

**Міністерство освіти і науки України
Карпатський національний університет
імені В.Стефаника**

**Факультет математики та інформатики
Кафедра інформаційних технологій**

Хмарні технології

Практична робота №8

Тема: Manage Virtual Machines

Мета: Порівняти віртуальні машини і набори масштабування віртуальних машин

Виконав: Андрусяк І.Р.
Група ІПЗ-41
Дата: 19 грудня 2025р.
Викладач: Поварчук Д.Д.

Івано-Франківськ — 2025

providers.tf

```
1  terraform {
2    required_version = ">= 1.0.0"
3    required_providers {
4      azurerm = {
5        source  = "hashicorp/azurerm"
6        version = "~> 3.0"
7      }
8    }
9  }
10
11 provider "azurerm" {
12   subscription_id = "xxx-xxx-xxx-xxx"
13   features {
14     virtual_machine {
15       delete_os_disk_on_deletion      = true
16       skip_shutdown_and_force_delete = false
17     }
18   }
19 }
```

main.tf

```
1  resource "azurerm_resource_group" "rg" {
2    name      = var.resource_group_name
3    location = var.location
4  }
5
6  resource "azurerm_virtual_network" "vnet1" {
7    name          = "az104-vnet1"
8    address_space = ["10.81.0.0/16"]
9    location      = azurerm_resource_group.rg.location
10   resource_group_name = azurerm_resource_group.rg.name
11 }
12
13 resource "azurerm_subnet" "subnet1" {
14   name          = "subnet1"
15   resource_group_name = azurerm_resource_group.rg.name
16   virtual_network_name = azurerm_virtual_network.vnet1.name
17   address_prefixes = ["10.81.0.0/24"]
18 }
```

```
20 resource "azurerm_network_interface" "vm_nics" {
21   count          = 2
22   name           = "az104-nic${count.index + 1}"
23   location        = azurerm_resource_group.rg.location
24   resource_group_name = azurerm_resource_group.rg.name
25
26   ip_configuration {
27     name            = "internal"
28     subnet_id       = azurerm_subnet.subnet1.id
29     private_ip_address_allocation = "Dynamic"
30   }
31 }
32
33 resource "azurerm_windows_virtual_machine" "vms" {
34   count          = 2
35   name           = "az104-vm${count.index + 1}"
36   resource_group_name = azurerm_resource_group.rg.name
37   location        = azurerm_resource_group.rg.location
38   size            = "Standard_D2s_v3"
39   admin_username  = var.admin_username
40   admin_password  = var.admin_password
41   zone            = count.index + 1
42   network_interface_ids = [azurerm_network_interface.vm_nics[count.index].id]
43
44   os_disk {
45     caching          = "ReadWrite"
46     storage_account_type = "Standard_LRS"
47   }
}
```

```
49  source_image_reference {
50    publisher = "MicrosoftWindowsServer"
51    offer     = "WindowsServer"
52    sku       = "2019-Datacenter"
53    version   = "latest"
54  }
55 }
56
57 resource "azurerm_virtual_network" "vmss_vnet" {
58   name          = "vmss-vnet"
59   address_space = ["10.82.0.0/20"]
60   location      = azurerm_resource_group.rg.location
61   resource_group_name = azurerm_resource_group.rg.name
62 }
63
64 resource "azurerm_subnet" "vmss_subnet" {
65   name          = "subnet0"
66   resource_group_name = azurerm_resource_group.rg.name
67   virtual_network_name = azurerm_virtual_network.vmss_vnet.name
68   address_prefixes = ["10.82.0.0/24"]
69 }
70
71 resource "azurerm_public_ip" "vmss_lb_pip" {
72   name          = "vmss-lb-pip"
73   location      = azurerm_resource_group.rg.location
74   resource_group_name = azurerm_resource_group.rg.name
75   allocation_method = "Static"
76   sku           = "Standard"
77 }
```

```
79 resource "azurerm_lb" "vmss_lb" {
80   name          = "vmss-lb"
81   location      = azurerm_resource_group.rg.location
82   resource_group_name = azurerm_resource_group.rg.name
83   sku           = "Standard"
84
85   frontend_ip_configuration {
86     name          = "PublicIPAddress"
87     public_ip_address_id = azurerm_public_ip.vmss_lb_pip.id
88   }
89 }
90
91 resource "azurerm_windows_virtual_machine_scale_set" "vmss" {
92   name          = "vmss1"
93   resource_group_name = azurerm_resource_group.rg.name
94   location      = azurerm_resource_group.rg.location
95   sku           = "Standard_D2s_v3"
96   instances     = 2
97   admin_password = var.admin_password
98   admin_username = var.admin_username
99   zones         = ["1", "2", "3"]
100
101  source_image_reference {
102    publisher = "MicrosoftWindowsServer"
103    offer     = "WindowsServer"
104    sku       = "2019-Datacenter"
105    version   = "latest"
106  }
```

```
108 |     os_disk {
109 |         storage_account_type = "Standard_LRS"
110 |         caching              = "ReadWrite"
111 |     }
112 |
113 |     network_interface {
114 |         name      = "vmss-nic"
115 |         primary   = true
116 |
117 |         ip_configuration {
118 |             name        = "internal"
119 |             primary    = true
120 |             subnet_id = azurerm_subnet.vmss_subnet.id
121 |         }
122     }
123 }
124
125 resource "azurerm_monitor_autoscale_setting" "vmss_autoscale" {
126     name          = "vmss-autoscale"
127     resource_group_name = azurerm_resource_group.rg.name
128     location       = azurerm_resource_group.rg.location
129     target_resource_id  = azurerm_windows_virtual_machine_scale_set.vmss.id
130
131     profile {
132         name = "defaultProfile"
133         capacity {
134             default = 2
135             minimum = 2
136             maximum = 10
137         }
138     }
139 }
```

```

139   rule {
140     metric_trigger {
141       metric_name      = "Percentage CPU"
142       metric_resource_id = azurerm_windows_virtual_machine_scale_set.vmss.id
143       time_grain       = "PT1M"
144       statistic        = "Average"
145       time_window      = "PT10M"
146       time_aggregation = "Average"
147       operator         = "GreaterThan"
148       threshold        = 70
149     }
150     scale_action {
151       direction = "Increase"
152       type      = "PercentChangeCount"
153       value     = "50"
154       cooldown  = "PT5M"
155     }
156   }
157
158   rule {
159     metric_trigger {
160       metric_name      = "Percentage CPU"
161       metric_resource_id = azurerm_windows_virtual_machine_scale_set.vmss.id
162       time_grain       = "PT1M"
163       statistic        = "Average"
164       time_window      = "PT10M"
165       time_aggregation = "Average"
166       operator         = "LessThan"
167       threshold        = 30

