Compute Services on the Cloud

Working With Images

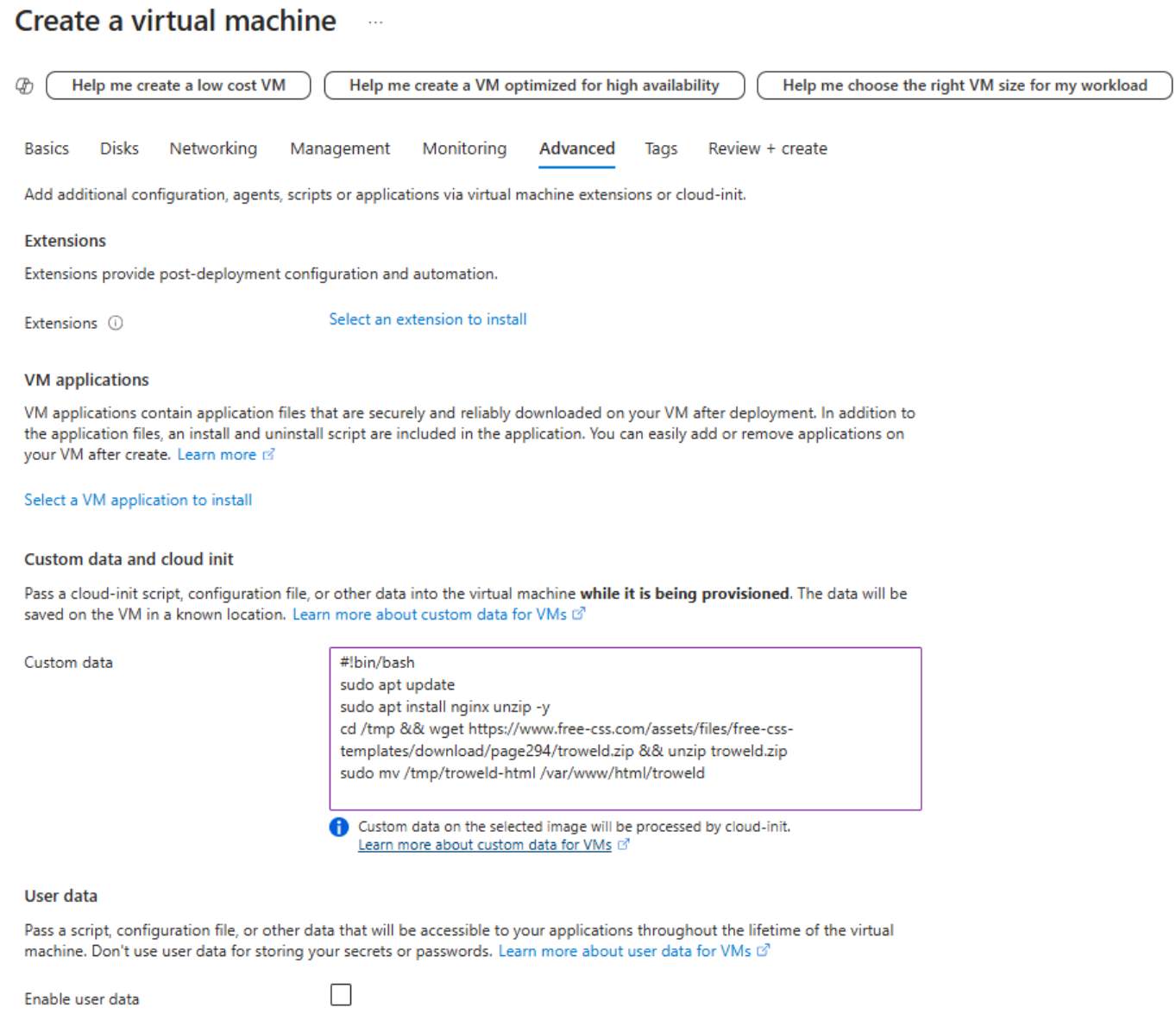
- Azure VM Image is snapshot of managed disk + additional metadata
- In Azure VM images we have two types of VM images
    - Generalized VM images : These images will allow the user to set username and passwords/keys during creation
    - Specialized VM images : same as AMi(usernames are fixed)
- Azure while creating the image will remove all the user specific information from vm and then taken a snapshot
- So once we use a vm to create a generalized vm image, vm becomes unusable.
- Azure VM images also are of two types
    - free
    - paid
- Azure also has market place
- Azure VM image has four properties
    - publisher : Organization/individual who is publishing image
    - offer : product name/ server name
    - sku : version of the product/ different releases
    - Version: current versions
- Azure vm image has a unique id or URN :::
- To store vm images we create a compute gallery with a vm image definition and a specific image version.
- image definitions are like to store an application with different versions

Activity

- create a new resource group for this activity
- Create a new virtual Machine and install nginx/apache and host a website by following below instructions
- Use ubuntu machine

```
#!bin/bash
sudo apt update
sudo apt install nginx unzip -y
cd /tmp && wget https://www.free-css.com/assets/files/free-css-
templates/download/page294/troweld.zip && unzip troweld.zip
```

```
sudo mv /tmp/troweld-html /var/www/html/troweld
```

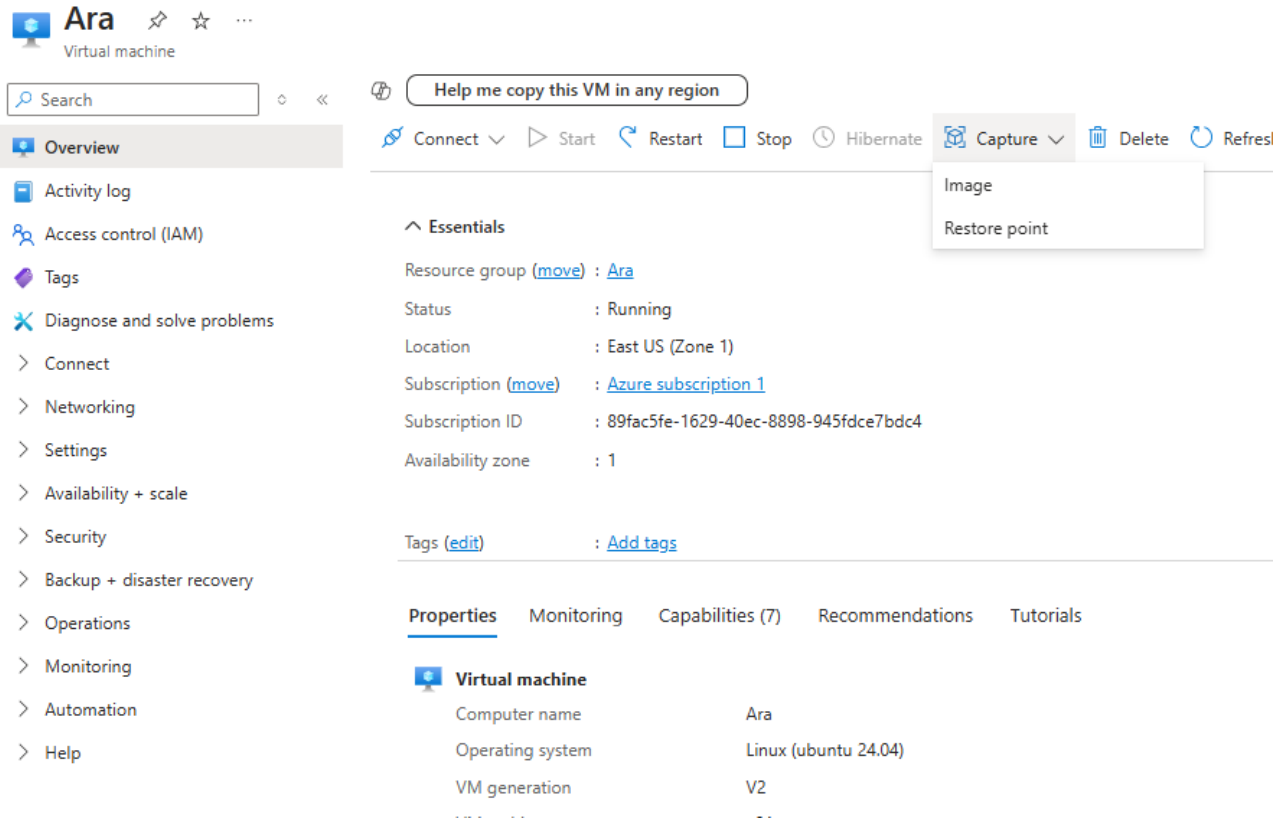


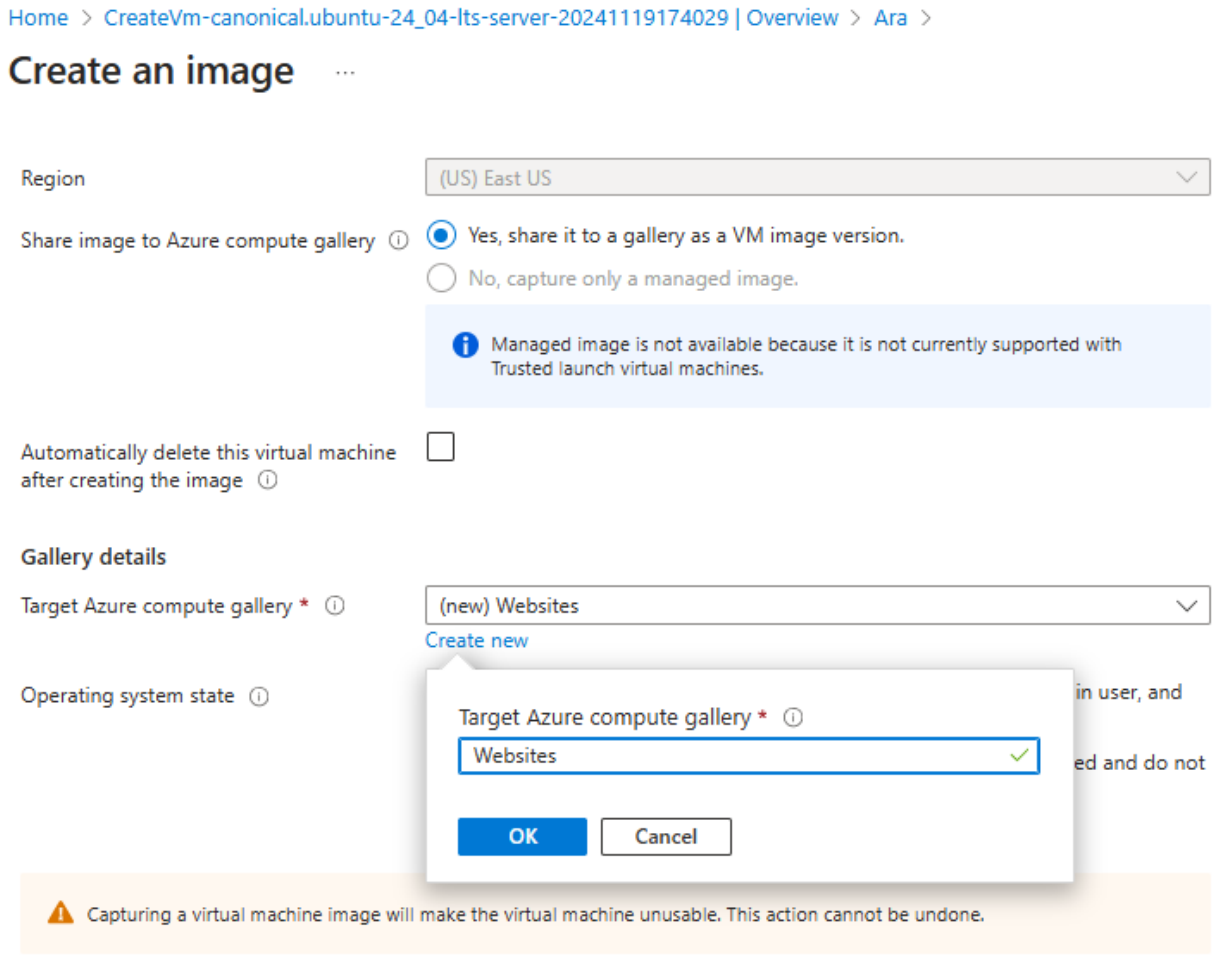
- Write abocve script in Advanced tab while creating virtual machine and create VM
- Now verify the website and connect to VM once to check connection

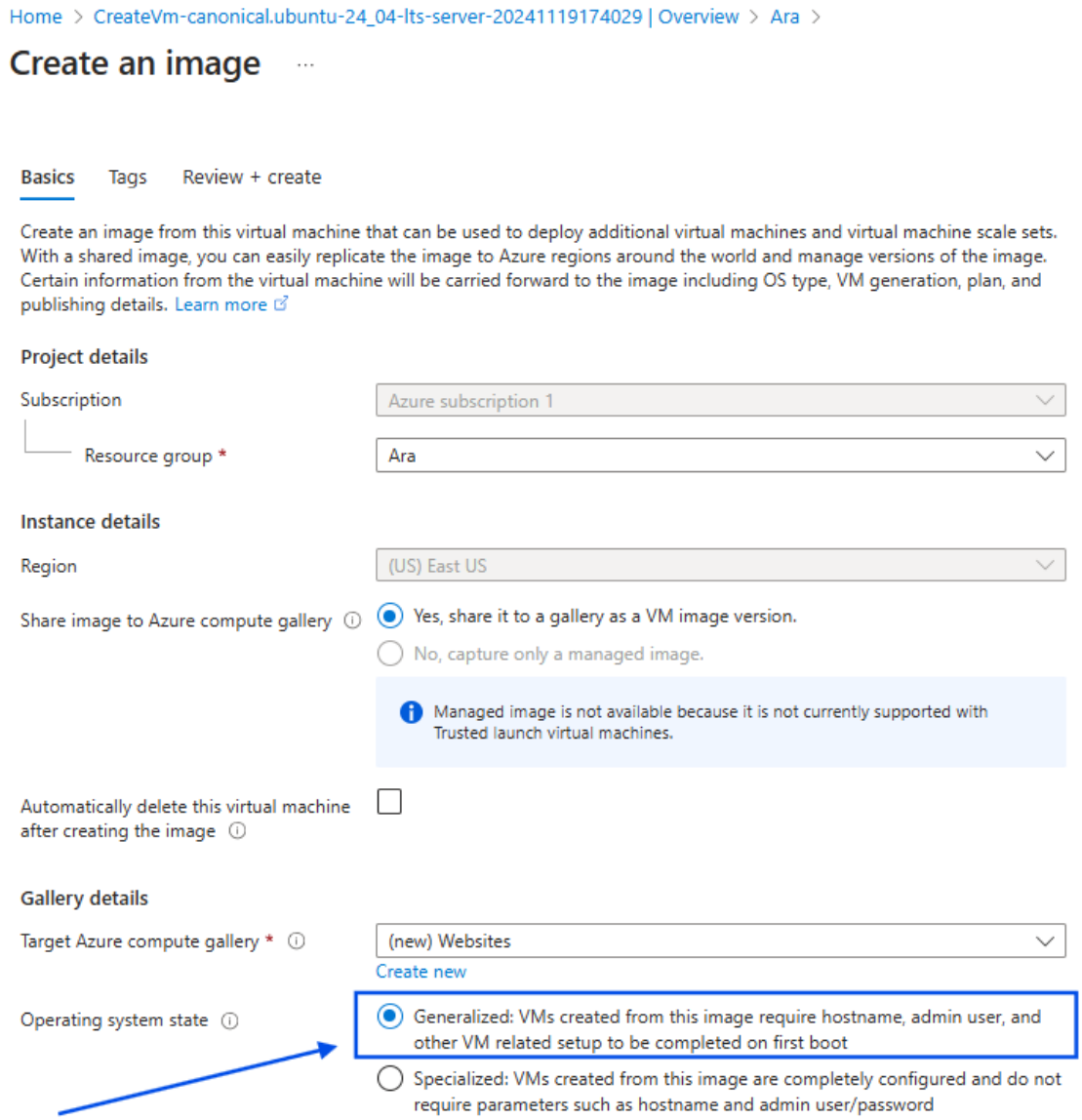
Taking IMage

- Go to Virtual Machines and select the created Virtual Machine

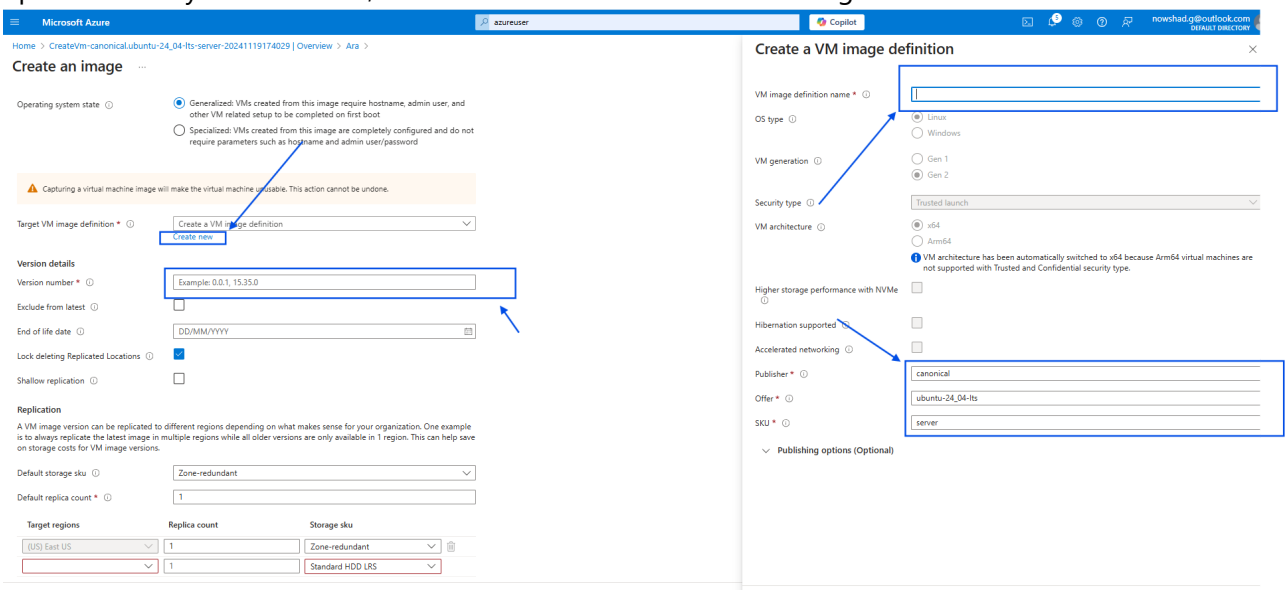
- in the horizantal blade find `Capture` select Capture and click on Image



