

Manage Virtual Machines in Azure

Task 1: Deploy zone-resilient Azure virtual machines by using the Azure portal and an Azure Resource Manager template

We create the Virtual Machine with the following settings:

The screenshot shows the 'Create a virtual machine' wizard in the Azure portal. The top section displays subscription and resource group selection. The main configuration area includes fields for Region, Availability options, Availability zone, Security type, Image, VM architecture, Run with Azure Spot discount, and Size.

Subscription *: Azure Pass - Sponsorship

Resource group *: (New) az104-08-rg01

Region *: (US) East US

Availability options: Availability zone

Availability zone *: Zone 1

Security type: Standard

Image *: Windows Server 2019 Datacenter - x64 Gen2

VM architecture: x64 (selected)

Run with Azure Spot discount:

Size *: Standard_D2s_v3 - 2 vcpus, 8 GiB memory (Loading price...)

Size * ⓘ Standard_D2s_v3 - 2 vcpus, 8 GiB memory (\$137.24/month) ▼

See all sizes

Administrator account

Username * ⓘ Student ✓

Password * ⓘ ✓

Confirm password * ⓘ ✓

Inbound port rules

Select which virtual machine network ports are accessible from the public internet. You can specify more limited or granular network access on the Networking tab.

Public inbound ports * ⓘ None Allow selected ports

Select inbound ports Select one or more ports ▼

i All traffic from the internet will be blocked by default. You will be able to change inbound port rules in the VM > Networking page.

Licensing

Save up to 49% with a license you already own using Azure Hybrid Benefit. [Learn more](#)

Would you like to use an existing Windows Server license? * ⓘ

[Review Azure hybrid benefit compliance](#)

Review + create < Previous Next : Disks > Give feedback

Click Next: Disks > and, on the Disks tab of the Create a virtual machine blade, specify the following settings (leave others with their default values):

Basics Disks Networking Management Monitoring Advanced Tags Review + create

Azure VMs have one operating system disk and a temporary disk for short-term storage. You can attach additional data disks. The size of the VM determines the type of storage you can use and the number of data disks allowed. [Learn more](#)

VM disk encryption

Azure disk storage encryption automatically encrypts your data stored on Azure managed disks (OS and data disks) at rest by default when persisting it to the cloud.

Encryption at host

i Encryption at host is not registered for the selected subscription.
[Learn more about enabling this feature](#)

OS disk

OS disk type *

Premium SSD (locally-redundant storage)

Delete with VM

Key management

Platform-managed key

Enable Ultra Disk compatibility

Data disks for az104-08-vm0

You can add and configure additional data disks for your virtual machine or attach existing disks. This VM also comes with a temporary disk.

LUN	Name	Size (GiB)	Disk type	Host caching	Delete with VM
-----	------	------------	-----------	--------------	----------------

[Create and attach a new disk](#) [Attach an existing disk](#)

v Advanced

[Review + create](#)

< Previous

Next : Networking >

 Give feedback

Click Next: Networking > and, on the Networking tab of the Create a virtual machine blade, click Create new below the Virtual network textbox.

[Learn more](#)

Network interface

When creating a virtual machine, a network interface will be created for you.

Virtual network * [\(i\)](#)

(new) az104-08-rg01-vnet [▼](#)

[Create new](#)

Subnet * [\(i\)](#)

(new) subnet0 (10.80.0.0/24) [▼](#)



[Create new](#)

Public IP [\(i\)](#)

(new) az104-08-vm0-ip [▼](#)



[Create new](#)

NIC network security group [\(i\)](#)

None

Basic

Advanced

Public inbound ports * [\(i\)](#)

None

Allow selected ports

Select inbound ports

Select one or more ports [▼](#)

i All traffic from the internet will be blocked by default. You will be able to change inbound port rules in the VM > Networking page.

Delete public IP and NIC when VM is deleted [\(i\)](#)



Enable accelerated networking [\(i\)](#)



Load balancing

You can place this virtual machine in the backend pool of an existing Azure load balancing solution. [Learn more](#)

[Review + create](#)

[< Previous](#)

[Next : Management >](#)

[Give feedback](#)

Click OK and, back on the Networking tab of the Create a virtual machine blade, specify the following settings (leave others with their default values):

Create virtual network X

The Microsoft Azure Virtual Network service enables Azure resources to securely communicate with each other in a virtual network which is a logical isolation of the Azure cloud dedicated to your subscription. You can connect virtual networks to other virtual networks, or your on-premises network. [Learn more ↗](#)

Name *

Address space
The virtual network's address space, specified as one or more address prefixes in CIDR notation (e.g. 192.168.1.0/24).

<input type="checkbox"/> Address range	Addresses	Overlap	
<input type="checkbox"/> 10.80.0.0/20 ✓	10.80.0.0 - 10.80.15.255 (4096 addresses)	None	...
	(0 Addresses)	None	

Subnets
The subnet's address range in CIDR notation. It must be contained by the address space of the virtual network.

<input type="checkbox"/> Subnet name	Address range	Addresses	
<input type="checkbox"/> subnet0 ✓	10.80.0.0/24 ✓	10.80.0.0 - 10.80.0.255 (256 addresses)	...
		(0 Addresses)	

Click Next: Monitoring > and, on the Monitoring tab of the Create a virtual machine blade, specify the following settings (leave others with their default values):

The screenshot shows the 'Create a virtual machine' blade with the 'Monitoring' tab selected. On the left, there are sections for 'Alerts' (checkbox for 'Enable recommended alert rules'), 'Diagnostics' (radio buttons for 'Boot diagnostics' options), and 'Enable OS guest diagnostics' (checkbox). Below these is a field for 'Diagnostics storage account' with a note about no existing accounts and a 'Create new' link. On the right, a 'Create storage account' dialog box is open, prompting for a 'Name' (storageacc7diag), 'Account kind' (Storage (general purpose v1)), 'Performance' (Standard selected), and 'Replication' (Locally-redundant storage (LRS)).

Once the validation is successful, we can continue on creating the Virtual Machine

Create a virtual machine ...

Validation passed

Basics Disks Networking Management Monitoring Advanced Tags **Review + create**

ⓘ Cost given below is an estimate and not the final price. Please use [Pricing calculator](#) for all your pricing needs.

Price

1 X Standard D2s v3 by Microsoft Subscription credits apply ⓘ **0.1880 USD/hr** [Pricing for other VM sizes](#)

TERMS

By clicking "Create", I (a) agree to the legal terms and privacy statement(s) associated with the Marketplace offering(s) listed above; (b) authorize Microsoft to bill my current payment method for the fees associated with the offering(s), with the same billing frequency as my Azure subscription; and (c) agree that Microsoft may share my contact, usage and transactional information with the provider(s) of the offering(s) for support, billing and other transactional activities. Microsoft does not provide rights for third-party offerings. See the [Azure Marketplace Terms](#) for additional details.

