Installing vThunder ADC using VMware Template 1.1.0

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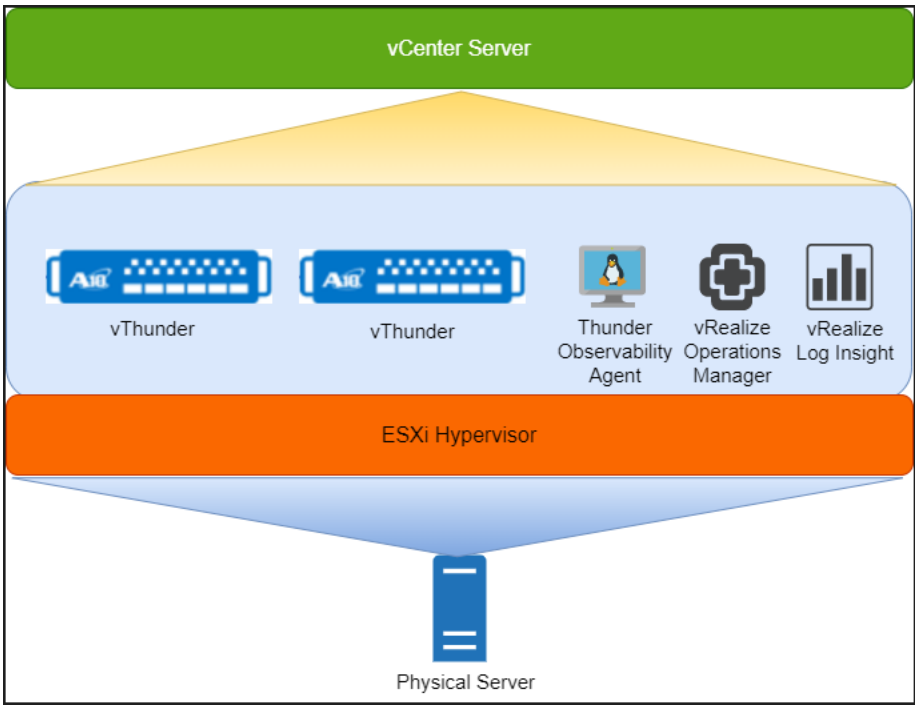
Introduction

The A10 Thunder® Application Delivery Controller (ADC) is a high-performance solution designed to accelerate and optimize critical applications, ensuring their reliable and efficient delivery.

vThunder is a fully operational, software-based Application Delivery Controller (ADC) solution that can run on VMware ESXi. vThunder provides a robust, flexible, and easy-to-deploy application delivery and server load balancing service.

Figure 1 shows vThunder operating on commodity servers (that are running on VMware ESXi hypervisor).

Figure 1 : vThunder for VMware ESXi



This documentation assists you in deploying Thunder® ADC instances on the VMware using VMware templates.

The following steps provide a high-level overview of the deployment process:

1. Provision the VMware Aria automation infrastructure.

   The deployment process needs infrastructure to be setup before the deployment. User needs to create Cloud account, Cloud zone, Projects, Flavor mappings, Image mappings and Network profile; if it already exists, it can be reused.

   Aria Automation Cloud Assembly is a cloud-based service that you use to create and deploy machines, applications, and services to your cloud infrastructure.

   As a cloud administrator, you can:

   - Configure the cloud vendor infrastructure to which your users deploy their cloud templates.
   - Set up projects to link the service users with the infrastructure resources.
   - Delegate the user management and deployment infrastructure to project managers, freeing you up to focus on your cloud resources.

   As a cloud template developer, you can:

   - Create and iterate on templates until they meet your development needs.
   - Deploy templates to the supporting cloud vendors based on your project membership.
   - Manage the deployed resources throughout the development life cycle.

   For more information on Cloud account, Cloud zone, Projects, Flavor mappings, Image mappings and Network profile, see Setup vRealize automation Cloud Assembly for VMware templates.

   For more information on other prerequisites, see Prerequisites.

2. Create Thunder virtual machine/s on the VMware.

   There are custom templates available for creating Thunder virtual machines (VMs) on VMware. Various templates are available for different deployment requirements.

   For more information on the specific use-cases, see Deployment Templates.

3. Configure Thunder.

   There are custom Python scripts available to apply the new Thunder configurations. Different scripts are available for various configuration needs.

For more information, see ADC Configuration Templates.

Terminology

- **ESXi** — A Bare Metal hypervisor in the VMware vSphere virtualization platform to create and run virtual machines.
- **Global Server Load Balancing (GSLB)** — A process to distribute incoming network traffic across multiple servers or data centre's located in different geographical locations.
- **High Availability (HA)** — A capability to remain operational and accessible for a significantly high percentage of the time.
- **Hybrid Cloud** — A cloud computing model that combines private cloud and public cloud services within the same seamless infrastructure.
- **Python3** — The latest major version of the Python programming language.
- **vThunder** — An A10 Thunder instance for virtual machine.
- **vSphere Client** — The VMware vSphere Client is a web-based application that connects to the vCenter Server so IT administrators can manage installations and handle inventory objects in a vSphere deployment. vSphere Client is a part of VMware's comprehensive product line.

Prerequisites

To create and configure Thunder virtual machine on the VMware cloud using VMWare template, you must ensure that the following prerequisites are met:

1. Download A10 custom VMware templates from GitHub.
2. ESXi host with a valid subscription. For more information, see VMware ESXi Installation and Setup.
3. Download and access VMware vSphere client to access Thunder virtual machine.
4. Access VMware Aria Automation Assembler to create Thunder virtual machine using VMware templates.
5. Sign up here to get Thunder Trial license.

6. Download the required vThunder OVA image version https://support.a10networks.com/support/axseries.

   Send a request to A10 Networks Support for A10 vThunder login default user credentials.

7. Download the Linux ISO image ubuntu-22.04.2-desktop-amd64.iso.
8. Download Python 3.x, see Install Python3.
9. Setup vRealize automation Cloud Assembly for VMware templates. For more information, see Setup vRealize automation Cloud Assembly for VMware templates.

For any queries, reach out to A10 Networks Support.

Image Repository

Table 1 provides the list of ACOS versions and modules that support the VMware templates:

Table 1 : Supported ACOS versions

ACOS Version	ADC	CGN	SSLi	TPS
64-bit Advanced Core OS (ACOS) version 6.0.3-P1	√	X	X	X
64-bit Advanced Core OS (ACOS) version 6.0.3	√	X	X	X
64-bit Advanced Core OS (ACOS) version 6.0.2	√	X	X	X
64-bit Advanced Core OS (ACOS) version 6.0.1	√	X	X	X
64-bit Advanced Core OS (ACOS) version 5.2.1-P9	√	X	X	X
64-bit Advanced Core OS (ACOS) version 5.2.1-P8	√	X	X	X
64-bit Advanced Core OS (ACOS) version 5.1.0-P7	√	X	X	X
64-bit Advanced Core OS (ACOS) version 5.2.1-P6	√	X	X	X

Deployment Templates

This section helps you in provisioning a new Thunder virtual machine on the VMware cloud.

Before proceeding, it is recommended to review the Prerequisites.

To provision a new virtual Thunder ADC instance on VMware cloud, perform the following steps:

1. Create Cloud Account, Cloud Zone, Projects, Flavor Mappings, Image Mappings, and Network Profile.
   It is not mandatory to create new resources, the existing resources can be used in deployment and configuration.
2. Select an appropriate template for deploying vThunder ADC on VMware cloud according to your use case.

   The following table provides a list of various use cases along with their respective supported VMware templates.

   Table 2: Supported VMware Templates

Use Case	Template Name	Number of Thunder/s	Number of NICs	Data-in NIC VIP	Description
Standalone Thunder ADC	Thunder-3NIC-1VM	1	3	Private	• Creates one vThunder instance with one management and two data NIC (data-in), see Figure 1. • Applies additional

Use Case	Template Name	Number of Thunder/s	Number of NICs	Data-in NIC VIP	Description
					configuration on vThunder as required: ◦ Change Password ◦ Basic Server Load Balancer ◦ A10 License ◦ SSL Certificate ◦ Backend Autoscale
Thunder ADC in High Availability mode with Private VIP.	Thunder-3NIC-2VM-PVTVIP	2	3	Private	• Creates two vThunder instances with HA setup and each vThunder has one management and two data NICs (data-in and data-out), see Figure 7. • Configures

Use Case	Template Name	Number of Thunder/s	Number of NICs	Data-in NIC VIP	Description
					data-in network interface card (NIC) with Private IP on VIP. • Applies additional configuration on vThunder as required: ◦ Change Password ◦ Basic Server Load Balancer ◦ A10 License ◦ SSL Certificate ◦ High Availability ◦ Backend Autoscale When one

Use Case	Template Name	Number of Thunder/s	Number of NICs	Data-in NIC VIP	Description
					instance becomes unavailable, another instance seamlessly handles the request without requiring manual intervention. • High availability can be configured within the same or different availability zone within a same region.
Thunder ADC in High Availability mode with Public VIP.	Thunder-3NIC-2VM-PUBVIP	2	3	Public	• Creates two vThunder instances with HA setup and each vThunder has one management and two data

Use Case	Template Name	Number of Thunder/s	Number of NICs	Data-in NIC VIP	Description
					NICs (data-in and data-out), see Figure 13. • Configures data-in network interface card (NIC) with Public IP on VIP. • Applies additional configuration on vThunder as required: ◦ Change Password ◦ Basic Server Load Balancer ◦ A10 License ◦ SSL Certificate ◦ High Availability

Use Case	Template Name	Number of Thunder/s	Number of NICs	Data-in NIC VIP	Description
					◦ Backend Autoscale When one instance becomes unavailable, another instance seamlessly handles the request without requiring manual intervention. • High availability can be configured within the same or different availability zone within a same region.
Thunder ADC with GSLB (Disaster Recovery Site in a cross-region	Thunder-3NIC-3VM	3	3	Public	• Creates three vThunder instances each vThunder has

Use Case	Template Name	Number of Thunder/s	Number of NICs	Data-in NIC VIP	Description
or hybrid cloud environment)					one management and two data NICs (data-in and data-out) in the same region1 and zone1, see Figure 19. These three vThunder instances are referred as Master Controller (Active), Site1 and Site2. • Applies additional configuration on vThunder as required: ◦ Change Password ◦ A10 License ◦ SSL Certificate ◦ Hybrid

Use Case	Template Name	Number of Thunder/s	Number of NICs	Data-in NIC VIP	Description
					Cloud GSLB The identical set of vThunder resources should be deployed in region2 zone1 using the same template. The three vThunder instances in region2 zone1 are referred as the Member Controller (Standby), Site1, and Site2. When region1 experiences an outage, region2 seamlessly handles all requests through DNS switch over.

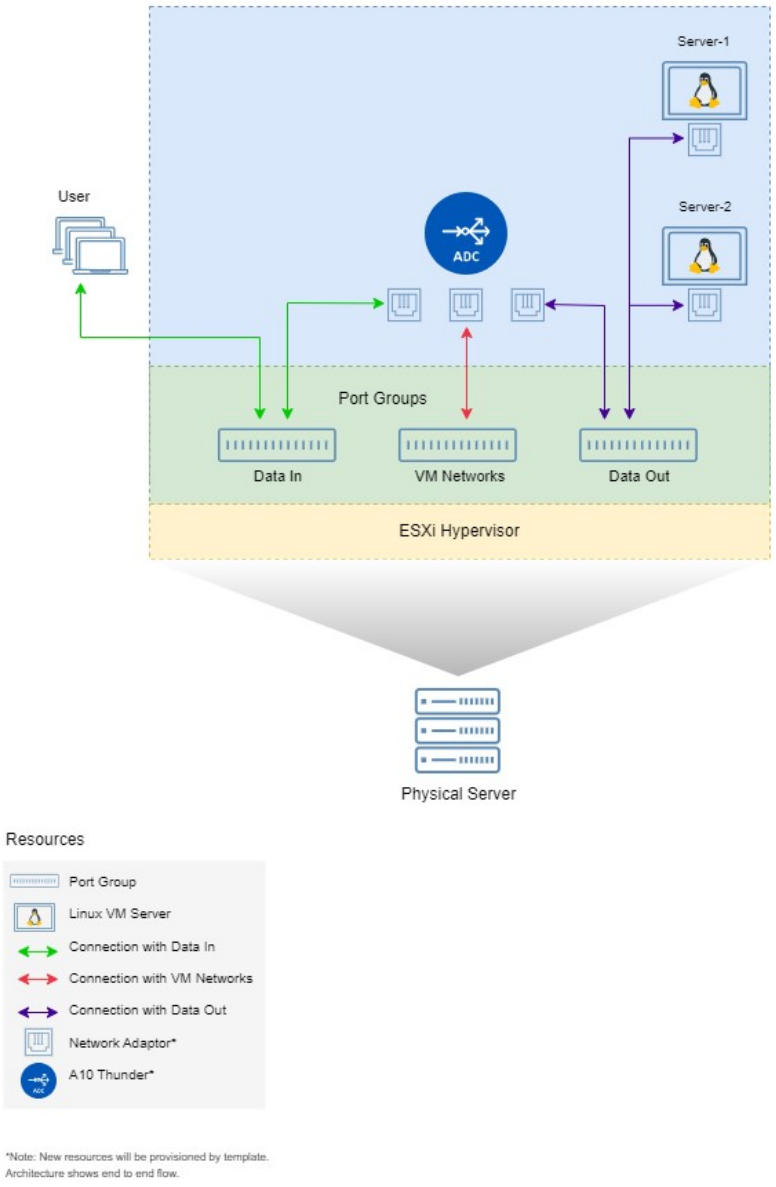
After completing the deployment process, proceed to configure your setup. For more information, see ADC Configuration Templates.

Thunder-3NIC-1VM

This template creates a new virtual machine with pre-loaded Thunder instance and attaches three new network interface cards (NICs).

For more information, see Create Thunder Virtual Machine.

Figure 1 : Standalone Thunder ADC



Additional Thunder configurations are available that can be applied as needed:

- Change Password
- Basic Server Load Balancer
- A10 License
- SSL Certificate
- Backend Autoscale

Various templates are available for different deployment needs.

For more information, see Deployment Templates.

The following topics are covered:

Create Thunder Virtual Machine

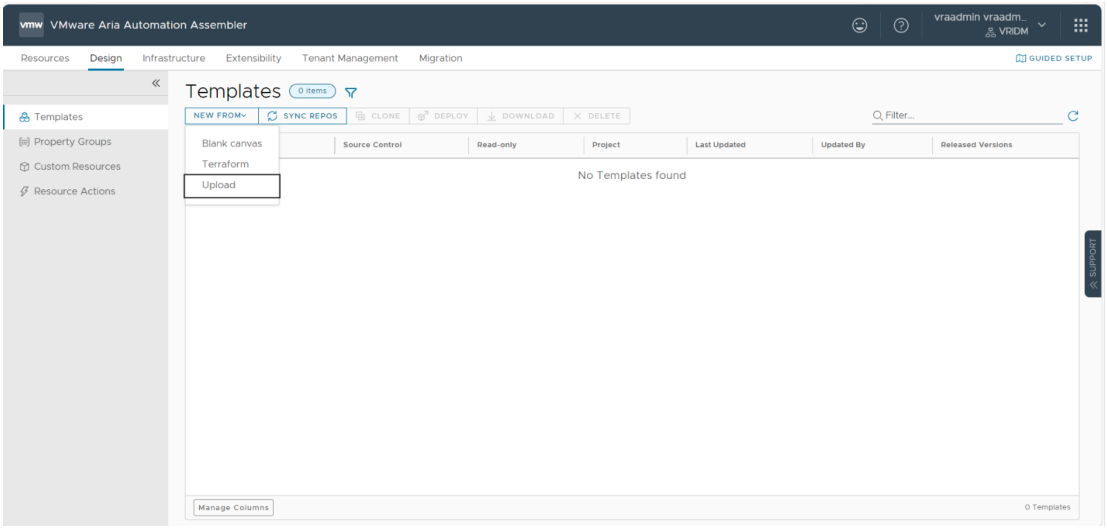
The A10-vThunder-3NIC-1VM template is used to create a Thunder virtual machine with three network interface cards.

Before deploying this template, it is recommended to review the Prerequisites.

To deploy the A10-vThunder-3NIC-1VM template using VMware Aria automation, perform the following steps:

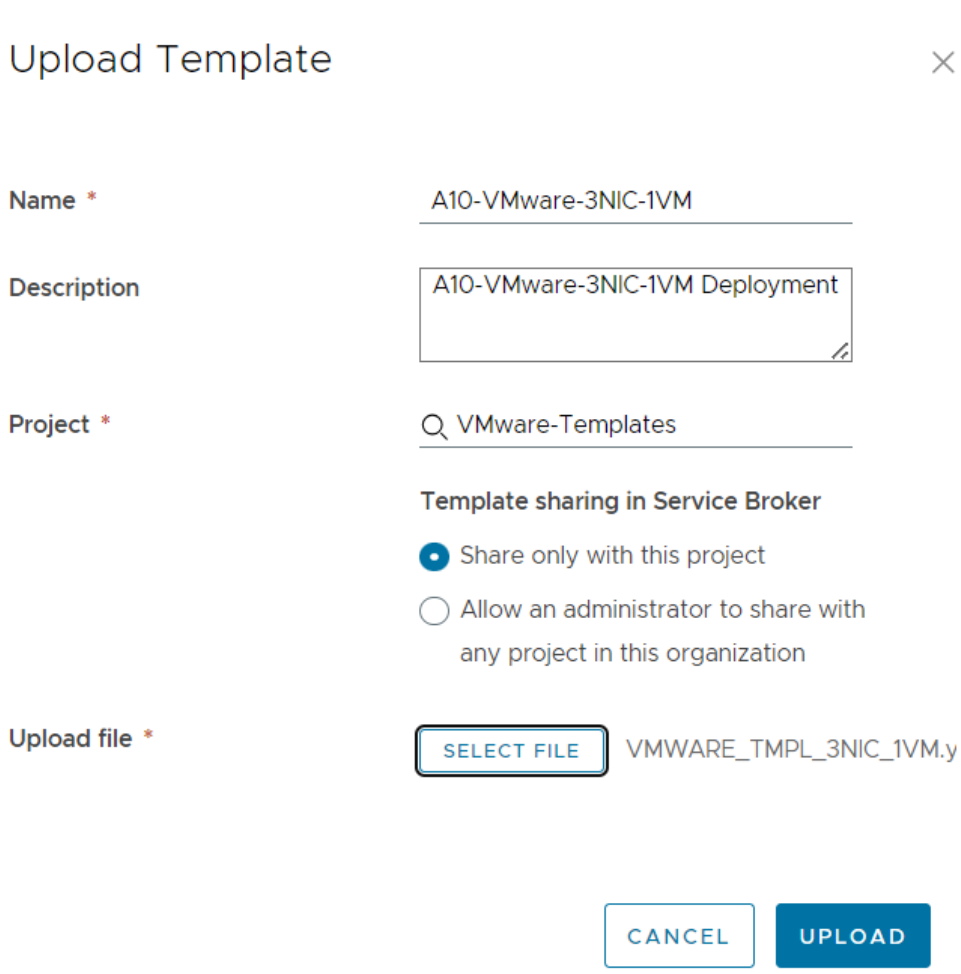
1. Download A10-vThunder-3NIC-1VM template.
2. Login VMware Aria Automation > **Services**, click **Assembler**.
3. From the **VMware Aria Automation Assembler** > **Design** > **Templates**, select **Upload** from **NEW FROM** dropdown window.

Figure 2 : VMware Aria Automation Assembler



4. Enter or select the appropriate values in the **Upload Template** fields:
   - **Name**: Enter your VMware Template name.
   - **Description**: Provide description for the VMware template.
   - **Project**: Select the available project.
   - **Upload file**: Select the **VMWARE_TMPL_3NIC_1VM.yaml** file.

Figure 3 : Upload Template window



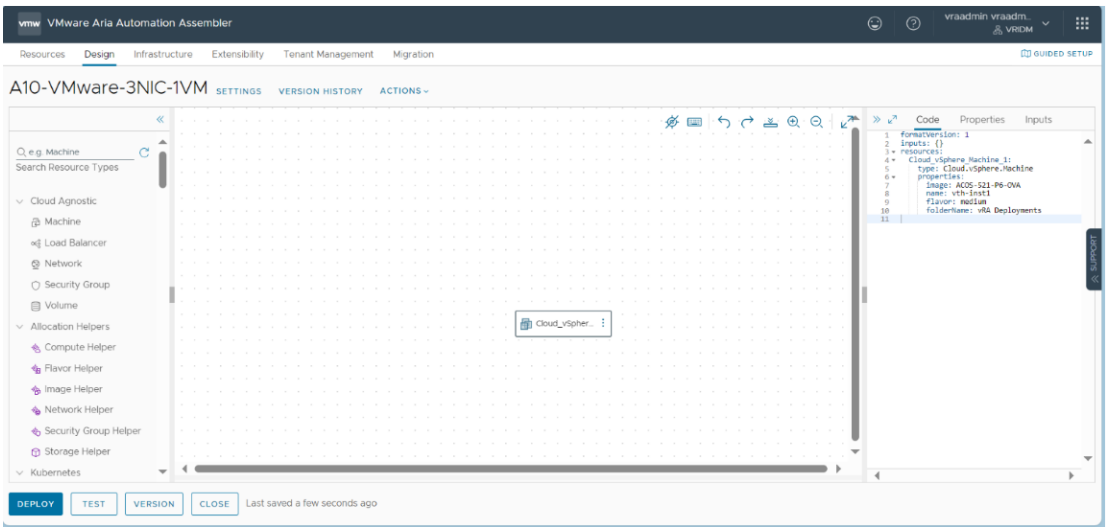
5. Click **UPLOAD**.
6. After template gets successfully uploaded, click the uploaded template name and configure the following parameters as appropriate in editor window:

Resource Name	Description
Virtual Machine	Specify a virtual machine name for vThunder. `name: vth-inst1`
Size	Specify a suitable size for the vThunder instance that supports at least 2 NICs which is available in Flavor mappings.

Resource Name	Description
	`flavor: medium`
Image	Specify the desired vThunder Image name which is available in Image mappings. `image: ACOS-521-P6-OVA`
Folder Name	Specify the folder name under which virtual machine to be created. `folderName: vRA Deployments`

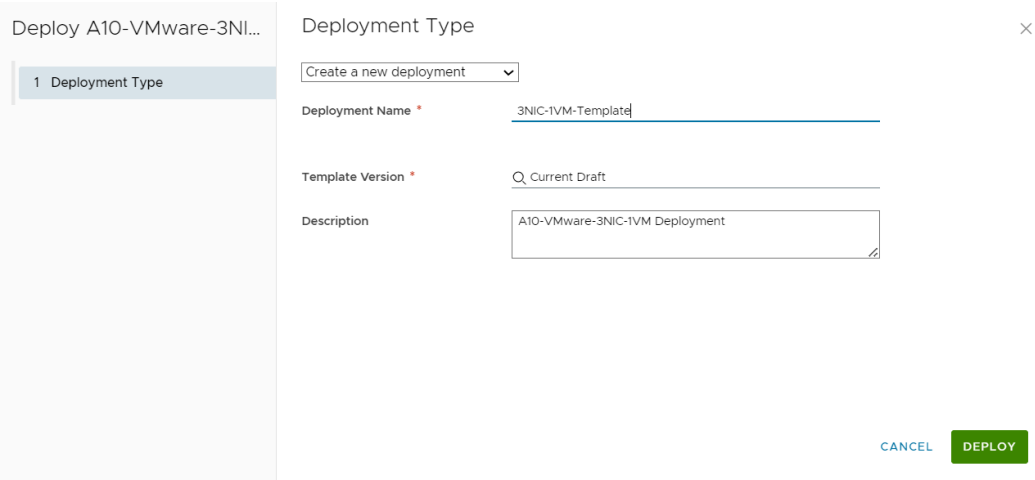
7. Click **TEST** to validate the template. Once validation is successful then click **DEPLOY**.

Figure 4 : Edit template window



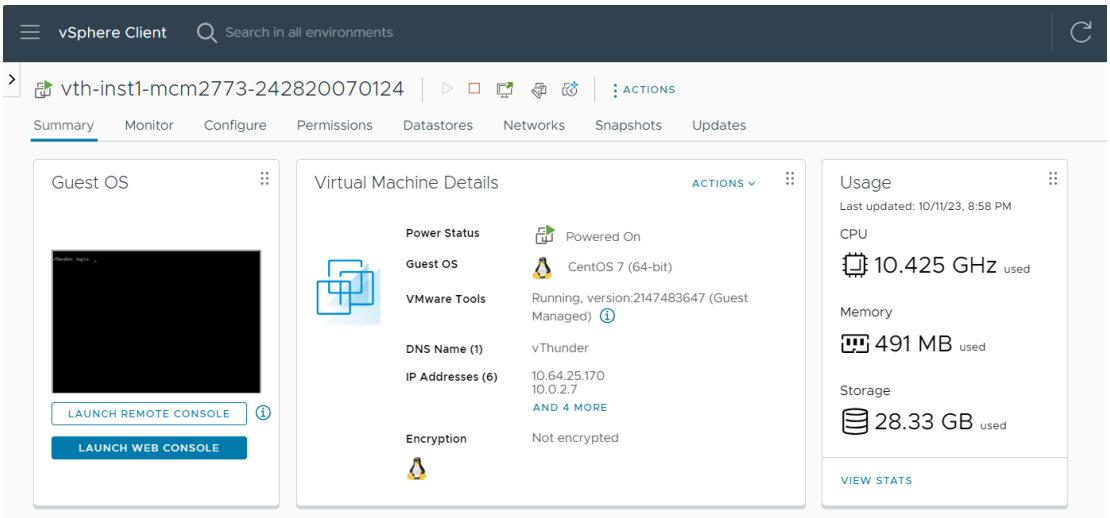
8. Enter or select the appropriate values in the **Deployment Type** fields:
   - Select **Create a new deployment** in the dropdown.
   - **Deployment Name**: Enter your VMware deployment name.
   - **Template Version**: Select the cloud template version.
   - **Description**: Provide description for the VMware deployment.

Figure 5 : Deployment Type window



9. Click **DEPLOY**
10. Go to **Resources** > **Deployments**, click the deployment name (3NIC-1VM-Template) provided during the deployment.
11. Wait till the deployment gets completed.
12. Once deployment gets successfully completed, login into VMware vSphere client and check created vThunder resource.

Figure 6 : vThunder instance



13. Click **Launch Web Console**.

14. Log in to vThunder and manually configure management public IP using below commands:

```
vThunder>en
Password:
vThunder#config
vThunder(config)#interface management
vThunder(config-if:management)#ip address 10.64.25.176 /24
vThunder(config-if:management)#ip default-gateway 10.64.25.1
vThunder(config-if:management)#write memory
Building configuration...
Write configuration to default primary startup-config
[OK]
vThunder(config-if:management)#
```

NOTE: The management public IP address and ethernet IP address are not configured automatically during the deployment. Hence, the management public IP address should be configured manually and the ethernet IP address will be configured with Basic Server Load Balancer script.

Access Thunder Virtual Machine

The Thunder virtual machine can be accessed using any of the following ways:

- Access vThunder using CLI
- Access vThunder using GUI

Create and Configure Server and Client Machine

This section applies only if you do not have a server and client machine already set up. If you haven't created the server and client machines yet, please refer to the provided link for instructions on how to set them up.

Create a Virtual Machine and Install Linux (vmware.com)

Configure Thunder

The following configurations can be applied to the deployed vThunder instance:

- Change Password
- A10 License
- SSL Certificate
- Basic Server Load Balancer
- Backend Autoscale

Verify Deployment

To verify vThunder deployment, perform the following steps:

1. Run the following command on the vThunder instance to verify SLB configuration:

```
vThunder(config)#show running-config
```

   If the deployment is successful with basic SLB, HTTP template, and Persist-cookie template configuration, the following output is displayed:

```
interface management
  ip address 10.64.25.176 255.255.255.0
  ip default-gateway 10.64.25.1
!
interface ethernet 1
  enable
  ip address 10.0.2.6 255.255.255.0
!
interface ethernet 2
  enable
  ip address 10.0.3.6 255.255.255.0
!
!
slb server server1 10.0.3.10
  port 53 udp
    health-check-disable
  port 80 tcp
    health-check-disable
  port 443 tcp
    health-check-disable
!
slb server server2 10.0.3.41
  port 53 udp
    health-check-disable
  port 80 tcp
    health-check-disable
  port 443 tcp
    health-check-disable
!
slb service-group sg443 tcp
  member server1 443
  member server2 443
!
slb service-group sg53 udp
  member server1 53
  member server2 53
!
```

```
slb service-group sg80 tcp
  member server1 80
  member server2 80
!
slb template persist cookie persist-cookie
  expire 60
  encrypt-level 0
  name a10-cookies
  match-type service-group
!
slb template http hostname-test
  host-switching contains s1 service-group sg80
!
slb template http url-test
  url-switching regex-match s1 service-group sg80
!
slb virtual-server vip 10.0.2.6
  port 53 udp
    source-nat auto
    service-group sg53
  port 80 http
    source-nat auto
    service-group sg80
    template persist cookie persist-cookie
    template http url-test
  port 443 https
    source-nat auto
    service-group sg443
    template persist cookie persist-cookie
    template http url-test
!
!
end
```

2. Run the following command on the vThunder instance to verify SSL configuration:

```
vThunder(config)#show pki cert
```

If the deployment is successful, the following SSL configuration is displayed:

```
Name    Type              Expiration  Status
 ---------------------------------------------------------------
 server certificate Jan 28 12:00:00 2028 GMT [Unexpired, Bound]
```

3. Run the following command on the vThunder instance to verify GLM configuration:

```
vThunder(config)#show license-info
```

If the GLM is successfully applied on vThunder, the following GLM configuration is displayed:

```
Host ID        : 5DCB01EC264BECCCFECB3C2ED42E02384EE8C527
 USB ID         : Not Available
 Billing Serials: A10f771cecbe0000
 Token        : A10f771cecbe
 Product        : ADC
 Platform       : vThunder
 Burst          : Disabled
 GLM Ping Interval In Hours : 24
 ---------------------------------------------------------------
 Enabled Licenses Expiry Date             Notes
 ---------------------------------------------------------------
 SLB  None
 CGN   None
 GSLB   None
 RC   None
 DAF   None
 WAF   None
 AAM   None
 FP   None
 WEBROOT   N/A      Requires an additional Webroot license.
 THREATSTOP   N/A         Requires an additional ThreatSTOP license.
 QOSMOS   N/A         Requires an additional QOSMOS license.
 WEBROOT_TI   N/A         Requires an additional Webroot Threat Intel
license.
 CYLANCE   N/A         Requires an additional Cylance license.
 IPSEC_VPN   N/A         Requires an additional IPsec VPN license.
 25 Mbps Bandwidth 21-December-2022
```

Verify Traffic Flow

To verify the traffic flow from client machine to server machine through vThunder instance, perform the following:

1. Select your client instance from the **Virtual machine** list.

   Here, **`vth-client`** is the client instance name.

2. SSH your client machine and run the following command to verify the traffic flow:

   ```
   curl <vThunder_instance_datain-nic_private_ip>
   ```

   Example

   ```
   curl 10.0.2.6
   ```

   Verify if a response is received from client server (For example: Apache Index page).

3. SSH your client machine and run the following command to verify the HTTP template traffic flow:

   ```
   curl <vThunder_instance_datain-nic_private_ip>:<port_number>/<host-match-string or url-match-string>/
   ```

   Example

   ```
   curl 10.0.2.6:80/s1/
   ```

   Verify if a response is received from client server (For example: Apache Index page).

4. SSH your client machine and run the following commands to verify the Persist cookie template traffic flow:

   a. Verify the current cookie configuration:

      ```
      curl --head <vThunder_instance_datain-nic_private_ip>
      ```

   b. Run the following commands to save the cookies in the **`cookie.txt`** file:

      ```
      curl -b cookie.txt -c cookie.txt <vThunder_instance_datain-nic_private_ip>
      cat cookie.txt
      ```

Example

```
curl --head 10.0.2.6
curl -b cookie.txt -c cookie.txt 10.0.2.6
cat cookie.txt
```

5. Run the following command on the vThunder instance to view the persistence load-balancing statistics:

```
vThunder(config)#show slb persist
```

If the deployment is successful, the following summary persistence statistics is displayed:

```
                                    Total
-----------------------------------------------
URL hash persist (pri)                0
URL hash persist (sec)                0
URL hash persist fail                 0
SRC IP persist ok                     0
SRC IP persist fail                   0
SRC IP hash persist(pri)              0
SRC IP hash persist(sec)              0
SRC IP hash persist fail              0
DST IP persist ok                     0
DST IP persist fail                   0
DST IP hash persist(pri)              0
DST IP hash persist(sec)              0
DST IP hash persist fail              0
SSL SID persist ok                    0
SSL SID persist fail                  0
Cookie persist ok                     1
Cookie persist fail                   0
Persist cookie not found              2
Persist cookie Pass-thru              0
Enforce higher priority               0
```

If the Persist-cookie configuration is successful, a value is displayed for the **`Cookie persist ok`** parameter else the value is 0.

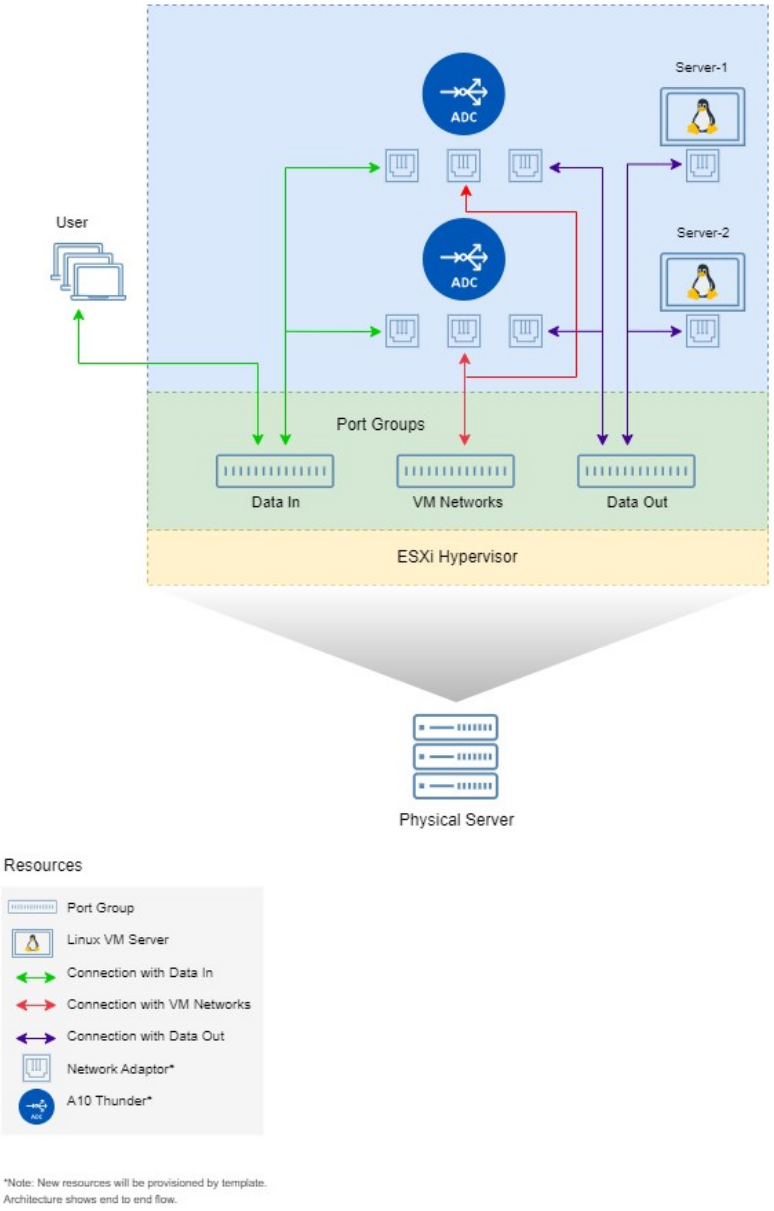
Thunder-3NIC-2VM-PVTVIP

This template creates two vThunder instances with HA setup and each vThunder has one management and two data NICs (data-in and data-out). It configures data-in network interface card (NIC) with Private IP on VIP.

If one instance goes down, other instance takes the request without any manual intervention.

For more information, see Create Thunder Virtual Machines.

Figure 7 : SLB Thunder ADC in High Availability mode with Private VIP



Additional Thunder configurations are available that can be applied as needed:

- Change Password
- A10 License
- SSL Certificate
- Basic Server Load Balancer
- High Availability
- Backend Autoscale

Various templates are available for different deployment needs.

For more information, see Deployment Templates.

The following topics are covered:

Create Thunder Virtual Machines

The A10-vThunder-3NIC-2VM template is used to create two Thunder virtual machines with three network interface cards each and configure the data-in network interface card with Private IP on VIP.

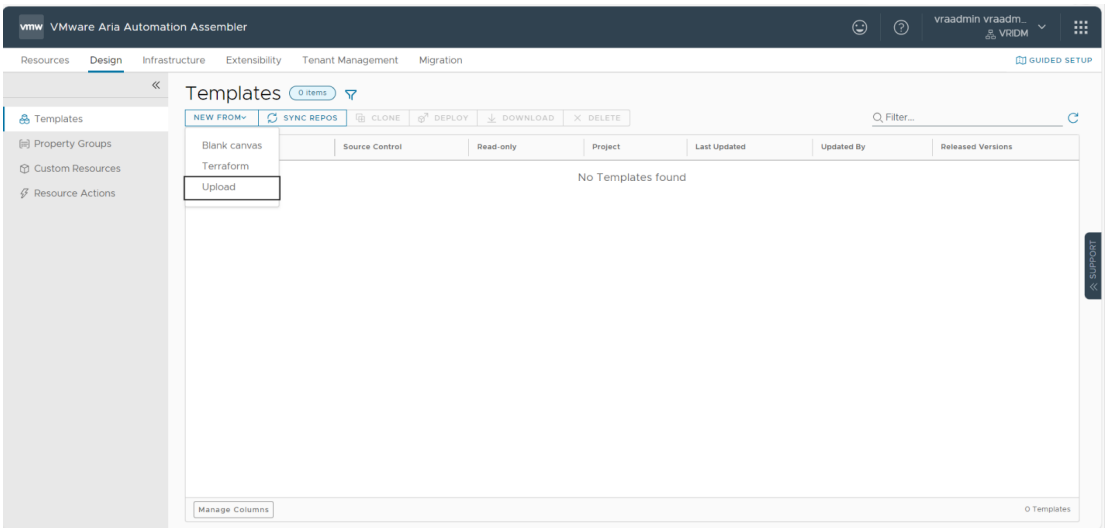
Before deploying this template, it is recommended to review the Prerequisites.

vThunder instances should have the same versions; otherwise, traffic flow will be disrupted.

To deploy the A10-vThunder-3NIC-2VM template using VMware Aria automation, perform the following steps:

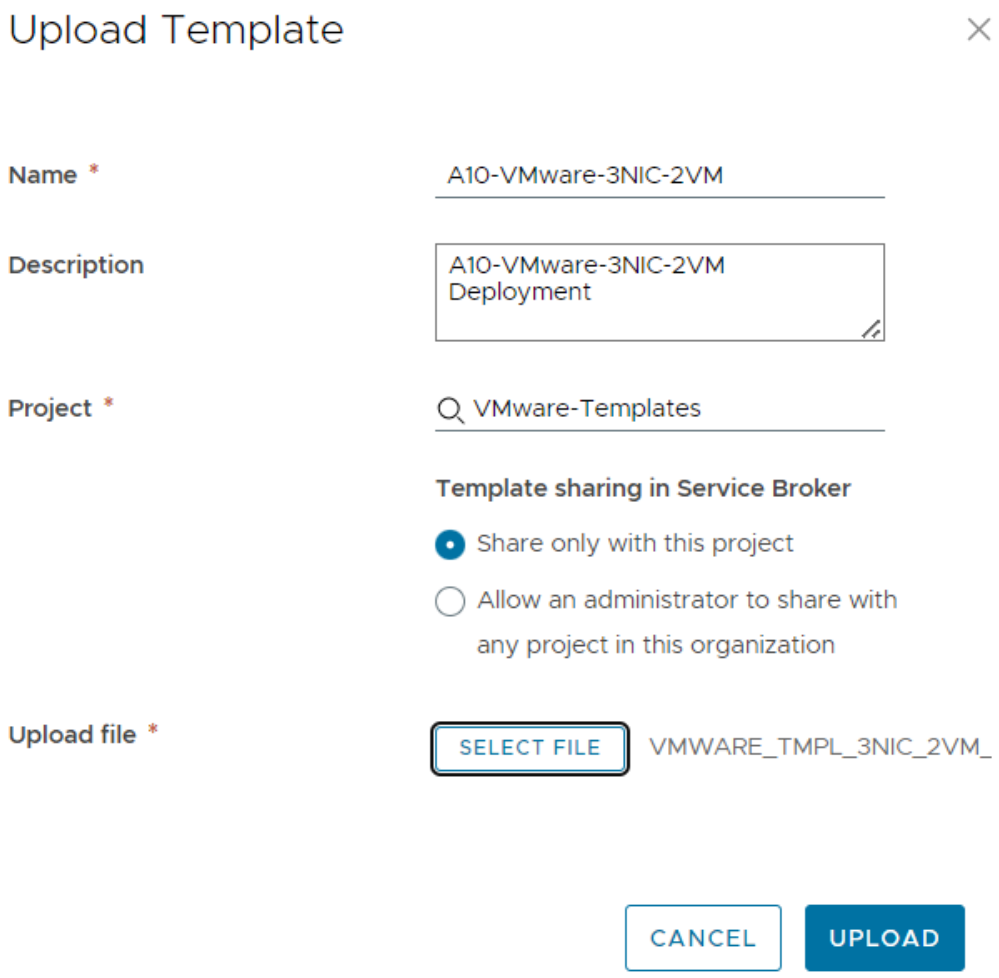
1. Download A10-vThunder-3NIC-2VM template.
2. Login VMware Aria Automation > **Services**, click **Assembler**.
3. From the **VMware Aria Automation Assembler** > **Design** > **Templates**, select **Upload** from **NEW FROM** dropdown window.