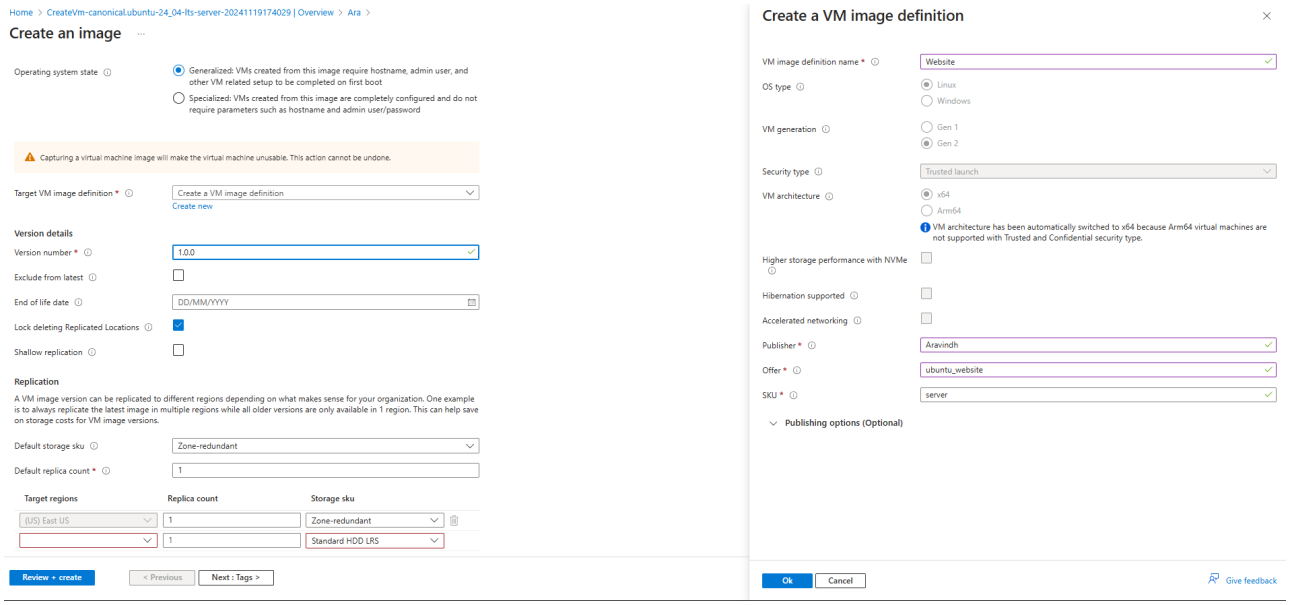

Home > CreateVm-canonical.ubuntu-24_04-lts-server-20241119174029 | Overview > Ara >
Create an image
Region
(US) East US
Share image to Azure compute gallery
Yes, share it to a gallery as a VM image version.
No, capture only a managed image.
Managed image is not available because it is not currently supported with Trusted launch virtual machines.
Automatically delete this virtual machine after creating the image
Gallery details
Target Azure compute gallery *
(new) Websites
Create new
Operating system state
in user, and
ed and do not
Target Azure compute gallery *
Websites
OK
Cancel
Capturing a virtual machine image will make the virtual machine unusable. This action cannot be undone.

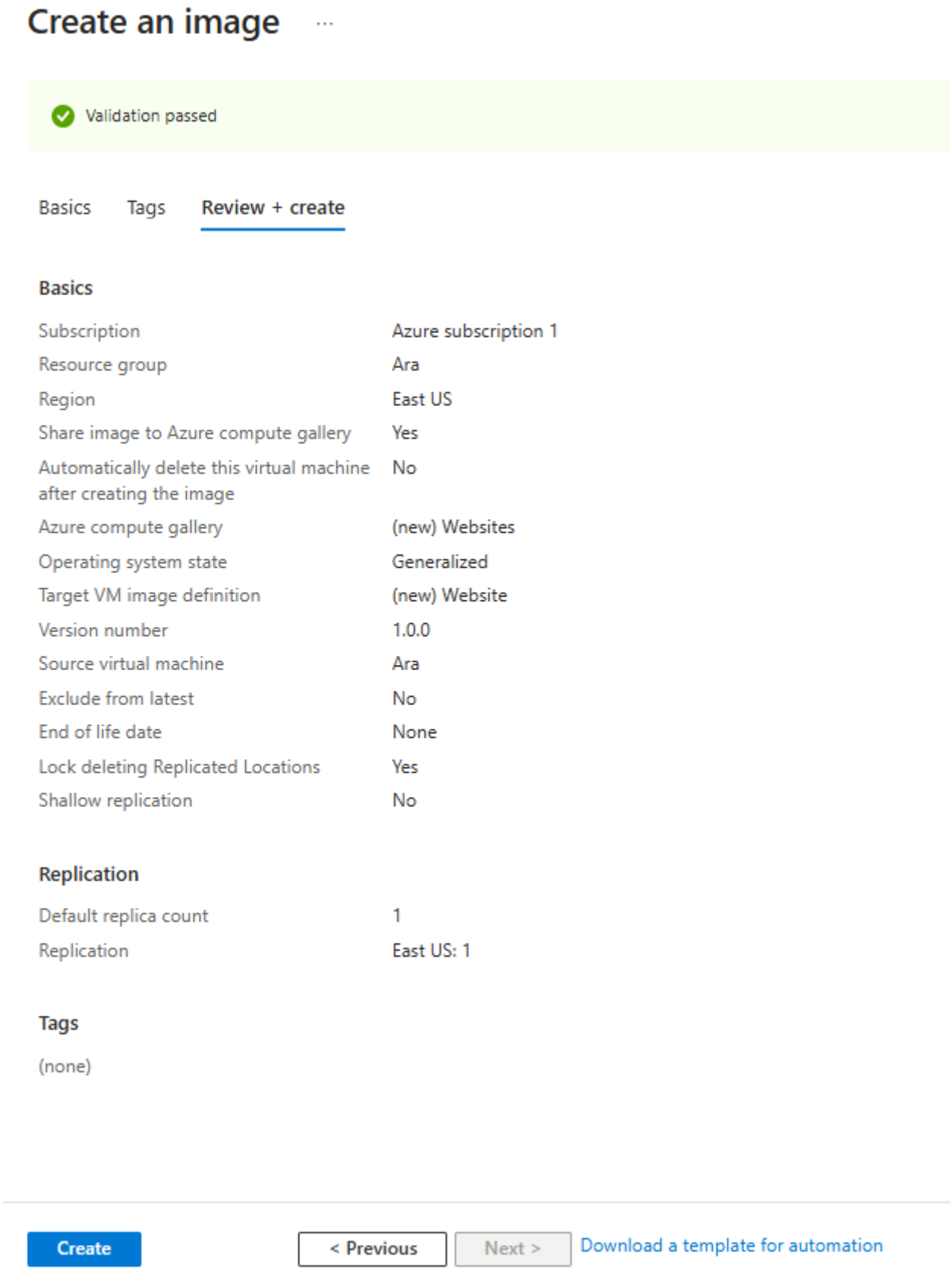


- Create a New Gallery and select Generalized
- Gneralized : if you select this the user data from the VM is deleted and takes the snapshot. provides option to create a new Vm with new user details
- Specialized : if you select this , all the data will remain same including user details



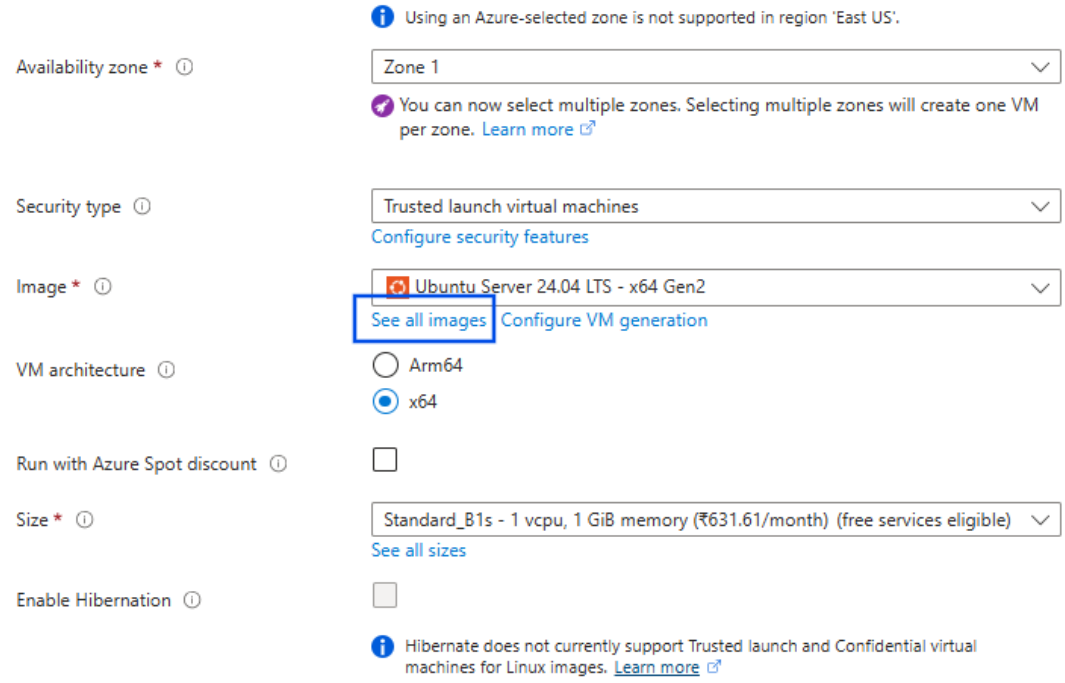
- Select Create new `image definition` fill all the details

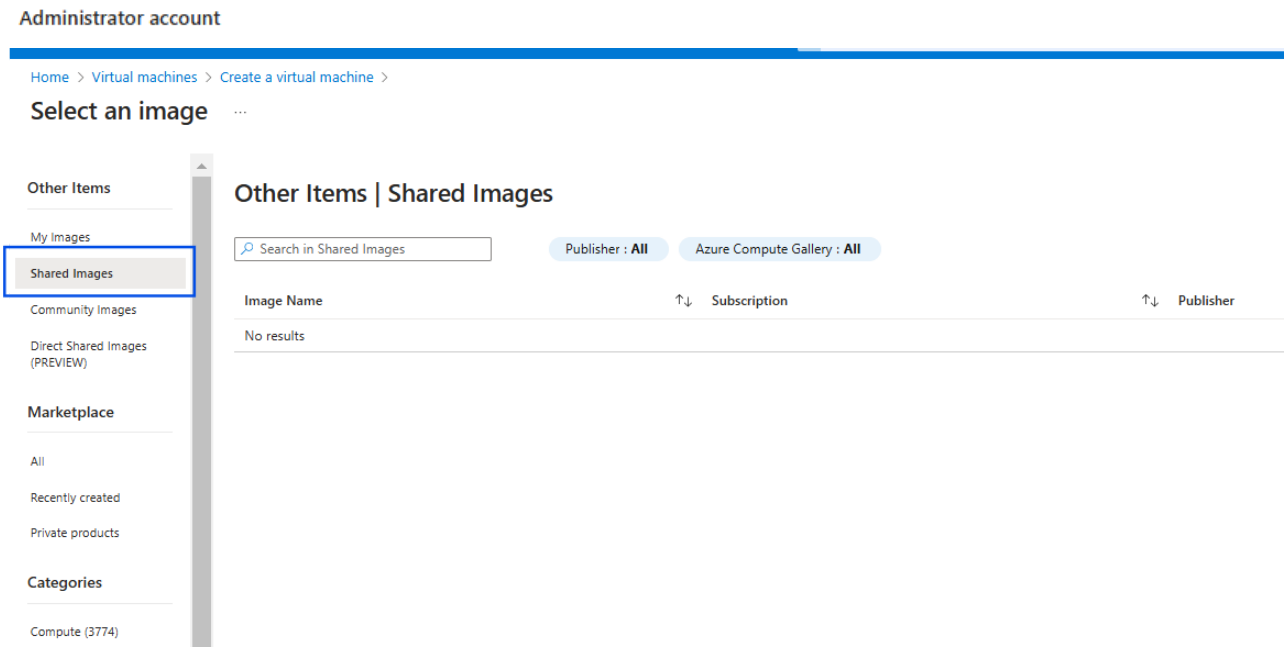




- Create image
- This will take a decent time to crete VM , as we selected Generalized image
- the VM won't work `delete the VM` check the website and connection to vm for confirmation
- After deletion of VM, Create a new VM

- while slecting a new VM image select on `see all images`





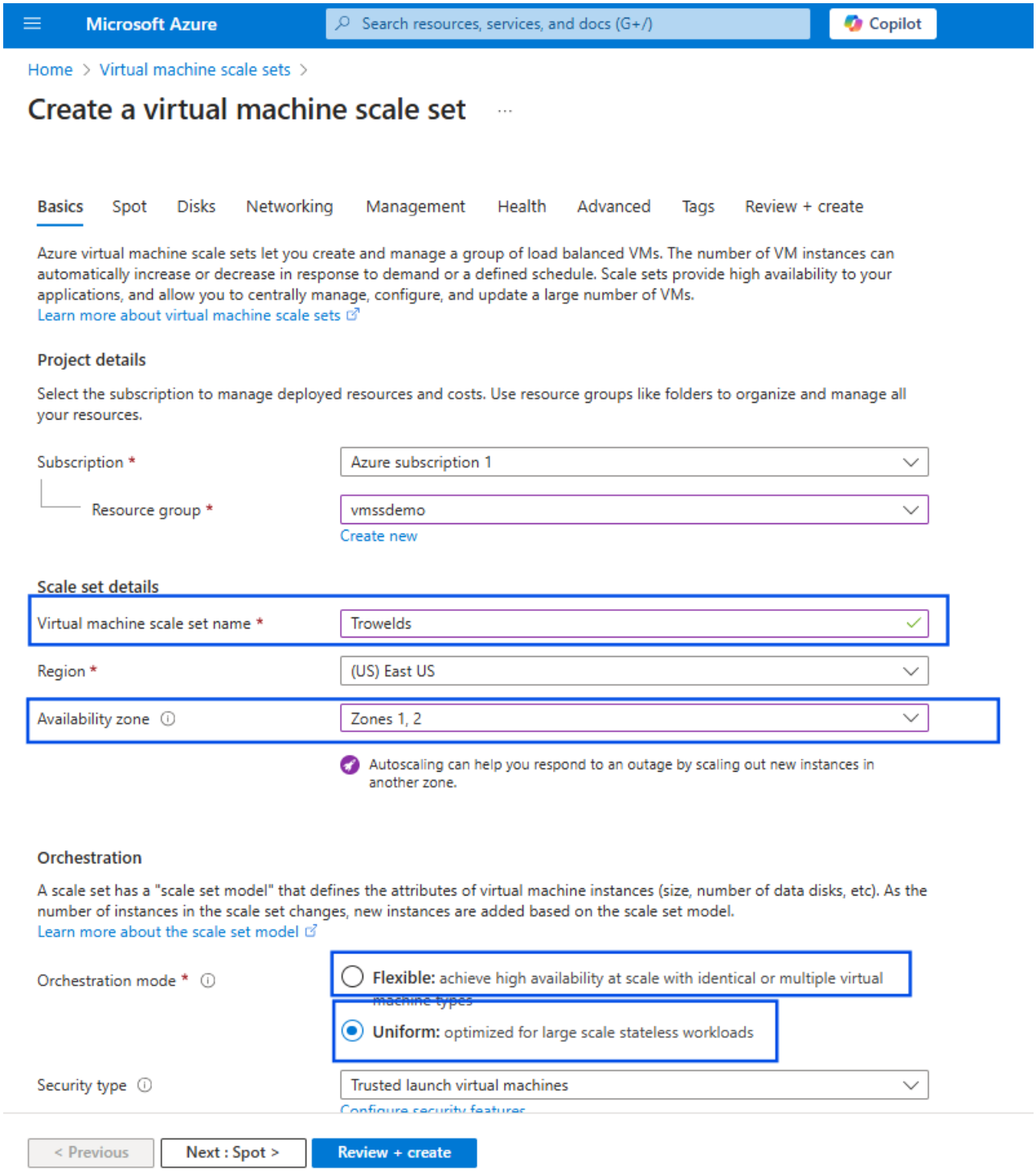
- here select shared you will find the image you created above select it and create VM.
- After creation of VM, take public ip and check whether website is working or not and check SSH connection from powershell

