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Інформатика і програмування

Лабораторна робота № 5
Тема: Впровадження міжсайтового з'єднання

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Дата: 12 жовтня 2025р.
Викладач: Поварчук Д.Д

Івано-Франківськ – 2025

Лабораторний сценарій

Ваша організація сегментує основні ІТ-програми та служби (такі як DNS та служби безпеки) від інших частин бізнесу, включаючи ваш виробничий відділ. Однак у деяких сценаріях програми та служби в основній області повинні взаємодіяти з програмами та службами у виробничій області. У цій лабораторній роботі ви налаштуєте зв'язок між сегментованими областями. Це поширений сценарій для відокремлення виробництва від розробки або відокремлення однієї дочірньої компанії від іншої.

Одразу хочу сказати що вирішив трішки ультанути і використати Hashicorp terraform. Тому стандартних скрінів не буде, замість цього маю демонстрацію як я це все намагався в консолі запускати.

Я кілька раз намагвся запускати, але все ж переміг, і задеплоїв все, хоч і не одразу. Кажу це бо в мене віртуальні машини не хотіли деплоїтись, тому в кінці тільки вони і додалились останніми.

Отож, скрін команди terraform plan

```
Note: You didn't use the -out option to save this plan, so Terraform can't guarantee to take exactly these actions if you run "terraform apply" now.
PS C:\Users\fedir\Documents\IPZ_43\Cloud technologies\lab5> terraform plan -out=lab5template
random_password.vm: Refreshing state... [id=none]
azurerm_resource_group.rg: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5]
azurerm_network_watcher.nw: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5/providers/Microsoft.Network/networkWatchers/NetworkWatcher_eastus]
azurerm_route_table.rt_core: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5/providers/Microsoft.Network/routeTables/rt-CoreServices]
azurerm_virtual_network.core_vnet: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5/providers/Microsoft.Network/virtualNetworks/CoreServicesVnet]
azurerm_virtual_network.mfg_vnet: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5/providers/Microsoft.Network/virtualNetworks/ManufacturingVnet]
azurerm_subnet.core_subnet: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5/providers/Microsoft.Network/virtualNetworks/CoreServicesVnet/subnets/Core]
azurerm_subnet.perimeter_subnet: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5/providers/Microsoft.Network/virtualNetworks/CoreServicesVnet/subnets/perimeter]
azurerm_virtual_network_peering.mfg_to_core: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5/providers/Microsoft.Network/virtualNetworks/ManufacturingVnet/virtualNetworkPeerings/ManufacturingVnet-to-CoreServicesVnet]
azurerm_virtual_network_peering.core_to_mfg: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5/providers/Microsoft.Network/virtualNetworks/CoreServicesVnet/virtualNetworkPeerings/CoreServicesVnet-to-ManufacturingVnet]
azurerm_subnet.mfg_subnet: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5/providers/Microsoft.Network/virtualNetworks/ManufacturingVnet/subnets/Manufacturing]
azurerm_network_interface.mfg_nic: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5/providers/Microsoft.Network/networkInterfaces/nic-ManufacturingVM]
azurerm_route.perimeter_to_core: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5/providers/Microsoft.Network/routeTables/rt-CoreServices/routes/PerimetertoCore]
azurerm_subnet_route_table_association.core_assoc: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5/providers/Microsoft.Network/virtualNetworks/CoreServicesVnet/subnets/Core]
azurerm_network_interface.core_nic: Refreshing state... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5/providers/Microsoft.Network/networkInterfaces/nic-CoreServicesVM]
```