Figure 8 : VMware Aria Automation Assembler



4. Enter or select the appropriate values in the **Upload Template** fields:
   - **Name**: Enter your VMware Template name.
   - **Description**: Provide description for the VMware template.
   - **Project**: Select the available project.
   - **Upload file**: Select the **VMWARE_TMPL_3NIC_2VM.yaml** file.

Figure 9 : Upload Template window



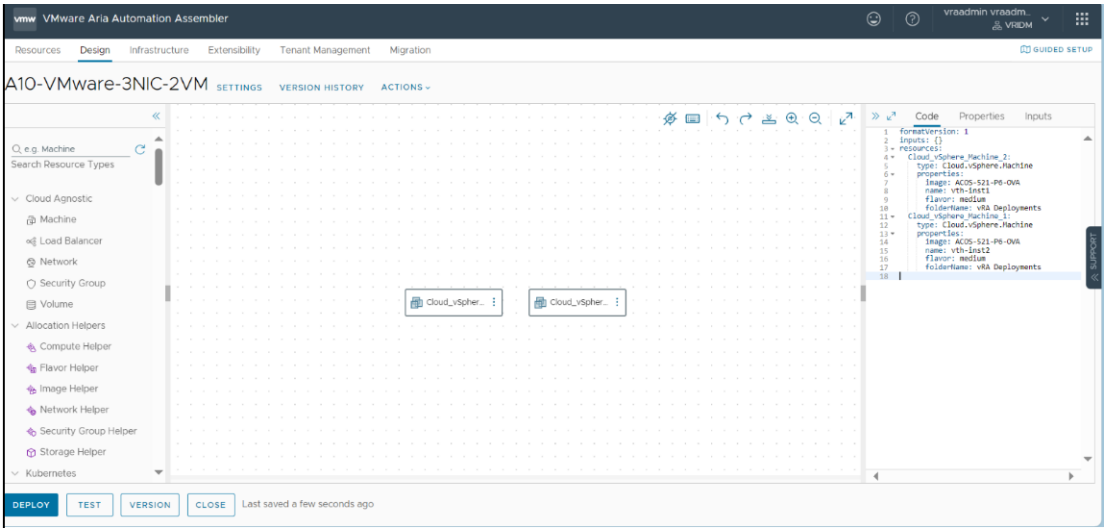
5. Click on **UPLOAD**.
6. After template gets successfully uploaded, click on upload template name and configure the following parameters as appropriate in editor window for both vThunder details:

Resource Name	Description
Virtual Machine	Specify a virtual machine name for vThunder. `name: vth-inst1`

Resource Name	Description
	`name: vth-inst2`
Size	Specify a suitable size for the vThunder instance that supports at least 3 NICs which is available in Flavor mappings. **`flavor: medium`**
Image	Specify the desired vThunder Image name which is available in Image mappings. **`image: ACOS-521-P6-OVA`**
Folder Name	Specify the folder name under which virtual machine to be created. `folderName: vRA Deployments`

7. Click **TEST** to validate the template. Once validation is successful then click **DEPLOY**.

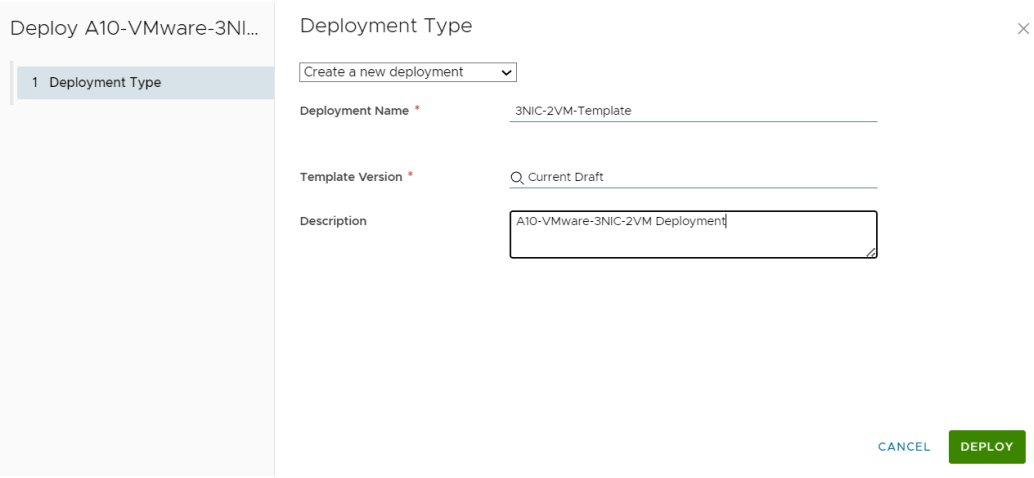
Figure 10 : Edit template window



8. Enter or select the appropriate values in the **Deployment Type** fields:
   - Select **Create a new deployment** in the dropdown.
   - **Deployment Name**: Enter your VMware deployment name.
   - **Template Version**: Select the cloud template version.

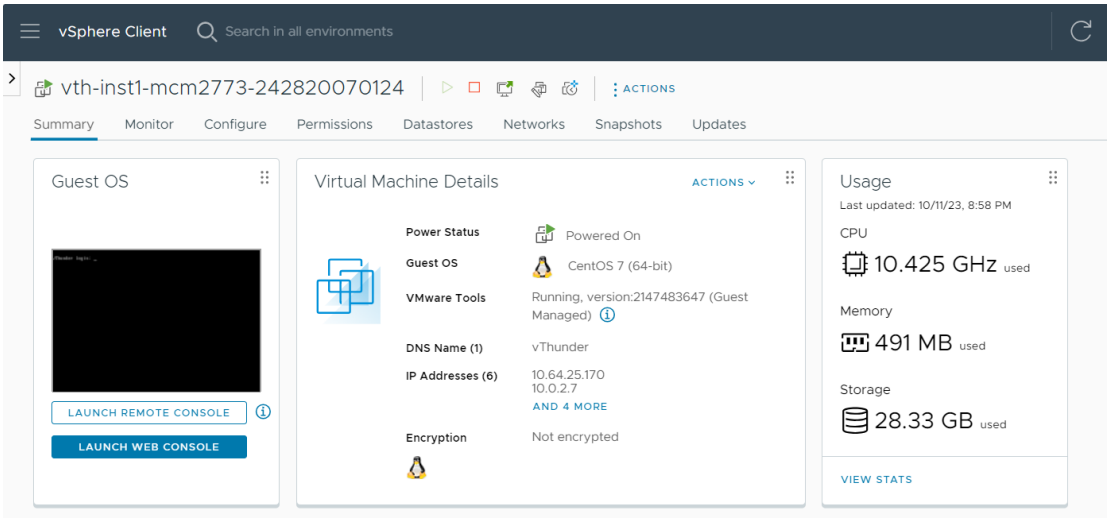
- **Description**: Provide description for the VMware deployment.

Figure 11 : Deployment Type window



9. Click **DEPLOY**.
10. Go to **Resources** > **Deployments**, click the deployment name (3NIC-2VM-Template) provided during the deployment.
11. Wait till the deployment gets completed.
12. Once deployment gets successfully completed, Log in to VMware vSphere client and check created vThunder resource.

Figure 12 : vThunder instance



13. Click **Launch Web Console**.

14. Log in to both vThunder and manually configure management public IP using below command:

    Active vThunder:

```
vThunder>en
Password:
vThunder#config
vThunder(config)#interface management
vThunder(config-if:management)#ip address 10.64.25.176 /24
vThunder(config-if:management)#ip default-gateway 10.64.25.1
vThunder(config-if:management)#write memory
Building configuration...
Write configuration to default primary startup-config
[OK]
vThunder(config-if:management)#
```

    Standby vThunder:

```
vThunder>en
Password:
vThunder#config
vThunder(config)#interface management
vThunder(config-if:management)#ip address 10.64.25.177 /24
vThunder(config-if:management)#ip default-gateway 10.64.25.1
vThunder(config-if:management)#write memory
Building configuration...
Write configuration to default primary startup-config
[OK]
vThunder(config-if:management)#
```

NOTE: The management public IP address and ethernet IP address are not configured automatically during the deployment. hence manually configuring management public IP address and ethernet IP address will get configured with Basic Server Load Balancer script.

Access Thunder Virtual Machine

The Thunder virtual machine can be accessed using any of the following ways:

- Access vThunder using CLI
- Access vThunder using GUI

Create and Configure Server and Client Machine

This section applies only if you do not have a server and client machine already set up. If you haven't created the server and client machines yet, please refer to the provided link for instructions on how to set them up.

Create a Virtual Machine and Install Linux (vmware.com)

Configure Thunder

The following configurations can be applied to the deployed vThunder instance:

- Change Password
- A10 License
- SSL Certificate
- Basic Server Load Balancer
- High Availability
- Backend Autoscale

Verify Deployment

To verify deployment using the VMware template, perform the following steps:

1. Run the following command on the active vThunder instance:
   ```
   vThunder-Active(config)#show running-config
   ```
   If the deployment is successful with basic SLB, HA, HTTP template, and Persist-cookie template configuration, the following output is displayed:

```
vrrp-a common
  device-id 1
  set-id 1
  enable
!
terminal idle-timeout 0
!
ip dns primary 8.8.8.8
!
interface management
  ip address 10.64.25.176 255.255.255.0
  ip default-gateway 10.64.25.1
!
interface ethernet 1
  enable
  ip address 10.0.2.7 255.255.255.0
!
interface ethernet 2
  enable
  ip address 10.0.3.20 255.255.255.0
!
vrrp-a vrid 0
  floating-ip 10.0.3.23
  blade-parameters
    priority 100
!
vrrp-a peer-group
  peer 10.0.2.7
  peer 10.0.2.8
!
ip route 0.0.0.0 /0 10.0.2.1
!
slb server server-ubuntu 10.0.3.10
  port 53 udp
    health-check-disable
  port 80 tcp
    health-check-disable
```

```
  port 443 tcp
    health-check-disable
!
slb service-group sg443 tcp
  health-check-disable
  member server-ubuntu 443
!
slb service-group sg53 udp
  health-check-disable
  member server-ubuntu 53
!
slb service-group sg80 tcp
  health-check-disable
  member server-ubuntu 80
!
slb template persist cookie persist-cookie
  expire 60
  encrypt-level 0
  name a10-cookies
  match-type service-group
!
slb template http hostname-test
  host-switching contains s1 service-group sg80
!
slb template http url-test
  url-switching regex-match s1 service-group sg80
!
slb virtual-server vip 10.0.2.16
  port 53 udp
    source-nat auto
    service-group sg53
  port 80 http
    source-nat auto
    service-group sg80
    template persist cookie persist-cookie
    template http url-test
  port 443 https
```

```
    source-nat auto
    service-group sg443
    template persist cookie persist-cookie
    template http url-test
!
!
end
```

2. Run the following command on active vThunder instance to verify the SSL Certificate configuration:

```
vThunder-Active(config)#show pki cert
```

If the deployment is successful, the following SSL configuration is displayed:

```
Name    Type              Expiration  Status
 ---------------------------------------------------------------
 server certificate Jan 28 12:00:00 2028 GMT [Unexpired, Bound]
```

3. Run the following command on active vThunder instance to verify the GLM License Provision configuration:

```
vThunder-Active(config)#show license-info
```

If the GLM is successfully applied on vThunder, the following GLM configuration is displayed:

```
Host ID         : 5DCB01EC264BECCCFECB3C2ED42E02384EE8C527
 USB ID          : Not Available
 Billing Serials: A10f771cecbe0000
 Token         : A10f771cecbe
 Product         : ADC
 Platform        : vThunder
 Burst           : Disabled
 GLM Ping Interval In Hours : 24
 ---------------------------------------------------------------
 Enabled Licenses Expiry Date              Notes
 ---------------------------------------------------------------
 SLB  None
 CGN   None
 GSLB   None
 RC   None
 DAF   None
 WAF   None
 AAM   None
 FP   None
 WEBROOT   N/A      Requires an additional Webroot license.
 THREATSTOP   N/A         Requires an additional ThreatSTOP license.
 QOSMOS   N/A         Requires an additional QOSMOS license.
 WEBROOT_TI   N/A         Requires an additional Webroot Threat Intel
license.
 CYLANCE   N/A         Requires an additional Cylance license.
 IPSEC_VPN   N/A         Requires an additional IPsec VPN license.
 25 Mbps Bandwidth 21-December-2022
```

4. Run the following command on the standby vThunder instance:

```
vThunder-Standby(config)#show running-config
```

If the deployment is successful with basic SLB, HA, HTTP template, and Persist-cookie template configuration, the following output is displayed:

```
vrrp-a common
  device-id 2
  set-id 1
  enable
!
terminal idle-timeout 0
!
ip dns primary 8.8.8.8
!
interface management
  ip address 10.64.25.177 255.255.255.0
  ip default-gateway 10.64.25.1
!
interface ethernet 1
  enable
  ip address 10.0.2.8 255.255.255.0
!
interface ethernet 2
  enable
  ip address 10.0.3.21 255.255.255.0
!
vrrp-a vrid 0
  floating-ip 10.0.3.23
  blade-parameters
    priority 100
!
vrrp-a peer-group
  peer 10.0.2.7
  peer 10.0.2.8
!
ip route 0.0.0.0 /0 10.0.2.1
!
slb server server-ubuntu 10.0.3.10
  port 53 udp
    health-check-disable
  port 80 tcp
    health-check-disable
```

```
  port 443 tcp
    health-check-disable
!
slb service-group sg443 tcp
  health-check-disable
  member server-ubuntu 443
!
slb service-group sg53 udp
  health-check-disable
  member server-ubuntu 53
!
slb service-group sg80 tcp
  health-check-disable
  member server-ubuntu 80
!
slb template persist cookie persist-cookie
  expire 60
  encrypt-level 0
  name a10-cookies
  match-type service-group
!
slb template http hostname-test
  host-switching contains s1 service-group sg80
!
slb template http url-test
  url-switching regex-match s1 service-group sg80
!
slb virtual-server vip 10.0.2.16
  port 53 udp
    source-nat auto
    service-group sg53
  port 80 http
    source-nat auto
    service-group sg80
    template persist cookie persist-cookie
    template http url-test
  port 443 https
```

```
    source-nat auto
    service-group sg443
    template persist cookie persist-cookie
    template http url-test
!
!
end
```

5. Run the following command to force stop the active vThunder instance and make the standby vThunder instance as active device:

```
vThunder-Active(config)#vrrp-a force-self-standby enable
vThunder-ForcedStandby(config)#
```

6. Run the following command to disable the active standby vThunder instance:

```
vThunder-ForcedStandby(config)#vrrp-a force-self-standby disable
vThunder-Active(config)#
```

Verify Traffic Flow

To verify the traffic flow from client machine to server machine via vThunder, perform the following:

1. SSH your client machine and run the following command using the copied VIP address to verify the traffic flow:

   ```
   curl <vThunder_instance_datain-nic_private_vip>
   ```

   Example

   ```
   curl 10.0.2.16
   ```

   Verify if a response is received.

2. After the switchover, vThunder instance 2 is active, copy the VIP address of the vThunder instance 2.
3. SSH your client machine and run the following command to verify the traffic flow:

   ```
   curl <vThunder_instance_datain-nic_private_vip>
   ```

   Example

   ```
   curl 10.0.2.16
   ```

   Verify if a response is received.

4. SSH your client machine and run the following command to verify the HTTP template traffic flow:

   ```
   curl <vThunder_instance_datain-nic_private_vip>:<port_number>/<host-match-string or url-match-string>/
   ```

   Example

   ```
   curl 10.0.2.16:80/s1/
   ```

   Verify if a response is received from client server (For example: Apache Index page).

5. SSH your client machine and run the following commands to verify the Persist cookie template traffic flow:

a. Verify the current cookie configuration:

```
curl --head <vThunder_instance_datain-nic_private_ip>
```

b. Run the following commands to save the cookies in the **cookie.txt** file:

```
curl -b cookie.txt -c cookie.txt <vThunder_instance_datain-nic_
private_ip>
cat cookie.txt
```

Example

```
curl --head 10.0.2.16
curl -b cookie.txt -c cookie.txt 10.0.2.16
cat cookie.txt
```

6. Run the following command on the active vThunder instance to view the persistence load-balancing statistics:

```
vThunder(config)#show slb persist
```

If the deployment is successful, the following summary persistence statistics is displayed:

```
                                        Total
-----------------------------------------------
URL hash persist (pri)                    0
URL hash persist (sec)                    0
URL hash persist fail                     0
SRC IP persist ok                         0
SRC IP persist fail                       0
SRC IP hash persist(pri)                  0
SRC IP hash persist(sec)                  0
SRC IP hash persist fail                  0
DST IP persist ok                         0
DST IP persist fail                       0
DST IP hash persist(pri)                  0
DST IP hash persist(sec)                  0
DST IP hash persist fail                  0
SSL SID persist ok                        0
SSL SID persist fail                      0
Cookie persist ok                         1
Cookie persist fail                       0
Persist cookie not found                  2
Persist cookie Pass-thru                  0
Enforce higher priority                   0
```

If the Persist-cookie configuration is successful, a value is displayed for the **`Cookie persist ok`** else the value is 0.

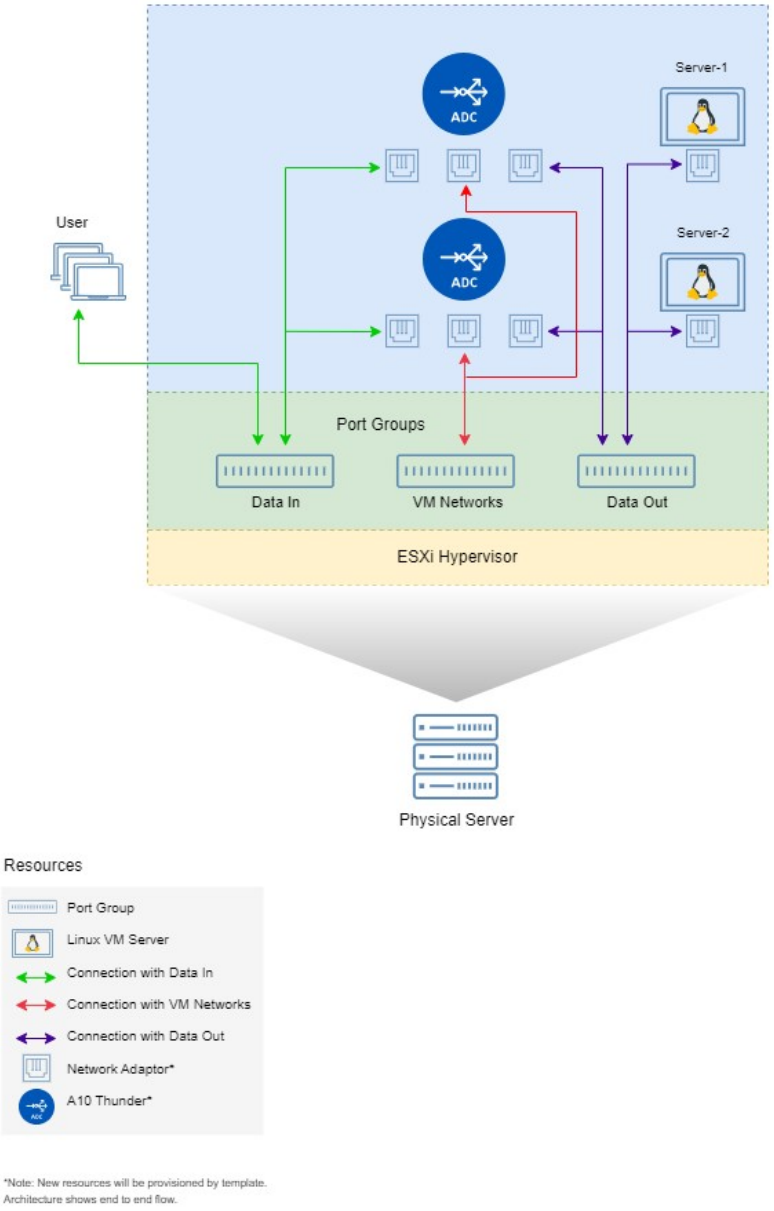
Thunder-3NIC-2VM-PUBVIP

This template creates two vThunder instances with HA setup and each vThunder has one management and two data NICs (data-in and data-out). It configures data-in network interface card (NIC) with Public IP on VIP.

High availability can be configured within the same or different availability zone within a same region. If one instance goes down, other instance takes the request without any manual intervention.

For more information, see Create Thunder Virtual Machines.

Figure 13 : SLB Thunder ADC in High Availability mode with Public VIP



Additional Thunder configurations are available that can be applied as needed:

- Change Password
- A10 License
- SSL Certificate
- Basic Server Load Balancer
- High Availability
- Backend Autoscale

Various templates are available for different deployment needs.

For more information, see Deployment Templates.

The following topics are covered:

Create Thunder Virtual Machines

The A10-vThunder-3NIC-2VM template is used to create two Thunder virtual machines with three network interface cards each and configure the data-in network interface card with Public IP on VIP.

vThunder management and Data-IN interfaces should be public interface to get traffic response on Public VIP.

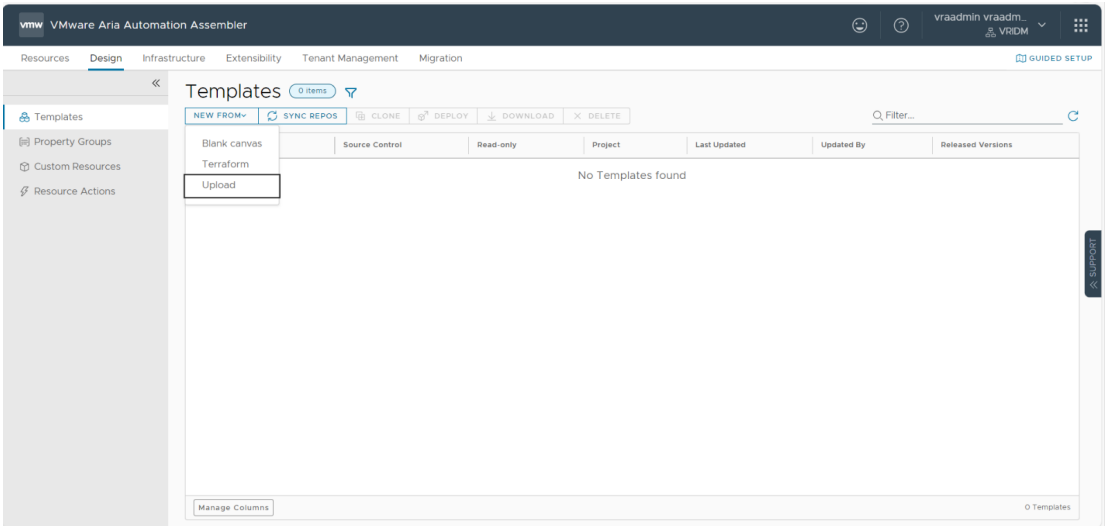
Before deploying this template, it is recommended to review the Prerequisites.

vThunder instances should have the same versions; otherwise, traffic flow will be disrupted.

To deploy the A10-vThunder-3NIC-2VM template using VMware Aria automation, perform the following steps:

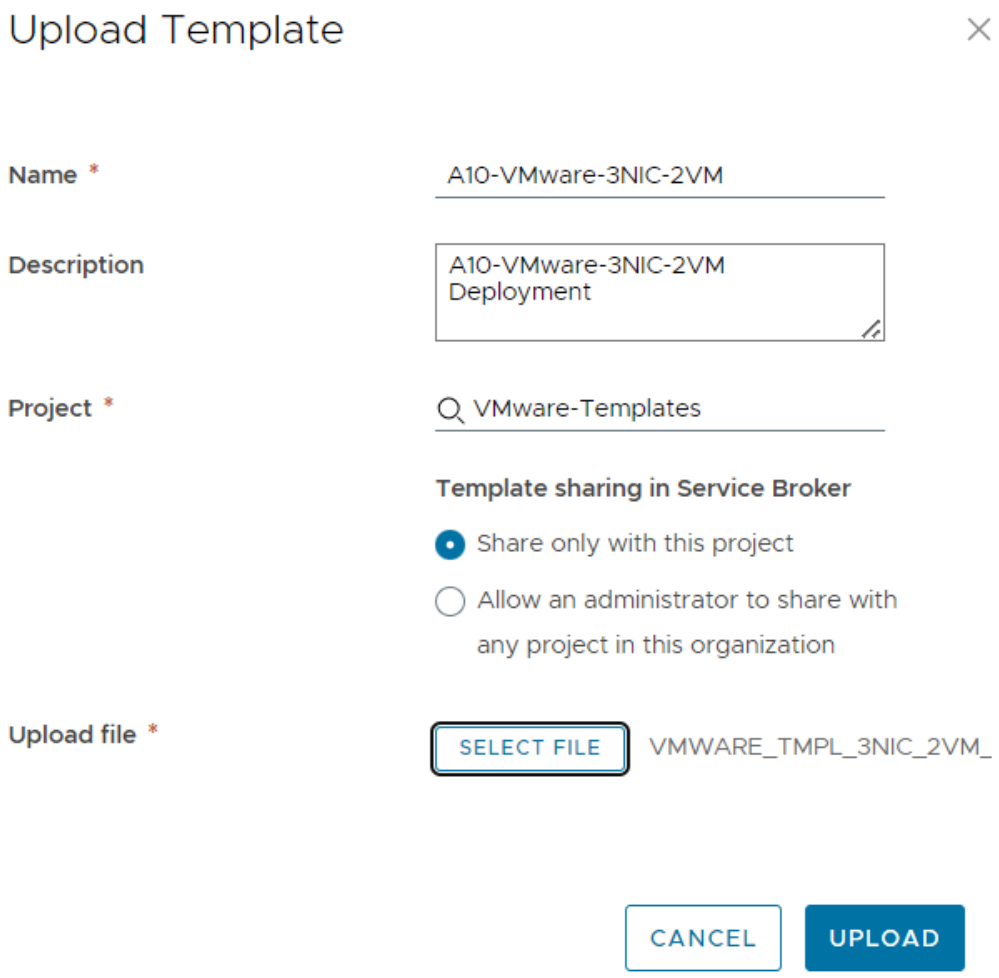
1. Download A10-vThunder-3NIC-2VM template.
2. Login VMware Aria Automation > **Services**, click **Assembler**.
3. From the **VMware Aria Automation Assembler** > **Design** > **Templates**, select **Upload** from **NEW FROM** dropdown window.

   Figure 14 : VMware Aria Automation Assembler



4. Enter or select the appropriate values in the **Upload Template** fields:
   - **Name**: Enter your VMware Template name.
   - **Description**: Provide description for the VMware template.
   - **Project**: Select the available project.
   - **Upload file**: Select the **VMWARE_TMPL_3NIC_2VM.yaml** file.

Figure 15 : Upload Template window



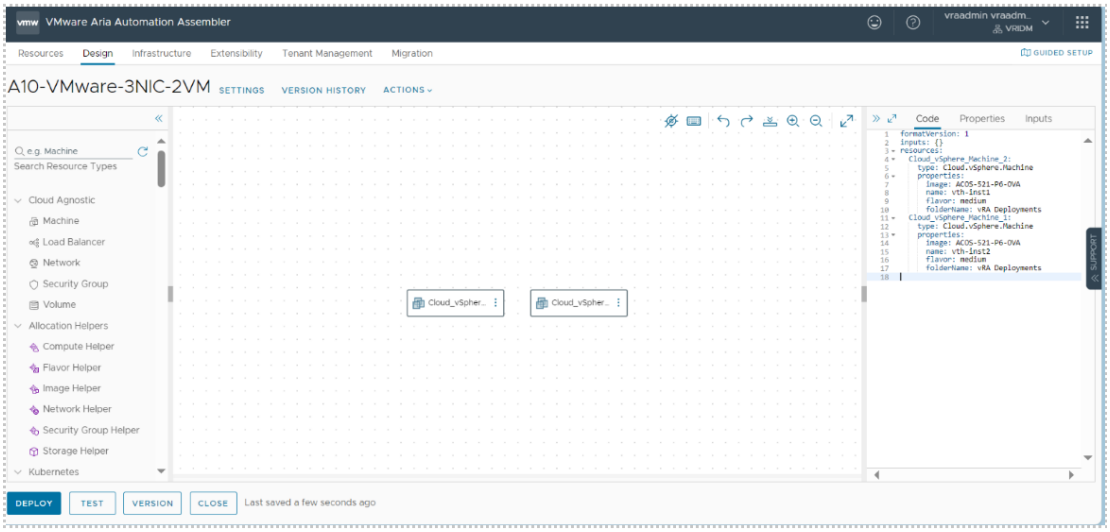
5. Click **UPLOAD**.
6. After template gets successfully uploaded, click on upload template name and configure the following parameters as appropriate in editor window for both vThunder details:

Resource Name	Description
Virtual Machine	Specify a virtual machine name for vThunder. `name: vth-inst1`

Resource Name	Description
	`name: vth-inst2`
Size	Specify a suitable size for the vThunder instance that supports at least 3 NICs which is available in Flavor mappings. **`flavor: medium`**
Image	Specify the desired vThunder Image name which is available in Image mappings. **`image: ACOS-521-P6-OVA`**
Folder Name	Specify the folder name under which virtual machine to be created. `folderName: vRA Deployments`

7. Click **TEST** to validate the template. Once validation is successful then click **DEPLOY**.

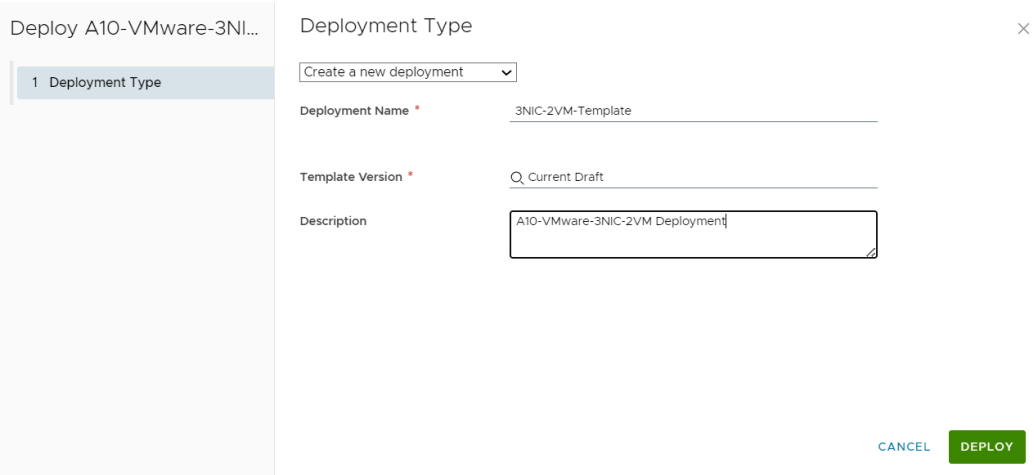
Figure 16 : Edit template window



8. Enter or select the appropriate values in the **Deployment Type** fields:
   - Select **Create a new deployment** in the dropdown.
   - **Deployment Name**: Enter your VMware deployment name.
   - **Template Version**: Select the cloud template version.

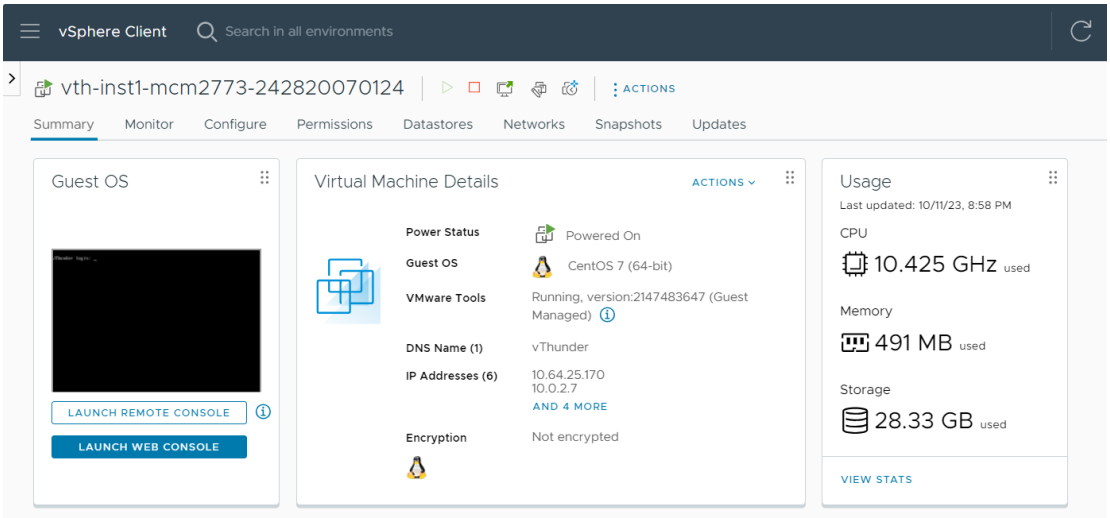
- **Description**: Provide description for the VMware deployment.

Figure 17 : Deployment Type window



9. Click **DEPLOY**.
10. Go to **Resources** > **Deployments**, click the deployment name (3NIC-2VM-Template) provided during the deployment.
11. Wait till the deployment gets completed.
12. Once deployment gets successfully completed, login into VMware vSphere client and check created vThunder resource.

Figure 18 : vThunder instance



13. Click **Launch Web Console**.

14. Log in to both vThunder and manually configure management public IP using below command:

    Active vThunder:

```
vThunder>en
Password:
vThunder#config
vThunder(config)#interface management
vThunder(config-if:management)#ip address 10.64.25.176 /24
vThunder(config-if:management)#ip default-gateway 10.64.25.1
vThunder(config-if:management)#write memory
Building configuration...
Write configuration to default primary startup-config
[OK]
vThunder(config-if:management)#
```

    Standby vThunder:

```
vThunder>en
Password:
vThunder#config
vThunder(config)#interface management
vThunder(config-if:management)#ip address 10.64.25.177 /24
vThunder(config-if:management)#ip default-gateway 10.64.25.1
vThunder(config-if:management)#write memory
Building configuration...
Write configuration to default primary startup-config
[OK]
vThunder(config-if:management)#
```

NOTE: The management public IP address and ethernet IP address are not configured automatically during the deployment. hence manually configure management public IP address and ethernet IP address will get configured with Basic Server Load Balancer script.

Access Thunder Virtual Machine

The Thunder virtual machine can be accessed using any of the following ways:

- Access vThunder using CLI
- Access vThunder using GUI

Create and Configure Server and Client Machine

This section applies only if you do not have a server and client machine already set up. If you haven't created the server and client machines yet, please refer to the provided link for instructions on how to set them up.

Create a Virtual Machine and Install Linux (vmware.com)

Configure Thunder

The following configurations can be applied to the deployed vThunder instance:

- Change Password
- A10 License
- SSL Certificate
- Basic Server Load Balancer
- High Availability
- Backend Autoscale

Verify Deployment

To verify deployment using the VMware template, perform the following steps:

1. Run the following command on the active vThunder instance:
   ```
   vThunder-Active(config)#show running-config
   ```
   If the deployment is successful with basic SLB, HA, HTTP template, and Persist-cookie template configuration, the following output is displayed:

```
vrrp-a common
  device-id 1
  set-id 1
  enable
!
terminal idle-timeout 0
!
ip dns primary 8.8.8.8
!
interface management
  ip address 10.64.25.176 255.255.255.0
  ip default-gateway 10.64.25.1
!
interface ethernet 1
  enable
  ip address 10.64.25.140 255.255.255.0
!
interface ethernet 2
  enable
  ip address 10.0.3.20 255.255.255.0
!
vrrp-a vrid 0
  floating-ip 10.0.3.23
  blade-parameters
    priority 100
!
vrrp-a peer-group
  peer 10.64.25.140
  peer 10.64.25.142
!
ip route 0.0.0.0 /0 10.64.25.1
!
slb server server-ubuntu 10.0.3.10
  port 53 udp
    health-check-disable
  port 80 tcp
    health-check-disable
```

```
  port 443 tcp
    health-check-disable
!
slb service-group sg443 tcp
  health-check-disable
  member server-ubuntu 443
!
slb service-group sg53 udp
  health-check-disable
  member server-ubuntu 53
!
slb service-group sg80 tcp
  health-check-disable
  member server-ubuntu 80
!
slb template persist cookie persist-cookie
  expire 60
  encrypt-level 0
  name a10-cookies
  match-type service-group
!
slb template http hostname-test
  host-switching contains s1 service-group sg80
!
slb template http url-test
  url-switching regex-match s1 service-group sg80
!
slb virtual-server vip 10.64.25.141
  port 53 udp
    source-nat auto
    service-group sg53
  port 80 http
    source-nat auto
    service-group sg80
    template persist cookie persist-cookie
    template http url-test
  port 443 https
```

```
    source-nat auto
    service-group sg443
    template persist cookie persist-cookie
    template http url-test
!
!
end
```

2. Run the following command on active vThunder instance to verify the SSL Certificate configuration:

```
vThunder-Active(config)#show pki cert
```

If the deployment is successful, the following SSL configuration is displayed:

```
Name    Type              Expiration  Status
 ---------------------------------------------------------------
 server certificate Jan 28 12:00:00 2028 GMT [Unexpired, Bound]
```

3. Run the following command on active vThunder instance to verify the GLM License Provision configuration:

```
vThunder-Active(config)#show license-info
```

If the GLM is successfully applied on vThunder, the following GLM configuration is displayed:

```
Host ID         : 5DCB01EC264BECCCFECB3C2ED42E02384EE8C527
 USB ID          : Not Available
 Billing Serials: A10f771cecbe0000
 Token         : A10f771cecbe
 Product         : ADC
 Platform        : vThunder
 Burst           : Disabled
 GLM Ping Interval In Hours : 24
 ---------------------------------------------------------------
 Enabled Licenses Expiry Date              Notes
 ---------------------------------------------------------------
 SLB  None
 CGN   None
 GSLB   None
 RC   None
 DAF   None
 WAF   None
 AAM   None
 FP   None
 WEBROOT   N/A      Requires an additional Webroot license.
 THREATSTOP   N/A         Requires an additional ThreatSTOP license.
 QOSMOS   N/A         Requires an additional QOSMOS license.
 WEBROOT_TI   N/A         Requires an additional Webroot Threat Intel
license.
 CYLANCE   N/A         Requires an additional Cylance license.
 IPSEC_VPN   N/A         Requires an additional IPsec VPN license.
 25 Mbps Bandwidth 21-December-2022
```

4. Run the following command on the standby vThunder instance:

```
vThunder-Standby(config)#show running-config
```

If the deployment is successful with basic SLB, HA, HTTP template, and Persist-cookie template configuration, the following output is displayed:

```
vrrp-a common
  device-id 2
  set-id 1
  enable
!
terminal idle-timeout 0
!
ip dns primary 8.8.8.8
!
interface management
  ip address 10.64.25.177 255.255.255.0
  ip default-gateway 10.64.25.1
!
interface ethernet 1
  enable
  ip address 10.64.25.142 255.255.255.0
!
interface ethernet 2
  enable
  ip address 10.0.3.21 255.255.255.0
!
vrrp-a vrid 0
  floating-ip 10.0.3.23
  blade-parameters
    priority 100
!
vrrp-a peer-group
  peer 10.64.25.140
  peer 10.64.25.142
!
ip route 0.0.0.0 /0 10.64.25.1
!
slb server server-ubuntu 10.0.3.10
  port 53 udp
    health-check-disable
  port 80 tcp
    health-check-disable
```

```
  port 443 tcp
    health-check-disable
!
slb service-group sg443 tcp
  health-check-disable
  member server-ubuntu 443
!
slb service-group sg53 udp
  health-check-disable
  member server-ubuntu 53
!
slb service-group sg80 tcp
  health-check-disable
  member server-ubuntu 80
!
slb template persist cookie persist-cookie
  expire 60
  encrypt-level 0
  name a10-cookies
  match-type service-group
!
slb template http hostname-test
  host-switching contains s1 service-group sg80
!
slb template http url-test
  url-switching regex-match s1 service-group sg80
!
slb virtual-server vip 10.64.25.141
  port 53 udp
    source-nat auto
    service-group sg53
  port 80 http
    source-nat auto
    service-group sg80
    template persist cookie persist-cookie
    template http url-test
  port 443 https
```

```
    source-nat auto
    service-group sg443
    template persist cookie persist-cookie
    template http url-test
!
!
end
```

5. Run the following command to force stop the active vThunder instance and make the standby vThunder instance as active device:

```
vThunder-Active(config)#vrrp-a force-self-standby enable
vThunder-ForcedStandby(config)#
```

6. Run the following command to disable the active standby vThunder instance:

```
vThunder-ForcedStandby(config)#vrrp-a force-self-standby disable
vThunder-Active(config)#
```

Verify Traffic Flow

To verify the traffic flow from client machine to server machine via vThunder, perform the following:

1. SSH your client machine and run the following command using the copied VIP address to verify the traffic flow:

```
curl <vThunder_instance_datain-nic_public_vip>
```

Example

```
curl 10.64.25.141
```

Verify if a response is received.

2. After the switchover, vThunder instance 2 is active, copy the VIP address of the vThunder instance 2.
3. SSH your client machine and run the following command to verify the traffic flow:

```
curl <vThunder_instance_datain-nic_public vip>
```

Example

```
curl 10.64.25.141
```

Verify if a response is received.

4. SSH your client machine and run the following command to verify the HTTP template traffic flow:

```
curl <vThunder_instance_datain-nic_public_vip>:<port_number>/<host-match-string or url-match-string>/
```

Example

```
curl 10.64.25.141:80/s1/
```

Verify if a response is received from client server (For example: Apache Index page).

5. SSH your client machine and run the following commands to verify the Persist cookie template traffic flow:

   a. Verify the current cookie configuration:

   ```
   curl --head <vThunder_instance_datain-nic_public_ip>
   ```

   b. Run the following commands to save the cookies in the **cookie.txt** file:

   ```
   curl -b cookie.txt -c cookie.txt <vThunder_instance_datain-nic_public_ip>
   cat cookie.txt
   ```

   Example

   ```
   curl --head 10.64.25.141
   curl -b cookie.txt -c cookie.txt 10.64.25.141
   cat cookie.txt
   ```

6. Run the following command on the active vThunder instance to view the persistence load-balancing statistics:

```
vThunder(config)#show slb persist
```

If the deployment is successful, the following summary persistence statistics is displayed:

```
                                        Total
-----------------------------------------------
URL hash persist (pri)                    0
URL hash persist (sec)                    0
URL hash persist fail                     0
SRC IP persist ok                         0
SRC IP persist fail                       0
SRC IP hash persist(pri)                  0
SRC IP hash persist(sec)                  0
SRC IP hash persist fail                  0
DST IP persist ok                         0
DST IP persist fail                       0
DST IP hash persist(pri)                  0
DST IP hash persist(sec)                  0
DST IP hash persist fail                  0
SSL SID persist ok                        0
SSL SID persist fail                      0
Cookie persist ok                         1
Cookie persist fail                       0
Persist cookie not found                  2
Persist cookie Pass-thru                  0
Enforce higher priority                   0
```

If the Persist-cookie configuration is successful, a value is displayed for the **`Cookie persist ok`** else the value is 0.