Working with Scaling

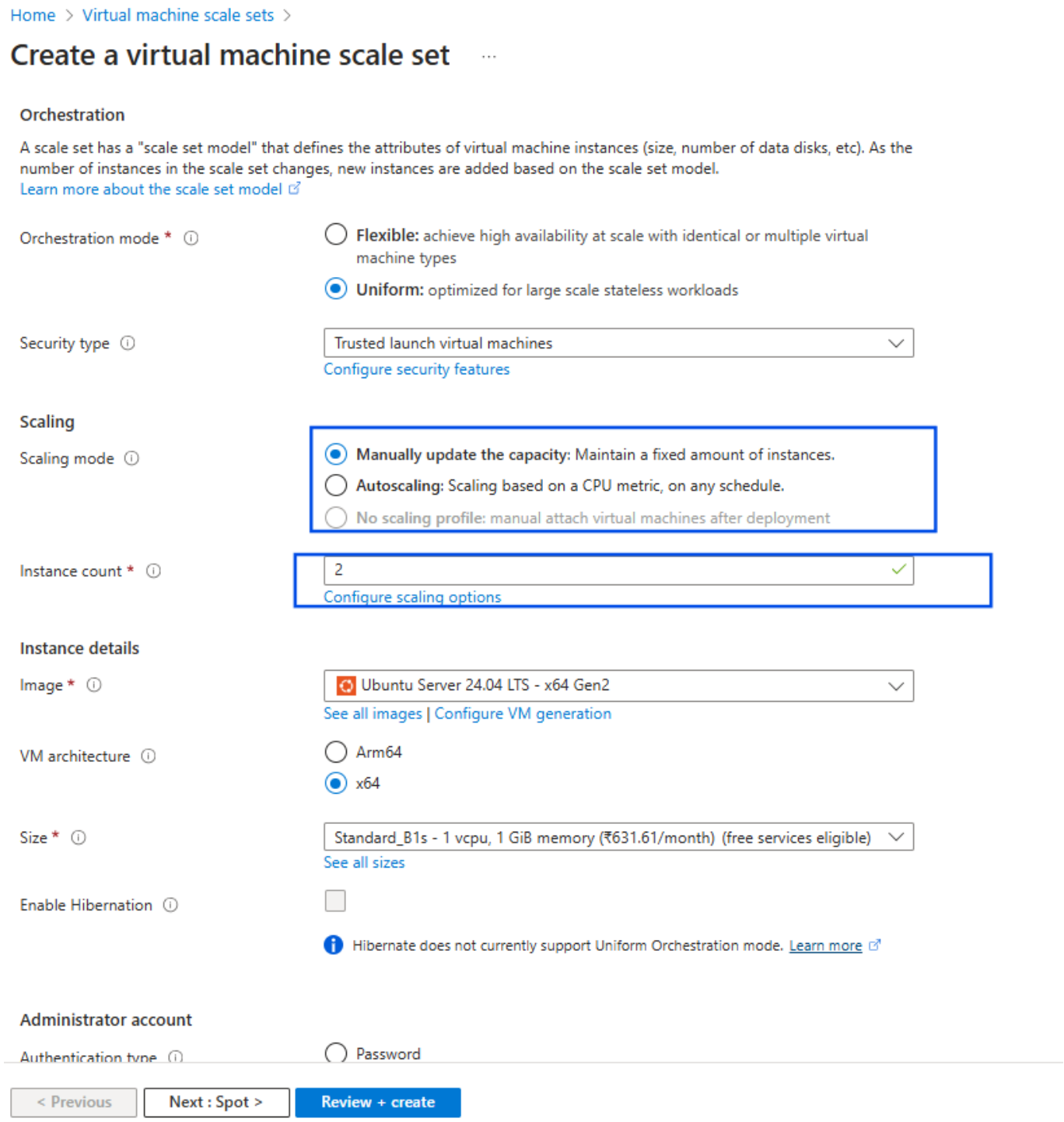
- Scaling refers to increasing machine sizes or machines
- Scaling is of two types
  - Vertical Scaling
  - Horizontal Scaling
- Vertical Scaling : This refers to increse in size of CPU/RAM or even instance families in cloud

Activity

- Open `Virtual Machine Scale Sets` and click on Create New

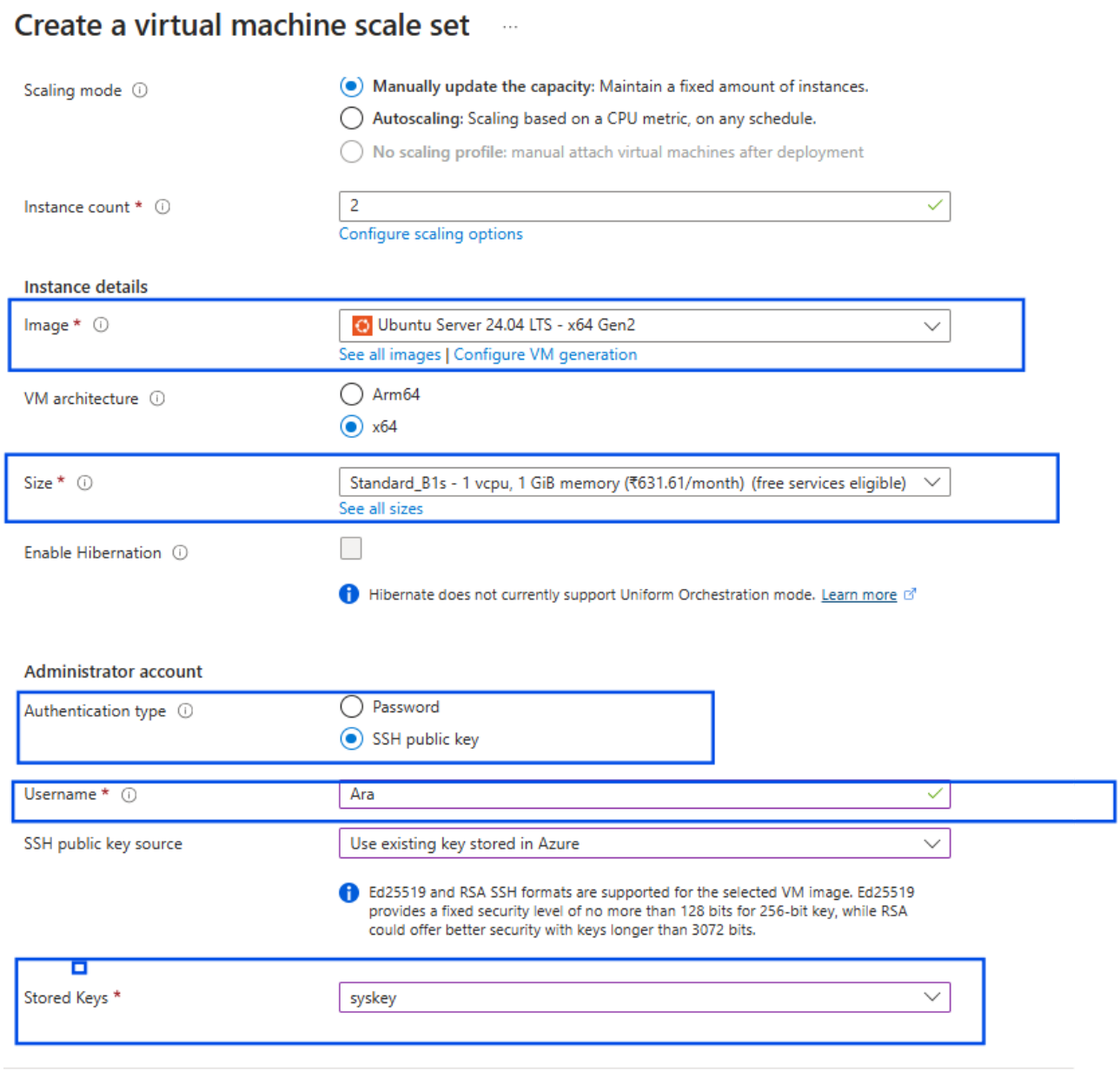


- Provide Resource group name
- Give Scale Sets Name
- Region make sure your image is there in same region
- select zones
- Orchestration:
    - Flexible : you can add different types of Vm's with different sizes
    - Uniform : Here it is Same Virtual Machines with sizes



- Scaling :
  - Manually update the Capacity : Maintain a fixed amount of instances
  - Autoscaling : Scaling based on a CPU metric, on any schedule.
- **Select `Manually update the capacity` option**

- Select instance count = 2



- image : click on see all images
    - under `shared` select your desired image
- size :
    - select your desired size
- username : someusername
- Authentication type : choose one of them Password/SSH public key
- License type : Other
- click on Next (Spot)
- **SPOT VM's** Spot VM's are defined as, where there is less demand for VM's Azure offers higer size VM's for low cost, these are not permanet. this is will be taken back without any intimation at any time. there is risk involved.

    - This section provides to utilize SPOT VM's which comes for low cost
    - These VM's will be taken back at any time.

- Skip this and go to next section

Disks :

- Change OS Disk type = standard SSD to decrese our cost

Networking :

- Select the virtual network if you have created, make sure the image shoud be there in same region
- select the `edit` icon for NIC card
    - Enable public ip [this is to verify in our activity]
    - select inbound ports
        - SSH
        - HTTP
- Select `None` for LoadBalancing options

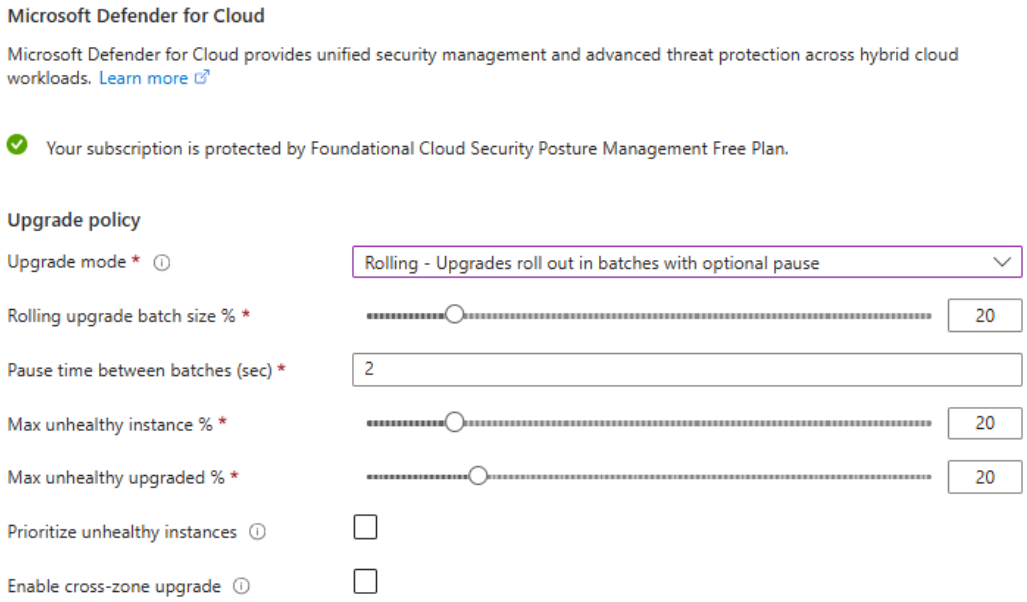
Management :

Management tells about upgrading of VM's

The Upgrade Policy in Azure Virtual Machine Scale Sets (VMSS) allows you to control how updates to your instances are applied. You can either manage upgrades manually, let Azure apply them automatically, or use a rolling upgrade strategy to apply changes incrementally across your instances. The rolling upgrade option offers the best flexibility for critical applications, allowing for high availability during the upgrade process.

- the options speaks about answer for below question
    - how do you want to upgrade your machines when a new version of image comes in
    - Automatic : (Azure will take over this)
        - when you give a new image Azure will automatically update all the machines with new image without any downtime.
    - Manual :
        - you have to click on some button to happen this upgrade
    - Rolling :

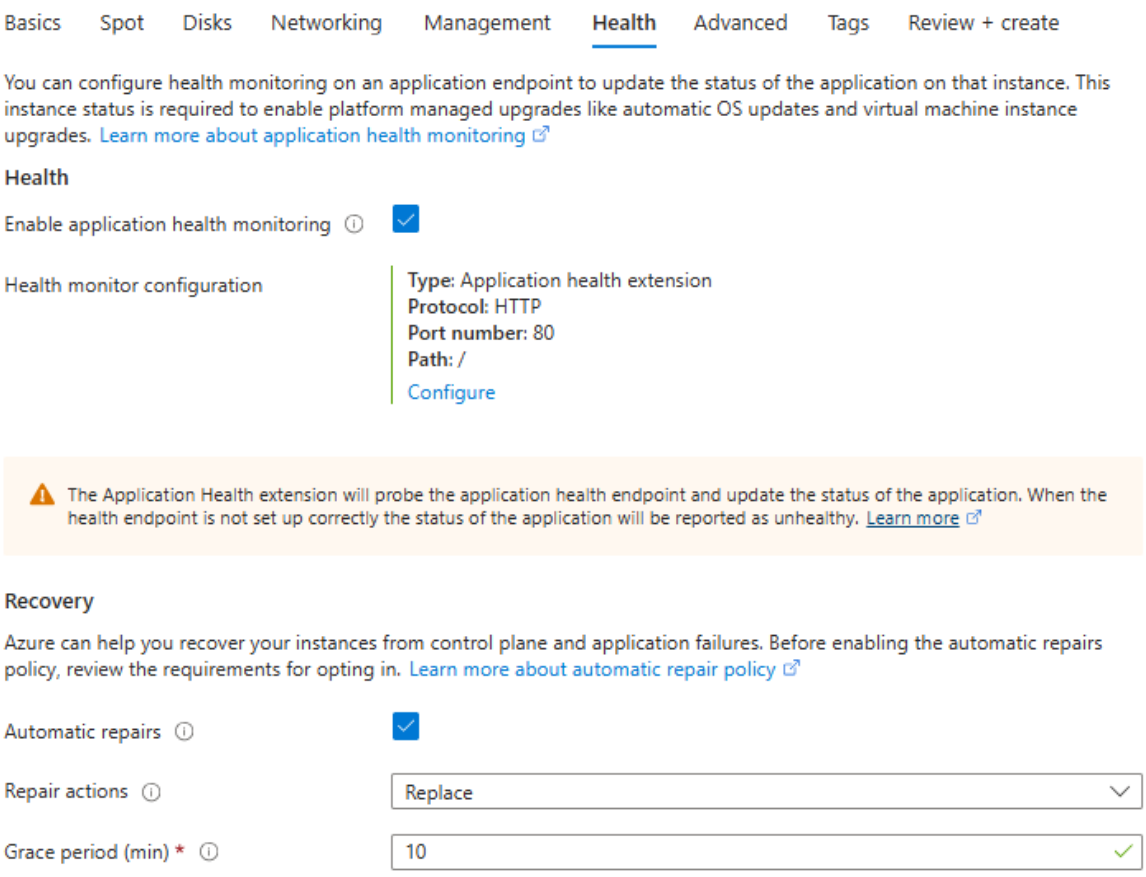
- this option is for upgrading batch wise



- Select `Automatic` and go to next section

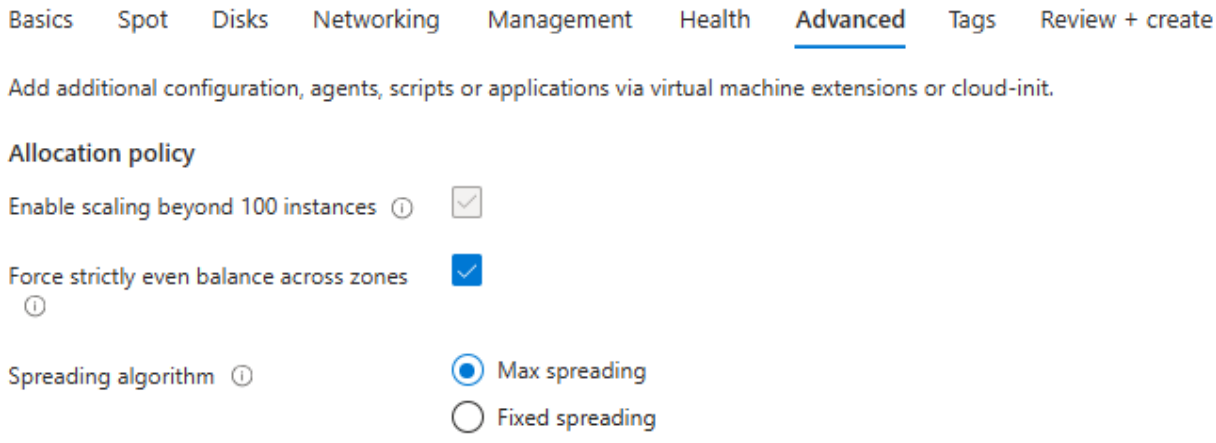
Health :

- Enable Application health monitoring
  - this will check your application is active or not
  - Confgure :
    - you can give a path here, so that you can check whether the page is responsive or not.
  - if the page is not responsive for the port 80 , using Automatic repair enabled, the vm will be deleted and creates a new



Advanced :