Остання (також успішна) спроба задеплоїти всі сервіси

The screenshot shows the VS Code interface with the Explorer sidebar on the left displaying a project structure for 'LABS'. The main editor shows the 'main.tf' file with Terraform code for an Azure virtual machine extension. The 'TERMINAL' tab at the bottom displays the command 'terraform apply "lab5template"' and the beginning of the execution output, showing the modification of existing resources and the start of creating new ones.

```
main.tf > resource "azurerm_network_connection_monitor" "cm_rdp"
182 resource "azurerm_virtual_machine_extension" "nw_agent_mfg" {
183   type_name = "Microsoft.Compute/VirtualMachines/ManufacturingVM"
184   type_publisher = "Microsoft"
185   auto_upgrade_minor_version = true
186 }
187
188
189
190
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS AZURE

To perform exactly these actions, run the following command to apply:
terraform apply "lab5template"

PS C:\Users\fedir\Documents\IPZ_43\Cloud technologies\lab5> terraform apply "lab5template"

azurerm_route_table.rt_core: Modifying... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9cab/resourceGroups/az104-rg5/providers/Microsoft.Network/routeTables/rt-Coreservices]

azurerm_windows_virtual_machine.mfg_vm: Modifying... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9cab/resourceGroups/az104-rg5/providers/Microsoft.Compute/virtualMachines/ManufacturingVM]

azurerm_windows_virtual_machine.core_vm: Modifying... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9cab/resourceGroups/az104-rg5/providers/Microsoft.Compute/virtualMachines/CoreServicesVM]

azurerm_route_table.rt_core: Modifications complete after 5s [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9cab/resourceGroups/az104-rg5/providers/Microsoft.Network/routeTables/rt-Coreservices]

azurerm_windows_virtual_machine.mfg_vm: Still modifying... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9cab/resourceGroups/az104-rg5/providers/Microsoft.Compute/virtualMachines/ManufacturingVM, 00m10s elapsed]

azurerm_windows_virtual_machine.core_vm: Still modifying... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9cab/resourceGroups/az104-rg5/providers/Microsoft.Compute/virtualMachines/CoreServicesVM, 00m10s elapsed]

azurerm_windows_virtual_machine.core_vm: Modifications complete after 14s [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9cab/resourceGroups/az104-rg5/providers/Microsoft.Compute/virtualMachines/CoreServicesVM]

azurerm_virtual_machine_extension.nw_agent_core: Creating... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9cab/resourceGroups/az104-rg5/providers/Microsoft.Compute/virtualMachines/ManufacturingVM]

azurerm_virtual_machine_extension.nw_agent_mfg: Creating... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9cab/resourceGroups/az104-rg5/providers/Microsoft.Compute/virtualMachines/ManufacturingVM, 00m10s elapsed]

azurerm_virtual_machine_extension.nw_agent_core: Still creating... [00m20s elapsed]

azurerm_virtual_machine_extension.nw_agent_mfg: Still creating... [00m20s elapsed]

azurerm_virtual_machine_extension.nw_agent_core: Still creating... [00m30s elapsed]

azurerm_virtual_machine_extension.nw_agent_mfg: Still creating... [00m30s elapsed]

azurerm_virtual_machine_extension.nw_agent_core: Still creating... [00m40s elapsed]

azurerm_virtual_machine_extension.nw_agent_mfg: Still creating... [00m40s elapsed]

azurerm_virtual_machine_extension.nw_agent_core: Creation complete after 46s [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9cab/resourceGroups/az104-rg5/providers/Microsoft.Compute/virtualMachines/CoreServicesVM/extensions/NetworkWatcherAgentWindows]

azurerm_virtual_machine_extension.nw_agent_mfg: Still creating... [00m50s elapsed]

This screenshot shows the continuation of the Terraform apply process. The terminal output indicates that all resources have been successfully created or updated. The 'Apply complete' message shows that 4 resources were added, 3 were changed, and 0 were destroyed. The 'Outputs' section displays the private IP addresses for the core and mfg VMs.

```
main.tf > resource "azurerm_network_connection_monitor" "cm_rdp"
182 resource "azurerm_virtual_machine_extension" "nw_agent_mfg" {
183   type_name = "Microsoft.Compute/VirtualMachines/ManufacturingVM"
184   type_publisher = "Microsoft"
185   auto_upgrade_minor_version = true
186 }
187
188
189
190
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS AZURE

azurerm_virtual_machine_extension.nw_agent_mfg: Still creating... [00m10s elapsed]

azurerm_virtual_machine_extension.nw_agent_core: Still creating... [00m20s elapsed]

