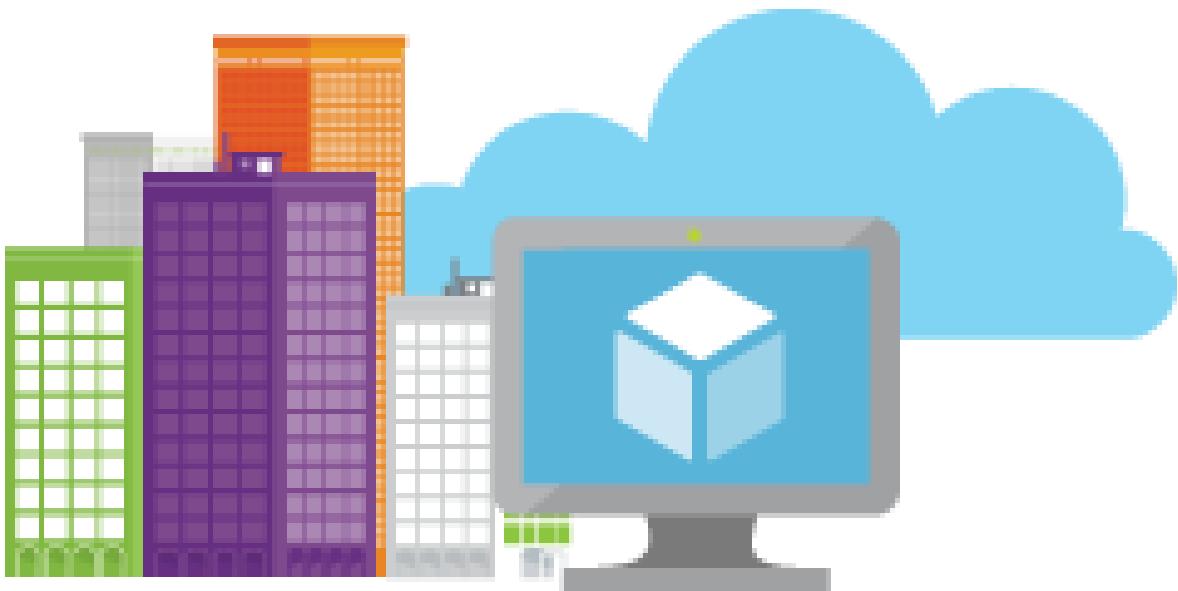


MICROSOFT AZURE INFRASTRUCTURE STEP BY STEP



Abstract

This document includes step by step guide for Implementing Microsoft Azure components including virtual machines, virtual network, storage and websites.



Mai Ali
MVP System Center Cloud
and Data Center Management



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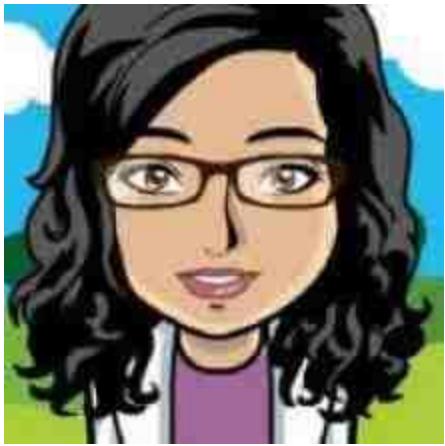
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Mai Ali is a Senior Infrastructure Consultant, with a strong focus in Microsoft, virtualization, Management solution and Unified Communications area. Over 5 years' study and hands on experience delivering small to large-scale projects for different industries, mainly based on Microsoft and other leading-edge technologies, systems applications and operations running on top of them. She has Broad and mixed technical background in infrastructure and communications field, systems integration, Systems Management, security, as well as an in-depth understanding of the business of computing and networking. Currently her main tasks are Architectural design and delivery of Microsoft

environments, with specific focus on multi-vendor UC solutions, based on Microsoft System Center 2007, Microsoft System Center 2012/1610, Microsoft Lync 2013 with Enterprise Voice, Office 365, Microsoft Enterprise Mobility Suite, Microsoft Operations Management Suite, Exchange Unified Messaging, migrations from Lync 2010 and OCS 2007, load balancers, reverse proxy, firewall, Exchange UM.

Mai Ali has various [Technology Certifications and Awards](#): **Microsoft Valuable Professional System Center Cloud and Data Management, Microsoft Certified Solutions Expert** (Communication, Server Infrastructure, Private Cloud, and Messaging), **MCITP** (Office 365 Administrator), **MCITP** (Enterprise Administrator Windows 2008), MCITP (Enterprise Messaging Administrator), **MCITP** (Lync Server 2010 Administrator), **Microsoft Certified Systems Engineer** (Security, Messaging) Windows 2003, **MCSA** (Office 365, Windows 2012), **MCSA** Windows 2008, **MCSA** (Security) Windows 2003, **Citrix Certified Professional - Virtualization, Cisco Certified Network Professional, Red Hat Certified Engineer, STS** Symantec Enterprise Vault 10.0 for Exchange and **Symantec Certified Professional Program Data Protection**.

Mai Ali has been very involved with Windows Server based virtualization, communication and Management solutions including Microsoft System Center, Microsoft Lync, Enterprise Mobility and Office 365. She is currently a prolific blogger at <http://expertslab.wordpress.com> and has done many Scripts for automatic configuration on Microsoft TechNet Gallery. Mai likes giving back via community forums: She has contributed thousands of posts to Microsoft System Center, Microsoft Lync and Experts-Exchange community forums over the years.

Mai Ali's Blog: <http://expertslab.wordpress.com>

Chapter 1

Definition for Microsoft Azure

What is Microsoft Azure?

Microsoft Azure is a comprehensive set of cloud platform that enables you to quick build, deploy and manage applications across a global network of Microsoft-managed datacenters. It provides cloud based servers, networks, storage and services. Azure deliver many of services. Some of the major services are listed under:

- **Azure Virtual Machines** is one of several types of on-demand, scalable computing resources that Azure offers. Azure Virtual Machines provide you with an operating system, storage, and networking capabilities and can run a wide range of applications.
- **Azure Content Delivery Network (CDN)** caches static web content at strategically placed locations to provide maximum throughput for delivering content to users. The CDN offers developers a global solution for delivering high-bandwidth content by caching the content at physical nodes across the world.
- **Azure Storage** is a Microsoft-managed cloud service that provides storage that is highly available, secure, durable, scalable, and redundant. Azure Storage consists of three data services: Blob storage, File storage, and Queue storage.
- **Azure SQL Database** is a managed cloud database for application developers. It is a fully managed database-as-a-service built on SQL. The service is useful in scenarios where you want the power of a relational database without the infrastructure and management hassles.
- **Azure Active Directory Domain Services** use to join Azure virtual machines to a domain, without having to deploy domain controllers. Sign in to the virtual machines using their corporate Azure Active Directory credentials and seamlessly access resources. Use Group Policy to more securely administer domain-joined virtual machines—a familiar way to apply and enforce security baselines on all of your Azure virtual machines.
- **Azure App Service** is a cloud service that's designed to solve the practical problems that engineers face today. App Service focuses on providing superior developer productivity without compromising on the need to deliver applications at cloud scale. App Service also provides the features and frameworks that are necessary for creating enterprise line-of-business applications while supporting developers with the most popular development languages (such as Microsoft .NET, Java, PHP, Node.js, and Python). Azure App Service offers several app types and capabilities:
 - **Web apps:** web based applications that can scale with business requirements
 - **Mobile Apps:** mobile applications that can run on any device

- **Logic apps:** For automating business processes and integrating systems and data across clouds without writing code.
- **API apps:** For hosting RESTful APIs that other services can leverage, such as in IoT scenarios
- **Functions:** Event based development and deployment, allowing you to define functions that trigger specific events in App Services, such as spinning up an application under specific circumstances, reducing overall costs

Why Microsoft Azure?

Microsoft Azure is Microsoft's cloud-based application platform for developing, managing, and hosting applications off-site. Azure has made significant advances over the years. It now offers a set of features and capabilities far surpassing its competitors. The following are some important aspects wherein Azure scores over AWS:

- **Trust the cloud that helps protect your work** - To protect your organization, Azure embeds security, privacy, and compliance into its [development methodology](#), and has been recognized as the most trusted cloud for [U.S. government institutions](#), earning a [FedRAMP](#) High authorization that covers 18 Azure services. In addition, [Azure IP Advantage](#) provides best-in-industry intellectual property protection, so you can focus on innovation, instead of worrying about baseless lawsuits.
- **Reduce risk and complexity with real hybrid consistency** - Optimize your existing assets by taking a hybrid approach to the cloud. Azure offers [hybrid consistency](#) everywhere—in [application development](#), [security and management](#), [identity management](#), and across the data platform. This helps reduce the risk and cost of a hybrid cloud environment by enabling a common set of skills and offering portability of applications and workloads. Plus, save up to 40 percent when migrating Windows Server virtual machines to Azure using the [Azure Hybrid Benefit](#).
- **Expand globally with the most regions** - Achieve global scale with [44 announced Azure regions](#)—more than any other cloud provider. Our priority on geographic expansion means you can choose the datacenter and region that's right for you and your customers, with the performance and support you need, where you need it.
- **Build faster with the leading cloud platform** - Rely on the only cloud provider recognized in the industry as having leading solutions in infrastructure as a service (IaaS), software as a service (SaaS), and platform as a service (PaaS)—in fact, according to this [Forrester Total Economic Impact study](#), you'll be more productive and increase your ROI with Azure PaaS services. Turn your ideas into solutions faster with more than 100 services, end-to-end management experiences, and app delivery with agile development practices.
- **Use any development tool or language** - Develop and build the way you want in Azure, with your choice of [tools, applications, and frameworks](#), like Jenkins and Chef. As a leading [open source contributor](#) on GitHub.
- **Easily implement ready-to-use IoT** - Quickly start with the most common [Internet of Things \(IoT\) scenarios](#), such as remote monitoring and predictive maintenance, using

preconfigured solutions in [Azure IoT Suite](#). Get the most comprehensive portfolio of IoT solutions, ranging from device and edge to data and the cloud, with Azure IoT. It's open and customizable by design, and 46 percent of Azure Certified for IoT devices run on Linux, Android, or other open source technologies.

- **Manage and optimize cloud spend with a complete cost management solution -** Optimize your cloud resources, manage departmental budgets, and allocate costs with free Azure Cost Management. Drive accountability through cost allocation and chargeback reports. Maximize resource utilization by right-sizing virtual machines and visualizing the cost-benefits of various purchasing options that Azure offers.

Chapter 2

Azure Virtual Network

Azure virtual networks define an organization's network in the cloud, where the administrators can have full control over IP address assignments, name resolution, security settings, and routing rules.

Implement and Manage Virtual Networks

An Azure virtual network is a representation of your own network in the cloud. The organization that provisions the virtual network fully controls the IP address blocks, DNS settings, security groups and route tables within the network. The virtual network can be segmented into as many subnets as are required to support the workload.

Creating Virtual Networks

In this exercise, you will create a new virtual network and deploy a virtual machine to each network

Task 1: Assign Static IP address

In this exercise, you will assign a static IP address to an existing Windows Server 2012 R2 VM using PowerShell. By default, all VMs have dynamic IP addresses. You can use a static IP address for specific use cases such as building a domain controller.

1. Navigate to the Azure Portal and sign in, then click virtual machine.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu is open, with 'Virtual machines' selected under the 'Compute' category. The main content area is titled 'Virtual machines' and shows a message: 'No Virtual machines to display'. Below this message, there is a link to 'Create a virtual machine'.

2. On the Hub menu, click **Add**.

This screenshot is identical to the one above, but the 'Add' button in the top-left corner of the main content area is highlighted with a blue rectangle, indicating it is the next step to be clicked.

3. On the New blade, search for **Server 2012**. In the search results, click **Windows Server 2012 Datacenter**.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure Compute Virtual machines blade. On the left, there's a sidebar with various service icons like App Services, Function Apps, SQL databases, etc. The main area has a search bar at the top with the placeholder 'Search resources, services and docs'. Below it, there's a 'Virtual machines' section with a 'NAME' column and a search input 'Filter by name...'. A large icon of a computer monitor with a cube on it is displayed. Below the icon, it says 'No Virtual machines to display'. There are links to 'Create a virtual machine' and 'Learn more about Windows virtual machines'. To the right, there's a 'Compute' section with a search bar 'Search resources, services and docs' and a results table. The table has columns for 'NAME', 'PUBLISHER', and 'C'. It lists several Windows Server versions: Windows Server 2016 Datacenter, Windows Server 2012 R2 Datacenter, Windows Server 2012 Datacenter, Windows Server 2016 - Nano Server, IIS on Windows Server 2016, Windows Server, version 1709, and [smalldisk] Windows Server 2016 Datacenter.

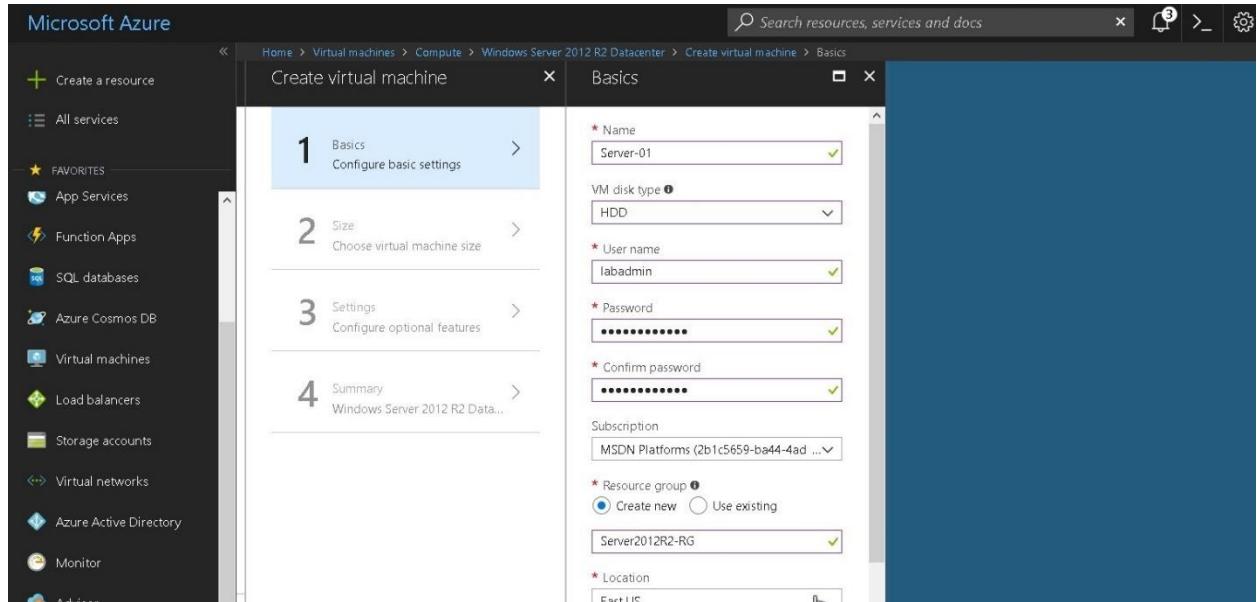
4. On the Windows Server 2012 R2 Datacenter blade, notice the default deployment model is set to Resource Manager. Click **Create**.

The screenshot shows the Microsoft Azure Marketplace blade for Windows Server 2012 R2 Datacenter. The left sidebar is identical to the previous screenshot. The main area shows a list of virtual machine images. One image, 'Windows Server 2012 R2 Datacenter', is highlighted. The right side of the screen displays detailed information about this image, including its publisher (Microsoft), category (Recommended), and a brief description: 'Windows Server 2012 R2 Datacenter edition off applications and workloads. This image include'. Below this, there are sections for 'Legal Terms' and social sharing links (Twitter, Facebook, LinkedIn, YouTube, Google+, Email). At the bottom, there are links for 'PUBLISHER' (Microsoft) and 'USEFUL LINKS' (Document, What's New).

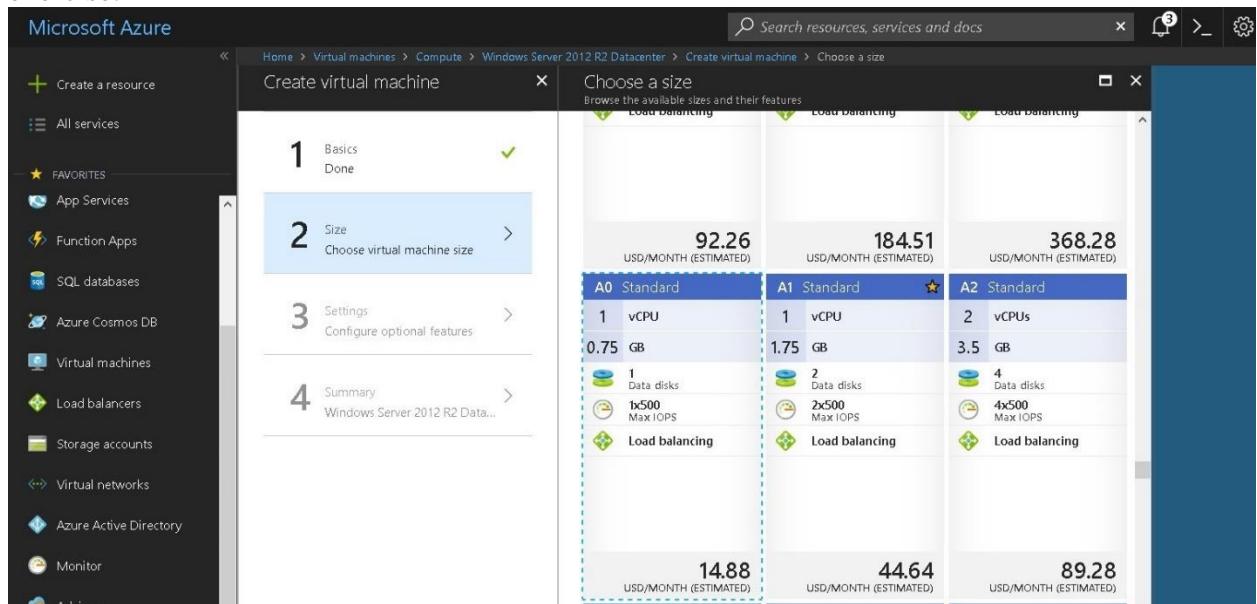
5. On the Create Virtual Machine blade, fill in the following values for basic settings (substituting your information for the user name, subscription, and location) and click **OK**.

- Name: **Server-01**
- VM disk type: **HDD**
- User name: <Your first name>
- Password: **Pa\$\$w0rd12345**
- Subscription: <Your subscription>
- Resource group: **Create a new one named “Server2012R2-RG”**
- Location: <Your location>

Microsoft Azure Infrastructure step by step

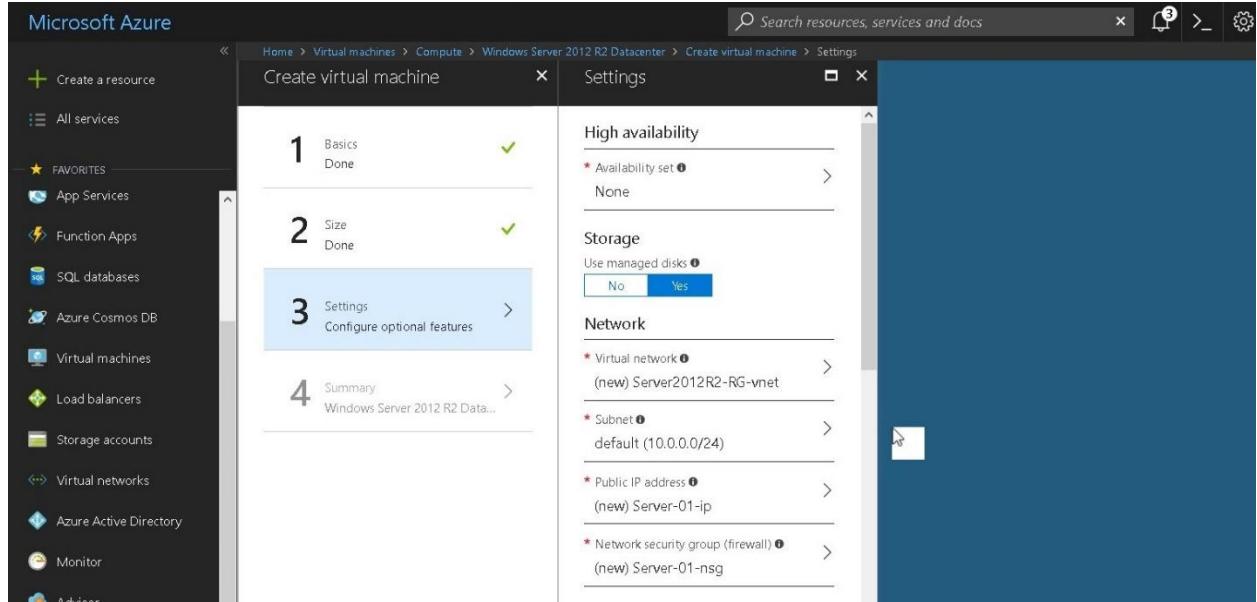


6. On the Choose a size blade, click **View all**. Click the **A0 Standard** size and then click **Select**. Note that we are choosing a larger size VM to support multiple NICs in a later exercise.

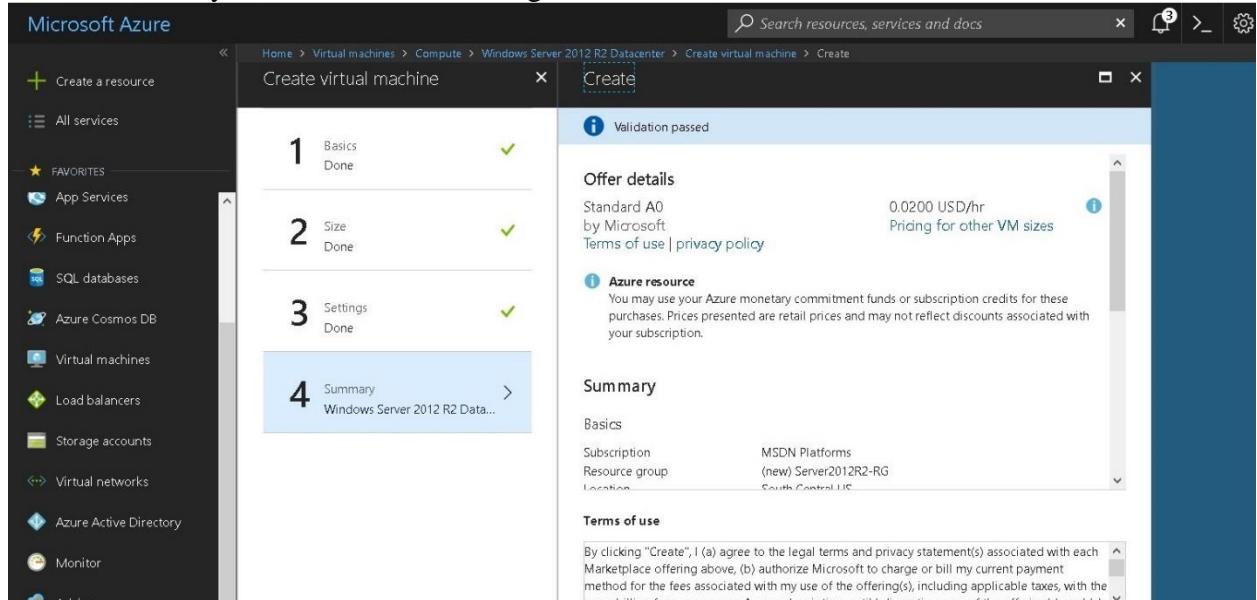


7. On the Settings blade, review the default options for storage, network, extensions, high availability, and monitoring. Click **OK**.

Microsoft Azure Infrastructure step by step



8. On the Summary blade, review the configuration and then click **Ok**.



9. Open an elevated PowerShell prompt. Run the **Install-Module AzureRM** command. This will install the AzureRM module which represents resource management.

Microsoft Azure Infrastructure step by step

Administrator: Windows PowerShell

```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

PS C:\WINDOWS\system32> Install-Module AzureRM

NuGet provider is required to continue
PowerShellGet requires NuGet provider version '2.8.5.201' or newer to intera
provider must be available in 'C:\Program Files\PackageManagement\ProviderAsse
Ali\AppData\Local\PackageManagement\ProviderAssemblies'. You can also instal
'Install-PackageProvider -Name NuGet -MinimumVersion 2.8.5.201 -Force'. Do y
the NuGet provider now?
[Y] Yes [N] No [S] Suspend [?] Help (default is "Y"):
```

10. If you get prompted to install and import the NuGet provider, Type **Y** and then press the **Enter** key. If you are notified that the repository is untrusted, confirm that you want to install the modules by typing **Y** and then pressing the **Enter** key. The installation process will take several minutes as packages are downloaded and installed.

Administrator: Windows PowerShell

```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

PS C:\WINDOWS\system32> Install-Module AzureRM

NuGet provider is required to continue
PowerShellGet requires NuGet provider version '2.8.5.201' or newer to intera
provider must be available in 'C:\Program Files\PackageManagement\ProviderAsse
Ali\AppData\Local\PackageManagement\ProviderAssemblies'. You can also instal
'Install-PackageProvider -Name NuGet -MinimumVersion 2.8.5.201 -Force'. Do y
the NuGet provider now?
[Y] Yes [N] No [S] Suspend [?] Help (default is "Y"): y

Untrusted repository
You are installing the modules from an untrusted repository. If you trust th
InstallationPolicy value by running the Set-PSRepository cmdlet. Are you sur
'PSGallery'?
:[Y] Yes [A] Yes to All [N] No [L] No to All [S] Suspend [?] Help (defau
```

11. After the download and installation is finished, run the **Import-Module AzureRM** command.
12. Run the **Install-Module Azure** command. This will install the Azure module which represents service management.

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> Install-Module Azure

Untrusted repository
You are installing the modules from an untrusted repository. If you trust thi
InstallationPolicy value by running the Set-PSRepository cmdlet. Are you sure
'PSGallery'?
[Y] Yes [A] Yes to All [N] No [L] No to All [S] Suspend [?] Help (default
[Y] Yes
```

13. If you are notified that the repository is untrusted, confirm that you want to install the modules by typing **Y** and then pressing the **Enter** key.

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> Install-Module Azure

Untrusted repository
You are installing the modules from an untrusted repository. If you trust thi
InstallationPolicy value by running the Set-PSRepository cmdlet. Are you sure
'PSGallery'?
[Y] Yes [A] Yes to All [N] No [L] No to All [S] Suspend [?] Help (default
PS C:\WINDOWS\system32> Set-ExecutionPolicy Unrestricted

Execution Policy Change
The execution policy helps protect you from scripts that you do not trust. Ch
you to the security risks described in the about_Execution_Policies help topi
https://go.microsoft.com/fwlink/?LinkID=135170. Do you want to change the exec
[Y] Yes [A] Yes to All [N] No [L] No to All [S] Suspend [?] Help (default
PS C:\WINDOWS\system32> Import-Module azureRM
PS C:\WINDOWS\system32>
```

14. Once the download and installation is finished, run the **Import-Module Azure** command.

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> Install-Module Azure

Untrusted repository
You are installing the modules from an untrusted repository. If you trust thi
InstallationPolicy value by running the Set-PSRepository cmdlet. Are you sure
'PSGallery'?
[Y] Yes [A] Yes to All [N] No [L] No to All [S] Suspend [?] Help (default
PS C:\WINDOWS\system32> Set-ExecutionPolicy Unrestricted

Execution Policy Change
The execution policy helps protect you from scripts that you do not trust. Ch
you to the security risks described in the about_Execution_Policies help topi
https://go.microsoft.com/fwlink/?LinkID=135170. Do you want to change the exec
[Y] Yes [A] Yes to All [N] No [L] No to All [S] Suspend [?] Help (default
PS C:\WINDOWS\system32> Import-Module azureRM
PS C:\WINDOWS\system32> Import-Module Azure
PS C:\WINDOWS\system32>
```

15. Run the **Login-AzureRmAccount** command and then authenticate with your Azure administrative credentials.

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> Import-Module azureRM
PS C:\WINDOWS\system32> Import-Module Azure
PS C:\WINDOWS\system32> Login-AzureRmAccount

Account      : [REDACTED]
SubscriptionName : MSDN Platforms
SubscriptionId   : 2b1c5659-ba44-4ada-bec9-b53a07460773
TenantId       : de12b8d9-3ccb-4ed5-a6fc-f02979ce6706
Environment     : AzureCloud

PS C:\WINDOWS\system32>
```

16. Run the **Get-AzureRmVM** command to list all of the VMs deployed with the Resource Manager model. Locate SERVER-01 (or your existing test VM). Note the values for ResourceGroupName and NetworkInterfaceIDs.

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> Import-Module azureRM
PS C:\WINDOWS\system32> Import-Module Azure
PS C:\WINDOWS\system32> Login-AzureRmAccount

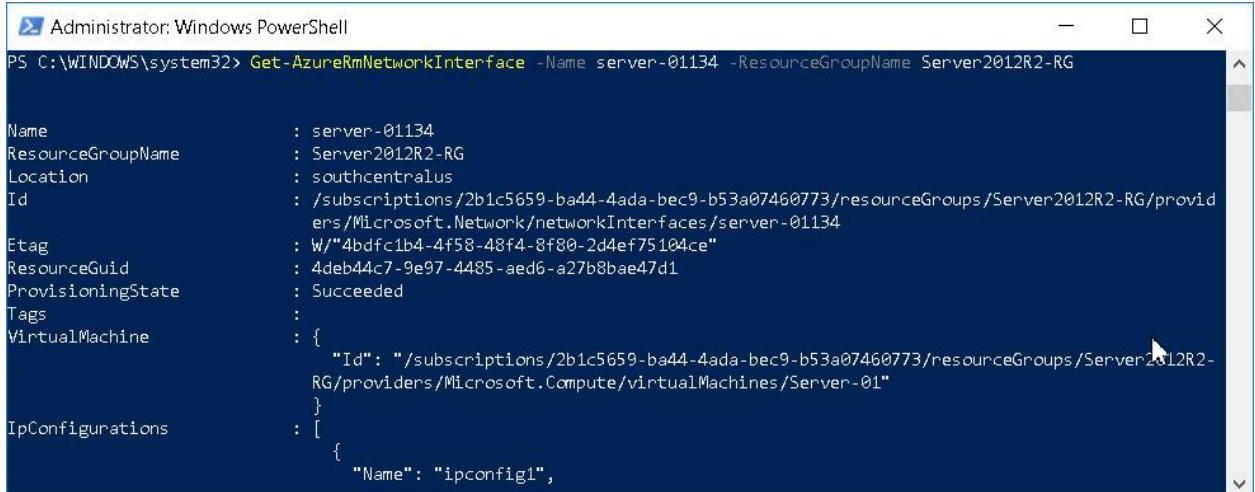
Account      : [REDACTED]
SubscriptionName : MSDN Platforms
SubscriptionId   : 2b1c5659-ba44-4ada-bec9-b53a07460773
TenantId       : de12b8d9-3ccb-4ed5-a6fc-f02979ce6706
Environment     : AzureCloud

PS C:\WINDOWS\system32> Get-AzureRmVM

ResourceGroupName    Name        Location     VmSize  OsType      NIC P
-----  -----  -----  -----  -----  -----
SERVER2012R2-RG    Server-01  southcentralus Standard_A0 Windows server-01134
```

17. Run the **Get-AzureRmNetworkInterface -Name <NetworkInterfaceID> -ResourceGroupName <ResourceGroupName>** command. Review the output. Note the values for PrivateIPAddress and PrivateIpAllocationMethod.

Microsoft Azure Infrastructure step by step

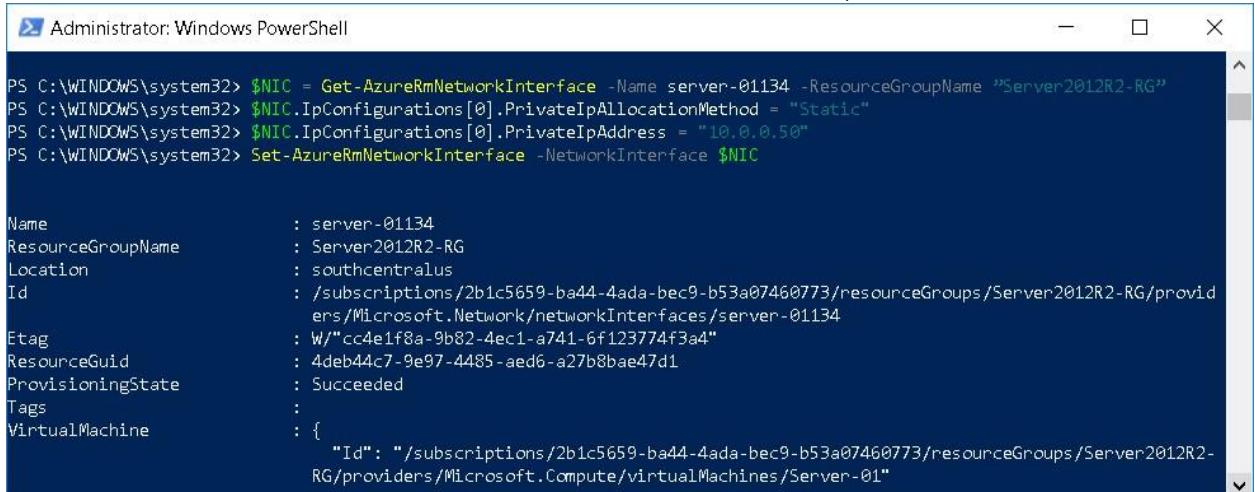


```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> Get-AzureRmNetworkInterface -Name server-01134 -ResourceGroupName Server2012R2-RG

Name          : server-01134
ResourceGroupName : Server2012R2-RG
Location      : southcentralus
Id           : /subscriptions/2b1c5659-ba44-4ada-bec9-b53a07460773/resourceGroups/Server2012R2-RG/providers/Microsoft.Network/networkInterfaces/server-01134
Etag          : W/"4bdfc1b4-4f58-48f4-8f80-2d4ef75104ce"
ResourceGuid   : 4deb44c7-9e97-4485-aed6-a27b8bae47d1
ProvisioningState : Succeeded
Tags          :
VirtualMachine   :
IpConfigurations :
  [
    {
      "Name": "ipconfig1",
    }
  ]
}
```

18. Run the following commands in sequence to update the PrivateIpAllocationMethod to static and assign a new private IP address:

- **\$NIC = Get-AzureRmNetworkInterface -Name <NetworkInterfaceID> - ResourceGroupName "Server-RG"**
- **\$NIC.IpConfigurations[0].PrivateIpAllocationMethod = "Static"**
- **\$NIC.IpConfigurations[0].PrivateIpAddress = "10.0.0.50"**
- **Set-AzureRmNetworkInterface -NetworkInterface \$NIC**

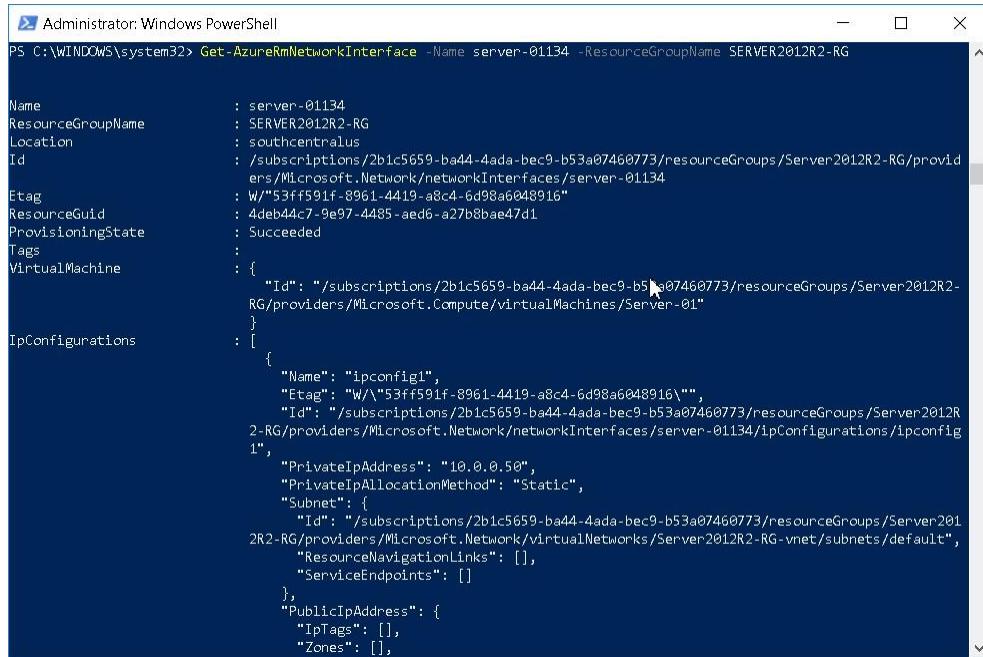


```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> $NIC = Get-AzureRmNetworkInterface -Name server-01134 -ResourceGroupName "Server2012R2-RG"
PS C:\WINDOWS\system32> $NIC.IpConfigurations[0].PrivateIpAllocationMethod = "Static"
PS C:\WINDOWS\system32> $NIC.IpConfigurations[0].PrivateIpAddress = "10.0.0.50"
PS C:\WINDOWS\system32> Set-AzureRmNetworkInterface -NetworkInterface $NIC

Name          : server-01134
ResourceGroupName : Server2012R2-RG
Location      : southcentralus
Id           : /subscriptions/2b1c5659-ba44-4ada-bec9-b53a07460773/resourceGroups/Server2012R2-RG/providers/Microsoft.Network/networkInterfaces/server-01134
Etag          : W/"cc4e1f8a-9b82-4ec1-a741-6f123774f3a4"
ResourceGuid   : 4deb44c7-9e97-4485-aed6-a27b8bae47d1
ProvisioningState : Succeeded
Tags          :
VirtualMachine   :
  {
    "Id": "/subscriptions/2b1c5659-ba44-4ada-bec9-b53a07460773/resourceGroups/Server2012R2-RG/providers/Microsoft.Compute/virtualMachines/Server-01"
  }
}
```

19. Run **Get-AzureRmNetworkInterface -Name <NetworkInterfaceID> - ResourceGroupName "Server2012R2-RG"**. Review the output and confirm that the PrivateIPAddress and PrivateIpAllocationMethod have been updated.

Microsoft Azure Infrastructure step by step



```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> Get-AzureRmNetworkInterface -Name server-01134 -ResourceGroupName SERVER2012R2-RG

Name          : server-01134
ResourceGroupName : SERVER2012R2-RG
Location      : southcentralus
Id            : /subscriptions/2b1c5659-ba44-4ada-bec9-b53a07460773/resourceGroups/Server2012R2-RG/providers/Microsoft.Network/networkInterfaces/server-01134
Etag          : W/"53ff591f-8961-4419-a8c4-6d98a6048916"
ResourceGuid   : 4deb44c7-9e97-4485-aed6-a27b8bae47d1
ProvisioningState : Succeeded
Tags          :
VirtualMachine  : {
    "Id": "/subscriptions/2b1c5659-ba44-4ada-bec9-b53a07460773/resourceGroups/Server2012R2-RG/providers/Microsoft.Compute/virtualMachines/Server-01"
}
IpConfigurations : [
    {
        "Name": "ipconfig1",
        "Etag": "W/"53ff591f-8961-4419-a8c4-6d98a6048916"",
        "Id": "/subscriptions/2b1c5659-ba44-4ada-bec9-b53a07460773/resourceGroups/Server2012R2-RG/providers/Microsoft.Network/networkInterfaces/server-01134/ipConfigurations/ipconfig1",
        "PrivateIpAddress": "10.0.0.50",
        "PrivateIpAllocationMethod": "Static",
        "Subnet": {
            "Id": "/subscriptions/2b1c5659-ba44-4ada-bec9-b53a07460773/resourceGroups/Server2012R2-RG/providers/Microsoft.Network/virtualNetworks/Server2012R2-RG-vnet/subnets/default",
            "ResourceNavigationLinks": [],
            "ServiceEndpoints": []
        },
        "PublicIpAddress": {
            "IpTags": [],
            "Zones": []
        }
    }
]
```

20. When you are finished with this exercise, run the **Get-AzureRmVM -Name "SERVER-01" -ResourceGroupName "Server-RG" | Stop-AzureRmVM** command to shut down the VM.

Task 2: Create Virtual Networks in the Management Portal

In this exercise, you will be working with virtual networks within the Azure Portal. You will create a new virtual network and explore the various management options.

1. Navigate to the [Azure Portal](#) and sign in. On the Hub menu, click **More Services**.
2. Type **virtual networks** in the filter to reveal the available options for managing virtual networks in the Azure Portal. Mark Virtual networks as a favorite to add it to your Hub menu.
3. Click **Virtual networks**. If you have any existing virtual networks they should appear in this list. Click **Add**.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes options like 'Create a resource', 'All services', 'Dashboard', 'Resource groups', 'App Services', 'Function Apps', 'SQL databases', 'Azure Cosmos DB', 'Virtual machines', 'Load balancers', and 'Storage accounts'. The main content area is titled 'Virtual networks' and shows a list of existing resources. One item is listed: 'Server2012R2-RG-vnet' under 'NAME', 'Server2012R2-RG' under 'RESOURCE GROUP', and 'South Central US' under 'LOCATION'. There are buttons for 'Edit columns', 'Refresh', and 'Assign Tags' at the top of the list.

4. On the Create virtual network blade, fill in the following values to create a new virtual network. Click **Create** when you are finished entering the information
 - Name: **Server-VNET**
 - Address space: **172.168.0.0/16**
 - Subnet name: **Server-Subnet**
 - Subnet address range: **172.168.0.0/24**
 - Subscription: <Your subscription>
 - Resource group: **Create a new one named “Server-VNET”**
 - Location: <Your location>

The screenshot shows the 'Create virtual network' blade. The 'Name' field is set to 'Server-Vnet'. The 'Address space' dropdown is set to '172.168.0.0/16'. The 'Subscription' dropdown is set to 'MSDN Platforms (2b1c5659-ba44-4ad ...v)'. The 'Resource group' section has 'Create new' selected, and the 'Name' field is 'Server-VNET'. The 'Location' dropdown is set to 'South Central US'. Under the 'Subnet' section, the 'Name' field is 'Server-Subnet' and the 'Address range' dropdown is set to '172.168.0.0/24'. The right side of the screen shows a dark blue background with the text 'Creating virtual network'.

5. On the menu bar, monitor the alerts for progress as the new virtual network is created.
6. On the Hub menu, click **Virtual networks**. Confirm that the new virtual network has been created. Click **Server-VNET**.

7. On the Server-VNET blade, review the list of available management options under Settings, such as address space, connected devices, subnets, DNS servers, and peerings.
8. When you are finished exploring the new virtual network, close the web page.

Connecting Virtual Networks

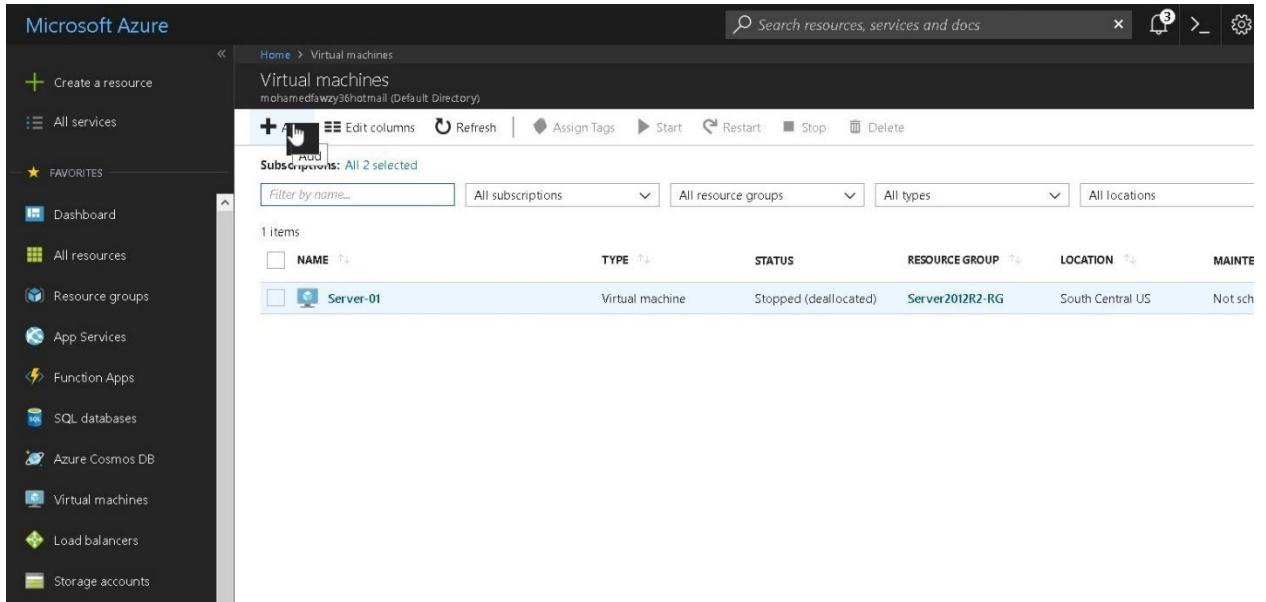
In this exercise, you will deploy Virtual Machine for each virtual network.

Task 1: Deploy a Virtual Machine into a Virtual Network

In this exercise, you will deploy a new Windows Server 2016 VM to a new virtual network within the Azure Portal.

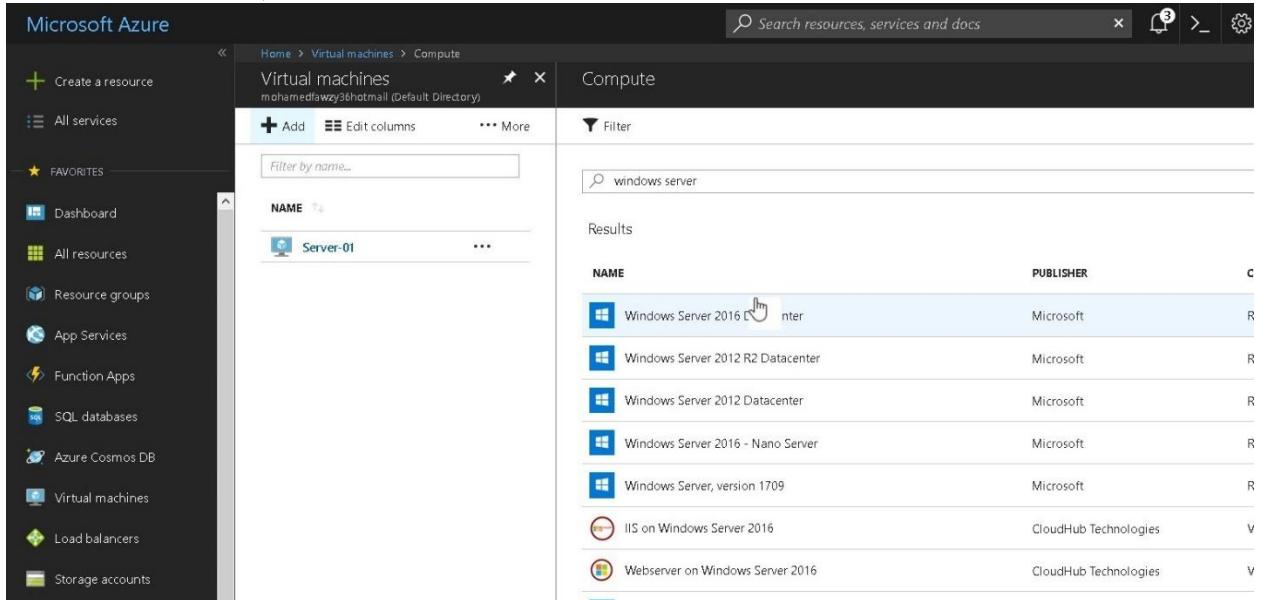
1. Navigate to the Azure Portal and sign in.
2. On the Hub menu, click **Add**.

Microsoft Azure Infrastructure step by step



The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes options like 'Create a resource', 'All services', 'Dashboard', 'Resource groups', 'App Services', 'Function Apps', 'SQL databases', 'Azure Cosmos DB', 'Virtual machines', 'Load balancers', and 'Storage accounts'. The main content area is titled 'Virtual machines' under 'mohamedawzy3@hotmail (Default Directory)'. It displays a table with one item: 'Server-01'. The columns in the table are NAME, TYPE, STATUS, RESOURCE GROUP, LOCATION, and MAINTENANCE. The status is 'Stopped (deallocated)'.

3. On the New blade, search for **Server 2016**.
4. In the search results, click **Windows Server 2016 Datacenter**.



The screenshot shows the 'Compute' blade under 'Virtual machines'. A search bar at the top right contains the text 'windows server'. Below it, a table lists several options, with 'Windows Server 2016 Datacenter' highlighted. The columns are NAME, PUBLISHER, and a small icon. Other listed items include 'Windows Server 2012 R2 Datacenter', 'Windows Server 2012 Datacenter', 'Windows Server 2016 - Nano Server', 'Windows Server, version 1709', 'IIS on Windows Server 2016', and 'Webserver on Windows Server 2016'.

5. On the Windows Server 2016 Datacenter blade, notice the default deployment model is set to Resource Manager. Click **Create**.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure Marketplace interface. The left sidebar includes options like 'Create a resource', 'All services', 'FAVORITES' (Dashboard, All resources, Resource groups, App Services, Function Apps, SQL databases, Azure Cosmos DB, Virtual machines, Load balancers, Storage accounts), and a 'Search resources, services and docs' bar. The main content area displays a table of VM images:

	PUBLISHER	CATEGORY
Windows Server 2016 Datacenter	Microsoft	Recommended
Windows Server 2012 R2 Datacenter	Microsoft	Recommended
Windows Server 2012 Datacenter	Microsoft	Recommended
Windows Server 2016 - Nano Server	Microsoft	Recommended
Windows Server, version 1709	Microsoft	Recommended
Windows Server 2016	CloudHub Technologies	Virtual Machine Images
Windows Server 2016	CloudHub Technologies	Virtual Machine Images

On the right side, there's a 'Windows Server 2016 Datacenter' summary card with details like 'Windows Server 2016 is a comprehensive server and infrastructure that power your business. It helps you run traditional and cloud-native applications. This image includes all roles including the' and links to 'Legal Terms', 'By clicking the Create button, I acknowledge that the legal terms of Microsoft apply to it. Microsoft. Also see the privacy statement from Microsoft.', social sharing icons, and a 'PUBLISHER' section.

6. On the Create Virtual Machine blade, fill in the following values for basic settings (substituting your information for the user name, subscription, and location) and click **OK**.
- Name: **Server-02**
 - VM disk type: **HDD**
 - User name: <Your first name>
 - Password: **Pa\$\$w0rd12345**
 - Subscription: <Your subscription>
 - Resource group: **Create a new one named “Server-RG”**
 - Location: <Your location>

The screenshot shows the 'Create virtual machine' Basics blade. The left sidebar is identical to the previous screenshot. The main area has a navigation bar with 'Create virtual machine' and 'Basics'. Below is a four-step wizard:

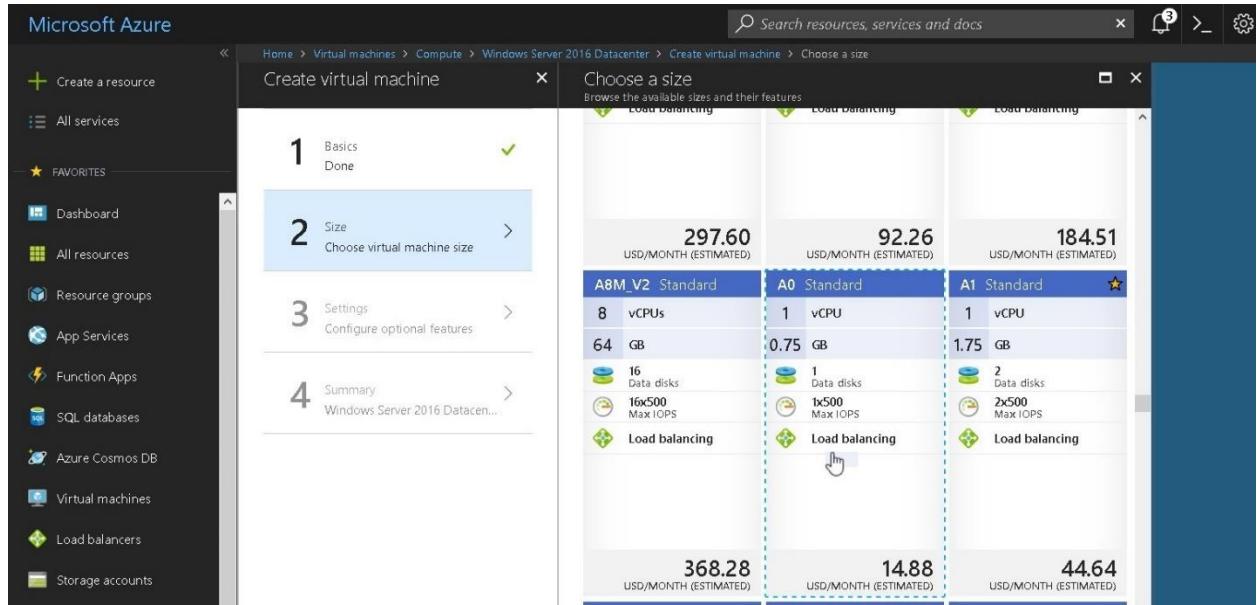
- 1 Basics: Configure basic settings
- 2 Size: Choose virtual machine size
- 3 Settings: Configure optional features
- 4 Summary: Windows Server 2016 Datacenter

The 'Basics' step contains the following configuration fields:

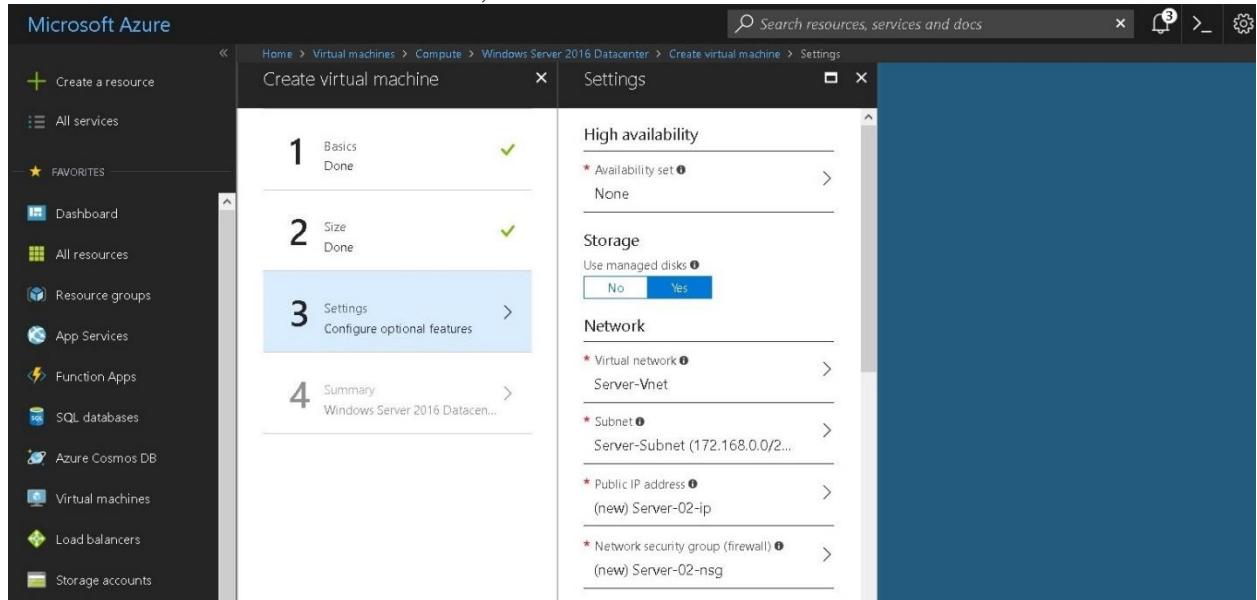
- * Name: Server-02
- VM disk type: HDD
- * User name: labadmin
- * Password: [REDACTED]
- * Confirm password: [REDACTED]
- Subscription: MSDN Platforms (2b1c5659-ba44-4ad ...)
- * Resource group:
 Create new
 Use existing
Server-VNET
Server2012R2-RG

7. On the Choose a size blade, click **View all**. Click the A0 Standard size and then click **Select**.

Microsoft Azure Infrastructure step by step

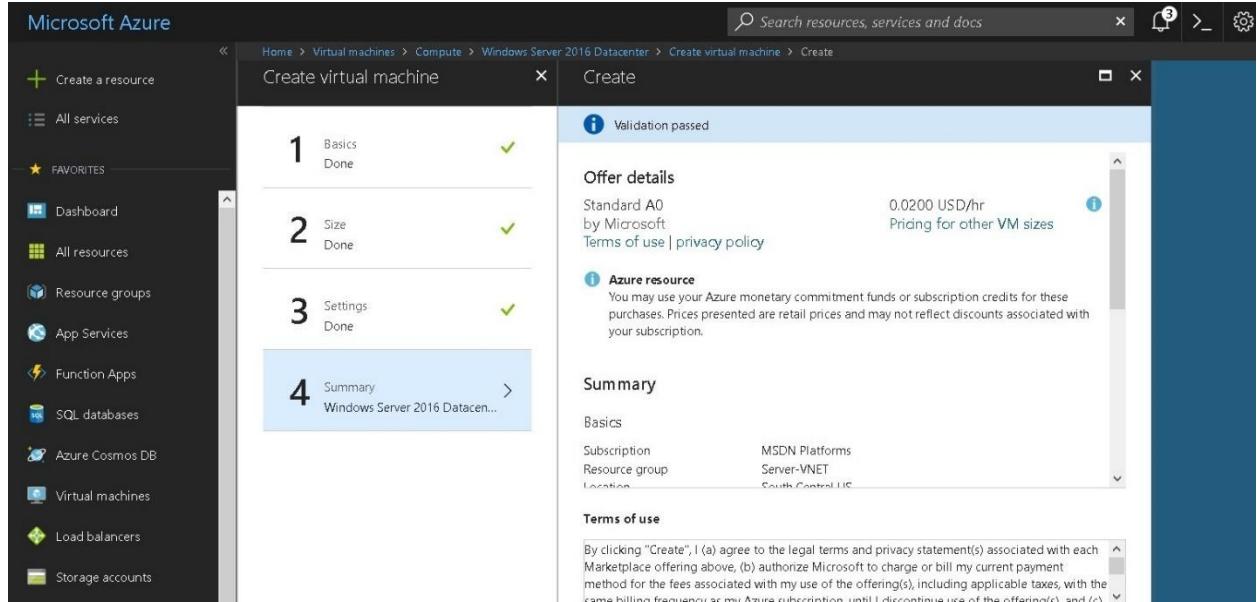


8. On the Settings blade, click **Network**.
9. On the Choose virtual network blade, click **Server-VNET**

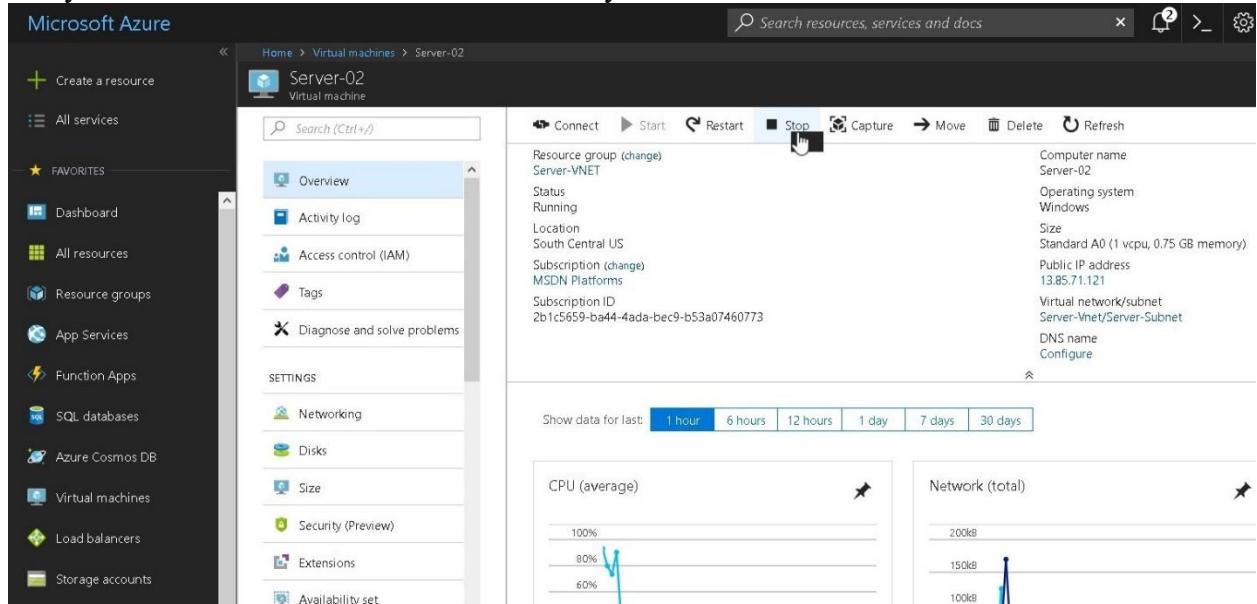


10. On the Settings blade, under Network, confirm that the Virtual network and Subnet reflect your selected network. Click **OK**.
11. On the Summary blade, review the configuration and then click **OK**.

Microsoft Azure Infrastructure step by step



12. On the menu bar, monitor the alerts for progress as the new virtual machine is created.
13. When the VM is created, click **Virtual machines** in the left pane.
14. In the Virtual machines blade, click the server name for the VM that you deployed.
15. In the Server-02 blade, click **Stop** at the top of the blade to stop the VM. This ensures that you don't consume resources unnecessarily.



Task 2: Add a new domain to DNS Zones

In this exercise, you will explore DNS zones in the Azure Portal, including how to add and manage them.

1. Navigate to the Azure Portal and sign in.
2. On the Hub menu, click **More Services**.
3. Type **dns zones** in the filter. Mark DNS zones as a favorite to add it to your Hub menu.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes 'Create a resource', 'All services', and a 'FAVORITES' section with icons for App Services, Function Apps, SQL databases, Azure Cosmos DB, Virtual machines, Load balancers, Storage accounts, Virtual networks, Azure Active Directory, and Monitor. The main content area is titled 'DNS zones' under 'mohamedawzy36hotmail (Default Directory)'. It displays a table with columns: NAME, NUMBER OF RECORD SETS, RESOURCE GROUP, and LOCATION. A large blue 'DNS' icon is centered on the page. Below the table, a message says 'No DNS zones to display' and 'Create a DNS zone to host the DNS records for your domain. After the DNS zone is deployed, you can add your DNS records to the zone. Learn more'. A blue 'Create DNS zones' button is at the bottom.

4. Click **DNS zones**. If you have any existing DNS zones they will appear in this list. Click **Add**.
5. On the Create DNS zone blade, fill in the following values to create a new DNS zone. Click **Create** when you are finished entering the information.
 - Name: **Labtest10.com**
 - Subscription: **<Your subscription>**
 - Resource group: **Create a new one named “Server-DNS”**
 - Resource group location: **<Your location>**

The screenshot shows the 'Create DNS zone' blade. The 'Name' field is set to 'LabTest10.com'. The 'Subscription' dropdown shows 'MSDN Platforms (2b1c5659-ba44-4ada-b ...v)'. Under 'Resource group', the 'Create new' radio button is selected, and the 'Server-DNS' dropdown is open. The 'Resource group location' dropdown is set to 'South Central US'. At the bottom, there is a blue 'Create DNS zones' button.

6. On the menu bar, monitor the alerts for progress as the new DNS zone is created.
7. On the Hub menu, click **DNS zones**. Confirm that the new DNS zone has been created. Click **Labtest10.com**.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes 'Create a resource', 'All services', and various service icons like Function Apps, SQL databases, Azure Cosmos DB, Virtual machines, Load balancers, Storage accounts, Virtual networks, Azure Active Directory, Monitor, and Advisor. The main content area is titled 'DNS zones' under 'mohamedfawzy3@hotmail (Default Directory)'. It displays a table with one item: 'LabTest10.com' with '2 / 5000' record sets, belonging to 'Server-DNS' in 'global' location. The table has columns for NAME, NUMBER OF RECORD SETS, RESOURCE GROUP, and LOCATION.

8. On the Labtest10.com DNS zone blade, review the available options and information, such as the list of existing records sets. Click **+ Record set**.

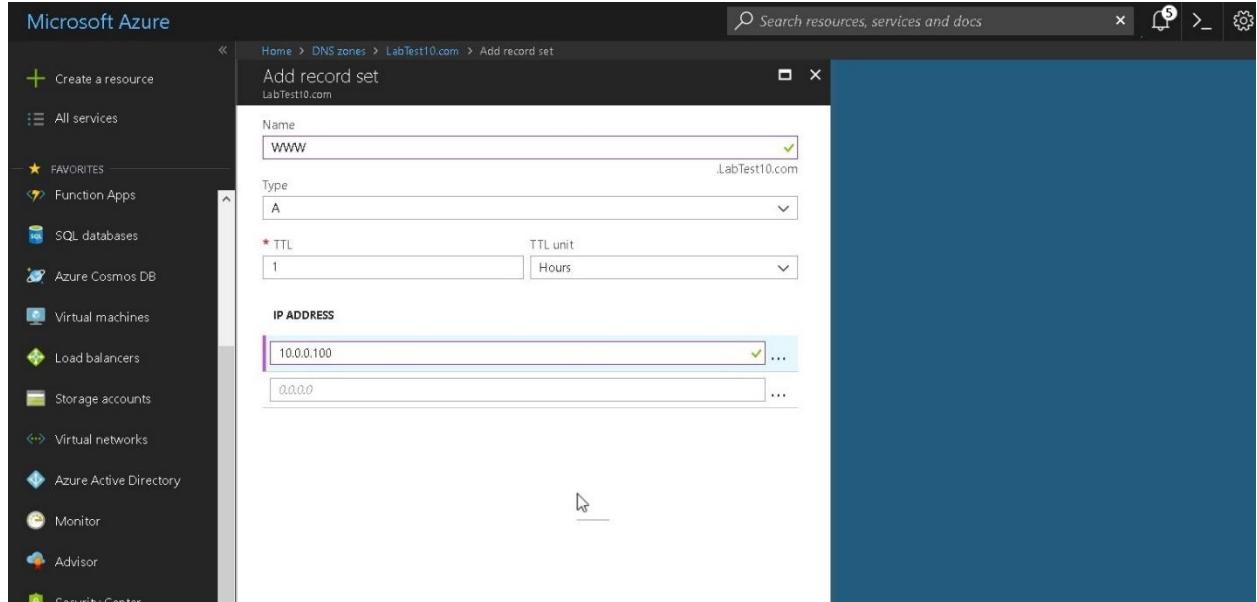
The screenshot shows the 'LabTest10.com' DNS zone blade. The left sidebar lists 'Overview', 'Activity log', 'Access control (IAM)', 'Tags', and 'Diagnose and solve problems'. The right pane shows a table of existing record sets. The table has columns for NAME, TYPE, TTL, and VALUE. The first record is '@' with type NS, TTL 172800, and value ns1-03.az. The second record is '@' with type SOA, TTL 3600, and value ns1-03.az. A search bar at the top right is labeled 'Search record sets'.

NAME	TYPE	TTL	VALUE
@	NS	172800	ns1-03.az ns2-0 ns3-0 ns4-0
@	SOA	3600	Email Host Refre: Retry: Expire: Minin: Serial

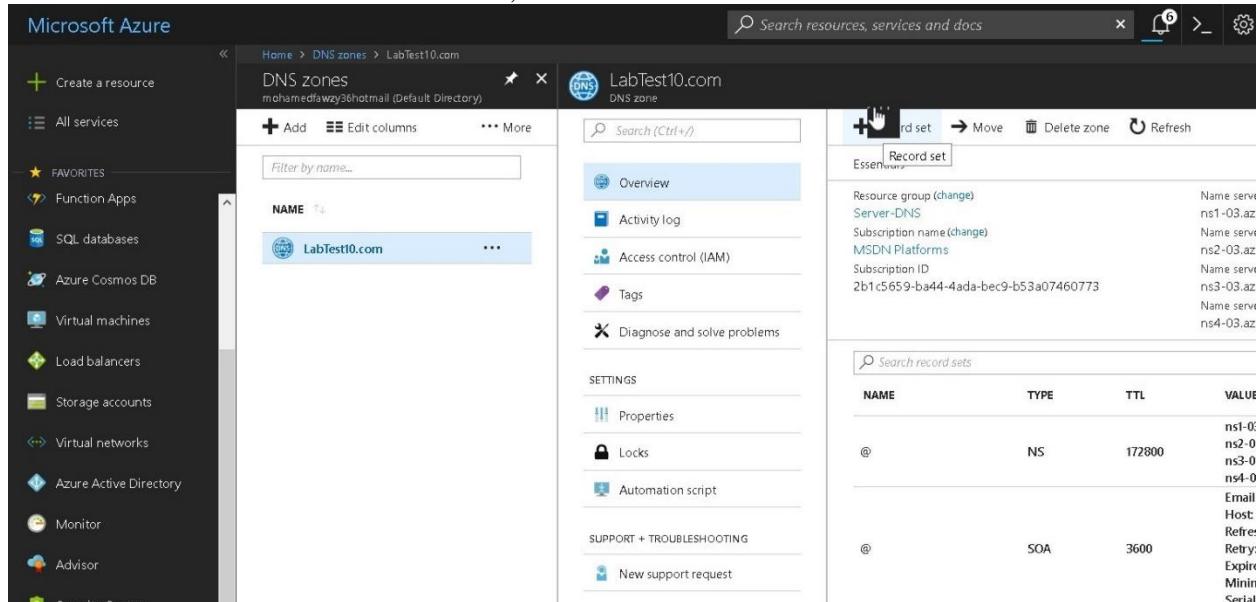
9. On the Add record set blade, fill in the following values to add a new record for WWW. Click **OK** when you are finished entering the information.

- Name: **WWW**
- Type: **A**
- TTL: **1**
- TTL unit: **Hours**
- IP address: **10.0.0.100**

Microsoft Azure Infrastructure step by step



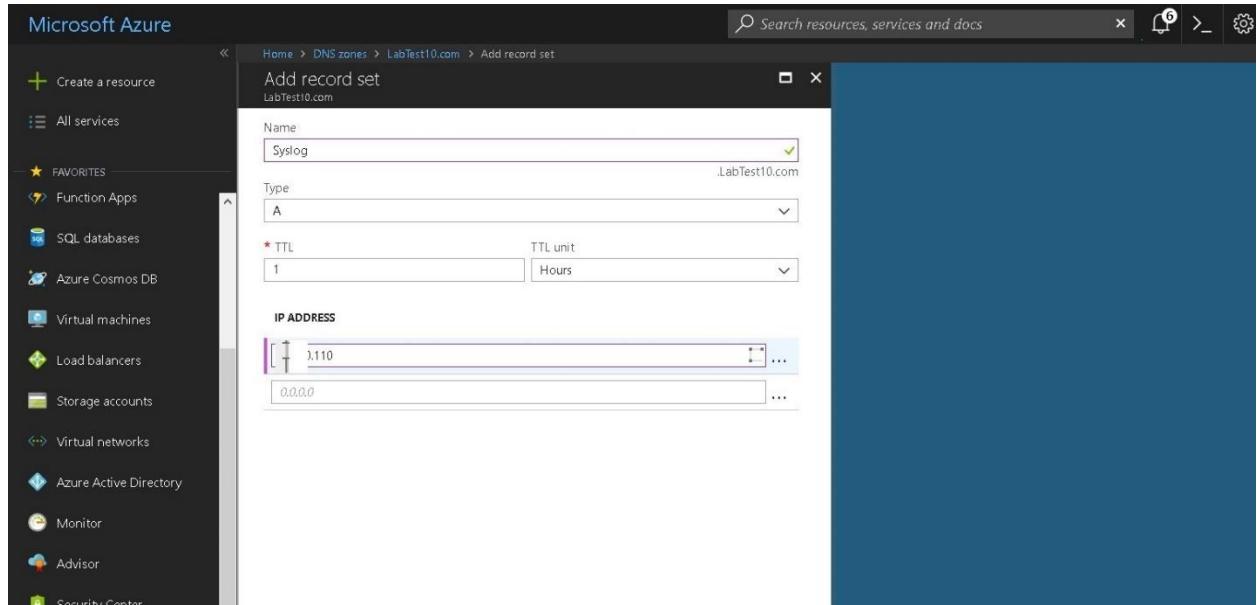
10. On the menu bar, monitor the alerts for progress as the new DNS record set is created. Confirm that the new record set has been added by reviewing the Labtest10.com DNS zone blade.
11. On the Labtest10.com DNS zone blade, click **+ Record set**.



NAME	TYPE	TTL	VALUE
@	NS	172800	ns1-0; ns2-0; ns3-0; ns4-0
@	SOA	3600	Email Host Refre: Retry: Expire: Minin Serial

12. On the Add record set blade, fill in the following values to add a new record for syslog. Click **OK** when you are finished entering the information.

- Name: **Syslog**
- Type: **A**
- TTL: **1**
- TTL unit: **Hours**
- IP address: **10.0.0.110**



13. On the menu bar, monitor the alerts for progress as the new DNS record set is created. Confirm that the new record set has been added by reviewing the Labtest10.com DNS zone blade.

Configuring a Point-to-Site VPN

In this exercise, you will configure and test a point-to-site VPN connection.

Task 1: Configuring a VPN Connection using PowerShell

In this exercise, you will configure a point-to-site VPN connection.

1. Run the **Login-AzureRMAccount** command from a PowerShell prompt.
2. Type **Y** to enable data collection. Authenticate with your administrative credentials.

```
PS C:\WINDOWS\system32> Login-AzureRMAccount

Account          : [REDACTED]
SubscriptionName : MSDN Platforms
SubscriptionId   : 2b1c5659-ba44-4ada-bec9-b53a07460773
TenantId         : de12b8d9-3ccb-4ed5-a6fc-f02979ce6706
Environment      : AzureCloud
```

3. Run the **Select-AzureRmSubscription -SubscriptionName "<YourSubscriptionName>"** command.

```
Administrator: Windows PowerShell
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

PS C:\WINDOWS\system32> Login-AzureRMAccount

Account      : [REDACTED]
SubscriptionName : MSDN Platforms
SubscriptionId   : 2b1c5659-ba44-4ada-bec9-b53a07460773
TenantId       : de12b8d9-3ccb-4ed5-a6fc-f02979ce6706
Environment    : AzureCloud

PS C:\WINDOWS\system32> Select-AzureRmSubscription -SubscriptionName "MSDN Platforms"

Name      : [REDACTED]
Account   : [REDACTED]
SubscriptionName : MSDN Platforms
TenantId   : de12b8d9-3ccb-4ed5-a6fc-f02979ce6706
Environment : AzureCloud

PS C:\WINDOWS\system32>
```

4. Run the following commands to declare your PowerShell variables using the following information. Note that you could opt to run through this exercise without relying heavily on variables but the reusability of the code is degraded in that scenario.

- \$VNetName = "VNet1"
- \$FESubName = "FrontEnd"
- \$BESubName = "Backend"
- \$GWSubName = "GatewaySubnet"
- \$VNetPrefix1 = "192.168.0.0/16"
- \$VNetPrefix2 = "10.254.0.0/16"
- \$FESubPrefix = "192.168.1.0/24"
- \$BESubPrefix = "10.254.1.0/24"
- \$GWSubPrefix = "192.168.200.0/26"
- \$VPNClientAddressPool = "172.16.201.0/24"
- \$RG = "TestRG"
- \$Location = "East US"
- \$DNS = "8.8.8"
- \$GWName = "GW"
- \$GWIPName = "GWIP"
- \$GWIPconfName = "gwipconf"
- \$P2SRootCertName = "ARMP2SRootCert.cer"

Microsoft Azure Infrastructure step by step

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> Import-Module AzureRM
PS C:\WINDOWS\system32> Import-Module Azure
PS C:\WINDOWS\system32> $VNetName = "VNet1"
PS C:\WINDOWS\system32> $FESubName = "FrontEnd"
PS C:\WINDOWS\system32> $BESubName = "Backend"
PS C:\WINDOWS\system32> $GWSubName = "GatewaySubnet"
PS C:\WINDOWS\system32> $VNetPrefix1 = "192.168.0.0/16"
PS C:\WINDOWS\system32> $VNetPrefix2 = "10.254.0.0/16"
PS C:\WINDOWS\system32> $FESubPrefix = "192.168.1.0/24"
PS C:\WINDOWS\system32> $BESubPrefix = "10.254.1.0/24"
PS C:\WINDOWS\system32> $GWSubPrefix = "192.168.200.0/26"
PS C:\WINDOWS\system32> $VPNClientAddressPool = "172.16.201.0/24"
PS C:\WINDOWS\system32> $RG = "TestRG"
PS C:\WINDOWS\system32> $Location = "East US"
PS C:\WINDOWS\system32> $DNS = "8.8.8.8"
PS C:\WINDOWS\system32> $GWName = "Gw"
PS C:\WINDOWS\system32> $GWIPName = "GWIP"
PS C:\WINDOWS\system32> $GWIPConfName = "gwipconf"
PS C:\WINDOWS\system32> $P2SRootCertName = "ARMP2SRootCert.cer"
PS C:\WINDOWS\system32>
```

5. Create a resource group by running the **New-AzureRmResourceGroup -Name \$RG -Location \$Location** command.

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> Import-Module AzureRM
PS C:\WINDOWS\system32> Import-Module Azure
PS C:\WINDOWS\system32> $VNetName = "VNet1"
PS C:\WINDOWS\system32> $FESubName = "FrontEnd"
PS C:\WINDOWS\system32> $BESubName = "Backend"
PS C:\WINDOWS\system32> $GWSubName = "GatewaySubnet"
PS C:\WINDOWS\system32> $VNetPrefix1 = "192.168.0.0/16"
PS C:\WINDOWS\system32> $VNetPrefix2 = "10.254.0.0/16"
PS C:\WINDOWS\system32> $FESubPrefix = "192.168.1.0/24"
PS C:\WINDOWS\system32> $BESubPrefix = "10.254.1.0/24"
PS C:\WINDOWS\system32> $GWSubPrefix = "192.168.200.0/26"
PS C:\WINDOWS\system32> $VPNClientAddressPool = "172.16.201.0/24"
PS C:\WINDOWS\system32> $RG = "TestRG"
PS C:\WINDOWS\system32> $Location = "East US"
PS C:\WINDOWS\system32> $DNS = "8.8.8.8"
PS C:\WINDOWS\system32> $GWName = "Gw"
PS C:\WINDOWS\system32> $GWIPName = "GWIP"
PS C:\WINDOWS\system32> $GWIPConfName = "gwipconf"
PS C:\WINDOWS\system32> $P2SRootCertName = "ARMP2SRootCert.cer"
PS C:\WINDOWS\system32> New-AzureRmResourceGroup -Name $RG -Location $Location
```

6. Run the **\$fesub = New-AzureRmVirtualNetworkSubnetConfig -Name \$FESubName -AddressPrefix \$FESubPrefix** command.

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> $fesub = New-AzureRmVirtualNetworkSubnetConfig -Name $FESubName -AddressPrefix $FESubPrefix
PS C:\WINDOWS\system32>
```

7. Run the **\$besub = New-AzureRmVirtualNetworkSubnetConfig -Name \$BESubName -AddressPrefix \$BESubPrefix** command.

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> $fesub = New-AzureRmVirtualNetworkSubnetConfig -Name $FESubName -AddressPrefix $FESubPrefix
PS C:\WINDOWS\system32> $besub = New-AzureRmVirtualNetworkSubnetConfig -Name $BESubName -AddressPrefix $BESubPrefix
```

- Run the `$gwsu = New-AzureRmVirtualNetworkSubnetConfig -Name $GWSubName -AddressPrefix $GWSubPrefix` command.

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> $fesub = New-AzureRmVirtualNetworkSubnetConfig -Name $FESubName -AddressPrefix $FESubPrefix
PS C:\WINDOWS\system32> $besub = New-AzureRmVirtualNetworkSubnetConfig -Name $BESubName -AddressPrefix $BESubPrefix
PS C:\WINDOWS\system32> $gwsu = New-AzureRmVirtualNetworkSubnetConfig -Name $GWSubName -AddressPrefix $GWSubPrefix
```

- Run the `New-AzureRmVirtualNetwork -Name $VNetName -ResourceGroupName $RG -Location $Location -AddressPrefix $VNetPrefix1,$VNetPrefix2 -Subnet $fesub, $besub, $gwsu -DnsServer $DNS` command.

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> $fesub = New-AzureRmVirtualNetworkSubnetConfig -Name $FESubName -AddressPrefix $FESubPrefix
PS C:\WINDOWS\system32> $besub = New-AzureRmVirtualNetworkSubnetConfig -Name $BESubName -AddressPrefix $BESubPrefix
PS C:\WINDOWS\system32> $gwsu = New-AzureRmVirtualNetworkSubnetConfig -Name $GWSubName -AddressPrefix $GWSubPrefix
PS C:\WINDOWS\system32> New-AzureRmVirtualNetwork -Name $VNetName -ResourceGroupName $RG -Location $Location -AddressPrefix $VNetPrefix1,$VNetPrefix2 -Subnet $fesub, $besub, $gwsu -DnsServer $DNS
```

- Run the `$vnet = Get-AzureRmVirtualNetwork -Name $VNetName -ResourceGroupName $RG` command.

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> $vnet = Get-AzureRmVirtualNetwork -Name $VNetName -ResourceGroupName $RG
```

- Run the `$subnet = Get-AzureRmVirtualNetworkSubnetConfig -Name "GatewaySubnet" -VirtualNetwork $vnet` command.

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> $vnet = Get-AzureRmVirtualNetwork -Name $VNetName -ResourceGroupName $RG
PS C:\WINDOWS\system32> $subnet = Get-AzureRmVirtualNetworkSubnetConfig -Name "GatewaySubnet" -VirtualNetwork $vnet
```

- Request a public IP address for the VPN gateway by running the `$pip = New-AzureRmPublicIpAddress -Name $GWIPName -ResourceGroupName $RG -Location $Location -AllocationMethod Dynamic` command.

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> $vnet = Get-AzureRmVirtualNetwork -Name $VNetName -ResourceGroupName $RG
PS C:\WINDOWS\system32> $subnet = Get-AzureRmVirtualNetworkSubnetConfig -Name "GatewaySubnet" -VirtualNetwork $vnet
PS C:\WINDOWS\system32> $pip = New-AzureRmPublicIpAddress -Name $GWIPName -ResourceGroupName $RG -Location $Location -AllocationMethod Dynamic
```

- Run the `$ipconf = New-AzureRmVirtualNetworkGatewayIpConfig -Name $GWIPconfName -Subnet $subnet -PublicIpAddress $pip` command.

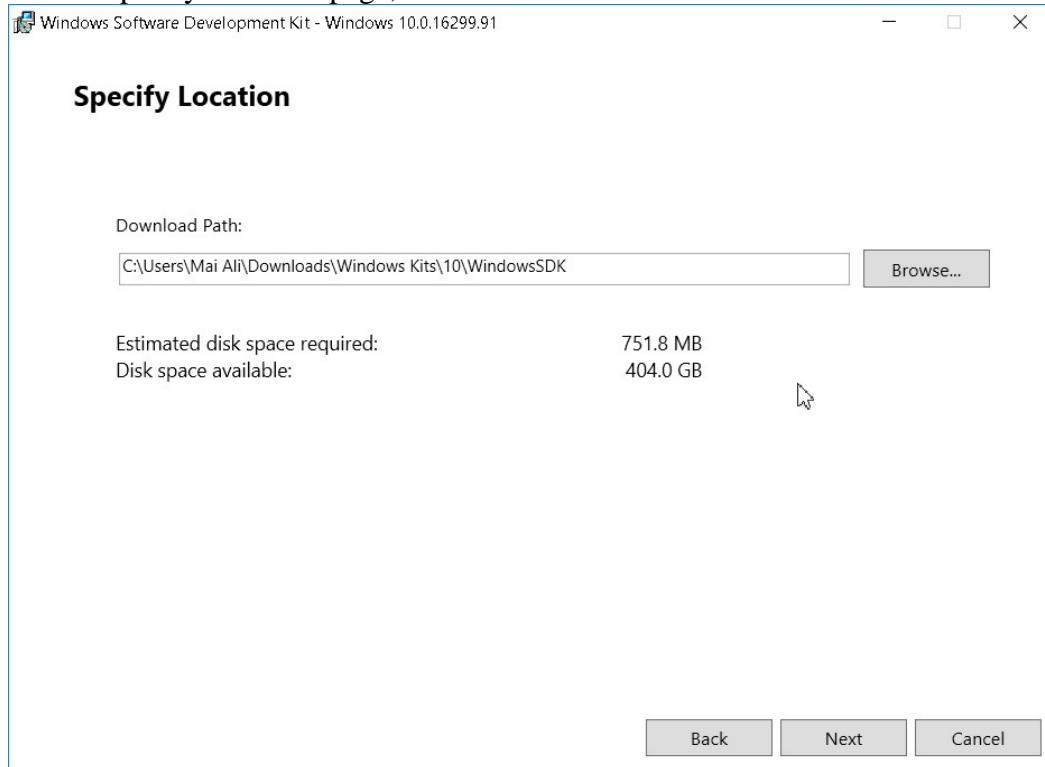
```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> $ipconf = New-AzureRmVirtualNetworkGatewayIpConfig -Name $GWIPconfName -Subnet $subnet -PublicIpAddress $pip
```

- Download the standalone Windows 10 SDK at <https://developer.microsoft.com/en-us/windows/downloads/windows-10-sdk>. The Windows 10 SDK includes a command-line utility named makecert.exe that you can use to create self-signed certificates.

Note: The makecert.exe tool is deprecated and its functionality will be replaced by Windows PowerShell.

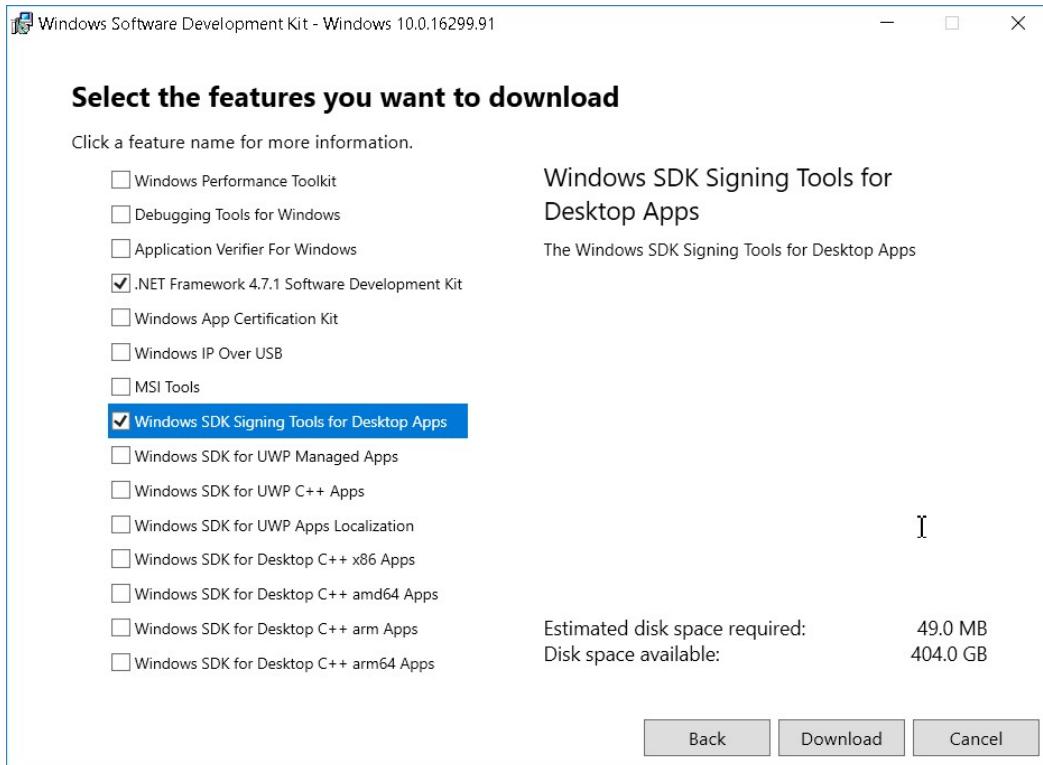
15. Once the download has completed, begin the installation.

16. On the Specify Location page, click **Next**.



17. On the License Agreement page, click **Accept**.

18. On the Select the feature you want to install page, update the feature selections so that only the .Net Framework 4.6.2 Software Development Kit and the Windows Software Development Kit are selected for installation.



19. Click **Install**. If you receive a User Account Control notification, click **Yes**.
20. When the installation is finished, click **Close**.
21. Open an elevated command prompt. Change the directory to **C:\Program Files (x86)\Windows Kits\10.0.16299.0\x64**.
22. Generate the root certificate by running the **makecert -sky exchange -r -n "CN=ARMP2SRootCert" -pe -a sha1 -len 2048 -ss My "ARMP2SRootCert.cer"** command. The certificate will be installed in the Current User\Personal\Certificates store.

The screenshot shows an elevated Command Prompt window titled "Select Administrator: Command Prompt". The window displays the following command and its output:

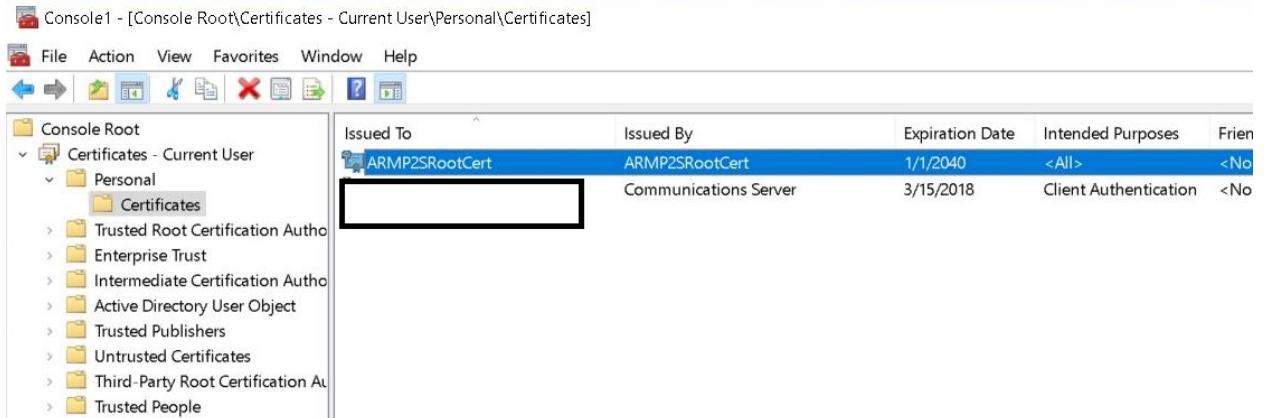
```
Microsoft Windows [Version 10.0.16299.309]
(c) 2017 Microsoft Corporation. All rights reserved.

C:\WINDOWS\system32>cd "C:\Program Files (x86)\Windows Kits\10\bin\10.0.16299.0\x64"

C:\Program Files (x86)\Windows Kits\10\bin\10.0.16299.0\x64>makecert -sky exchange -r -n "CN= ARMP2SRootCert" -pe -a sha1 -len 2048 -ss My "ARMP2SRootCert.cer"
Succeeded
```

23. Open the Certificates MMC and export the certificate to **c:\temp**. Export the certificate without the private key in Base-64 encoded X.509 (.CER) format.

Microsoft Azure Infrastructure step by step



The next commands upload the exported certificate to Microsoft Azure and uses it as the VPN client root certificate.

24. Run the `$filePathForCert = "c:\temp\ARMP2SRootCert.cer"` command.

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> $filePathForCert = "c:\temp\ARMP2SRootCert.cer"
```

25. Run the `$cert = new-object System.Security.Cryptography.X509Certificates.X509Certificate2($filePathForCert)` command.

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> $filePathForCert = "c:\temp\ARMP2SRootCert.cer"
PS C:\WINDOWS\system32> $cert = new-object System.Security.Cryptography.X509Certificates.X509Certificate2($filePathForCert)
```

26. Run the `$CertBase64 = [system.convert]::ToBase64String($cert.RawData)` command.

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> $filePathForCert = "c:\temp\ARMP2SRootCert.cer"
PS C:\WINDOWS\system32> $cert = new-object System.Security.Cryptography.X509Certificates.X509Certificate2($filePathForCert)
PS C:\WINDOWS\system32> $CertBase64 = [system.convert]::ToBase64String($cert.RawData)
```

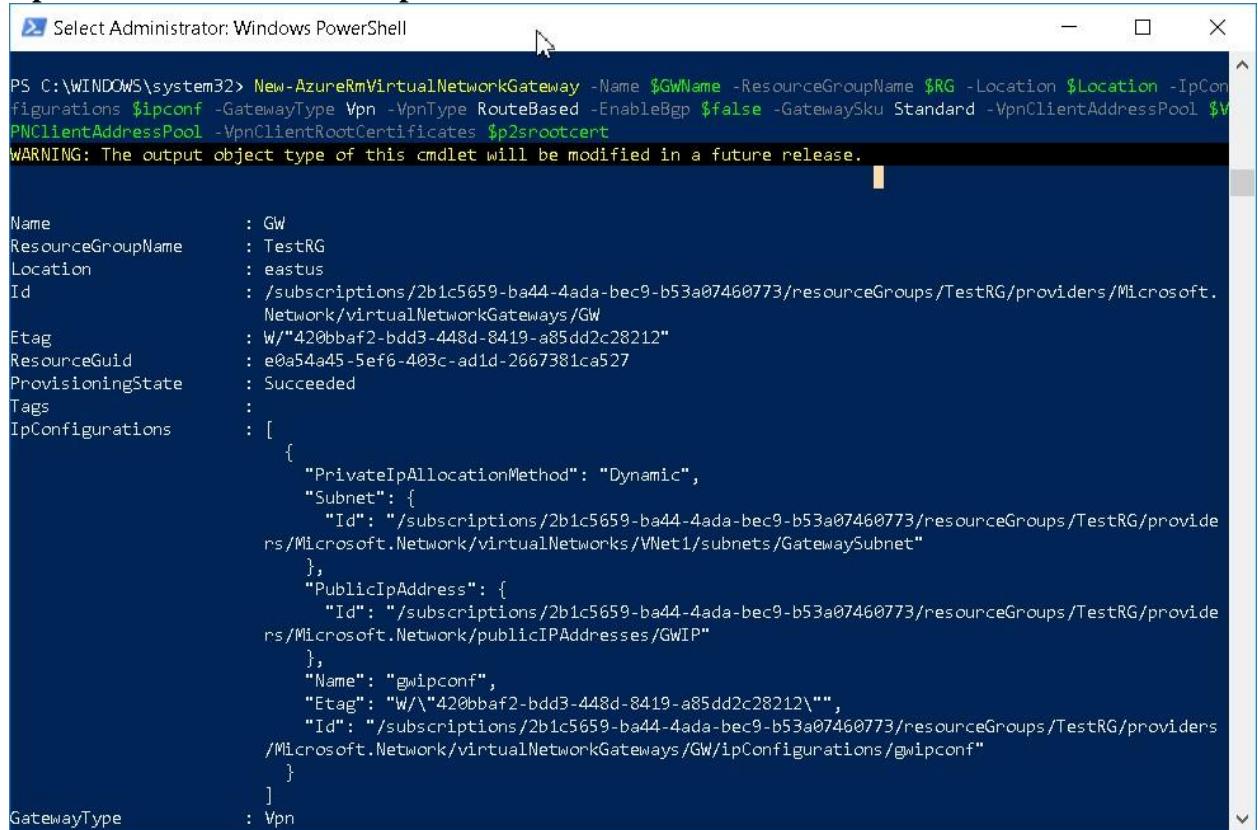
27. Run the `$p2srootcert = New-AzureRmVpnClientRootCertificate -Name $P2SRootCertName -PublicCertData $CertBase64` command.

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> $filePathForCert = "c:\temp\ARMP2SRootCert.cer"
PS C:\WINDOWS\system32> $cert = new-object System.Security.Cryptography.X509Certificates.X509Certificate2($filePathForCert)
PS C:\WINDOWS\system32> $CertBase64 = [system.convert]::ToBase64String($cert.RawData)
PS C:\WINDOWS\system32> $p2srootcert = New-AzureRmVpnClientRootCertificate -Name $P2SRootCertName -PublicCertData $CertBase64
PS C:\WINDOWS\system32>
```

The next command creates the VPN gateway. It can take as many as 30 minutes to complete.

28. Run the `New-AzureRmVirtualNetworkGateway -Name $GWName -ResourceGroupName $RG -Location $Location -IpConfigurations $ipconf` command.

GatewayType Vpn -VpnType RouteBased -EnableBgp \$false -GatewaySku Standard -VpnClientAddressPool \$VPNClientAddressPool -VpnClientRootCertificates \$p2srootcert command.



```
PS C:\WINDOWS\system32> New-AzureRmVirtualNetworkGateway -Name $GwName -ResourceGroupName $RG -Location $Location -IpConfigurations $ipconf -GatewayType Vpn -VpnType RouteBased -EnableBgp $false -GatewaySku Standard -VpnClientAddressPool $VPNClientAddressPool -VpnClientRootCertificates $p2srootcert
WARNING: The output object type of this cmdlet will be modified in a future release.

Name          : GW
ResourceGroupName : TestRG
Location       : eastus
Id            : /subscriptions/2b1c5659-ba44-4ada-bec9-b53a07460773/resourceGroups/TestRG/providers/Microsoft.Network/virtualNetworkGateways/GW
Etag          : W/"420bbaf2-bdd3-448d-8419-a85dd2c28212"
ResourceGuid   : e0a54a45-5ef6-403c-ad1d-2667381ca527
ProvisioningState : Succeeded
Tags          :
IpConfigurations : [
    {
        "PrivateIpAllocationMethod": "Dynamic",
        "Subnet": {
            "Id": "/subscriptions/2b1c5659-ba44-4ada-bec9-b53a07460773/resourceGroups/TestRG/providers/Microsoft.Network/virtualNetworks/VNet1/subnets/GatewaySubnet"
        },
        "PublicIpAddress": {
            "Id": "/subscriptions/2b1c5659-ba44-4ada-bec9-b53a07460773/resourceGroups/TestRG/providers/Microsoft.Network/publicIPAddresses/GWIP"
        },
        "Name": "gwipconf",
        "Etag": "W/"420bbaf2-bdd3-448d-8419-a85dd2c28212"",
        "Id": "/subscriptions/2b1c5659-ba44-4ada-bec9-b53a07460773/resourceGroups/TestRG/providers/Microsoft.Network/virtualNetworkGateways/GW/ipConfigurations/gwipconf"
    }
]
GatewayType   : Vpn
```

Task 2: Connecting Client to the HQ Virtual Network

In this exercise, you will test a point-to-site VPN connection.

1. Open Azure Portal, Select Virtual Network for VPN.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, there's a sidebar with various service icons like Function Apps, SQL databases, and Virtual machines. The main content area is titled "Virtual networks" and shows a list of resources. There are three items listed:

NAME	RESOURCE GROUP	LOCATION	SUBSCRIPTION
Server2012R2-RG-vnet	Server2012R2-RG	South Central US	MSDN Platforms (2b1c5659-ba44-4ada-b...)
Server-VNet	Server-VNet	South Central US	MSDN Platforms (2b1c5659-ba44-4ada-b...)
VNet1	TestRG	East US	MSDN Platforms (2b1c5659-ba44-4ada-b...)

2. Select Virtual Network Gateway

The screenshot shows the Microsoft Azure portal interface, specifically the "VNet1" virtual network details page. The left sidebar has the same set of icons as the previous screen. The main panel shows the "Overview" tab selected. It provides basic information about the resource group:

- Resource group (change): TestRG
- Location: East US
- Subscription (change): MSDN Platforms
- Subscription ID: 2b1c5659-ba44-4ada-be9-b53a07460773

On the right, there's a section for "Connected devices" which currently lists one device:

DEVICE	TYPE	IP ADDRESS	SUBNET
GW	Virtual network gateway	-	GatewaySubnet

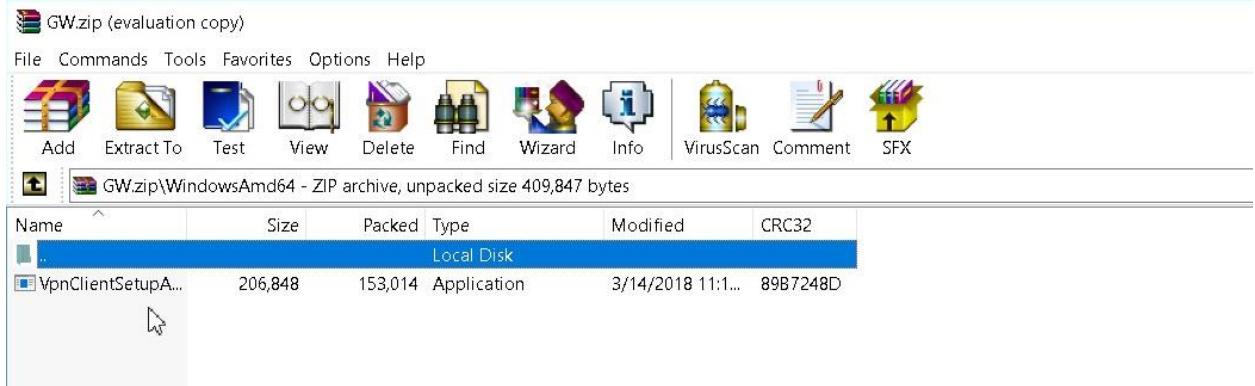
3. Select Point-to-site Connection.

Microsoft Azure Infrastructure step by step

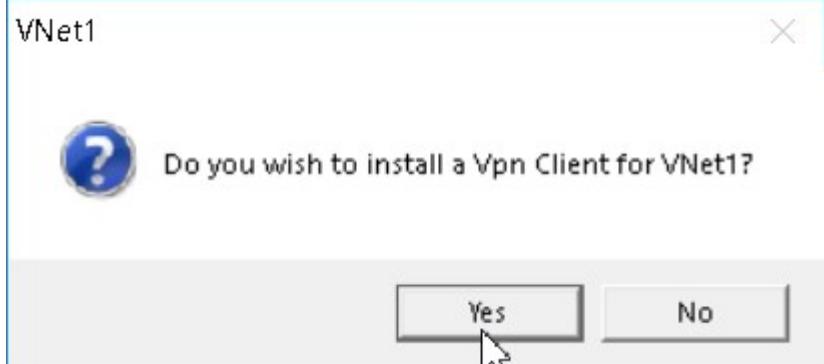
- Once the package has been downloaded, run the installer.

- You may receive a Windows SmartScreen security prompt. If so, click **More info** and then click **Run anyway**.

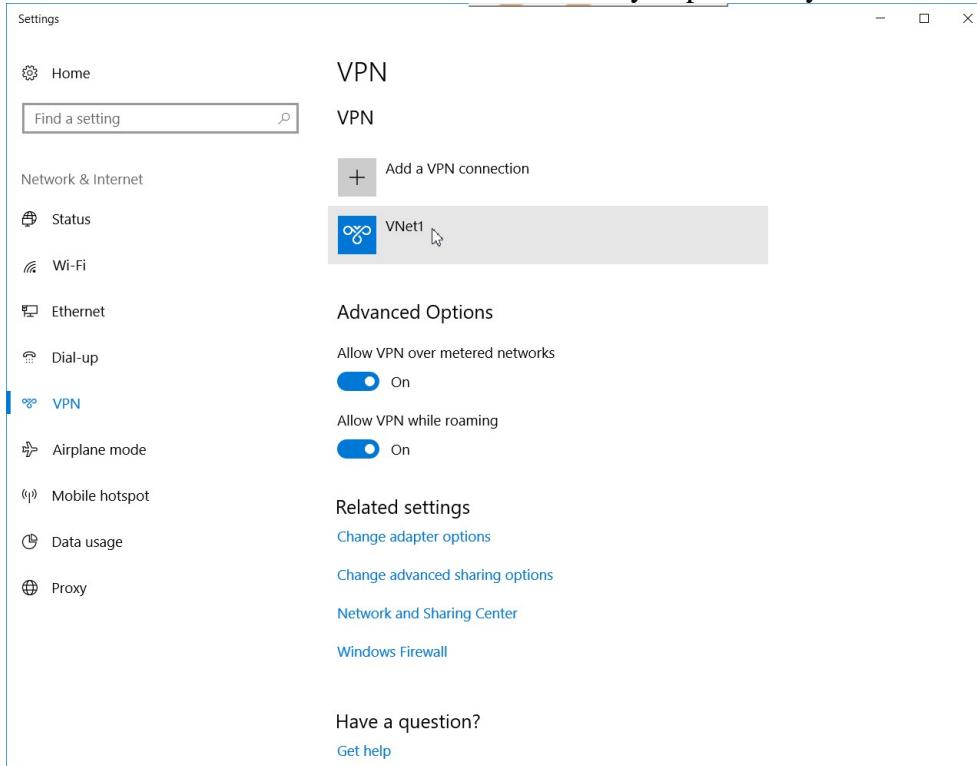
Microsoft Azure Infrastructure step by step



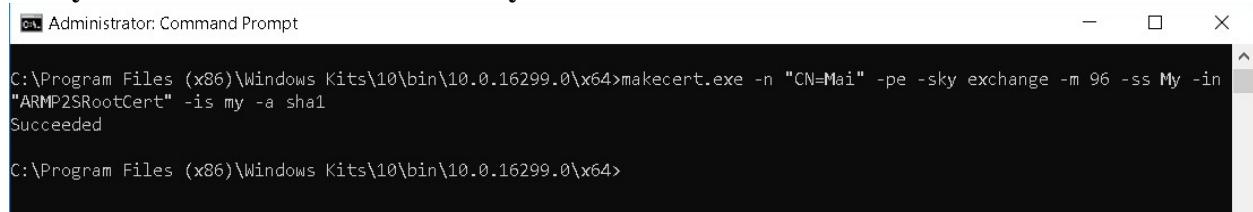
6. In the installer confirmation window, click Yes install the VPN client.



7. On the client computer, navigate to Network Connections. You should see a new connection with the name of the virtual network you previously created.



8. Back at the elevated command prompt, run the following command to install a client certificate: **makecert.exe -n "CN=<YourCommonName>" -pe -sky exchange -m 96 -ss My -in "ARMP2SRootCert" -is my -a sha1**

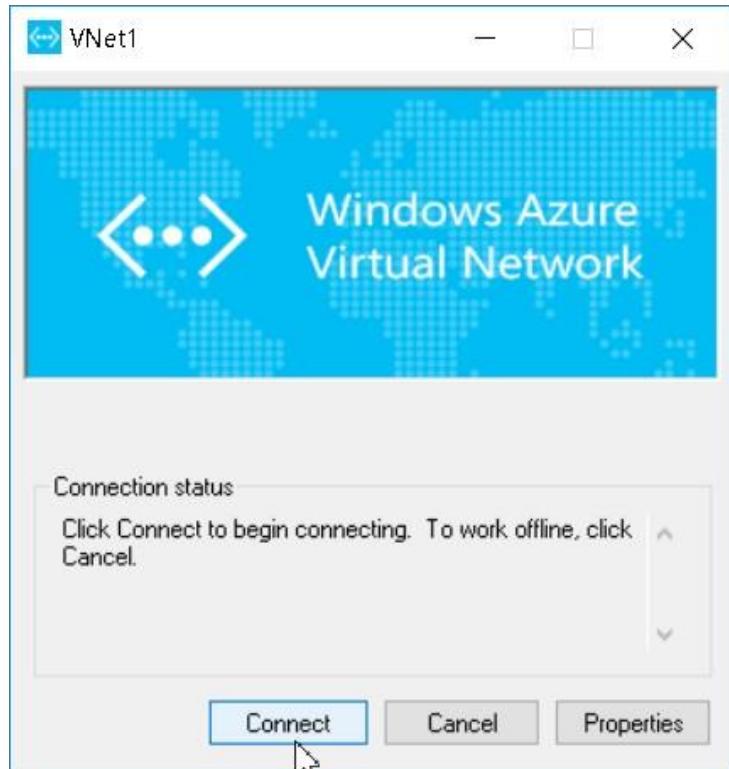


```
Administrator: Command Prompt

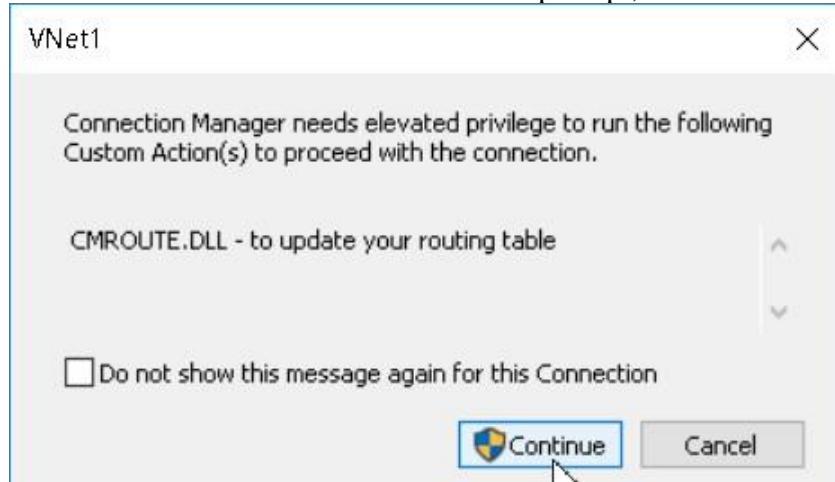
C:\Program Files (x86)\Windows Kits\10\bin\10.0.16299.0\x64>makecert.exe -n "CN=Mai" -pe -sky exchange -m 96 -ss My -in "ARMP2SRootCert" -is my -a sha1
Succeeded

C:\Program Files (x86)\Windows Kits\10\bin\10.0.16299.0\x64>
```

9. On the VPN page of Network & Internet settings, select your virtual network and then click **Connect**.



10. On the Windows Azure Virtual Network prompt, click **Connect** and then click **Continue**.



Microsoft Azure Infrastructure step by step

11. Once connected, you will have full access to any service and virtual machine hosted in your virtual network. Verify your connection by running the **ipconfig /all** command and confirming that you have an IP address from the point-to-site network range.

The screenshot displays two windows side-by-side. The left window is the Windows Settings app, specifically the Network & Internet section under the VPN category. It shows a connection named "VNet1" is "Connected". The right window is a Command Prompt window titled "Administrator: Command Prompt" running on Windows 10. The command "ipconfig /all" has been run, and its output is shown. The output includes details for the "Ethernet adapter Ethernet", "Wireless LAN adapter Local Area Connection* 2", and "PPP adapter VNet1". The "PPP adapter VNet1" section shows an IPv4 Address of 172.16.201.1, which is the expected IP address for a point-to-site VPN connection.

```
C:\>ipconfig /all

Windows IP Configuration

Host Name . . . . . : DESKTOP-U5JA2OS
Primary Dns Suffix . . . . . :
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No

Ethernet adapter Ethernet:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . . . . . :
    Description . . . . . : Intel(R) Ethernet Connection I217-LM
    Physical Address. . . . . : EC-F4-BB-11-82-5F
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . . : Yes

Wireless LAN adapter Local Area Connection* 2:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . . . . . :
    Description . . . . . : Microsoft Wi-Fi Direct Virtual Adapter
    Physical Address. . . . . : 16-39-C4-19-7F-AC
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . . : Yes

PPP adapter VNet1:

    Connection-specific DNS Suffix . . . . . :
    Description . . . . . : VNet1
    Physical Address. . . . . :
    DHCP Enabled. . . . . : No
    Autoconfiguration Enabled . . . . . : Yes
    IPv4 Address. . . . . : 172.16.201.1(Preferred)
    Subnet Mask . . . . . : 255.255.255.255
    Default Gateway . . . . . :
    DNS Servers . . . . . : 8.8.8.8
    NetBIOS over Tcpip. . . . . : Enabled
```

Chapter 3

Azure Virtual Machine

An Azure virtual machine gives you the flexibility of virtualization without having to buy and maintain the physical hardware that runs the virtual machine. However, you still need to maintain the virtual machine — configuring, patching, and maintaining the software that runs on the virtual machine.

Azure Virtual Machines lets you create and use virtual machines in the cloud. Providing what's known as ***Infrastructure as a Service (IaaS)***, virtual machine technology can be used in variety of ways. Some examples are:

- **Test and Development.** Virtual machines provide a quick and easy way to create different operating system and application configurations. Test and Development can then easily delete the VMs when they are no longer needed.
- **Running applications in the cloud.** The ability to run certain applications in the public cloud as opposed to creating a traditional infrastructure to run those applications can provide substantial economic benefits. For example, if an application needs to handle fluctuations in demand, being able to shut VMs down when you don't need them or quickly start them up to meet a sudden increased demand means you only pay for the resources you are using.
- **Extending your data center to the cloud.** An organization can extend the capabilities of its own on-premises network by creating a virtual network (VNET) in Azure and adding VMs to that VNET. Applications like SharePoint can then run on an Azure VM instead of running locally, making it easier to deploy or less expensive to do so than in an on-premises environment.
- **Disaster recovery.** Similar to running certain types of applications in the cloud and extending an on-premises network to the cloud, you can use an IaaS-based approach to disaster recovery, and obtain significant costs savings. If a primary datacenter fails, you can create the VMs running on Azure to run your critical applications, then shut them down when the primary datacenter is once more operational.

Implementing Virtual Machine

Deploying Windows Virtual Machines

In this exercise you will create a new windows virtual machine with a Resource Manager deployment model.

Task 1: Deploy a Custom Windows Virtual Machine

Microsoft Azure Infrastructure step by step

In this exercise you will create a new windows virtual machine using Azure Portal.

1. Start Internet Explorer, browse to the new Azure Preview Portal (<https://portal.azure.com>), and sign in using the Microsoft account that is associated with your Azure subscription.
2. On the Hub menu, click **New**.
3. On the New blade, click **Everything**.
4. Under **Virtual Machines** click on **Windows Server**. In the image list, click **Windows Server 2016 Datacenter**.

The screenshot shows the Microsoft Azure portal interface. On the left, there's a sidebar with various service icons like Dashboard, Resource groups, App Services, etc. The main area has a breadcrumb navigation bar: Home > Virtual machines > Compute. A search bar at the top right says 'Search resources, services and docs'. Below it, a 'Compute' blade is open with a 'Virtual machines' section showing two existing VMs: 'Server-01' and 'Server-02'. To the right, a large search results grid is displayed with the query 'windows server'. The results include several options from Microsoft, such as 'Windows Server 2016 Datacenter', 'Windows Server 2012 R2 Datacenter', and 'Windows Server 2012 Datacenter'. Other results from CloudHub Technologies like 'IIS on Windows Server 2016' and 'Webserver on Windows Server 2016' are also listed. At the bottom of the results grid, there's a section titled 'Related to your search' with links to 'IBM® WebSphere® Application Server V8.5.5.3' and 'Microsoft SQL Server 2016 SP1 Standard on Windows Server 2016'.

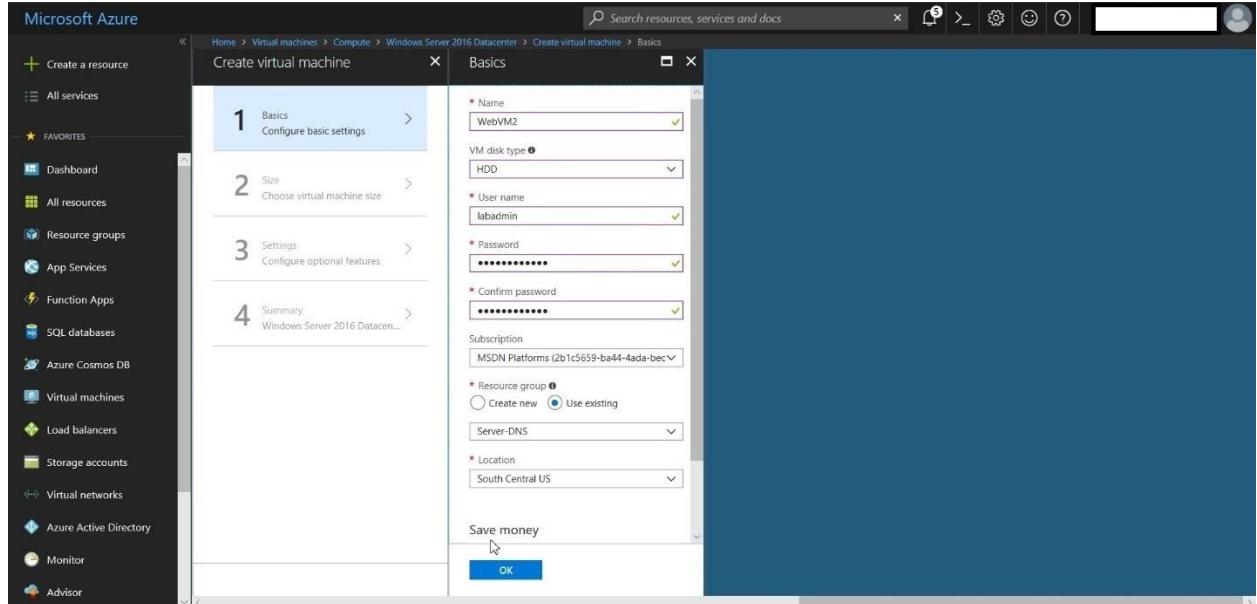
5. On the **Windows Server 2016 Datacenter** blade, click **Create**.

This screenshot shows the 'Create VM' blade for the 'Windows Server 2016 Datacenter' image. The left sidebar is identical to the previous screenshot. The main area shows the 'Windows Server 2016 Datacenter' image selected in the list. To the right, there's descriptive text about Windows Server 2016, a 'Legal Terms' section, social sharing icons, and useful links to documentation and news. At the bottom, there's a dropdown for 'Select a deployment model' set to 'Resource Manager' and a prominent blue 'Create' button.

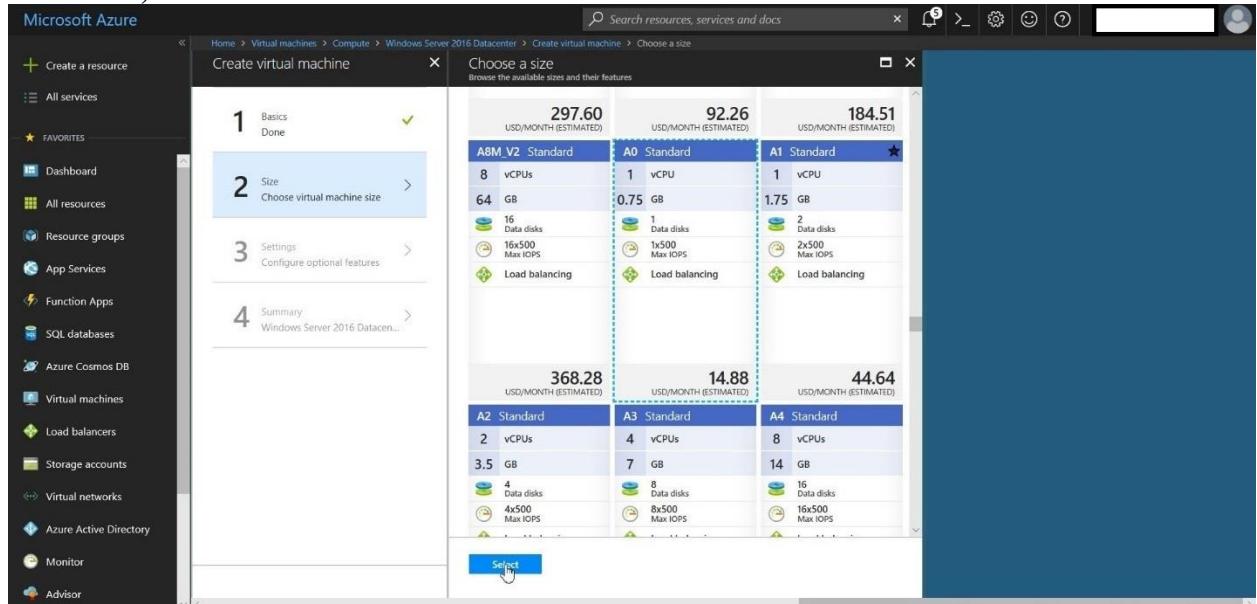
6. On the **Create VM** blade, in the **Host Name** box, type **WebVM2**.

- In the **Username** box, type **labadmin**.
- In the **Password** box, type **Pa\$\$w0rd123**.

