

- That the Nginx web page is accessible via the VM's public IP.
- Destroy the infrastructure when complete.

Practical Task 3: Implement a Scalable Infrastructure with Load Balancer and Auto Scaling

Requirements:

Extend the Terraform configuration to create a **highly available infrastructure** by deploying:

- A **Virtual Network (VNet)** with multiple subnets across **two Azure Availability Zones**.
- An **Azure Load Balancer** with:
 - A **backend pool** of multiple **Virtual Machines (VMs)**.

- A **health probe** for HTTP on port 80.
 - A **load-balancing rule** to distribute traffic across VMs.
- A **Virtual Machine Scale Set (VMSS)** with:
 - At least **two VM instances** that auto-scale based on CPU usage.
 - A startup script to install **Apache** and deploy a sample website.
- A **Storage Account** to store Terraform state remotely.
- Verify that:
 - The **Load Balancer IP** distributes traffic between VM instances.
 - Auto-scaling works when CPU usage spikes.
- Implement **Terraform modules** to modularize networking, compute, and security configurations.
- Destroy the infrastructure when testing is complete.

Practical Task 4: Install and Configure Ansible for Azure

/ — mc [sk@sk-MacBook-Air.local]:/dev — mc • bash

~/Downloads/libsodium-1.0.20 — mc [sk@sk-MacBook-Air.local]:~/Documents/AzureDevOps/06 Azure — -bash +

```
</div>
<div class="validator">
</div>
</body>
</html>
```

```
* Connection #0 to host 172.178.58.2 left intact
* Closing connection 0
sk-MacBook-Air:libsodium-1.0.20 sk$ curl -v http://172.178.58.2/
* Trying 172.178.58.2...
* TCP_NODELAY set
* Connected to 172.178.58.2 (172.178.58.2) port 80 (#0)
> GET / HTTP/1.1
> Host: 172.178.58.2
> User-Agent: curl/7.64.1
> Accept: */*
>
< HTTP/1.1 200 OK
< Date: Fri, 14 Feb 2025 13:44:15 GMT
< Server: Apache/2.4.29 (Ubuntu)
< Last-Modified: Fri, 14 Feb 2025 12:42:23 GMT
< ETag: "f-62e19819678ad"
< Accept-Ranges: bytes
< Content-Length: 15
< Content-Type: text/html
<
Sample Website
* Connection #0 to host 172.178.58.2 left intact
* Closing connection 0
sk-MacBook-Air:libsodium-1.0.20 sk$ █
```

Microsoft Azure

Search resources, services, and docs (G+)

Copilot

StanislavKostenich@dm...
DEFAULT DIRECTORY (DMYTROS...

Home > terraform-rg-dev2025 > my-lb

my-lb | Load balancing rules

☆ ...

Load balancer

Search

×

«

+ Add

↻ Refresh

🗑 Delete

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Settings

Frontend IP configuration

Backend pools

Health probes

Load balancing rules

Inbound NAT rules

Outbound rules

Properties

Locks

Monitoring

Insights

Diagnostic settings

Logs

Alerts

Metrics

Automation

Filter by name...

A load balancer rule is used to define how incoming traffic is distributed to the all the instances within the backend pool. A load-balancing rule maps a given frontend IP configuration and port to multiple backend IP addresses and ports. An example would be a rule created on port 80 to load balance web traffic. [Learn more.](#)

<input type="checkbox"/>	Name ↕	Protocol ↕	Backend pool ↕	Health probe ↕	Health status
<input type="checkbox"/>	http-rule	TCP/80	my-backend-pool	http-probe	View details

Give feedback

https://portal.azure.com/#@dmytroslovinskyygmail.onmicrosoft.com/resource/subscriptions/9a6ae428-d8c3-44fe-bdf2-4e08593901a0/resourceGroups/terraform-rg-dev2025/providers/Microsoft.Network/loadBalancers/my-lb/loa...