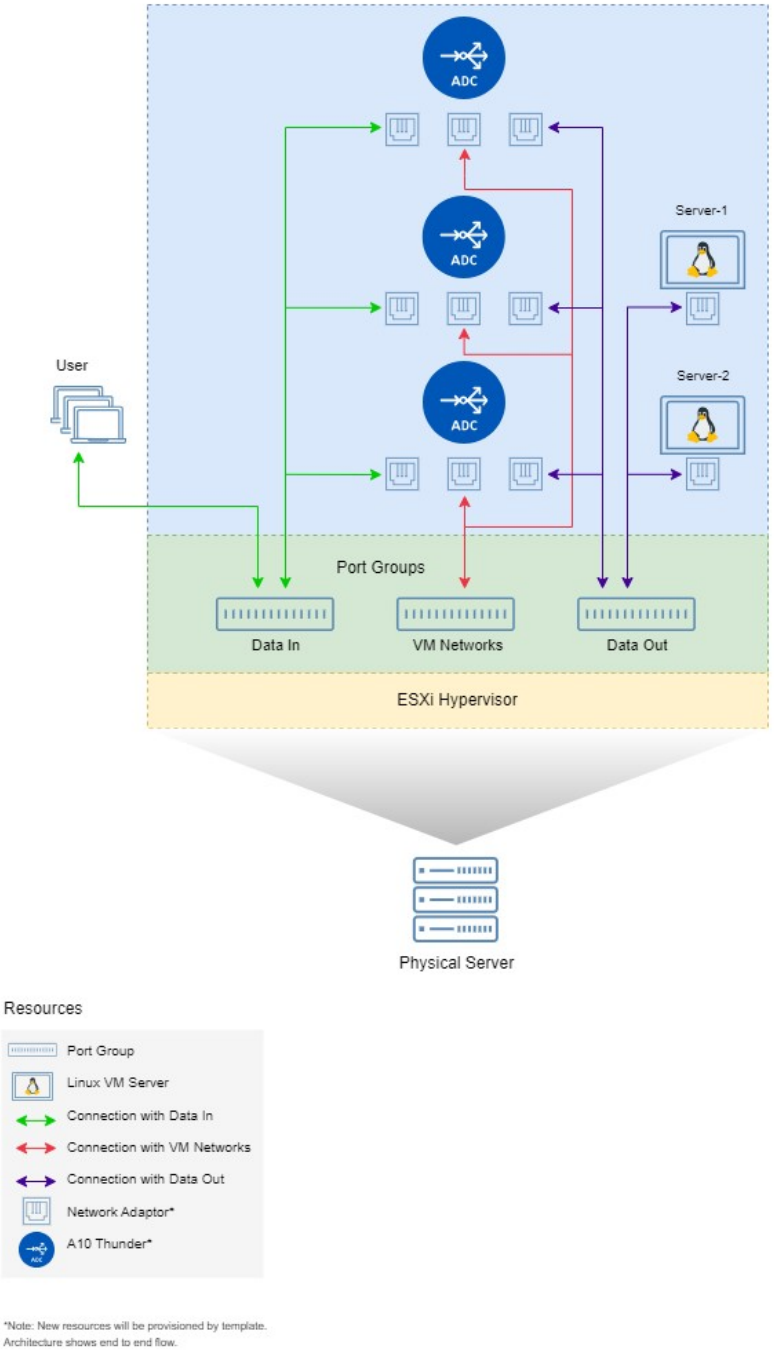
Thunder-3NIC-3VM

This template creates three new virtual machine with pre-loaded Thunder instance in the same region and zone and attaches three new network interface cards (NICs). These three vThunder instances are referred as Master Controller (Active), Site1 and Site2. Same template can be used to install identical number of resources in another region. The three vThunder instances in another region are referred as Member Controller, Site1 and Site2.

This template is used to setup disaster recovery site in a cross-region or hybrid cloud environment.

For more information, see Create Thunder Virtual Machines.

Figure 19 : Thunder ADC with GSLB



Additional Thunder configurations are available that can be applied as needed:

- Change Password
- A10 License
- SSL Certificate
- Hybrid Cloud GSLB

Various templates are available for different deployment needs.

For more information, see Deployment Templates.

The following topics are covered:

Create Thunder Virtual Machines

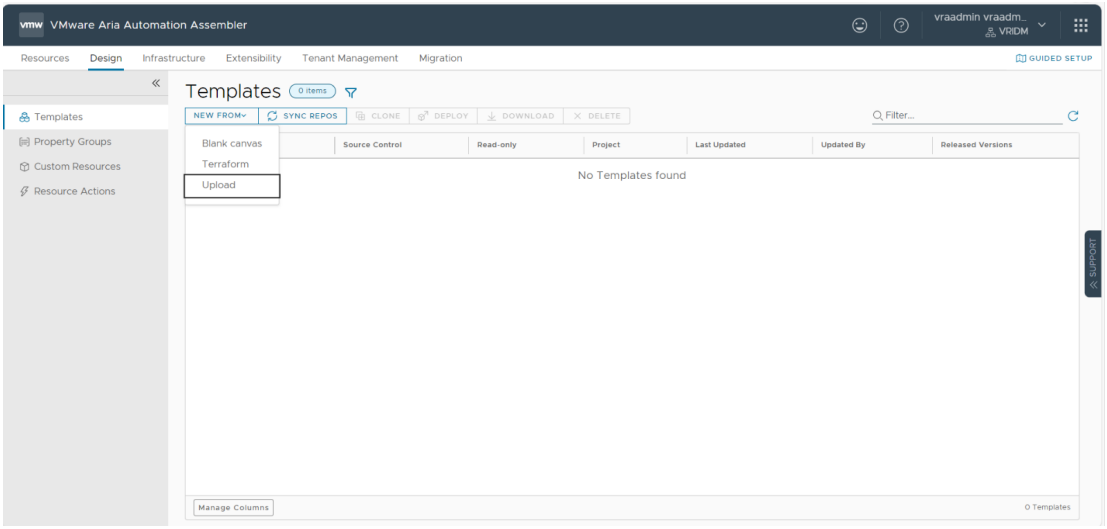
The A10-vThunder-3NIC-3VM template is used to create three Thunder virtual machines with three network interface cards each.

Before deploying this template, it is recommended to review the Prerequisites.

To deploy the A10-vThunder-3NIC-3VM template using VMware Aria automation, perform the following steps:

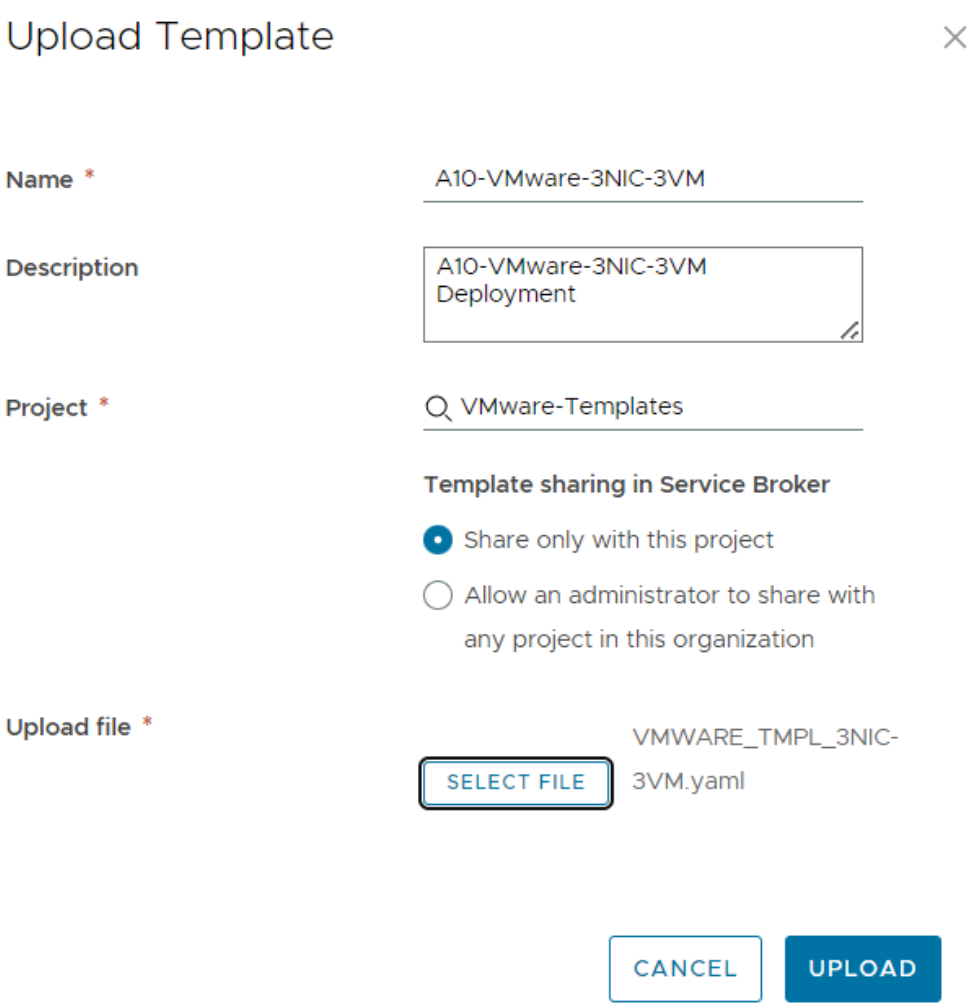
1. Download A10-vThunder-3NIC-3VM template.
2. Login VMware Aria Automation > **Services**, click **Assembler**.
3. From the **VMware Aria Automation Assembler** > **Design** > **Templates**, select **Upload** from **NEW FROM** dropdown window.

Figure 20 : VMware Aria Automation Assembler



4. Enter or select the appropriate values in the **Upload Template** fields:
   - **Name**: Enter your VMware Template name.
   - **Description**: Provide description for the VMware template.
   - **Project**: Select the available project.
   - **Upload file**: Select the **VMWARE_TMPL_3NIC_3VM.yaml** file.

Figure 21 : Upload Template window



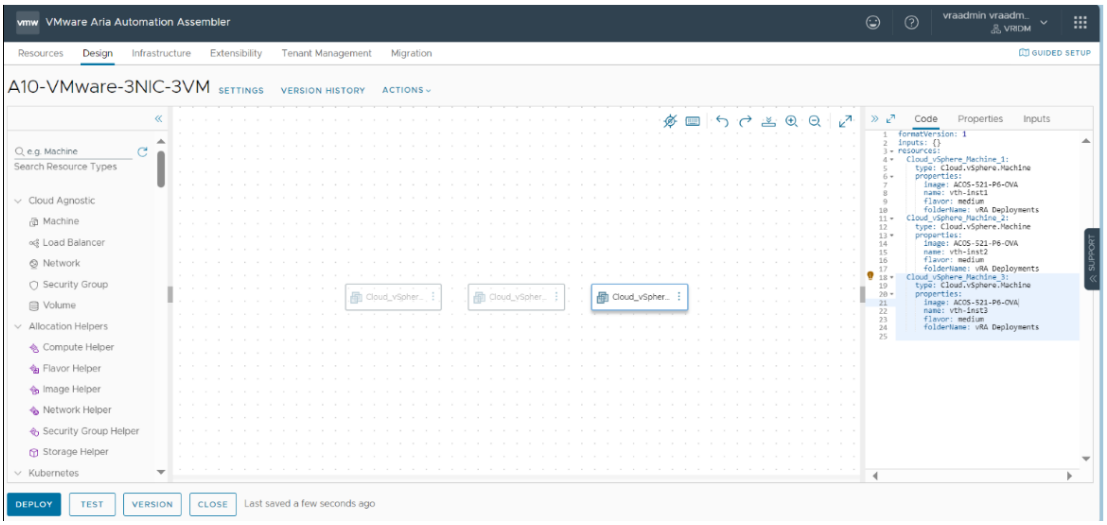
5. Click **UPLOAD**.
6. After template gets successfully uploaded, click on upload template name and configure the following parameters as appropriate in editor window for all three vThunders:

Resource Name	Description
Virtual Machine	Specify a virtual machine name for vThunder. `name: vth-inst1`

Resource Name	Description
	`name: vth-inst2` `name: vth-inst3`
Size	Specify a suitable size for the vThunder instance that supports at least 3 NICs which is available in Flavor mappings. `flavor: medium`
Image	Specify the desired vThunder Image name which is available in Image mappings. `image: ACOS-521-P6-OVA`
Folder Name	Specify the folder name under which virtual machine to be created. `folderName: vRA Deployments`

7. Click **TEST** to validate the template. Once validation is successful then click **DEPLOY**.

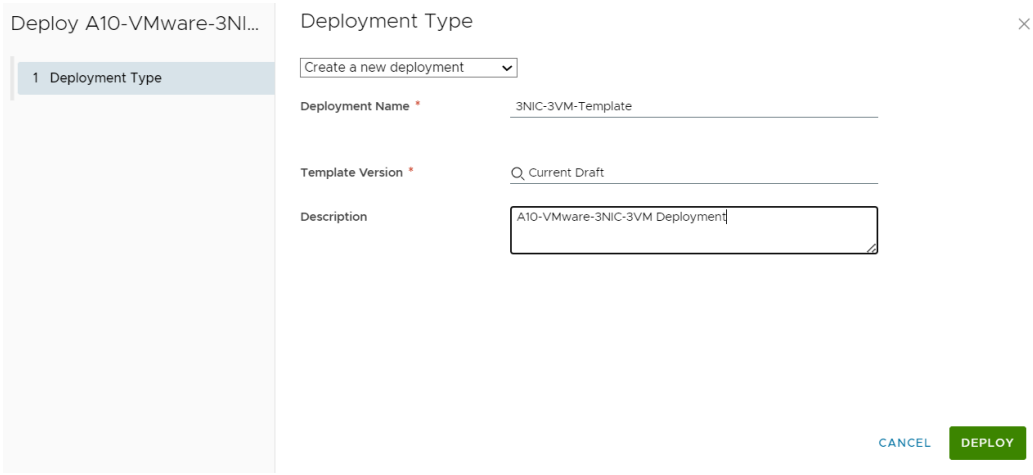
Figure 22 : Edit template window



8. Enter or select the appropriate values in the **Deployment Type** fields:
   - Select **Create a new deployment** in the dropdown.
   - **Deployment Name**: Enter your VMware deployment name.

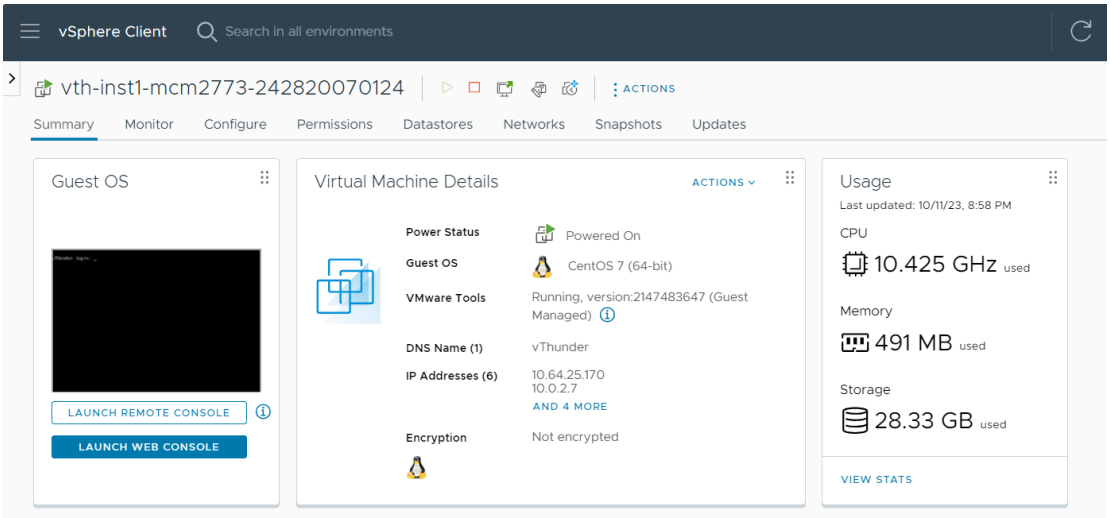
- **Template Version**: Select the cloud template version.
- **Description**: Provide description for the VMware deployment.

Figure 23 : Deployment Type window



9. Click **DEPLOY**.
10. Go to **Resources** > **Deployments**, click the deployment name (3NIC-3VM-Template) provided during the deployment.
11. Wait till the deployment gets completed.
12. Once deployment gets successfully completed, login into VMware vSphere client and check created vThunder resource.

Figure 24 : vThunder instance



13. Click **Launch Web Console**.

14. Log in to vThunder and manually configure management public IP using below command:

vth-inst1:

```
vThunder>en
Password:
vThunder#config
vThunder(config)#interface management
vThunder(config-if:management)#ip address 10.64.25.176 /24
vThunder(config-if:management)#ip default-gateway 10.64.25.1
vThunder(config-if:management)#write memory
Building configuration...
Write configuration to default primary startup-config
[OK]
vThunder(config-if:management)#
```

vth-inst2:

```
vThunder>en
Password:
vThunder#config
vThunder(config)#interface management
vThunder(config-if:management)#ip address 10.64.25.177 /24
vThunder(config-if:management)#ip default-gateway 10.64.25.1
vThunder(config-if:management)#write memory
Building configuration...
Write configuration to default primary startup-config
[OK]
vThunder(config-if:management)#
```

vth-inst3:

```
vThunder>en
Password:
vThunder#config
vThunder(config)#interface management
vThunder(config-if:management)#ip address 10.64.25.178 /24
vThunder(config-if:management)#ip default-gateway 10.64.25.1
vThunder(config-if:management)#write memory
Building configuration...
Write configuration to default primary startup-config
[OK]
vThunder(config-if:management)#
```

NOTE: The management public IP address and ethernet IP address are not configured automatically during the deployment. hence manually configuring management public IP address and ethernet IP address will get configured with Basic Server Load Balancer script/ Hybrid Cloud GSLB Script.

Access Thunder Virtual Machine

The Thunder virtual machine can be accessed using any of the following ways:

- Access vThunder using CLI
- Access vThunder using GUI

Create and Configure Server and Client Machine

This section applies only if you do not have a server and client machine already set up. If you haven't created the server and client machines yet, please refer to the provided link for instructions on how to set them up.

Create a Virtual Machine and Install Linux (vmware.com)

Configure Thunder

The following configurations can be applied to the deployed vThunder instance:

- Change Password
- A10 License
- SSL Certificate
- Hybrid Cloud GSLB

Verify Deployment

To verify ARM template deployment using CLI, perform the following steps:

1. Verify SLB configuration on the following vThunder instances:

   CONTROLLER 1 - Master configuration

   Run the following command:

   ```
   vThunder-gslb:Master(config)(NOLICENSE)#show running-config
   ```

   If the deployment is successful, the following controller and site configuration is displayed on vThunder master controller:

```
no system geo-location load iana
system geo-location load GeoLite2-City
!
!
interface management
  ip address 10.64.25.176 255.255.255.0
  ip default-gateway 10.64.25.1
!
interface ethernet 1
  enable
  ip address 10.0.2.20 255.255.255.0
!
interface ethernet 2
  enable
  ip address 10.0.3.20 255.255.255.0
!
!
ip route 0.0.0.0 /0 10.0.2.1
!
slb virtual-server gslb-server 10.64.25.165
  port 53 udp
    gslb-enable
!
gslb service-ip vs1 10.0.2.9
  external-ip 10.64.25.161
  port 80 tcp
!
gslb service-ip vs2 10.0.2.10
  external-ip 10.64.25.162
  port 80 tcp
!
gslb service-ip vs3 10.0.2.15
  external-ip 10.64.25.163
  port 80 tcp
!
gslb service-ip vs4 10.0.2.16
  external-ip 10.64.25.164
```

```
  port 80 tcp
!
gslb group default
  enable
  priority 255
!
gslb site eastus_1
  geo-location "North America,United States"
  slb-dev slb1 10.64.25.177
    vip-server vs1
!
gslb site eastus_2
  geo-location "North America,United States"
  slb-dev slb2 10.64.25.178
    vip-server vs2
!
gslb site eastus2_1
  geo-location "North America.United States.California.San Jose"
  slb-dev slb3 10.64.25.180
    vip-server vs3
!
gslb site eastus2_2
  geo-location "North America.United States.California.San Jose"
  slb-dev slb4 10.64.25.181
    vip-server vs4
!
gslb policy a10
  metric-order health-check geographic
  dns server authoritative
!
gslb zone gslb.a10.com
  policy a10
  service 80 www
    dns-a-record vs1 static
    dns-a-record vs2 static
    dns-a-record vs3 static
    dns-a-record vs4 static
```

```
!
gslb protocol status-interval 1
!
gslb protocol enable controller
!
!
end
```

CONTROLLER 2 - Member configuration

Run the following command:

```
vThunder-gslb:Member(config)(NOLICENSE)#show running-config
```

If the deployment is successful, the following controller and site configuration is displayed on vThunder member controller:

```
 interface management
!
interface management
  ip address 10.64.25.179 255.255.255.0
  ip default-gateway 10.64.25.1
!
interface ethernet 1
  enable
  ip address 10.0.2.30 255.255.255.0
!
interface ethernet 2
  enable
  ip address 10.0.3.30 255.255.255.0
!
!
ip route 0.0.0.0 /0 10.0.2.1
!
slb virtual-server gslb-server 10.64.25.166
  port 53 udp
    gslb-enable
!
gslb service-ip vs1 10.0.2.9
  external-ip 10.64.25.161
  port 80 tcp
!
gslb service-ip vs2 10.0.2.10
  external-ip 10.64.25.162
  port 80 tcp
!
gslb service-ip vs3 10.0.2.15
  external-ip 10.64.25.163
  port 80 tcp
!
gslb service-ip vs4 10.0.2.16
  external-ip 10.64.25.164
  port 80 tcp
!
```

```
gslb group default
  enable
  primary 10.64.25.176
!
gslb site eastus_1
  geo-location "North America,United States"
  slb-dev slb1 10.64.25.177
    vip-server vs1
!
gslb site eastus_2
  geo-location "North America,United States"
  slb-dev slb2 10.64.25.178
    vip-server vs2
!
gslb site eastus2_1
  geo-location "North America.United States.California.San Jose"
  slb-dev slb3 10.64.25.180
    vip-server vs3
!
gslb site eastus2_2
  geo-location "North America.United States.California.San Jose"
  slb-dev slb4 10.64.25.181
    vip-server vs4
!
gslb policy a10
  metric-order health-check geographic
  dns server authoritative
!
gslb zone gslb.a10.com
  policy a10
  service 80 www
    dns-a-record vs1 static
    dns-a-record vs2 static
    dns-a-record vs3 static
    dns-a-record vs4 static
!
gslb protocol status-interval 1
```

```
!
gslb protocol enable controller
!
!
end!
```

SITE1 REGION1 configuration

Run the following command:

```
vThunder(config)(NOLICENSE)#show running-config
```

If the deployment is successful, the following controller and site configuration is displayed on vThunder site1 region1:

```
interface management
  ip address 10.64.25.177 255.255.255.0
  ip default-gateway 10.64.25.1
!
interface ethernet 1
  enable
  ip address 10.0.2.31 255.255.255.0
!
interface ethernet 2
  enable
  ip address 10.0.3.32 255.255.255.0
 !
 ip route 0.0.0.0 /0 10.0.2.1
 !
 slb server vth-server1 10.0.3.9
   health-check disable
   port 80 tcp
 health-check disable
 !
 slb service-group sg tcp
   member vth-server1 80
 !
 slb virtual-server vs1 10.0.2.9
   port 80 tcp
     source-nat auto
     service-group sg
 !
 !
 gslb protocol enable device
 !
!
```

SITE2 REGION1 configuration

Run the following command:

```
vThunder(config)(NOLICENSE)#show running-config
```

If the deployment is successful, the following controller and site configuration is displayed on vThunder site1 region2:

```
interface management
  ip address 10.64.25.178 255.255.255.0
  ip default-gateway 10.64.25.1
!
interface ethernet 1
  enable
  ip address 10.0.2.34 255.255.255.0
!
interface ethernet 2
  enable
  ip address 10.0.3.34 255.255.255.0
 !
 ip route 0.0.0.0 /0 10.0.2.1
 !
 slb server vth-server1 10.0.3.10
   health-check disable
   port 80 tcp
 health-check disable
 !
 slb service-group sg tcp
   member vth-server1 80
 !
 slb virtual-server vs1 10.0.2.10
   port 80 tcp
     source-nat auto
     service-group sg
 !
 !
 gslb protocol enable device
 !
!
```

SITE1 REGION2 configuration

Run the following command:

```
vThunder(config)(NOLICENSE)#show running-config
```

If the deployment is successful, the following controller and site configuration is displayed on vThunder site1 region2:

```
interface management
  ip address 10.64.25.180 255.255.255.0
  ip default-gateway 10.64.25.1
!
interface ethernet 1
  enable
  ip address 10.0.2.35 255.255.255.0
!
interface ethernet 2
  enable
  ip address 10.0.3.35 255.255.255.0
 !
 ip route 0.0.0.0 /0 10.0.2.1
 !
 slb server vth-server1 10.0.3.11
   health-check disable
   port 80 tcp
 health-check disable
 !
 slb service-group sg tcp
   member vth-server1 80
 !
 slb virtual-server vs1 10.0.2.15
   port 80 tcp
     source-nat auto
     service-group sg
 !
 !
 gslb protocol enable device
 !
!
```

SITE2 REGION2 configuration

Run the following command:

```
vThunder(config)(NOLICENSE)#show running-config
```

If the deployment is successful, the following controller and site configuration is displayed on vThunder site2 region2:

```
interface management
  ip address 10.64.25.181 255.255.255.0
  ip default-gateway 10.64.25.1
!
interface ethernet 1
  enable
  ip address 10.0.2.36 255.255.255.0
!
interface ethernet 2
  enable
  ip address 10.0.3.37 255.255.255.0
 !
 ip route 0.0.0.0 /0 10.0.2.1
 !
 slb server vth-server1 10.0.3.12
   health-check disable
   port 80 tcp
 health-check disable
 !
 slb service-group sg tcp
   member vth-server1 80
 !
 slb virtual-server vs1 10.0.2.16
   port 80 tcp
     source-nat auto
     service-group sg
 !
 !
 gslb protocol enable device
 !!
 gslb protocol enable device
```

2. Verify the GSLB group information on the following vThunder instances:

   CONTROLLER - Master configuration

   Run the following command:

```
vThunder-gslb:Master(config)(NOLICENSE)#show gslb group
```

   If the deployment is successful, the following configuration is displayed:

```
                       Pri = Priority, Attrs = Attributes
                      S-Cfg = Secure Config
                      S-State = Secure Status
                          D = Disabled, L = Learn
                          P = Passive, * = Master
                          E = Enabled, EF = Enable-Fallback
                          Unsec = Unsecure, Unkwn = Unknown
                          Estng = Establishing, Estd = Established
Group: default, Master: local
Member                          Sys-ID   Pri Attrs  Status      S-Cfg
S-State Address
-------------------------------------------------------------------------
---------------------------
local                           c14da456 255 L*     OK
vThunder                        f5fba456 100 PL     Synced      D
Unsec   10.64.25.179
```

   CONTROLLER - Member configuration

   Run the following command:

```
vThunder-gslb:Member(config)(NOLICENSE)#show gslb group
```

   If the deployment is successful, the following configuration is displayed:

```
                      Pri = Priority, Attrs = Attributes
                    S-Cfg = Secure Config
                    S-State = Secure Status
                        D = Disabled, L = Learn
                        P = Passive, * = Master
                        E = Enabled, EF = Enable-Fallback
                        Unsec = Unsecure, Unkwn = Unknown
                        Estng = Establishing, Estd = Established
Group: default, Master: vThunder
Member                          Sys-ID    Pri Attrs  Status      S-Cfg
S-State Address
-------------------------------------------------------------------------
---------
local                           f5fba456  100 L      OK
vThunder                        c14da456  255 L*     Synced      D
Unsec   10.64.25.176
```

3. Verify the GSLB protocol information on the following vThunder instances:

   CONTROLLER - Master configuration

   Run the following command:

```
vThunder-gslb:Master(config)(NOLICENSE)#show gslb protocol
```

   If the deployment is successful, the following configuration is displayed:

```
GSLB site: eastus_1
   SLB device: slb1 (10.64.25.176:17244) Established
  Session ID:    2869
  Secure Config:                      Disable |Current SSL State:
 Unsecure
  Connection succeeded:                     1 |Connection failed:
 1
  Open packet sent:                         1 |Open packet received:
 1
  Open session succeeded:                   1 |Open session failed:
 0
  Sessions Dropped:                         0 |Update packet received:
 7346
  Keepalive packet sent:                  123 |Keepalive packet
received:                    122
  Notify packet sent:                       0 |Notify packet received:
 0
  Message Header Error:                     0 |Protocol RDT(ms):
 40
  GSLB Protocol Version:                    2 |Peer ACOS Version:
 5.2.0 Build 155
  Secure negotiation Success:               0 |Secure negotiation
Failures:                    0
  SSL handshake Success:                    0 |SSL handshake Failures:
 0

 GSLB site: eastus_2
   SLB device: slb2 (10.64.25.176:9478) Established
  Session ID:    7186
  Secure Config:                      Disable |Current SSL State:
 Unsecure
  Connection succeeded:                     1 |Connection failed:
 1
  Open packet sent:                         1 |Open packet received:
 1
  Open session succeeded:                   1 |Open session failed:
 0
  Sessions Dropped:                         0 |Update packet received:
```

```
 7344
  Keepalive packet sent:                 123 |Keepalive packet
received:                    122
  Notify packet sent:                      0 |Notify packet received:
 0
  Message Header Error:                    0 |Protocol RDT(ms):
 32
  GSLB Protocol Version:                   2 |Peer ACOS Version:
 5.2.0 Build 155
  Secure negotiation Success:              0 |Secure negotiation
Failures:                    0
  SSL handshake Success:                   0 |SSL handshake Failures:
 0

 GSLB site: eastus2_1
   SLB device: slb3 (10.64.25.176:7604) Established
  Session ID:    1353
  Secure Config:                     Disable |Current SSL State:
 Unsecure
  Connection succeeded:                    1 |Connection failed:
 0
  Open packet sent:                        1 |Open packet received:
 1
  Open session succeeded:                  1 |Open session failed:
 0
  Sessions Dropped:                        0 |Update packet received:
 7346
  Keepalive packet sent:                 123 |Keepalive packet
received:                    122
  Notify packet sent:                      0 |Notify packet received:
 0
  Message Header Error:                    0 |Protocol RDT(ms):
 20
  GSLB Protocol Version:                   2 |Peer ACOS Version:
 5.2.0 Build 155
  Secure negotiation Success:              0 |Secure negotiation
Failures:                    0
  SSL handshake Success:                   0 |SSL handshake Failures:
```

```
0

GSLB site: eastus2_2
  SLB device: slb4 (10.64.25.181:7604) Established
 Session ID:    46932
 Secure Config:                      Disable |Current SSL State:
Unsecure
 Connection succeeded:                     1 |Connection failed:
0
 Open packet sent:                         1 |Open packet received:
1
 Open session succeeded:                   1 |Open session failed:
0
 Sessions Dropped:                         0 |Update packet received:
7348
 Keepalive packet sent:                  124 |Keepalive packet
received:                    123
 Notify packet sent:                       0 |Notify packet received:
0
 Message Header Error:                     0 |Protocol RDT(ms):
20
 GSLB Protocol Version:                    2 |Peer ACOS Version:
5.2.0 Build 155
 Secure negotiation Success:               0 |Secure negotiation
Failures:                    0
 SSL handshake Success:                    0 |SSL handshake Failures:
0

GSLB protocol is disabled for site devices.
```

CONTROLLER - Member configuration

Run the following command on vThunder to verify the GSLB protocol information:

```
vThunder-gslb:Member(config)(NOLICENSE)#show gslb protocol
```

If the deployment is successful, the following configuration is displayed:

```
GSLB site: eastus_1
  SLB device: slb1 (0.0.0.0:0) GroupControl
 Session ID:    Not Available
 Secure Config:                          None |Current SSL State:
 None
 Connection succeeded:                      0 |Connection failed:
 0
 Open packet sent:                          0 |Open packet received:
 0
 Open session succeeded:                    0 |Open session failed:
 0
 Sessions Dropped:                          0 |Update packet received:
 0
 Keepalive packet sent:                     0 |Keepalive packet received:
 0
 Notify packet sent:                        0 |Notify packet received:
 0
 Message Header Error:                      0 |Protocol RDT(ms):
 0
 GSLB Protocol Version:                     2
 Secure negotiation Success:                0 |Secure negotiation
Failures:                    0
 SSL handshake Success:                     0 |SSL handshake Failures:
 0

GSLB site: eastus_2
  SLB device: slb2 (0.0.0.0:0) GroupControl
 Session ID:    Not Available
 Secure Config:                          None |Current SSL State:
 None
 Connection succeeded:                      0 |Connection failed:
 0
 Open packet sent:                          0 |Open packet received:
 0
 Open session succeeded:                    0 |Open session failed:
 0
 Sessions Dropped:                          0 |Update packet received:
```

```
 0
 Keepalive packet sent:                    0 |Keepalive packet received:
 0
 Notify packet sent:                       0 |Notify packet received:
 0
 Message Header Error:                     0 |Protocol RDT(ms):
 0
 GSLB Protocol Version:                    2
 Secure negotiation Success:               0 |Secure negotiation
Failures:                    0
 SSL handshake Success:                    0 |SSL handshake Failures:
 0

GSLB site: eastus2_1
  SLB device: slb3 (0.0.0.0:0) GroupControl
 Session ID:    Not Available
 Secure Config:                          None |Current SSL State:
 None
 Connection succeeded:                     0 |Connection failed:
 0
 Open packet sent:                         0 |Open packet received:
 0
 Open session succeeded:                   0 |Open session failed:
 0
 Sessions Dropped:                         0 |Update packet received:
 0
 Keepalive packet sent:                    0 |Keepalive packet received:
 0
 Notify packet sent:                       0 |Notify packet received:
 0
 Message Header Error:                     0 |Protocol RDT(ms):
 0
 GSLB Protocol Version:                    2
 Secure negotiation Success:               0 |Secure negotiation
Failures:                    0
 SSL handshake Success:                    0 |SSL handshake Failures:
 0
```

```
GSLB site: eastus2_2
  SLB device: slb4 (0.0.0.0:0) GroupControl
 Session ID:    Not Available
 Secure Config:                          None |Current SSL State:
 None
 Connection succeeded:                      0 |Connection failed:
 0
 Open packet sent:                          0 |Open packet received:
 0
 Open session succeeded:                    0 |Open session failed:
 0
 Sessions Dropped:                          0 |Update packet received:
 0
 Keepalive packet sent:                     0 |Keepalive packet received:
 0
 Notify packet sent:                        0 |Notify packet received:
 0
 Message Header Error:                      0 |Protocol RDT(ms):
 0
 GSLB Protocol Version:                     2
 Secure negotiation Success:                0 |Secure negotiation
Failures:                    0
 SSL handshake Success:                     0 |SSL handshake Failures:
 0

 GSLB protocol is disabled for site devices.
```

Verify Traffic Flow

The traffic flow can be tested using the following:

- DNS Lookup
- WGET

DNS Lookup

To verify the traffic flow from via vThunder, perform the following:

1. Perform a DNS lookup on client machine using the master controller's client-side data interface public IP in the following command:

```
$ dig @master_controller_data_secondary_public_IP  www.gslb.a10.com
```

The following response is received:

```
$ dig @10.64.25.165 www.gslb.a10.com
 ; <<>> DiG 9.11.4-P2-RedHat-9.11.4-26.P2.el7_9.8 <<>> @10.64.25.165
www.gslb.a10.com
 ; (1 server found)
 ;; global options: +cmd
 ;; Got answer:
 ;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 11393
 ;; flags: qr rd; QUERY: 1, ANSWER: 4, AUTHORITY: 0, ADDITIONAL: 1
 ;; WARNING: recursion requested but not available

 ;; OPT PSEUDOSECTION:
 ; EDNS: version: 0, flags:; udp: 1400
 ;; QUESTION SECTION:
 ;www.gslb.a10.com.              IN      A

 ;; ANSWER SECTION:
 www.gslb.a10.com.       10      IN      A       10.64.25.161
 www.gslb.a10.com.       10      IN      A       10.64.25.162
 www.gslb.a10.com.       10      IN      A       10.64.25.163
 www.gslb.a10.com.       10      IN      A       10.64.25.164

 ;; Query time: 82 msec
 ;; SERVER: 10.64.25.165#53(10.64.25.165)
 ;; WHEN: Wed Aug 31 00:11:40 PDT 2022
 ;; MSG SIZE  rcvd: 125
```

2. Stop the site1 of region1 and then perform the DNS lookup again.

```
$ dig @10.64.25.165 www.gslb.a10.com
; <<>> DiG 9.11.4-P2-RedHat-9.11.4-26.P2.el7_9.8 <<>> @10.64.25.165
www.gslb.a10.com
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 11393
;; flags: qr rd; QUERY: 1, ANSWER: 4, AUTHORITY: 0, ADDITIONAL: 1
;; WARNING: recursion requested but not available

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1400
;; QUESTION SECTION:
;www.gslb.a10.com.              IN      A

;; ANSWER SECTION:
www.gslb.a10.com.       10      IN      A       10.64.25.162
www.gslb.a10.com.       10      IN      A       10.64.25.163
www.gslb.a10.com.       10      IN      A       10.64.25.164
www.gslb.a10.com.       10      IN      A       10.64.25.161

;; Query time: 82 msec
;; SERVER: 10.64.25.165#53(10.64.25.165)
;; WHEN: Wed Aug 31 00:11:46 PDT 2022
;; MSG SIZE  rcvd: 125
```

The response is received with shuffled server IP addresses.

WGET

To verify the traffic flow on the load balancer, perform the following:

1. Run the following command in the Terminal window of the server1 of region1 instance to create an Apache Server virtual machine:

```
$ sudo apt install apache2
```

While the Apache server is getting installed, you get a prompt to continue further. Enter 'Y' to continue. After the installation is complete, a newline prompt is displayed.

2. Run the following command on the client machine:

```
$ wget site_device_secondary_data_private_ip
```

The following response is received:

```
$ wget 10.0.2.9
 --2023-01-09 17:49:47--  http:// 10.0.2.9/
 Connecting to 10.0.2.9:80... connected.
 HTTP request sent, awaiting response... 200 OK
 Length: 11321 (11K) [text/html]
 Saving to: ‘index.html.4’

 index.html.4                                  100%
[=====================================================================
=========]  10.42K  --.-KB/s    in 0s

 2023-01-09 17:49:47 (63.8 MB/s) - ‘index.html.4’
saved [10671/10671]
```

ADC Configuration Templates

This section guides you in applying new Application Delivery Controller (ADC) configurations on Thunder using Python scripts. These Python scripts make Thunder aXAPI calls over the HTTPS protocol.

Python is required to execute the Python script. For more information, see Prerequisites.

Table 2 provides an overview of the different supported Thunder configurations. These configurations are optional. You can choose to apply them based on your specific use cases. For more information, see Deployment Templates.

Table 2 : Supported Thunder configurations

Configuration	Description
Change Password	Applies a new vThunder instance password. **NOTE:** After the deployment of vThunder instance, it is highly recommended to change the default password for `admin` user.
Basic Server Load Balancer	Applies an SLB configuration for inbound traffic, outbound traffic, policies, server grouping, and routing to destination virtual servers.
A10 License	Applies an A10 license to the vThunder instance. **NOTE:** A10 Thunder is proprietary software that requires either a trial or BYOL (Bring Your Own License) subscription.
SSL Certificate	Applies a server connection certificate configuration. An SSL certificate is a digital certificate that authenticates a website's identity and enables an encrypted connection. SSL stands for Secure Sockets Layer, a security protocol that creates an encrypted link between a web server and a web browser. Applies server connection certificate configurations. A Secure Sockets Layer (SSL) certificate is a digital certificate that verifies a website's identity and facilitates an encrypted connection. SSL

Configuration	Description
	is a security protocol that establishes an encrypted link between a web server and a web browser.
High Availability	Applies a high availability configuration. These configurations automatically synchronize Thunder configurations between the active and standby Thunder instances. In the event of a failover, it designates the other Thunder instance as active to ensure uninterrupted traffic routing. For this functionality, it is essential for both Thunder instances to have identical resources and configurations.
Server Load Balancer on Backend Autoscale	Applies an SLB configuration automatically whenever backend app/web servers are autoscaled. When the backend web/app servers are in an autoscale group within the VMware Cloud, autoscale-in or autoscale-out of the server triggers the AutoScale logs for applying or removing SLB server configuration in Thunder.
Hybrid Cloud GSLB	Applies a disaster recovery configuration using a global server load balancer across any two regions or locations, whether same cloud, hybrid-cloud or on-premise. It requires a minimum of two Thunder instances in each region or location — one acting as the master controller and the other as a site device. Multiple site devices can be configured but it is recommended to have minimum of three site devices for seamless failover and effective disaster recovery. For a configuration with three Thunders instances, the recommended setup includes one as the master controller and the other two as a site device. Ensure that both regions have identical set of resources. To create and install three thunder instances in one region use Thunder-3NIC-3VM template. Same template can be used to install in another region.

Change Password

After provisioning the vThunder instance, you can change the vThunder instance password at any given time.

NOTE: It is highly recommended to change the default password. For default password, see Support Information.