Microsoft Azure Infrastructure step by step

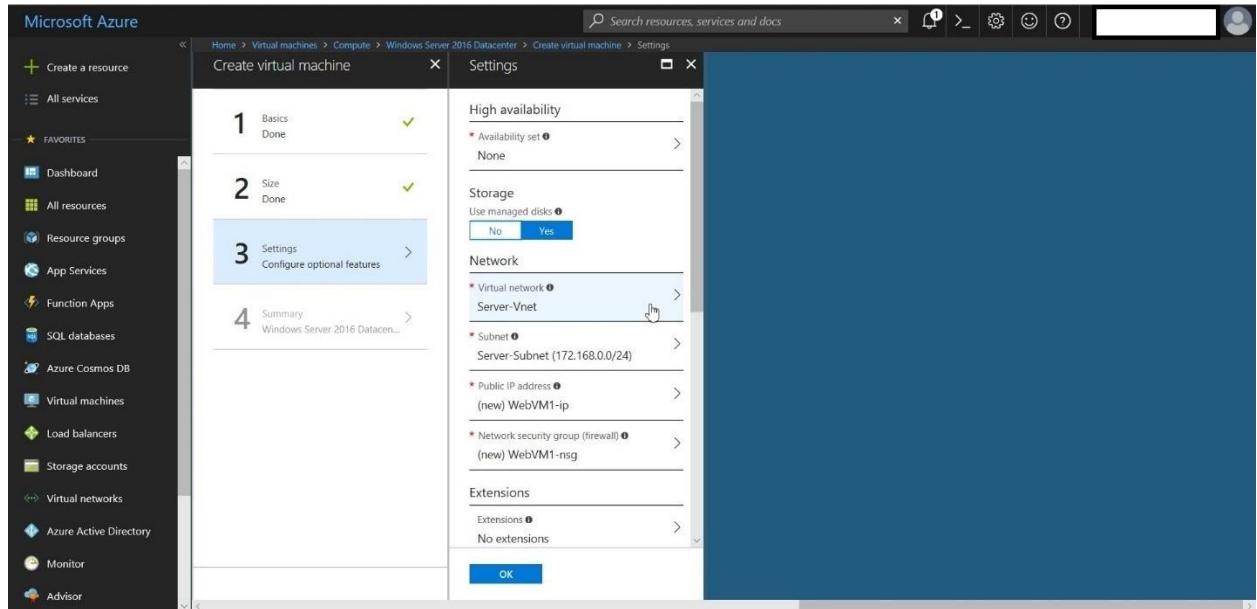


7. Click Size, Select Standard A0 Standard.

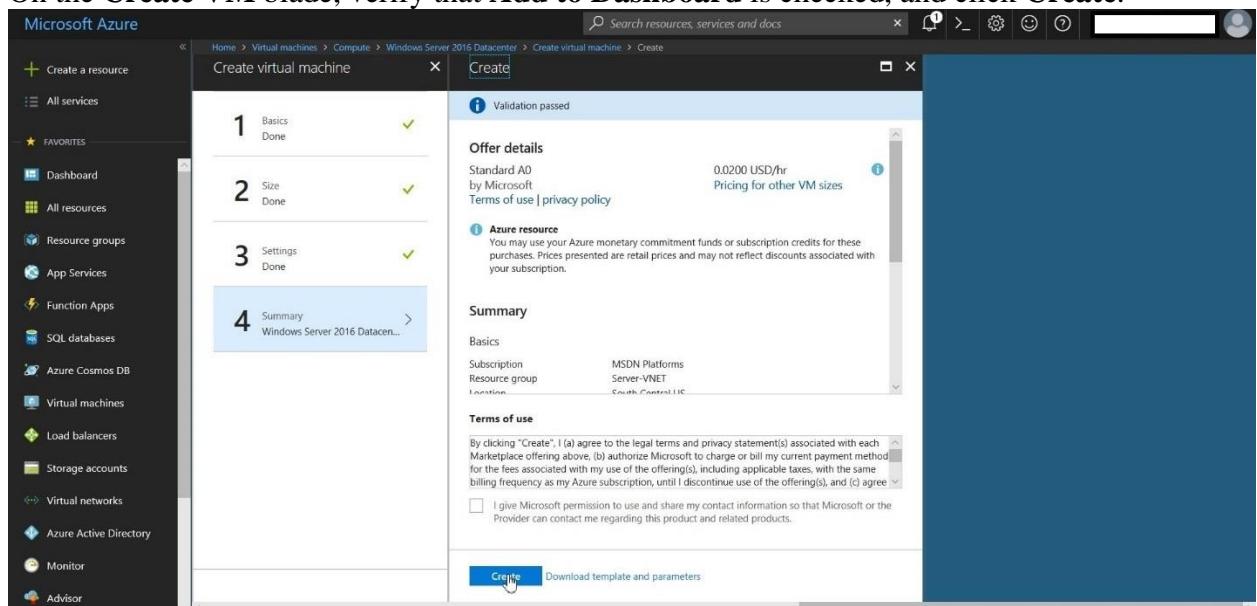


8. On the **Optional config** blade, click **Network**.
9. On the **Network** blade, click **Virtual Network**.
10. On the **Virtual Network** blade, under **Use an existing virtual network**, click **Server-VNET**.

Microsoft Azure Infrastructure step by step

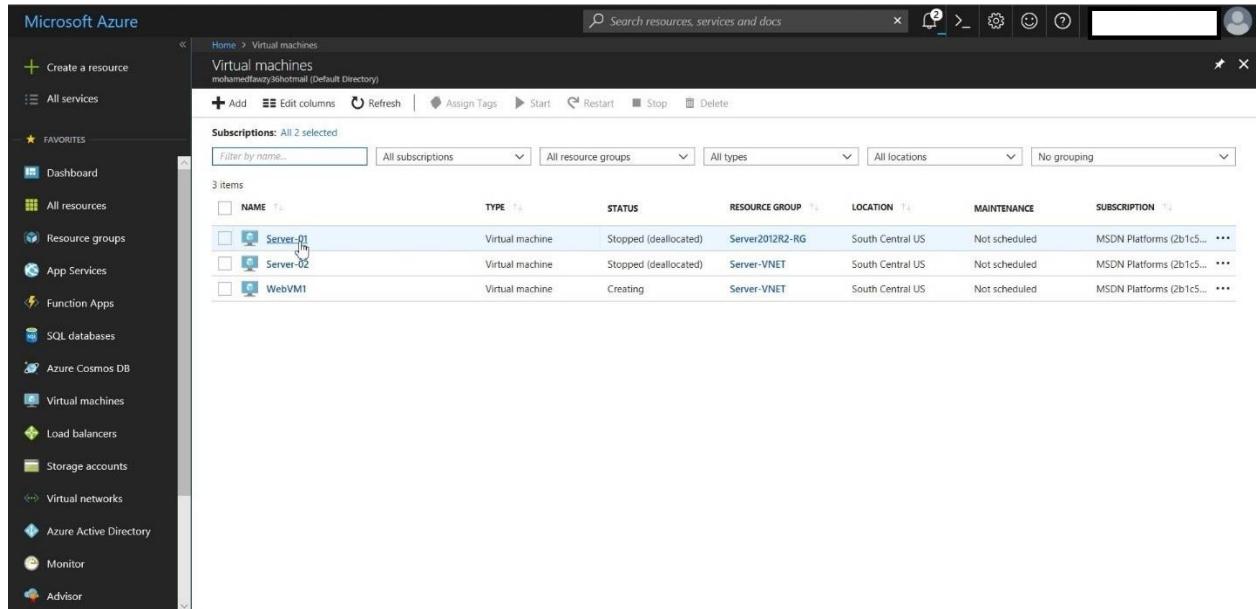


11. On the **Network** blade, click **OK**.
12. On the **Optional config** blade, click **OK**.
13. On the **Create VM** blade, verify that **Add to Dashboard** is checked, and click **Create**.



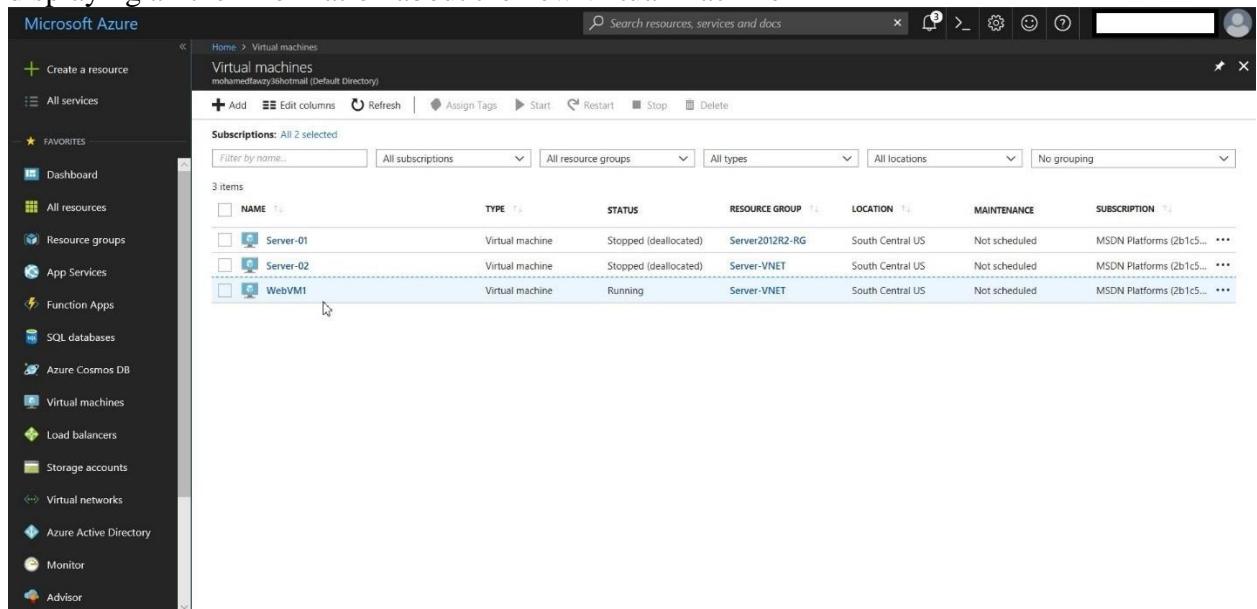
14. On the Hub menu, click **Notifications**, which indicates that the virtual machine is still being provisioned. The virtual machine provisioning process should take approximately 20-25 minutes. If the process appears to be taking longer than this, on the Dashboard, click **Azure Portal** to switch to the full portal, click **Virtual Machines**, and check the status of **WebVM1**.

Microsoft Azure Infrastructure step by step



The screenshot shows the Microsoft Azure portal interface. On the left, there's a navigation sidebar with various service icons like Create a resource, All services, Favorites, Dashboard, All resources, Resource groups, App Services, Function Apps, SQL databases, Azure Cosmos DB, Virtual machines, Load balancers, Storage accounts, Virtual networks, Azure Active Directory, Monitor, and Advisor. The main content area is titled "Virtual machines" and shows a list of three items: "Server-01", "Server-02", and "WebVM1". Each item has a small icon, a name, type (Virtual machine), status (Stopped (deallocated) or Creating), resource group (Server2012R2-RG or Server-VNET), location (South Central US), maintenance (Not scheduled), and subscription (MSDN Platforms). There are also "Edit columns", "Refresh", "Assign Tags", "Start", "Restart", "Stop", and "Delete" buttons at the top of the list.

15. When provisioning is complete, the tile on the Dashboard will be updated to display the name of the new virtual machine and the **WebVM1** virtual machine blade will open, displaying all the information about the new virtual machine



This screenshot is identical to the one above, showing the Microsoft Azure portal's Virtual machines blade. It lists the same three virtual machines: Server-01, Server-02, and WebVM1. The difference is that the cursor is hovering over the "WebVM1" entry in the list, which is highlighted with a dashed border. The rest of the interface, including the sidebar and other buttons, remains the same.

Task 2: Configuring Endpoints on Virtual Machines (Resource Manager)

In this exercise you will explore virtual machine endpoints and how to add them. When you need connectivity over to the internet to a VM, you need to use endpoints. If you are using an operating system firewall, you might need to configure the firewall to enable connectivity too.

1. Navigate to the new [Azure Portal](#) and sign in.
2. On the Hub menu, click **Virtual machines**.
3. Click **Server-01**. This will reveal the properties page for the VM.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes options like Create a resource, All services, Favorites, Dashboard, Resource groups, App Services, Function Apps, SQL databases, Azure Cosmos DB, Virtual machines, Load balancers, Storage accounts, Virtual networks, Azure Active Directory, Monitor, and Advisor. The main content area is titled "Virtual machines" and shows a list of resources. At the top of the list, it says "Subscriptions: All 2 selected". The table displays the following information:

NAME	TYPE	STATUS	RESOURCE GROUP	LOCATION	MAINTENANCE	SUBSCRIPTION
Server-01	Virtual machine	Stopped (deallocated)	Server2012R2-RG	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
Server-02	Virtual machine	Stopped (deallocated)	Server-VNET	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
WebVM1	Virtual machine	Creating	Server-VNET	South Central US	Not scheduled	MSDN Platforms (2b1c5...)

4. Under Settings, click Networking.

The screenshot shows the Microsoft Azure portal interface for a specific virtual machine named "Server-01". The left sidebar lists various settings: Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Networking (which is highlighted in blue), Disks, Size, Security (Preview), Extensions, Availability set, Configuration, Properties, and Locks. The main pane displays detailed information about the VM, including its resource group (Server2012R2-RG), status (Stopped (deallocated)), location (South Central US), and subscription details. It also shows network-related metrics for the last hour, such as CPU usage and network traffic. The "Networking" section is currently active, showing a list of network interfaces associated with the VM.

5. On the Network interfaces blade, click the interface for this VM. For example, click **server-01134**.

Microsoft Azure Infrastructure step by step

Microsoft Azure

Virtual machines

Server-01 - Networking

Network Interface: server-01134 Effective security rules Topology

Virtual network/subnet: Server2012R2-RG-vnet/default Public IP: Server-01-ip Private IP: 10.0.0.50

INBOUND PORT RULES

PRIORITY	NAME	PORT	PROTOCOL	SOURCE	DESTINATION	ACTION
1000	default-allow-rdp	3389	TCP	Any	Any	Allow
65000	AllowVnetInBound	Any	Any	VirtualNet...	VirtualNet...	Allow
65001	AllowAzureLoadBalanc...	Any	Any	AzureLoad...	Any	Allow
65500	DenyAllInBound	Any	Any	Any	Any	Deny

OUTBOUND PORT RULES

PRIORITY	NAME	PORT	PROTOCOL	SOURCE	DESTINATION	ACTION
65000	AllowVnetOutBound	Any	Any	VirtualNet...	VirtualNet...	Allow
65001	AllowInternetOutBound	Any	Any	Any	Internet	Allow

6. On the Network interface blade for this VM, under Settings, click **Network security group**.
7. On the Network security group blade, click the NSG for this VM. For example, click the name of the network security group. For example, **Server01-nsg**.

Microsoft Azure

Virtual machines

Server-01 - Networking

Network Interface: server-01134 Effective security rules Topology

Virtual network/subnet: Server2012R2-RG-vnet/default Public IP: Server-01-ip Private IP: 10.0.0.50

INBOUND PORT RULES

PRIORITY	NAME	PORT	PROTOCOL	SOURCE	DESTINATION	ACTION
1000	default-allow-rdp	3389	TCP	Any	Any	Allow
65000	AllowVnetInBound	Any	Any	VirtualNet...	VirtualNet...	Allow
65001	AllowAzureLoadBalanc...	Any	Any	AzureLoad...	Any	Allow
65500	DenyAllInBound	Any	Any	Any	Any	Deny

OUTBOUND PORT RULES

PRIORITY	NAME	PORT	PROTOCOL	SOURCE	DESTINATION	ACTION
65000	AllowVnetOutBound	Any	Any	VirtualNet...	VirtualNet...	Allow
65001	AllowInternetOutBound	Any	Any	Internet	Internet	Allow

8. On the Network security group blade for this VM, review the available options, such as inbound security rules and outbound security rules. Click **Inbound security rules**. Review the existing endpoints configured for the virtual machine, such as the default-allow-rdp inbound rule (which enables you to connect to the VM with Remote Desktop Connection).

Microsoft Azure Infrastructure step by step

The screenshot shows the Azure portal interface for managing a Network Security Group (NSG). The left sidebar lists various Azure services. The main content area shows the details for 'Server-01-nsg'. Under 'SETTINGS', the 'Inbound security rules' option is selected. The table below lists existing inbound rules:

PRIORITY	NAME	PORT	PROTOCOL	SOURCE	DESTINATION	ACTION
1000	default-allow-rdp	3389	TCP	Any	Any	Allow
65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
65001	AllowAzureLoadBalancerInBound	Any	Any	AzureLoadBalancer	Any	Allow
65500	DenyAllInBound	Any	Any	Any	Any	Deny

Below the table, there is a section for 'Outbound security rules'.

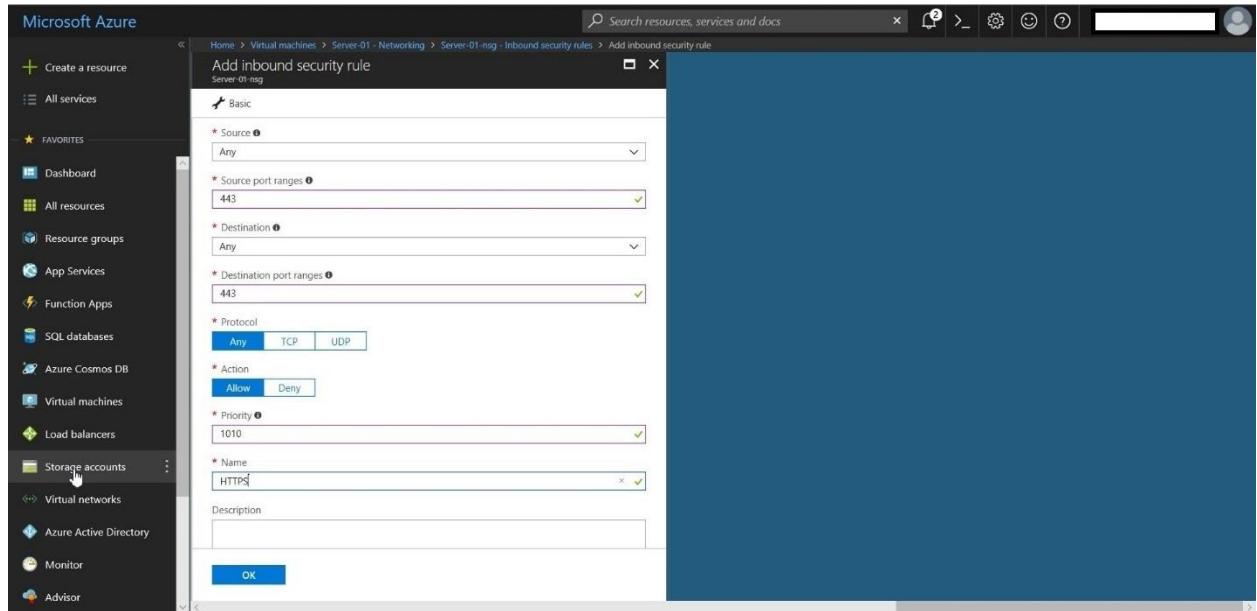
9. Click **Inbound security rules**. On the Inbound security rules blade, click **Add**. Fill in the following values to add HTTPS as a new endpoint to this VM. Click **OK** to apply your changes. Now, you can connect to the VM over HTTPS (TCP port 443). This is the default port for secure web services.

- Name: **HTTPS**
- Priority: **1010**
- Source: **Any**
- Protocol: **Any**
- Source port range: **443**
- Destination: **Any**
- Destination port range: **443**
- Action: **Allow**

The screenshot shows the 'Inbound security rules' blade for 'Server-01-nsg'. The 'Add' button is highlighted with a cursor. The table displays the following rules:

PRIORITY	NAME	PORT	PROTOCOL	SOURCE	DESTINATION	ACTION
1000	default-allow-rdp	3389	TCP	Any	Any	Allow
65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
65001	AllowAzureLoadBalancerInBound	Any	Any	AzureLoadBalancer	Any	Allow
65500	DenyAllInBound	Any	Any	Any	Any	Deny

Microsoft Azure Infrastructure step by step



10. On the menu bar, monitor the progress alerts as the new security rule is applied.
11. When you are finished adding your new endpoint, close the web page.

Task 3: Deploy a Windows Virtual Machine in Microsoft Azure PowerShell

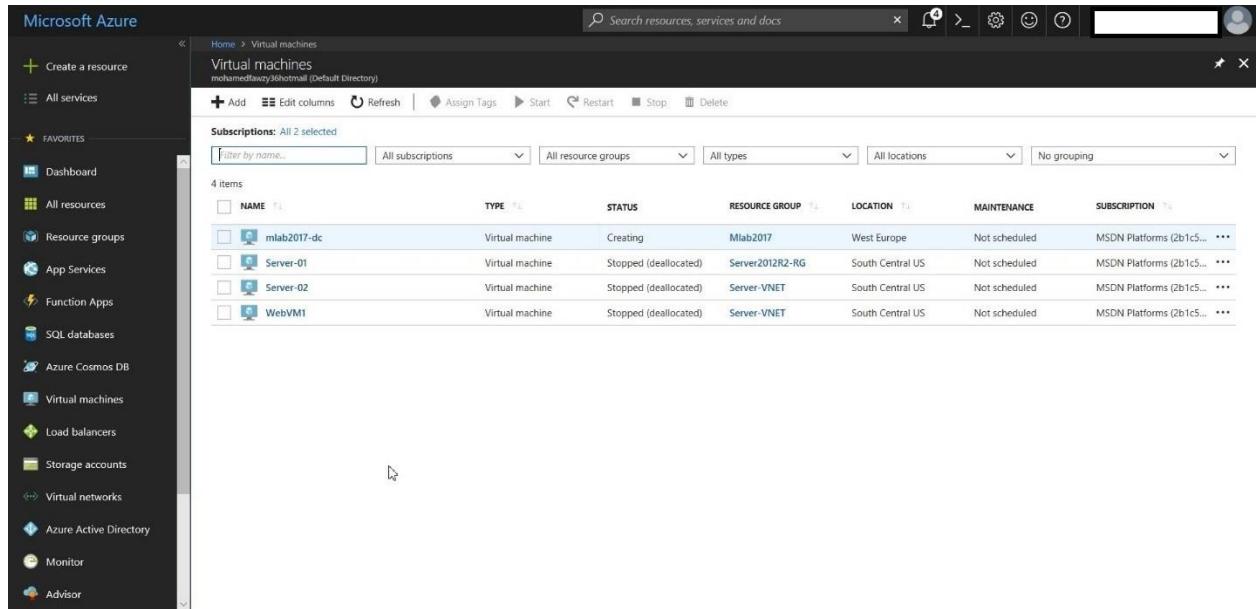
In this exercise you will create a new virtual machine using PowerShell script.

1. On the taskbar, right-click **Microsoft Azure PowerShell** and click **Run ISE as Administrator**. Click **Yes** when prompted.
2. Edit on [this script](#), you can add the Network IP, Name of resources, VM name & size and credentials for admin

A screenshot of a Windows PowerShell window with 'Administrator: Windows PowerShell' in the title bar. The command 'PS C:\Windows\system32> C:\CreateAzureWinServer.ps1' is typed into the console. A 'Security Warning' message is displayed, stating: 'Run only scripts that you trust. While scripts from the internet can be useful, this script can potentially harm your computer. If you trust this script, use the Unblock-File cmdlet to allow the script to run without this warning message. Do you want to run C:\CreateAzureWinServer.ps1?'. Below the message are four options: '[D] Do not run' (highlighted in green), '[R] Run once', '[S] Suspend', and '[?] Help (default is "D")'. The cursor is positioned over the '[D]' option.

3. On the toolbar, click the **Run Selection** button and wait for the script to complete.
4. In the **Microsoft Azure Preview Portal**, click **BROWSE**, then click **Virtual machines**.

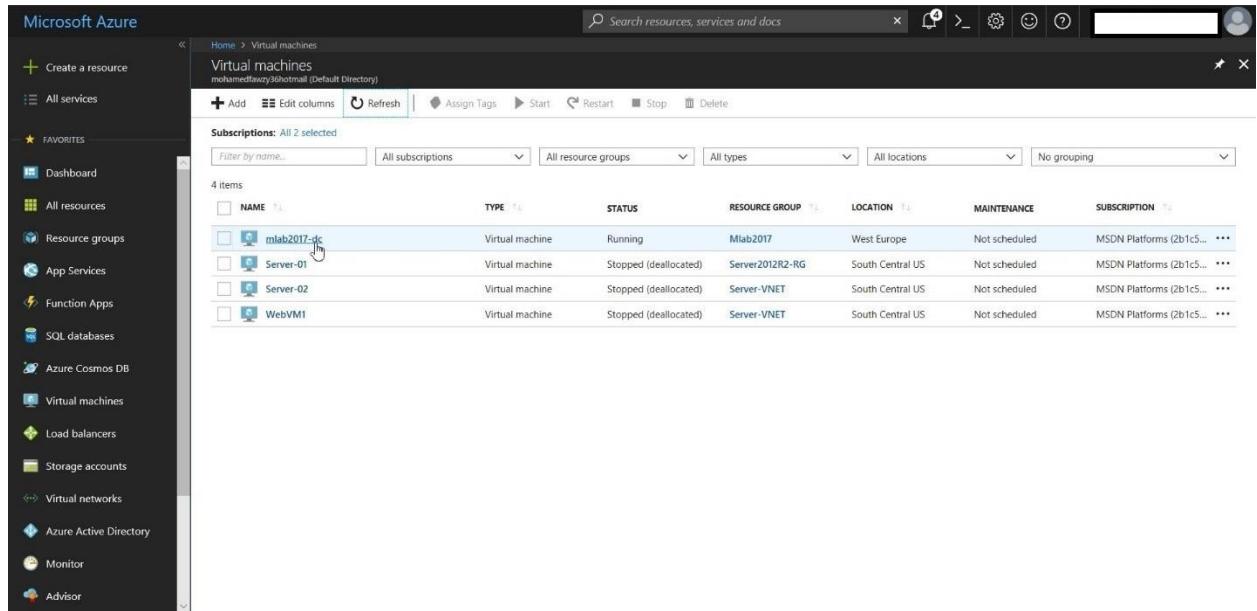
Microsoft Azure Infrastructure step by step



NAME	TYPE	STATUS	RESOURCE GROUP	LOCATION	MAINTENANCE	SUBSCRIPTION
mlab2017-dc	Virtual machine	Creating	Mlab2017	West Europe	Not scheduled	MSDN Platforms (2b1c5...)
Server-01	Virtual machine	Stopped (deallocated)	Server2012R2-RG	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
Server-02	Virtual machine	Stopped (deallocated)	Server-VNET	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
WebVM1	Virtual machine	Stopped (deallocated)	Server-VNET	South Central US	Not scheduled	MSDN Platforms (2b1c5...)

5. On the **Virtual machines** blade, note the new virtual machine listed called **mlab2017-dc**. (The virtual machine provisioning process should take approximately 15-20 minutes.) You can continue to the next task while the **mlab2017-dc** virtual machine is deploying.

Results: After completing this exercise, you will have: Deployed a custom Windows virtual machine using the Preview Portal. Deployed a Windows virtual machine using Windows PowerShell.



NAME	TYPE	STATUS	RESOURCE GROUP	LOCATION	MAINTENANCE	SUBSCRIPTION
mlab2017-dc	Virtual machine	Running	Mlab2017	West Europe	Not scheduled	MSDN Platforms (2b1c5...)
Server-01	Virtual machine	Stopped (deallocated)	Server2012R2-RG	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
Server-02	Virtual machine	Stopped (deallocated)	Server-VNET	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
WebVM1	Virtual machine	Stopped (deallocated)	Server-VNET	South Central US	Not scheduled	MSDN Platforms (2b1c5...)

Deploying Linux Virtual Machines

In this exercise you will create a new Linux virtual machine with a Resource Manager deployment model.

Task 1: Deploy a Custom Linux Virtual Machine

Microsoft Azure Infrastructure step by step

In this exercise you will create a new Linux virtual machine using PowerShell Script

1. In the PowerShell ISE, in the command prompt pane, Enter **Login-AzureRMAccount**

```
Administrator: Windows PowerShell
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

PS C:\WINDOWS\system32> Login-AzureRMAccount

Account      : [REDACTED]
SubscriptionName : MSDN Platforms
SubscriptionId   : 2b1c5659-ba44-4ada-bec9-b53a07460773
TenantId       : de12b8d9-3ccb-4ed5-a6fc-f02979ce6706
Environment     : AzureCloud

PS C:\WINDOWS\system32>
```

2. Enter **Select-AzureRMSubscription -SubscriptionName "Sub. Name"**

```
Administrator: Windows PowerShell
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

PS C:\WINDOWS\system32> Select-AzureRMSubscription -SubscriptionName "MSDN Platforms"

Name      : [REDACTED], 2b1c5659-ba44-4ada-bec9-b53a07460773
Account   : [REDACTED]
SubscriptionName : MSDN Platforms
TenantId   : de12b8d9-3ccb-4ed5-a6fc-f02979ce6706
Environment : AzureCloud

PS C:\WINDOWS\system32>
```

3. Enter the following command and press Enter, where *uniquecloudservicename* is a unique name: **Test-AzureName –service "uniquecloudservicename"**. The response must be ‘False’ for it to be unique; if the response is ‘True’, try another name for the service. If this command failed, run Add-AzureAccount and enter administrative account first

```
Administrator: Windows PowerShell
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

PS C:\WINDOWS\system32> Select-AzureRMSubscription -SubscriptionName "MSDN Platforms"

Name      : [REDACTED], 2b1c5659-ba44-4ada-bec9-b53a07460773
Account   : [REDACTED]
SubscriptionName : MSDN Platforms
TenantId   : de12b8d9-3ccb-4ed5-a6fc-f02979ce6706
Environment : AzureCloud

PS C:\WINDOWS\system32> Test-AzureName –service "uniquecloudservicename"
False
PS C:\WINDOWS\system32>
```

4. In the PowerShell ISE, enter the following command and press Enter, where *uniquecloudservicename* is the unique name from the previous test step:
- \$cloudSvcName = "uniquecloudservicename"
 - \$location = "Central South US"

```

Administrator: Windows PowerShell
Account : [REDACTED]
SubscriptionName : MSDN Platforms
SubscriptionId : 2b1c5659-ba44-4ada-bec9-b53a07460773
TenantId : de12b8d9-3ccb-4ed5-a6fc-f02979ce6706
Environment : AzureCloud

PS C:\WINDOWS\system32> Select-AzureRMSubscription -SubscriptionName "MSDN Platforms"

Name : [REDACTED] 2b1c5659-ba44-4ada-bec9-b53a07460773]
Account : [REDACTED]
SubscriptionName : MSDN Platforms
TenantId : de12b8d9-3ccb-4ed5-a6fc-f02979ce6706
Environment : AzureCloud

PS C:\WINDOWS\system32> Test-AzureName -service "uniquecloudservicename"
False
PS C:\WINDOWS\system32> $cloudSvcName = "uniquecloudservicename"
PS C:\WINDOWS\system32>

```

5. In the PowerShell ISE, in the Script pane, select the following code: `$linuximage = (Get-AzureVMImage | where {$_.ImageFamily -like "Ubuntu Server 17.10"} | where {$_.ImageName -like "*Ubuntu*"}| sort PublishedDate -Descending)[0].ImageName`

```

Select Administrator: Windows PowerShell
SubscriptionId : 2b1c5659-ba44-4ada-bec9-b53a07460773
TenantId : de12b8d9-3ccb-4ed5-a6fc-f02979ce6706
Environment : AzureCloud

PS C:\WINDOWS\system32> Select-AzureRMSubscription -SubscriptionName "MSDN Platforms"

Name : [REDACTED], 2b1c5659-ba44-4ada-bec9-b53a07460773]
Account : [REDACTED]
SubscriptionName : MSDN Platforms
TenantId : de12b8d9-3ccb-4ed5-a6fc-f02979ce6706
Environment : AzureCloud

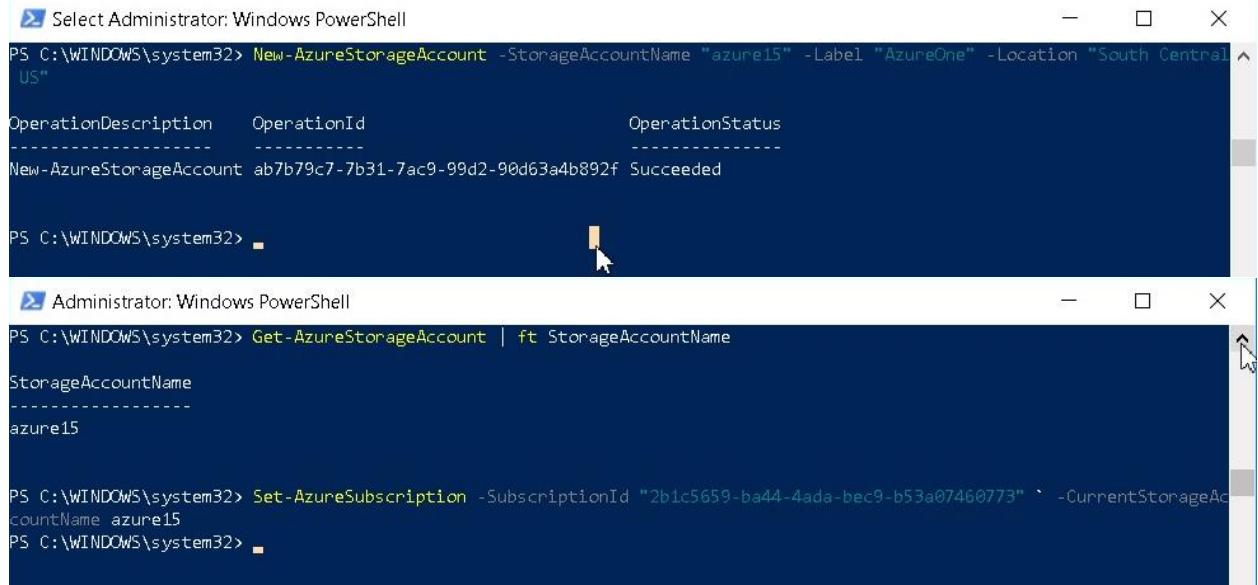
PS C:\WINDOWS\system32> Test-AzureName -service "uniquecloudservicename"
False
PS C:\WINDOWS\system32> $cloudSvcName = "uniquecloudservicename"
PS C:\WINDOWS\system32> $linuximage = (Get-AzureVMImage | where {$_.ImageFamily -like "Ubuntu Server 17.10"} | where {$_.ImageName -like "*Ubuntu*"}| sort PublishedDate -Descending)[0].ImageName
PS C:\WINDOWS\system32>

```

6. In the PowerShell ISE, you need to verify that you already have storage account if not, you need to run below commands.

- `New-AzureStorageAccount -StorageAccountName "azure15"-Label "azureone" -Location "South Central US"`
- `Get-AzureStorageAccount | ft StorageAccountName`
- `Set-AzureSubscription -SubscriptionId "Sub. ID" -CurrentStorageAccountName azure15`

Microsoft Azure Infrastructure step by step



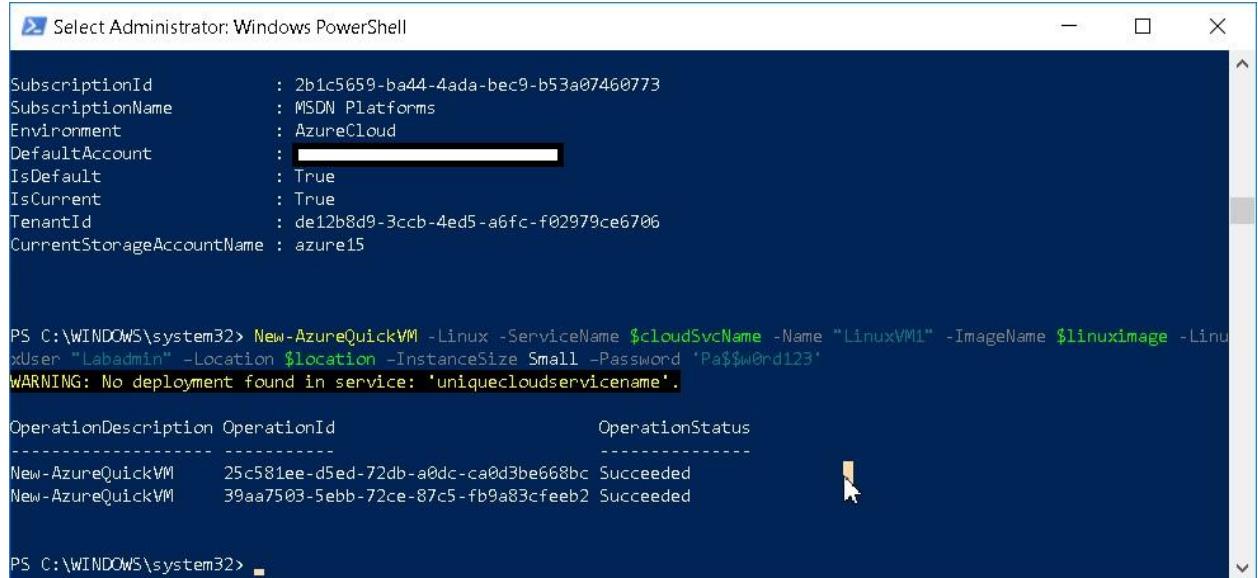
```
PS C:\WINDOWS\system32> New-AzureStorageAccount -StorageAccountName "azure15" -Label "AzureOne" -Location "South Central US"
OperationDescription OperationId OperationStatus
-----
New-AzureStorageAccount ab7b79c7-7b31-7ac9-99d2-90d63a4b892f Succeeded

PS C:\WINDOWS\system32>

PS C:\WINDOWS\system32> Get-AzureStorageAccount | ft StorageAccountName
StorageAccountName
-----
azure15

PS C:\WINDOWS\system32> Set-AzureSubscription -SubscriptionId "2b1c5659-ba44-4ada-bec9-b53a07460773" -CurrentStorageAc
countName azure15
PS C:\WINDOWS\system32>
```

7. In the PowerShell ISE, in the Script pane, select the following code: **New-AzureQuickVM -Linux -ServiceName \$cloudSvcName -Name "LinuxVM1" -ImageName \$linuxImage -LinuxUser "Labadmin" -Location \$location -InstanceSize Small -Password 'Pa\$\$w0rd123'**



```
PS C:\WINDOWS\system32>
SubscriptionId : 2b1c5659-ba44-4ada-bec9-b53a07460773
SubscriptionName : MSDN Platforms
Environment : AzureCloud
DefaultAccount :
IsDefault : True
IsCurrent : True
TenantId : de12b8d9-3ccb-4ed5-a6fc-f02979ce6706
CurrentStorageAccountName : azure15

PS C:\WINDOWS\system32> New-AzureQuickVM -Linux -ServiceName $cloudSvcName -Name "LinuxVM1" -ImageName $linuxImage -Linu
xUser "Labadmin" -Location $location -InstanceSize Small -Password 'Pa$$w0rd123'
WARNING: No deployment found in service: 'uniquecloudservicename'.

OperationDescription OperationId OperationStatus
-----
New-AzureQuickVM 25c581ee-d5ed-72db-a0dc-ca0d3be668bc Succeeded
New-AzureQuickVM 39aa7503-5ebb-72ce-87c5-fb9a83cfeeb2 Succeeded

PS C:\WINDOWS\system32>
```

8. On the toolbar, click the **Run Selection** button and wait for the script to complete. (The virtual machine provisioning process should take approximately 5-10 minutes.)

Microsoft Azure Infrastructure step by step

NAME	TYPE	STATUS	RESOURCE GROUP	LOCATION	MAINTENANCE	SUBSCRIPTION
LinuxVM1	Virtual machine (classic)	Running	uniquecloudservicename	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
mlab2017-dc	Virtual machine	Stopped (deallocated)	mlab2017	West Europe	Not scheduled	MSDN Platforms (2b1c5...)
Server-01	Virtual machine	Stopped (deallocated)	Server2012R2-RG	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
Server-02	Virtual machine	Stopped (deallocated)	Server-VNET	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
WebVM1	Virtual machine	Stopped (deallocated)	Server-VNET	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
WebVM2	Virtual machine	Stopped (deallocated)	Server-DNS	South Central US	Not scheduled	MSDN Platforms (2b1c5...)

Task 2: Configure SSH

In this exercise you will configure SSH to connect with Linux VM

1. Start Internet Explorer, and browse to <https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html>.
2. Right-click **putty.exe**, and click **Save target as**. Save the executable to the Downloads folder on the local computer.

Package files

You probably want one of these. They include all the PuTTY utilities.
(Not sure whether you want the 32-bit or the 64-bit version? Read the [FAQ entry](#).)

MSI ('Windows Installer')

32-bit:	putty-0.70-installer.msi	(or by FTP)	(signature)
64-bit:	putty-64bit-0.70-installer.msi	(or by FTP)	(signature)

Unix source archive

.tar.gz:	putty-0.70.tar.gz	(or by FTP)	(signature)
----------	-----------------------------------	------------------------------	-------------

Alternative binary files

The installer packages above will provide all of these (except PuTTYtel), but you can download them one by one if you prefer.
(Not sure whether you want the 32-bit or the 64-bit version? Read the [FAQ entry](#).)

<https://the.earth.li/~sgtatham/putty/latest/w32/putty-0.70-installer.msi>

3. Start Internet Explorer, browse to <http://portal.azure.com>, and sign in using the Microsoft account that is associated with your Azure subscription.
4. On the Browse blade, click **Virtual machines**.

5. On the Virtual machines blade, click **LinuxVM1**.

The screenshot shows the Microsoft Azure portal's 'Virtual machines' blade. The left sidebar includes options like 'Create a resource', 'All services', 'Dashboard', 'All resources', 'Resource groups', 'App Services', 'Function Apps', 'SQL databases', 'Azure Cosmos DB', 'Virtual machines', 'Load balancers', 'Storage accounts', 'Virtual networks', 'Azure Active Directory', 'Monitor', and 'Advisor'. The main area displays a table of virtual machines with columns: NAME, TYPE, STATUS, RESOURCE GROUP, LOCATION, MAINTENANCE, and SUBSCRIPTION. The table lists several VMs, with 'LinuxVM1' being the one selected and highlighted.

6. On the LinuxVM1 blade, **Settings**, and then click **Properties**.

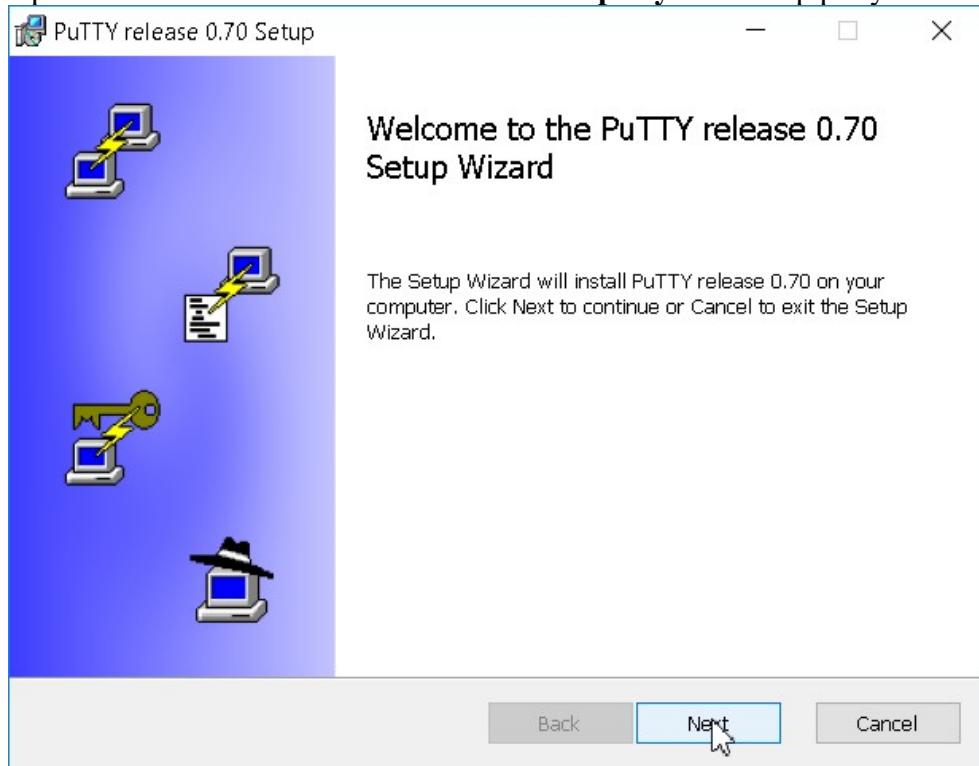
The screenshot shows the 'LinuxVM1' blade under the 'Virtual machines' section. The left sidebar has the same set of options as the previous screenshot. The main area shows the 'SETTINGS' section with a list of properties: Resource group (uniquecloudservicename), Status (Running), Location (South Central US), Subscription (MSDN Platform), and Subscription ID (2b1c5659-ba44-4ada-bee9-b53a07460773). Below this, the 'Properties' section is selected in the menu. Two monitoring charts are displayed: 'CPU percentage last day' and 'Network In and Network Out last day'. The 'CPU percentage last day' chart shows 0% usage from Mar 16 to 6 PM. The 'Network In and Network Out last day' chart shows 2.09 kB for Network IN and 1.53 kB for Network OUT over the same period.

7. On the Properties blade, under **SSH**, click the **Copy** button to copy the host name and port number (for example **uniquecloudservicename.cloudapp.net:49460**).

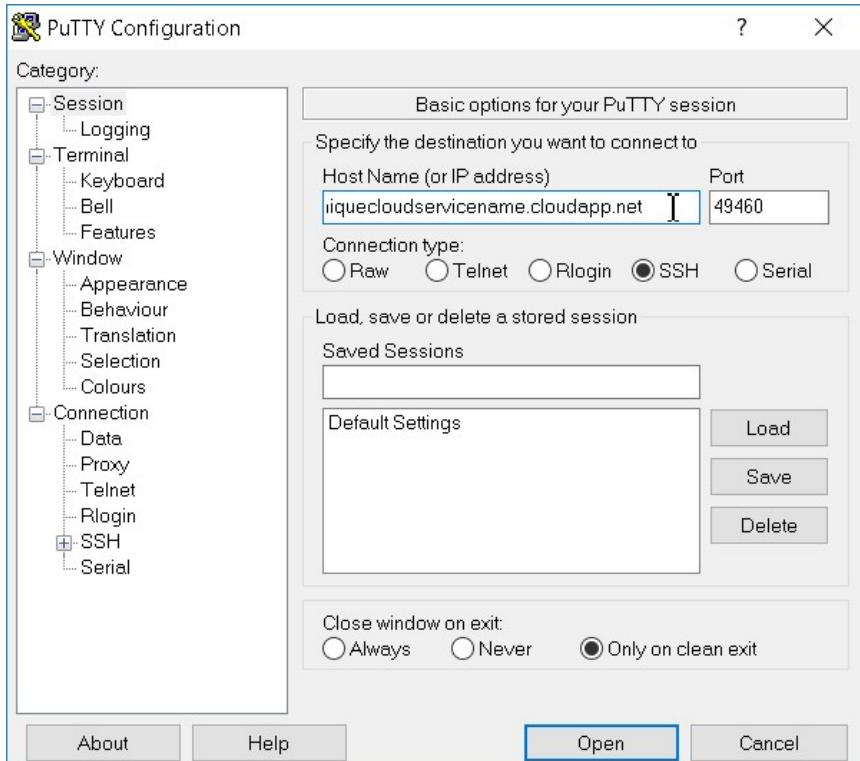
Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes options like Create a resource, All services, Favorites, Dashboard, All resources, Resource groups, App Services, Function Apps, SQL databases, Azure Cosmos DB, Virtual machines, Load balancers, Storage accounts, Virtual networks, Azure Active Directory, Monitor, and Advisor. The main area displays the 'Virtual machines' blade, with a list of VMs including 'LinuxVM1', 'mlab2017-dc', 'Server-01', 'Server-02', 'WebVM1', and 'WebVM2'. To the right, the 'LinuxVM1 - Properties' blade is open, showing details such as STATUS (Running), DNS NAME (uniquecloudservicename.cloudapp.net), COMPUTER NAME (ubuntu), VIRTUAL IP ADDRESS (13.84.188.119), PRIVATE IP ADDRESS (100.72.60.43), OPERATING SYSTEM (Linux), and SSH settings. The SSH host name is listed as uniquecloudservicename.cloudapp.net:49460.

8. In the Microsoft Azure portal, close all the open blades.
9. Open the **Downloads** folder and double-click **putty.exe**. Setup putty.exe



10. In the **Host Name** text box, paste the host name from step 7 in the previous task, and in the **Port** textbox, paste the port number from step 7 in the previous task. Click **Open**.



11. If you get a **PuTTY Security Alert** dialog box, click **Yes**.



12. In the PuTTY command window, at the **login as:** prompt, type **Labadmin** and press Enter.

```
uniquecloudservicename.cloudapp.net - PuTTY
login as: Labadmin
Labadmin@uniquecloudservicename.cloudapp.net's password: [REDACTED]
```

13. At the **Password:** prompt, type **Pa\$\$w0rd123** and press Enter.

```
Labadmin@LinuxVM1: ~
login as: Labadmin
Labadmin@uniquecloudservicename.cloudapp.net's password:
Welcome to Ubuntu 17.10 (GNU/Linux 4.13.0-37-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

 Get cloud support with Ubuntu Advantage Cloud Guest:
 http://www.ubuntu.com/business/services/cloud

0 packages can be updated.
0 updates are security updates.

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
```

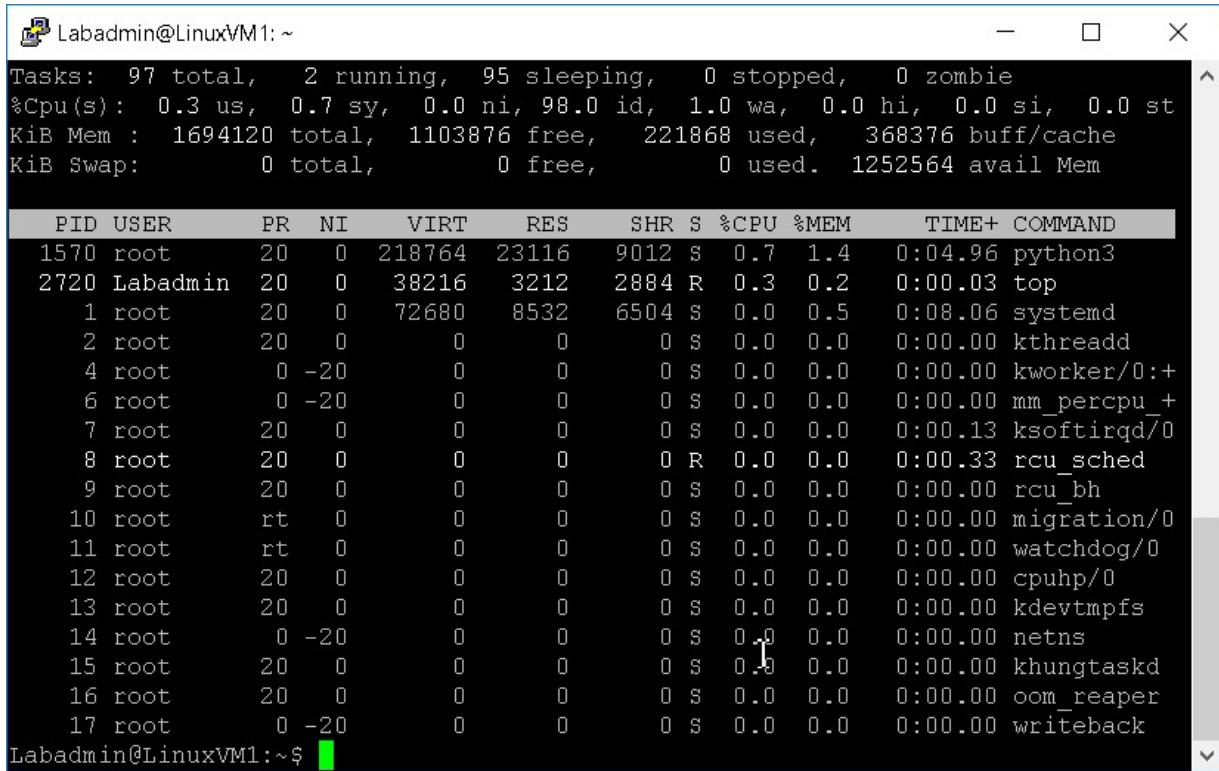
14. At the command prompt, type **who** and press Enter.
15. At the command prompt, type **dir** and press Enter.
16. At the command prompt, type **df** and press Enter.
17. At the command prompt, type **ps** and press Enter.

```
Labadmin@LinuxVM1: ~
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

Labadmin@LinuxVM1:~$ who
Labadmin pts/0      2018-03-16 19:11 (156.223.249.134)
Labadmin@LinuxVM1:~$ dir
Labadmin@LinuxVM1:~$ df
Filesystem      1K-blocks    Used Available Use% Mounted on
udev            820132       0   820132   0% /dev
tmpfs           169412   3284   166128   2% /run
/dev/sda1      30308240 1569944  28721912   6% /
tmpfs           847060       0   847060   0% /dev/shm
tmpfs            5120       0     5120   0% /run/lock
tmpfs           847060       0   847060   0% /sys/fs/cgroup
/dev/sda15      106858   3416   103443   4% /boot/efi
/dev/sdb1      71722104  53276  67982532   1% /mnt
tmpfs           169412       0   169412   0% /run/user/1000
Labadmin@LinuxVM1:~$ ps
  PID TTY      TIME CMD
 2607 pts/0    00:00:00 bash
 2713 pts/0    00:00:00 ps
Labadmin@LinuxVM1:~$
```

18. At the command prompt, type **top** and press Enter.



The screenshot shows a terminal window titled 'Labadmin@LinuxVM1: ~'. The window displays system monitoring information. At the top, it shows 'Tasks: 97 total, 2 running, 95 sleeping, 0 stopped, 0 zombie', '%Cpu(s): 0.3 us, 0.7 sy, 0.0 ni, 98.0 id, 1.0 wa, 0.0 hi, 0.0 si, 0.0 st', 'KiB Mem : 1694120 total, 1103876 free, 221868 used, 368376 buff/cache', and 'KiB Swap: 0 total, 0 free, 0 used. 1252564 avail Mem'. Below this is a table of processes:

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
1570	root	20	0	218764	23116	9012	S	0.7	1.4	0:04.96	python3
2720	Labadmin	20	0	38216	3212	2884	R	0.3	0.2	0:00.03	top
1	root	20	0	72680	8532	6504	S	0.0	0.5	0:08.06	systemd
2	root	20	0	0	0	0	S	0.0	0.0	0:00.00	kthreadd
4	root	0	-20	0	0	0	S	0.0	0.0	0:00.00	kworker/0:+
6	root	0	-20	0	0	0	S	0.0	0.0	0:00.00	mm_percpu_
7	root	20	0	0	0	0	S	0.0	0.0	0:00.13	ksoftirqd/0
8	root	20	0	0	0	0	R	0.0	0.0	0:00.33	rcu_sched
9	root	20	0	0	0	0	S	0.0	0.0	0:00.00	rcu_bh
10	root	rt	0	0	0	0	S	0.0	0.0	0:00.00	migration/0
11	root	rt	0	0	0	0	S	0.0	0.0	0:00.00	watchdog/0
12	root	20	0	0	0	0	S	0.0	0.0	0:00.00	cpuhp/0
13	root	20	0	0	0	0	S	0.0	0.0	0:00.00	kdevtmpfs
14	root	0	-20	0	0	0	S	0.0	0.0	0:00.00	netns
15	root	20	0	0	0	0	S	0.0	0.0	0:00.00	khungtaskd
16	root	20	0	0	0	0	S	0.0	0.0	0:00.00	oom_reaper
17	root	0	-20	0	0	0	S	0.0	0.0	0:00.00	writeback

Labadmin@LinuxVM1:~\$

19. Press **q** to stop the command.
20. At the command prompt, type **exit** and press Enter.

Managing Virtual Machine

Azure virtual machines provide a fully configurable and flexible computing environment. This topic covers basic Azure virtual machine deployment items such as selecting a VM size, selecting a VM image, and deploying a VM.

Exploring Availability

In this exercise, you will configure an availability set and a load-balanced set between 2 VMs.

Task 1: Specify Availability Sets

VMs must be created within the availability set to make sure they are correctly distributed across the hardware. You can't add an existing VM to an availability set after it is created.

In this exercise, you will configure an availability set

1. Start Internet Explorer, browse to the new Azure Preview Portal (<https://portal.azure.com>), and sign in using the Microsoft account that is associated with your Azure subscription.
2. On the Hub menu, click **NEW**.
3. On the New blade, click **Everything**.

4. Under **Virtual Machines** click on **Windows Server**. In the image list, click **Windows Server 2016 Datacenter**.

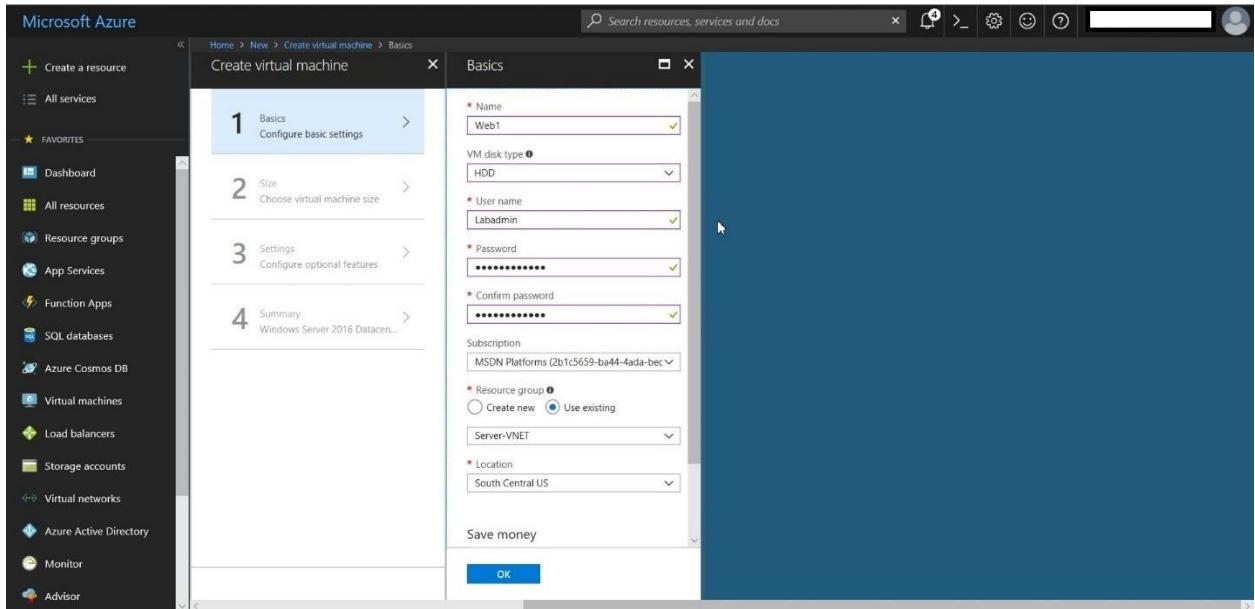
NAME	PUBLISHER	CATEGORY
Windows Server 2016 Datacenter	Microsoft	Recommended
Windows Server 2012 R2 Datacenter	Microsoft	Recommended
Windows Server 2012 Datacenter	Microsoft	Recommended
Windows Server 2016 - Nano Server	Microsoft	Recommended
Windows Server, version 1709	Microsoft	Recommended
IIS on Windows Server 2016	CloudHub Technologies	Virtual Machine Images
Webserver on Windows Server 2016	CloudHub Technologies	Virtual Machine Images
SQL Server 2016 SP1 Standard on Windows Server 2016	Microsoft	Recommended

5. On the **Windows Server 2016 Datacenter** blade, click **Create**.

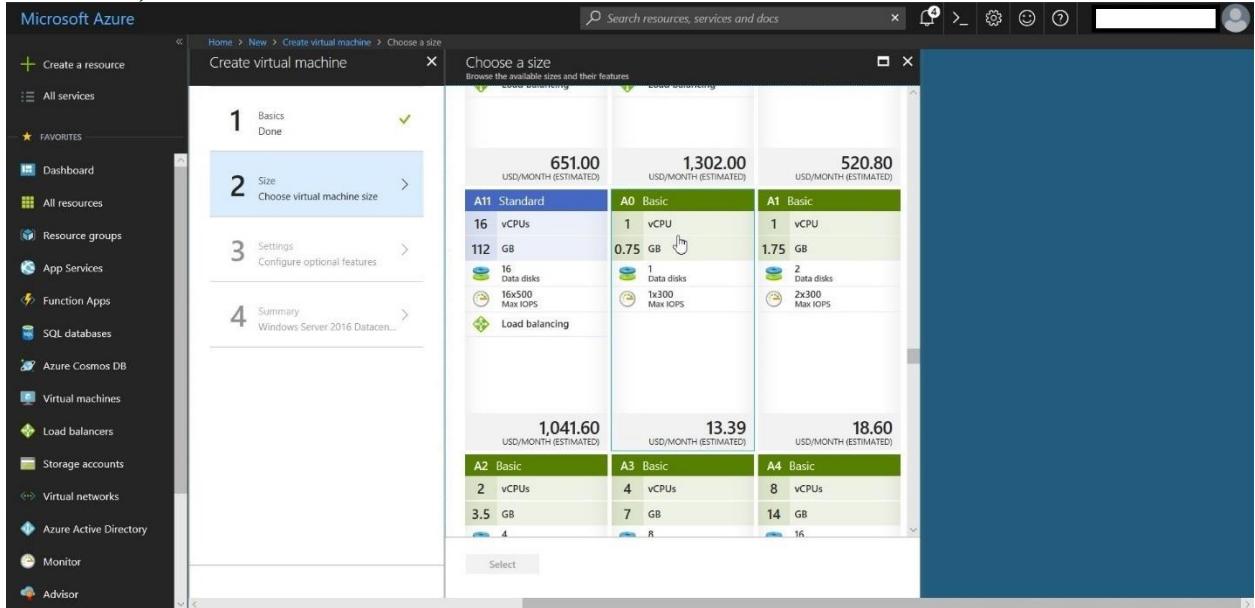
6. On the **Create VM** blade, in the **Host Name** box, type **Web1**.

- In the **Username** box, type **labadmin**.
- In the **Password** box, type **Pa\$\$w0rd123**.

Microsoft Azure Infrastructure step by step

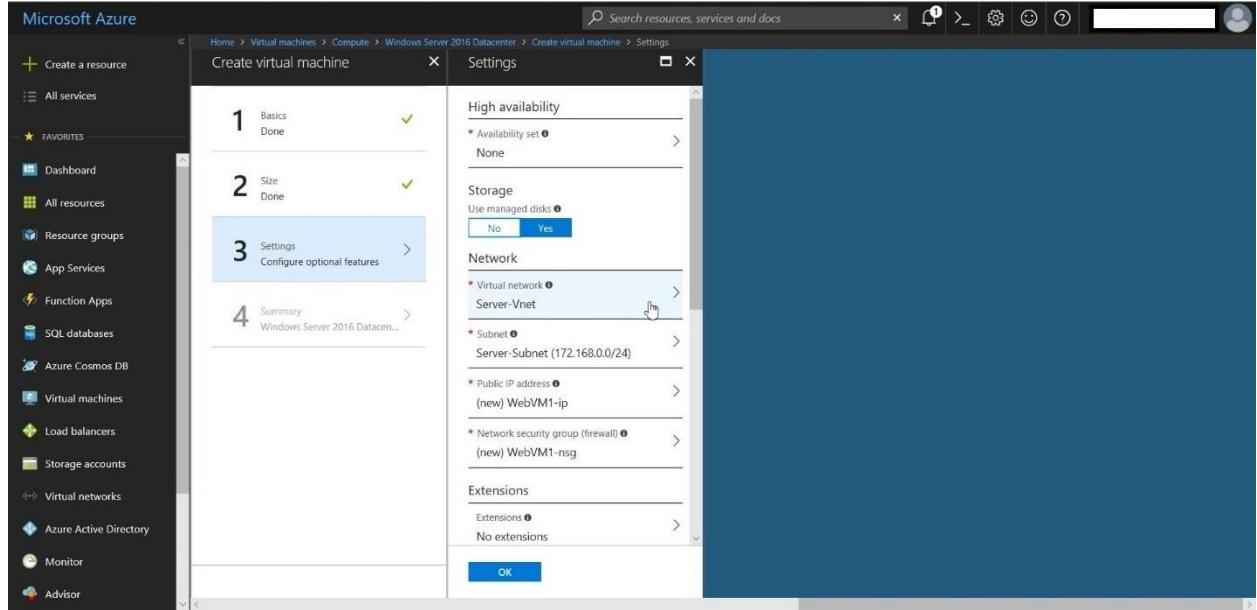


7. Click Size, Select Standard A0 Basic.

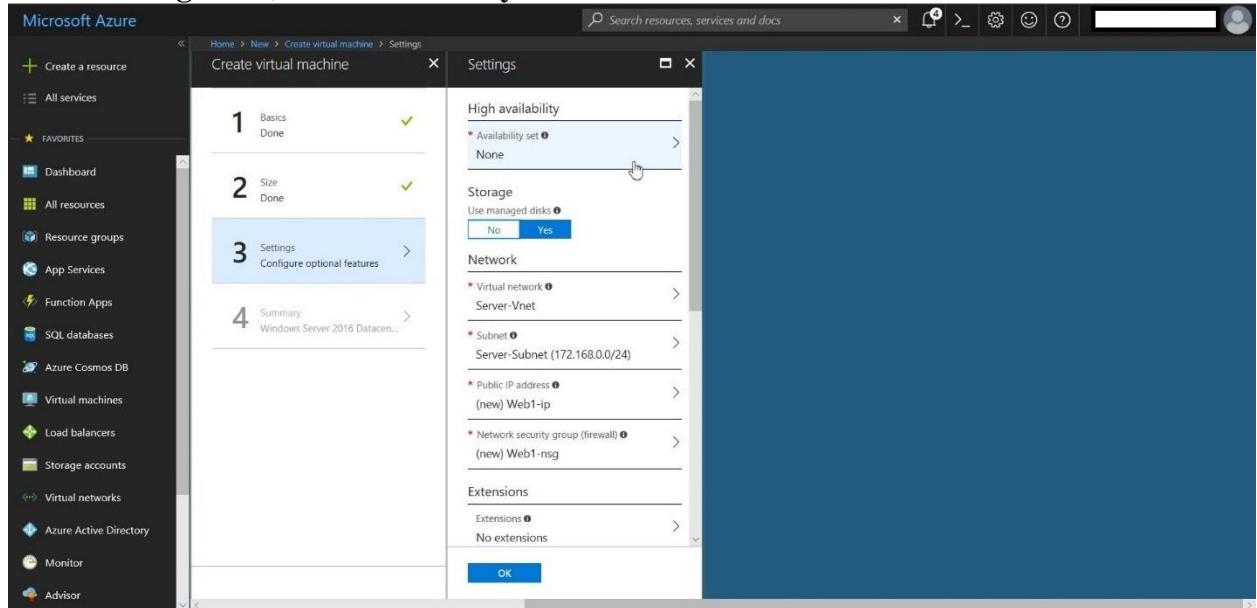


8. On the **Optional config** blade, click **Network**.
9. On the **Network** blade, click **Virtual Network**.
10. On the **Virtual Network** blade, under **Use an existing virtual network**, click **Server-VNET**.

Microsoft Azure Infrastructure step by step

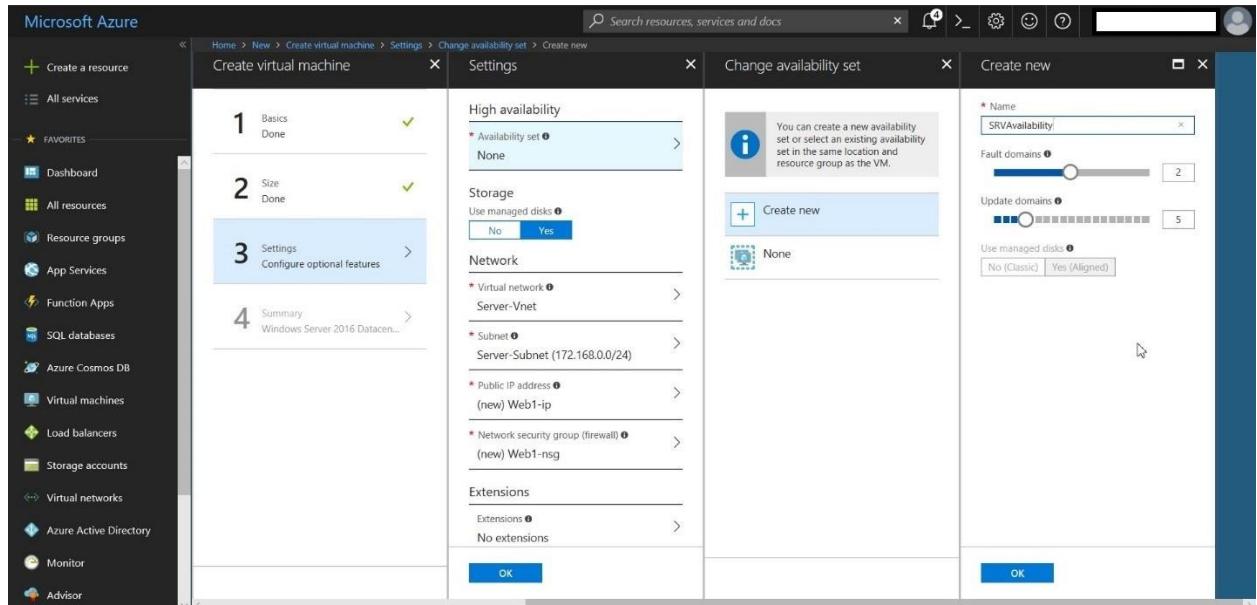


11. On the setting blade, click **Availability set**.

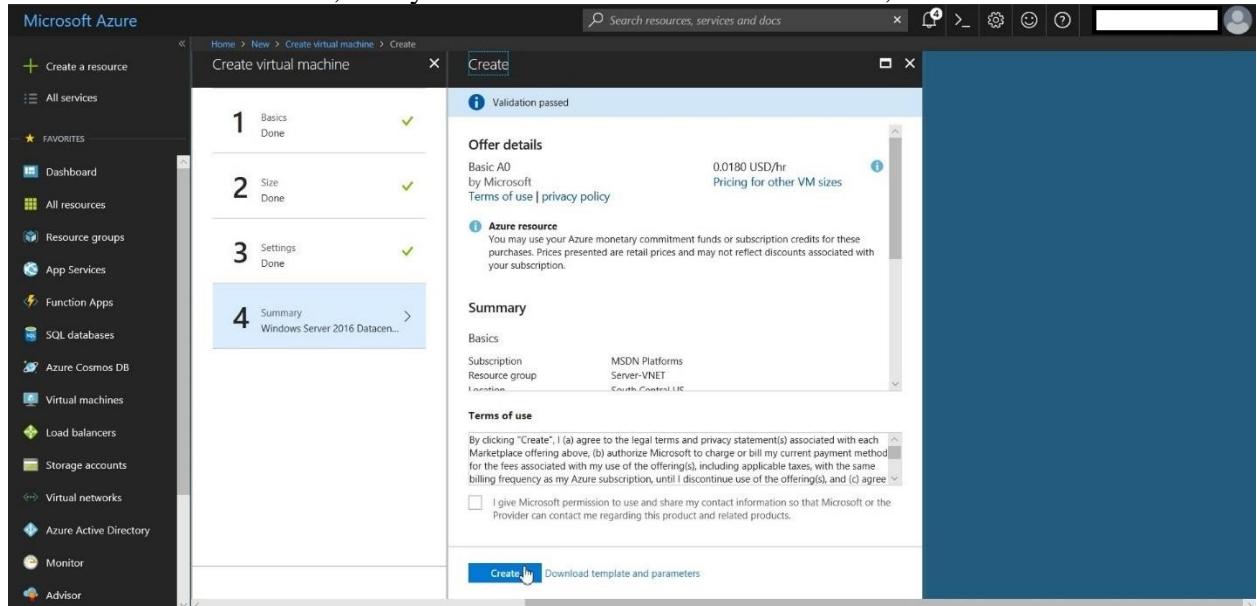


12. On the **Availability set** blade, click **create**.

Microsoft Azure Infrastructure step by step



13. On the **Create VM** blade, verify that **Add to Dashboard** is checked, and click **Create**.



14. On the Hub menu, click **NOTIFICATIONS**, which indicates that the virtual machine is still being provisioned. The virtual machine provisioning process should take approximately 20-25 minutes. If the process appears to be taking longer than this, on the Dashboard, click **AZURE PORTAL** to switch to the full portal, click **VIRTUAL MACHINES**, and check the status of **Web1**.

Create Availability set & virtual machine using PowerShell

15. On the taskbar, right-click Microsoft Azure PowerShell and click **Run ISE as Administrator**. Click **Yes** when prompted.
16. In the PowerShell ISE, in the command prompt pane, enter the following command to add an Azure account to the local PowerShell environment: `Add-AzureAccount`
17. When prompted, sign in using the Microsoft account associated with your Azure subscription.

18. In the PowerShell ISE, run this command to create availability set using powershell

- **New-AzureRmAvailabilitySet`**
- **-Location "South Central US" `**
- **-Name "SRV2012R2AVR" `**
- **-ResourceGroupName "Server2012R2-RG" `**
- **-Sku aligned `**
- **-PlatformFaultDomainCount 2 `**
- **-PlatformUpdateDomainCount 2**

The screenshot shows a Windows PowerShell window titled 'Administrator: Windows PowerShell'. The command entered is:

```
PS C:\WINDOWS\system32> New-AzureRmAvailabilitySet`  
PS C:\WINDOWS\system32> >> -Location "South Central US" `  
>> -Name "SRV2012R2AVR" `  
>> -ResourceGroupName "Server2012R2-RG" `  
>> -Sku aligned `  
>> -PlatformFaultDomainCount 2 `  
>> -PlatformUpdateDomainCount 2
```

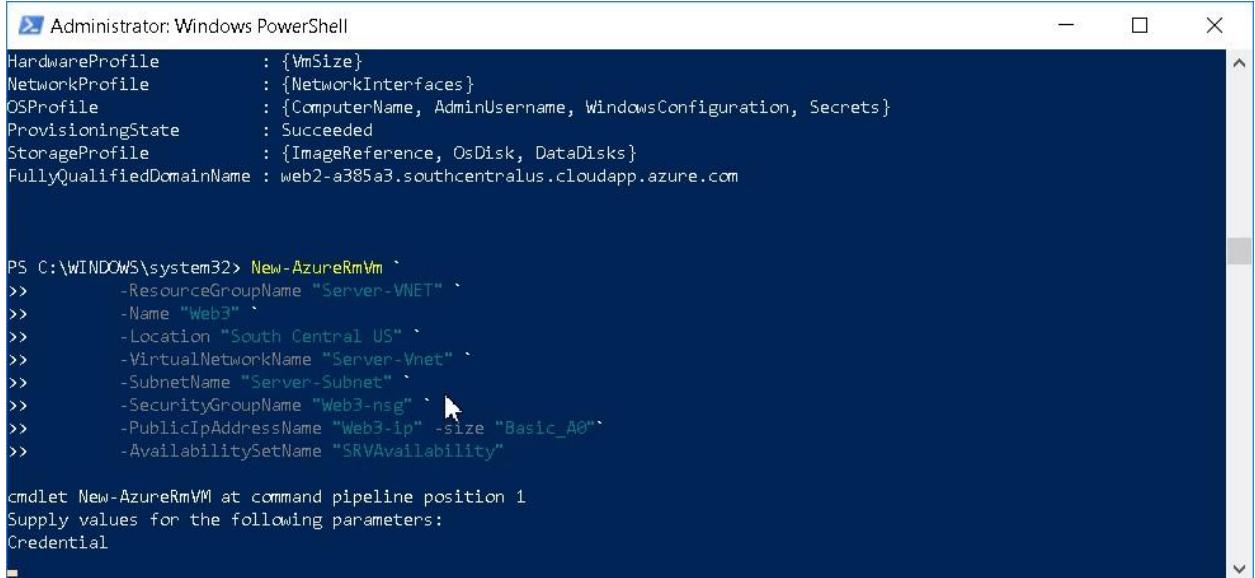
After execution, the output displays the properties of the newly created availability set:

```
ResourceGroupName      : Server2012R2-RG  
Id                   : /subscriptions/2b1c5659-ba44-4ada-bec9-b53a07460773/resourceGroups/Server2012R2-RG/providers/Microsoft.Compute/availabilitySets/SRV2012R2AVR  
Name                 : SRV2012R2AVR  
Type                 : Microsoft.Compute/availabilitySets  
Location              : southcentralus  
Managed               : True  
Sku                  : Aligned  
Tags                 : {}  
PlatformFaultDomainCount : 2  
PlatformUpdateDomainCount : 2  
Statuses              : []  
VirtualMachinesReferences : []
```

19. In the PowerShell ISE, in the command prompt pane, enter the following command and press Enter:

- **New-AzureRmVm`**
- **-ResourceGroupName "Server-VNET" `**
- **-Name "Web3" `**
- **-VirtualNetworkName "Server-Vnet" `**
- **-SubnetName "Server-Subnet" `**
- **-SecurityGroupName "Web3-ip" `**
- **-PublicIpAddressName "Web3-nsg" `**
- **-Location "South Central US" `**
- **-size "Basic_A0" `**
- **-AvailabilitySetName "SRVAvailability"**

Microsoft Azure Infrastructure step by step

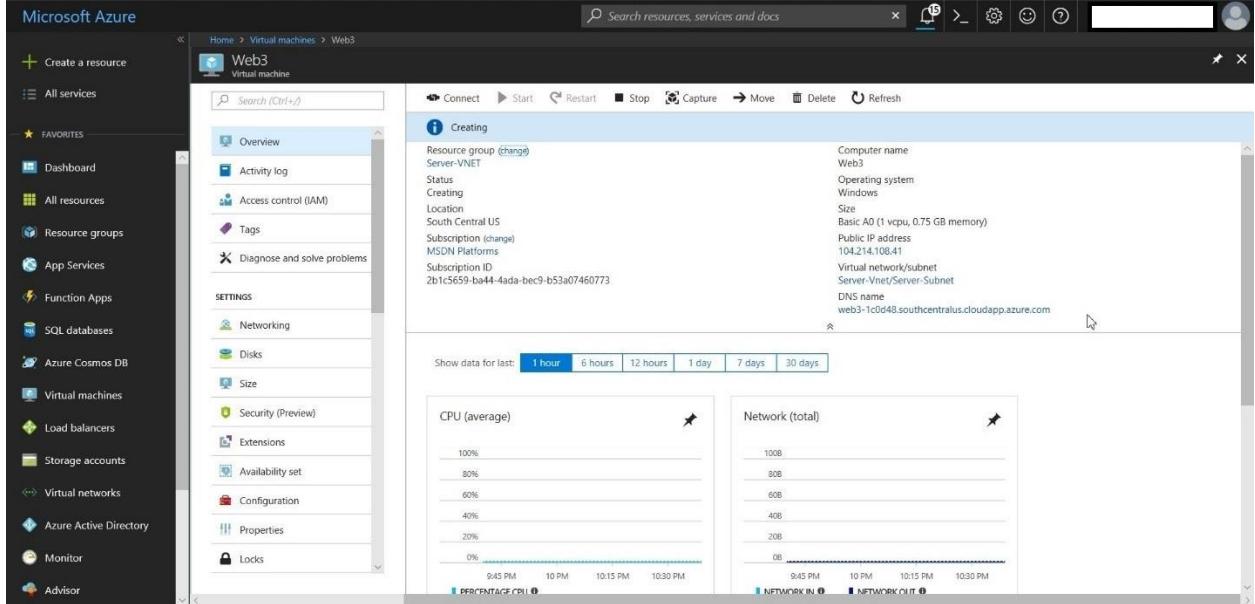


```
Administrator: Windows PowerShell
HardwareProfile      : {VmSize}
NetworkProfile       : {NetworkInterfaces}
OSProfile            : {ComputerName, AdminUsername, WindowsConfiguration, Secrets}
ProvisioningState    : Succeeded
StorageProfile        : {ImageReference, OsDisk, DataDisks}
FullyQualifiedDomainName : web2-a385a3.southcentralus.cloudapp.azure.com

PS C:\WINDOWS\system32> New-AzureRmVm ` 
>>     -ResourceGroupName "Server-VNET" ` 
>>     -Name "Web3" ` 
>>     -Location "South Central US" ` 
>>     -VirtualNetworkName "Server-Vnet" ` 
>>     -SubnetName "Server-Subnet" ` 
>>     -SecurityGroupName "Web3-nsg" ` 
>>     -PublicIpAddressName "Web3-ip" -size "Basic_A0" ` 
>>     -AvailabilitySetName "SRVAvailability"

cmdlet New-AzureRmVm at command pipeline position 1
Supply values for the following parameters:
Credential
```

20. In Azure portal, you will VM web3 created.



The screenshot shows the Azure portal interface with the 'Virtual machines' section selected. On the left, there's a sidebar with various service icons. The main area displays a 'Web3' virtual machine card. The card includes a 'Creating' status indicator, resource group information ('Web3'), and detailed configuration settings like location ('South Central US'), subscription ID ('2b1c5659-ba44-4ada-bee9-b53a07460773'), and DNS name ('web3-1c0d48.southcentralus.cloudapp.azure.com'). Below the card, two performance charts are shown: 'CPU (average)' and 'Network (total)', both spanning from 9:45 PM to 10:30 PM. The CPU chart shows usage levels around 10%, while the network chart shows traffic levels between 100B and 100B.

21. Select **Availability set**, you should find SRVAvailability.

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes 'Create a resource', 'All services', and a 'FAVORITES' section with items like Dashboard, All resources, Resource groups, App Services, Function Apps, SQL databases, Azure Cosmos DB, Virtual machines, Load balancers, Storage accounts, Virtual networks, Azure Active Directory, Monitor, and Advisor. The main content area is titled 'Web3 - Availability set' under 'Virtual machines'. It shows a list of virtual machines: LinuxVM1, mlab2017-dc, Server-01, Server-02, Web1, Web2, Web3 (which is selected), WebVM1, and WebVM2. On the right, the 'Availability set' blade is open, showing 'SRVAVAILABILITY' as the selected availability set. A note states: 'The availability set can only be configured when creating a virtual machine. You must recreate the virtual machine to move it in or out of an availability set.' Other tabs in the blade include Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Networking, Disks, Size, Security (Preview), Extensions, Configuration, Properties, and Locks.

Task 2: Create the Azure Load Balancer

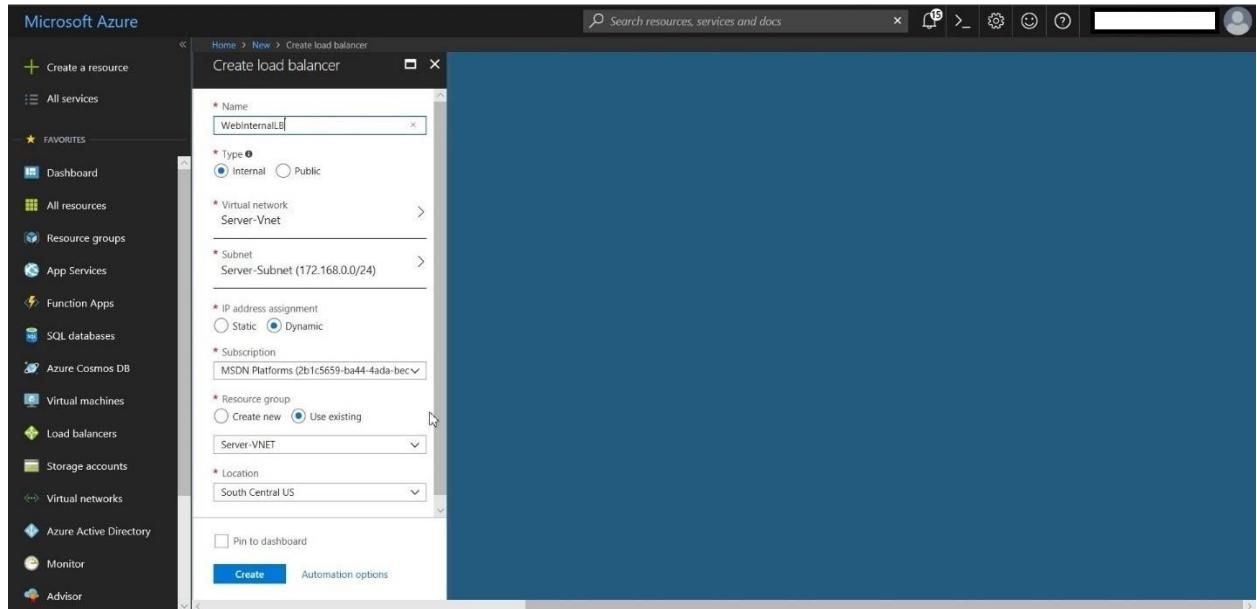
Use the following steps to create an internal load balancer from the Azure portal.

1. Open a browser, navigate to the [Azure portal](#), and sign in with your Azure account.
2. In the upper left-hand side of the screen, click **Create a resource > Networking > Load balancer**.

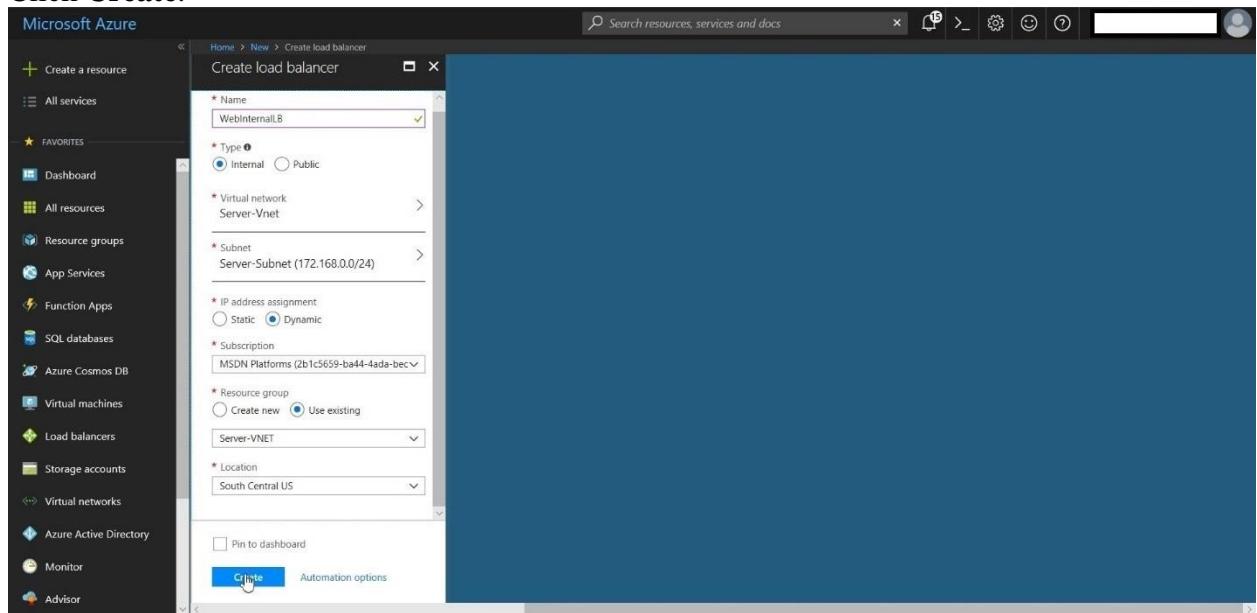
The screenshot shows the Microsoft Azure portal 'New' blade for creating a new resource. The left sidebar lists categories: Compute, Networking (which is selected and highlighted in blue), Storage, Web + Mobile, Containers, Databases, Data + Analytics, AI + Cognitive Services, Internet of Things, Enterprise Integration, Security + Identity, Developer tools, Monitoring + Management, Add-ons, and Blockchain. The main area displays a 'Featured' section with tiles for Virtual network (Quickstart tutorial), Load Balancer (Learn more), Application Gateway (Learn more), Virtual network gateway (Learn more), Local network gateway (Learn more), Traffic Manager profile (Quickstart tutorial), DNS zone (Quickstart tutorial), and Route table (Learn more). A search bar at the top says 'Search the Marketplace'.

3. In the **Create load balancer** blade, enter a **Name** for your load balancer.
4. Under **Type**, click **Internal**.
5. Click **Virtual network**, and then select the virtual network where you want to create the load balancer.

Microsoft Azure Infrastructure step by step



6. Click **Subnet**, and then select the subnet where you want to create the load balancer.
7. Under **IP address assignment**, click either **Dynamic** or **Static**, depending on whether you want the IP address for the load balancer to be fixed (static) or not.
8. Under **Resource group** either specify the name of a new resource group for the load balancer, or click **select existing** and select an existing resource group.
9. Click **Create**.



Task 3: Configure load balancing rules

After the load balancer creation, navigate to the load balancer resource to configure it. Configure a backend address pool and a probe before configuring a load balancing rule.

Step 1: Configure a backend pool

To configure a backend pool, you need to follow steps

1. In the Azure portal, click **Browse > Load balancers**, and then click the load balancer that you created earlier.

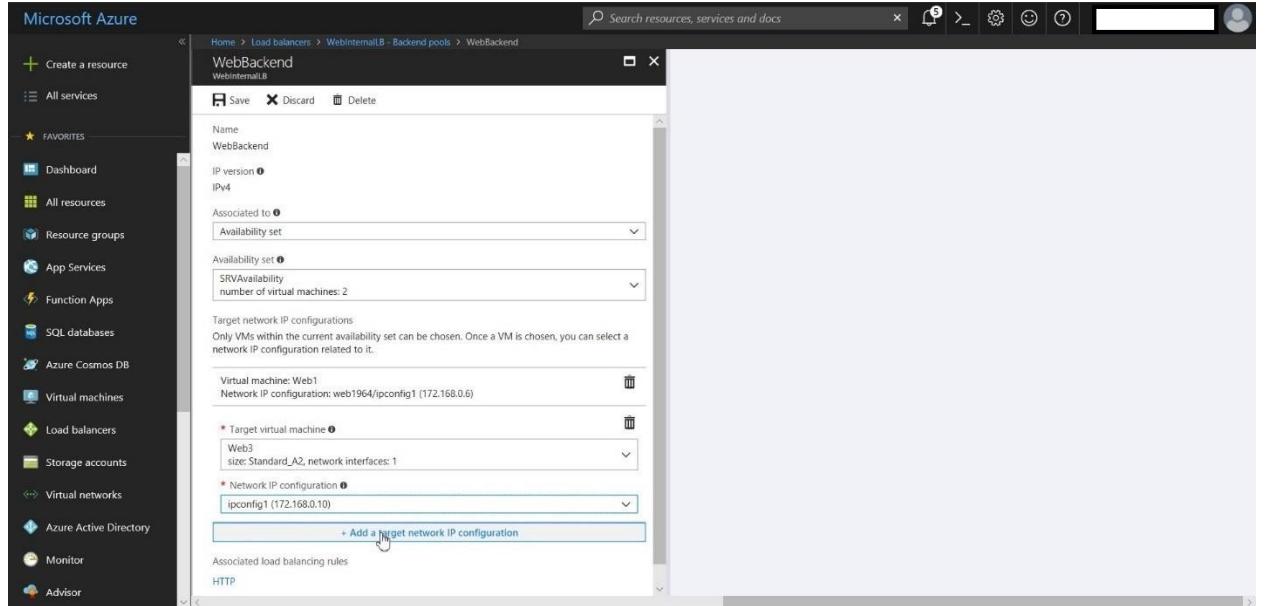
The screenshot shows the Azure portal's 'Load balancers' page. On the left is a navigation sidebar with various service icons. The main area displays a table of load balancers. One row is selected, showing details: 'WebInternalLB' as the name, 'Server-VNET' as the resource group, 'South Central US' as the location, and 'MSDN Platforms' as the subscription. The 'NAME' column has a filter input field above it.

2. In the **Settings** page, click **Backend pools**.

The screenshot shows the 'WebInternalLB' settings page. The left sidebar lists several options like Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, and Backend pools. The 'Backend pools' option is currently selected and highlighted with a blue border. The main pane displays essential information about the load balancer, including its resource group (Server-VNET), location (South Central US), subscription (MSDN Platforms), and SKU (Basic). It also lists the private IP address (172.168.0.9).

3. In the **Backend address pools** page, click **Add**.

Microsoft Azure Infrastructure step by step



4. In the **Add backend pool** page, enter a **Name** for the backend pool, and then click **OK**.

The screenshot shows the Microsoft Azure portal interface. The left navigation menu is identical to the previous screenshot. The main content area is titled 'Load balancers' under 'WebInternalLB - Backend pools'. It shows a list of load balancers: 'WebExternalLB' and 'WebInternalLB'. The 'WebInternalLB' item is selected. The right pane shows the 'WebInternalLB - Backend pools' blade with a table of 'Backend pools'. The table has columns: VIRTUAL MACHINE, VIRTUAL MACHIN..., NETWORK INTERFACE, and PRIVATE IP ADDRESS. It lists two entries: 'Web1' (Running, web1964, 172.168.0.6) and 'Web3' (Running, web316, 172.168.0.10). The 'SETTINGS' sidebar on the right includes options like 'Frontend IP configuration', 'Backend pools' (which is selected), 'Health probes', 'Load balancing rules', 'Inbound NAT rules', 'Properties', 'Locks', and 'Automation script'.

Step 2: Configure a probe

To configure a probe, you need to follow steps

1. In the Azure portal, click **Browse > Load balancers**, and then click the load balancer that you created earlier.
2. In the **Settings** page, click **Health probes**.

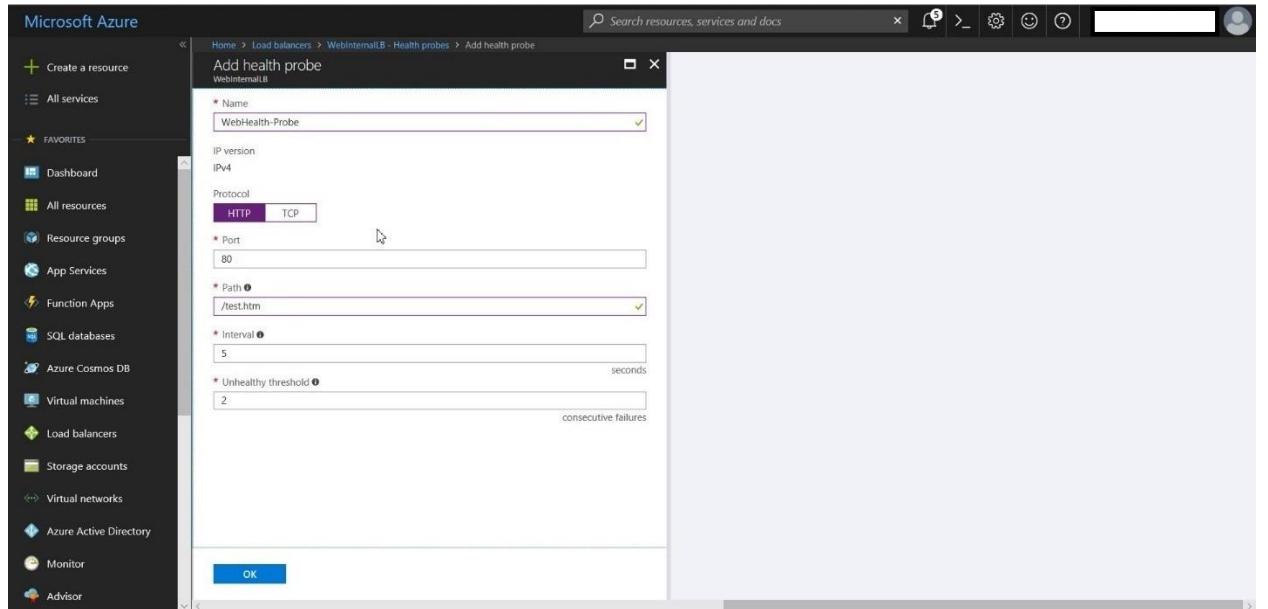
Microsoft Azure Infrastructure step by step

3. In the **Health probes** page, click **Add**.

4. In the **Add health probe** page, enter a **Name** for the probe.

- Under **Protocol**, select **HTTP** (for web sites) or **TCP** (for other TCP-based applications).
- Under **Port**, specify the port to use when accessing the probe.
- Under **Path** (for HTTP probes only), specify the path to use as a probe.
- Under **Interval** specify how frequently to probe the application.
- Under **Unhealthy threshold**, specify how many attempts should fail before the backend virtual machine is marked as unhealthy.

Microsoft Azure Infrastructure step by step



5. Click OK to create probe.

The screenshot shows the 'WebInternalLB - Health probes' page in the Azure portal. The 'WebInternalLB' probe is selected. The table displays the probe configuration:

NAME	PROTO...	PORT	PATH	USED BY
WebHealthProbe	HTTP	80	/test.htm	HTTP

Step 3: Configure load balancing rules

To configure load balancing rules, you need to follow steps

1. In the Azure portal, click **Browse > Load balancers**, and then click the load balancer that you created earlier.
2. In the **Settings** page, click **Load balancing rules**.

Microsoft Azure Infrastructure step by step

The screenshot shows the Azure portal interface. On the left, the navigation menu includes 'Create a resource', 'All services', 'Dashboard', 'All resources', 'Resource groups', 'App Services', 'Function Apps', 'SQL databases', 'Azure Cosmos DB', 'Virtual machines', 'Load balancers', 'Storage accounts', 'Virtual networks', 'Azure Active Directory', 'Monitor', and 'Advisor'. The main content area shows 'Load balancers' under 'WebInternalLB'. The 'WebInternalLB' blade displays the following details:

- Essentials:** Resource group (WebBackend), Server-VMNET, Location: South Central US, Subscription name (change), MSDN Platforms, Subscription ID: 2b1c5659-ba44-4ada-be9-b53a07460773, SKU: Basic, Private IP address: 172.168.0.9.
- SETTINGS:** Frontend IP configuration, Backend pools, Health probes, Load balancing rules (highlighted), Inbound NAT rules, Properties, Locks, Automation script.
- SUPPORT + TROUBLESHOOTING:**

3. In the **Load balancing rules** page, click **Add**.

- In the **Add load balancing rule** page, enter a **Name** for the rule.
- Under **Protocol**, select **TCP** or **UDP**.
- Under **Port**, specify the port clients connect to in the load balancer.
- Under **Backend port**, specify the port to be used in the backend pool (usually, the load balancer port and the backend port are the same).
- Under **Backend pool**, select the backend pool you created earlier.
- Under **Session persistence**, select how you want sessions to persist.
- Under **Idle timeout (minutes)**, specify the idle timeout.
- Under **Floating IP (direct server return)**, click **Disabled** or **Enabled**.

The screenshot shows the 'Add load balancing rule' dialog box. The form fields are as follows:

- Name:** HTTP
- IP Version:** IPv4 (radio button selected)
- Frontend IP address:** 172.168.0.9 (LoadBalancerFrontEnd)
- Protocol:** TCP (radio button selected)
- Port:** 80
- Backend port:** 80
- Backend pool:** WebBackend
- Health probe:** WebHealthProbe (HTTP:80)
- Session persistence:** None
- Idle timeout (minutes):** 4

4. Click **OK**.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes options like Create a resource, All services, Favorites, Dashboard, All resources, Resource groups, App Services, Function Apps, SQL databases, Azure Cosmos DB, Virtual machines, Load balancers, Storage accounts, Virtual networks, Azure Active Directory, Monitor, and Advisor. The main content area shows the 'Load balancers' section under 'WebInternalLB'. A search bar at the top right says 'Search resources, services and docs'. The 'Load balancers' page lists 'WebExternalLB' and 'WebInternalLB'. The 'WebInternalLB' page has a sidebar with links for Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, SETTINGS (Frontend IP configuration, Backend pools, Health probes, Load balancing rules, Inbound NAT rules, Properties, Locks, Automation script), and SUPPORT + TROUBLESHOOTING. The main content area shows a table for 'Load balancing rules' with columns for NAME, LOAD BALANCING RULE, BACKEND POOL, and HEALTH PROBE. One rule is listed: HTTP (HTTP (TCP/80)) for WebBackend using WebHealthProbe.

Task 3: Add Test Pages

In this exercise, you will add Test pages

1. Double-click **Web1.rdp**. If the Remote Desktop Connection message box appears, click **Connect**.

The screenshot shows the Microsoft Azure portal interface. The navigation menu is the same as the previous screenshot. The main content area shows the 'Virtual machines' section under 'Web1'. The 'Web1' page has a toolbar with Connect, Start, Restart, Stop, Capture, Move, Delete, Refresh, and a status message: 'We recently resolved a problem with your virtual machine.' Below the toolbar, there's a summary of the VM's properties: Resource group (change) to Server-VNET, Computer name Web1, Status Running, Location South Central US, Subscription (change) to MSDN Platforms, Public IP address 13.05.193.160, Virtual network/subnet Server-Vnet/Server-Subnet, and DNS name Configure. There are also sections for Networking, Disks, Size, Security (Preview), Extensions, Availability set, Configuration, and Properties. At the bottom, a modal dialog box asks 'What do you want to do with Web1.rdp (89 bytes)? From: portal.azure.com' with options Open, Save, and Cancel. The 'Connect' button in the toolbar is highlighted.

2. On the Windows **Start** screen, click **This PC**. Browse to **C:\inetpub\wwwroot**.
3. Click the **Home** menu, click **New Item** and then click **Text Document**.
4. Type **Test** and then press Enter. Double-click the **Test.txt** file.
5. In the **How do you want to open this type of file** dialog box, click **Notepad**.
 - Type the following code, and then press Enter: <h1>Mai Ali Page</h1>
 - Type the following code, and then press Enter: <p>This is the Web1 server</p>
6. Click **File** and then click **Save**. Close **Notepad**.

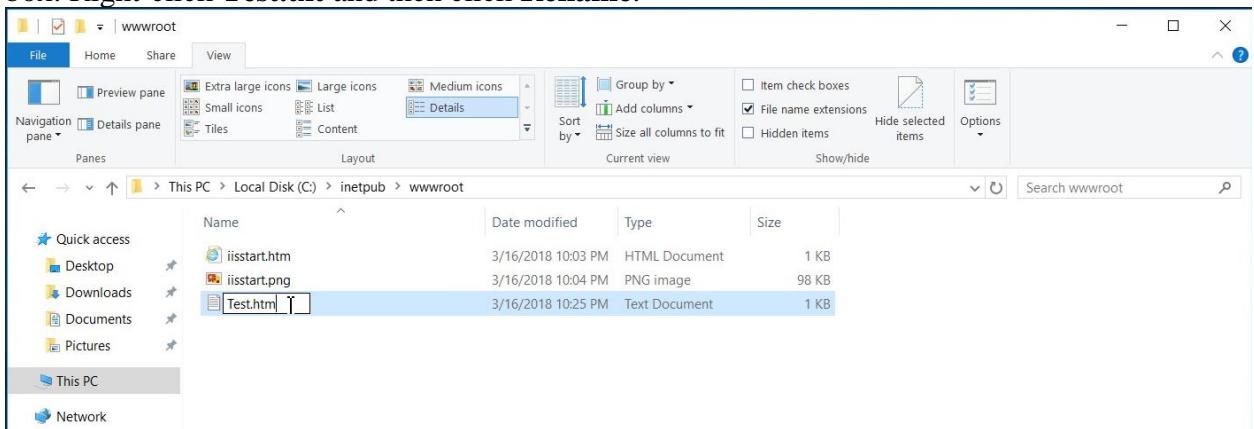


Test - Notepad

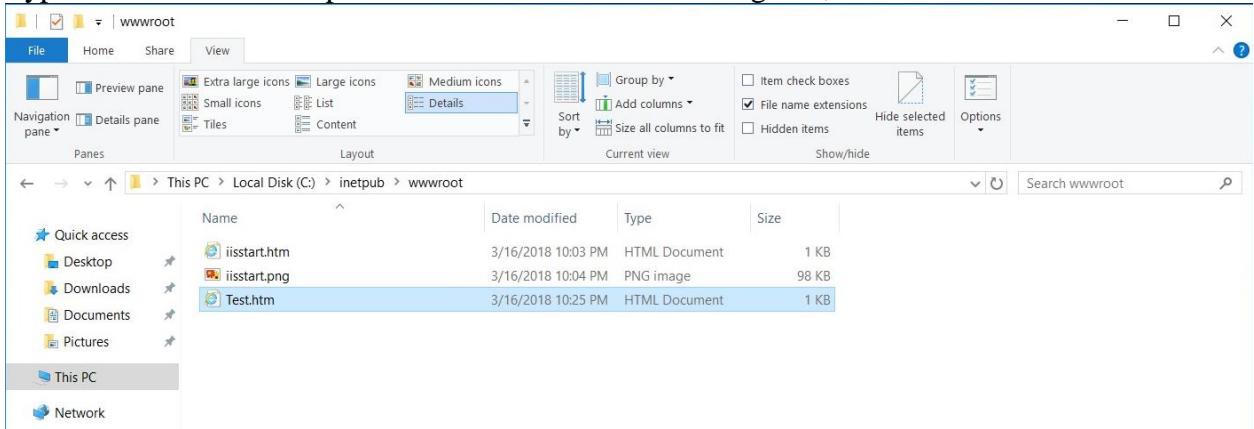
File Edit Format View Help

```
<h1>Mai Ali Page</h1>
<p>This is the Web1 server</p>
```

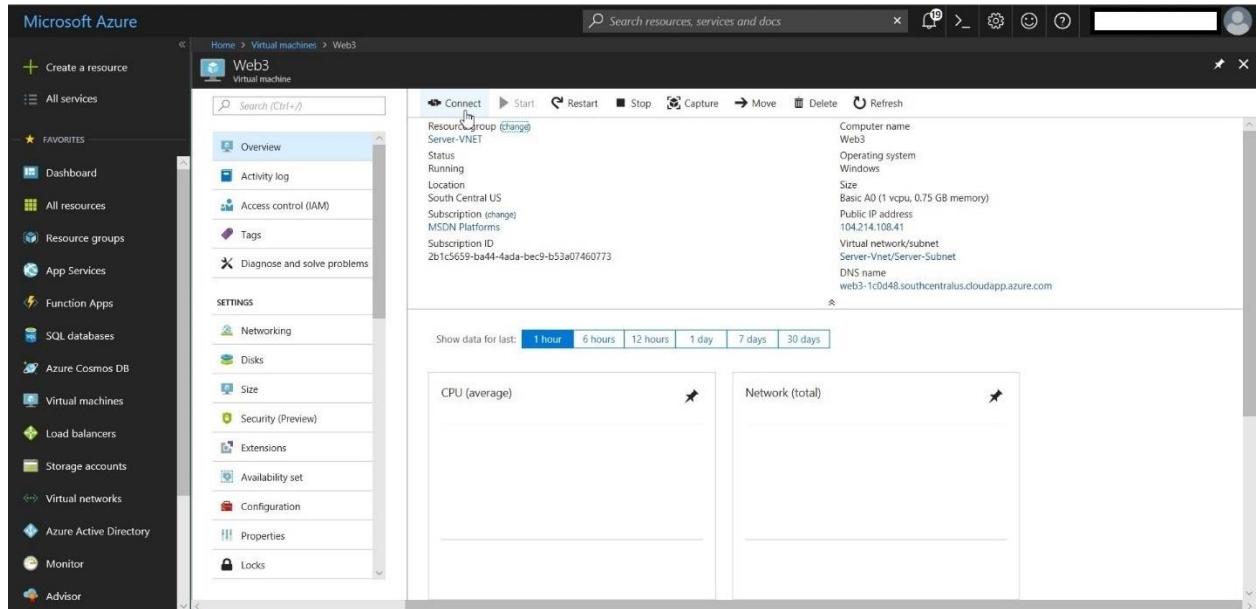
7. In the **Windows Explorer**, click **View** and then select the **File name extensions** check box. Right-click **Test.txt** and then click **Rename**.



8. Type **Test.htm** and then press Enter. In the **Rename** dialog box, click **Yes**.



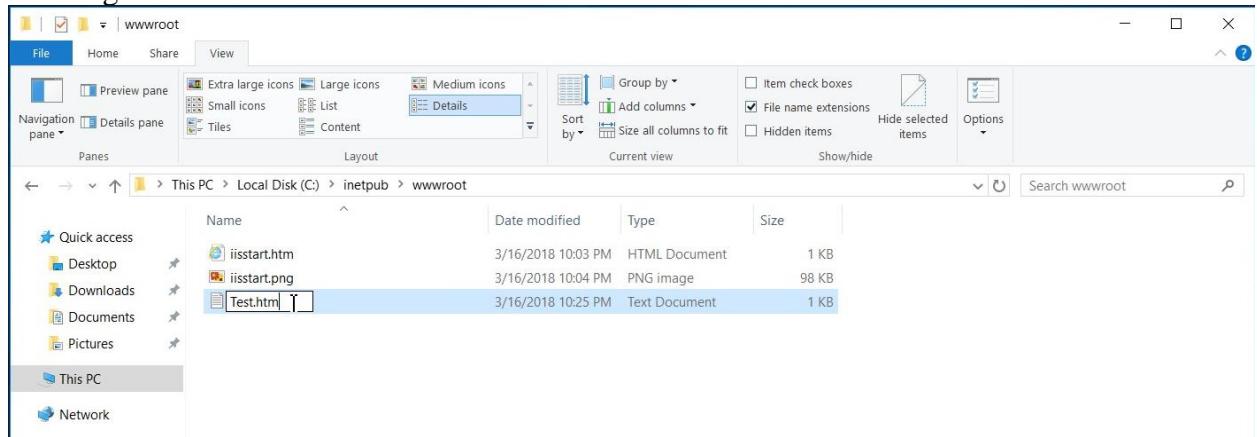
9. In the RDP tab at the top, click **Close** and then click **OK**.
10. Double-click **Web3.rdp**. If the Remote Desktop Connection message box appears, click **Connect**.



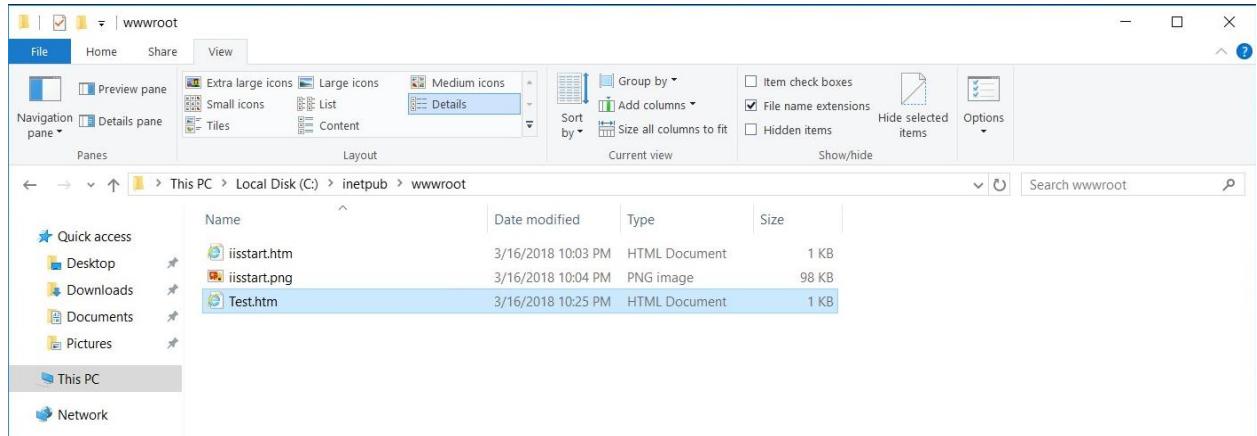
11. Click the **Home** menu, click **New Item** and then click **Text Document**.
12. Type **Test** and then press Enter. Double-click the **Test.txt** file.
13. In the **How do you want to open this type of file** dialog box, click **Notepad**.
 - Type the following code, and then press Enter: <h1>Mai Ali Page</h1>
 - Type the following code, and then press Enter: <p>This is the Web3 server</p>
14. Click **File** and then click **Save**. Close **Notepad**.



15. In the **Windows Explorer**, click **View** and then select the **File name extensions** check box. Right-click **Test.txt** and then click **Rename**.



16. Type **Test.htm** and then press Enter. In the **Rename** dialog box, click **Yes**.



17. In the RDP tab at the top, click **Close** and then click **OK**.

Task 4: Test Availability

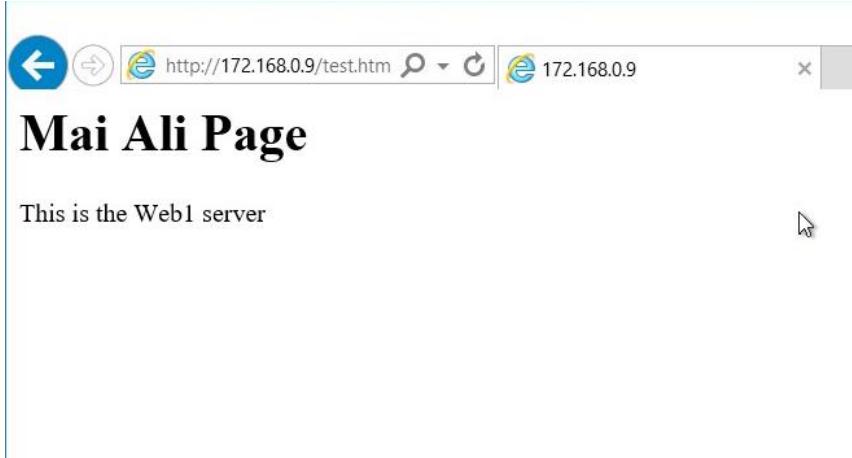
In this exercise, you will test Availability set

1. In the Window Azure preview portal, in the list of virtual machines, click **Web3**.
2. In the **Web3** blade, click **stop** and then click **YES**.

The screenshot shows the Microsoft Azure preview portal. The left sidebar lists various services: Create a resource, All services, Favorites (Dashboard, All resources, Resource groups, App Services, Function Apps, SQL databases, Azure Cosmos DB, Virtual machines, Load balancers, Storage accounts, Virtual networks, Azure Active Directory, Monitor, Advisor). The main area shows the "Load balancers" blade for "WebInternalLB - Backend pools". The left sidebar of this blade shows "Overview", "Activity log", "Access control (IAM)", "Tags", "Diagnose and solve problems", "SETTINGS" (Backend pools, Health probes, Load balancing rules, Inbound NAT rules, Properties, Locks, Automation script), and "SUPPORT + TROUBLESHOOTING". The main content area shows a table of "Backend pools":

VIRTUAL MACHINE	VIRTUAL MACHIN...	NETWORK INTERFACE	PRIVATE IP ADDRESS
Web1	Running	web1964	172.168.0.6
Web3	Stopped (deall...)	web316	172.168.0.10

3. When the virtual machine shutdown is complete, switch to the Internet Explorer tab that shows the **Mai Ali Page**. Press **CTRL+F5**. The page refreshes.



4. Note that the page is now served by the other virtual machine in the load balanced set.

Configuring Virtual Machine Storage

In this exercise, you will configure two virtual data disks on an Azure virtual machine.

Task 1: Upload a VHD to Azure

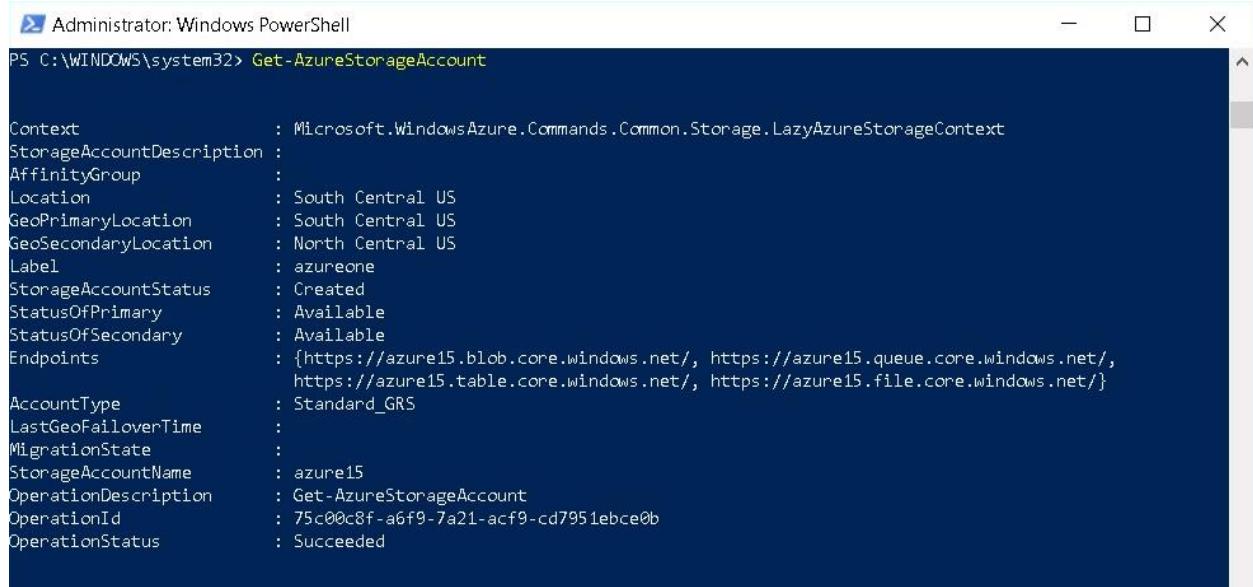
In this exercise, you will upload VHD to Azure.

1. Switch to the PowerShell ISE.
2. In the PowerShell ISE, in the command prompt pane, enter the following command and press Enter: **Get-AzureSubscription**
3. In the PowerShell ISE, in the command prompt pane, select the subscription name, then right-click, and click **Copy**.

A screenshot of the Windows PowerShell ISE. The command 'Get-AzureSubscription' is run, displaying a list of subscriptions. The 'SubscriptionName' column shows 'MSDN Platforms'. A mouse cursor is hovering over this row, likely preparing to copy the subscription name.

4. In the PowerShell ISE, in the command prompt pane, enter the following command and press Enter: **Select-AzureRmSubscription -SubscriptionName "MSDN Platforms"**

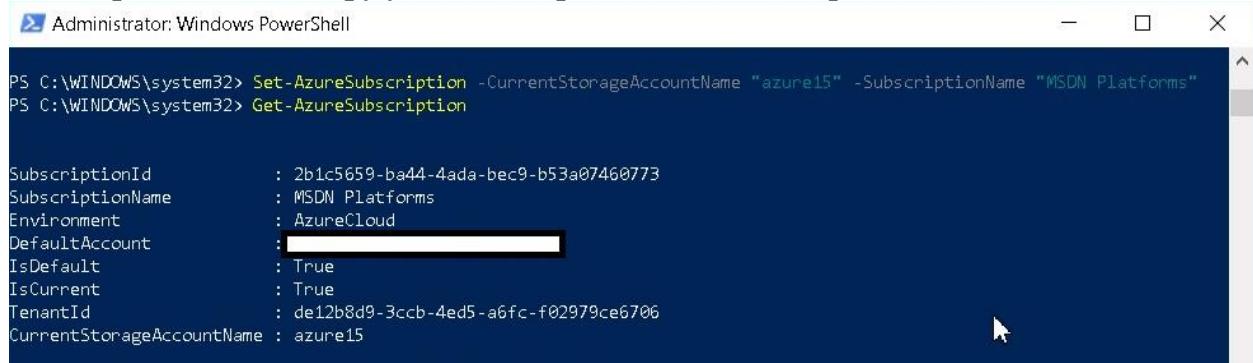
Microsoft Azure Infrastructure step by step



```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> Get-AzureStorageAccount

Context          : Microsoft.WindowsAzure.Commands.Common.Storage.LazyAzureStorageContext
StorageAccountDescription :
AffinityGroup    :
Location        : South Central US
GeoPrimaryLocation : South Central US
GeoSecondaryLocation : North Central US
Label           : azureone
StorageAccountStatus   : Created
StatusOfPrimary    : Available
StatusOfSecondary  : Available
Endpoints        : {https://azure15.blob.core.windows.net/, https://azure15.queue.core.windows.net/, https://azure15.table.core.windows.net/, https://azure15.file.core.windows.net/}
AccountType      : Standard_GRS
LastGeoFailoverTime :
MigrationState   :
StorageAccountName  : azure15
OperationDescription : Get-AzureStorageAccount
OperationId       : 75c00c8f-a6f9-7a21-acf9-cd7951ebce0b
OperationStatus    : Succeeded
```

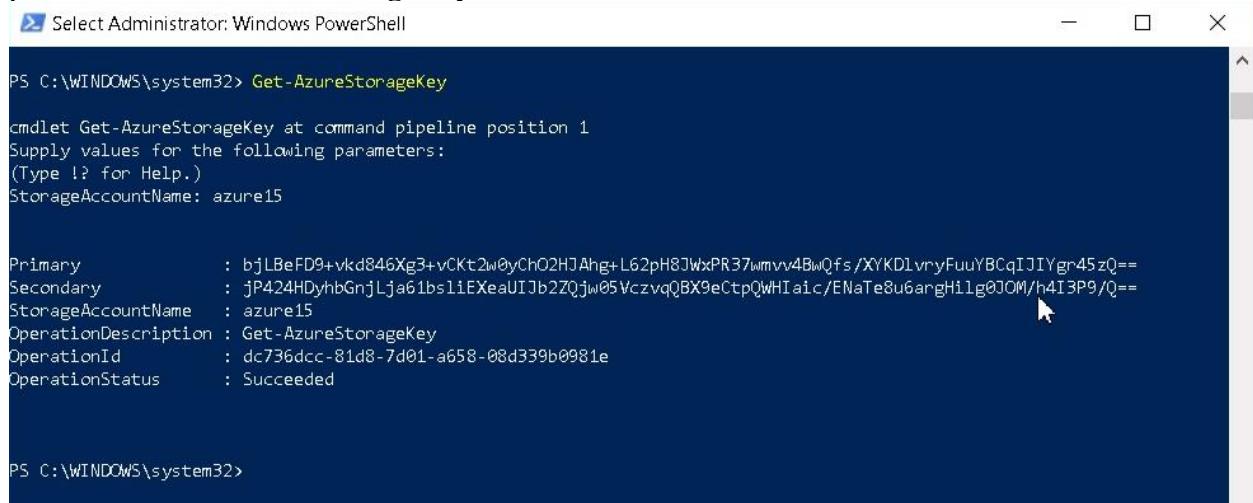
5. In the PowerShell ISE, in the command prompt pane, select the string to the right of **Label**, then right-click, and click **Copy**.
6. In the PowerShell ISE, locate the following code: **Set-AzureSubscription -CurrentStorageAccountName <#Copy your storage account name here#> -SubscriptionName <#Copy your subscription name here in quote marks#>**



```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> Set-AzureSubscription -CurrentStorageAccountName "azure15" -SubscriptionName "MSDN Platforms"
PS C:\WINDOWS\system32> Get-AzureSubscription

SubscriptionId      : 2b1c5659-ba44-4ada-bec9-b53a07460773
SubscriptionName    : MSDN Platforms
Environment        : AzureCloud
DefaultAccount     : [REDACTED]
IsDefault          : True
IsCurrent          : True
TenantId           : de12b8d9-3ccb-4ed5-a6fc-f02979ce6706
CurrentStorageAccountName : azure15
```

7. In the PowerShell ISE, in the command prompt pane, enter the following command and press Enter: **Get-AzureStorageKey**



```
Select Administrator: Windows PowerShell
PS C:\WINDOWS\system32> Get-AzureStorageKey

cmdlet Get-AzureStorageKey at command pipeline position 1
Supply values for the following parameters:
(Type !? for Help.)
StorageAccountName: azure15

Primary          : bjlBeFD9+vkD846Xg3+vCKt2w0yChO2HJAhg+L62pH8JWxPR37wmvv4BwQfs/XYKDlvryFuuYBCqIJYgr45zQ==
Secondary        : jp424HDyhbGnjLja61bsliEXeaUIJb2ZQjw05VczvqQBX9eCtpQwHiaic/ENaTe8u6argH1lg0JOM/h4I3P9/Q==
StorageAccountName : azure15
OperationDescription : Get-AzureStorageKey
OperationId       : dc736dcc-81d8-7d01-a658-08d339b0981e
OperationStatus    : Succeeded

PS C:\WINDOWS\system32>
```

8. In the PowerShell ISE, in the command prompt pane, enter the following command and press Enter: **New-AzureStorageContainer**
9. At the **Name:** prompt, enter **2-azurestorage** and press Enter.

```
Administrator: Windows PowerShell
PS C:\Users\Labadmin> New-AzureStorageContainer
cmdlet New-AzureStorageContainer at command pipeline position 1
Supply values for the following parameters:
(Type !? for Help.)
Name: 2-azurestorage

    Blob End Point: https://azure15.blob.core.windows.net/
Name          PublicAccess      LastModified
----          -----          -----
2-azurestorage  off            2018-03-17 15:02:13Z
```

10. In the PowerShell ISE, in the command prompt pane, select the **Blob End Point**, then right-click, and click **Copy**.
11. In the PowerShell ISE, in the Script pane, locate the following code: **Add-AzureVhd -Destination <#Copy your blob end point here#>2-azurestorage/Mai_DataDisk.vhd -LocalFilePath c:\Lab\Mai_DataDisk.vhd**

```
Administrator: Windows PowerShell
PS C:\Users\Labadmin> New-AzureStorageContainer
cmdlet New-AzureStorageContainer at command pipeline position 1
Supply values for the following parameters:
(Type !? for Help.)
Name: 2-azurestorage

    Blob End Point: https://azure15.blob.core.windows.net/
Name          PublicAccess      LastModified
----          -----          -----
2-azurestorage  off            2018-03-17 15:02:13Z

PS C:\Users\Labadmin> Add-AzureVhd -Destination https://azure15.blob.core.windows.net/2-azurestorage/Mai_DataDisk.vhd -LocalFilePath C:\Lab\Mai_DataDisk.vhd
```

12. You should now see upload data as the VHD is uploaded to Microsoft Azure; the process will take several minutes to complete.

```
Administrator: Windows PowerShell
PS C:\Users\Labadmin> New-AzureStorageContainer
cmdlet New-AzureStorageContainer at command pipeline position 1
Supply values for the following parameters:
(Type !? for Help.)
Name: 2-azurestorage

    Blob End Point: https://azure15.blob.core.windows.net/
Name          PublicAccess      LastModified
----          -----          -----
2-azurestorage  off            2018-03-17 15:02:13Z

PS C:\Users\Labadmin> Add-AzureVhd -Destination https://azure15.blob.core.windows.net/2-azurestorage/Mai_DataDisk.vhd -LocalFilePath C:\Lab\Mai_DataDisk.vhd
MD5 hash is being calculated for the file C:\Lab\Mai_DataDisk.vhd.
MD5 hash calculation is completed.
Elapsed time for the operation: 00:00:01
Creating new page blob of size 104858112...
Detecting the empty data blocks in the local file.
Detecting the empty data blocks completed.
Elapsed time for upload: 00:00:02

LocalFilePath      DestinationUri
-----          -----
C:\Lab\Mai_DataDisk.vhd https://azure15.blob.core.windows.net/2-azurestorage/Mai_DataDisk.vhd

PS C:\Users\Labadmin>
```

Task 2: Connect a VHD to a Virtual Machine

In this exercise, you will connect VHD to Virtual Machine.