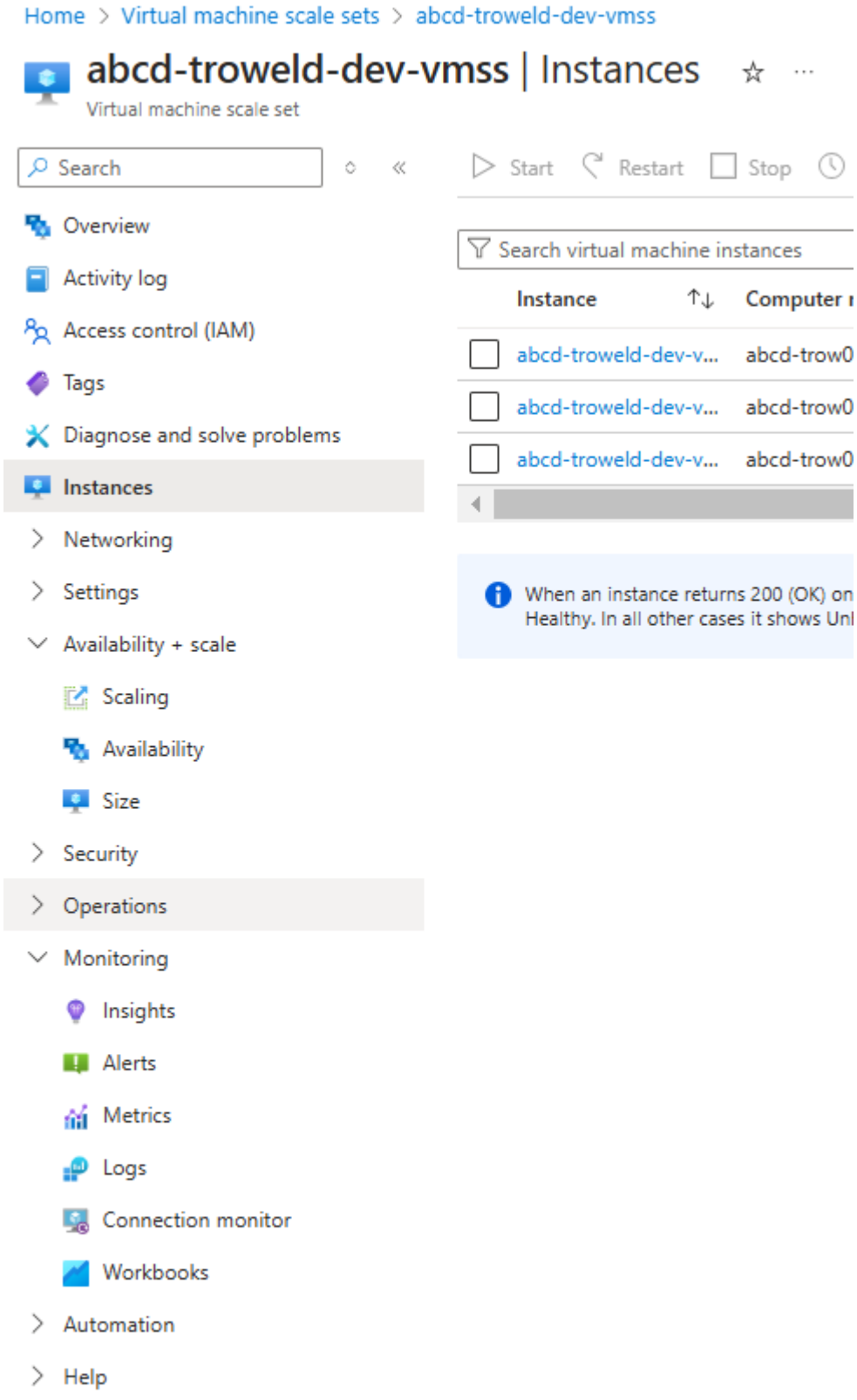
- How you want your scaling to be done



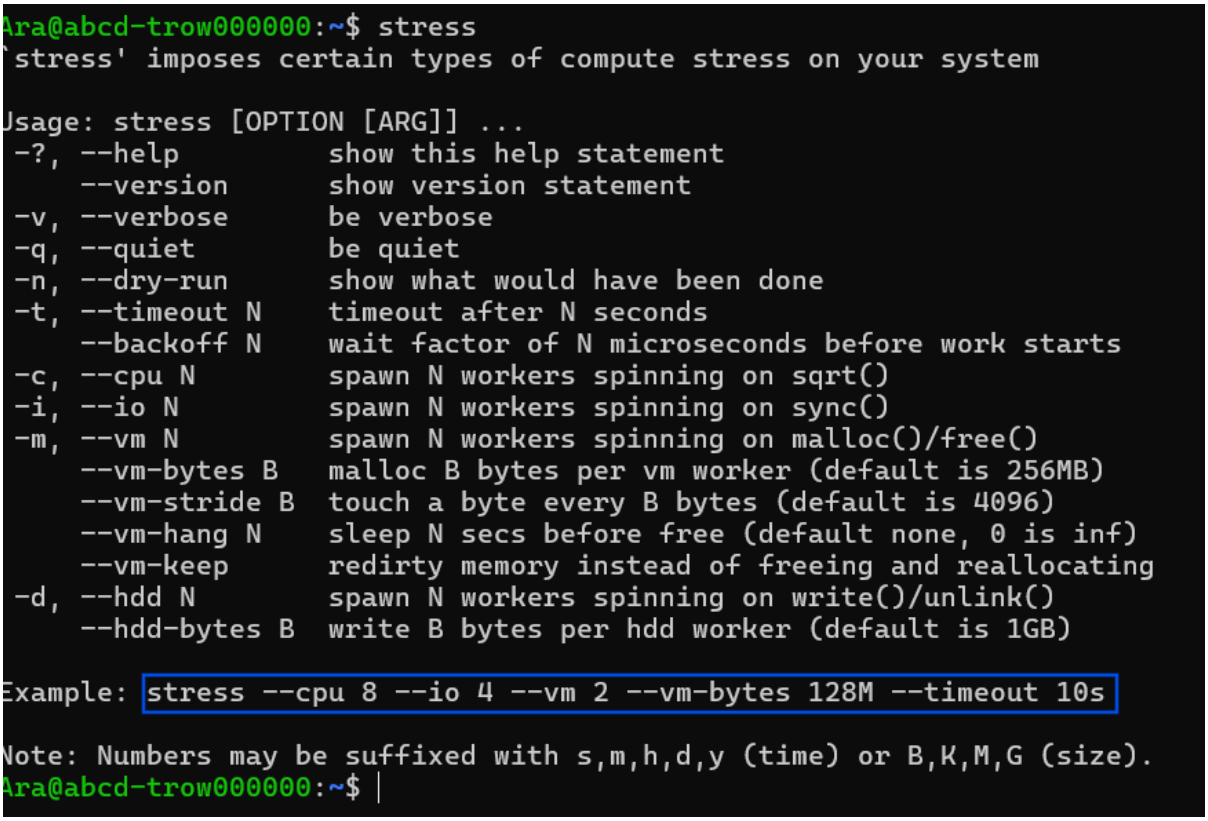
- select `Force strictly even balence across zones` :
    - this option make sure that if you hve 1o machines it will maintain 5 in one zone and 5 in another zone.
- Spreading algorithm:
    - Max spreading :

    - fixed spreading
        - for fixed you need to create `fault domain` which is not recommended.

- Review and create it.
- Once deployment is succesfull
- Open the virtul machine scalesets

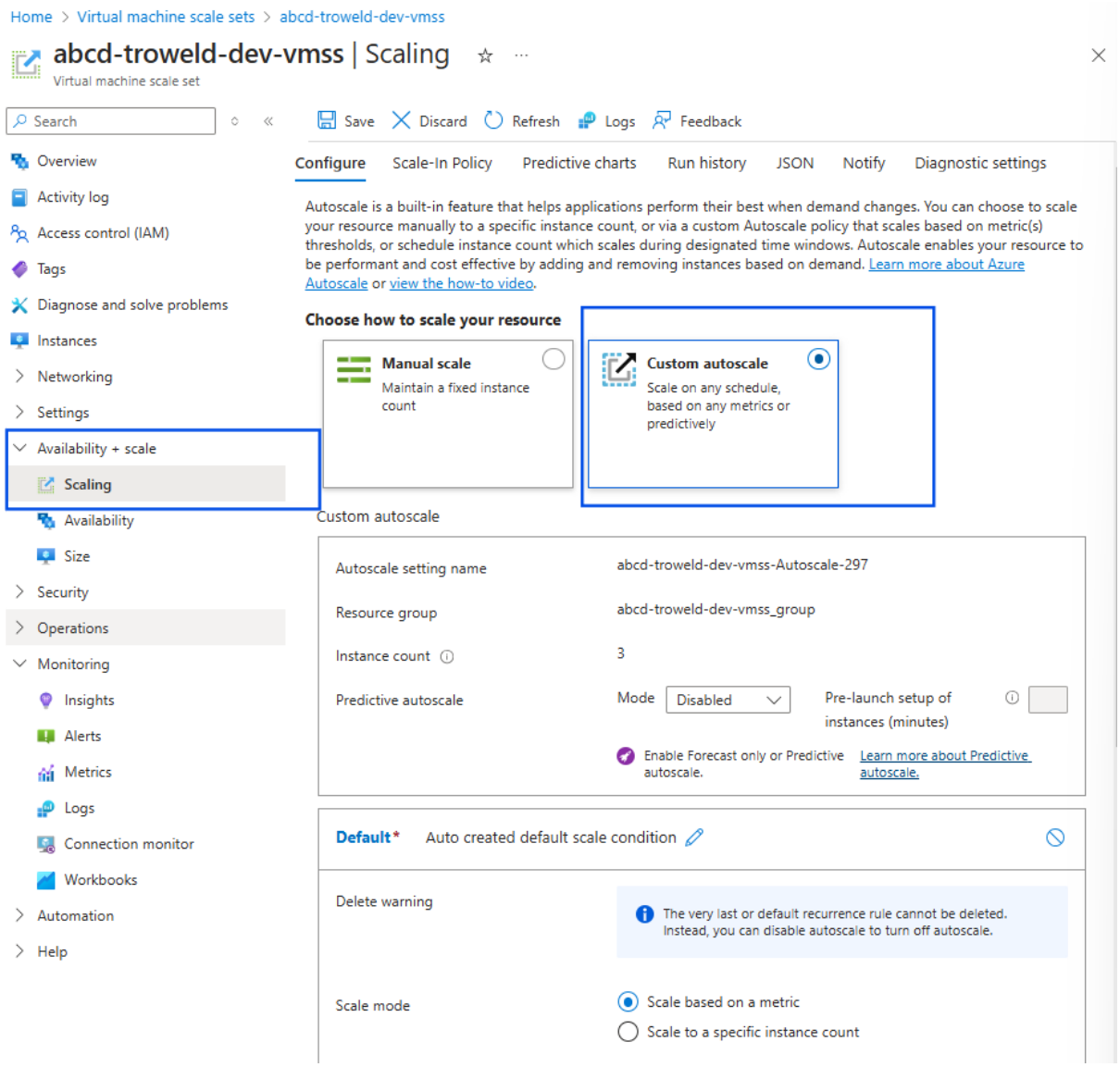


- from the left side balde select `Instances`
- check the number of instances the count will be `2`
- As we selected `Manual update capacity` and the count we gave 2, since it created 2 machines.
- login to both machines
    - use public ip and login from poweshell
    - login : ssh Ara@*ip*
    - after logged in
    - install Stress appllication, which increses stress on cpu and shows 100%.
    - cmd : `sudo apt install stress`
    - after installation is finished , type cmd : `stress`



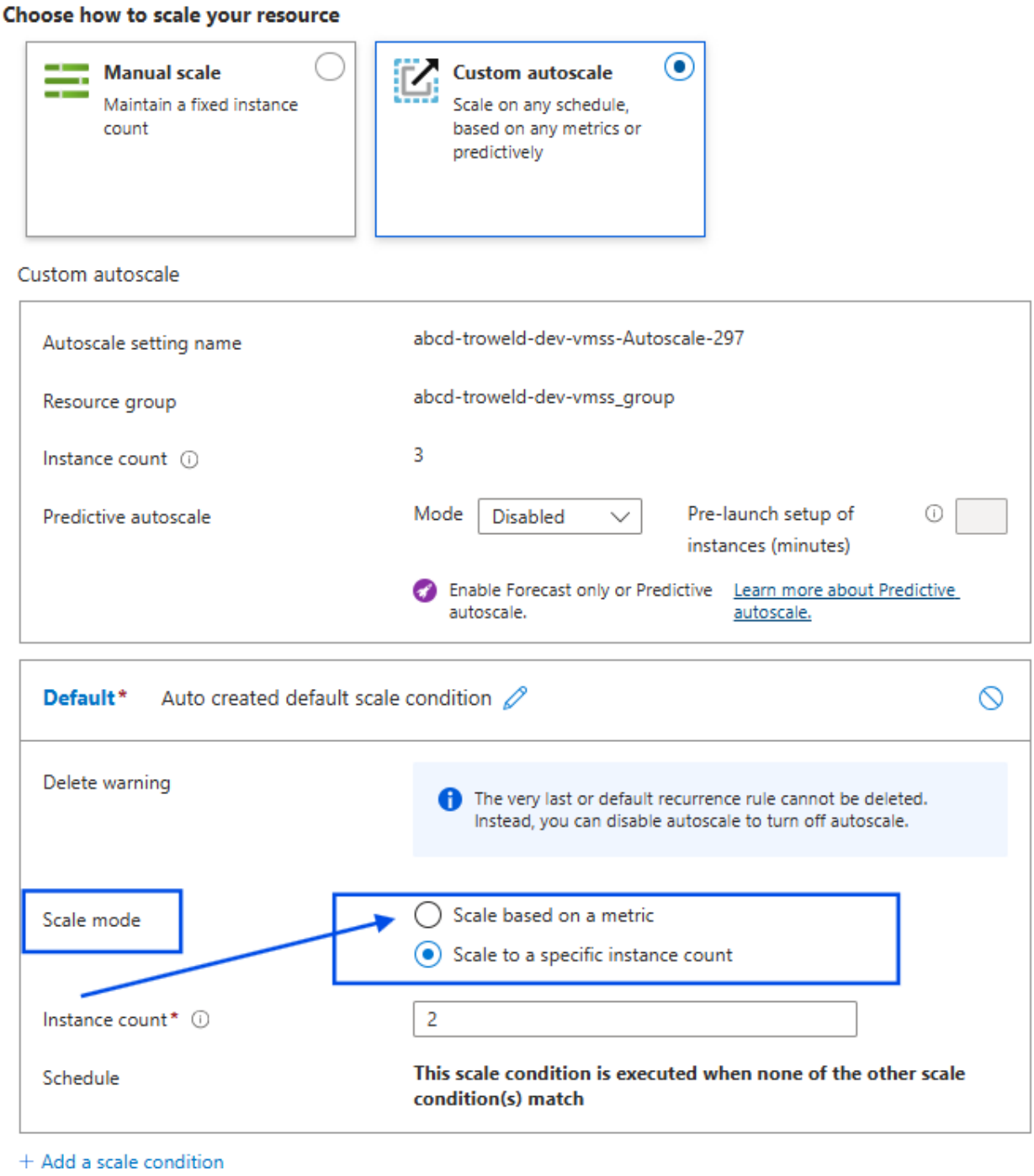
    - copy the hilighed line : `stress --cpu 8 --io 4 --vm 2 --vm-bytes 128M --timeout 15m -v`
    - change the timing at last
    - do this on both the machines.
- Above activity increses load on both machines
- As we enabled Manual the VM'd wont ge incresed based on any factor the count remains same. *Even if one of the two VMs is deleted, a new VM will not be created to maintain the desired count. This feature is not available in Azure but is supported in AWS.*
- To enable this feature, you need to change the update policy to `Automatic` and set the
- Now go to `Availability+ scale` section