Basics

Subscription	Azure Pass - Sponsorship
Resource group	(new) az104-08-rg01
Virtual machine name	az104-08-vm0
Region	East US
Availability options	Availability zone
Availability zone	1

Considerations Downloaded

Create [< Previous](#) [Next >](#) [Download a template for automation](#)

On the Custom Deployment blade, we set up the following settings:

Custom deployment

...

Deploy from a custom template

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription * ⓘ

Azure Pass - Sponsorship

Resource group * ⓘ

az104-08-rg01

[Create new](#)

Instance details

Region * ⓘ

(US) East US

Location *

eastus

Network Interface Name1 *

az104-08-vm1-nic1

Network Security Group Name *

az104-08-vm0-nsg

Network Security Group Rules *

Custom deployment

Deploy from a custom template

Subnets *	[{"name": "subnet0", "properties": {"addressPrefix": "10.80.0.0/24"}]}
Public Ip Address Name1 *	az104-08-vm1-ip ✓
Public Ip Address Type *	Static ✓
Public Ip Address Sku *	Standard ✓
Pip Delete Option *	Detach ✓
Virtual Machine Name *	az104-08-vm1 ✓
Virtual Machine Name1 *	az104-08-vm1 ✓
Virtual Machine Computer Name1 *	az104-08-vm1 ✓
Virtual Machine RG *	az104-08-rg01 ✓
Os Disk Type *	Premium_LRS ✓
Os Disk Delete Option *	Delete ✓
Virtual Machine Size *	1x Standard D2s v3 2 vcpus, 8 GB memory Change size
Nic Delete Option *	Detach ✓
Admin Username *	Student ✓
Admin Password *	(redacted)
Patch Mode *	Manual ✓
Enable Hotpatching *	false ✓

The Deployment is complete.

Home >

Microsoft.Template-20230321171816 | Overview

Deployment

» Delete Cancel Redeploy Download Refresh

✓ Your deployment is complete

Deployment name: Microsoft.Template-2023032117181... Start time: 3/21/2023, 5:18:22 PM
Subscription: Azure Pass - Sponsorship Correlation ID: 29449a6c-4694-4609-812e-00e35c71802c

Resource group: az104-08-rg01

Deployment details

Next steps

[Go to resource group](#)

Give feedback

[Tell us about your experience with deployment](#)

Task 2: Configure Azure virtual machines by using virtual machine extensions

Container Change access level Restore containers Refresh

Search containers by prefix

Name	Last modified	Put:
<input type="checkbox"/> bootdiagnostics-az10408vm-17f95453-34f1-473c...	3/21/2023, 5:15:06 PM	Priv
<input type="checkbox"/> bootdiagnostics-az10408vm-c795186d-c785-4bf7...	3/21/2023, 5:18:33 PM	Priv

New container

Name *

Public access level

Advanced

Once we create the scripts storage account, we click on “Create” and continue to the next step.

scripts ...
Container

Search Upload Change access level Refresh Delete Change

Overview az104-08-vm1-ip
 Diagnose and solve problems
 Access Control (IAM)

Authentication method: Access key ([Switch to Azure AD User Account](#))
Location: scripts

Search blobs by prefix (case-sensitive)

Name	Modified
No results	

Settings

- Shared access tokens
- Access policy
- Properties
- Metadata

We upload the `az104-08-install_IIS.ps1` file.

Upload blob

1 file(s) selected: `az104-08-install_IIS.ps1`
Drag and drop files here or [Browse for files](#)

Overwrite if files already exist

Advanced

Upload Give feedback

*On the az104-08-vm0 virtual machine blade, in the Settings section, click **Extensions + applications**, and then click + Add*

The screenshot shows the 'Extensions + applications' blade for the 'az104-08-vm0' virtual machine. The left sidebar lists various management options like Overview, Activity log, and Settings. Under Settings, 'Extensions + applications' is highlighted. The main area has tabs for 'Extensions' (selected) and 'VM Applications'. It includes a search bar, an 'Add' button, a 'Refresh' button, and a 'Feedback' link. A table displays columns for Name, Type, Version, and Status, with one row currently listed.

Name	Type	Version	Status
[Placeholder]			

Install an Extension

custom script extension

 **Custom Script Extension**

Microsoft Corp.

Custom Script handler extension for Windows

[Load more](#)

Microsoft.CustomScriptExtension-20230321172214 | Overview [↗](#)

»

[Delete](#)



[Cancel](#)



[Redeploy](#)



[Download](#)



[Refresh](#)

 Your deployment is complete



Deployment name: Microsoft.CustomScriptExtension-202303... Start time: 3/21/2023, 5:22:56 PM
Subscription: Azure Pass - Sponsorship Correlation ID: 4fe10567-2aee-444e-a8d6-6262...
Resource group: az104-08-rg01

 [Deployment details](#)

 [Next steps](#)

[Go to resource](#)

We deploy the custom

Home > Virtual machines > az104-08-vm1

az104-08-vm1 | Export template

Virtual machine

Search Download Add to library Deploy Visualize template

To export related resources, select the resources from the Resource Group view then select the "Export template" option from the tool bar.

Include parameters

Template Parameters Scripts

Parameters (3) Variables (0) Resources (1)

```

1  {
2      "$schema": "https://schema.management.azure.com/schemas/
2019-04-01/deploymentTemplate.json#",
3      "contentVersion": "1.0.0.0",
4      "parameters": {
5          "virtualMachines_az104_08_vm1_name": {
6              "defaultValue": "az104-08-vm1",
7              "type": "String"
8          },
9
10         "disks_az104_08_vm1_OsDisk_1_id80bc08706e4070837545c06f5fb96f_e
xternalId": {
11             "defaultValue": "/subscriptions/
836f56df-cca0-4866-b552-adbe26a742da/resourceGroups/
az104-08-rg01/providers/Microsoft.Compute/disks/
az104-08-vm1_OsDisk_1_id80bc08706e4070837545c06f5fb96f",
12             "type": "String"
13         },
14         "networkInterfaces_az104_08_vm1_nic1_externalId": {
15             "defaultValue": "/subscriptions/
836f56df-cca0-4866-b552-adbe26a742da/resourceGroups/
az104-08-rg01/providers/Microsoft.Network/networkInterfaces/
az104-08-vm1_nic1"
16         }
17     }
18 }
```

We add the following code after the “resources” line

```

{
    "type": "Microsoft.Compute/virtualMachines/extensions",
    "name": "az104-08-vm1/customScriptExtension",
    "apiVersion": "2018-06-01",
    "location": "[resourceGroup().location]",
    "dependsOn": [
        "az104-08-vm1"
    ],
    "properties": {
        "publisher": "Microsoft.Compute",
        "type": "CustomScriptExtension",
        "typeHandlerVersion": "1.7",
    }
}
```

```

        "autoUpgradeMinorVersion": true,
    },
    "settings": {
        "commandToExecute": "powershell.exe
Install-WindowsFeature -name Web-Server -IncludeManagementTools &&
powershell.exe remove-item 'C:\\inetpub\\wwwroot\\iisstart.htm' &&
powershell.exe Add-Content -Path 'C:\\inetpub\\wwwroot\\iisstart.htm'
-Value $($Hello World from ' + $env:computername)"
    }
},
},