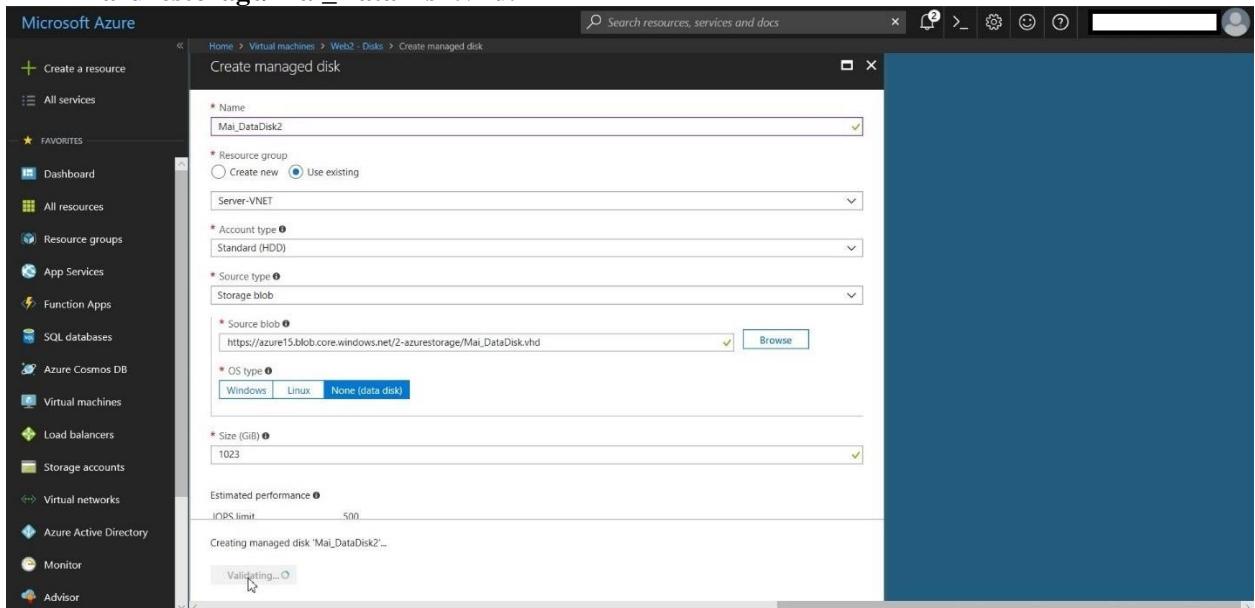
1. Switch to Internet Explorer, and click the new Azure Preview Portal tab.
2. In the **Virtual machines** blade, click **Web2**, click **Start**, and then click **Yes**; wait for Web2 to enter the **Running** state before continuing.

3. In the **Web2** blade, scroll down and click the **Disks** tile.
4. In the **Disks** blade, click **Add disk data**.
5. In the **Data disks** blade, click **Create disk**.

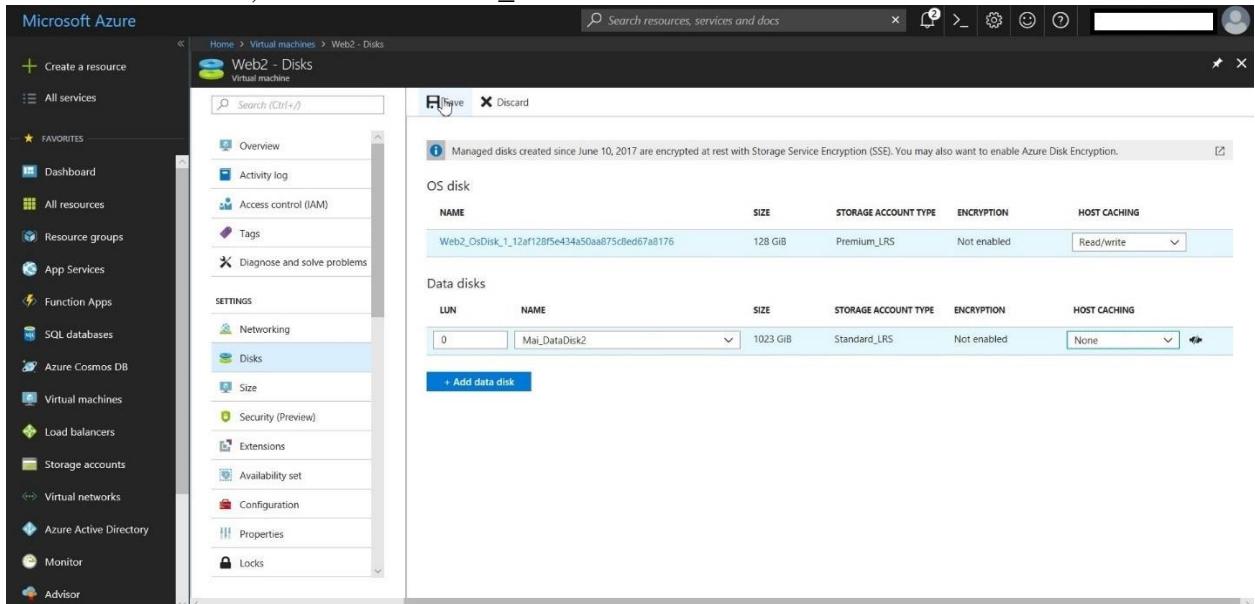
6. In the **Create managed disk** blade, fill the info.
 - In the **Name** blade, type **Mai_DataDisk2**.
 - Select **Resource group**, Select existing **Server-VNET**.
 - In the **Account type** blade, click **Standard (HDD)**.

Microsoft Azure Infrastructure step by step

- In the **Storage blob** blade, type URL https://azure15.blob.windows.net/2-azurestorage/Mai_DataDisk.vhd.

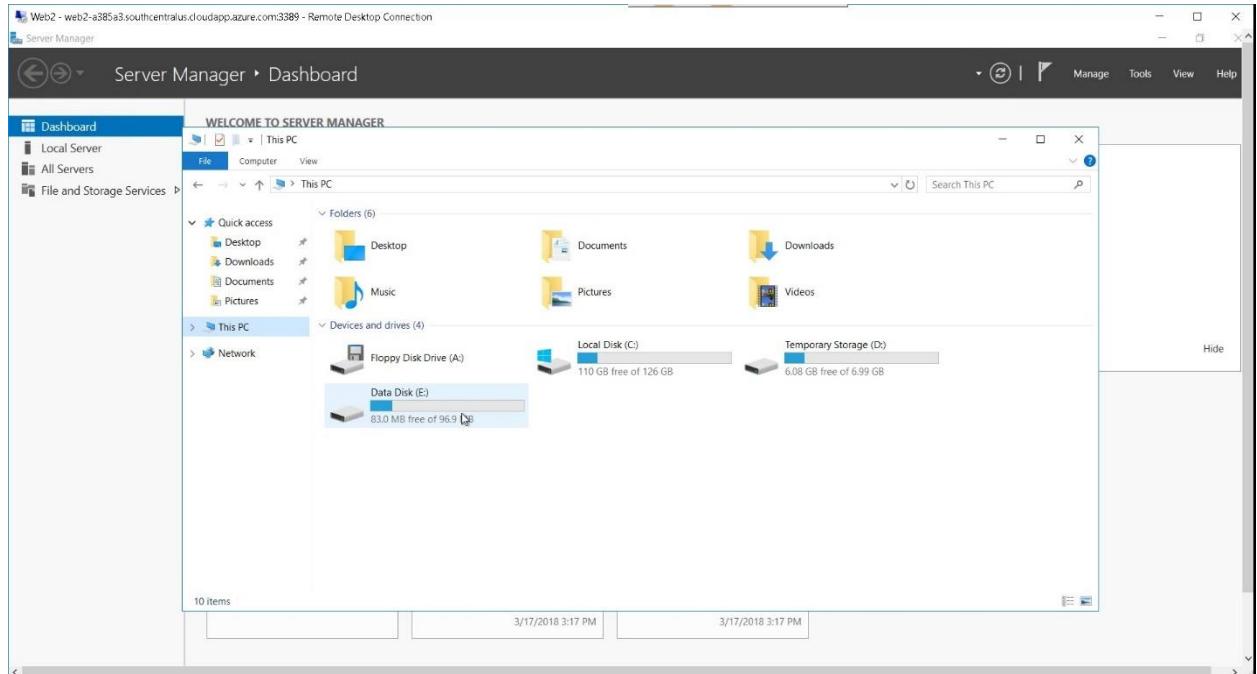


- On the Disks blade, wait until the **Mai_DataDisk2.vhd** is listed under **Data Disks**.

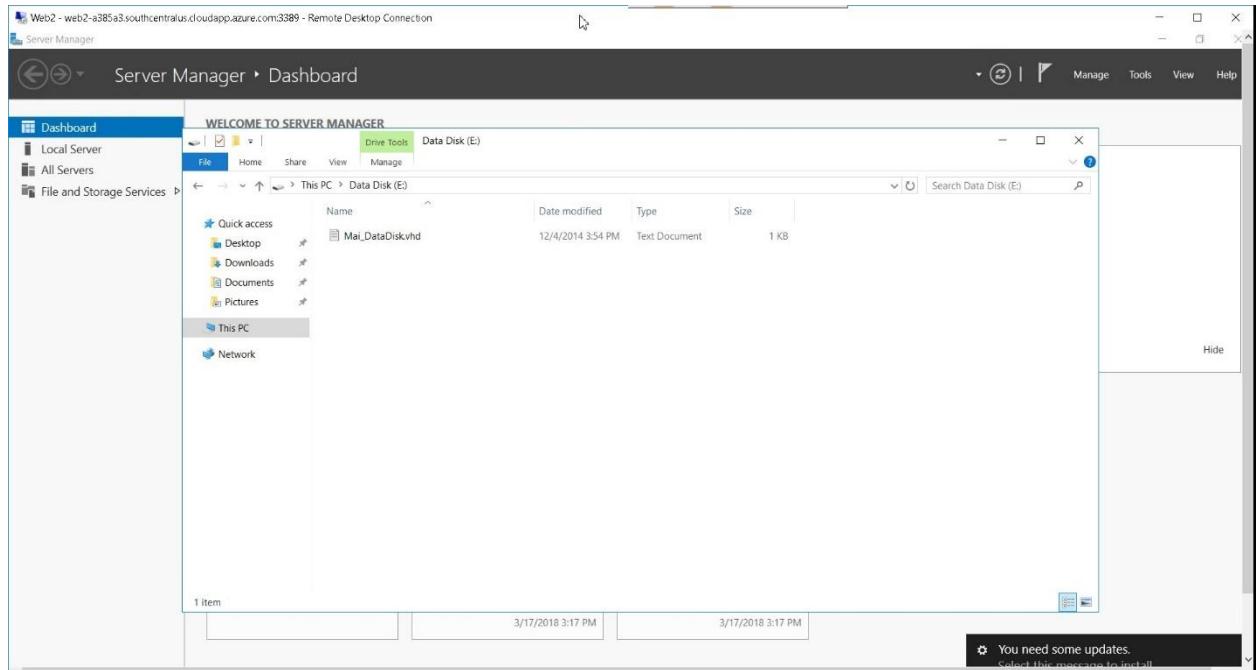


- Close the Disks blade.
- On the Web2 blade, click **Connect**.
- When you have logged in, on the Taskbar on Web2, click **File Explorer**. Click the Data Disk (E:) drive.

Microsoft Azure Infrastructure step by step

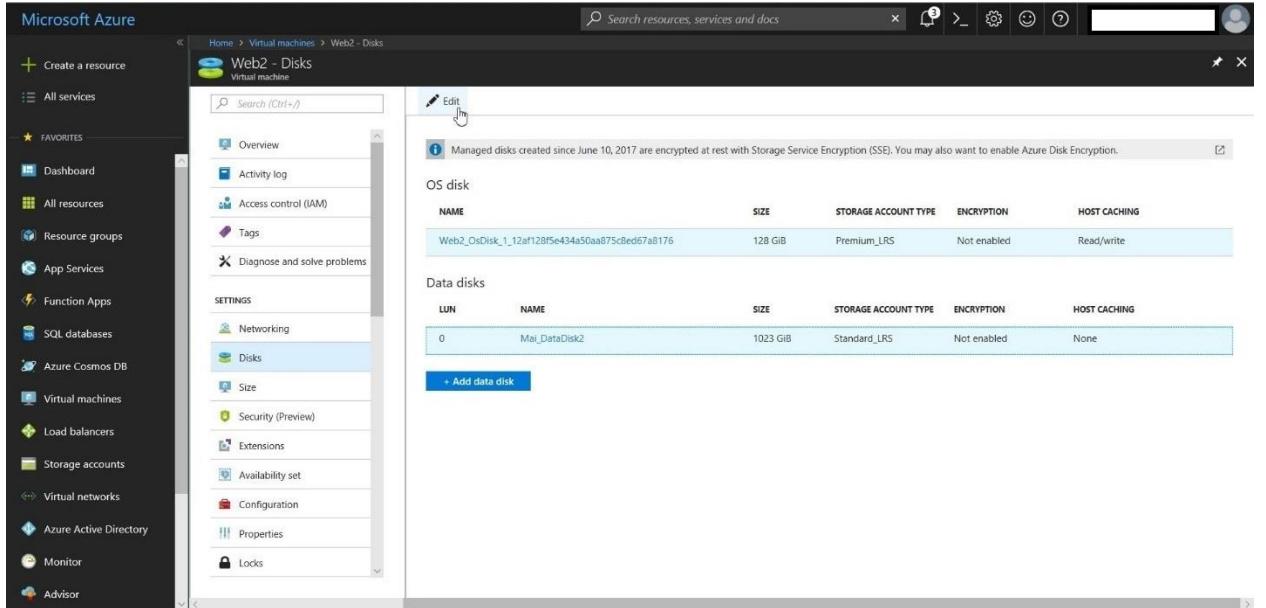


11. Note the text file at the root of this drive.



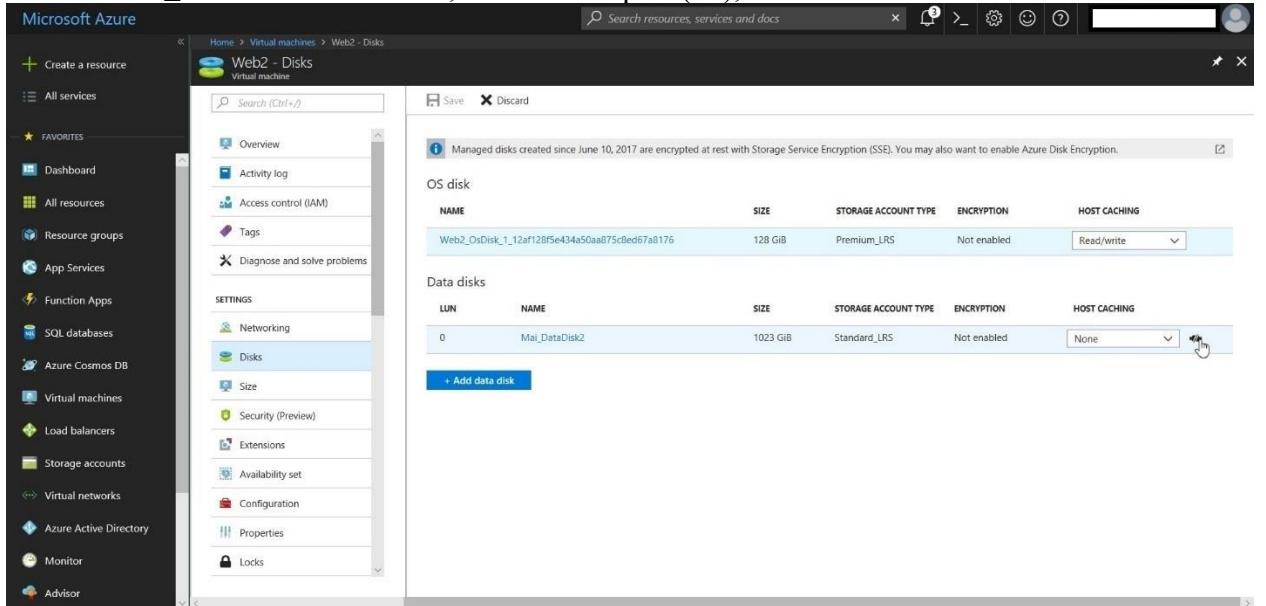
12. On the Web2 blade, click the **Disks** tile.

Microsoft Azure Infrastructure step by step



The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes options like Create a resource, All services, Favorites, Dashboard, All resources, Resource groups, App Services, Function Apps, SQL databases, Azure Cosmos DB, Virtual machines, Load balancers, Storage accounts, Virtual networks, Azure Active Directory, Monitor, and Advisor. The main content area is titled "Web2 - Disks" under "Virtual machines". It displays two sections: "OS disk" and "Data disks". The "OS disk" section lists "Web2_OsDisk_1_12af12bf5e434a50aa875cbed67a8176" with a size of 128 GiB, storage account type Premium_LRS, and encryption Not enabled. The "Data disks" section lists "0 Mai_DataDisk2" with a size of 1023 GiB, storage account type Standard_LRS, and encryption Not enabled. A blue button labeled "+ Add data disk" is visible. The status bar at the bottom right indicates "Read/write".

13. Next to Mai_DataDisk.VHD disk, click the ellipsis (...), and click **Detach**.



This screenshot shows the same Microsoft Azure portal interface as the previous one, but the "Mai_DataDisk2" data disk is now selected. The ellipsis (...) button next to it is highlighted with a mouse cursor, indicating the user is about to perform an action on the disk.

14. Wait until the page refreshes.

15. On the **Disks** blade, click **Attach New**.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes options like Create a resource, All services, Favorites, Dashboard, All resources, Resource groups, App Services, Function Apps, SQL databases, Azure Cosmos DB, Virtual machines, Load balancers, Storage accounts, Virtual networks, Azure Active Directory, Monitor, and Advisor. The main content area is titled "Web2 - Disks" under "Virtual machines". It shows the "OS disk" section with one entry: "Web2_OsDisk_1_12af1285e434a50aa875c8ed67a8176" (Size: 128 GiB, Storage account type: Premium_LRS, Encryption: Not enabled, Host caching: Read/write). Below this is the "Data disks" section, which has a "Create disk" button highlighted with a tooltip: "Disk & resource group 'Server-VNET'". Other entries in the list include "Web3_OsDisk_1_f1058645c9204e89bb8ed626d05c63f" (size: 128 GiB, account type: Standard_LRS) and "All disks" (Web3_OsDisk_1_f1058645c9204e89bb8ed626d05c63f, size: 128 GiB, account type: Standard_LRS, resource group: SERVER-VNET).

16. In the **Create managed disk** blade, fill the info.

- In the **Name** blade, type **NewDisk10**.
- Select **Resource group**, Select existing **Server-VNET**.
- In the **Account type** blade, click **Standard (HDD)**.
- In the **Storage blob** blade, select None (empty disk)
- Under **SIZE**, enter **10**, and then click **OK**.

The screenshot shows the "Create managed disk" blade. The "Name" field is set to "NewDisk10". The "Resource group" section shows "Use existing" selected with "Server-VNET" chosen. The "Account type" is set to "Standard (HDD)". The "Source type" is set to "None (empty disk)". The "Size (GiB)" is set to "10". Below these fields, there is an "Estimated performance" section with IOPS limit (500) and Throughput limit (60 MB/s). At the bottom of the blade is a "Create" button.

17. Wait until the new disk appears in the Disks blade.

Microsoft Azure Infrastructure step by step

LUN	NAME	SIZE	STORAGE ACCOUNT TYPE	ENCRYPTION	HOST CACHING
0	NewDisk10	10 GiB	Standard_LRS	Not enabled	None

18. Repeat steps 15-18 to create and attach a second 10GB virtual disk.

19. Wait until the second new disk appears in the Disks blade.

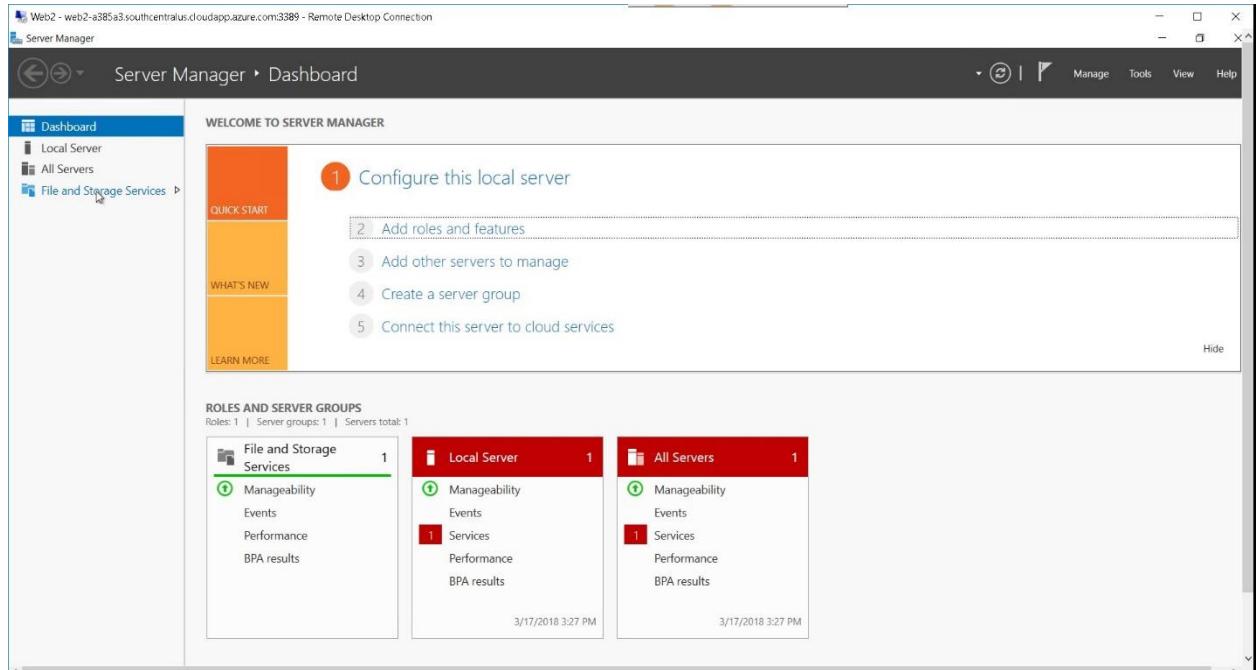
LUN	NAME	SIZE	STORAGE ACCOUNT TYPE	ENCRYPTION	HOST CACHING
0	NewDisk10	10 GiB	Standard_LRS	Not enabled	None
1	NewDisk2-10	10 GiB	Standard_LRS	Not enabled	None

Task 3: Create a Storage Space

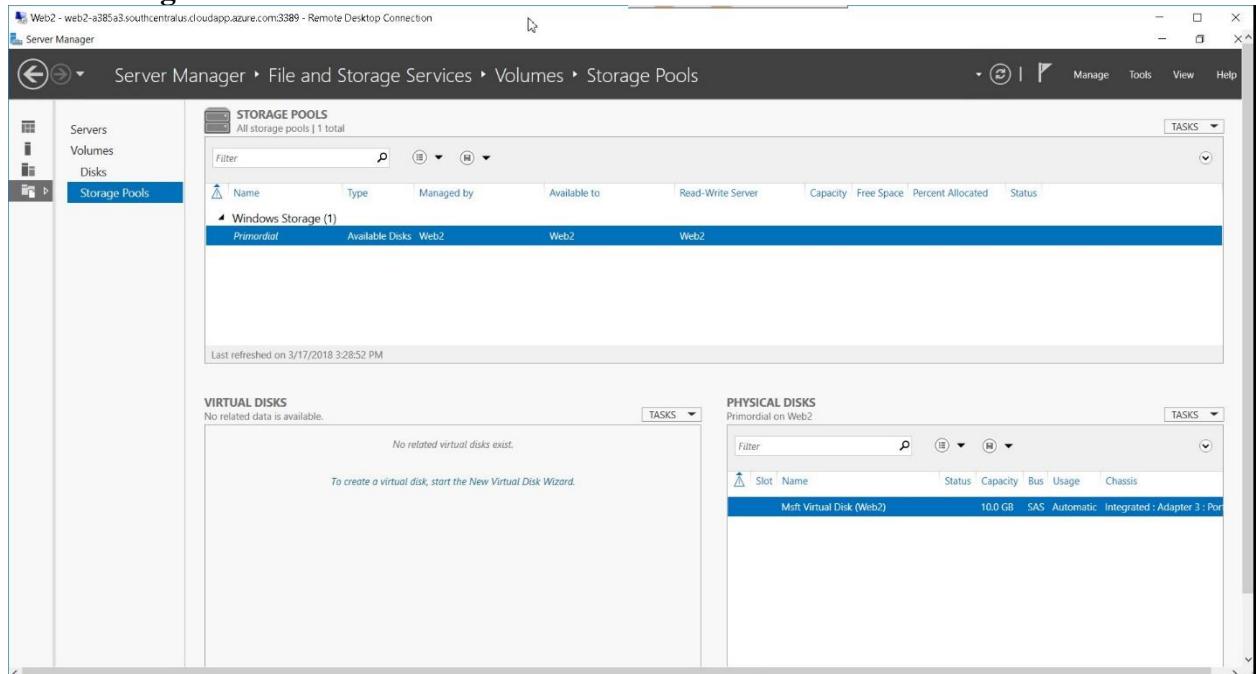
In this exercise, you will create virtual data disks on Azure virtual machine.

1. Switch to the Web2 Remote Desktop.
2. On the Taskbar, click **Server Manager**.
3. In Server Manager, on the left-hand pane, click **File and Storage Services**.

Microsoft Azure Infrastructure step by step

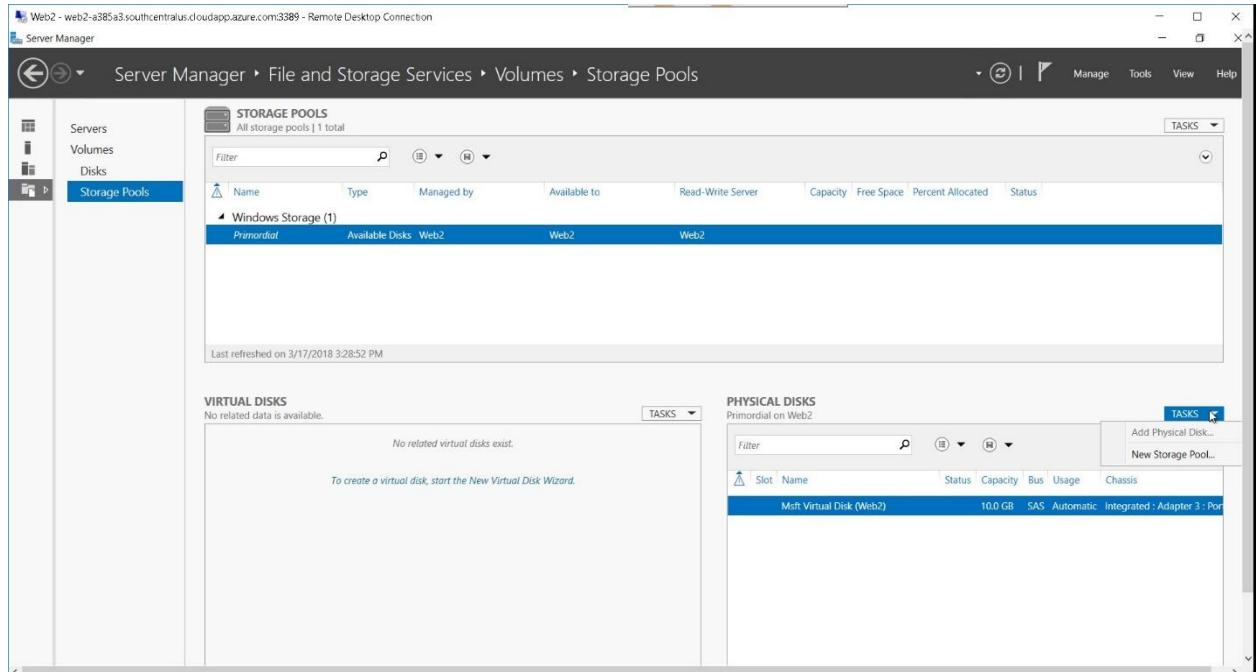


4. Click Storage Pools.

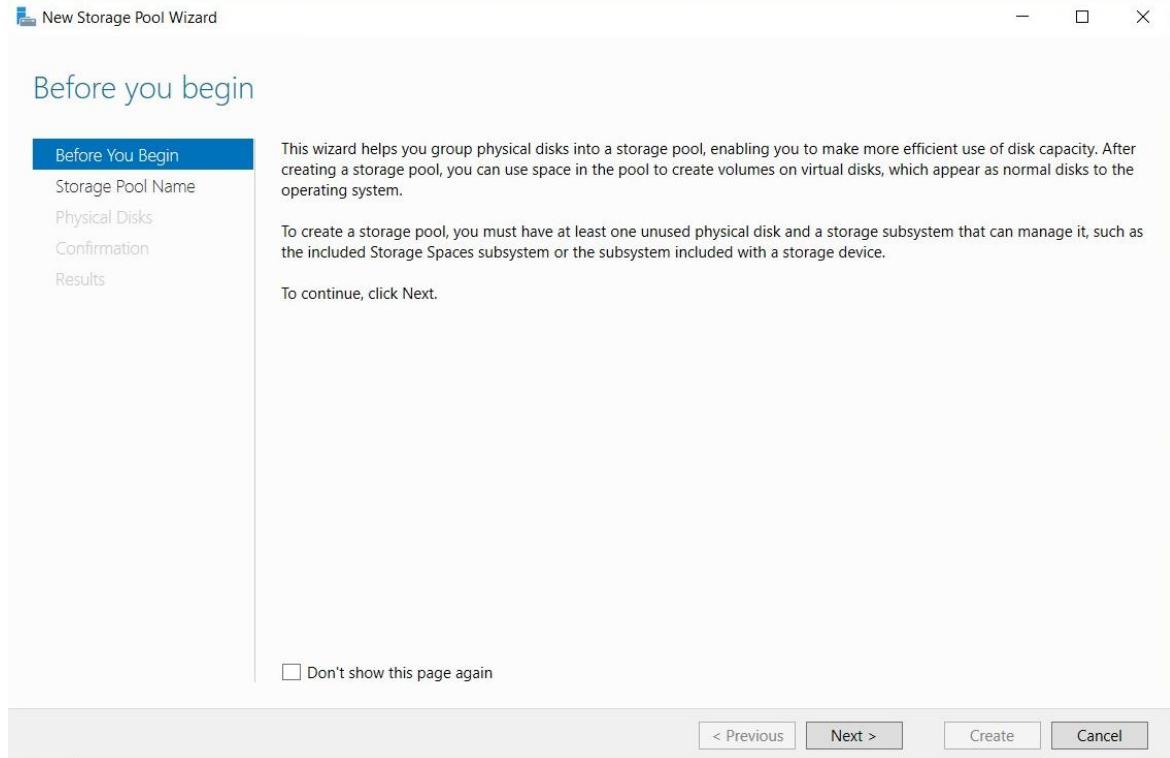


5. Under Storage Pools, click Tasks, and then click New Storage Pool.

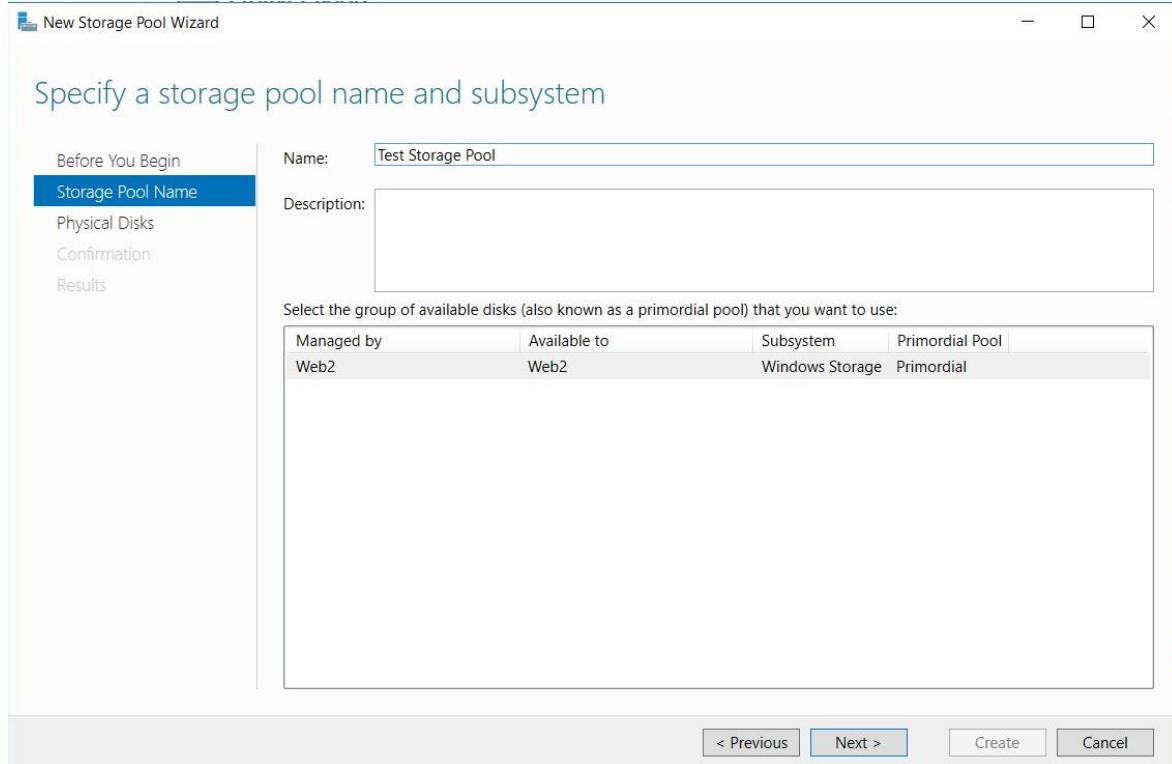
Microsoft Azure Infrastructure step by step



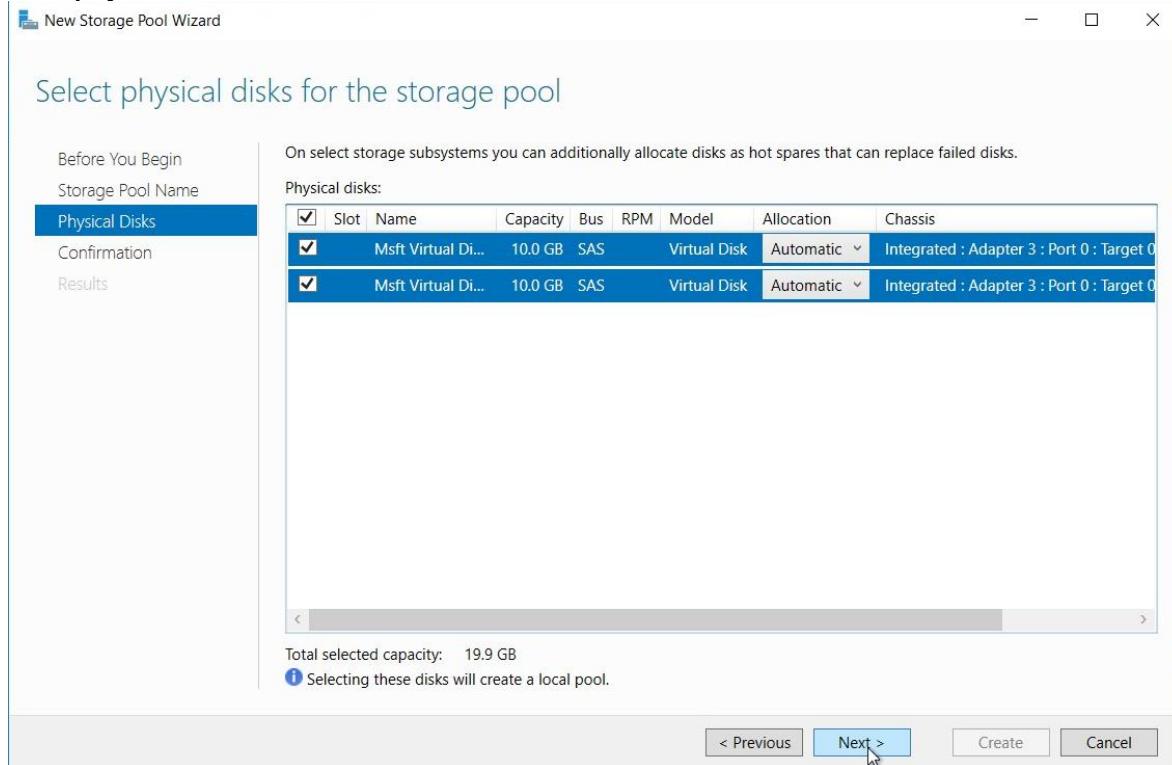
6. On the **Before you begin** page, click **Next**.



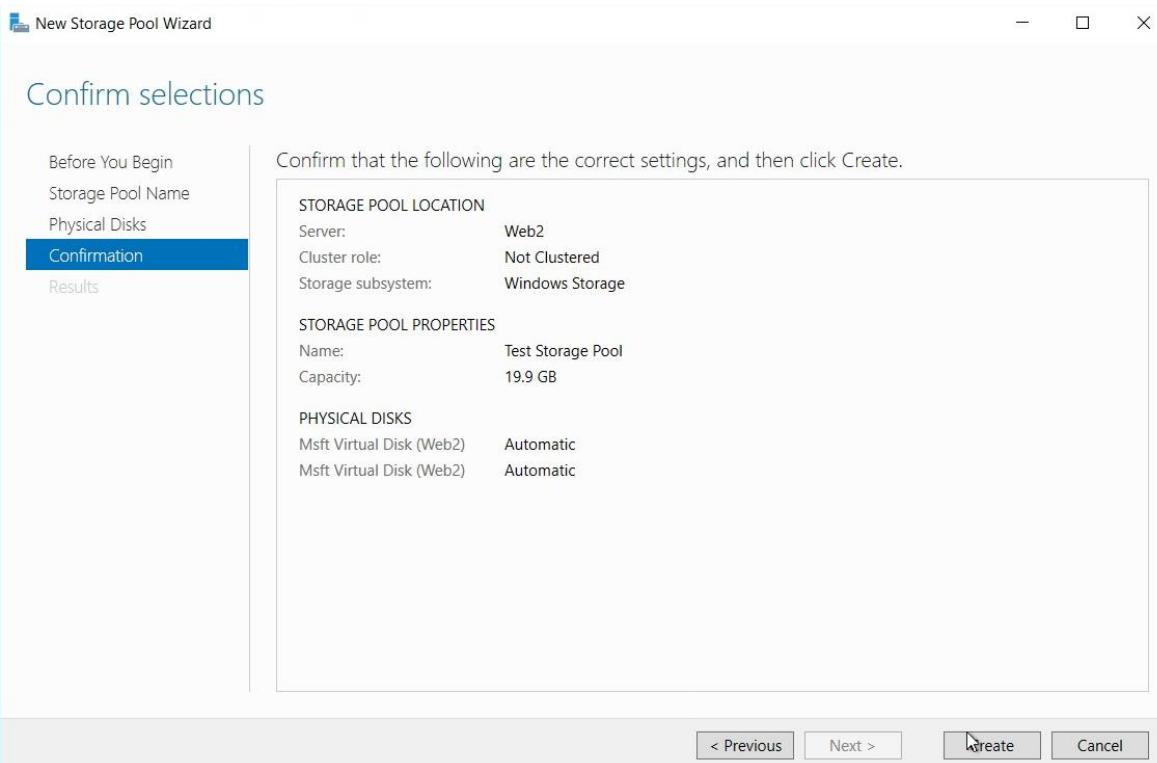
7. On the **Specify a storage pool name and subsystem** page, in the **Name** box, type **New Storage Pool**.



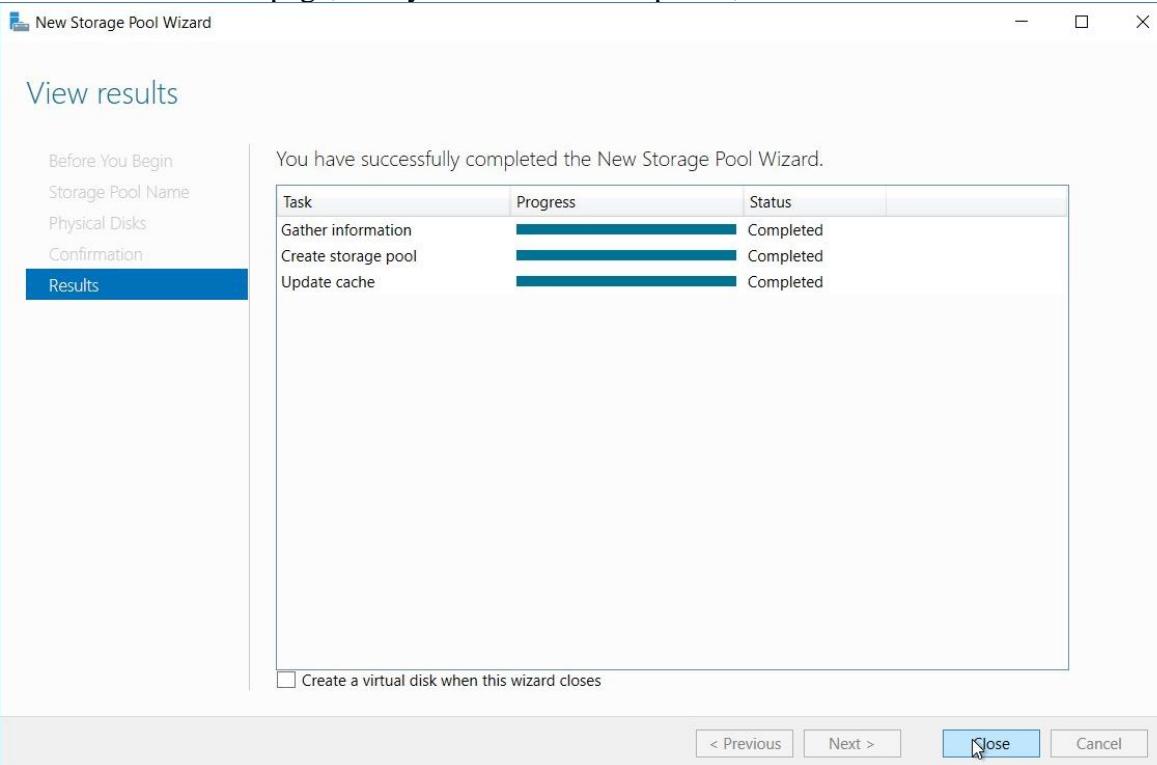
- On the **Select physical disks for the storage pool** page, select the check boxes next to each physical disk, and then click **Next**.



- On the **Confirm selections** page, verify that the settings are correct, and then click **Create**.

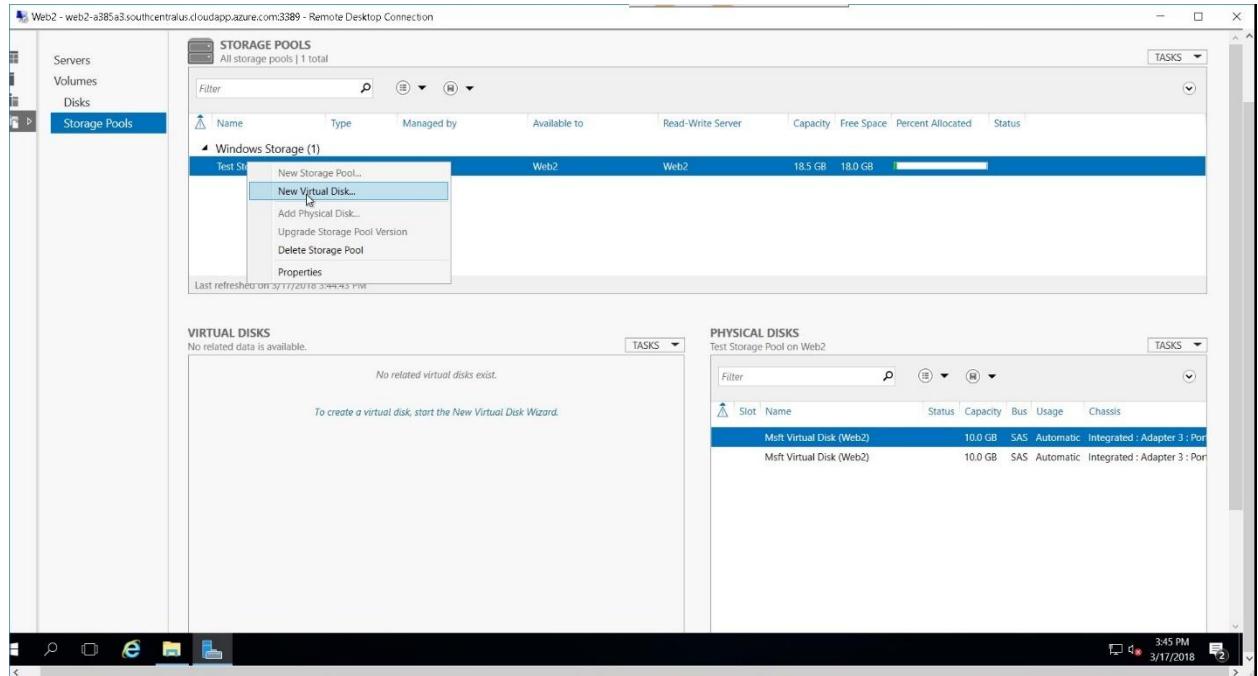


10. On the **View results** page, verify that all tasks completed, and then click **Close**.

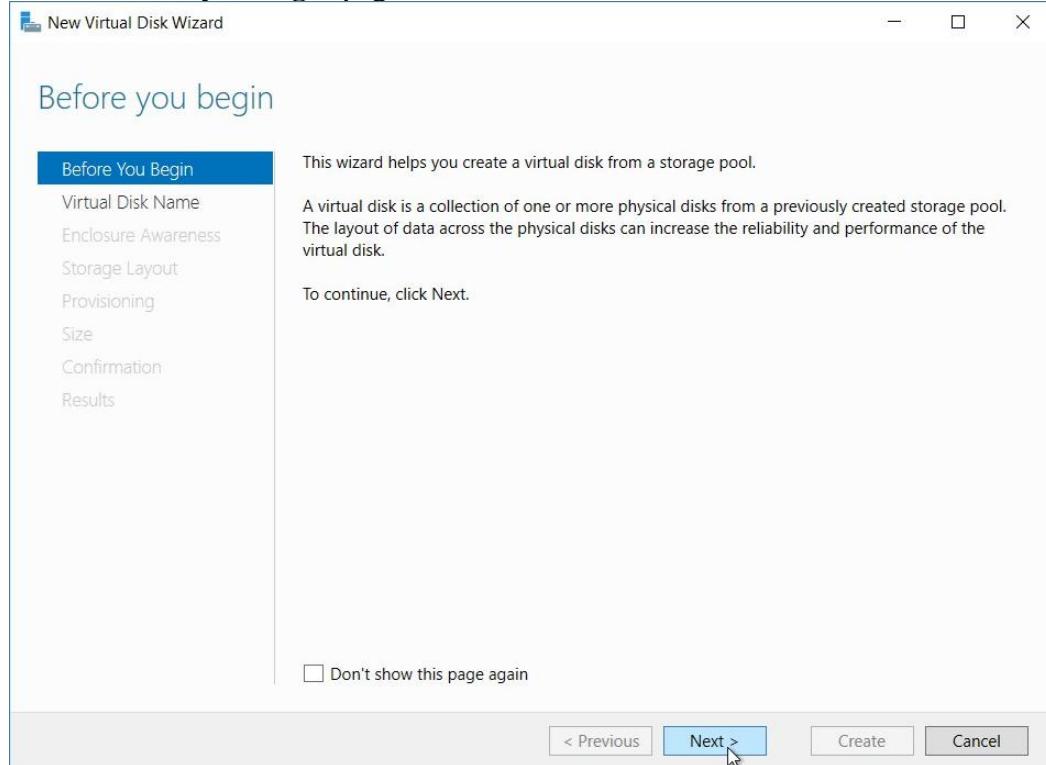


11. In **Storage Pools**, right-click **New Storage Pool** and click **New Virtual Disk**.

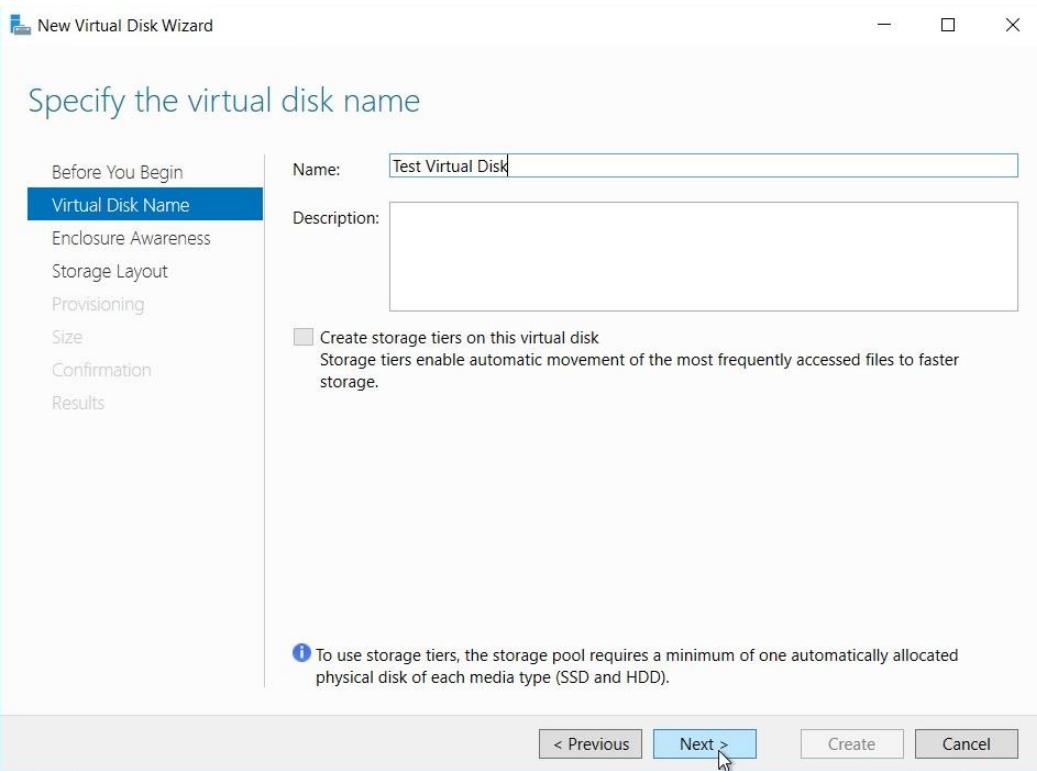
Microsoft Azure Infrastructure step by step



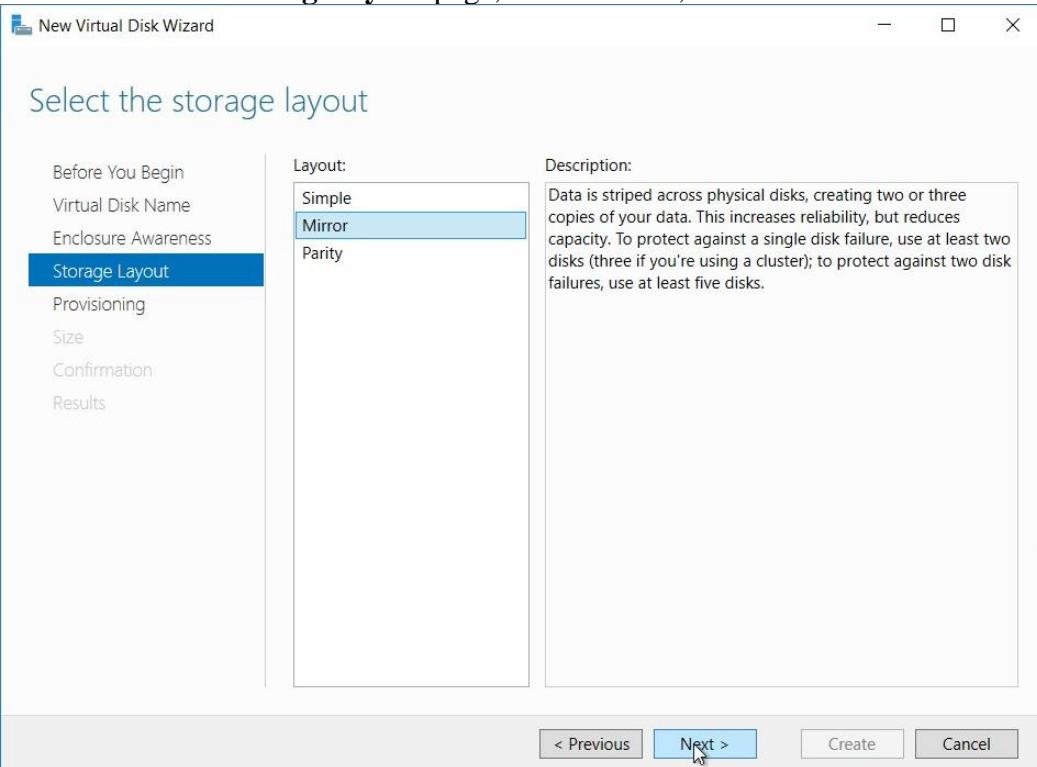
12. On the **Before you begin** page, click **Next**.



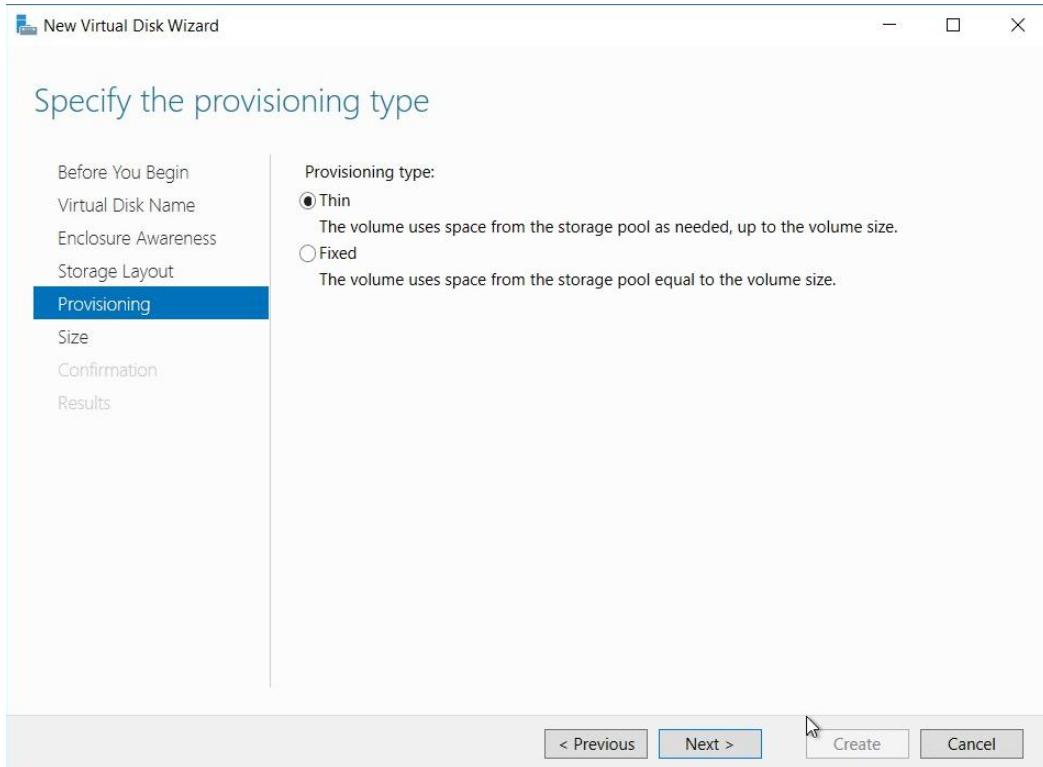
13. In the **Name** box, type **New Virtual Disk** and click **Next**



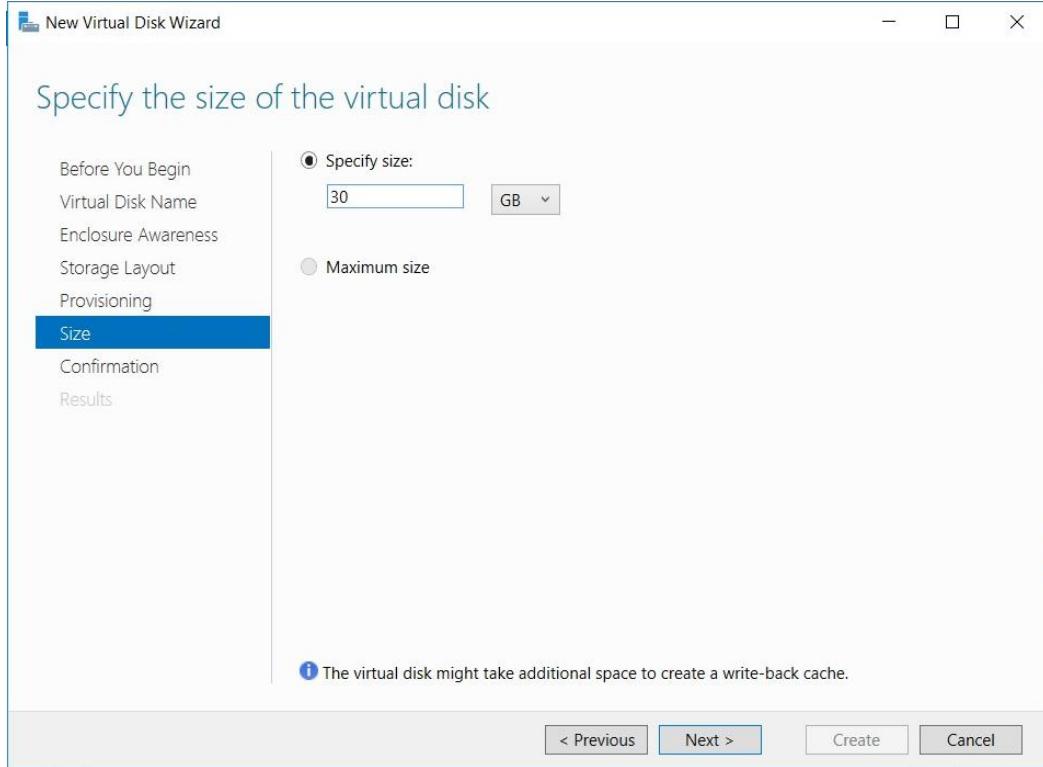
14. On the **Select the storage layout** page, click **Mirror**, and click **Next**.



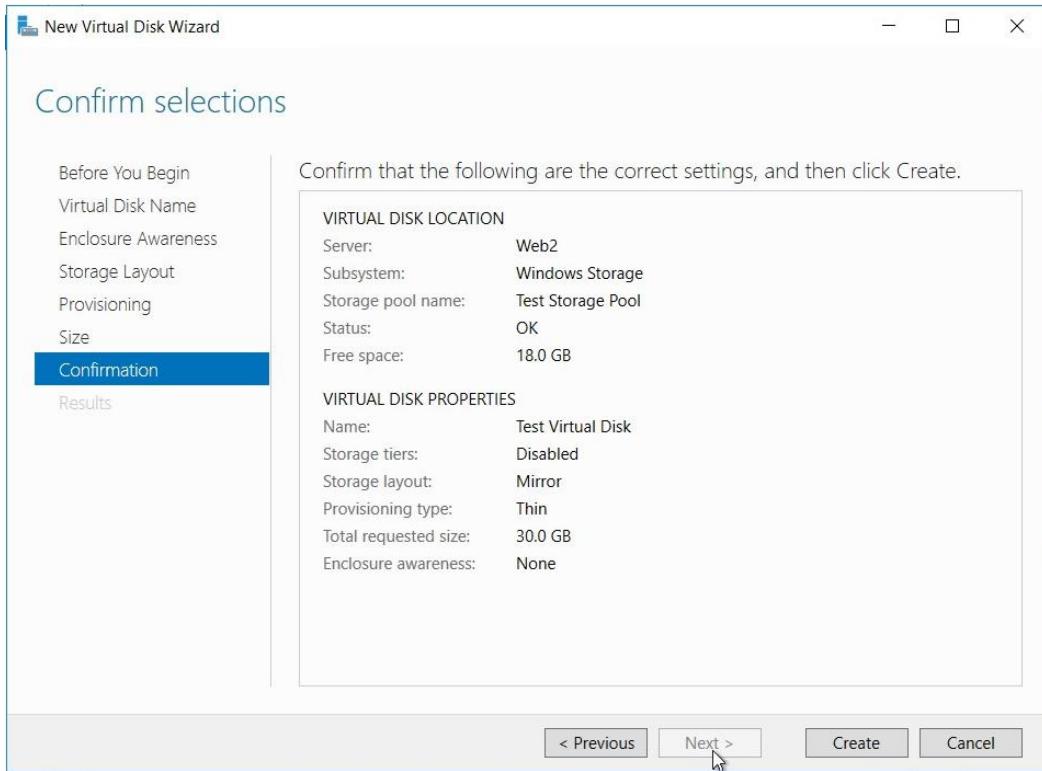
15. On the **Specify the provisioning type** page, click **Thin**, and then click **Next**.



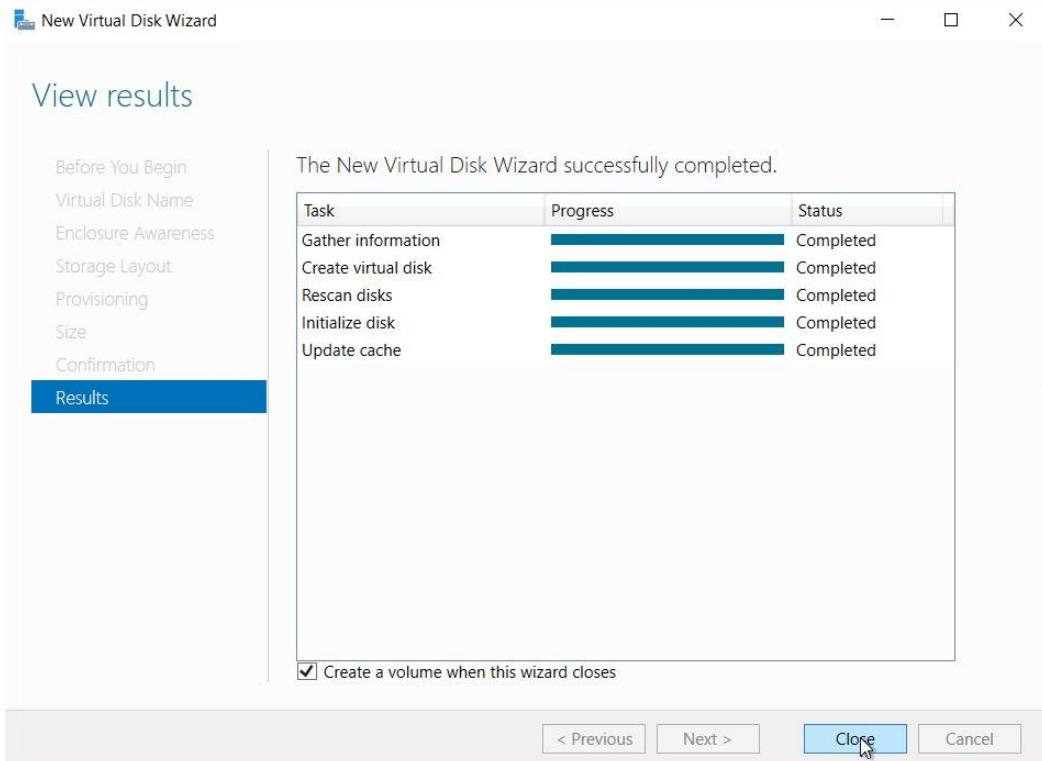
16. On the **Specify the size of the virtual disk** page, click **Specify size** and in **Virtual disk size** box, enter **30**, then click **Next**.



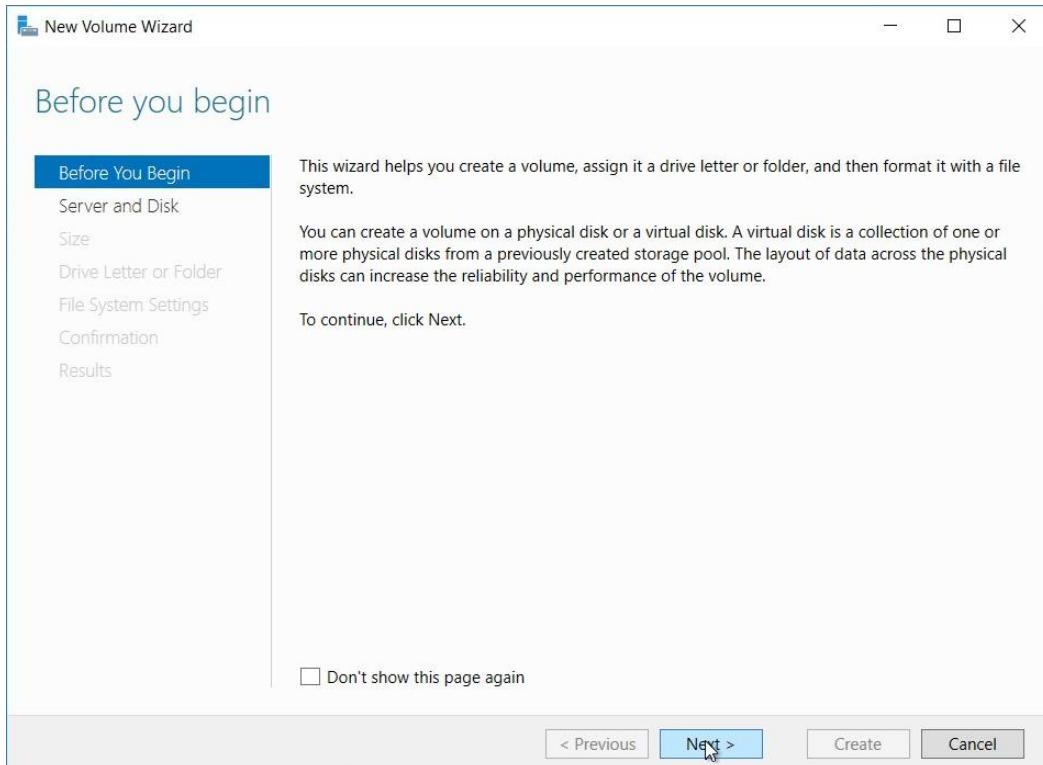
17. On the **Confirm selections** page, note that the size of the virtual disk is larger than the available space in the storage pool. Click **Create**.



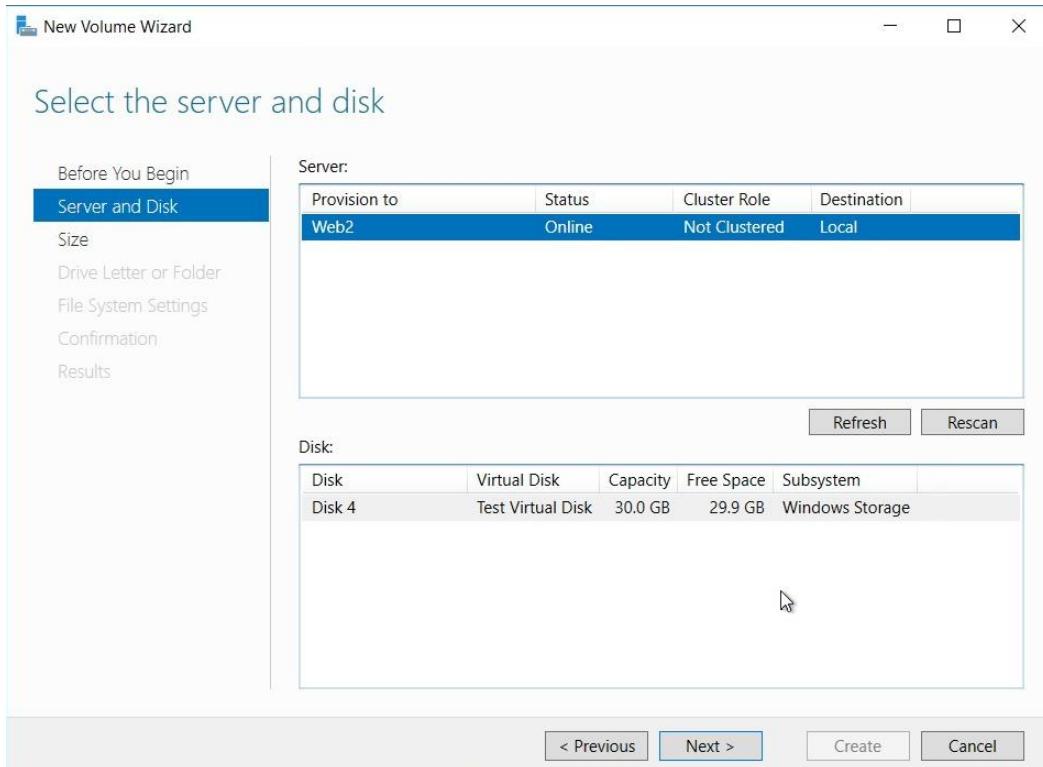
18. When the configuration completes, click **Close**.



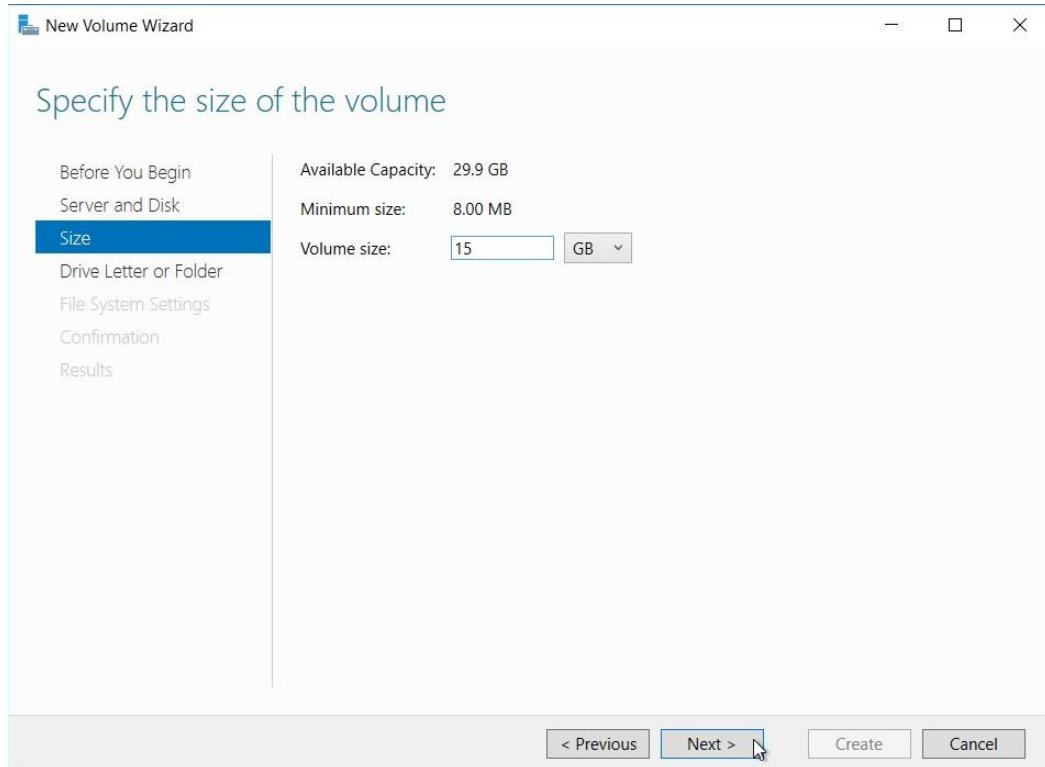
19. On the **Before you begin** page, click **Next**.



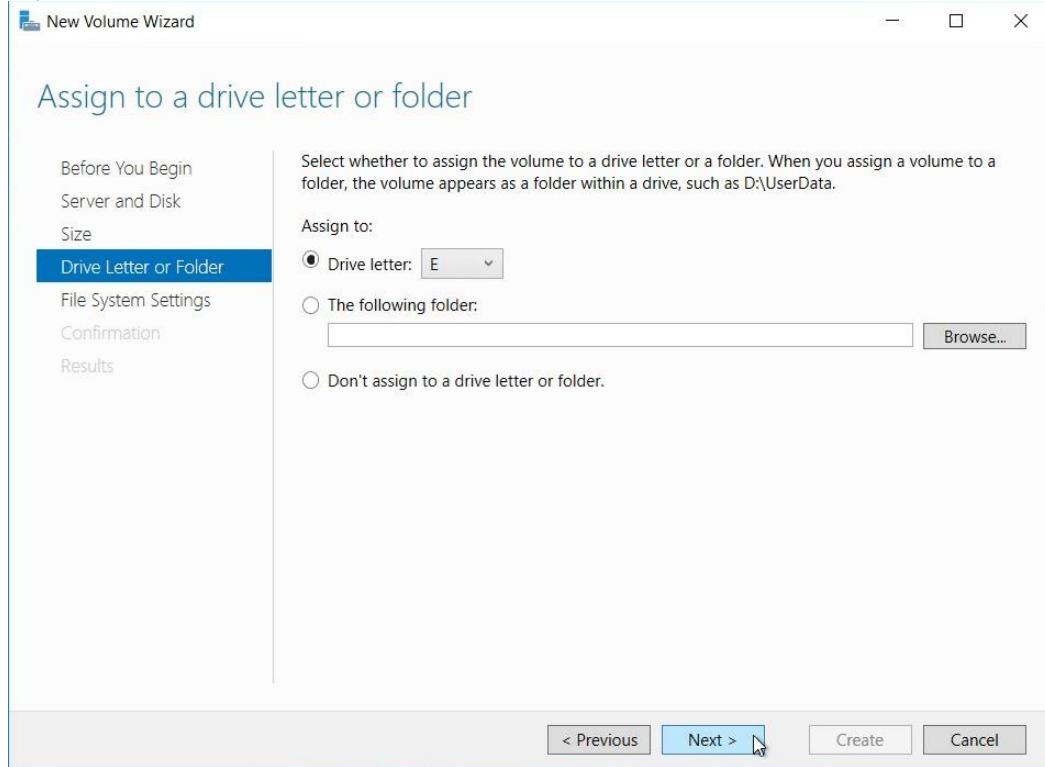
20. On the **Select the server and disk** page, click the 30 GB Storage Spaces disk, and click **Next**.



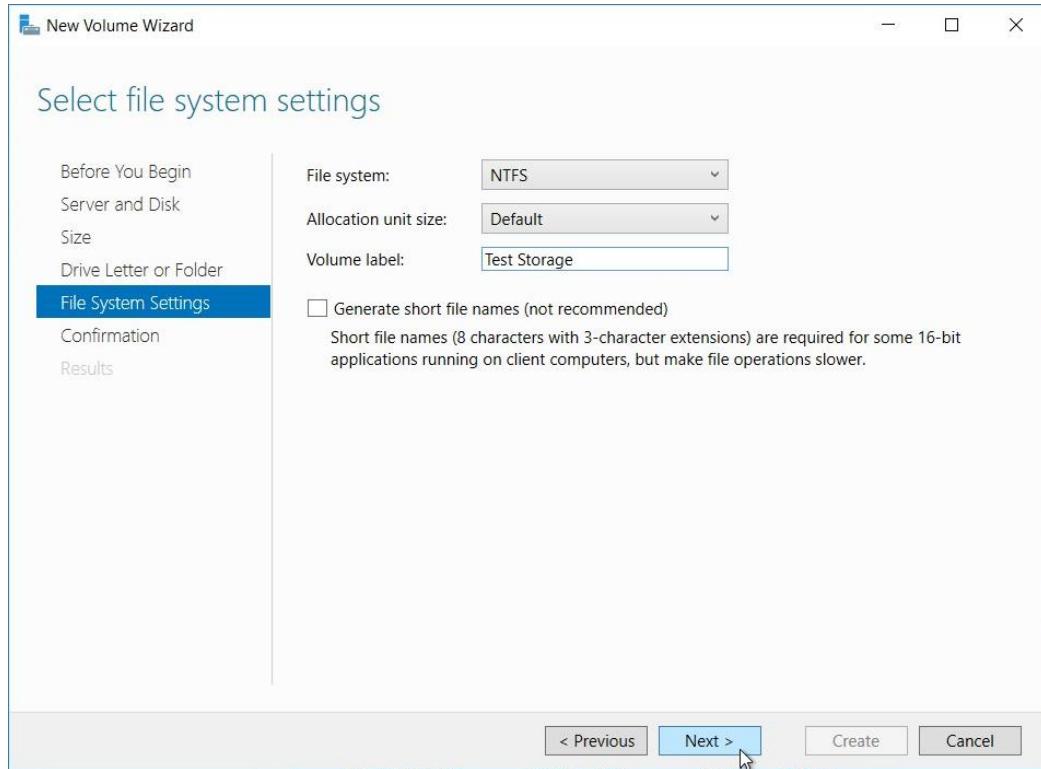
21. On the **Specify the Size of the volume** page, enter **15 GB**, and click **Next**.



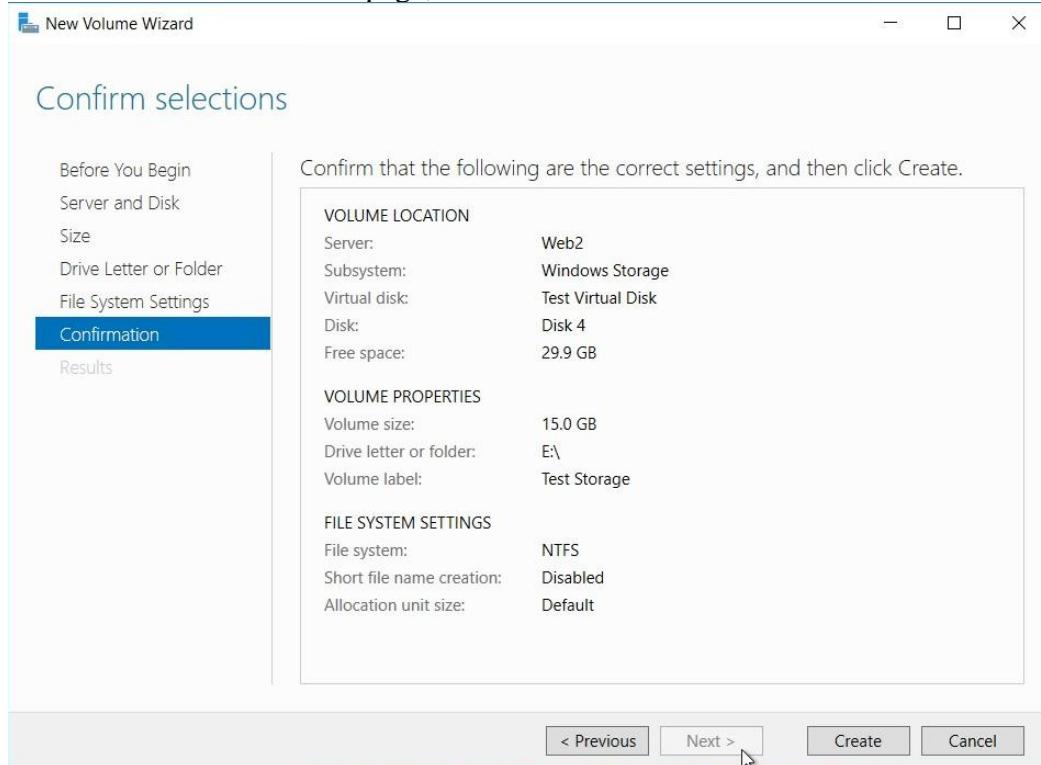
22. On the **Assign to a drive letter or folder** page, select the next free drive letter (should be E:), and click **Next**.



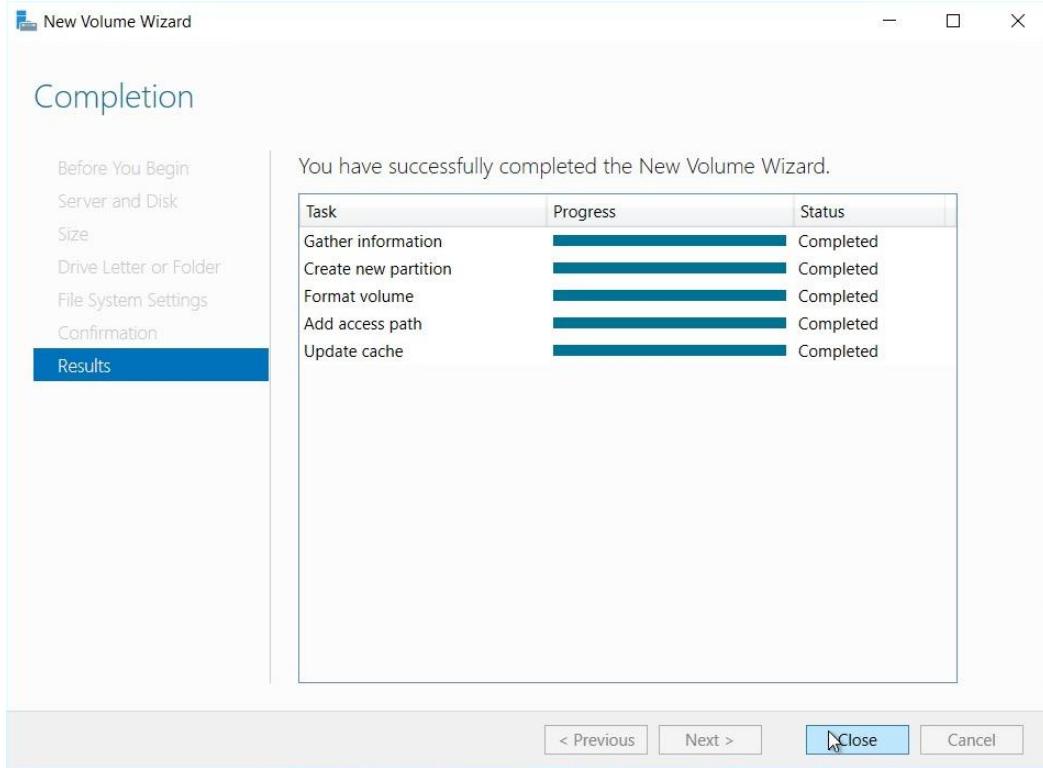
23. On the **Select file system settings** page, change the volume label to **Test Storage** and click **Next**.



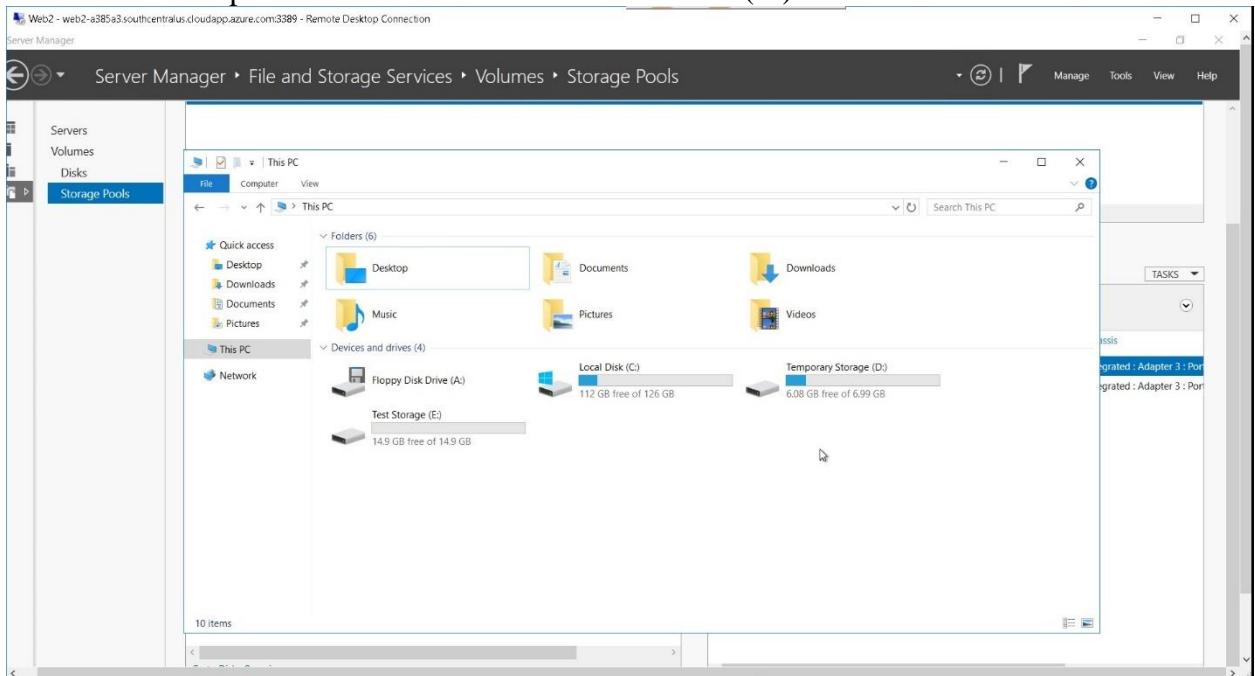
24. On the **Confirm selections** page, click **Create**.



25. When the configuration completes, click **Close**.



26. Review the status of the New Storage Pool. Note the free space, which virtual disks are configured and which physical disks are being used in the storage pool.
27. Switch to File Explorer and view the new RAID Volume (E:) drive of 14.9 GB.



Chapter 4

Azure Web Apps

The Azure Websites service is a platform of technologies that enable you to host websites in Azure without configuring and maintaining your own virtual machines (VMs). You can run websites written with the ASP.NET, PHP, Node.js, and Python frameworks.

Websites often require two supporting services: data storage and file storage. The raw data that server-side code formats into a webpage and sends to the user is often kept in a database and in Azure you can use SQL Database to host that database. Alternatively, you can provision a database in a VM or use Azure table storage. Websites often include media files, such as images, videos, and sound files. Performance is usually improved if these images are stored outside the database. In Azure, you can use a Storage Account for these files. Again, another alternative is to use the file system on a VM for file storage.

Implementing Web Apps

You can choose to host your web application in the Azure Websites service. After creating a new Azure website, you can either upload a custom web application or choose from a wide range of popular general-purpose web applications, including Drupal, Word Press, Umbraco, and others. Developers can build custom web applications to host in Azure Websites by using ASP.NET, Node.js, PHP, and Python.

You can scale up an Azure website by changing tiers. This increases the traffic a single instance of the site can service. Alternatively, scale out by installing a website in multiple instances and using Azure load balancing to distribute traffic. However, you can only scale the website as a single component—you cannot scale separate parts of the application differently. You also cannot gain RDP access to the web server. You can use Azure SQL Database or SQL Server on a virtual machine to host an underlying database.

Creating Web App

In this exercise, you will have created a new website in the Azure portal and configured the new website with deployment slots and deployment credentials.

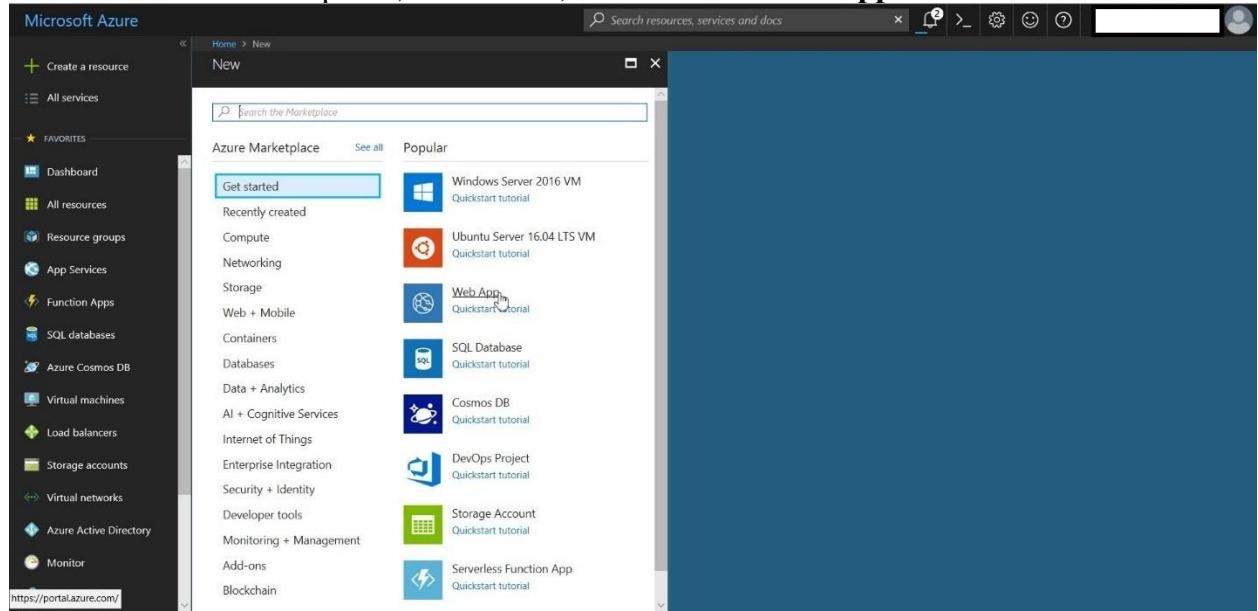
Task 1: Create a Web App

To create a new website in the Azure Preview Portal, following this procedure:

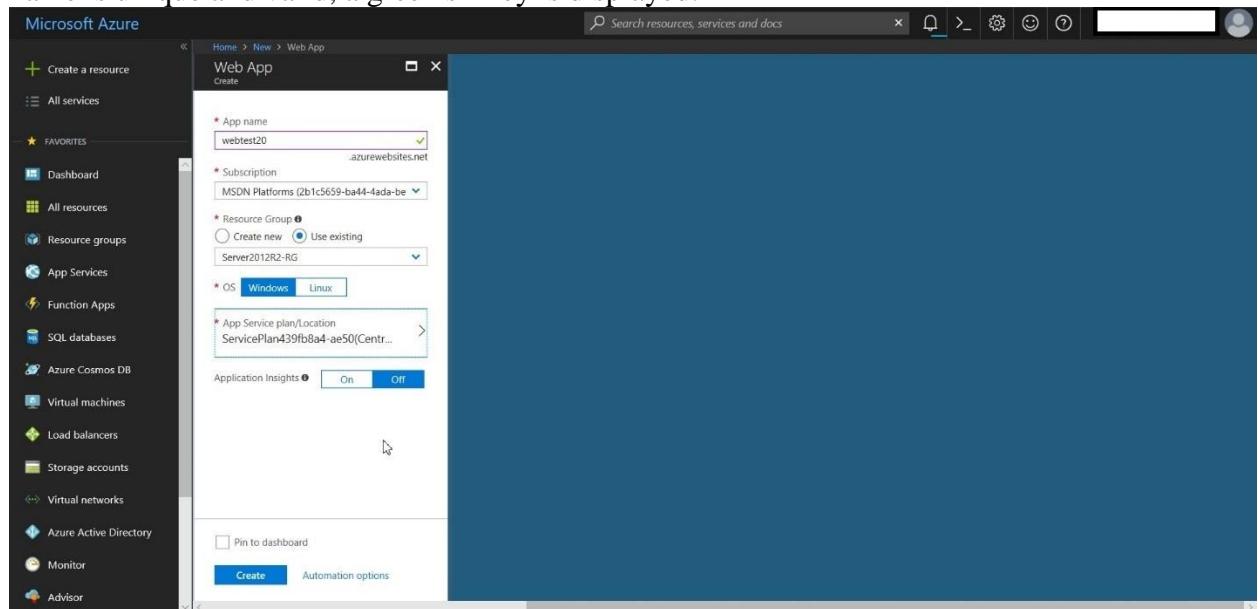
1. Start Internet Explorer, browse to **http://portal.azure.com**, and sign in using the Microsoft account that is associated with your Azure subscription.

Microsoft Azure Infrastructure step by step

2. In the bottom left of the portal, click NEW, and then click Web App.

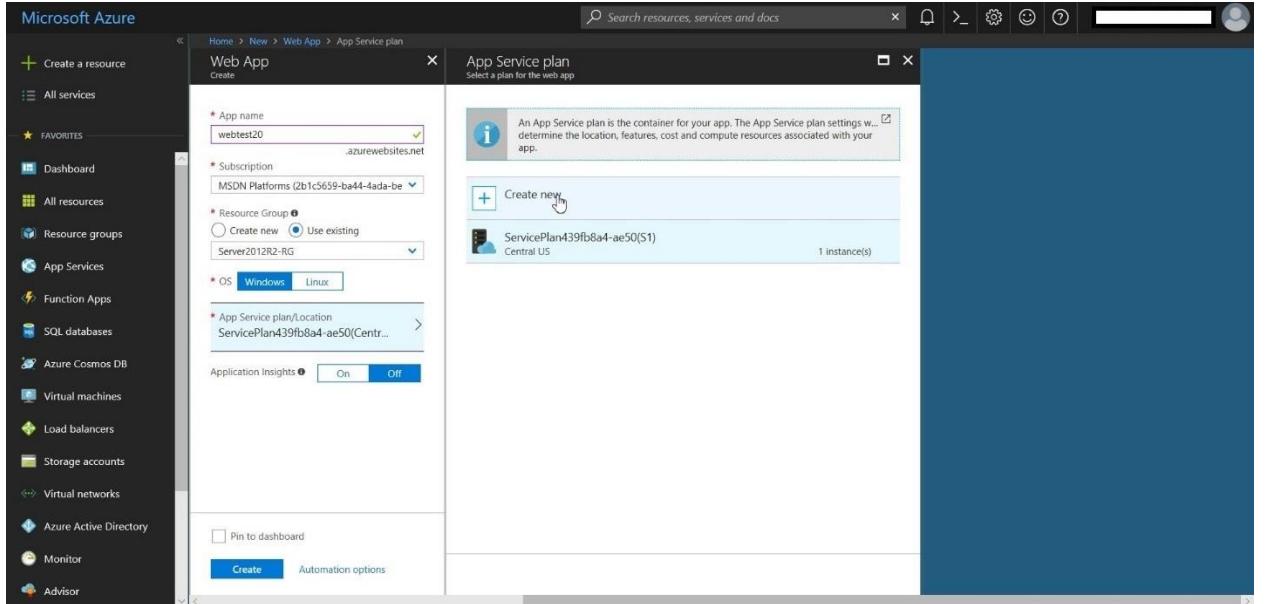


3. In the **Web App** blade, in the **URL** text box, type any unique valid server name. If the name is unique and valid, a green smiley is displayed.

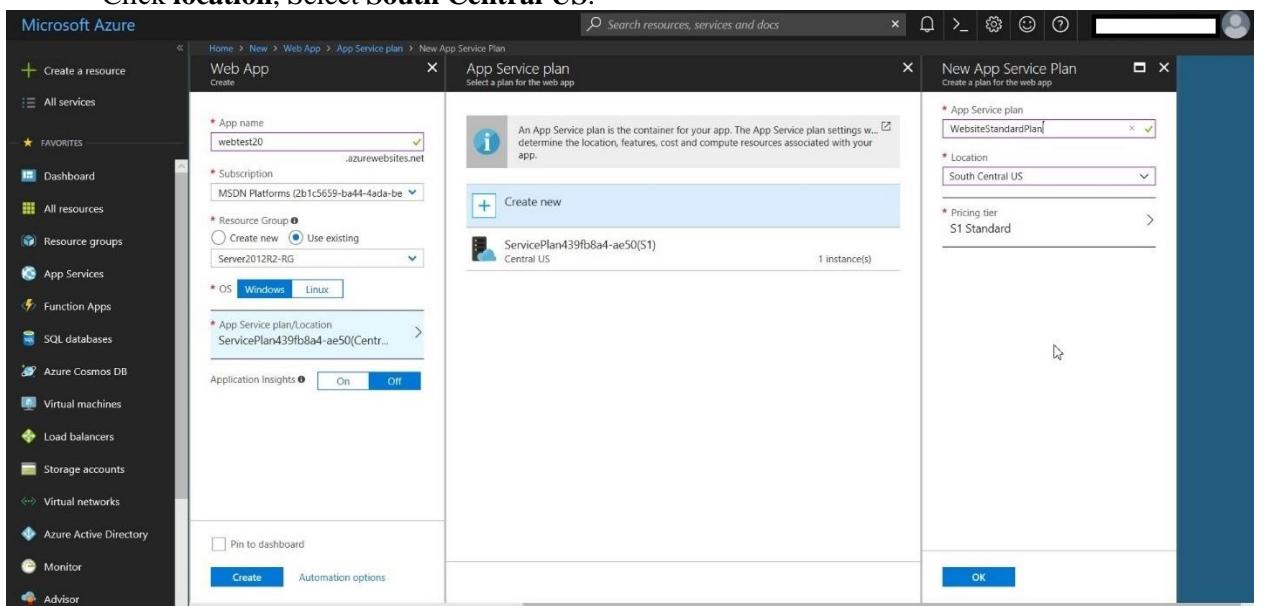


4. Click **App Service plan/location**, click create New

Microsoft Azure Infrastructure step by step

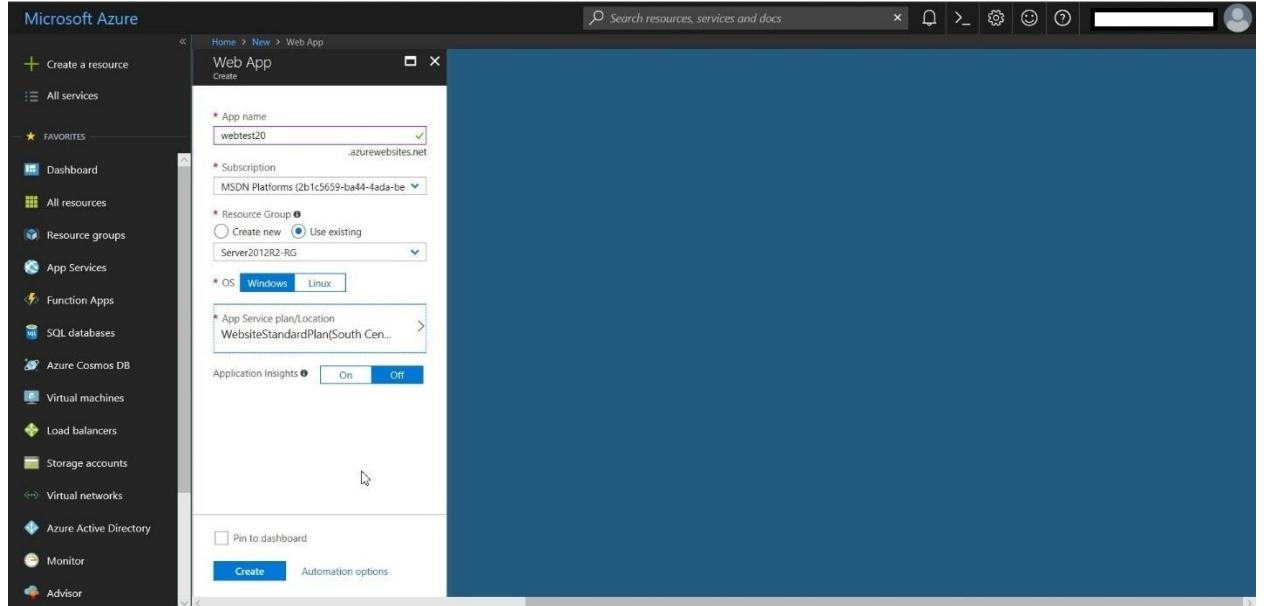


5. In the **App Service plan** blade,
 - in the Name text box, type **WebsiteStandardPlan**.
 - Click **S1 Standard**, and then click **OK**.
 - Click **location**, Select **South Central US**.

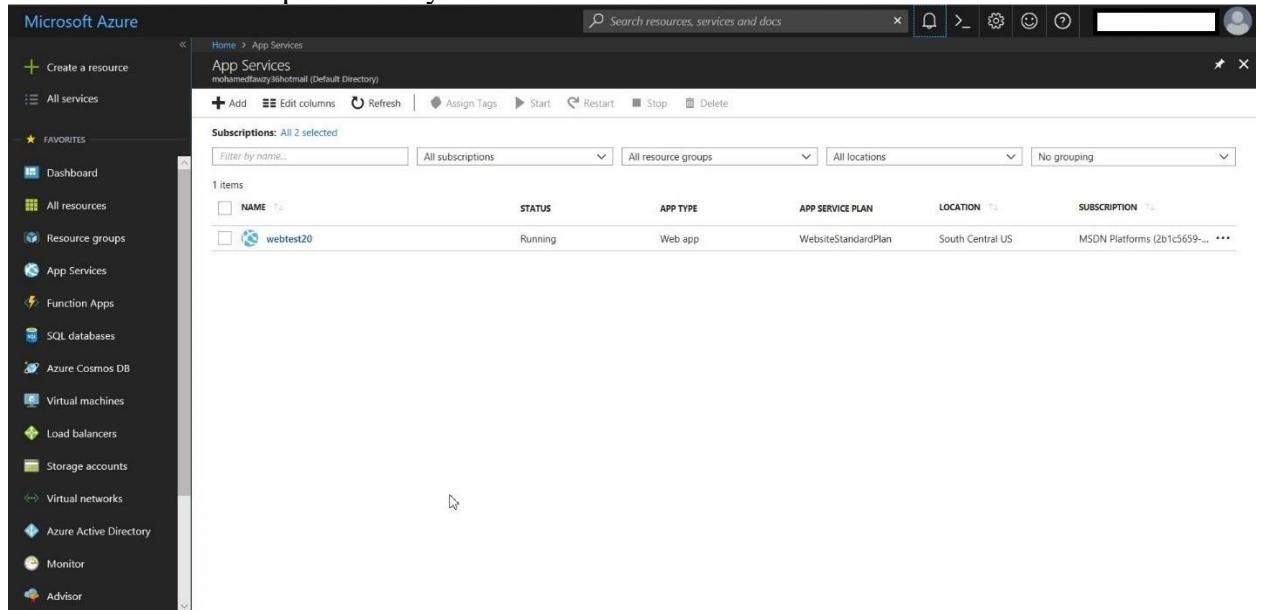


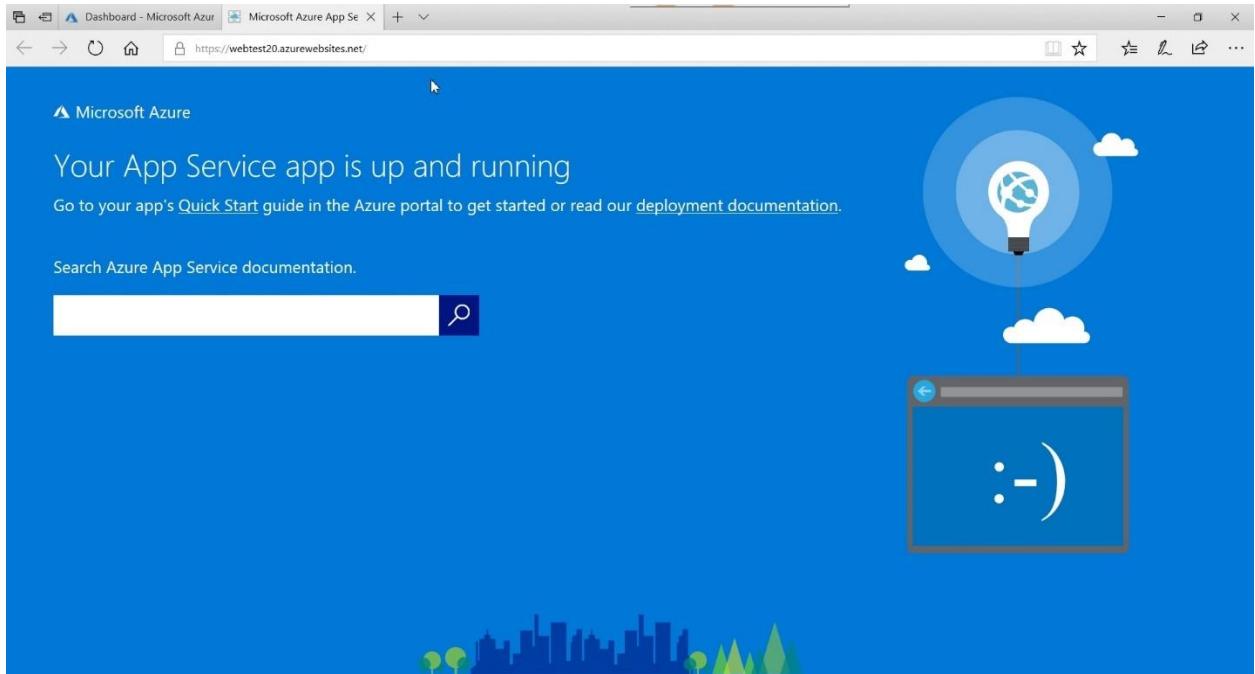
6. In the **Web App** blade, click **Create**.

Microsoft Azure Infrastructure step by step



7. The website creation process may take several minutes.





Task 2: Add a Deployment Slot

To add deployment slot, following this procedure:

1. On the left of the Azure preview portal, click **Home**.
2. In the **App Services** blade, click the web App you created.

A screenshot of the Microsoft Azure preview portal's App Services blade. The sidebar on the left shows various service categories like 'Create a resource', 'All services', 'Dashboard', etc. The main area is titled 'App Services' and shows a single item: 'mohamedfawzy36@hotmail (Default Directory)'. Below it, there's a table with one row for 'webtest20'. The table columns are NAME, STATUS, APP TYPE, APP SERVICE PLAN, LOCATION, and SUBSCRIPTION. The 'NAME' column shows 'webtest20', 'STATUS' shows 'Running', 'APP TYPE' shows 'Web app', 'APP SERVICE PLAN' shows 'WebsiteStandardPlan', 'LOCATION' shows 'South Central US', and 'SUBSCRIPTION' shows 'MSDN Platforms (2b1c5659...)'.

3. Scroll down to locate the **Deployment** section, and then click **Deployment slots**.

Microsoft Azure Infrastructure step by step

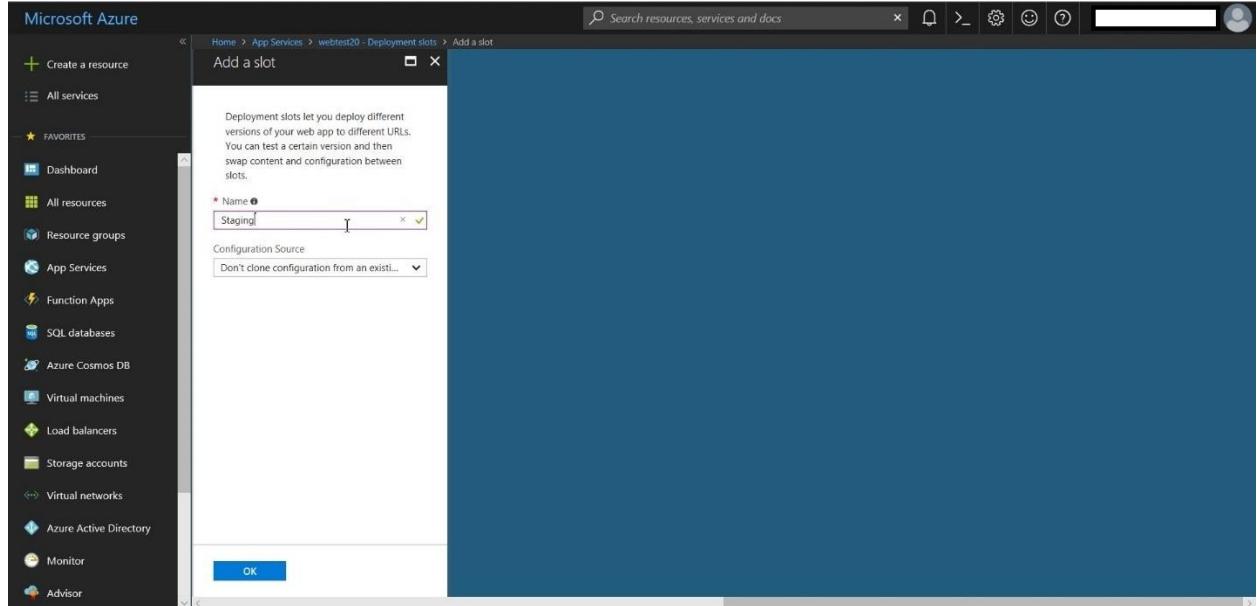
The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes 'Create a resource', 'All services', 'FAVORITES' (Dashboard, All resources, Resource groups), 'App Services', 'Function Apps', 'SQL databases', 'Azure Cosmos DB', 'Virtual machines', 'Load balancers', 'Storage accounts', 'Virtual networks', 'Azure Active Directory', 'Monitor', and 'Advisor'. The main content area is titled 'webtest20 App Service' and shows the 'Overview' blade. It includes sections for 'Resource group (change)', 'Status' (Running), 'Location' (South Central US), 'Subscription (change)', 'MSDN Platform', 'Subscription ID', and 'Deployment' (Quickstart, Deployment credentials, Deployment slots, Deployment options, Continuous Delivery (Preview)). The 'Deployment slots' section is currently selected. Other sections include 'Diagnose and solve problems', 'Application Insights', and 'App Service Advisor'. At the bottom, there are tabs for 'Http 5xx' and 'Data In'.

4. In the **Deployment slots** blade, click **Add Slot**.

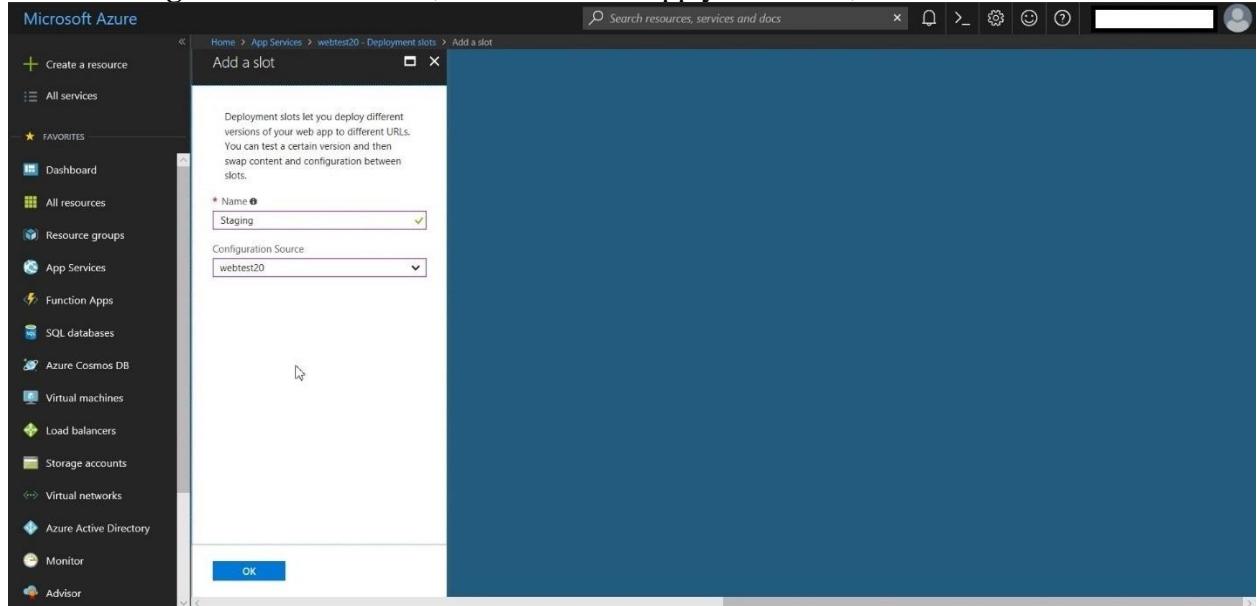
The screenshot shows the 'Deployment slots' blade for the 'webtest20' app service. The left sidebar has 'App Services' selected. The main area shows a table with one row for 'webtest20'. A 'NAME' column dropdown is open, showing 'webtest20'. The right side of the blade shows 'Overview', 'Activity log', 'Access control (IAM)', 'Tags', 'Diagnose and solve problems', 'Deployment' (Quickstart, Deployment credentials, Deployment slots, Deployment options, Continuous Delivery (Preview)), 'SETTINGS' (Application settings, Authentication / Authorization, Managed service identity), and 'Application Insights'. A large button labeled '+ Add Slot' is visible at the top right.

5. In the **Add a slot** blade, in the **Name** text box, type **Staging**.

Microsoft Azure Infrastructure step by step



6. In the **Configuration Source** list, select the web App you created, click **OK**.



7. Close the **Deployment slots** blade.

8. On the Start screen, type the **Microsoft Azure PowerShell**, and then click **Microsoft Azure PowerShell**. If you are not logged in, type the following command, and then press Enter: **Add-AzureAccount**. Login with the account associated with your Azure subscription.
9. Type the following PowerShell command and then press Enter: **Get-AzureWebsite**

```
PS C:\WINDOWS\system32> Get-AzureWebsite

Name      : webtest20
State     : Running
Host Names : {webtest20.azurewebsites.net}

Name      : webtest20(Staging)
State     : Running
Host Names : {webtest20-staging.azurewebsites.net}

PS C:\WINDOWS\system32>
```

10. Check that the list of websites includes both the website you created and the staging slot you created.

Task 3: Configure Deployment Credentials

To configure deployment credentials, following this procedure

1. In Internet Explorer, in the website you created in Task 1 blade, scroll down to locate the **Deployment** section, and then click **Set deployment credentials**.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes 'Create a resource', 'All services', 'Dashboard', 'All resources', 'Resource groups', 'App Services', 'Function Apps', 'SQL databases', 'Azure Cosmos DB', 'Virtual machines', 'Load balancers', 'Storage accounts', 'Virtual networks', 'Azure Active Directory', 'Monitor', and 'Advisor'. The main content area is titled 'App Services' and shows 'webtest20 - Deployment credentials'. The 'Deployment' section is selected, displaying options like 'Quickstart', 'Deployment credentials' (which is highlighted), 'Deployment slots', 'Deployment options', and 'Continuous Delivery (Preview)'. Below this, the 'SETTINGS' section includes 'Application settings', 'Authentication / Authorization', and 'Managed service identity'. The right pane is titled 'Deployment Credentials' and contains fields for 'FTP/deployment username' (set to 'ftpadmin20'), 'Password' (set to 'Pa\$\$w0rd'), and 'Confirm password' (set to 'Pa\$\$w0rd'). A note at the top states: 'Local Git and FTP can't authenticate using the credentials used for the portal. Create a new username and password to use with those deployment methods. This username and password will be the same across all apps in all subscriptions associated with your Microsoft Azure account.' A 'Save' button is visible.

2. In the Deployment Credentials Page

- **Username** box, type **ftpadminXXXX** where **XXXX** is a unique number.
- In the **Password** box, type **Pa\$\$w0rd**.
- In the **Confirm Password** box, type **Pa\$\$w0rd**, and then click **Save**.

This screenshot is identical to the one above, but it shows the state after the changes have been saved. The 'Deployment credentials' form now has a green checkmark icon next to each of the three input fields: 'FTP/deployment username' (ftpadmin20), 'Password' (Pa\$\$w0rd), and 'Confirm password' (Pa\$\$w0rd). The 'Save' button is no longer visible.

Deploying a Web App

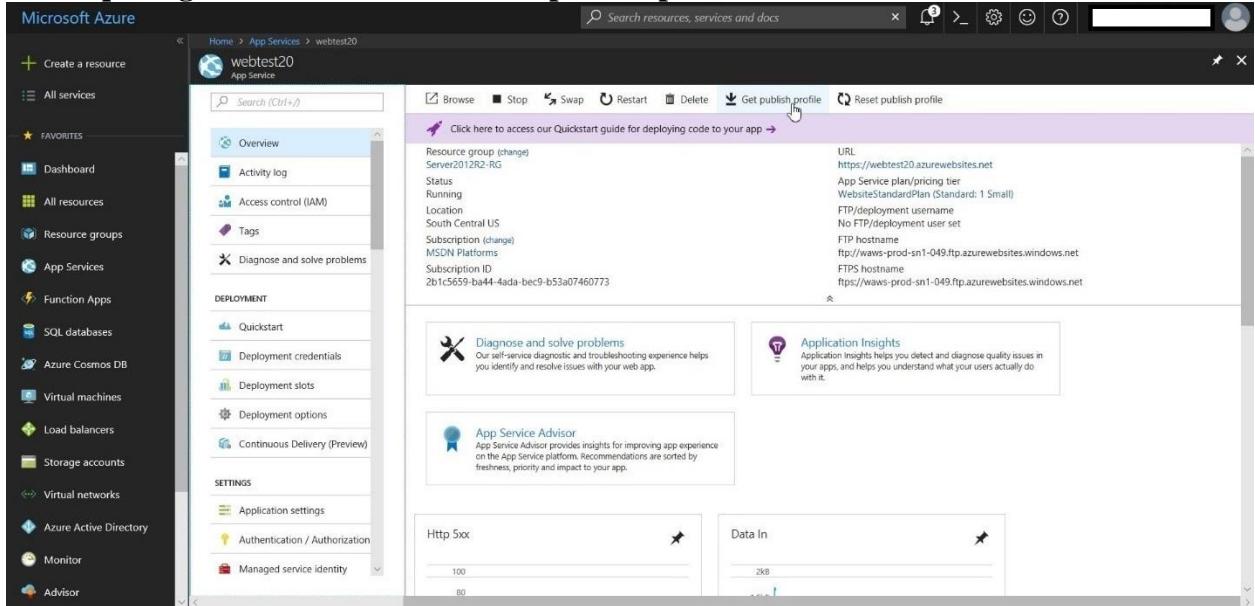
Web applications are usually created by teams of web designers and developers by using a variety of tools such as graphic design packages, image editing packages, web design software, and Integrated Development Environments (IDEs) such as Visual Studio. When the first version of the web application is complete, developers or administrators must deploy it to a web server and you can choose to use Azure Websites as a web server to host your application. There are many ways to package and deploy a web application to Azure.

In this exercise, you will use a publishing profile in Visual Studio 2013 to connect to the new website and deploy the web content

Task 1: Obtain a Publishing Profile

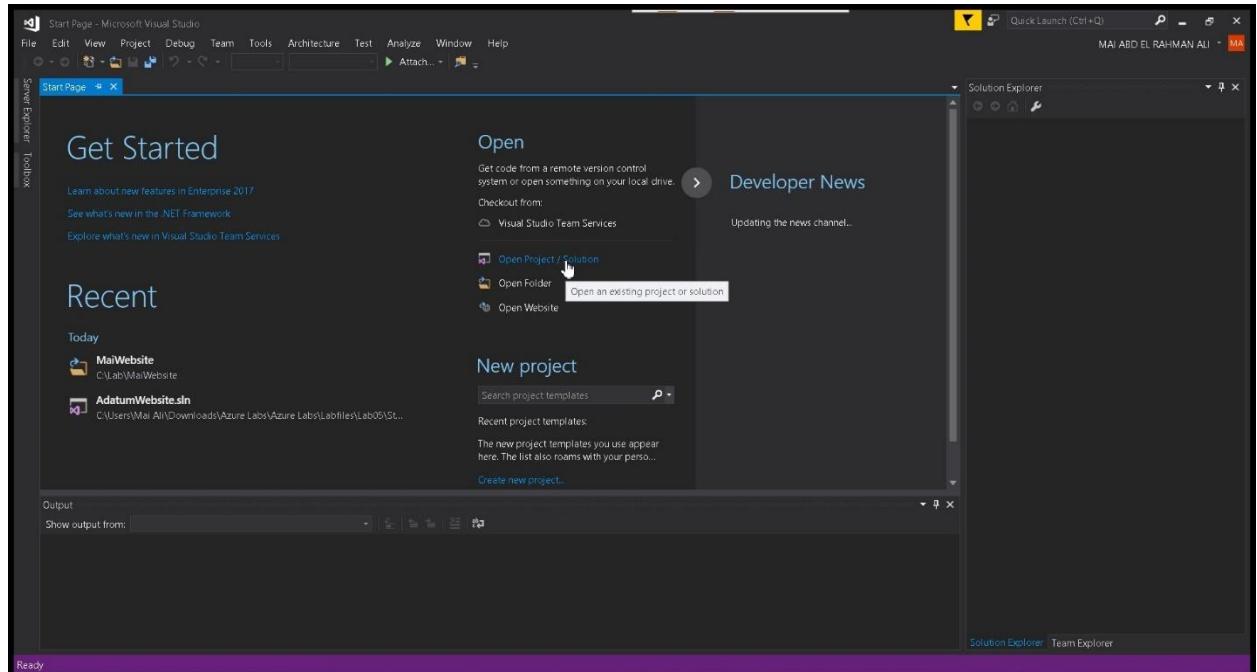
To publish profile, following this procedure

1. In the navigation shortcuts on the left, click **App services**.
2. In the list of App services, click the web App you created and then click **DASHBOARD**.
3. Under quick glance, click **Download the publish profile**.