```

```

158   rule {
159     metric_trigger {
160       metric_name      = "Percentage CPU"
161       metric_resource_id = azurerm_windows_virtual_machine_scale_set.vmss.id
162       time_grain       = "PT1M"
163       statistic        = "Average"
164       time_window      = "PT10M"
165       time_aggregation = "Average"
166       operator         = "LessThan"
167       threshold        = 30
168     }
169     scale_action {
170       direction = "Decrease"
171       type      = "PercentChangeCount"
172       value     = "50"
173       cooldown  = "PT5M"
174     }
175   }
176 }
177 }
```

outputs.tf

```

1  output "vm1_id" { value = azurerm_windows_virtual_machine.vms[0].id }
2  output "vmss_id" [ value = azurerm_windows_virtual_machine_scale_set.vmss.id ]
```

variables.tf

```
1  variable "resource_group_name" {
2    default = "az104-rg8"
3  }
4
5  variable "location" {
6    default = "East US"
7  }
8
9  variable "admin_username" {
10   default = "localadmin"
11 }
12
13 variable "admin_password" [
14   default = "P@ssw0rd12345!"
15 ]
```

Висновок

Було зроблено ще одну лабораторну. На цьому по суті все.
Гітхаб: https://github.com/Iolloizaur/azure_labs/tree/main/lab8