```

```

9   "disks_az104_08_vm1_OsDisk_1_1d80bc08706e4070837545c06f5fb96f_externalid": {
10     "defaultValue": "/subscriptions/836f56df-cca0-4866-b552-adbe26a742da/resourceGroups/az104-08-rg01/providers/
Microsoft.Compute/disks/az104-08-vm1_OsDisk_1_1d80bc08706e4070837545c06f5fb96f",
11     "type": "String"
12   },
13   "networkInterfaces_az104_08_vm1_nic1_externalid": {
14     "defaultValue": "/subscriptions/836f56df-cca0-4866-b552-adbe26a742da/resourceGroups/az104-08-rg01/providers/
Microsoft.Network/networkInterfaces/az104-08-vm1-nic1",
15     "type": "String"
16   },
17 },
18 "variables": {},
19 "resources": [
20   {
21     "type": "Microsoft.Compute/virtualMachines/extensions",
22     "name": "az104-08-vm1/customScriptExtension",
23     "apiVersion": "2018-06-01",
24     "location": "[resourceGroup().location]",
25     "dependsOn": [
26       "az104-08-vm1"
27     ],
28     "properties": {
29       "publisher": "Microsoft.Compute",
30       "type": "CustomScriptExtension",
31       "typeHandlerVersion": "1.7",
32       "autoUpgradeMinorVersion": true,
33       "settings": {
34         "commandToExecute": "powershell.exe Install-WindowsFeature -name Web-Server -IncludeManagementTools &&
powershell.exe remove-item 'C:\\inetpub\\wwwroot\\iisstart.htm' && powershell.exe Add-Content -Path
'C:\\inetpub\\wwwroot\\iisstart.htm' -Value $($Hello World from ' + $env:computername)"
35       }
36     }
37   }
38 ]

```

On the Run Command Script blade, type the following and click Run to access the web site hosted on az104-08-vm0:

```
Invoke-WebRequest -URI http://10.80.0.4 -UseBasicParsing
```

Run Command Script

RunPowerShellScript

i Script execution complete

PowerShell Script

```
1 Invoke-WebRequest -URI http://10.80.0.4 -UseBasicParsing
```

Run

Output

```
StatusCode      : 200
StatusDescription: OK
Content         : az104-08-vm0

RawContent      :
                  HTTP/1.1 200 OK
                  Accept-Ranges: bytes
                  Content-Length: 14
                  Content-Type: text/html
                  Date: Tue, 21 Mar 2023 16:30:08 GMT
                  ETag: "ad445db7115cd91:0"
                  Last-Modified: Tue, 21 Mar 2023 16:25:14 GMT
                  Server...
Forms           :
Headers         :
                  {[Accept-Ranges, bytes], [Content-Length, 14], [Content-Type, text/html], [Date, Tue,
21 Mar 2023
                  16:30:08 GMT]...}
Images          : {}
InputFields     : {}
Links           : {}
ParsedHtml      :
RawContentLength : 14
```

Task 3: Scale compute and storage for Azure virtual machines

On the az104-08-vm0 virtual machine blade, click Size and set the virtual machine size to Standard_DS1_v2 and click Resize

If the virtual machine is currently running, changing its size will cause it to be restarted. Stopping the virtual machine may reveal additional sizes.

Search by VM size... Display cost : Monthly vCPUs : All RAM (GiB) : All Add filter

Showing 404 VM sizes. Subscription: Azure Pass - Sponsorship Region: East US Current size: Standard_DS1_v2

Learn more about VM sizes Group by series

VM Size ↑↓	Type ↑↓	vCPUs ↑↓	RAM (GiB) ↑↓	Data disks ↑↓	Max IO
DS1_v2 ↗	General purpose	1	3.5	4	3200
D2s_v3 ↗	General purpose	2	8	4	3200
D2as_v4 ↗	General purpose	2	8	4	3200
B2s ↗	General purpose	2	4	4	1280
B1s ↗	General purpose	1	1	2	320
B2ms ↗	General purpose	2	8	4	1920
DS2_v2 ↗	General purpose	2	7	8	6400
B4ms ↗	General purpose	4	16	8	2880
D4s_v3 ↗	General purpose	4	16	8	6400
DS3_v2 ↗	General purpose	4	14	16	12800
D8s_v3 ↗	General purpose	8	32	16	12800
D-Series v5 The latest generation D family sizes recommended for your general purpose needs					
D-Series v4 The 4th generation D family sizes for your general purpose needs					

Prices presented are estimates in USD that include only Azure infrastructure costs and any discounts for the subscription and location. The prices don't include any applicable software costs. Final charges will appear in your local currency in cost analysis and billing views. View Azure pricing calculator.

Resize

On the az104-08-vm0 virtual machine blade, click Disks, Under Data disks click + Create and attach a new disk.

The screenshot shows the Windows Admin Center interface with the 'Disks' section selected in the left sidebar. The main pane displays 'Data disks' with a search bar labeled 'Filter by name'. It shows two attached disks: 'az104-08-vm0-disk0' and 'az104-08-vm0-disk1'. Both are listed as Premium SSDs with a size of 1024 GiB, max IOPS of 5000, and max throughput of 200. There are buttons for 'Create and attach a new disk' and 'Attach existing disks'.

LUN	Disk name	Storage type	Size (GiB)	Max IOPS	Max throughput (
0	az104-08-vm0-disk0	Premium SSD (I...)	1024	5000	200
1	az104-08-vm0-disk1	Premium SSD (I...)	1024	5000	200

On the Run Command Script blade, type the following and click Run to create a drive Z: consisting of the two newly attached disks with the simple layout and fixed provisioning:

```
New-StoragePool -FriendlyName storagepool1 -StorageSubsystemFriendlyName "Windows Storage*" -PhysicalDisks (Get-PhysicalDisk -CanPool $true)
```

```
New-VirtualDisk -StoragePoolFriendlyName storagepool1 -FriendlyName virtualdisk1 -Size 2046GB -ResiliencySettingName Simple -ProvisioningType Fixed
```

```
Initialize-Disk -VirtualDisk (Get-VirtualDisk -FriendlyName virtualdisk1)
```

```
New-Partition -DiskNumber 4 -UseMaximumSize -DriveLetter Z
```

Run Command Script

RunPowerShellScript

Script execution complete

```
3 New-VirtualDisk -StoragePoolFriendlyName storagepool1 -FriendlyName virtualdisk1 -Size 2048GB
4
5 Initialize-Disk -VirtualDisk (Get-VirtualDisk -FriendlyName virtualdisk1)
6
7 New-Partition -DiskNumber 4 -UseMaximumSize -DriveLetter Z
```