- select Scaling option

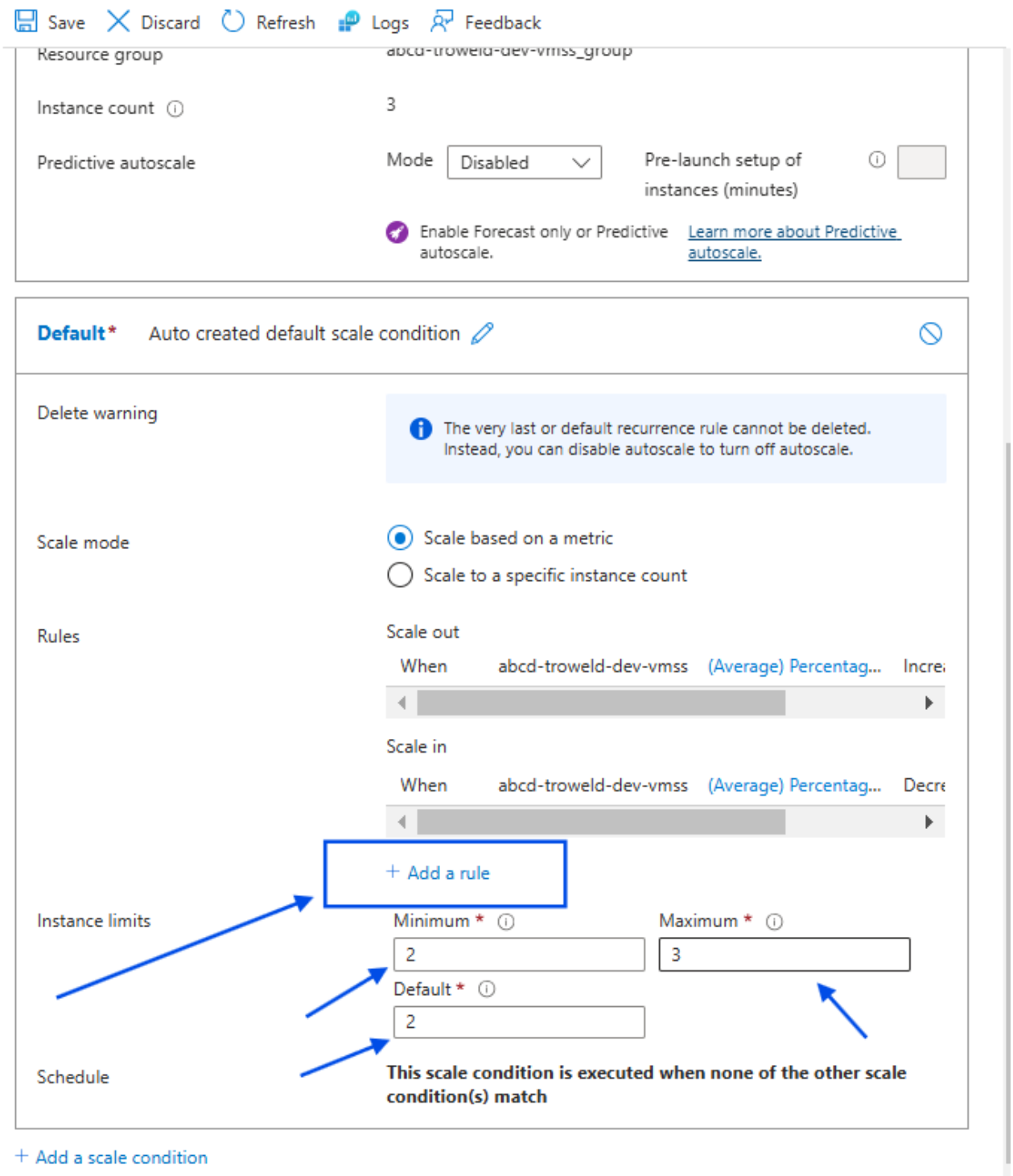


- rigt side you can see two options
  - Manual Scale
  - Custom autoscale

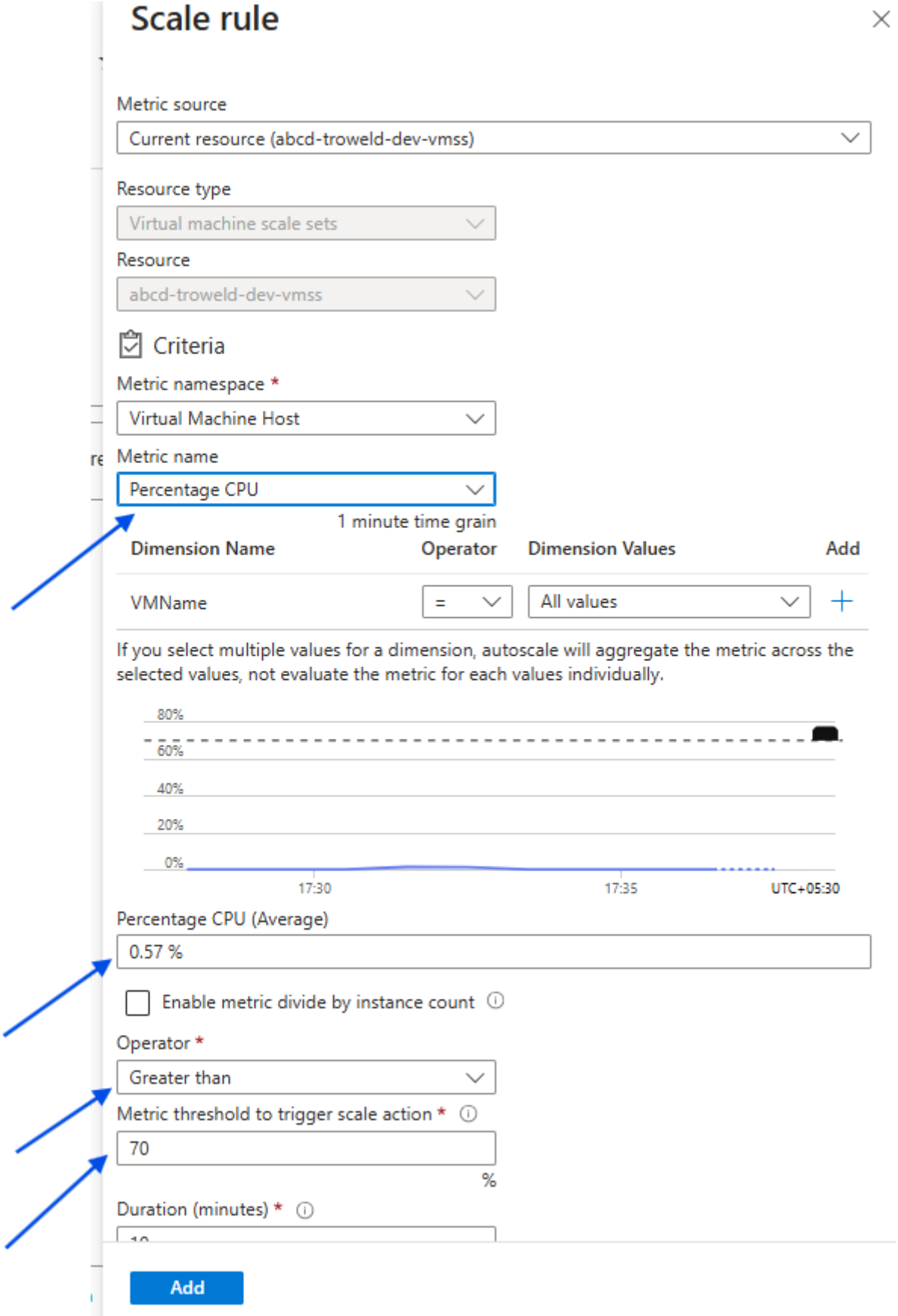
- select `Custom autoscale`



- select Scale based on a metric option

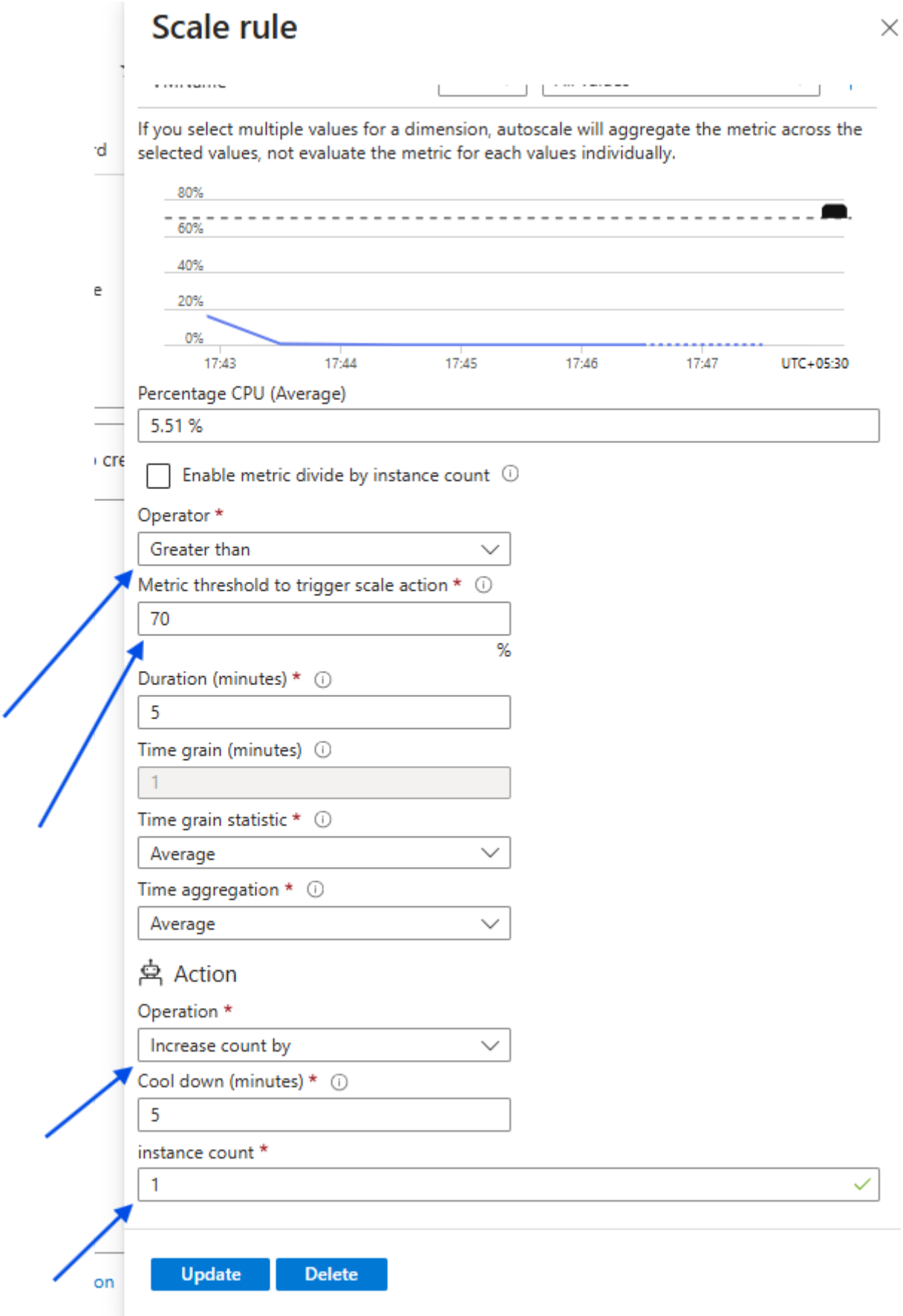


- select Add Rule



- here the default metric name is cpu percentage, let it be. based on the requirement you can choose from the list

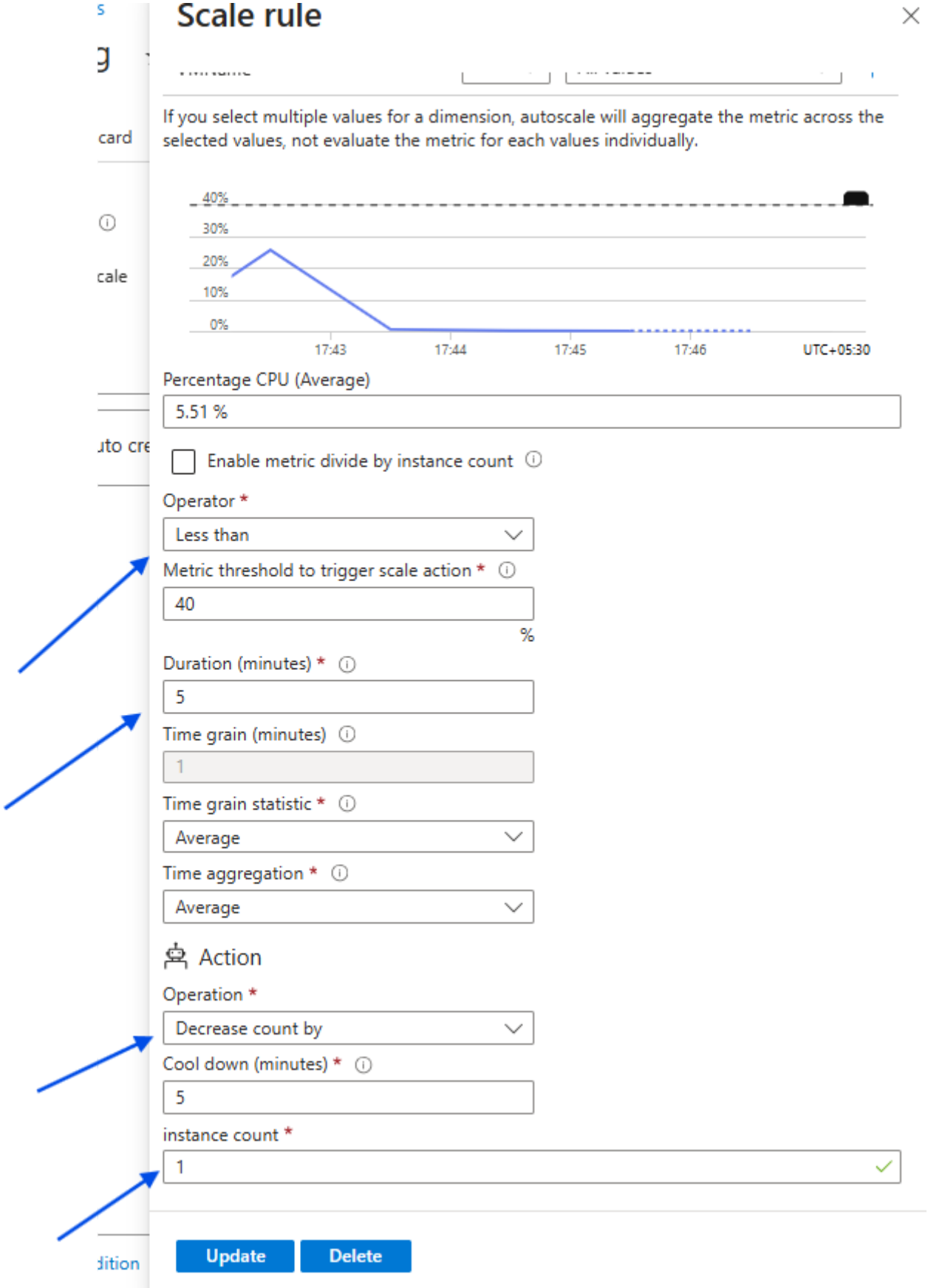
- below it shows the Avg CPU usage



- Operator :
    - choose greater than
- Metric threshold to trigger scale action

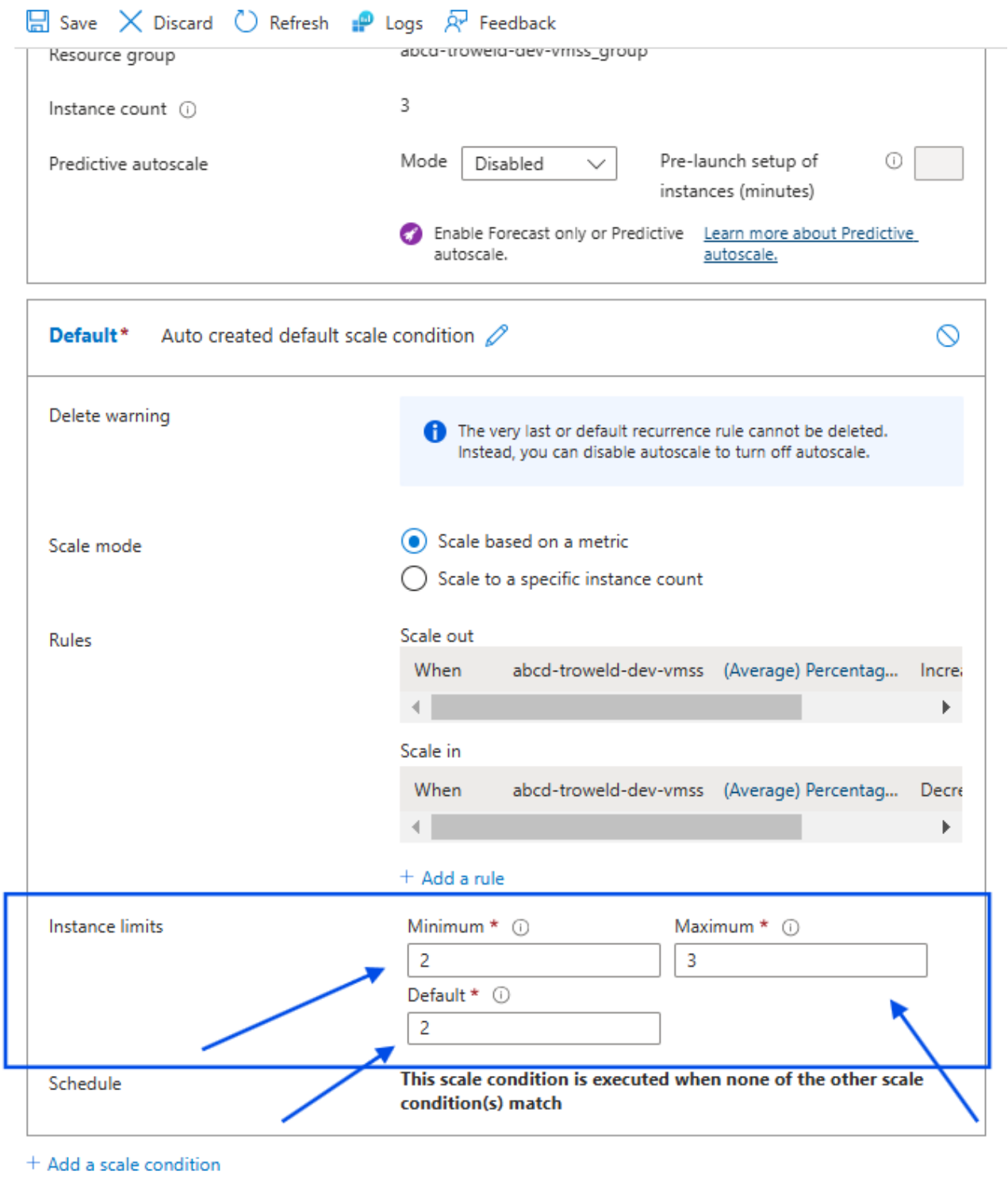
    - choose 70
- duration put 5 min [checks cpu for every 5 min]
- Operation :
    - select increase count by
- instance count = keep 1 [it means when cpu threshold increses by 70% then 1 vm will be created]

- select Add rule to add one more rule to decrease a vm if the CPU below 40%



- save and come back

- below you can see instance limits



- here you can see the instance count for min is 2 and max is 2 increase max by 1 that is 3, and default keep 2.
- Save the configuration and wait for few minutes, it will create one more vm as the stess increses to 100% .
- after the new vm is created and go to two machins and stop the execution.
- cmd to stop : ctrl+c
- wait for few minutes agin it will delete one vm.

