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*Інформатика і програмування*

Лабораторна робота № 8

Тема: Управління віртуальними машинами

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Група ІПЗ-43

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Івано-Франківськ – 2025

## Лабораторний сценарій

Ваша організація хоче дослідити розгортання та налаштування віртуальних машин Azure. Спочатку ви впроваджуєте віртуальну машину Azure з ручним масштабуванням. Далі ви впроваджуєте набір масштабованих віртуальних машин та досліджуєте автоматичне масштабування. Знову я і знову воно якось важко далось але я всеодно все задеплоїв

Отож, я довго не міг підібрати регіон та розміри SKU щоб воно працювало, та і зараз є кілька нюансів, тому щось робив через azure shell

Також хочу сказати що цього разу я все розкидав по файлах і мав змінну яка відповідає який файл (яке завдання зараз виконується) кидати на деплой

Завдання 1: Розгортання стійких до зон віртуальних машин Azure за допомогою порталу Azure

Не з першого разу запустив тераформ але все ж запустив, тому скріни що воно все відпахало

```
resource "azurerm_windows_virtual_machine" "vm" {
  count           = local.do_vm_pair ? 2 : 0
  name            = "az104-vm${count.index + 1}"
  resource_group_name = azurerm_resource_group.rg.location
  location        = azurerm_resource_group.rg.location
  size            = local.do_vm_resize && count.index == 0 ? "Standard_E2s_v6" : "Standard_E2s_v6"
  admin_username   = var.admin.username
  admin_password   = var.admin.password
  network_interface_ids = [
    azurerm_network_interface.vm_nic[count.index].id
  ]
}
```

PS C:\Users\fedir\Documents\IPZ 43\Cloud technologies\lab8> terraform plan -out=lab8template

random\_string.suffix: Refreshing state... [id=2bd2]

azurerm\_resource\_group.rg: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8]

azurerm\_virtual\_network.vnet: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Network/virtualNetworks/lab8-vnet]

azurerm\_managed\_disk.vm1\_data[0]: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Compute/disks/vm1-disk1]

azurerm\_subnet.subnet: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Network/virtualNetworks/lab8-vnet/subnets/default]

azurerm\_network\_interface.vm\_nic[0]: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Network/networkInterfaces/vm1-nic-zbd]

azurerm\_network\_interface.vm\_nic[1]: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Network/networkInterfaces/vm2-nic-zbd]

azurerm\_windows\_virtual\_machine.vm[0]: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Compute/virtualMachines/az104-vm1]

azurerm\_virtual\_machine\_data\_disk\_attachment.vm1\_attach[0]: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Compute/virtualMachines/az104-vm1/dataDisks/vm1-disk1]

Terraform used the selected providers to generate the following execution plan. Resource actions are indicated with the following symbols:

- + create
- update in-place

Terraform will perform the following actions:

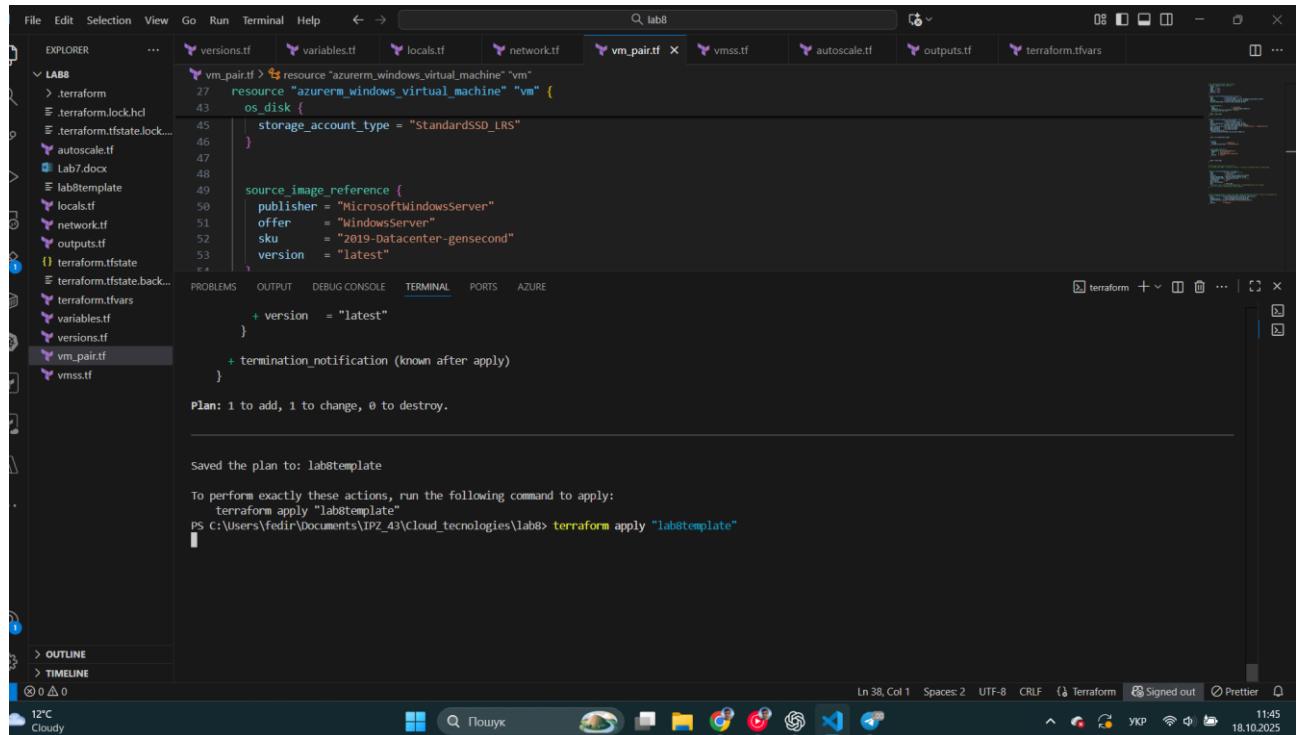
Ln 40, Col 32 (103 selected) Spaces: 2 UTF-8 CRLF Terraform Signed out Prettier

12°C Cloudy

Пошук

11:45 18.10.2025

Не перший раз запускаємо, тому мало ресурсів додається



The screenshot shows the Visual Studio Code interface with the Terraform extension open. The left sidebar shows a file tree with files like .terraform, .tfstate.lock.hcl, autoscale.tf, Lab7.docx, lab8template, locals.tf, network.tf, outputs.tf, terraform.tfstate, terraform.tfstate.backup, terraform.tfvars, variables.tf, versions.tf, vm\_pair.tf, and vmsstf. The main editor pane displays a Terraform configuration for creating a Windows virtual machine:

```
File Edit Selection View Go Run Terminal Help <- > lab8
EXPLORER ... 
LAB8
> .terraform
> .tfstate.lock.hcl
> .tfstate.tfstate.lock...
autoscale.tf
Lab7.docx
lab8template
locals.tf
network.tf
outputs.tf
terraform.tfstate
terraform.tfstate.backup
terraform.tfvars
variables.tf
versions.tf
vm_pair.tf
vmsstf

vm_pair.tf > resource "azurerm_windows_virtual_machine" "vm" {
  count           = local.do_vm_pair ? 2 : 0
  name            = "az104-vm${count.index + 1}"
  resource_group_name = azurerm_resource_group.rg.name
  location        = azurerm_resource_group.rg.location
  size            = local.do_vm_resize && count.index == 0 ? "Standard_E2s_v6" : "Standard_E2s_v6"
  admin_username   = var.admin_username
  admin_password   = var.admin_password
  network_interface_ids = [
```

TERMINAL tab is selected. The terminal output shows the plan:

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS AZURE
+ version = "latest"
+
+ termination_notification (known after apply)
}

