any residue.

You can perform a manual deletion or use Cloud Shell.

Manual Deletion

The end-to-end autoscale solution deletion consist of three steps: Delete Terraform Template-2 Stack, Delete Oracle Functions, and then Delete Terraform Template-1 Stack.

Delete Terraform Template-2 Stack

To delete the Autoscale configuration, you must begin with Terraform Template-2 stack deletion.

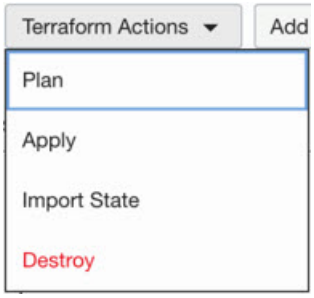
Procedure

Step 1 Log into the OCI portal.

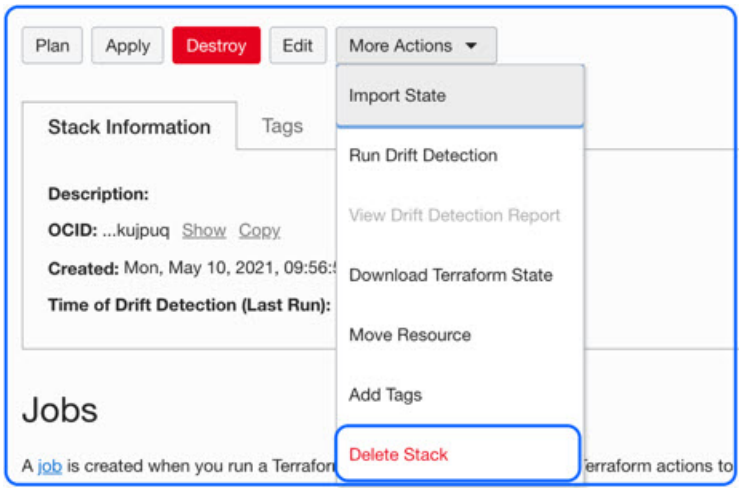
The region is displayed in the upper right corner of your screen. Make sure you are in the intended region.

Step 2 Choose **Developer Services** > **Resource Manager** > **Stack**.

Step 3 Select the stack created by Terraform Template-2, then select **Destroy** in **Terraform Actions** drop-down menu as shown in the figure below:



Destroy Job is created which takes some time to remove resources one after another. You can delete the stack after the destroy job is completed. as shown in the figure below:



Step 4 Proceed to delete the Oracle functions.

Delete Oracle-Functions

The Oracle-Function deployment is not a part of Terraform Template Stack deployment, it is uploaded separately using Cloud Shell. Hence, its deletion is also not supported by Terraform Stack deletion. You must delete all the Oracle-Functions inside the OCI application created by Terraform Template-1.

Procedure

Step 1 Log into the OCI portal.

The region is displayed in the upper right corner of your screen. Make sure you are in the intended region.

Step 2 Choose **Developer Services** > **Functions**. Choose the application name that was created in Template-1 stack.

Step 3 Inside this application visit each function and delete it.

Delete Terraform Template-1 Stack

Note Template-1 Stack deletion will only succeed after deleting all Oracle-Functions.

Same as Terraform Template-2 Deletion.

Procedure

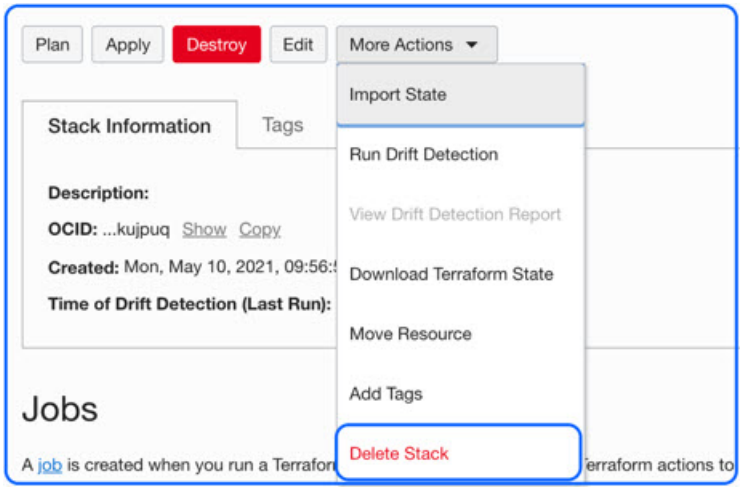
Step 1 Log into the OCI portal.

The region is displayed in the upper right corner of your screen. Make sure you are in the intended region.

Step 2 Choose **Developer Services** > **Resource Manager** > **Stack**.

Step 3 Select the stack created by Terraform Template-2, then click **Destroy** in Terraform **Actions** drop-down menu. Destroy Job will be created which will take some time to remove resources one after another.

Step 4 After the destroy job is completed, you can delete the stack from **More Actions** drop-down menu as shown in the figure below.



Post successful deletion of Terraform Template-1 stack, you must verify whether all the resources are deleted and there is no residue of any kind.

Delete Autoscale Using Cloud Shell

User can use the script to delete the stacks and oracle functions by executing the command in the cloud shell. If the stacks are deployed manually, update the stack id of the stack1 and stack2, and update the application id in the *teardown_parameters.json* file.