Microsoft Azure

Search resources, services, and docs (G+)

Copilot

StanislavKostenich@dm...
DEFAULT DIRECTORY (DMYTROS...

Home > terraform-rg-dev2025 > my-lb

my-lb | Health probes

Load balancer

☆ ...

×

Search

×

«

+ Add

🔄 Refresh

🗨 Give feedback

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Settings

Frontend IP configuration

Backend pools

Health probes

Load balancing rules

Inbound NAT rules

Outbound rules

Properties

Locks

Monitoring

Insights

Diagnostic settings

Logs

Alerts

Metrics

Automation

Type to start filtering ...

Name	Protocol	Port	Path	Used By	
http-probe	Http	80	/	http-rule	🗑

https://portal.azure.com/#@dmytroslovinskyygmail.onmicrosoft.com/resource/subscriptions/9a6ae428-d8c3-44fe-bdf2-4e08593901a0/resourceGroups/terraform-rg-dev2025/providers/Microsoft.Network/loadBalancers/my-lb/pro...

Microsoft Azure

Search resources, services, and docs (G+/)

Copilot

StanislavKostenich@dm...
DEFAULT DIRECTORY (DMYTROS...

Home > terraform-rg-dev2025 > my-lb

my-lb | Backend pools

Load balancer

Search

+ Add

Refresh

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Settings

Frontend IP configuration

Backend pools

Health probes

Load balancing rules

Inbound NAT rules

Outbound rules

Properties

Locks

Monitoring

Insights

Diagnostic settings

Logs

Alerts

Metrics

Automation

The backend pool is a critical component of the load balancer. The backend pool defines the group of resources that will serve traffic for a given load-balancing rule. [Learn more.](#)

Backend pool 'my-backend-pool' was added to Virtual machine scale set 'my-vmss'. Upgrade all the instances of 'my-vmss' for this change to work

Search

Add filter

Backend pool	Resource Name	IP address	Network interface	Availability zone	Rules count	Resource Status	Admin state
my-backend-pool (4)							
my-backend-pool	my-vmss (instance 0)	10.0.1.4	vmss-nic	2	1	Running	None
my-backend-pool	my-vmss (instance 3)	10.0.1.7	vmss-nic	1	1	Stopped (deallocated)	None
my-backend-pool	my-vmss (instance 4)	10.0.1.5	vmss-nic	2	1	Creating (Starting)	None
my-backend-pool	my-vmss (instance 5)	10.0.1.6	vmss-nic	1	1	Running	None

Give feedback

https://portal.azure.com/#@dmytroslotvinskygmail.onmicrosoft.com/resource/subscriptions/9a6ae428-d8c3-44fe-bdf2-4e08593901a0/resourceGroups/terraform-rg-dev2025/providers/Microsoft.Network/loadBalancers/my-lb/bac...

Microsoft Azure

Search resources, services, and docs (G+/)

Copilot

StanislavKostenich@dm...

DEFAULT DIRECTORY (DMYTROS...