azurerm_virtual_machine_extension.nw_agent_mfg: Still creating... [00m20s elapsed]

azurerm_virtual_machine_extension.nw_agent_core: Still creating... [00m30s elapsed]

azurerm_virtual_machine_extension.nw_agent_mfg: Still creating... [00m30s elapsed]

azurerm_virtual_machine_extension.nw_agent_core: Still creating... [00m40s elapsed]

azurerm_virtual_machine_extension.nw_agent_mfg: Still creating... [00m40s elapsed]

azurerm_virtual_machine_extension.nw_agent_core: Creation complete after 46s [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9cab/resourceGroups/az104-rg5/providers/Microsoft.Compute/virtualMachines/CoreServicesVM/extensions/NetworkWatcherAgentWindows]

azurerm_virtual_machine_extension.nw_agent_mfg: Creation complete after 55s [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9cab/resourceGroups/az104-rg5/providers/Microsoft.Compute/virtualMachines/ManufacturingVM/extensions/NetworkWatcherAgentWindows]

time.sleep.wait_for_agents: Creating... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9cab/resourceGroups/az104-rg5/providers/Microsoft.Compute/virtualMachines/ManufacturingVM/extensions/NetworkWatcherAgentWindows]

time.sleep.wait_for_agents: Still creating... [00m10s elapsed]

time.sleep.wait_for_agents: Still creating... [00m20s elapsed]

time.sleep.wait_for_agents: Still creating... [00m30s elapsed]

time.sleep.wait_for_agents: Still creating... [00m40s elapsed]

time.sleep.wait_for_agents: Still creating... [00m50s elapsed]

time.sleep.wait_for_agents: Creation complete after 1m0s [id=2025-10-12T10:23:51Z]

azurerm_network_connection_monitor.cm_rdp: Creating... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9cab/resourceGroups/az104-rg5/providers/Microsoft.Network/networkWatchers/NetworkWatcher-eastus/connectionMonitors/cm-Core-to-Mfg-RDP]

azurerm_network_connection_monitor.cm_rdp: Still creating... [00m10s elapsed]

azurerm_network_connection_monitor.cm_rdp: Creation complete after 13s [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9cab/resourceGroups/az104-rg5/providers/Microsoft.Network/networkWatchers/NetworkWatcher-eastus/connectionMonitors/cm-Core-to-Mfg-RDP]

Apply complete! Resources: 4 added, 3 changed, 0 destroyed.

Outputs:

core_vm_private_ip = "10.0.0.4"

generated_vm_password_if_any = <sensitive>

mfg_vm_private_ip = "172.16.0.4"

PS C:\Users\fedir\Documents\IPZ_43\Cloud technologies\lab5>

Ну і скріни-докази що все запустилось

Спочатку список ресурсів

Lab 05 - Implement InterSite C... az104-rg5 - Microsoft Azure

portal.azure.com/#@fedirko816gmail.onmicrosoft.com/resource/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5/overview

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

Home > Resource groups >

Resource groups

Default Directory (fedirko816gmail.onmicrosoft.co...)

+ Create Manage view

☐ Name ↑

- ☐ az104-rg5
- ☐ DefaultResourceGroup-EUS
- ☐ NetworkWatcherRG

Showing 1 - 3 of 3. Display count: auto

az104-rg5
Resource group

How to manage these changes more efficiently with deployment tools? Generate Bicep code to duplicate this resource group. +1

Search

+ Create Manage view Delete resource group Refresh Export to CSV Open query Group by none

Overview

- Activity log
- Access control (IAM)
- Tags
- Resource visualizer
- Events
- Settings
 - Deployments
 - Security
 - Deployment stacks
 - Policies
 - Properties
 - Locks
- Cost Management
- Monitoring
- Automation

Add or remove favorites by pressing Ctrl+Shift+F

Essentials

Resources Recommendations

Filter for any field... Type equals all Location equals all Add filter

Name ↑	Type	Location
CoreServicesVM	Virtual machine	East US
CoreServicesVM_OSDisk	Disk	East US
CoreServicesVnet	Virtual network	East US
ManufacturingVM	Virtual machine	East US
ManufacturingVM_OSDisk	Disk	East US
ManufacturingVnet	Virtual network	East US
NetworkWatcher_eastus	Network Watcher	East US
nic-CoreServicesVM	Network Interface	East US
nic-ManufacturingVM	Network Interface	East US
rt-CoreServices	Route table	East US