Configure LoadBalencer for VMSS

A **load balancer** is a tool that distributes incoming traffic evenly across multiple servers to:

- Prevent overloading any single server.
- Ensure high availability and better performance.
- Automatically redirect traffic if a server goes down.

Think of it like a traffic cop directing cars (users) to different open lanes (servers) so everyone moves smoothly without jams.

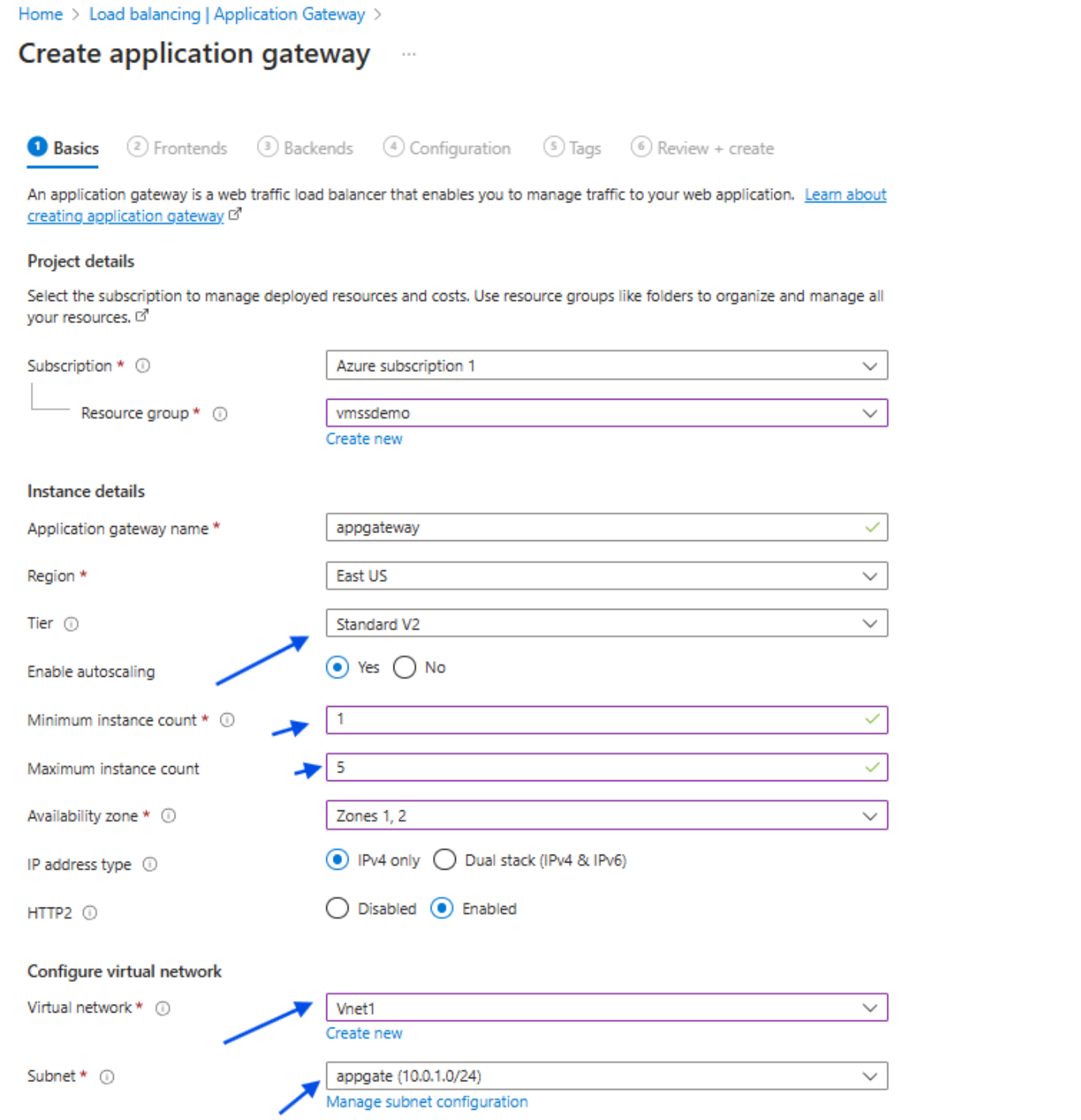
Layer 4 Load Balancer:

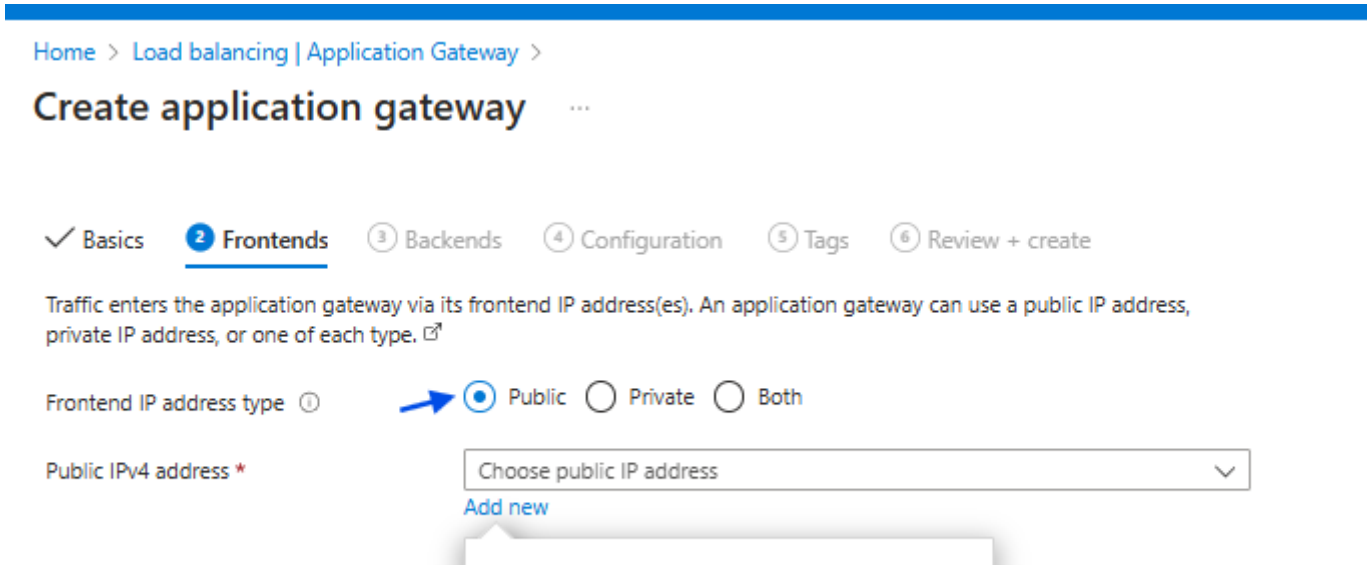
- Operates at the **transport layer** (Layer 4 of the OSI model).
- Balances traffic based on **IP addresses** and **ports** (e.g., TCP/UDP traffic).
- Does not inspect the actual content of the traffic (e.g., HTTP requests).
- Faster and more efficient but less intelligent.
- Example Use: Routing packets for a database or application server.

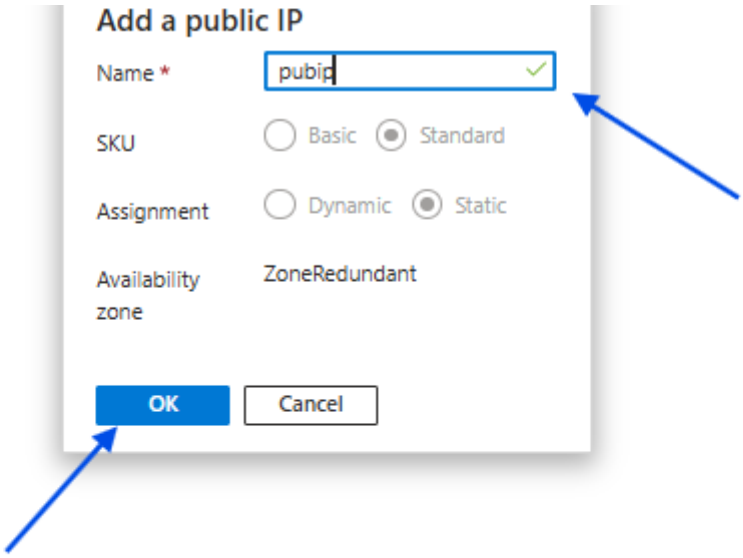
Layer 7 Load Balancer:

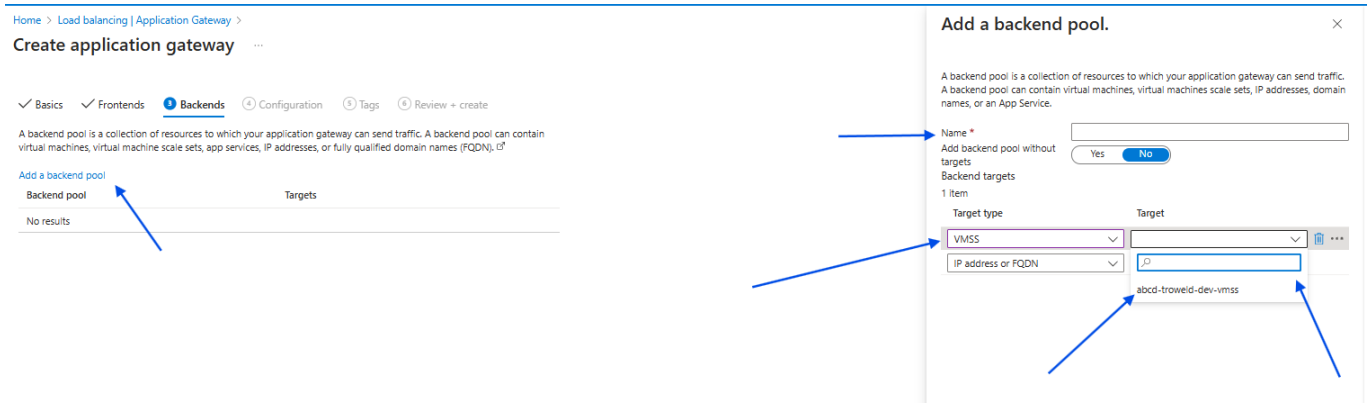
- Operates at the **application layer** (Layer 7 of the OSI model).
- Balances traffic based on **content of the request** (e.g., URL, headers, cookies).
- Can perform smart routing, such as sending requests for `/images` to one server and `/api` to another.
- More flexible but slightly slower due to deeper packet inspection.
- Example Use: Routing web application traffic (e.g., HTTP/HTTPS).

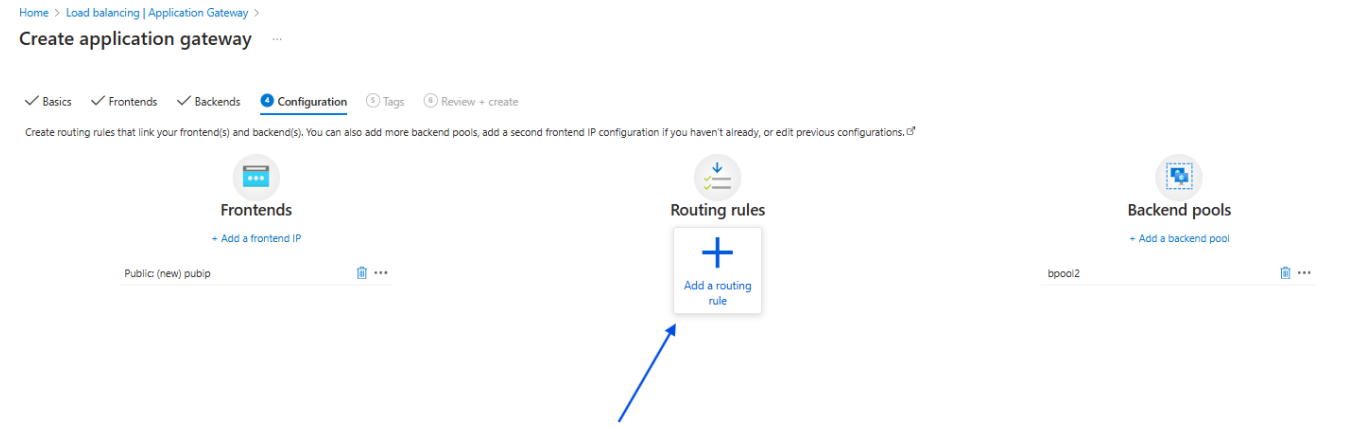
- Create Application gateway (layer 7 load balencer)/ load balenser
- Follow below images to create Application Gateway.

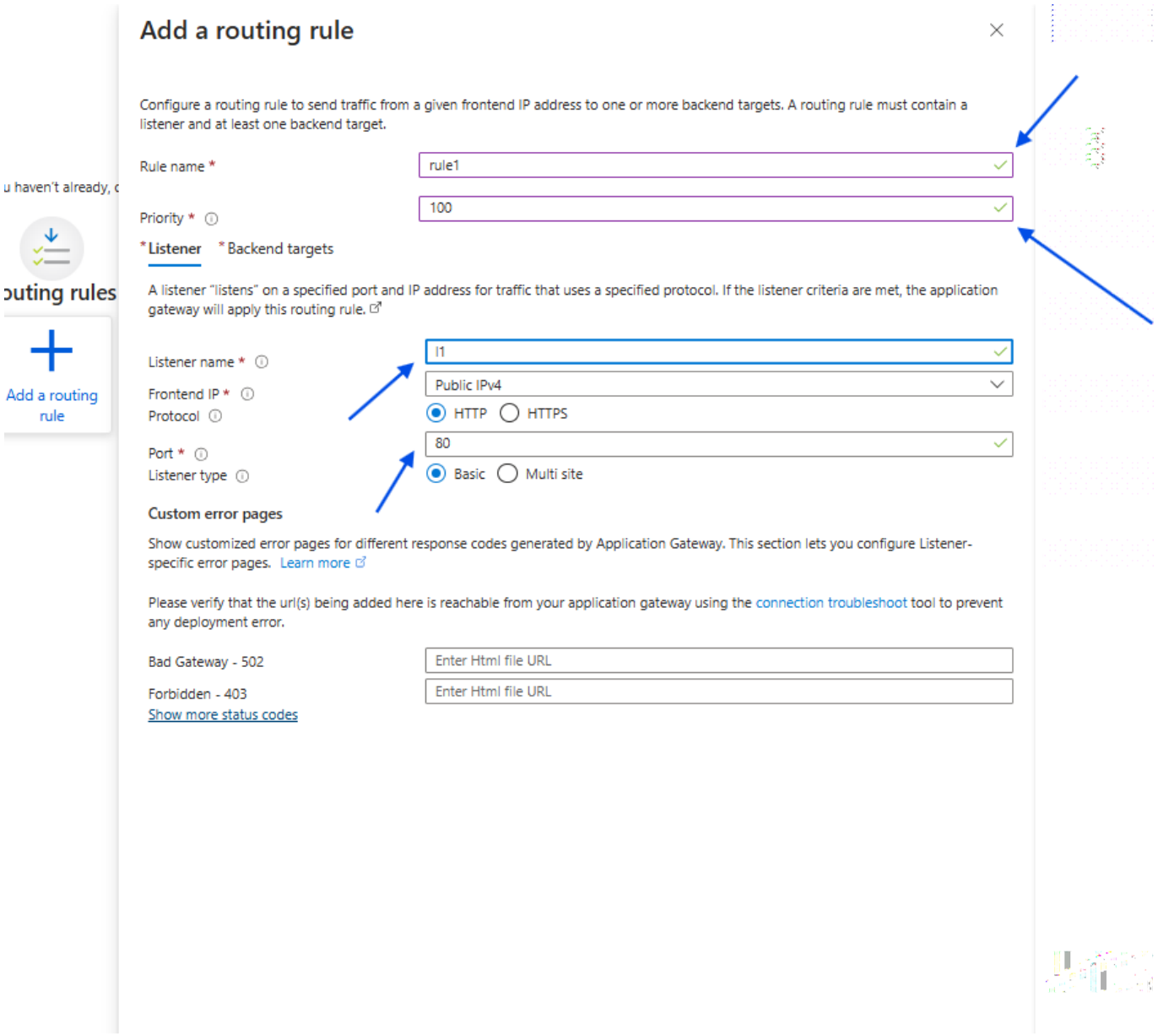

Home > Load balancing | Application Gateway >
Create application gateway
1 Basics
2 Frontends
3 Backends
4 Configuration
5 Tags
6 Review + create
An application gateway is a web traffic load balancer that enables you to manage traffic to your web application. Learn about creating application gateway
Project details
Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.
Subscription *
Azure subscription 1
Resource group *
vmssdemo
Create new
Instance details
Application gateway name *
appgateway
Region *
East US
Tier
Standard V2
Enable autoscaling
Yes
No
Minimum instance count *
1
Maximum instance count
5
Availability zone *
Zones 1, 2
IP address type
IPv4 only
Dual stack (IPv4 & IPv6)
HTTP2
Disabled
Enabled
Configure virtual network
Virtual network *
Vnet1
Create new
Subnet *
appgate (10.0.1.0/24)
Manage subnet configuration