Home > terraform-rg-dev2025 >

my-nsg

Network security group

Search

Move

Delete

Refresh

Give feedback

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Settings

Inbound security rules

Outbound security rules

Network interfaces

Subnets

Properties

Locks

Monitoring

Alerts

Diagnostic settings

Logs

NSG flow logs

Automation

CLI / PS

Tasks

Export template

Essentials

Resource group (move) : terraform-rg-dev2025

Location : East US

Subscription (move) : Azure subscription 1

Subscription ID : 9a6ae428-d8c3-44fe-bdf2-4e08593901a0

Tags (edit) : Add tags

Custom security rules : 3 inbound, 0 outbound

Associated with : 2 subnets, 0 network interfaces

JSON View

Filter by name

Port == all

Protocol == all

Source == all

Destination == all

Action == all

Priority	Name	Port	Protocol	Source	Destination	Action
Inbound Security Rules						
1001	AllowSSH	22	Tcp	91.210.250.0/24	Any	Allow
1002	AllowHTTP	80	Tcp	Any	Any	Allow
4096	DenyAllInbound	Any	Any	Any	Any	Deny
65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
65001	AllowAzureLoadBalancer...	Any	Any	AzureLoadBalancer	Any	Allow
65500	DenyAllInBound	Any	Any	Any	Any	Deny
Outbound Security Rules						
65000	AllowVnetOutBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
65001	AllowInternetOutBound	Any	Any	Any	Internet	Allow
65500	DenyAllOutBound	Any	Any	Any	Any	Deny

Home > terraform-rg-dev2025 >

my-vmss

Virtual machine scale set

Search

Overview

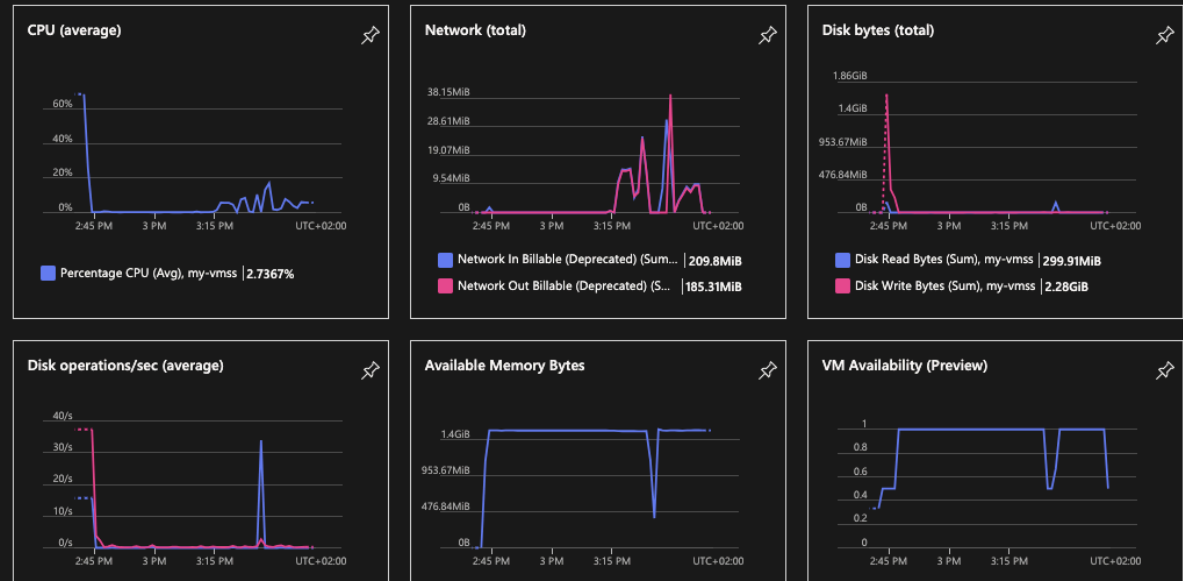
- Activity log
- Access control (IAM)
- Tags
- Diagnose and solve problems
- Instances
- Networking
- Settings
- Availability + scale
 - Scaling
 - Availability
 - Size
- Security
- Operations
- Monitoring
 - Insights
 - Alerts
 - Metrics
 - Logs
 - Connection monitor
 - Workbooks

Move Start Restart Stop Hibernate Reimage Delete Refresh Feedback

Updating →

Properties monitoring Capabilities (0) Recommendations Tutorials

Show data for last: 1 hour 6 hours 12 hours 1 day 7 days 30 days



/ — mc [sk@sks-MacBook-Air.local]:/dev — mc • bash

~/Downloads/libsodium-1.0.20 — mc [sk@sks-MacBook-Air.local]:~/Documents/AzureDevOps/06 Azure — -bash +

```
0.975 [33] |
1.119 [11] |
1.262 [15] |
1.406 [0]  |
1.549 [6]  |
```

