# Lab Answer Key: Module 3: Implementing Azure virtual machines

# Lab: Deploying Azure virtual machines

## Exercise 1: Creating virtual machines by using the Azure portal and Azure PowerShell

#### Task 1: Use the Azure portal to create a virtual machine

1. Ensure that you are signed in to MIA-CL1 as **Student** with the password **Pa55w.rd**.
2. Start Microsoft Edge, browse to [**https://portal.azure.com**](https://portal.azure.com), and sign in by using the Microsoft account that is the Service Administrator of your Azure subscription.
3. In Microsoft Edge, in the Azure portal, click **+ Create resource**, click **Compute**, and then click **Windows Server 2016 Datacenter**.
4. On the Basics blade, specify the following:

* Subscription: the name of your Azure subscription
* Resource group : click **Create new** and, in the **Name** box below, type **20533E0301-LabRG**.
* Virtual Machine name: **20533E03labVM1**
* Region : In the drop-down list, select an Azure region close to the location of your lab , in which you can provision Azure VMs
* Availabitlity options : **Availability Set**
* Availability Set : click **Create new** and in the **Create new** Blade :
  + Name : **20533E0301-db-avset**
  + Fault domains : **2**
  + Update domains : **5**
  + Use managed disks : **Yes(Aligned)** and click **OK**
* Image : **Windows Server 2016 Datacenter**
* Size : click **Change size** and
  + click the cross near **Premium disk : Supported** to remove this filter
  + Wait for the list to update
  + Select the **D1\_v2** line
  + click **Select**
* Username : **Student**
* Password (and Confirm Password) : **Pa55w.rd1234**
* VM disk type: **HHD**
* Public inbound ports : **Allow selected ports**
* Select inbound ports : **RDP**

1. Click **Next : Disks >** and select **Standard HDD** for "OS disk type"
2. click **Next : Networking >** and specify the following :

* Virtual network : click **Create new**
* On the "Create virtual network blade" use the following values and click **OK**
  + Name : **20533E0301-labVNet**
  + Address Space : **10.0.0.0/20**
  + Subnet name : **database**
  + Subnet address range : **10.0.0.0/24**
* Leave the default other values

1. click **Review + create**
2. On the "Create a virtual machine" blade, click **Create**.
3. Wait for the deployment to complete successfully.
4. Leave the Microsoft Edge with the Azure portal window open.

#### Task 2: Use Azure PowerShell to create a virtual machine

1. On MIA-CL1, click **Start**, in the Start menu, expand the **Windows PowerShell** folder, right-click **Windows PowerShell ISE**, click **More**, and then click **Run as administrator**. When prompted by User Account Control for confirmation, click **Yes**.
2. In the Windows PowerShell Integrated Scripting Environment (ISE) window, open the **New-20533E03labVM2.ps1** script located in **F:\Labfiles\Lab03\Starter\**.
3. In the Windows PowerShell ISE window, review the content of the script.
4. In the Windows PowerShell ISE window, click the **Run Script** icon or press F5.
5. When prompted, sign in using the Microsoft account that is the Service Administrator of your Azure subscription.
6. If you have multiple subscriptions, select the one you used when running **Add-20533EEnvironment** at the beginning of this module.
7. When the script is complete, leave the Windows PowerShell ISE window open.

**Result**: After completing this exercise, you have created virtual machines by using the Azure portal and Azure PowerShell.

## Exercise 2: Validating virtual machine creation

#### Task 1: Use Azure PowerShell to validate virtual machine deployment

1. In the Windows PowerShell ISE window, at the command prompt, type the following command, and then press Enter:

Get-AzureRmVM -ResourceGroupName $rgName

1. Confirm that the 20533E03labVM1 and the 20533E03labVM2 virtual machines are listed.
2. Close the Windows PowerShell ISE window.