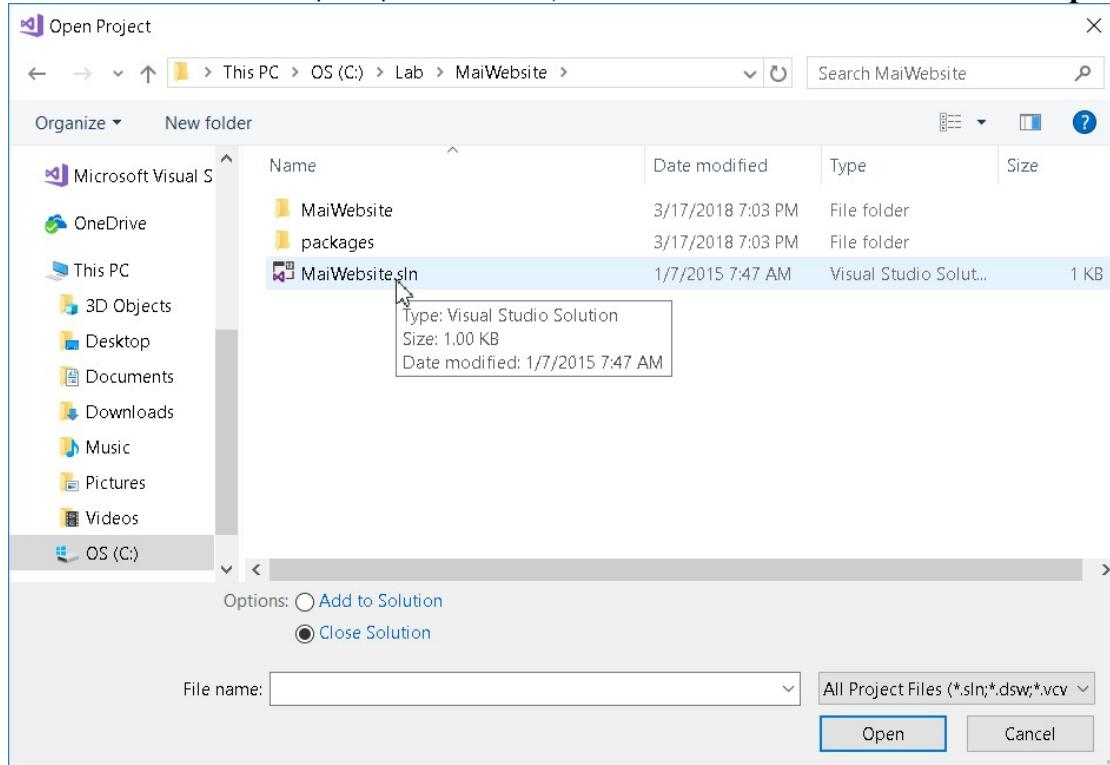


4. In the dialog, click **Save**. Internet Explorer saves the publish profile in the **Downloads** folder.
5. On the Taskbar, click **Visual Studio 2017**.
6. On the **File** menu, point to **Open**, and then click **Project/Solution**.

Microsoft Azure Infrastructure step by step

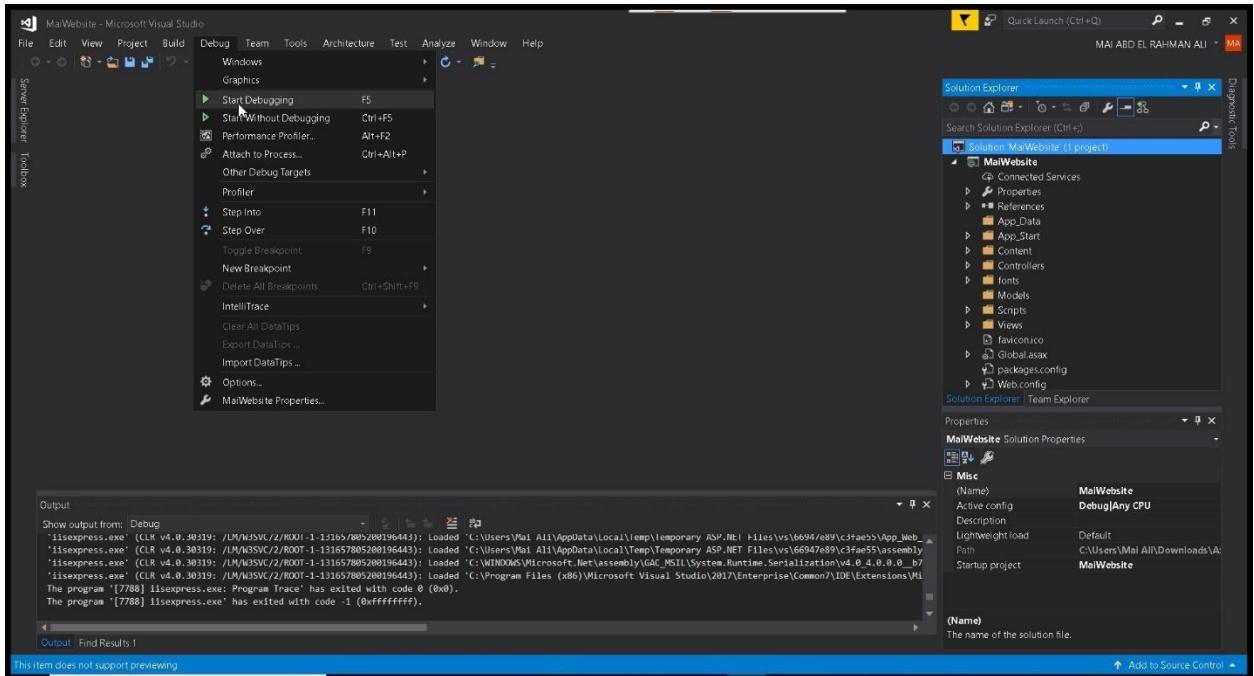


7. Browse to the folder C:\Lab\MaiWebsite, click MaiWebsite.sln and then click Open.

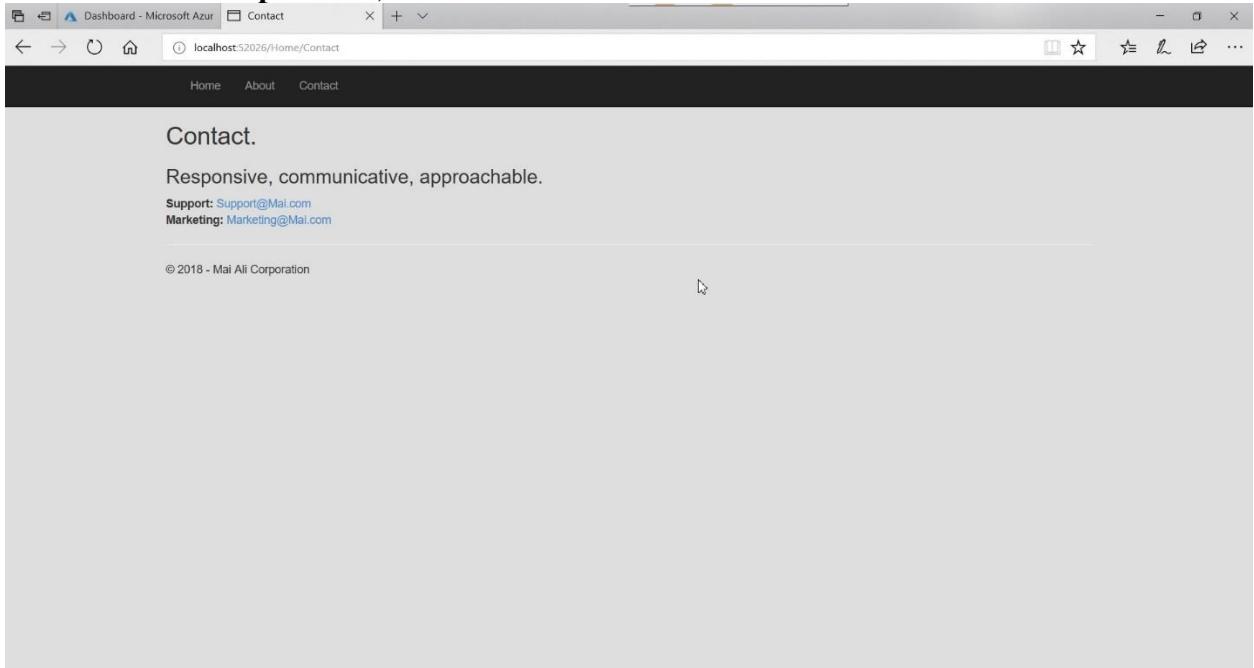


8. On the Debug menu, click Start Debugging.

Microsoft Azure Infrastructure step by step



9. Under Mai Ali Corporation, Click Contact.



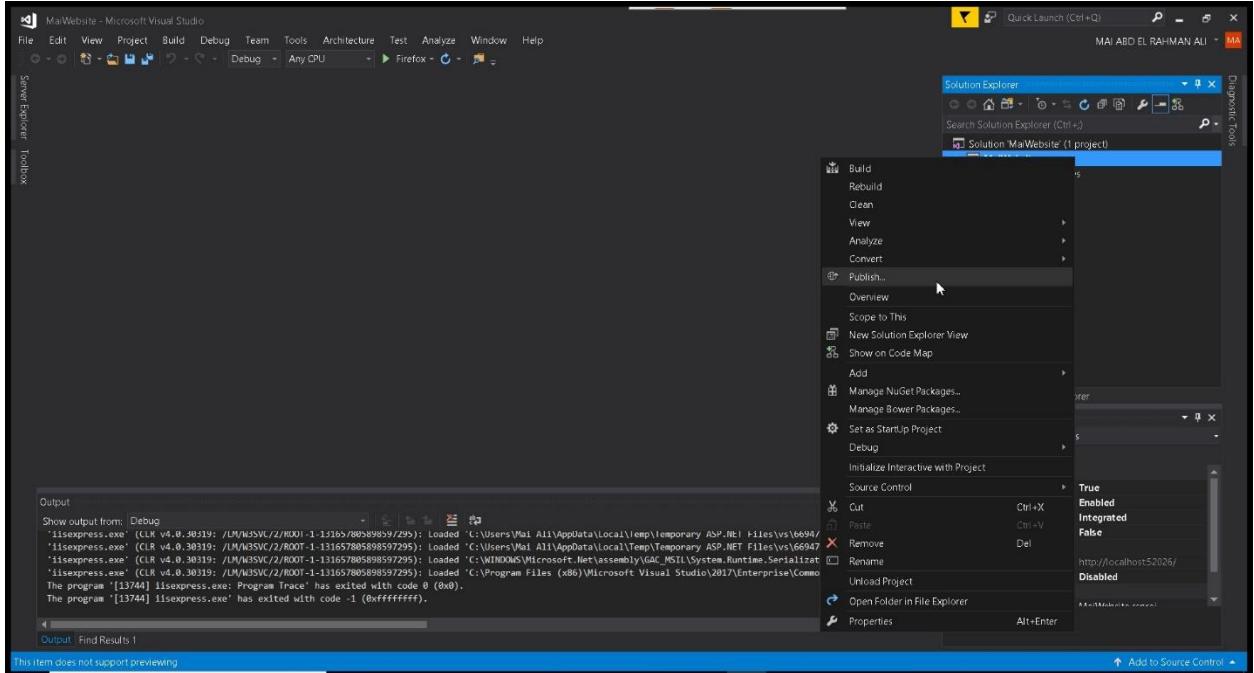
10. Close Internet Explorer.

Task 2: Deploy a Website

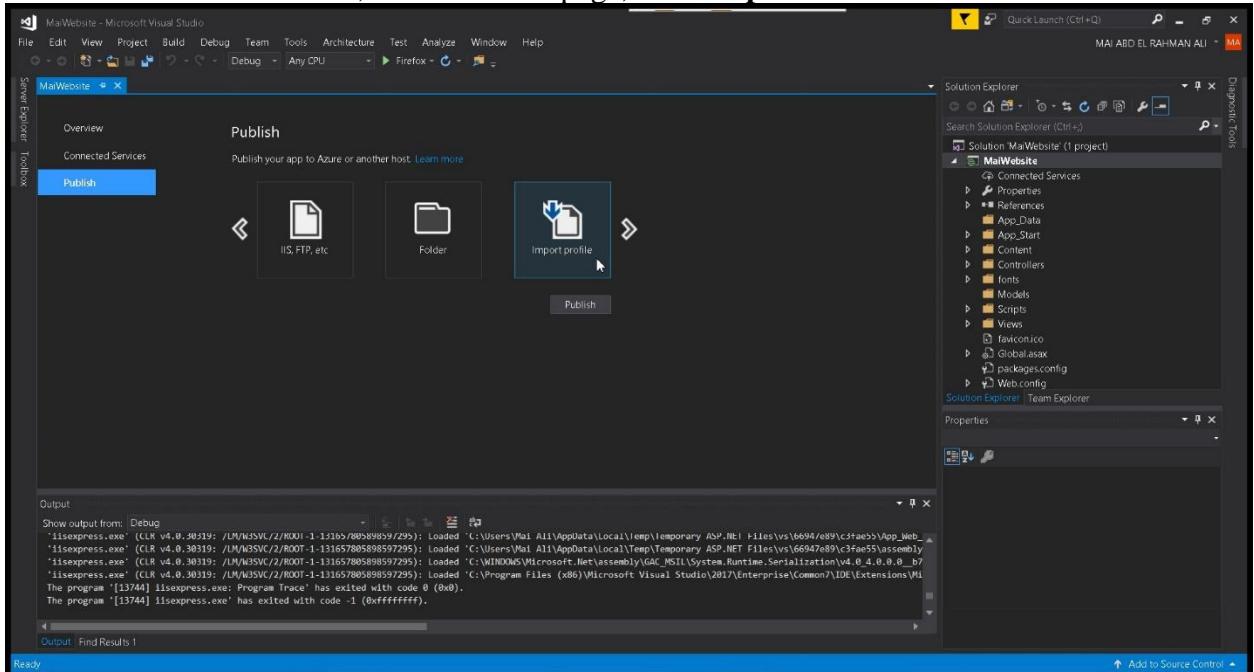
To deploy website, following this procedure

1. In Visual Studio, in the **Solution Explorer**, right-click the **MaiWebsite** project and then click **Publish**.

Microsoft Azure Infrastructure step by step

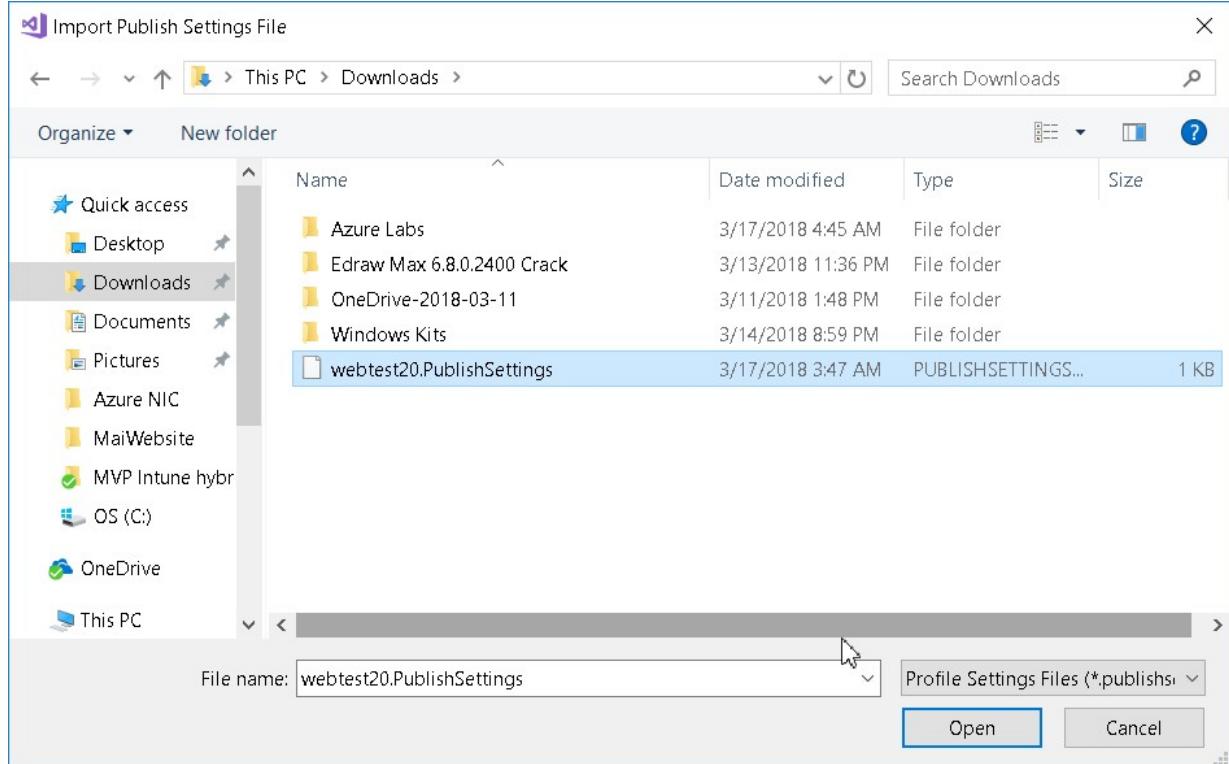


2. In the **Publish Web** wizard, on the **Profile** page, click **Import**.

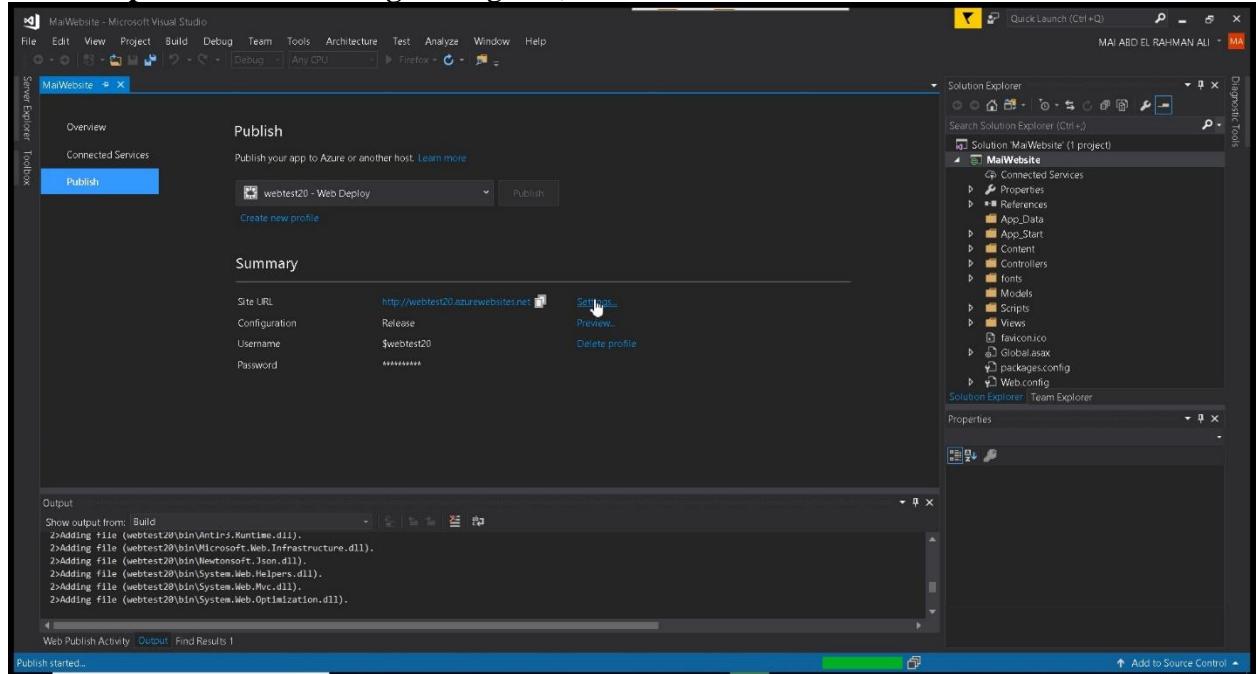


3. In the **Import Publish Settings** dialog box, click **Browse**.
4. Select the **webtest20.PublishSettings** file you downloaded and then click **Open**.

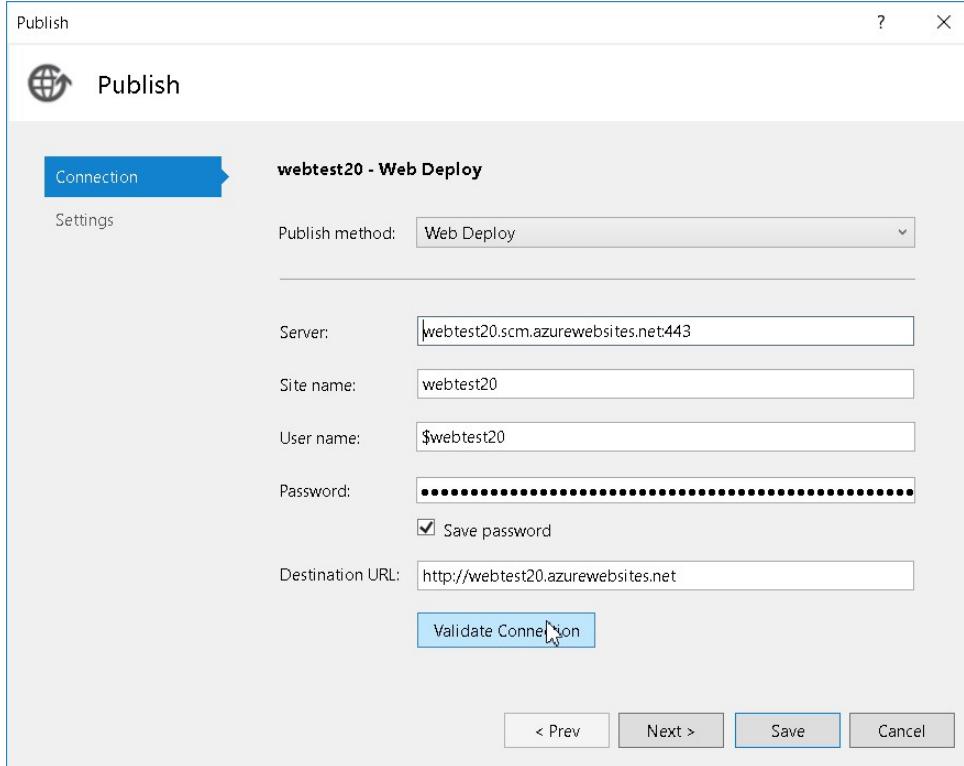
Microsoft Azure Infrastructure step by step



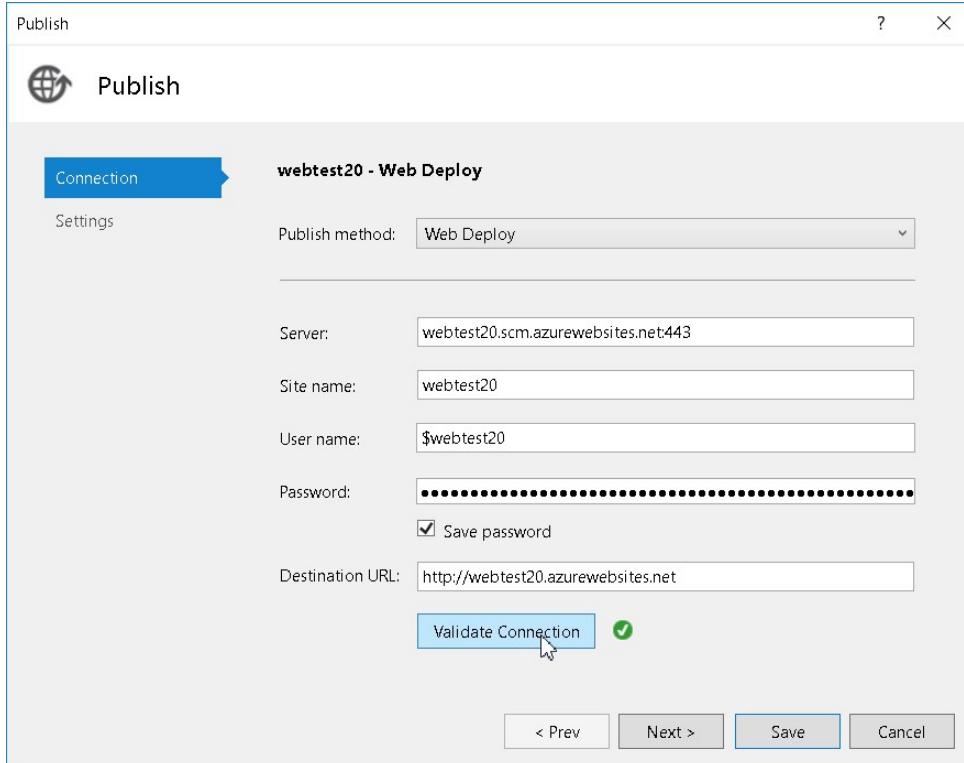
5. In the Import Publish Settings dialog box, click OK.



6. On the Connection page, click Validate Connection.

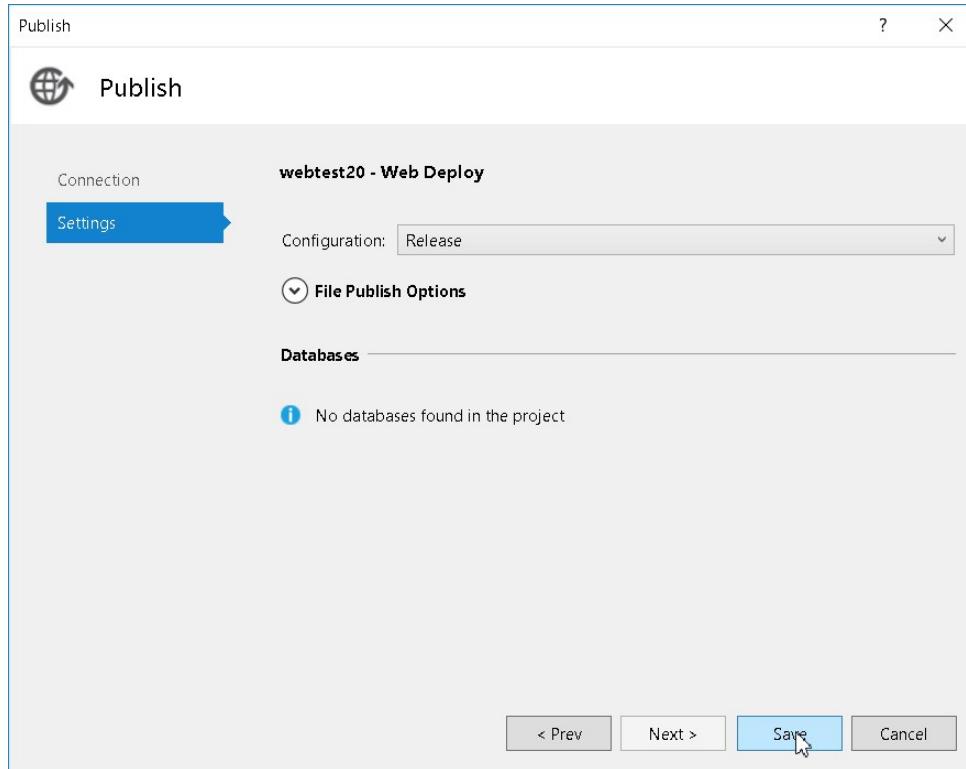


7. Click Next.

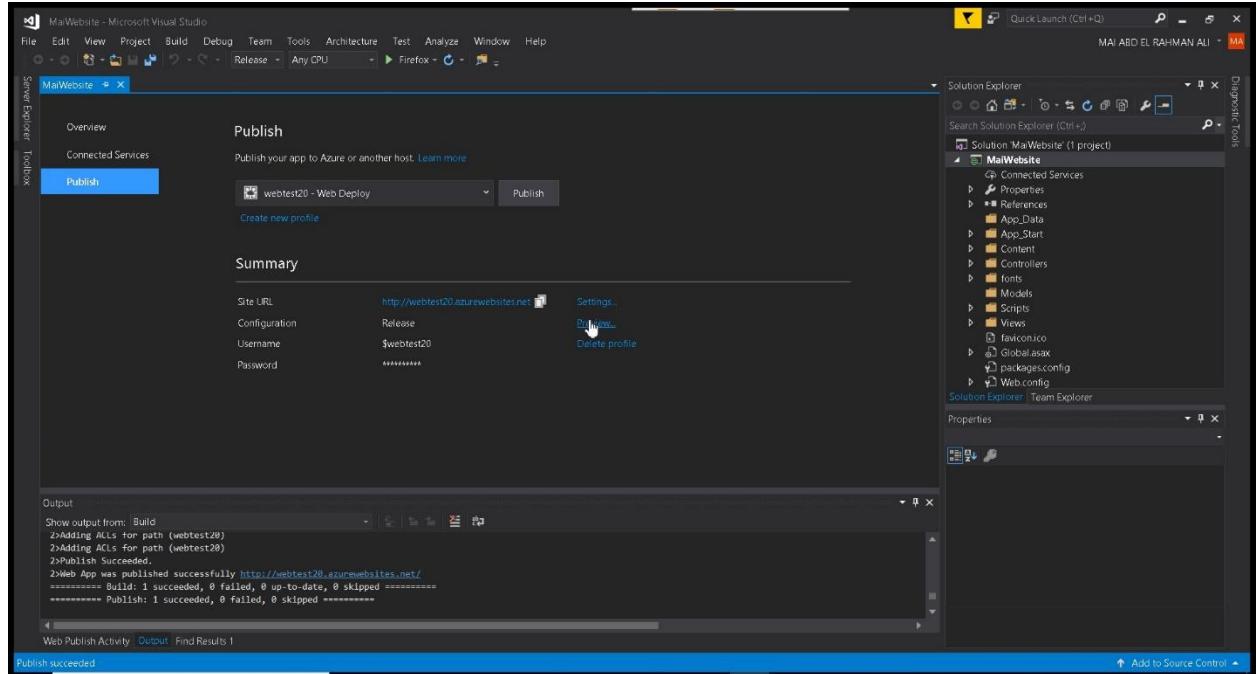


8. On the **Settings** page, in the **Configuration** drop-down list, select **Release**.

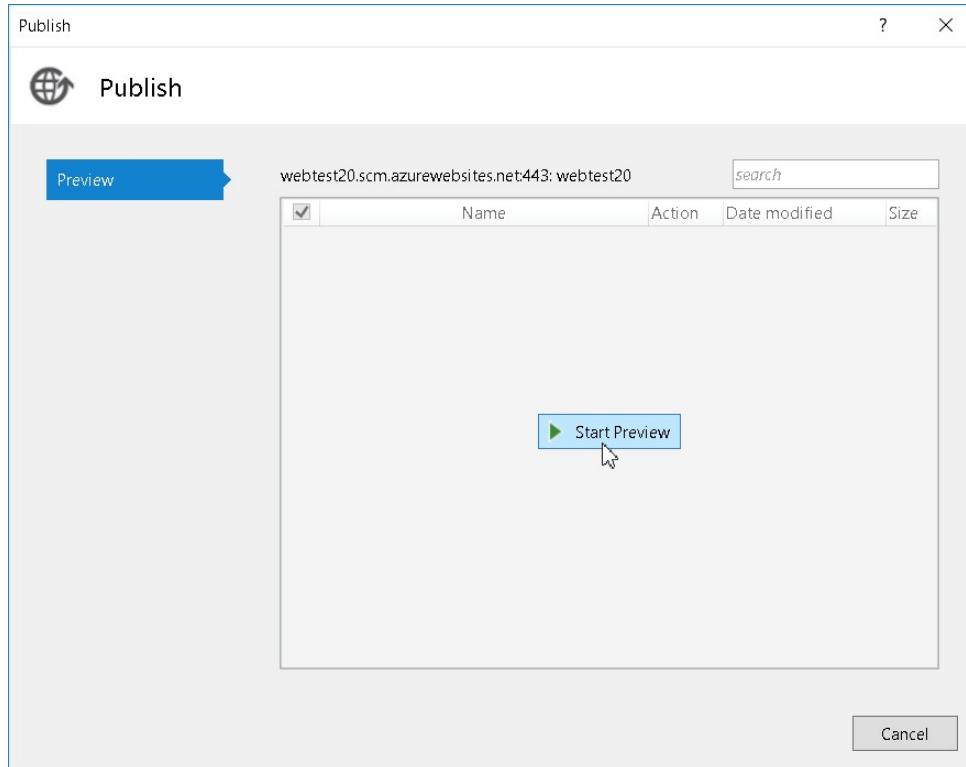
Microsoft Azure Infrastructure step by step



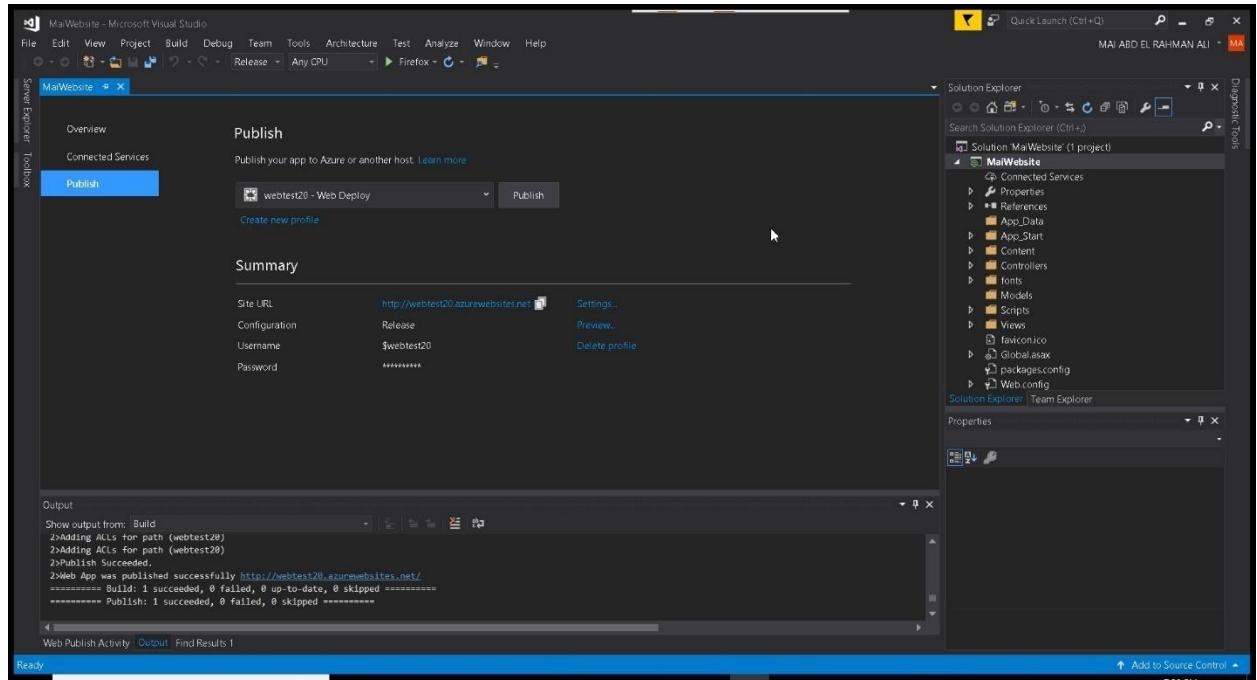
9. Click Preview.



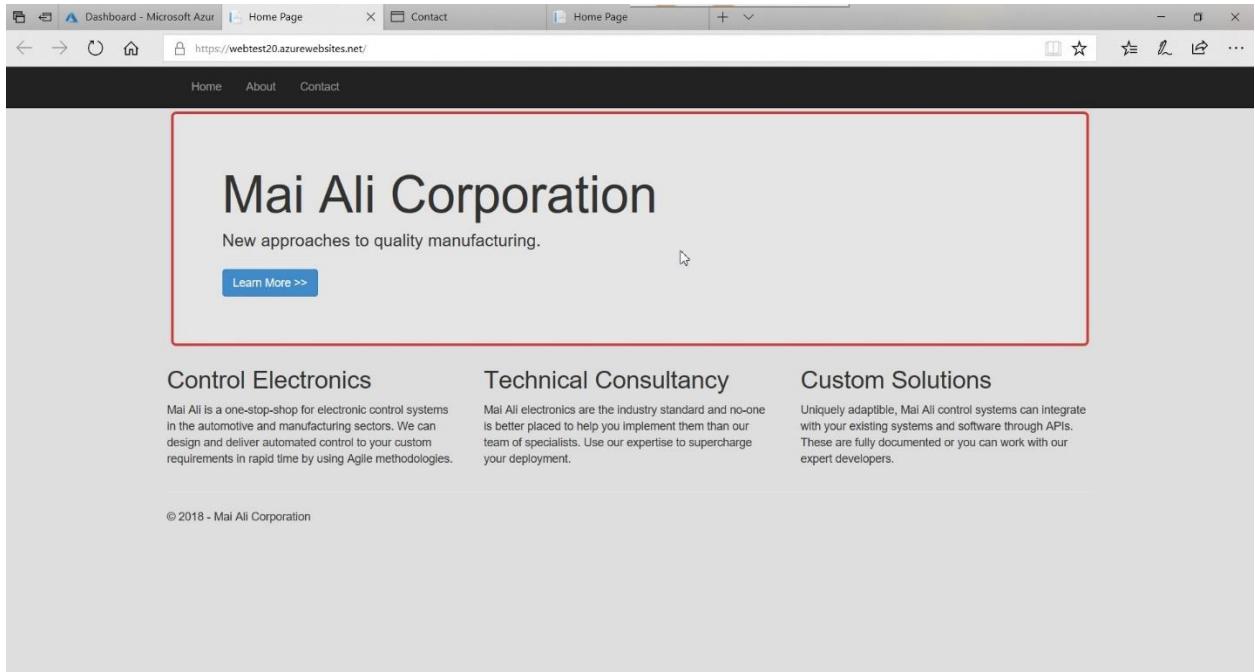
10. On the Preview page, click Start Preview. Examine the list of changes to apply to the website.



11. Click Publish.



12. Close the Home Page tab.



Managing Web App

Before you deploy source code to a public-facing website, you must have confidence in its integrity and reliability. For this reason, it is important to implement a strict testing and acceptance regime that identifies bugs and other issues in code before they are deployed to the production website. Much of this testing can be performed in the development environment. For example, unit tests can be run on developers' computers. However, the final testing location should be the staging environment. The staging environment should match the production environment as closely as possible.

If you are using standard tier Azure websites, you can create two or more slots for each site. Create one slot for the production website and deploy tested and accepted code there. You can create a second slot as the staging environment. Deploy new code to this staging slot and use it to run acceptance tests. The staging slot has a different URL for browsing.

When the new version in the staging slot passes all tests, you can safely deploy it to production by swapping the slots. This also provides a simple rollback path: if the new version causes unexpected problems you can swap the slots a second time to move back to the old production site.

In this exercise, you will upload the new website to the staging slot you created. You will then move the new site into the production slot to published in Azure websites.

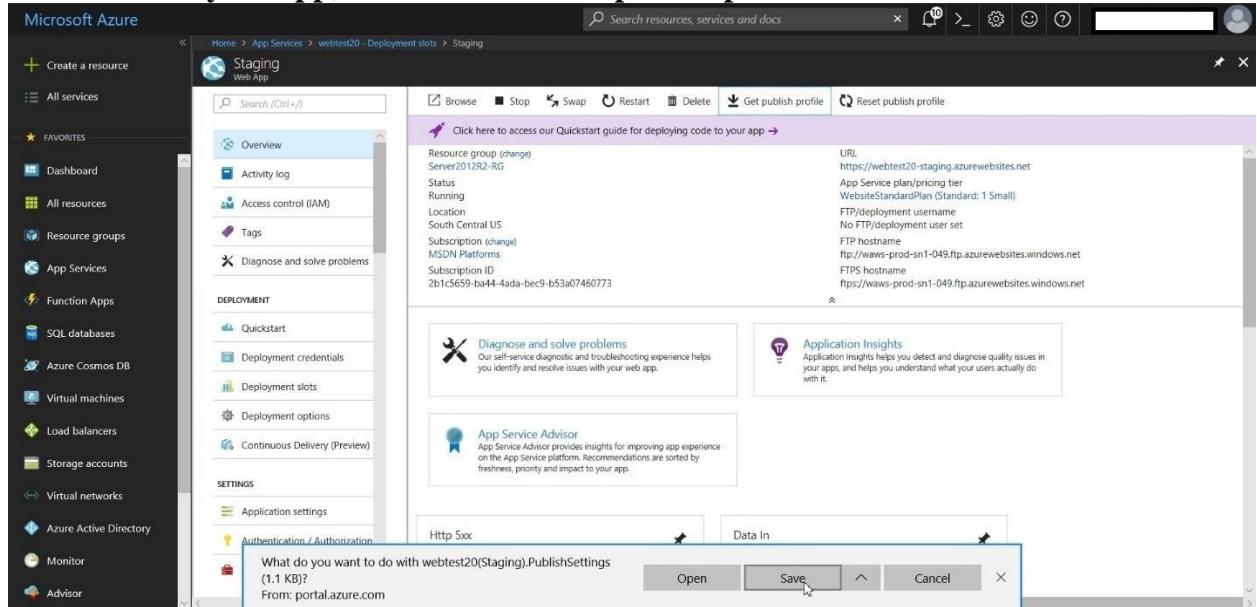
Task 1: Deploy a Website for Staging

To deploy website for staging phase, following this procedure

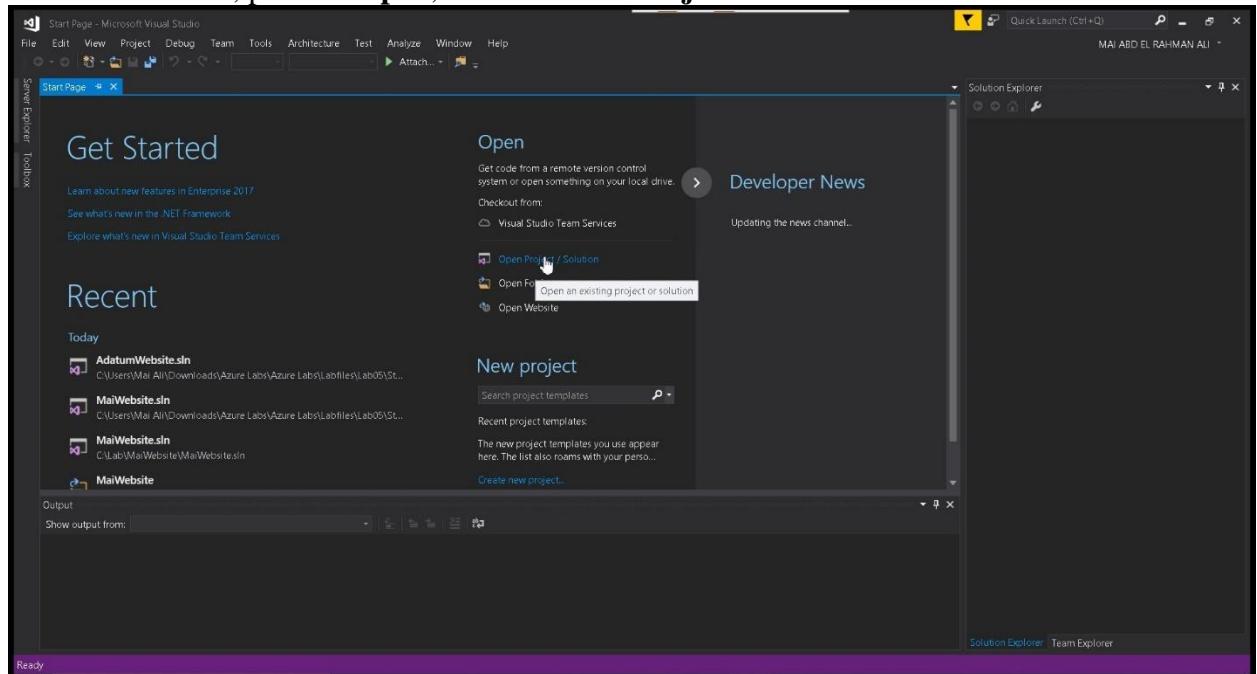
1. In Internet Explorer, in the full portal, in the navigation on the left, click **App Services**.

Microsoft Azure Infrastructure step by step

2. In the list of web App, to the left of the name of your website, click the arrow to display all slots. Click **yourwebsite(Staging)**.
3. Under **Publish your app**, click **Download the publish profile**.

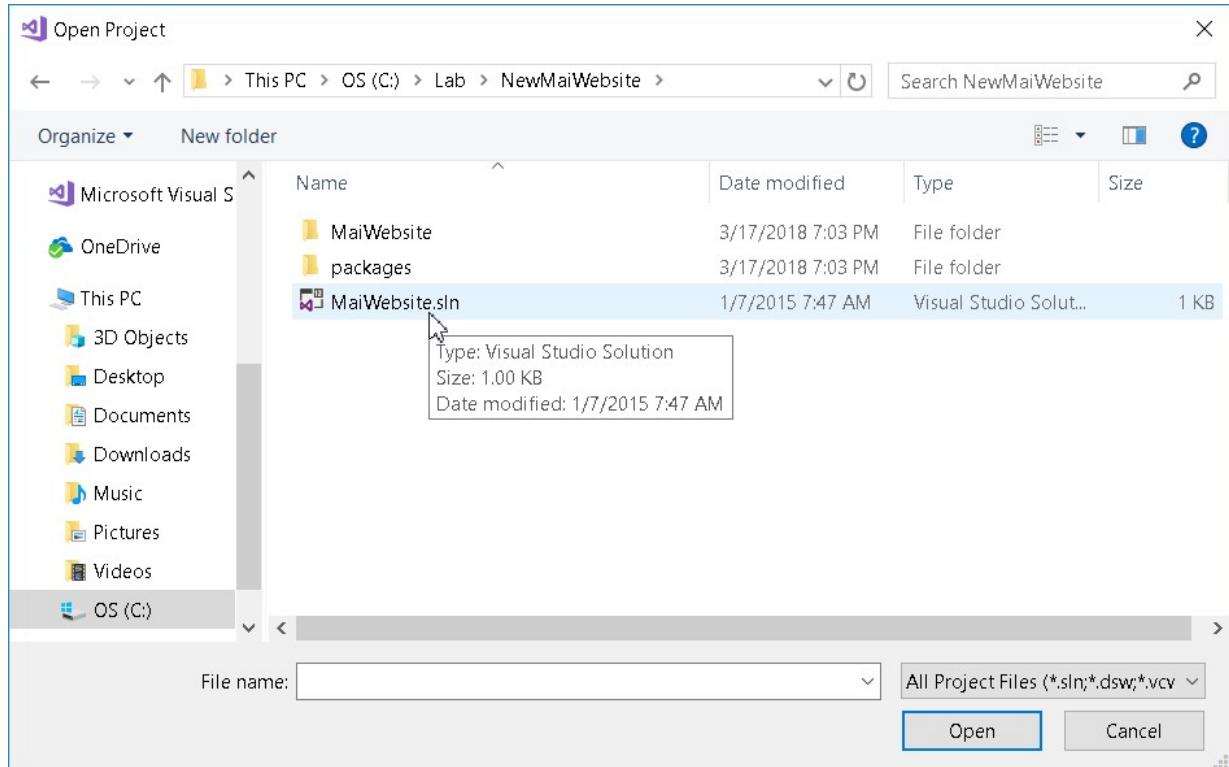


4. On the Start menu, click **Visual Studio 2017**.
5. On the **File** menu, point to **Open**, and then click **Project/Solution**.

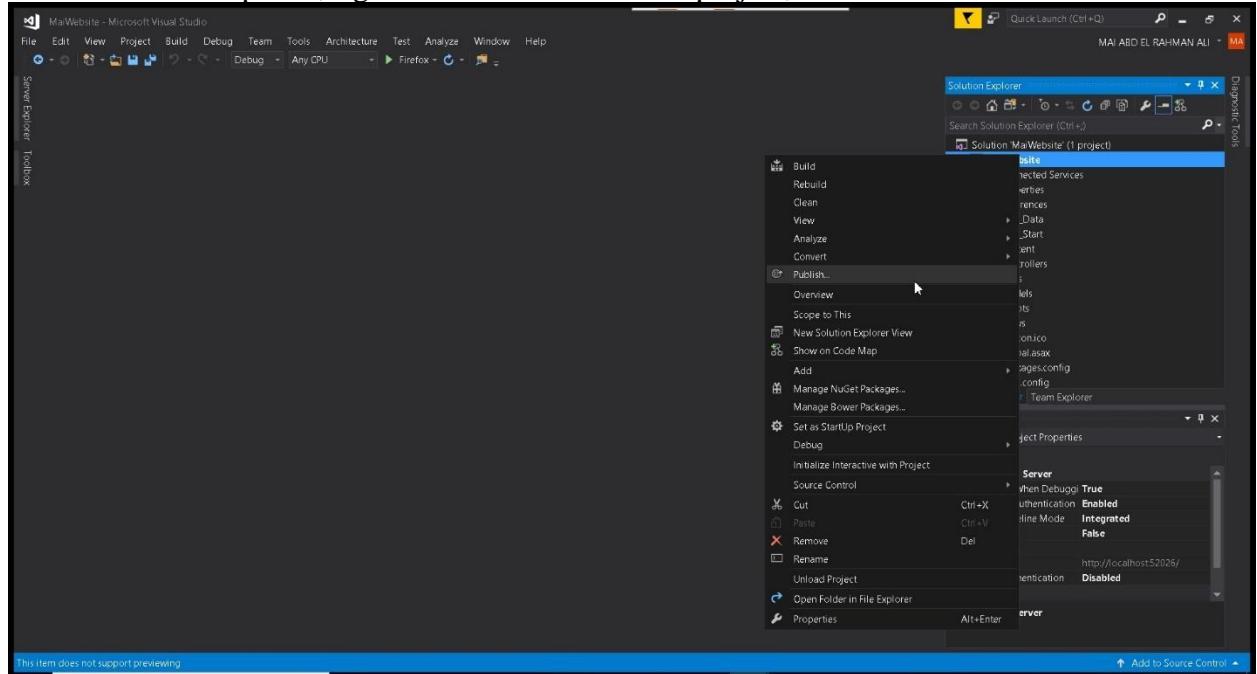


6. Browse to the folder **c:\lab\NewMaiWebsite**. Click **MaiWebsite.sln** and then click **Open**.

Microsoft Azure Infrastructure step by step

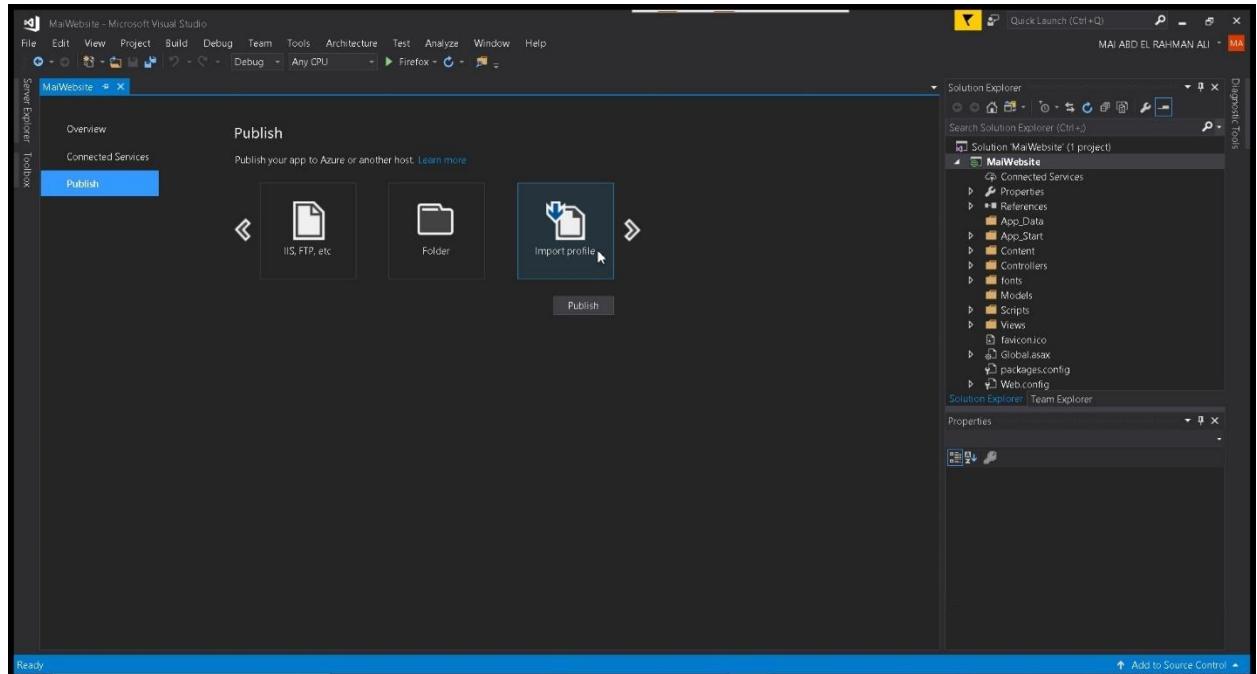


7. In the Solution Explorer, right-click the **MaiWebsite** project, and then click **Publish**.

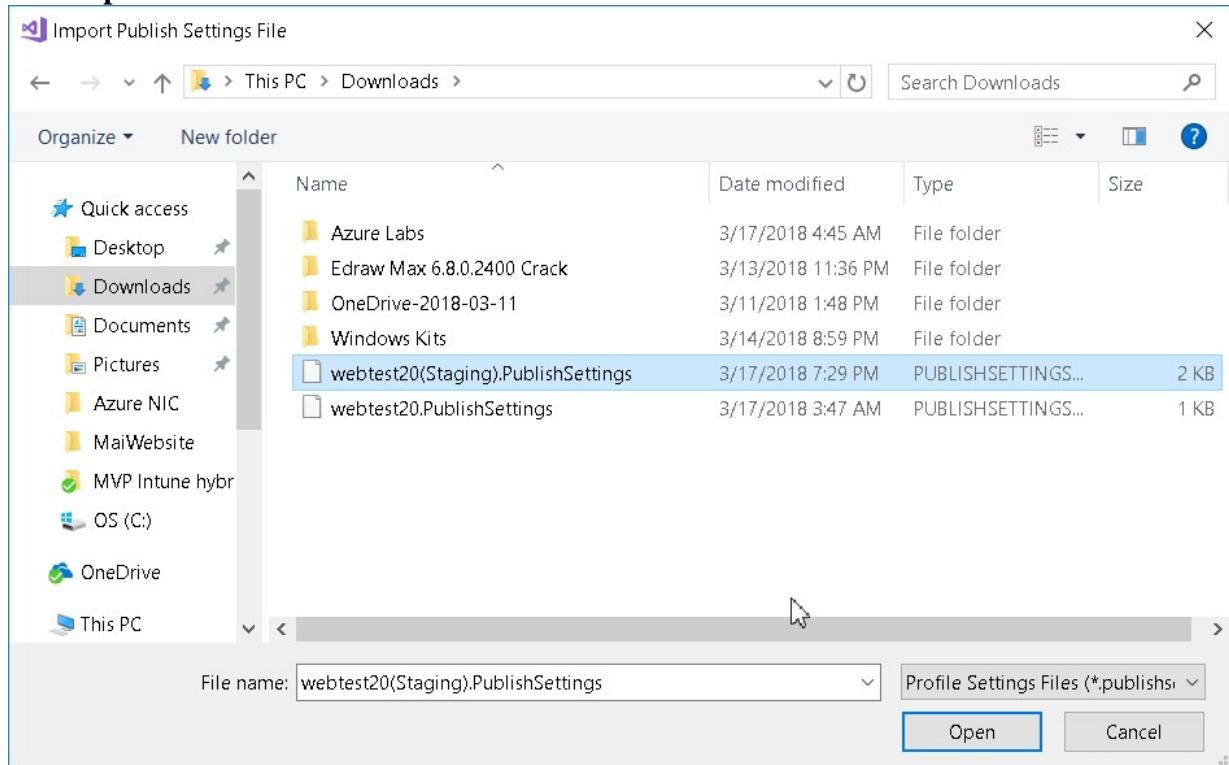


8. In the **Publish Web** wizard, on the **Profile** page, click **Import**.

Microsoft Azure Infrastructure step by step

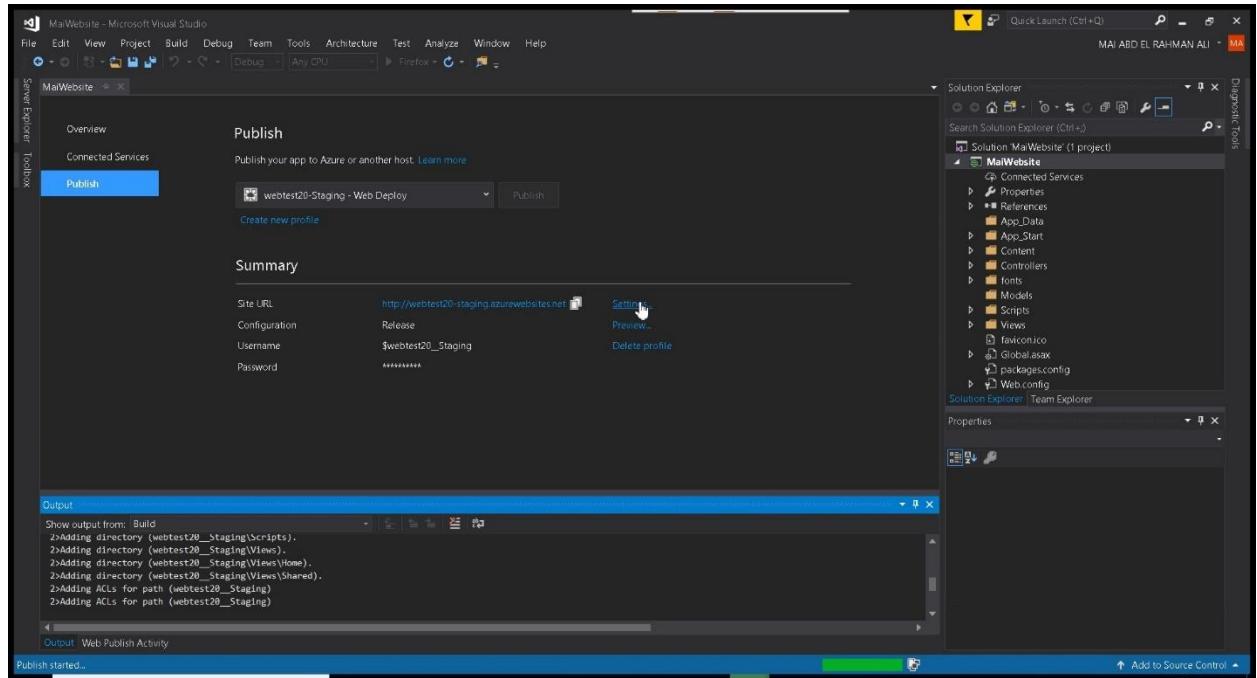


9. In the **Import Publish Settings** dialog box, click **Browse**.
10. In the **Downloads** folder, select the **YourWebsite(Staging).PublishSettings** file, and then click **Open**.

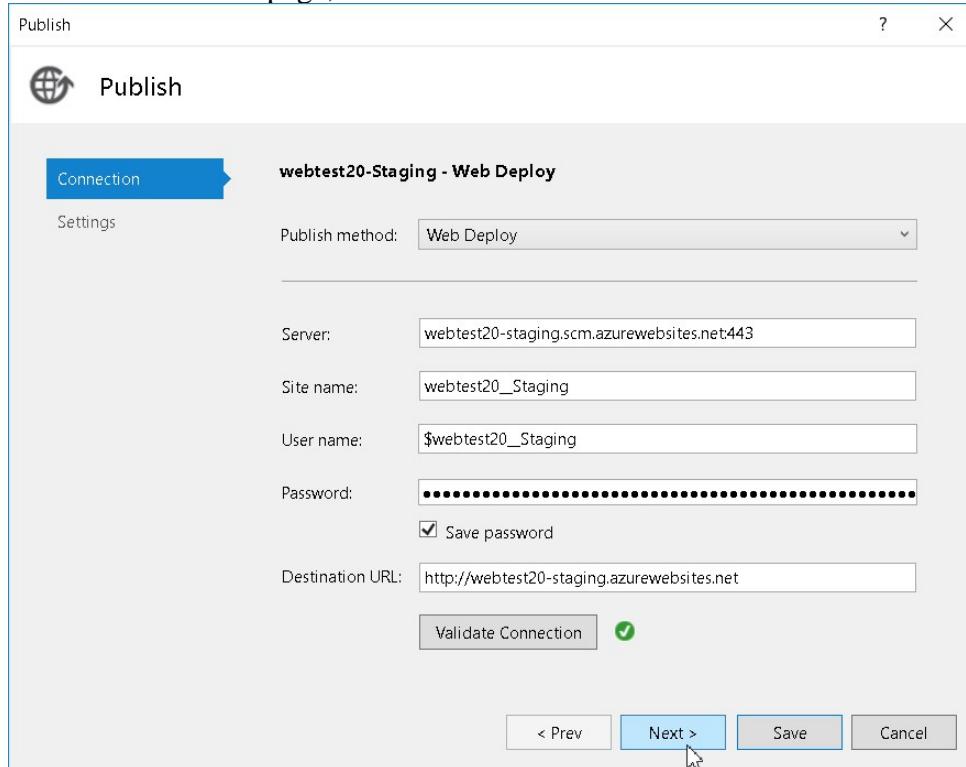


11. In the **Import Publish Settings** dialog box, click **OK**.

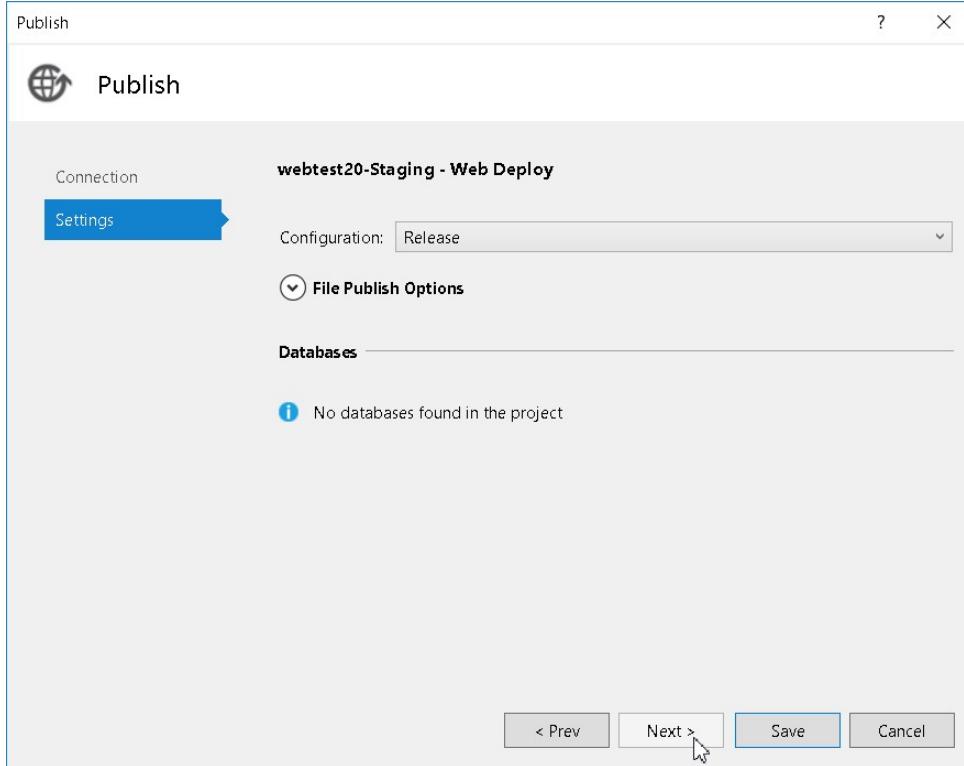
Microsoft Azure Infrastructure step by step



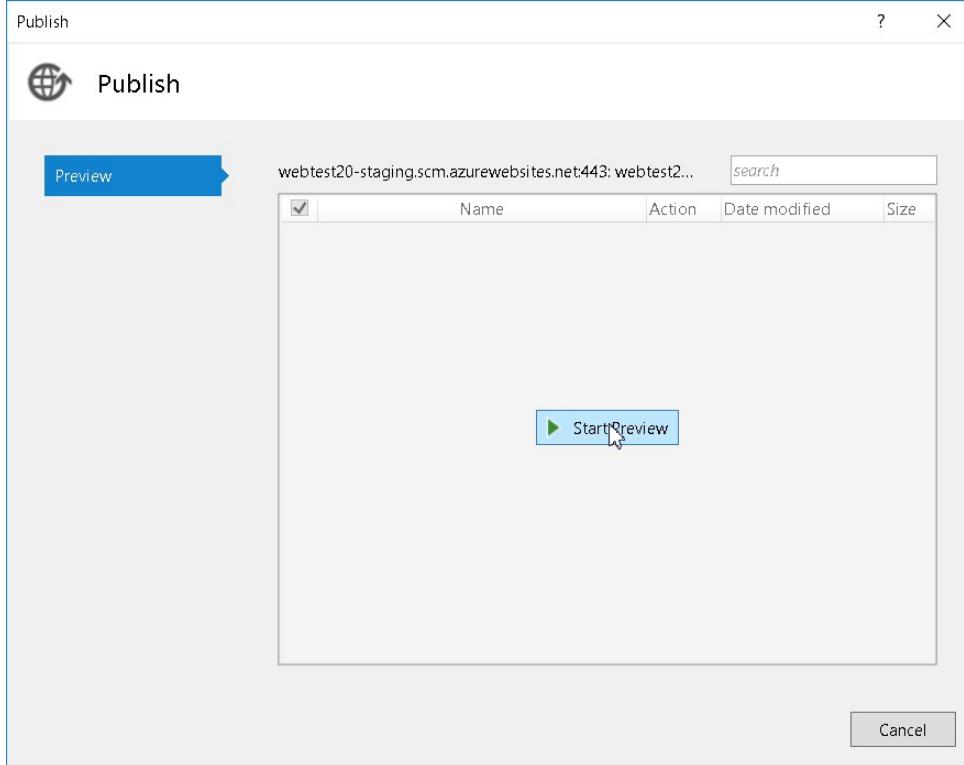
12. On the **Connection** page, click **Validate Connection**. Click **Next**.



13. In the **Configuration** drop-down list, ensure that **Release** is selected, and then click **Next**.

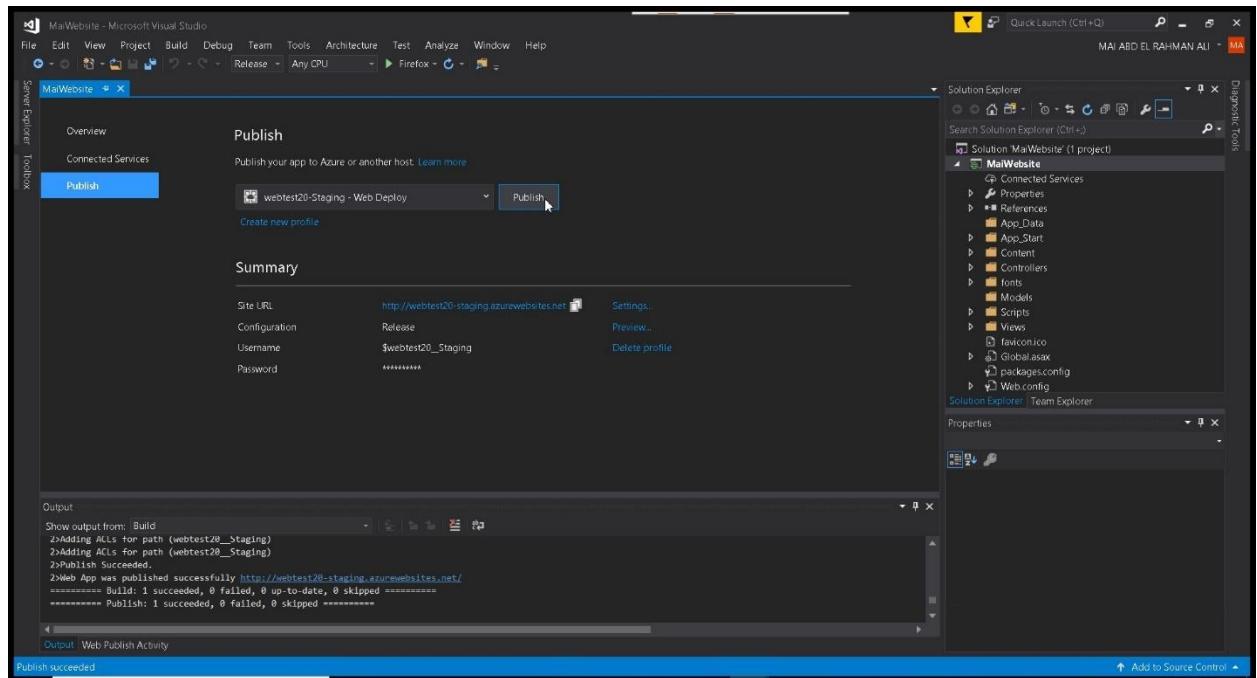


14. On the **Preview** page, click **Start Preview**.

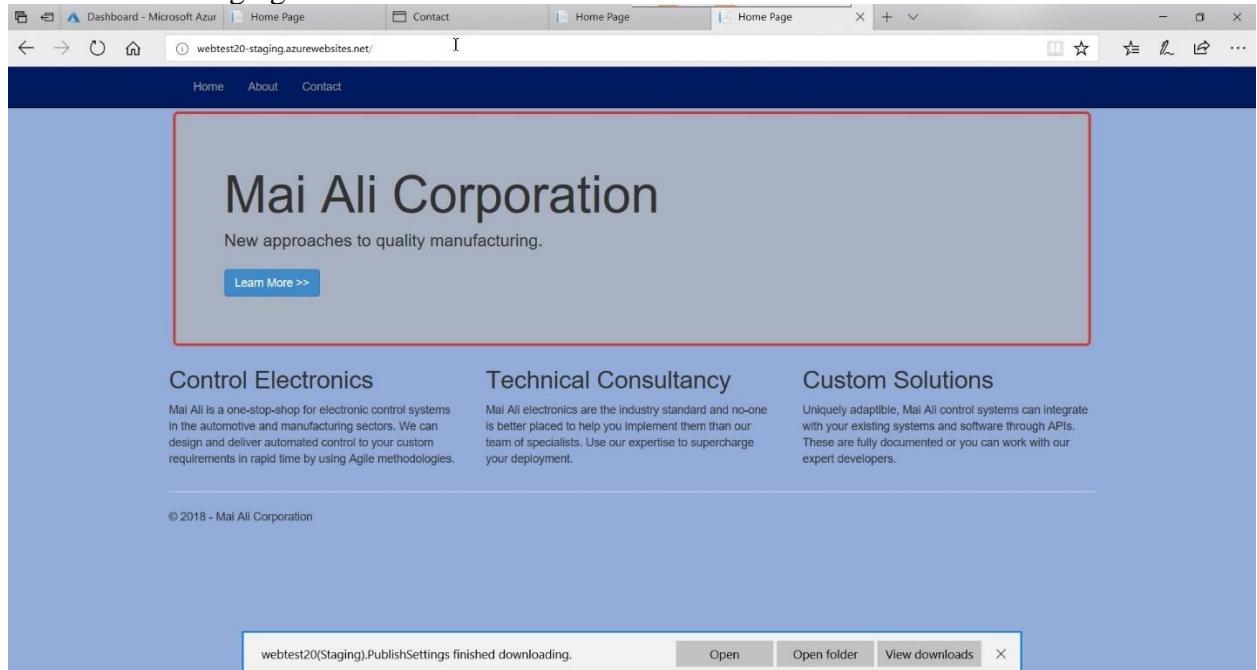


15. Examine the files to publish and then click **Publish**.

Microsoft Azure Infrastructure step by step



16. When the publish operation is complete, Internet Explorer opens and displays the new website in the staging slot.



Task 2: Swap Deployment Slots

To swap website on deployment slots, following this procedure

1. Start Internet Explorer and browse to <http://portal.azure.com>, and sign in using the Microsoft account that is associated with your Azure subscription.
2. In the full portal, in the navigation on the left, click **App Services**.

Microsoft Azure Infrastructure step by step

3. In the list of web App, click the website you created.

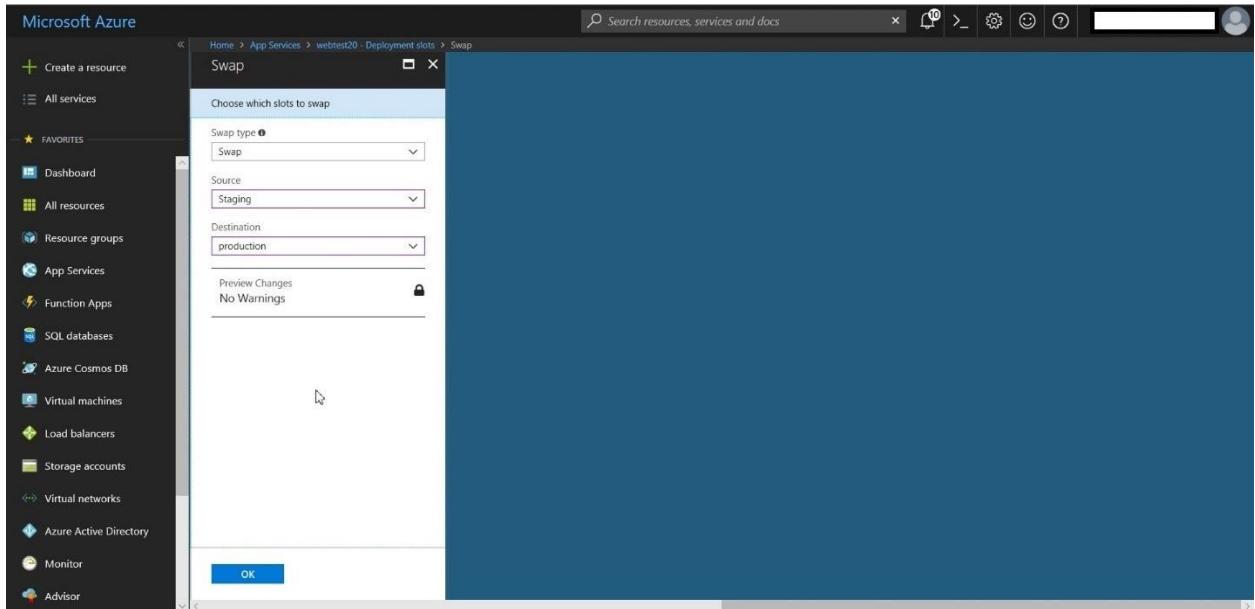
The screenshot shows the Microsoft Azure portal's 'App Services' section. On the left is a navigation sidebar with various service icons. The main area displays a table of app services. One row is highlighted with a blue background, corresponding to the 'webtest20' entry in the list. The table columns include NAME, STATUS, APP TYPE, APP SERVICE PLAN, LOCATION, and SUBSCRIPTION. The 'NAME' column shows 'webtest20', 'STATUS' shows 'Running', 'APP TYPE' shows 'Web app', 'APP SERVICE PLAN' shows 'WebsiteStandardPlan', 'LOCATION' shows 'South Central US', and 'SUBSCRIPTION' shows 'MSDN Platforms (2b1c5659-...)'.

4. In the toolbar at the bottom, click **Browse**.
5. Notice that the color scheme is the old one.
6. In the Azure portal, in the toolbar at the bottom, click **Swap**.

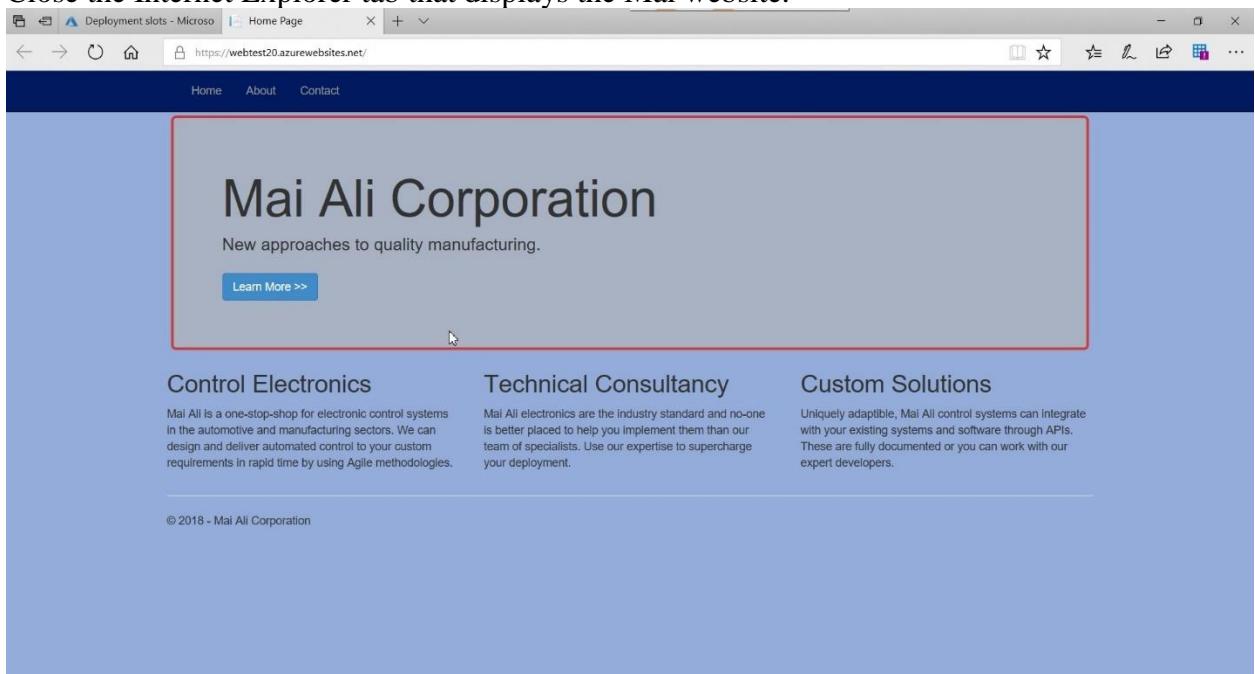
The screenshot shows the 'Deployment slots' page for the 'webtest20' app service. The left sidebar has 'Deployment slots' selected. The main area shows a table with one row: 'webtest20-staging' under 'NAME', 'Running' under 'STATUS', and 'WebsiteStandardPlan' under 'APP SERVICE PLAN'. On the right, there is a 'Swap' button with a swap icon. The left sidebar also includes links for Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Quickstart, Deployment credentials, Deployment slots (which is currently selected), Deployment options, Continuous Delivery (Preview), Application settings, Authentication / Authorization, and Managed service identity.

7. In Swap page, Select the following:
 - In the **Source** drop-down list, Select **Staging**.
 - In the **Destination** drop-down list, Select **Production**.

Microsoft Azure Infrastructure step by step



8. Notice that the color scheme is the new one.
9. Close the Internet Explorer tab that displays the Mai website.



Task 3: Rollback a Deployment

To rollback website deployment, following this procedure

1. In the Azure portal, in the toolbar at the bottom, click **Swap**.

Microsoft Azure Infrastructure step by step

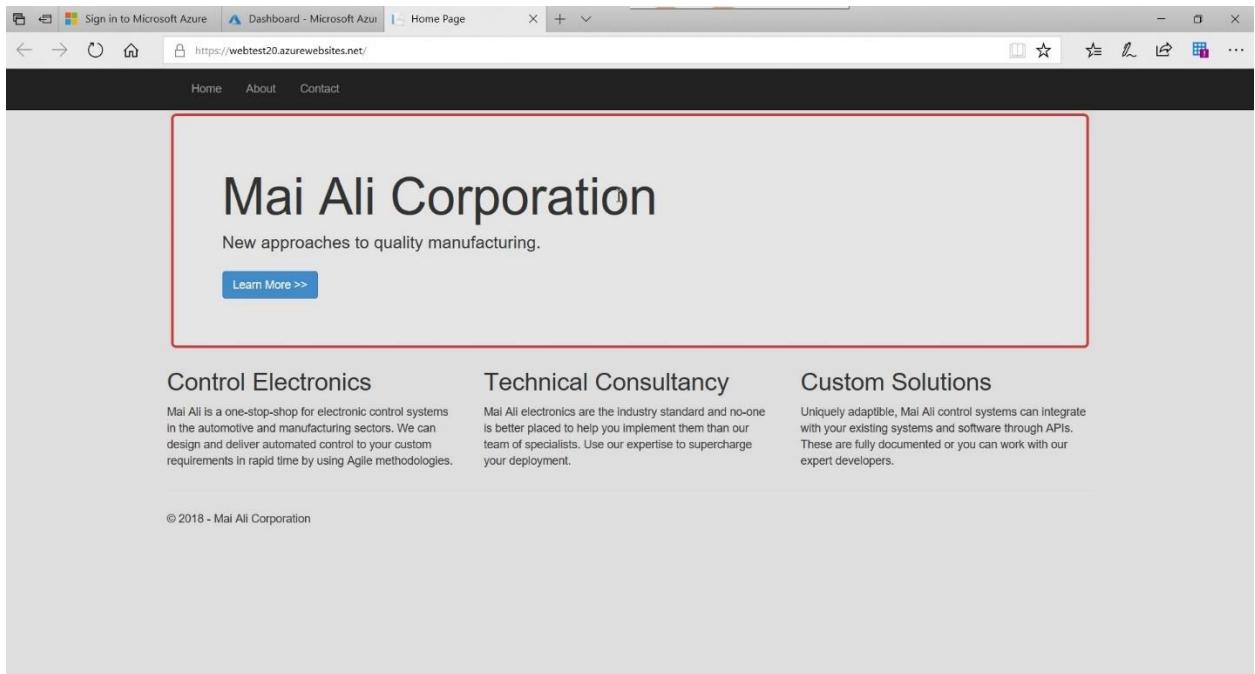
The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes 'Create a resource', 'All services', 'FAVORITES' (Dashboard, All resources, Resource groups), 'App Services' (selected), 'Function Apps', 'SQL databases', 'Azure Cosmos DB', 'Virtual machines', 'Load balancers', 'Storage accounts', 'Virtual networks', 'Azure Active Directory', 'Monitor', and 'Advisor'. The main content area shows the 'App Services' blade for 'webtest20'. The URL is 'Home > App Services > webtest20 - Deployment slots'. The sidebar has sections for Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Quickstart, Deployment credentials (selected), Deployment slots (selected), Deployment options, Continuous Delivery (Preview), Application settings, Authentication / Authorization, and Managed service identity. The main content area shows 'webtest20 - Deployment slots' with a table:

NAME	STATUS	APP SERVICE PLAN
webtest20-staging	Running	WebsiteStandardPlan

2. In Swap page, Select the following:
 - In the **Source** drop-down list, Select **Staging**.
 - In the **Destination** drop-down list, Select **Production**.

The screenshot shows the 'Swap' dialog box. The title is 'Choose which slots to swap'. It contains fields for 'Swap type' (set to 'Swap'), 'Source' (set to 'Staging'), and 'Destination' (set to 'production'). Below these fields, a section says 'Preview Changes' followed by 'No Warnings'. At the bottom is a blue 'OK' button.

3. Notice that the color scheme has reverted.
4. Close the Mai website Internet Explorer tab.



Implementing Traffic Manager

When you create a website in Azure, you must choose an Azure data center where the site will be physically located. If you have chosen a basic or standard tier website, you can create multiple instances of your website to increase capacity and resilience to failure. These instances will be in the same Azure data center and have requests automatically distributed by the Azure load balancer.

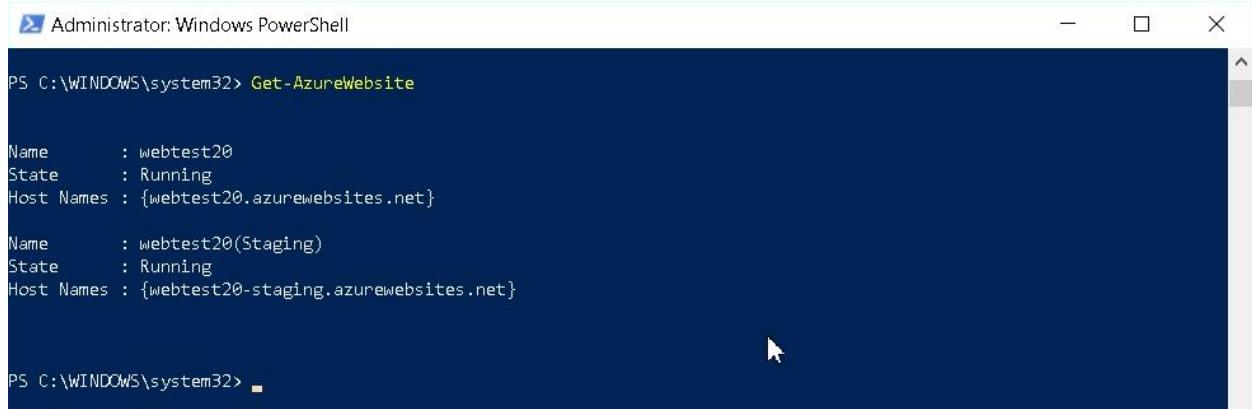
However, you may also wish to distribute load across websites located in different Azure data centers. You can do this distribution by using Traffic Manager.

In this exercise, you will have a website set up in two Azure regions and Traffic Manager will be configured to distribute requests between them.

Task 1: Deploy a Website to Another Region

To deploy website on another region, following this procedure

1. Switch to **Microsoft Azure PowerShell**, type the following command, and then press Enter: **Get-AzureWebsite**



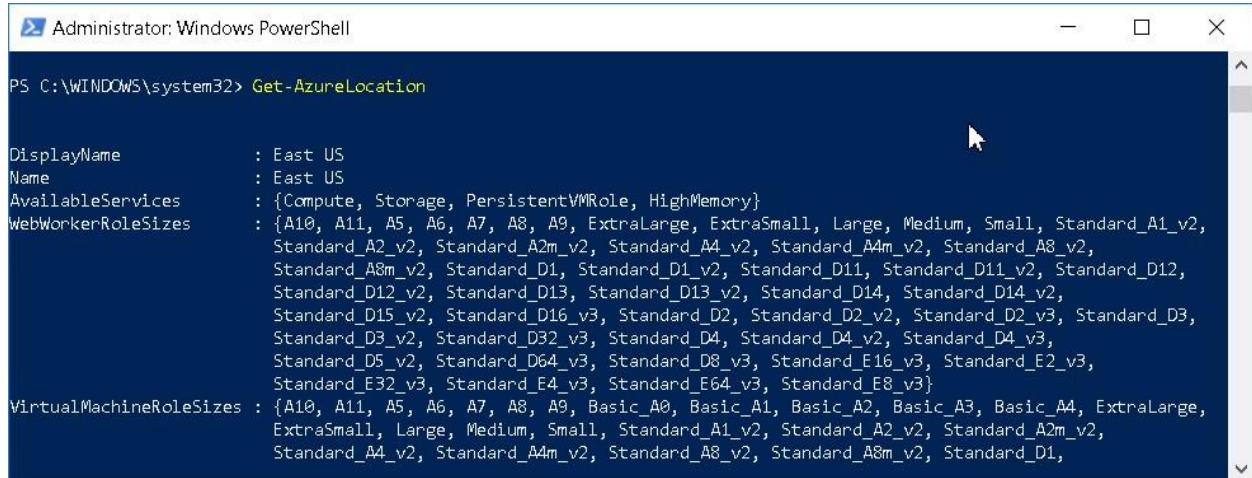
```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> Get-AzureWebsite

Name      : webtest20
State     : Running
Host Names : {webtest20.azurewebsites.net}

Name      : webtest20(Staging)
State     : Running
Host Names : {webtest20-staging.azurewebsites.net}

PS C:\WINDOWS\system32>
```

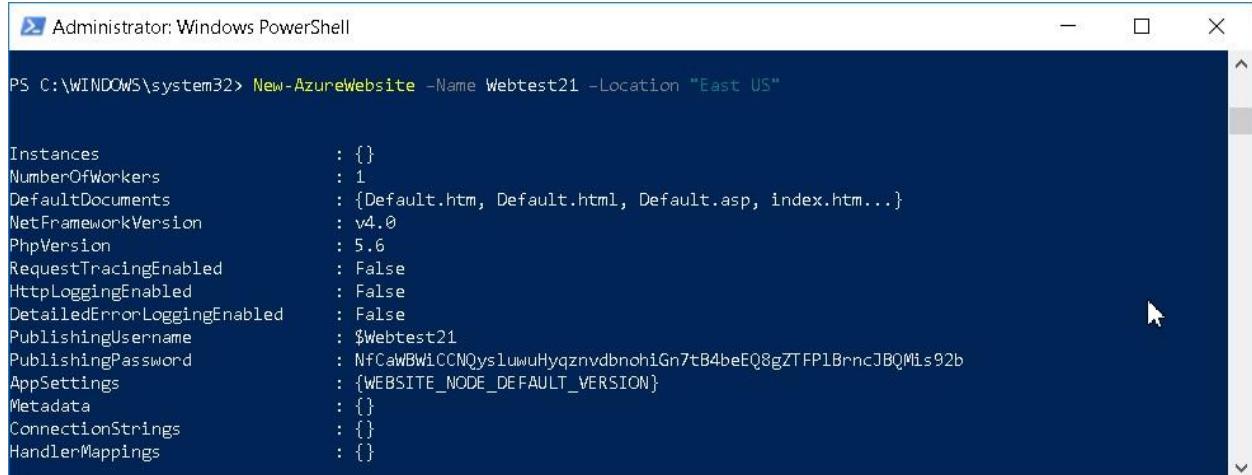
2. At the command prompt, type the following command, and then press Enter: **Get-AzureLocation**



```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> Get-AzureLocation

DisplayName      : East US
Name             : East US
AvailableServices : {Compute, Storage, PersistentVMRole, HighMemory}
WebWorkerRoleSizes : {A10, A11, A5, A6, A7, A8, A9, ExtraLarge, ExtraSmall, Large, Medium, Small, Standard_A1_v2, Standard_A2_v2, Standard_A2m_v2, Standard_A4_v2, Standard_A4m_v2, Standard_A8_v2, Standard_A8m_v2, Standard_D1, Standard_D1_v2, Standard_D11, Standard_D11_v2, Standard_D12, Standard_D12_v2, Standard_D13, Standard_D13_v2, Standard_D14, Standard_D14_v2, Standard_D15_v2, Standard_D16_v3, Standard_D2, Standard_D2_v2, Standard_D2_v3, Standard_D3, Standard_D3_v2, Standard_D32_v3, Standard_D4, Standard_D4_v2, Standard_D4_v3, Standard_D5_v2, Standard_D64_v3, Standard_D8_v3, Standard_E16_v3, Standard_E2_v3, Standard_E32_v3, Standard_E4_v3, Standard_E64_v3, Standard_E8_v3}
VirtualMachineRoleSizes : {A10, A11, A5, A6, A7, A8, A9, Basic_A0, Basic_A1, Basic_A2, Basic_A3, Basic_A4, ExtraLarge, ExtraSmall, Large, Medium, Small, Standard_A1_v2, Standard_A2_v2, Standard_A2m_v2, Standard_A4_v2, Standard_A4m_v2, Standard_A8_v2, Standard_A8m_v2, Standard_D1,
```

3. Choose a location that is not the location you chose previous web App.
4. At the command prompt, type the following command, and then press Enter: **New-AzureWebsite -Name Webtest21 -Location "East US"**



```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> New-AzureWebsite -Name Webtest21 -Location "East US"

Instances          : {}
NumberOfWorkers   : 1
DefaultDocuments  : {Default.htm, Default.html, Default.asp, index.htm...}
NetFrameworkVersion : v4.0
PhpVersion        : 5.6
RequestTracingEnabled : False
HttpLoggingEnabled : False
DetailedErrorLoggingEnabled : False
PublishingUsername : $Webtest21
PublishingPassword : NfcawBwiCCNQysluuuHyqznnvdbnhoiGn7tB4beEQ8gZTFP1BrncJBQMls92b
AppSettings       : {WEBSITE_NODE_DEFAULT_VERSION}
Metadata          : {}
ConnectionStrings : {}
HandlerMappings   : {}
```

5. In Internet Explorer, in the full portal, in the navigation on the left, click **App Services**.
6. In the list of App Services, click Webtest21.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure App Services dashboard. On the left, there's a sidebar with various service icons like Create a resource, All services, Dashboard, Resource groups, App Services, Function Apps, SQL databases, Azure Cosmos DB, Virtual machines, Load balancers, Storage accounts, Virtual networks, Azure Active Directory, Monitor, and Advisor. The main area is titled "App Services" and shows "mohammedfawzy36@hotmail (Default Directory)". It lists "Subscriptions: All 2 selected". There are two items in the table:

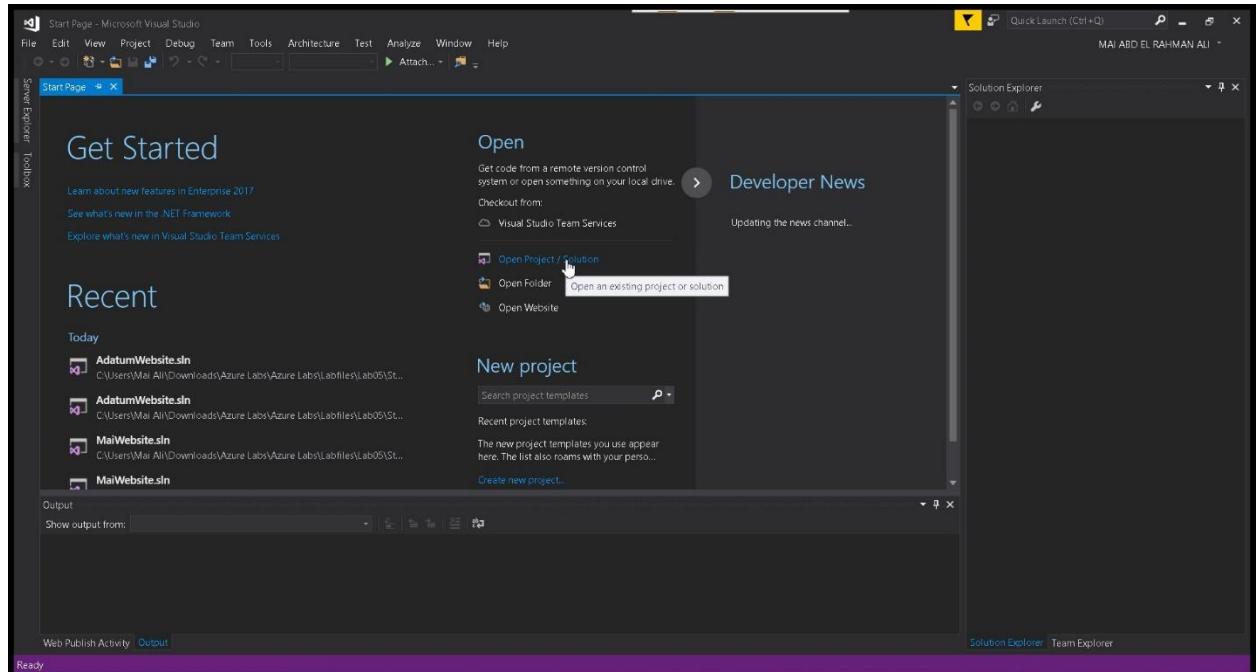
NAME	STATUS	APP TYPE	APP SERVICE PLAN	LOCATION	SUBSCRIPTION
webtest20	Running	Web app	WebsiteStandardPlan	South Central US	MSDN Platforms (2b1c5659...)
Webtest21	Running	Web app	Default1	East US	MSDN Platforms (2b1c5659...)

7. Under Publish your app, click Download the publish profile.

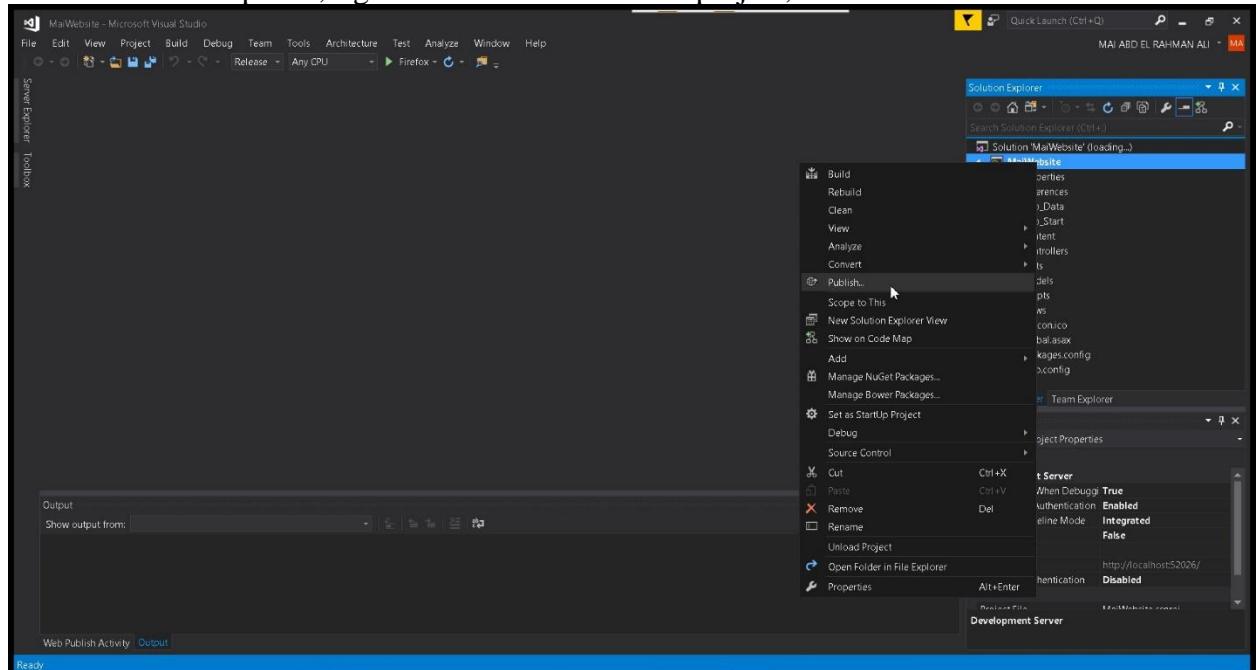
The screenshot shows the Azure App Service blade for "Webtest21". The left sidebar has the same set of icons as the previous screenshot. The main area has tabs for Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Deployment, Quickstart, Deployment credentials, Deployment slots, Deployment options, Continuous Delivery (Preview), Application settings, Authentication / Authorization, and a "What do you want to do with Webtest21.PublishSettings (1015 bytes)? From: portal.azure.com" dropdown menu. The "Deployment" tab is currently selected. On the toolbar at the top right, there are buttons for Browse, Stop, Swap, Restart, Delete, Get publish profile (which is highlighted with a red box), and Reset publish profile. Below the toolbar, there's a purple bar with the text "Click here to access our Quickstart guide for deploying code to your app". The main content area shows deployment details like Resource group (change) Default-Web-EastUS, Status Running, Location East US, Subscription (change) MSDN Platforms, and Subscription ID 2b1c5659-ba44-4ada-bec9-b53a07460773. To the right, there are sections for Diagnose and solve problems, Application Insights, and App Service Advisor. A modal window is open at the bottom with the title "What do you want to do with Webtest21.PublishSettings (1015 bytes)? From: portal.azure.com" and buttons for Open, Save, Cancel, and Close.

8. On the Toolbar, click Visual Studio 2017.
9. On the File menu, point to Open, and then click Project/Solution.

Microsoft Azure Infrastructure step by step

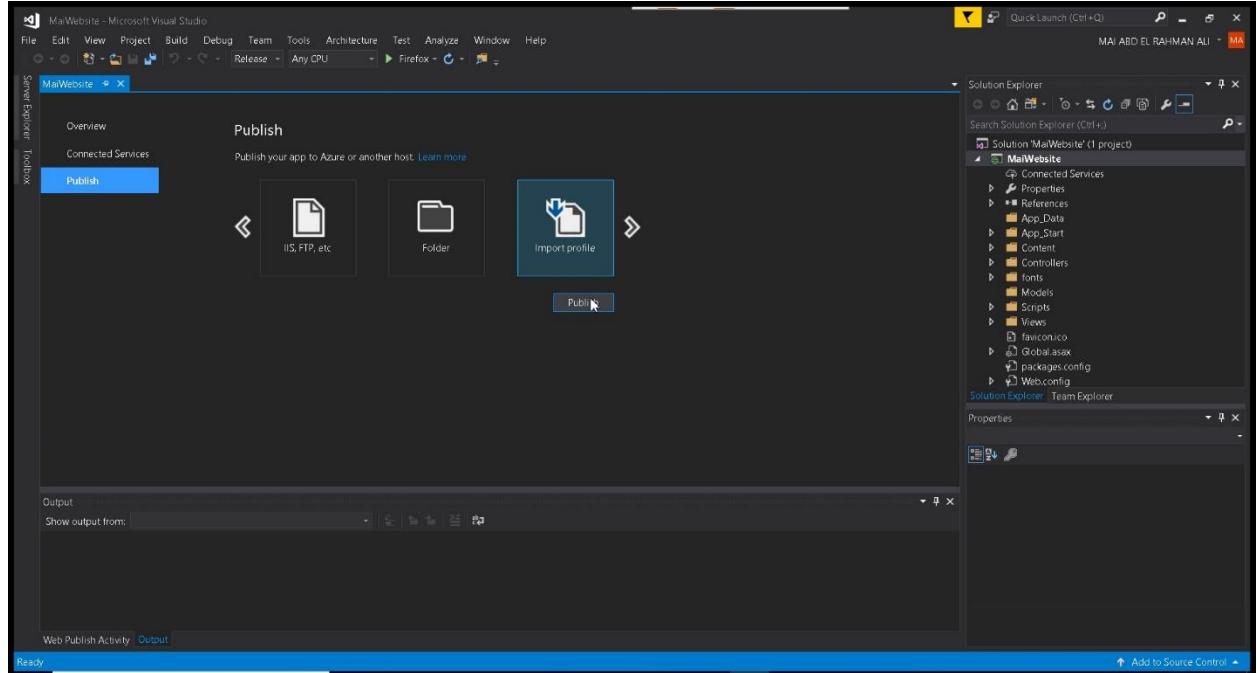


10. Browse to the folder **c:\Lab\ MaiWebsite**. Click **MaiWebsite.sln** and then click **Open**.
11. In the Solution Explorer, right-click the **MaiWebsite** project, and then click **Publish**.

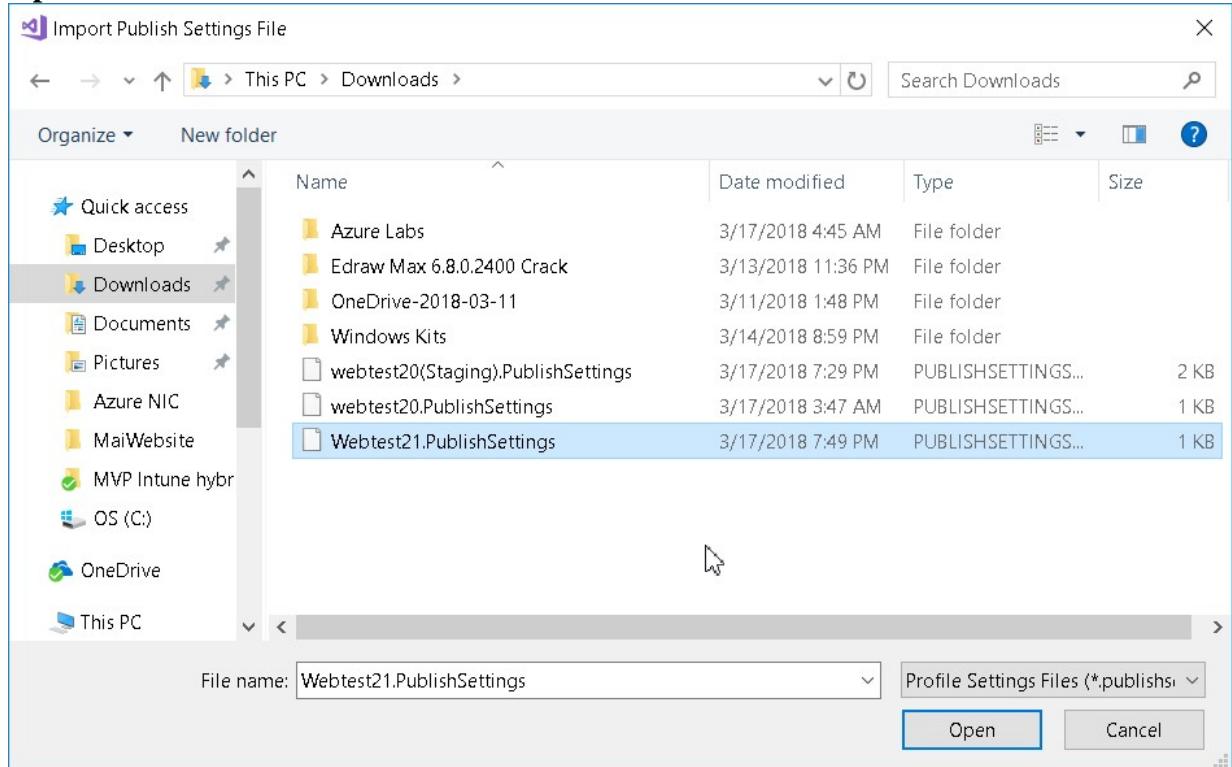


12. In the **Publish Web** wizard, on the left, click **Profile** and then click **Import**.

Microsoft Azure Infrastructure step by step

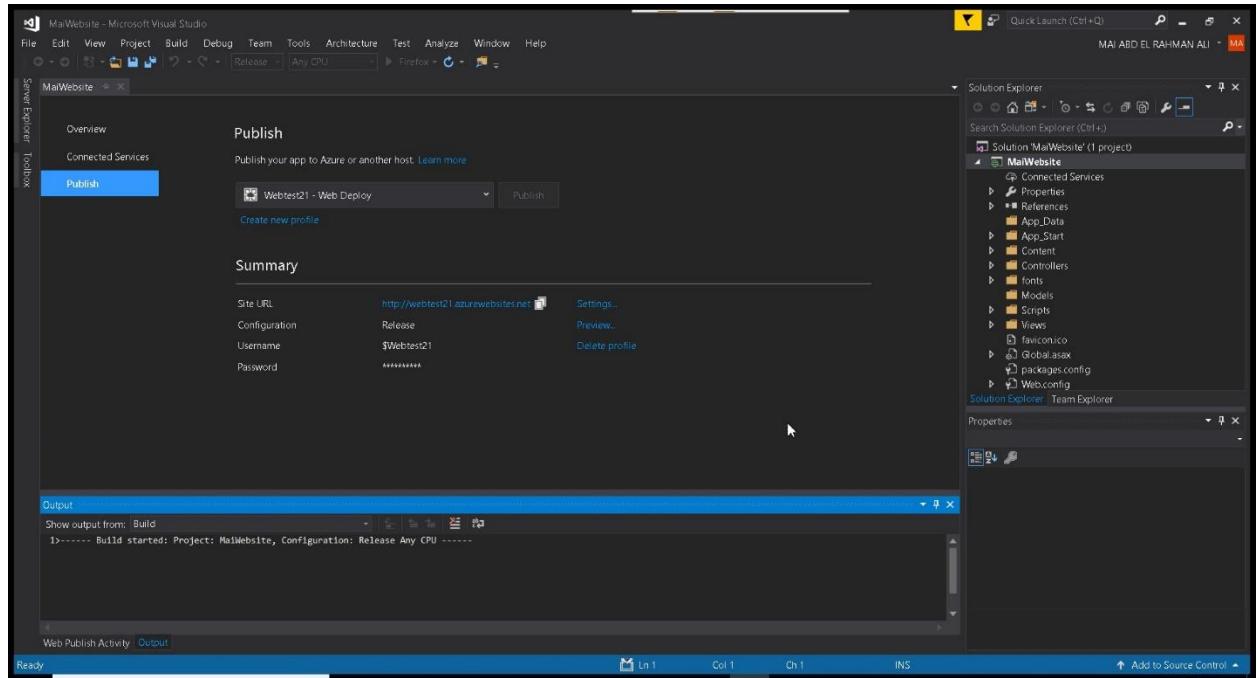


13. In the **Import Publish Settings** dialog box, click **Browse**.
14. In the **Downloads** folder, select the **Webtest21.PublishSettings** file, and then click **Open**.

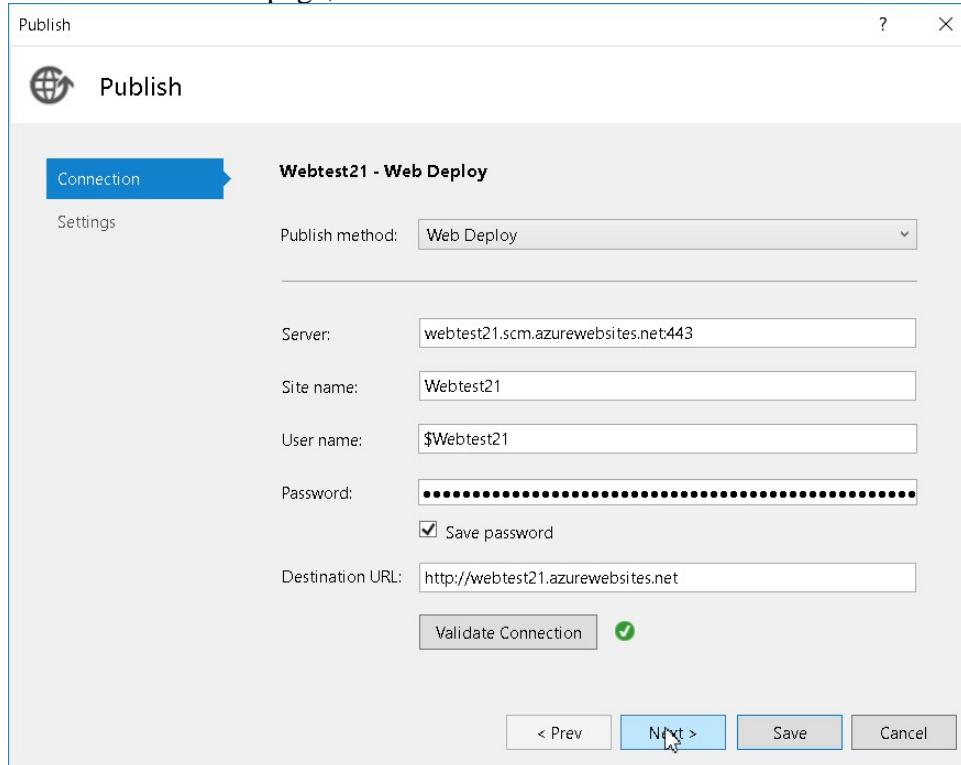


15. In the **Import Publish Settings** dialog box, click **OK**.

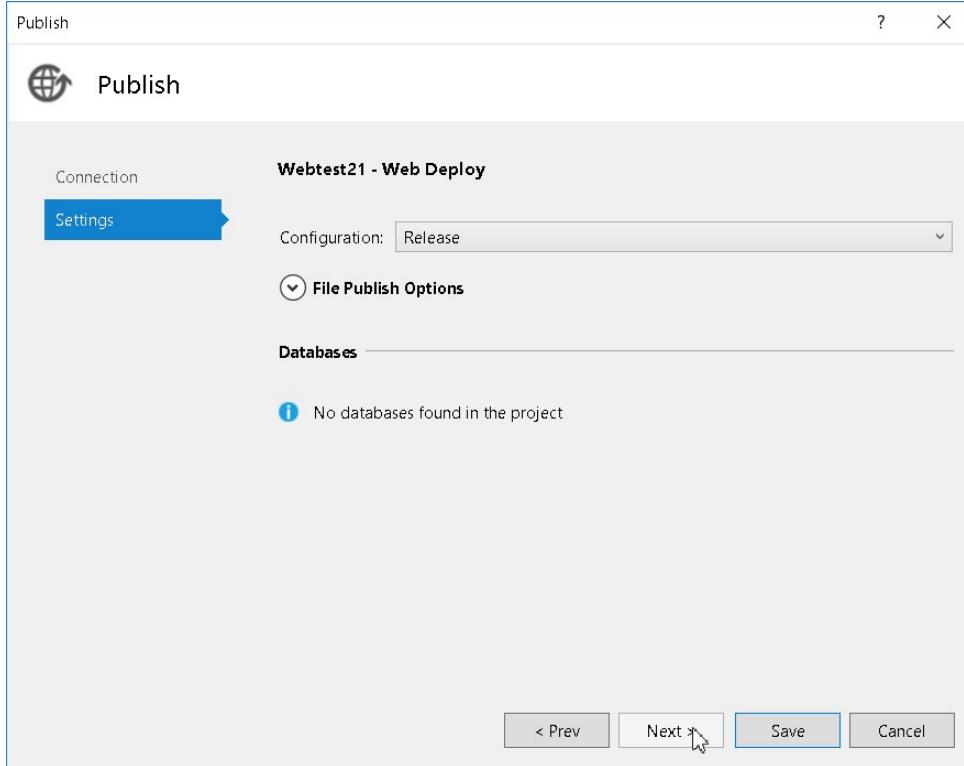
Microsoft Azure Infrastructure step by step



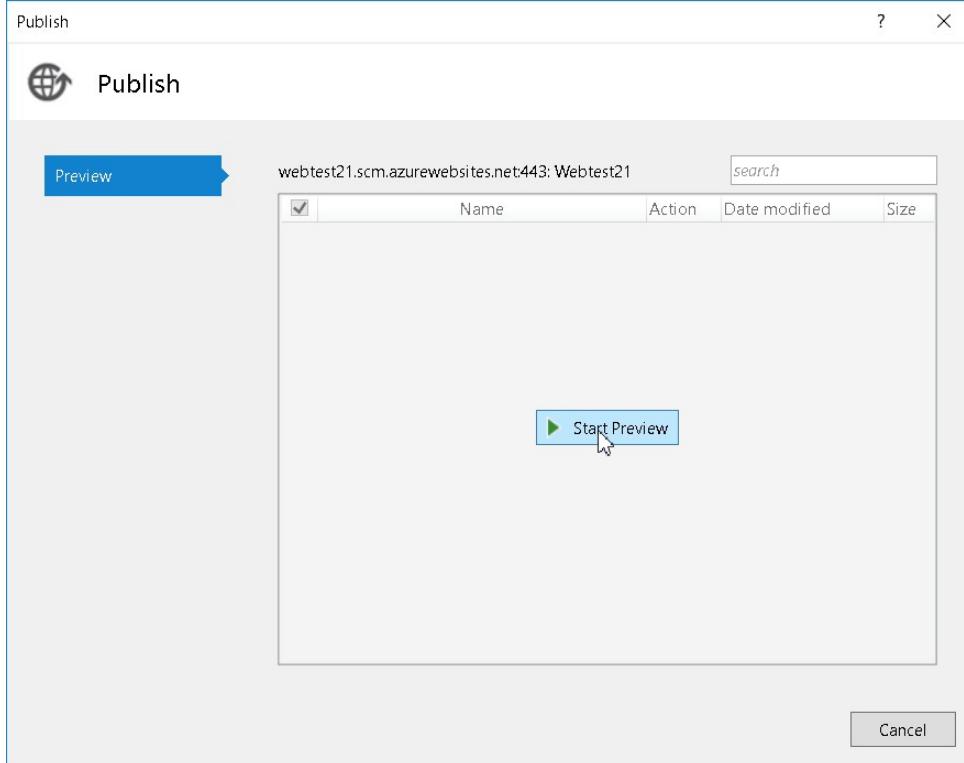
16. On the **Connection** page, click **Validate Connection**. Click **Next**.



17. In the **Configuration** drop-down list, ensure that **Release** is selected, and then click **Next**.

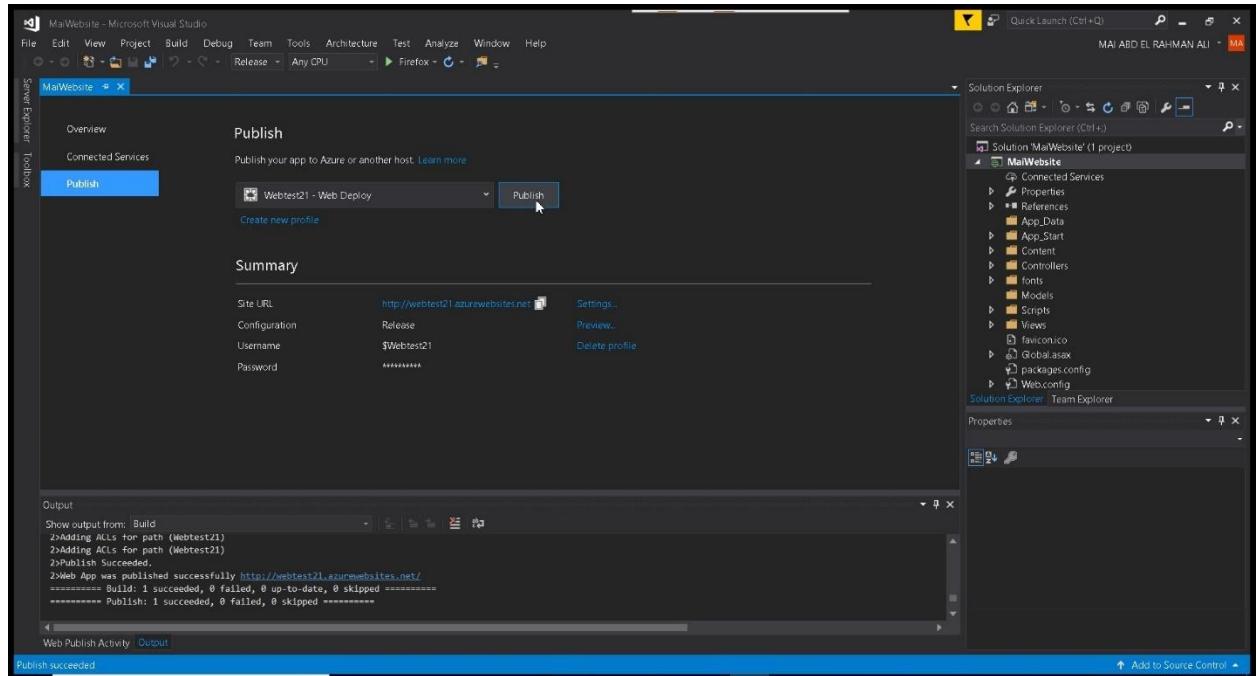


18. On the **Preview** page, click **Start Preview**.

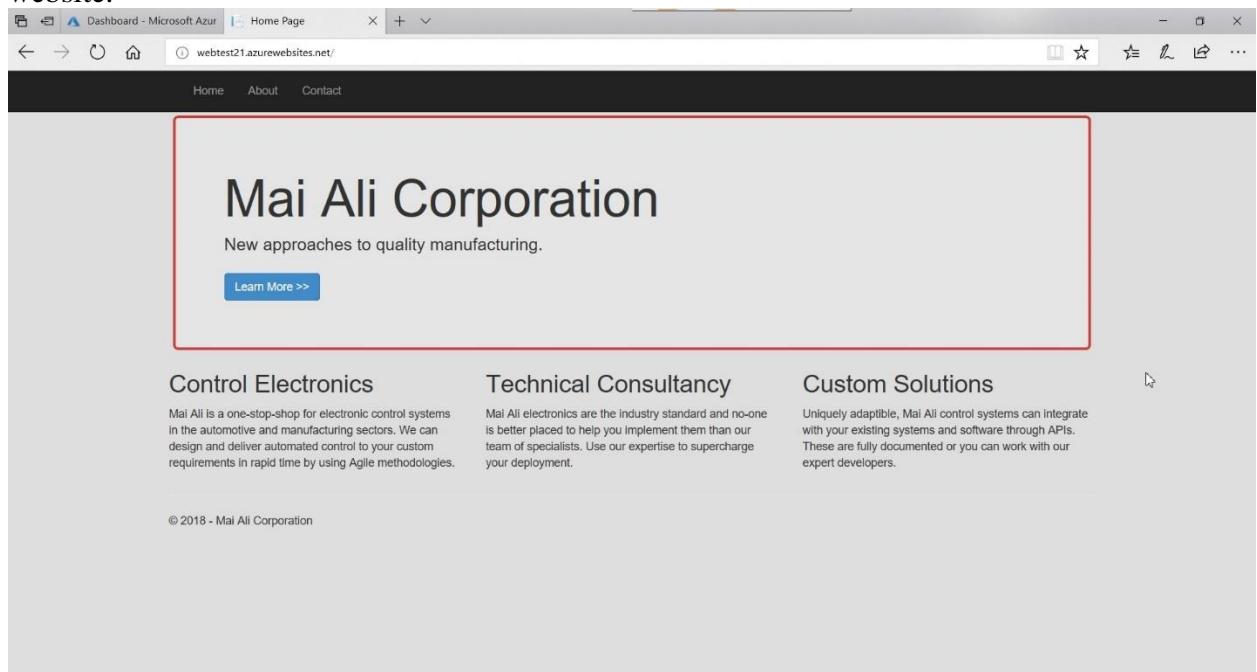


19. Examine the files to publish and then click **Publish**.

Microsoft Azure Infrastructure step by step



20. When the publish operation is complete, Internet Explorer opens and displays the new website.



21. In Webtest21 blade, click **Scale up**.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation bar includes 'Create a resource', 'All services', and 'FAVORITES' (Dashboard, All resources, Resource groups, App Services, Function Apps, SQL databases, Azure Cosmos DB, Virtual machines, Load balancers, Storage accounts, Virtual networks, Azure Active Directory, Monitor, Advisor). The main content area is titled 'Webtest21' under 'App Service'. It shows deployment options like 'Quickstart', 'Deployment credentials', and 'Deployment slots'. There's a 'SETTINGS' section with 'Application settings', 'Authentication / Authorization', 'Managed service identity', 'Backups', 'Custom domains', 'SSL certificates', 'Networking', and 'Scale up (Service plan)'. A 'Diagnose and solve problems' section provides self-service diagnostic tools. Another section for 'App Service Advisor' offers insights for improving app experience. Monitoring metrics for 'Http 5xx' and 'Data In' are displayed at the bottom.