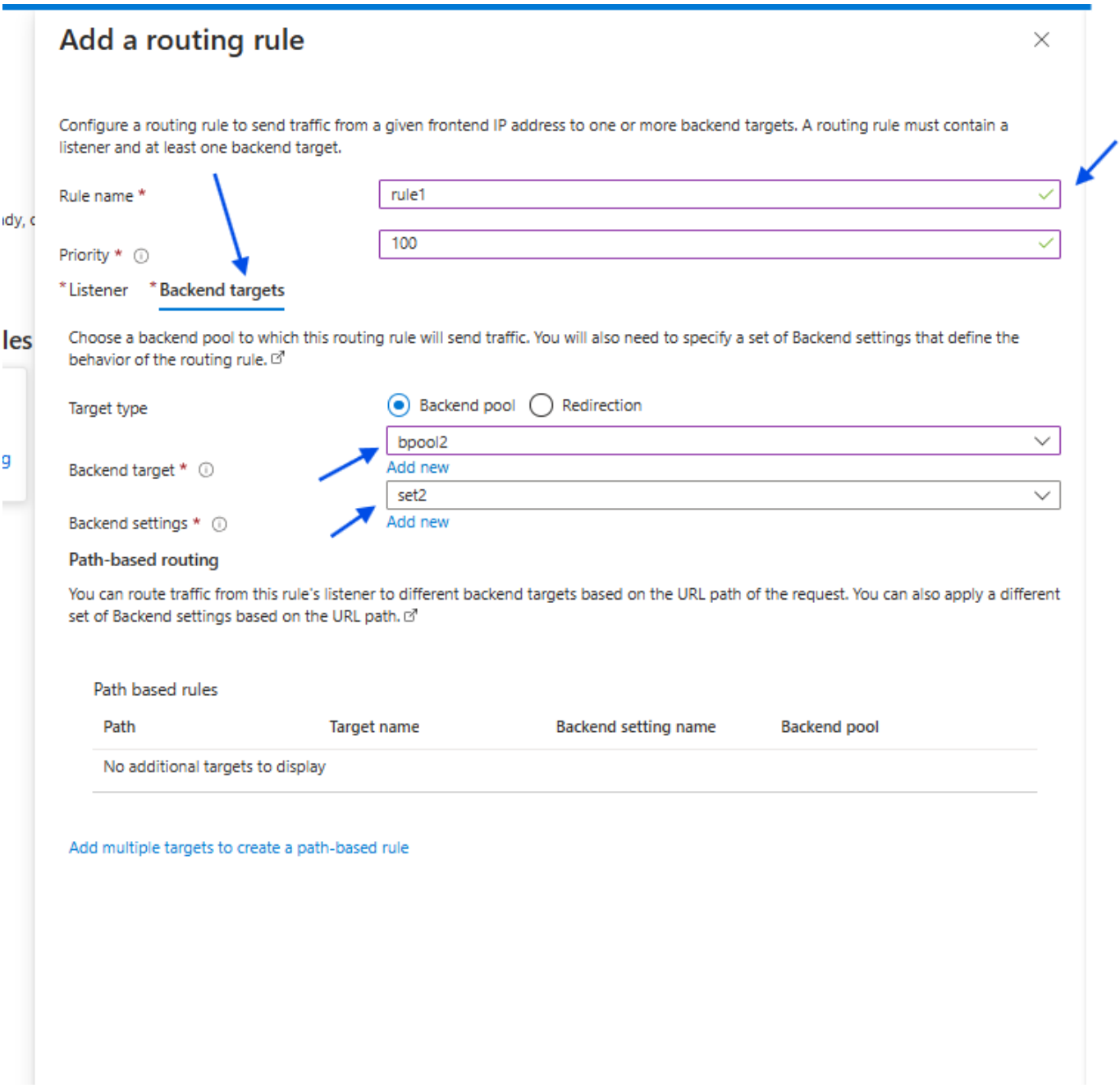

Home > Load balancing | Application Gateway >
Create application gateway
Basics
2 Frontends
3 Backends
4 Configuration
5 Tags
6 Review + create
Traffic enters the application gateway via its frontend IP address(es). An application gateway can use a public IP address, private IP address, or one of each type.
Frontend IP address type
Public
Private
Both
Public IPv4 address *
Choose public IP address
Add new

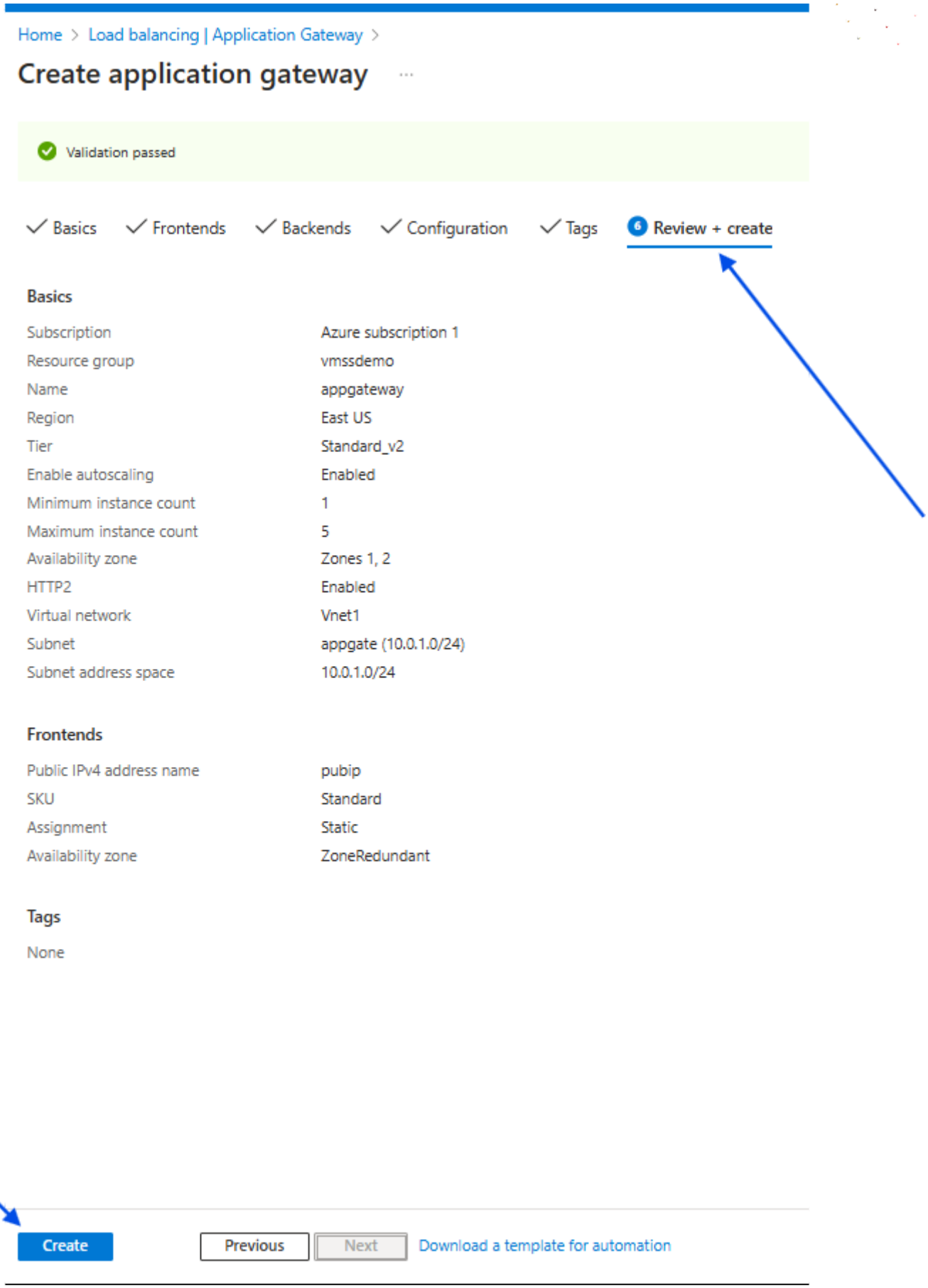

Add a public IP
Name *
pubip
SKU
Basic
Standard
Assignment
Dynamic
Static
Availability zone
ZoneRedundant
OK
Cancel


Home > Load balancing | Application Gateway >
Create application gateway
Basics
Frontends
Backends
Configuration
Tags
Review + create
A backend pool is a collection of resources to which your application gateway can send traffic. A backend pool can contain virtual machines, virtual machine scale sets, app services, IP addresses, or fully qualified domain names (FQDN).
Add a backend pool
Backend pool
Targets
No results
Add a backend pool.
A backend pool is a collection of resources to which your application gateway can send traffic. A backend pool can contain virtual machines, virtual machines scale sets, IP addresses, domain names, or an App Service.
Name *
Add backend pool without targets
Yes
No
Backend targets
1 item
Target type
Target
VMSS
IP address or FQDN
abcd-troweld-dev-vmss


Home > Load balancing | Application Gateway >
Create application gateway
Basics
Frontends
Backends
Configuration
Tags
Review + create
Create routing rules that link your frontend(s) and backend(s). You can also add more backend pools, add a second frontend IP configuration if you haven't already, or edit previous configurations.
Frontends
+ Add a frontend IP
Public (new) pubip
Routing rules
Add a routing rule
Backend pools
+ Add a backend pool
bpool2


Add a routing rule
Configure a routing rule to send traffic from a given frontend IP address to one or more backend targets. A routing rule must contain a listener and at least one backend target.
Rule name *
rule1
Priority *
100
*Listener
*Backend targets
A listener "listens" on a specified port and IP address for traffic that uses a specified protocol. If the listener criteria are met, the application gateway will apply this routing rule.
Listener name *
l1
Frontend IP *
Public IPv4
Protocol
HTTP
HTTPS
Port *
80
Listener type
Basic
Multi site
Custom error pages
Show customized error pages for different response codes generated by Application Gateway. This section lets you configure Listener-specific error pages. Learn more
Please verify that the url(s) being added here is reachable from your application gateway using the connection troubleshoot tool to prevent any deployment error.
Bad Gateway - 502
Enter Html file URL
Forbidden - 403
Enter Html file URL
Show more status codes
Add a routing rule

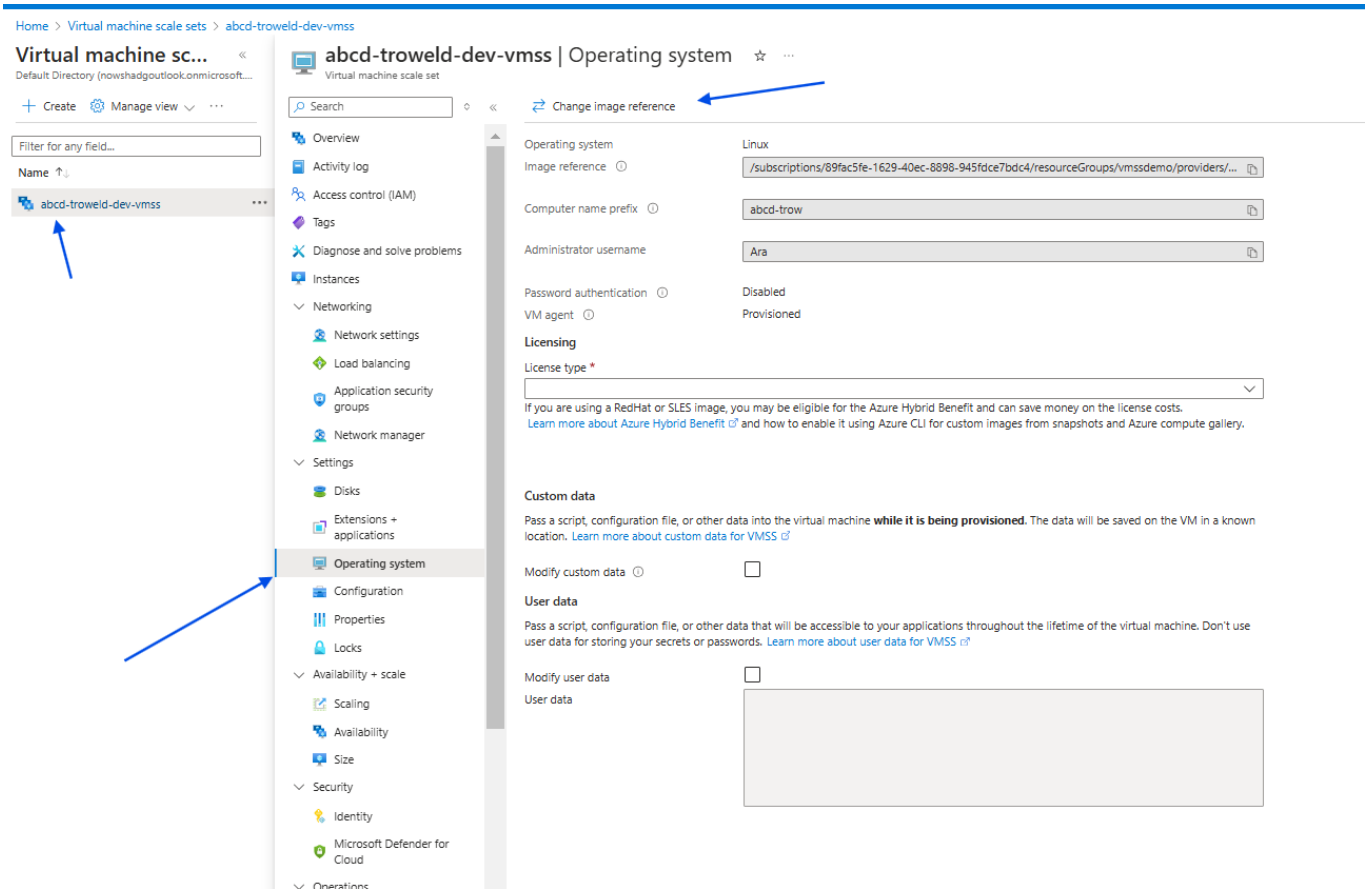

Add a routing rule
Configure a routing rule to send traffic from a given frontend IP address to one or more backend targets. A routing rule must contain a listener and at least one backend target.
Rule name *
rule1
Priority *
100
*Listener
*Backend targets
Choose a backend pool to which this routing rule will send traffic. You will also need to specify a set of Backend settings that define the behavior of the routing rule.
Target type
Backend pool
Redirection
Backend target *
bpool2
Add new
Backend settings *
set2
Add new
Path-based routing
You can route traffic from this rule's listener to different backend targets based on the URL path of the request. You can also apply a different set of Backend settings based on the URL path.
Path based rules
Path
Target name
Backend setting name
Backend pool
No additional targets to display
Add multiple targets to create a path-based rule



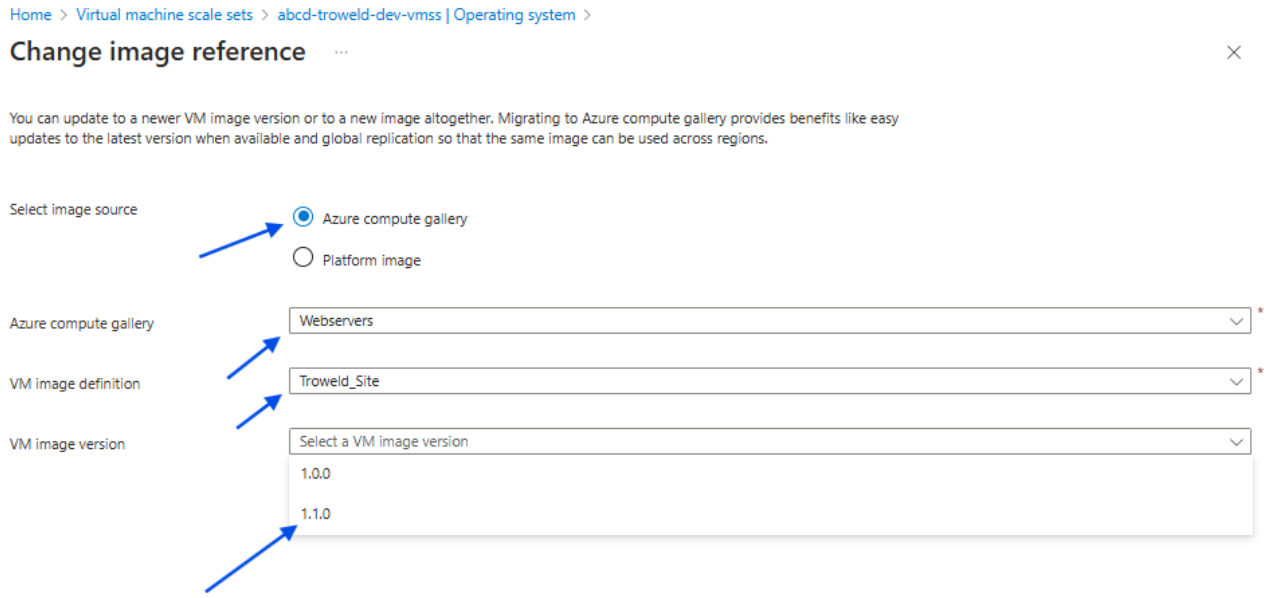
- Take the Loadbalenser ip and check whether the site is working or not
- if it is working then you have successfully created the load balencer for vmss.

Change image for VMSS [upgrading the image]

- Create a new VM and deploy different website and take image from it. and give version 1.1.0.