Latency distribution:

```
10% in 0.1157 secs
25% in 0.1162 secs
50% in 0.1172 secs
75% in 0.1189 secs
90% in 0.1276 secs
95% in 0.1719 secs
99% in 0.4818 secs
```

Details (average, fastest, slowest):

```
DNS+dialup: 0.0006 secs, 0.1141 secs, 1.5491 secs
DNS-lookup: 0.0000 secs, 0.0000 secs, 0.0000 secs
req write:  0.0000 secs, 0.0000 secs, 0.0073 secs
resp wait:  0.1290 secs, 0.1140 secs, 1.5489 secs
resp read:  0.0002 secs, 0.0000 secs, 0.1291 secs
```

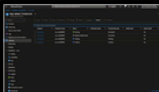
Status code distribution:

```
[200] 29197 responses
```

Error distribution:

```
[803] Get "http://172.178.58.2/": dial tcp 172.178.58.2:80: socket: too many open files
```

sks-MacBook-Air:libsodium-1.0.20 sk\$ █



Microsoft Azure

Search resources, services, and docs (G+/)

Copilot

StanislavKostenich@dm...
DEFAULT DIRECTORY (DMYTROS...

Home > terraform-rg-dev2025 >

my-vmss
Virtual machine scale set

Search

MoveStartRestartStopHibernateReimageDeleteRefreshFeedback

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Instances

Networking

Settings

Availability + scale

Scaling

Availability

Size

Security

Operations

Monitoring

Insights

Alerts

Metrics

Logs

Connection monitor

Workbooks

Updating

Essentials

Resource group (move) : terraform-rg-dev2025

Status : 3 out of 4 succeeded

Location : East US (Zone 2, 1)

Subscription (move) : Azure subscription 1

Subscription ID : 9a6ae428-d8c3-44fe-bdf2-4e08593901a0

Tags (edit) : environment : production

Operating system : Linux

Size : Standard_B1ms (3 instances)

Public IP address : 172.178.51 Standard_B1ms (3 instances)

Public IP address (IPv6) : -

Virtual network/subnet : my-vnet/subnet1

Orchestration mode : Uniform

Time created : 2/14/2025, 12:41 PM UTC

JSON View

PropertiesMonitoringCapabilities (6)RecommendationsTutorials

Virtual machine profile

Operating systemLinux

Capacity reservation group-

HibernationDisabled

Azure Spot

Azure SpotDisabled

Availability + scaling

Availability zone1, 2

Proximity placement group-

Status

Provisioning stateUpdating

Power state1 out of 4 running

Networking

Public IP address172.178.58.2

Public IP address (IPv6)-

Virtual network/subnetmy-vnet/subnet1

Size

SizeStandard_B1ms

Microsoft Azure

Search resources, services, and docs (G+/)

Copilot

StanislavKostenich@dm...
DEFAULT DIRECTORY (DMYTROS...

Home >

terraform-rg-dev2025

Resource group

Search

Overview

Activity log

Access control (IAM)

Tags

Resource visualizer

Events

Settings

Cost Management

Cost analysis

Cost alerts (preview)

Budgets

Advisor recommendations

Monitoring

Insights (preview)

Alerts

Metrics

Diagnostic settings

Logs

Advisor recommendations

Workbooks

Automation

Create

Manage view

Delete resource group

Refresh

Export to CSV

Open query

Assign tags

Move

Delete

Export template

Essentials

Subscription (move) : Azure subscription 1

Subscription ID : 9a6ae428-d8c3-44fe-bdf2-4e08593901a0

Tags (edit) : Add tags

Deployments : 6 Succeeded

Location : East US

Resources

Recommendations (4)

Filter for any field...

Type equals all

Location equals all

Add filter

Showing 1 to 7 of 7 records.