To change the password of the deployed vThunder instance, perform the following steps:

1. Download **A10-vThunder_ADC-CONFIGURATION** > **CHANGE-PASSWORD** template from GitHub.
2. From Start menu, open command prompt and navigate to this downloaded folder.
3. Open the CHANGE_PASSWORD_CONFIG_PARAM.json with a text editor.
4. Configure the following parameter:

Table 3 : JSON Parameters

Resource Name	Description
vThunder instance/s details	Specify the Public IP address of one or more vThunder instance/s (comma separated) depending on the deployed template. `{ "publicIpList":["X.X.X.X"] }`

5. From Start menu, open cmd and navigate to this downloaded folder to run the following command:

```
C:\Users\TestUser\A10-VMware_ADC-CONFIGURATION\CHANGE-PASSWORD> python ./CHANGE_PASSWORD_CONFIG.py
```

A message is prompted displaying the primary conditions for password validation:

```
Primary conditions for password validation, user should provide the new
password according to the given combination:

Minimum length of 9 characters
Minimum lowercase character should be 1
Minimum uppercase character should be 1
Minimum number should be 1
Minimum special character should be 1
Should not include repeated characters
Should not include more than 3 keyboard consecutive characters.
```

6. Provide the vThunder instance's Host/IP, username, current, and new password when prompted:

```
Enter vThunder [x.x.x.x] password: ***
Enter vThunder new password: *********
Confirm new password: *********
```

NOTE: The default password is provided by the A10 Networks Support. The new password should meet the default password policy criteria. For more information, see Default Password Policy.

7. If the password is changed successfully, the following message is displayed:

```
vThunder [x.x.x.x] Password changed successfully.
Password change configurations saved on partition: shared
```

Basic Server Load Balancer

This template configures vThunder instance as a Server Load Balancer (SLB) to evenly distribute the traffic across a set of predefined servers and requires manual scaling.

To configure vThunder as an SLB, perform the following steps:

1. Download **A10-vThunder_ADC-CONFIGURATION** > **BASIC-SLB** template from GitHub.
2. From Start menu, open command prompt and navigate to this downloaded folder.

3. Open the SLB_CONFIG_PARAM.json with a text editor.

NOTE: Each parameter has a default value mentioned in the parameter file which can be modified as required.

4. Configure the following parameters:

Table 4 : JSON Parameters

Resource Name	Description
vThunder instance username	Specify a 'Read/Write/HM' privilege username. `"vth_username": "admin",` **NOTE:** The vThunder instance user should have 'Read/Write/HM' privilege to configure vThunder as an SLB.
Data Interface Count	Specify the number of data NICs. The value should be 1 for 2 NICs and 2 for 3 NICs. `"data_interface_count":2,`
Host IP addresses	Specify the Public IP address of one or more vThunder instance/s depending on the deployed template. `"publicIpList": ["X.X.X.X","X.X.X.X"],`

Ethernet IP addresses	Specify the ethernet 1 & 2 Private IP addresses of one or more vThunder instance/s depending on the deployed template.
	NOTE: For 3NIC-2VM-PUBVIP the ethernet1 address should be public on both vThunder to configure public VIP.
	`"vthunder1-address-list": {`
	`"ethernet1-addresses" : [`
	`{`
	`"ipv4-address": "X.X.X.X",`
	`"ipv4-netmask": "255.255.255.0"`
	`}`

Table 4 : JSON Parameters

Resource Name	Description

	<pre>],
	"ethernet2-addresses" : [
	{
	"ipv4-address": "X.X.X.X",
	"ipv4-netmask": "255.255.255.0"
	}
	]
	},
	"vthunder2-address-list": {
	"ethernet1-addresses" : [
	{
	"ipv4-address": "X.X.X.X",
	"ipv4-netmask": "255.255.255.0"
	}
	
	],
	"ethernet2-addresses" : [
	{
	"ipv4-address": "X.X.X.X",
	"ipv4-netmask": "255.255.255.0"
	}
	]
	},</pre>

Template HTTP	Specify the value as 1 if you want to configure the HTTP template. For more information on SLB HTTP template, see Command Line Interface Reference. <pre>"template-http": 0,</pre> **NOTE:** By default, the template HTTP value is 0.
Template Persist Cookie	Specify the value as 1 if you want to configure the Persist-Cookie template. For more information on SLB persist cookie template, see Command Line Interface Reference. <pre>"template-persist-cookie": 0,</pre>

Table 4 : JSON Parameters

Resource Name	Description
	NOTE: By default, the template Persist-Cookie value is 0.

SLB server host	Specify name and host IP address or domain name of one or more SLB servers.
	The SLB server host value is the datain NIC's private IP address instance acting as the server.
	`"server_details": {`
	`"value": [`
	`{`
	`"server-name": "server1",`
	`"pvt-ip-address": "X.X.X.X"`
	`},`
	`{`
	`"server-name": "server2",`
	`"pvt-ip-address": "X.X.X.X"`
	`}`
	`]},`

SLB server ports	Specify the SLB Server ports details.
	`"slbServerPortList": {`
	`"value": [`
	`{`
	`"port-number": 53,`
	`"protocol": "udp",`
	`"health-check-disable":1`
	`},`
	`{`
	`"port-number": 80,`
	`"protocol": "tcp",`
	`"health-check-disable":1`
	`},`
	`{`
	`"port-number": 443,`

Table 4 : JSON Parameters

Resource Name	Description

	<pre>"protocol": "tcp",
	"health-check-disable":1
	}
	]
	},</pre>
	NOTE: For 3NICs, the **`health-check-disable`** value is recommended to be 1.

Service Group List	Specify the SLB Service group.
	<pre>"serviceGroupList": {
	"value": [
	{
	"name": "sg443",
	"protocol": "tcp"
	},
	{
	"name": "sg53",
	"protocol": "udp"
	},
	{
	"name": "sg80",
	"protocol": "tcp"
	}
	]
	},</pre>

HTTP Template	Specify the HTTP template details if **`templateHTTP = 1`**.

Table 4 : JSON Parameters

Resource Name	Description
	"httpList": { "value": [{ "name":"<host-switching-template-name>", "host-switching": [{ "host-switching-type":"contains", "host-match-string":"s1", "host-service-group":"sg80" }] }, { "name":"<url-switching-template-name>", "url-switching": [{ "url-switching-type":"regex-match", "url-match-string":"s1", "url-service-group":"sg80" }] }] },
Persist Cookie Template	Specify the Persist Cookies template details if **templatePersistCookie = 1**. "cookie-list":{ "value": [{ "name": "<persist-cookie-template-name>", "expire": 60, "cookie-name": "<cookie-template-name>", "encrypt-level": 0,

Table 4 : JSON Parameters

Resource Name	Description

	<pre>"match-type": 1,
	"service-group":1
	}
	]},</pre>

Virtual Server	Specify virtual server details.
	The virtual server default name is “vip”.
	NOTE: The vip address is not generated dynamically after deploying the VMware template. So user needs to configure available IP address within ethernet 1 IP range in case of 3NIC-2VM. It can be private or public as per the requirement.
	If you want to configure an HTTP template (**`template-http= 1`**), provide the HTTP template name in the **`template-http`** parameter.
	If you want to configure a Persist-Cookie template (**`template-persist-cookie= 1`**), provide the Persist-Cookie template name in the **`template-persist-cookie`** parameter.
	<pre>"virtualServerList": {
	"virtual-server-name": "vip",
	"eth1-ip-address": "x.x.x.x",
	"metadata": {
	"description": "specify ethernet 1 primary private IP address in case of SLB without High Availability and secondary private IP address in case of SLB with High Availability."
	},
	"value": [
	{
	"port-number": 53,
	"protocol": "udp",
	"auto": 1,
	"service-group": "sg53"</pre>

Table 4 : JSON Parameters

Resource Name	Description

	<pre>},
	{
	"port-number": 80,
	"protocol": "http",
	"auto": 1,
	"service-group": "sg80",
	"template-http":"<host-switching-template-name or url-switching-template-name>",
	"template-persist-cookie": "<persist-cookie-template-name>"
	},
	{
	"port-number": 443,
	"protocol": "https",
	"auto": 1,
	"service-group": "sg443",
	"template-http": "<host-switching-template-name or url-switching-template-name>",
	"template-persist-cookie": "<persist-cookie-template-name>"
	
	}
	]
	},</pre>
	NOTE: Either **host-switching-template-name** or **url-switching-template-name** can be used in the **template-http**.
	For 3NICs, the **ha-conn-mirror** value is recommended to be 1.
	The **ha-conn-mirror** works on l4 vport only.

5. Verify if all the configurations in the SLB_CONFIG_PARAM.json file are correct and save the changes.

6. From Start menu, open cmd and navigate to this downloaded folder to run the following command to configure the vThunder instance/s as an SLB:

```
C:\Users\TestUser\A10-VMware_ADC-CONFIGURATION\BASIC-SLB> python ./SLB_
CONFIG.py
```

7. Provide password for the vThunder instances/s whose IP address is mentioned in the SLB_CONFIG_PARAM.json file.

   If SLB is configured successfully for 3NIC-1VM, the following message is displayed:

```
Enter vThunder [x.x.x.x] Password:
[{'ipv4-address': 'x.x.x.x', 'ipv4-netmask': '255.255.255.0'}]
configured ethernet- 1 ip
configured ethernet- 2 ip
Successfully configure service group.
Do you want to configure SLB Server? [yes/no]yes
Successfully Configured server server1
Successfully Configured server server2
Successfully logged out from vThunder.
Successfully configured http template.
Successfully logged out from vThunder.
Successfully configured slb persist cookie.
Successfully configured virtual servers.
Configurations are saved on partition: shared
Successfully logged out from vThunder.
----------------------------------------------------------------------
```

   The above configuration has two servers, an HTTP template, and a Persist-Cookie template configured for 3NIC-1VM.

SSL Certificate

This template applies Certificate Authority SSL Certificate to the vThunder instance. This certificate establishes an encrypted link between a server and your browser, ensuring that all data transferred between them remains private and secure.

To configure SSL certificate for a vThunder instance, perform the following steps:

1. Download **A10-vThunder_ADC-CONFIGURATION** > **SSL-CERTIFICATE** template from GitHub.
2. From Start menu, open command prompt and navigate to this downloaded folder.
3. Open the SSL_CONFIG_PARAM.json with a text editor.

NOTE: Each parameter has a default value mentioned in the parameter file which can be modified as required.

4. Configure the following parameters:

Table 5 : JSON Parameters

Resource Name	Description

SSL Configuration	Specify SSL details.
	`"sslConfig": {`
	`"requestTimeOut": 40,`
	`"path": "<absolute file path of certificate file>",`
	`"file": "<certificate file name>",`
	`"certificationType": "<certificate file type>"`
	`},`
	NOTE: By default, SSL configuration is disabled i.e. no SSL configuration is applied.
	Example
	The sample values for the SSL certificate are as shown below:

Table 5 : JSON Parameters

Resource Name	Description

	<pre>"sslConfig": {
	"requestTimeOut": 40,
	"Path": "C:\\..............
	\\server.pem",
	"File": "server",
	"CertificationType": "pem"
	}</pre>

vThunder instance/s details	Specify Public IP address of one or more vThunder instance/s depending on the deployed template. <pre>"publicIpList": ["X.X.X.X", "X.X.X.X"],</pre>

5. Verify if the configurations in the SSL_CONFIG_PARAM.json file are correct and then save the changes.
6. From Start menu, open cmd and navigate to this downloaded folder to run the following command to apply SSL configuration on the vThunder instance/s:

```
C:\Users\TestUser\A10-VMware_ADC-CONFIGURATION\SSL-CERTIFICATE>python
SSL_CONFIG.py
```

7. Provide password for the vThunder instances/s whose IP address is mentioned in the SSL_CONFIG_PARAM.json file:

```
Configuring vThunder with ip x.x.x.x
Enter vThunder Password: *********
```

8. If the SSL certificate is uploaded successfully, the following message is displayed:

```
Successfully configured SSL.
Configurations are saved on partition:  shared
Successfully logged out from vThunder.
```

A10 License

This template applies GLM license to the vThunder instance for legal compliance, security, all feature access, and support.

To configure GLM license for vThunder instance, perform the following steps:

1. Download **A10-vThunder_ADC-CONFIGURATION** > **GLM-LICENSE** from GitHub.
2. From Start menu, open command prompt and navigate to this downloaded folder.
3. Open the GLM_CONFIG_PARAM.json with a text editor.

NOTE: Each parameter has a default value mentioned in the parameter file which can be modified as required.

4. Configure the following parameters:

Table 6 : JSON Parameters

Resource Name	Description

Entitlement Token	Specify the entitlement token.
	`"entitlementToken": {`
	`"value": "<license entitlementToken>"`
	`},`

vThunder details	Specify and the Public IP address of one or more vThunder instance/s depending on the deployed template.
	`"publicIpList":["X.X.X.X","X.X.X.X"],`
	`"dns": {`
	`"value": "8.8.8.8"`
	`}`

5. Verify if the configurations in the GLM_CONFIG_PARAM.json file are correct and then save the changes.
6. From Start menu, open cmd and navigate to this downloaded folder to run the following command to apply GLM license on the vThunder instance/s:

```
C:\Users\TestUser\A10-VMware_ADC-CONFIGURATION\GLM-LICENSE>python GLM_CONFIG.py
```

7. Provide password for the vThunder instances/s whose IP address is mentioned in the GLM_CONFIG_PARAM.json file.

```
Configuring vThunder with ip x.x.x.x
Enter vThunder password: *********
```

If the GLM license is applied successfully, a message 'BASE License successfully updated' is displayed.

```
Successfully configured primary DNS.
Successfully configured GLM Entitlement token in vThunder.
GLM license request send successfully.
Configurations are saved on partition: shared
Successfully logged out from vThunder.
```

High Availability

This template applies high availability configuration to the Thunder instances. It automatically synchronizes Thunder configurations between the active and standby Thunder instances. In the event of a failover, it designates the other Thunder instance as active to ensure uninterrupted traffic routing. For this functionality, it is essential for both Thunder instances to have identical resources and configurations.

To configure HA for Thunder instances, perform the following steps:

1. Download **A10-vThunder_ADC-CONFIGURATION** > **HIGH-AVAILABILITY** template from GitHub.
2. From Start menu, open command prompt and navigate to this downloaded folder.
3. Navigate to this downloaded folder and open the HA_CONFIG_PARAM.json with a text editor.

NOTE:	Each parameter has a default value mentioned in the parameter file which can be modified as required.

4. Configure the following parameters:

Table 7 : JSON Parameters

Resource Name	Description
DNS	Specify a domain namespace. `"dns": { "value": "8.8.8.8" },`
Network Gateway IP	Specify a Network Gateway IP. The default value of network gateway IP address is 10.0.2.1 as this is the first IP address of the data subnet 1 configuration. `"rib-list": [ { "ip-dest-addr":"0.0.0.0", "ip-mask":"/0", "ip-nexthop-ipv4": [ { "ip-next-hop":"10.0.2.1" } ] } ],`
VRRP-A	Specify the value as 1 to enable VRRP-A. `"vrrp-a": { "set-id":1 },`
Terminal Idle Timeout	Specify the interval in minutes for closing connection when there is no input detected. The value '0' means never timeout. `"terminal": { "idle-timeout":0 },`
VRID details	Specify the VRID details. The default value of vrid is 0. The default priority for vThunder-1 is

Table 7 : JSON Parameters

Resource Name	Description
	100, and for vThunder-2 is 99 (100-1). The floating ip address value is generated dynamically after deploying the template. Therefore, its default value under **vrid-list** should be replaced, see Get FIP address . `"vrid-list": [ { "vrid-val":0, "blade-parameters": { "priority": 100 }, "floating-ip": { "ip-address-cfg": [ { "ip-address":"10.0.3.23" } ] } } ],`
vThunder Host IP	Specify the Public IP address of one or more vThunder instance/s depending on the deployed template. `"privateIpList": ["X.X.X.X", "X.X.X.X"]`

NOTE: **ha-conn-mirror** does not work on port 80 and 443.

5. Verify if all the configurations in the HA_CONFIG_PARAM.json file are correct and save the changes.
6. From Start menu, open cmd and navigate to this downloaded folder to run the following command to configure HA:

```
C:\Users\TestUser\A10-VMware_ADC-CONFIGURATION\HIGH-AVAILABILITY>python HA_CONFIG.py
```

7. Provide password for the vThunder instances/s whose IP address is mentioned in the HA_CONFIG_PARAM.json file.

   If HA is configured successfully, the following message is displayed:

```
Configuring vThunder with ip x.x.x.x
Enter vThunder password: *********
Successfully configured Primary DNS.
Successfully configured IP Route.
Successfully configured Vrrp-A Common.
Successfully configured Idle Timeout.
Successfully configured Vrrd Rid.
Successfully configured Peer Group.
Configurations are saved on partition: shared
Successfully logged out from vThunder.
-------------------------------------------------------
Configuring vThunder with ip x.x.x.x
Enter vThunder password: *********
Successfully configured Primary DNS.
Successfully configured IP Route.
Successfully configured Vrrp-A Common.
Successfully configured Idle Timeout.
Successfully configured Vrrd Rid.
Successfully configured Peer Group.
Configurations are saved on partition: shared
Successfully logged out from vThunder.
-------------------------------------------------------
```

Server Load Balancer on Backend Autoscale

The Back-Auto scripts allow users to configure scale-out and scale-in operations for the application servers running on VMware vSphere ESXi, located behind the vThunder. This solution leverages the VMware vCenter's monitoring metrics and alert feature to trigger scale-out or scale-in operations based on the CPU usage by the application server VMs.

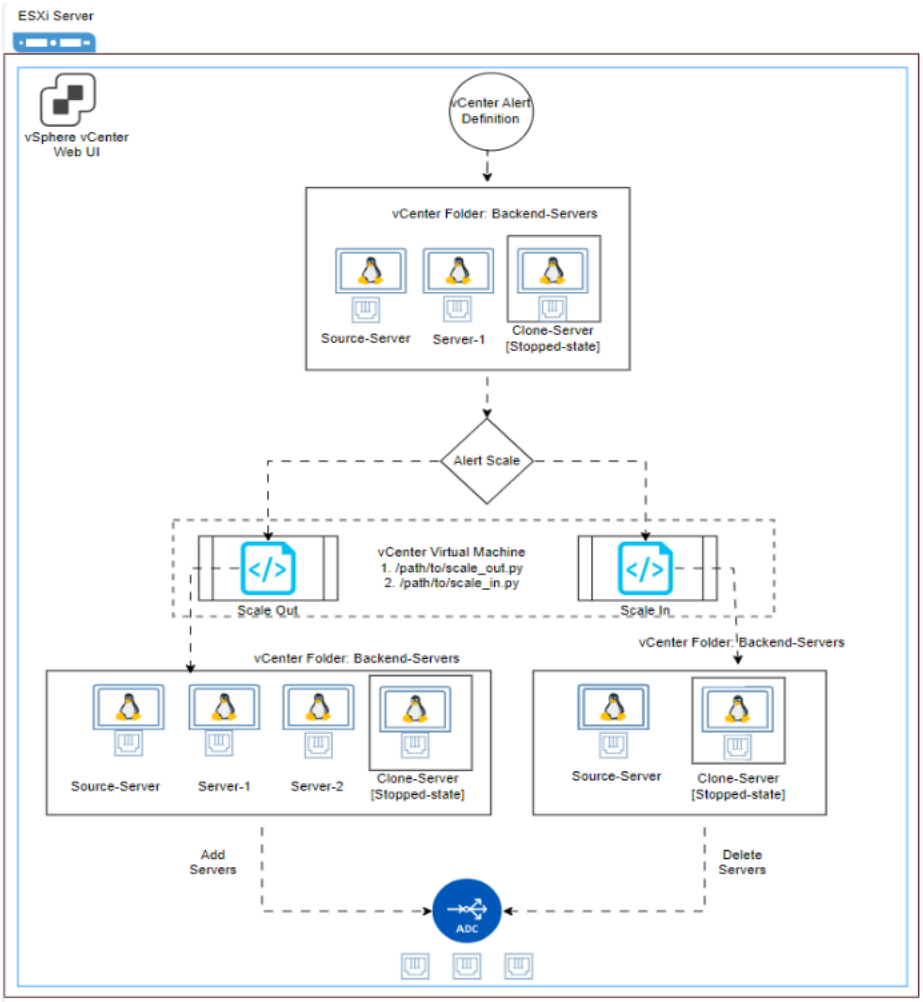
This template configures vThunder instance as a Server Load Balancer (SLB) to automate the scaling process and allow dynamic adjustment of servers based on the workload.

Architectural References

Refer to the following for architectural reference:

- Server Load Balancer on Backend Autoscale

Figure 25 : Server Load Balancer on Backend Autoscale



Prerequisites

To configure a Backend Autoscale Server, ensure that the following prerequisites are met:

- Thunder Instance
- AutoScale Folder Creation
- Source-Server Creation
- vCenter VM Configuration/Setup

Thunder Instance

Thunder instance/instances with either two network interfaces (one for management and one for data) or three network interfaces (one for management and two for data), along with a basic SLB (Server Load Balancer) configuration. Refer to VMware templates for Thunder deployment and Configurations for SLB configuration.

AutoScale Folder Creation

AutoScale Folder refers to a folder within vCenter Server where virtual machines (VMs) are organized and managed by the Back-Auto scripts. The AutoScale folder contains the following servers:

a. Source-Server – Source-Server is the original server or the VM that is used as a template or source for creating new instances. Back-Auto scripts copy this server to create a Clone-Server.

b. Clone-Server – Clone server is replica of source server. The copy of Source-Server is automatically created. This server always remain in the shut-down state.

c. Scaled-out servers – Scaled-out servers are additional instances created from clone-server to handle increased demand. They are created and deleted dynamically depending on the CPU usage thresholds configured for the Back-Auto.

NOTE: For more details on creating Scaled-out servers, refer Create Inventory Folder.

Source-Server Creation

The Source-Server or Application Server is the original server or VM that is used as a template or source for creating new instances. If there are multiple source-

servers, you must specify the server name you want to use as the Source-Server.

NOTE:

1. Source-Server should have at least one network interface.
2. To enable Back-Auto in application servers, ensure that the following Source-Server details are readily available:
   a. Source-Server Name.
   b. Source-Server Id.
   c. Source-Server interface-name.
   d. Source-Server's IPv4 address.
   e. Source-Server Username.
   f. Source-Server Password.
   g. Source-Server DNS address.
   h. Clone-Server name (name you want to give to the machine which will be used for creating [cloning] the scale out machine from Clone-Server.

Following are the prerequisites and the packages required for the Source VM.

- Ensure that the service port is allowed in the firewall, for example for web server the HTTPS/HTTP port should be allowed.
- Ensure that the Open-VM-Tool is installed on Source VM as it plays a crucial role in optimizing the performance, management, and integration of virtual machines running on VMware platforms.
- Install `nmcli` for network configuration if it is not already installed.
  - On Ubuntu

    ```
    sudo apt-get install network-manager
    ```

  - On CentOS

    ```
    sudo yum install NetworkManager
    ```

vCenter VM Configuration/Setup

A vCenter v8.0+ is required for deploying this template. The vCenter VM must be reachable from the server VMs.

For details, refer to Setup vCenter VM.

Configuring vThunder on Backend Autoscale

To configure vThunder as an SLB on Backend Autoscale, perform the following steps:

1. Install a10_vcenter_backauto_plugin in vCenter VM
2. Configure Clone-Server in vCenter [One Time Step]
3. Configure Source Server in vThunder
4. Create Alarm for Scale Out and Scale In
5. Configure Multiple Application Servers
6. AutoScale Folder Creation

Install a10_vcenter_backauto_plugin in vCenter VM

To install a10_vcenter_backauto_plugin in vCenter VM, perform the following steps:

1. Download **A10-vThunder_ADC-CONFIGURATION** > **CONFIG-SLB_ON_BACKEND-AUTOSCALE** template from GitHub.
2. Navigate to **a10_vcenter_backauto_plugin**, open the **vcenter.ini** file in a text editor, and configure the following parameters:

Table 8 : vCenter Key Value pair

Key	Value
Directory name	Specify vCenter directory name where you want to place the scaling scripts. The directory name should not contain spaces. Here, the directory name is provided as **a10networks**. `installation_dir = /a10networks`

Table 8 : vCenter Key Value pair

Key	Value
Server IP address or FQDN	Specify the server IP address or FQDN of the required vCenter VM. `vcenter_server_ip = x.x.x.x`

vCenter Server SSH values	Provide the vCenter server SSH values.
	`vcenter_server_ssh_username - <vCenter SSH username>`
	`vcenter_server_ssh_password - <vCenter SSH password>`

vCenter Server UI values	Provide the vCenter server UI values.
	`vcenter_server_ui_username - <vCenter UI username>`
	`vcenter_server_ui_password - <vCenter UI password>`

3. Navigate to **CONFIG-SLB_ON_BACKEND-AUTOSCALE** > **a10_vcenter_backauto_plugin** > **apps** > **app1**, open the **config.ini** file in a text editor, and configure the following parameters:

Table 9 : JSON Parameters

Resource Name	Description
Clone VM name	Name to be given to the cloned powered-off VM which will be used as a cloning source during scale-out. `clone vm_name = cloning_vm`
Clone VM ID	ID of the cloned server. This field is filled automatically by the script. There is no need to specify a value. `clone vm_id = vm-18079`
Source VM name	Specify App Server reference VM name, which can also be used as a prefix for the newly created VMs. `source_vm_name = pd-ubuntu`

Table 9 : JSON Parameters

Resource Name	Description
Source VM OS	Specify the source VM Operating System type: 'CentOS/Ubuntu/rhel'. `source_vm_os = ubuntu`

Source VM ID	Specify the application server source VM ID. To get this ID, click the source VM name and in the browser URL **VM-ID** will be displayed.
	`https://<vCenter-FQDN>/ui/app/vm;nav=v/urn:vmomi:VirtualMachine:<VM-ID>:e62e1ec9-8a34-4bf1-bdaa-93026523ae8d/summary`
	Example URL:
	`https://<vCenter-FQDN>/ui/app/vm;nav=v/urn:vmomi:VirtualMachine:vm-5165:e62e1ec9-8a34-4bf1-bdaa-93026523ae8d/summary`
	`source_vm_id = vm-5165`

Source VM SSH Login Credentials	Specify the Source VM SSH values. • source_vm_username - <*source_vm_username*> • source_vm_password - <*source_vm_password*>
Server Subnet	Specify the data subnet for the application server. **NOTE:** This must be used for auto-scale application server only. `server_subnet = X.X.X.X/24`
Source Transit IP	Specify a temporary IP address to the newly created server. `source_transit_ip = X.X.X.X`
Source	Specify the primary DNS of the source server.

Table 9 : JSON Parameters

Resource Name	Description
Server DNS	`source_dns = X.X.X.X`
Source VM Interface Name	Specify the application server source VM interface name. For steps, refer toRetrieve Active Interface Name. `source_interface_name = ens192`
Service Ports	Specify the list of the ports on which your services will be running on the server to verify their running status prior to configuring them on Thunder. `services_ports = 5004, 80`

VMware vSphere vCenter cluster ID	Specify the VMware vSphere vCenter cluster ID. To get this ID, click the cluster name and in the browser URL **CLUSTER-ID** will be displayed.
	`https://<vCenter-FQDN>/ui/app/cluster;nav=h/urn:vmomi:ClusterComputeResource:<CLUSTER-ID>:e62e1ec9-8a34-4bf1-bdaa-93026523ae8d/...`
	Example:
	`https://<vCenter-FQDN>/ui/app/cluster;nav=h/urn:vmomi:ClusterComputeResource:domain-c8:e62e1ec9-8a34-4bf1-bdaa-93026523ae8d/...`
	`cluster_id = domain-c8`

Attached Datastore ID	Specify the VMware vSphere Attached Datastore ID. To get this ID, click the datastore name and in the browser URL **DATASTORE-ID** will be displayed.

Table 9 : JSON Parameters

Resource Name	Description

	`https://<vCenter-FQDN>/ui/app/datastore;nav=s/urn:vmomi:Datastore:<DATASTORE-ID>:e62e1ec9-8a34-4bf1-bdaa-93026523ae8d/files`
	Example:
	`https://<vCenter-FQDN>/ui/app/datastore;nav=s/urn:vmomi:Datastore:datastore-17:e62e1ec9-8a34-4bf1-bdaa-93026523ae8d/files`
	`datastore_id = datastore-17`

Folder ID	Specify the VMware vSphere Folder ID. To get this ID, click the folder name and in the browser URL **FOLDER-ID** will be displayed.
	NOTE: This must be used for auto-scale application server only.
	`https://<vCenter-FQDN>/ui/app/folder;nav=v/urn:vmomi:Folder:<FOLDER-ID>:e62e1ec9-8a34-4bf1-bdaa-93026523ae8d/...`
	Example:
	`https://<vCenter-FQDN>/ui/app/folder;nav=v/urn:vmomi:Folder:group-v2014:e62e1ec9-8a34-4bf1-bdaa-93026523ae8d/...`
	`folder_id = group-v2014`

Minimum Replica	Specify the minimum number of application servers that need to be available including the source VM. `minimum_replica = 1`
Maximum	Specify the maximum number of application servers that need

Table 9 : JSON Parameters

Resource Name	Description
Replica	to be scaled out including the source VM. `maximum_replica = 10`
Cool Down	Specify the time between two scaling operations in seconds. `cool_down = 200`
Graceful scale-in time	Specify the wait time duration for which a system or service allows processes to close active connections during scale-in operation in seconds. `graceful_scale_in_time = 600` **NOTE:** If active connections do not get closed within specified graceful_scale_in_time, then scale-in operation will be aborted.
Service up timeout	Specify the time duration for service running on specified ports on server in seconds. `service_up_timeout = 60`
Thunder IP	Specify the list of the management IPs of Thunder VMs where app server will be configured. `thunder_ip = 'X.X.X.X'`
Thunder VM Credentials	Specify the Thunder VM credentials: • thunder_vm_username - *<thunder_username>* • thunder_vm_password - *<thunder_password>*
Thunder Active Partition Name	Specify the active partition name. The default partition is 'shared' `thunder_partition_name = shared`

NOTE: If the source VM user is not root then disable non- root user password for sudo commands. For more information, refer Enable root user.

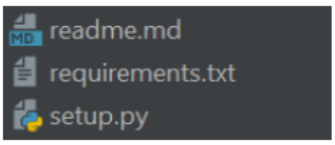
4. Navigate to **CONFIG-SLB_ON_BACKEND-AUTOSCALE** > **a10_vcenter_backauto_plugin** > **apps** > **app1**, open **app_servers.ini** in a text editor, and enter all the IP addresses from the server subnet, that are already in use.

   These IPs include Data Out interface IP, Reference server IP, Source transit IP, vCenter Data Out IP, and more.

```
[AppServer]
last_scaling_timestamp = 0
# add vThunder instances data out interface ip addresses, reference
server ip address, source_transit_ip, vcenter data out ip and any ip
address which is already in use from server subnet.
assigned_ip_addr = {'X.X.X.X', 'X.X.X.X', 'X.X.X.X', 'X.X.X.X',
'X.X.X.X'}
```

5. Navigate to **CONFIG-SLB_ON_BACKEND-AUTOSCALE**, locate the **setup.py** file, and execute the following commands to execute the setup.py file:

```
pip install -r requirements.txt
python setup.py
```



6. If the clone VM is configured successfully, the following message will be displayed:

```
Cloning source vm...
Remote folder '/a10networks/a10_vcenter_Back-Auto_plugin' does not
exist.
Creating...
Uploading package into vcenter…
Uploaded.
Granting read, write, and execute permissions...
```

```
Done.
Setup virtual environment...
Done.
```

7. Log in to the vCenter VM and execute the following command on the console to verify if the folders are created with the required permissions:

```
ls -lrt
```

```
root@localhost [ / ]# cd /
root@localhost [ / ]# ls
a10networks
```

```
root@localhost [ /a10networks/a10_vcenter_backauto_plugin ]# ls
apps  plugins  requirements.txt  vcenter.ini
root@localhost [ /a10networks/a10_vcenter_backauto_plugin ]# ls -lah
total 24K
drwxr-xr-x 4 vpxd root 4.0K Feb 29 04:06 .
drwxr-xr-x 3 vpxd root 4.0K Jan 11 12:39 ..
drwxr-xr-x 8 vpxd root 4.0K Mar  1 12:25 apps
drwxr-xr-x 6 root root 4.0K Feb 29 04:02 plugins
-rwxr--r-- 1 vpxd root   45 Jan 11 12:39 requirements.txt
-rwxr--r-- 1 vpxd root  446 Jan 12 11:32 vcenter.ini
```

```
root@localhost [ /a10networks/a10_vcenter_backauto_plugin/apps/app1 ]# ls
app_servers.ini  config  config.ini
root@localhost [ /a10networks/a10_vcenter_backauto_plugin/apps/app1 ]# ls -lah
total 20K
drwxr-xr-x 3 vpxd root 4.0K Jan 23 02:59 .
drwxr-xr-x 8 vpxd root 4.0K Mar  1 12:25 ..
-rwxr--r-- 1 vpxd root  485 Mar  5 09:51 app_servers.ini
drwxr-xr-x 2 vpxd root 4.0K Jan 15 17:13 config
-rwxr--r-- 1 vpxd root 3.0K Jan 23 02:59 config.ini
```

```
root@localhost [ /a10networks/a10_vcenter_backauto_plugin/apps/app1/config ]# ls
scale_in.py  scale_out.py
root@localhost [ /a10networks/a10_vcenter_backauto_plugin/apps/app1/config ]# ls -lah
total 40K
drwxr-xr-x 2 vpxd root 4.0K Mar 21 08:54 .
drwxr-xr-x 3 vpxd root 4.0K Jan 23 02:59 ..
-rwxr--r-- 1 vpxd root 8.1K Jan 15 17:13 scale_in.py
-rwxr--r-- 1 vpxd root  17K Jan 11 12:39 scale_out.py
```

```
root@localhost [ /a10networks/a10_vcenter_backauto_plugin ]# cd plugins/
root@localhost [ /a10networks/a10_vcenter_backauto_plugin/plugins ]# ls
__init__.py  __pycache__  thunder  utils  vcenter
root@localhost [ /a10networks/a10_vcenter_backauto_plugin/plugins ]# cd thunder/
root@localhost [ /a10networks/a10_vcenter_backauto_plugin/plugins/thunder ]# ls
__init__.py  __pycache__  thunder.py
root@localhost [ /a10networks/a10_vcenter_backauto_plugin/plugins/thunder ]# ls -lah
total 28K
drwxr-xr-x 3 root root 4.0K Feb 29 04:12 .
drwxr-xr-x 6 root root 4.0K Feb 29 04:02 ..
-rwxr--r-- 1 root root    0 Feb 29 04:02 __init__.py
drwxr-xr-x 2 root root 4.0K Mar  5 09:22 __pycache__
-rwxr--r-- 1 root root  14K Feb 29 04:12 thunder.py
root@localhost [ /a10networks/a10_vcenter_backauto_plugin/plugins/thunder ]# cd ../vcenter/
root@localhost [ /a10networks/a10_vcenter_backauto_plugin/plugins/vcenter ]# ls
config_manager.py  __init__.py  __pycache__  session_manager.py
root@localhost [ /a10networks/a10_vcenter_backauto_plugin/plugins/vcenter ]# ls -lah
total 20K
drwxr-xr-x 3 root root 4.0K Feb 29 04:16 .
drwxr-xr-x 6 root root 4.0K Feb 29 04:02 ..
-rwxr--r-- 1 root root 2.7K Feb 29 04:14 config_manager.py
-rwxr--r-- 1 root root    0 Feb 29 04:02 __init__.py
drwxr-xr-x 2 root root 4.0K Mar  5 09:22 __pycache__
-rwxr--r-- 1 root root 1.8K Feb 29 04:16 session_manager.py
root@localhost [ /a10networks/a10_vcenter_backauto_plugin/plugins/vcenter ]# cd ../utils/
root@localhost [ /a10networks/a10_vcenter_backauto_plugin/plugins/utils ]# ls
__init__.py  logger.py  __pycache__  virtual_machine.py
root@localhost [ /a10networks/a10_vcenter_backauto_plugin/plugins/utils ]# ls -lah
total 20K
drwxr-xr-x 3 root root 4.0K Feb 29 04:13 .
drwxr-xr-x 6 root root 4.0K Feb 29 04:02 ..
-rwxr--r-- 1 root root    0 Feb 29 04:02 __init__.py
-rwxr--r-- 1 root root 1.2K Feb 29 04:02 logger.py
drwxr-xr-x 2 root root 4.0K Mar  5 09:22 __pycache__
-rwxr--r-- 1 root root 1.9K Feb 29 04:13 virtual_machine.py
root@localhost [ /a10networks/a10_vcenter_backauto_plugin/plugins/utils ]#
```

Configure Clone-Server in vCenter [One Time Step]

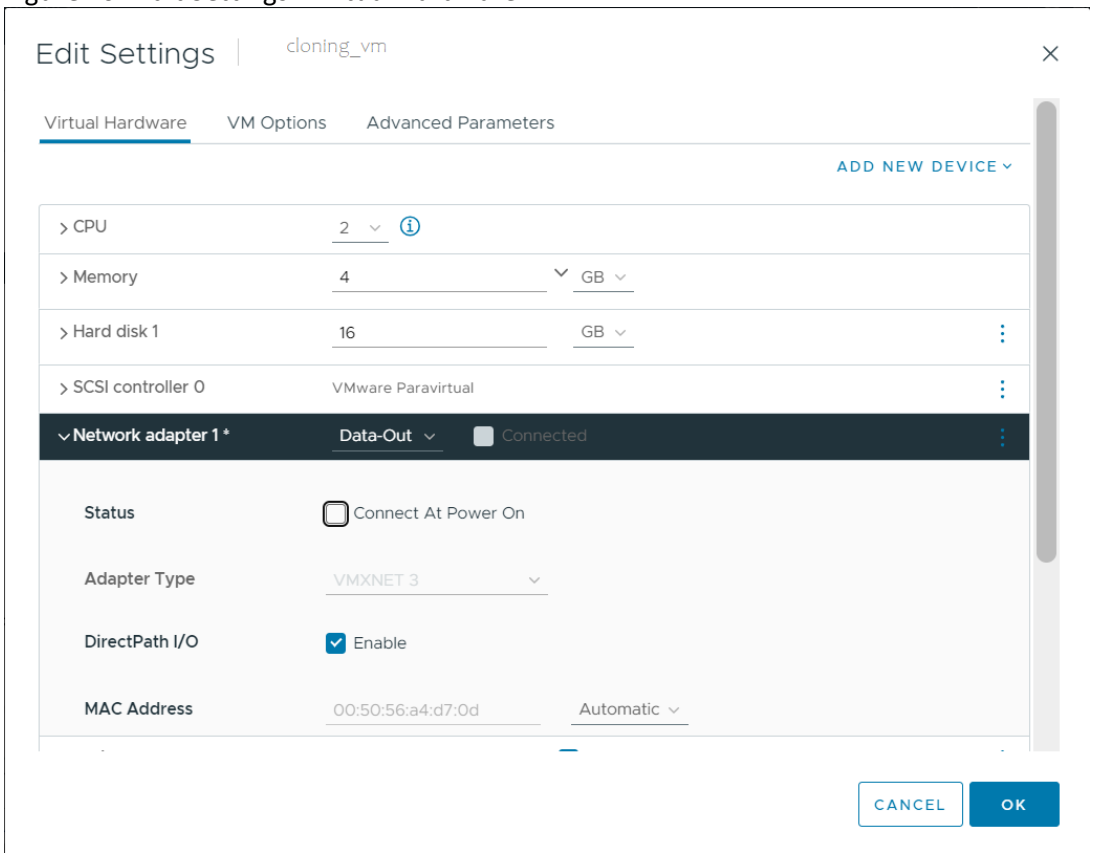
You need to configure Clone-Server so that the scale-out script will use Clone-Server to create new application servers at the time of scale-out. To configure Clone-Server in vCenter, perform the following steps:

1. Log in to vCenter UI using your vCenter server IP address or FDQN.

   https://vcenter_server_ip_address_or_fqdn

2. Navigate to the inventory folder previously created for back-auto application servers.
3. Right click the VM that was previously cloned and click **Edit Settings**.
4. On the Edit Settings page, under the Virtual Hardware tab, expand the **Network Adapter 1** dropdown, uncheck **[Connect at Power On]** option, and click **OK**.

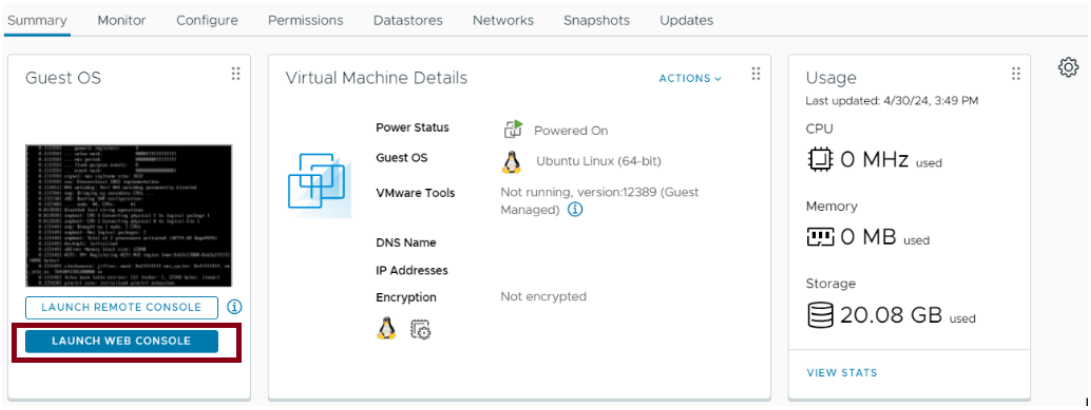
Figure 26 : Edit Settings - Virtual Hardware



5. Navigate to the inventory folder, right click **cloning_vm**, and click **Power > Power ON** to turn on the clone VM.

   The **LAUNCH WEB CONSOLE** button present under the "Summary" tab is enabled.