Showing 1 - 10 of 10. Display count: auto Give feedback

13°C Mostly cloudy 13:24 12.10.2025

Завдання з 4-го по 6-те

Завдання 4 Налаштування віртуальних мережевих пірингів між віртуальними мережами

Lab 05 - Implement InterSite C... CoreServicesVnet - Microsoft A...

portal.azure.com/#@fedirko816gmail.onmicrosoft.com/resource/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5/providers/Microsoft.Network...

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

Home > Resource groups > az104-rg5 > CoreServicesVnet

CoreServicesVnet | Peerings

Virtual network

Search

+ Add Refresh Export to CSV Delete Sync

Settings

- Address space
- Connected devices
- Subnets
- Bastion
- DDoS protection
- Firewall
- Microsoft Defender for Cloud
- Network manager
- DNS
- Peerings**
- Service endpoints
- Private endpoints
- Properties
- Locks

Virtual network peering enables you to seamlessly connect two or more virtual networks in Azure. The virtual networks appear as one for connectivity purposes. Learn more

Filter by name...

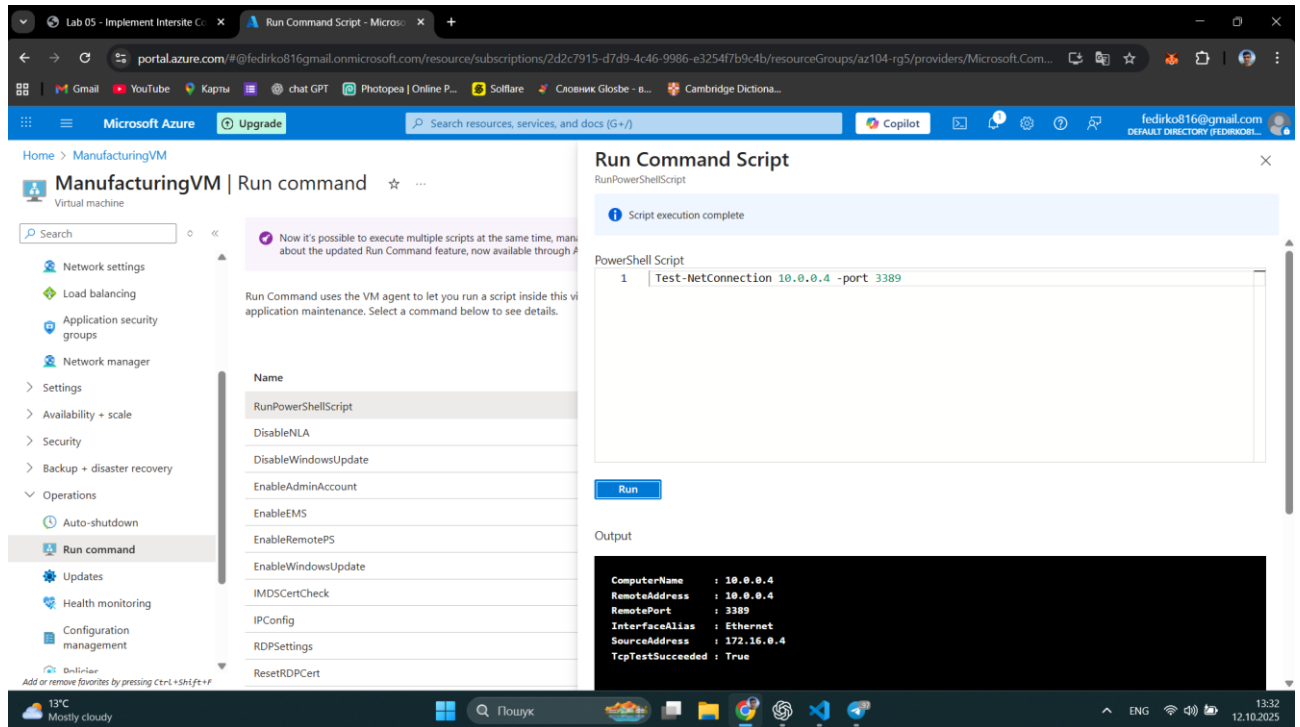
Showing all 1 items

Name ↑	Peering sync status ↑	Peering state ↑	Remo... ↑	Virtu... ↑	Cross-tenant ↑
CoreServicesVnet-to-ManufacturingVnet	Fully Synchronized	Connected	Manufac...	Disabled	No

Give feedback

13°C Mostly cloudy 13:35 12.10.2025

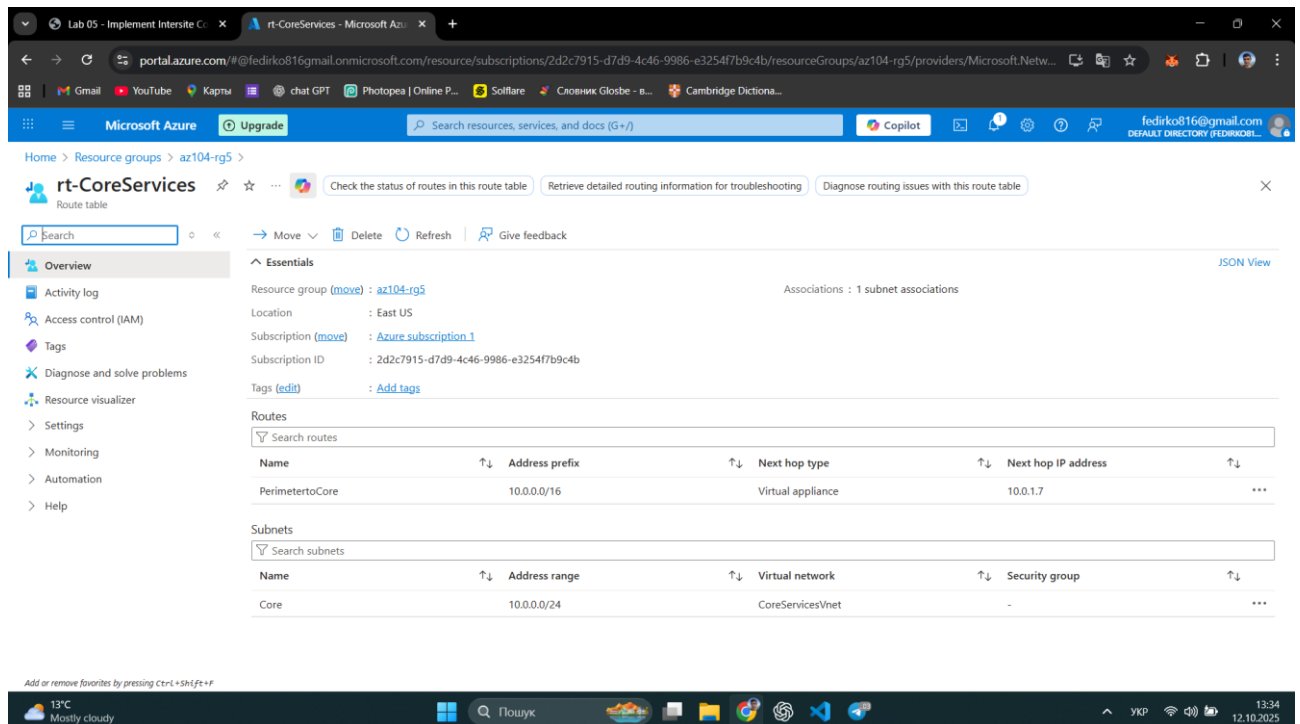
Завдання 5 Використання Azure PowerShell для перевірки з'єднання між віртуальними машинами