Run

Output

FriendlyName	OperationalStatus	HealthStatus	IsPrimordial	IsReadOnly	Size	AllocatedSize
storagepool1	OK	Healthy	False	False	2 TB	512 MB
ObjectId	:	{1}\az104-08-vm0\root\Microsoft\Windows\Storage\Providers_v2\SPACE				
S_VirtualDisk.Ob	:	jectId="{9db9a5cb-c803-11ed-8e88-806e6f6e6963}:VD:{ea2df698-6c35-42				
40-8ee0-152d359e	:	667e}{4cf50b18-4d8c-428f-9e05-ab738ac58c44}"				
PassThroughClass	:					
PassThroughIds	:					
PassThroughNamespace	:					
PassThroughServer	:					
UniqueId	:	180BF54C8C4D8F429E05AB738AC58C44				
Access	:	Read/Write				
AllocatedSize	:	2196875771904				
AllocationUnitSize	:	1073741824				
ColumnIsolation	:	PhysicalDisk				
DetachedReason	:	None				
FaultDomainAwareness	:	PhysicalDisk				
FootprintOnPool	:	2196875771904				
FriendlyName	:	virtualdisk1				
HealthStatus	:	Healthy				
Interleave	:	262144				
IsDeduplicationEnabled	:	False				

When the OperationalStatus displays OK, the drive creation was successful.

On the Edit template blade, in the section displaying the content of the template, replace the line 30 "vmSize": "Standard_D2s_v3" with the following line):

```
"vmSize": "Standard_DS1_v2"
```

```
        ],
      "properties": {
        "hardwareProfile": [
          {
            "vmSize": "Standard_DS1_v2"
          }
        ]
      }
    }
```

On the *Edit template blade*, in the section displaying the content of the template, replace line (`"dataDisks": []` line) with the following code :

```
      "dataDisks": [
        {
          "lun": 0,
          "name": "az104-08-vm1-disk0",
          "diskSizeGB": "1024",
          "caching": "ReadOnly",
          "createOption": "Empty"
        },
        {
          "lun": 1,
          "name": "az104-08-vm1-disk1",
          "diskSizeGB": "1024",
          "caching": "ReadOnly",
          "createOption": "Empty"
        }
      ]
```

```

44     "managedDisk": {
45         "storageAccountType": "Premium_LRS",
46         "id": "[parameters
47             ('disks_az104_08_vm1_OsDisk_1_1d80bc08706e4070837545c06f5fb96f_externalid')]"
48     },
49     "deleteOption": "Delete",
50     "diskSizeGB": 127
51 },
52 "dataDisks": [
53 {
54     "lun": 0,
55     "name": "az104-08-vm1-disk0",
56     "diskSizeGB": "1024",
57     "caching": "ReadOnly",
58     "createOption": "Empty"
59 },
60 {
61     "lun": 1,
62     "name": "az104-08-vm1-disk1",
63     "diskSizeGB": "1024",
64     "caching": "ReadOnly",
65     "createOption": "Empty"
66 }
]

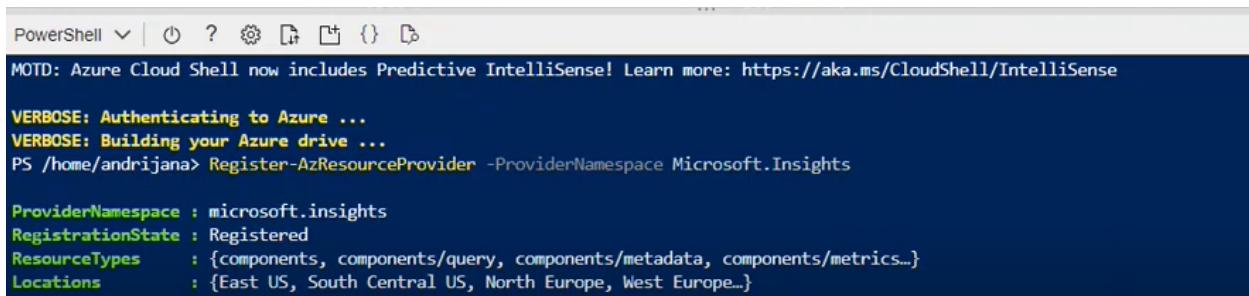
```

In the next step, we create another drive Z, following the same procedure from previously.

Task 4: Register the Microsoft.Insights and Microsoft.AlertsManagement resource providers

From the Cloud Shell pane, run the following to register the Microsoft.Insights and Microsoft.AlertsManagement resource providers.

```
Register-AzResourceProvider -ProviderNamespace Microsoft.Insights
```



The screenshot shows a PowerShell session in the Azure Cloud Shell. The command `Register-AzResourceProvider -ProviderNamespace Microsoft.Insights` is being run. The output shows the provider registered with its properties:

```

PowerShell v | ⚡ ? ⚡ ⚡ ⚡ {} ⚡
MOTD: Azure Cloud Shell now includes Predictive IntelliSense! Learn more: https://aka.ms/CloudShell/IntelliSense

VERBOSE: Authenticating to Azure ...
VERBOSE: Building your Azure drive ...
PS /home/andrijana> Register-AzResourceProvider -ProviderNamespace Microsoft.Insights

ProviderNamespace : microsoft.insights
RegistrationState : Registered
ResourceTypes    : {components, components/query, components/metadata, components/metrics...}
Locations        : {East US, South Central US, North Europe, West Europe...}

```

```
Register-AzResourceProvider -ProviderNamespace Microsoft.AlertsManagement
```

```
PS /home/andrijana> Register-AzResourceProvider -ProviderNamespace Microsoft.AlertsManagement

ProviderNamespace : Microsoft.AlertsManagement
RegistrationState : Registered
ResourceTypes    : {alerts, alertsSummary, smartGroups, smartDetectorAlertRules...}
Locations        : {global, North Central US, East US, East US 2...}

PS /home/andrijana>
PS /home/andrijana> █
```

Task 5: Deploy zone-resilient Azure virtual machine scale sets by using the Azure portal

The screenshot shows the 'Create a virtual machine scale set' wizard in the Azure portal. The steps completed are:

- Subscription:** Azure Pass - Sponsorship
- Resource group:** (New) az104-08-rg02
- Scale set details:**
 - Virtual machine scale set name:** az10408vmss0
 - Region:** (Europe) UK South
 - Availability zone:** Zones 1, 2, 3
 - A note about Autoscaling: "Autoscaling can help you respond to an outage by scaling out new instances in another zone. Turn on Autoscaling in the [Scaling tab](#)."
- Orchestration:**
 - Orchestration mode:** Uniform (selected)
 - Flexible:** achieve high availability at scale with identical or multiple virtual machine types
- Security type:** Standard

A note at the bottom left states: "Trusted launch virtual machines are not supported for Azure Automanage. To disable this feature, navigate to the Management tab."

Instance details

Image * ⓘ [See all images](#) | [Configure VM generation](#)

VM architecture ⓘ Arm64 x64
Info: Arm64 is not supported with the selected image.