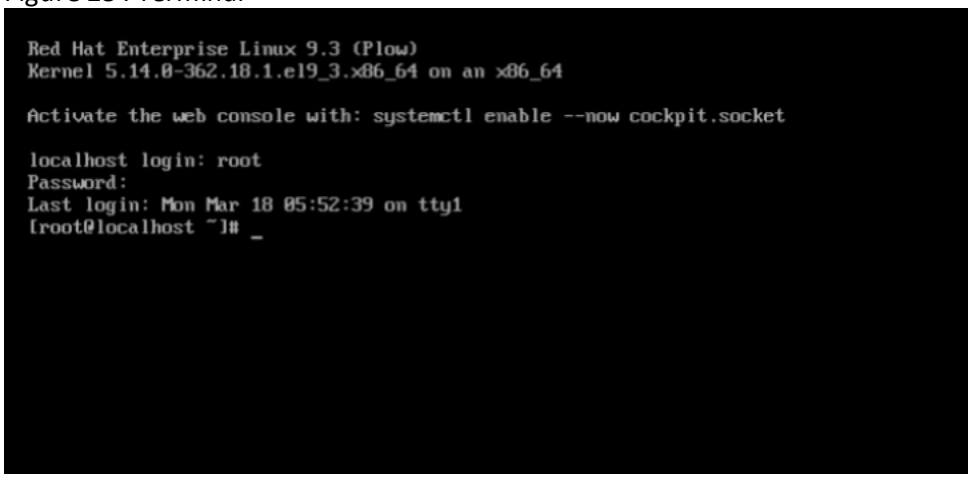
Figure 27 : Launch Web Console - Enabled



6. Click **LAUNCH WEB CONSOLE** to log in to the Clone-Server VM. Log in using the root credentials.

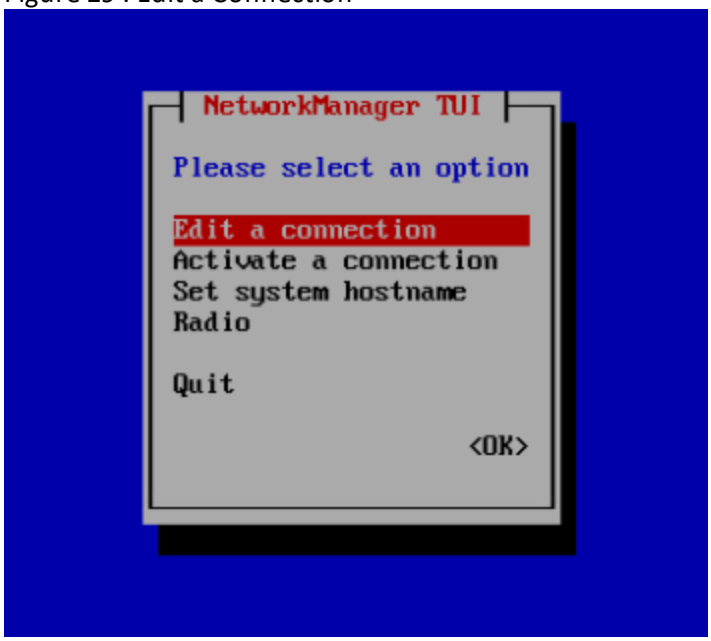
   A terminal window is displayed.

Figure 28 : Terminal



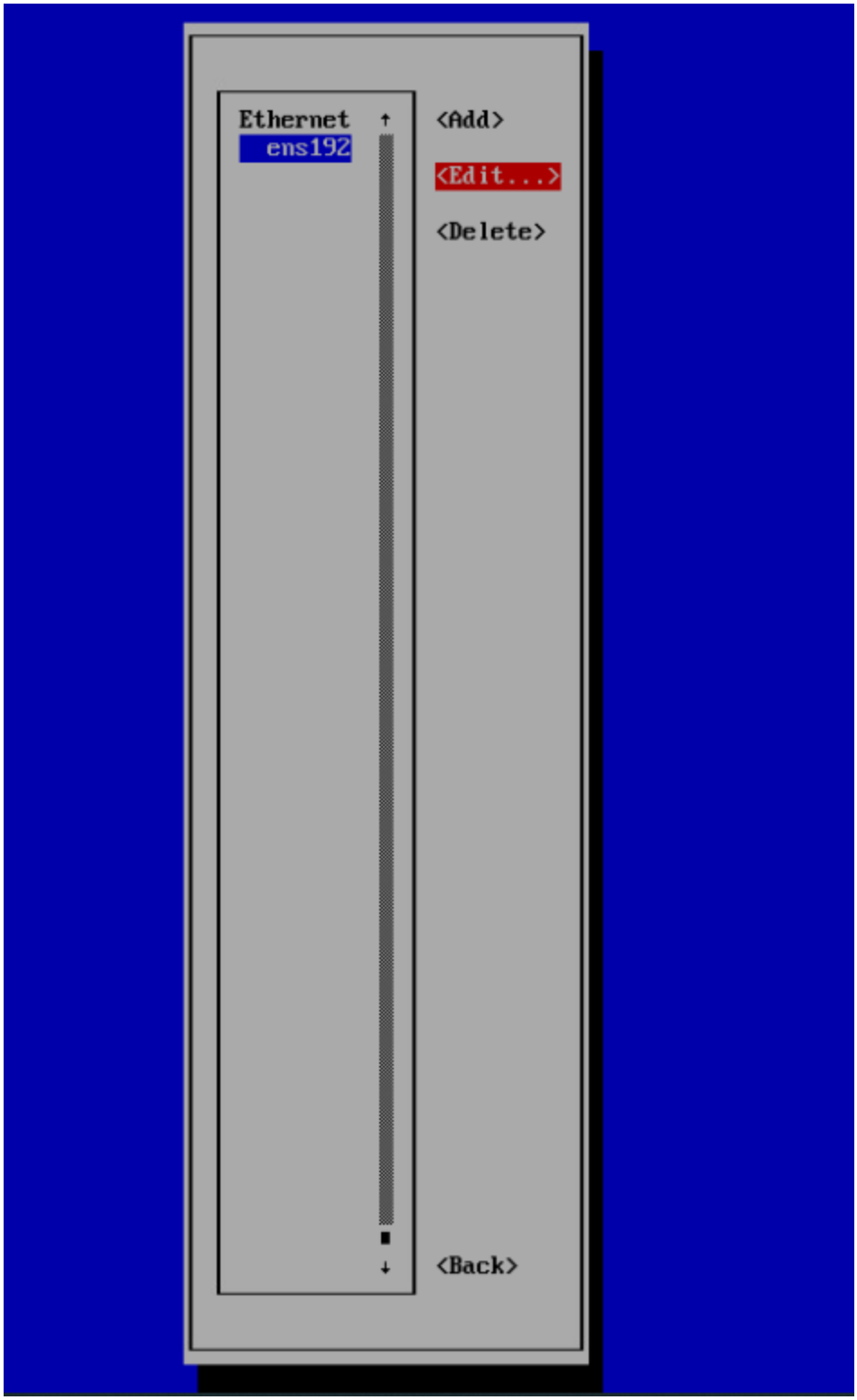
7. Invoke the `nmtui` tool, select **Edit a connection**, and press **Enter**.

Figure 29 : Edit a Connection



8. Select the interface you want to configure (in this case **ens192**), select **<Edit…>**, and press **Enter**.

Figure 30 : Edit - ens192


Ethernet
ens192
<Add>
<Edit...>
<Delete>
<Back>

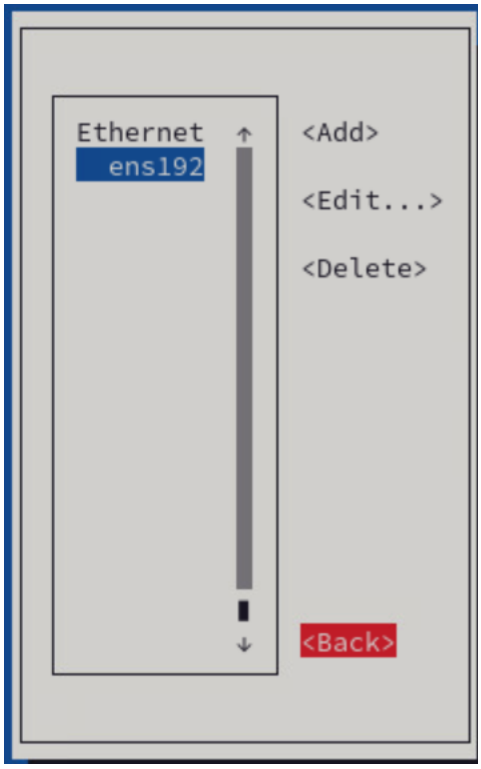
9. Provide transit IP `X.X.X.X/24` inside **IPV4 CONFIGURATION**, select **OK**, and press **Enter**.

   Figure 31 : IPV4 CONFIGURATION

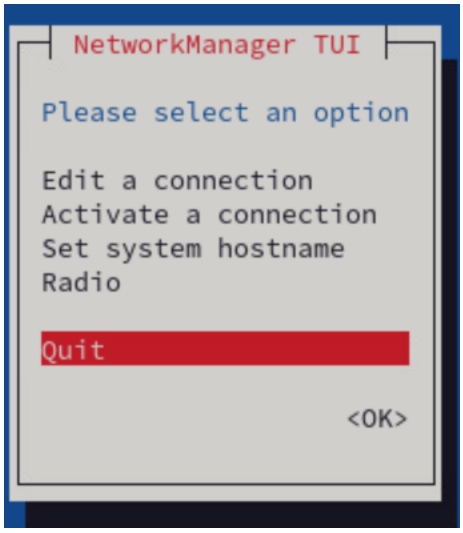
10. Select **BACK** and press **Enter**.

    Figure 32 : Back - ens192

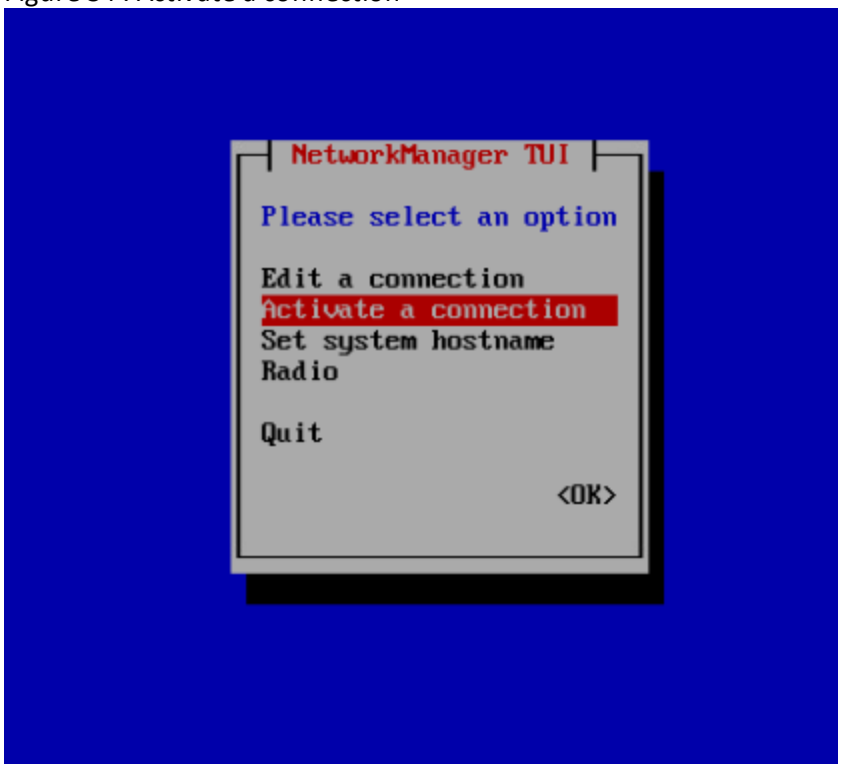
11. Select **QUIT** and press **Enter**.

Figure 33 : Quit



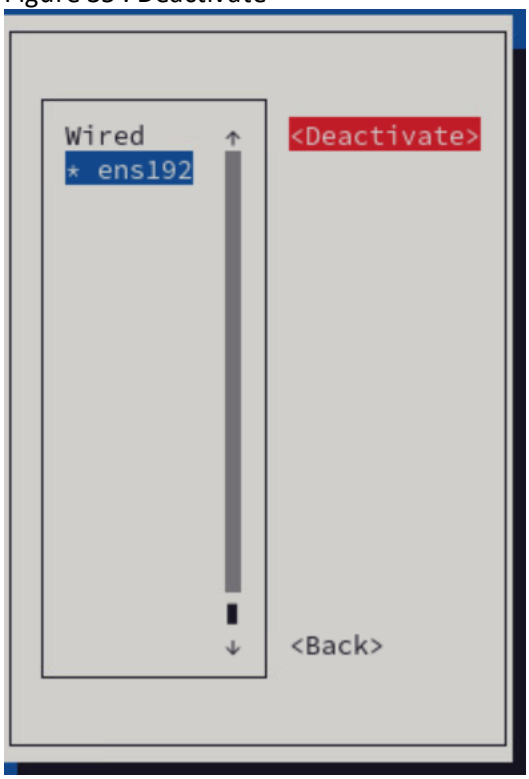
12. Execute the command `nmtui` in the terminal again, select **Edit a connection**, and press **Enter**.
13. Select **Activate a connection** and press **Enter**.

Figure 34 : Activate a connection



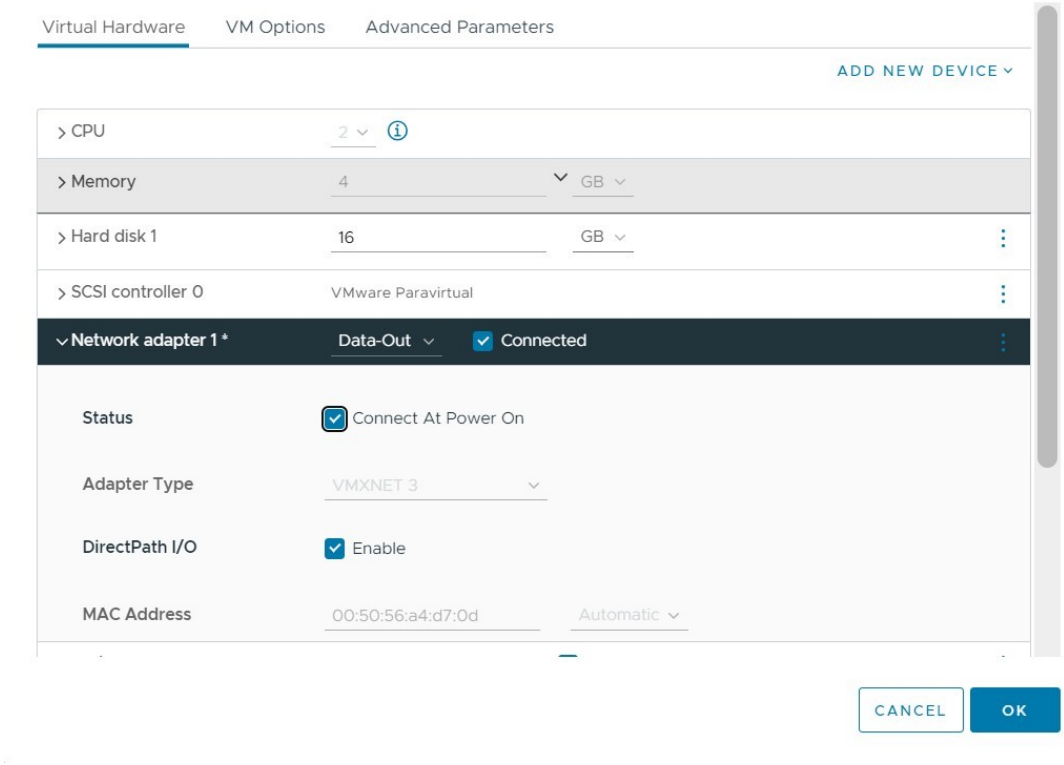
14. Select your interface name, select **Deactivate**, and press **Enter**.

Figure 35 : Deactivate



15. Navigate to the vCenter, right click the cloned VM, and click **Edit Settings**.
16. Expand the **Network Adapter 1** dropdown, select **[Connect at Power On]**, and **Connected** checkboxes.

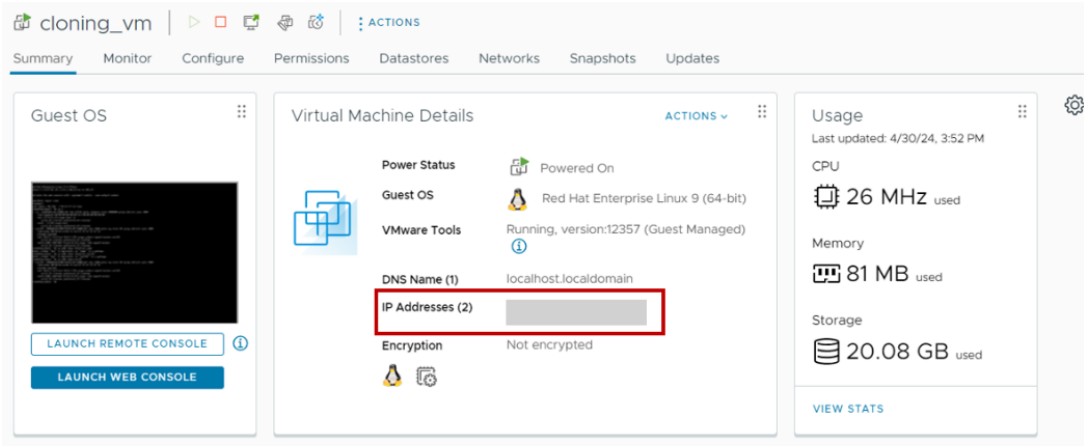
Figure 36 : Virtual Hardware



17. Click **OK** to save the configurations.

18. In the **Summary** section of the Clone-Server VM confirm that IP Address assigned is transit-ip `x.x.x.x`.

Figure 37 : Summary



19. Finally, right click **cloning_vm**, and click **Power > Power OFF** to turn off the clone VM.

Configure Source Server in vThunder

To configure the Source-Server in a vThunder instance, perform any of the following steps:

1. Refer the steps from the Basic Server Load Balancer
2. From Start menu, open command prompt, and configure the following:

   Consider the following table as an example for basic SLB configurations on vThunder.

Table 10 : JSON Parameters

Resource Name	Description
Source Server	Specify source server with its IP address. For Example: The source server's name is “nginx-app” `slb server nginx-app X.X.X.X`

Port List	Specify the ports that are in use from the server subnet
	`health-check ping`
	`port 53 udp`
	`health-check ping`
	`port 80 tcp`
	`health-check ping`
	`port 443 tcp`
	`health-check ping`

Service Group	Specify the service groups for each port
	`!`
	`slb service-group nginx-app-server-sg443 tcp`
	`member nginx-app 443`
	`!`
	`slb service-group nginx-app-server-sg53 udp`
	`member nginx-app 53`
	`!`

Table 10 : JSON Parameters

Resource Name	Description

	`slb service-group nginx-app-server-sg80 tcp`
	`member nginx-app 80`
	`!`

NOTE:

- vThunder must have a network adaptor with Data-Out port group.
- vThunder must be configured with service groups and virtual server.

Create Alarm for Scale Out and Scale In

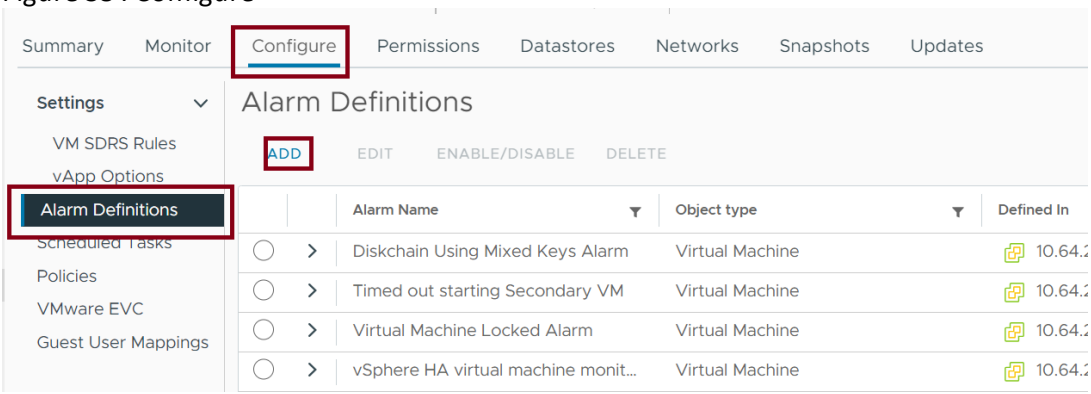
Creating an alarm is required for the proactive resource management. To create an alarm for scale out and scale in, perform the following steps:

1. Log in to vCenter UI using your vCenter server IP address or FDQN.

   https://vcenter_server_ip_address_or_fqdn

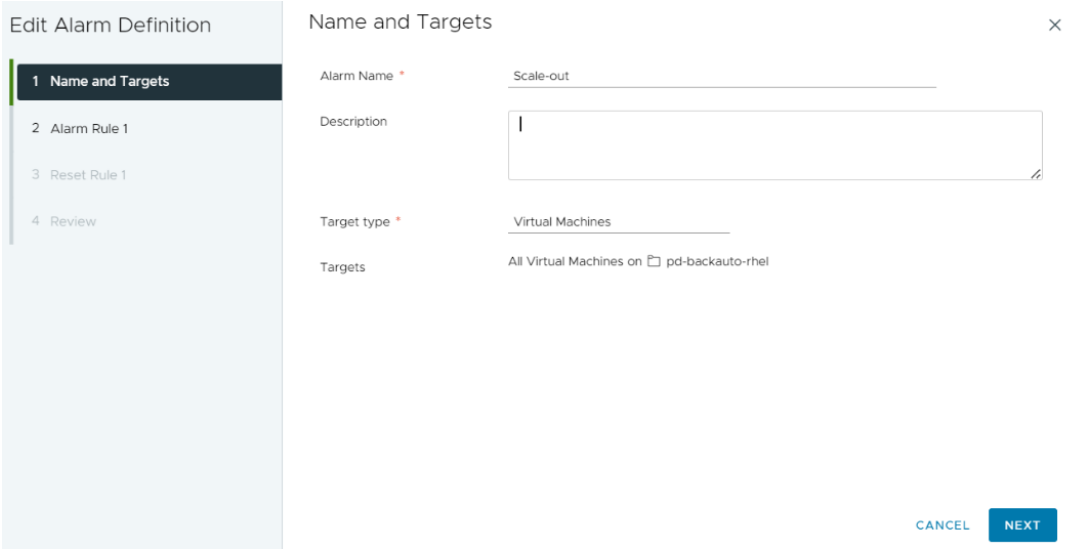
2. Navigate to the inventory folder previously created for back-auto application servers.
3. Click the inventory folder.
4. Click **Configure** tab, navigate to **Alarm Definitions**, and click **Add** to add a scale out alarm. **New Alarm Definition** page is displayed.

Figure 38 : Configure



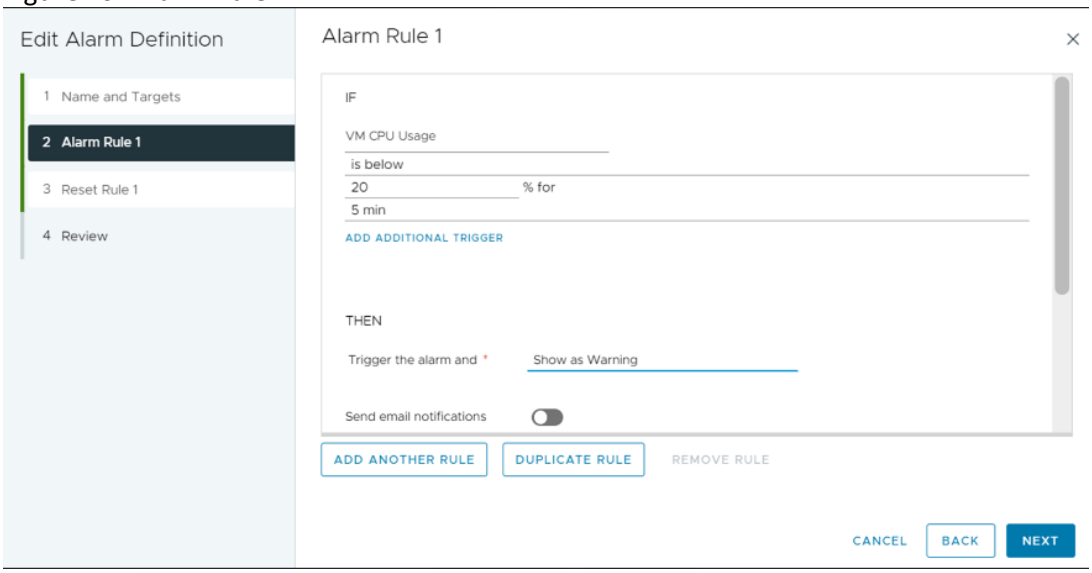
5. In the **Name and Targets** tab, enter all the required details, and click **Next**. **Alarm Rule 1** page is displayed.

Figure 39 : Name and Targets



6. Select a trigger and severity as per your requirements.

Figure 40 : Alarm Rule 1

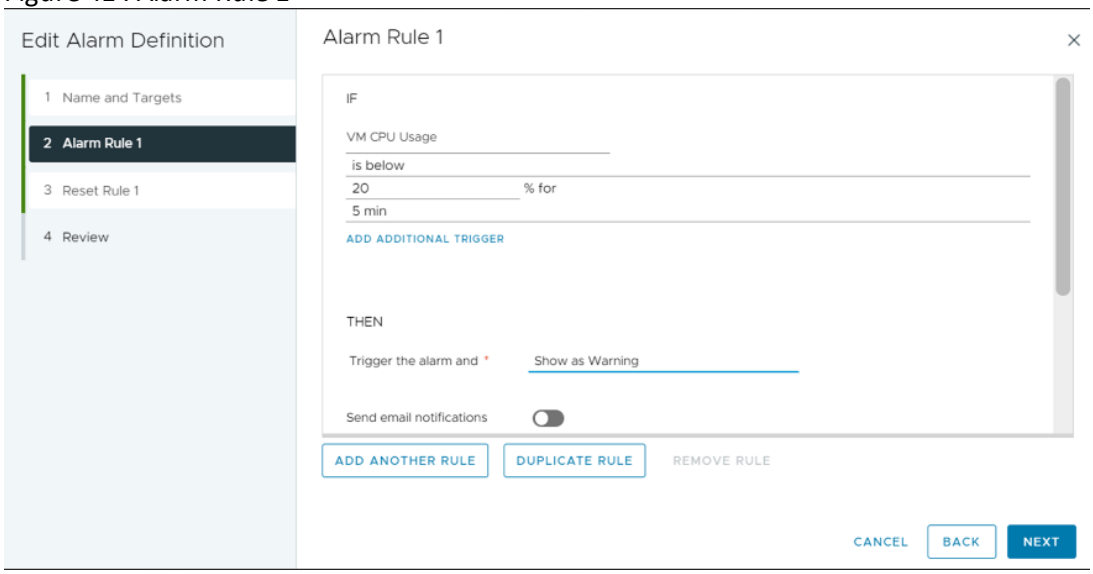


7. Enable **Run script** and select **Repeat**.
8. Enter the scale_out.py path in the **Run this Script** section and click **Next**:

```
Example: /a10networks/a10_vcenter_backauto_
plugin/apps/app1/config/scale_out.py
```

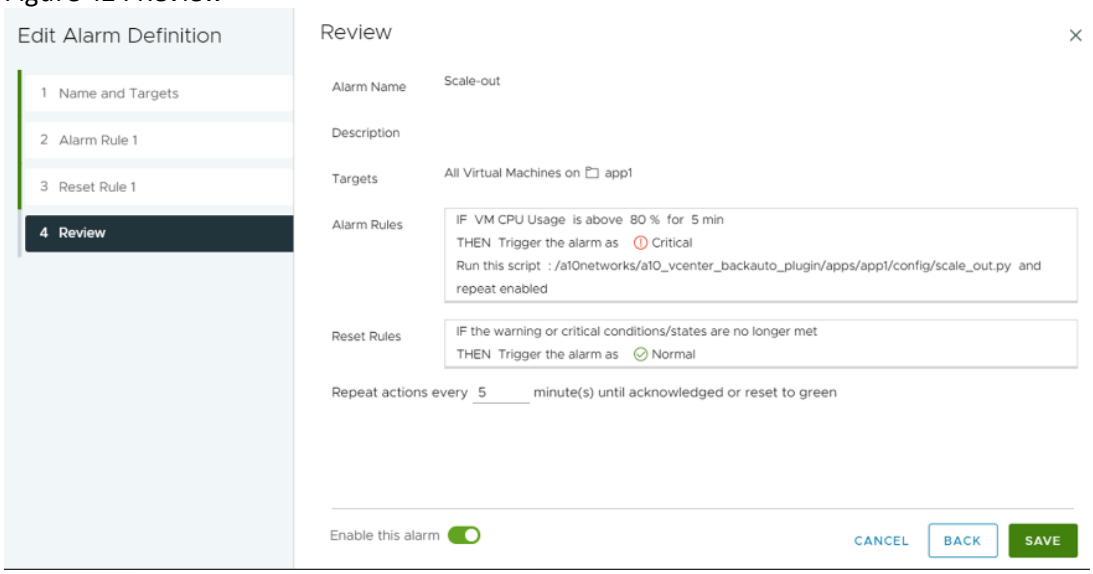
Reset Rule 1 page is displayed.

Figure 41 : Alarm Rule 1



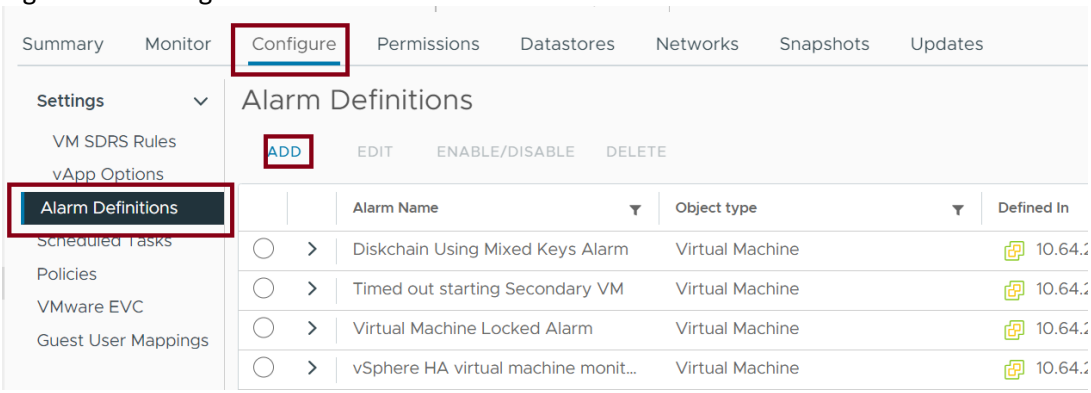
9. Click **Next**. **Review** page is displayed.
10. Choose 5 minutes if you want to execute scale_out script every 5 minutes. Ensure the alarm is enabled.

Figure 42 : Review



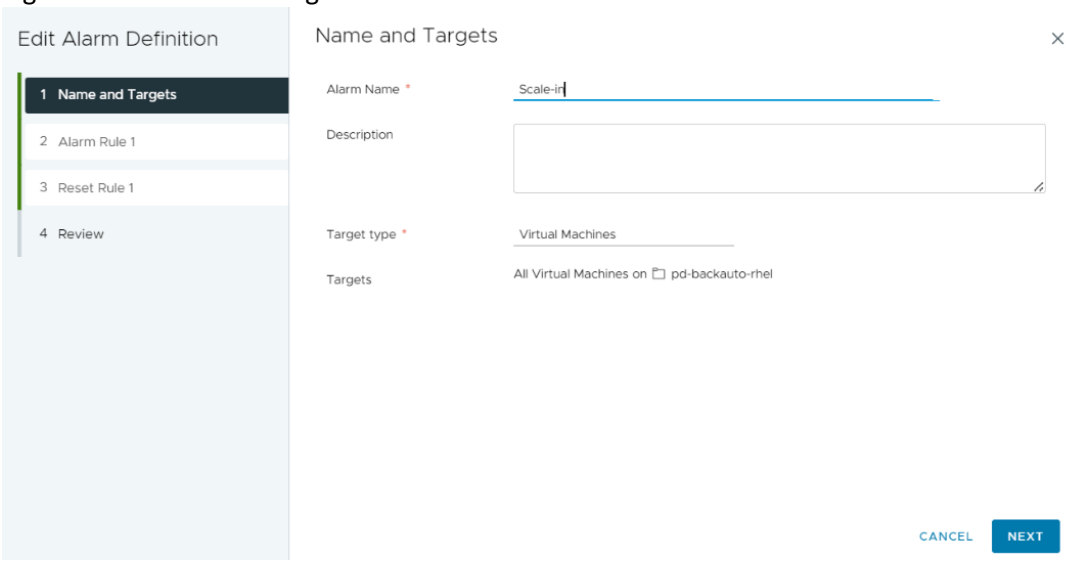
11. Click **CREATE**.
12. Click **Configure** tab, navigate to **Alarm Definitions**, and click **Add** to add a scale in alarm.

Figure 43 : Configure



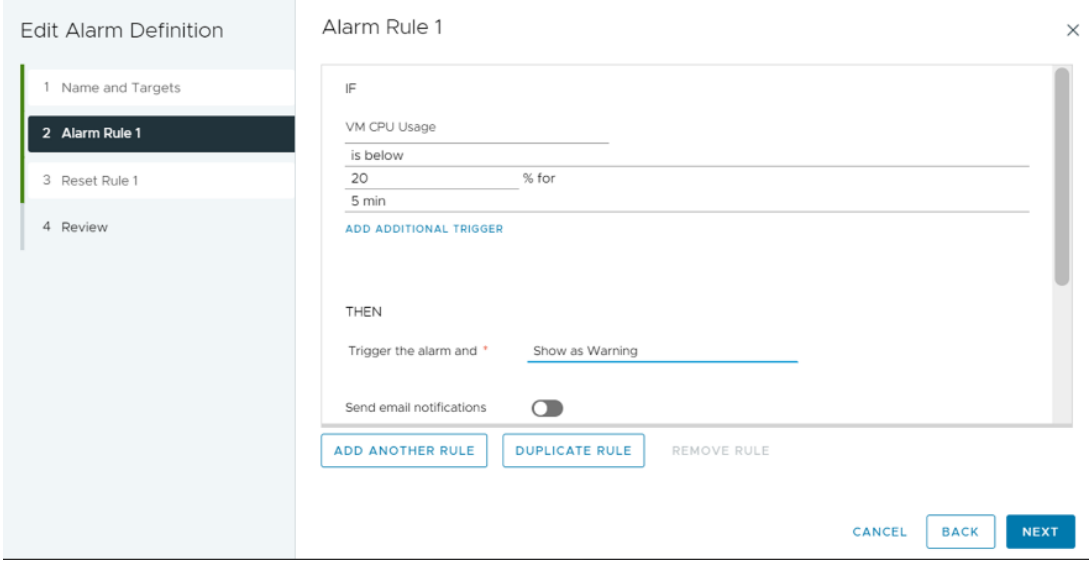
13. **New Alarm Definition** page is displayed. In the **Name and Targets** tab, enter all the required details, and click **Next**.

Figure 44 : Name and Targets



14. **Alarm Rule 1** page is displayed. Select a trigger and severity as per your requirements.

Figure 45 : Alarm Rule 1

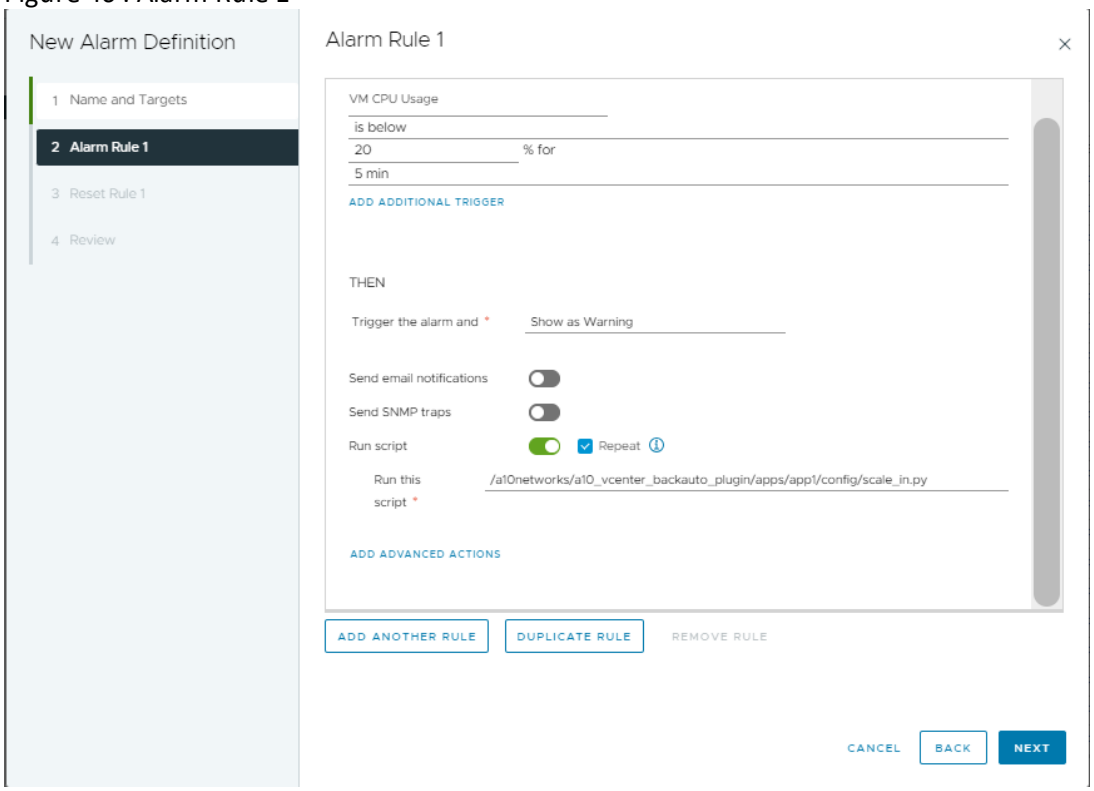


15. Enable **Run script** and select **Repeat**.
16. Enter the scale_in.py path in the **Run this Script** section:

    `Example: /a10networks/a10_vcenter_backauto_plugin/apps/app1/config/scale_in.py`

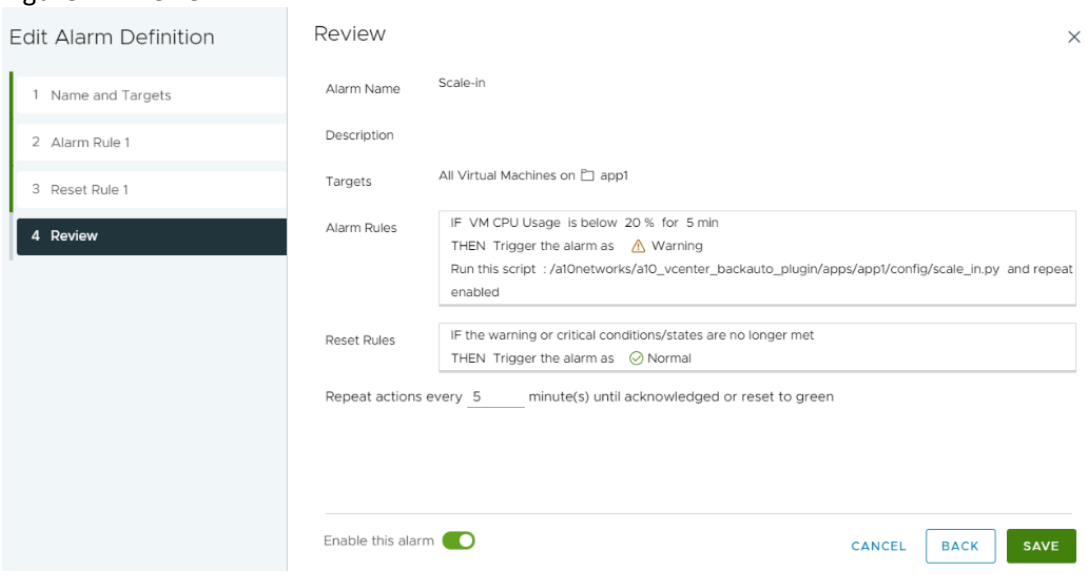
    Reset Rule 1 page is displayed.

Figure 46 : Alarm Rule 1



17. Click **Next**. **Review** page is displayed.
18. Choose 5 minutes if you want to execute scale_in script every 5 minutes. Ensure the alarm is enabled.

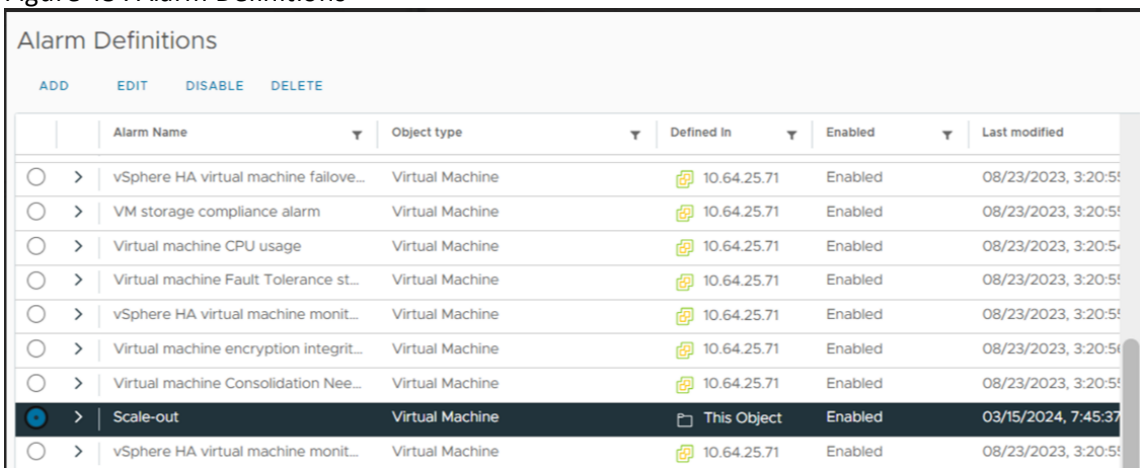
Figure 47 : Review



19. Click **CREATE**.

The alarms have been created successfully for scale in and scale out. You can see the created alarms under the **Alarm Definitions** section.

Figure 48 : Alarm Definitions



Configure Multiple Application Servers

In the current release, setting up Multiple Application Servers requires manual configuration. The separate Inventory Folder in vCenter for each application server

has to be manually created and then the Back-Auto scripts have to be copied in the application folder.