The screenshot shows the Azure portal interface for a virtual machine named "ManufacturingVM". The "Run Command" feature is being used to execute a PowerShell script. The script is "Test-NetConnection 10.0.0.4 -port 3389". The output of the script is displayed in the "Output" section, showing that the connection to 10.0.0.4 on port 3389 was successful.

```
ComputerName : 10.0.0.4
RemoteAddress : 10.0.0.4
RemotePort : 3389
InterfaceAlias : Ethernet
SourceAddress : 172.16.0.4
TcpTestSucceeded : True
```

Завдання 6 Створення власного маршруту



The screenshot shows the Azure portal interface for a route table named "rt-CoreServices". The "Overview" tab is active, displaying the route table's configuration. The route table is located in the "East US" region and is associated with the "Azure subscription 1". The route table contains one route named "PerimetertoCore" with the address prefix "10.0.0.0/16" and the next hop type "Virtual appliance". The route table also contains one subnet named "Core" with the address range "10.0.0.0/24" and the virtual network "CoreServicesVnet".

Name	Address prefix	Next hop type	Next hop IP address
PerimetertoCore	10.0.0.0/16	Virtual appliance	10.0.1.7

Name	Address range	Virtual network	Security group
Core	10.0.0.0/24	CoreServicesVnet	-

Ну і видалення

```
azurerm_network_interface.core_nic: Still destroying... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-...k/networkInterfaces/nic-CoreServicesVM, 00m10s elapsed]
azurerm_windows_virtual_machine.mfg_vm: Still destroying... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-...ompute/virtualMachines/ManufacturingVM, 00m30s elapsed]
azurerm_network_interface.core_nic: Destruction complete after 11s
k... azurerm_subnet.core_subnet: Destroying... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5/providers/Microsoft.Network/virtualNetworks/CoreServicesVnet/subnets/Core]
azurerm_windows_virtual_machine.mfg_vm: Destruction complete after 40s
azurerm_network_interface.mfg_nic: Destroying... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5/providers/Microsoft.Network/networkInterf
aces/nic-ManufacturingVM]
random_password.vm: Destroying... [id=none]
random_password.vm: Destruction complete after 0s
azurerm_subnet.core_subnet: Still destroying... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-...Networks/CoreServicesVnet/subnets/Core, 00m10s elapsed]
azurerm_subnet.core_subnet: Destruction complete after 11s
azurerm_virtual_network.core_vnet: Destroying... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5/providers/Microsoft.Network/virtualNetworks/CoreServicesVnet]
azurerm_network_interface.mfg_nic: Still destroying... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-.../networkInterfaces/nic-ManufacturingVM, 00m10s elapsed]
azurerm_virtual_network.core_vnet: Still destroying... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-...work/virtualNetworks/CoreServicesVnet, 00m10s elapsed]
azurerm_network_interface.mfg_nic: Destruction complete after 12s
azurerm_subnet.mfg_subnet: Destroying... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5/providers/Microsoft.Network/virtualNetworks/ManufacturingVnet/subnets/Manufacturing]
azurerm_virtual_network.core_vnet: Destruction complete after 11s
azurerm_subnet.mfg_subnet: Still destroying... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-...anufacturingVnet/subnets/Manufacturing, 00m10s elapsed]
azurerm_subnet.mfg_subnet: Destruction complete after 11s
azurerm_virtual_network.mfg_vnet: Destroying... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5/providers/Microsoft.Network/virtualNetworks/ManufacturingVnet]
azurerm_virtual_network.mfg_vnet: Still destroying... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-...work/virtualNetworks/ManufacturingVnet, 00m10s elapsed]
azurerm_virtual_network.mfg_vnet: Destruction complete after 11s
azurerm_resource_group.rg: Destroying... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5]
azurerm_resource_group.rg: Still destroying... [id=/subscriptions/2d2c7915-d7d9-4c46-9986-e3254f7b9c4b/resourceGroups/az104-rg5, 00m10s elapsed]
azurerm_resource_group.rg: Destruction complete after 16s

Destroy complete! Resources: 21 destroyed.
PS C:\Users\fedir\Documents\IPZ_43\Cloud_tecnologies\lab5>
```

Ln 208, Col 3 Spaces: 2 UTF-8 CRLF Terraform Signed out

Пошук

13:42 12.10.2025