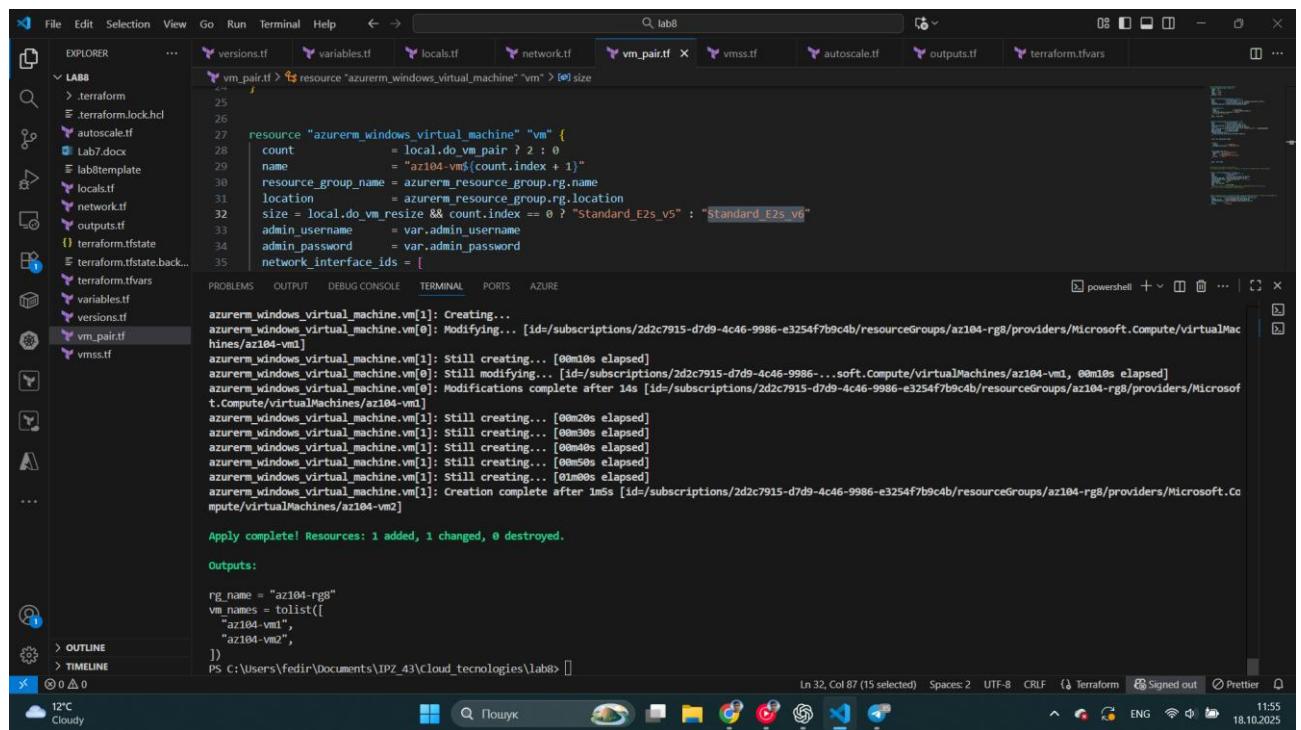
Plan: 1 to add, 1 to change, 0 to destroy.
```

Saved the plan to: lab8template

To perform exactly these actions, run the following command to apply:  
terraform apply "lab8template"  
PS C:\Users\fedor\Documents\IPZ\_43\Cloud\_tecnologies\lab8> terraform apply "lab8template"

Bottom status bar: Ln 38, Col 1 Spaces: 2 UTF-8 CRLF Terraform Signed out Prettier 11:45 18.10.2025

## Успішний деплой



The screenshot shows the Visual Studio Code interface with the Terraform extension open. The left sidebar shows a file tree with files like .terraform, .tfstate.lock.hcl, autoscale.tf, Lab7.docx, lab8template, locals.tf, network.tf, outputs.tf, terraform.tfstate, terraform.tfstate.backup, terraform.tfvars, variables.tf, versions.tf, vm\_pair.tf, and vmsstf. The main editor pane displays the same Terraform configuration as the previous screenshot, but the terminal output shows the deployment process:

```
File Edit Selection View Go Run Terminal Help <- > lab8
EXPLORER ... 
LAB8
> .terraform
> .tfstate.lock.hcl
> .tfstate.tfstate.lock...
autoscale.tf
Lab7.docx
lab8template
locals.tf
network.tf
outputs.tf
terraform.tfstate
terraform.tfstate.backup
terraform.tfvars
variables.tf
versions.tf
vm_pair.tf
vmsstf

vm_pair.tf > resource "azurerm_windows_virtual_machine" "vm" {
  count           = local.do_vm_pair ? 2 : 0
  name            = "az104-vm${count.index + 1}"
  resource_group_name = azurerm_resource_group.rg.name
  location        = azurerm_resource_group.rg.location
  size            = local.do_vm_resize && count.index == 0 ? "Standard_E2s_v6" : "Standard_E2s_v6"
  admin_username   = var.admin_username
  admin_password   = var.admin_password
  network_interface_ids = [
```

TERMINAL tab is selected. The terminal output shows the deployment progress and completion:

```
azurerm_windows_virtual_machine.vm[1]: Creating...
azurerm_windows_virtual_machine.vm[0]: Modifying... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Compute/virtualMachines/az104-vm1]
azurerm_windows_virtual_machine.vm[1]: Still creating... [00m10s elapsed]
azurerm_windows_virtual_machine.vm[0]: Still modifying... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Compute/virtualMachines/az104-vm1]
azurerm_windows_virtual_machine.vm[1]: Modifications complete after 14s [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Compute/virtualMachines/az104-vm1]
azurerm_windows_virtual_machine.vm[1]: Still creating... [00m20s elapsed]
azurerm_windows_virtual_machine.vm[1]: Still creating... [00m30s elapsed]
azurerm_windows_virtual_machine.vm[1]: Still creating... [00m40s elapsed]
azurerm_windows_virtual_machine.vm[1]: Still creating... [00m50s elapsed]
azurerm_windows_virtual_machine.vm[1]: Still creating... [01m00s elapsed]
azurerm_windows_virtual_machine.vm[1]: Creation complete after 1m5s [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Compute/virtualMachines/az104-vm1]

Apply complete! Resources: 1 added, 1 changed, 0 destroyed.

