

- Destroy the storage account (after confirming the state behavior).

Practical Task 2: Deploy an Azure Virtual Machine with a Custom Network and Security Rules

Requirements:

Extend the Terraform configuration to deploy:

- An **Azure Virtual Network (VNet)** with a **custom subnet**.
- A **Network Security Group (NSG)** with the following rules:
 - Allow **SSH (port 22) inbound** for a specific IP range.
 - Allow **HTTP (port 80) inbound** for all users.
 - Deny all other inbound traffic.
- A **Public IP Address** assigned to the VM.
- An **Azure Virtual Machine (VM)** using an Ubuntu image, attached to the subnet and NSG.
- A **Terraform output variable** to display the public IP of the VM after deployment.
- Use **Provisioners** to run a startup script that installs and starts an Nginx web server on the VM.
- Verify:
 - That SSH access works for the specified IP range.
 - 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:

azure_stanislav.kostenich [Codespaces: reimagined space guide]

PROВOДНИК

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\$ nginx-init.sh

terraform.lock.hcl

main.tf

terraform.tfvars

variables.tf

terraform_azure_setup.sh

terraform_setup.log

▼ СТРУКТУРА

▼ ВРЕМЕННАЯ ШКАЛА

ables.tf .../networking U

variables.tf .../compute U

variables.tf .../terraform U

outputs.tf U

\$ nginx-init.sh U

Code (IaC) Monitoring And Logging > 02 Deploy an Azure Virtual Machine with a Custom Network and Security Rules > terraform > scripts > \$ nginx-init.sh

1 #!/bin/bash

2 sudo apt update -y

3 sudo apt install -y nginx

4 sudo systemctl start nginx

5 sudo systemctl enable nginx

ПРОБЛЕМЫ

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ПОРТЫ

AZURE

КОММЕНТАРИИ

@ukrsite → .../azure_stanislav.kostenich/08 Infrastructure as Code (IaC) Monitoring And Logging/02 Deploy an Azure Virtual Machine with a Custom Network and Security Rules/terraform (main) \$ terraform destroy

bash terraf...

bash

Codespaces: reimagined space guide

main*

0 0 0

0

Строка 5, столбец 28

Пробелов: 4

UTF-8

LF

Shell Script

Макет: U.S.

☰

ПРОВОДНИК

...

terraform U

variables.tf .../networking U

variables.tf .../compute U

variables.tf .../terraform U

outputs.tf U X

🔍

📄

...

▼ AZURE_STANISLAV.KOSTENICH [CODESPACES: REIMAGI...]

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▼ modules ●

▼ compute ●

▼ main.tf U

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> networking ●

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> scripts ●

≡ .terraform.lock.hcl U

▼ main.tf U

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▼ variables.tf U

\$ terraform_azure_setup.sh U

≡ terraform_setup.log U

Monitoring And Logging > 02 Deploy an Azure Virtual Machine with a Custom Network and Security Rules > terraform > modules > compute > outputs.tf

1 output "vm_public_ip" {

2 | value = azurerm_linux_virtual_machine.vm.public_ip_address

3 }

ПРОБЛЕМЫ

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+ v ... ^ x

@ukrsite → .../azure_stanislav.kostenich/08 Infrastructure as Code (IaC) Monitoring And Logging/02 Deploy an Azure

Virtual Machine with a Custom Network and Security Rules/terraform (main) \$ terraform destroy[]

bash terraf...

bash

CodeSpaces: reimagined space guide

main*

0 0 0

0

Строка 3, столбец 2

Пробелов: 2

UTF-8

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Terraform

Макет: U.S.

🔔

Microsoft Azure

Search resources, services, and docs (G+)

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Home > terraform-rg-dev2025 > custom-vm

custom-vm | Network settings

Virtual machine

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Network manager

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Advisor recommendations

Properties

Locks

Availability + scale

Size

This is a new experience. [Please provide feedback](#)

List all my network interfaces for custom-vm. What are the requirements for attaching or detaching a network

Attach network interface Detach network interface View topology Troubleshoot Refr

Network interface / IP configuration
vm-nic (primary) / internal (primary)

Essentials

Network interface : vm-nic

Virtual network / subnet : custom-vnet / custom-subnet

Public IP address : 4.157.243.24

Private IP address : 10.0.1.4

Admin security rules : 0 (Configure)