22. Next to Web Hosting Plan Mode click S1 Standard.

The screenshot shows the 'Choose your pricing tier' dialog for 'Webtest21'. It compares three pricing tiers: S1 Standard, S2 Standard, and S3 Standard. The S1 Standard row is highlighted with a dashed blue border. The dialog lists features for each tier, such as storage, SSL support, and backup options. The 'Select' button is located at the bottom of the dialog.

1.75 GB RAM	3.5 GB RAM	7 GB RAM
250 GB Storage Custom domains / SSL SNI Inc & IP SSL Support Up to 20 instance(s) * Auto scale availability 20 slots Web app staging 50 times daily Backup Traffic Manager Geo availability	250 GB Storage Custom domains / SSL SNI Inc & IP SSL Support Up to 20 instance(s) * Auto scale availability 20 slots Web app staging 50 times daily Backup Traffic Manager Geo availability	250 GB Storage Custom domains / SSL SNI Inc & IP SSL Support Up to 20 instance(s) * Auto scale availability 20 slots Web app staging 50 times daily Backup Traffic Manager Geo availability
223.20 USD/MONTH (ESTIMATED)	446.40 USD/MONTH (ESTIMATED)	892.80 USD/MONTH (ESTIMATED)

S1 Standard	S2 Standard	S3 Standard
1 Core 1.75 GB RAM 50 GB Storage Custom domains / SSL SNI Inc & IP SSL Support Up to 10 instance(s) Auto scale Daily Backup 5 slots Web app staging Traffic Manager Geo availability	2 Core 3.5 GB RAM 50 GB Storage Custom domains / SSL SNI Inc & IP SSL Support Up to 10 instance(s) Auto scale Daily Backup 5 slots Web app staging Traffic Manager Geo availability	4 Core 7 GB RAM 50 GB Storage Custom domains / SSL SNI Inc & IP SSL Support Up to 10 instance(s) Auto scale Daily Backup 5 slots Web app staging Traffic Manager Geo availability

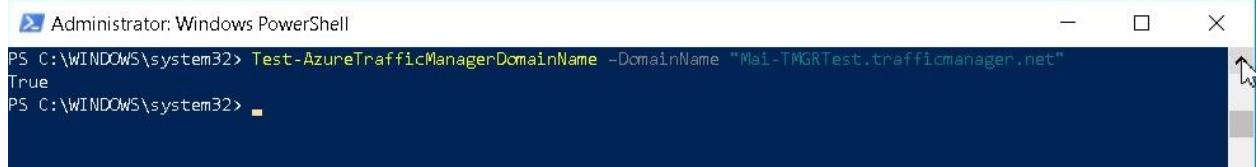
23. Click SAVE and then click YES.

Task 2: Create a Traffic Manager Profile

To create Traffic Manager, following this procedure

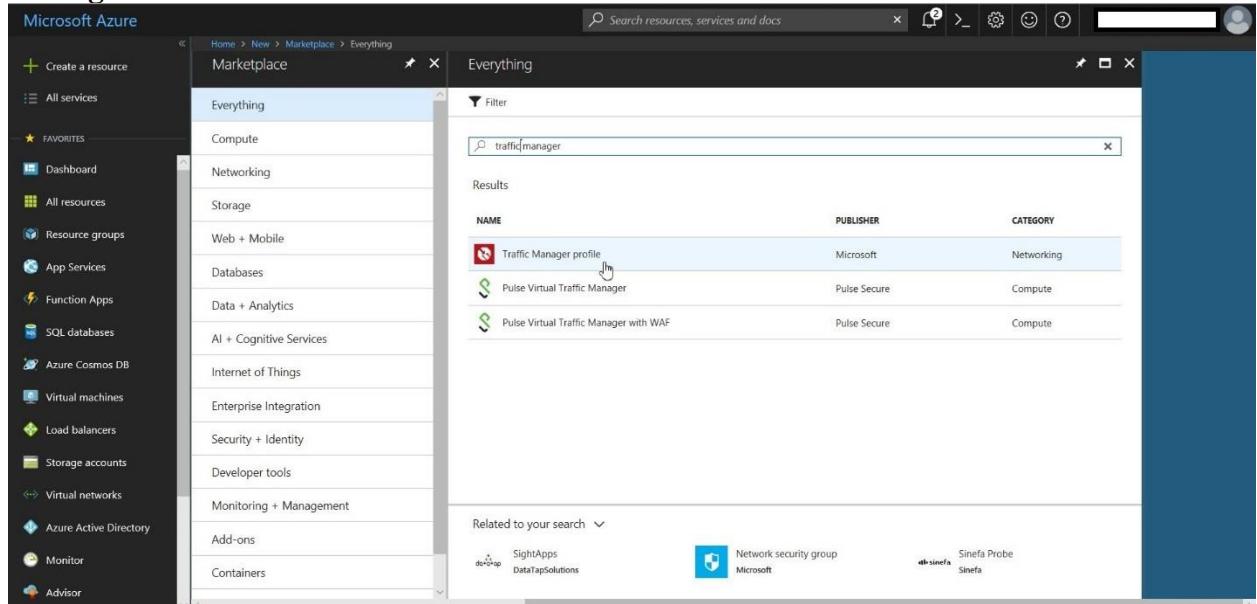
1. In Windows Azure PowerShell, type the following command and then press Enter: **Test-AzureTrafficManagerDomainName -DomainName "yourname.trafficmanager.net"**. Where *yourname* is your full name with no spaces. If the command returns true use your name for this Exercise. If the command returns false, try other names until you find a free domain.

Microsoft Azure Infrastructure step by step



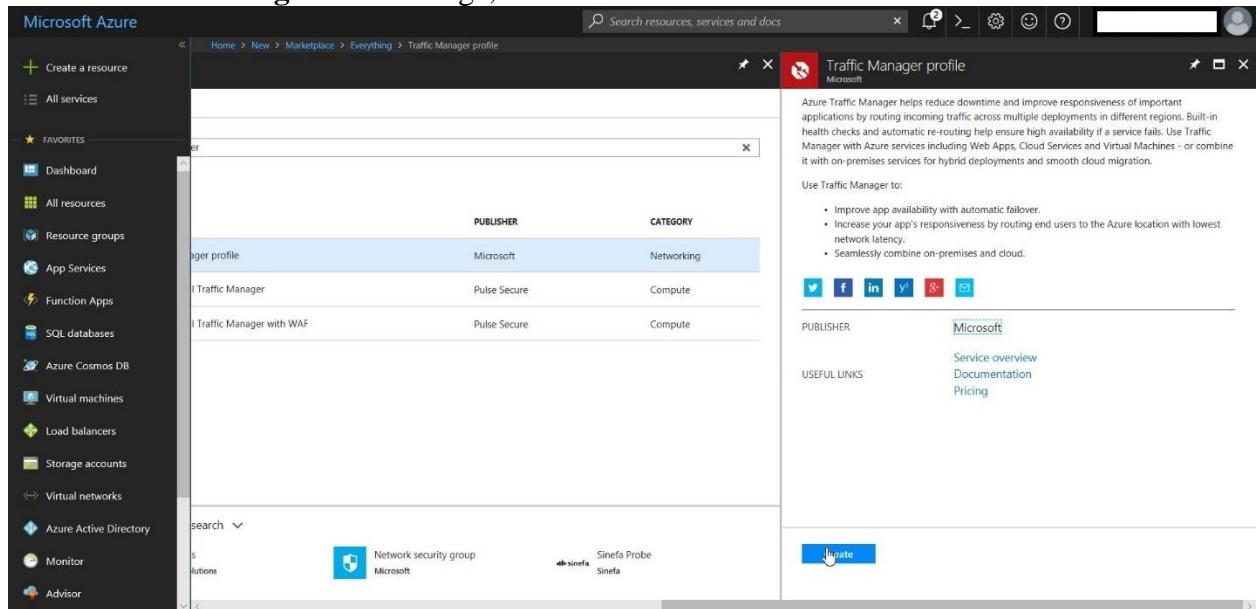
```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> Test-AzureTrafficManagerDomainName -DomainName "Mai-TMGRTest.trafficmanager.net"
True
PS C:\WINDOWS\system32>
```

2. In Azure portal, click All Services, then type **Traffic Manager**. Click **Create a Traffic Manager Profile**.



The screenshot shows the Microsoft Azure Marketplace search results for 'trafficmanager'. The search bar at the top contains 'trafficmanager'. The results table has columns for NAME, PUBLISHER, and CATEGORY. One result is highlighted: 'Traffic Manager profile' by Microsoft, categorized under Networking. Other results include 'Pulse Virtual Traffic Manager' and 'Pulse Virtual Traffic Manager with WAF', both by Pulse Secure, categorized under Compute.

3. In the **Traffic Manager Profile Page**, Click Create.

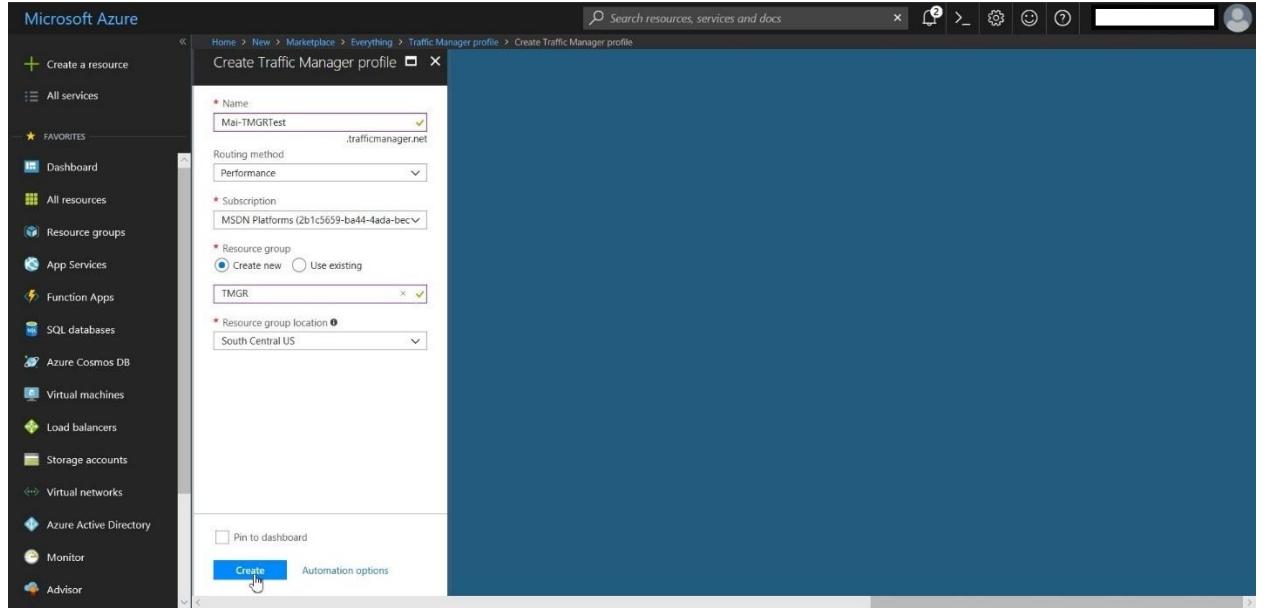


The screenshot shows the 'Traffic Manager profile' creation page in the Azure portal. The left sidebar shows the navigation path: Home > New > Marketplace > Everything > Traffic Manager profile. The main area displays a table of traffic manager profiles, with the first item, 'Traffic Manager profile' by Microsoft, selected. To the right of the table, there is descriptive text about Azure Traffic Manager, social sharing links, and a 'Create' button.

4. In **Create Traffic Manager Profile Page**, fill the required info. Then click **Create**

- Name: **Mai-TMGRTest**
- Routing Method: **Performance**
- Resource Manager: click create new **TMGR**
- Resource group location: **South Central US**

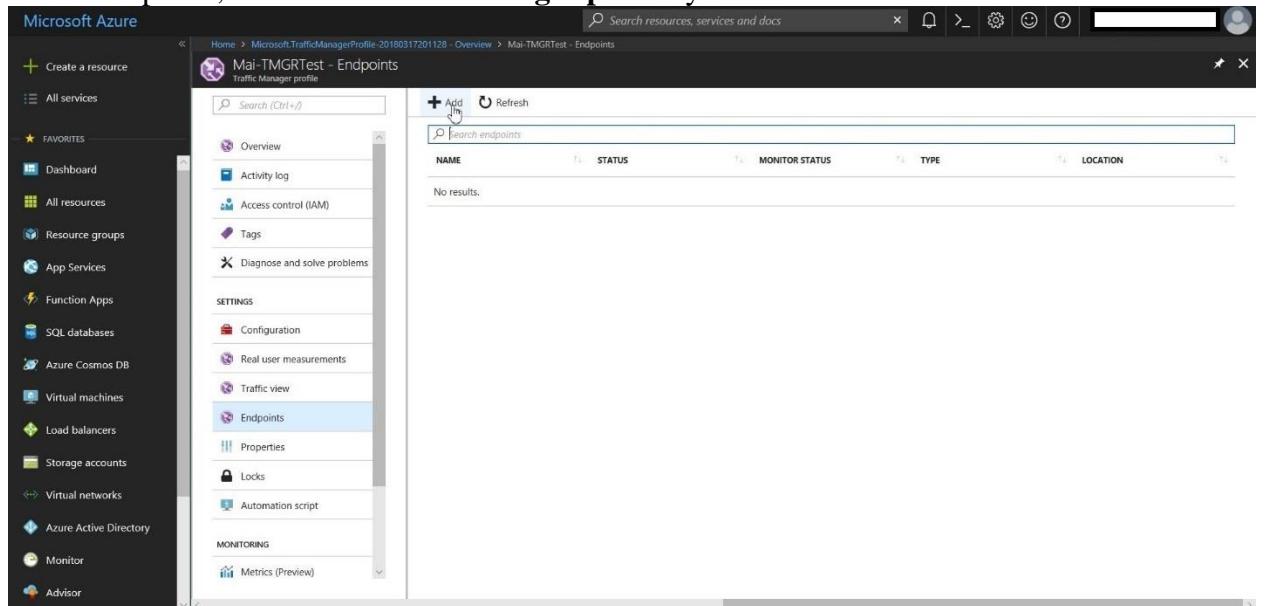
Microsoft Azure Infrastructure step by step



Task 3: Add Endpoints and Configure Traffic Manager

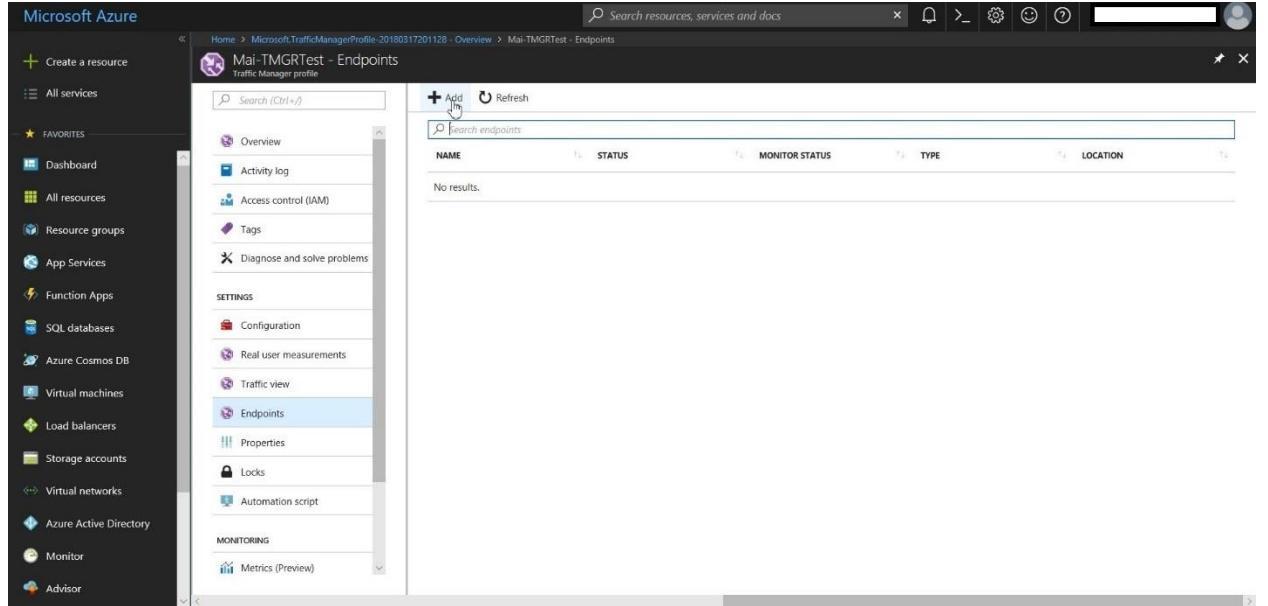
To add endpoints & configure Traffic Manager, following this procedure

1. In the full portal, click the **Traffic Manager profile** you created.



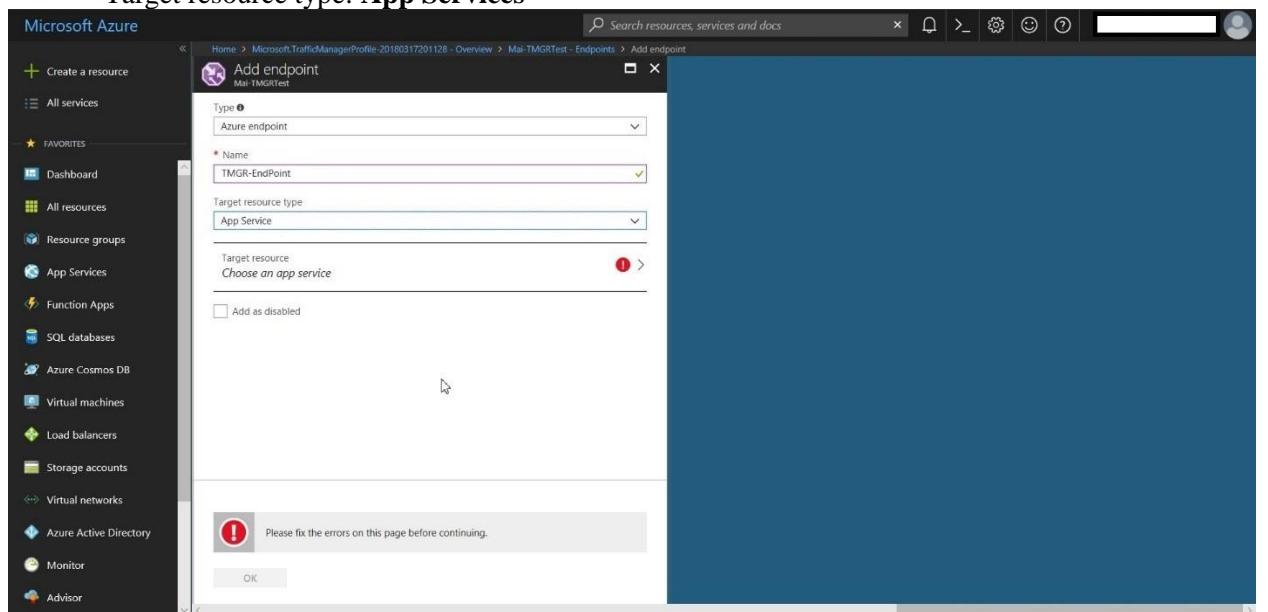
2. Click **Endpoints** and then click **Add**.

Microsoft Azure Infrastructure step by step



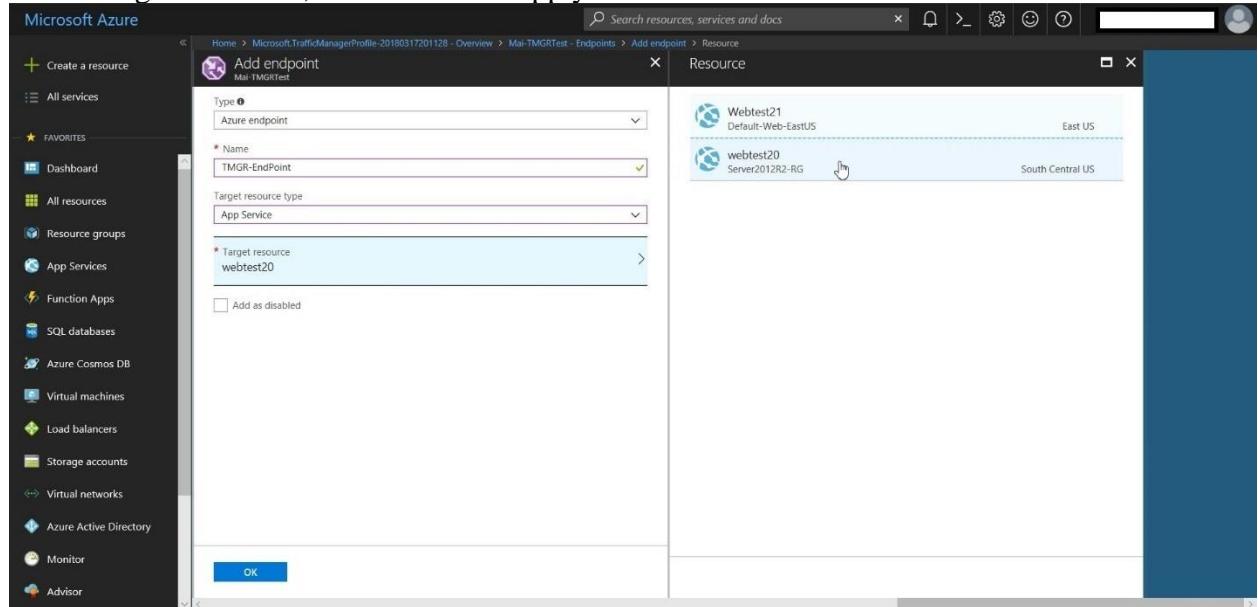
The screenshot shows the Microsoft Azure portal interface. On the left, there's a navigation sidebar with various service icons like App Services, Function Apps, SQL databases, etc. The main area is titled 'Mai-TMGRTest - Endpoints' under 'Traffic Manager profile'. A search bar at the top says 'Search resources, services and docs'. Below the title, there's a table header with columns: NAME, STATUS, MONITOR STATUS, TYPE, and LOCATION. A message 'No results.' is displayed below the table. On the far left, a vertical sidebar has 'Endpoints' selected. At the top of this sidebar, there's a '+ Add' button which is being clicked.

3. In the **Add endpoint** page, fill the field with required data.
 - Type: **Azure endpoint**
 - Name: **TMGR-Endpoint**
 - Target resource type: **App Services**

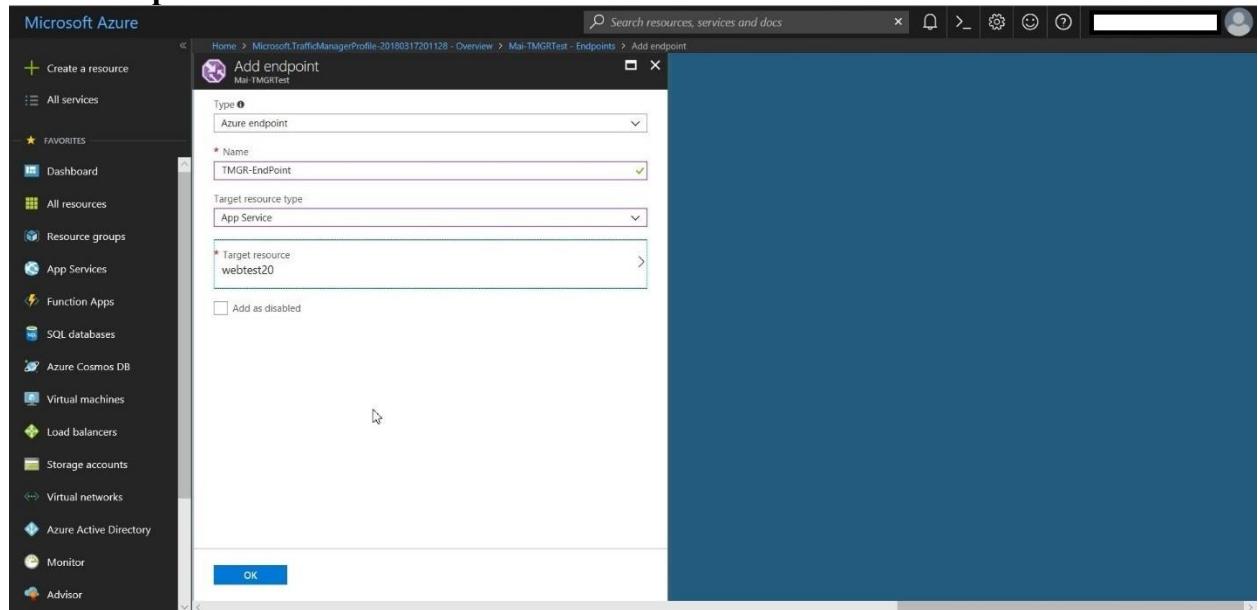


This screenshot shows the 'Add endpoint' dialog box. It has fields for 'Type' (set to 'Azure endpoint'), 'Name' (set to 'TMGR-Endpoint'), and 'Target resource type' (set to 'App Service'). Below these fields is a note: 'Target resource Choose an app service' with a red exclamation mark icon. At the bottom, there's a checkbox 'Add as disabled' and a message box with an exclamation mark icon that says 'Please fix the errors on this page before continuing.' with an 'OK' button.

4. In the Target resources, select the web App you created.



5. Click Complete.



6. Click the **Ok** tab.

Microsoft Azure Infrastructure step by step

NAME	STATUS	MONITOR STATUS	TYPE	LOCATION
TMGR-EndPoint	Enabled	Online	Azure endpoint	South Central US

7. In the **DNS Time To Live (TTL)** text box, remove the original setting and then type **30**.

DNS time to live (TTL): 30 seconds

8. In the toolbar at the bottom, click **Save**.

Task 4: Test Traffic Manager

To test Traffic Manager, following this procedure

1. In Internet Explorer, in the navigation on the left, click **Traffic Manager**.
2. For the traffic manager profile, note the entry in the **DNS Name** column.
3. Place the cursor in the **Address** bar, type the DNS NAME you just noted, and then press Enter.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes 'Create a resource', 'All services', 'Dashboard', 'All resources', 'Resource groups', 'App Services', 'Function Apps', 'SQL databases', 'Azure Cosmos DB', 'Virtual machines', 'Load balancers', 'Storage accounts', 'Virtual networks', 'Azure Active Directory', and 'Monitor'. The main content area is titled 'Mai-TMGRTest - Traffic Manager profile'. It displays the 'Overview' tab, which includes sections for 'Essentials' (Resource group: TMGR, Status: Enabled, Subscription name: MSDN Platforms, Subscription ID: 2b1c5659-ba44-4ada-bee9-b53a0746077), 'DNS name' (http://mai-tmgrtest.trafficmanager.net), and 'Endpoints' (TMGR-EndPoint, Enabled, Online, Azure endpoint, South Central US). A sidebar on the left lists 'SETTINGS' (Configuration, Real user measurements, Traffic view, Endpoints, Properties, Locks, Automation script) and 'MONITORING' (Metrics (Preview)).

4. Internet Explorer displays the website.

The screenshot shows an Internet Explorer browser window with the title 'Mai-TMGRTest - Microsoft Internet Explorer'. The address bar shows the URL 'mai-tmgrtest.trafficmanager.net'. The page content is the website for 'Mai Ali Corporation', featuring a header with the company name and tagline 'New approaches to quality manufacturing.', a 'Learn More >' button, and three service sections: 'Control Electronics', 'Technical Consultancy', and 'Custom Solutions'. The footer contains the copyright notice '© 2018 - Mai Ali Corporation'.

5. From the Start Menu, type **cmd** and then press Enter.
6. Type the following command and then press Enter: **nslookup dnsname** Where *dnsname* is the DNS NAME. Note the aliases that are returned.

Microsoft Azure Infrastructure step by step

```
Administrator: Command Prompt
Microsoft Windows [Version 10.0.16299.309]
(c) 2017 Microsoft Corporation. All rights reserved.

C:\WINDOWS\system32>nslookup mai-tmgrtest.trafficmanager.net
Server: 192.168.1.1
Address: 192.168.1.1

Non-authoritative answer:
Name: waws-prod-sn1-049.cloudapp.net
Address: 40.84.226.176
Aliases: mai-tmgrtest.trafficmanager.net
webtest20.azurewebsites.net
waws-prod-sn1-049.vip.azurewebsites.windows.net

C:\WINDOWS\system32>
```

7. In Internet Explorer, switch to the tab that displays the Azure portal.
8. In the navigation on the left, click **Traffic Manager**. Click **Endpoints**.

The screenshot shows the Microsoft Azure portal interface. On the left, there is a navigation sidebar with various service icons like App Services, Function Apps, and Storage accounts. The main content area is titled "Mai-TMGRTest - Endpoints" under "Traffic Manager profile". It has a toolbar with "Add", "Refresh", and search fields. A table lists an endpoint named "TMGR-EndPoint" with status "Enabled", monitor status "Online", type "Azure endpoint", and location "South Central US". The "Endpoints" option in the sidebar is highlighted with a blue selection bar.

NAME	STATUS	MONITOR STATUS	TYPE	LOCATION
TMGR-EndPoint	Enabled	Online	Azure endpoint	South Central US

9. In the toolbar, click **Disable** and then click **Yes**.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, there's a sidebar with various service icons like App Services, Function Apps, SQL databases, etc. The main content area is titled 'TMGR-EndPoint' under 'mai-TMGRtest'. It has tabs for 'Save', 'Discard', and 'Delete'. Under the 'Status' section, 'Disabled' is selected over 'Enabled'. The 'Monitor status' is listed as 'Online'. The 'Type' is set to 'Azure endpoint'. In the 'Target resource type' dropdown, 'App Service' is selected. Below it, the 'Target resource' is set to 'webtest20'. There are also sections for 'Target resource type' and 'Target resource' with arrows pointing to the right.

10. Switch to the **Command Prompt**. Type the following command and then press Enter:
nslookup dnsname Where *dnsname* is the DNS NAME. Note that the aliases returned have changed from those returned before.

A screenshot of a Windows Command Prompt window titled 'Administrator: Command Prompt'. The prompt shows the command 'nslookup mai-tmgrtest.trafficmanager.net' being run. The output indicates that the server is 192.168.1.1 and the address is 192.168.1.1. A note at the bottom states '*** 192.168.1.1 can't find mai-tmgrtest.trafficmanager.net: Non-existent domain'. The command prompt window has standard minimize, maximize, and close buttons at the top right.

```
C:\WINDOWS\system32>nslookup mai-tmgrtest.trafficmanager.net
Server: 192.168.1.1
Address: 192.168.1.1

*** 192.168.1.1 can't find mai-tmgrtest.trafficmanager.net: Non-existent domain
C:\WINDOWS\system32>
```

Chapter 5

Microsoft Azure Storage

Microsoft Azure Storage is a Microsoft-managed cloud service that provides storage that is highly available, secure, durable, scalable, and redundant. Microsoft takes care of maintenance and handles critical problems for you.

Azure Storage consists of three data services: Blob storage, File storage, and Queue storage. Blob storage supports both standard and premium storage, with premium storage using only SSDs for the fastest performance possible.

Creating and Configuring Storage

Azure Storage is used to store files, and virtual machine disks, together with other types of information. Azure Storage is used by websites, mobile apps, desktop applications, and cloud services, as well as custom solutions. Azure Storage is part of Azure Data Services, together with backup and recovery.

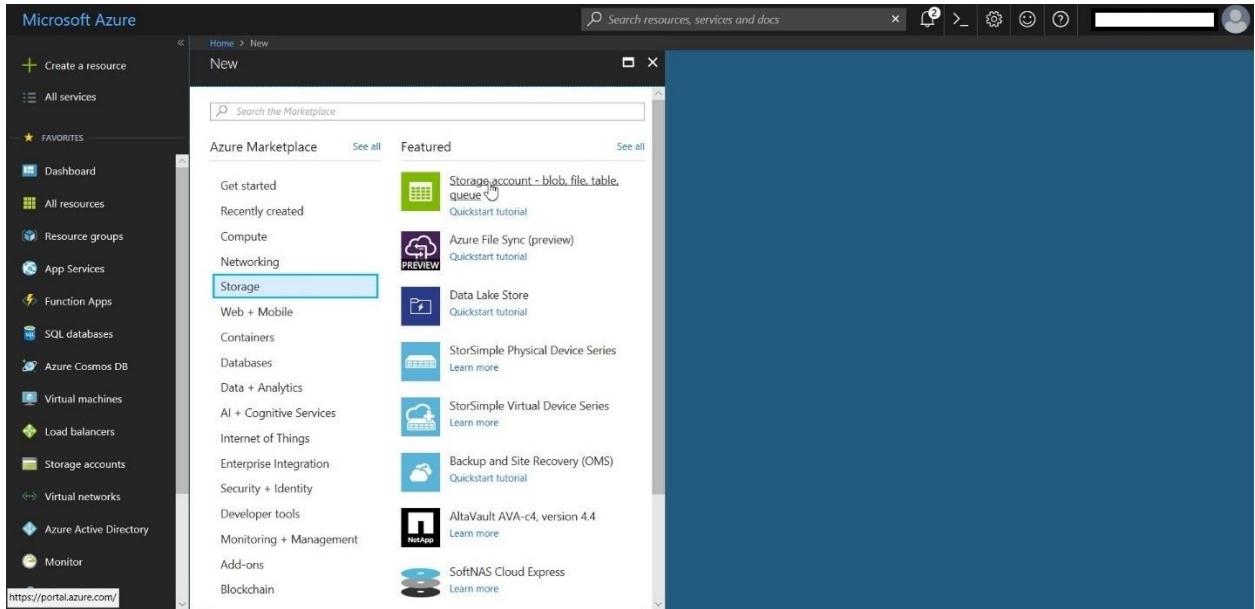
In this exercise, you will have a new Azure storage account with a container named **asset-images**

Task 1: Create a Storage Account

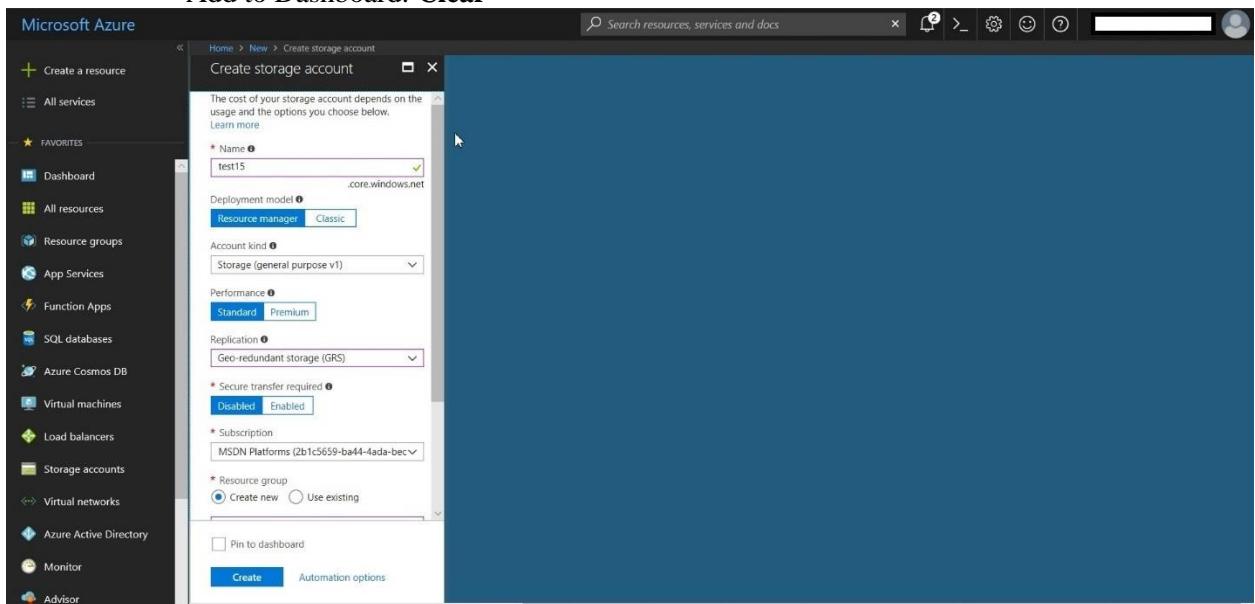
To create storage account, following this procedure

1. Start Internet Explorer and browse to <https://portal.azure.com>. When prompted, sign in using the credentials for the Microsoft account associated with your Azure subscription.
2. On the menu hub, click **New**, and then click **Everything**.
3. Close the **Everything** blade, then under **Marketplace**, click **Storage, cache, + backup**.

Microsoft Azure Infrastructure step by step

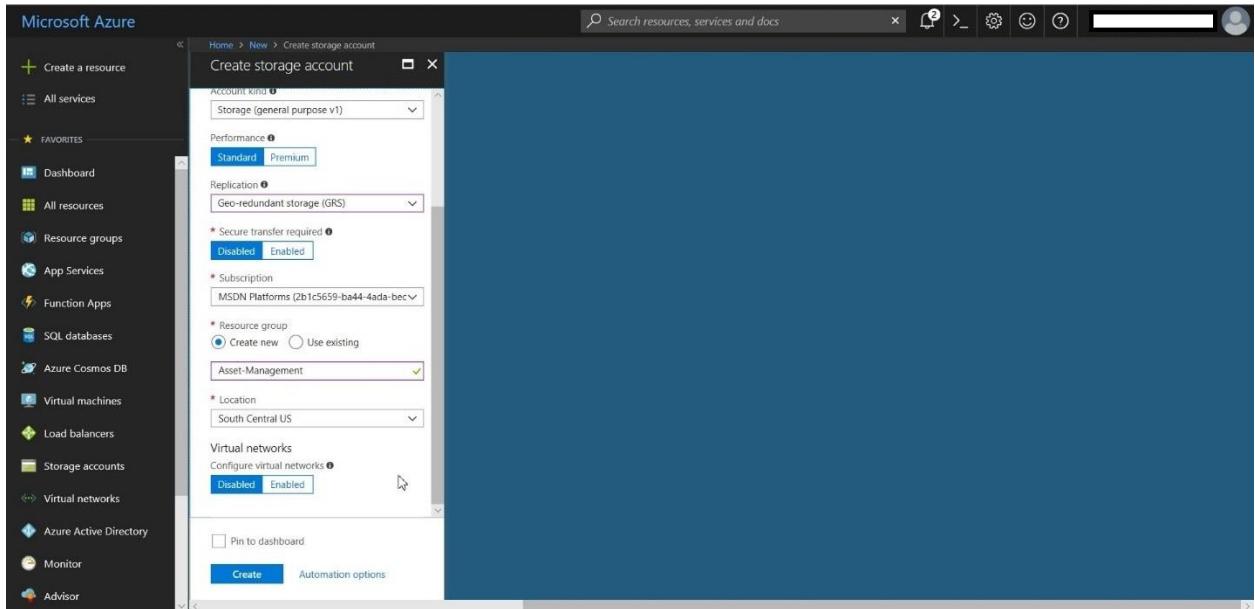


4. On the **Storage, cache, + backup** blade, under **Storage and Cache**, click **Storage**, and then click **Create**.
5. In the **Storage account** blade, apply the following settings and click **Create**:
 - Storage: Enter a valid, unique name
 - Pricing Tier: **Standard-GRS**
 - Resource Group: Click the current resource group, and then click Create a new resource group. Name the new resource group **Asset-Management** and click **OK**
 - Subscription: **Your Azure subscription**
 - Location: **Select the region nearest to you**
 - Diagnostics: **Leave as not configured**
 - Add to Dashboard: **Clear**

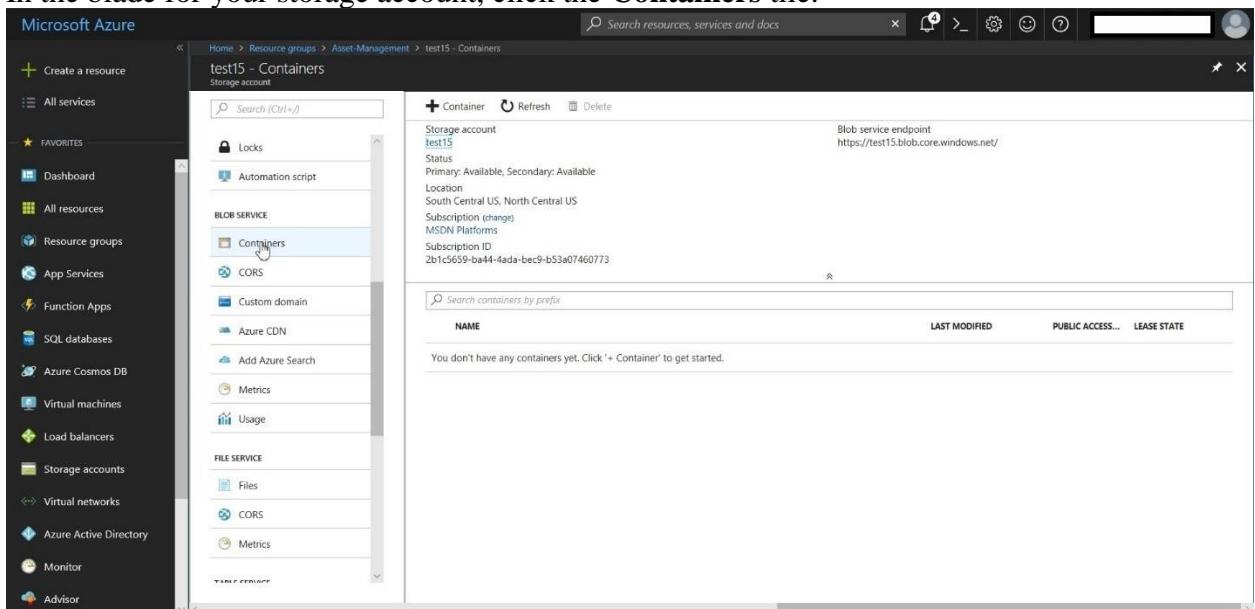


6. Click **Create**.

Microsoft Azure Infrastructure step by step



7. In the **Storage** blade, click the storage account you just created.
8. In the blade for your storage account, click the **Containers** tile.



9. On the **Containers** blade, click **ADD**. Then in the **Add a container** blade, apply the following settings and click **OK**:
 - Name: **asset-images**
 - Access type: **Private**

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes 'Create a resource', 'All services', 'FAVORITES' (Dashboard, All resources, Resource groups, App Services, Function Apps, SQL databases, Azure Cosmos DB, Virtual machines, Load balancers, Storage accounts, Virtual networks, Azure Active Directory, Monitor, Advisor), and 'Container' (under 'All services'). The main workspace is titled 'test15 - Containers' and shows a 'Storage account' context. A search bar at the top right says 'Search resources, services and docs'. The central area has a header 'Containers' with buttons for '+ Container', 'Refresh', and 'Delete'. Below is a 'New container' form with fields: 'Name' (asset-images), 'Public access level' (Private (no anonymous access)), and buttons 'OK' and 'Cancel'. A note at the bottom says 'You don't have any containers yet. Click '+ Container' to get started.'

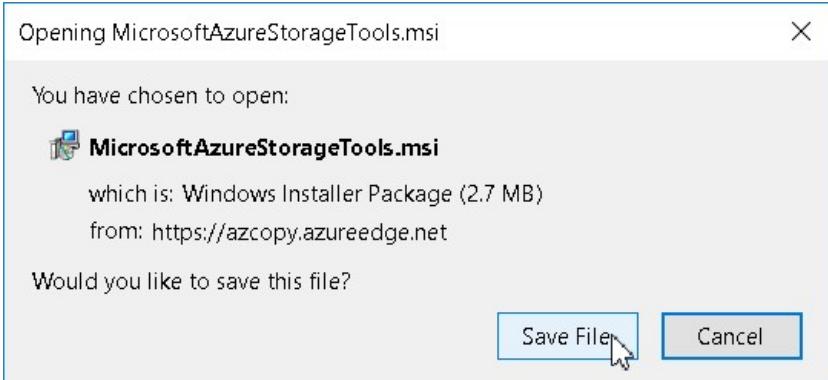
10. Close the Containers blade, but keep the blade for your storage account open.

The screenshot shows the 'test15 - Containers' blade still open. At the top, it displays the storage account details: 'test15', 'Status: Primary: Available, Secondary: Available', 'Location: South Central US, North Central US', 'Subscription (change) MSDN Platform', and 'Subscription ID 2b1c5659-ba44-4ada-bec9-b53a07460773'. Below this is a table titled 'Search containers by prefix' with one row: 'asset-images' (Last Modified: 3/17/2018 4:00:11 AM, Public Access: Private, Lease State: Available). The left sidebar remains the same as in the previous screenshot.

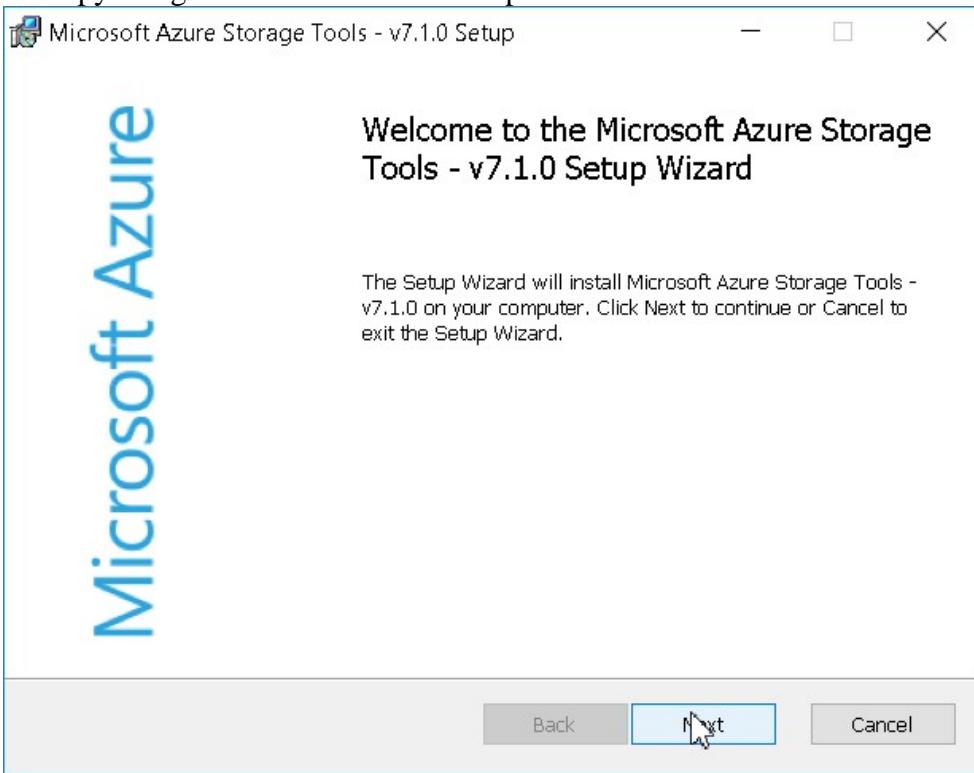
Task 2: Install AzCopy

To install Azcopy, following this procedure

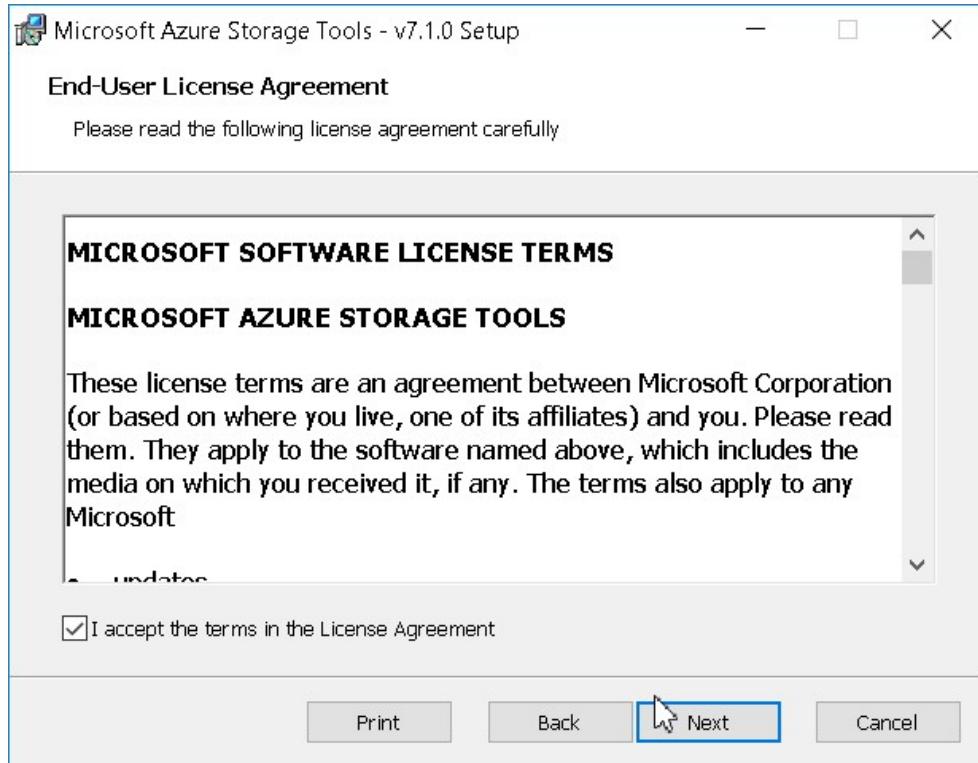
1. In Internet Explorer, open a new tab and browse to <http://aka.ms/AzCopy>.
2. In the **Download and install AzCopy** section, click the link to install the latest version of AzCopy.



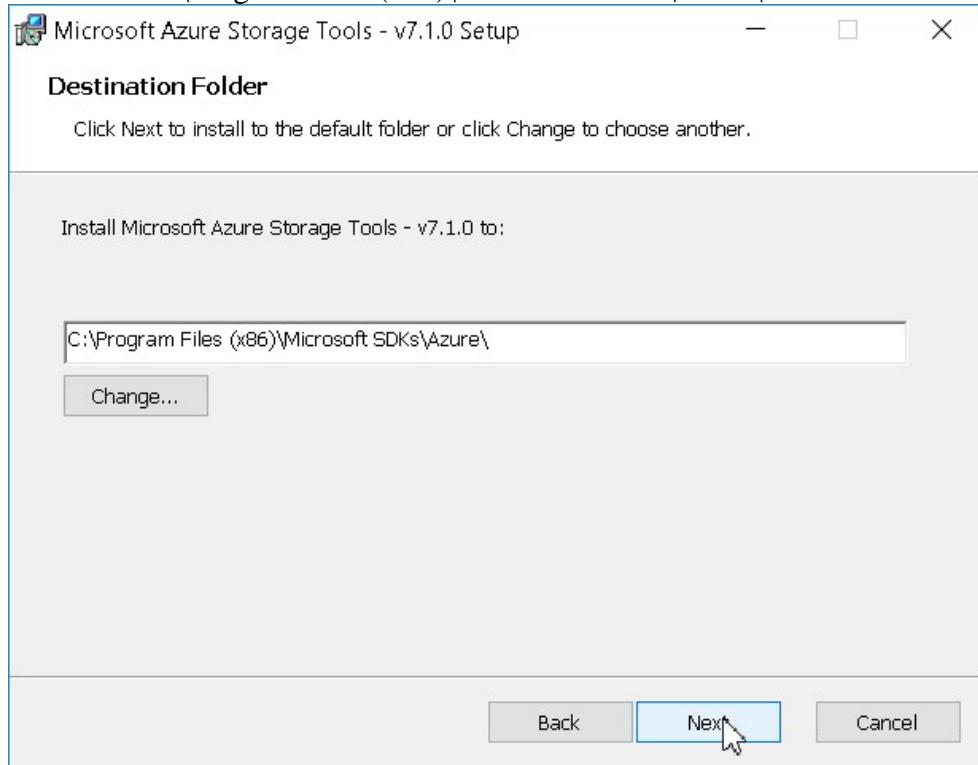
- When prompted to run or save the file, click **Run**. Then click **Yes** if prompted to allow the program to make changes to the computer, and complete the wizard to install the AzCopy using the default installation options.



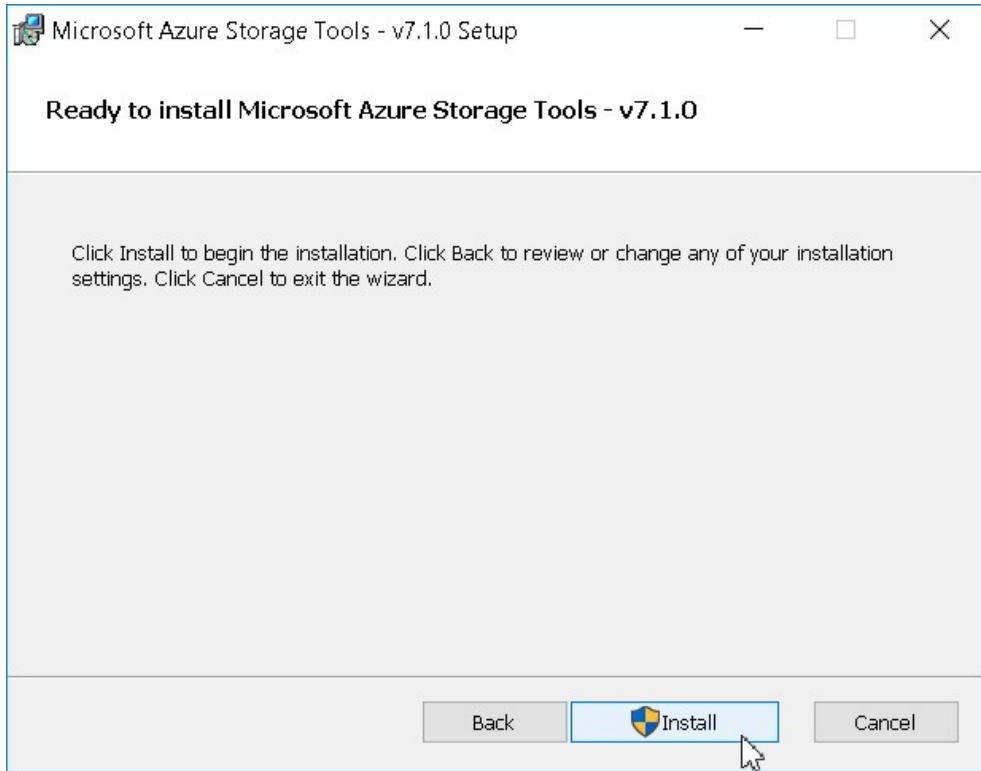
- On **End-User License Agreement** Page, Click **Next**.



5. In the **Edit System Variable** dialog box, in the **Variable value** text box, append the following text (including the semicolon at the beginning) to the existing value, and then click **OK** "C:\Program Files (x86)\Microsoft SDKs\Azure"



6. Click **Install**



7. Right-click the Start button and click **Command Prompt**. Then in the command prompt window, enter the following command: AzCopy /?



Task 3: Use AzCopy to Upload Blobs

To upload Blobs, following this procedure

1. In Internet Explorer, on the **Microsoft Azure** tab, in the blade for your storage account, click **Keys**.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure Storage accounts blade. On the left, there's a sidebar with various service icons. The main area shows a list of storage accounts under the heading 'Storage accounts'. One account, 'test15', is selected. On the right, there's a detailed view for 'test15'. Under the 'SETTINGS' section, 'Access keys' is selected. A tooltip indicates that the 'Copy' icon is being used to copy the primary access key. The detailed view also includes sections for Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Blobs, Files, and Tables.

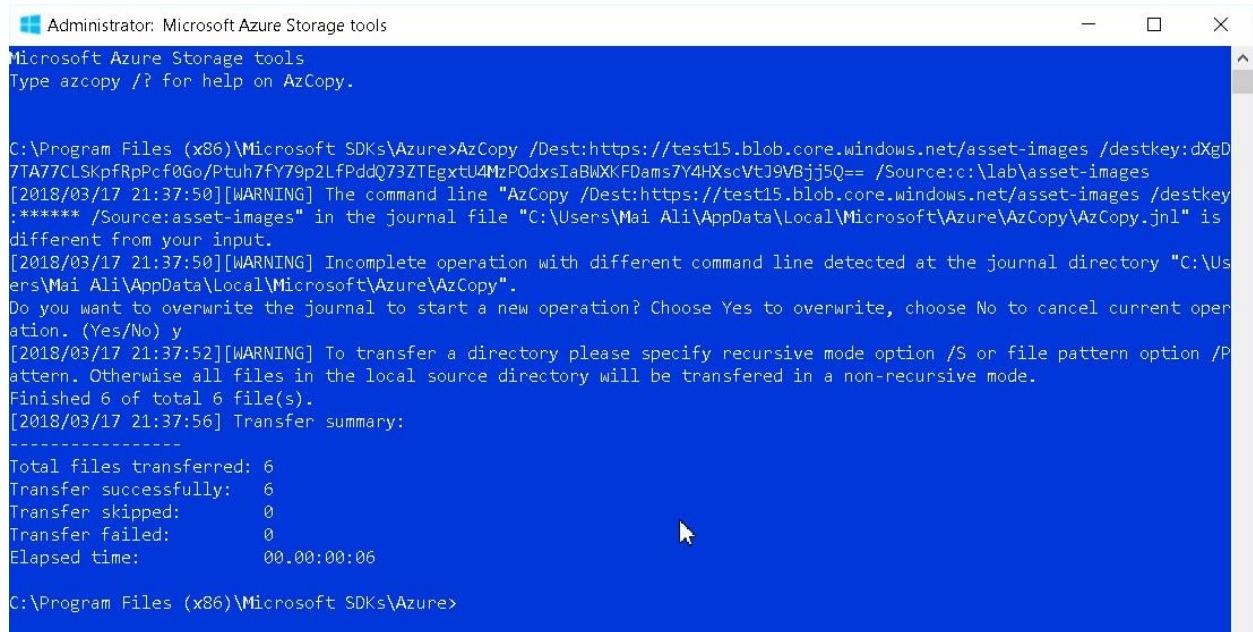
- On the **Manage keys** blade, click the **Copy** icon next to the primary access key. If prompted to allow access to the clipboard, click **Allow access**.

This screenshot shows the same 'Access keys' blade for storage account 'test15'. The 'key1' section shows the copied access key value. A 'Click to copy' button is visible above the key value. The 'key2' section also shows a copied access key value. The rest of the interface is identical to the previous screenshot, including the sidebar and the list of other storage accounts.

- In the Microsoft Azure Storage tools, locate the following command: **AzCopy /Dest:https://<your storage account>.blob.core.windows.net/asset-images /destkey:<your primary access key> /Source:c:\asset-images**

The screenshot shows a Windows Command Prompt window titled 'Administrator: Microsoft Azure Storage tools'. The command 'AzCopy /? for help on AzCopy.' is displayed. Below it, the command 'C:\Program Files (x86)\Microsoft SDKs\Azure>AzCopy /Dest:https://test15.blob.core.windows.net/asset-images /destkey:dXgD7TA77CLSKpRpPcf0Go/Ptuh7fY79p2LfPddQ73ZTEgxtU4MzPOdxsIaBWXKFdams7Y4HScVtJ9VBjj5Q== /Source:c:\lab\asset-images' is entered and executed. The command is shown in green, indicating it's being processed.

- Wait for the command to complete and view the file transfer information that is displayed.



```
Administrator: Microsoft Azure Storage tools
Microsoft Azure Storage tools
Type azcopy /? for help on AzCopy.

C:\Program Files (x86)\Microsoft SDKs\Azure>AzCopy /Dest:https://test15.blob.core.windows.net/asset-images /destkey:dXgD7TA7CLSkpfRpPcf0Go/Ptuh7fY79p2Lfpddq73ZTEgxtU4MzPOdxs1aBwXKDams7Y4HXscVtJ9Vbjj5Q== /Source::c:\lab\asset-images
[2018/03/17 21:37:50][WARNING] The command line "AzCopy /Dest:https://test15.blob.core.windows.net/asset-images /destkey:***** /Source:asset-images" in the journal file "C:\Users\Mai Ali\AppData\Local\Microsoft\Azure\AzCopy\AzCopy.jnl" is different from your input.
[2018/03/17 21:37:50][WARNING] Incomplete operation with different command line detected at the journal directory "C:\Users\Mai Ali\AppData\Local\Microsoft\Azure\AzCopy".
Do you want to overwrite the journal to start a new operation? Choose Yes to overwrite, choose No to cancel current operation. (Yes/No) y
[2018/03/17 21:37:52][WARNING] To transfer a directory please specify recursive mode option /S or file pattern option /P attern. Otherwise all files in the local source directory will be transferred in a non-recursive mode.
Finished 6 of total 6 file(s).
[2018/03/17 21:37:56] Transfer summary:
-----
Total files transferred: 6
Transfer successfully: 6
Transfer skipped: 0
Transfer failed: 0
Elapsed time: 00.00:00:06

C:\Program Files (x86)\Microsoft SDKs\Azure>
```

Using Azure File Storage

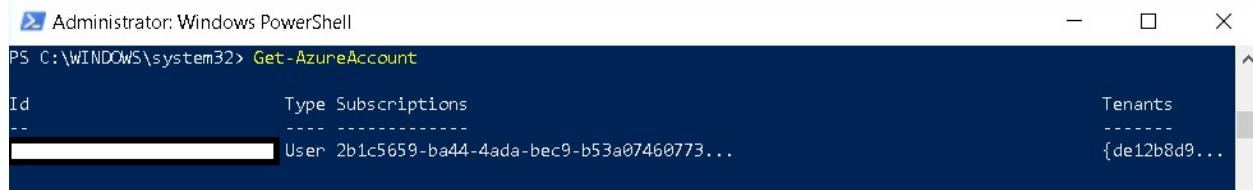
The Azure Files service enables you to create file shares in an Azure storage account that can then be accessed with the SMB 2.1 protocol. Since all Windows computers and many other devices support this protocol, an SMB file share can be used in a wide variety of situations. It can be particularly helpful when you migrate an on-premises application to Azure—if that application uses a file share to store configuration or data files—because you can store these files in Azure with no recoding to the application. You can also use Azure Files to share data between Azure VMs.

In this exercise, you will have a file share named “assets” that contains a folder named invoices. This folder will contain three invoice documents and be accessible from the **Server-02** virtual machine.

Task 1: Create a File Share and Upload Files

To create file share, following this procedure

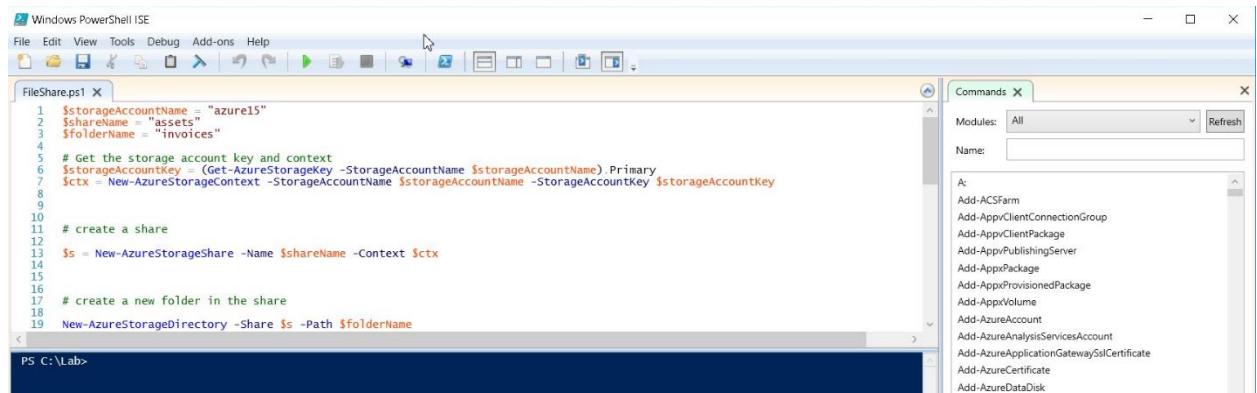
1. Switch to the PowerShell ISE.
2. In the Windows PowerShell ISE, enter the command **Get-AzureAccount** and verify that your Microsoft account is displayed. **Note:** If your account is not displayed, enter the command **Add-AzureAccount** and sign in using your Microsoft account.



```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> Get-AzureAccount

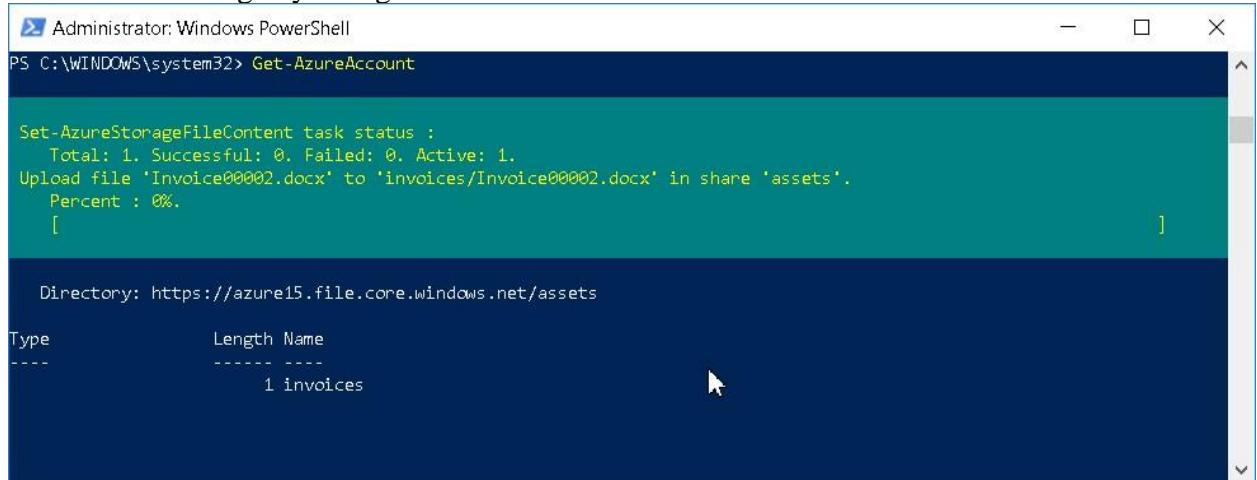
Id                               Type Subscriptions                                     Tenants
--                               --   --
[REDACTED] User 2b1c5659-ba44-4ada-bec9-b53a07460773... {de12b8d9...
```

3. In the script pane, in the **\$storageAccountName** variable declaration at the beginning, replace the value <your_storage_account_name> with the name of the Azure storage account you created in the previous task.
4. Review [the script](#), noting that it performs the following tasks:
 - Declares variables named **\$shareName** and **\$folderName** for the file share and folder to be created.
 - Uses the **Get-AzureStorageKey** cmdlet to retrieve the access key for your storage account.
 - Uses the **New-AzureStorageContext** to create a storage context that connects to your storage account using the access key.
 - Uses the **New-AzureStorageShare** cmdlet to create a share.
 - Uses the **New-AzureStorageDirectory** cmdlet to create a folder in the share.
 - Finds the folder where the script is stored and declares a variable named **\$sourceFolder** that references the **invoices** subfolder.
 - Iterates through the files in the source folder and uses the **Set-AzureStorageFileContent** cmdlet to write each file to the folder in the file share.



```
Windows PowerShell ISE
File Edit View Tools Debug Add-ons Help
FileShare.ps1 X Commands X
File Share.ps1
1 $storageAccountName = "azure15"
2 $shareName = "assets"
3 $folderName = "invoices"
4
5 # Get the storage account key and context
6 $storageAccountKey = (Get-AzureStorageKey -StorageAccountName $storageAccountName) Primary
7 $ctx = New-AzureStorageContext -StorageAccountName $storageAccountName -StorageAccountKey $storageAccountKey
8
9
10
11 # create a share
12 $s = New-AzureStorageShare -Name $shareName -Context $ctx
13
14
15
16 # create a new folder in the share
17 New-AzureStorageDirectory -Share $s -Path $folderName
18
PS C:\Lab>
```

5. Save [the script](#), then on the toolbar, click **Run Script**.
6. Observe the script as it runs, and view the output. Then close the Windows PowerShell ISE without saving any changes.



```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> Get-AzureAccount

Set-AzureStorageFileContent task status :
Total: 1. Successful: 0. Failed: 0. Active: 1.
Upload file 'Invoice00002.docx' to 'invoices/Invoice00002.docx' in share 'assets'.
Percent : 0%.
[

Directory: https://azure15.file.core.windows.net/assets

Type          Length Name
----          ---- 
1 invoices
```

Task 2: Access a File Share from a Virtual Machine

Microsoft Azure Infrastructure step by step

To access file share, following this procedure

1. In Internet Explorer, on the **Microsoft Azure** tab, in the hub menu, click **BROWSE** and click **Virtual machines**. Then in the **Virtual machines** blade, click **Server-02**.
2. In the **Server-02** blade, click **Connect**

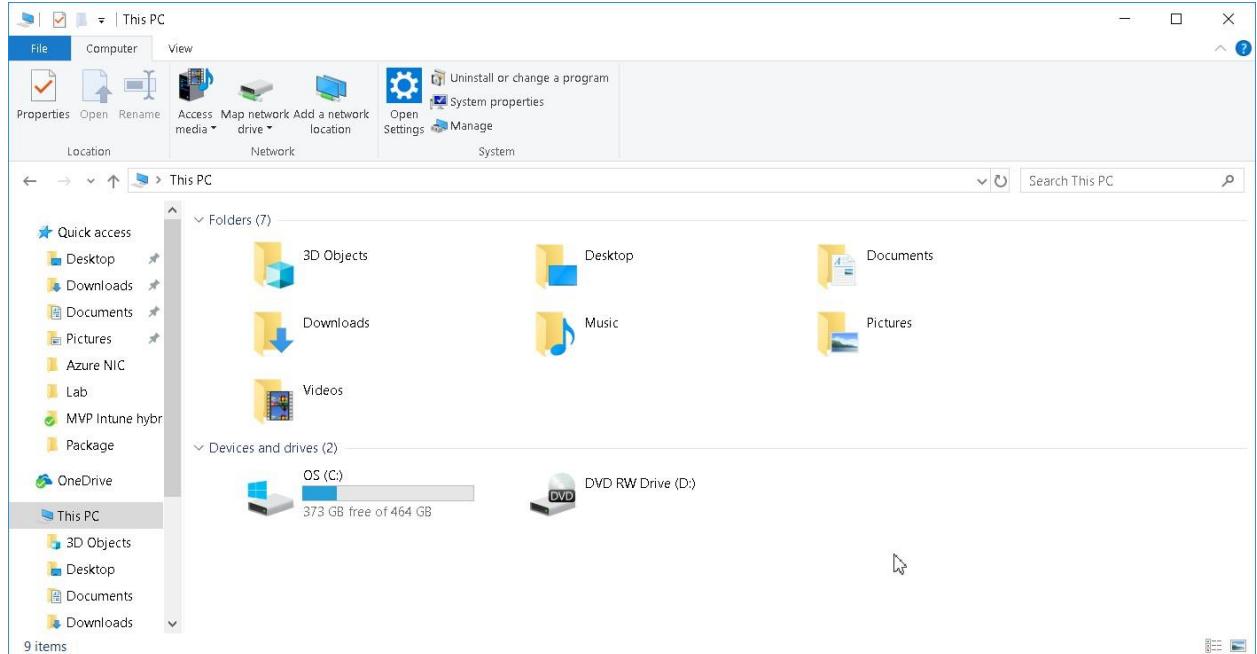
The screenshot shows the Microsoft Azure portal interface. On the left, the navigation bar includes 'Create a resource', 'All services', 'Dashboard', 'Resource groups', 'App Services', 'Function Apps', 'SQL databases', 'Azure Cosmos DB', 'Virtual machines' (selected), 'Load balancers', 'Storage accounts', 'Virtual networks', 'Azure Active Directory', 'Monitor', and 'Advisor'. The main content area shows the 'Server-02' virtual machine details. The 'Overview' tab is selected, displaying information such as Resource group (change), Server-VNET, Status (Running), Location (South Central US), Subscription (change), MSDN Platforms, and Subscription ID. Below this, there are two performance monitoring charts: 'CPU (average)' and 'Network (total)'. The CPU chart shows usage from 0% to 100% over a 30-day period. The Network chart shows traffic from 0B to 100B over the same period, with both 'NETWORK IN' and 'NETWORK OUT' at 0B.

3. In the **Storage** blade, click the storage account you created in the previous exercise. Then, in the blade for your storage account, click **Keys**.
4. On the **Manage Keys** blade, click the **Copy** icon next to the primary access key. If prompted to allow access to the clipboard, click **Allow access**.

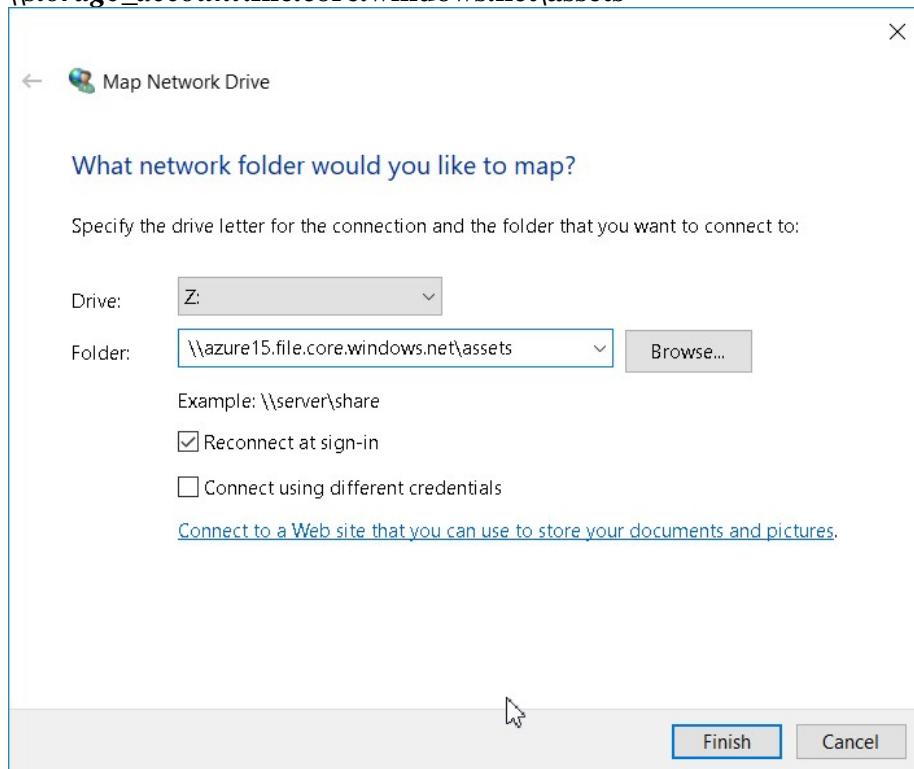
The screenshot shows the Microsoft Azure portal interface. The left navigation bar is identical to the previous screenshot. The main content area shows the 'Storage accounts' blade, listing accounts like 'mohamedmedwzy36@gmail.com (Default Directory)', 'azure15 - Access keys' (selected), 'cdnstgaccount', 'cloudappprod20', 'msdnmlab20mlab0315...', 'server2012r2rgdiag935', and 'test15'. The 'azure15 - Access keys' blade is open, showing the 'Primary' and 'Secondary' access keys. The 'Key' field for the primary key contains the value 'bjlBeFD9+vkd846Xg3+vCkt2w0yChO2HIAhg+L6zpH8JWxPR37wmv4BwQf5/YXKDlvryfuuYBCqjIJYgr45zQ=='. Below it, the 'Connection string' field contains 'DefaultEndpointsProtocol=https;AccountName=azure15;AccountKey=bjlBeFD9+vkd846Xg3+vCkt2w0yChO2HIAhg...'. The 'Secondary' section shows a similar set of fields for the secondary key.

5. In the Server-02 remote desktop window, on the This PC page, click Map Network drive, select Map network drive.

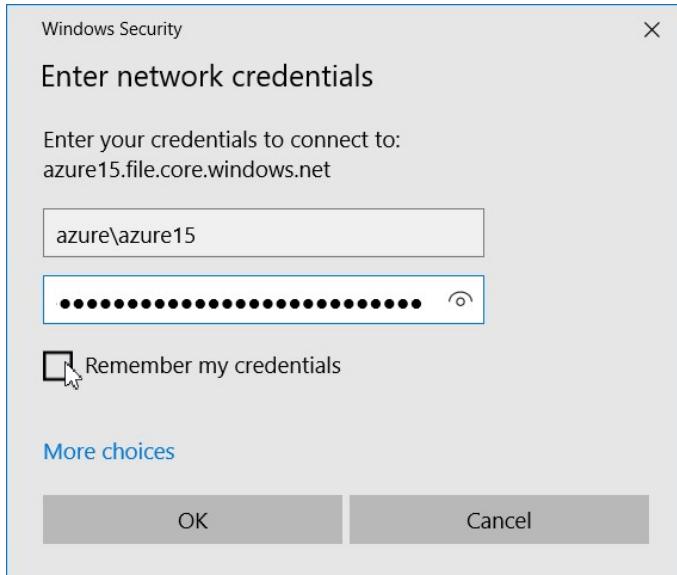
Microsoft Azure Infrastructure step by step



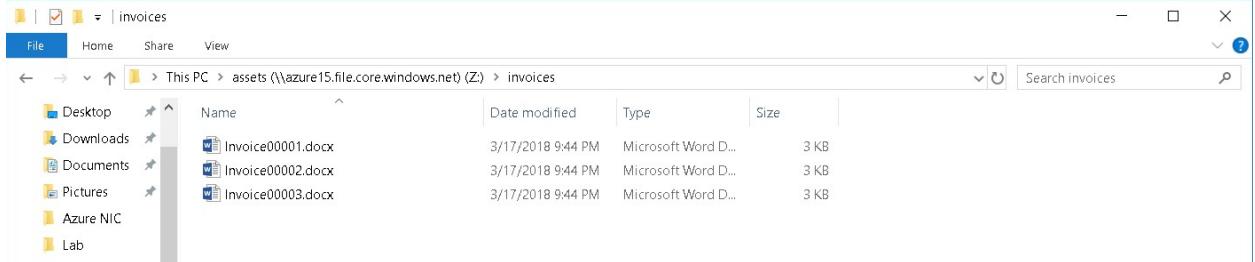
6. In the folder window, enter the following URL
\storage_account.file.core.windows.net\assets



7. In credential Windows, enter the following:
 - Username: **Azure\your-storageaccount**
 - Password: **Enter key that you copy before**



- Double click on z: drive Verify that three invoice files are listed.



Protecting Data with Azure Backup

In Azure Recovery Services, you can use Site Recovery to replicate and fail over from one on-premises set of virtual servers to another. Alternatively, you can replicate and fail over to a set of virtual machines in Azure. You can also use Azure Backup Vaults to protect data by effectively using Azure as an off-site backup medium.

You can use Backup Vaults to protect server data off-site with automated backups to Azure. The maximum retention time for production data using Azure Backup is 30 days, and the maximum size of a single backup from a specific volume is 850 GB. If you wish to retain data for longer than 30 days, you should use System Center 2012 Data Protection Manager with Azure Backup, and this will provide up to 120 days retention of Azure protected data.

In this exercise you will have an Azure backup vault in your subscription, created Backup Vault Credentials, and installed the Azure backup agent. You will have backed up the contents of the **Labs** folders to the backup vault.

Task 1: Create Recovery Service Vault

To create Recovery Service Vault, following this procedure

- Login [Azure Portal](#) using your Azure subscription.

Microsoft Azure Infrastructure step by step

2. On the Hub menu, click **All services** and in the list of resources, type **Recovery Services** and click **Recovery Services vaults**.

The screenshot shows the Microsoft Azure portal's search interface. The search bar at the top contains the text "recovery". Below the search bar, the results are displayed under the heading "Recovery Services vaults". A sub-header "Keywords: Disaster recovery" is shown. To the right of the search results, there is a grid view of virtual machines. The grid has four columns labeled "WebVM1", "Web1", "WebVM2", and "Web3". Each column contains two rows of VMs, both of which are currently "Stopped". The status icons show a blue computer monitor with a red slash.

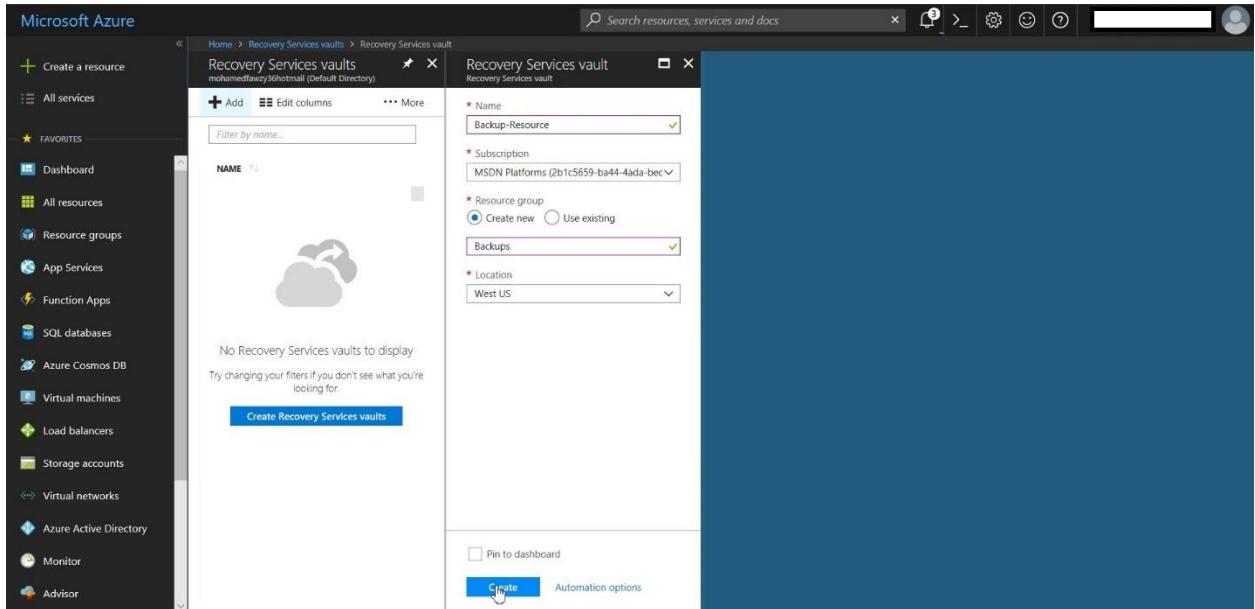
3. On the **Recovery Services vaults** menu, click **Add**

The screenshot shows the "Recovery Services vaults" blade. The left sidebar includes options like "Create a resource", "All services", and "Resource groups". The main area displays a table with three columns: "NAME", "RESOURCE GROUP", and "LOCATION". A large cloud icon is centered above the table. Below the table, a message states "No Recovery Services vaults to display" and "Try changing your filters if you don't see what you're looking for.". At the bottom of the blade, there is a prominent blue button labeled "Create Recovery Services vaults".

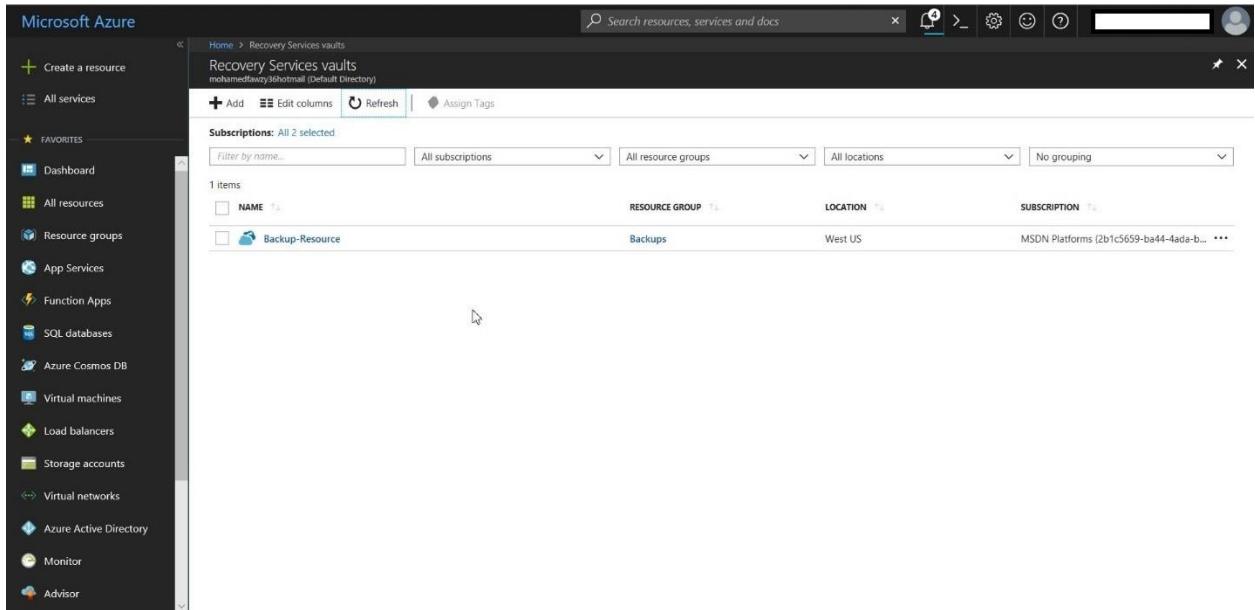
4. Enter the following data, At the bottom of the Recovery Services vault blade, click **Create**

- Name: **Backup-Resources**
- Resource Group: Select **New** and type **Backups**

Microsoft Azure Infrastructure step by step



- Once it's created.



Task 2: Set Storage Redundancy

To set storage redundancy, following this procedure

- From the **Recovery Services vaults** blade, click the vault that you created before. The vault details blade open.

Microsoft Azure Infrastructure step by step

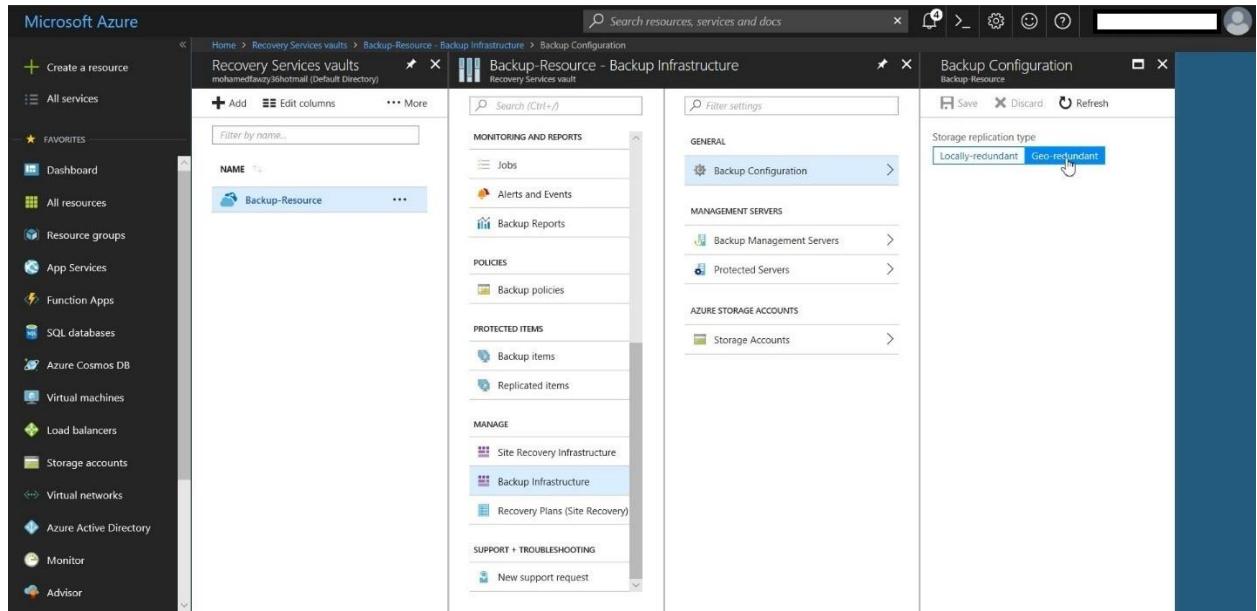
The screenshot shows the Microsoft Azure portal interface. The left sidebar contains a 'FAVORITES' section with various service icons. The main content area is titled 'Recovery Services vaults' and shows a single item named 'Backup-Resource'. The table details for this vault are:

NAME	RESOURCE GROUP	LOCATION	SUBSCRIPTION
Backup-Resource	Backups	West US	MSDN Platforms (2b1c5659-ba44-4ada-b...)

2. In the new vault's Settings blade, use the vertical slide to scroll down to the Manage section, and click **Backup Infrastructure**.

The screenshot shows the 'Backup-Resource' Recovery Services vault settings page. The left sidebar includes sections like Monitoring and Reports, Policies, Protected Items, Manage, and Support + Troubleshooting. The main area has tabs for 'Backup' and 'Site Recovery'. The 'Backup' tab is active, displaying monitoring information such as Backup Alerts (last 24 hours) and Backup Pre-Check Status (Azure VMs). It also shows usage statistics for Backup items and Backup Storage.

3. In the Backup Infrastructure blade, click **Backup Configuration** to open the **Backup Configuration** blade. Choose the appropriate storage replication option for your vault.

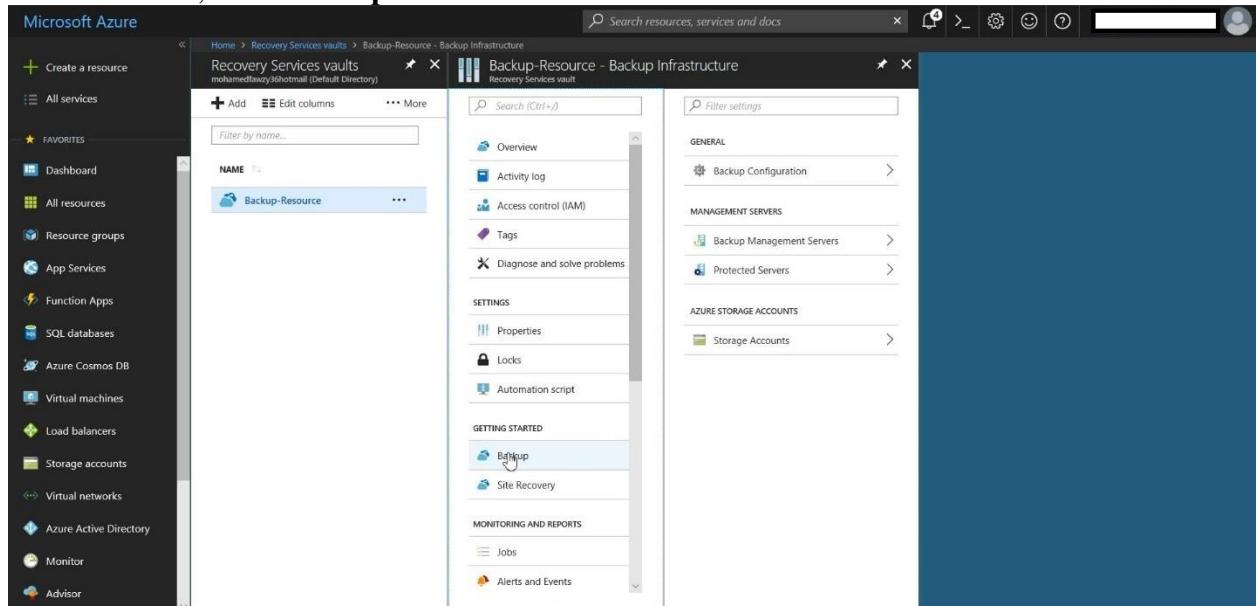


By default, your vault has geo-redundant storage. If you use Azure as a primary backup storage endpoint, continue to use **Geo-redundant**. If you don't use Azure as a primary backup storage endpoint, then choose **Locally-redundant**, which reduces the Azure storage costs.

Task 3: Install and Configure a Backup Agent

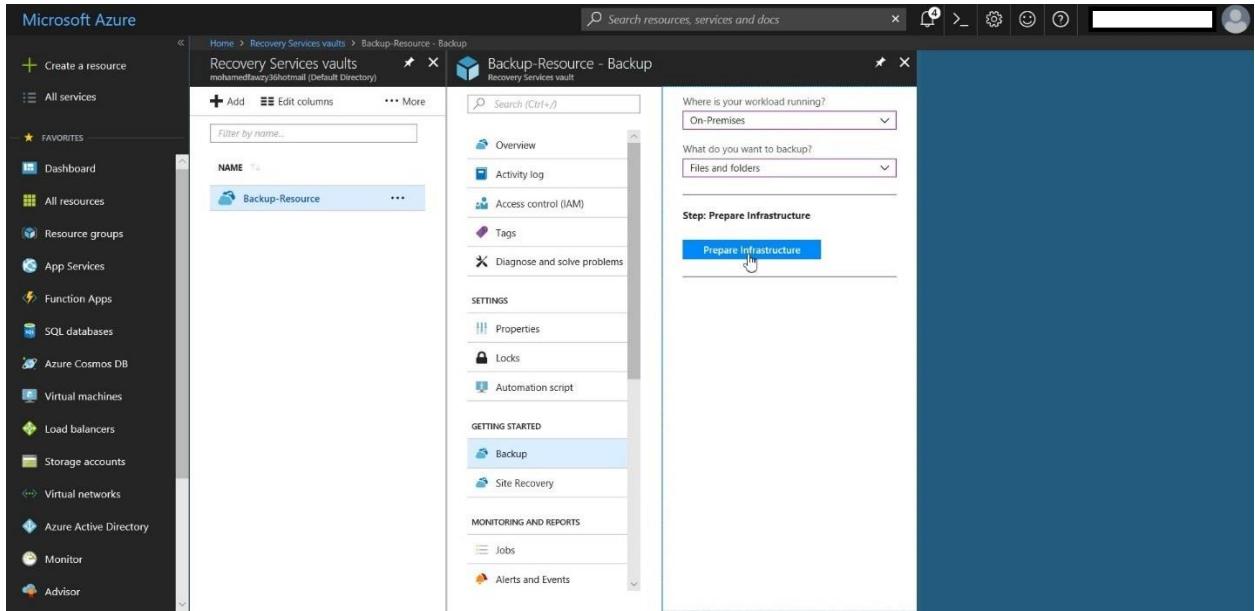
To install backup Agent, following this procedure

1. On the Recovery Services vault blade (for the vault you just created), in the Getting Started section, click **Backup**.

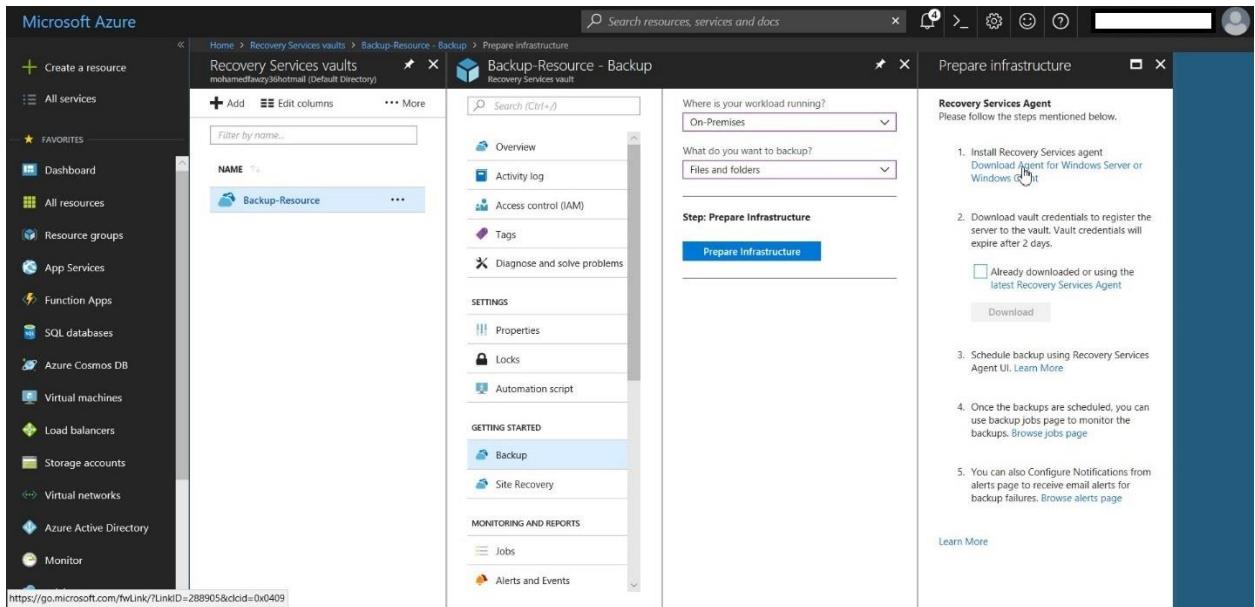


2. From the **Where is your workload running?** drop-down menu, select **On-premises**.
3. From the **What do you want to backup?** menu, select **Files and folders**, and click **OK**.

Microsoft Azure Infrastructure step by step



4. On the **Prepare infrastructure** blade, click **Download Agent for Windows Server or Windows Client**.



5. On the **Prepare infrastructure** blade, Select download vault credential. click **Download**.

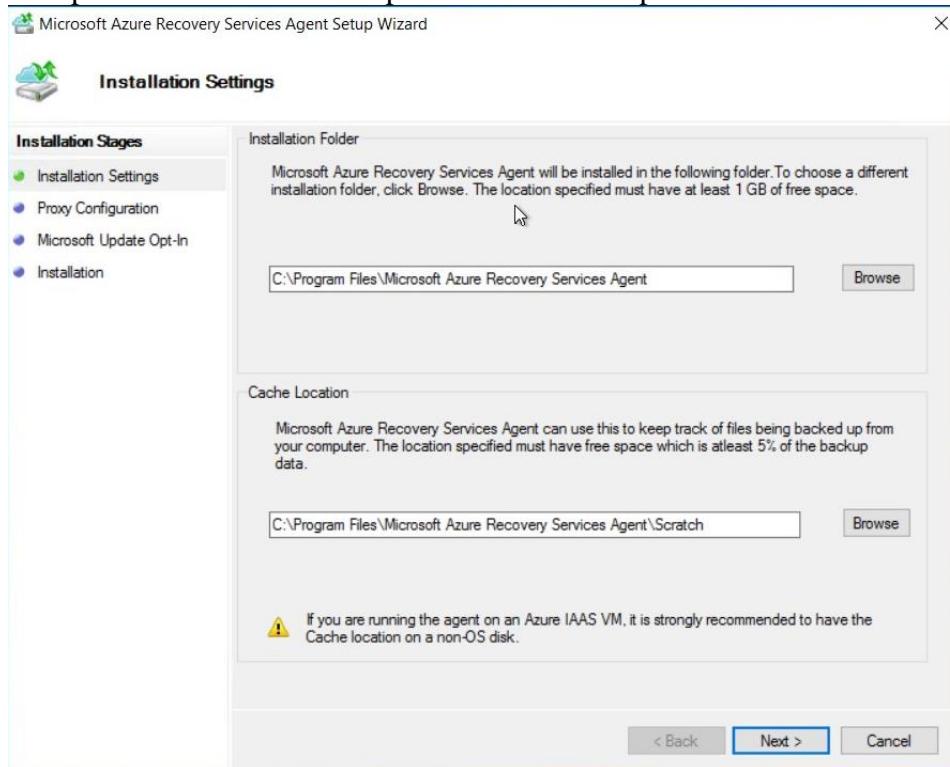
Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal with the following windows open:

- Left sidebar:** Shows 'Create a resource', 'All services', and a list of resources including Dashboard, All resources, Resource groups, App Services, Function Apps, SQL databases, Azure Cosmos DB, Virtual machines, Load balancers, Storage accounts, Virtual networks, Azure Active Directory, Monitor, and Advisor.
- Middle-left window:** 'Recovery Services vaults' titled 'mohamedfawzy3@hotmail (Default Directory)'. It lists a single item: 'Backup-Resource'.
- Middle-right window:** 'Backup-Resource - Backup' under 'Recovery Services vault'. It has tabs for Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Properties, Locks, Automation script, Backup, Site Recovery, and Jobs. The 'Backup' tab is selected.
- Rightmost window:** 'Prepare infrastructure' titled 'Recovery Services Agent'. It contains steps:
 - Install Recovery Services agent
 - Download vault credentials to register the server to the vault. Vault credentials will expire after 2 days.
 - Schedule backup using Recovery Services Agent UI. Learn More
 - Once the backups are scheduled, you can use backup jobs page to monitor the backups. Browse jobs page
 - You can also Configure Notifications from alerts page to receive email alerts for backup failures. Browse alerts pageA checkbox 'Already downloaded or using the latest Recovery Services Agent' is checked, and a 'Download' button is visible.

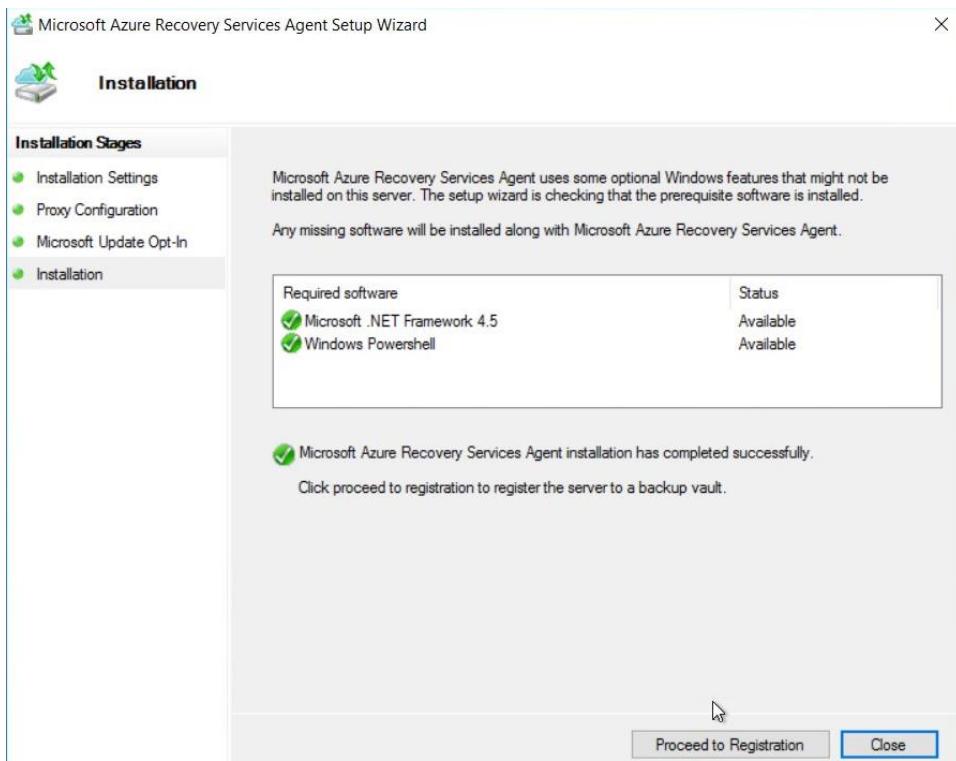
At the bottom, a message says 'MARSAgentInstaller.exe finished downloading.' with buttons for Run, Open folder, and View downloads.

6. When prompted to run or save the file, click **Run**. Then when prompted to allow the program to make changes, click **Yes** and complete the wizard to install the agent. Choose the option to use Microsoft Update to check for updates.

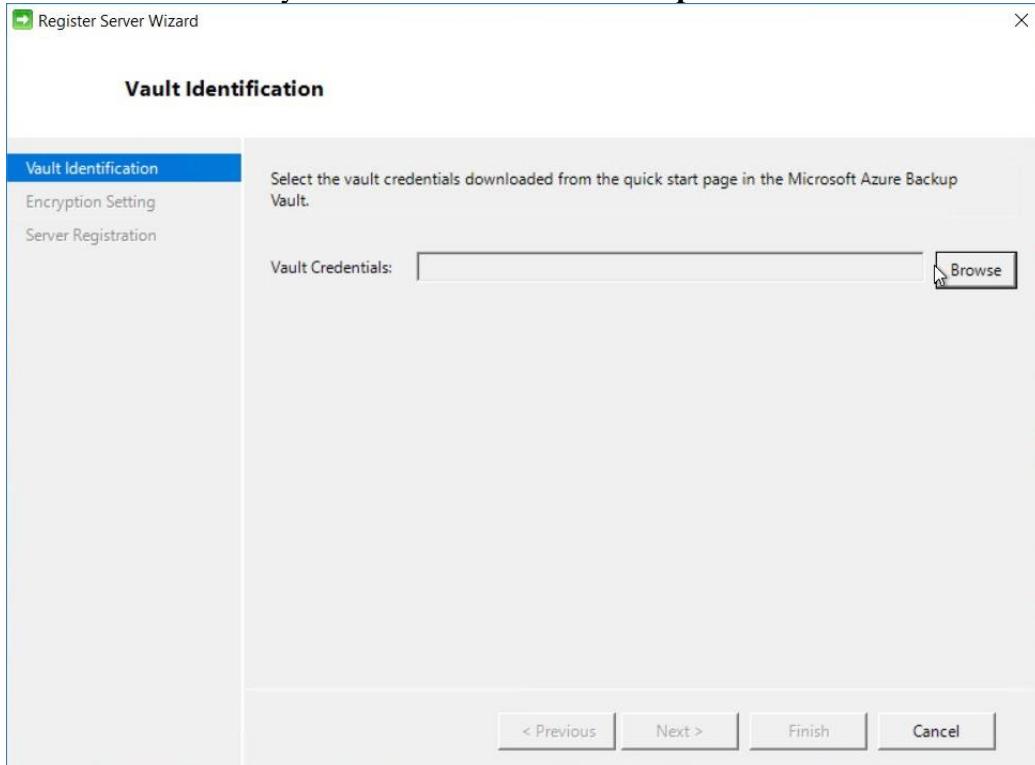


7. In Microsoft Azure Backup, in the **Actions** pane, click **Proceed to Registration**.

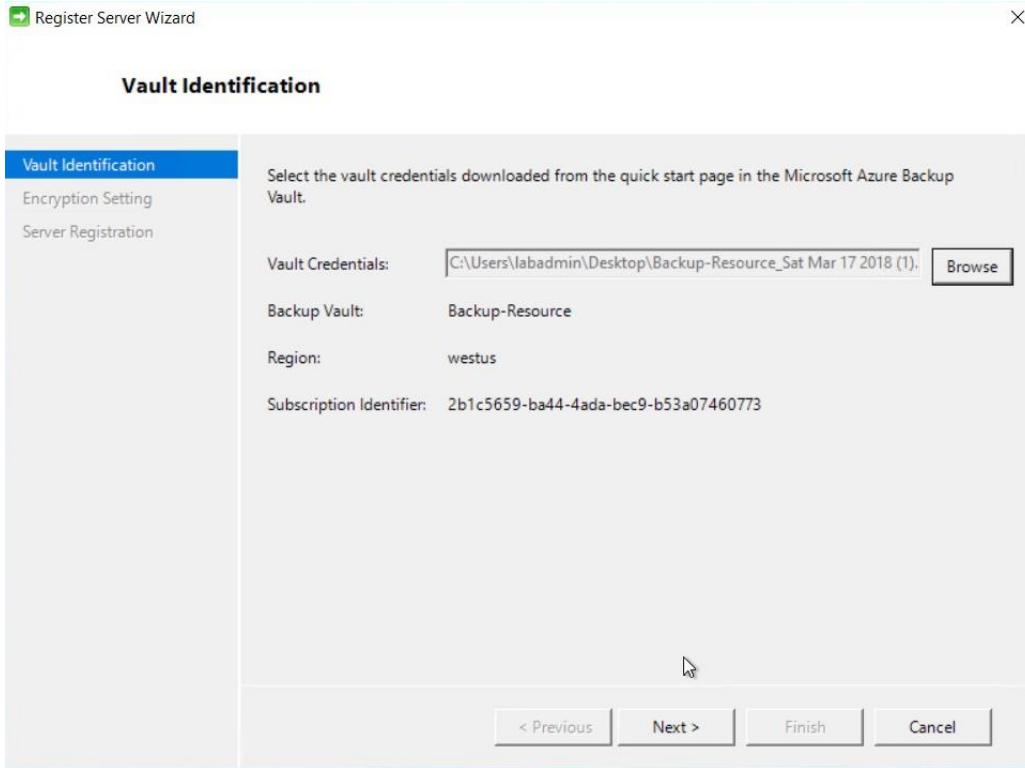
Microsoft Azure Infrastructure step by step



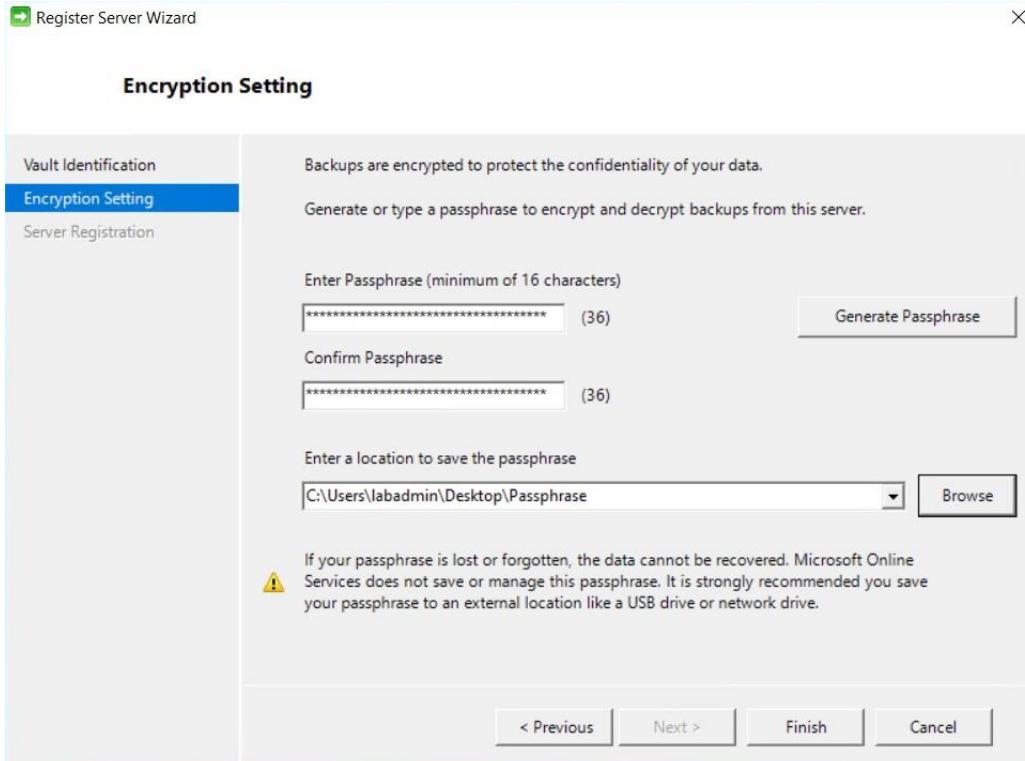
8. On the **Vault Identification** page, click **Browse**, navigate to the **Downloads** folder, and select the credentials you created earlier and click **Open**.



9. On the **Vault Identification** page, click **Next**.

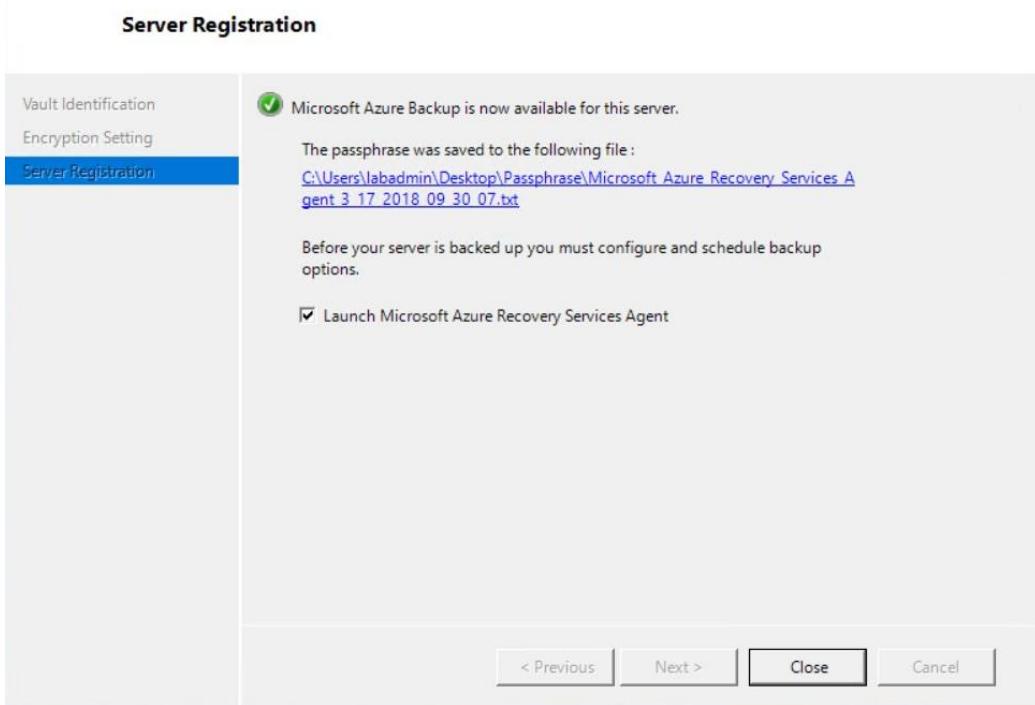


10. On the **Encryption Setting** page, click **Generate Passphrase**. Then click **Browse** and browse to the **C:\lab** folder, click **OK**.



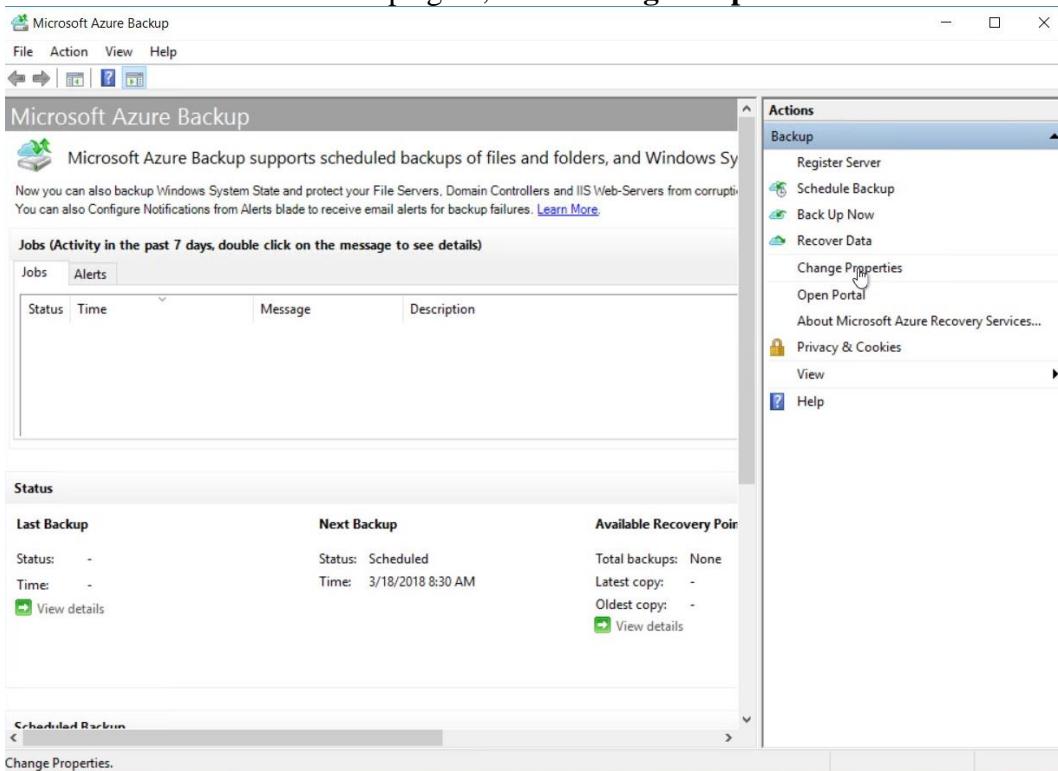
11. Click **Register**. Then, when registration is complete, click **Close**.

Register Server Wizard

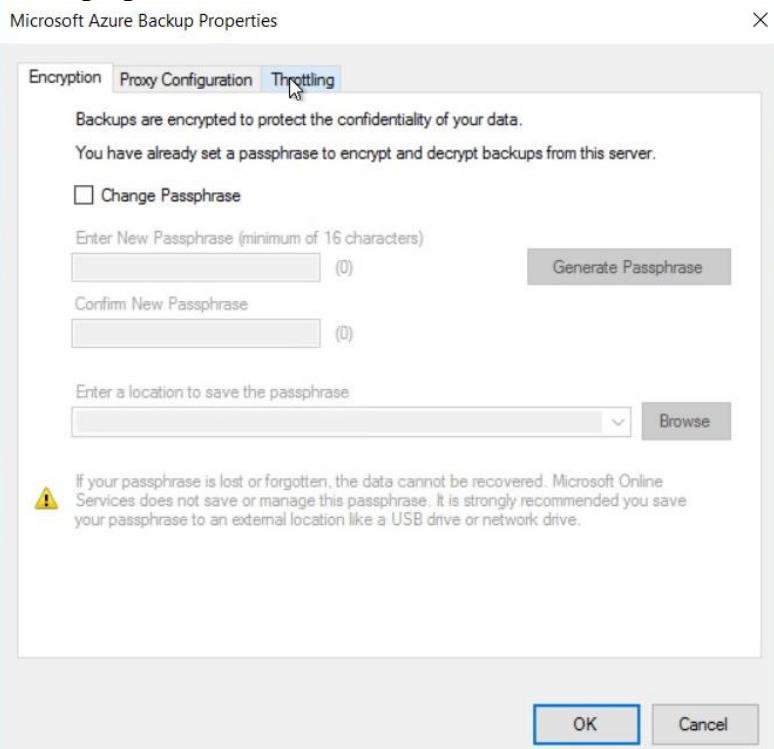


To enable network throttling

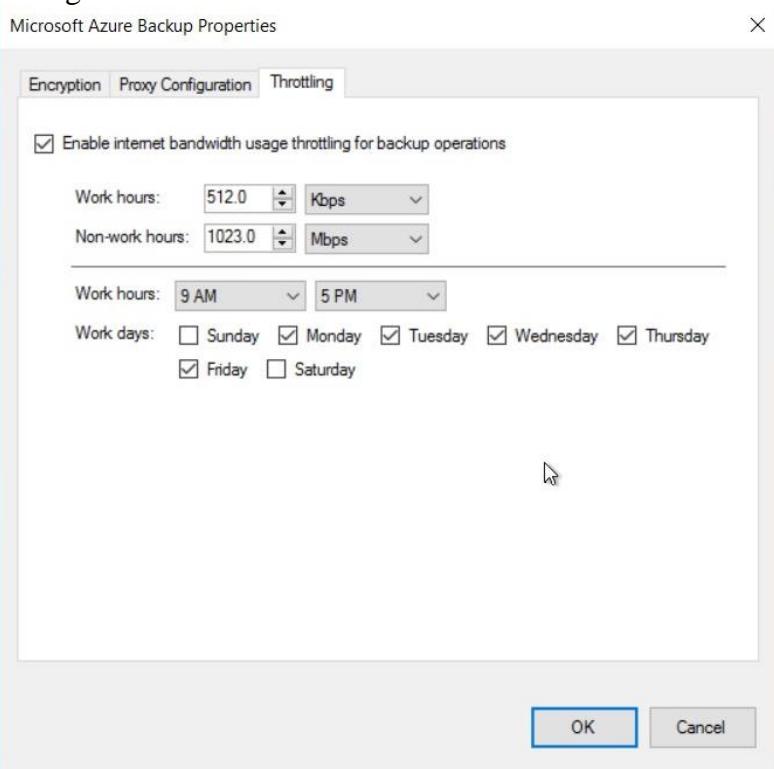
1. In the Microsoft Azure Backup agent, click **Change Properties**.



2. On the **Throttling** tab, select the **Enable internet bandwidth usage throttling for backup operations** check box.



3. After you have enabled throttling, specify the allowed bandwidth for backup data transfer during **Work hours** and **Non-work hours**. Click **OK**.

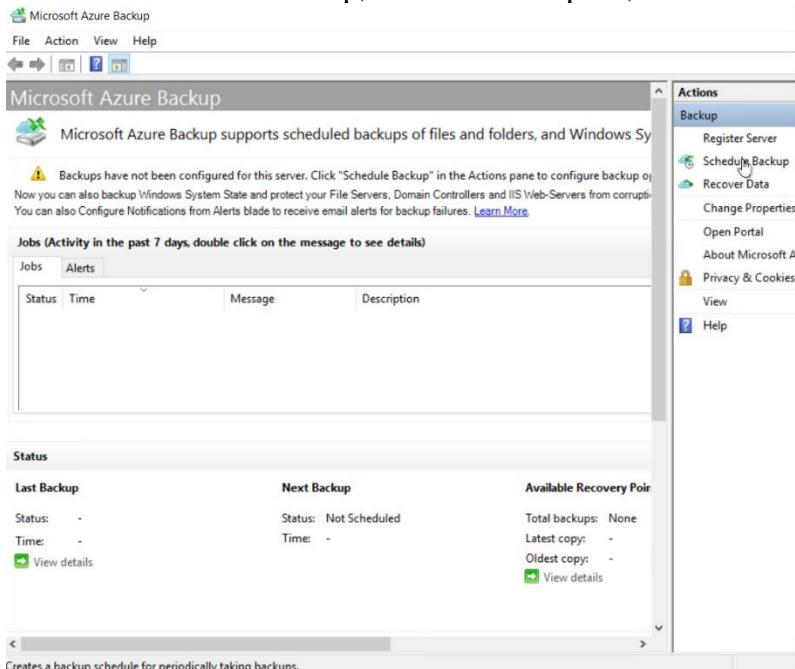


The bandwidth values begin at 512 kilobits per second (Kbps) and can go up to 1,023 megabytes per second (MBps). You can also designate the start and finish for **Work hours**, and which days of the week are considered work days. Hours outside of designated work hours are considered non-work hours.