Outputs:
```

Bottom status bar: Ln 32, Col 87 (15 selected) Spaces: 2 UTF-8 CRLF Terraform Signed out Prettier 11:55 18.10.2025

Ну і тут скріни що все спрацювало як треба

## Ресурси в групі ресурсів

The screenshot shows the Microsoft Azure portal interface. The top navigation bar includes links for 'Create', 'Copilot', and 'Search resources, services, and docs (G+)'. The left sidebar has sections for Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Security, Resource visualizer, Events, and Resource groups. Under Resource groups, 'az104-rg8' is selected. The main content area shows the 'az104-rg8' resource group overview with a table of resources:

Name	Type	Location
az104-vm1	Virtual machine	Poland Central
az104-vm1_OsDisk_1_28c47793e41b4b	Disk	Poland Central
az104-vm2	Virtual machine	Poland Central
az104-vm2_OsDisk_1_7fa870d60834451	Disk	Poland Central
lab08-vnet	Virtual network	Poland Central
vm1-disk1	Disk	Poland Central
vm1-nic-zbd	Network Interface	Poland Central
vm2-nic-zbd	Network Interface	Poland Central

## Віртуальна машина 1

The screenshot shows the Microsoft Azure portal interface, specifically the 'az104-vm1' virtual machine details page. The left sidebar shows 'Virtual machine' selected. The main content area displays the VM configuration:

**Essentials**

Resource group (move)	: az104-rg8
Status	: Running
Location	: Poland Central (Zone 1)
Subscription (move)	: Azure subscription 1
Subscription ID	: 2d2c7915-d7d9-4c46-9986-e3254f7b9c4b
Availability zone	: 1

**Properties**

Tags (edit)	: lab : az104-lab08
Operating system	: Windows (Windows Server 2019 Datacenter)
Size	: Standard E2s v6 (2 vcpus, 16 GiB memory)
Primary NIC public IP	: -
Virtual network/subnet	: lab08-vnet/default
DNS name	: -
Health state	: -
Time created	: 10/18/2025, 8:41 AM UTC

## Віртуальна машина 2

Your VM has a default outbound IP, which is insecure and will no longer be assigned by default for new subnets after March 2026. To secure your VM and subnets and ensure future compatibility, follow guidance to add an explicit method of outbound and set your subnets to private.

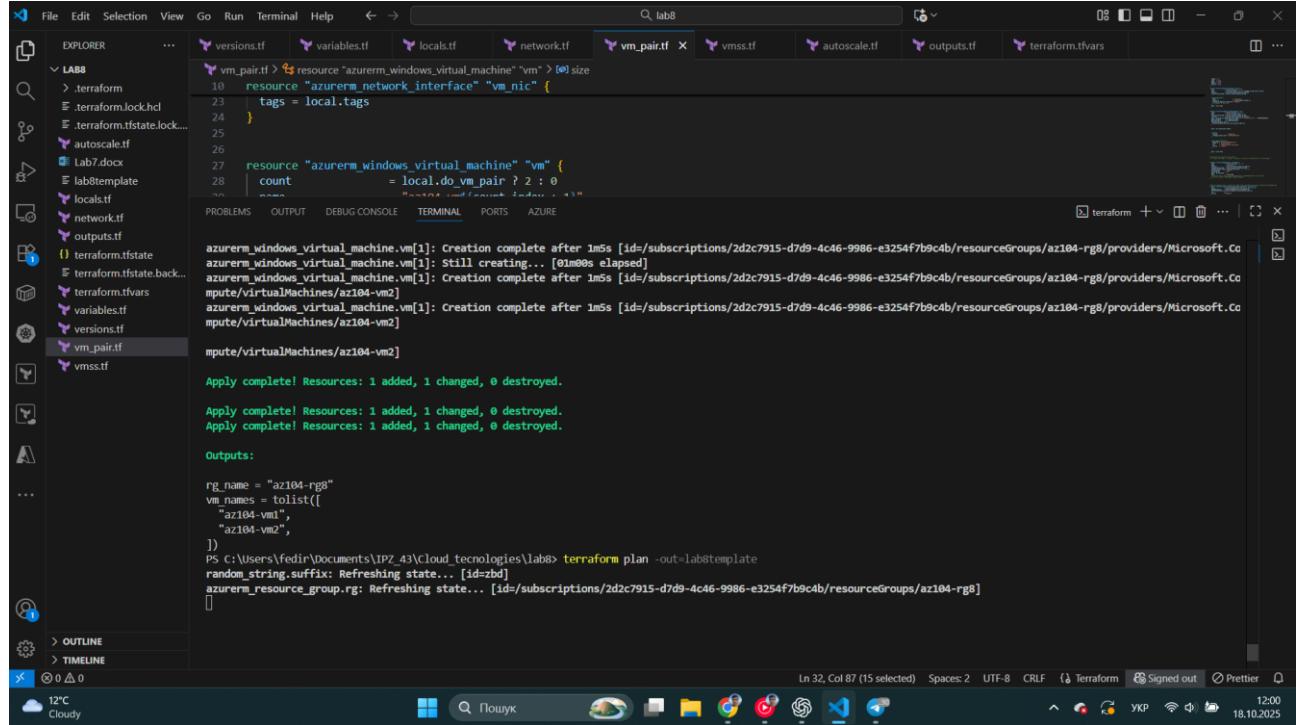
## Накопичував першої віртуальної машини

Your disk has a default outbound IP, which is insecure and will no longer be assigned by default for new subnets after March 2026. To secure your disk and subnets and ensure future compatibility, follow guidance to add an explicit method of outbound and set your subnets to private.

## Завдання 2: Керування масштабуванням обчислень та сховища для віртуальних машин

I так, знову запускаємо тераформ

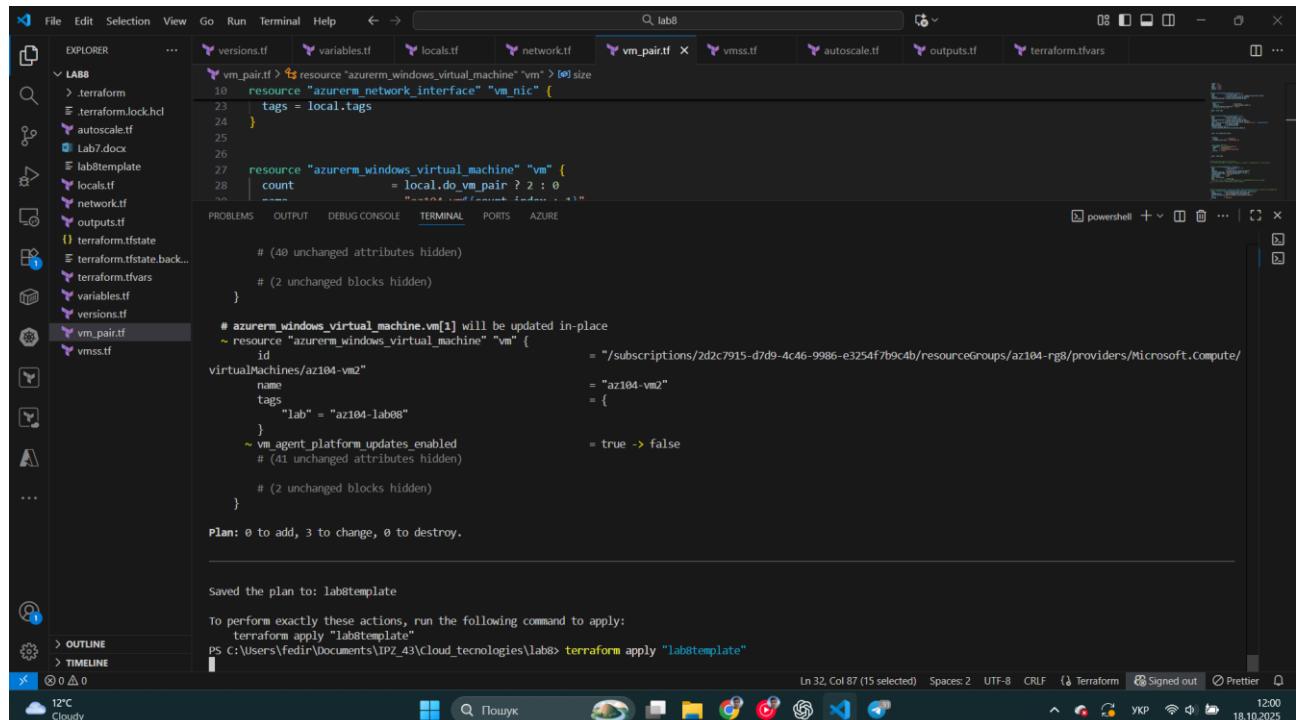
Запускаємо заново terraform plan з новим параметром в змінній lab\_phase



```
File Edit Selection View Go Run Terminal Help ⏎ → 🔍 lab8 🌐 ... EXPLORER ... versions.tf variables.tf locals.tf network.tf vm_pair.tf x vms.tf autoscale.tf outputs.tf terraform.tfstate Lab7.docx lab8template locals.tf network.tf outputs.tf terraform.tfstate lab8template.lock.hcl .terraform.lock.hcl .terraform.state.lock... terraform.tfvars variables.tf versions.tf vm_pair.tf vms.tf PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS AZURE azurerm_windows_virtual_machine.vm[1]: Creation complete after 1m5s [id:/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Compute/virtualMachines/az104-vm2] azurerm_windows_virtual_machine.vm[1]: Still creating... [0m00s elapsed] azurerm_windows_virtual_machine.vm[1]: Creation complete after 1m5s [id:/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Compute/virtualMachines/az104-vm2] azurerm_resource_group.rg: Refreshing state... [id:zbd] azurerm_resource_group.rg: Refreshing state... [id:/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8] Apply complete! Resources: 1 added, 1 changed, 0 destroyed. Apply complete! Resources: 1 added, 1 changed, 0 destroyed. Apply complete! Resources: 1 added, 1 changed, 0 destroyed.
```

Outputs:

```
rg_name = "az104-rg8"
vm_names = tolist([
  "az104-vm1",
  "az104-vm2",
])
PS C:\Users\fedor\Documents\IPZ_43\Cloud_tecnologies\lab8> terraform plan -out=lab8template
random_string.suffix: Refreshing state... [id:zbd]
azurerm_resource_group.rg: Refreshing state... [id:/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8]
```

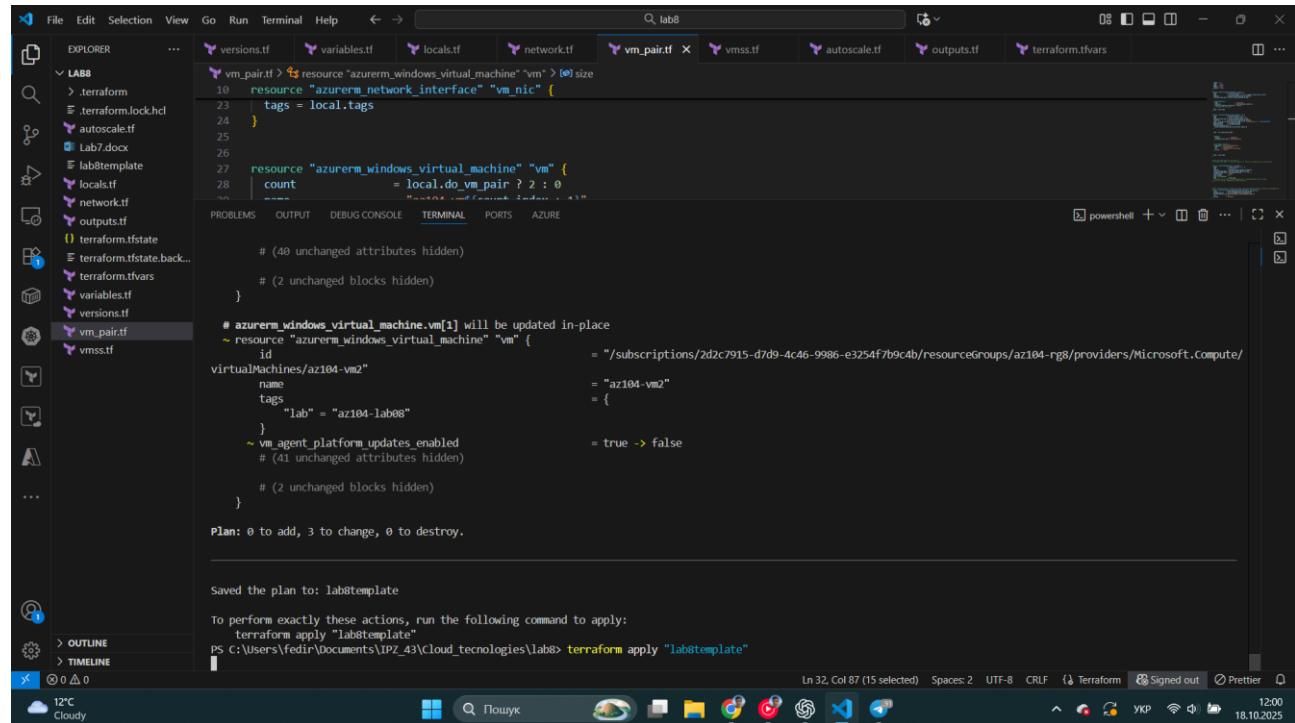