#### Task 2: Use the Azure portal to validate virtual machine deployment

1. On MIA-CL1, switch to Microsoft Edge.
2. In the Microsoft Edge window, in the Azure portal, in the Hub menu, click **Resource groups**.
3. On the Resource groups blade, click **20533E0301-LabRG**.
4. On the 20533E0301-LabRG blade, review the list of resources associated with both virtual machines.
5. In the Hub menu, click **Virtual machines**.
6. On the Virtual machines blade, click **20533E03labVM1**.
7. On the 20533E03labVM1 blade, confirm the following values:

* Resource group: **20533E0301-LabRG**
* Virtual network/subnet: **20533E0301-labVNet/database**

1. Repeat steps 6 and 7 for the **20533E03labVM2** virtual machine.

**Result**: After completing this exercise, you should have validated the configuration of Azure virtual machines.

## Exercise 3: Use Visual Studio and an Azure Resource Manager template to deploy Azure Resource Manager virtual machines

#### Task 1: Use Visual Studio to deploy Linux app servers Azure VMs

1. On MIA-CL1, click **Start** and, in the Start menu, click **Visual Studio 2017**. If prompted with the message that the evaluation period has ended, click the **Sign in** and provide the Microsoft account that is the Service Administrator of your Azure subscription. Next, click **Close**.
2. In Visual Studio, click **File**, click **Open**, click **Project/Solution**, and then browse to **F:\Labfiles\Lab03\Starter\Projects\ResDevLinuxDeploy**.
3. In the Open Project dialog box, click **ResDevLinuxDeploy.sln**, and then click **Open**. If prompted, in the Security Warning for ResDevLinuxDeploy dialog box, clear the checkbox **Ask me for every project in this solution** and click **OK**.
4. In Visual Studio, in the Solution Explorer window, expand **Templates**, and then click **azuredeploy.json**. This will display the content of the Azure Resource Manager template.
5. View the content of the parameters and variables section of the template in the central window pane and in the **JSON Outline** window.
6. In the Solution Explorer pane, right-click **ResDevLinuxDeploy**, click **Deploy**, and then click **New**.
7. In the Deploy to Resource Group window, ensure that the target subscription appears in the **Subscription** drop-down list.
8. In the Deploy to Resource Group window, click the **Resource Group** drop-down box, and then click **20533E0301-LabRG**.
9. In the Deploy to Resource Group window, click **Edit Parameters**.
10. In the Edit Parameters window, specify the parameter values according to details in the following list:

* vmName: **20533E03LabVM3**
* adminUsername: **Student**
* adminPassword: **Pa55w.rd1234**
* virtualNetworkName: **20533E0301-LabVNet**
* resourceGroupName: **20533E0301-LabRG**
* subnetName: **app**
* subnetPrefix: **10.0.1.0/24**
* vmSize: set the value to the same Azure VM size you used when you provisioned an Azure VM from the Azure portal
* ubuntuOSVersion: specify **18.04-LTS** or a more recent version if available
* storageAccountType: **Standard\_LRS**

1. In the Edit Parameters window, ensure that the **Save passwords** check box is enabled and then click **Save**.
2. In the Deploy to Resource Group window, click **Deploy**. > **Note:** Deployment will run with the progress displayed in the Output pane. You can determine when a deployment is complete based on a message stating the template was deployed successfully to the resource group 20533E0301-LabRG.
3. In the Solution Explorer pane, expand the **Templates** folder and click **Azuredeploy.parameters.json**. In the main window pane, notice that the parameters that you entered in the first deployment are saved in this file. You can reuse these parameters for the deployment of the second app server.
4. In the Solution Explorer pane, right-click **ResDevLinuxDeploy**, click **Deploy**, and then click **20533E0301-LabRG**.
5. In the Deploy to Resource Group window, click **Edit Parameters**.
6. In the Edit Parameters window, in the vmName **Value** box, type **20533E03LabVM4**, and then click **Save**.
7. In the Deploy to Resource Group window, click **Deploy**. > **Note:** Deployment will run with the output that appears in the Output pane, which is at the bottom of the window. When deployment is complete, you will receive a message stating the template was deployed successfully to the resource group 20533E0301-LabRG.
8. In the Visual Studio, click **File** and then on the drop-down menu, click **Close Solution**.
9. Leave Visual Studio open.