To configure Multiple Application Servers, perform the following steps:

1. Log in to vCenter UI using your vCenter server IP address or FDQN.

   https://vcenter_server_ip_address_or_fqdn

2. Create Inventory folder for each source VM separately. For more information, refer Create Inventory Folder.
3. Log in to the vCenter VM and execute the following commands to copy back-auto configurations scripts in different folder:

```
cd /a10networks/a10_vcenter_Back-Auto_plugin/apps/
cp -a app1/ app2
```

NOTE: Each source VM has a different application folder. Eg. Ubuntu source VM will have app1 folder and RHEL source VM will have app2 folder.

4. Create a Clone-Server VM manually from the existing Source-Server VM for app2. For steps, refer to Clone a Virtual Machine.

NOTE: If the source VM user is not root then disable non root user password for sudo commands. For steps, refer to Enable root user.

5. Use the vi command to open and update the config.ini file for each source VM as shown below:

```
vi app1/config.ini
vi app2/config.ini
```

   Update the following details in app2/config.ini:

```
clone_vm_name
clone_vm_id
```

6. Similarly, update the assigned IP addresses for each source VM using the following command:

```
vi app1/app_servers.ini
vi app2/app_servers.ini
Example:
[AppServer]
last_scaling_timestamp = 0
assigned_ip_addr = {'X.X.X.X', 'X.X.X.X', 'X.X.X.X', 'X.X.X.X',
'X.X.X.X'}
```

7. Create alarms for scale out and scale in for app2 folder. For steps, refer to Create Alarm for Scale Out and Scale In

Configure AutoScale logs

AutoScale logs for all application folders are available at the following location:

```
/var/log/vmware/vpxd/autoscale.log
```

Hybrid Cloud GSLB

A hybrid cloud configuration as a Global Server Load balancer (GSLB) between two regions residing in same or different cloud or on-premise environments. It provides flexibility to implement disaster recovery site.

It requires atleast two Thunder instances in each region or location. One instance serves as the master controller, while the other functions as the site device. It is possible to configure multiple site devices, but it is recommended to have a minimum of three site devices to ensure seamless failover and effective disaster recovery.

Both regions should maintain an equivalent number of resources, whether hosted in the cloud or on-premise.

To create and install three thunder instances in any one region use Thunder-3NIC-3VM template. Same template can be used to install in another region.

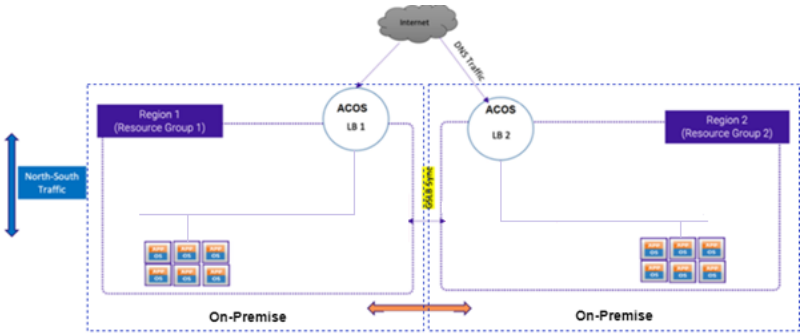
Architectural References

Refer to the following for architectural reference:

- On-Premise-to-On-Premise (any)

  Region1 and Region2 are on-premises.

  Figure 49 : On-Premise-to-On-Premise

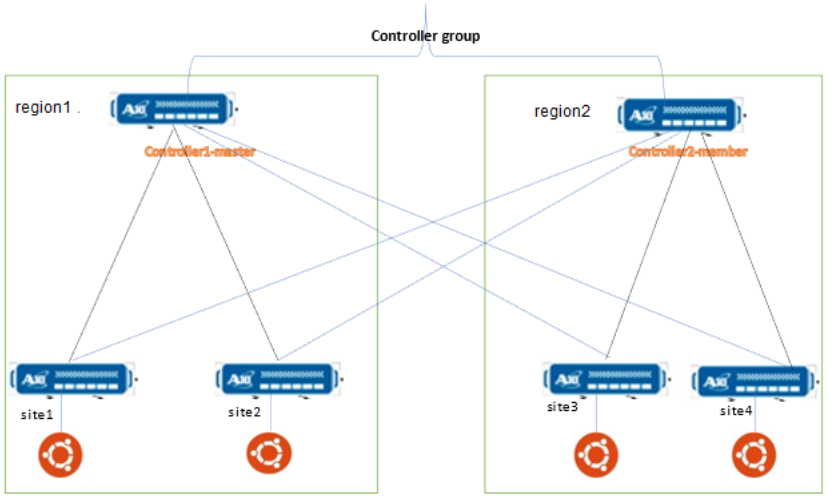


GSLB Deployment Topology

Figure 1 shows the GSLB deployment topology having two regions, Region1 and Region2. Both the regions must have identical number of resources:

- One GSLB controller
  This Thunder instance act as a DNS server that directs client to reach the active load balancer.
  GLSB controller of Region1 is considered as 'Master' and Region2 is considered as 'Member'.
- Two site devices
  These Thunder instances act as a load balancer and sends traffic to the server. Each site device may have multiple app or web servers configured and route the traffic accordingly.

Figure 50 : Hybrid Cloud GSLB Deployment Topology



Configure Hybrid Cloud GSLB

Hybrid Cloud GSLB configuration requires two regions and each region should host three Thunder instances.

Python3 should be installed on your machine from where the scripts are executed to run the Hybrid Cloud GSLB configuration. For more information, see Install Python3.

To configure hybrid cloud GSLB, perform the following:

1. Create three vThunder instances if not already created. For more information, see Thunder-3NIC-3VM.
2. Download **A10-vThunder_ADC-CONFIGURATION** > **HYBRID-CLOUD-GSLB** folder from GitHub.
3. From Start menu, open command prompt and navigate to this downloaded folder.
4. Open the HYBRID_CLOUD_CONFIG_GSLB_PARAM.json with a text editor.

NOTE: Each parameter has a default value mentioned in the parameter file which can be modified as required.

5. Configure the following parameters:

Table 11 : JSON Parameters

Resource Name	Description
Master controller ethernet IP addresses	Specify the ethernet 1 & 2 Private IP addresses of master controller vThunder instance. `"master-controller-address-list": { "ethernet1-addresses" : [ { "ipv4-address": "x.x.x.x", "ipv4-netmask": "255.255.255.0" } ], "ethernet2-addresses" : [ { "ipv4-address": " x.x.x.x", "ipv4-netmask": "255.255.255.0" } ] },`
Site 1 region 1 ethernet IP addresses	Specify the ethernet 1 & 2 Private IP addresses of Site 1 region 1 vThunder instance. `"site1-address-list-reg1": { "ethernet1-addresses" : [ { "ipv4-address": "x.x.x.x", "ipv4-netmask": "255.255.255.0" } ], "ethernet2-addresses" : [`

Table 11 : JSON Parameters

Resource Name	Description

	<pre>{
	"ipv4-address":
	"x.x.x.x",
	"ipv4-netmask":
	"255.255.255.0"
	}
	]
	},</pre>

Site 2 region 1 ethernet IP addresses	Specify the ethernet 1 & 2 Private IP addresses of Site 2 region 1 vThunder instance.
	<pre>"site2-address-list-reg1": {
	"ethernet1-addresses" : [
	{
	"ipv4-address":
	"x.x.x.x",
	"ipv4-netmask":
	"255.255.255.0"
	}
	],
	"ethernet2-addresses" : [
	{
	"ipv4-address":
	"x.x.x.x",
	"ipv4-netmask":
	"255.255.255.0"
	}
	]
	},</pre>

Member controller ethernet IP addresses	Specify the ethernet 1 & 2 Private IP addresses of member controller vThunder instance.
	<pre>"member-controller-address-list": {
	"ethernet1-addresses" : [
	{</pre>

Table 11 : JSON Parameters

Resource Name	Description

	<pre>"ipv4-address": "x.x.x.x",
	"ipv4-netmask": "255.255.255.0"
	}
	
	],
	"ethernet2-addresses" : [
	{
	"ipv4-address": "x.x.x.x",
	"ipv4-netmask": "255.255.255.0"
	}
	]
	},</pre>

Site 1 region 2 ethernet IP addresses	Specify the ethernet 1 & 2 Private IP addresses of Site 1 region 2 vThunder instance.
	<pre>"site1-address-list-reg2": {
	"ethernet1-addresses" : [
	{
	"ipv4-address": "x.x.x.x",
	"ipv4-netmask": "255.255.255.0"
	}
	
	],
	"ethernet2-addresses" : [
	{
	"ipv4-address": "x.x.x.x",
	"ipv4-netmask": "255.255.255.0"
	}</pre>

Table 11 : JSON Parameters

Resource Name	Description
	] },

Site 2 region 2 ethernet IP addresses	Specify the ethernet 1 & 2 Private IP addresses of Site 2 region 2 vThunder instance.
	"site2-address-list-reg2": {
	"ethernet1-addresses" : [
	{
	"ipv4-address": "x.x.x.x",
	"ipv4-netmask": "255.255.255.0"
	}
	],
	"ethernet2-addresses" : [
	{
	"ipv4-address": "x.x.x.x",
	"ipv4-netmask": "255.255.255.0"
	}
	]
	},

5. Configure Master Controller for Region1.

   Master Controller is the first vThunder instance in Region1 and it could be any vThunder instance.

   a. Collect Master Controller Parameter Details information.

   b. Update this information under **masterConfigDetails** section of the **//CONFIGURATIONS/HYBRID-CLOUD-GSLB/HYBRID_CLOUD_CONFIG_GSLB_PARAM.json** file.

6. Configure Site1 for Region1.

   Site1 is the second vThunder instance in Region1 and it could be any vThunder instance.

   a. Collect Site Details information.

   b. Update this information under `siteList1` section of the **//CONFIGURATIONS/HYBRID-CLOUD-GSLB/HYBRID_CLOUD_CONFIG_GSLB_PARAM.json** file.

7. Configure Site2 for Region1.

   Site2 is the third vThunder instance in Region1 and it could be any vThunder instance.

   a. Collect Site Details information.

   b. Update this information under `siteList2` section of the **//CONFIGURATIONS/HYBRID-CLOUD-GSLB/HYBRID_CLOUD_CONFIG_GSLB_PARAM.json** file.

8. Configure Member Controller for Region2.

   Member Controller is the first vThunder instance in Region2 and it could be any vThunder instance.

   a. Collect Member Controller Parameter details information.

   b. Update this information under `memberConfigDetails` section of the **//CONFIGURATIONS/HYBRID-CLOUD-GSLB/HYBRID_CLOUD_CONFIG_GSLB_PARAM.json** file.

9. Configure Site1 for Region2.

   Site1 is the second vThunder instance in Region2 and it could be any vThunder instance.

   a. Collect Site Details information.

   b. Update this information under `siteList3` section of the **//CONFIGURATIONS/HYBRID-CLOUD-GSLB/HYBRID_CLOUD_CONFIG_GSLB_PARAM.json** file.

10. Configure Site2 for Region2.

    Site2 is the third vThunder instance in Region2 and it could be any vThunder instance.

    a. Collect Site Details information.

    b. Update this information under **`siteList4`** section of the **//CONFIGURATIONS/HYBRID-CLOUD-GSLB/HYBRID_CLOUD_CONFIG_GSLB_PARAM.json** file.

11. Verify if all the configurations in the HYBRID_CLOUD_CONFIG_GSLB_PARAM.json file are correct and save the changes.

12. From Start menu, open cmd and navigate to this downloaded folder to run the following command to configure GSLB:

```
C:\Users\TestUser\A10-VMware_ADC-CONFIGURATION\HYBRID-CLOUD-GSLB>
python HYBRID_CLOUD_CONFIG_GSLB.py
```

13. If the Hybrid cloud is configured successfully, the following message is displayed:

```
Gathering public and private ip address for site devices.
------------------------------------------------------------
[{'ipv4-address': 'x.x.x.x', 'ipv4-netmask': '255.255.255.0'}]
configured ethernet- 1 ip
configured ethernet- 2 ip
Configuring slb server for site: site1
Successfully Configured slb server for site: site1
Configuring service group for site: site1
Successfully Configured service group for site:site1
Successfully Configured virtual server for site: site1
Successfully Configured gslb site: site1
Successfully Configured default route:site1
Configurations are saved on partition: shared
------------------------------------------------------------
[{'ipv4-address': 'x.x.x.x', 'ipv4-netmask': '255.255.255.0'}]
configured ethernet- 1 ip
configured ethernet- 2 ip
Configuring slb server for site: site2
Successfully Configured slb server for site: site2
```

```
Configuring service group for site: site2
Successfully Configured service group for site:site2
Successfully Configured virtual server for site: site2
Successfully Configured gslb site: site2
Successfully Configured default route:site2
Configurations are saved on partition: shared
------------------------------------------------------------
[{'ipv4-address': 'x.x.x.x', 'ipv4-netmask': '255.255.255.0'}]
configured ethernet- 1 ip
configured ethernet- 2 ip
Configuring slb server for site: site3
Successfully Configured slb server for site: site3
Configuring service group for site: site3
Successfully Configured service group for site:site3
Successfully Configured virtual server for site: site3
Successfully Configured gslb site: site3
Successfully Configured default route:site3
Configurations are saved on partition: shared
------------------------------------------------------------
[{'ipv4-address': 'x.x.x.x', 'ipv4-netmask': '255.255.255.0'}]
configured ethernet- 1 ip
configured ethernet- 2 ip
Configuring slb server for site: site4
Successfully Configured slb server for site: site4
Configuring service group for site: site4
Successfully Configured service group for site:site4
Successfully Configured virtual server for site: site4
Successfully Configured gslb site: site4
Successfully Configured default route:site4
Configurations are saved on partition: shared
------------------------------------------------------------
```

```
Configuring controller devices
[{'ipv4-address': 'x.x.x.x', 'ipv4-netmask': '255.255.255.0'}]
configured ethernet- 1 ip
configured ethernet- 2 ip
Successfully Configuring gslb server for controller: masterController
Successfully Configured ServiceIp for site: masterController
Successfully Configured ServiceIp for site: masterController
Successfully Configured ServiceIp for site: masterController
Successfully Configured ServiceIp for site: masterController
Successfully Configured site information for: masterController
Successfully Configured site information for: masterController
Successfully Configured site information for: masterController
Successfully Configured site information for: masterController
Successfully Configured gslb policy for: masterController
Successfully Configured gslb zone for: masterController
Successfully Configured gslb controller and status interval:
masterController
Successfully Configured gslb controller group: masterController
Successfully Configured geo location: masterController
Successfully Configured default route:masterController
Configurations are saved on partition: shared
[{'ipv4-address': 'x.x.x.x', 'ipv4-netmask': '255.255.255.0'}]
configured ethernet- 1 ip
configured ethernet- 2 ip
Successfully Configured gslb server for controller: memberController
Successfully Configured gslb controller group: memberController
Successfully Configured default route:memberController
Configurations are saved on partition: shared
```

Master Controller Parameter Details

Table 12 : Master Controller Parameter details

Parameter	Description	Sample value
controllerMngmtPublicIp	Public IP of Management Interface of Region1 Controller.	`10.64.25.176`
controllerPassword	vThunder instance Login password of Region1 Controller.	***

Parameter	Description	Sample value
controllerSecPrivateIpData1	Secondary Private IP of Data Interface Subnet1 of Region1 Controller.	10.64.25.165
site1MngmtPublicIp	Public IP of Management Interface of Region1 Site1.	10.64.25.177
site1Password	vThunder instance Login password of Region1 Site1 .	***
site2MngmtPublicIp	Public IP of Management Interface of Region1 Site2.	10.64.25.178
site2Password	vThunder instance Login password of Region1 Site2 .	***
site1SecPrivateIpData1	Secondary Private IP of DataSubnet1 of Region1 Site1 vThunder.	10.0.2.9
site1SecPublicIpData1	Secondary Public IP of DataSubnet1 of Region1 Site1 vThunder.	10.64.25.161
site2SecPrivateIpData1	Secondary Private IP of DataSubnet1 of Region1 Site2 vThunder.	10.0.2.10
site2SecPublicIpData1	Secondary Public IP of DataSubnet1 of Region1 Site2 vThunder.	10.64.25.162
server1PrivateIp	Private IPv4 address of Server1 of Region1.	10.0.3.9
server2PrivateIp	Private IPv4 address of Server1 of Region1.	10.0.3.10

Member Controller Parameter Details

Table 13 : Member Controller Parameter details

Parameter	Description	Sample value
controllerMngmtPublicIp	Public IP of Management Interface	10.64.25.179

Parameter	Description	Sample value
	of Region2 Controller.	
controllerPassword	vThunder instance Login password of Region2 Controller.	***
controllerSecPrivateIpData1	Secondary Private IP of Data Interface Subnet1 of Region2 Controller.	10.64.25.165
site1MngmtPublicIp	Public IP of Management Interface of Region2 Site1.	10.64.25.180
site1Password	vThunder instance Login password of Region2 Site1 .	***
site2MngmtPublicIp	Public IP of Management Interface of Region2 Site2.	10.64.25.181
site2Password	vThunder instance Login password of Region2 Site2 .	***
site1SecPrivateIpData1	Secondary Private IP of DataSubnet1 of Region2 Site1 vThunder.	10.0.2.15
site1SecPublicIpData1	Secondary Public IP of DataSubnet1 of Region2 Site1 vThunder.	10.64.25.163
site2SecPrivateIpData1	Secondary Private IP of DataSubnet1 of Region2 Site2 vThunder.	10.0.2.16
site2SecPublicIpData1	Secondary Public IP of DataSubnet1 of Region2 Site2 vThunder.	10.64.25.164
server1PrivateIp	Private IPv4 address of Server1 of Region2.	10.0.3.11
server2PrivateIp	Private IPv4 address of Server1 of Region2.	10.0.3.12

Site Details

Table 14 : Site details

Site Name	VIP Name	Device Name	GEO Location
eastus_1	vs1	slb1	North America, United States
eastus_2	vs2	slb2	North America, United States
eastus2_1	vs3	slb3	North America.United States.California.San Jose
eastus2_2	vs4	slb4	North America.United States.California.San Jose

IP Routes

Table 15 : IP routes

RIB List Of Region	Destination IP Address	Subnet Mask	Next Hop
Region1	0.0.0.0	/0	10.0.2.1
Region2	0.0.0.0	/0	10.0.2.1

Troubleshooting

Common Errors

While deploying the templates, you might encounter some errors or issues. The common error is listed below:

Not getting response from curl request:

Make sure all the configurations are valid. If yes, then traffic issue is due to below problems.

- VIP/server is down. Sometimes VIP/server is not stable. It keeps changing its status between up and down.
- Check with below command if VIP and server are up.
  - For server: show slb server
  - For VIP: show slb virtual-server

Appendix

Default Password Policy

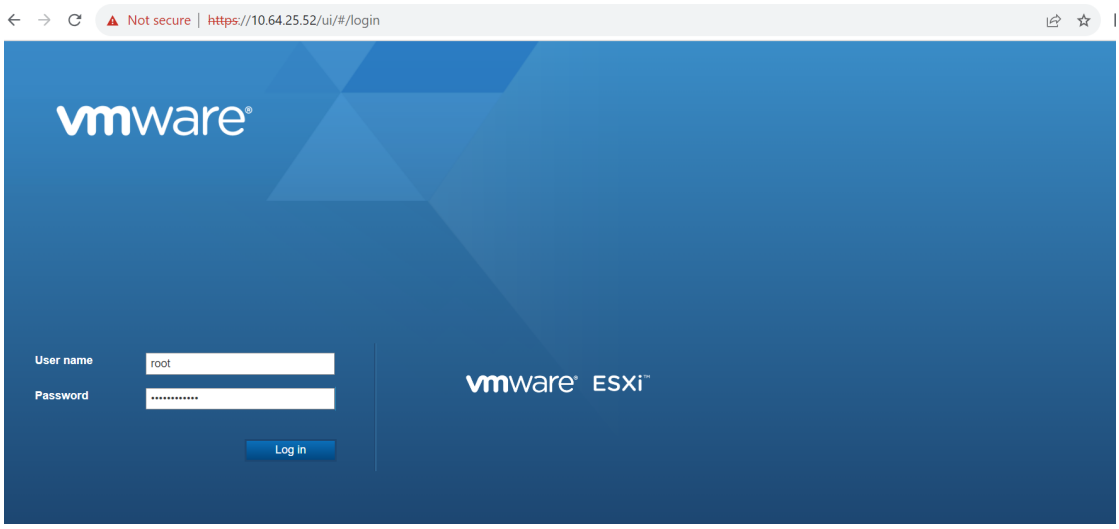
The default password policy has the following criteria:

- The password should be at least nine characters in length.
- The password should contain at least one number, an uppercase letter (English), a lowercase letter (English), and a special character.
- The password should have at least one letter or number different from the previous password.
- The password should not contain its corresponding username with the same capitalization of letters.
- The password should not contain repeated characters of the same letter or number with the same capitalization of letters.
- The password should not contain the sequential row keyboard input of four letters or numbers with the same capitalization of letters.

Create a Template from the ACOS OVF or OVA file

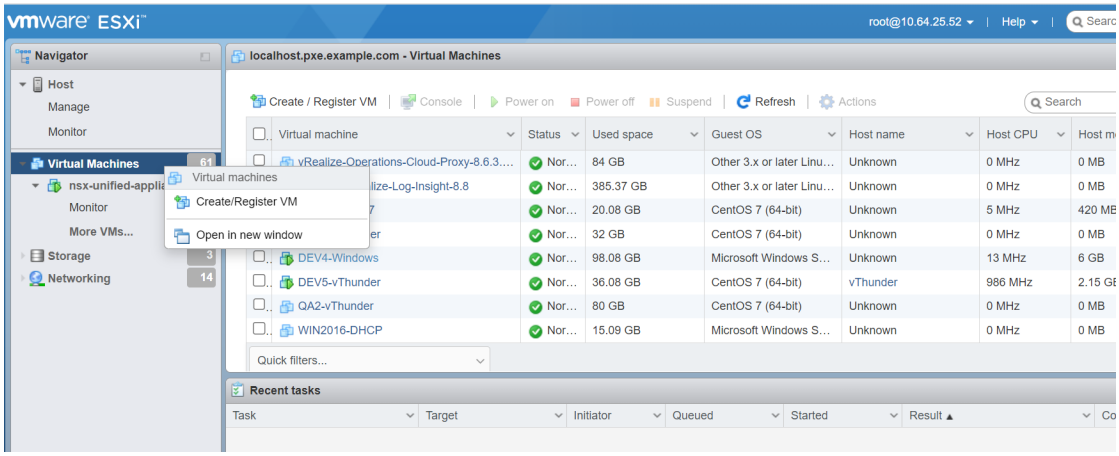
1. Download OVA or OVF file onto your local machine from https://support.a10networks.com/support/axseries
2. Go to the ESXI host and login.

Figure 51 : VMware GUI



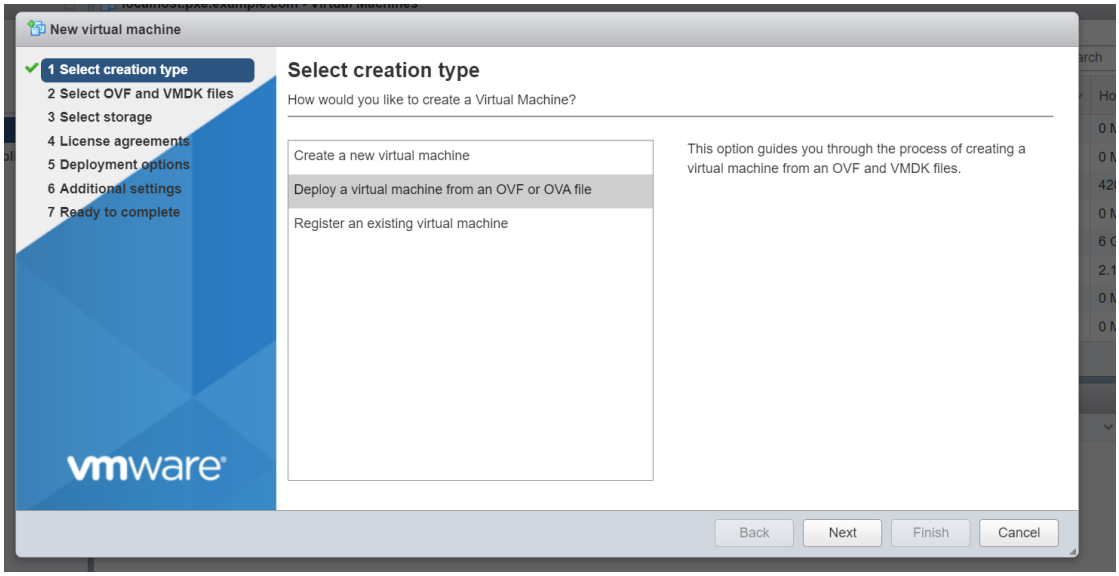
3. Right click on virtual machines and click **Create/Register VM**.

Figure 52 : Virtual Machines window



4. Select deploy a virtual machine from an OVF or OVA file, click **Next**.

Figure 53 : Select Creation Type



5. Select/drag OVF or OVA file from your local machine.

Figure 54 : Select OVF and VMDK files tab

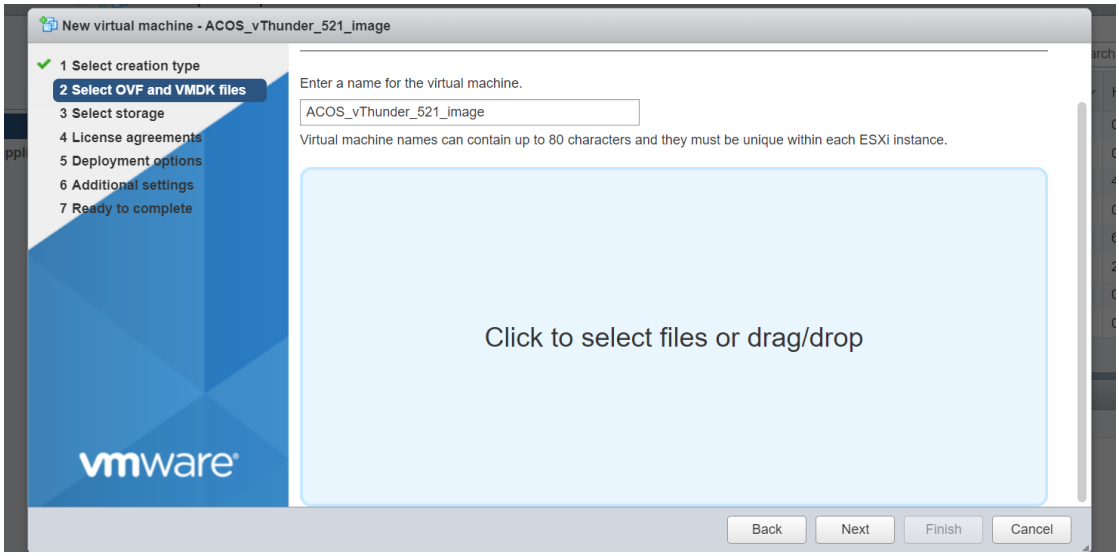
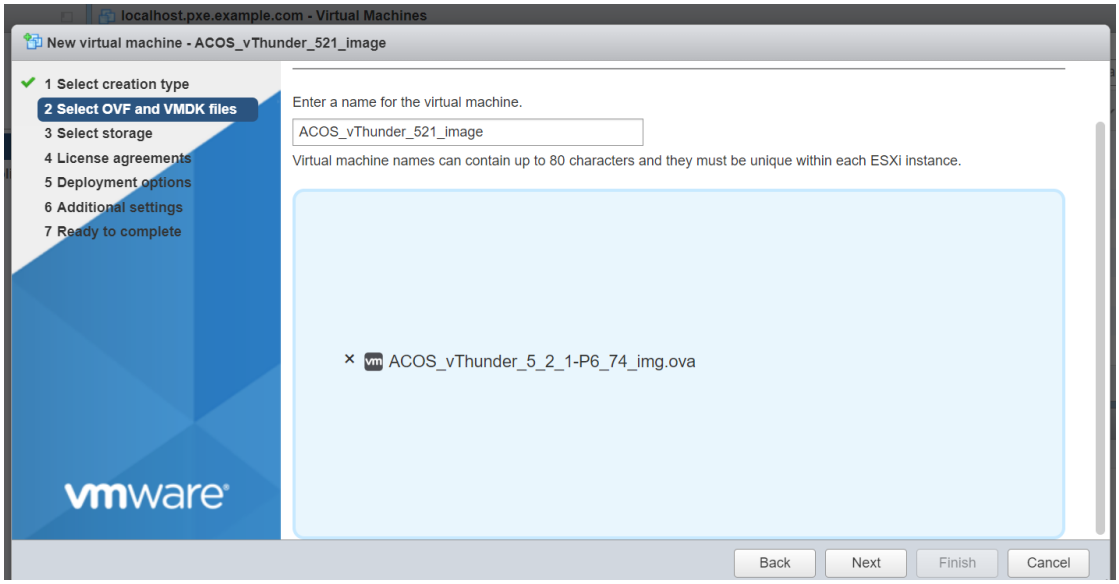
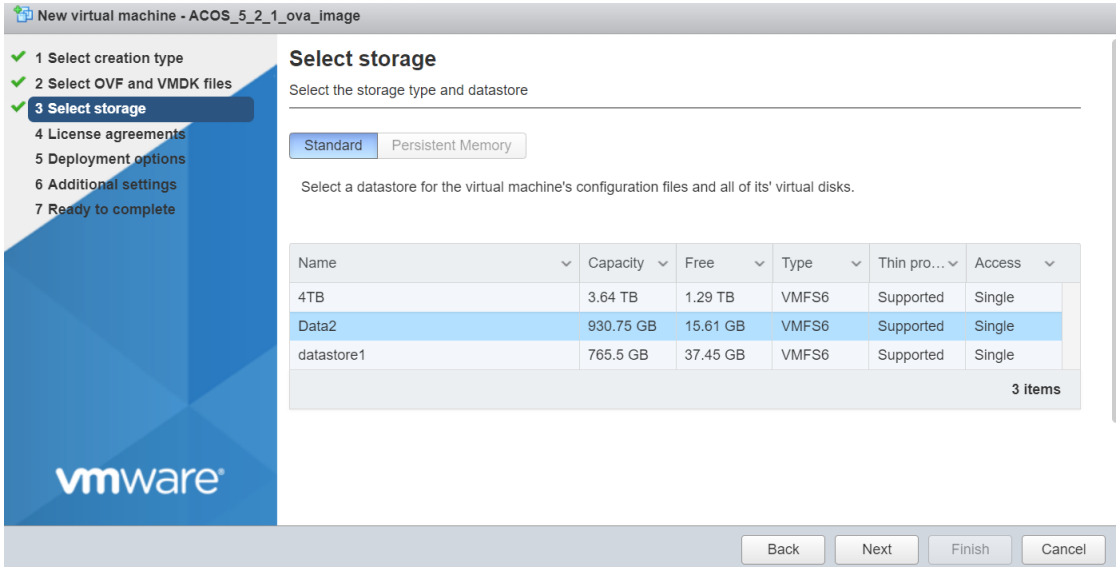


Figure 55 : Select OVF and VMDK files tab



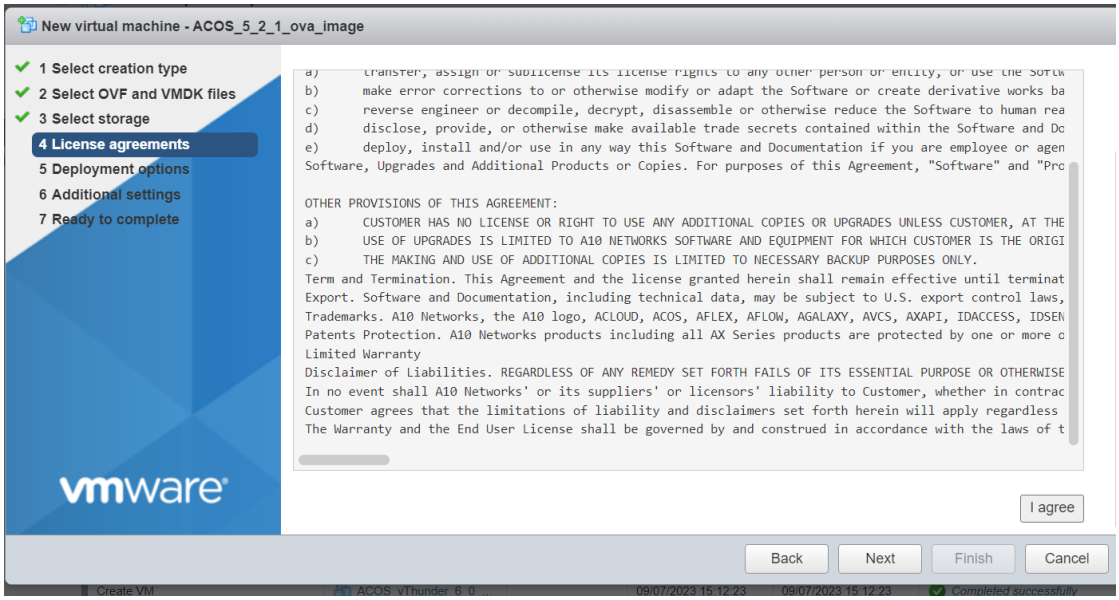
6. Choose storage.

Figure 56 : Select Storage tab



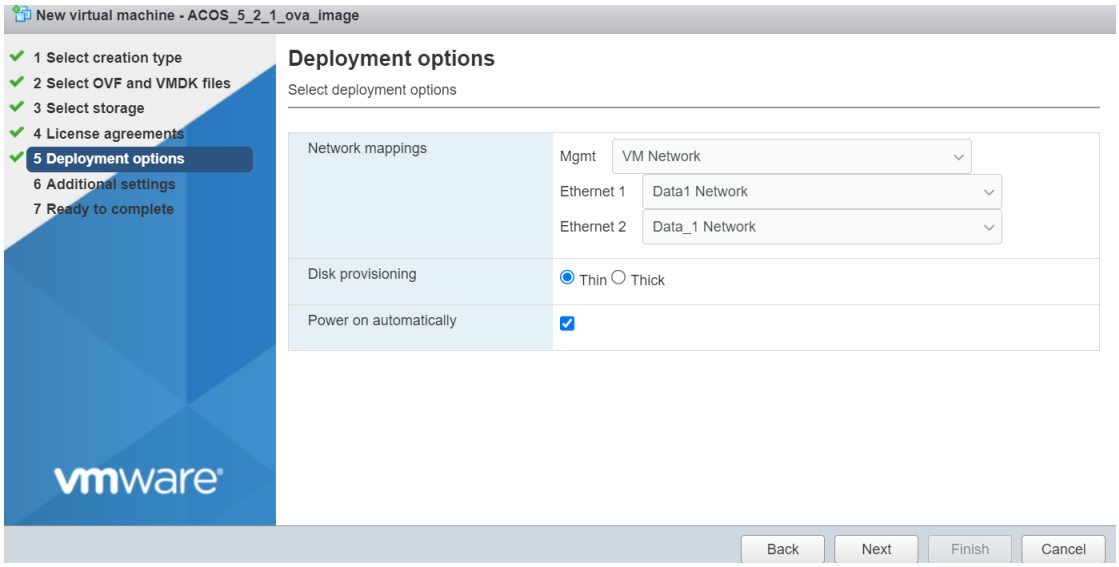
7. Click **I agree** and click **Next**.

Figure 57 : License agreements Tab



8. Select network mappings from the available networks.

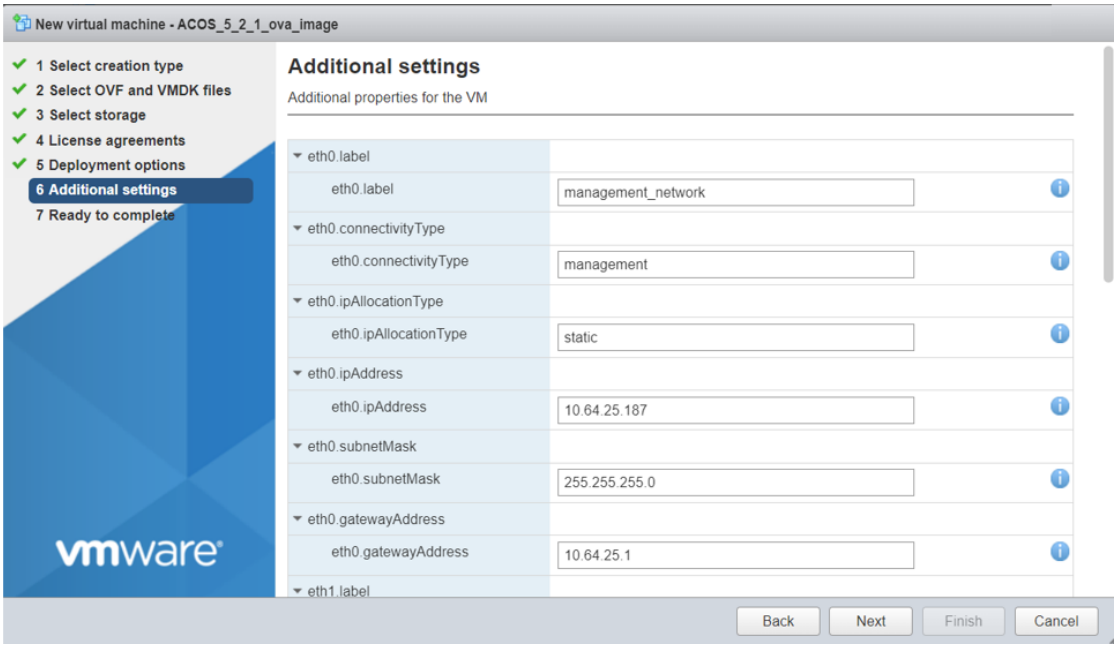
Figure 58 : Deployment Options tab



9. Provide the values in the **Additional Settings** fields as appropriate.

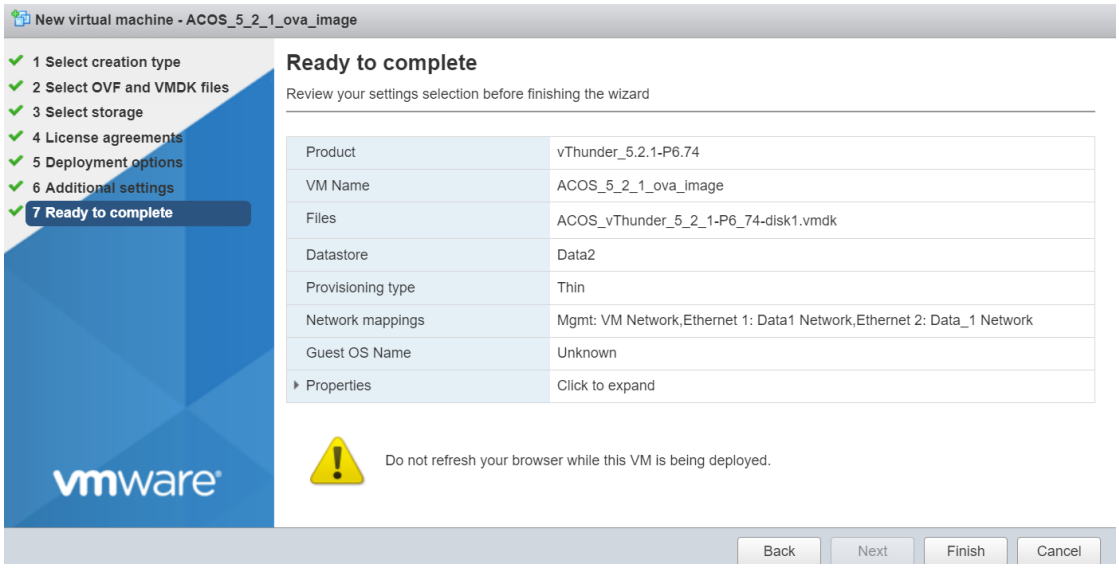
NOTE: Click ⓘ for description of each corresponding parameter.

Figure 59 : Additional Settings Tab



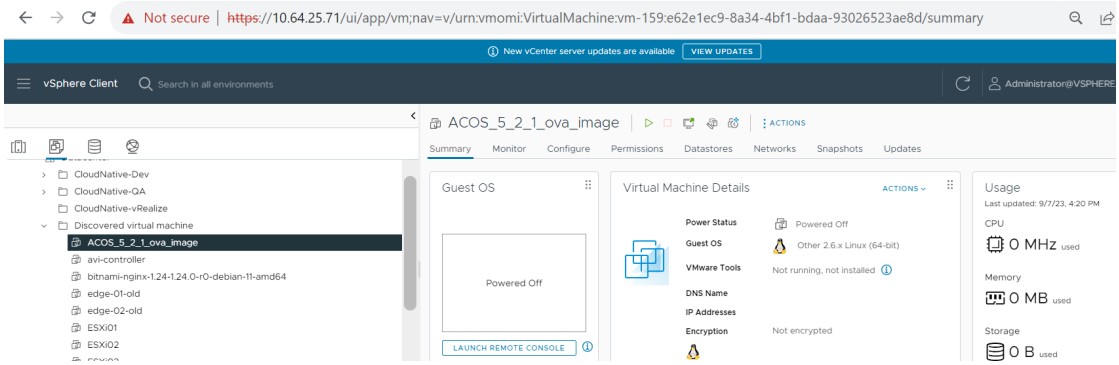
10. Review details and click **Finish**.

Figure 60 : Ready to complete Tab



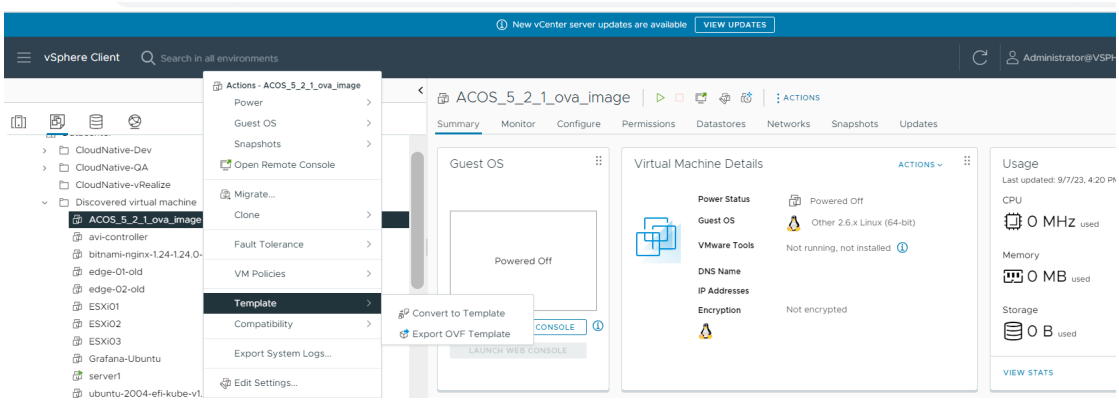
11. Virtual machine created, user can check in VMware vSphere client.