```
File Edit Selection View Go Run Terminal Help ⏎ → 🔍 lab8 🌐 ... EXPLORER ... versions.tf variables.tf locals.tf network.tf vm_pair.tf x vms.tf autoscale.tf outputs.tf terraform.tfvars Lab7.docx lab8template locals.tf network.tf outputs.tf terraform.tfstate lab8template.lock.hcl .terraform.lock.hcl .terraform.state.lock... terraform.tfvars variables.tf versions.tf vm_pair.tf vms.tf PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS AZURE # azurerm_windows_virtual_machine.vm[1] will be updated in-place
~ resource "azurerm_windows_virtual_machine" "vm" {
  id                               = "/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Compute/virtualMachines/az104-vm2"
  name                            = "az104-vm2"
  tags                            = {
    "lab" = "az104-lab08"
  }
  ~ vm_agent_platform_updates_enabled
    # (41 unchanged attributes hidden)
    # (2 unchanged blocks hidden)
}
Plan: 0 to add, 3 to change, 0 to destroy.

Saved the plan to: lab8template

To perform exactly these actions, run the following command to apply:
  terraform apply "lab8template"
PS C:\Users\fedor\Documents\IPZ_43\Cloud_tecnologies\lab8> terraform apply "lab8template"
```

Далі terraform apply в мене провалився тому я через командний рядок змінив розмір SKU



```
resource "azurerm_windows_virtual_machine" "vm" {
    count        = local.do_vm_pair ? 2 : 0
    name         = "az104-lab08"
    tags         = local.tags
    location     = azurerm_resource_group.rg.location
    size         = local.do_vm_resize & count.index == 0 ? "Standard_E2ds_v6" : "Standard_E2s_v6"
    vm_size      = "Standard_E2s_v6"
    network_interface_ids = [network_interface.id]
    ...
}
```

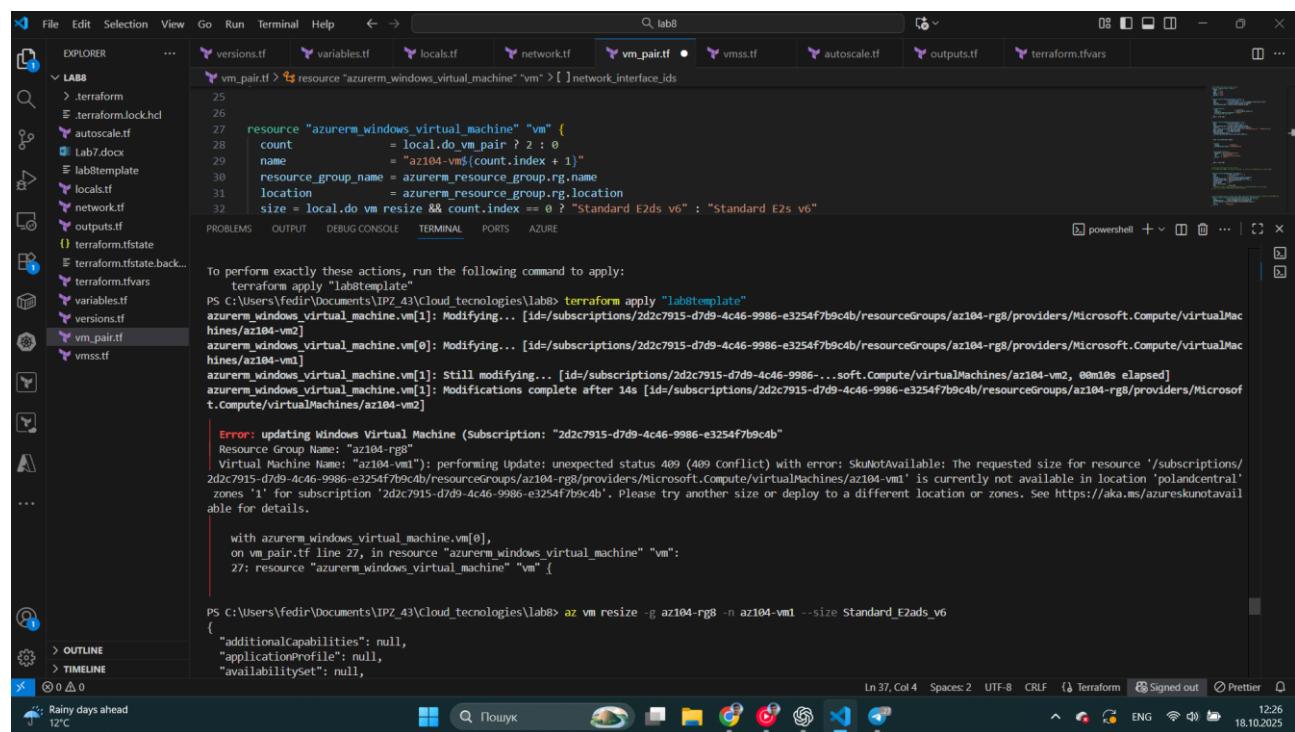
Plan: 0 to add, 3 to change, 0 to destroy.

Saved the plan to: lab8template

To perform exactly these actions, run the following command to apply:

```
terraform apply "lab8template"
```

PS C:\Users\fedor\Documents\IPZ\_43\Cloud\_tecnologies\lab8> terraform apply "lab8template"



```
resource "azurerm_windows_virtual_machine" "vm" {
    count        = local.do_vm_pair ? 2 : 0
    name         = "az104-vm${count.index + 1}"
    resource_group_name = azurerm_resource_group.rg.name
    location     = azurerm_resource_group.rg.location
    size         = local.do_vm_resize & count.index == 0 ? "Standard_E2ds_v6" : "Standard_E2s_v6"
    ...
}
```

To perform exactly these actions, run the following command to apply:

```
terraform apply "lab8template"
```

PS C:\Users\fedor\Documents\IPZ\_43\Cloud\_tecnologies\lab8> terraform apply "lab8template"

azurerm\_windows\_virtual\_machine.vm[1]: Modifying... [id:/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Compute/virtualMachines/az104-vm2]

azurerm\_windows\_virtual\_machine.vm[0]: Modifying... [id:/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Compute/virtualMachines/az104-vm1]

azurerm\_windows\_virtual\_machine.vm[1]: Still modifying... [id:/subscriptions/2d2c7915-d7d9-4c46-9986-...soft.Compute/virtualMachines/az104-vm2, 80m10s elapsed]

azurerm\_windows\_virtual\_machine.vm[1]: Modifications complete after 14s [id:/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Compute/virtualMachines/az104-vm2]

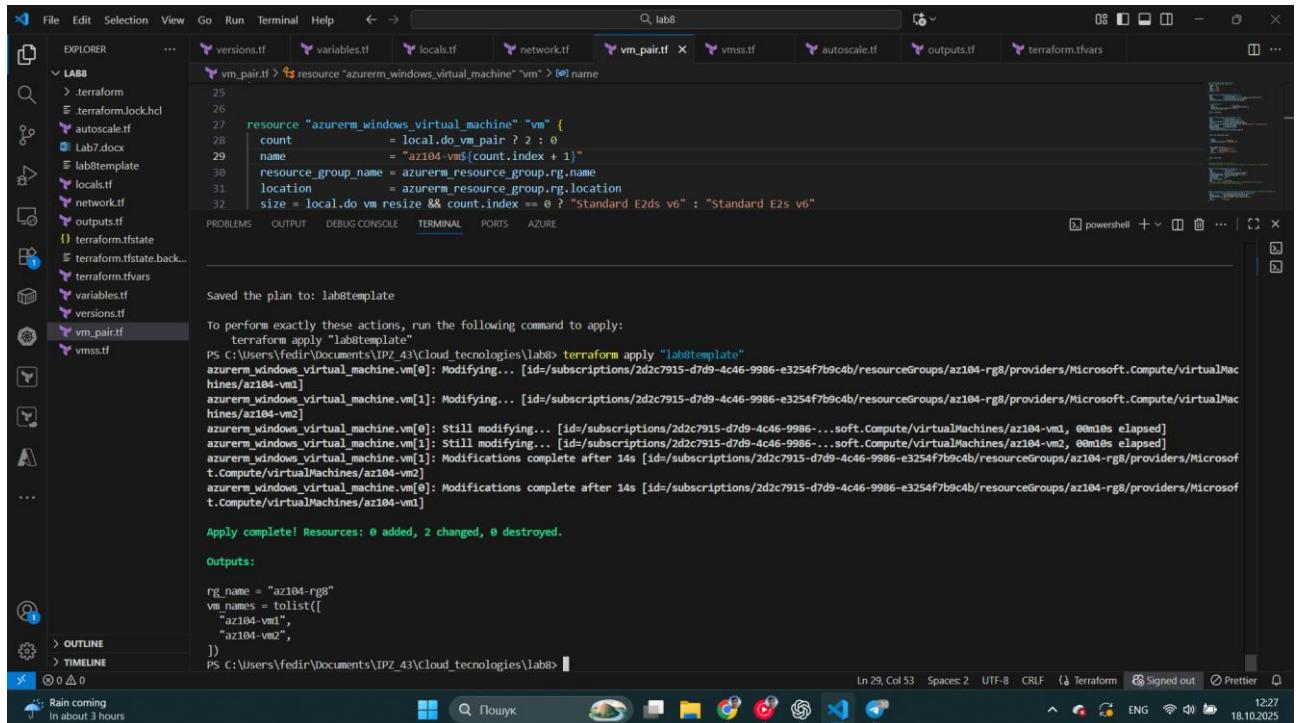
Error: updating Windows Virtual Machine (Subscription: "2d2c7915-d7d9-4c46-9986-e3254f7b9c4b")  
Resource Group Name: "az104-rg8"  
Virtual Machine Name: "az104-vm1": performing Update: unexpected status 409 (409 Conflict) with error: skuNotAvailable: The requested size for resource '/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Compute/virtualMachines/az104-vm1' is currently not available in location 'polandcentral' zones '1' for subscription '2d2c7915-d7d9-4c46-9986-e3254f7b9c4b'. Please try another size or deploy to a different location or zones. See https://aka.ms/azureskuunavailable for details.

```
with azurerm_windows_virtual_machine.vm[0],  
on vm_pair.tf line 27, in resource "azurerm_windows_virtual_machine" "vm":  
27: resource "azurerm_windows_virtual_machine" "vm" {
```

```
PS C:\Users\fedor\Documents\IPZ_43\Cloud_tecnologies\lab8> az vm resize -g az104-rg8 -n az104-vm1 --size Standard_E2ads_v6
```

Rainy days ahead  
12°C

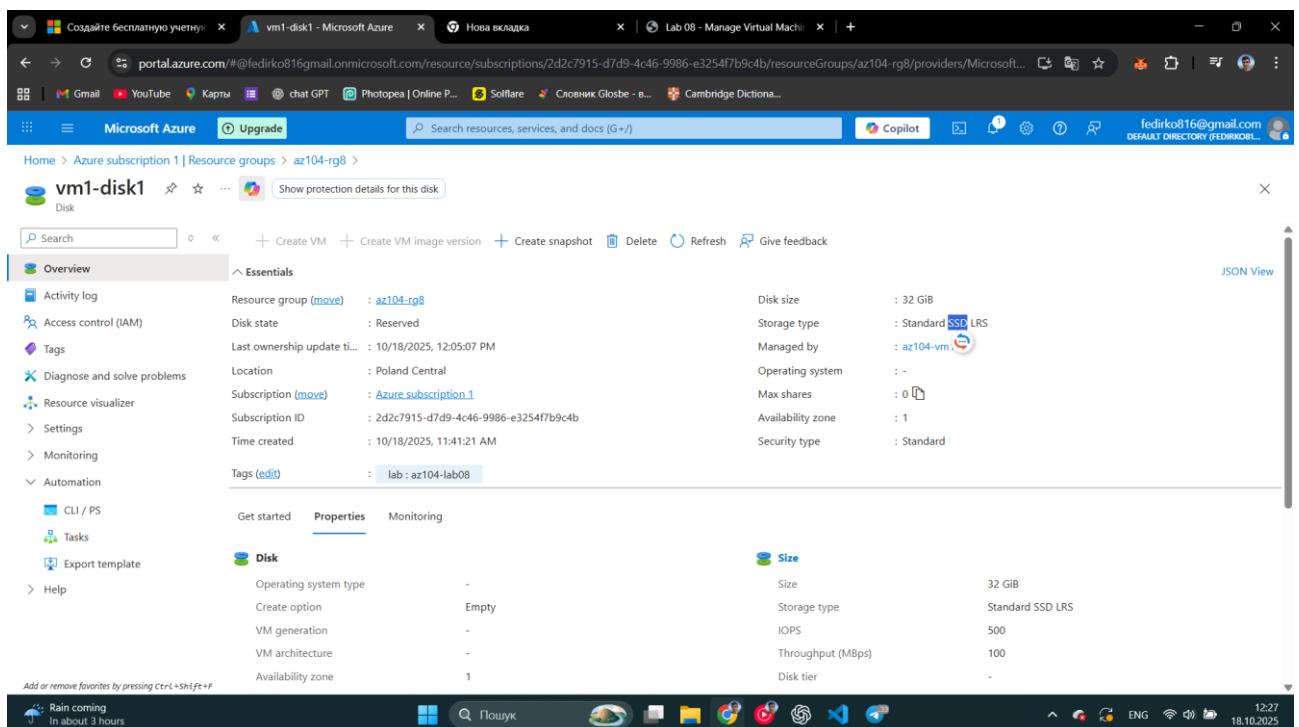
І ще раз запустив terraform щоб він додеплоїв те що треба



```
File Edit Selection View Go Run Terminal Help < - > lab8 PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS AZURE powershell + ... x ...  
EXPLORER ...  
LABB  
> .terraform  
E .terraform.lock.hcl  
autoscale.tf  
Lab7.docx  
E lab8template  
locals.tf  
network.tf  
outputs.tf  
terrafrom.tfstate  
terrafrom.tfstate.backup  
variables.tf  
versions.tf  
vm_pair.tf  
vmss.tf  
  
25  
26  
27 resource "azurerm_windows_virtual_machine" "vm" {  
28   count = local.do_vm_pair ? 2 : 0  
29   name = "az104-vm${count.index + 1}"  
30   resource_group_name = azurerm_resource_group.rg.name  
31   location = azurerm_resource_group.rg.location  
32   size = local.do_vm_resize && count.index == 0 ? "Standard_E2ds_v6" : "Standard_E2s_v6"  
  
Saved the plan to: lab8template  
  
To perform exactly these actions, run the following command to apply:  
  terraform apply "lab8template"  
PS C:\Users\fedor\Documents\IPZ_43\Cloud_tecnologies\lab8> terraform apply "lab8template"  
azurerm_windows_virtual_machine.vm[0]: Modifying... [id:/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Compute/virtualMachines/az104-vm1]  
azurerm_windows_virtual_machine.vm[1]: Modifying... [id:/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Compute/virtualMachines/az104-vm2]  
azurerm_windows_virtual_machine.vm[0]: Still modifying... [id:/subscriptions/2d2c7915-d7d9-4c46-9986...soft.Compute/virtualMachines/az104-vm1, 00m0s elapsed]  
azurerm_windows_virtual_machine.vm[1]: Still modifying... [id:/subscriptions/2d2c7915-d7d9-4c46-9986...soft.Compute/virtualMachines/az104-vm2, 00m0s elapsed]  
azurerm_windows_virtual_machine.vm[1]: Modifications complete after 14s [id:/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Compute/virtualMachines/az104-vm2]  
azurerm_windows_virtual_machine.vm[0]: Modifications complete after 14s [id:/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Compute/virtualMachines/az104-vm1]  
  
Apply complete! Resources: 0 added, 2 changed, 0 destroyed.  
  