Rules [Collapse all](#)

Network security group custom-nsg (attached to networkInterface: vm-nic)
Impacts 0 subnets, 1 network interfaces

Search rules

Source == all Destination == all Protocol == all Action

Priority ↑	Name	Port	Protocol
Inbound port rules (5)			
1001	Allow-SSH	22	TCP

Allow-SSH

custom-nsg

Source [ⓘ](#)

IP Addresses

Source IP addresses/CIDR ranges * [ⓘ](#)

91.210.250.0/24

Source port ranges * [ⓘ](#)

*

Destination [ⓘ](#)

Any

Service [ⓘ](#)

SSH

Destination port ranges [ⓘ](#)

22

Protocol

Any

TCP

UDP

ICMPv4

Action

Allow

Deny

Priority * [ⓘ](#)

Save Cancel

[Give feedback](#)

/ — 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

-bash: debug1:: command not found

sk-MacBook-Air:libsodium-1.0.20 sk\$ ssh -v azureuser@4.157.243.24
OpenSSH_8.1p1, LibreSSL 2.7.3

debug1: Reading configuration data /etc/ssh/ssh_config

debug1: /etc/ssh/ssh_config line 47: Applying options for *

debug1: Connecting to 4.157.243.24 [4.157.243.24] port 22.

debug1: Connection established.

debug1: identity file /Users/sk/.ssh/id_rsa type -1

debug1: identity file /Users/sk/.ssh/id_rsa-cert type -1

debug1: identity file /Users/sk/.ssh/id_dsa type -1

debug1: identity file /Users/sk/.ssh/id_dsa-cert type -1

debug1: identity file /Users/sk/.ssh/id_ecdsa type -1

debug1: identity file /Users/sk/.ssh/id_ecdsa-cert type -1

debug1: identity file /Users/sk/.ssh/id_ed25519 type 3

debug1: identity file /Users/sk/.ssh/id_ed25519-cert type -1

debug1: identity file /Users/sk/.ssh/id_xmss type -1

debug1: identity file /Users/sk/.ssh/id_xmss-cert type -1

debug1: Local version string SSH-2.0-OpenSSH_8.1

debug1: Remote protocol version 2.0, remote software version OpenSSH_7.6p1 Ubuntu-4ubuntu0.7

debug1: match: OpenSSH_7.6p1 Ubuntu-4ubuntu0.7 pat OpenSSH_7.0*,OpenSSH_7.1*,OpenSSH_7.2*,OpenSSH_7.3*,OpenSSH_7.4*,OpenSSH_7.5*,OpenSSH_7.6*,OpenSSH_7.7* compat 0x04000002

debug1: Authenticating to 4.157.243.24:22 as 'azureuser'

debug1: SSH2_MSG_KEXINIT sent

debug1: SSH2_MSG_KEXINIT received

debug1: kex: algorithm: curve25519-sha256

debug1: kex: host key algorithm: ecdsa-sha2-nistp256

debug1: kex: server->client cipher: chacha20-poly1305@openssh.com MAC: <implicit> compression: none

debug1: kex: client->server cipher: chacha20-poly1305@openssh.com MAC: <implicit> compression: none

debug1: expecting SSH2_MSG_KEX_ECDH_REPLY

debug1: Server host key: ecdsa-sha2-nistp256 SHA256:Lr473AtMAYmY6061UCwa+H2QpRoq4+/a++X015t1tzw

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

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

```
< Accept-Ranges: bytes
<
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
  body {
    width: 35em;
    margin: 0 auto;
    font-family: Tahoma, Verdana, Arial, sans-serif;
  }
</style>
</head>
<body>
<h1>Welcome to nginx!</h1>
<p>If you see this page, the nginx web server is successfully installed and
working. Further configuration is required.</p>

<p>For online documentation and support please refer to
<a href="http://nginx.org/">nginx.org</a>.<br>
Commercial support is available at
<a href="http://nginx.com/">nginx.com</a>.</p>

<p><em>Thank you for using nginx.</em></p>
</body>
</html>
* Connection #0 to host 4.157.243.24 left intact
* Closing connection 0
sk-MacBook-Air:libsodium-1.0.20 sk$
```