Run with Azure Spot discount ⓘ

Size * ⓘ [See all sizes](#)

Administrator account

Username * ⓘ

Password * ⓘ

Confirm password * ⓘ

Licensing

Save up to 49% with a license you already own using Azure Hybrid Benefit. [Learn more](#) ⓘ
Would you like to use an existing
Windows Server license? * ⓘ

[Review Azure hybrid benefit compliance](#) ⓘ

Review + create [< Previous](#) [Next : Spot >](#) [Cancel](#) [Save](#)

*On the Networking tab of the Create a virtual machine scale set blade, click the **Create virtual network** link below the Virtual network textbox and create a new virtual network with the following settings (leave others with their default values):*

[Learn more about VMSS networking](#)

Virtual network configuration

Azure Virtual Network (VNet) enables many types of Azure resources to securely communicate with each other, the internet, and on-premises networks. [Learn more about VNet](#)

Virtual network * ⓘ

(New) az104-08-rg02-vnet (recommended)

[Create virtual network](#)

Network interface

A network interface enables an Azure virtual machine to communicate with internet, Azure, and on-premises resources. A VM can have one or more network interfaces.

+ Create new nic Delete

	NAME	CREATE PUBL...	SUBNET	NETWORK SECURI...	ACCELERATED N...	
<input type="checkbox"/>	az104-08-rg02-vnet-ni...	No	default (10.0.0.0/20)	Basic	On	

Load balancing

You can place this virtual machine in the backend pool of an existing Azure load balancing solution. [Learn more](#)

Load balancing options ⓘ

None

Azure load balancer

Supports all TCP/UDP network traffic, port-forwarding, and outbound flows.

Application gateway

Web traffic load balancer for HTTP/HTTPS with URL-based routing, SSL termination, session persistence, and web application firewall.

To allow traffic from your load balancing product, please update the appropriate port configuration on your network security group associated with your network interface.

[Review + create](#)

[< Previous](#)

[Next : Scaling >](#)

Click *Add an inbound rule* and add an inbound security rule with the following settings (leave others with their default values):

Virtual Network service enables Azure resources to securely communicate with each other in a virtual network which is a logical isolation of the Azure cloud dedicated to your subscription. You can connect virtual networks to other virtual networks, or your on-premises network.
[Learn more about virtual networks](#)

Name *	az104-08-rg02-vnet
Resource group *	(New) az104-08-rg02 Create new

Address space

The virtual network's address space specified as one or more address prefixes in CIDR notation (e.g. 10.0.0.0/16).

<input type="checkbox"/> Address range	Addresses	Overlap	
<input type="checkbox"/> 10.82.0.0/20 ✓	10.82.0.4 - 10.82.15.254 (4091 addresses)	None	
	(0 Addresses)	None	

Subnets

The subnet's address range in CIDR notation (e.g. 10.0.0.0/24). It must be contained by the address space of the virtual network.

<input type="checkbox"/> Subnet name	Address range	Addresses	
<input type="checkbox"/> subnet0 ✓	10.82.0.0/24 ✓	10.82.0.4 - 10.82.0.254 (251 addresses)	
	(0 Addresses)		

We Enable the Public IP Address in the Network Interface Settings

Edit network interface ...

Network interface

Name *

az104-08-rg02-vnet-nic01

Virtual network ⓘ

az104-08-rg02-vnet

Subnet * ⓘ

subnet0 (10.82.0.0/24)

NIC network security group ⓘ

- None
- Basic
- Advanced

Configure network security group *

(new) az10408vmss0-nsg

Create new

Public IP address ⓘ

Disabled **Enabled**

Accelerated networking ⓘ

Disabled **Enabled**

Here, I had to create a Load Balancer because a default option was not showing in the dropdown menu

Create a load balancer

X

Details such as subscription and resource group will be inherited from the virtual machine that you're creating. A default IP, backend pool, and load balancer rule will be created on your behalf, though certain configurations can be changed if desired.

Load balancer name *

az10408vmss0-lb

Type * ⓘ

Public

Provides outbound connections for virtual machines inside your virtual network using public load balancers.

Internal

Used to load balance traffic inside a virtual network. A load balancer frontend can be accessed from an on-premises network in a hybrid scenario.

Protocol * ⓘ

TCP

UDP

Rules

Rules

Load balancer rule

Inbound NAT rule

Load balancer rule

A load balancing rule distributes incoming traffic that is sent to a selected IP address and port combination across a group of backend pool instances. Only backend instances that the health probe considers healthy receive new traffic.

Port * ⓘ

80

Create

Cancel

Home > virtual machine scale sets > Create a virtual machine scale set > edit network

Create network security group ...

Name * az10408vmss0-nsg

Inbound rules ⓘ

- 1000: default-allow-ssh
- Any
- SSH (TCP/22)

+ Add an inbound rule

Outbound rules ⓘ

- No results

+ Add an outbound rule

Add inbound security rule az10408vmss0-nsg

Source port ranges * ⓘ * Any

Destination ⓘ Any

Service ⓘ Custom

Destination port ranges * ⓘ 80

Protocol

- Any
- TCP
- UDP
- ICMP

Action

- Allow
- Deny

Priority * ⓘ 1010

Name * custom-allow-http

Description

OK Add Cancel Give feedback

The screenshot shows the 'Add inbound security rule' dialog box. It includes fields for source and destination ports, protocol (TCP selected), action (Allow selected), priority (1010), and a name (custom-allow-http). Buttons at the bottom include OK, Add, Cancel, and Give feedback.

On the Scaling tab of the Create a virtual machine scale set blade, specify the following settings (leave others with their default values) and click Next : Management >:

Basics Spot Disks Networking **Scaling** Management Health Advanced Tags Review + create

An Azure virtual machine scale set can automatically increase or decrease the number of VM instances that run your application. This automated and elastic behavior reduces the management overhead to monitor and optimize the performance of your application. [Learn more about VMSS scaling](#)

Initial instance count * ⓘ

2

Scaling

Scaling policy ⓘ

- Manual
 Custom

Scale-In policy

Configure the order in which virtual machines are selected for deletion during a scale-in operation.
[Learn more about scale-in policies](#)

Scale-in policy

Default - Balance across availability zones and fault domains, then delete V...

Apply force delete to scale-in operations

Set the Initial instance count to 2, and the Scaling policy to Manual.

On the Management tab, we set the Boot diagnostics to Enable with custom storage account and accept the default value for the Diagnostics storage account.

Upgrade policy

Upgrade mode * ⓘ

Manual - Existing instances must be manually upgraded



Monitoring

Boot diagnostics ⓘ

- Enable with managed storage account (recommended)
 Enable with custom storage account
 Disable

Diagnostics storage account * ⓘ

No existing storage accounts in current subscription and location.