Outputs:  
rg_name = "az104-rg8"  
vm_names = tolist([  
  "az104-vm1",  
  "az104-vm2",  
])  
PS C:\Users\fedor\Documents\IPZ_43\Cloud_tecnologies\lab8>  
Ln 29, Col 53 Spaces: 2 UTF-8 CRLF ⚡ Terraform ⚡ Signed out ⚡ Prettier ⚡  
Rain coming In about 3 hours ⚡  
Помаранчевий ⚡  
Глянути ⚡  
Timeline ⚡  
Outline ⚡  
X ⚡  
12:27 18.10.2025
```

Ну і докази ТОГО що все докинулось

Зміни в диску



Создайте бесплатную учетную запись | portal.azure.com | vm1-disk1 - Microsoft Azure | Новая вкладка | Lab-08 - Manage Virtual Machine | +

Home > Azure subscription 1 | Resource groups > az104-rg8 >

vm1-disk1 Disk

Show protection details for this disk

Search Create VM Create VM image version Create snapshot Delete Refresh Give feedback

Overview Essentials

Resource group (move)	: az104-rg8	Disk size	: 32 GiB
Access control (IAM)	Disk state	Storage type	: Standard SSD LRS
Tags	Last ownership update ti...	Managed by	: az104-vm
Diagnose and solve problems	Location	Operating system	: -
Resource visualizer	Subscription (move)	Max shares	: 0
Settings	Subscription ID	Availability zone	: 1
Monitoring	Time created	Security type	: Standard
Automation	Tags (edit)		

Get started Properties Monitoring

Disk Size

Operating system type	-	Size	32 GiB
Create option	Empty	Storage type	Standard SSD LRS
VM generation	-	IOPS	500
VM architecture	-	Throughput (Mbps)	100
Availability zone	1	Disk tier	-

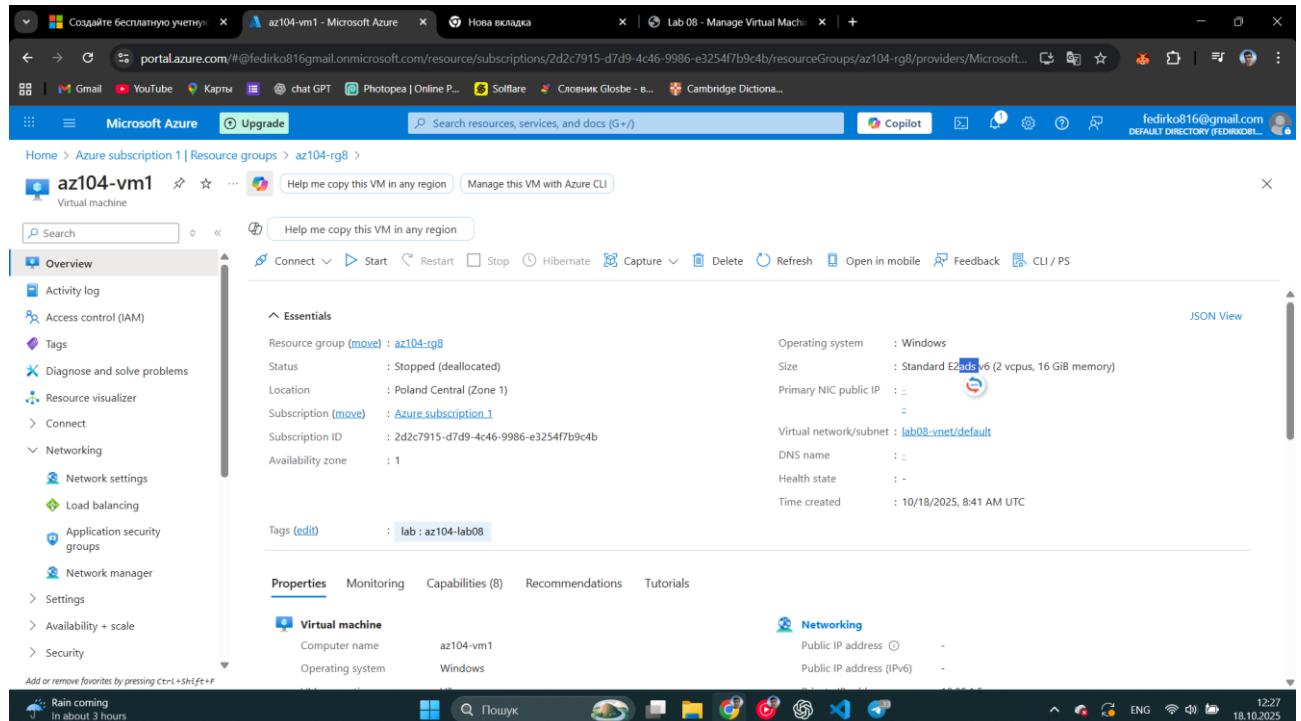
Add or remove favorites by pressing Ctrl+Shift+F + F

Rain coming In about 3 hours ⚡

Пошук ⚡

ENG ⚡ 12:27 18.10.2025

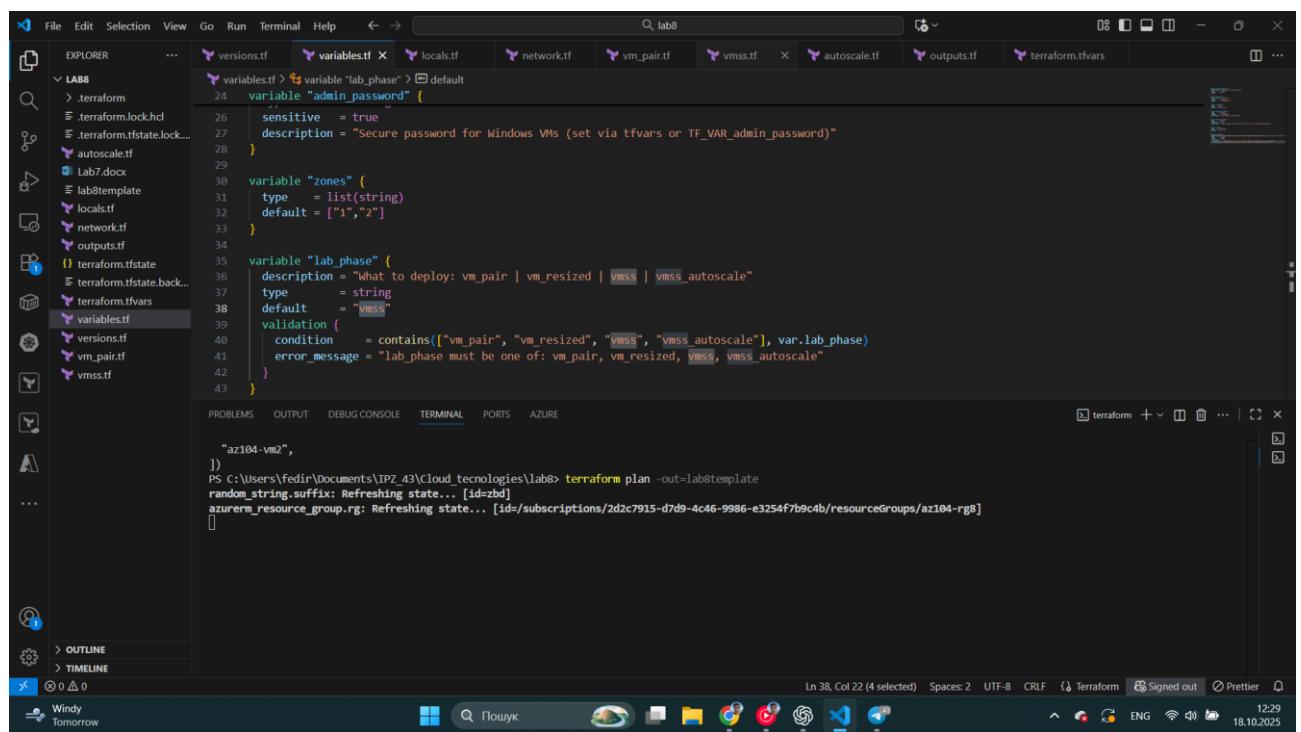
## Зміни в віртуалці



## Завдання 3: Створення та налаштування масштабованих наборів віртуальних машин Azure

Знову міняємо параметр в змінній `lap_phase` і знову деплоїмо (без нюансів не обійшлося)

Запускаю команди `terraform plan` та `terraform apply`



```

variable "admin_password" {
  sensitive = true
  description = "Secure password for Windows VMs (set via tfvars or TF_VAR_admin_password)"
}

variable "zones" {
  type    = list(string)
  default = ["1","2"]
}

variable "lab_phase" {
  description = "What to deploy: vm_pair | vm_resized | vmss | vmss_autoscale"
  type        = string
  default     = "vmss"
  validation {
    condition = contains(["vm pair", "vm resized", "vmss", "vmss autoscale"], var.lab_phase)
  }
}

Plan: 8 to add, 0 to change, 6 to destroy.