Show hidden types

No grouping

List view

Name	Type	Location	
lb-public-ip	Public IP address	East US	
my-lb	Load balancer	East US	
my-nsg	Network security group	East US	
my-vmss	Virtual machine scale set	East US	
my-vnet	Virtual network	East US	
tfstatestorage12345dev	Storage account	East US	
vm-public-ip	Public IP address	East US	

< Previous

Page 1 of 1

Next >

Give feedback

The screenshot shows the Visual Studio Code interface with a terminal window open. The left sidebar displays the file explorer with a project structure for 'terraform-project'. The main editor area shows the terminal output of a Terraform run, including resource creation logs for virtual networks, subnets, security groups, load balancers, and virtual machine scale sets. The status bar at the bottom indicates the current file is 'main.tf' and the workspace is 'CodeSpaces: reimagined space guide'.

☰

ПРОВОДНИК

▼ AZURE_STANISLAV.KOSTENICH [CODESPACES: REIMAGI...
 > 03 IAM Tasks
 > 04 Compute tasks
 > 05 Azure Storage and Databases Practical tasks
 > 06 Containerization and Orchestration Practical ta...
 > 07 Azure Cli and Azure PowerShell and Azure Auto...
 ▼ 08 Infrastructure as Code (IaC) Monitoring ...
 > 01 Install, Configure, and Manage Terraform Stat...
 ▼ 02 Deploy an Azure Virtual Machine with a ...
 > terraform
 \$ terraform_azure_setup.sh
 ≡ terraform_setup.log
 ▼ 03 Implement a Scalable Infrastructure wit...
 > terraform-project
 > .terraform
 > modules
 ≡ .terraform.lock.hcl
 main.tf
 terraform.tfvars
 variables.tf
 \$ terraform_azure_setup.sh
 ≡ terraform_setup.log
 > СТРУКТУРА
 ▼ ВРЕМЕННАЯ ШКАЛА variables.tf
 ○ Файл сохранен сейчас
 ○ Файл сохранен 1 мин
 ○ Отмена или повтор 8 мин
 ○ Файл сохранен
 ○ Файл сохранен 13 ч

ПРОБЛЕМЫ

ВЫХОДНЫЕ ДАННЫЕ

КОНСОЛЬ ОТЛАДКИ

ТЕРМИНАЛ

ПОРТЫ

AZURE

terraform - terraform-project

```
+ source_address_prefixes = []
+ source_application_security_group_ids = []
+ source_port_range = "*"
+ source_port_ranges = []
# (1 unchanged attribute hidden)
},
+ {
+   access = "Deny"
+   destination_address_prefix = "*"
+   destination_address_prefixes = []
+   destination_application_security_group_ids = []
+   destination_port_range = "*"
+   destination_port_ranges = []
+   direction = "Inbound"
+   name = "DenyAllInbound"
+   priority = 4096
+   protocol = "*"
+   source_address_prefix = "*"
+   source_address_prefixes = []
+   source_application_security_group_ids = []
+   source_port_range = "*"
+   source_port_ranges = []
# (1 unchanged attribute hidden)
}
}
},
}

# module.security.azure_rm_subnet_network_security_group_association.subnet1_nsg_assoc will be created
+ resource "azurerm_subnet_network_security_group_association" "subnet1_nsg_assoc" {
+   id = (known after apply)
+   network_security_group_id = (known after apply)
+   subnet_id = (known after apply)
}

# module.security.azure_rm_subnet_network_security_group_association.subnet2_nsg_assoc will be created
+ resource "azurerm_subnet_network_security_group_association" "subnet2_nsg_assoc" {
+   id = (known after apply)
+   network_security_group_id = (known after apply)
+   subnet_id = (known after apply)
}

Plan: 13 to add, 0 to change, 0 to destroy.

Do you want to perform these actions?
Terraform will perform the actions described above.
Only 'yes' will be accepted to approve.

Enter a value: 
```

Строка 40, столбец 26 Пробелов: 2 UTF-8 LF Terraform Макет: U.S.