[Create new](#)



Identity

Enable system assigned managed identity ⓘ

Azure AD

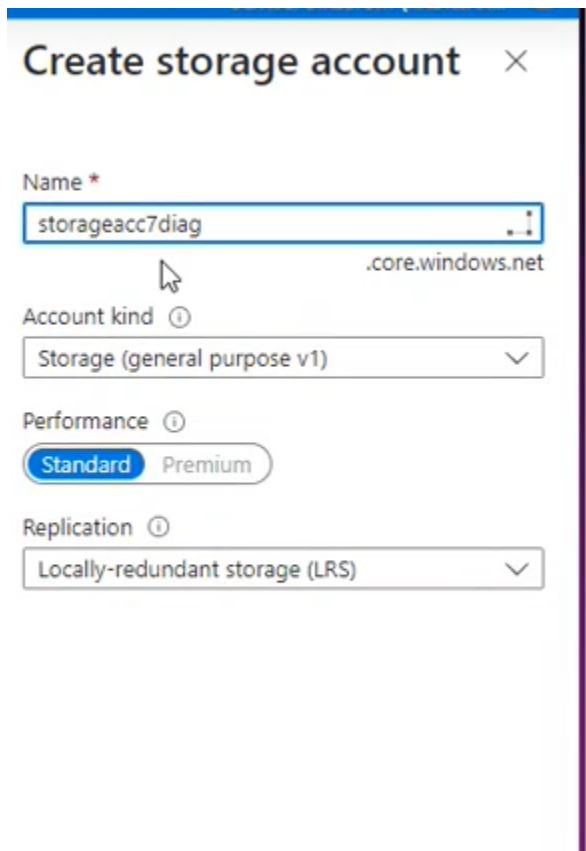
Login with Azure AD ⓘ

ⓘ RBAC role assignment of Virtual Machine Administrator Login or Virtual Machine User Login is required when using Azure AD login. [Learn more](#)

Overprovisioning

With overprovisioning turned on, the scale set actually spins up more VMs than you asked for, then deletes the extra VMs once the requested number of VMs are successfully provisioned. Overprovisioning improves provisioning success rates and reduces deployment time. You are not billed for the extra VMs, and they do not count toward your quota limits.

In this case, I had to create another diagnostics storage account because a default value wasn't showing in the menu.



*Set the **Spreading algorithm** setting to Fixed spreading in the Advanced tab*

Allocation policy

Enable scaling beyond 100 instances

Force strictly even balance across zones

Spreading algorithm Max spreading Fixed spreading (not recommended with zones)

Fault domain count *

Home >

CreateVmss-MicrosoftWindowsServer.WindowsServer-2-20230321174043 | Overview

Deployment

» Delete Cancel Redeploy Download Refresh

✓ Your deployment is complete

Deployment name: CreateVmss-MicrosoftWindowsServer.Windows... Start time: 3/21/2023, 5:52:07 PM
Subscription: Azure Pass - Sponsorship Correlation ID: 2062b9bd-ab2f-45e2-a615-576cc0
Resource group: az104-08-rg02

Deployment details

Next steps

[Go to resource](#)

Give feedback

Tell us about your experience with deployment

Cost Management
Get notified to stay within your budget and prevent unexpected charges on your resources. Set up cost alerts >

Microsoft Defender for Cloud
Secure your apps and infrastructure with threat detection and response.

The deployment is successful.

Task 6: Configure Azure virtual machine scale sets by using virtual machine extensions

We select the storage account we've created previously, and in the Data Storage section, we create a new Container.

Home >

Storage accounts

Default Directory (andrijanasharkoskaoutlook.onmicrosoft.com)

+ Create Restore Manage view Refresh Export to CSV Open query | Assign tags Delete

Filter for any field... Subscription equals all Resource group equals all Location equals all Add filter

Showing 1 to 3 of 3 records.

Name	Type	Kind	Resource group	Location	Subscription
csb10032002887d7e2c	Storage account	StorageV2	cloud-shell-storage-we...	West Europe	Azure Pass - Sponsor
storageacc77diag	Storage account	Storage	az104-08-rg02	UK South	Azure Pass - Sponsor
storageacc7diag	Storage account	Storage	az104-08-rg01	East US	Azure Pass - Sponsor

We set up the name of the container as scripts, and upload the az104-08-install_IIS.ps1 file.

New container X

Name *

scripts ✓

Public access level ⓘ

Private (no anonymous access) ▼

▼ Advanced

On the az10408vmss0 blade, in the Settings section, click Extensions and applications, and the click + Add



az10408vmss0 | Extensions + applications

Virtual machine scale set



Tags



Diagnose and solve problems

Settings



Instances



Networking



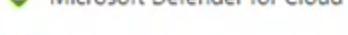
Scaling



Disks



Operating system



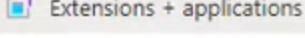
Microsoft Defender for Cloud



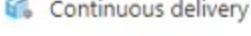
Guest + host updates



Size



Extensions + applications



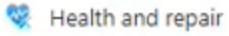
Continuous delivery



Configuration



Upgrade policy



Health and repair



Identity



Properties

<<

Extensions

VM Applications



Add



Refresh



Upgrade



Search to filter items...

Name

No resource extensions found.

Install an Extension

A screenshot of the Azure portal's search interface. A search bar at the top contains the text "custom script extension". Below the search bar, a card displays the "Custom Script Extension" by Microsoft Corp. The card includes a Microsoft logo, the extension name, the developer information, and a brief description: "Custom Script handler extension for Windows". At the bottom of the card is a blue "Load more" button.

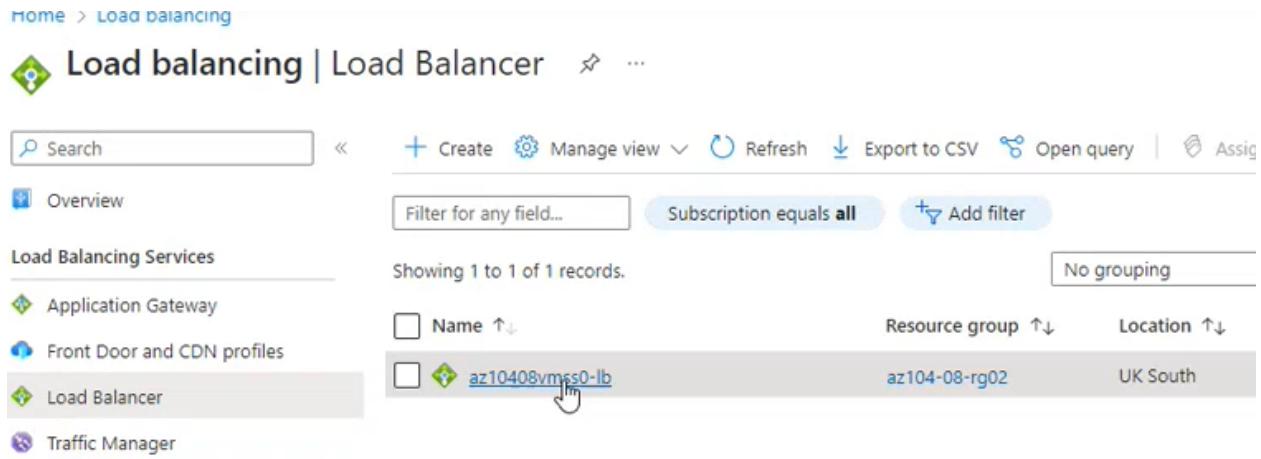
Once the custom script extension is loaded, we click **Next**.