Figure 61 : VMware vSphere client



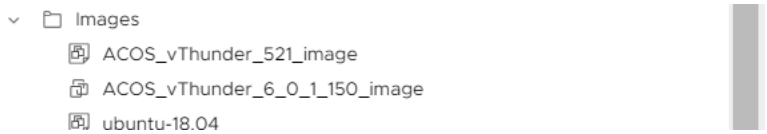
12. Right click on this virtual machine, select Template, and then select convert to template.

Figure 62 : Select Template tab



13. Move created template into the images folder.

Figure 63 : VMware GUI



14. Now users can user these templates in the vRealize automation cloud assembly cloud templates.

Setup vRealize automation Cloud Assembly for VMware templates

1. Visit URL https://vra.a10networks.com.

   The VMware vRealize Automation window is displayed.

2. Click **GO TO LOGIN PAGE**.

   Workspace ONE login window is displayed. Enter your credentials and click "**SIGN IN**"

   Figure 64 : vRealize Automation GUI

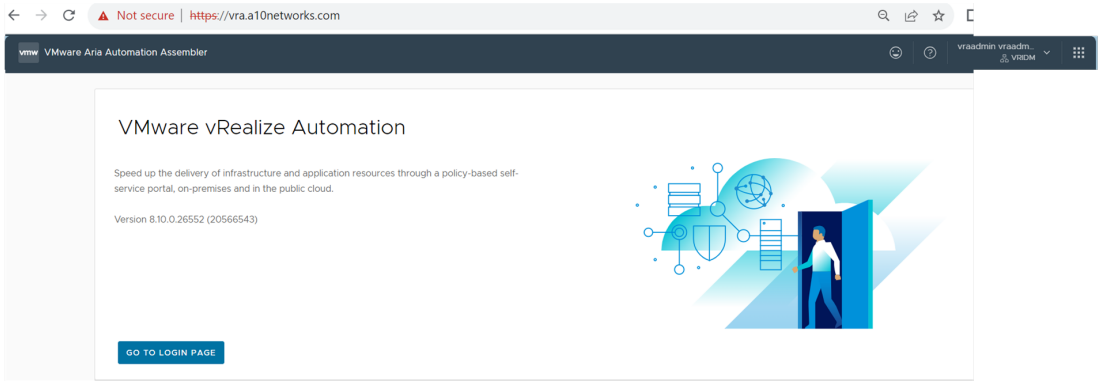
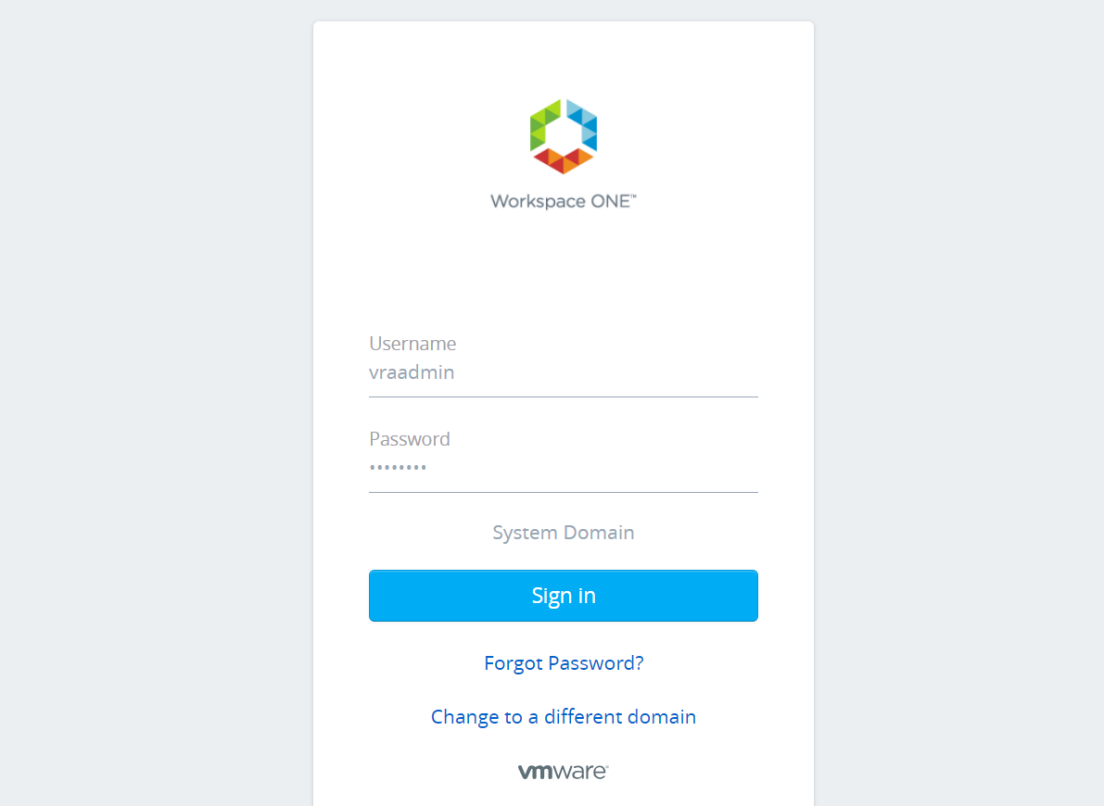
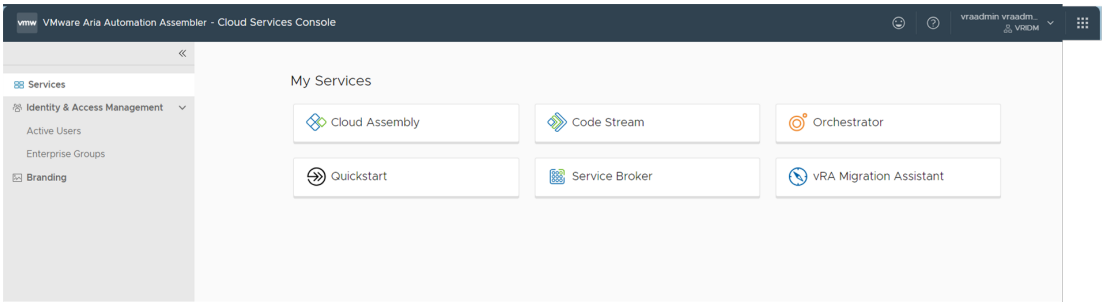


Figure 65 : workspace ONE GUI



3. The VMware vRealize Automation - Cloud Service Console window is displayed. Click **Cloud Assembly** .

Figure 66 : vRealize Automation - Cloud Service Console



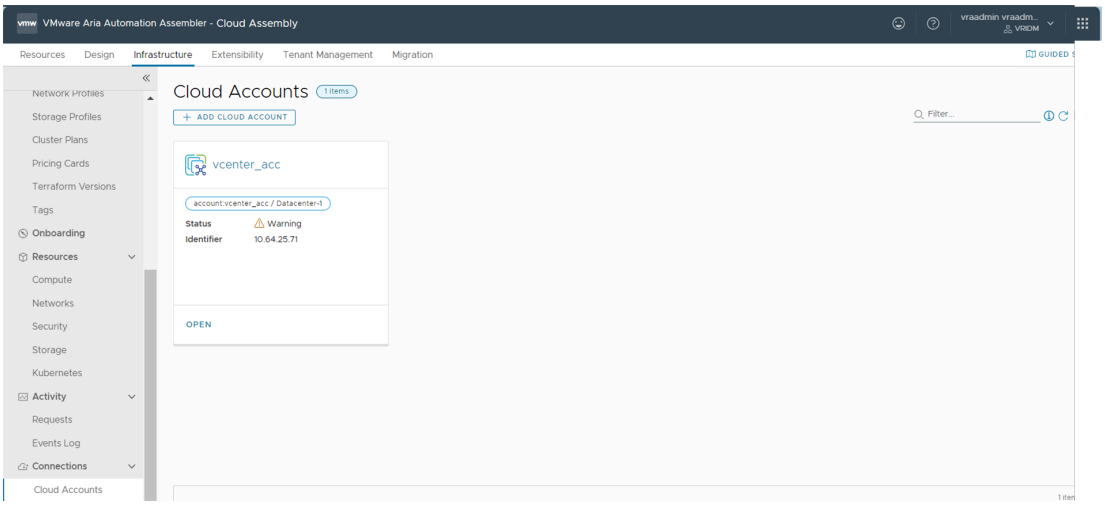
4. Select the **Infrastructure** tab.
5. Create and configure the following properties:

Cloud Account

Cloud accounts allow you to bring your public cloud and on-prem data centers under management.

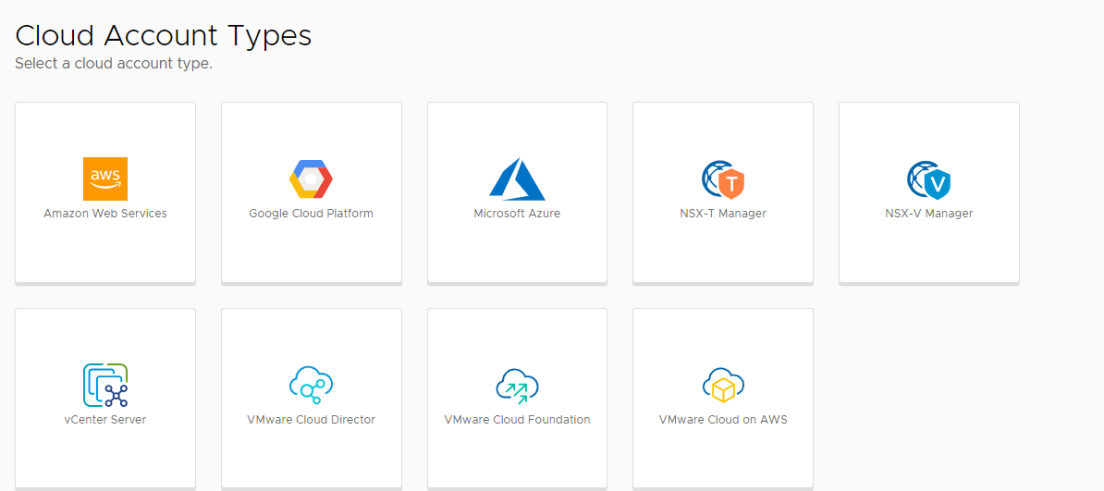
1. Click **Add Cloud Account** on the cloud accounts window.

   Figure 67 : vRealize Automation - Cloud Assembly



2. The "**Cloud Account Types**" window is displayed. Select the account type you would like to add. For cloud formation template click on vCenter Server.

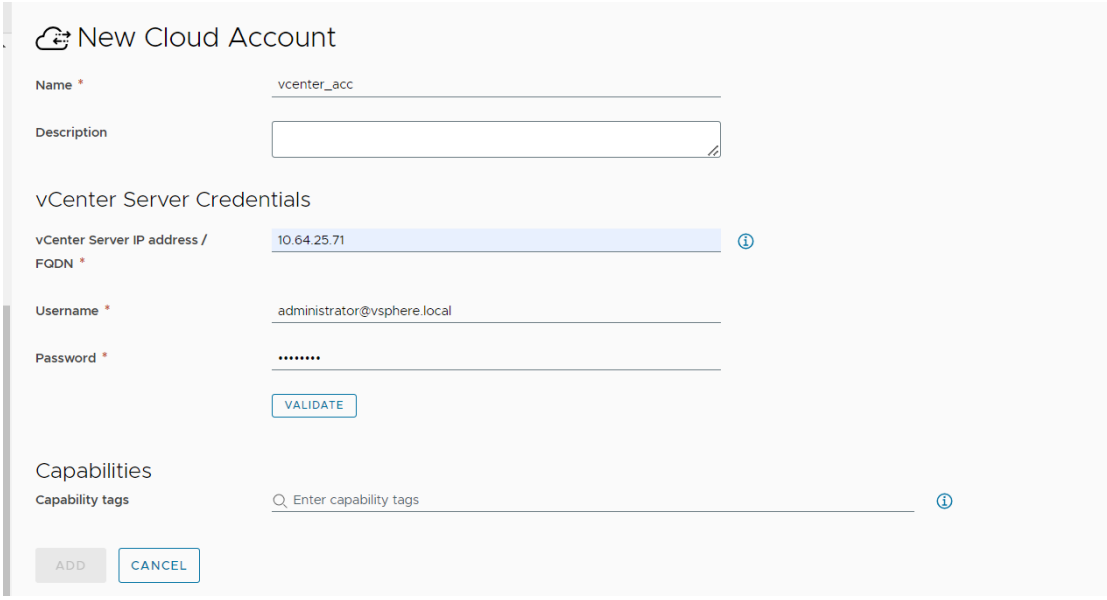
Figure 68 : Cloud Account Types



3. Enter cloud account name, vCenter Server Credentials and click **Validate**.

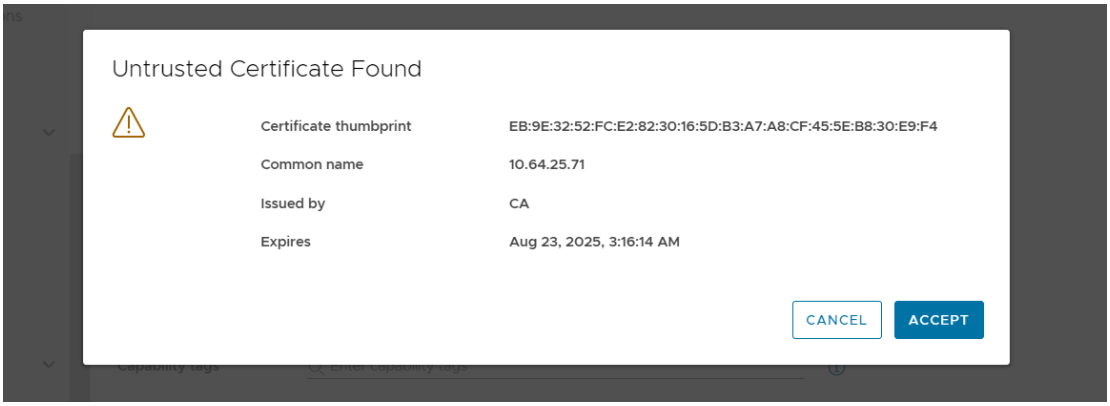
   Untrusted Certificate found pop-up window is displayed.

Figure 69 : New Cloud Account



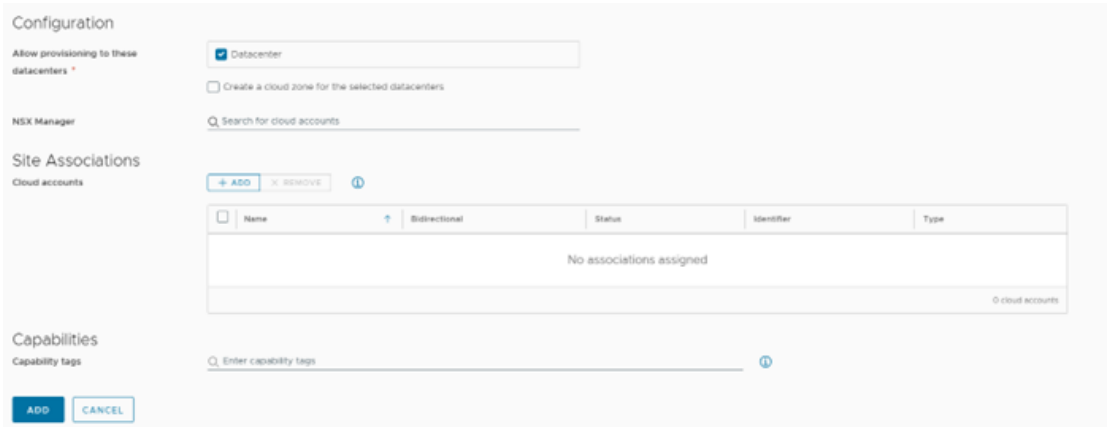
4. For untrusted certificate found, click **Accept**.

Figure 70 : Untrusted Certificate found pop-up



5. After validating credentials, allow provision to datacenter.

Figure 71 : Credentials



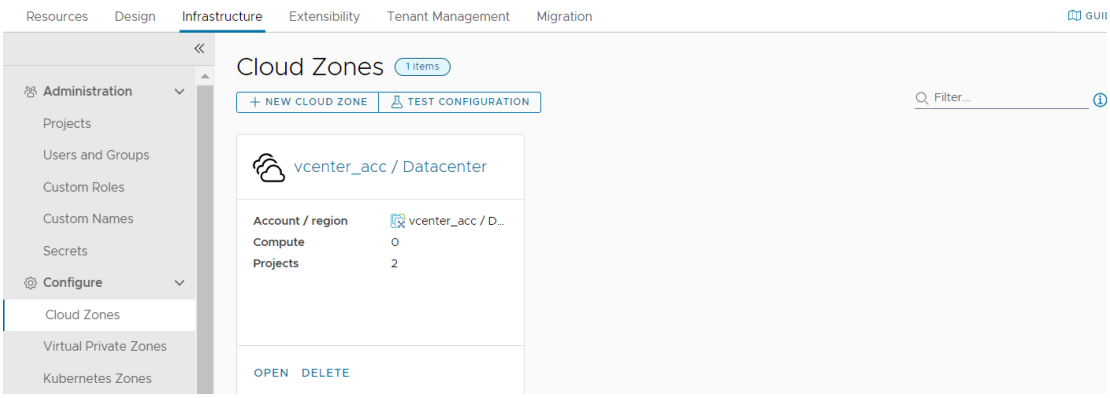
6. Click on **ADD**

Cloud Zone

Cloud zones associate computer resources with projects and account/regions to form the basis of deployable virtual machines. In addition, they enable you to define capabilities that Cloud Assembly matches with cloud template constraints to define where and how resources are configured for deployments.

1. Create new cloud zone or use one of the existing cloud zones. Click "**New Cloud Zone**" on the cloud zones window

Figure 72 : vRealize Automation - Cloud Assembly- Cloud Zones Tab

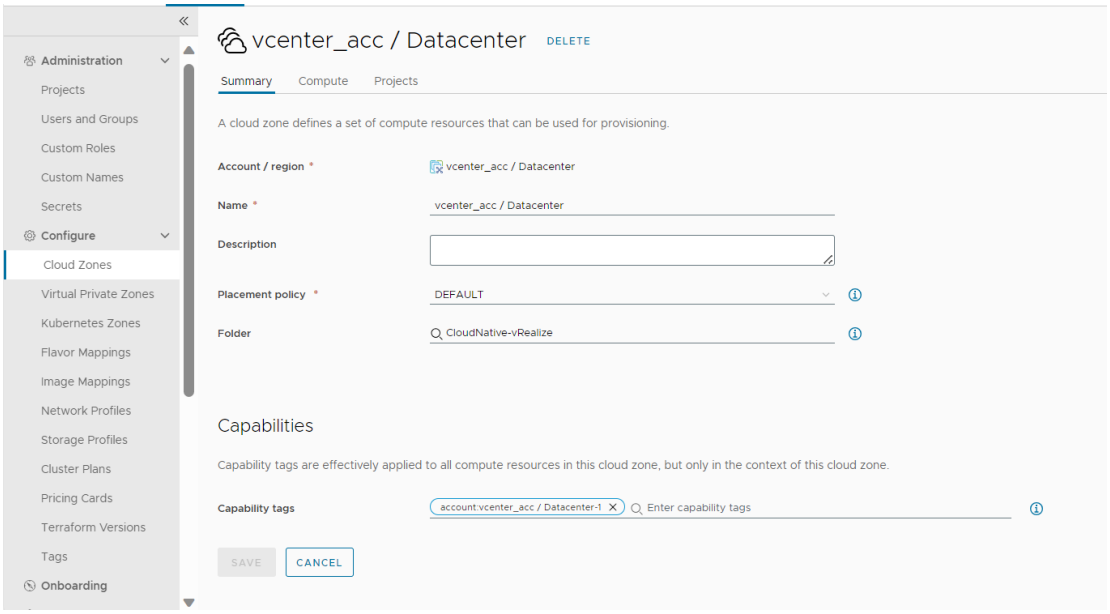


2. Select an account/region and enter a name and description.

   Path: Infrastructure -> Configure -> Cloud zones then click on NEW CLOUD ZONE

3. Select a placement policy that defines how provisioned resources are distributed among hosts in this cloud zone.

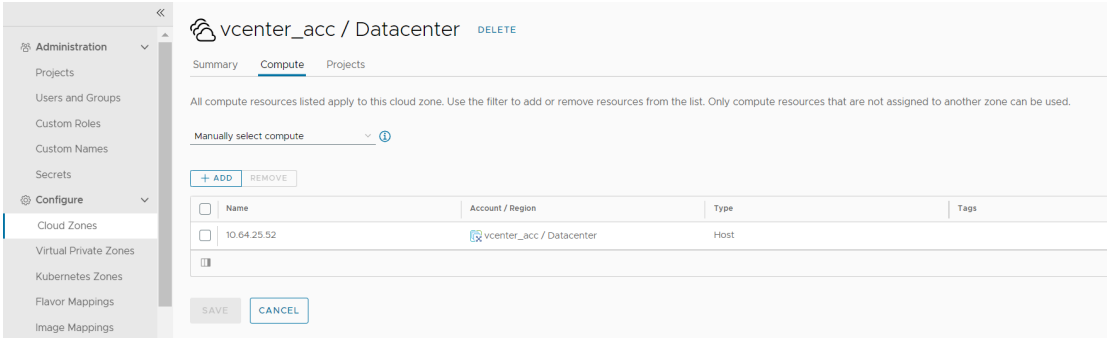
   Figure 73 : Cloud Zones - Summary Tab



4. Click the Compute tab and view the compute resources in this cloud zone. If you don't want to use all the compute resources, add a tag to the compute resources that you want, and then enter that tag in the filter.

5. Click add and add the available account/region.

Figure 74 : Cloud Zones - Compute Tab

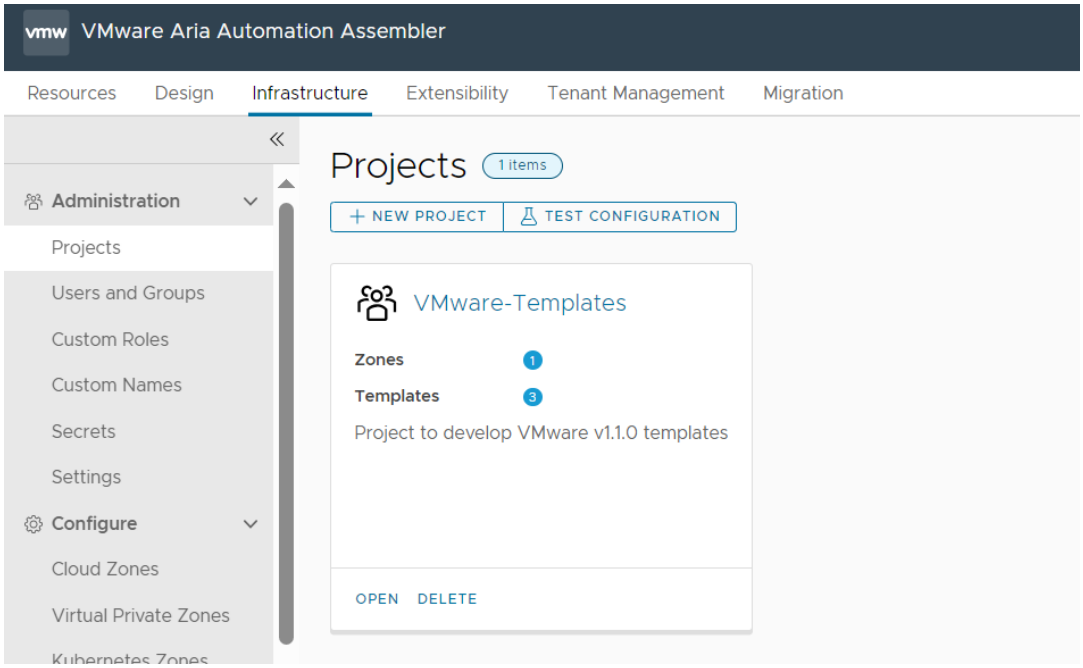


6. Click **Create**.

Projects

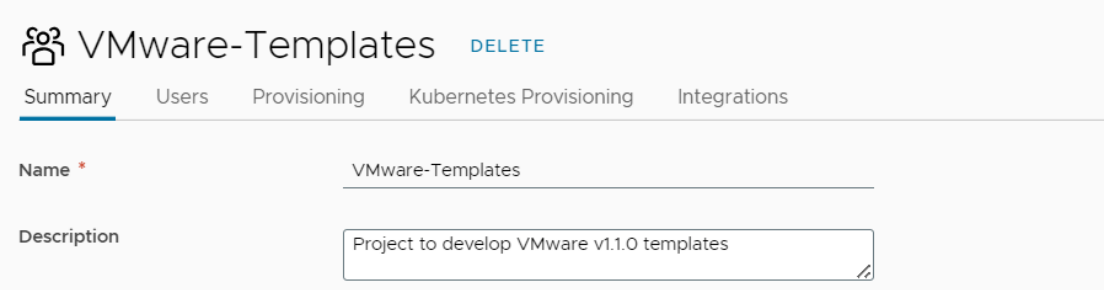
Projects links user and cloud zones. Think of projects as groups that control who can use what cloud resources. Create projects that support the goals of your organization, ensuring that users have access to the appropriate zones.

Figure 75 : VMware Aria Automation Assembler - Projects Tab



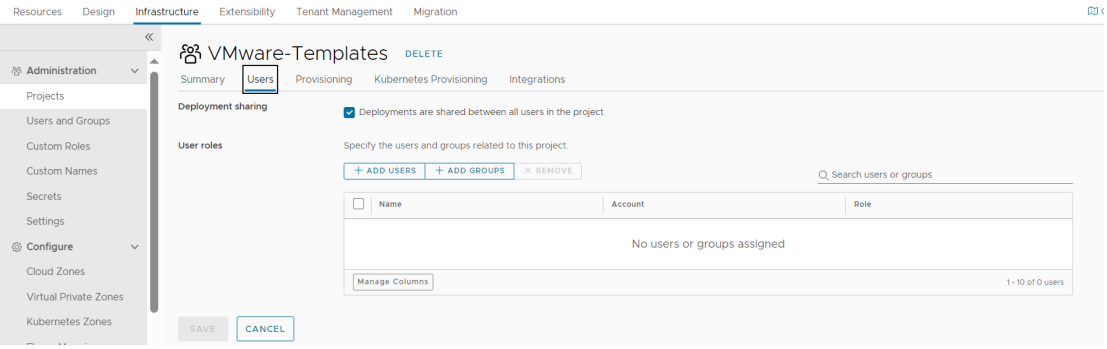
1. Click **New Project** on the Projects window.
2. Enter project information on the Summary tab.

Figure 76 : VMware Templates - Summary Tab



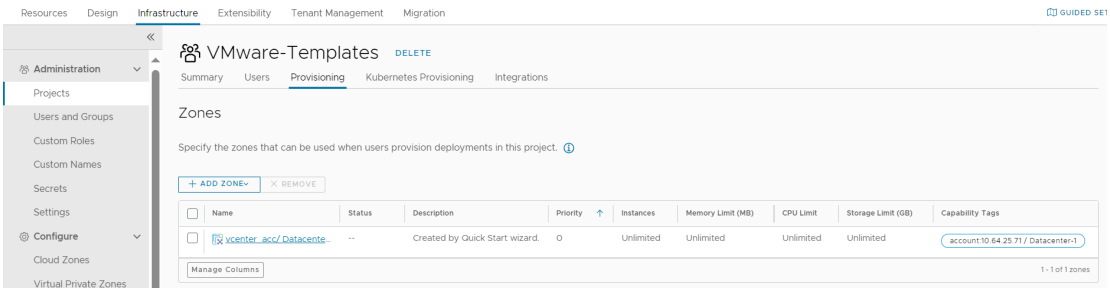
3. Click the Users tab and add one or more users. Mark the deployment sharing option.

Figure 77 : VMware Templates - Users Tab



4. Click the Provisioning tab and add one or more zones. The selected zones must have the appropriate infrastructure resources to support the project goals. If you are just getting started, ignore Constraints and Custom Properties for now. You can go back and add them later if necessary.

Figure 78 : VMware Templates - Provisioning Tab

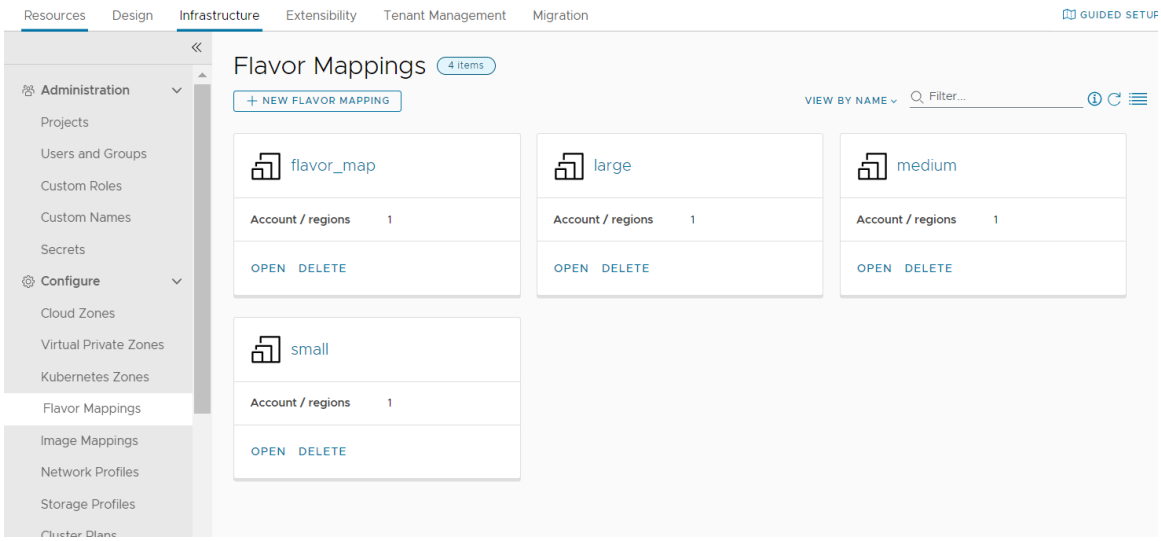


5. Click **Create**.

Flavor Mappings

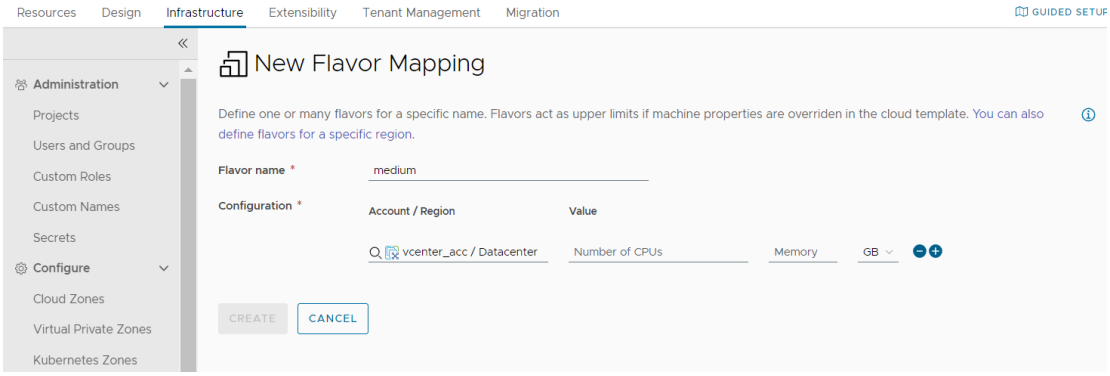
Cloud vendors use flavors, or instance types, to express standard deployment sizes such as small (1 CPU,2 GB RAM) or large (2 CPU, 8 GB RAM) for compute resources. When you build a cloud template, you pick a flavor that fits your needs. Map a flavor name to a value for each account/region.

Figure 79 : vRealize Automation - Cloud Assembly- Flavor Mappings Tab



1. Click **New Flavor Mapping** on the Flavor Mappings window.
2. Enter a new Flavor name, such as small, medium, or large.
3. Specify the number of CPUs for e.g. 2 and Memory for e.g. 8 GB.

Figure 80 : Infrastructure Tab



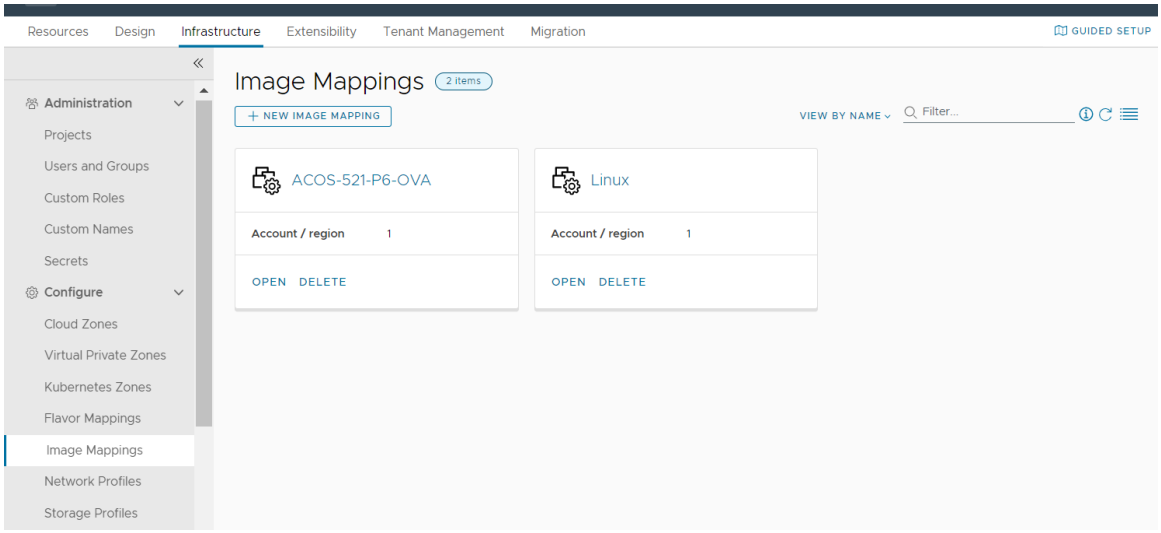
4. Click (+) to add another flavor map row of the same size for each available cloud account/region.
5. Click Create.

Image Mappings

Cloud vendors use images to configure a VM based on OS settings, such as an ubuntu-16 configuration. When you build a cloud template, you pick an image that fits your needs. Map an image name to a value for each account/region. You can also add constraints and configuration scripts to further control resource placement. Map an image name to a value for each account/region.

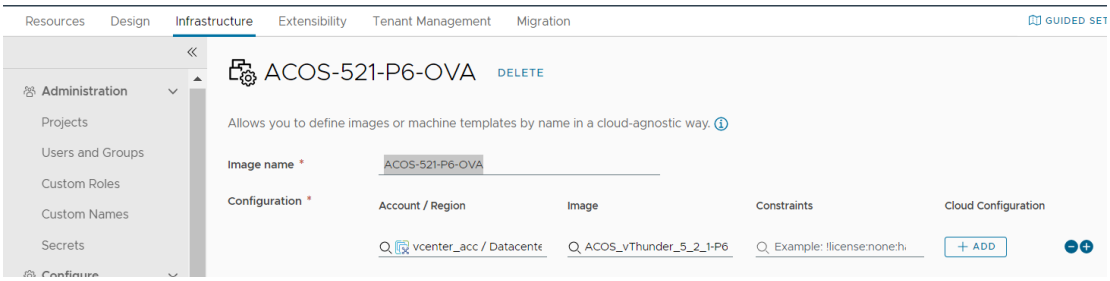
NOTE: Before proceeding to Image mappings creation, please create a template from a ACOS image file. Refer Create a Template from the ACOS OVF or OVA file

Figure 81 : Image Mappings Tab



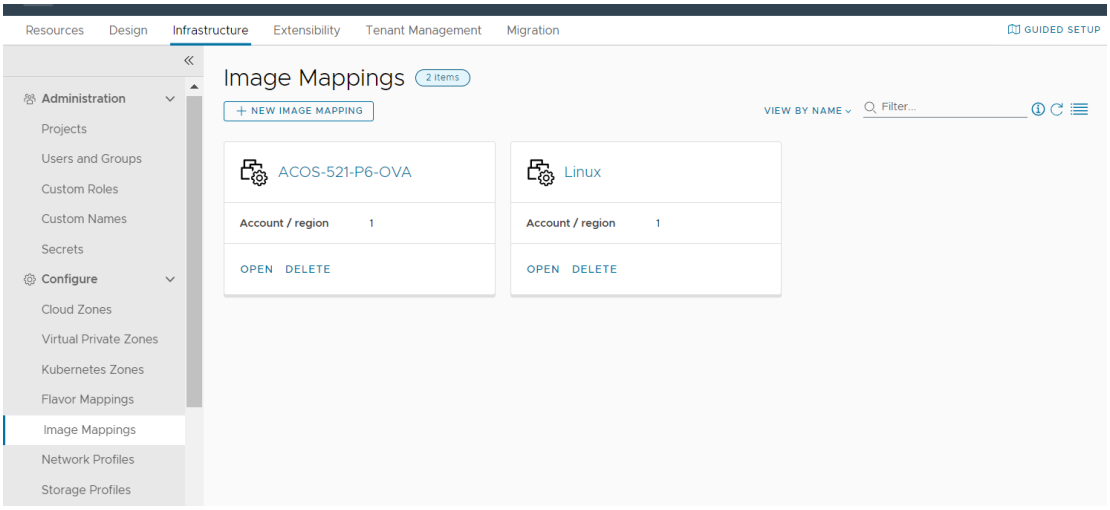
1. Click **New Image Mapping** on the Image Mappings window.
2. Enter a new Image name.

   Figure 82 : Image Mappings - Infrastructure Tab



3. Click in Account/Region and select one of the available cloud account/regions.
4. Select one of the available ACOS images configurations to complete the first map row. If you are just getting started, ignore Constraints and CloudConfig for now. You can go back and add them later if necessary.

Figure 83 : Image Mappings - Infrastructure Tab

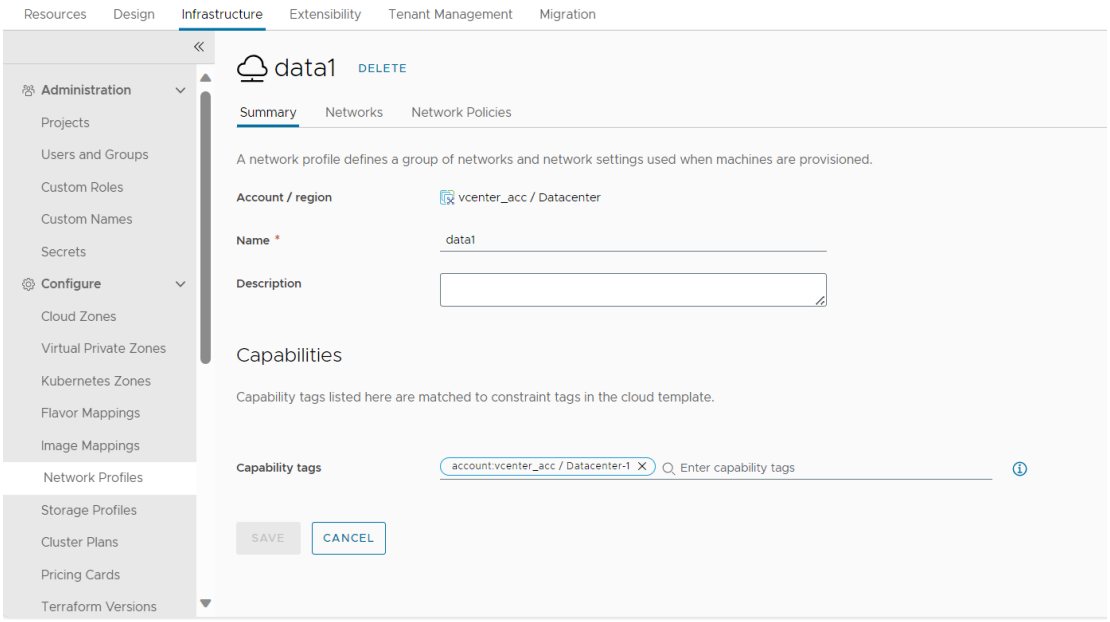


5. Click (+) to add another image map row for an ubuntu-16 image for each available cloud account/region.
6. Click **Create**.

Network Profile

1. Click **New network profile** on the Network Profiles window.
2. Enter the Account/ region name which was created earlier. And name of the network profile.
3. Enter the **capability tags**.