Microsoft Azure

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Virtual machine

Help me copy this VM in any region

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Restart

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Open in mobile

Feedback

CLI / PS

Essentials

Resource group (move) : terraform-rg-dev2025

Status : Running

Location : East US

Subscription (move) : Azure subscription 1

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

Tags (edit) : Add tags

Operating system : Linux (ubuntu 18.04)

Size : Standard B1s (1 vcpu, 1 GiB memory)

Public IP address : 4.157.243.24

Virtual network/subnet : custom-vnet/custom-subnet

DNS name : Not configured

Health state : -

Time created : 2/12/2025, 9:45 PM UTC

JSON View

Properties

Monitoring

Capabilities (7)

Recommendations

Tutorials

Virtual machine

Computer name : custom-vm

Operating system : Linux (ubuntu 18.04)

VM generation : V1

VM architecture : x64

Agent status : Ready

Agent version : 2.12.0.2

Hibernation : Disabled

Host group : -

Host : -

Networking

Public IP address : 4.157.243.24 (Network interface vm-nic)

Public IP address (IPv6) : -

Private IP address : 10.0.1.4

Private IP address (IPv6) : -

Virtual network/subnet : custom-vnet/custom-subnet

DNS name : Configure

Size

Size : Standard B1s

vCPUs : 1

Microsoft Azure

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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 : No deployments

Location : East US

Resources

Recommendations (1)

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
custom-nsg	Network security group	East US
custom-vm	Virtual machine	East US
custom-vm_disk1_92e4ef90a7f341cdafa61d626e2bcf98	Disk	East US
custom-vnet	Virtual network	East US
tfstatestorage12345dev	Storage account	East US
vm-nic	Network Interface	East US
vm-public-ip	Public IP address	East US

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variables.tf U

\$ terraform_azure_setup.sh U

terraform_setup.log U

> СТРУКТУРА

> ВРЕМЕННАЯ ШКАЛА

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КОММЕНТАРИИ

bash terraf...

bash

```
+ network_interface_id = (known after apply)
+ network_security_group_id = "/subscriptions/9a6ae428-d8c3-44fe-bdf2-4e08593901a0/resourceGroups/terraform-rg-dev2025/providers/Microsoft.Network/networkSecurityGroups/custom-nsg"
}

# module.networking.azure_rm_public_ip.public_ip will be created
+ resource "azurerm_public_ip" "public_ip" {
+   allocation_method = "Static"
+   ddos_protection_mode = "VirtualNetworkInherited"
+   fqdn = (known after apply)
+   id = (known after apply)
+   idle_timeout_in_minutes = 4
+   ip_address = (known after apply)
+   ip_version = "IPv4"
+   location = "eastus"
+   name = "vm-public-ip"
+   resource_group_name = "terraform-rg-dev2025"
+   sku = "Standard"
+   sku_tier = "Regional"
}

Plan: 4 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: yes

module.networking.azure_rm_public_ip.public_ip: Creating...
module.networking.azure_rm_public_ip.public_ip: Creation complete after 4s [id=/subscriptions/9a6ae428-d8c3-44fe-bdf2-4e08593901a0/resourceGroups/terraform-rg-dev2025/providers/Microsoft.Network/publicIPAddresses/vm-public-ip]
module.compute.azure_rm_network_interface.nic: Creating...
module.compute.azure_rm_network_interface.nic: Creation complete after 4s [id=/subscriptions/9a6ae428-d8c3-44fe-bdf2-4e08593901a0/resourceGroups/terraform-rg-dev2025/providers/Microsoft.Network/networkInterfaces/vm-nic]
module.compute.azure_rm_network_interface_security_group_association.nsg_association: Creating...
module.compute.azure_rm_linux_virtual_machine.vm: Creating...
module.compute.azure_rm_network_interface_security_group_association.nsg_association: Creation complete after 4s [id=/subscriptions/9a6ae428-d8c3-44fe-bdf2-4e08593901a0/resourceGroups/terraform-rg-dev2025/providers/Microsoft.Network/networkInterfaces/vm-nic]
module.compute.azure_rm_linux_virtual_machine.vm: Still creating... [10s elapsed]
module.compute.azure_rm_linux_virtual_machine.vm: Creation complete after 20s [id=/subscriptions/9a6ae428-d8c3-44fe-bdf2-4e08593901a0/resourceGroups/terraform-rg-dev2025/providers/Microsoft.Compute/virtualMachines/custom-vm]

Apply complete! Resources: 4 added, 0 changed, 0 destroyed.
@ukrsite → .../azure_stanislav.kostenich/08 Infrastructure as Code (IaC) Monitoring And Logging/02 Deploy an Azure Virtual Machine with a Custom Network and Security Rules/terraform (main) $
```