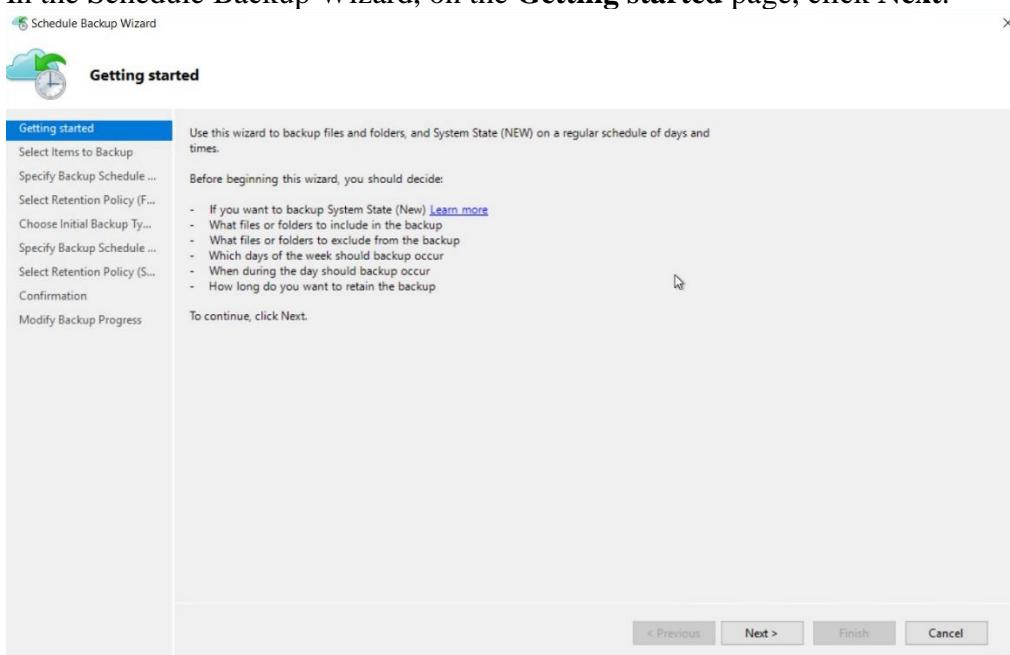
Task 4: Create a Backup Schedule

To create Backup Schedule, following this procedure

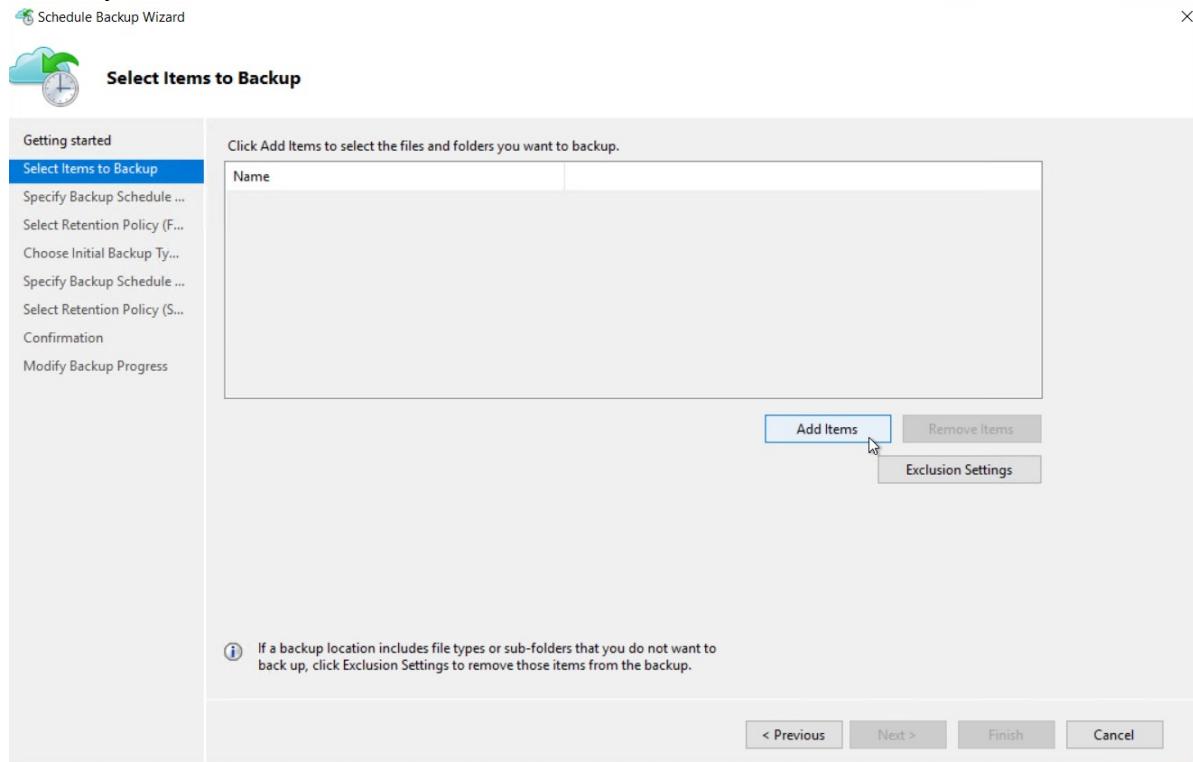
1. In Microsoft Azure Backup, in the **Actions** pane, click **Schedule Backup**.



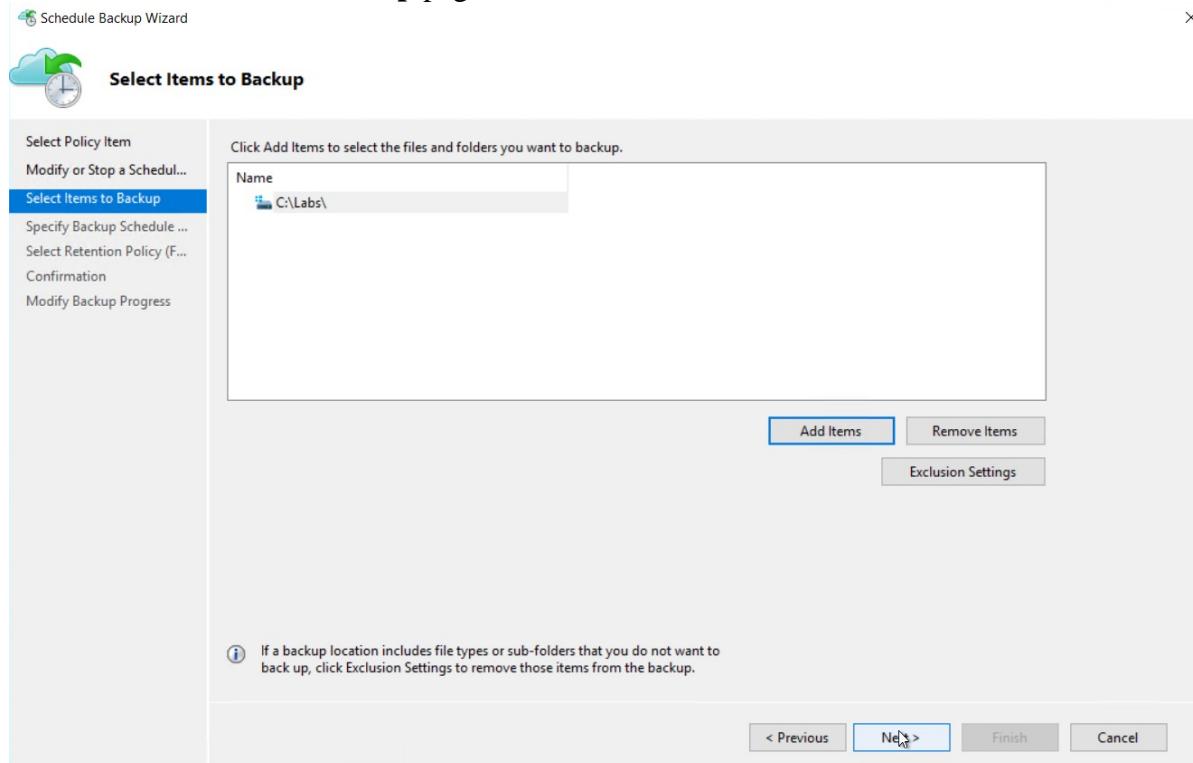
2. In the Schedule Backup Wizard, on the **Getting started** page, click **Next**.



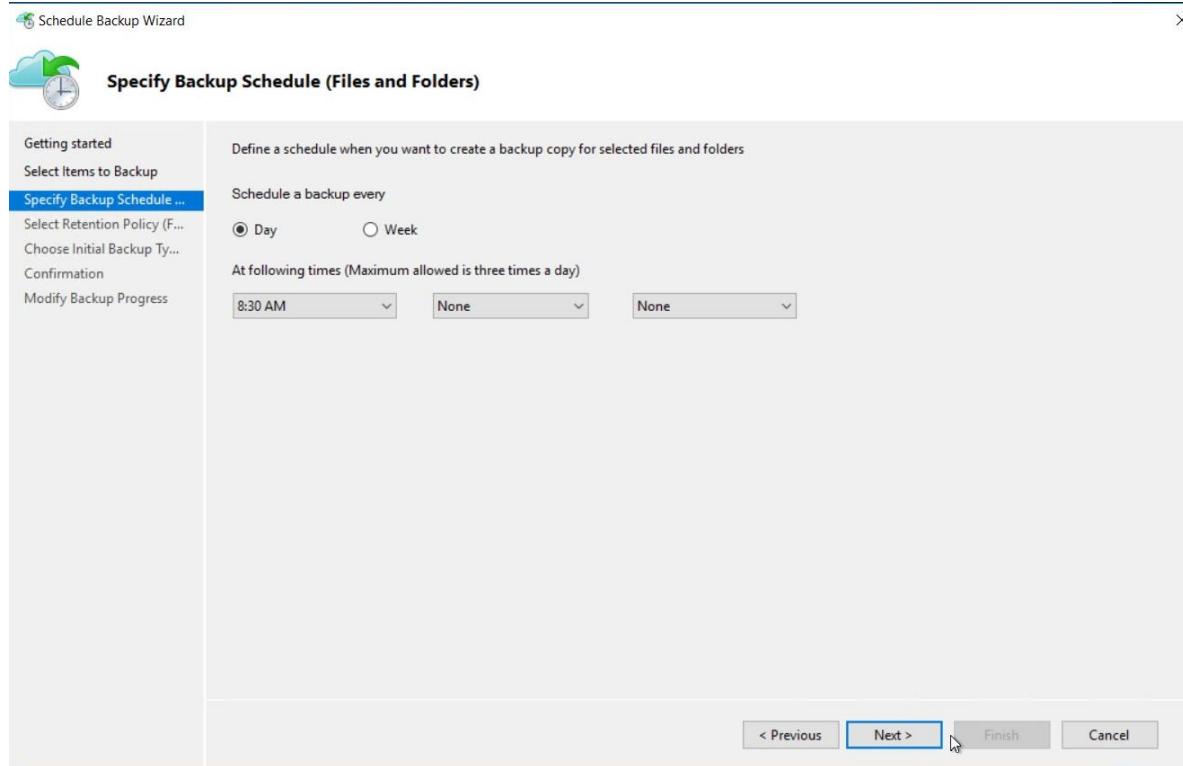
3. On the **Select Items to Backup** page, click **Add Items**. Then in the **Select Items** dialog box, expand **C**, and select the **Labs** folders and click **OK**.



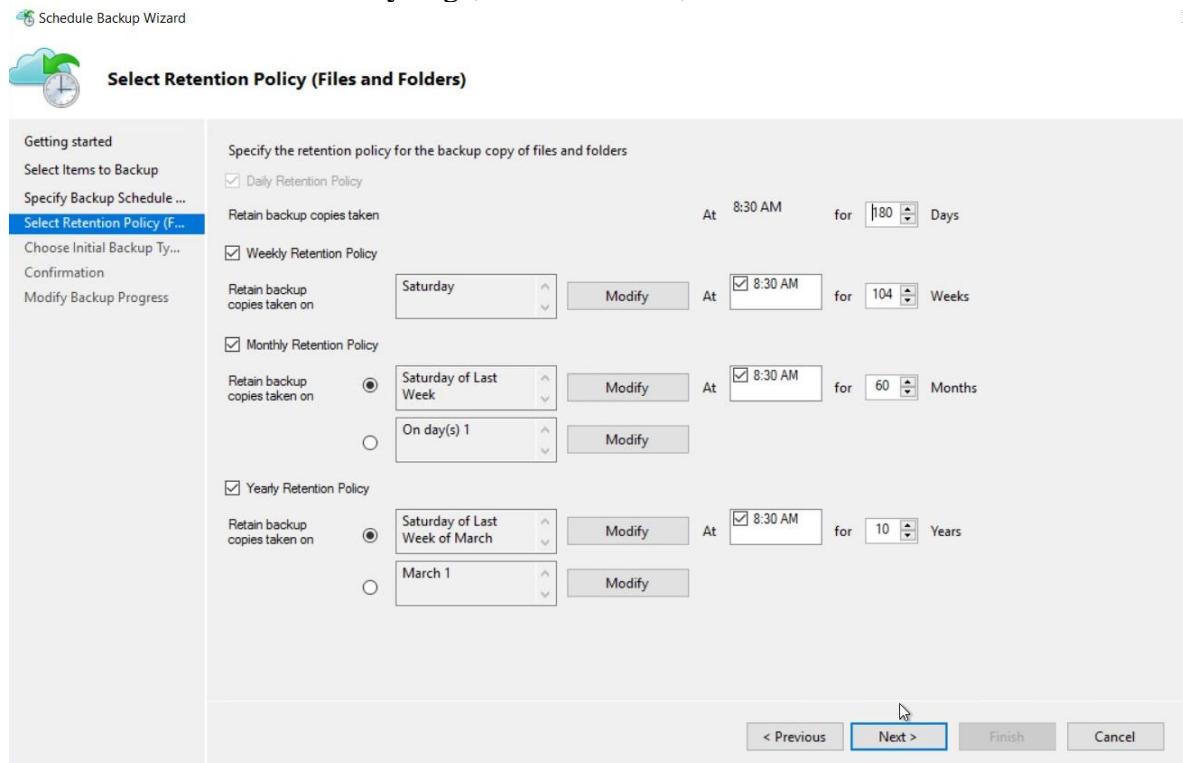
4. On the **Select Items to Backup** page, click **Next**.



5. On the **Specify Backup Time** page, click **8:30 AM**, and then click **Next**.

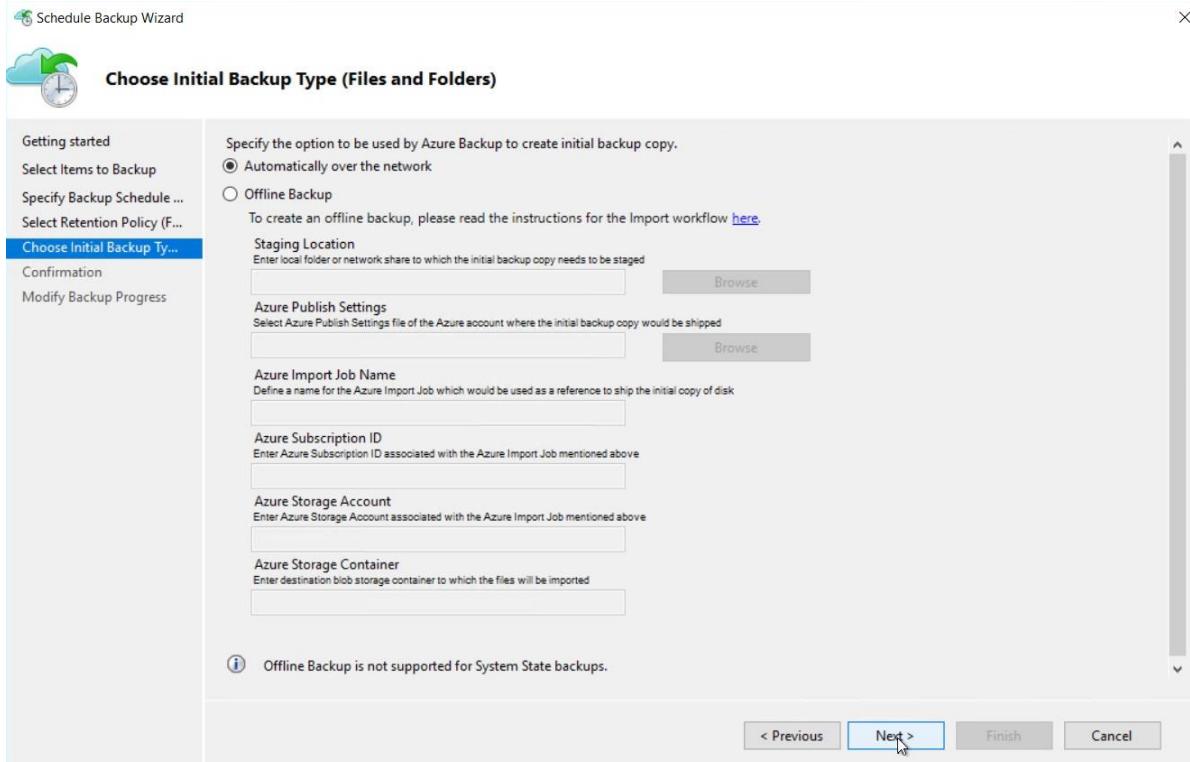


6. In the **Select Retention Policy** Page, click **8:30 AM**, and then click **Next**.

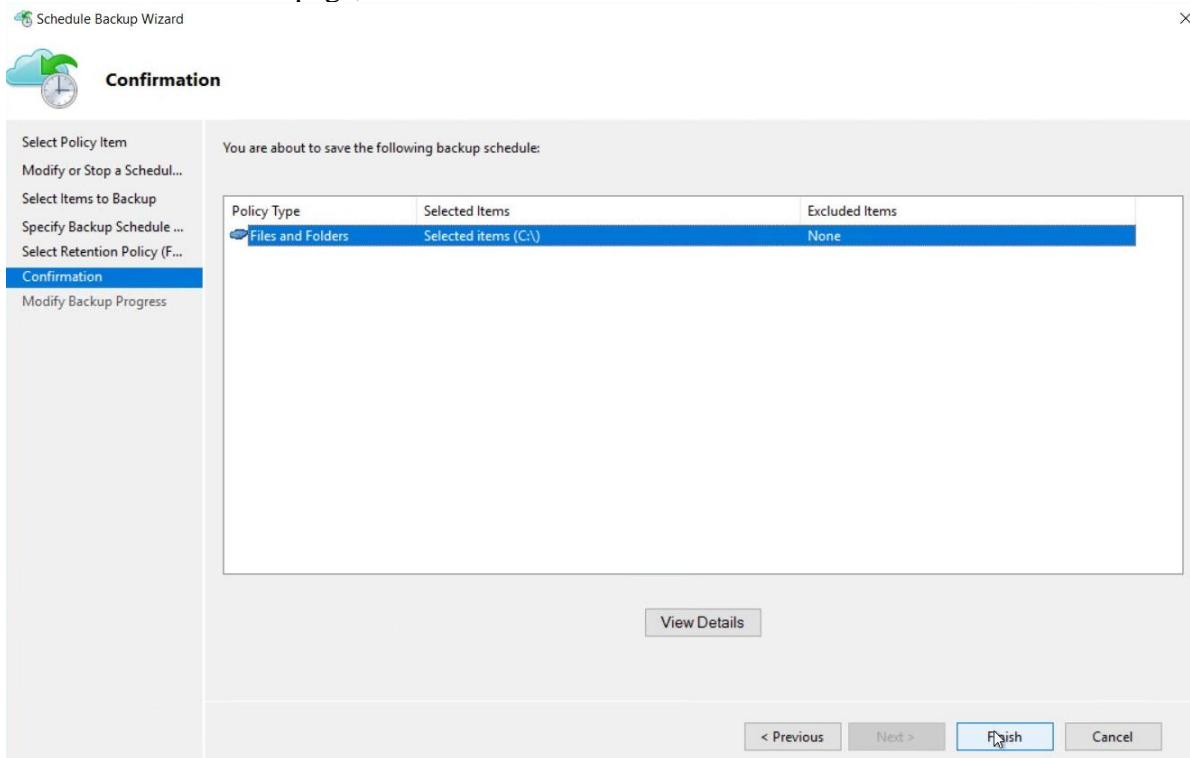


7. Select **Automatically over the network**, click **Next**

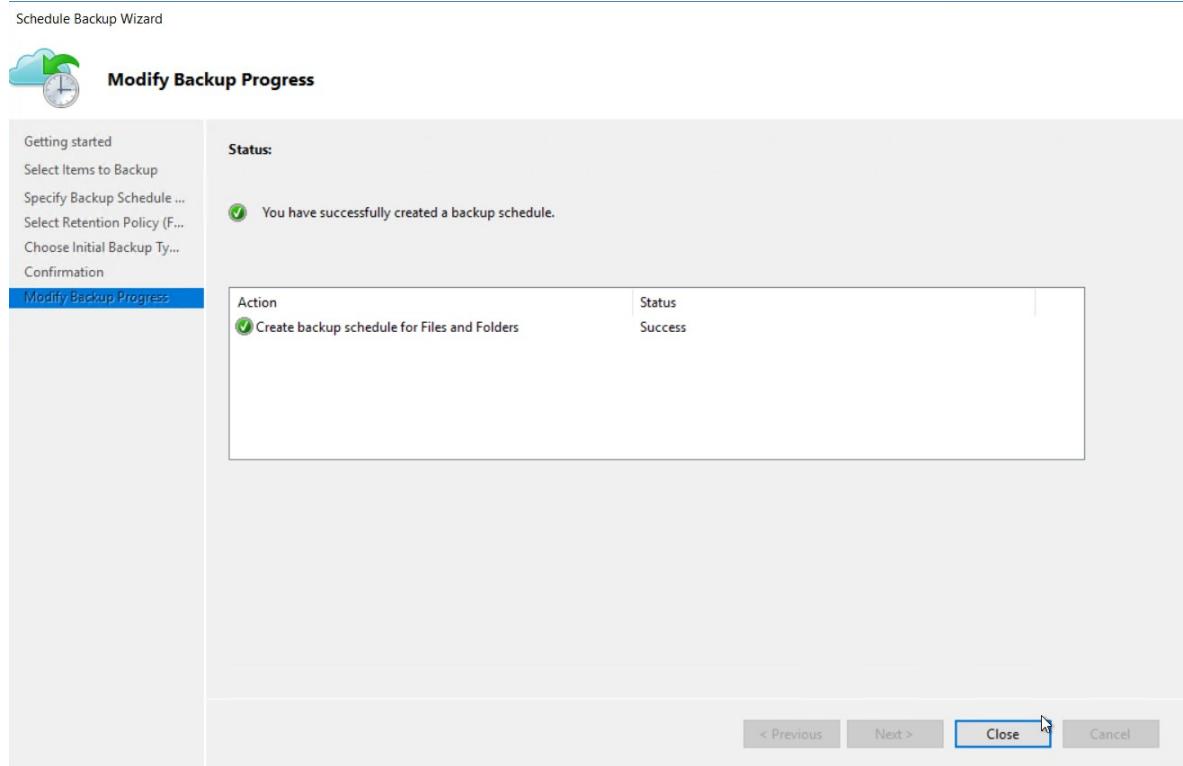
Microsoft Azure Infrastructure step by step



8. On the Confirmation page, click **Finish**.



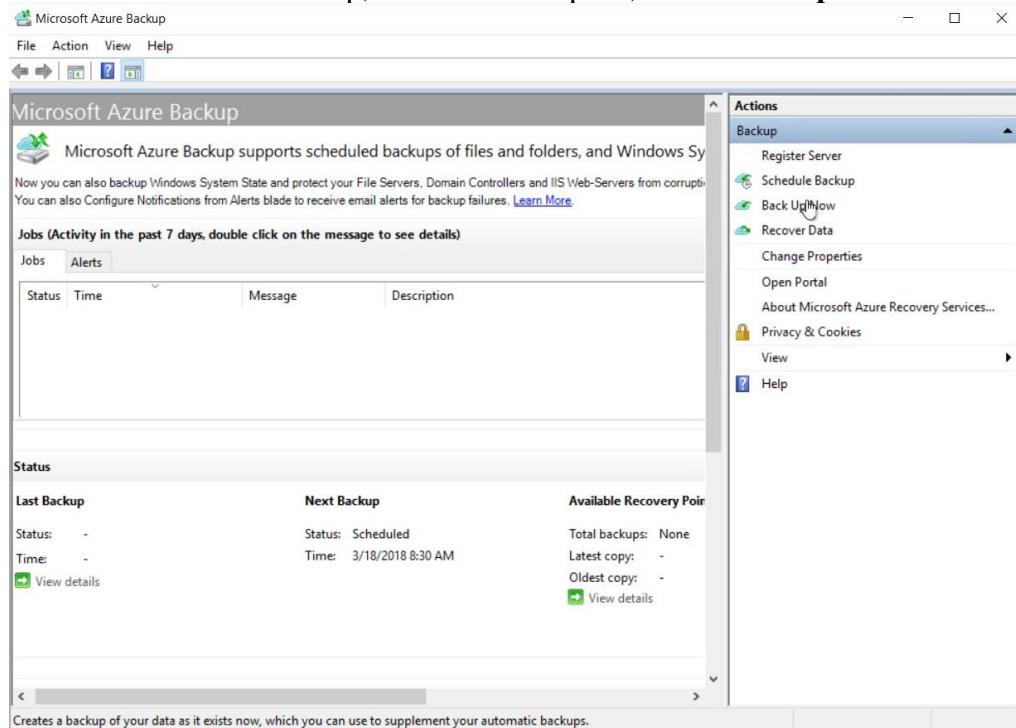
9. When the backup schedule is created, click **Close**.



Task 5: Run a Backup

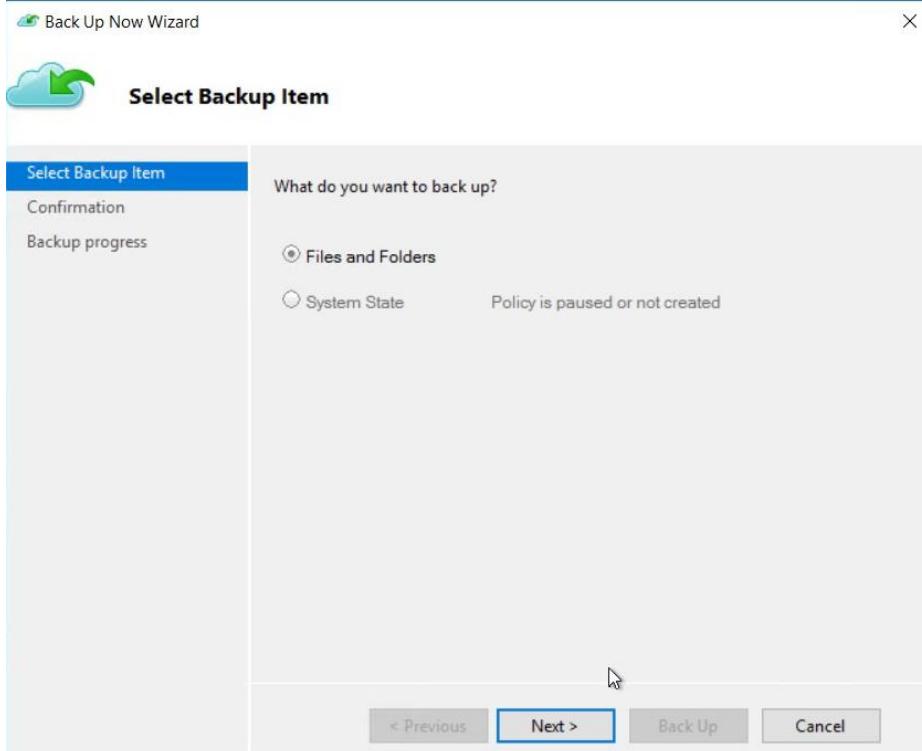
To run Azure Backup, following this procedure

1. In Microsoft Azure Backup, in the **Actions** pane, click **Back Up Now**.

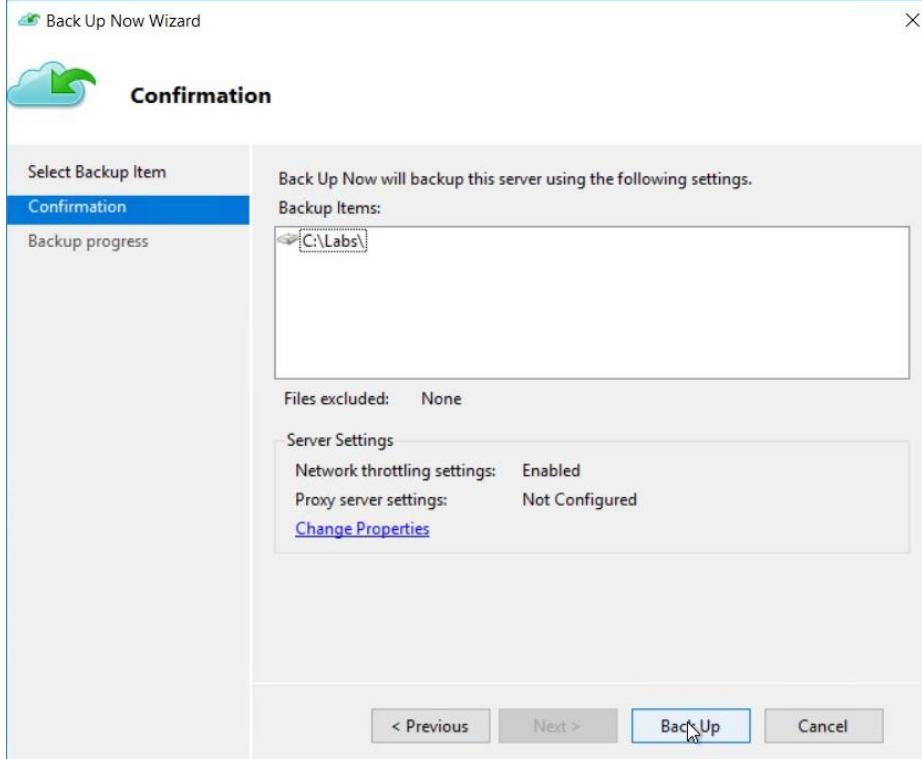


Microsoft Azure Infrastructure step by step

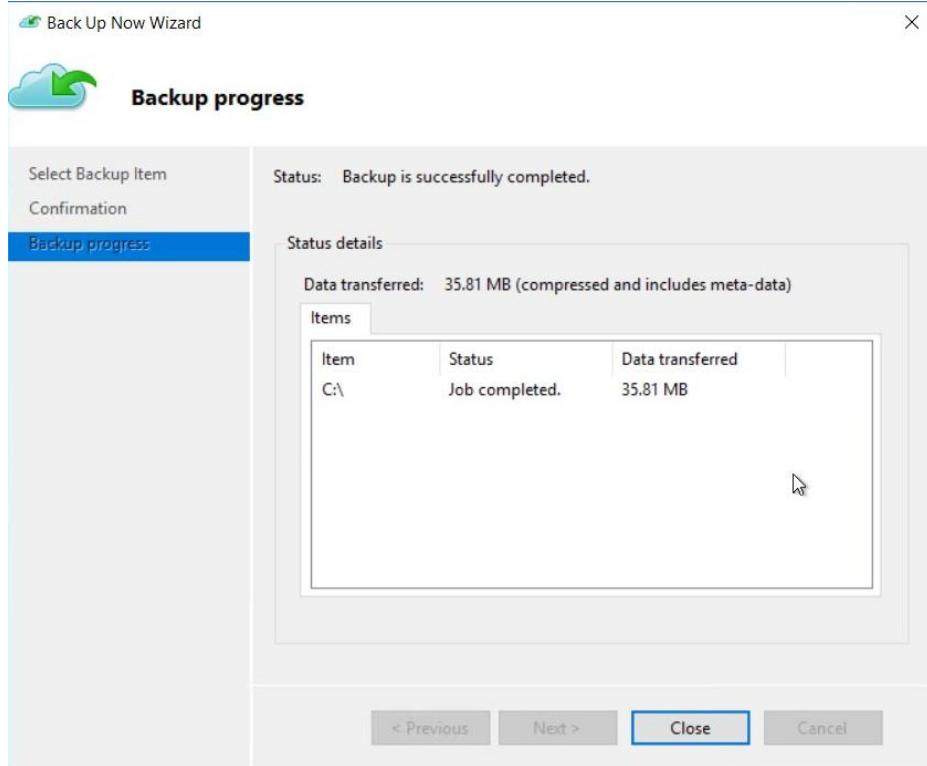
2. In the Back Up Now Wizard, click **Next**.



3. In the Back Up Now Wizard, on the **Confirmation** page, click **Back Up**.



4. When the backup is complete, click **Close**, and close Microsoft Azure Backup.



- In Internet Explorer, in the full Azure portal, on the page for your backup vault, click Servers and verify that the Server-02 server is listed.

The screenshot shows the Microsoft Azure portal with the URL 'https://portal.azure.com/#blade/Microsoft_Azure_RecoveryServices/BackupResourceBlade/Overview'. The left sidebar shows 'All services' and 'Recovery Services vaults'. The main content area is titled 'Backup-Resource' and shows 'Overview' details. It includes sections for 'Monitoring' (Backup Alerts last 24 hours: Critical 1, Warning 0), 'Usage' (Backup items: 2, Backup Storage: Cloud - LRS 0 B, Cloud - GRS 0 B), and 'Backup Jobs' (In progress 0, Failed 0). There are also 'Backup' and 'Site Recovery' buttons at the top right.

Chapter 6

Azure SQL Database Service

Microsoft Azure provides multiple services that you can use to store, manage, and analyze data. The appropriate service to use depends on the specific data management requirements of the applications your Azure infrastructure must support.

Microsoft has included the SQL Database service within Azure. This is a Platform as a Service (PaaS) offering that frees you from patching and maintaining operating systems and database management software. It also includes built-in features for fault tolerance and scalability.

Creating, Securing, and Monitoring an Azure SQL Database

Azure [SQL Database](#) is a managed cloud database for application developers. It is a fully managed database-as-a-service built on SQL. The service is useful in scenarios where you want the power of a relational database without the infrastructure and management hassles. Here are some good reasons to consider Azure SQL database.

- **Automatic tuning.** SQL Database can track each query and its duration, frequency, and resource utilization. Based on this telemetry, automatic algorithms optimally tune your databases exactly to your queries.
- **Easy to scale.** SQL Database makes it easy to scale at a moment's notice. You can scale performance up or down, and on the fly to quickly adapt to changing workload demands.
- **Layered protection.** SQL Database provides multiple layers of data protection. Your data is protected by encrypting data while at rest, in motion or in use, authenticating only authorized users against the database or application, and limiting user access to the appropriate subset of the data.
- **No administration required.** SQL Database provides the automatic administration and data protection such as back-ups, disaster recovery failover, infrastructure maintenance, security and software patches, and feature updates.
- **Threat and anomaly detection.** With threat and anomaly detection, SQL Database has built-in behavioral analysis, real-time alerts, a configurable threat policy, an audit log, and intelligent ways to detect and fix unusual patterns.

In this exercise, you will have created an Azure SQL Database named **operations** on a new server with a name of your choosing. You will also have used SQL Server Management Studio to create a table named **dbo.serverlist** and created an alert to help you monitor database storage

Task 1: Create a SQL Database

To create SQL Database, following this procedure

Microsoft Azure Infrastructure step by step

1. Start Internet Explorer, browse to <http://portal.azure.com>, and sign in using the Microsoft account that is associated with your Azure subscription.
2. In the Hub menu on the left, click **New**, and then click **SQL Database**.

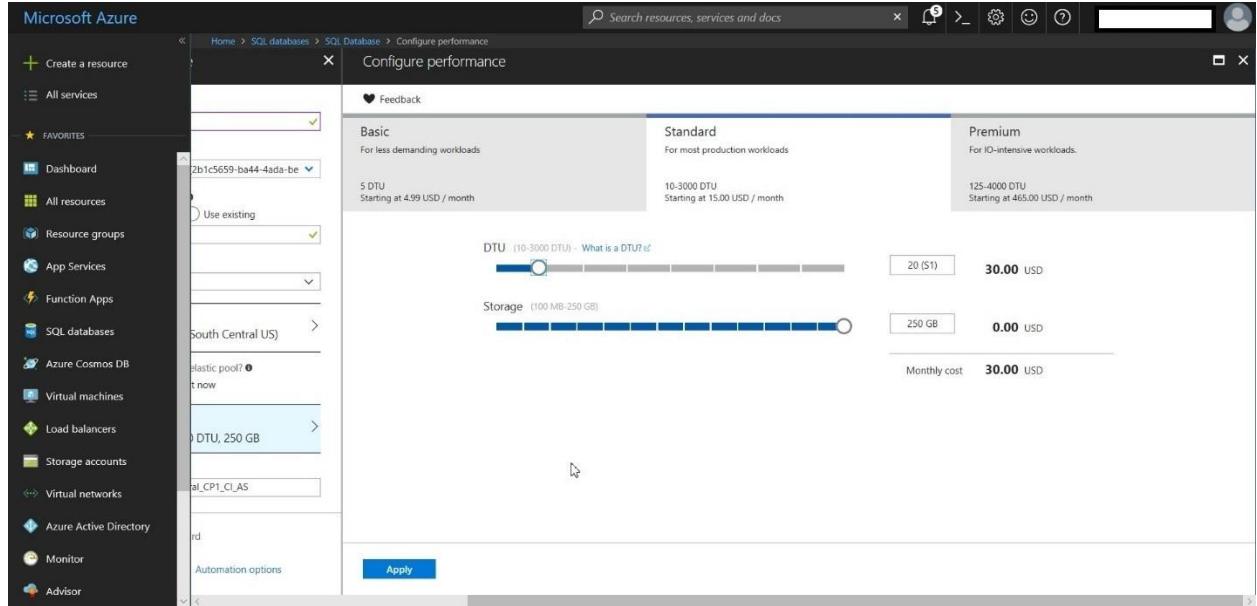
The screenshot shows the Microsoft Azure portal interface. On the left, there is a navigation sidebar with various service icons. The 'SQL Databases' icon is highlighted with a mouse cursor. The main content area has a title 'SQL databases' and a sub-header 'mohamedfawzy36@hotmail (Default Directory)'. It includes a search bar and several filter dropdowns: 'Subscriptions: All 2 selected', 'Filter by name...', 'All subscriptions', 'All resource groups', 'All locations', and 'No grouping'. Below these filters, there is a table header with columns: NAME, STATUS, REPLICATION ROLE, SERVER, PRICING TIER, LOCATION, and SUBSCRIPTION. A large 'SQL' cylinder icon is centered in the main area, and below it, a message says 'No SQL databases to display' with a note 'Try changing your filters if you don't see what you're looking for.' At the bottom right, there is a blue 'Create SQL databases' button. The URL in the browser's address bar is https://portal.azure.com/#@mohamedfawzy36@hotmail.onmicrosoft.comblade/HubsExtension/Resources/resourceType/Microsoft.Sql%2fservers.

3. Click **Add**.

This screenshot shows the 'Add' blade for creating a new SQL database. The 'Add' button is highlighted with a mouse cursor. The rest of the page is identical to the previous screenshot, showing the 'SQL databases' blade with no results. The URL in the browser's address bar is https://portal.azure.com/#@mohamedfawzy36@hotmail.onmicrosoft.comblade/HubsExtension/Resources/resourceType/Microsoft.Sql%2fservers.

4. In the **SQL database** blade, in the **NAME** box, type **operations**.
5. Click **Pricing Tier**, and in the **Recommended pricing tiers** blade, click **Browse All Pricing Tiers**.
6. In the **Change your pricing tier to** blade, click **S1 Standard**, and then click **Select**.

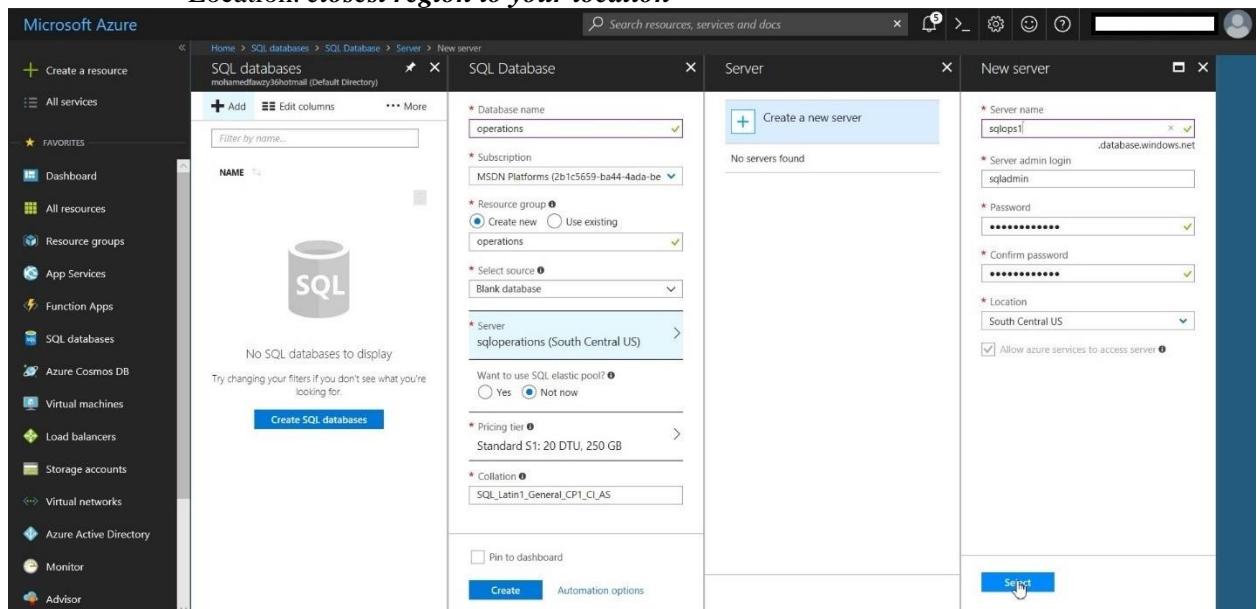
Microsoft Azure Infrastructure step by step



7. Click **Server**, and then in the **Server** blade, click **Create a new server**.

8. In the **New server** blade, enter the following settings and click **OK**:

- Server Name: *any valid unique name*
- Server admin Login: **Sqldadmin**
- Password: **Pa\$\$w0rd**
- Confirm Password: **Pa\$\$w0rd**
- Location: *closest region to your location*

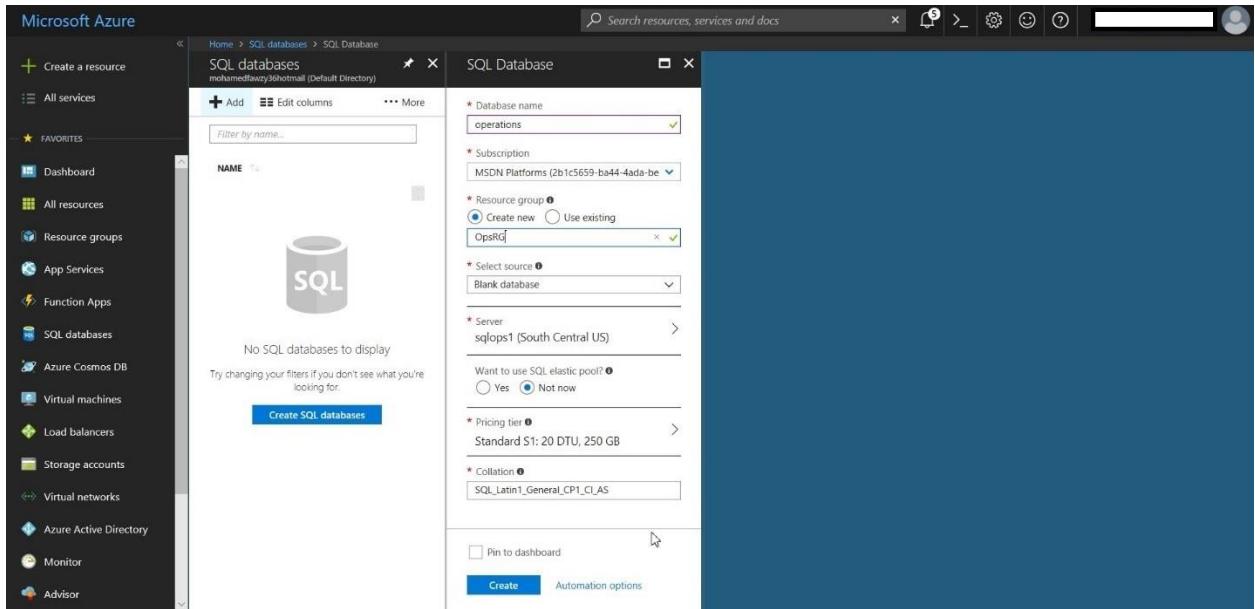


9. In the **SQL database** blade, click **RESOURCE GROUP**, and then in the **Resource group** blade, click **Create a new resource group**.

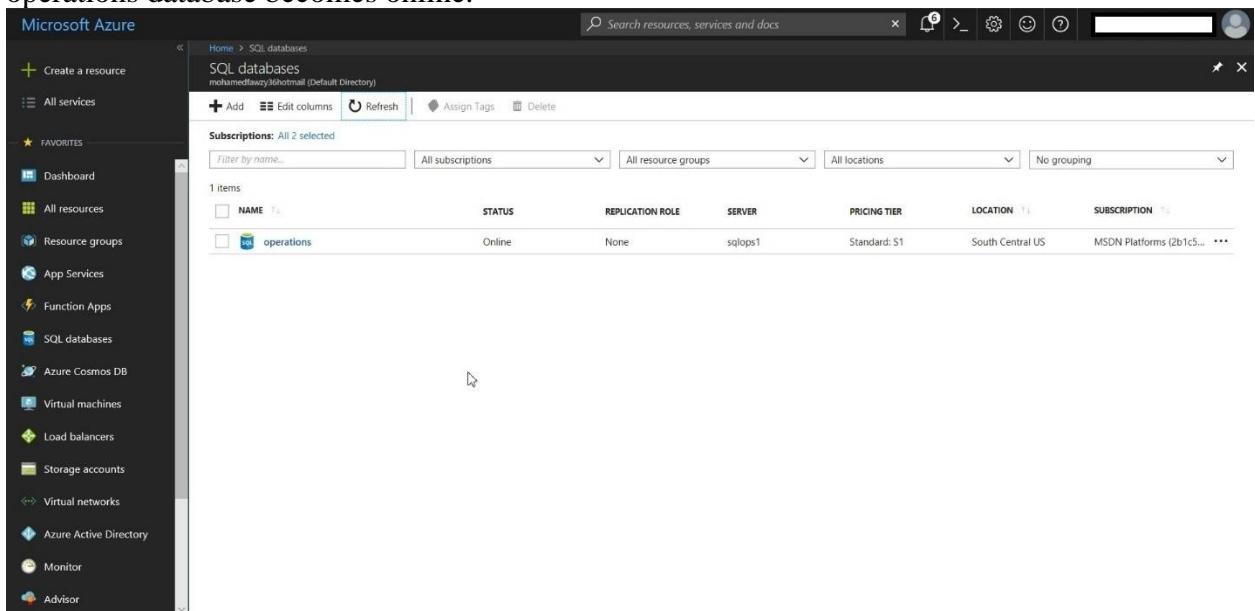
10. In the **Resource group** blade, in the NAME box, type **OpsRG**, and click **OK**.

11. In the **SQL database** blade, ensure that **Add to Dashboard** is selected and click **Create**. Then wait for the SQL Database to be created.

Microsoft Azure Infrastructure step by step



12. If a **Message from webpage** dialog box appears, click **OK**, and then wait until the operations database becomes online.



Task 2: Configure Server Firewall Rules

To configure Server Firewall rules, following this procedure

1. In the service pane on the left, click **SQL Databases** and verify that the **operations** database you created in the new portal is listed.
2. On the **Overview** page, click **Set Server firewall**.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface for managing SQL databases. On the left, the navigation menu includes options like 'Create a resource', 'All services', 'Dashboard', 'Resource groups', 'App Services', 'Function Apps', 'SQL databases', 'Azure Cosmos DB', 'Virtual machines', 'Load balancers', 'Storage accounts', 'Virtual networks', 'Azure Active Directory', 'Monitor', and 'Advisor'. The main content area is titled 'operations' under 'SQL databases'. It displays a summary of the database 'operations' with a status of 'Normal'. The 'SETTINGS' section includes options for 'Pricing tier (scale DTUs)', 'Geo-Replication', 'Auditing & Threat Detection', 'Vulnerability Assessment (Preview)', 'Data discovery & classification', 'Dynamic Data Masking', 'Transparent data encryption', and 'Connection strings'. The 'DTU' section shows a graph of DTU usage over time, with a current value of 0.26%. Below it, a 'Database size' chart indicates a current size of 4 MB.

3. **Current Client IP Address** show, and click the **Add to the allowed IP Addresses** icon. Change the **Start IP Address** to **XXX.XXX.0.0**, and the **End IP Address** to **XXX.XXX.255.255**, leaving XXX as it is (where XXX.XXX is the first two fields of the Current Client IP address), and then click **Save**.

The screenshot shows the 'Firewall settings' page for the 'sqllops1' SQL server. It includes sections for 'Allow access to Azure services' (ON), 'Client IP address' (156.223.249.134), and a table for defining IP rules. A new rule is being created with the following details:

RULE NAME	START IP	END IP
Allow Access	156.223.0.0	156.223.255.255

Below the table, there are sections for 'Virtual networks' (with options to 'Add existing virtual network' or 'Create new virtual network') and 'No vnet rules for this server'.

Task 3: Use SQL Server Management Studio

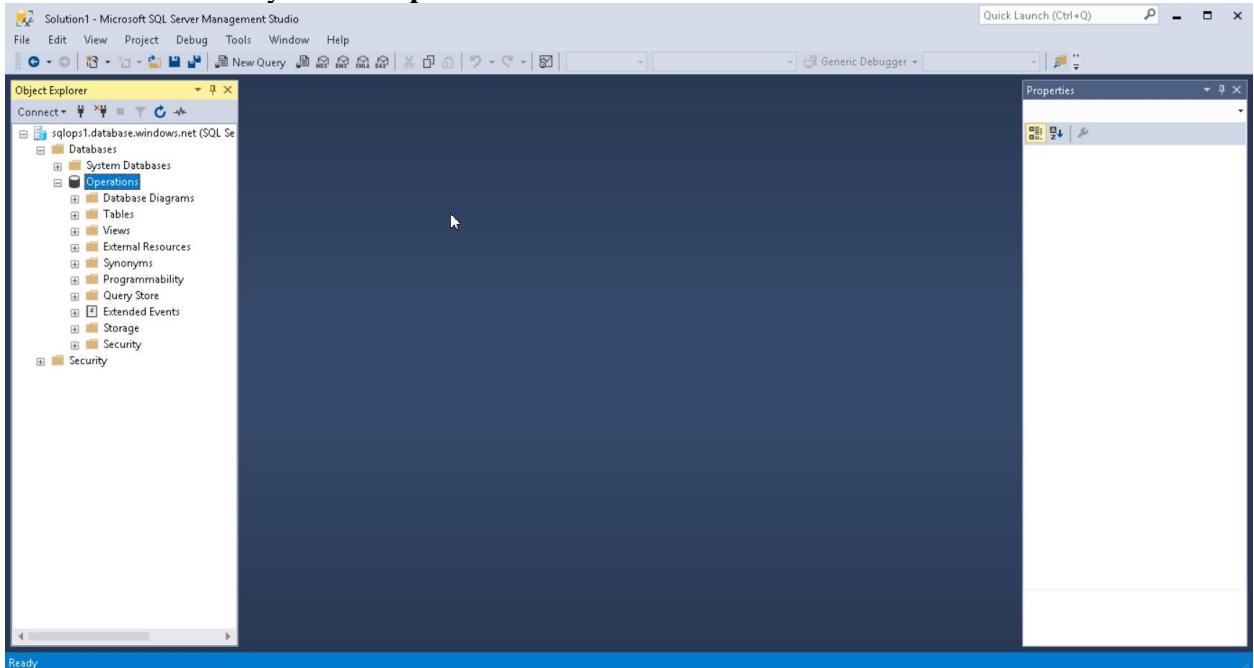
To use SQL Server management studio, following this procedure

1. Minimize Internet Explorer, and start SQL Server Management Studio.
2. In the **Connect to Server** dialog box, specify the following settings (replacing *server_name* with the unique name you specified when creating your SQL Database server) and click **Connect**:
 - Server type: **Database Engine**

- Server name: **server_name.database.windows.net**
- Authentication: **SQL Server Authentication**
- Login: **sqladmin**
- Password: **Pa\$\$w0rd**

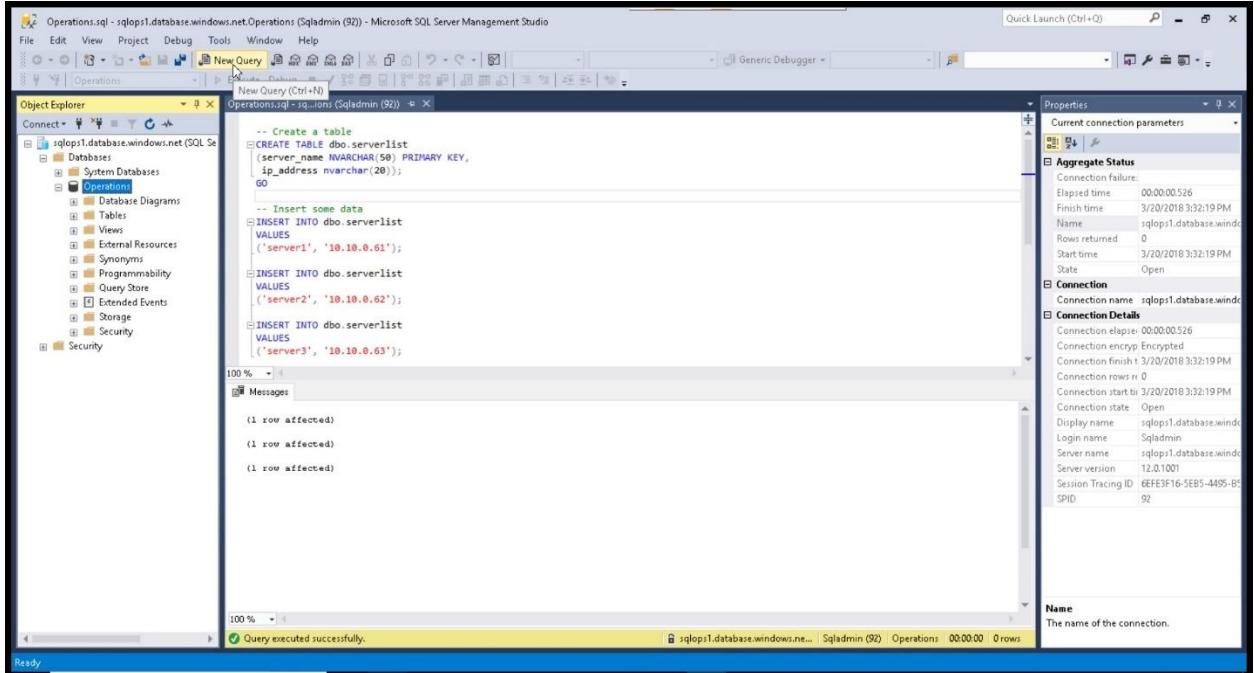


3. In SQL Server Management Studio, in Object Explorer, under the server name, expand **Databases** and verify that the **operations** database is listed.



4. In SQL Server Management Studio, open the **Operations.sql** file and view the Transact-SQL code it contains.
5. On the toolbar, in the Available Databases list, select **operations**. Then click **Execute**.

Microsoft Azure Infrastructure step by step



The screenshot shows the Microsoft SQL Server Management Studio interface. In the Object Explorer, the database 'Operations' is selected. A new query window titled 'Operations.sql - sqlops1.database.windows.net.Operations (Sqladmin (92)) - Microsoft SQL Server Management Studio' is open. The query pane contains the following Transact-SQL code:

```
-- Create a table
CREATE TABLE dbo.serverlist
(server_name NVARCHAR(50) PRIMARY KEY,
ip_address nvarchar(20));
GO

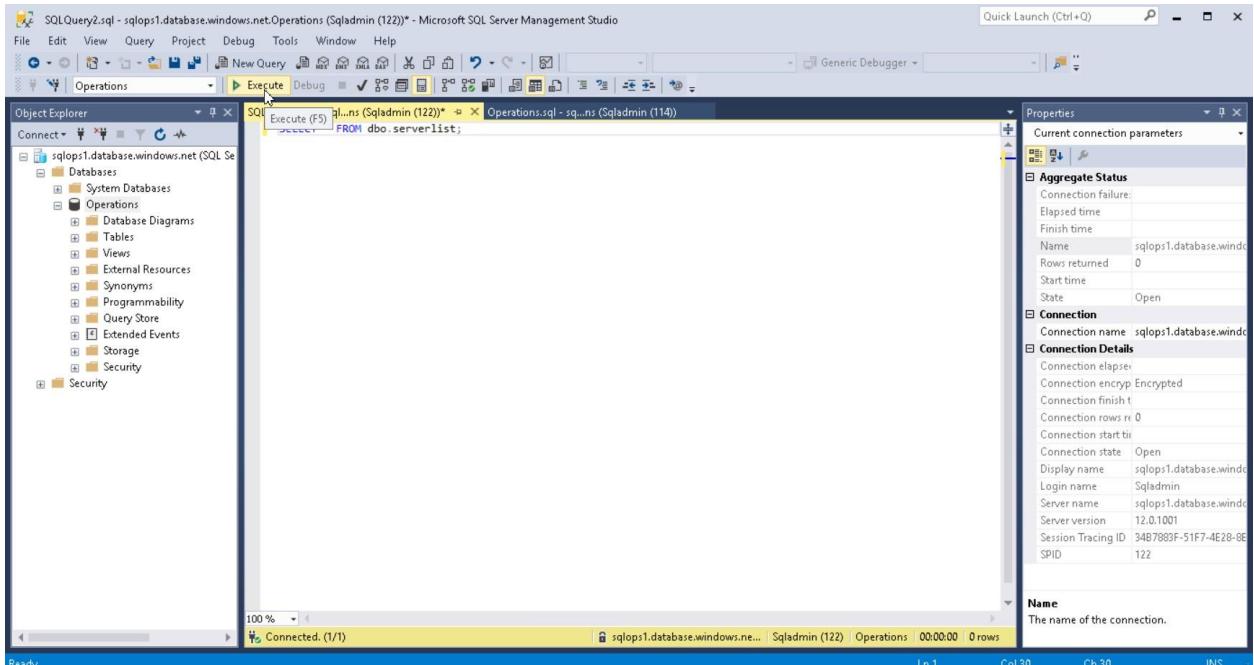
-- Insert some data
INSERT INTO dbo.serverlist
VALUES
('server1', '10.10.0.61');

INSERT INTO dbo.serverlist
VALUES
('server2', '10.10.0.62');

INSERT INTO dbo.serverlist
VALUES
('server3', '10.10.0.63');

The status bar at the bottom indicates 'Query executed successfully.' and '0 rows'. The Properties pane on the right shows connection details for the current session.
```

6. Click **New Query** and enter the following Transact-SQL code in the new query pane:
`SELECT * FROM dbo.serverlist;`
7. On the toolbar, in the **Available Databases** list, ensure that **operations** is selected. Then click **Execute**.



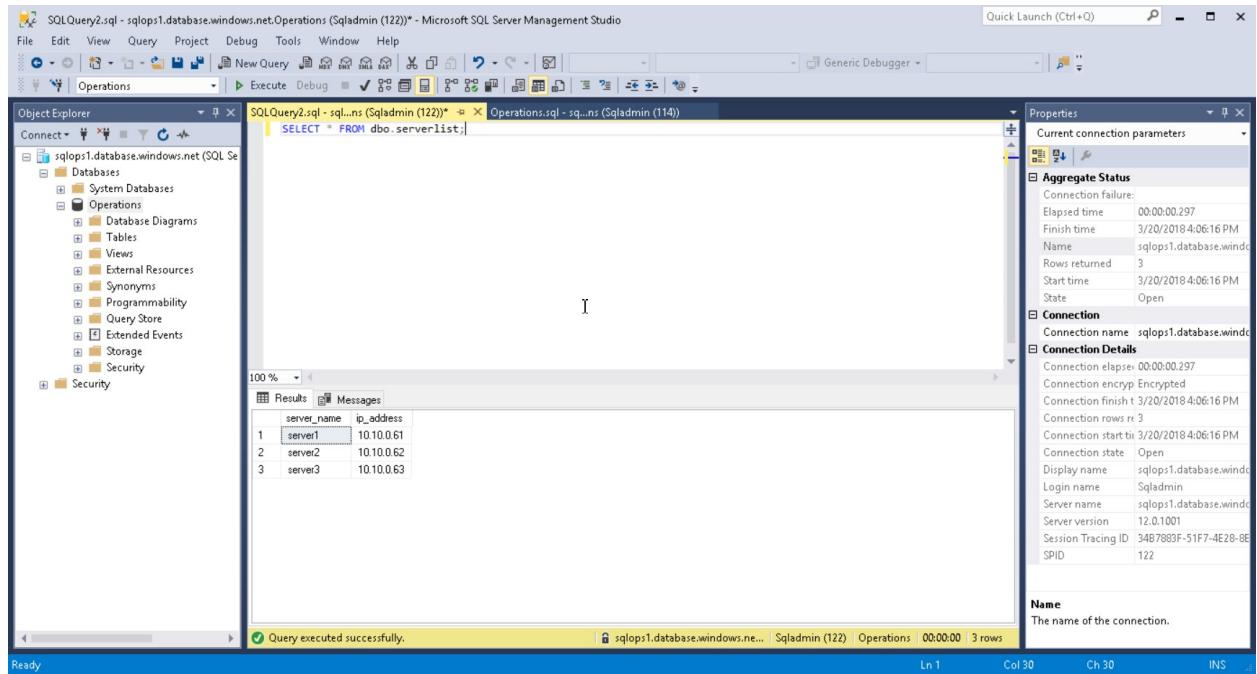
The screenshot shows the Microsoft SQL Server Management Studio interface. The Object Explorer shows the 'Operations' database selected. A query window titled 'SQLQuery2.sql - sqlops1.database.windows.net.Operations (Sqladmin (122)) - Microsoft SQL Server Management Studio' is open, displaying the result of the previous query:

```
servername
server1
server2
server3
```

The status bar at the bottom indicates 'Connected. (1/1)' and '0 rows'. The Properties pane on the right shows connection details for the current session.

8. View the query results and verify that a list of three servers and their IP addresses is returned.

Microsoft Azure Infrastructure step by step



Task 4: View Database Metrics

To view Database metrics, following this procedure

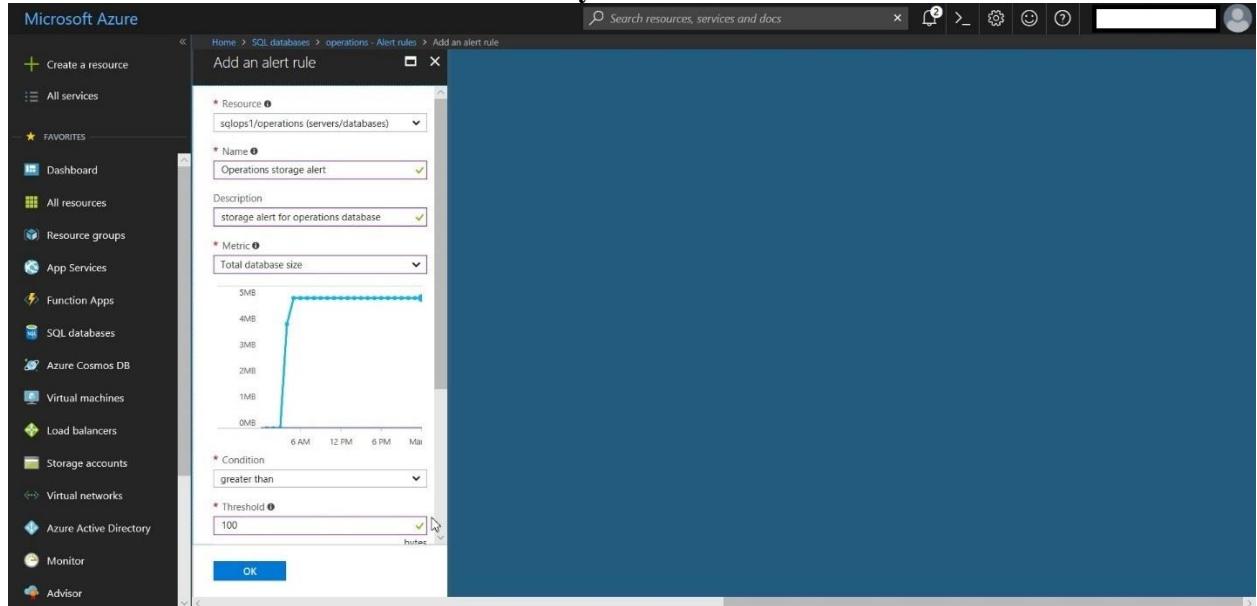
1. In Internet Explorer, on the tab containing the preview Azure portal, in the **Dashboard**, click the tile for the **operations** SQL Database (which was pinned to the Dashboard when you created it).
2. Click the **Operations** SQL Database. Then Select **Alert rules**.

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes 'Create a resource', 'All services', 'Dashboard', 'All resources', 'Resource groups', 'App Services', 'Function Apps', 'SQL databases', 'Azure Cosmos DB', 'Virtual machines', 'Load balancers', 'Storage accounts', 'Virtual networks', 'Azure Active Directory', 'Monitor', and 'Advisor'. The main content area is titled 'operations' SQL database. The 'Alert rules' section is currently selected. To the right, there is a 'DTU' chart showing usage over time, with a peak around 11:45 PM on March 18. Below the chart, a 'Database size' chart shows 'CURRENT 5 MB'.

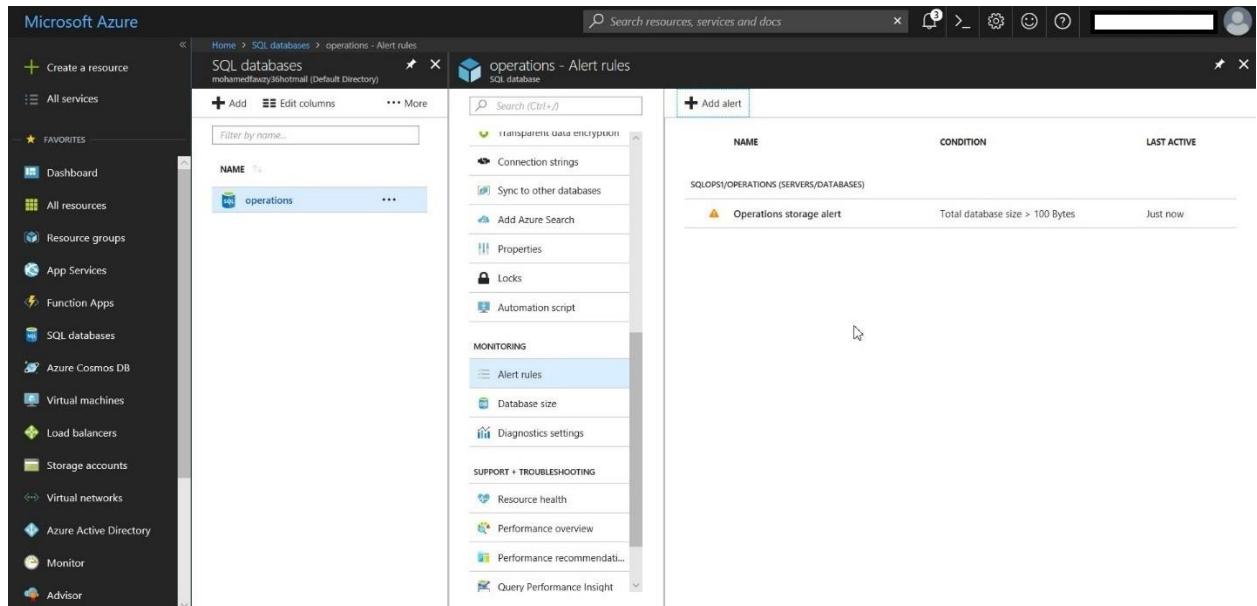
3. On the **Alert rules** blade, click **Add Alert**. Then in the **Add an alert rule** blade, specify the following settings and click **OK**:
 - Resource: **Operations**

Microsoft Azure Infrastructure step by step

- Name: **Operations storage alert**
- Description: **Storage alert for operations database**
- Metric: **total database size**
- Condition: **greater than**
- Threshold: **100**
- Period: **over the last 15 minutes**
- Email Service and CO-Administrators: **selected**
- Additional Administrator Email: **your email address**



4. Alert should be created.



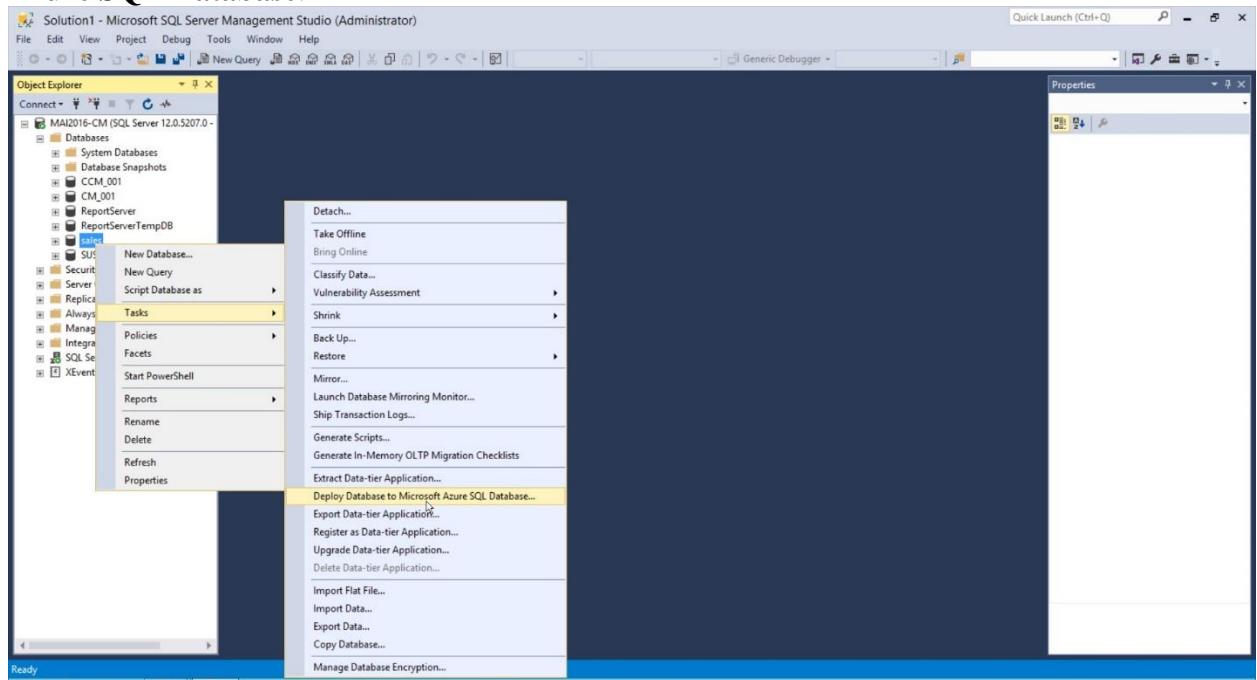
Migrating a SQL Server Database to Azure SQL Database

In this exercise, you will have deployed the **sales** SQL Server database on the local SQL Server instance to your Azure SQL Database server, and configured the **SalesApp** web application to use a connection string for the new Azure SQL Database.

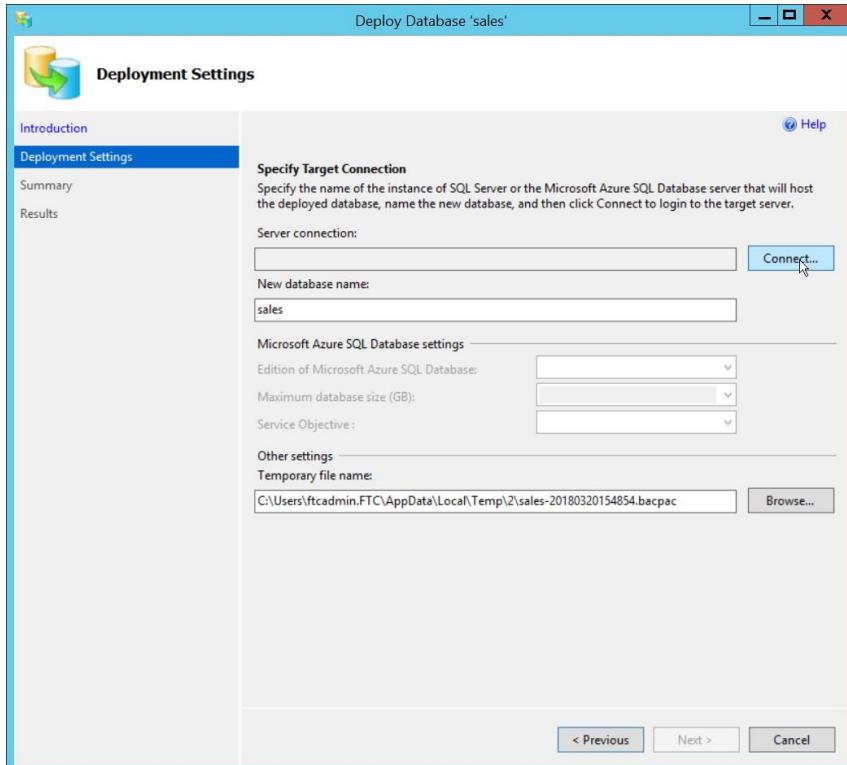
Task 1: Deploy a Database to Azure

To deploy Database, following this procedure

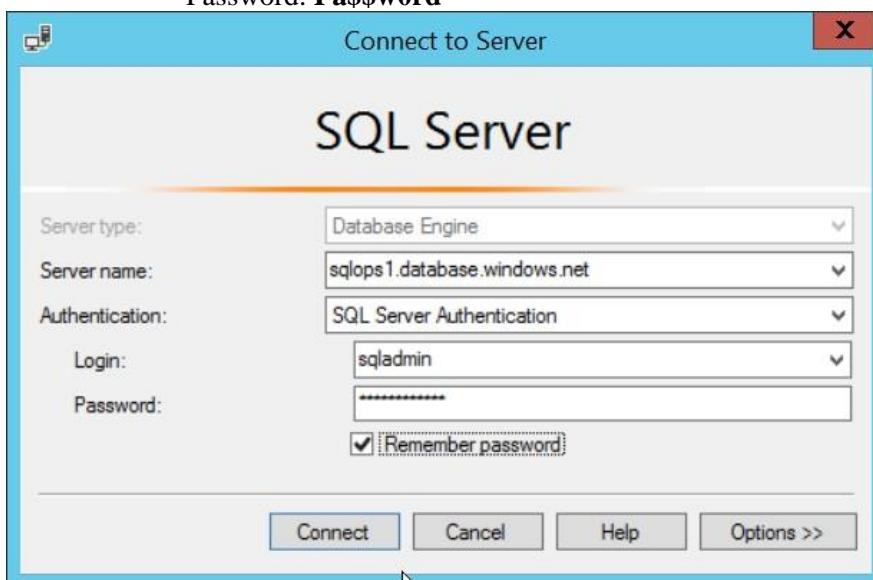
1. In [SQL Server Management Studio](#), in Object Explorer, in the **Connect** drop-down list, click **Database Engine**.
2. In the **Connect to Server** dialog box, specify the following settings, and click **Connect**:
 - Server type: **Database Engine**
 - Server name: **localhost**
 - Authentication: **Windows Authentication**
3. In SQL Server Management Studio, in Object Explorer, under the **Mai2016-CM** server, expand **Databases** and verify that the **sales** database is listed.
4. Right-click the **sales** database, point to **Tasks**, and click **Deploy Database to Windows Azure SQL Database**.



5. In the Deploy Database “Sales” wizard, on the **Introduction** page, click **Next**.
6. On the **Deployment Settings** page, click **Connect**.

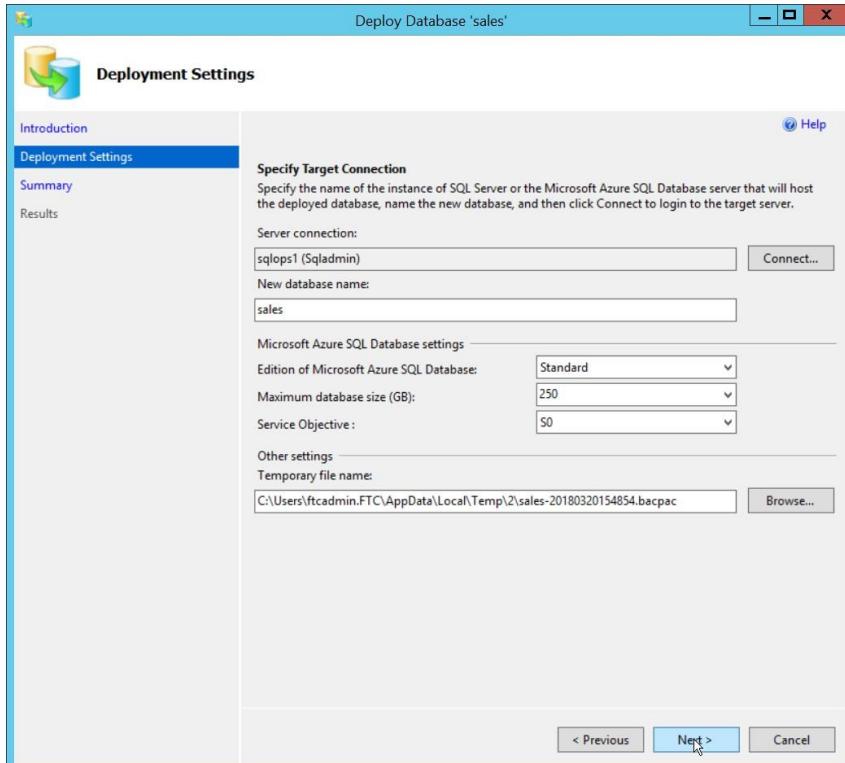


7. Then in the **Connect to Server** dialog box, specify the following settings (replacing *server_name* with the unique name of your SQL Database server) and click **Connect**:
 - Server type: **Database Engine**
 - Server name: *server_name.database.windows.net*
 - Authentication: **SQL Server Authentication**
 - Login: **sqladmin**
 - Password: **Pa\$\$w0rd**

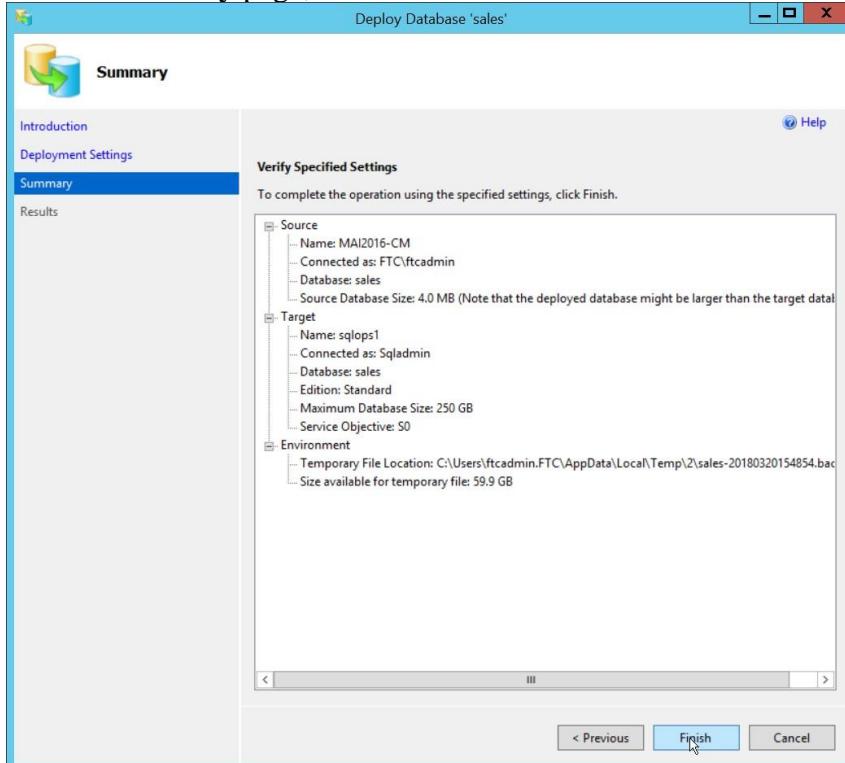


8. On the **Deployment Settings** page, ensure that the new database name is **sales** and note the temporary file name used for the .bacpac file that will be exported and imported, and then click **Next**.

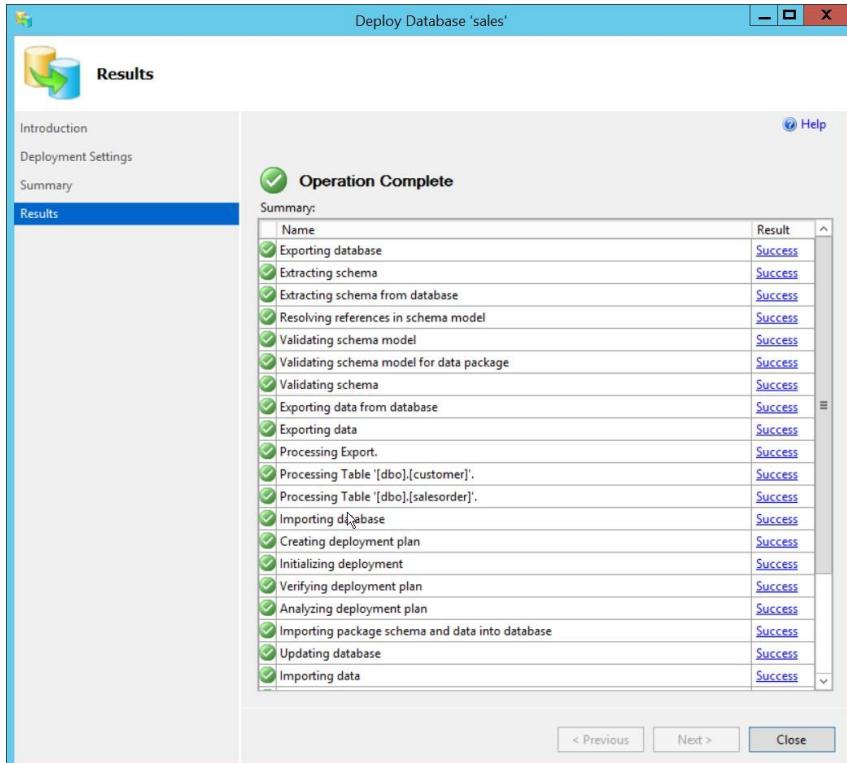
Microsoft Azure Infrastructure step by step



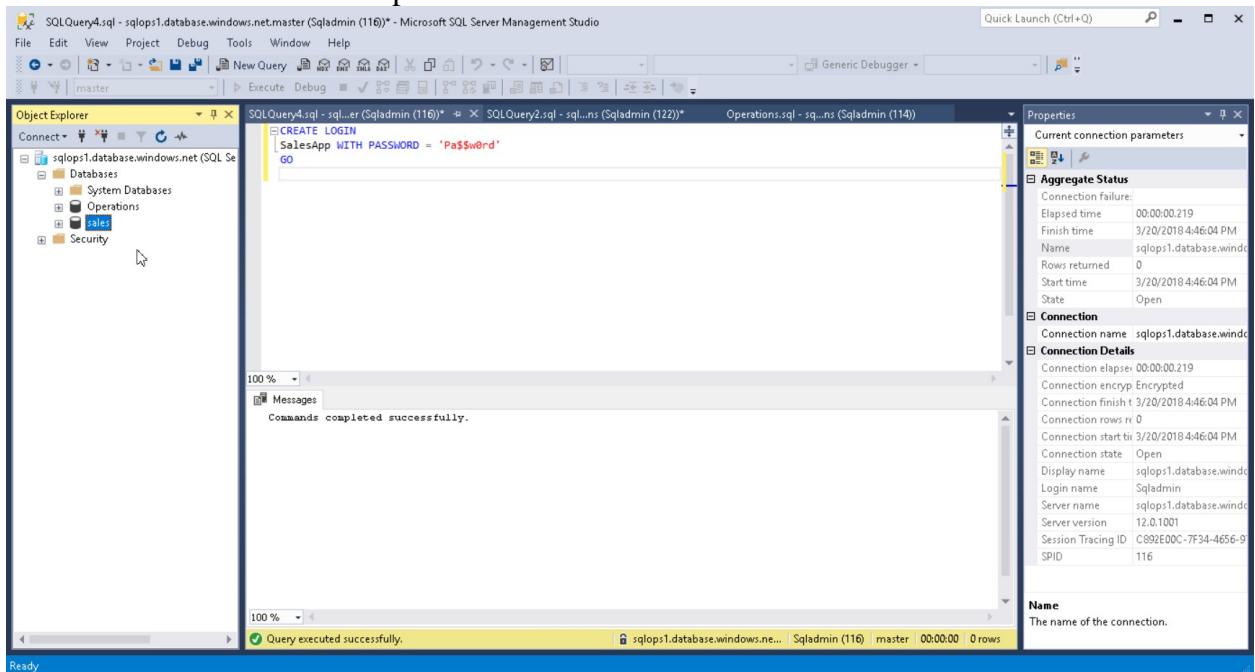
9. On the **Summary** page, click **Finish**.



10. On the **Results** page, verify that the operation completed successfully, and click **Close**.



11. In SQL Server Management Studio, in Object Explorer, if necessary, right-click the **Databases** folder under your Azure SQL Database server and click **Refresh** to verify that the **sales** database has been copied to this server.

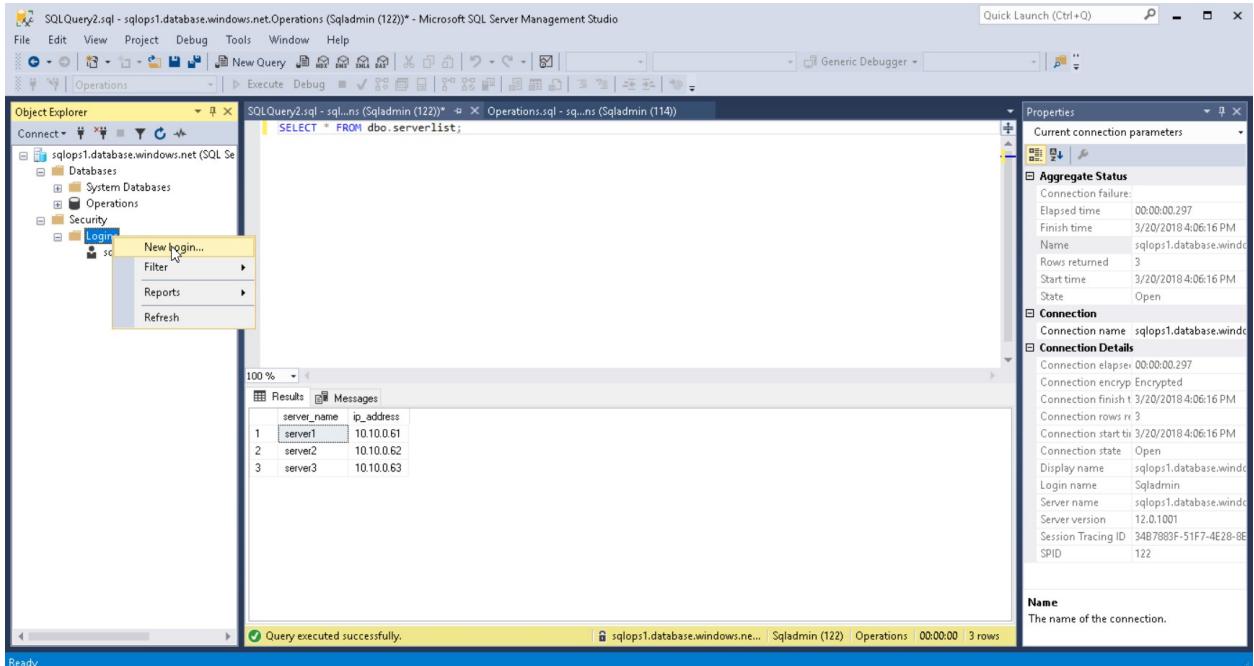


Task 2: Configure SQL Database Security

To configure SQL Database security, following this procedure

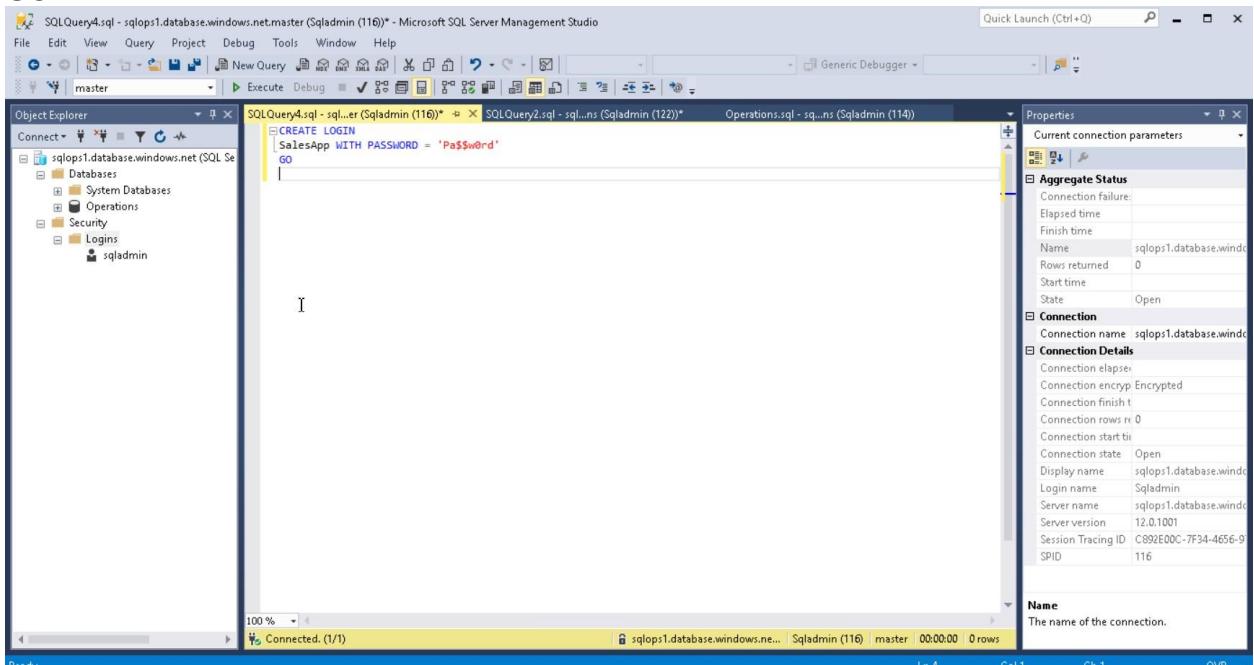
Microsoft Azure Infrastructure step by step

1. In SQL Server Management Studio, in Object Explorer, under your Azure SQL Database server, expand **Security**, expand **Logins**, and verify that only the **Sqladmin** login is listed.



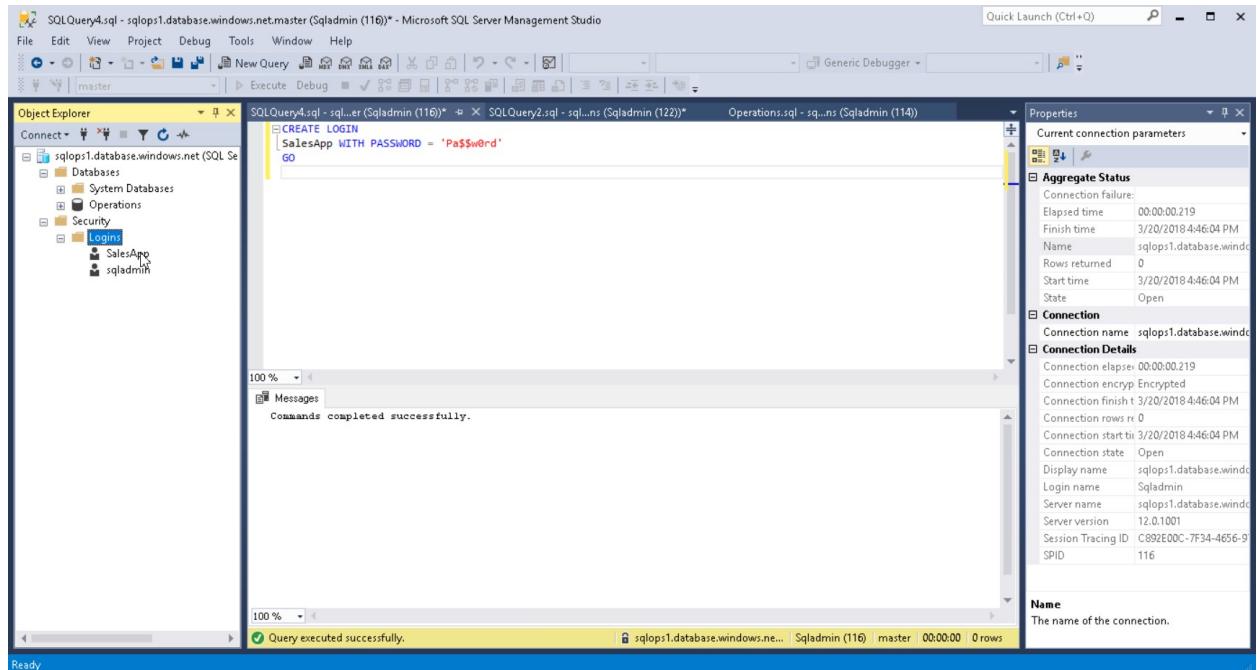
2. Right-click **Logins** and click **New Login**. Then modify the Transact-SQL script that is generated as shown here and click **Execute**:

**CREATE LOGIN
SalesApp WITH PASSWORD = 'Pa\$\$w0rd'
GO**

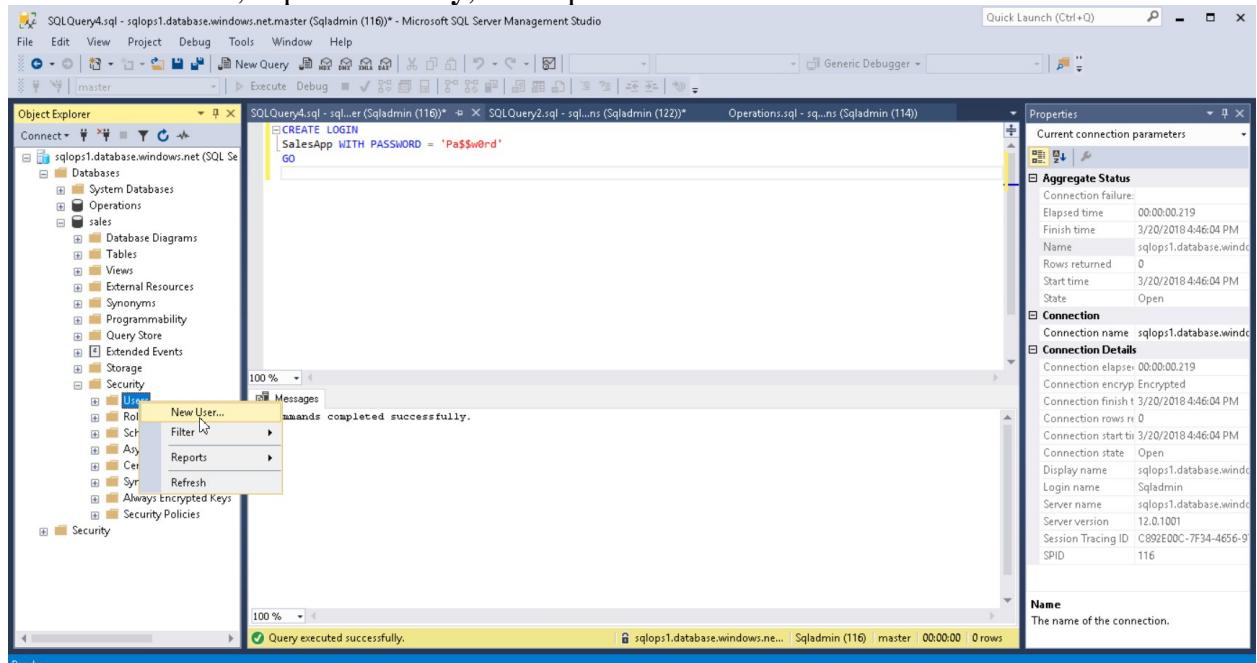


3. In Object Explorer, right-click the **Logins** folder and click **Refresh** to verify that the **SalesApp** login has been created.

Microsoft Azure Infrastructure step by step



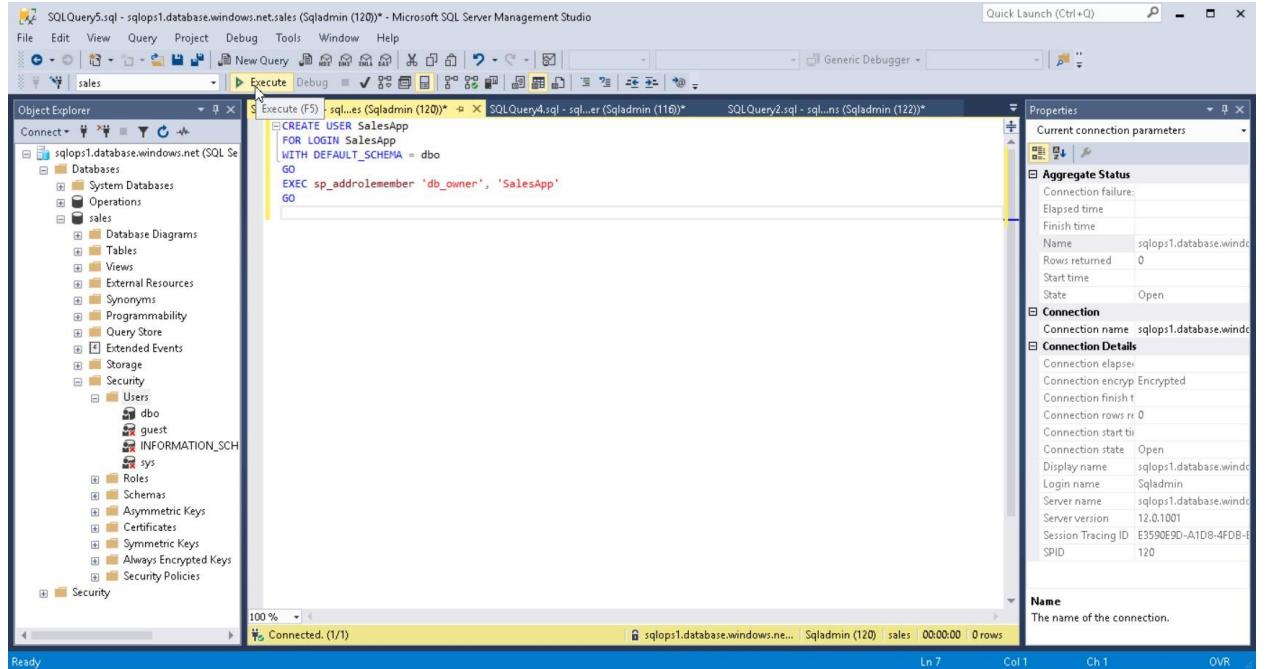
4. In Object Explorer, in the **Databases** folder for your Azure SQL Database server, expand the **sales** database, expand **Security**, and expand **Users**.



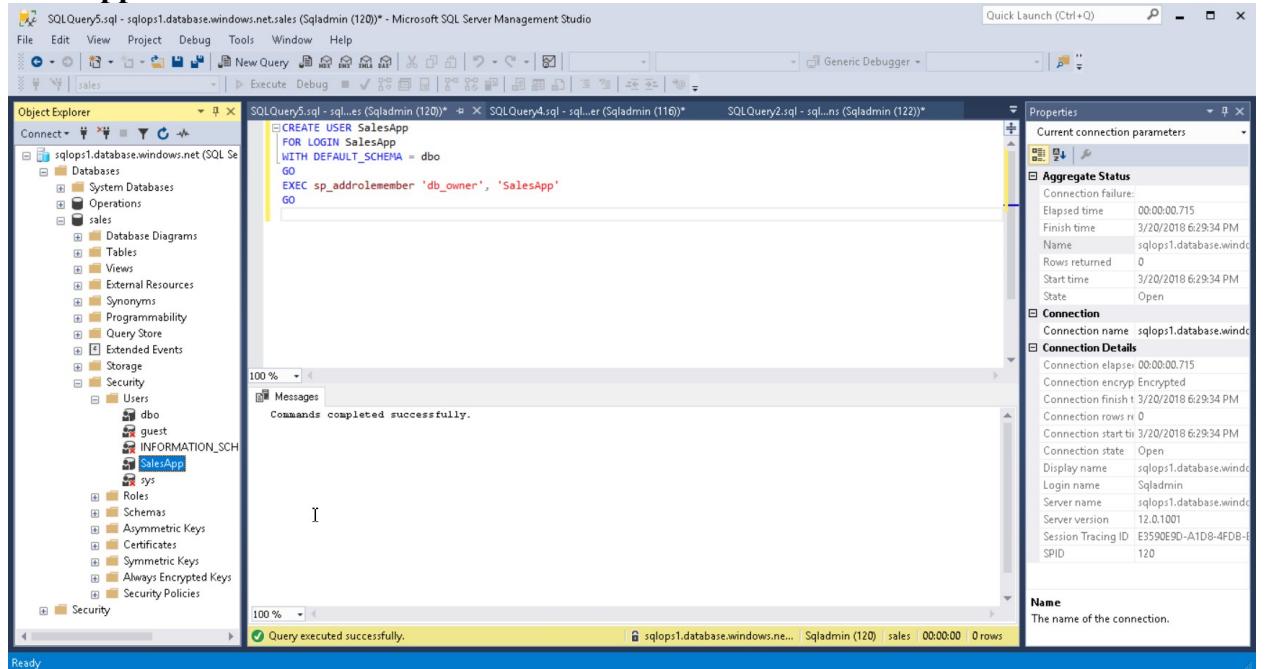
5. Right-click **Users** and click **New User**. Then modify the Transact-SQL script that is generated as shown here and click **Execute**:

```
CREATE USER SalesApp
FOR LOGIN SalesApp
WITH DEFAULT_SCHEMA = dbo
GO
EXEC sp_addrolemember 'db_owner', 'SalesApp'
GO
```

Microsoft Azure Infrastructure step by step



6. In Object Explorer, right-click the **Users** folder and click **Refresh** to verify that the **SalesApp** user has been created.



Chapter 7

PaaS Cloud Services & Mobile Services

You can use the PaaS Cloud Services execution model to host websites or any other web service that can be addressed through the HTTP protocol. You can build these web services with a more modular architecture than those that you host in Azure Websites. Specifically, a PaaS cloud service can include:

- **Web roles.** A web role hosts the front end of the cloud service and always runs on a dedicated virtual machine that hosts an Internet Information Services (IIS) web server. In a website, for example, the web role would include the webpages that make up the user interface for the application.
- **Worker roles.** A worker role executes asynchronous tasks and runs on a dedicated virtual machine. The web roles call worker roles to complete long-running, intensive, or perpetual procedures.

Like Azure Websites, in PaaS Cloud Services, you can create multiple instances of web roles and worker roles to ensure fault tolerance and increase scalability. However, you have extra flexibility in PaaS cloud services because you can scale each role separately from all the others in the same service.

Azure is frequently used to host back-end portions of a mobile device app. Many mobile apps, for example, require a centralized database to store information for all users and a centralized location to run business logic. The Azure Mobile Services compute feature is an execution model that brings together all the commonly used server-side features that developers assemble to support mobile apps. A mobile service makes it easy for developers to put together the functionality they need.

Deploying a PaaS Cloud Service

In this exercise, you will create the necessary resources required by the PaaS cloud service (a storage account and a SQL database). You will also edit the service configuration file and deploy the cloud service to the production slot.

Task 1: Create Linked Resources

To create linked resources, following this procedure

1. Start the **Microsoft Azure PowerShell**. Type the following command, and then press Enter: **Add-AzureAccount**. Sign in with the user credentials associated with your Azure account.
2. Type the following command, and then press Enter: **Get-AzureLocation**. From the list of locations, choose a location near you and note the location's name.

Microsoft Azure Infrastructure step by step

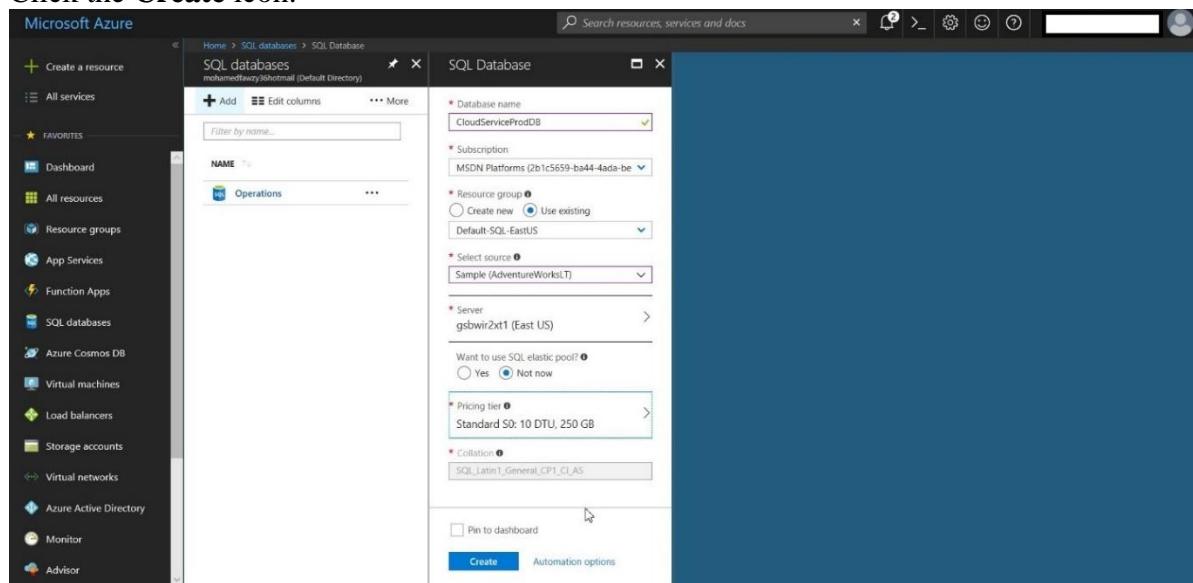
3. Type the following command, and then press Enter: **New-AzureSqlDatabaseServer –AdministratorLogin *yourname* –AdministratorLoginPassword Pa\$\$w0rd –Location "Your Location"**

```
Select Administrator: Windows PowerShell  
PS C:\WINDOWS\system32> New-AzureSqlDatabaseServer -AdministratorLogin labadmin -AdministratorLoginPassword Pa$$w0rd -Location "East US"  
  
ServerName Location AdministratorLogin Version  
----- ----- -----  
gsbwir2xt1 East US labadmin 12.0  
  
PS C:\WINDOWS\system32>
```

4. Type the following command, and then press Enter: **Get-AzureSqlDatabaseServer**

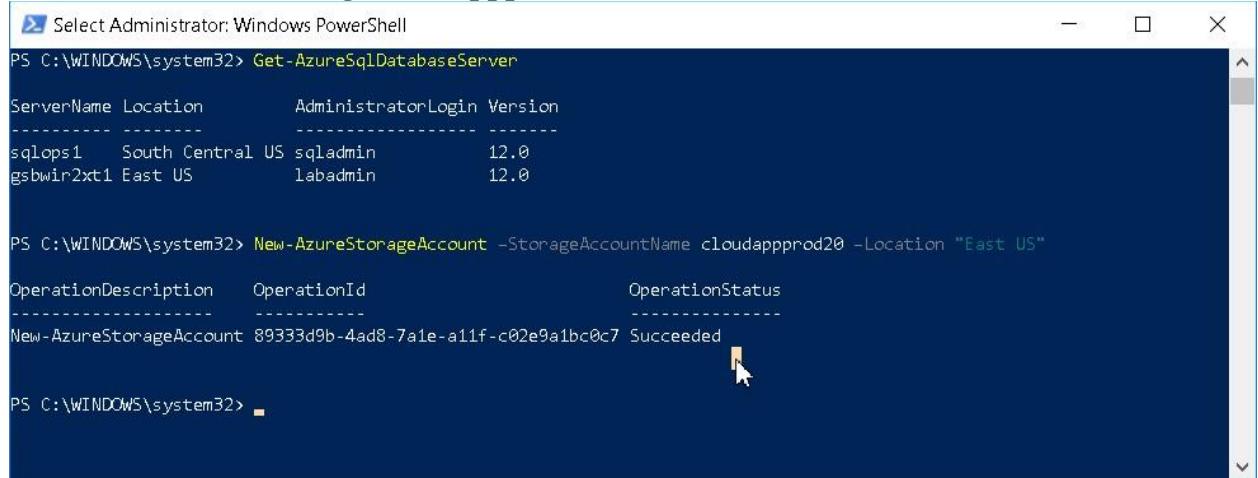
```
Administrator: Windows PowerShell  
PS C:\WINDOWS\system32> New-AzureSqlDatabaseServer -AdministratorLogin labadmin -AdministratorLoginPassword Pa$$w0rd -Location "East US"  
  
ServerName Location AdministratorLogin Version  
----- ----- -----  
gsbwir2xt1 East US labadmin 12.0  
  
PS C:\WINDOWS\system32> Get-AzureSqlDatabaseServer  
  
ServerName Location AdministratorLogin Version  
----- ----- -----  
sqlops1 South Central US sqladmin 12.0  
gsbwir2xt1 East US labadmin 12.0  
  
PS C:\WINDOWS\system32>
```

5. Then start Internet Explorer, browse to <http://portal.azure.com>, and then sign in with the credentials associated with your Azure account.
6. In the navigation on the left, click **SQL Databases**. Click **Add**.
 - In the **Name** box, type **CloudServiceProdDB**.
 - In the **Server** drop-down list, choose the SQL Database server name you created before.
7. Click the **Create** icon.



8. Switch to Azure PowerShell, type the following command and then press Enter: **New-AzureStorageAccount –StorageAccountName cloudappprodXXX –Location "Your Location"**

To test if the account already exists, type the following command and then press Enter: **Test-AzureName –Storage cloudappprodXXX**

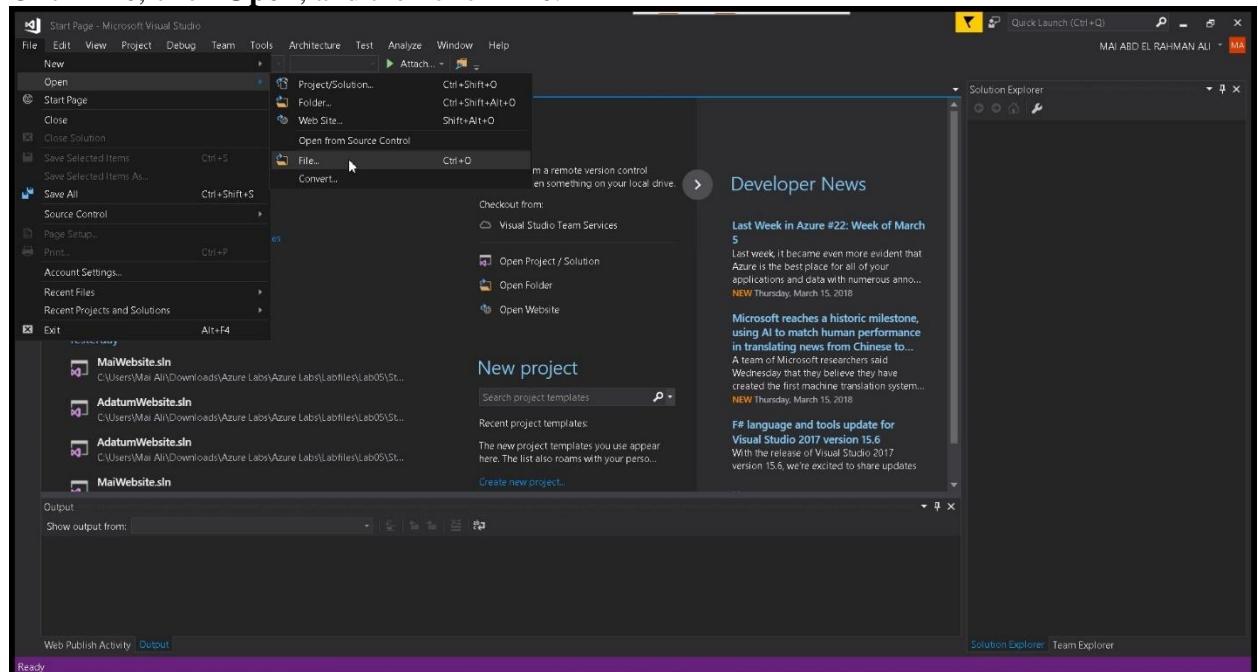


The screenshot shows a Windows PowerShell window titled "Select Administrator: Windows PowerShell". The command `Get-AzureSqlDatabaseServer` is run, displaying two database servers: sqlops1 and gsbwin2xt1. Then, the command `New-AzureStorageAccount -StorageAccountName cloudappprod20 -Location "East US"` is run, which creates a new storage account named "cloudappprod20" in the East US location. The output shows the operation status as "Succeeded".

Task 2: Configure the Service Definition File

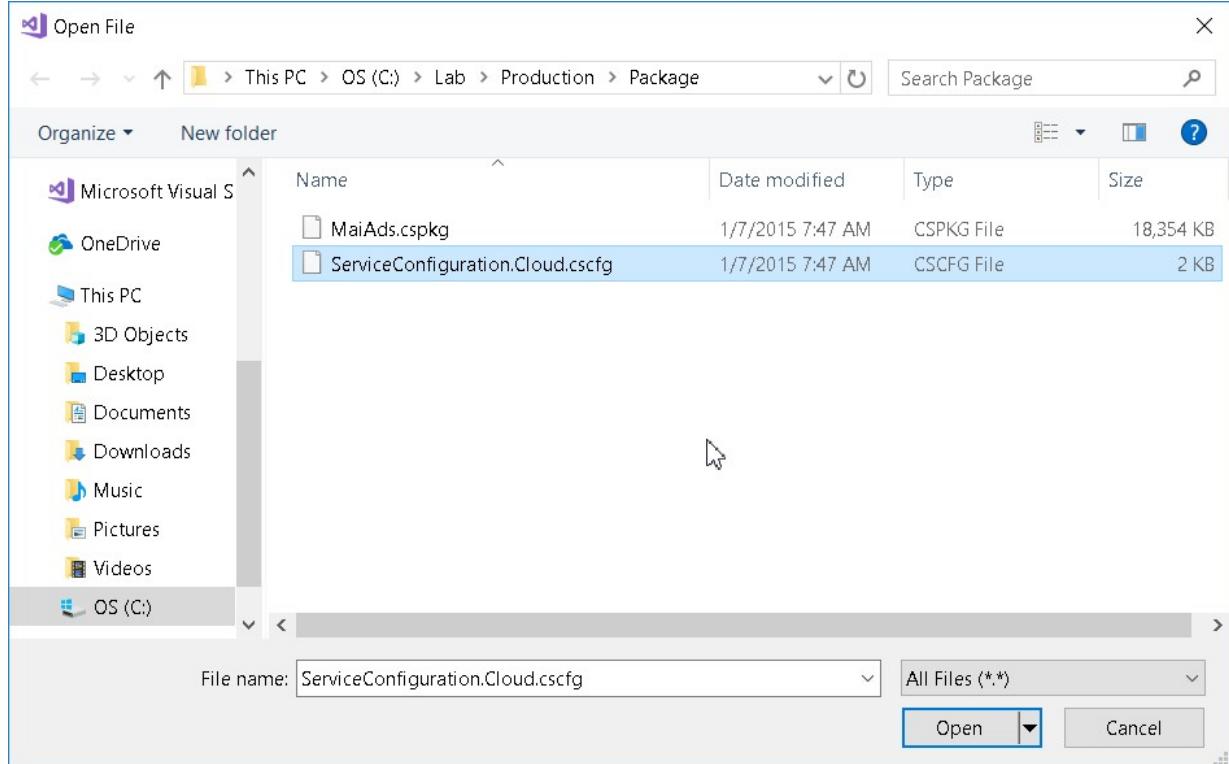
To configure service definition file, following this procedure

1. On the Taskbar, click **Visual Studio 2017**.
2. Click **File**, click **Open**, and then click **File**.

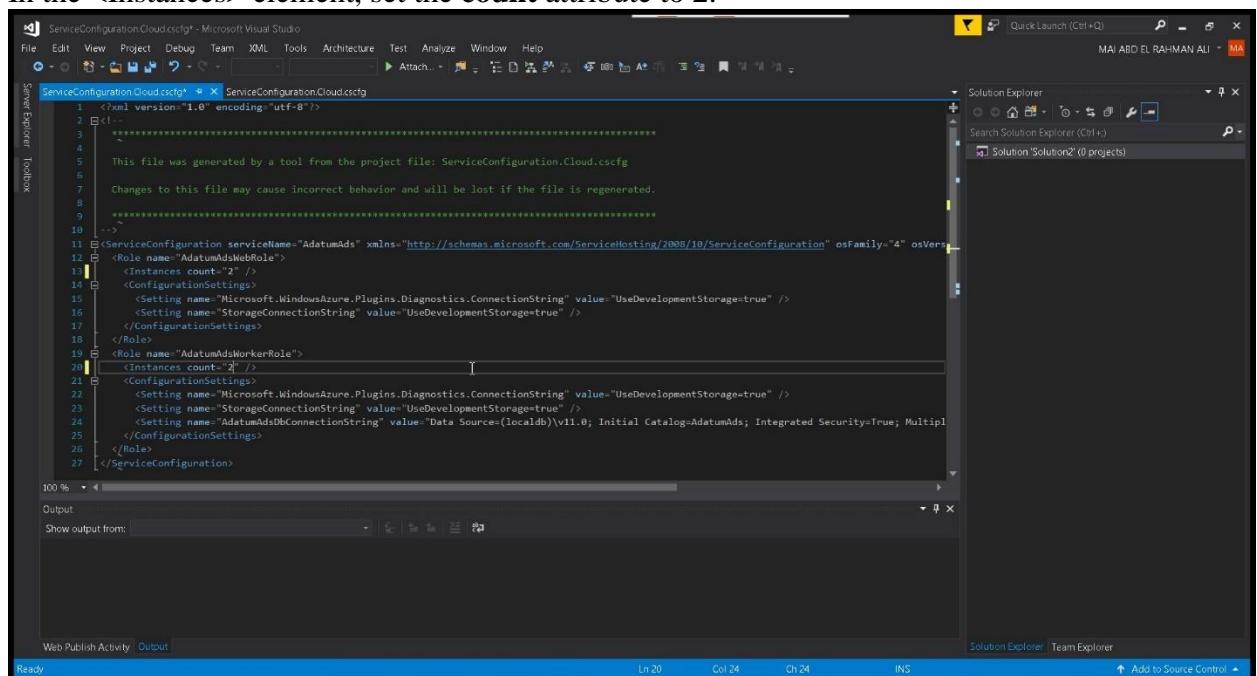


3. Click **ServiceConfiguration.Cloud.cscfg** and then click **Open**.

Microsoft Azure Infrastructure step by step



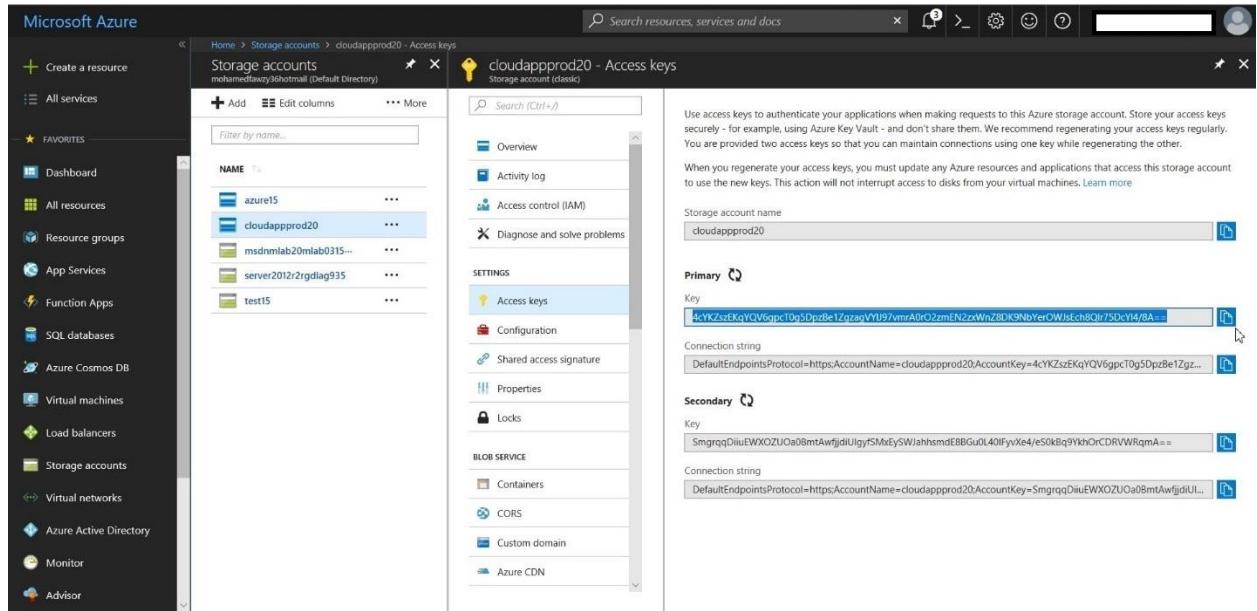
4. Locate the **<Role>** element with the Name **AdatumAdsWebRole**.
5. In the **<Instances>** element, set the **count** attribute to **2**.
6. Locate the **<Role>** element with the Name **AdatumAdsWorkerRole**.
7. In the **<Instances>** element, set the **count** attribute to **2**.



8. Click **File** and then click **Save ServiceConfiguration.Cloud.cscfg**.
9. Switch to Internet Explorer. In the Azure Portal, in the navigation on the left, click **Storage Account**.