Changes to Outputs:
~ vm names = [
  - "az104-vm1",
  - "az104-vm2",
]
+ vmss_public_ip = (known after apply)

Saved the plan to: lab8template

To perform exactly these actions, run the following command to apply:
  terraform apply "lab8template"
PS C:\Users\fedor\Documents\IPZ_43\Cloud_tecnologies\lab8> terraform apply "lab8template"

```

Тут в мене ні з першого, ні з друго разу не вийшло (причиною була квота на кількість ядер)

Друга спроба (бачимо що деякі ресурси додались а деякі видалились)

```

resource "azurerm_windows_virtual_machine_scale_set" "vmss" {
  sku                = "Manual"
  upgrade_mode       = "Manual"
  admin_username     = var.admin_username
  admin_password     = var.admin_password

  source_image_reference {
    publisher = "MicrosoftWindowsServer"
    offer     = "WindowsServer"
    sku       = "2019-Datacenter-gensecond"
    version   = "latest"
  }

  + offer          = "WindowsServer"
  + publisher      = "MicrosoftWindowsServer"
  + sku            = "2019-Datacenter-gensecond"
  + version         = "latest"
}

+ spot_restore (known after apply)
+ terminate_notification (known after apply)
+ termination_notification (known after apply)

Plan: 1 to add, 0 to change, 3 to destroy.

Saved the plan to: lab8template

To perform exactly these actions, run the following command to apply:
  terraform apply "lab8template"
PS C:\Users\fedor\Documents\IPZ_43\Cloud_tecnologies\lab8> terraform apply "lab8template"

```

Це третя спроба і я знову через azure shell видалив віртуальну машину, бо тепер вона заважала всьому працювати добре

```
To perform exactly these actions, run the following command to apply:  
  terraform apply "lab8template"  
PS C:\Users\fedor\Documents\IPZ_43\Cloud_tecnologies\lab8> terraform apply "lab8template"  
azurerm_windows_virtual_machine.vm[0]: Destroying... [id=/subscriptions/2dc7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Compute/virtualMachines/az104-vm1]  
  
Error: powering off Windows Virtual Machine (Subscription: "2dc7915-d7d9-4c46-9986-e3254f7b9c4b")  
Resource Group Name: "az104-rg8"  
Virtual Machine Name: "az104-vm1": performing PowerOff: unexpected status 409 (409 Conflict) with error: OperationNotAllowed: Operation 'powerOff' is not allowed on VM 'az104-vm1' since the VM is either deallocated or marked to be deallocated. Please refer to https://aka.ms/vmpowersstates to learn about different VM power states.  
  
PS C:\Users\fedor\Documents\IPZ_43\Cloud_tecnologies\lab8> az vm delete -g az104-rg8 -n az104-vm1 --yes  
PS C:\Users\fedor\Documents\IPZ_43\Cloud_tecnologies\lab8> terraform plan -out=lab8template  
random_string.suffix: Refreshing state... [id=zbd]  
|  
Ln 62, Col 38 Spaces:2 UTF-8 CRLF Terraform Signed out Prettier 12:37 18.10.2025
```

Ще раз зробив terraform plan

```
terraform tfvars  
variables.tf  
versions.tf  
vm_pair.tf  
vmsst.tf  
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS AZURE  
- primary  
- private_ip_address  
- private_ip_address_allocation  
- private_ip_address_version  
- subnet_id  
virtualNetworks/lab8-vnet/subnets/default" -> null  
    # (2 unchanged attributes hidden)  
}  
}  
Plan: 0 to add, 0 to change, 2 to destroy.  
  
Saved the plan to: lab8template  
To perform exactly these actions, run the following command to apply:  
  terraform apply "lab8template"  
PS C:\Users\fedor\Documents\IPZ_43\Cloud_tecnologies\lab8> terraform apply "lab8template"  
|  
Ln 62, Col 38 Spaces:2 UTF-8 CRLF Terraform Signed out Prettier 12:37 18.10.2025
```

І нарешті успішний результат

```
File Edit Selection View Go Run Terminal Help ← → 🔍 lab8  
EXPLORER ...  
LABB .terraform .terraform.lock.hcl autoscale.tf Lab7.docx labTemplate locals.tf network.tf outputs.tf terraform.state terraform.state.back.. terraform.tfvars variables.tf versions.tf vm_pair.tf vmsst.tf  
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS AZURE  
resource "azurerm_windows_virtual_machine_scale_set" "vms" {  
  sku  
  upgrade_mode = "Manual"  
  admin_username = var.admin.username  
  admin_password = var.admin.password  
  
  source_image_reference {  
    publisher = "MicrosoftWindowsServer"  
    offer = "WindowsServer"  
    sku = "2019-Datacenter-gensecond"  
    version = "latest"  
  }  
}  
  
terrafom apply "lab8template"  
PS C:\Users\fedor\Documents\IPZ_43\Cloud_tecnologies\lab8> terraform apply "lab8template"  
azurerm_network_interface.vm_nic[0]: Destroying... [id=/subscriptions/2dc7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Network/networkInterfaces/vml-nic-zbd]  
azurerm_network_interface.vm_nic[1]: Destroying... [id=/subscriptions/2dc7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Network/networkInterfaces/vm2-nic-zbd]  
azurerm_network_interface.vm_nic[1]: Still destroying... [id=/subscriptions/2dc7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Network/networkInterfaces/vm2-nic-zbd, 00m10s elapsed]  
azurerm_network_interface.vm_nic[0]: Still destroying... [id=/subscriptions/2dc7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Network/networkInterfaces/vml-nic-zbd, 00m10s elapsed]  
azurerm_network_interface.vm_nic[1]: Destruction complete after 1s  
azurerm_network_interface.vm_nic[0]: Still destroying... [id=/subscriptions/2dc7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Network/networkInterfaces/vml-nic-zbd, 00m20s elapsed]  
azurerm_network_interface.vm_nic[0]: Destruction complete after 22s  
  
Apply complete! Resources: 0 added, 0 changed, 2 destroyed.  
  