#### Task 2: Use Azure PowerShell to validate the deployment of the app servers Azure VMs

1. On MIA-CL1, click **Start**, in the Start menu, expand the **Windows PowerShell** folder, right-click **Windows PowerShell ISE**, click **More**, and then click **Run as administrator**. When prompted by User Account Control for confirmation, click **Yes**.
2. In the Windows PowerShell Integrated Scripting Environment (ISE), in the console pane, type the following cmdlet and then press Enter:

Add-AzureRmAccount

1. In the sign-in windows that appears, sign in by using the Microsoft account that is the Service Administrator of your Azure subscription.
2. If you have multiple subscriptions associated with your Microsoft account, to identify the subscription in which you are going to create a virtual network, type the following command, and then press Enter:

Get-AzureRmSubscription

1. Note the value of the ***Id*** property for each subscription in the output of the previous command. To specify the subscription in which you are going to create a virtual network, type the following commands, and then press Enter (replace ***SubscriptionId*** with the actual SubscriptionId property of that subscription):

Set-AzureRmContext -SubscriptionId 'SubscriptionId'

1. Type the following cmdlet, and then press Enter:

Find-AzureRmResource -ResourceGroupNameContains 20533E0301-LabRG | Format-Table -Property Name, ResourceType

**Note** If you are using AzureRM 6.8.1 you need to use **Get-AzureRmResource** cmdlet instead:

Get-AzureRmResource -ResourceGroupName 20533E0301-LabRG | Format-Table -Property Name, ResourceType

1. In the cmdlet output, note the resources created in this exercise including virtual machines, disks, NICs, public IPs, and a storage account.
2. Leave the Windows PowerShell ISE window open for the next exercise.

**Result**: After completing this exercise, you should have deployed an Azure VM by using Visual Studio and an Azure Resource Manager template.

## Exercise 4: Using Azure PowerShell and an Azure Resource Manager template to deploy Azure VMs

#### Task 1: Use Azure PowerShell to deploy the Windows virtual machines

1. In the Windows PowerShell ISE window, click **File**, and then click **Open**.
2. In the **Open** dialog box, navigate to the **F:\Labfiles\Lab03\Starter\Templates** folder.
3. Click **Deploy-AzureResourceGroup.ps1**, and then click **Open**.
4. In the Windows PowerShell ISE window, review the script that will deploy the template.

**Note:** Note the $templateFile and $rgName variables. These represent the location of the Azure Resource Manager template file and the resource group to which you will deploy the virtual machines.

1. Switch to Visual Studio and click **File**, click **Open**, and then click **File**.
2. In the **Open File** dialog box, navigate to the **F:\Labfiles\Lab03\Starter\Templates** folder.
3. Click **azuredeploywebvm.json**, and then click **Open**.

**Note:** Note that the template has a very similar structure to the template for the Linux virtual machines in the previous exercise. The primary differences between the two templates include the variables identifying the operating system image, the target subnet, and the availability set. You could replace these variables with equivalent parameters, in order to minimize the number of templates used to deploy Azure VMs.

1. Close Visual Studio.
2. Switch back to the Windows PowerShell ISE window and run the **Deploy-AzureResourceGroup.ps1** script. When prompted, provide the following values for the parameter prompts, pressing Enter after each value:

* vmName: **20533E03LabVM5**
* adminUsername: **Student**
* adminPassword: **Pa55w.rd1234**
* virtualNetworkName: **20533E0301-LabVNet**
* vmSize: **as indicated by the instructor**

#### Task 2: Use the Azure portal to monitor deployment

1. To monitor the progress of the deployment, in Microsoft Edge, in the Azure portal, on the Hub menu, click **Resource groups**.
2. On the Resource groups blade, click **20533E0301-LabRG**.
3. On the 20533E0301-LabRG blade, in the Settings section, click the **Deployments** link.
4. On the 20533E0301-LabRG - Deployments blade, click the **WebTierVM1-Deployment** link.

#### Task 3: Use the Azure portal to validate deployment of the Windows virtual machine

1. In Microsoft Edge, in the Azure portal, navigate back to the **20533E0301-LabRG** blade.
2. On the 20533E0301-LabRG blade, in the Overview section, view the list of resources.
3. On the Resources blade, click **20533E03LabVM5**.
4. On the 20533E03LabVM5 blade, in the Essentials section, note that 20533E03LabVM5 has been assigned to the **20533E0301-LabVNet/web** virtual network/subnet, and the operating system is **Windows**.

**Result**: After completing this exercise, you should have deployed Azure Virtual Machines by using Azure PowerShell and Resource Manager templates.