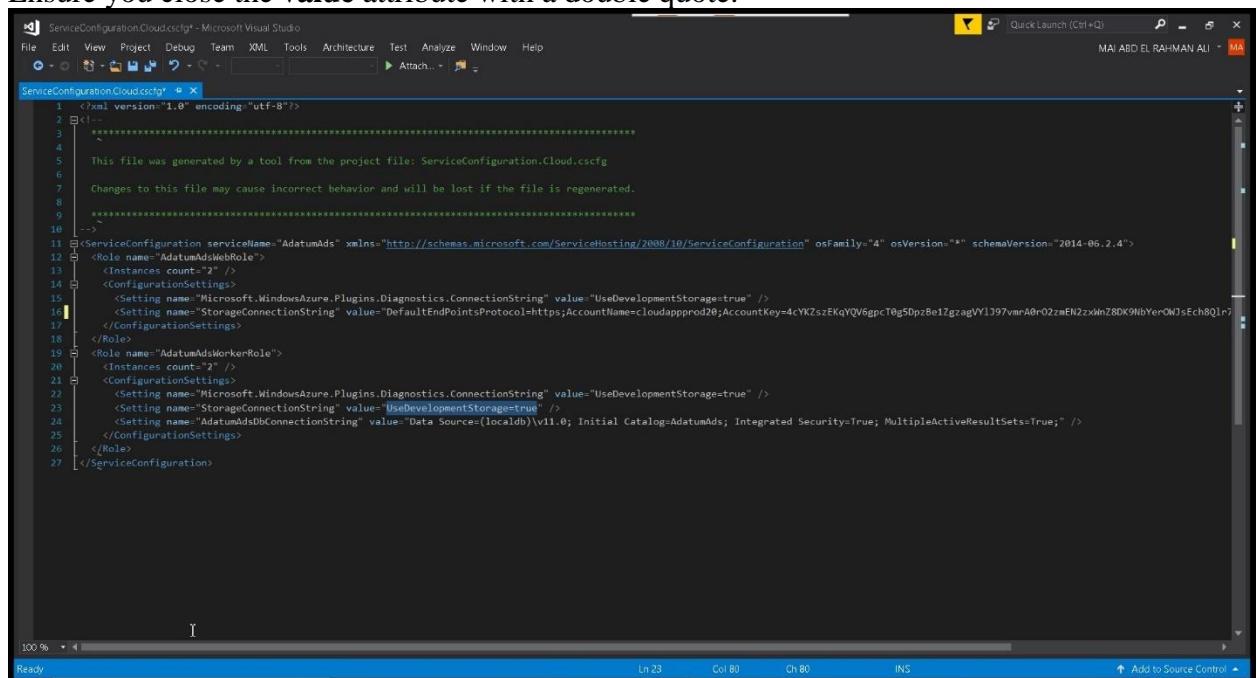
Microsoft Azure Infrastructure step by step

10. In the list of storage accounts, click **cloudappprodXXX**. If there are no storage accounts in the list, refresh the webpage, click **Access Keys**.
11. To the right of the **Primary Access Key** box, click the **Copy** button, and then click **Allow access**.



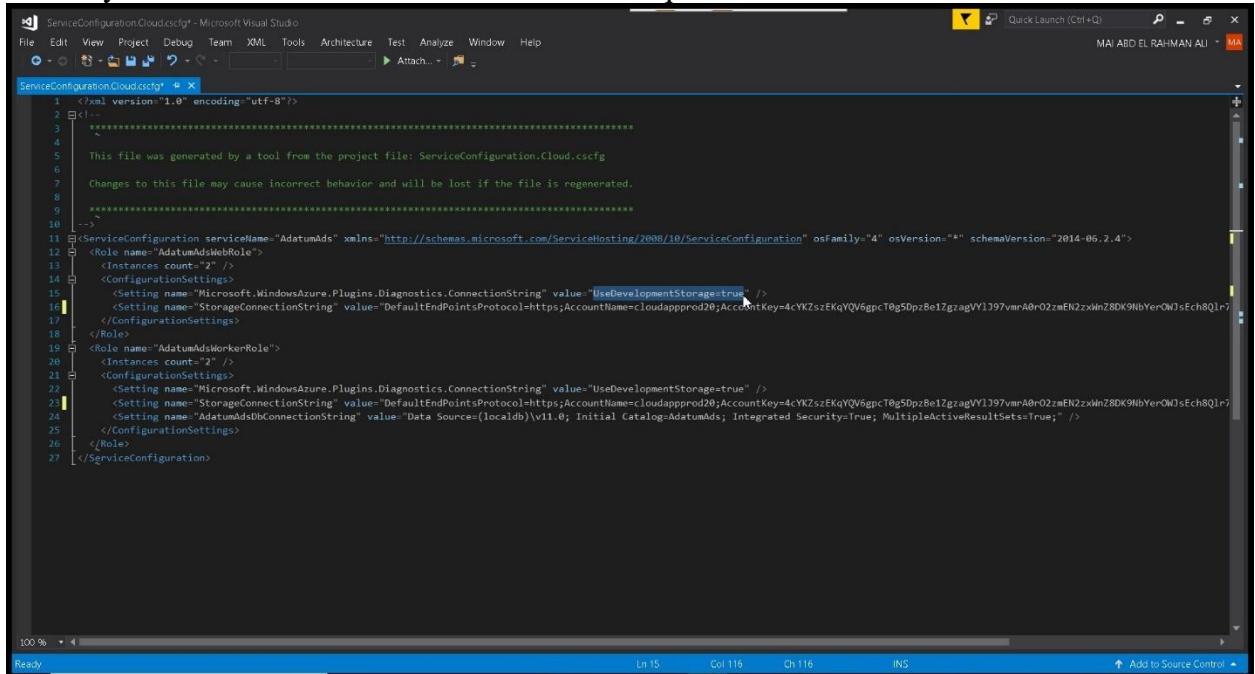
The screenshot shows the Microsoft Azure Storage Accounts page. On the left, there's a sidebar with various service icons. The main area shows a list of storage accounts under 'Storage accounts'. One account, 'cloudappprod20', is selected. To the right, a detailed view of 'cloudappprod20 - Access keys' is displayed. Under the 'Primary' tab, the 'Key' field contains the primary access key value: '4cYKzsxEKqYQV6gpcT0g5DpzBe1zgzaqVYU9/vmrA0tQzmEnzzxWnzbDK9NbYerOWJseh8Qlr75DcyI4/8A=='. Below it, the 'Connection string' field contains the connection string: 'DefaultEndpointsProtocol=https;AccountName=cloudappprod20;AccountKey=4cYKzsxEKqYQV6gpcT0g5DpzBe1zg...'. There's also a 'Secondary' tab with its own key and connection string.

12. Switch to Visual Studio. Locate the **<Role>** element with the Name **AdatumAdsWebRole**.
13. Within that **<Role>** element, locate the **<Setting>** element with the Name **StorageConnectionString**.
14. Delete the string in the **value** attribute and replace it with the following text:
DefaultEndpointsProtocol=https;AccountName=cloudappprodXXX;AccountKey=
<storage account primary key>
15. Ensure you close the **value** attribute with a double quote.



```
<?xml version="1.0" encoding="utf-8"?>
2 <ServiceConfiguration serviceName="AdatumAds" xmlns="http://schemas.microsoft.com/ServiceHosting/2008/10/ServiceConfiguration" osFamily="4" osVersion="" schemaVersion="2014-06-2.4">
3   ****
4   This file was generated by a tool from the project file: ServiceConfiguration.Cloud.cscfg
5   Changes to this file may cause incorrect behavior and will be lost if the file is regenerated.
6   ****
7
8   <Role name="AdatumAdsWebRole">
9     <Instances count="2" />
10    <ConfigurationSettings>
11      <Setting name="Microsoft.WindowsAzure.Plugins.Diagnostics.ConnectionString" value="UseDevelopmentStorage=true" />
12      <Setting name="StorageConnectionString" value="DefaultEndpointsProtocol=https;AccountName=cloudappprod20;AccountKey=4cYKzsxEKqYQV6gpcT0g5DpzBe1zgzaqVYU9/vmrA0tQzmEnzzxWnzbDK9NbYerOWJseh8Qlr75DcyI4/8A==" />
13    </ConfigurationSettings>
14  </Role>
15  <Role name="AdatumAdsWorkerRole">
16    <Instances count="2" />
17    <ConfigurationSettings>
18      <Setting name="Microsoft.WindowsAzure.Plugins.Diagnostics.ConnectionString" value="UseDevelopmentStorage=true" />
19      <Setting name="StorageConnectionString" value="DefaultEndpointsProtocol=https;AccountName=cloudappprod20;AccountKey=4cYKzsxEKqYQV6gpcT0g5DpzBe1zgzaqVYU9/vmrA0tQzmEnzzxWnzbDK9NbYerOWJseh8Qlr75DcyI4/8A==" />
20      <Setting name="AdatumAdsDbConnectionString" value="Data Source=(localdb)\v11.0; Initial Catalog=AdatumAds; Integrated Security=True; MultipleActiveResultSets=True;" />
21    </ConfigurationSettings>
22  </Role>
23 </ServiceConfiguration>
```

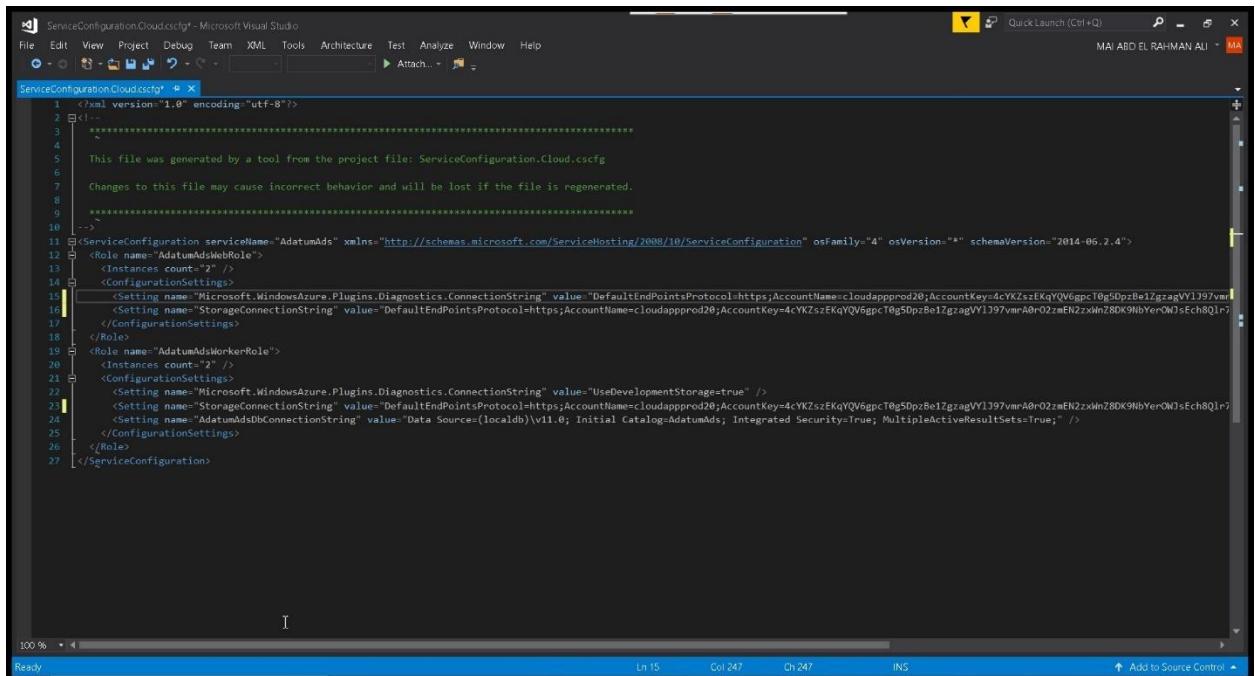
16. Click **File** and then click **Save ServiceConfiguration.Cloud.cscfg**.
17. Locate the **<Role>** element with the name **AdatumAdsWorkerRole**.
18. Within that **<Role>** element, locate the **<Setting>** element with the Name **StorageConnectionString**.
19. Delete the string in the **value** attribute and replace it with the following text:
DefaultEndpointsProtocol=https;AccountName=cloudappprodXXX;AccountKey=<storage account primary key>
20. Ensure you close the **value** attribute with a double quote.



```
1 <?xml version="1.0" encoding="utf-8"?>
2 <!--
3   ****
4   This file was generated by a tool from the project file: ServiceConfiguration.Cloud.cscfg
5   Changes to this file may cause incorrect behavior and will be lost if the file is regenerated.
6   ****
7 -->
8 <ServiceConfiguration serviceName="AdatumAds" xmlns="http://schemas.microsoft.com/ServiceHosting/2008/10/ServiceConfiguration" osFamily="4" osVersion="*" schemaVersion="2014-06.2.4">
9   <Role name="AdatumAdsWebRole">
10    <Instances count="2" />
11    <ConfigurationSettings>
12      <Setting name="Microsoft.WindowsAzure.Plugins.Diagnostics.ConnectionString" value="UseDevelopmentStorage=true" />
13      <Setting name="StorageConnectionString" value="DefaultEndpointsProtocol=https;AccountName=cloudappprod20;AccountKey=4cYKZszEKqYQV6gpcT0g5DpzBe1zg;agVY1397vmrA0r02zmEN2zxlnZ8DK9lbYerONjsEch8Q1r;" />
14    </ConfigurationSettings>
15  </Role>
16  <Role name="AdatumAdsWorkerRole">
17    <Instances count="2" />
18    <ConfigurationSettings>
19      <Setting name="Microsoft.WindowsAzure.Plugins.Diagnostics.ConnectionString" value="UseDevelopmentStorage=true" />
20      <Setting name="StorageConnectionString" value="DefaultEndpointsProtocol=https;AccountName=cloudappprod20;AccountKey=4cYKZszEKqYQV6gpcT0g5DpzBe1zg;agVY1397vmrA0r02zmEN2zxlnZ8DK9lbYerONjsEch8Q1r;" />
21      <Setting name="AdatumAdsDbConnectionString" value="Data Source=(localdb)\v11.0; Initial Catalog=AdatumAds; Integrated Security=True; MultipleActiveResultSets=True;" />
22    </ConfigurationSettings>
23  </Role>
24 </ServiceConfiguration>
```

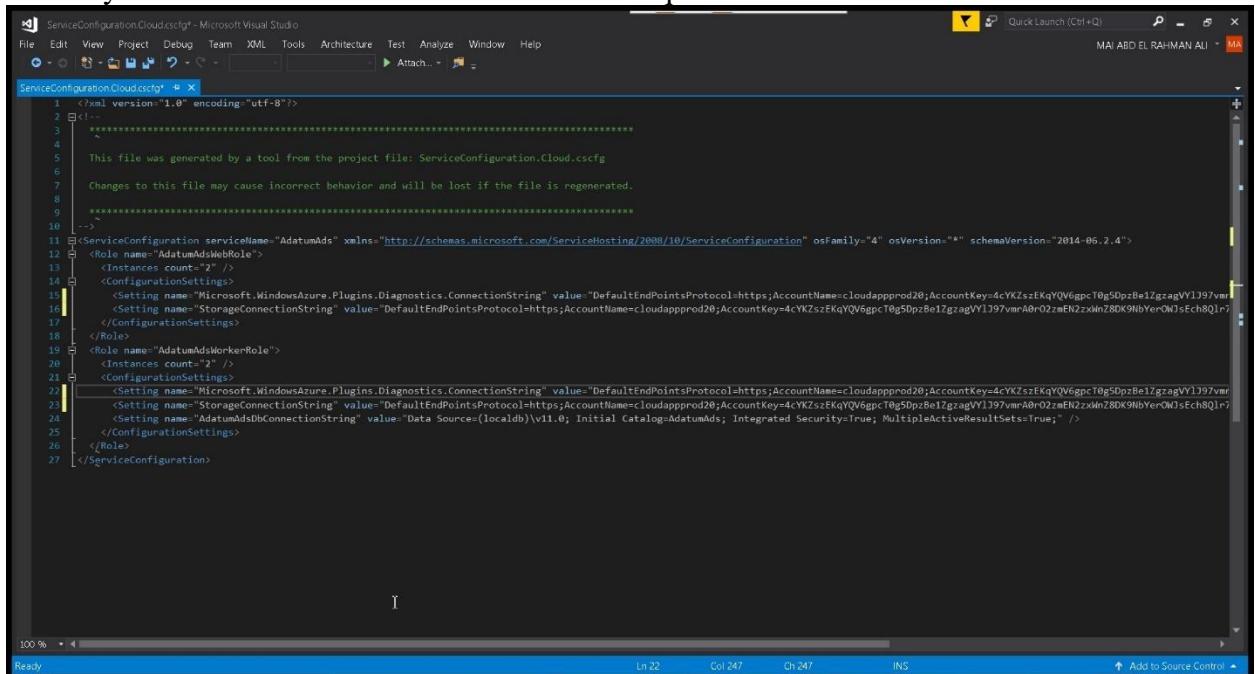
21. Click **File** and then click **Save ServiceConfiguration.Cloud.cscfg**.
22. Locate the **<Role>** element with the name **AdatumAdsWebRole**.
23. Within that **<Role>** element, locate the **<Setting>** element with the Name **Microsoft.WindowsAzure.Plugins.Diagnostics.ConnectionString**.
24. Delete the string in the **value** attribute and replace it with the following text:
DefaultEndpointsProtocol=https;AccountName=cloudappprodXXX;AccountKey=<storage account primary key>
25. Ensure you close the **value** attribute with a double quote.

Microsoft Azure Infrastructure step by step



```
<?xml version="1.0" encoding="utf-8"?>
<!--
  This file was generated by a tool from the project file: ServiceConfiguration.Cloud.cscfg
  Changes to this file may cause incorrect behavior and will be lost if the file is regenerated.
-->
<ServiceConfiguration serviceName="AdatumAds" xmlns="http://schemas.microsoft.com/ServiceHosting/2008/10/ServiceConfiguration" osFamily="4" osVersion="4" schemaVersion="2014-06.2.4">
  <Role name="AdatumAdsWebRole">
    <Instances count="2" />
    <ConfigurationSettings>
      <Setting name="Microsoft.WindowsAzure.Plugins.Diagnostics.ConnectionString" value="DefaultEndpointsProtocol=https;AccountName=cloudappprod20;AccountKey=4cYKzsxEKqYQV6gpcT0g5DpzBe1ZgzagVY1J97vmrA0rO2zEN2zxiInZ8DK9NbYerONjsEch8Ql;r"/>
      <Setting name="StorageConnectionString" value="DefaultEndpointsProtocol=https;AccountName=cloudappprod20;AccountKey=4cYKzsxEKqYQV6gpcT0g5DpzBe1ZgzagVY1J97vmrA0rO2zEN2zxiInZ8DK9NbYerONjsEch8Ql;r"/>
    </ConfigurationSettings>
  </Role>
  <Role name="AdatumAdsWorkerRole">
    <Instances count="2" />
    <ConfigurationSettings>
      <Setting name="Microsoft.WindowsAzure.Plugins.Diagnostics.ConnectionString" value="UseDevelopmentStorage=true" />
      <Setting name="StorageConnectionString" value="DefaultEndpointsProtocol=https;AccountName=cloudappprod20;AccountKey=4cYKzsxEKqYQV6gpcT0g5DpzBe1ZgzagVY1J97vmrA0rO2zEN2zxiInZ8DK9NbYerONjsEch8Ql;r"/>
      <Setting name="AdatumAdsDbConnectionString" value="Data Source=(localdb)\v11.0; Initial Catalog=AdatumAds; Integrated Security=True; MultipleActiveResultSets=True;" />
    </ConfigurationSettings>
  </Role>
</ServiceConfiguration>
```

26. Click **File** and then click **Save ServiceConfiguration.Cloud.cscfg**.
27. Locate the **<Role>** element with the name **AdatumAdsWorkerRole**.
28. Within that **<Role>** element, locate the **<Setting>** element with the Name **Microsoft.WindowsAzure.Plugins.Diagnostics.ConnectionString**.
29. Delete the string in the **value** attribute and replace it with the following text:
DefaultEndpointsProtocol=https;AccountName=cloudappprodXXX;AccountKey=<storage account primary key>
30. Ensure you close the **value** attribute with a double quote.



```
<?xml version="1.0" encoding="utf-8"?>
<!--
  This file was generated by a tool from the project file: ServiceConfiguration.Cloud.cscfg
  Changes to this file may cause incorrect behavior and will be lost if the file is regenerated.
-->
<ServiceConfiguration serviceName="AdatumAds" xmlns="http://schemas.microsoft.com/ServiceHosting/2008/10/ServiceConfiguration" osFamily="4" osVersion="4" schemaVersion="2014-06.2.4">
  <Role name="AdatumAdsWebRole">
    <Instances count="2" />
    <ConfigurationSettings>
      <Setting name="Microsoft.WindowsAzure.Plugins.Diagnostics.ConnectionString" value="DefaultEndpointsProtocol=https;AccountName=cloudappprod20;AccountKey=4cYKzsxEKqYQV6gpcT0g5DpzBe1ZgzagVY1J97vmrA0rO2zEN2zxiInZ8DK9NbYerONjsEch8Ql;r"/>
      <Setting name="StorageConnectionString" value="DefaultEndpointsProtocol=https;AccountName=cloudappprod20;AccountKey=4cYKzsxEKqYQV6gpcT0g5DpzBe1ZgzagVY1J97vmrA0rO2zEN2zxiInZ8DK9NbYerONjsEch8Ql;r"/>
    </ConfigurationSettings>
  </Role>
  <Role name="AdatumAdsWorkerRole">
    <Instances count="2" />
    <ConfigurationSettings>
      <Setting name="Microsoft.WindowsAzure.Plugins.Diagnostics.ConnectionString" value="DefaultEndpointsProtocol=https;AccountName=cloudappprod20;AccountKey=4cYKzsxEKqYQV6gpcT0g5DpzBe1ZgzagVY1J97vmrA0rO2zEN2zxiInZ8DK9NbYerONjsEch8Ql;r"/>
      <Setting name="StorageConnectionString" value="DefaultEndpointsProtocol=https;AccountName=cloudappprod20;AccountKey=4cYKzsxEKqYQV6gpcT0g5DpzBe1ZgzagVY1J97vmrA0rO2zEN2zxiInZ8DK9NbYerONjsEch8Ql;r"/>
      <Setting name="AdatumAdsDbConnectionString" value="Data Source=(localdb)\v11.0; Initial Catalog=AdatumAds; Integrated Security=True; MultipleActiveResultSets=True;" />
    </ConfigurationSettings>
  </Role>
</ServiceConfiguration>
```

31. Click **File** and then click **Save ServiceConfiguration.Cloud.cscfg**.
32. Switch to Internet Explorer.

Microsoft Azure Infrastructure step by step

33. In the navigation on the left, click **SQL Databases**.
34. In the list of databases, click **CloudServiceProdDB**.

The screenshot shows the Microsoft Azure portal's 'SQL databases' page. On the left, there's a sidebar with various service icons. The main area displays a table of databases. The first row, 'CloudServiceProdDB', is highlighted with a blue selection bar and has a cursor pointing at it. The table columns include NAME, STATUS, REPLICATION ROLE, SERVER, PRICING TIER, LOCATION, and SUBSCRIPTION.

NAME	STATUS	REPLICATION ROLE	SERVER	PRICING TIER	LOCATION	SUBSCRIPTION
CloudServiceProdDB	Online	None	gpbwir2xt1	Standard: S0	East US	MSDN Platforms (2b1c5...)
Operations	Online	None	sqlps1	Standard: S2	South Central US	MSDN Platforms (2b1c5...)

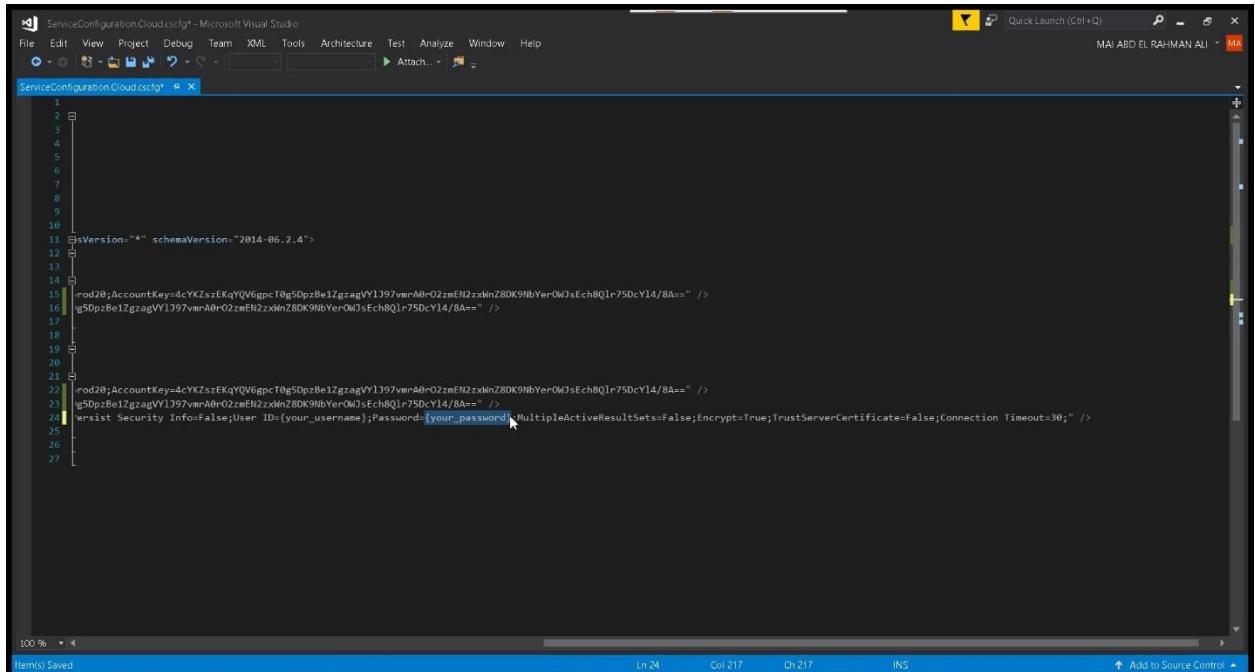
35. Under **Connect to your database**, click **View SQL Database connection strings for ADO.NET, ODBC, PHP, and JDBC**.
36. In the **Connection Strings** dialog box, select all the text in the **ADO.NET** box and then press **CTRL+C**.

The screenshot shows the 'CloudServiceProdDB - Connection strings' blade within the Azure portal. The left sidebar shows the 'CloudServiceProdDB' database. The right pane has tabs for ADO.NET, JDBC, ODBC, and PHP. The ADO.NET tab is active, showing a connection string in a text box. A 'Click to copy' button is visible next to the text box, with a cursor hovering over it.

```
Server=tcp:gpbwir2xt1.database.windows.net,1433;Initial Catalog=CloudServiceProdDB;Persist Security Info=False;User ID=[your_username];Password=[your_password];MultipleActiveResultSets=False;Encrypt=True;TrustServerCertificate=False;Connection Timeout=30;
```

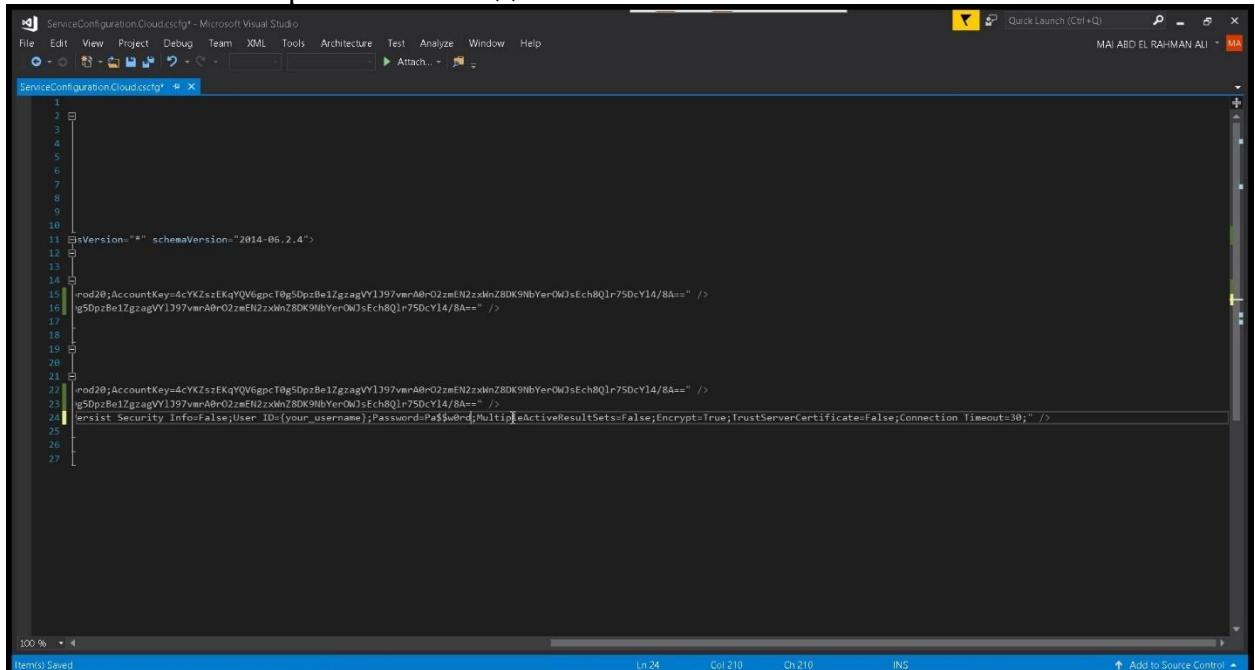
37. Switch to Visual Studio.
38. Locate the <Role> element with the name **AdatumAdsWorkerRole**.
39. Within that <Role> element, locate the <Setting> element with the Name **AdatumAdsDbConnectionString**.
40. Delete the string in the **value** attribute.
41. Press **CTRL+V** to paste the connection string you copied to the clipboard.

Microsoft Azure Infrastructure step by step



```
<?xml version="1.0" encoding="utf-8"?>
<ServiceConfiguration xmlns="http://schemas.microsoft.com/ServiceHosting/2008/10/ServiceConfiguration" schemaVersion="2014-06.2.4">
  <RoleDefinition name="WebRole1">
    <Instances count="1" />
    <Configuration>
      <Setting name="DefaultEndpointsProtocol" value="https" />
      <Setting name="Microsoft.WindowsAzure.Plugins.Diagnostics.ConnectionString" value="InstrumentationKey=4cYKZszEKqYQV6gpcT0g5DpzBe1zgzagVY1J97vmrA0rO2zmEN2zxlnZ8DK9NbYer0WjsEch8Qlr75DcY14/8A==" />
      <Setting name="MyConnectionString" value="Persist Security Info=False;User ID=(your_username);Password={your_password_here};MultipleActiveResultSets=False;Encrypt=True;TrustServerCertificate=False;Connection Timeout=30;" />
    </Configuration>
  </RoleDefinition>
</ServiceConfiguration>
```

42. In the connection string you just pasted, locate the text **{your_password_here}**. Delete the located text and replace it with **Pa\$\$w0rd**.



```
<?xml version="1.0" encoding="utf-8"?>
<ServiceConfiguration xmlns="http://schemas.microsoft.com/ServiceHosting/2008/10/ServiceConfiguration" schemaVersion="2014-06.2.4">
  <RoleDefinition name="WebRole1">
    <Instances count="1" />
    <Configuration>
      <Setting name="DefaultEndpointsProtocol" value="https" />
      <Setting name="Microsoft.WindowsAzure.Plugins.Diagnostics.ConnectionString" value="InstrumentationKey=4cYKZszEKqYQV6gpcT0g5DpzBe1zgzagVY1J97vmrA0rO2zmEN2zxlnZ8DK9NbYer0WjsEch8Qlr75DcY14/8A==" />
      <Setting name="MyConnectionString" value="Persist Security Info=False;User ID=(your_username);Password=Pa$$w0rd;MultipleActiveResultSets=False;Encrypt=True;TrustServerCertificate=False;Connection Timeout=30;" />
    </Configuration>
  </RoleDefinition>
</ServiceConfiguration>
```

43. Click **File** and then click **Save ServiceConfiguration.Cloud.cscfg**.
44. Close Visual Studio.

Task 3: Deploy the Cloud Service

To deploy the cloud service, following this procedure

1. In Internet Explorer, close the **Connection Strings** dialog box.

Microsoft Azure Infrastructure step by step

2. In the navigation on the left, click **Cloud Services**.
3. In the toolbar at the bottom, click **New** and then click **Custom Create**.

The screenshot shows the Microsoft Azure Cloud services (classic) dashboard. On the left, there's a sidebar with various service icons. The main area displays a table of existing cloud services. The columns are labeled: NAME, RESOURCE GROUP, LOCATION, and SUBSCRIPTION. There are two entries:

NAME	RESOURCE GROUP	LOCATION	SUBSCRIPTION
clouddappprod	Default-Web-EastUS	East US	MSDN Platforms (2b1c5659-ba44-4ada-b...)
uniquecloudservicename	uniquecloudservicename	South Central US	MSDN Platforms (2b1c5659-ba44-4ada-b...)

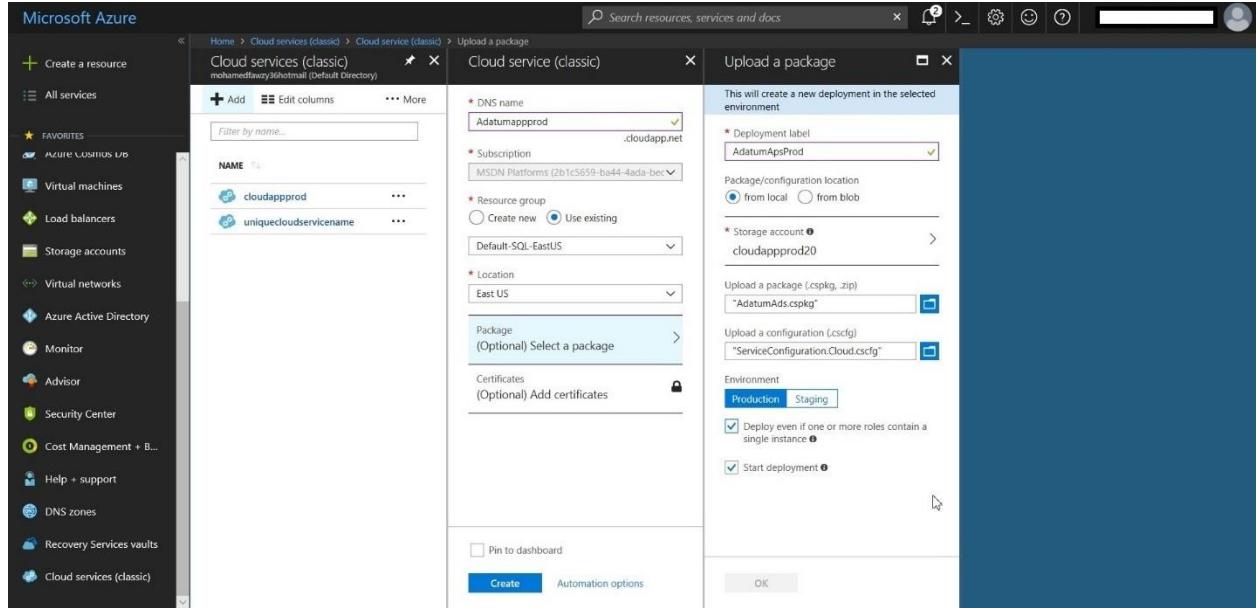
4. In the **URL** box, type your name. If a green tick does not appear, try another name.
5. Select the **Deploy a cloud service package** check box, and then click **Next**.
6. In the **Deployment Name** box, type **AdatumAdsProd**.

The screenshot shows the 'Cloud service (classic)' creation wizard. The 'Basic' configuration page is displayed. The 'Deployment Name' field contains 'AdatumAdsProd'. Other fields include:

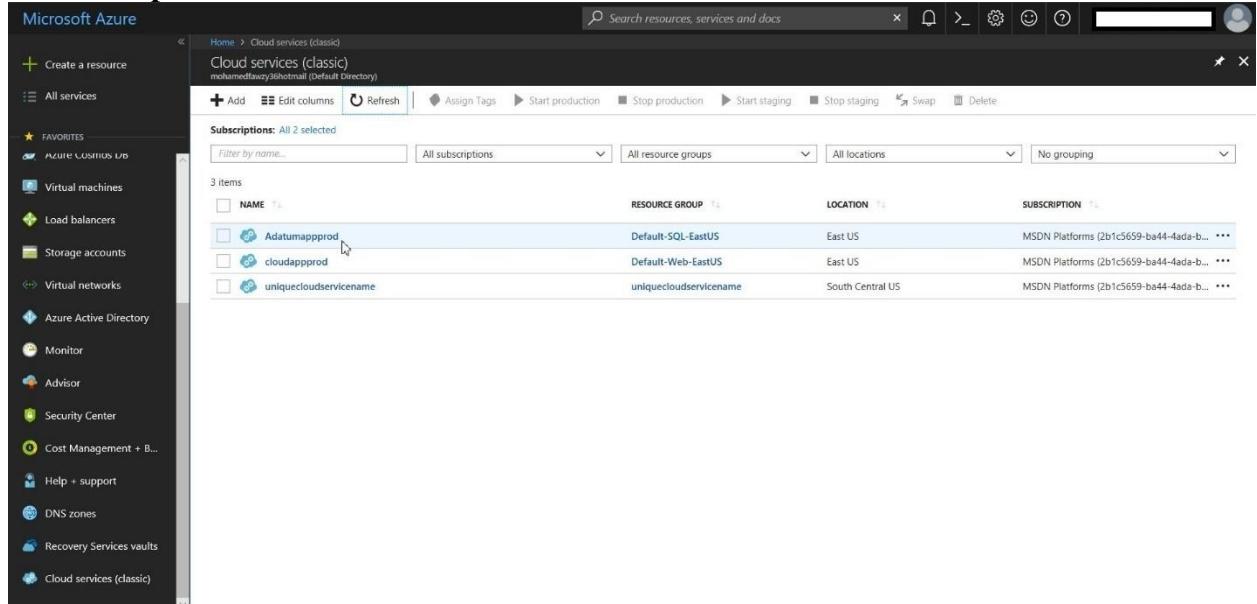
- * DNS name: AdatumAppProd.cloudapp.net
- * Subscription: MSDN Platforms (2b1c5659-ba44-4ada-bec...)
- * Resource group:
○ Create new
○ Use existing (selected)
- Default-SQL-EastUS
- * Location: East US
- Package (Optional) Select a package
- Certificates (Optional) Add certificates

7. Next to the **Package** box, click **From Local**. Click **AdatumAds.cspkg** and then click **Open**.
8. Next to the **Configuration** box, click **From Local**. Click **ServiceConfiguration.Cloud.cscfg** and then click **Open**.

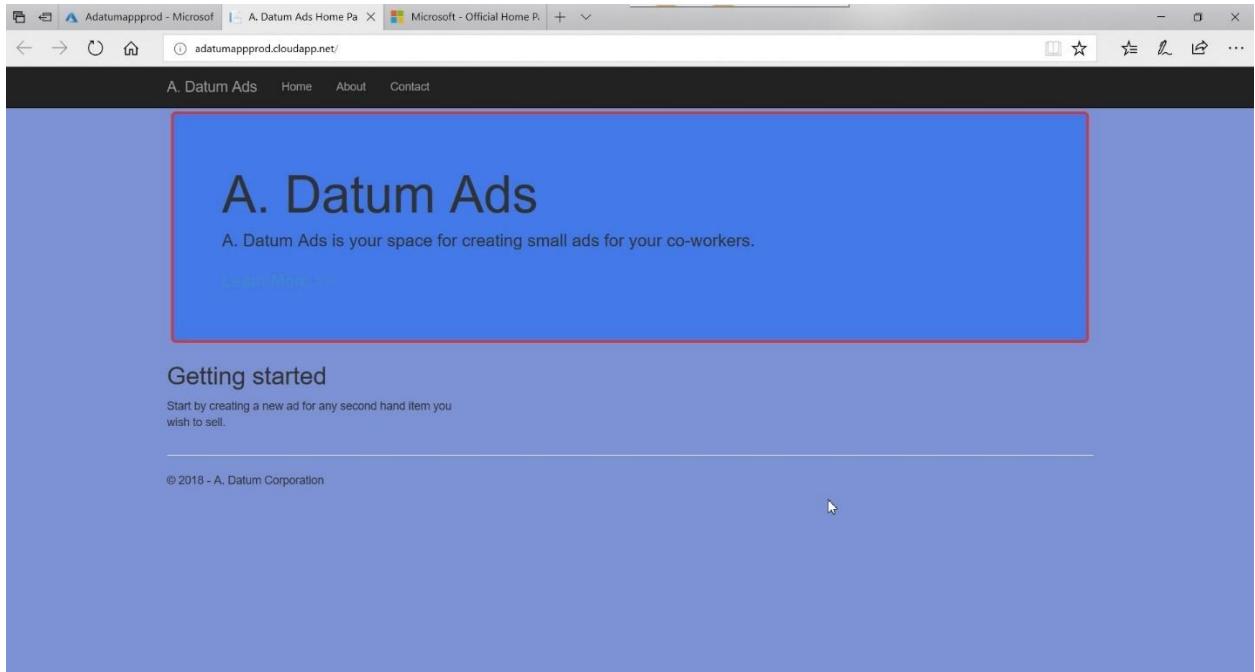
Microsoft Azure Infrastructure step by step



9. Click Complete.



Note: The deployment process for the PaaS cloud service can take several minutes to complete. Wait for the Service Status column to display Created and the Production column to display Running. If needed, you can refresh the webpage.



Configuring Deployment Slots and Remote Desktop Protocol

Task 1: Deploy a Staged Cloud Service

To deploy staged cloud service, following this procedure

1. In Internet Explorer, in the navigation on the left, click **Cloud Services**.
2. In the list of cloud services, click the name of the service you created before.

NAME	RESOURCE GROUP	LOCATION	SUBSCRIPTION
Adatumappprod	Default-SQL-EastUS	East US	MSDN Platforms (2b1c5659-ba44-4ada-b...)
clouddappprod	Default-Web-EastUS	East US	MSDN Platforms (2b1c5659-ba44-4ada-b...)
uniquecloudservicename	uniquecloudservicename	South Central US	MSDN Platforms (2b1c5659-ba44-4ada-b...)

3. Under **Deployment settings**, click **New Staging deployment**.

Microsoft Azure Infrastructure step by step

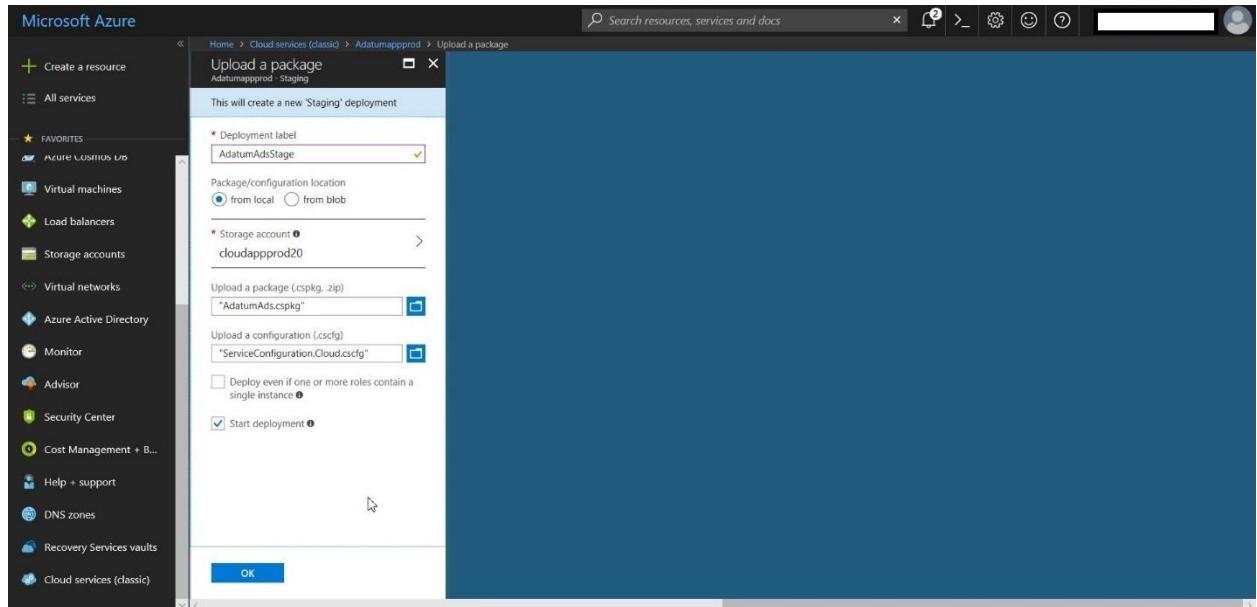
The screenshot shows the Microsoft Azure Cloud services (classic) interface. On the left, the navigation menu includes options like 'Create a resource', 'All services', and various Azure services. The main area displays the 'Adatumappprod' service, which is a 'Cloud service (classic)'. The service has three instances: 'AdatumAdsWebRole' (2 instances, both running), 'AdatumAdsWorkerRole' (2 instances, both running), and 'uniquecloudservicename' (1 instance, stopped). The 'Production' tab is selected. The 'Staging' tab is highlighted with a blue border. The right side of the screen provides deployment details: Site URL (http://adatumappprod.cloudapp.net/), Public IP addresses (13.92.157.242), Deployment name (a445787sea3f45b6a9ea62ba1535a5a2), Deployment label (AdatumApsProd), Deployment ID (f341ae1066514059af13eb427f13d9dc), and Subscription ID (2b1c5659-be44-4ada-bee9-b53a07460773).

4. In the **Deployment Label** box, type **AdatumAdsStage**.

The screenshot shows the 'Upload a package' dialog box. It prompts the user to create a new 'Staging' deployment. The 'Deployment label' field contains 'AdatumAdsStage'. The 'Package/configuration location' section has 'from local' selected. The 'Storage account' dropdown is set to 'cloudappprod20'. Below these, there are two 'Browse for file...' buttons for 'Upload a package (.cspkg, .zip)' and 'Upload a configuration (.cscfg)'. A checkbox 'Deploy even if one or more roles contain a single instance' is unchecked. A checked checkbox 'Start deployment' is present at the bottom. The 'OK' button is visible at the bottom left.

5. To the right of the **Package** box, click **From Local**. Click **AdatumAds.cspkg** and then click **Open**.
6. To the right of the **Configuration** box, click **From Local**. Click **ServiceConfiguration.Cloud.cscfg** and then click **Open**.

Microsoft Azure Infrastructure step by step

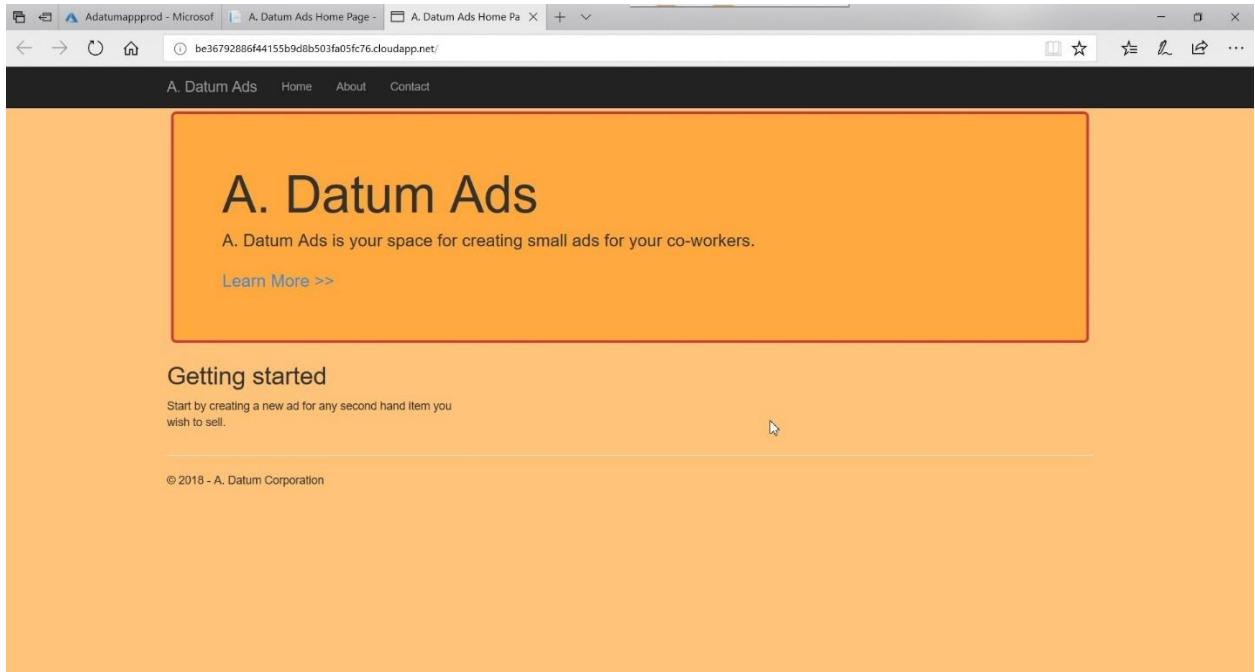


7. In the navigation on the left, click **Cloud Services**.

The screenshot shows the Microsoft Azure classic portal with the 'Cloud services (classic)' section selected in the navigation bar. The main area displays the 'Adatumappprod' service details. On the left, there is a sidebar with service management options like 'Add', 'Edit columns', and 'More'. The main content area includes:

- Overview:** Shows basic service information including Resource group (change), Default SQL (East US), Status (Running), Location (East US), Subscription (MSDN Platforms), and Subscription ID (2b1c5659-ba44-4ada-bee9-b53a07460773).
- Activity log:** Shows logs for the service.
- Access control (IAM):** Shows IAM roles and access controls.
- Diagnose and solve problems:** Provides troubleshooting tools.
- Operation log (classic):** Shows operation logs.
- SETTINGS:** Includes sections for Antimalware, Certificates, Configuration, Extensions, Roles and Instances, Remote Desktop, Scale, Azure CDN, and Properties.
- Staging:** A tab showing deployment details. It lists the Site URL (http://be36792886f44155b9d8b503fa05fc76.cloudapp.net/), Public IP addresses (52.234.214.31), Deployment name (0db3465fc5004518125a07cd04c629c), Deployment label (AdatumAdsStage), Deployment ID (be36792886f44155b9d8b503fa05fc76), and Deployment status (Running).
- Role Instances:** A table showing role instances for 'AdatumAdsWebRole' and 'AdatumAdsWorkerRole'. Both roles have two instances running.
- Cloud service role (classic):** A dropdown set to 'AdatumAdsWebRole'. Below it are buttons for 'Show data for last' (1 hour, 6 hours, 12 hours, 1 day, 7 days) and a refresh icon.

Note: The deployment process for the PaaS cloud service can take several minutes to complete. Wait for the Service Status column to display Created and the Staging column to display Running. If needed, you can refresh the webpage.



Task 2: Configure Remote Desktop Protocol Access

To configure RDP Access, following this procedure

1. User PowerShell create a self-signed cert.

```
$cert = New-SelfSignedCertificate -DnsName mai2016cmg.cloudapp.net -CertStoreLocation "cert:\LocalMachine\My"  
$password = ConvertTo-SecureString -String "P@ssw0rd" -Force -AsPlainText  
Export-PfxCertificate -Cert $cert -FilePath ".\my-cert-file.pfx" -Password $password  
Export-Certificate -Type CERT -Cert $cert -FilePath .\my-cert-file.cer
```

```
Administrator: Windows PowerShell  
Copyright (C) Microsoft Corporation. All rights reserved.  
PS C:\WINDOWS\system32> $cert = New-SelfSignedCertificate -DnsName Adatumappprod.cloudapp.net -CertStoreLocation "cert:\LocalMachine\My" -KeyLength 2048 -KeySpec "KeyExchange"  
PS C:\WINDOWS\system32> $password = ConvertTo-SecureString -String Passw0rd -Force -AsPlainText  
PS C:\WINDOWS\system32> Export-PfxCertificate -Cert $cert -FilePath ".\my-cert-file.pfx" -Password $password  
  
Directory: C:\WINDOWS\system32  
  
Mode LastWriteTime Length Name  
---- ----- ----  
-a--- 3/18/2018 4:43 PM 2701 my-cert-file.pfx  
  
PS C:\WINDOWS\system32>
```

2. In the navigation on the left, click **Cloud Services**.
3. Click the name of the PaaS cloud service you created.
4. Click **Configure**, and then click **Production**.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure Cloud services (classic) interface. On the left, the navigation menu includes options like 'Create a resource', 'All services', and various Azure services. The main area displays the 'Adatumappprod' service, which is a 'Cloud service (classic)' under 'mohamedfawzy36@hotmail (Default Directory)'. The service list shows three items: 'Adatumappprod', 'cloudappprod', and 'uniquecloudservicename'. The 'Adatumappprod' item is selected. The right pane provides detailed information about the service, including its status (Production), location (East US), subscription details, and deployment logs. It also lists the roles and instances: 'AdatumAdsWebRole' (IN_0, IN_1) and 'AdatumAdsWorkerRole' (IN_0, IN_1), both of which are running.

5. Select Certificate, then Click Upload

This screenshot shows the 'Certificates' section within the 'Adatumappprod - Certificates' blade. The 'Certificates' option in the left sidebar is highlighted. A modal dialog titled 'Upload certificate' is open on the right, prompting for a certificate file ('my-cert-file.pfx') and a password. The 'FILE' field contains the path to the certificate file, and the 'PASSWORD' field has a password entered with a checked checkbox.

6. Certificate should appear on dashboard.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure Cloud services (classic) interface. On the left, the navigation menu includes options like Create a resource, All services, Favorites, Virtual machines, Load balancers, Storage accounts, Virtual networks, Azure Active Directory, Monitor, Advisor, Security Center, Cost Management + B..., Help + support, DNS zones, Recovery Services vaults, and Cloud services (classic). The main area displays the 'Adatumappprod - Certificates' blade. It shows a list of certificates with columns for SUBJECT, STATUS, THUMBPRINT, and EXPIRES ON. One certificate is listed: CN=Adatumappprod.cloudapp.net, Status: Created, Thumbprint: CC2D29ED4186D0844857D8CBAA4A304B2C54..., Expires On: 3/18/2019.

7. On the toolbar at the bottom, click **Remote Desktop**.

The screenshot shows the Microsoft Azure Cloud services (classic) interface. The navigation menu is identical to the previous screenshot. The main area displays the 'Adatumappprod' blade under the 'Cloud service (classic)' section. The 'SETTINGS' sidebar includes options like Antimalware, Certificates, Configuration, Extensions, Roles and Instances, Remote Desktop, Scale, Azure CDN, and Properties. The 'Remote Desktop' option is highlighted. The main content area shows the 'Starting cloud service' details and a table of roles. The 'AdatumAdsWebRole' table has two rows: AdatumAdsWebRole_IN_0 and AdatumAdsWebRole_IN_1, both in Starting status. The 'AdatumAdsWorkerRole' table also has two rows: AdatumAdsWorkerRole_IN_0 and AdatumAdsWorkerRole_IN_1, both in Starting status. At the bottom, there are buttons for Show data for last (1 hour, 6 hours, 12 hours, 1 day) and a dropdown for Cloud service role (classic).

8. Select the **Enable Remote Desktop** check box.

- In the **User Name** box, type **RDPAdmin**.
- In the **New Password** box, type **Pa\$\$w0rd**.
- In the **Confirm Password** box, type **Pa\$\$w0rd**.
- In the **Expire On** box, select a date one month from today's date.

Microsoft Azure Infrastructure step by step

The screenshot shows the Azure portal interface. On the left, the navigation menu includes 'Create a resource', 'All services', and various Azure services like Virtual machines, Load balancers, Storage accounts, etc. The main area shows 'Cloud services (classic)' under 'mohamedfawzy36@hotmail (Default Directory)'. A specific service named 'Adatumappprod' is selected. The right pane displays the 'Adatumappprod - Remote Desktop' configuration page. Under 'SETTINGS', the 'Remote Desktop' section is open, showing the 'Enabled' status. It requires a 'User name' (set to 'RDPAdmin') and a 'Password' (set to '*****'). An 'Encryption certificate' is also specified with the value 'CN=Adatumappprod.cloudapp.net'. At the bottom, a date '2018-04-17' is shown.

9. Click **save**.
10. Wait until the configuration operation is complete.

Task 3: Test Connectivity

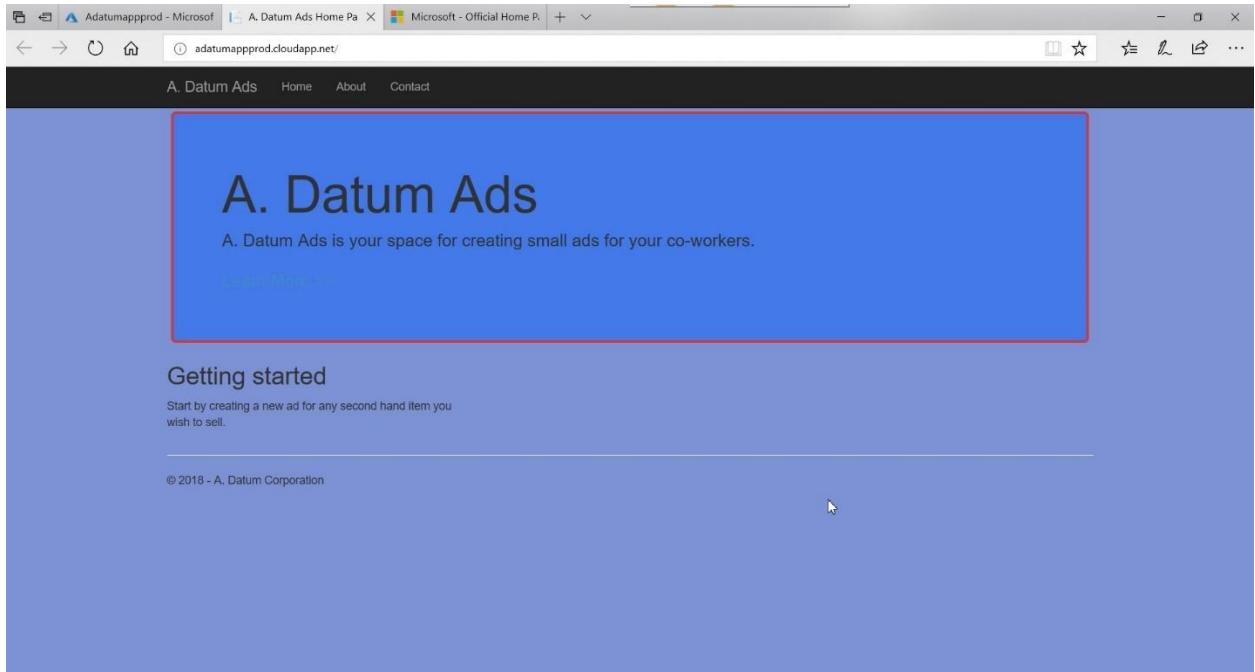
To test connectivity between production & staging, following this procedure

1. In the Azure Portal, in the navigation on the left, click **Cloud Services**.
2. Click the name of the cloud service you created.
3. Click **Dashboard**, and then click **Production**.

The screenshot shows the Azure portal interface. The left navigation bar is identical to the previous screenshot. The main area shows 'Cloud services (classic)' under 'mohamedfawzy36@hotmail (Default Directory)'. The service 'Adatumappprod' is selected. The right pane is the 'Adatumappprod - Dashboard' page. It displays the 'Quick Glance' section with a 'Site URL' of 'http://adatumappprod.cloudapp.net/'. Below this, detailed information about the deployment is provided, including the resource group ('Default-SQL-EastUS'), status ('Running'), location ('East US'), subscription ('MSDN Platforms'), and deployment ID ('f341ae1866514059af13eb427f13d9dc'). The 'Cloud service role (classic)' section lists two roles: 'AdatumAdsWebRole' and 'AdatumAdsWorkerRole', each with two instances running successfully. A 'Show data for last' dropdown at the bottom allows selecting time intervals: '1 hour', '6 hours', '12 hours', '1 day', or '7 days'.

4. Under **Quick Glance**, click the **Site URL**. The cloud service home page opens in a new Internet Explorer tab.

Microsoft Azure Infrastructure step by step

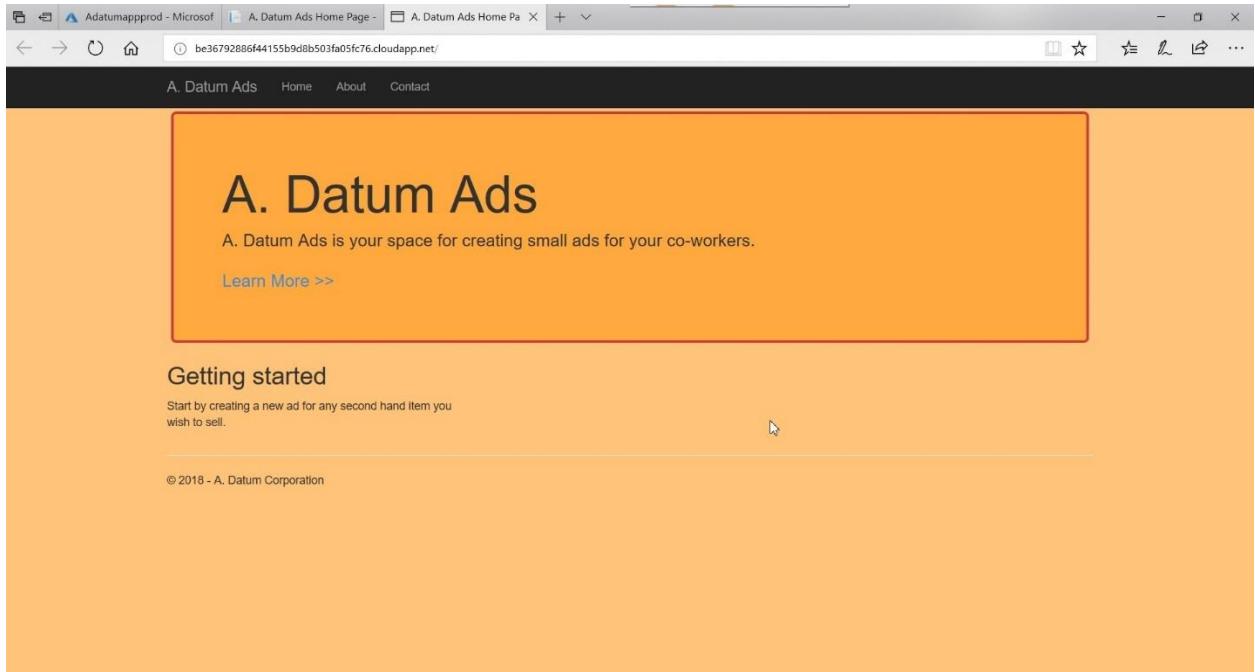


5. Close the new Internet Explorer tab.
6. In the cloud service dashboard, click **Staging**.

NAME	STATUS	SIZE	UPDATE	FAULT
AdatumAdsWebRole_IN_0	Running	Small	0	0
AdatumAdsWebRole_IN_1	Running	Small	1	1
AdatumAdsWorkerRole_IN_0	Running	Small	0	0
AdatumAdsWorkerRole_IN_1	Running	Small	1	1

7. Under **Quick Glance**, click the **Site URL**. The cloud service staging home page opens in a new Internet Explorer tab.

Microsoft Azure Infrastructure step by step

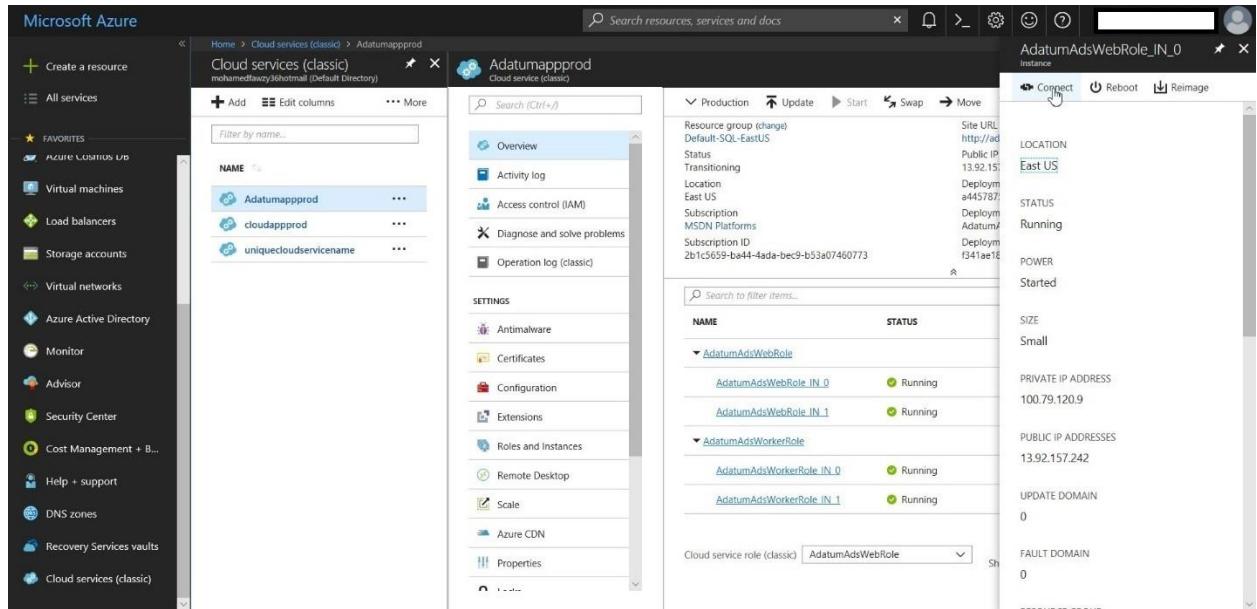


8. Close the new Internet Explorer tab.
9. At the top of the portal, click **Instances** and then click **Production**.
10. In the list of instances, click **AdatumAdsWebRole_IN_0**.

NAME	STATUS	SIZE	UPDATE	FAULT
AdatumAdsWebRole_IN_0	Running	Small	0	0
AdatumAdsWebRole_IN_1	Running	Small	1	1
AdatumAdsWorkerRole_IN_0	Running	Small	0	0
AdatumAdsWorkerRole_IN_1	Running	Small	1	1

11. In the toolbar at the bottom, click **Connect** and then click **Open**.

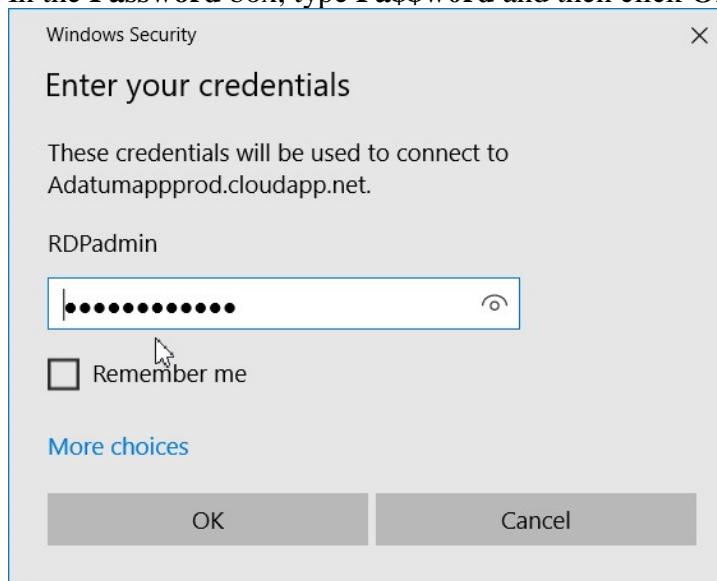
Microsoft Azure Infrastructure step by step



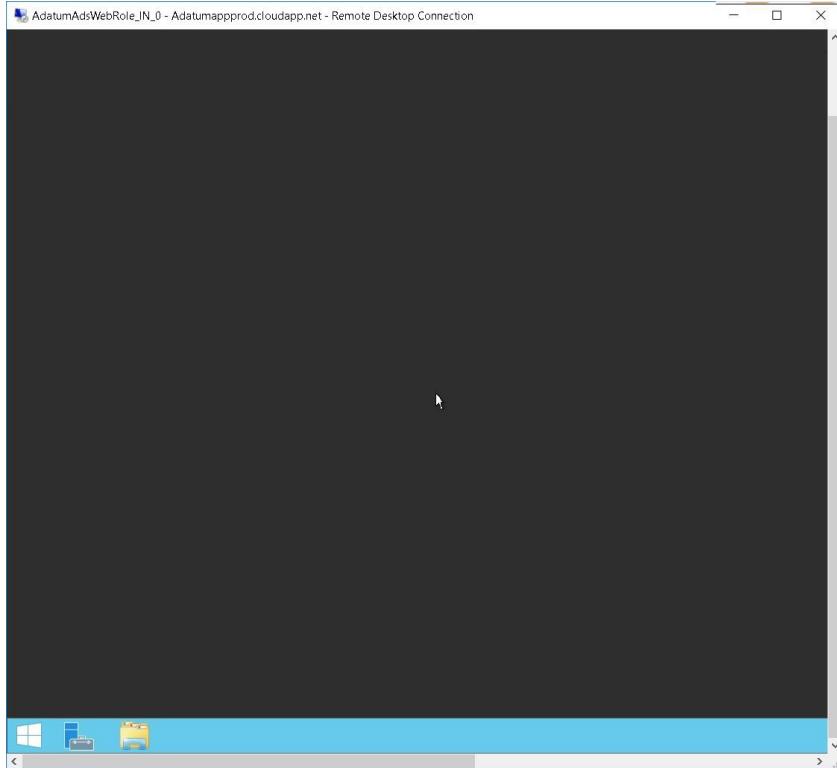
The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes 'Create a resource', 'All services', and various Azure services like Virtual machines, Load balancers, Storage accounts, and Cloud services (classic). The main area displays the 'Adatumappprod' cloud service (classic). The 'Overview' section shows the service is in Production, Status: Transitioning, Location: East US, and Subscription: MSDN Platforms. It lists two instances: 'AdatumAdsWebRole_IN_0' and 'AdatumAdsWebRole_IN_1', both running. The 'SETTINGS' sidebar includes options for Antimalware, Certificates, Configuration, Extensions, Roles and Instances, Remote Desktop, Scale, Azure CDN, and Properties. The bottom right shows deployment details: Site URL (http://ad), Public IP (13.92.15.242), Deployment ID (a445787), Deployment Name (AdatumAdsWebRole_IN_0), Deployment Type (Deploy), and Deployment Status (Running). Other metrics shown include Size (Small), Private IP Address (100.79.120.9), Public IP Addresses (13.92.157.242), Update Domain (0), and Fault Domain (0).

12. In the **Remote Desktop Connection** dialog box, click **Connect**.

13. In the **Password** box, type **Pa\$\$w0rd** and then click **OK**.



14. In the **Remote Desktop Connection** dialog box, click **Yes**. The RDP client displays the desktop for the first instance of the web role.



15. Close the remote desktop connection.

Monitoring Cloud Services

Cloud services and mobile services may need to support large numbers of users and still respond quickly. During times of high demand, you should be able to monitor the performance of your service in detail so that you can be sure users have a smooth experience.

In this exercise, you will have configured monitoring for a PaaS cloud service with new metrics and an alert.

Task 1: Add Metrics to the Monitoring Table

To add metric to monitoring table, following this procedure

1. At the top of the portal, click **Monitoring** and then click **Production**.
2. In the **Monitoring** blade, click **Metrics**.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure Cloud services (classic) interface. On the left, the navigation menu includes options like 'Create a resource', 'All services', and various Azure services. The main area displays the 'Adatumappprod' service details. The 'NAME' section lists three entries: 'Adatumappprod', 'cloudappprod', and 'uniquecloudservicename'. The 'MONITORING' section has 'Metrics' selected. The 'SUPPORT + TROUBLESHOOTING' section includes a 'New support request' button. To the right, detailed information about the service is shown, including its deployment ID, deployment name, and deployment label. A table lists the roles and their status: 'AdatumAdsWebRole IN_0' and 'AdatumAdsWebRole IN_1' are both running. Below the table, there's a dropdown for 'Cloud service role (classic)' and a 'Show data for last' dropdown with options for 1 hour, 6 hours, 12 hours, 1 day, and 7 days.

3. Click on Graph.

This screenshot shows the 'Adatumappprod - Metrics' view. The left sidebar remains the same. The main area now displays two metric graphs. The top graph, titled 'CPU percentage ADATUMADSWEBROLE', shows a sharp spike from 0% to 100% between 6 AM and 10 AM on March 18. The bottom graph, titled 'Disk read and write ADATUMADSWEBROLE', shows a high peak of 2500B/s around 6 AM on March 18. Both graphs have time ranges from 6 PM on March 18 to 10 AM on March 19.

4. Click Add Metric Rule.

Microsoft Azure Infrastructure step by step

Metrics

Diagnostics settings + Add metric alert

Launch the preview of the new metrics experience.

Subscription: MSDN Platforms (2b1c5659-ba44-4ada-bec9-b53a07460773) Resource group: Default-SQL-EastUS Resource type: roles Resource: AdatumAdsWebRole

Available metrics

Filter metrics... You can only select metrics of the same unit (%)

CPU percentage ADATUMADSWEBSITE

CPU percentage Disk read Disk write Network In Network Out

No alerts configured for this resource. Click to add an alert.

5. Type Name **Network Out WebRole** section, on Metric **Network Out**.

Search resources, services and docs

Add rule

Name: Network OUT WebRole

Description:

Source

Alert on: Metrics

Criteria

Subscription: MSDN Platforms (2b1c5659-ba44-4ada-bec9-b53a07460773)

Resource group: Default-SQL-EastUS

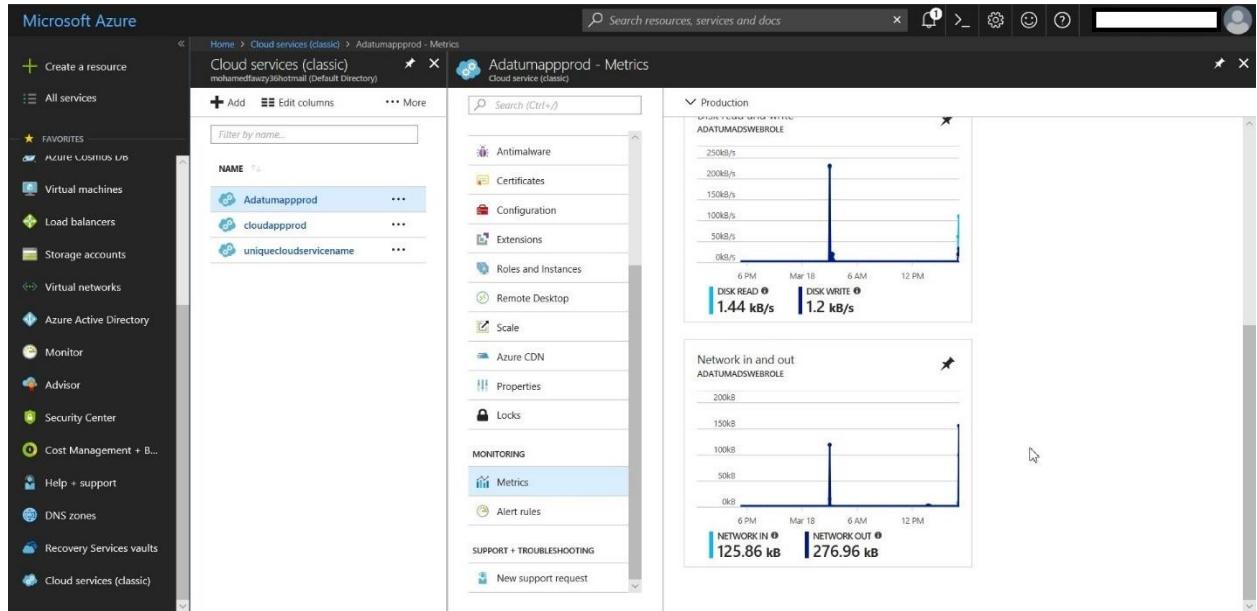
Resource: Adatumappprod/Production/AdatumAdsWebRole

Metric: Network Out

OK

6. At the metric page, you should find new metric called Network Out for Adatum WebRole.

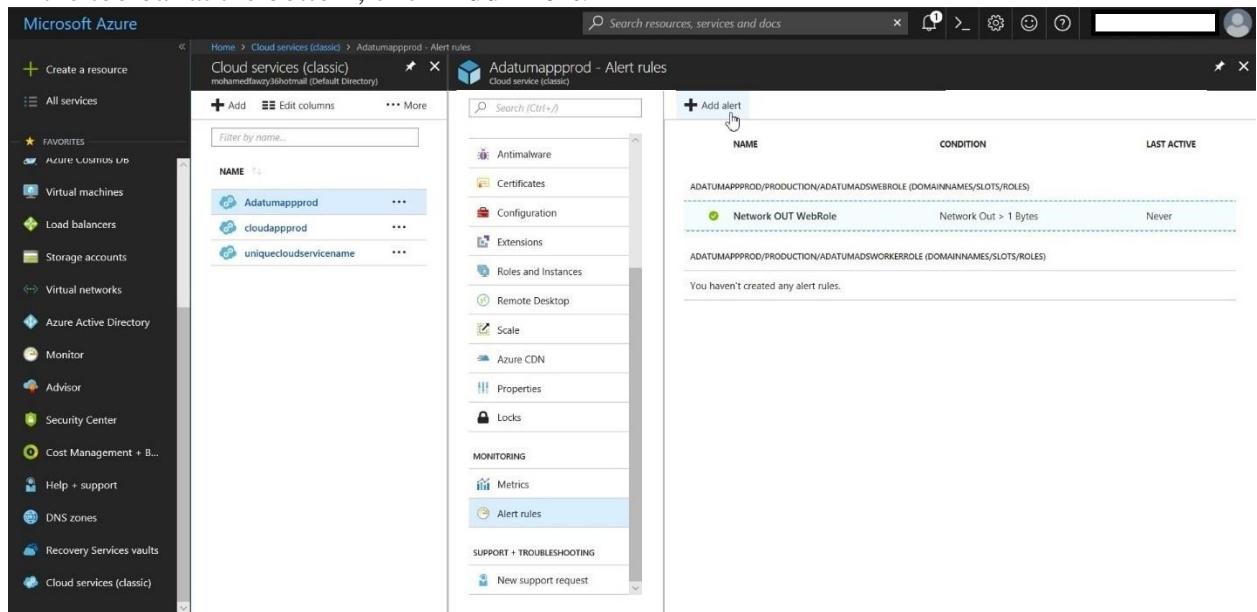
Microsoft Azure Infrastructure step by step



Task 2: Create an Alert

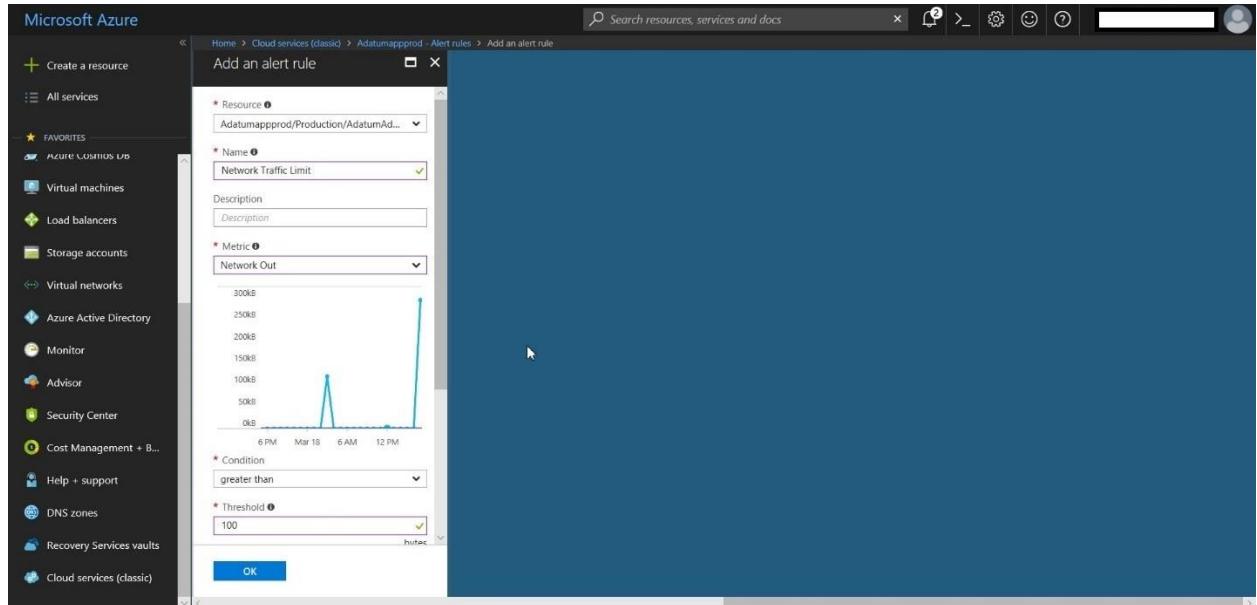
To create alert, following this procedure

1. In the list of metrics, select the **Network Out** metric for the **AdatumAdsWebRole** role.
2. In the toolbar at the bottom, click **Add Alert**.

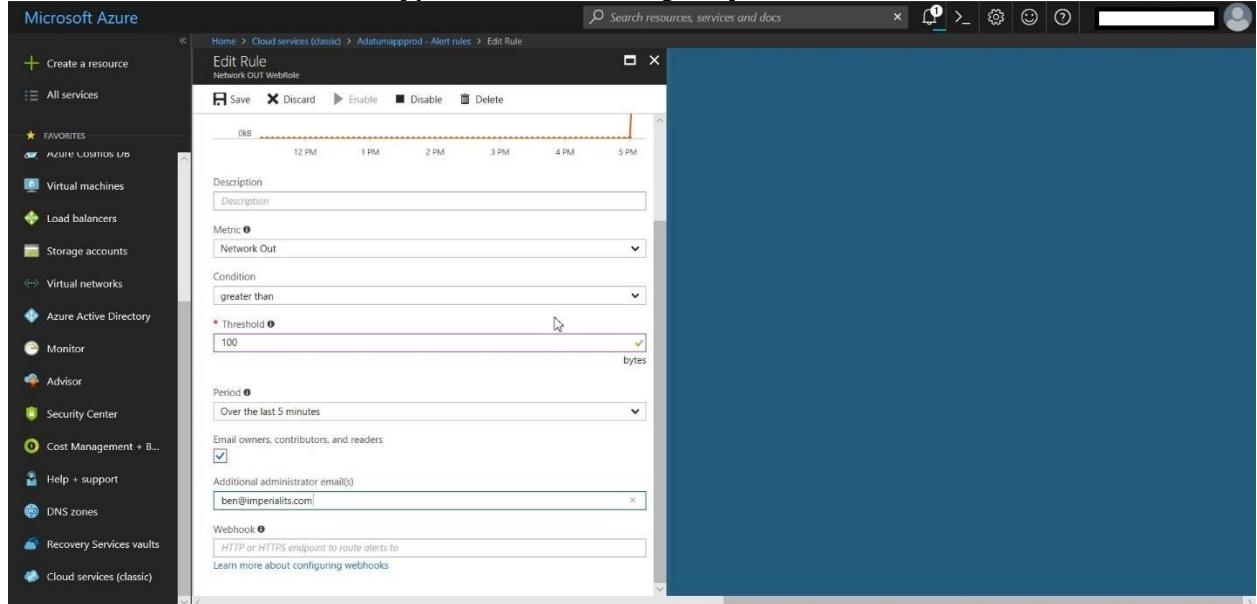


3. In the **Name** box, type **Network Traffic Limit**.

Microsoft Azure Infrastructure step by step



4. In the **Threshold Value** box, type **100** and select **Specify the email address**



5. Click **Ok**.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface for Cloud services (classic). The left sidebar lists various service categories like Virtual machines, Storage accounts, and Cloud services (classic). The main pane displays 'Adatumappprod - Alert rules' for the 'Cloud service (classic)' named 'mohamedfawzy360mail (Default Directory)'. A search bar at the top right says 'Search resources, services and docs'. On the left, a sidebar menu includes 'Add alert', 'Edit columns', 'More', 'NAME', 'Filter by name...', 'Antimalware', 'Certificates', 'Configuration', 'Extensions', 'Roles and Instances', 'Remote Desktop', 'Scale', 'Azure CDN', 'Properties', 'Locks', 'MONITORING', 'Metrics', 'Alert rules' (which is selected), and 'SUPPORT + TROUBLESHOOTING'. The main content area shows two alert rules under 'ADATUMAPPPROD/PRODUCTION/ADATUMADSWEBOROLE (DOMAINNAMES/SLOTS/ROLES)': 'Network OUT WebRole' (Network Out > 100 Bytes) and 'Network Traffic Limit' (Network Out > 100 Bytes). Below these, a message says 'You haven't created any alert rules.'.

Task 3: Monitor an Active Cloud Service

To monitor active cloud service, following this procedure

1. At the top, click **Monitor** and then click **Overview**.

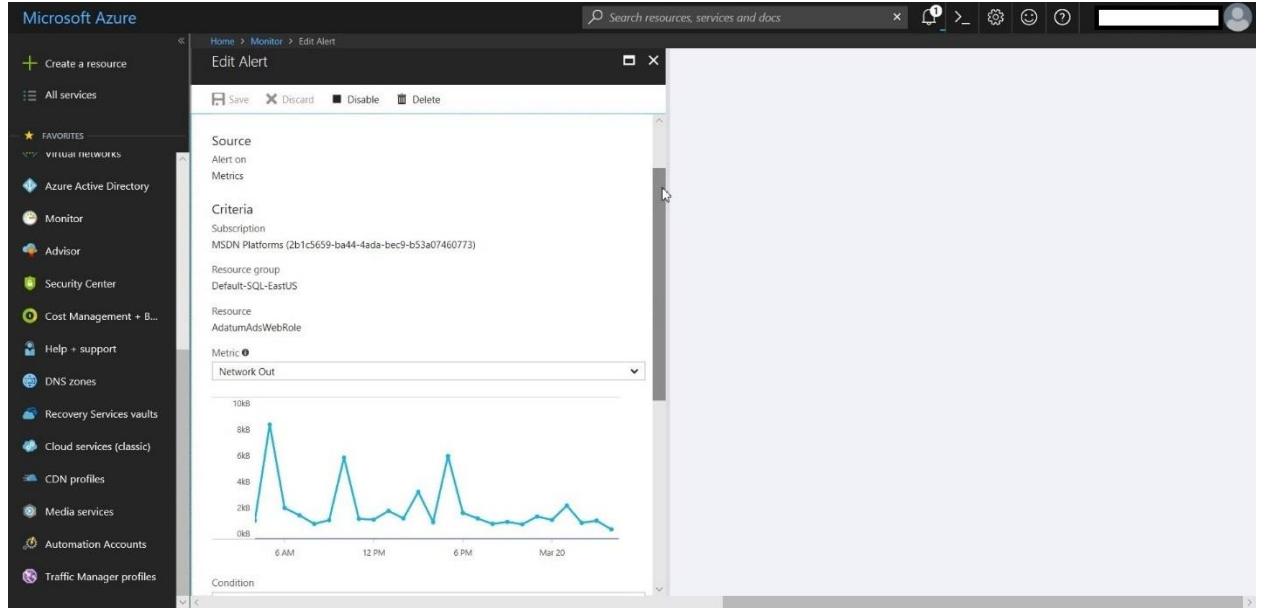
The screenshot shows the Microsoft Azure portal interface for Monitor. The left sidebar lists various monitoring solutions like Application Insights, Network watcher, and Management solutions. The main pane displays the 'Monitor Microsoft' overview. It features a 'Refresh' button, a 'Subscription' dropdown set to 'forms (2b1c5659-ba44-4ada-bec9-b53a07460773)', and a 'Time range' dropdown set to 'Last 6 hours'. Key metrics shown include 'Alerts (Classic) fired' (34), 'Alerts fired' (0), 'Activity log errors' (0), and 'Service Health' (0 Service Issues, 0 Planned Maintenance, 0 Health Advisories). Below this is a section for 'Alert (Classic) sources (3)' with a table:

NAME	STATUS	CONDITION	SOURCE	RESOURCE GR...	RESOURCE TYPE	RESOURCE	FIRE ALERTS...	LAST FIRED
AdatumWebRole...	Warning	Network Out > ...	Metrics	Default-SQL-Eas...	Microsoft.Classic...	Adatumappprod...	18	16 min ago
Network OUT W...	Warning	Network Out > ...	Metrics	Default-SQL-Eas...	Microsoft.Classic...	Adatumappprod...	8	18 min ago
Network Traffic L...	Warning	Network Out > ...	Metrics	Default-SQL-Eas...	Microsoft.Classic...	Adatumappprod...	8	18 min ago

At the bottom, there are sections for 'Application Insights' and 'Log Analytics' with 'Add' buttons.

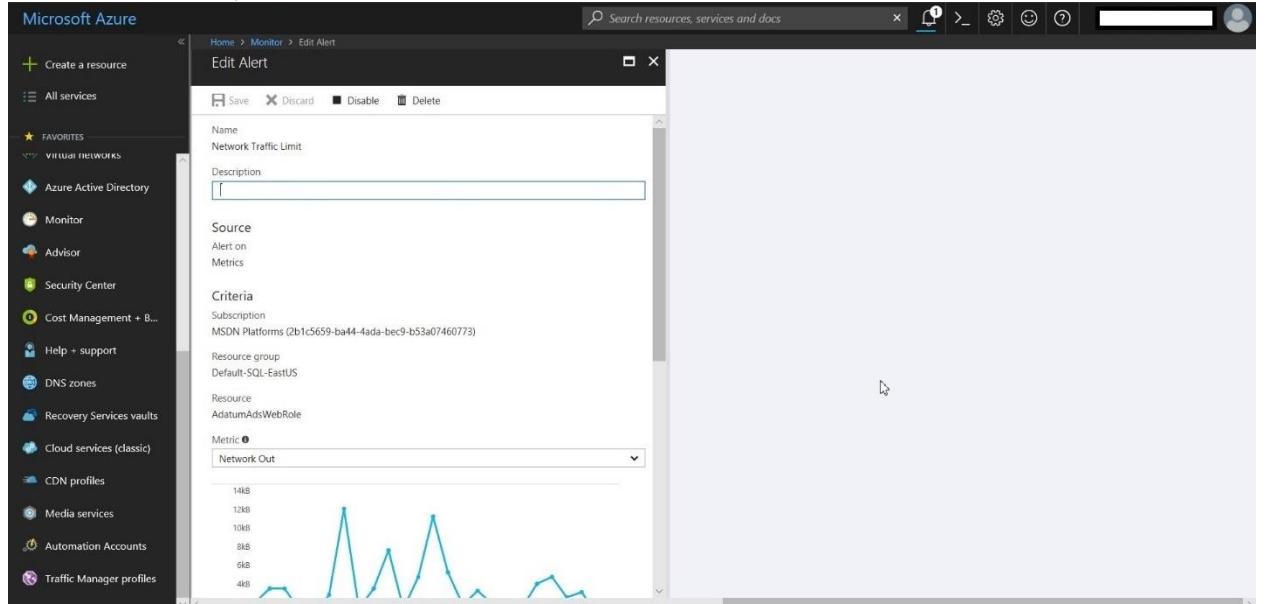
2. In the list of metrics, select **Network Out** metric for the **AdatumAdsWebRole** role.

Microsoft Azure Infrastructure step by step



The screenshot shows the 'Edit Alert' dialog box in the Microsoft Azure portal. The 'Criteria' section is selected, displaying a chart titled 'Network Out'. The chart shows network traffic volume over time, with major peaks around 8 AM, 1 PM, and 5 PM. The Y-axis ranges from 0KB to 10KB, and the X-axis shows hours from 6 AM to 6 PM on March 20. Below the chart, there is a 'Condition' section which is currently empty.

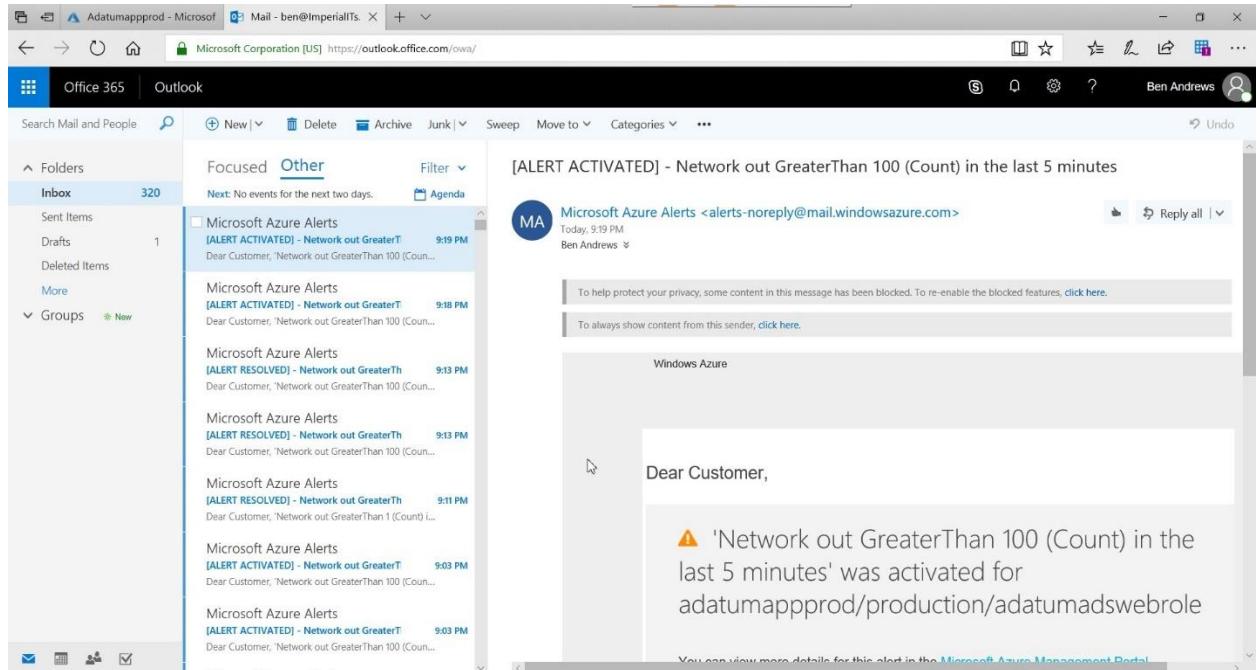
3. In the list of rules, click **Network Traffic Limit**.



The screenshot shows the 'Edit Alert' dialog box in the Microsoft Azure portal. The 'Condition' section at the bottom of the dialog now contains the text 'Network Traffic Limit'. The rest of the dialog remains the same as the previous screenshot, showing the 'Edit Alert' interface with the 'Criteria' tab active and a network traffic chart.

4. In the list of emails, click **Microsoft Azure Alerts**.

Microsoft Azure Infrastructure step by step



5. Inspect the details of the alert.

Chapter 8

Azure Content Delivery Networks and Media Services

A CDN is a concept widely used on the Internet to accelerate and improve the delivery of all kinds of content to web users. The content can include text files, script libraries, downloadable software, and media such as video and audio files. In a CDN, content is replicated to a large number of servers, which are geographically distributed around the world. When a user requests an item of content, the request is forwarded to a CDN server that is close to the user's location.

You can create your own CDN by configuring the Azure Content Delivery Network service. This service can cache content from Azure storage accounts, PaaS cloud services, virtual machines in IaaS cloud services, or Azure websites.

Azure Media Services provides the facilities many organizations need to stream media such as video and audio content. You can use Media Services to encode, publish, and stream a wide variety of formats to a broad base of clients, such as mobile devices, computers, and connected televisions. Media Services streams content from Azure Storage accounts.

Implementing a Content Delivery Network & Cloud Services

The Azure Content Delivery Network (CDN) caches static web content at strategically placed locations to provide maximum throughput for delivering content to users. The CDN offers developers a global solution for delivering high-bandwidth content by caching the content at physical nodes across the world.

The benefits of using the CDN to cache web site assets include:

- Better performance and user experience for end users, especially when using applications where multiple round-trips are required to load content.
- Large scaling to better handle instantaneous high load, like at the start of a product launch event.
- By distributing user requests and serving content from edge servers, less traffic is sent to the origin.

Configuring a Content Delivery Network

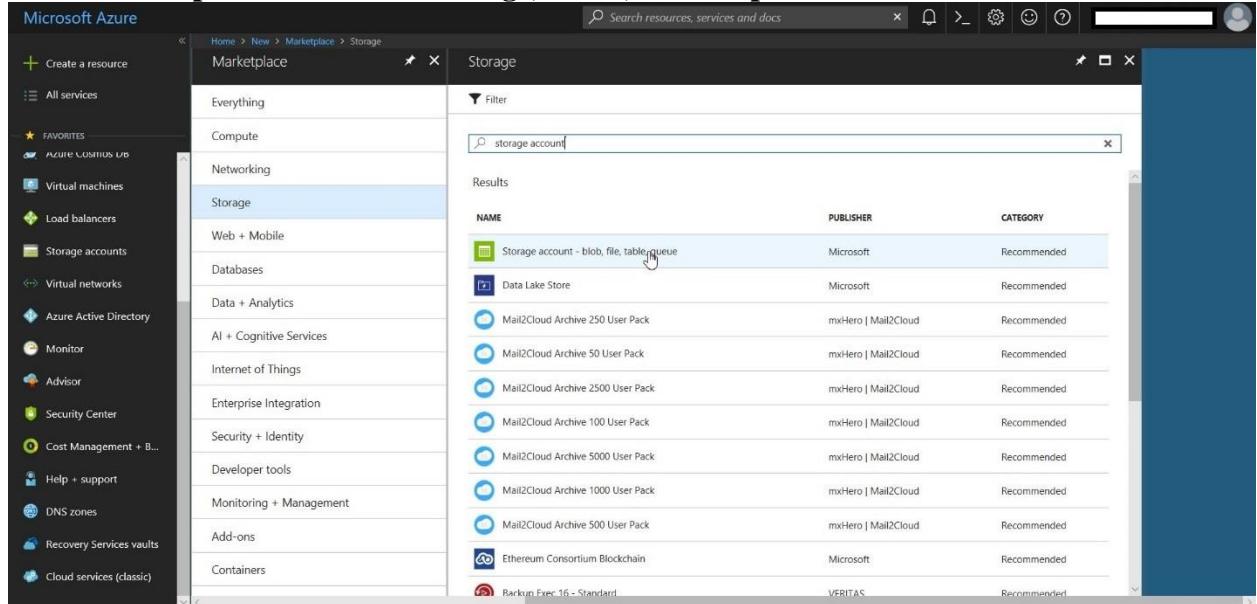
In this exercise, you will enable content delivery network

Task 1: Create a New Storage Account

To create new storage account, following this procedure

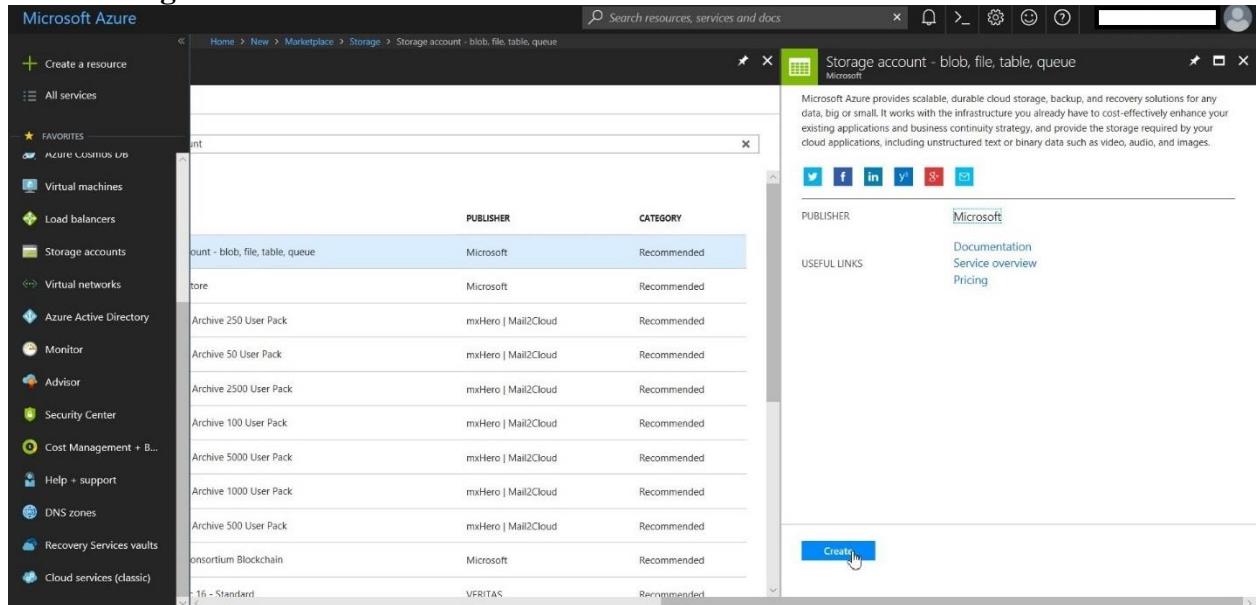
Microsoft Azure Infrastructure step by step

1. Start Internet Explorer, browse to <https://portal.azure.com>, and sign in using the Microsoft account that is associated with your Azure subscription.
2. Click **New**, and then click **Everything**.
3. In the **Marketplace** blade, click **Storage, cache, + backup**.



The screenshot shows the Microsoft Azure Marketplace blade. The left sidebar has a 'Create a resource' button and a 'Marketplace' section with categories like All services, Compute, Networking, Storage, Web + Mobile, Databases, Data + Analytics, AI + Cognitive Services, Internet of Things, Enterprise Integration, Security + Identity, Developer tools, Monitoring + Management, Add-ons, and Containers. The 'Storage' category is selected. The main area is titled 'Storage' and shows a search bar with 'storage account'. Below it is a table with columns 'NAME', 'PUBLISHER', and 'CATEGORY'. The first item in the list is 'Storage account - blob, file, table, queue' by Microsoft, which is highlighted with a cursor. Other items include Data Lake Store, Mail2Cloud Archive User Packs, and Backup Exec 16 - Standard.

4. Click **Storage** and then click **Create**.

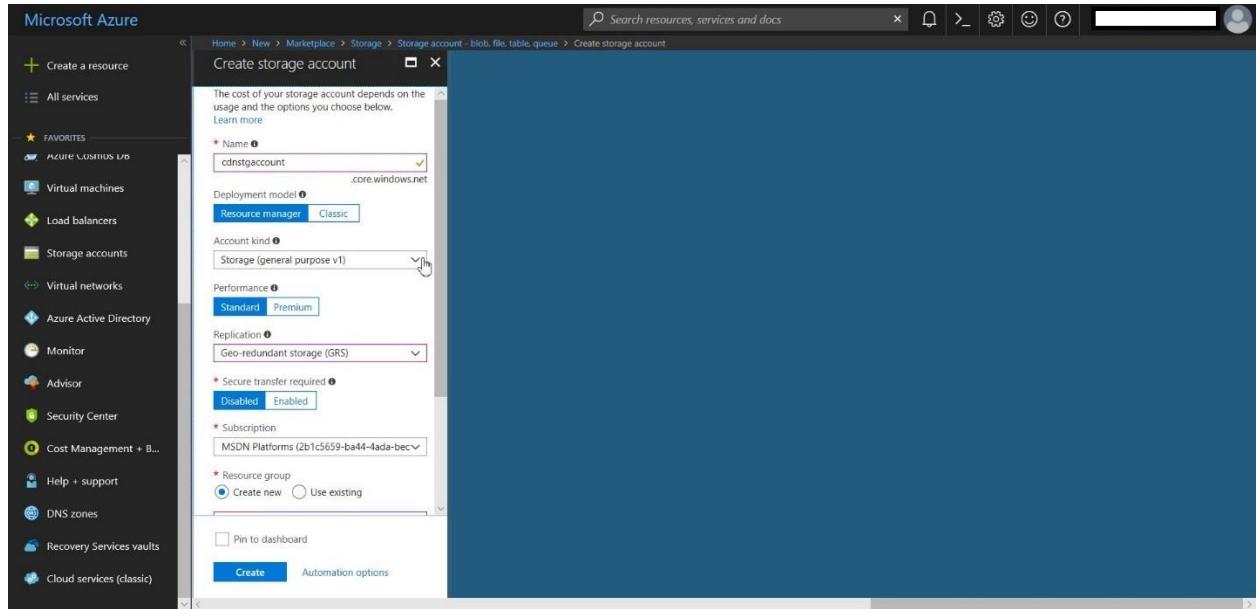


The screenshot shows the 'Storage account - blob, file, table, queue' creation blade. The left sidebar is identical to the previous screenshot. The main area shows a table with the same items as the previous screenshot. On the right side, there is a 'Microsoft' logo and social sharing icons. Below that is a 'DESCRIPTION' section with text about Azure storage solutions. At the bottom right is a 'PUBLISHER' section with a Microsoft link. Further down are 'USEFUL LINKS' for Documentation, Service overview, and Pricing. At the very bottom right is a large blue 'Create' button with a cursor pointing to it.

5. In the **Storage account** blade, enter the following settings and click **Create**:

- Storage: Use **cdnstgaccount**.
- Pricing Tier: **Standard-GRS**
- Resource Group: **CDN-Storage**
- Subscription: **Default value**.
- Location: **Default value**.

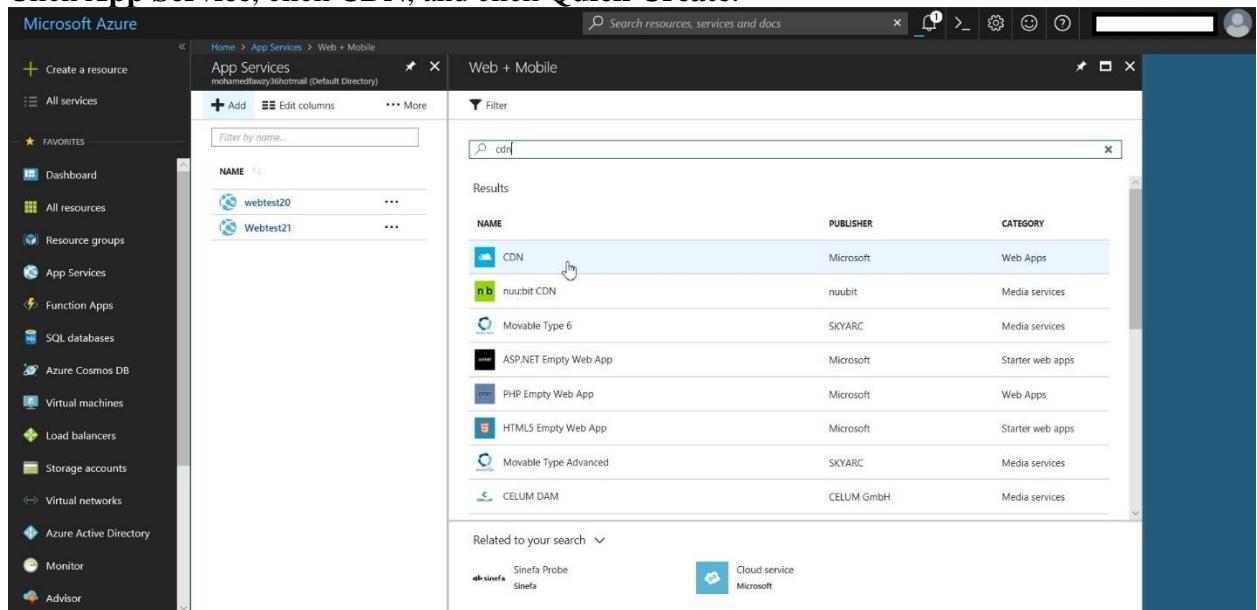
Microsoft Azure Infrastructure step by step



Task 2: Enable the Content Delivery Network

To enable content delivery network, following this procedure

1. Start Internet Explorer, browse to <http://azure.microsoft.com>, and sign in using the Microsoft account that is associated with your Azure subscription.
2. Click App Service, click CDN, and click Quick Create.



3. In Origin Domain, select the storage account that you created in the previous task and click Create.

Adding Content to the Source Service

In this exercise, you will upload media and explore the media that you have uploaded.

Task 1: Add a Container to the Storage Account

To add container to storage account, following this procedure

1. Start Internet Explorer, browse to <http://azure.microsoft.com>, click **Portal**, and sign in using the Microsoft account that is associated with your Azure subscription.
2. On the navigation bar on the left, click **Storage Account**. Click the storage account that you created.
3. Click **Containers**, Click **Create Container**.

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes 'Create a resource', 'All services', 'FAVORITES' (Dashboard, All resources, Resource groups, App Services, Function Apps, SQL databases, Azure Cosmos DB, Virtual machines, Load balancers, Storage accounts, Virtual networks, Azure Active Directory, Monitor, Advisor), and 'Storage accounts'. The main content area is titled 'Storage accounts' and shows a list of existing containers: 'azure15', 'cdnstgaccount' (which is selected), 'cloudappprod20', 'msdnmlab20mlab0315...', 'server2012r2rgdiag935', and 'text15'. To the right, a detailed view of the selected container 'cdnstgaccount' is shown. It lists settings like 'Access keys', 'Configuration', 'Encryption', 'Shared access signature', 'Firewalls and virtual networks', 'Metrics (preview)', 'Properties', 'Locks', and 'Automation script'. Below these settings, under 'BLOB SERVICE', are 'Containers', 'CORS', and 'Custom domain'. At the top right, there are tabs for 'Container', 'Refresh', and 'Delete'. The URL https://cdnstgaccount.blob.core.windows.net/ is displayed. A message at the bottom states: 'You don't have any containers yet. Click '+ Container' to get started.'

4. In the New container dialog box, enter the following settings and click **OK**:
 - Name: **cdncontainer**
 - Access: **Public Container**

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes 'Create a resource', 'All services', 'FAVORITES' (Dashboard, All resources, Resource groups, App Services, Function Apps, SQL databases, Azure Cosmos DB, Virtual machines, Load balancers, Storage accounts, Virtual networks, Azure Active Directory, Monitor, Advisor), and 'All services' (Storage accounts, Virtual machines, Load balancers, Storage accounts, Virtual networks, Azure Active Directory, Monitor, Advisor). The main area shows 'Storage accounts' for 'mohamedfawzy3@hotmail (Default Directory)'. A sub-menu for 'cdnstgaccount - Containers' is open, showing a list of existing containers: 'azure15', 'cdnstgaccount' (selected), 'cloudappprod20', 'msdnmlab20mlab0315...', 'server2012/2rgdiag935', and 'test15'. On the right, a 'New container' dialog box is displayed, with 'Name' set to 'CDNContainer' and 'Public access level' set to 'Container (anonymous read access for containers and blobs)'. Below the dialog, a note says 'You don't have any containers yet. Click '+' Container' to get started.'

Task 2: Upload Content to the Content Delivery Network

To uploaded content to content delivery network, following this procedure

1. Click **Start**, and then type **PowerShell**.
2. At the **Microsoft Azure PowerShell** prompt, type the following command and press Enter: **Get-AzurePublishSettingsFile**

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> Select-AzureRmSubscription -SubscriptionName "MSDN Platforms"

Name          : [REDACTED], 2b1c5659-ba44-4ada-bec9-b53a07460773]
Account       : [REDACTED]
SubscriptionName : MSDN Platforms
TenantId      : de12b8d9-3ccb-4ed5-a6fc-f02979ce6706
Environment    : AzureCloud

PS C:\WINDOWS\system32> Get-AzurePublishSettingsFile
PS C:\WINDOWS\system32>
```

3. Internet Explorer will start, Select the Generate publish settings and Validate.

Microsoft Azure Infrastructure step by step

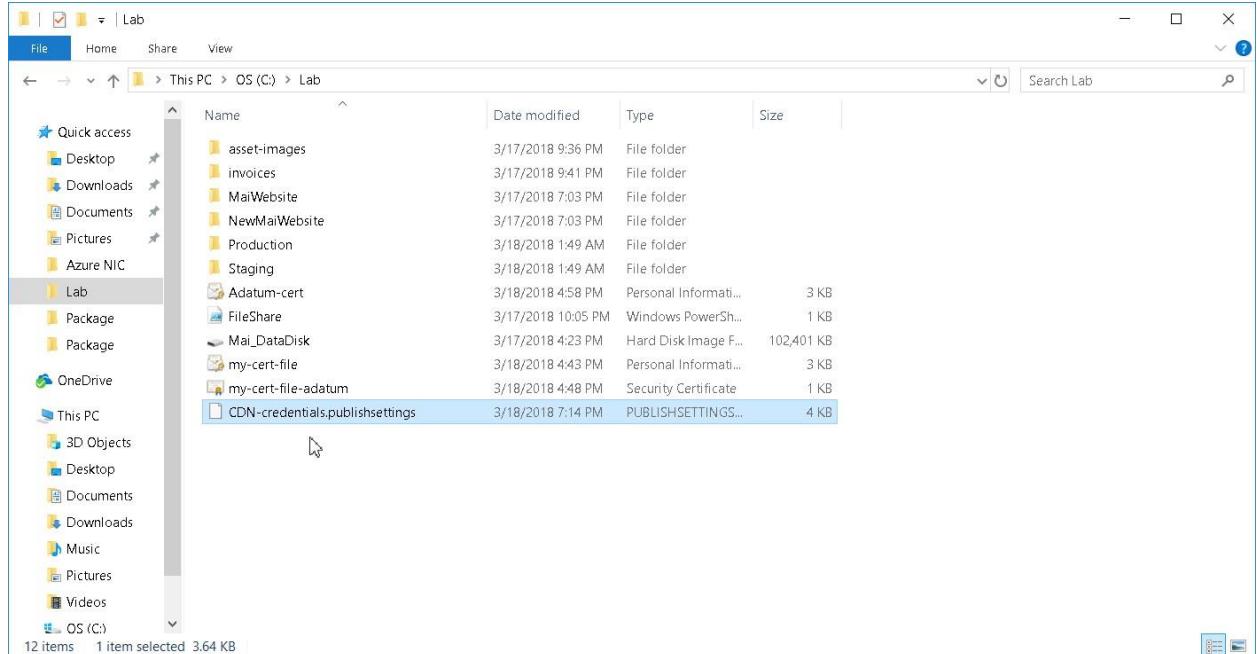
The screenshot shows the Microsoft Azure portal interface. On the left, there's a sidebar with various service icons like App Services, Function Apps, SQL databases, etc. The main area is titled 'Publish Settings' under 'Management Certificate Publish Settings'. A sub-section titled 'Generate Publish Settings' is displayed, which includes a note about generating a publish settings file for selected subscriptions. It has a dropdown menu set to 'MSDN Platforms'. Below this, there's a button labeled 'Validate' and another labeled 'Download Publish Settings'. At the bottom of the page, there's a message asking to validate subscriptions before download.

4. Click Download Publish Settings, Click to Save and click Save as.

This screenshot is similar to the previous one but includes a tooltip in the top right corner. The tooltip displays '\$65.78 credit remaining' and 'Subscription 'MSDN Platforms' has a remaining credit of \$65.78'. The rest of the interface is identical to the first screenshot, showing the 'Generate Publish Settings' section with its respective buttons and validation message.

5. In File name type **CDN-credentials** and click Save.

Microsoft Azure Infrastructure step by step



6. At the **Microsoft Azure PowerShell** prompt, type the following command and press Enter: **Import-AzurePublishSettingsFile –PublishSettingsFile “C:\Lab\CDN-credentials.publishsettings”**

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> Import-AzurePublishSettingsFile -PublishSettingsFile C:\Lab\CDN-credentials.publishsettings

Id          : 2b1c5659-ba44-4ada-bec9-b53a07460773
Name        : MSDN Platforms
Environment : AzureCloud
Account     : 941D2061B3D9E97BA5F6F11F5851FECEB5A89B1C
State       :
Properties   : {}

PS C:\WINDOWS\system32>
```

7. Copy primary key of storage account that we created before

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes 'Create a resource', 'All services', 'Dashboard', 'All resources', 'Resource groups', 'App Services', 'Function Apps', 'SQL databases', 'Azure Cosmos DB', 'Virtual machines', 'Load balancers', 'Storage accounts', 'Virtual networks', 'Azure Active Directory', 'Monitor', and 'Advisor'. The main content area is titled 'Storage accounts' and shows a list of storage accounts: 'azure15', 'cdnstgaccount' (selected), 'cloudappprod20', 'msdnmlab20mlab0315...', 'server2012r2gdialg935', and 'test15'. On the right, the specific details for 'cdnstgaccount' are shown under the 'Access keys' tab. It includes sections for 'Overview', 'Activity log', 'Access control (IAM)', 'Tags', 'Diagnose and solve problems', 'SETTINGS', 'Access keys' (selected), 'Configuration', 'Encryption', 'Shared access signature', 'Firewalls and virtual networks', 'Metrics (preview)', 'Properties', 'Locks', and 'Automation script'. Under 'Access keys', there are two entries: 'key1' with the value 'SeywxjPEEw2fGnP1wezzMhk/vKa0oFvwDQ/YfUxhz7FZ01so0mCyHvlnbo4+kSbfPv2ush9/N5aZ6Bz95EQg=' and 'key2' with the value 'bD0Yqj94Z9zn23lNRbyC1rNX4w//cZx37uHkVzobqpkIB2ZDEidKng5IP8EiCEMZ188NIYw6W5oY0NmFzw='.

8. At the **Microsoft Azure PowerShell** prompt, type the following command and press Enter: **\$Key1= “Copy the key”**
9. At the **Microsoft Azure PowerShell** prompt, type the following command and press Enter: **\$Context1=New-AzureStorageContext –StorageAccountKey \$Key1 –StorageAccountName “Enter storage account name”**

```
Administrator: Windows PowerShell
https://cloudappprod20.file.core.windows.net/
AccountType : Standard_GRS
LastGeoFailoverTime :
MigrationState :
StorageAccountName : cloudappprod20
OperationDescription : Get-AzureStorageAccount
OperationId : 54d34178-a3af-7833-bc3b-822d2205a0ba
OperationStatus : Succeeded

PS C:\WINDOWS\system32>
PS C:\WINDOWS\system32>
PS C:\WINDOWS\system32> $key1 = "SeywxjPEEw2fGnP1wezzMhk/vKa0oFvwDQ/YfUxhz7FZ01so0mCyHvlnbo4+kSbfPv2ush9/N5aZ6Bz95EQg="
PS C:\WINDOWS\system32> $Context1=New-AzureStorageContext -StorageAccountKey $key1 -StorageAccountName "cdnstgaccount"
PS C:\WINDOWS\system32> $Context1
```

10. At the **Microsoft Azure PowerShell** prompt, type the following command and press Enter: **Set-AzureStorageBlobContent –Blob “Welcome” –Container “cdncontainer” –File “C:\Lab\Welcome.png” –Context \$Context1 -Force**

```

Administrator: Windows PowerShell

PS C:\WINDOWS\system32> Set-AzureStorageBlobContent -Blob "Welcome" -Container "cdncontainer" -File "c:\lab\Welcome.png" -Context $Context1 -Force

Container Uri: https://cdnstgaccount.blob.core.windows.net/cdncontainer

Name          BlobType  Length    ContentType      LastModified   AccessTier SnapshotT
-----        -----    -----    -----          -----        -----        ike
----- Welcome     BlockBlob 102864  application/octet-stream 2018-03-18 18:22:31Z Unknown

PS C:\WINDOWS\system32>

```

Task 3: Explore the Content Delivery Network

To view media stored in content delivery network, following this procedure

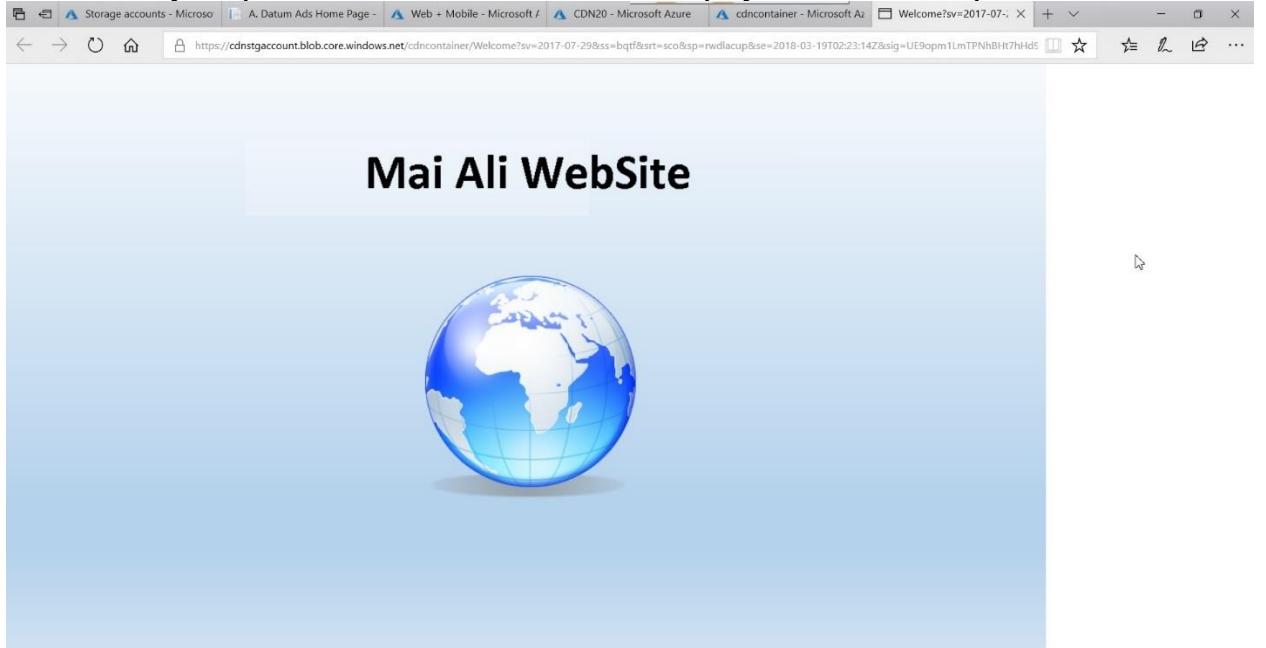
1. Start Internet Explorer, browse to <http://Portal.azure.com>, and sign in using the Microsoft account that is associated with your Azure subscription.
2. On the navigation bar on the left, click **Storage Accounts**. Click the storage account that you created. Click **Containers**.

The screenshot shows the Azure portal interface. The left sidebar has a 'Storage accounts' section with a list of accounts: 'azurite15', 'cdnstgaccount' (selected), 'cloudappprod20', 'msdmmlab20mlab0315...', 'server2012r2rgdiag935', and 'test15'. The main content area is titled 'cdnstgaccount - Access keys'. It displays two sets of access keys: 'key1' and 'key2'. The 'key1' section shows a 'Key' value: 'SeywwjPEEw2fGnP1wezZMhK/vKa0cfvwDjQ/YfUxhz7FZ01soCmCyHvnbo4+KsbFcPv2uh9/N5a768+95fQg...'. The 'key2' section shows a 'Key' value: 'bD0YqjYs4Z9zn23lNRbyC1rNX4w//cZx37uHkVzobqXkB2ZDEidKzng5IP8ECEMZ188NjYYW6W5oY0NmFw=='. Below each key, there is a 'Copy' button. A note at the top right says: 'Use access keys to authenticate your applications when making requests to this Azure storage account. Store your access keys securely - for example, using Azure Key Vault - and don't share them. We recommend regenerating your access keys regularly. You are provided two access keys so that you can maintain connections using one key while regenerating the other.' A 'Connection string' section is also present.