Outputs:  
rg_name = "az104-rg8"  
vm_names = []  
vmsst_public_ip = "20.215.255.224"  
PS C:\Users\fedor\Documents\IPZ_43\Cloud_tecnologies\lab8>  
Ln 62, Col 38 Spaces:2 UTF-8 CRLF Terraform Signed out Prettier 12:38 18.10.2025
```

# Ну і скріни на платформі

## Vmss

vmss1

Virtual machine scale set

Overview

Resource group (move) : az104-rg8

Status : 2 out of 2 succeeded

Subscription : Azure subscription 1

Location (move) : Poland Central

Subscription ID : 2d2c7915-d7d9-4c46-9986-e3254f7b9c4b

Operating system : Windows

Size : Standard\_B1s (2 instances)

Public IP address : 20.215.255.224

Public IP address (IPv6) : -

Virtual network/subnet : lab08-vnet/default

Orchestration mode : Uniform

Time created : 18.10.2025, 9:32:05 UTC

Tags (edit) : lab : az104-lab08

Properties

Virtual machine profile

Operating system : Windows

Capacity reservation group : -

Hibernation : Disabled

Status

Provisioning state : Succeeded

Power state : 2 out of 2 instances running

Networking

Public IP address : 20.215.255.224

Azure Spot

Rainy days ahead 12°C

Search

Search resources, services, and docs (G+)

Copilot

Feedback

Refresh Start Stop Delete Reimage Move Open in mobile Feedback

JSON View

12:38 18.10.2025

## Netwok security group

vmss1-nsg

Network security group

Overview

Resource group (move) : az104-rg8

Location : Poland Central

Subscription (move) : Azure subscription 1

Subscription ID : 2d2c7915-d7d9-4c46-9986-e3254f7b9c4b

Tags (edit) : lab : az104-lab08

Custom security rules : 1 inbound, 0 outbound

Associated with : 1 subnets, 0 network interfaces

Inbound Security Rules

Priority ↑	Name ↑	Port ↑	Protocol ↑	Source ↑	Destination ↑	Action ↑
1010	allow- <u>http</u>	80	Tcp	Any	Any	Allow
65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
65001	AllowAzureLoadBalancerIn	Any	Any	AzureLoadBalancer	Any	Allow
65500	DenyAllInBound	Any	Any	Any	Any	Deny

Outbound Security Rules

Priority ↑	Name ↑	Port ↑	Protocol ↑	Source ↑	Destination ↑	Action ↑
65000	AllowVnetOutBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
65001	AllowInternetOutBound	Any	Any	Any	Internet	Allow
65500	DenyAllOutBound	Any	Any	Any	Any	Deny

Filter by name

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

Rainy days ahead 12°C

Search

Search resources, services, and docs (G+)

Copilot

Feedback

Move Delete Refresh Give feedback

12:39 18.10.2025

## Hy i load balancer

vmss-lb - Microsoft Azure

Home > az104-rg8 >

vmss-lb Load balancer

Search

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Resource visualizer

> Settings

> Monitoring

> Automation

> Help

Resource group (move) : az104-rg8

Location (move) : Poland Central

Subscription (move) : Azure subscription 1

Subscription ID : 2d2c7915-d7d9-4c46-9986-e3254f7b9c4b

SKU : Standard

Tier : Regional

Backend pool : bepool (2 virtual machines)

Load balancing rule : http-80 (Tcp/80)

Health probe : http-80 (Tcp/80)

Inbound NAT rules : -

Outbound rules : -

Frontend IP address : 20.215.255.224 (vmss-lb-pip)

Tags (edit) : lab : az104-lab08

Configure high availability and scalability for your applications

Create highly-available and scalable applications in minutes by using built-in load balancing for cloud services and virtual machines. Azure Load Balancer supports TCP/UDP-based protocols and protocols used for real-time voice and video messaging applications. [Learn more](#)

Balance IPv4 and IPv6 addresses

Native dual-stack endpoints help meet regulatory requirements and address the fast-growing number of devices in mobile and IoT. [Learn more](#)

Build highly reliable applications

Load Balancer improves application uptime by routing traffic to healthy nodes. [Learn more](#)

Secure your networks

Control network traffic and protect private networks using built-in network address translation (NAT). [Learn more](#)

Add or remove favorites by pressing Ctrl+Shift+F

Rainy days ahead 12°C

View frontend IP configuration

Пошук

12:39 18.10.2025

## Завдання 4: Масштабування наборів масштабування віртуальних машин Azure

Знову міняємо параметр в `lab_phase` і знову деплоїмо

File Edit Selection View Go Run Terminal Help

EXPLORER LABS .terraform.lock.hcl .terraform.state.lock... .tfstate .tfstate.state .tfstate.state.back... .tfvars .tfvars

variables.tf

```
variable "zones" {
  type    = list(string)
  default = ["1", "2"]
}

variable "lab_phase" {
  description = "What to deploy: vm_pair | vm_resized | vmss | vmss_autoscale"
  type        = string
  default     = "vmss_autoscale"
  validation {
    condition = contains(["vm_pair", "vm_resized", "vmss", "vmss_autoscale"], var.lab_phase)
    error_message = "lab_phase must be one of: vm_pair, vm_resized, vmss, vmss_autoscale"
  }
}
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS AZURE

```
azurerm_network_interface.vm_nic[0]: Destroying... [id:/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Network/networkInterfaces/vm1-nic-zbd]
azurerm_network_interface.vm_nic[1]: Destroying... [id:/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft.Network/networkInterfaces/vm2-nic-zbd]
azurerm_network_interface.vm_nic[0]: Still destroying... [id:/subscriptions/2d2c7915-d7d9-4c46-9986-...Network/networkInterfaces/vm1-nic-zbd, 00m10s elapsed]
azurerm_network_interface.vm_nic[0]: Still destroying... [id:/subscriptions/2d2c7915-d7d9-4c46-9986-...Network/networkInterfaces/vm1-nic-zbd, 00m10s elapsed]
azurerm_network_interface.vm_nic[1]: Destruction complete after 1s
azurerm_network_interface.vm_nic[0]: Still destroying... [id:/subscriptions/2d2c7915-d7d9-4c46-9986-...Network/networkInterfaces/vm1-nic-zbd, 00m20s elapsed]
azurerm_network_interface.vm_nic[0]: Destruction complete after 2s
```

Apply completed Resources: 0 added, 0 changed, 2 destroyed.

Outputs:

```
rg_name = "az104-rg8"
vm_names = []
vmss_public_ip = "20.215.255.224"
PS C:\Users\fedor\Documents\IPZ_43\Cloud_technologies\lab8> terraform plan -out=lab8template
random_string.suffix: Refreshing state... [id=zbd]
```

12:39 18.10.2025

```

variable "zones" {
  type    = list(string)
  default = ["1", "2"]
}

variable "lab_phase" {
  description = "What to deploy: vm_pair | vm_resized | vmss | vmss_autoscale"
  type        = string
  default     = "vmss_autoscale"
  validation {
    condition = contains(["vm_pair", "vm_resized", "vmss", "vmss_autoscale"], var.lab_phase)
    error_message = "lab_phase must be one of: vm_pair, vm_resized, vmss, vmss_autoscale"
  }
}

scale_action {
  cooldown = "PT5M"
  direction = "Decrease"
  type      = "PercentChangeCount"
  value     = 50
}
}
}

```

**Plan:** 1 to add, 0 to change, 0 to destroy.

Saved the plan to: lab8template

To perform exactly these actions, run the following command to apply:

```
terraform apply "lab8template"
```

PS C:\Users\fedir\Documents\IPZ\_43\Cloud\_tecnologies\lab8> terraform apply "lab8template"

Лн 38, Кол 32 Спейс: 2 UTF-8 CRLF (terraform) Signed out Prettier 12:42 18.10.2025

Ну і надіво з першого разу вийшло

```

variable "zones" {
  type    = list(string)
  default = ["1", "2"]
}

variable "lab_phase" {
  description = "What to deploy: vm_pair | vm_resized | vmss | vmss_autoscale"
  type        = string
  default     = "vmss_autoscale"
  validation {
    condition = contains(["vm_pair", "vm_resized", "vmss", "vmss_autoscale"], var.lab_phase)
    error_message = "lab_phase must be one of: vm_pair, vm_resized, vmss, vmss_autoscale"
  }
}

scale_action {
  cooldown = "PT5M"
  direction = "Decrease"
  type      = "PercentChangeCount"
  value     = 50
}
}
}

```

Saved the plan to: lab8template

To perform exactly these actions, run the following command to apply:

```
terraform apply "lab8template"
```

PS C:\Users\fedir\Documents\IPZ\_43\Cloud\_tecnologies\lab8> terraform apply "lab8template"

azurerm\_monitor\_autoscale\_setting.vmss\_auto[0]: Creating...  
azurerm\_monitor\_autoscale\_setting.vmss\_auto[0]: Creation complete after 5s [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg/providers/Microsoft.Insights/autoscaleSettings/vmss1-autoscale]

Apply complete! Resources: 1 added, 0 changed, 0 destroyed.

Outputs:

```

rg_name = "az104-rg8"
vm_names = []
vmss_public_ip = "20.215.255.224"

```

PS C:\Users\fedir\Documents\IPZ\_43\Cloud\_tecnologies\lab8>

Лн 38, Кол 32 Спейс: 2 UTF-8 CRLF (powershell) Signed out Prettier 12:42 18.10.2025

Ну і показ що autoscale є

Создайте бесплатную учетную... portal.azure.com/#@fedoriko816@gmail.onmicrosoft.com/resource/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg8/providers/Microsoft...

Microsoft Azure Upgrade Search resources, services, and docs (G+)

Home > az104-rg8 > vmss1 Virtual machine scale set

Recommend a size for this scale set

Availability + scaling

Setting	Value
Availability zone	1, 2, 3
Extended zone	-
Proximity placement group	-
Colocation status	-
Host group	-
Instance count	2
Scaling	Autoscale
Scale-In policy	Default
Zone balance	Best-effort
Overprovisioning	Enabled
Fault domain count	5
Single placement group	Enabled
Disk controller type	SCSI

Size

Setting	Value
Size	Standard_B1s
vCPUs	1
RAM	1 GiB

Source image details

Setting	Value
Source image publisher	MicrosoftWindowsServer
Source image offer	WindowsServer
Source image plan	2019-Datacenter-gensecond

Disk

Setting	Value
OS disk	Premium SSD LRS
Encryption at host	Disabled
Ultra disk compatibility	Disabled
Data disks	0
Managed disks	Enabled
Ephemeral OS disk	N/A

Extensions

12°C Cloudy Поиск 12:44 18.10.2025