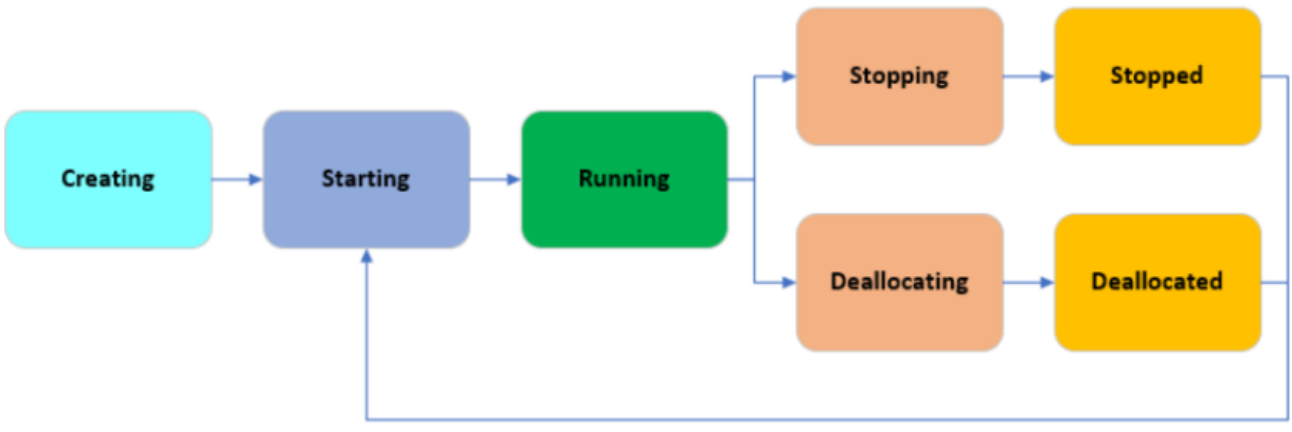


- Open the VMSS under, see above image select `Operating System` and top left side you can see `Change image reference`



- change the image by seeing above image
- Apply
- The upgrade will be done automatically after few minutes
- check manually and through load balencer if it comes with new site the deployment is succesful.

Azure VM States



- Above images shows the multiple steps a vm undergoes during creation. Azure official docs

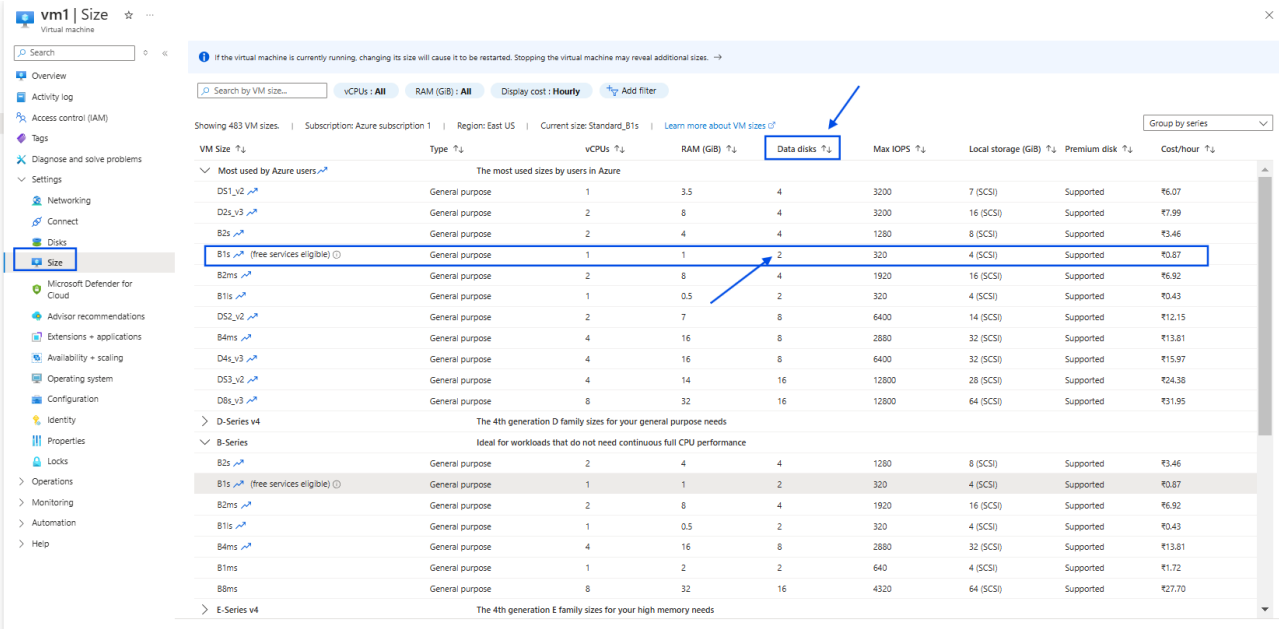
Expand table

Power state	Description	Billing
Creating	Virtual machine is allocating resources.	Not Billed*
Starting	Virtual machine is powering up.	Billed
Running	Virtual machine is fully up. This state is the standard working state.	Billed
Stopping	This state is transitional between running and stopped.	Billed
Stopped	The virtual machine is allocated on a host but not running. Also called *PoweredOff* state or *Stopped (Allocated)*. This state can be result of invoking the `PowerOff` API operation or invoking shutdown from within the guest OS. The *Stopped* state might also be observed briefly during VM creation or while starting a VM from *Stopped (Deallocated)* state.	Billed
Deallocating	This state is transitional between *Running* and *Deallocated*.	Not billed*
Deallocated	The virtual machine has released the lease on the underlying hardware. If the machine is powered off it is shown as *Stopped (Deallocated)*. If it has entered hibernation it is shown as *Hibernated (Deallocated)*	Not billed*

- the stop which we do from portal leads to deallocation, so no bill. but there will disk charges

Disk Related Options in Azure VM

- In Azure we have virtual disks managed by Managed Disk and Temp Disk (Local storage)
- Data in local storage will be erased when you stop instance
- Azure uses Data Disks (Managed disks) for persistence even after vm is stopped or deleted
- In Azure many instance sizes come with local storage and information is present in vm size detailing
- Azure has a restriction on number of disks according to vm size

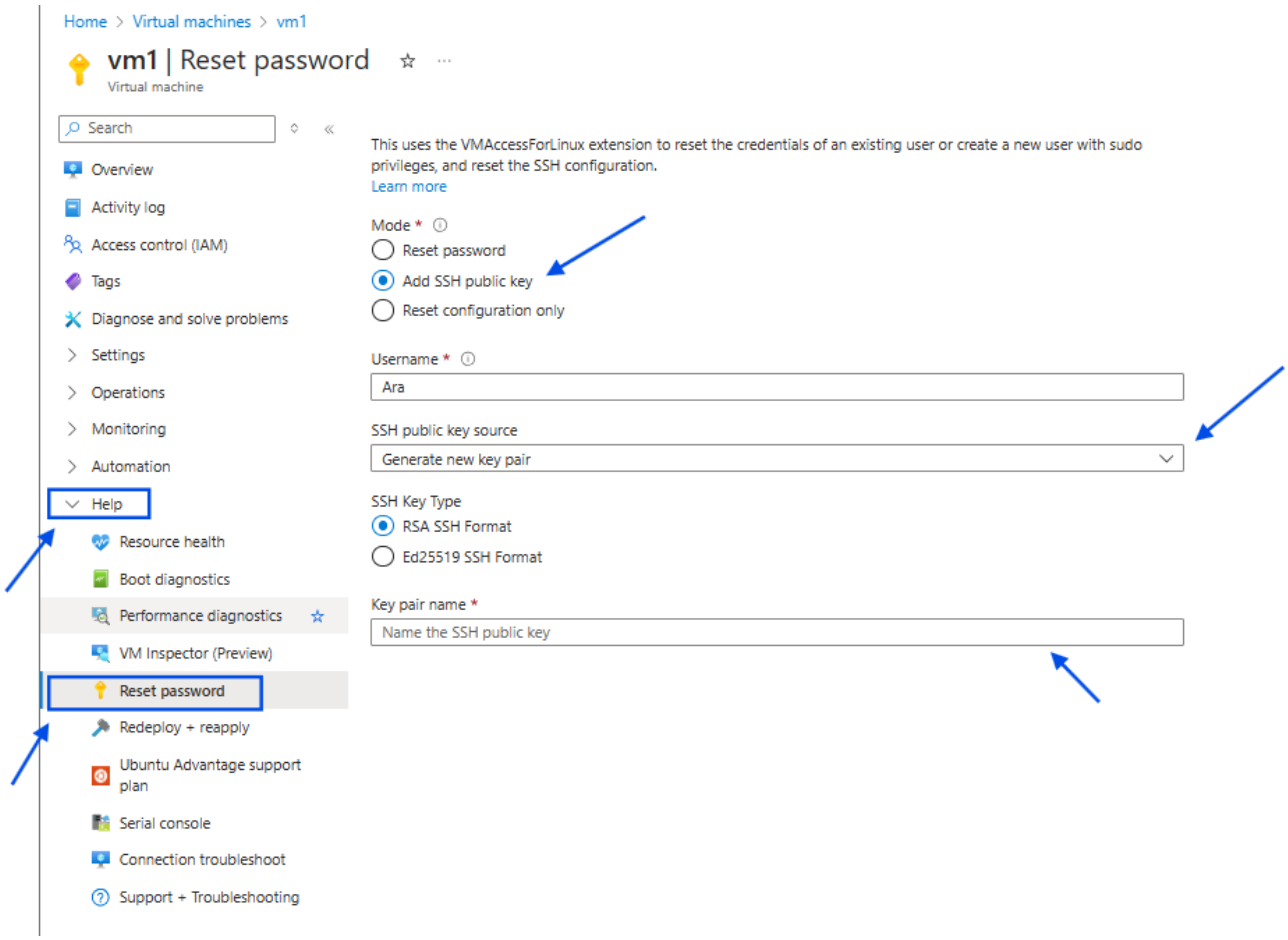


Agents in Azure VM

- Azure VM will have an inbuit agent running inside VMs
  - Linux VM Agents azure official docs
  - Windows VM Agentsazure official docs

Activity : LOST PEM File in Azure

- Open the VM in azure.
- from the left side blade select click on `Help`, from the list select `Reset Password`

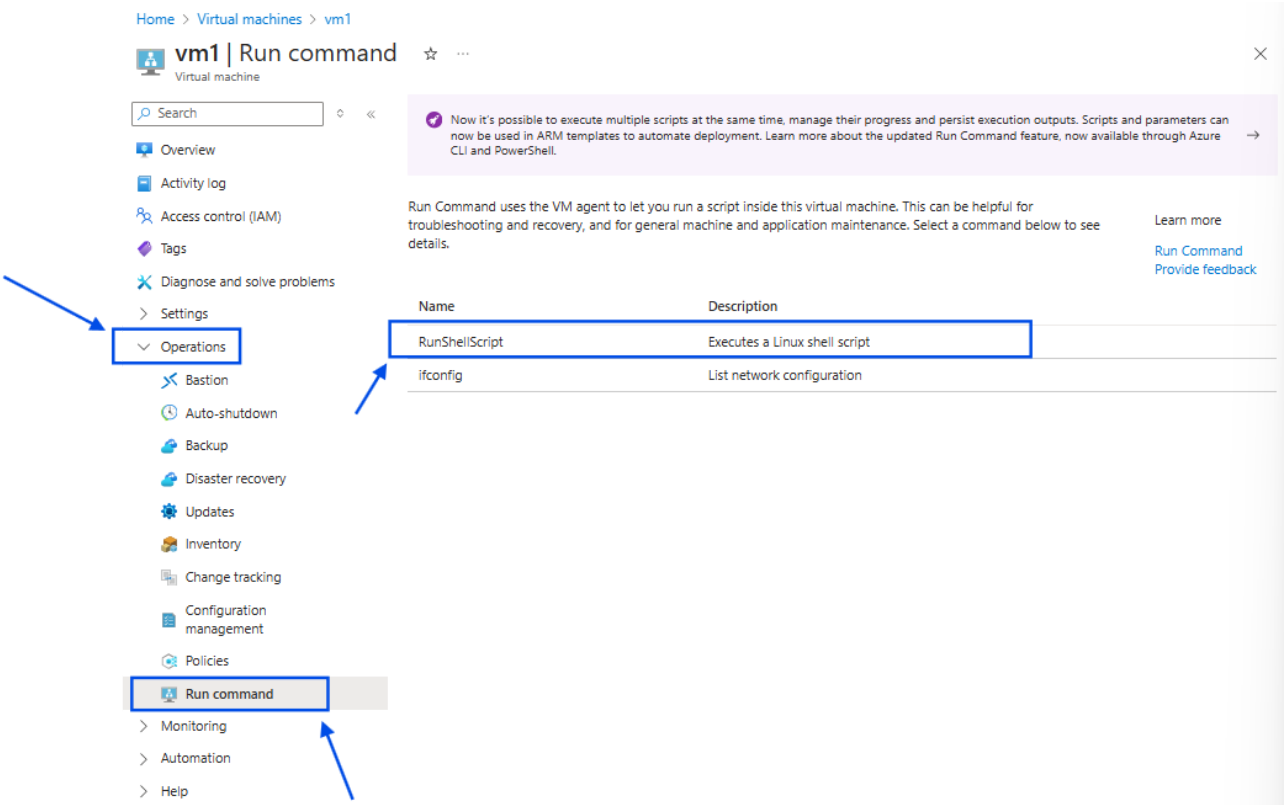


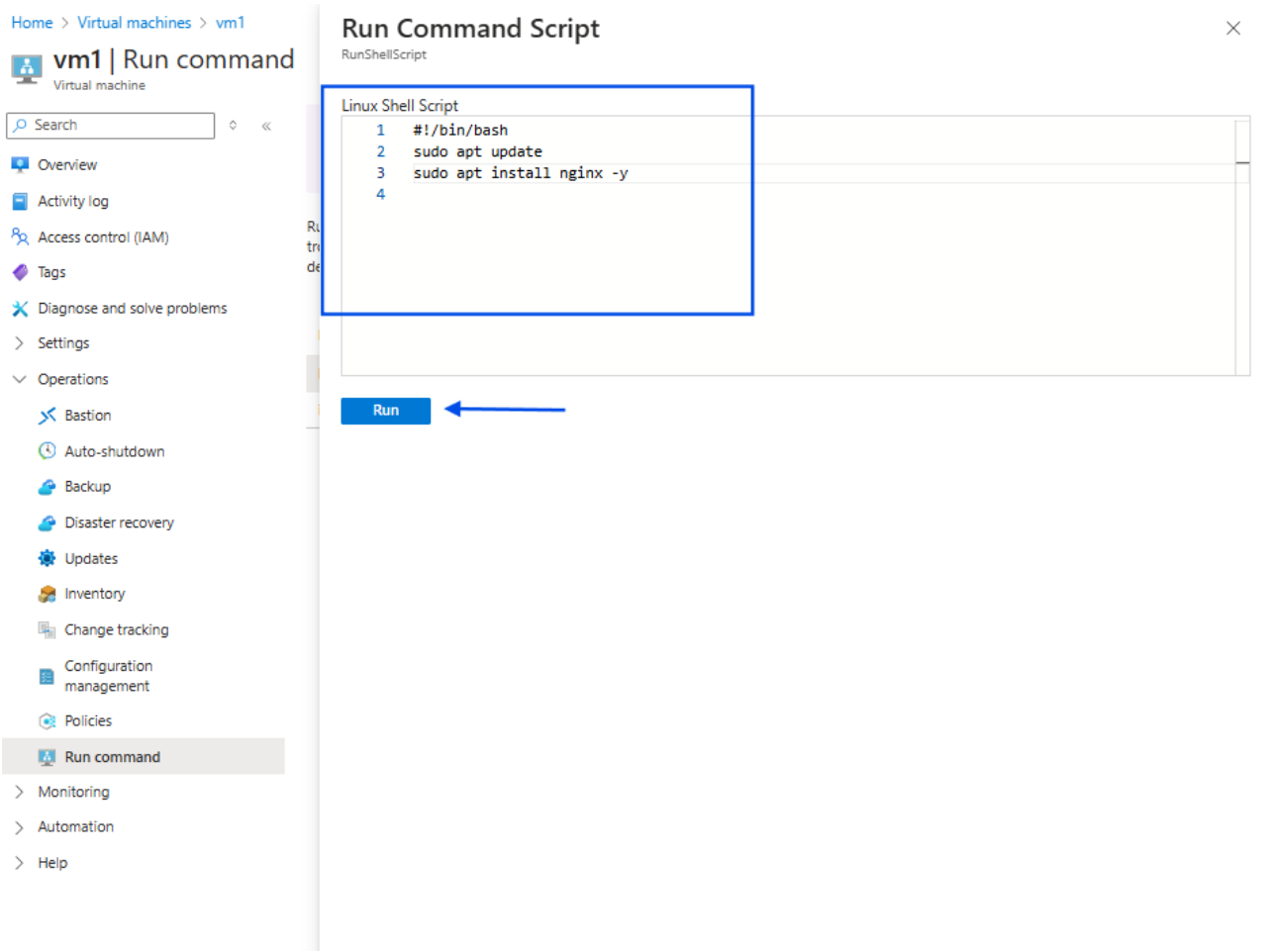
- fill the necessary details
  - create a new SSH key from `SSH key` services
  - select `Add SSH public Key`
  - let username be same
  - select `Use existing key stored in Azure`
  - now select the new key and `Update` the change.

if you want to Run any script without logging into Machine even after lost the pem file

- Open the VM ,find the `Operations` section expand it.
- find `Run Command` option and click on it.

- select `RunShellScript`





- enter above script and run, it will execute the script and shows output below

- to test, take public ip and browse it you should get nginx page where a sign of script executed correctly.