Строка 26, столбец 3 Пробелов: 2 UTF-8 LF Terraform Макет: U.S.

The screenshot shows the Visual Studio Code interface with the Terraform CLI output in the terminal. The left sidebar displays the file explorer with the project structure. The main editor shows the Terraform configuration files. The terminal window at the bottom displays the Terraform plan output, which includes the resource 'azurerm_network_security_group' and the rule 'allow_http'. The plan shows that the resource will be created with specific attributes like location, name, and security rules. The output also indicates that the rule 'allow_http' will be created with access to all destinations on port 80.

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terraform.tfvars

variables.tf

\$ terraform_azure_setup.sh

terraform_setup.log

form U

variables.tf .../compute U

variables.tf .../terraform U

terraform.tfvars U

main.tf .../security U

azure_stanislav.kostenich [Codespaces: reimagined space guide]

1 resource "azurerm_network_security_group" "nsg"

3 location = var.location

4 resource_group_name = var.resource_group_name

5 }

6

7 resource "azurerm_network_security_rule" "allow_ssh" {

8 name = "Allow-SSH"

9 priority = 1001

10 direction = "Inbound"

11 access = "Allow"

12 protocol = "Tcp"

13 source_port_range = "*"

14 destination_port_range = "22"

15 source_address_prefix = var.allowed_ssh_ip

16 destination_address_prefix = "*"

17 resource_group_name = var.resource_group_name

18 network_security_group_name = azurerm_network_security_group.nsg.name

19 }

20

21 resource "azurerm_network_security_rule" "allow_http" {

22 name = "Allow-HTTP"

23 priority = 1002

24 direction = "Inbound"

25 access = "Allow"

26 protocol = "Tcp"

27 source_port_range = "*"

28 destination_port_range = "80"

29 source_address_prefix = "*"

30 destination_address_prefix = "*"

31 resource_group_name = var.resource_group_name

32 network_security_group_name = azurerm_network_security_group.nsg.name

33 }

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@ukrsite → .../azure_stanislav.kostenich/08 Infrastructure as Code (IaC) Monitoring And Logging/02 Deploy an Azure

Virtual Machine with a Custom Network and Security Rules/terraform (main) \$

bash terraform

bash

Codespaces: reimagined space guide

main*

0 0 0

0

Строка 7, столбец 55

Пробелов: 2

UTF-8

LF

Terraform

Макет: U.S.

The image shows a screenshot of the Visual Studio Code editor interface. The main editor window displays a Terraform configuration file named 'variables.tf'. The file contains several variable definitions for an Azure Virtual Machine deployment, including 'subscription_id', 'location', 'resource_group_name', 'admin_username', and 'ssh_public_key'. The left sidebar shows the 'EXPLORER' view with a project structure for 'AZURE_STANISLAV.KOSTENICH [CODESPACES: ...]'. The structure includes folders for '03 IAM Tasks', '04 Compute tasks', '05 Azure Storage and Databases Practical...', '06 Containerization and Orchestration Pra...', '07 Azure Cli and Azure PowerShell and Az...', and '08 Infrastructure as Code (IaC) Mon...'. Under '08 Infrastructure as Code (IaC) Mon...', there are two sub-folders: '01 Install, Configure, and Manage Terrafo...' and '02 Deploy an Azure Virtual Machine...'. The '02 Deploy an Azure Virtual Machine...' folder is expanded, showing files like 'terraform', '.terraform.lock.hcl', 'main.tf', and 'variables.tf'. The 'main.tf' file is currently selected. The top status bar shows the file path 'main.tf .../terraform U' and the workspace name 'Codespaces: reimagined space guide'. The bottom status bar indicates the current line and column: 'Строка 1, столбец 1'.