In the **Settings** section of the **az10408vmss0** blade, click **Instances**, select the checkboxes next to the two instances of the virtual machine scale set, click **Upgrade**, and then, when prompted for confirmation, click **Yes**.

A screenshot of the "az10408vmss0 | Instances" blade in the Azure portal. The left sidebar shows navigation options: Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Settings, Instances (selected), and Networking. The main area displays a table of virtual machine instances. The table has columns: Instance, Computer name, Status, Protection policy, Provisioning sta..., and Health sta... The first instance, "az10408vmss0_0", and the second instance, "az10408vmss0_1", are both checked and listed as "Running" and "Succeeded".

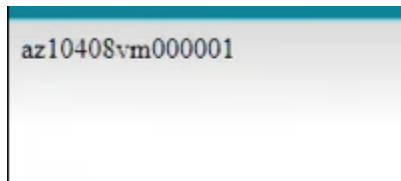
Instance	Computer name	Status	Protection policy	Provisioning sta...	Health sta...
az10408vmss0_0	az10408vm000000	Running		Succeeded	
az10408vmss0_1	az10408vm000001	Running		Succeeded	

In the Azure portal, search for and select Load balancers and, in the list of load balancers, click az10408vmss0-lb.



The screenshot shows the Azure Load Balancing blade. At the top, there's a navigation bar with 'Home > Load balancing'. Below it is a title 'Load balancing | Load Balancer' with a gear icon and three dots. A search bar and several action buttons ('Create', 'Manage view', 'Refresh', 'Export to CSV', 'Open query', 'Assign') are on the right. On the left, a sidebar lists 'Load Balancing Services' with icons: Application Gateway (green diamond), Front Door and CDN profiles (blue cloud), Load Balancer (green diamond), and Traffic Manager (blue globe). The 'Load Balancer' item is selected and highlighted in grey. The main area shows a table with one record: 'az10408vmss0-lb' (selected with a cursor), 'az104-08-rg02' (Resource group), and 'UK South' (Location). There are filters for 'Name' and sorting by 'Resource group' and 'Location'.

On the az10408vmss0-lb blade, note the value of the Public IP address assigned to the frontend of the load balancer, open a new browser tab, and navigate to that IP address.



Task 7: Scale compute and storage for Azure virtual machine scale sets (optional)

We navigate to the **az10408vmss0** blade and resize the **Standard DS1_v2**.

In the Settings section, click Instances, select the checkboxes next to the two instances of the virtual machine scale set, click Upgrade, and then, when prompted for confirmation, click Yes.

Return to the **az10408vmss0 - Instances** blade, click the entry representing the first and second instances and, on the scale set instance blade, note its **Location** (it should be one of the other two zones in the target Azure region into which you deployed the Azure virtual machine scale set)

az10408vmss0_0

Scale set instance

Search Connect Start Restart Stop

Overview

Settings

Networking Connect Disks Properties

Monitoring Insights Metrics

Support + troubleshooting

Essentials

Instance ID	0
Status	Running_1
Location	UK South (Zone 1)
Provisioning state	Succeeded
Latest model applied	Yes
Computer name	az10408vm000000
Fault domains	5

Essentials

Instance ID	1
Status	Running_1 more
Location	UK South (Zone 2)
Provisioning state	Succeeded
Latest model applied	Yes

On the az10408vmss0 - **Scaling** blade, select the **Custom autoscale** option and configure autoscale with the following settings (leave others with their default values)

az10408vmss0 | Scaling

Virtual machine scale set

Choose how to scale your resource

Manual scale

Maintain a fixed instance count

Custom autoscale

Custom autoscale

Autoscale setting name *

az10408vmss0-Autoscale-195

Resource group

az104-08-ra02

Click the + Add a rule link and, on the Scale rule blade, specify the following settings (leave others with their default values):

Setting	Value
Metric source	Current resource (az10408vmss0)
Time aggregation	Average
Metric namespace	Virtual Machine Host

Metric name	Network In Total
Operator	Greater than
Metric threshold to trigger scale action	10
Duration (in minutes)	1
Time grain statistic	Average
Operation	Increase count by
Instance count	1
Cool down (minutes)	5

Scale rule

X

Metric source

Current resource (az10408vmss0)

Resource type

Virtual machine scale sets az10408vmss0

Criteria

Metric namespace *

Virtual Machine Host Network In Total

Metric name

1 minute time grain

Dimension Name	Operator	Dimension Values	Add
VMName	=	All values	+

If you select multiple values for a dimension, autoscale will aggregate the metric across the selected values, not evaluate the metric for each value individually.



Network In Total (Average)

21.99 MB

Enable metric divide by instance count ⓘ

Operator *

Greater than 70

bytes

Duration (minutes) * ⓘ

Time grain (minutes) ⓘ

10 1

Time grain statistic * ⓘ

Time aggregation * ⓘ

Average Average

Autoscale setting name * az10408vmss0-Autoscale-195

Resource group az104-08-rg02

Predictive autoscale Mode Disabled Pre-launch setup of instances (minutes)

Enable Forecast only or Predictive autoscale. [Learn more about Predictive autoscale.](#)

Default* Auto created default scale condition [Edit](#) [Delete](#)

Delete warning i The very last or default recurrence rule cannot be deleted. Instead, you can disable autoscale to turn off autoscale.

Scale mode Scale based on a metric Scale to a specific instance count

Rules i It is recommended to have at least one scale in rule. To create new rules, click [Add a rule](#)

Scale out When az10408vmss0 (Average) Network I... Increase count by 1

+ Add a rule

Instance limits Minimum * 1 Maximum * 3

Default * 1

Schedule This scale condition is executed when none of the other scale condition(s) match

From the **Cloud Shell pane**, run the following to identify the public IP address of the load balancer in front of the Azure virtual machine scale set az10408vmss0.

```
$rgName = 'az104-08-rg02'
```

```
$lbipName = 'az10408vmss0-ip'
```

```
$pip = (Get-AzPublicIpAddress -ResourceGroupName $rgName -Name $lbipName).IpAddress
```

```
PS /home/andrijana> code .
PS /home/andrijana> $lbipName = 'az10408vmss0-lb-publicip'
PS /home/andrijana> |
```

```
while ($true) { Invoke-WebRequest -Uri "http://$pip" }
```

```
StatusDescription : OK
Content          : az10408vm000002

RawContent       : HTTP/1.1 200 OK
Accept-Ranges: bytes
ETag: "641e29f3175cd91:0"
Server: Microsoft-IIS/10.0
Date: Tue, 21 Mar 2023 17:11:01 GMT
Content-Type: text/html
Last-Modified: Tue, 21 Mar 2023 17:09:51 GMT
Content-Length: 17
RelationLink    : { }

Headers          : {[Accept-Ranges, System.String[]], [ETag, System.String[]], [Server, System.String[]], [Date, System.String[]]...}
Images           : {}
InputFields      : {}
Links            : {}
RawContentLength: 17
RelationLink    : { }
```