## Exercise 5: Using Azure CLI and an Azure Resource Manager template to deploy Azure VMs

#### Task 1: Use Azure CLI to deploy the Windows virtual machines

1. On MIA-CL1, click **Start**, in the Start menu, expand the **Windows System** folder, right-click **Command Prompt**, click **More**, and click **Run as administrator**. When prompted by User Account Control for confirmation, click **Yes**.
2. From **Administrator: Command Prompt**, type the following command and then press Enter:

az login

1. You will be presented with the message instructing you to open a browser at the page [**https://aka.ms/devicelogin**](https://aka.ms/devicelogin) and provide the code included in the message to authenicate. Start Microsoft Edge and browse to [**https://aka.ms/devicelogin**](https://aka.ms/devicelogin).
2. On the **Device Login** page, type the code included in the message. This will identify Microsoft Azure Cross-platform Command Line Interface as the application publisher. Click **Continue**.
3. In the sign-in windows that appears, sign in by using the Microsoft account that is the Service Administrator of your Azure subscription.
4. Note the message stating that you have signed in to the Microsoft Azure Cross-platform Command Line Interface application on your device. Close the Microsoft Edge window.
5. If you have multiple subscriptions associated with your Microsoft account, to identify the subscription in which you are going to create a virtual network, type the following command, and then press Enter:

az account show

1. Note the value of the ***Id*** property for each subscription in the output of the previous command. To specify the subscription in which you are going to create a virtual network, type the following commands, and then press Enter (replace ***SubscriptionId*** with the actual SubscriptionId property of that subscription):

az account set --subscription "SubscriptionId"

1. To deploy an Azure VM based on the same template you used in the previous exercise by using Azure CLI, from **Administrator: Command Prompt**, type the following command and then press Enter:

az group deployment create --name "WebTierVM2-Deployment" --resource-group "20533E0301-LabRG" --template-file "F:\Labfiles\Lab03\Starter\Templates\azuredeploywebvm.json" --parameters vmName=20533E03LabVM6 virtualNetworkName=20533E0301-LabVNet

1. When prompted to provide securestring value for **adminUsername**, type **Student** and press **Enter**.
2. When prompted to provide securestring value for **adminPassword**, type **Pa55w.rd1234** and press **Enter**.
3. When prompted to provide value for **vmSize**, type vmSize as indicated by the instructor and press **Enter**.

#### Task 2: Use the Azure portal to monitor deployment

1. To monitor the progress of the deployment, in Microsoft Edge, in the Azure portal, on the Hub menu, click **Resource groups**.
2. On the Resource groups blade, click **20533E0301-LabRG**.
3. On the 20533E0301-LabRG blade, in the Settings section, click the **Deployments** link.
4. On the 20533E0301-LabRG - Deployments blade, click the **WebTierVM2-Deployment** link.

#### Task 3: Use the Azure portal to validate deployment of the Windows virtual machine

1. In Microsoft Edge, in the Azure portal, navigate back to the **20533E0301-LabRG** blade.
2. On the 20533E0301-LabRG blade, in the Overview section, view the list of resources.
3. On the Resources blade, click **20533E03LabVM6**.
4. On the 20533E03LabVM6 blade, in the Essentials section, note that 20533E03LabVM6 has been assigned to the **20533E0301-LabVNet/web** virtual network/subnet, and the operating system is **Windows**.

#### Task 4: Remove the lab environment

1. On MIA-CL1, close all open windows without saving any files.
2. On the taskbar, right-click the **Windows PowerShell** icon, and then click **Run as Administrator**. In the User Account Control dialog box, click **Yes**.
3. Type the following command, and then press **Enter**:

Remove-20533EEnvironment

1. When prompted, sign in by using the Microsoft account that is the Service Administrator of your Azure subscription.
2. If you have multiple Azure subscriptions, select the one you want the script to target.
3. If prompted, specify the current lab number.
4. When prompted for confirmation, type **y**.
5. Start Microsoft Edge, browse to the Azure portal at [**https://portal.azure.com**](https://portal.azure.com), and sign in by using the Microsoft account that is the Service Administrator of your Azure subscription.
6. In the Azure portal, on Dashboard, click **Edit**.
7. Right-click unoccupied area of the dashboard and, in the right-click menu, click **Reset to default state**. When prompted to confirm, click **Yes**.
8. Click **Done customizing**.
9. Close all open windows.

**Result**: After completing this exercise, you should have deployed Azure Virtual Machines by using Azure CLI and Resource Manager templates.

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