Figure 84 : Network Profiles



4. Click on add network.

Figure 85 : New Network Profile

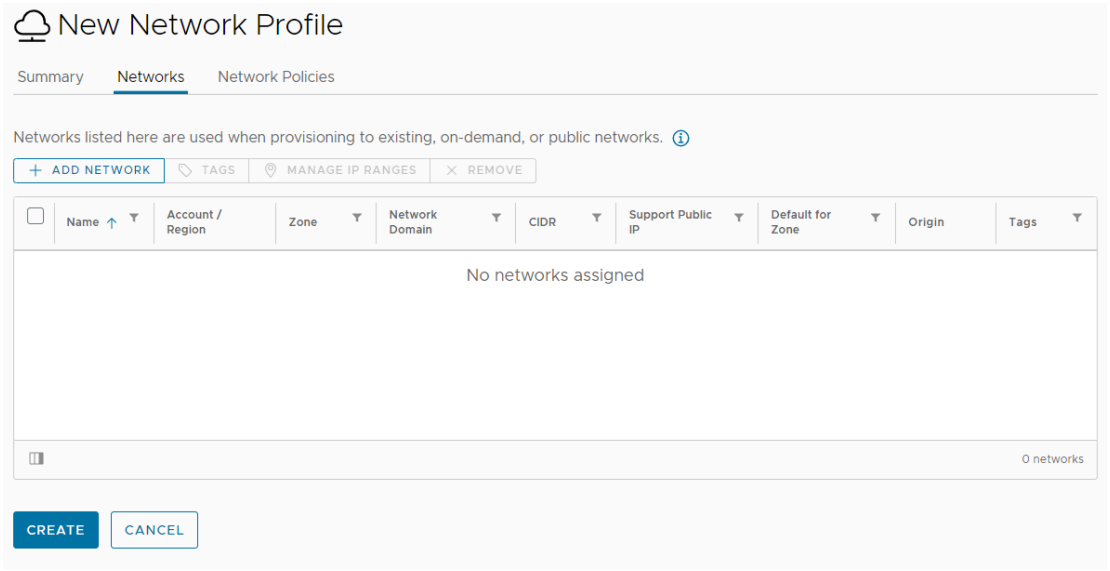
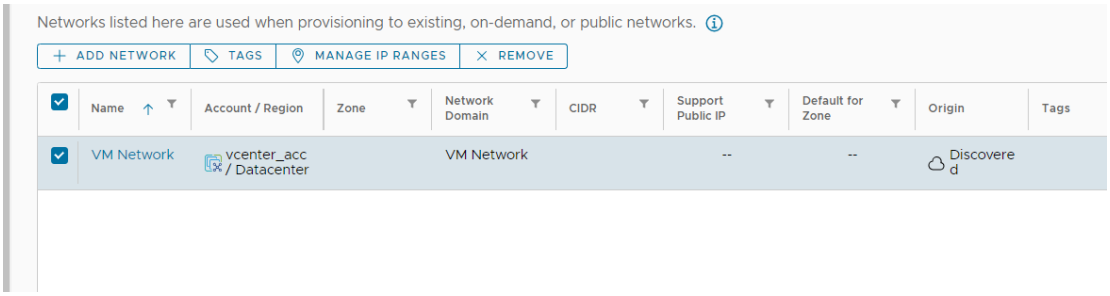
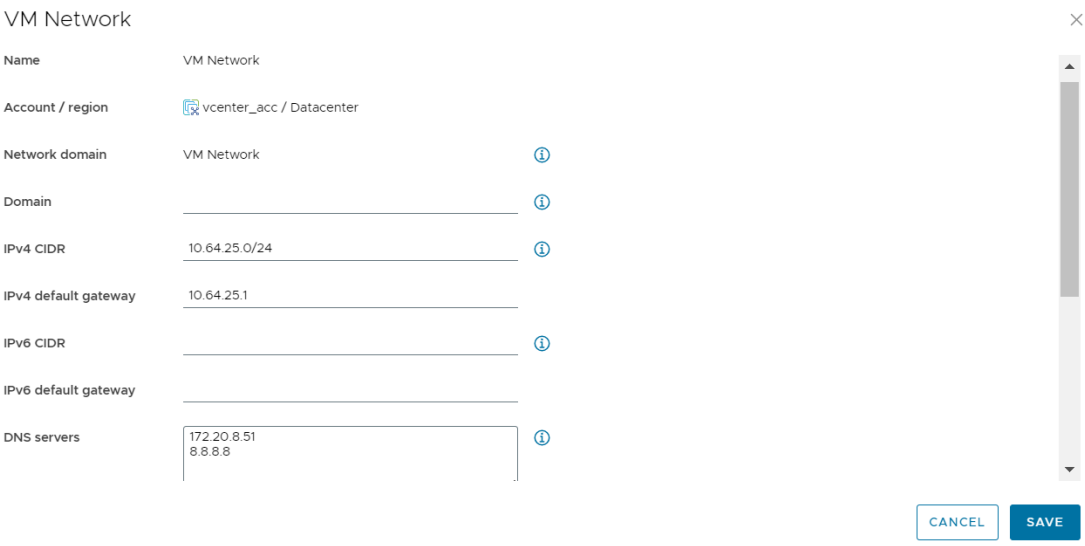


Figure 86 : Networks List



5. Select VM Network and Click on **Add Network**.
6. Add Name of the network. And Account/ region name which was created earlier.
7. Add IPV4 CIDR and default gateway.
8. Also add DNS servers.

Figure 87 : VM Network



9. Click on manage ip ranges and add.

Figure 88 : VM Network - Networks Tab

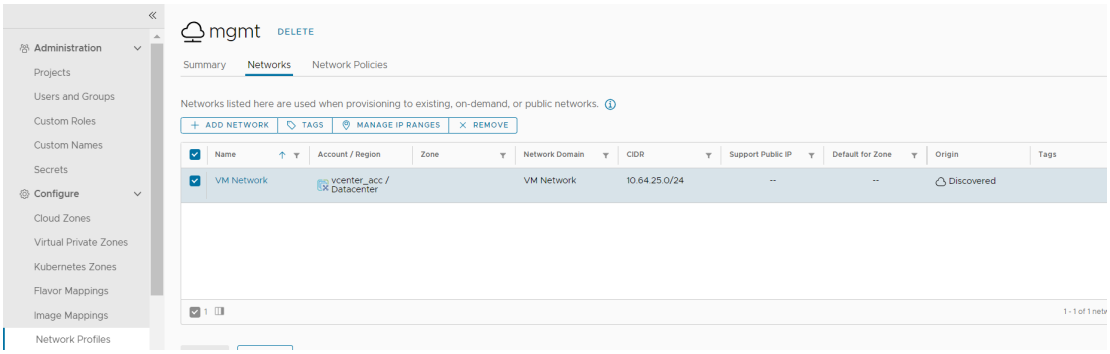
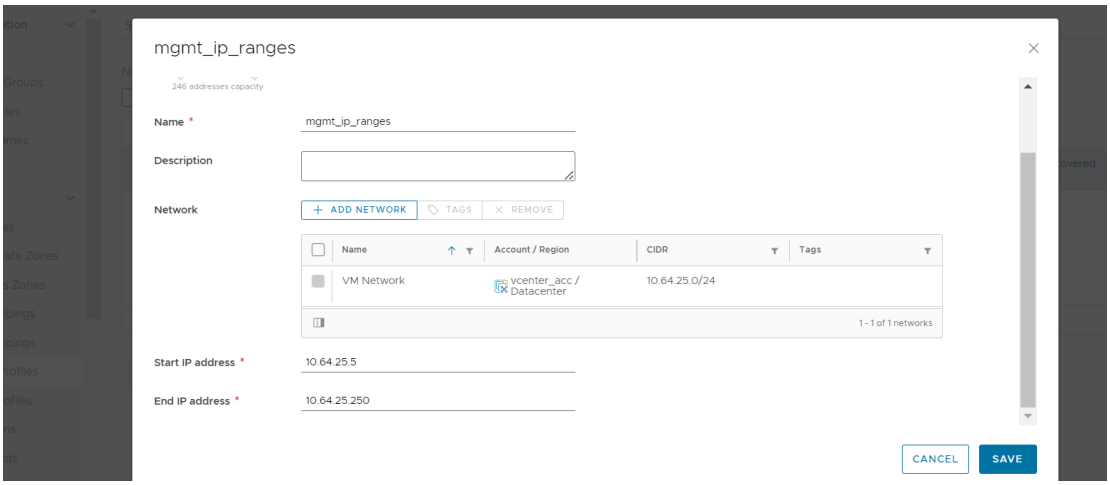
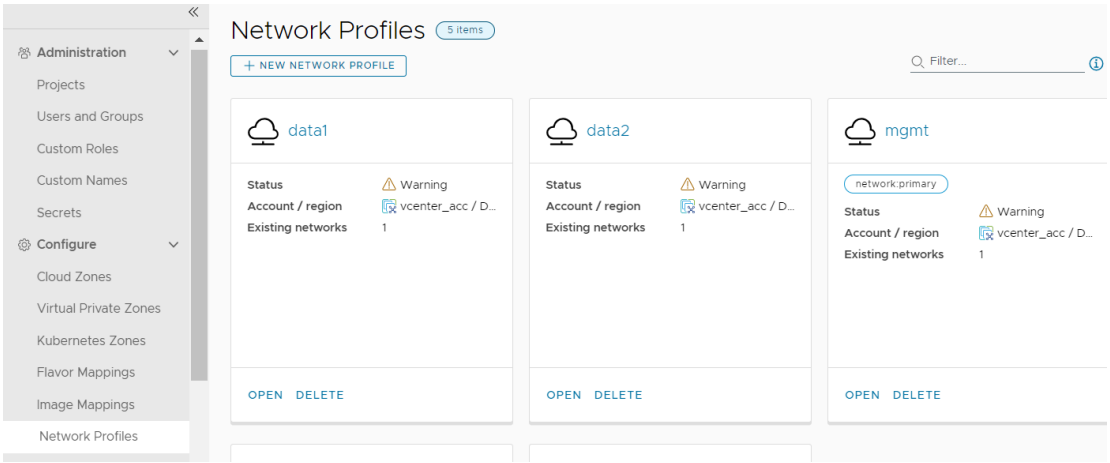


Figure 89 : VM Network



10. Click **create**

Figure 90 : Network Profiles

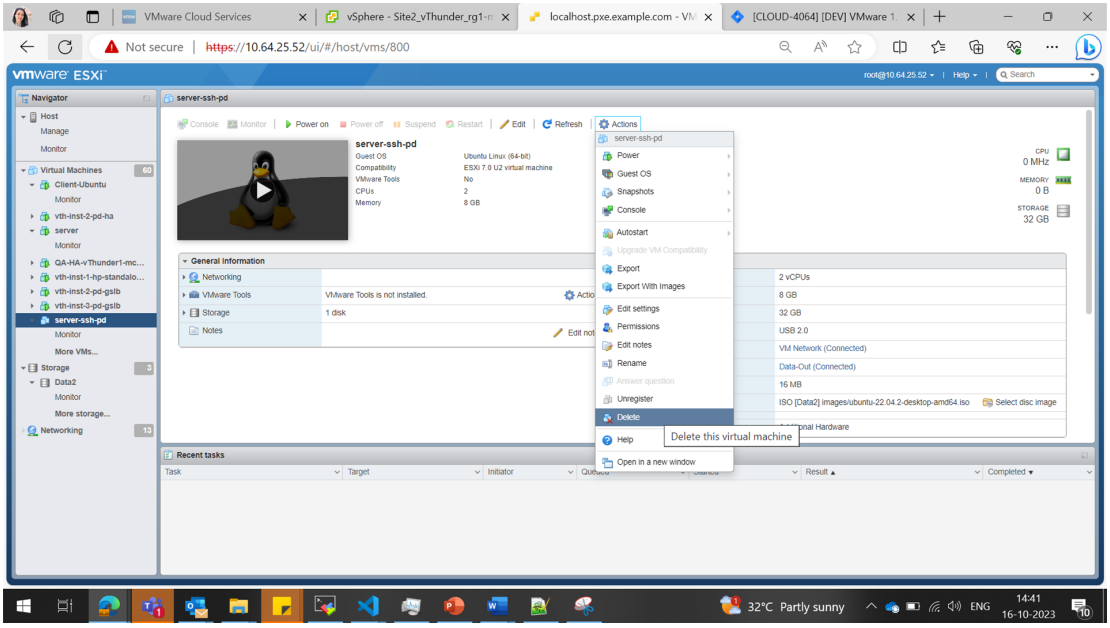


11. Similarly do it for Data-IN and Data-Out network profiles.

Delete the resources

To delete the resources, perform the following steps:

1. From the **VMware ESXi** console, go to **Navigator** > **Virtual Machines** for the selected host.
   select the resource to be deleted.
2. Click on **Power-off** then from **Action**, click on **Delete** so resource will get deleted.



The resource is stopped when do Power-off.

Install Python3

Depending on your operation system, install Python (3.8.5 or higher):

CentOS

To install latest Python3 from OS repository, perform the following steps:

```
yum install -y python3
```

Linux/Ubuntu

To install Python3, perform the following steps:

```
apt update
apt-get install python3.10
 apt install python3-pip
```

Supported VM Sizes

The following is the minimum VM size compatible with the VMware template.

Table 16 : Supported VM sizes

CPU	RAM	Hard Disc
2	4	32

Access vThunder using CLI

Access vThunder using CLI

To access vThunder using CLI, perform the following steps:

1. Open any SSH client and provide the following to establish a connection:
   - Hostname: Public IPv4 address
     Here, Public IP of **`vth-inst1`**.
   - Username: *admin*
   - Password: <*recent_password*>
2. Connect to the session.

3. In the active SSH session, login with the recently configured user credentials.

```
login as: admin
Using keyboard-interactive authentication.
Password: xxxxxxxxx <---Enter your password--->
Last login: Day MM DD HH:MM:SS from a.b.c.d

System is ready now.

[type ? for help]

vThunder> enable <---Execute command--->
Password:<---just press Enter key--->
vThunder#config <---Configuration mode--->
```

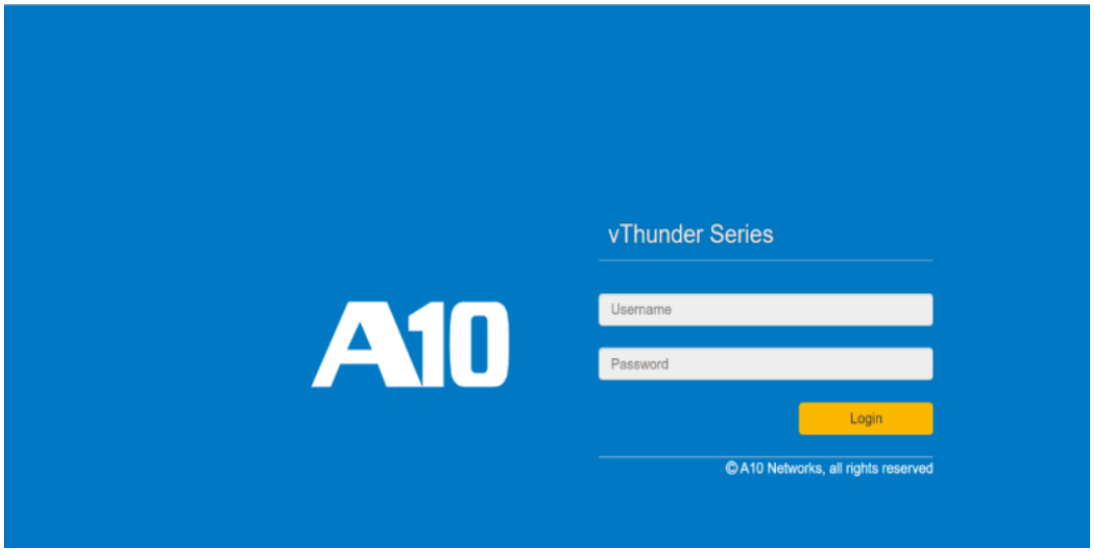
The vThunder instance is ready to use.

Access vThunder using GUI

Access vThunder using GUI

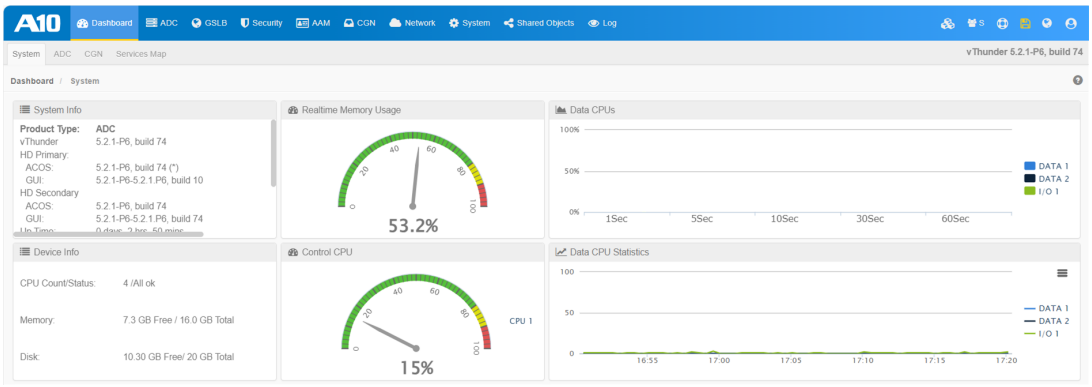
To access vThunder using GUI, perform the following steps:

1. Open any browser.
2. Enter *https://<vthunder_public_IP>/gui/auth/login/* in the address bar.



3. Enter the recently configured user credentials.
   The home page gets displayed.

   Figure 91 : Home page



Create Inventory Folder

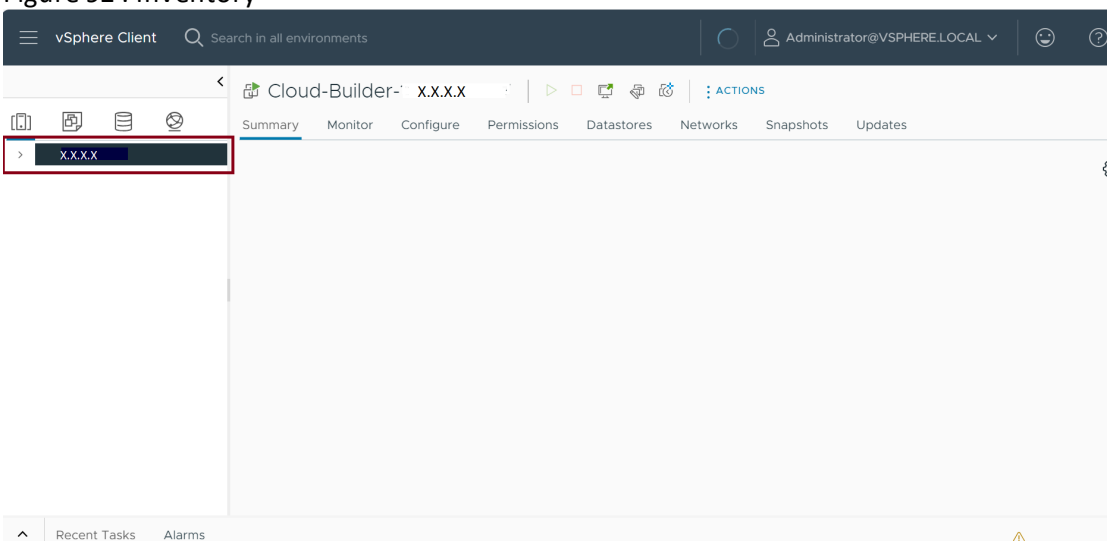
To create an inventory folder, perform the following steps:

1. Log in to vCenter UI using your vCenter server IP address or FDQN.

   https://vcenter_server_ip_address_or_fqdn

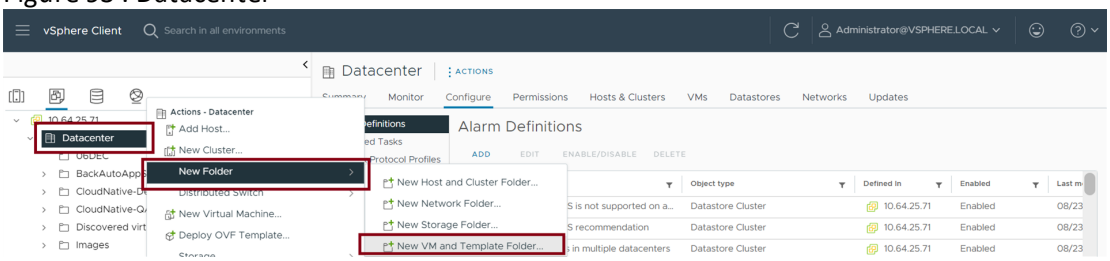
2. Click **Inventory**, x.x.x.x in the left navigation pane to expand it.

   Figure 92 : Inventory



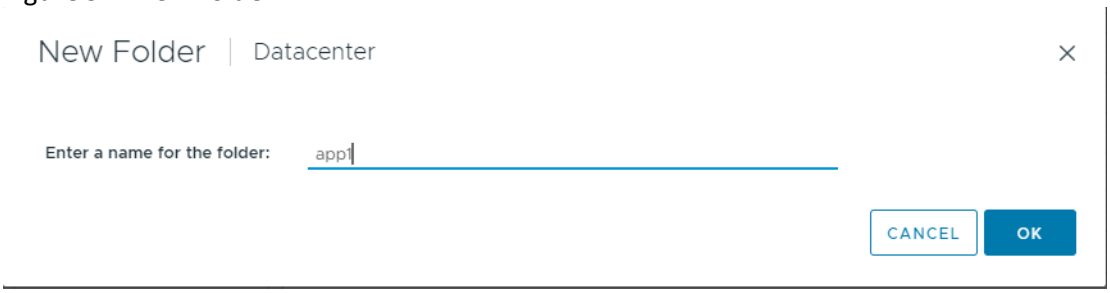
3. Right click **Datacentre**. In the **Actions - Datacenter** menu, click **New Folder**, and click **New VM and Template Folder**.

Figure 93 : Datacenter



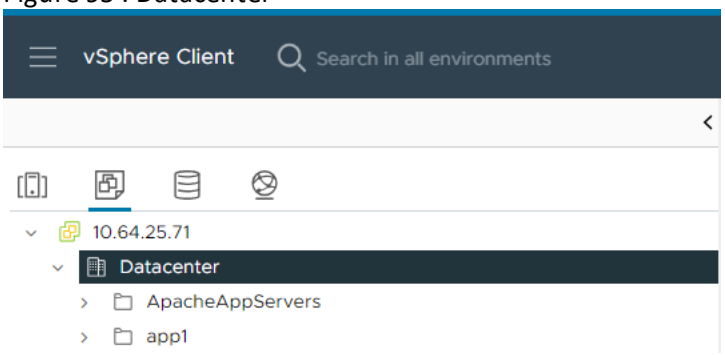
4. On the New Folder dialog box, enter the folder name, and click **OK**.

Figure 94 : New Folder



5. Verify the created folder.

Figure 95 : Datacenter



Setup vCenter VM

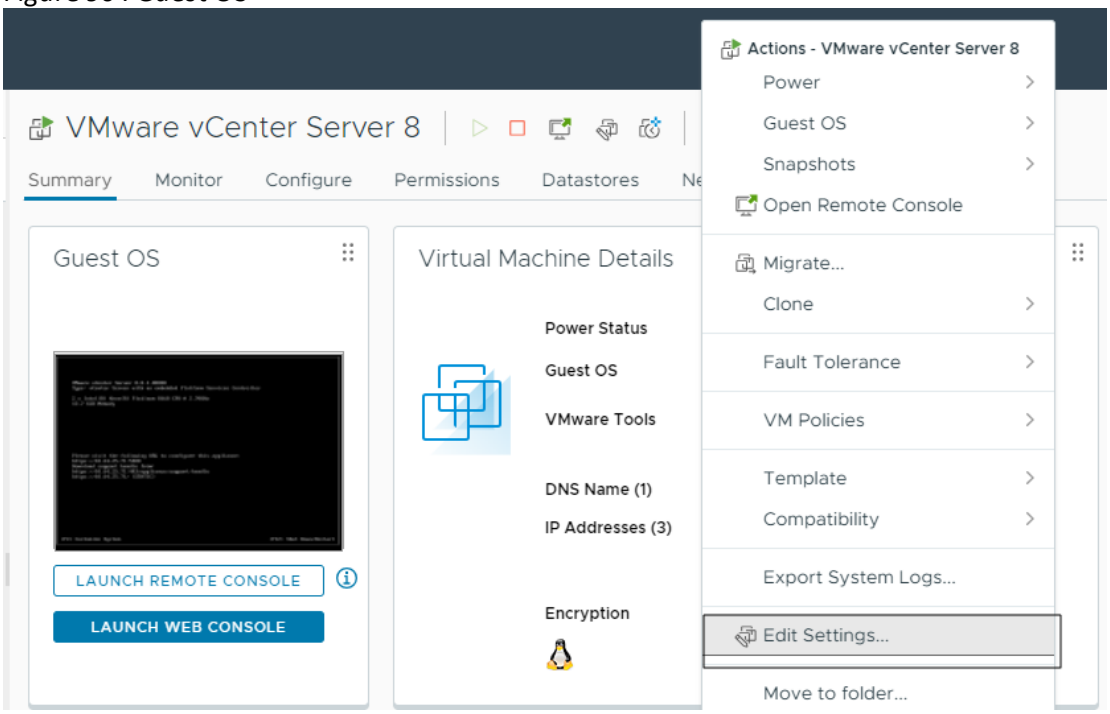
To setup a vCenter VM, perform the following steps:

1. Log in to vCenter UI using your vCenter server IP address or FDQN.

   https://vcenter_server_ip_address_or_fqdn

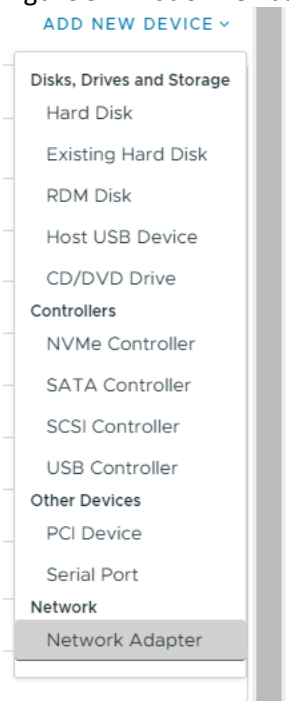
2. Select the vCenter VM. Navigate to **Action** button present at the top and click **Edit Settings**.

   Figure 96 : Guest OS



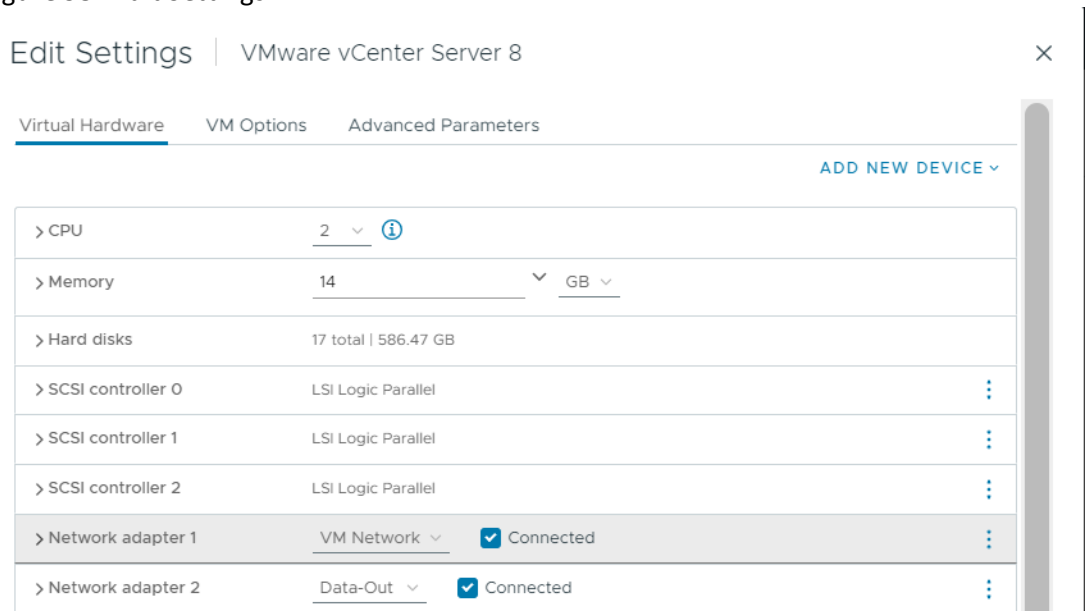
3. Click **ADD NEW DEVICE** on the **Edit Settings** page and select **Network Adapter** from the list of Devices.

Figure 97 : List of Devices



4. Choose Data-Out port group in the added Network Adapter.

Figure 98 : Edit Settings



5. Click **OK**.

6. Log in to the vCenter VM and execute the following command to assign IP address to the added network adaptor.

   The IP address must be from the application server subnet.

```
ifconfig <interface name> <IP address> netmask <netmask>
ifconfig
```

```
root@localhost [ ~ ]# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:0c:29:ba:db:25
          inet addr:10.64.25.71  Bcast:10.64.25.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:24043982 errors:0 dropped:454829 overruns:0 frame:0
          TX packets:6322354 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:8021840511 (8.0 GB)  TX bytes:6385441879 (6.3 GB)

eth1      Link encap:Ethernet  HWaddr 00:50:56:a4:1f:a4
          inet addr:10.0.3.253  Bcast:10.0.3.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:17506658 errors:0 dropped:454829 overruns:0 frame:0
          TX packets:15717 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1127072559 (1.1 GB)  TX bytes:4735864 (4.7 MB)
```

NOTE: For each application a new network adaptor must be added into vCenter VM, and IP from a new subnet must be configured into this adaptor.

Enable root User

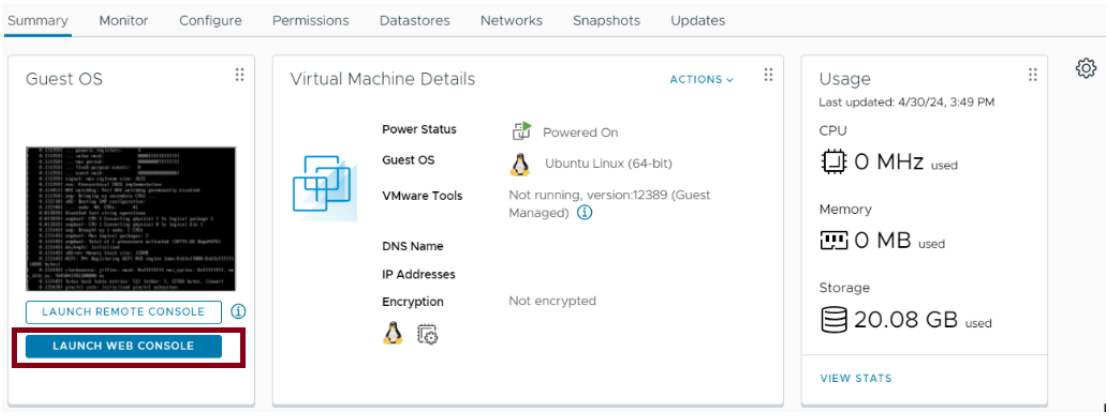
To enable a root user, perform the following steps:

1. Log in to vCenter UI using your vCenter server IP address or FDQN.

   https://vcenter_server_ip_address_or_fqdn

2. Click the VM for which you need to enable the root user.

Figure 99 : Launch Web Console



3. Click **Launch Web Console** to log in to the Clone-Server VM. Log in using login details other than the root credentials.

   A terminal window is displayed.

4. Execute the following command to set a new password:

```
sudo passwd root
[sudo] password for XXXX:
New password:
Retype new password:
Passwd: password updated successfully.
```

5. Execute the following command to install vim, if it is not already installed:

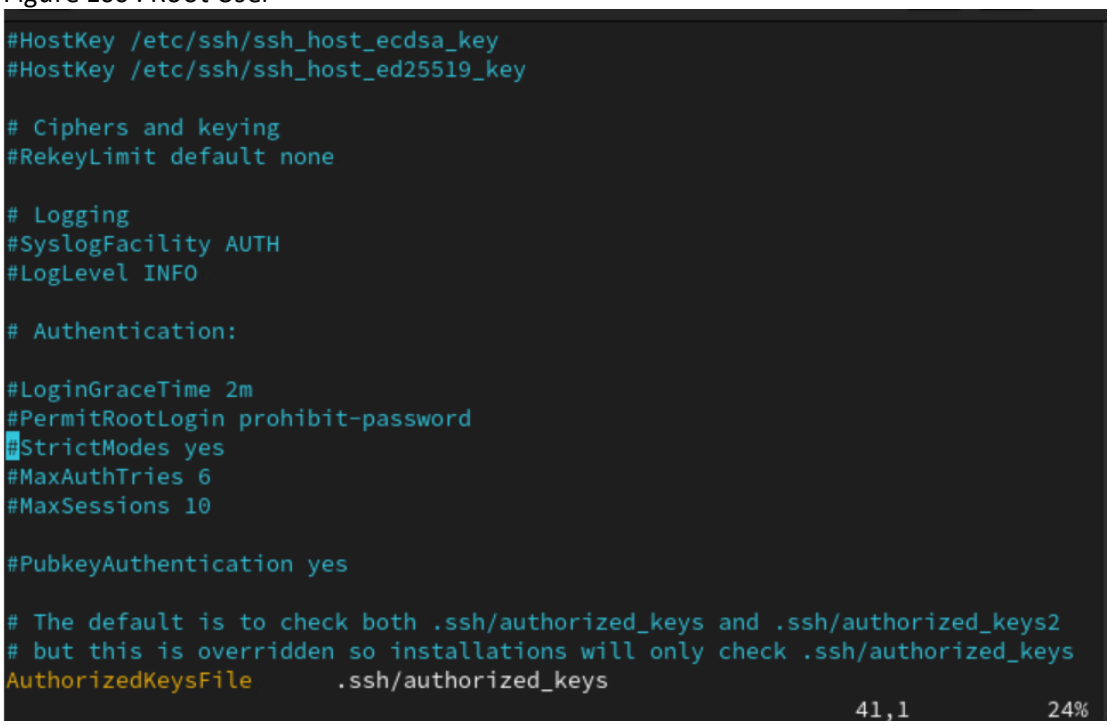
```
sudo apt install vim
```

6. Execute the following command to open the config file:

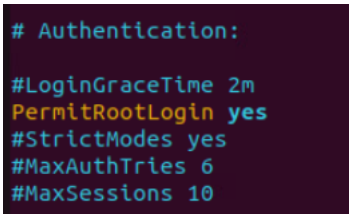
```
sudo vi /etc/ssh/sshd_config
```

   The following window is displayed.

Figure 100 : Root User



7. Uncomment **PermitRootLogin** and change the status to **yes**



8. Execute the following command to restart the VM:

```
sudo systemctl restart ssh
```

9. Verify the VM using the root credentials.

Retrieve Active Interface Name

To get the active interface name, perform the following steps:

1. Log in to the vCenter VM.
2. Execute the below command:

```
nmcli con show --active
```

```
root@cloudnative-virtual-machine:/home/cloudnative# nmcli con show --active
NAME    UUID                                  TYPE      DEVICE
ens160  92d58fb8-1c5f-31f8-b4ac-bfecd21b582c  ethernet  ens160
root@cloudnative-virtual-machine:/home/cloudnative#
```

The active interface name `ens160` is displayed.

Change Interface Name

To change the interface name, perform the following steps:

1. Log in to the vCenter VM.
2. Invoke the `nmtui` tool.

   ```
   nmtui
   ```

   The **NetworkManager TUI** window is displayed.
3. Select **Edit a connection** and press **Enter**

   Figure 101 : Edit a Connection

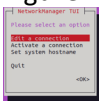
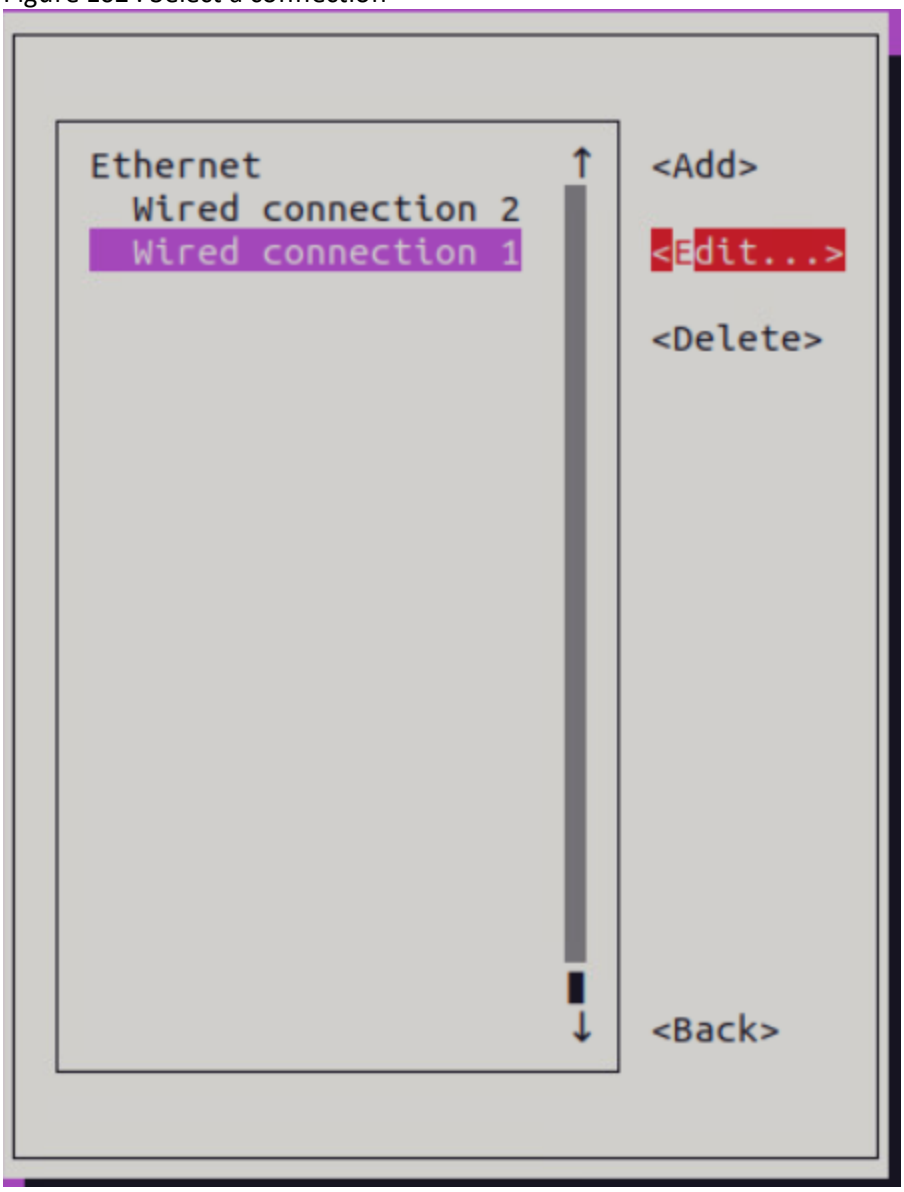
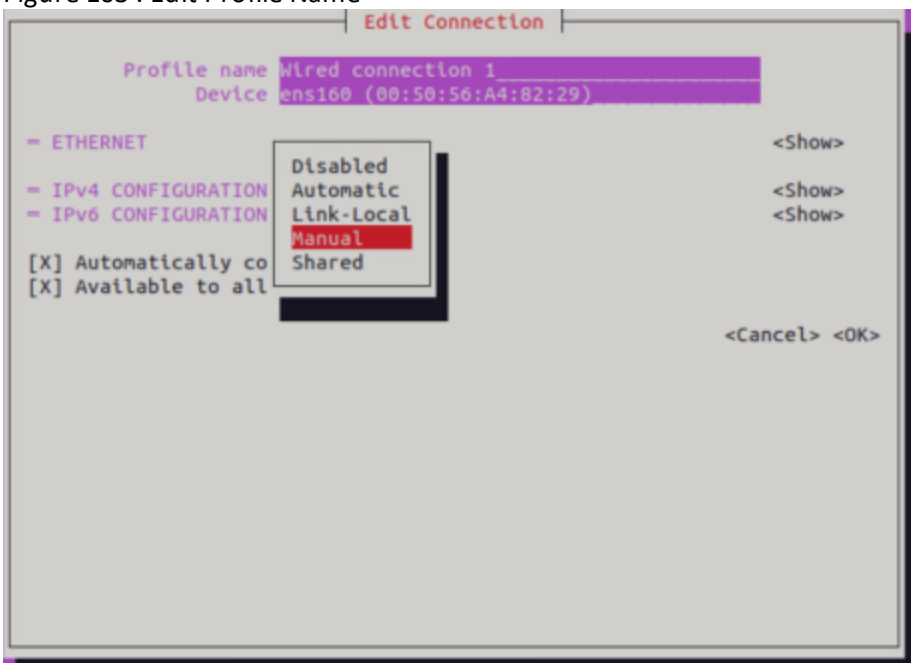
   
4. Select the required connection, select **Edit**, and press **Enter**.

Figure 102 : Select a connection



5. Edit the profile name and click **OK**

Figure 103 : Edit Profile Name



6. Close the **NetworkManager TUI** window.
7. Execute the following command to check interface name.

```
nmtui con show –active
```

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Support Information

For any issues or queries related to VMware templates, open a case at A10 Networks Support or reach out to support@a10networks.com and mention "A10-vmware-templates" in the subject line.

What's New

1.1.0

This release has the following enhancements for Thunder® Application Delivery Controller (ADC):

- Added GLM, HA, SLB, SSL, and Backend Autoscale vThunder configuration.
- Introduced two new SLB templates, SLB HTTP and Persist Cookie to enhance the functionality and performance of the Server Load Balancer (SLB) by optimizing HTTP traffic distribution and implementing efficient cookie persistence.
- Introduced vThunder instance as a Server Load Balancer (SLB) to automate the scaling process allowing dynamic adjustment of servers based on the workload.
- Added new hybrid cloud GSLB configuration to optimize performance, reliability, and ease of use in hybrid cloud environments.
- Separated the deployment and configuration parameters to ensure a clear distinction between the resources needed for initial deployment and those required for subsequent configuration and customization.
- Added support for Thunder Observability Agent (TOA) to collect, process and publish Thunder metrics and syslogs.
- Added the following deployment templates:
  - A10-VMware_ADC-3NIC-1VM
  - A10-VMware_ADC-3NIC-2VM-HA-GLM-PUBVIP
  - A10-VMware_ADC-3NIC-2VM-HA-GLM-PVTVIP
  - A10-VMware_ADC-3NIC-3VM

1.0.0

The VMware Templates 1.0.0 offers the following monitoring capabilities for Thunder® Application Delivery Controller (ADC):

- Configure vRealize Log Insight (vRLI) dashboard to view vThunder logs using the data collected by the Thunder Observability Agent (TOA).
- For more information on Thunder logs, see Supported Thunder Logs.
- Configure vRealize Operations (vROps) dashboard to view vThunder metrics using the data collected by the Thunder Observability Agent (TOA).
- For more information on Thunder logs, see Supported Thunder Metric.
    - Create/Import a Dashboard in vROps
    - Create/Import an Alert in vROps
    - Create/Import a Notification in vROps
    - View Thunder Metrics in vROps

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