Minimize the Cloud Shell pane but do not close it, switch back to the az10408vmss0 - Instances blade and monitor the number of instances

Instance	Computer name	Status	Protection policy	Provisioning sta...	Health stat...
az10408vmss0_0	az10408vm000000	Running		Succeeded	
az10408vmss0_1	az10408vm000001	Running		Succeeded	
az10408vmss0_2	az10408vm000002	Running		Succeeded	

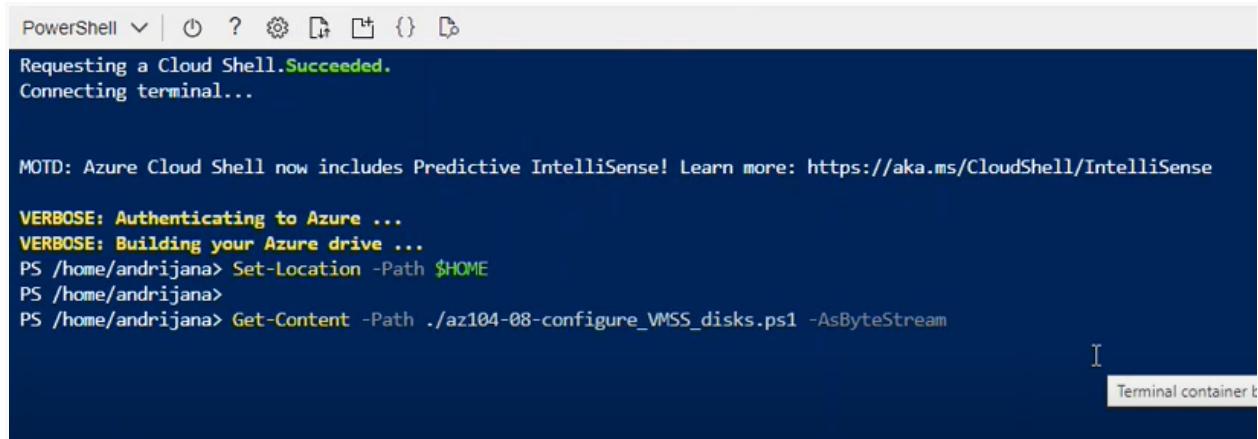
On the az10408vmss0 blade, in the **Settings** section, click **Disk**, click **+ Create and attach a new disk**, and attach a new managed disk with the following settings (leave others with their default values)

LUN	Storage type	Size (GiB)	Max IOPS	Max throughput (MB/s)	Encryption
0	Standard HDD (...)	32	500	60	Platform-managed

From the Cloud Shell pane, run the following to display the content of the script:

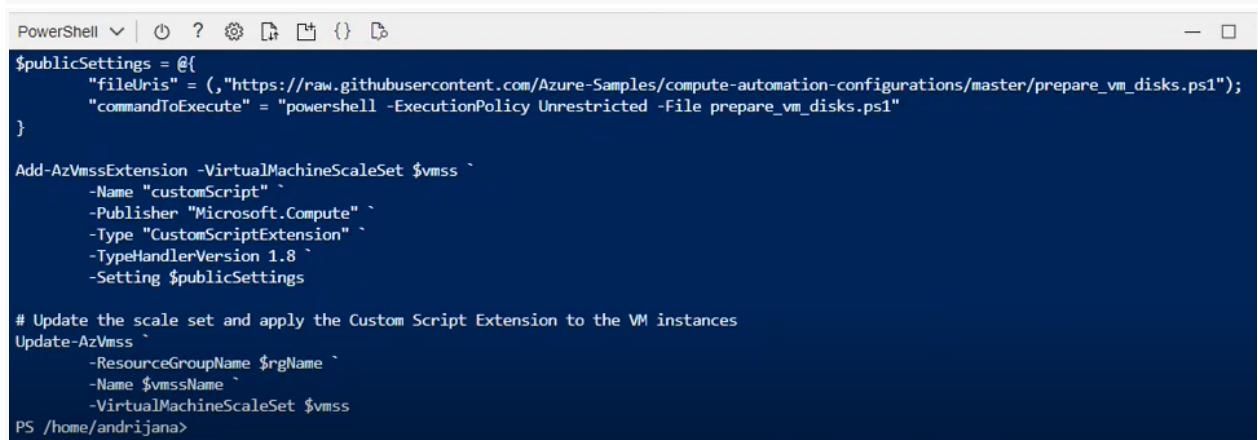
```
Set-Location -Path $HOME
```

```
Get-Content -Path ./az104-08-configure_VMSS_disks.ps1
```



The screenshot shows the Azure Cloud Shell interface. At the top, it says "Requesting a Cloud Shell. Succeeded." and "Connecting terminal...". Below that is the MOTD message: "MOTD: Azure Cloud Shell now includes Predictive IntelliSense! Learn more: https://aka.ms/CloudShell/IntelliSense". The main area shows the PowerShell command history and output:

```
VERBOSE: Authenticating to Azure ...
VERBOSE: Building your Azure drive ...
PS /home/andrijana> Set-Location -Path $HOME
PS /home/andrijana> Get-Content -Path ./az104-08-configure_VMSS_disks.ps1 -AsByteStream
```



The screenshot continues the PowerShell session. It shows the definition of a variable \$publicSettings containing a hashtable with fileUri and commandToExecute properties. Then, it runs the Add-AzVmssExtension cmdlet to add a custom script extension to a VirtualMachineScaleSet named \$vmss. Finally, it runs the Update-AzVmss cmdlet to apply the changes to the scale set.

```
$publicSettings = @{
    "fileUris" = ("https://raw.githubusercontent.com/Azure-Samples/compute-automation-configurations/master/prepare_vm_disks.ps1");
    "commandToExecute" = "powershell -ExecutionPolicy Unrestricted -File prepare_vm_disks.ps1"
}

Add-AzVmssExtension -VirtualMachineScaleSet $vmss ` 
    -Name "customScript" ` 
    -Publisher "Microsoft.Compute" ` 
    -Type "CustomScriptExtension" ` 
    -TypeHandlerVersion 1.8 ` 
    -Setting $publicSettings

# Update the scale set and apply the Custom Script Extension to the VM instances
Update-AzVmss ` 
    -ResourceGroupName $rgName ` 
    -Name $vmssName ` 
    -VirtualMachineScaleSet $vmss
PS /home/andrijana>
```