3. Click on **Welcome Pic**. Click **Download**.

The screenshot shows the Microsoft Azure Storage account interface. On the left, there's a sidebar with various service links such as Storage accounts, App Services, and Virtual machines. The main area is titled 'cdnstgaccount - Containers' and shows a list of containers. One container, 'cdncontainer', is selected. Inside 'cdncontainer', there's a list of blobs. One blob, 'Welcome', is selected. A context menu is open over the 'Welcome' blob, showing options like 'Edit', 'Download', 'Blob properties', 'Edit metadata', 'Acquire lease', 'Break lease', and 'Delete'.

4. The file that you uploaded to the CDN will now be displayed in Internet Explorer.



5. Close the tab with the uploaded image.

Creating a Media Services Account and Uploading Content

In this exercise, you will make content available to multiple device types. The data is currently stored in WMV format, but you want to re-encode the video and store it for online viewing.

Task 1: Create a New Storage Account

Microsoft Azure Infrastructure step by step

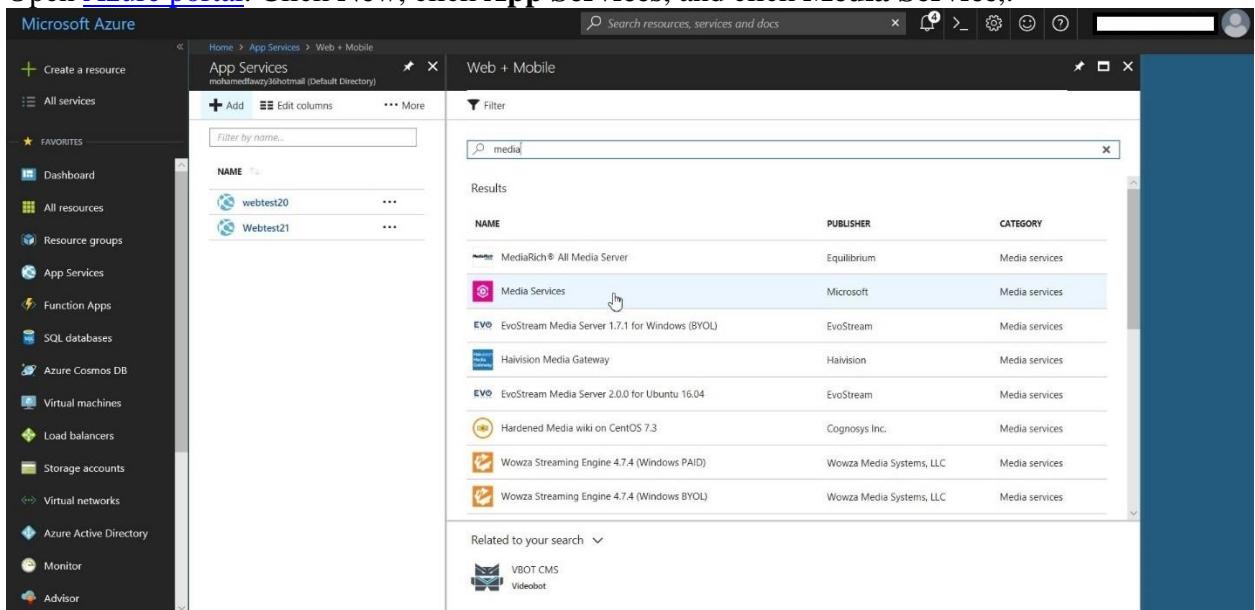
To create new storage account, following this procedure

1. At the **Microsoft Azure PowerShell** prompt, type the following command and press Enter: **Get-AzureLocation**
2. At the **Microsoft Azure PowerShell** prompt, type the following command and press Enter: **New-AzureStorageAccount –StorageAccountName “Storage account name” – Location “East US”**

Task 2: Enable Media Services

To enable media services, following this procedure

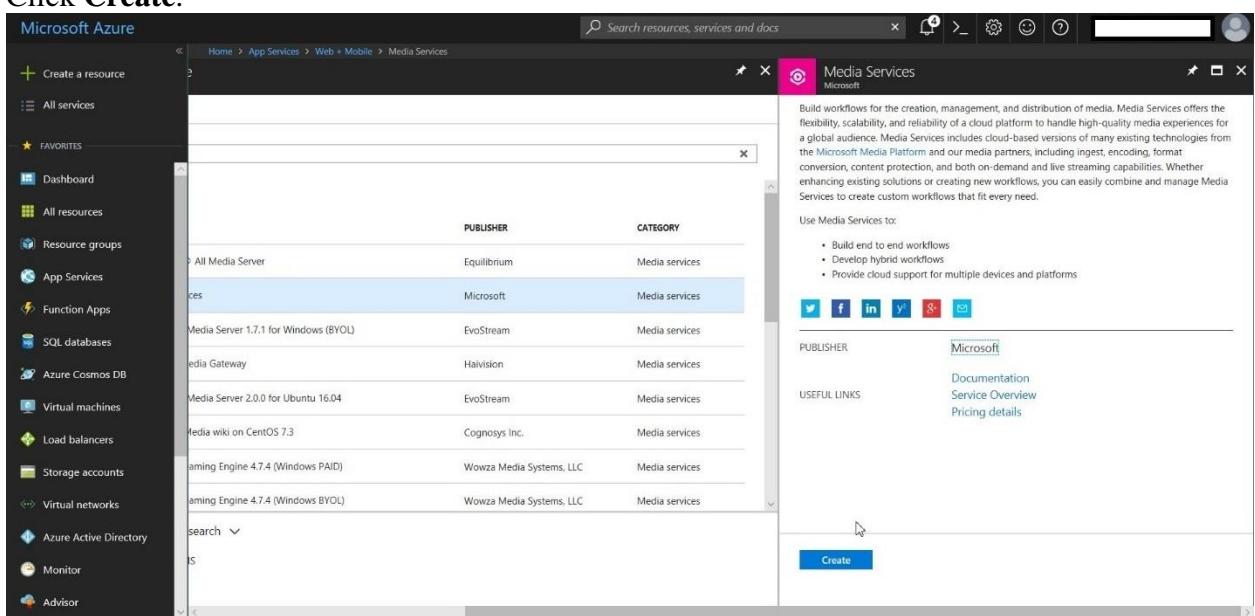
1. Open [Azure portal](#). Click **New**, click **App Services**, and click **Media Service**.



The screenshot shows the Azure portal interface. On the left, there's a sidebar with various service icons like App Services, Storage accounts, and Virtual machines. The main area is titled 'App Services' under 'Web + Mobile'. A search bar at the top right contains the text 'media'. Below it, a table lists several media-related services:

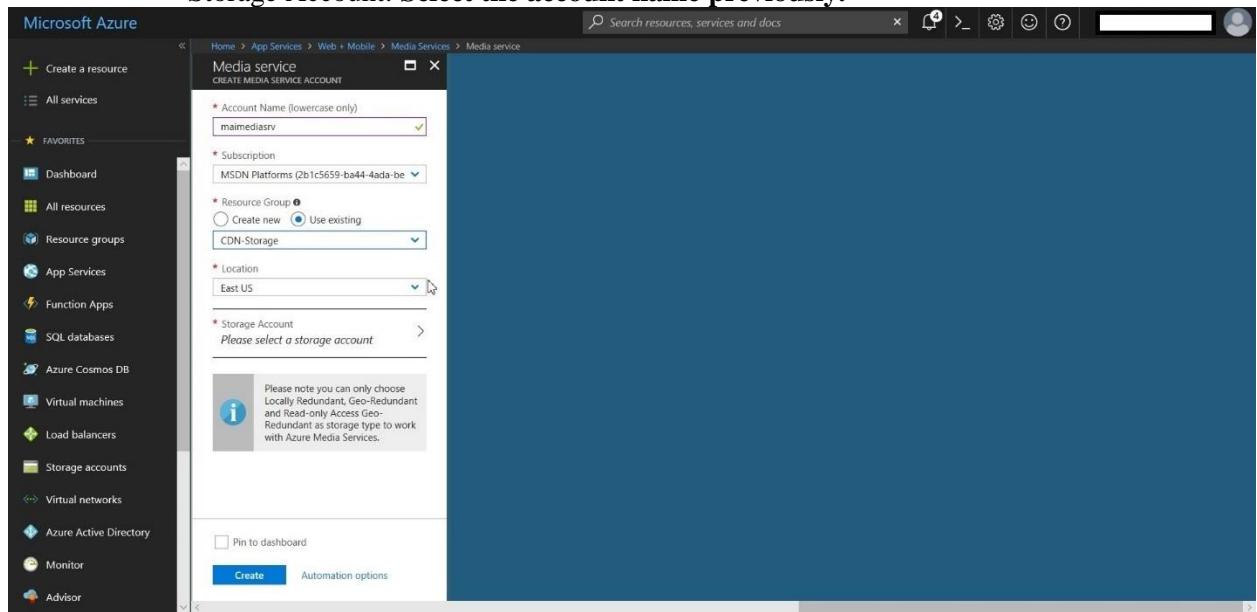
NAME	PUBLISHER	CATEGORY
MediaRich® All Media Server	Equilibrium	Media services
Media Services	Microsoft	Media services
EvoStream Media Server 1.7.1 for Windows (BYOL)	EvoStream	Media services
Haivision Media Gateway	Haivision	Media services
EvoStream Media Server 2.0.0 for Ubuntu 16.04	EvoStream	Media services
Hardened Media wiki on CentOS 7.3	Cognosys Inc.	Media services
Wowza Streaming Engine 4.7.4 (Windows PAID)	Wowza Media Systems, LLC	Media services
Wowza Streaming Engine 4.7.4 (Windows BYOL)	Wowza Media Systems, LLC	Media services

2. Click **Create**.



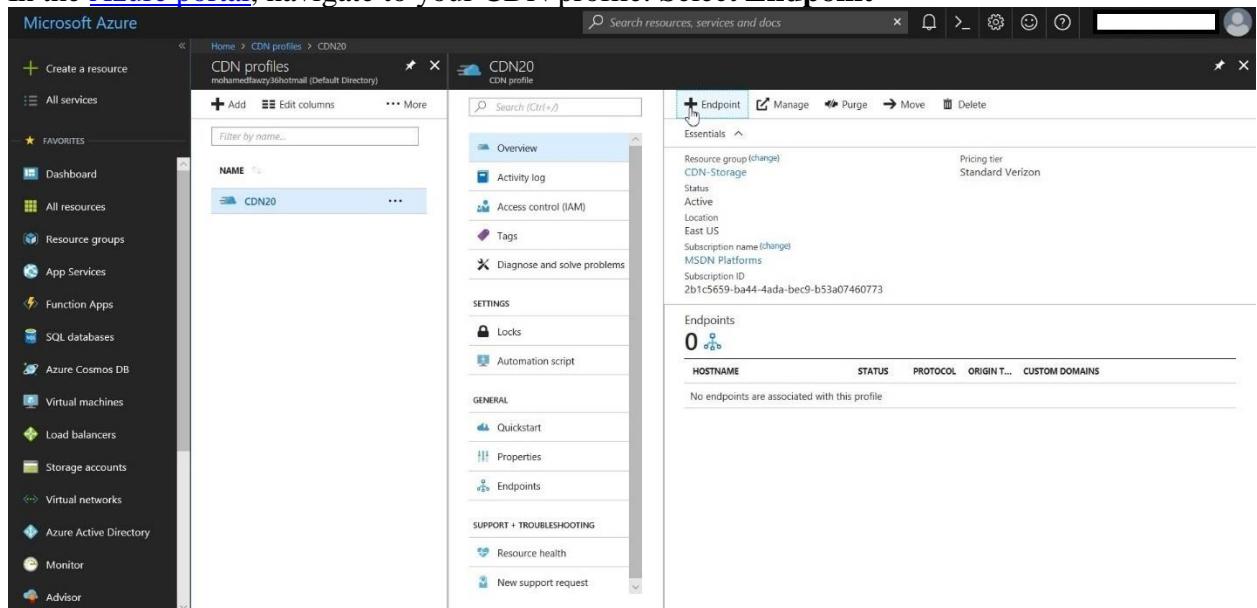
The screenshot shows the 'Media Services' blade in the Azure portal. It features a search bar at the top and a table of available media services. On the right side, there's a detailed description of what Media Services offer, a 'Use Media Services to:' list, social sharing icons, and useful links. A prominent blue 'Create' button is located at the bottom right.

- In the **Media Service** dialog box, enter the following settings and click **Create Media Service**:
 - Name: **maimediasrv**.
 - Region: **East US**.
 - Storage Account: **Select the account name previously.**



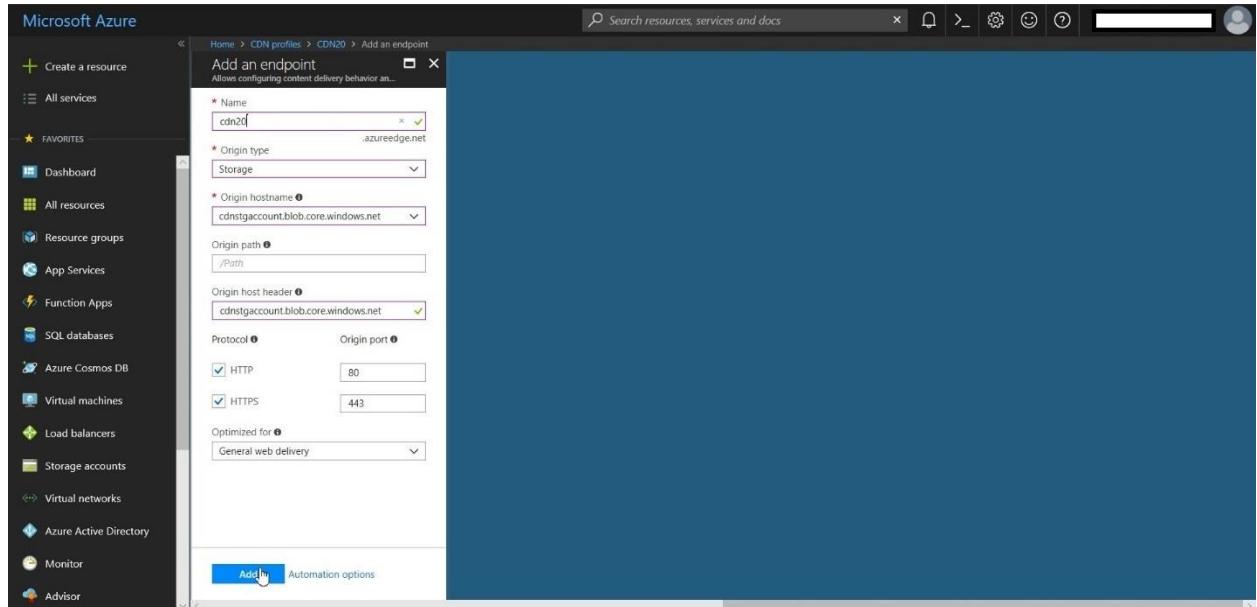
To Add Endpoint CDN

- In the [Azure portal](#), navigate to your CDN profile. Select **Endpoint**

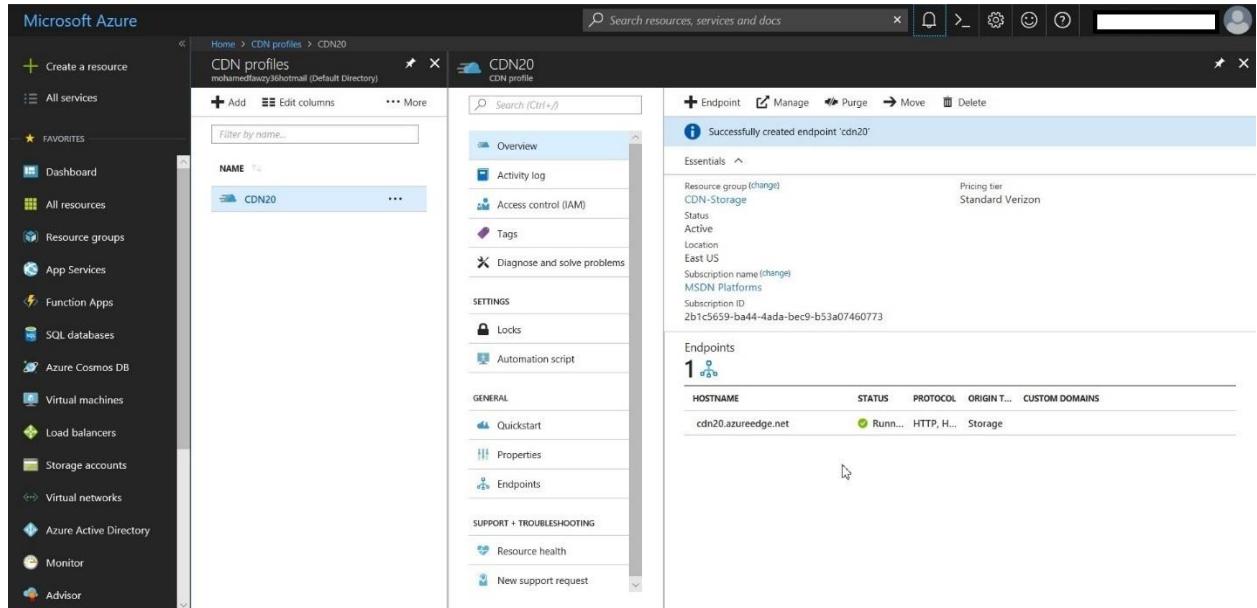


- The **Add an endpoint** pane appears, Select Origin type.

Microsoft Azure Infrastructure step by step



3. Click Add.



Task 3: Upload Videos

To upload video, following this procedure

1. In the navigation bar on the left, click **Media Service**. Click the media service that you created.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes options like 'Create a resource', 'All services', 'Media services', and others. The main content area is titled 'Media services' and shows a single item named 'mainmediasrv'. A table provides details about this item:

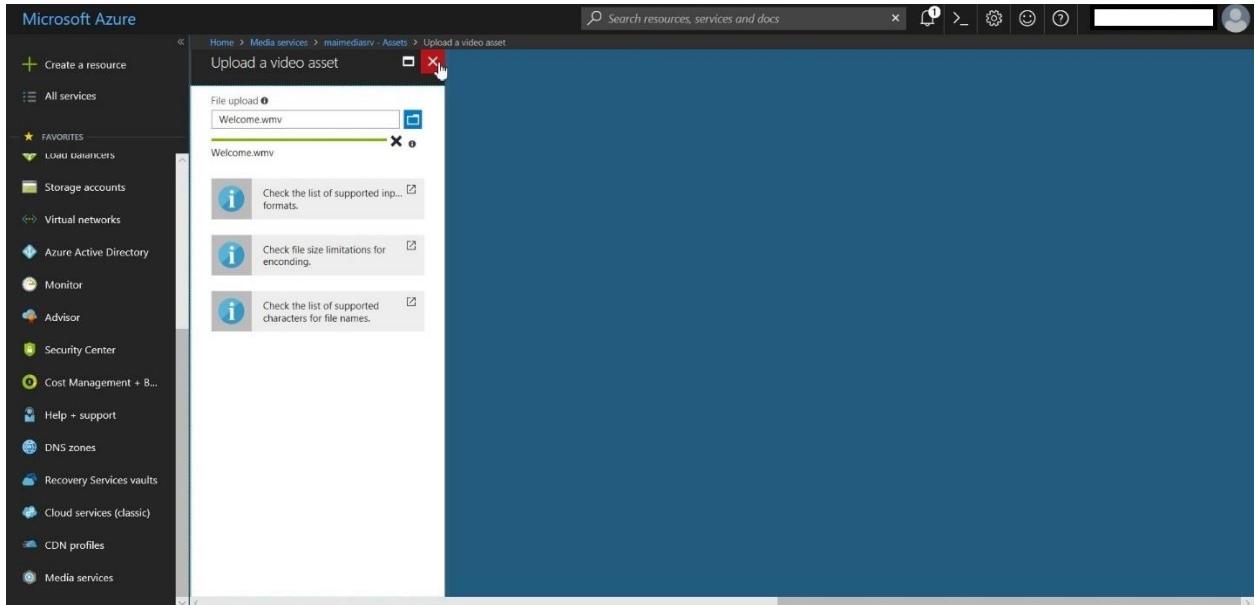
NAME	TYPE	RESOURCE GROUP	LOCATION	SUBSCRIPTION
mainmediasrv	Media service	CDN-Storage	East US	MSDN Platforms (2b1c5659-b944...)

2. Click Asset, Click Upload a video file.

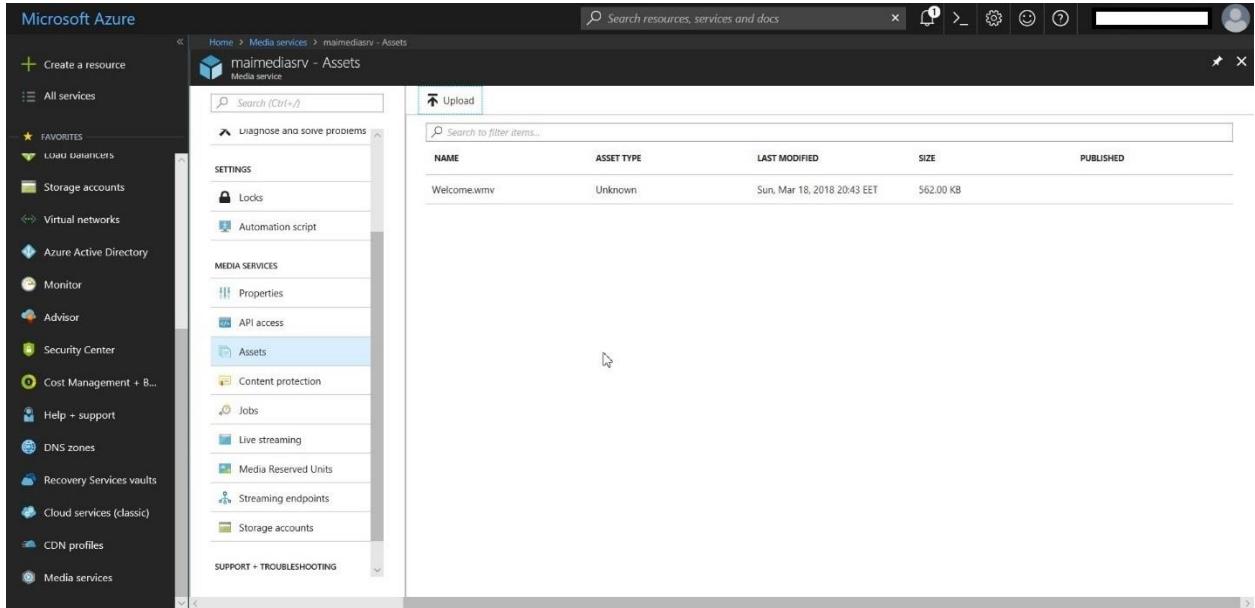
The screenshot shows the 'Assets' blade within the Azure Media services. The left sidebar lists various settings and services, with 'Assets' currently selected under 'MEDIA SERVICES'. The main area features a large 'Upload' button at the top, followed by a search bar and a table for managing assets. The table has columns for NAME, ASSET TYPE, LAST MODIFIED, SIZE, and PUBLISHED. The message 'No results' is displayed below the table.

3. Click File upload, Select file.

Microsoft Azure Infrastructure step by step



4. Click OK.



Publishing and Scaling Media Content

In this exercise, you have uploaded a video file to Media Services, you want to encode and publish the file for delivery to users.

Task 1: Encode Media

To encode media, following this procedure

1. In Internet Explorer, in the navigation bar on the left, click **Media Services**. Click the media service that you created.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes 'Create a resource', 'All services', and various Azure services like Storage accounts, Virtual networks, and Media services. The 'Media services' section is expanded, showing options like Properties, API access, Assets, Content protection, Jobs, Live streaming, Media Reserved Units, Streaming endpoints, and Storage accounts. The main content area is titled 'maimediasrv - Assets' and shows a table of assets. The table has columns: NAME, ASSET TYPE, LAST MODIFIED, SIZE, and PUBLISHED. One asset, 'Welcome.wmv', is listed with the details: Unknown asset type, last modified on Sun, Mar 18, 2018 20:43 EET, size 562.00 KB, and published status.

2. At the top of the page, click **Encode**.

The screenshot shows the Microsoft Azure portal interface, specifically the asset details for 'Welcome.wmv'. The asset ID is nbcid:UUID:a9ff1892-60a2-446a-885e-19e31fa67f3d. The asset was last modified on Sun, Mar 18, 2018 20:43 EET. It is an Unknown asset type, 562.00 KB in size, and contains 1 file. There is no encryption applied. The 'Encode' button is highlighted with a cursor. Other tabs include 'Upload captions', 'Analyze', 'Encrypt', 'Remove Encryption', 'Publish', 'Unpublish', 'Play', and 'More'.

3. In the **Azure Media Encoder** dialog box, review the values for **Preset** and select **Content Adaptive Multiple Bitrate MP4**

Microsoft Azure Infrastructure step by step

The screenshot shows the 'Encode an asset' dialog box in the Azure portal. On the left, the Azure navigation menu is visible, showing various service icons like Storage accounts, Virtual networks, and Media services. The main area displays details about an asset named 'Welcome.wmv':
- Job input asset: 'Welcome.wmv'
- Media encoder name: 'Media Encoder Standard'
- Encoding preset: 'Content Adaptive Multiple Bitrate MP4'
- Job name: 'Media Encoder Standard processing of Welcome.wmv'
- Output media asset name: 'Welcome.wmv - Media Encoder Standard encoded'
A large 'Create' button is at the bottom right of the dialog.

4. Wait until the video is encoded successfully before continuing.

The screenshot shows the 'Assets' blade within the 'maimediasrv - Assets' section of the Azure portal. The left sidebar lists various service settings like Overview, Activity log, and Assets. The main area displays a list of assets:

NAME	ASSET TYPE	LAST MODIFIED	SIZE	PUBLISHED
Welcome.wmv - Media Encoder St...	Multi-Bitrate MP4	Sun, Mar 18, 2018 20:50 EET	1.06 MB	
Welcome.wmv	Unknown	Sun, Mar 18, 2018 20:43 EET	562.00 KB	

A cursor is hovering over the first asset entry.

Task 2: Publish Media

To publish media, following this procedure

1. Click **Welcome-wmv-Media Encoder** and, at the top of the page, click **PUBLISH**.

Microsoft Azure Infrastructure step by step

Microsoft Azure

Home > mainmediasrv - Assets

mainmediasrv - Assets

Search resources, services and docs

Upload

NAME ASSET TYPE LAST MODIFIED SIZE PUBLISHED

Welcome.wmv - Media Encoder St... Multi-Bitrate MP4 Sun, Mar 18, 2018 20:50 EET 1.06 MB

Welcome.wmv Unknown Sun, Mar 18, 2018 20:43 EET 562.00 KB

Create a resource

All services

Favorites

Dashboard

All resources

Resource groups

App Services

Function Apps

SQL databases

Azure Cosmos DB

Virtual machines

Load balancers

Storage accounts

Virtual networks

Azure Active Directory

Monitor

Advisor

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

SETTINGS

Locks

Automation script

MEDIA SERVICES

Properties

API access

Assets

Content protection

Jobs

Live streaming

2. In the **Publish** the asset Page, Select **Streaming** and select start & end data for publishing. Click **Add**

Microsoft Azure

Home > mainmediasrv - Assets > Welcome.wmv - Media Encoder Standard encoded > Publish the asset

Welcome.wmv - Media Encoder Standard encoded

ASSET

Upload captions Encode Analyze Encrypt Remove Encryption Publish Unpublish Play More

Overview

ID nb:cid:UUID:f6993137-2f58-4a42-a9f5-7a4084adaa77

LAST MODIFIED Sun, Mar 18, 2018 20:50 EET

ASSET TYPE Multi-Bitrate MP4

TOTAL SIZE 1.06 MB

FILE COUNT 9

ENCRYPTION No Encryption

Content Keys

NAME	TYPE	AUTHORIZATION POLICY ID
There are no keys in the asset.		

Delivery Policies

NAME	TYPE	PROTOCOL
There are no delivery policies in the asset.		

Published URLs

Publish the asset

By adding a locator to the asset, you publish the asset

Locator type Streaming Progressive

* Start date and time 2018-03-18 8:53:16 PM

* End date and time 2018-03-18 8:53:16 PM

Billing for the streaming endpoint will begin when it starts

To begin streaming, start running 'default' streaming endpoint

Add

3. On Assets Page, it should appear published.

Microsoft Azure Infrastructure step by step

NAME	ASSET TYPE	LAST MODIFIED	SIZE	PUBLISHED
Welcome.wmv - Media Encoder St...	Multi-Bitrate MP4	Sun, Mar 18, 2018 20:50 EET	1.06 MB	
Welcome.wmv	Unknown	Sun, Mar 18, 2018 20:43 EET	562.00 KB	

Task 3: Scale Media Delivery

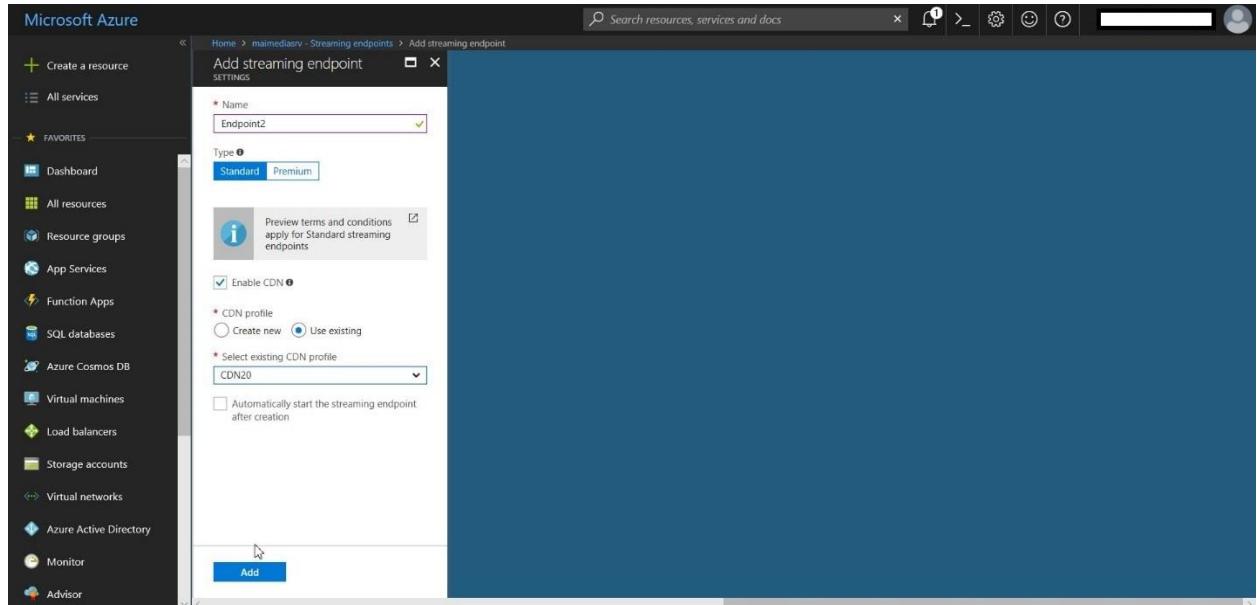
To scale media delivery, following this procedure

1. On **Streaming Endpoint**, click **Endpoint**.

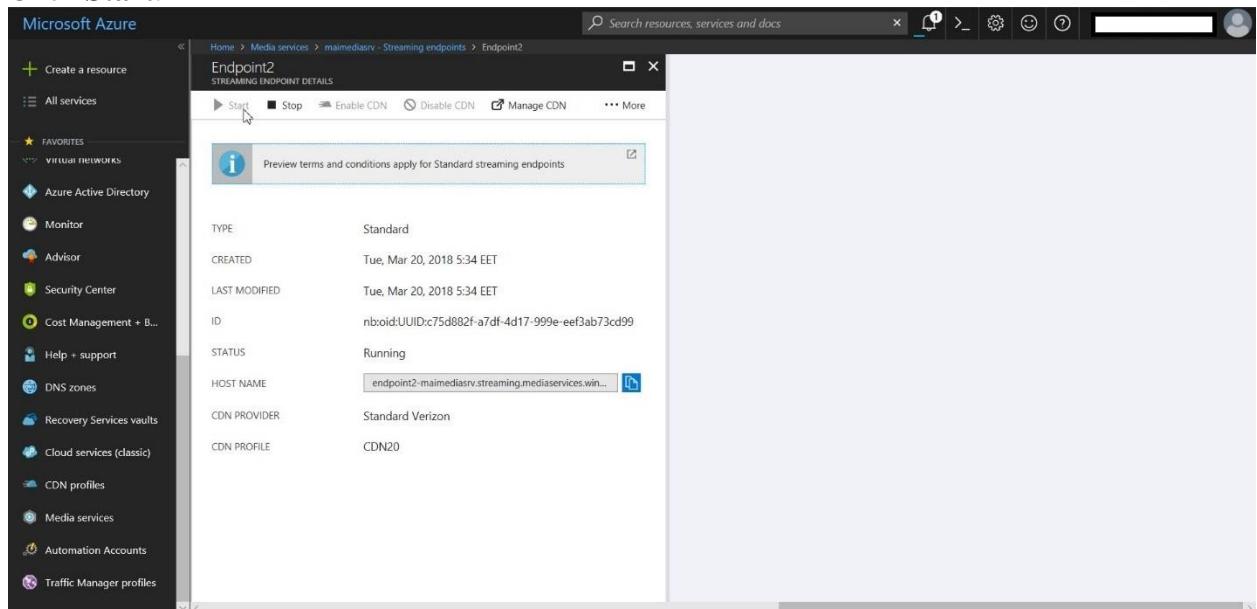
NAME	STATUS	CDN	TYPE	STREAMING UNITS	HOST NAME
default	■ Stopped	Enabled	Standard	N/A	mainmediasrv.streaming.mediaservices.windows.net

2. In Name, type **endpoint2** and Select **existing CDN profile** that we created before.

Microsoft Azure Infrastructure step by step



3. Click Start.



4. You should find endpoint running

NAME	STATUS	CDN	TYPE	STREAMING UNITS	HOST NAME
default	Stopped	Enabled	Standard	N/A	maimediasrv.streaming.mediaservices.windows.net
endpoint2	Running	Enabled	Standard	N/A	endpoint2-maimediasrv.streaming.mediaservices.windows.net

Task 4: Play the Media Stream

To play media stream, following this procedure

1. In the **Address** bar, type **http://portal.azure.com** and then press Enter.
2. In the navigation on the left, click **Media Services**.
3. Click **Welcome-wmv-Media Encoder** and then click **Play**.

MIME TYPE	SIZE
application/octet-stream	1.00 KB
application/octet-stream	1.00 KB
video/mp4	89.00 KB
video/mp4	156.00 KB
video/mp4	245.00 KB

Chapter 9

Azure Active Directory

Azure Active Directory (Azure AD) is Microsoft's multi-tenant cloud based directory and identity management service. For IT Admins, Azure AD provides an affordable, easy to use solution to give employees and business partners single sign-on (SSO) access to thousands of cloud SaaS Applications like Office365, Salesforce.com, DropBox, and Concur.

For application developers, Azure AD lets you focus on building your application by making it fast and simple to integrate with a world class identity management solution used by millions of organizations around the world.

Azure AD also includes a full suite of identity management capabilities including multi-factor authentication, device registration, self-service password management, self-service group management, privileged account management, role based access control, application usage monitoring, rich auditing and security monitoring and alerting. These capabilities can help secure cloud based applications, streamline IT processes, cut costs and help assure corporate compliance goals are met.

Additionally, with just four clicks, Azure AD can be integrated with an existing Windows Server Active Directory, giving organizations the ability to leverage their existing on-premises identity investments to manage access to cloud based SaaS applications.

If you are an Office365, Azure or Dynamics CRM Online customer, you might not realize that you are already using Azure AD. Every Office365, Azure and Dynamics CRM tenant is actually already an Azure AD tenant. Whenever you want you can start using that tenant to manage access to thousands of other clouds applications Azure AD integrates with!

The Benefits of Azure AD

- Quickly adopt cloud services, providing employees and partners with an easy single-sign on experience powered by Azure AD's fully automated SaaS app access management and provisioning services capabilities.
- Empower employees with access to world class cloud apps and service and self-services capabilities from wherever they need to work on the devices they love to use.
- Easily and securely manage employee and vendor access to your corporate social media accounts.
- Improve application security with Azure AD multifactor authentication and conditional access.
- Implement consistent, self-service application access management, empowering business owners to move quickly while cutting IT costs and overhead.

- Monitor application usage and protect your business from advanced threats with security reporting and monitoring.
- Secure mobile (remote) access to on-premises applications.

Implementing Azure Active Directory

The “directory” component of AAD is, by design, multi-tenant and provides a highly scalable cloud-based directory service:

- **Multi-tenant.** Microsoft hosts millions of users and directories within AAD, but as each Azure AD directory is distinct and separate from other Azure AD directories, customer data and identity information is completely isolated from other tenants; users and administrators of one Azure AD directory cannot accidentally or maliciously access data in another directory.
- **Scalable.** The directory technologies used by AAD have been in use as a directory supporting Microsoft Office 365 and Microsoft Intune long before Azure became available; these are scalable to millions of users. AAD’s flexible, extensible data model uses the REST-based Graph API (not LDAP).

AAD also supports federation by design, and can provide a federation platform, as well as a directory service. AAD can also act as an authorization service for other cloud-based services, when federating with them.

Administering Azure AD

In this exercise, you will have created some pilot users and groups in Azure AD using the portal and Microsoft Azure Active Directory module for Azure PowerShell.

Task 1: Create Directories

To create directory, following this procedure

1. Start Internet Explorer, browse to <http://portal.azure.com>, and sign in using the Microsoft account that is associated with your Azure subscription.
2. In the navigation panel on the left, click **Azure Active Directory**.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure Marketplace interface. On the left, there's a sidebar with various service categories like Compute, Networking, Storage, etc. The main area is titled 'Everything' and has a search bar at the top with the query 'directory'. Below the search bar is a 'Filter' button. The results table has columns for NAME, PUBLISHER, and CATEGORY. The first result is 'Azure Active Directory' by Microsoft, categorized under 'Security + Identity'. There are several other entries from Microsoft and other publishers like Cloudera and Steelhive.

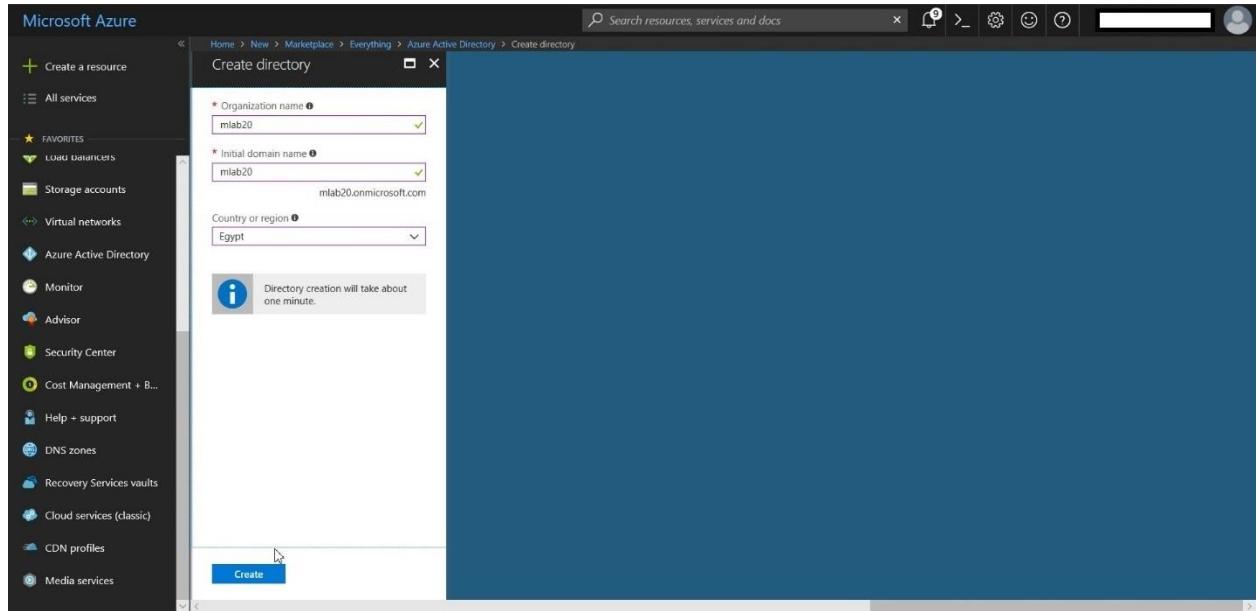
3. Click Azure Active Directory, and then click Create.

This screenshot shows the 'Create' dialog for Azure Active Directory. The left pane lists several options: 'Azure Active Directory', 'Azure Active Directory B2C', 'Active Directory Health Check', 'Cloudera Director', 'Steelhive Carbon 5 Concurrent Users', 'Steelhive Carbon 10 Concurrent Users', 'SoftNAS Cloud Enterprise-20TB Extreme Performance', 'SoftNAS Cloud Enterprise-BYOL', 'SoftNAS Cloud Enterprise-20TB High Performance', 'SoftNAS Cloud Enterprise-1TB General Purpose', and 'Steelhive Carbon 15+ Concurrent Users'. The right pane displays a summary of Azure Active Directory, its benefits, and a preview of the Azure Active Directory portal. At the bottom right of the preview window, there is a large blue 'Create' button.

4. In the Add directory dialog box, enter the following settings and click Create

- Name: **Mlab20**
- Domain Name: **Mlab20**
- Country OR Region: **Egypt**

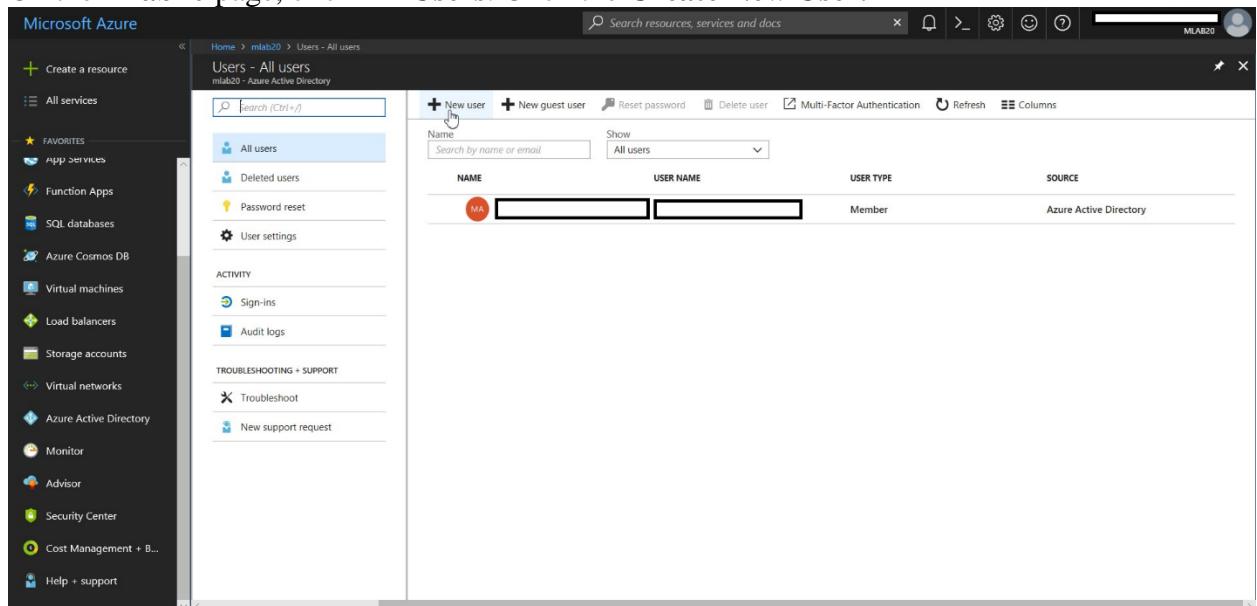
Microsoft Azure Infrastructure step by step



Task 2: Manage Users in the Portal

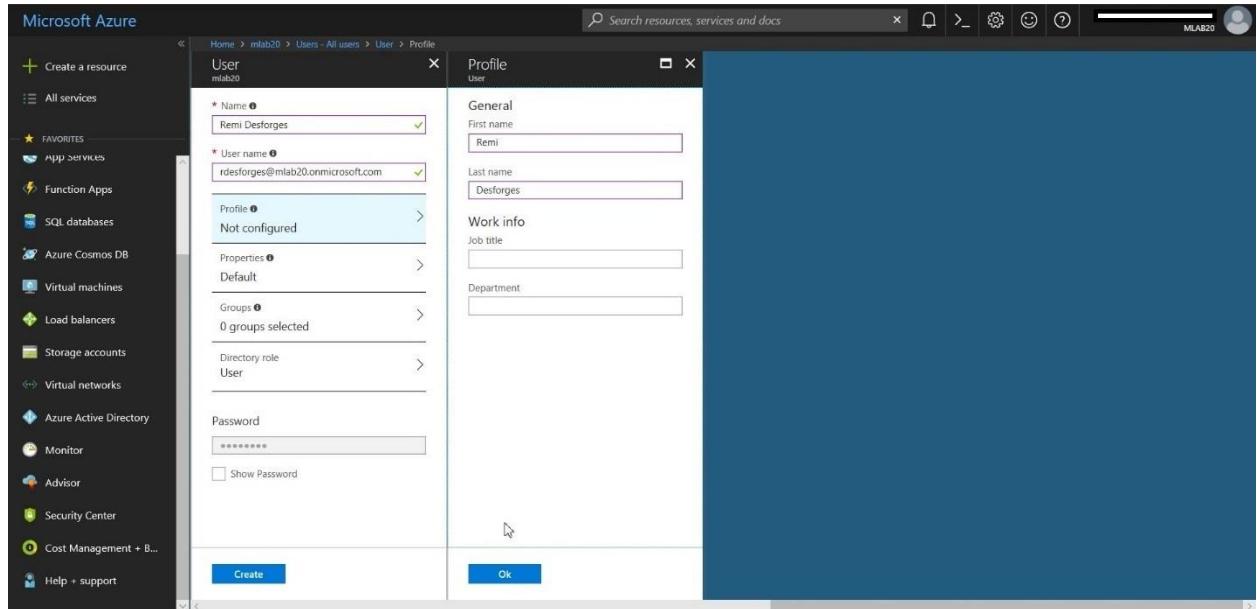
To manage users, following this procedure

1. On the **Azure Active Directory** page, click **Mlab20**.
2. On the **Mlab20** page, click **All Users**. Click the **Create New User**.



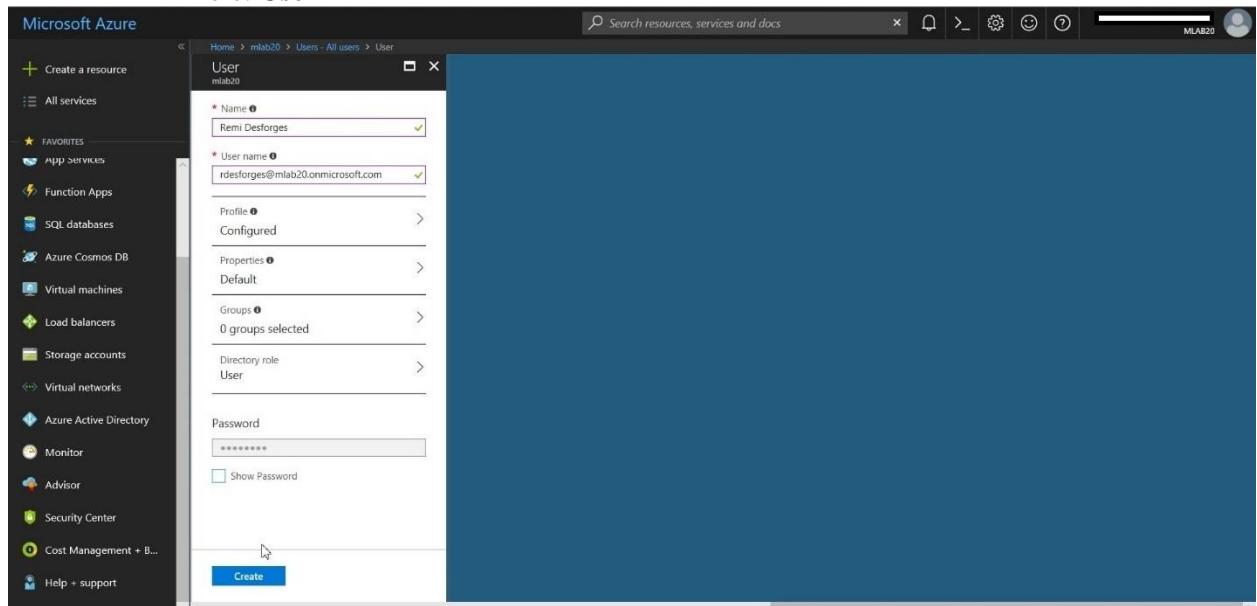
3. In the **Tell us about this user** dialog box, enter the following settings and click **Next**:
 - Type of User: **New user in your organization**
 - User Name: **rdesforges**

Microsoft Azure Infrastructure step by step



4. In the **user profile** dialog box, enter the following settings and click **Create**:

- First Name: **Remi**
- Last Name: **Desforges**
- Display Name: **Remi Desforges**
- Role: **User**



5. Click **New user**.

Microsoft Azure Infrastructure step by step

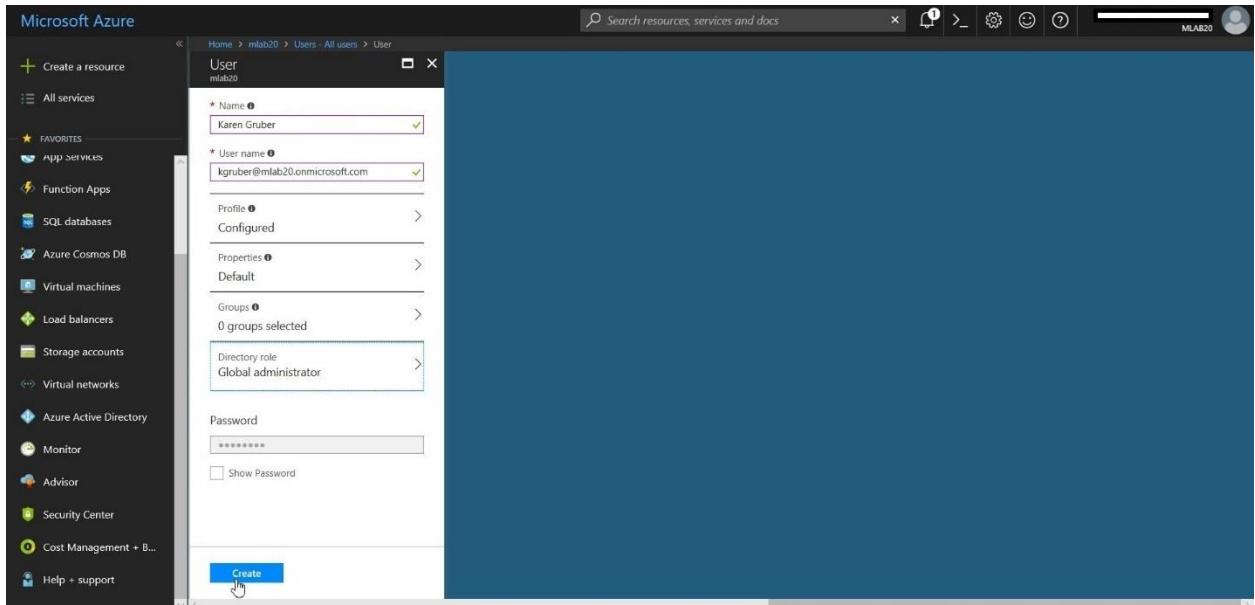
NAME	USER NAME	USER TYPE	SOURCE
Redacted	redacted@mlab20.onmicrosoft.com	Member	Azure Active Directory
RD	rdesforges@mlab20.onmicrosoft.com	Member	Azure Active Directory

6. In the **Tell us about this user** dialog box, enter the following settings and click **Next**:
- Type of User: **New user in your organization**
 - Username: **kgruber**

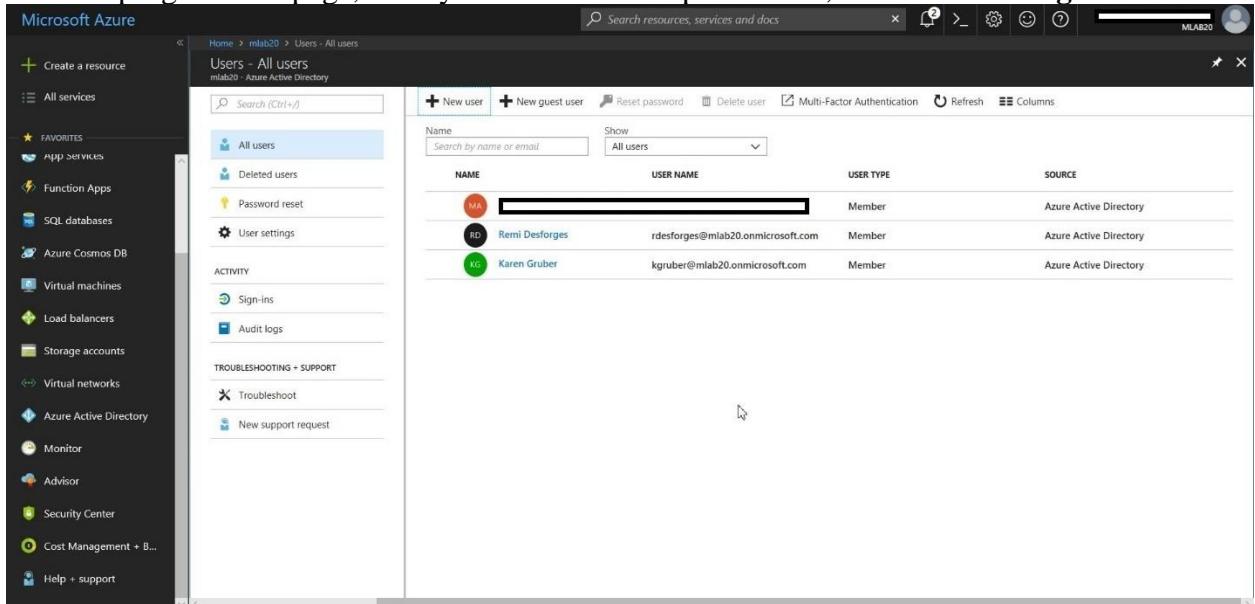
Name: Karen Gruber	General
User name: kgruber@mlab20.onmicrosoft.com	First name: Karen
Profile: Not configured	Last name: Gruber
Properties: Default	Work info
Groups: 0 groups selected	Job title:
Directory role: User	Department:
Password: *****	
<input type="checkbox"/> Show Password	

7. In the **user profile** dialog box, enter the following settings and click **Create**:
- First Name: **Karen**
 - Last Name: **Gruber**
 - Display Name: **Karen Gruber**
 - Role: **Global Administrator**
 - Alternate Email Address: **Type the email address of your Azure subscription**

Microsoft Azure Infrastructure step by step



- At the top right of the page, click your Azure subscription name, and then click **Sign out**.



- On the **You have been signed out** page, click **SIGN IN**.
 - On the **Windows Azure** page, click **Use another account** and sign into Azure using the following credentials:
 - Username: **kgruber@mlab20.onmicrosoft.com**
 - Password: **the temporary password you noted above**
 - On the **Update your password** page, in the **Current password** box, type the temporary password, in the **New password** and **Confirm password** boxes, type **Pa\$\$w0rd123**, and click **Update password and sign in**.
- Note:** Although **kgruber** is a Global Administrator, this account is not a Co-Administrator of the Azure tenant, so the attempt to log in to the portal fails ("We were unable to find any subscriptions associated with your account"); this is by design.
- Close Internet Explorer.

Task 3: Manage Groups in the Portal

To manage groups, following this procedure

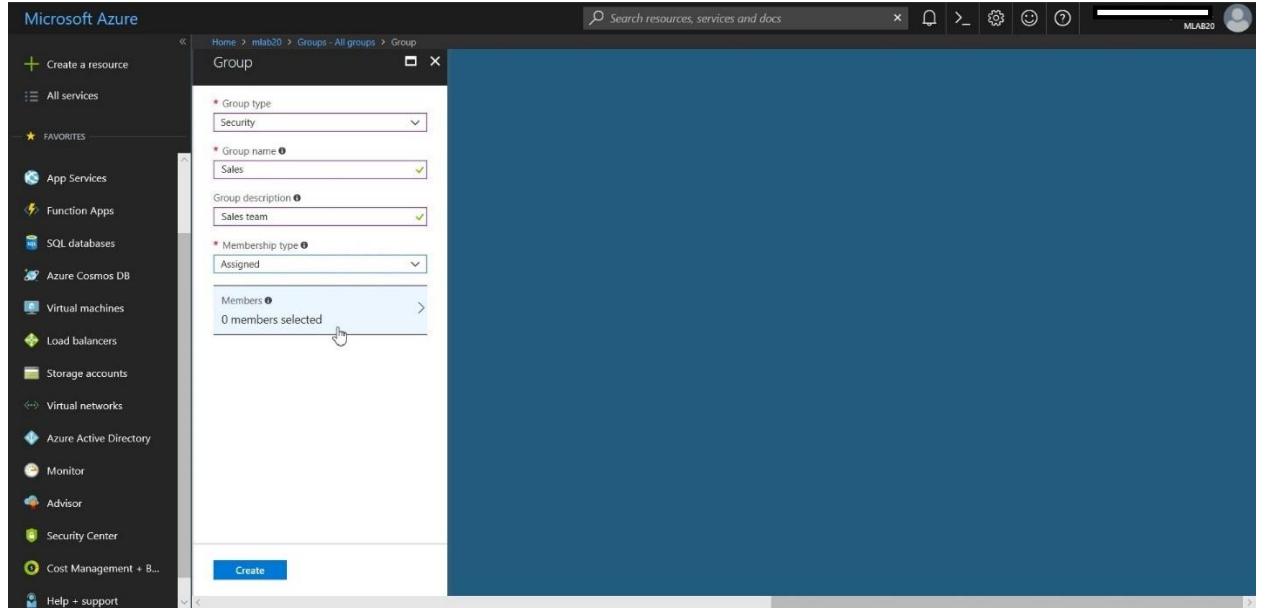
1. Start Internet Explorer, browse to <https://portal.azure.com>, and sign in using the Microsoft account that is associated with your Azure subscription.
2. In the navigation panel on the left, click **Azure Active Directory**.
3. Click **Groups**.

4. Click **New group**.

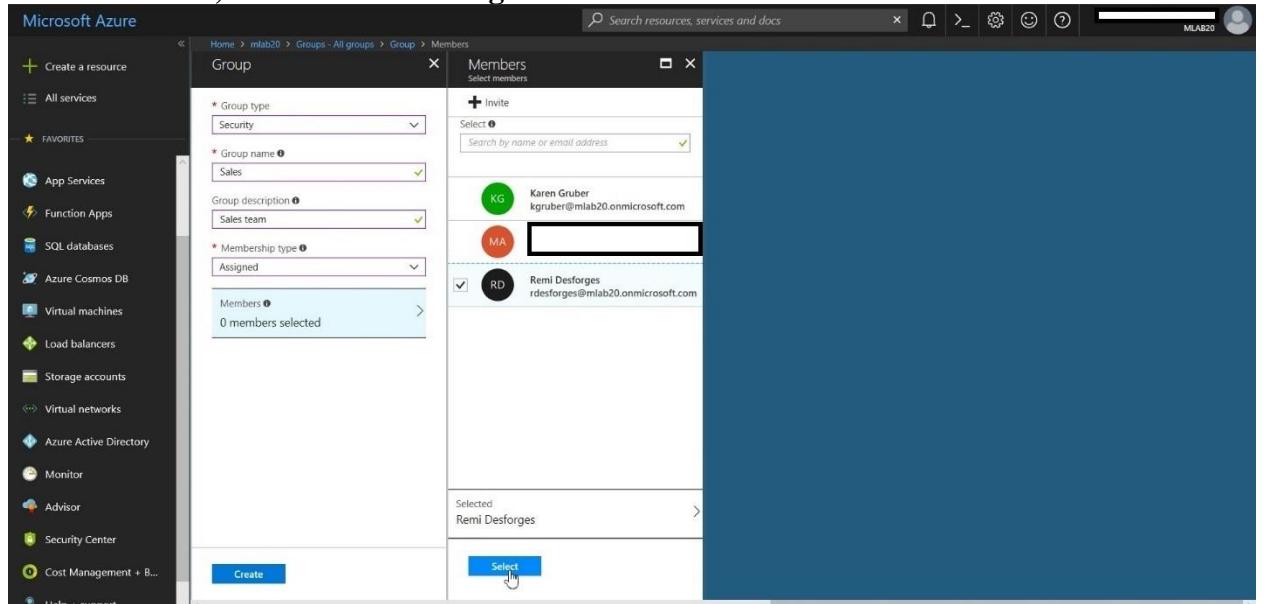
5. In the **Group** dialog box, enter the following settings and click **Create**:

- Group type: **Security**
- Name: **Sales**
- Description: **Sales team**
- Membership type: **Assigned**

Microsoft Azure Infrastructure step by step



6. Click Members, Select Remi Desforges and click Ok.



7. Click New group.

Microsoft Azure Infrastructure step by step

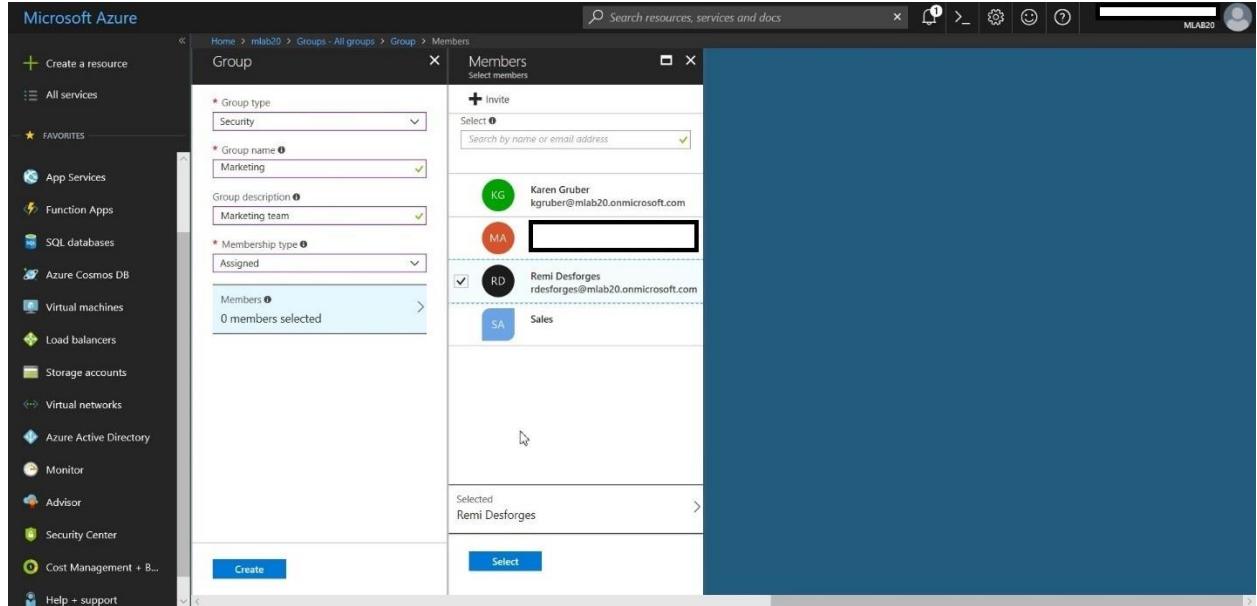
The screenshot shows the Microsoft Azure portal interface. On the left, there's a sidebar with various service icons like App Services, Function Apps, etc. The main area is titled 'Groups - All groups' under 'mtab20 - Azure Active Directory'. A search bar at the top says 'Search resources, services and docs'. Below it, there's a button labeled '+ New group' with a plus sign icon. A modal window is open, prompting for a 'Name' with a placeholder 'Search groups...'. To the right of the modal, a table lists one group: 'Sales' (Security type, Assigned membership). A success message in a toast notification says 'Successfully created group Sales.' at 9:36 PM.

8. In the **Group** dialog box, enter the following settings and click **Create**:
 - Group type: **Security**
 - Name: **Marketing**
 - Description: **Marketing team**
 - Membership type: **Assigned**

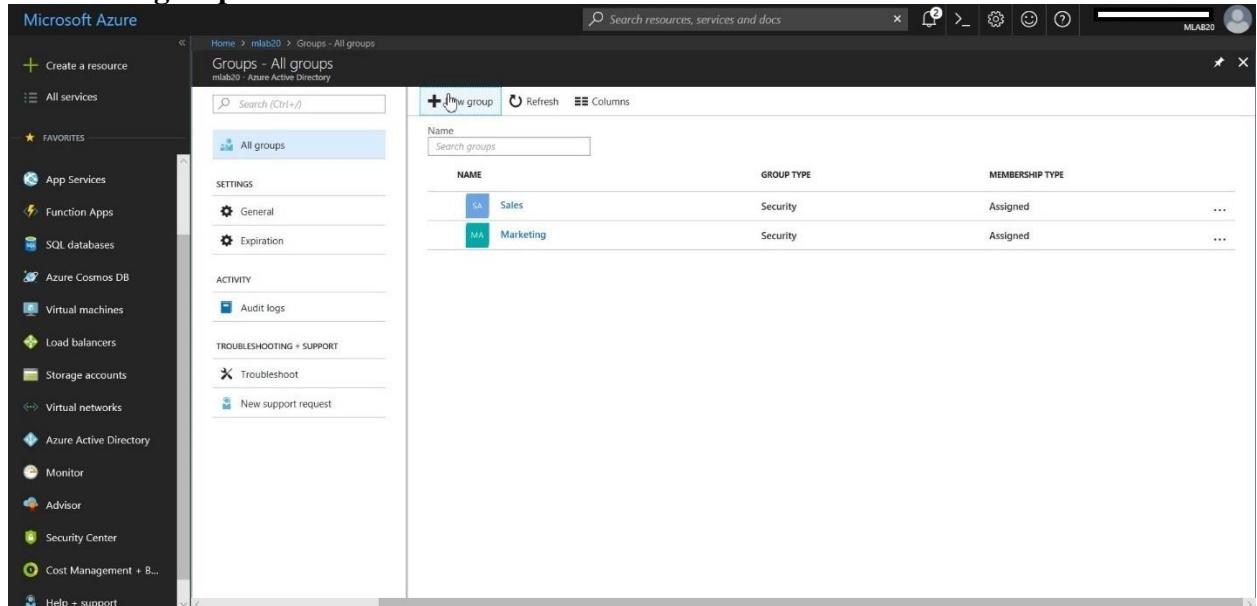
This screenshot shows the 'Group' dialog box from the previous step. It has four fields: 'Group type' set to 'Security', 'Group name' set to 'Marketing', 'Group description' set to 'Marketing team', and 'Membership type' set to 'Assigned'. Below these, there's a 'Members' section with a button '0 members selected' and a 'Create' button at the bottom.

9. Click **Members**, Select **Remi Desforges** and click **Ok**.

Microsoft Azure Infrastructure step by step



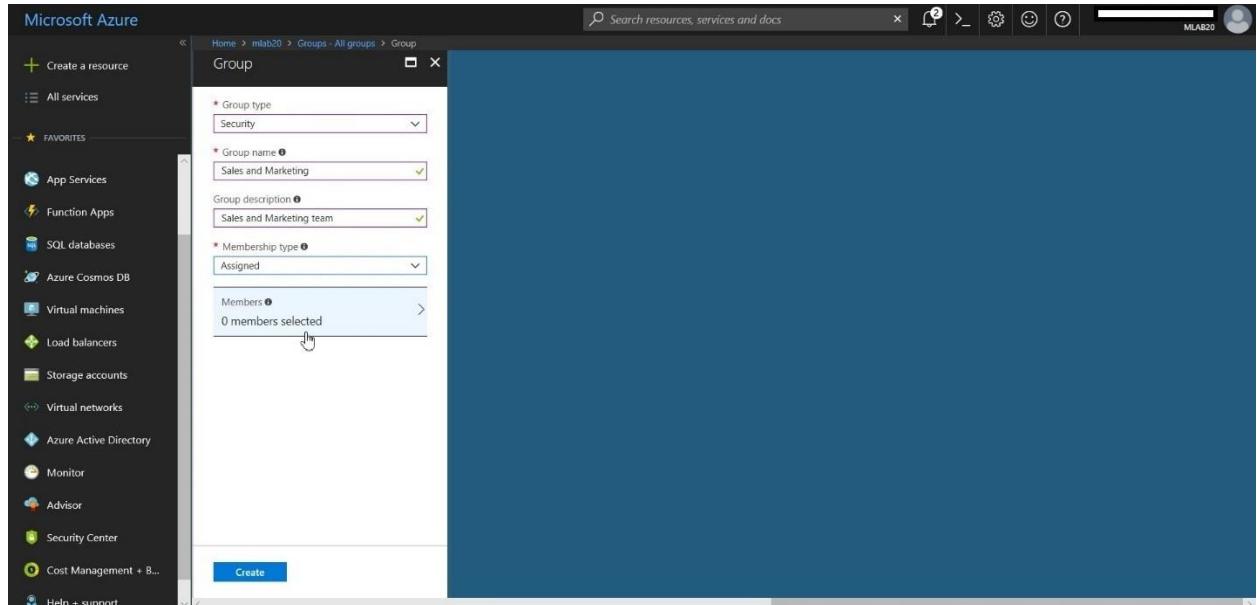
10. Click New group.



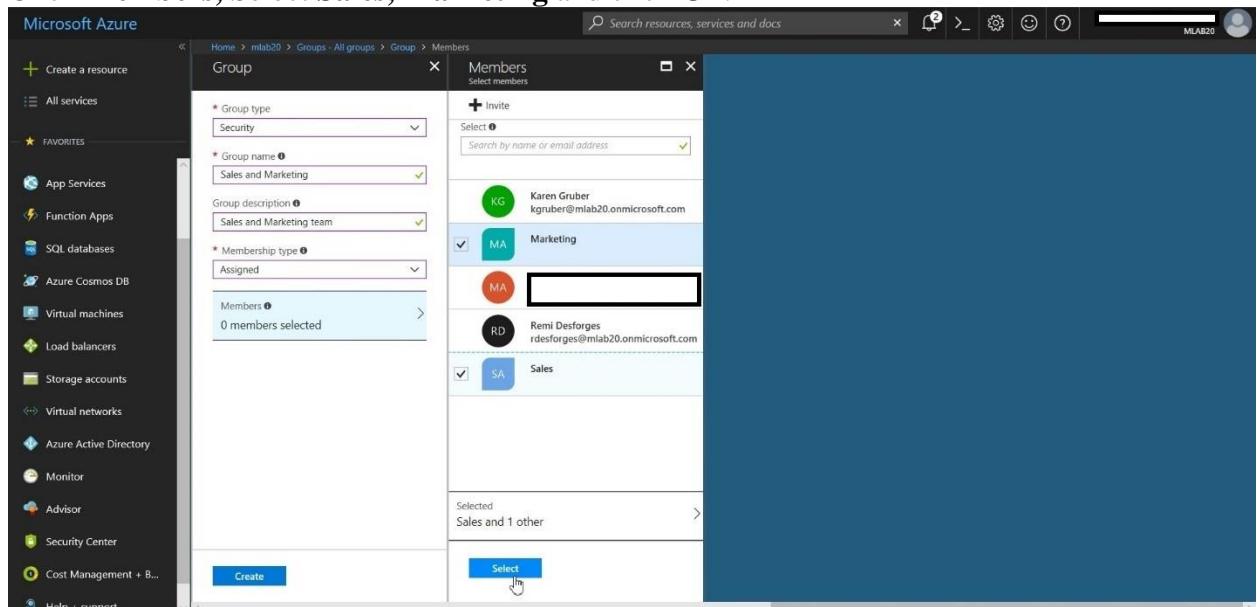
11. In the **Group** dialog box, enter the following settings and click **Create**:

- Group type: **Security**
- Name: **Sales and Marketing**
- Description: **Sales and Marketing team**
- Membership type: **Assigned**

Microsoft Azure Infrastructure step by step



12. Click Members, Select Sales, Marketing and click Ok.



13. Now 3 groups created.

The screenshot shows the Microsoft Azure portal interface. On the left, there's a sidebar with various service icons like App Services, Function Apps, SQL databases, etc. The main area is titled 'Groups - All groups' under 'mlab20 - Azure Active Directory'. It has a search bar at the top. Below it, there's a table with columns for NAME, GROUP TYPE, and MEMBERSHIP TYPE. Three groups are listed: 'Sales' (Security, Assigned), 'Marketing' (Security, Assigned), and 'Sales and Marketing' (Security, Assigned). There are also tabs for 'New group', 'Refresh', and 'Columns'. On the left side of the main content area, there are sections for SETTINGS (General, Expiration), ACTIVITY (Audit logs), and TROUBLESHOOTING + SUPPORT (Troubleshoot, New support request).

Task 4: Manage Users and Groups with Azure PowerShell

To manage users & groups using PowerShell, following this procedure

1. In the PowerShell ISE, in the command prompt pane, enter the following command and press Enter and enter global admin credential:
 - **Install-Module Msonline**
 - **Connect-MsolService**

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> Install-Module Msonline
Untrusted repository
You are installing the modules from an untrusted repository. If you trust this repository, change its
InstallationPolicy value by running the Set-PSRepository cmdlet. Are you sure you want to install the modules from
'PSGallery'?
[Y] Yes [A] Yes to All [N] No [L] No to All [S] Suspend [?] Help (default is "N"): y
PS C:\WINDOWS\system32> Connect-MsolService
```

2. In the PowerShell ISE, in the Script pane, locate the following code: **New-MsolUser -UserPrincipalName mledford@mlab20onmicrosoft.com -DisplayName “Mario Ledford” -FirstName “Mario” -LastName “Ledford”**

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> New-MsolUser -UserPrincipalName mledford@mlab20.onmicrosoft.com -DisplayName "Mario Ledford" -FirstName "Mario" -LastName "Ledford"
Password UserPrincipalName DisplayName isLicensed
----- -----
Cuc00172 mledford@mlab20.onmicrosoft.com Mario Ledford False
```

3. In the PowerShell ISE, in the command prompt pane, enter the following command and press Enter: **Get-MsolUser**

Microsoft Azure Infrastructure step by step

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> New-MsolUser -UserPrincipalName mledford@mlab20.onmicrosoft.com -DisplayName "Mario Ledford" -FirstName "Mario" -LastName "Ledford"
Password UserPrincipalName DisplayName isLicensed
----- -----
Cuc00172 mledford@mlab20.onmicrosoft.com Mario Ledford False

PS C:\WINDOWS\system32> Get-MsolUser
UserPrincipalName DisplayName isLicensed
----- -----
AutomationUser@mlab20.onmicrosoft.com Automation User False
kgruber@mlab20.onmicrosoft.com Karen Gruber False
mledford@mlab20.onmicrosoft.com Mario Ledford False
Sync_Web1_253102edff2@mlab20.onmicrosoft.com On-Premises Directory Synchronization Service Account False
Syncadmin@mlab20.onmicrosoft.com Sync Admin. False
rdesforges@mlab20.onmicrosoft.com Remi Desforges False

PS C:\WINDOWS\system32>
```

4. In the PowerShell ISE, in the Script pane, locate the following code: **New-MsolGroup -DisplayName "Azure team" -Description "Azure team users"**

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> New-MsolGroup -DisplayName "Azure team" -Description "Azure team users"
ObjectId DisplayName GroupType Description
----- -----
11ba5f8d-7c8a-439f-ae85-3123e508df1e Azure team Security Azure team users

PS C:\WINDOWS\system32>
```

5. In the PowerShell ISE, in the command prompt pane, enter the following command and press Enter: **Get-MsolGroup**

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> New-MsolGroup -DisplayName "Azure team" -Description "Azure team users"
ObjectId DisplayName GroupType Description
----- -----
11ba5f8d-7c8a-439f-ae85-3123e508df1e Azure team Security Azure team users

PS C:\WINDOWS\system32> Get-MsolGroup
ObjectId DisplayName GroupType Description
----- -----
e7bd045c-d869-42a8-94d9-4a25024c91e0 Sales Security Sales team
36db2298-e119-4a66-bb1b-11ca51ed15c0 Marketing Security Marketing team
1cbc5c0d-6fdd-4453-9ed7-4939e61ac52 Sales and Marketing Security Sales and Marketing team
11ba5f8d-7c8a-439f-ae85-3123e508df1e Azure team Security Azure team users

PS C:\WINDOWS\system32>
```

6. In the PowerShell ISE, in the Script pane, locate the following code:

- **\$group = Get-MsolGroup | Where-Object {\$_._DisplayName -eq "Azure team"}**
- **\$user = Get-MsolUser | Where-Object {\$_._DisplayName -eq "Mario Ledford"}**

Microsoft Azure Infrastructure step by step

```
Administrator: Windows PowerShell
```

```
PS C:\WINDOWS\system32> $group = Get-MsolGroup | Where-Object {$_['DisplayName'] -eq "Azure team"}  
PS C:\WINDOWS\system32> $user = Get-MsolUser | Where-Object {$_['DisplayName'] -eq "Mario Ledford"}  
PS C:\WINDOWS\system32>
```

7. In the PowerShell ISE, in the Script pane, locate the following code: **Add-MsolGroupMember -GroupObjectId \$group.ObjectId -GroupMemberType "User" -GroupMemberObjectId \$user.ObjectId**

```
Administrator: Windows PowerShell
```

```
PS C:\WINDOWS\system32> $group = Get-MsolGroup | Where-Object {$_['DisplayName'] -eq "Azure team"}  
PS C:\WINDOWS\system32> $user = Get-MsolUser | Where-Object {$_['DisplayName'] -eq "Mario Ledford"}  
PS C:\WINDOWS\system32> Add-MsolGroupMember -GroupObjectId $group.ObjectId -GroupMemberType "User" -GroupMemberObjectId  
$user.ObjectId  
PS C:\WINDOWS\system32>
```

8. In the PowerShell ISE, in the Script pane, locate the following code: **Get-MsolGroupMember -GroupObjectId \$group.ObjectId**

```
Administrator: Windows PowerShell
```

```
PS C:\WINDOWS\system32> $group = Get-MsolGroup | Where-Object {$_['DisplayName'] -eq "Azure team"}  
PS C:\WINDOWS\system32> $user = Get-MsolUser | Where-Object {$_['DisplayName'] -eq "Mario Ledford"}  
PS C:\WINDOWS\system32> Add-MsolGroupMember -GroupObjectId $group.ObjectId -GroupMemberType "User" -GroupMemberObjectId  
$user.ObjectId  
PS C:\WINDOWS\system32> Get-MsolGroupMember -GroupObjectId $group.ObjectId
```

GroupMemberType	EmailAddress	DisplayName
User	mledford@mlab20.onmicrosoft.com	Mario Ledford

9. Open Azure Portal, Click Users, verify that Mario is member of Azure groups.

The screenshot shows the Microsoft Azure portal interface. On the left, there's a navigation sidebar with various service icons like Dashboard, Resource groups, App Services, etc. The main area shows a user profile for 'Mario Ledford'. Under the 'User' section, there's a 'Groups' tab which is currently selected. A table lists the groups the user is a member of:

NAME	GROUP TYPE	MEMBERSHIP TYPE
Azure team	Security	Assigned

Configure Single Sign-On

In this exercise, you will have installed and configured a test application, and confirmed successful single sign-on.

Task 1: Add Directory Applications and Configure Single Sign-On

To configure Single Sign-On, following this procedure

1. On the **Azure Active Directory** page, click **Enterprise Application**.

The screenshot shows the Microsoft Azure portal with the 'mlab20' directory selected. The left sidebar lists various services like App Services, Function Apps, etc. The main content area is titled 'mlab20' and shows the 'Enterprise applications' section under 'MANAGE'. It includes sections for 'Sign-ins', 'What's new in Azure AD', and 'Azure AD Connect sync'. A search bar at the top right says 'Search resources, services and docs'.

2. In the **Add from the gallery** dialog box, in the search box, type **Microsoft**, and press Enter.

The screenshot shows the 'Add from the gallery' dialog box. In the search bar, 'microsoft' is typed. Below it, a table lists several Microsoft applications: Cloud Management Portal for Microsoft Azure, Confluence SAML SSO by Microsoft, Directions on Microsoft, JIRA SAML SSO by Microsoft, Microsoft Account (Windows Live), and Microsoft Azure RemoteApp. The 'Microsoft Account (Windows Live)' row is highlighted.

3. Click **Microsoft Account (Windows Live)**, and then click the **Add**.

Microsoft Azure Infrastructure step by step

Microsoft Account (Windows Live) - Add app

Microsoft Corporation

Name: Microsoft Account (Windows Live)

Publisher: Microsoft Corporation

Single Sign-On Mode: Password-based Sign-on

URL: http://www.live.com/

Logo: Microsoft logo

Add

4. Click Assign a user for testing.

Microsoft Account (Windows Live) - Quick start

Overview (recommended)

Assign a user for testing (required)

Configure single sign-on (required)

Set up conditional access (optional)

Configure self-service (optional)

Deploy single sign-on to users and groups (recommended)

5. In the user list, click Remi. In the Assign Users dialog box, select the I want to enter Microsoft Account (Windows Live) credentials on behalf of the user check box.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, there's a sidebar with various service icons like App Services, Function Apps, SQL databases, etc. The main area has a breadcrumb navigation path: Home > mlab20 > Enterprise applications - All applications > Categories > Add an application > Microsoft Account (Windows Live) - Quick start > Users and groups > Add Assignment > Users. There are three open tabs: 'Users and groups' (selected), 'Add Assignment' (mlab20), and 'Users'. In the 'Add Assignment' tab, it says 'Groups are not available for assignment due to your Active Directory plan level.' Below that, under 'Users', 'None Selected' is shown. Under 'Select Role', 'Default Access' is chosen. In the 'Users' tab, two users are listed: Karen Gruber (kgruber@mlab20.onmicrosoft.com) and Remi Desforges (rdesforges@mlab20.onmicrosoft.com). Both users have a checked checkbox next to their names. At the bottom of the 'Users' tab, there's a 'Select' button.

6. At the bottom of the screen, click **Assign**.

This screenshot is similar to the previous one but focuses on the 'Add Assignment' dialog. It shows the same structure with the 'Users' tab selected, displaying '1 user selected.' Below that, the 'Select Role' dropdown is set to 'Default Access'. At the bottom of the dialog, the 'Assign' button is highlighted in blue, indicating it is the next step to be clicked.

7. Click **Configure Single Sign-on**

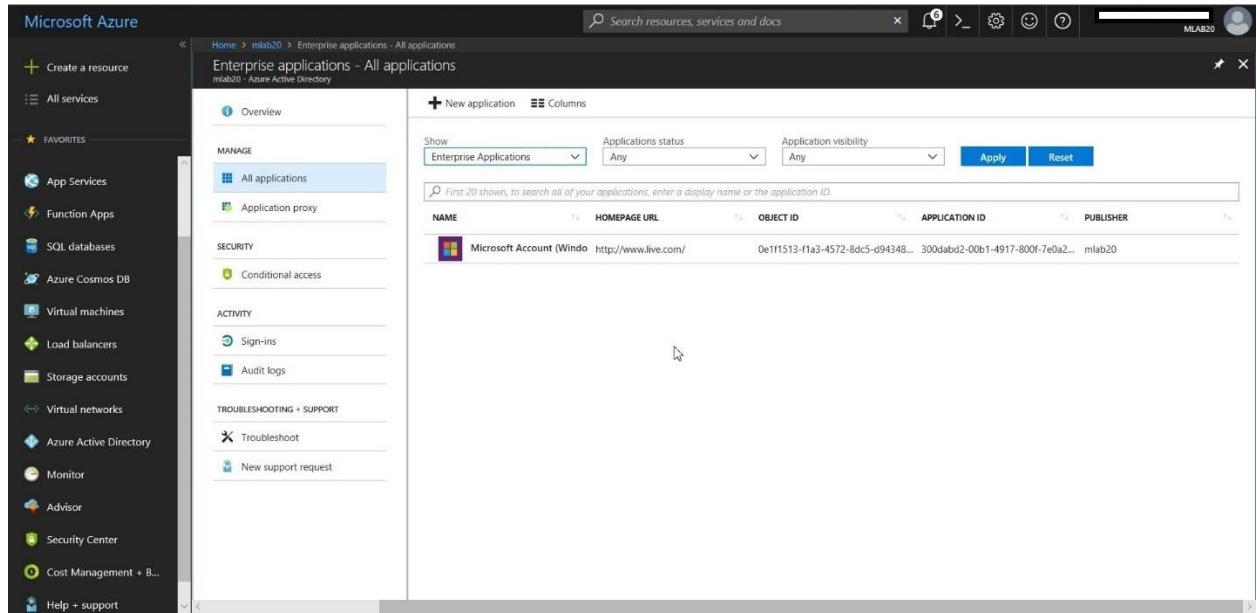
Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, there's a sidebar with various service icons like App Services, Function Apps, SQL databases, etc. The main area is titled 'Microsoft Account (Windows Live) - Quick start' under 'Enterprise Application'. It has a navigation menu on the left with options like 'Quick start', 'Properties', 'Users and groups', 'Single sign-on', 'Provisioning', 'Self-service', 'Conditional access', 'Permissions', 'Sign-ins', 'Audit logs', and 'TROUBLESHOOTING + SUPPORT'. The 'Single sign-on' section is highlighted with a dashed blue border. The 'Assign a user for testing (required)' step is also highlighted. Below it, other steps include 'Configure single sign-on (required)', 'Set up conditional access (optional)', 'Configure self-service (optional)', and 'Deploy single sign-on to users and groups (recommended)'. A status bar at the bottom right shows 'MLAB20'.

8. Select Password Based Sign-on, and click Save

The screenshot shows the 'Single sign-on' configuration page. In the top right, there are 'Save' and 'Discard' buttons. The 'Save' button is highlighted. The main area shows the 'Single Sign-on Mode' dropdown set to 'Password-based Sign-on'. Below it, there's a note about password-based sign-on and a 'Sign-on URL' input field containing 'https://'. A status bar at the bottom right shows 'Save Single Sign-on configuration 9:54 PM' and 'Single Sign-on configuration was saved successfully'.

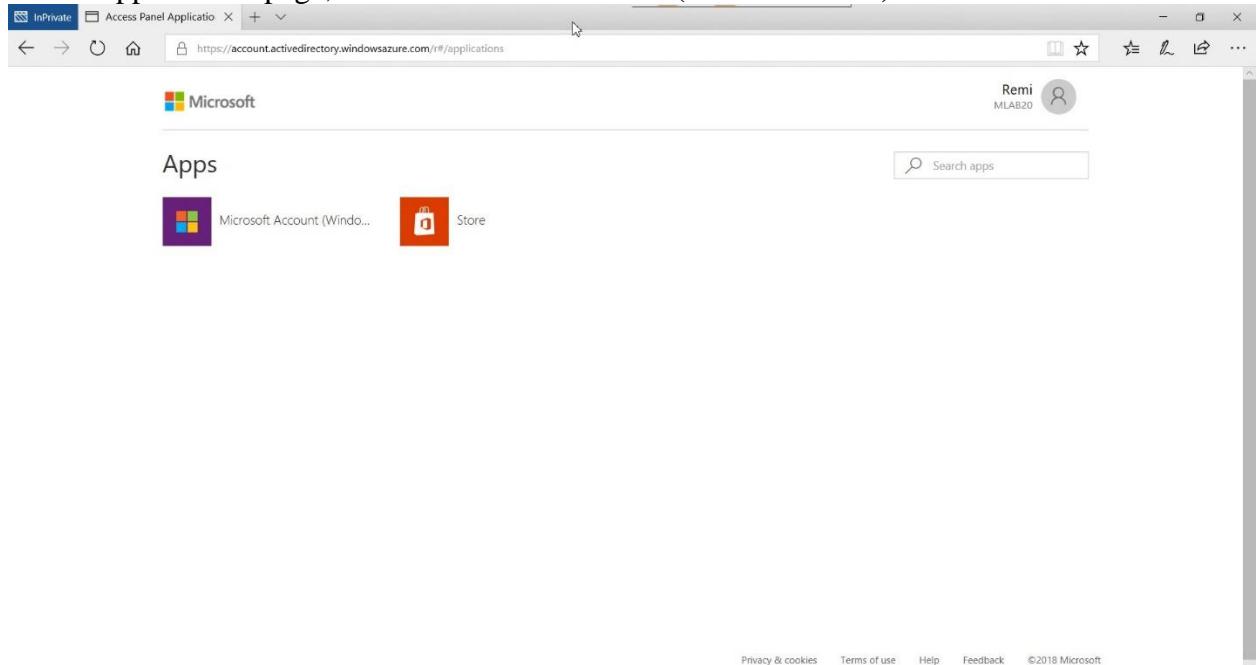
9. Now Application is created



Task 2: Test Single Sign-On

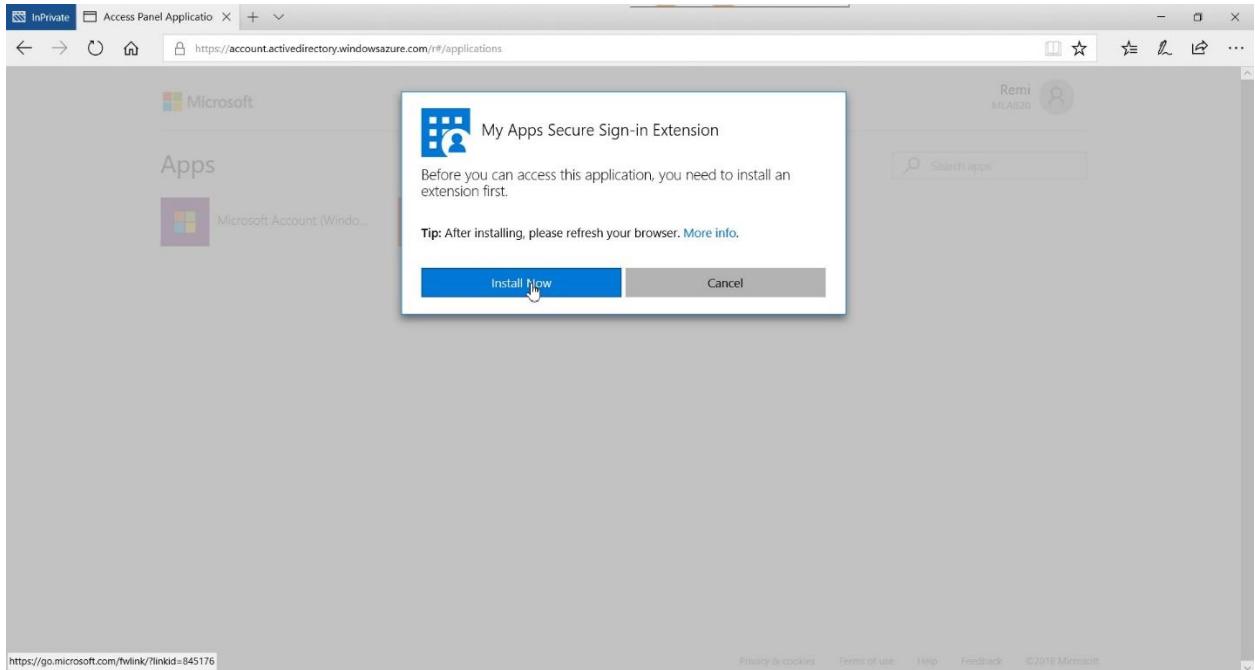
To verify Single Sign-On, following this procedure

1. In Internet Explorer, in the address box, type <https://myapps.microsoft.com>, and press Enter.
2. On the applications page, click **Microsoft Account (Windows Live)**.



3. In the **Microsoft Account (Windows Live)** dialog box, click **Install Now**.

Microsoft Azure Infrastructure step by step



4. On the **My Apps Secure Sign-in Extension** page, click **Install**.

A screenshot of the Microsoft Store page for the 'My Apps Secure Sign-in Extension'. The page title is 'My Apps Secure Sign-in Extension' by Microsoft Corporation. It has a 5-star rating and a 'Write a review' button. A message indicates that the user owns this product. Below the title, there is an 'Install' button which is highlighted with a mouse cursor. To the right of the button, there is an 'Everyone' rating and an ESRB rating of 'E'. The page is divided into sections: 'Description' and 'Available on'. The 'Description' section contains text about the extension's purpose and functionality. The 'Available on' section shows that the extension is available for PC. Below these sections is a 'Screenshots' section featuring a screenshot of the Microsoft Edge browser displaying the 'Access Panel Application' interface.

5. In the **My Apps Secure Sign-in Extension** page, click **launch**.
6. In the Internet Explorer bar, click **Sign in to get started**.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, there's a sidebar with various service icons like App Services, Function Apps, SQL databases, etc. The main content area shows the 'User' blade for 'Remi Desforges'. It includes tabs for 'Overview', 'Manage' (Profile, Directory role, Groups, Applications, Licenses, Devices, Azure resources), 'Activity' (Sign-ins, Audit logs), and 'Troubleshooting + Support' (Troubleshoot). A summary section displays 'Users Sign-ins' with a link to 'FDB35664-4BED-45FD-894B-fe25a6b5d395'. A right-hand sidebar provides links to sign in to apps faster and safer, manage saved passwords, and a 'Sign in to get started' button.

7. Sign in on live mail with your personal mail and then Close Internet Explorer.
8. On the taskbar, click Internet Explorer.
9. In Internet Explorer, in the address box, type <https://myapps.microsoft.com>, and then press Enter.
10. On the **Sign in** page, enter the following credentials and click **Sign in** with Remi
11. On the **applications** page, click **Microsoft Account (Windows Live)**; note the **Redirecting to Microsoft Account (Windows Live)** message.

The screenshot shows the Microsoft Outlook Mail inbox. The left sidebar lists 'Folders' including 'Inbox' (1313 messages), 'Journal', 'Notes', 'Junk Email' (10 messages), and 'Drafts' (3 messages). The main pane shows several email messages from 'Jobsite' with subject lines related to job matches. The bottom right corner shows a list of recent messages with their times: 7:11 PM, 6:12 PM, 5:13 PM, 4:11 PM, and 3:08 PM.

12. Verify that your sign-on to the Access Panel has automatically signed you in to your Microsoft Account.

Configuring Multi-Factor Authentication

By default, user authentication in Azure AD uses passwords only. Azure Multi-Factor Authentication adds a second level of authentication, requiring users to also use a text message, an automated call to an office phone, or mobile phone app.

The full Azure MFA capabilities enable MFA to be used by all users, and for all global administrators to be able to use the MFA management portal, custom greetings, and reports. However, full Azure MFA capabilities require an MFA provider to be purchased and configured.

Microsoft Azure Infrastructure step by step

A subset of the full MFA capabilities is available at no cost to Global Administrators of the Azure AD instance. These subset features are:

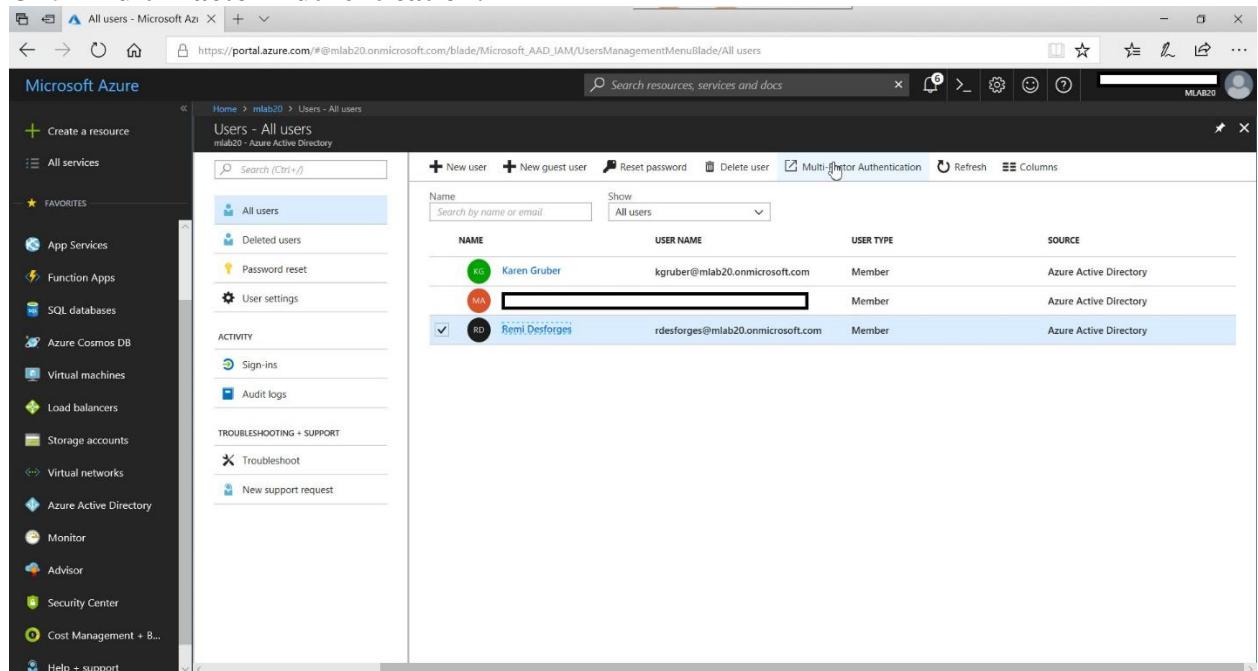
- Ability to enable and enforce multi-factor authentication for end users (note that using MFA for end users is not part of the free service).
- Use of text message, call to an office phone, or mobile phone app as a second authentication factor.
- App passwords for non-browser clients, such as Microsoft Outlook.
- Default voice messages during authentication phone calls.

In this exercise, you will have configured MFA for administrators.

Task 1: Configure Multi-Factor Authentication

To configure Multi-Factor Authentication, following this procedure

1. In Internet Explorer, in the address box, type <https://portal.azure.com>, and then press Enter.
2. In the navigation pane, scroll down, and click **Azure Active Directory**.
3. Click **Multi-Factor Authentication**.

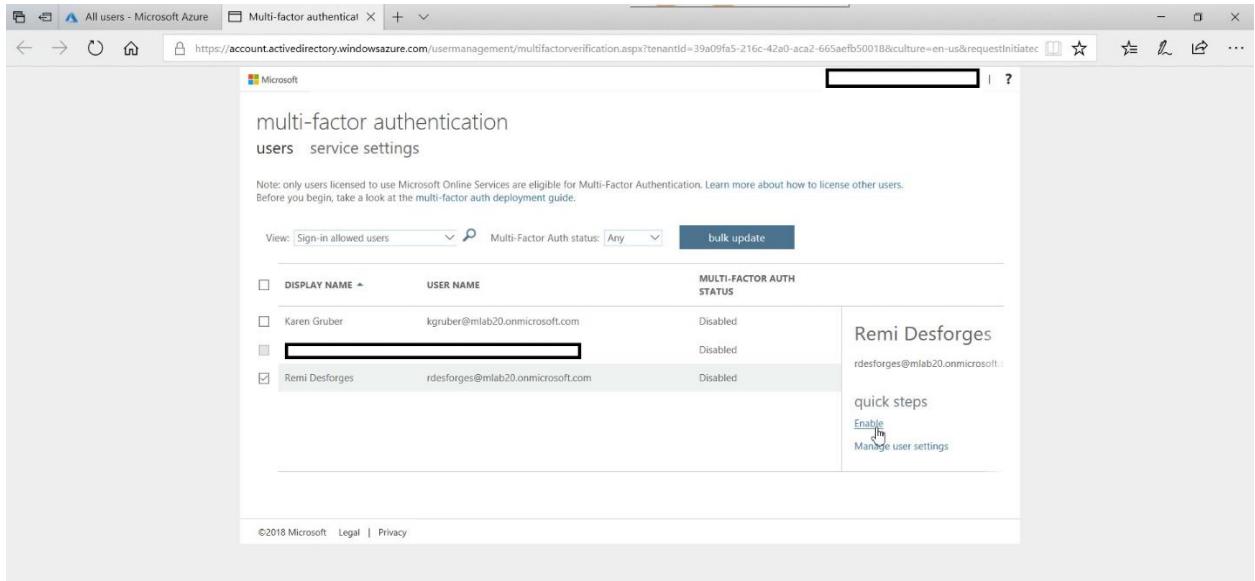


The screenshot shows the Azure portal interface. The left sidebar lists various services like App Services, Function Apps, SQL databases, etc. The main area is titled 'Users - All users' under 'Azure Active Directory'. It shows a table with three users: Karen Gruber, MA [REDACTED], and Remi Desforges. A 'Multi-Factor Authentication' button is visible in the top right of the user list. A 'quick steps' section is open, showing the 'Multi-Factor Authentication' option.

NAME	USER NAME	USER TYPE	SOURCE
Karen Gruber	kgruber@mlab20.onmicrosoft.com	Member	Azure Active Directory
MA [REDACTED]	[REDACTED]	Member	Azure Active Directory
Remi Desforges	rdesforges@mlab20.onmicrosoft.com	Member	Azure Active Directory

4. On the **multi-factor authentication page**, click **users**.
5. In the **users** list, select the check box for **Karen Gruber**, and in the **quick steps** section, click **Enable**.

Microsoft Azure Infrastructure step by step



The screenshot shows the 'Multi-factor authentication' page in the Azure portal. It lists users with their display names, user names, and current multi-factor auth status (all set to 'Disabled'). A 'bulk update' button is available at the top right. On the right side, there's a sidebar for 'Remi Desforges' with options like 'quick steps', 'Enable' (which is highlighted with a red box), and 'Manage user settings'.

DISPLAY NAME	USER NAME	MULTI-FACTOR AUTH STATUS
Karen Gruber	kgruber@mlab20.onmicrosoft.com	Disabled
Remi Desforges	rdesforges@mlab20.onmicrosoft.com	Disabled

6. On the **About enabling multi-factor auth** page, click **enable multi-factor auth**.



About enabling multi-factor auth

Please read the [deployment guide](#) if you haven't already.

If your users do not regularly sign in through the browser, you can send them to this link to register for multi-factor auth: <https://aka.ms/MFASetup>

enable multi-factor auth

cancel

7. On the **Updates successful** page, click **close**.



Updates successful

Multi-factor auth is now enabled for the selected accounts.

close

8. In Internet Explorer, close the multi-factor authentication tab.

The screenshot shows a Microsoft Azure web interface titled "multi-factor authentication users service settings". It displays a list of users with their names, email addresses, and multi-factor auth status. The users listed are Karen Gruber (disabled), [REDACTED] (disabled), and Remi Desforges (enabled). A "bulk update" button is visible at the top right. The URL in the address bar is <https://account.activedirectory.windowsazure.com/usermanagement/multifactorverification.aspx?tenantId=39a09fa5-216c-42a0-aca2-665afeb5001&culture=en-us&requestInitiate>.

Task 2: Test Multi-Factor Authentication

To test Multi-Factor Authentication, following this procedure

1. In Internet Explorer, in the address box, type <https://myapps.microsoft.com>, and then press Enter.
2. On the **Sign in** page, enter the credentials,
3. Note the following message: **Your admin has required that you set up this account for additional security verification. Click Set it up now.**

The screenshot shows a Microsoft sign-in page with a blue background featuring a city skyline silhouette and a lightbulb icon. The Microsoft logo is in the top right. The text "For added security, we need to further verify your account" is displayed. Below it, a user profile picture for "rdesforges@mlab20.onmicrosoft.com" is shown with the message "Your admin has required that you set up this account for additional security verification." A blue "Set it up now" button is highlighted with a cursor. Other options like "Sign out and sign in with a different account" and "More information" are also present. The URL in the address bar is <https://login.microsoftonline.com/common/login>. The page includes standard copyright and privacy links at the bottom.

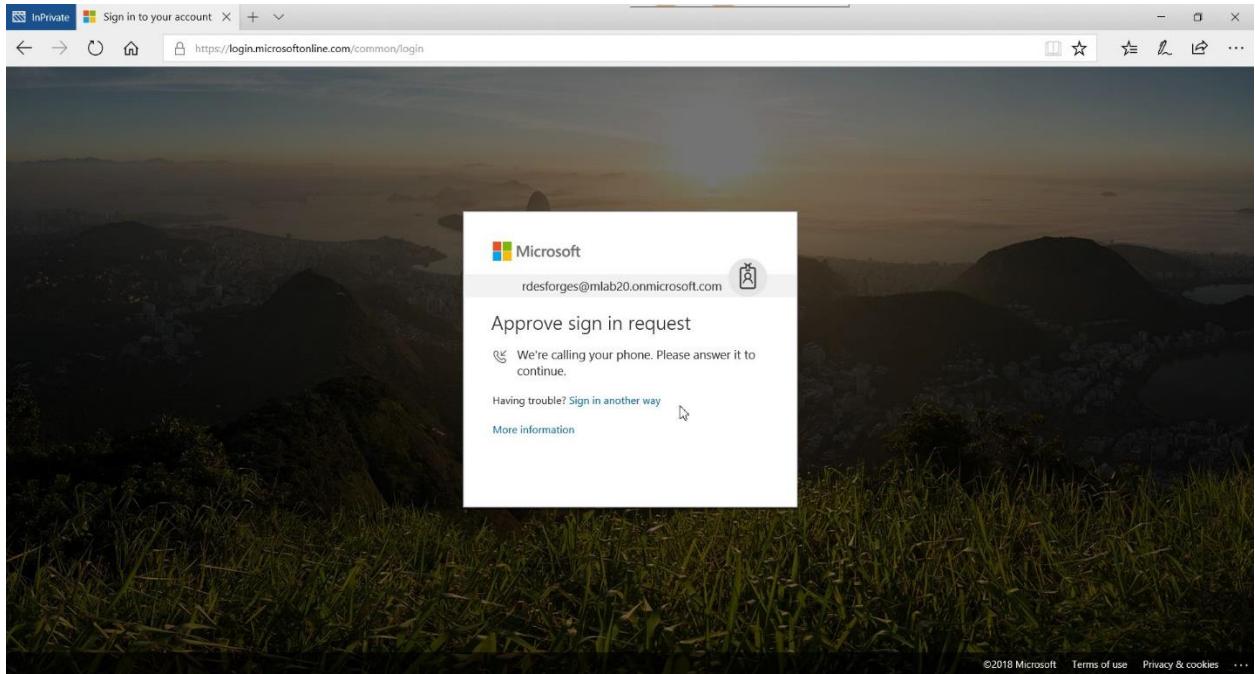
4. On the **additional security verification** page, click in the first box, and note the contact method options.

The screenshot shows a Microsoft Edge browser window with the URL <https://account.activedirectory.windowsazure.com/proofup.aspx?culture=en-US>. The page title is "Additional security verification". It instructs the user to "Secure your account by adding phone verification to your password. View video to know how to secure your account". Below this, the heading "Step 1: How should we contact you?" is displayed. A dropdown menu shows "Authentication phone" selected. A dropdown menu for "Country (+20)" shows "Egypt (+20)" selected. A "Method" section contains two radio button options: "Send me a code by text message" (unchecked) and "Call me" (checked). A "Next" button is located at the bottom right. A note below the method selection states: "Your phone numbers will only be used for account security. Standard telephone and SMS charges will apply." At the bottom of the page, there is a copyright notice: "©2018 Microsoft Legal | Privacy".

5. Optional step: If you have access to a mobile phone in the classroom, and have a signal or data connection, you may wish to complete the "additional security verification" steps on the **additional security verification** page.

The screenshot shows a Microsoft Edge browser window with the same URL as the previous screenshot. The page title is "Additional security verification". It reiterates the goal of securing the account with phone verification. Below this, the heading "Step 3: Keep using your existing applications" is shown. A note states: "In some apps, like Outlook, Apple Mail, and Microsoft Office, you can't use a phone to secure your account. To use these apps, you'll need to create a new 'app password' to use in place of your work or school account password. Learn more". A "Get started with this app password:" section contains a text input field with the value "zvmtzgrsnryrfyld" and a copy icon. A "Done" button is located at the bottom right. At the bottom of the page, there is a copyright notice: "©2018 Microsoft Legal | Privacy".

6. MFA will work every time that you sign in.



Managing an Active Directory Hybrid Environment

There are three main options for integrating Microsoft Azure with your on-premises Active Directory Domain Service. These three options are:

- **Extending on-premises Active Directory into Microsoft Azure.** With this option, you host virtual machines in Microsoft Azure that you then promote to be domain controllers within your on-premises Active Directory.
- **Synchronizing on-premises Active Directory with Microsoft Azure Active Directory.** Directory Synchronization (DirSync) propagates user, group and contact information into Active Directory and keeps that information synchronized. It can be used with optional password synchronization so the user logs on to Microsoft Azure using the same user account and password as his or her on-premises account—although the authentication processes are still separate.
- **Implementing single sign-on between on-premises Active Directory and Microsoft Azure Active Directory.** This third option supports the largest range of integration features and enables a user to log on to Microsoft Azure after being authenticated by the on-premises Active Directory. The technology used is Active Directory Federation Services (AD FS) and a typical implementation uses ADFS proxies to handle incoming authentication requests from the Internet. Alternatively, you can use the Windows Server® 2012 R2 Web Application Proxy (WAP) role service to provide this proxying.

Configuring Directory Synchronization

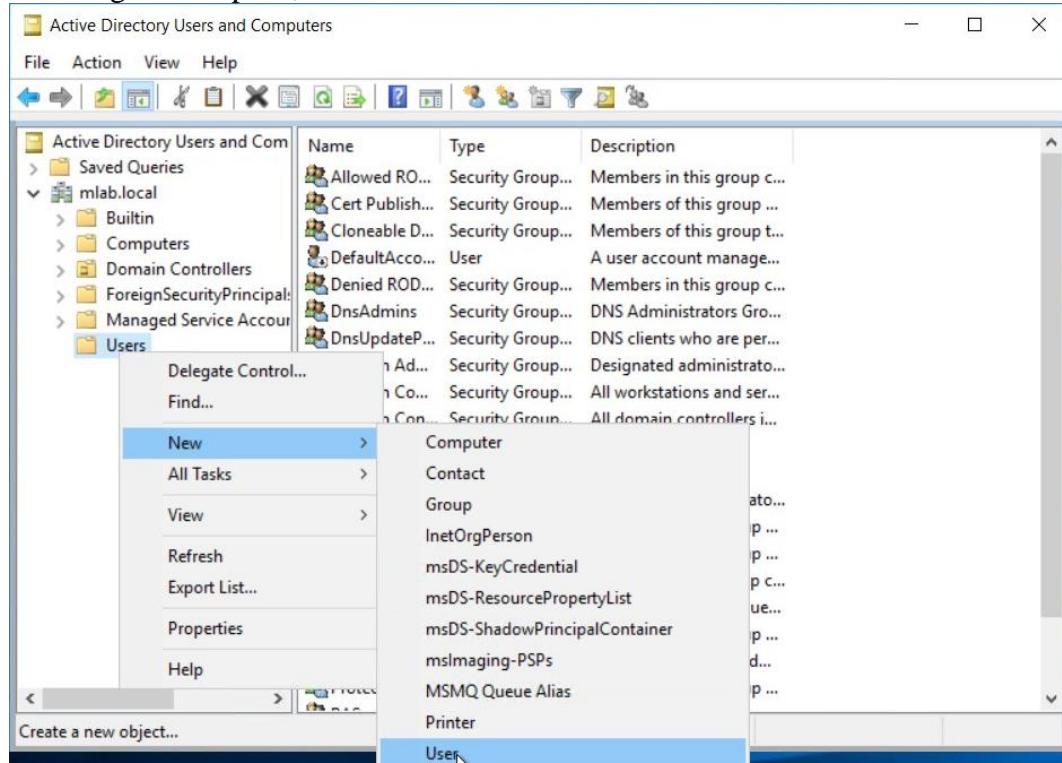
In this exercise, you will have installed and configured AD-Connect, ready for a test synchronization.

Note: After you add verified domain on Azure, you will need to update UPN suffix on AD with routable domain using [this script](#) to get users sync with verified domain not with tenant domain.

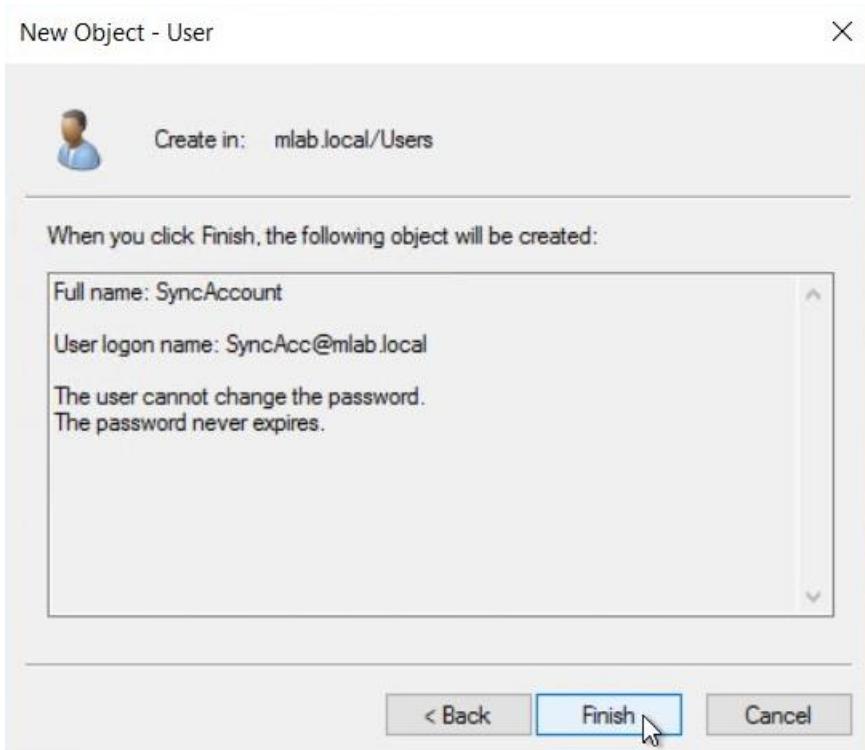
Task 1: Create Service Accounts

To create service accounts, following this procedure

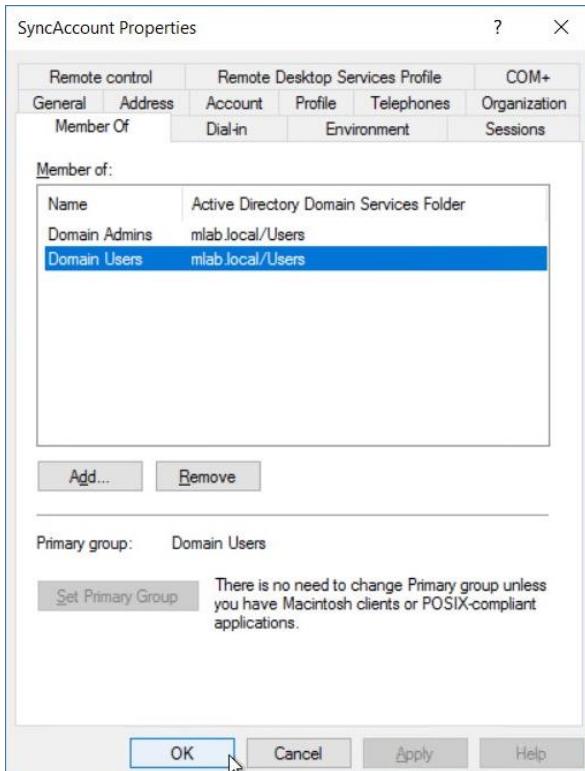
1. On DC, click **Active Directory Users & Computers**.
2. In the left-hand pane, click **Mlab.local**. Click the **Users** OU.
3. In the right-hand pane, click **New** and click **User**.



4. In the **Create User** dialog box, in **Full Name**, enter **Syncacc**.
 - In the **User UPN logon**, enter **Syncacc**.
 - In **Password** and **Confirm password**, enter **Pa\$\$w0rd123**.
 - Under **Password options**, click **Other password options**, then click **Password never expires**.

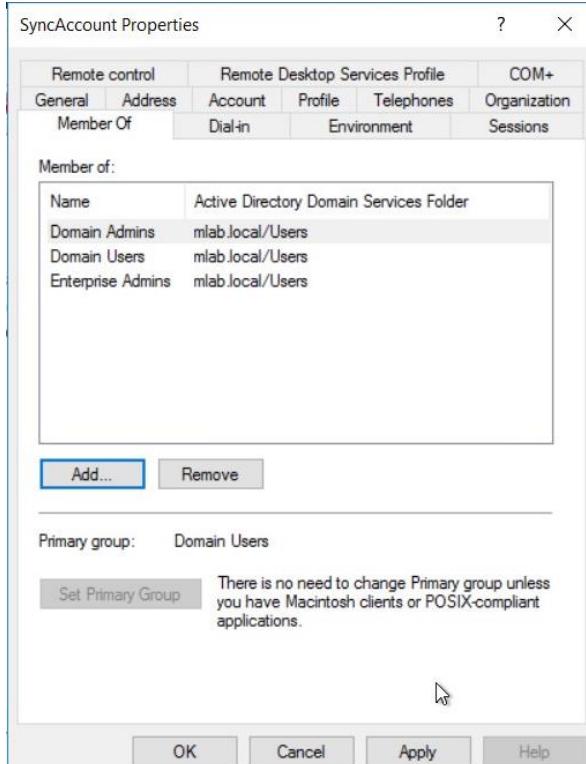


5. Click the **Member Of** tab, Click **Add**.
6. In **Enter the object names to select**, type **Domain Admins**, then click **Check Names**, and then click **OK**.



7. Repeat steps 5 and 6 for the Enterprise Admins group.

Microsoft Azure Infrastructure step by step



8. Double-click the **Lab Users OU**. Verify that there are some user accounts in this OU.
9. Login to [Azure portal](#), click **Azure Active Directory**.
10. Click **Users**, Select **New user**.
11. In the **user profile** dialog box, enter the following settings and click **Create**:
 - First Name: **Sync**
 - Last Name: **Admin**
 - Display Name: **Sync Admin**
 - Role: **Global Administrator**
 - Alternate Email Address: Type the email address of your Azure subscription

Microsoft Azure

User

* Name: Sync Admin.

* User name: Syncadmin@mlab20.onmicrosoft.com

Profile: Configured

Properties: Default

Groups: 0 groups selected

Directory role: Global administrator

Password: Show Password

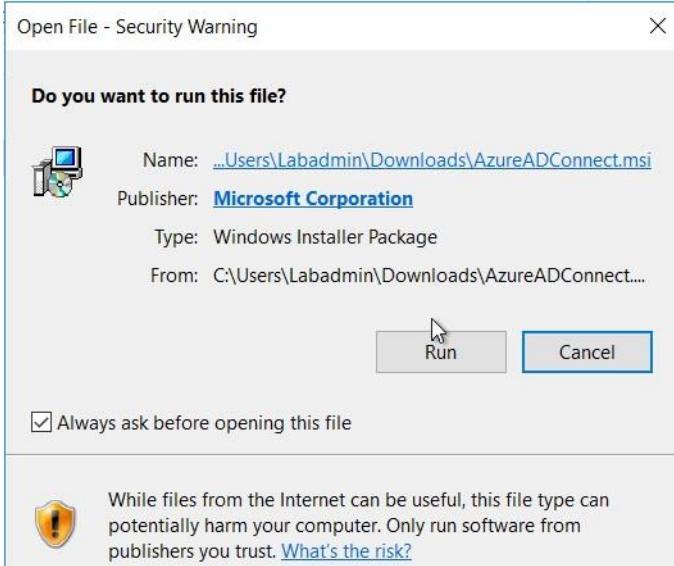
Create

12. At the top right-hand corner, click your logon name and click **sign out**.
13. Click **Sign in** with syncadmin@mlab20.onmicrosoft.com with temp password, and create new password then sign out.

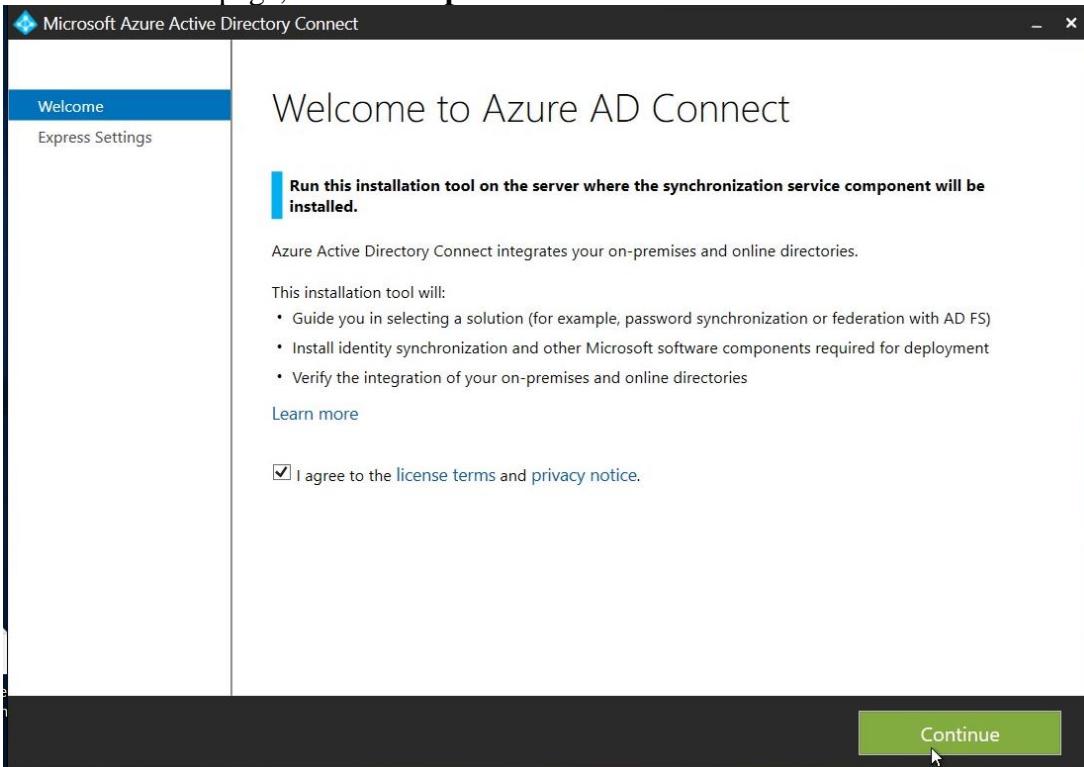
Task 2: Install & Configure AD Connect

To configure AD-Connect Server, following this procedure

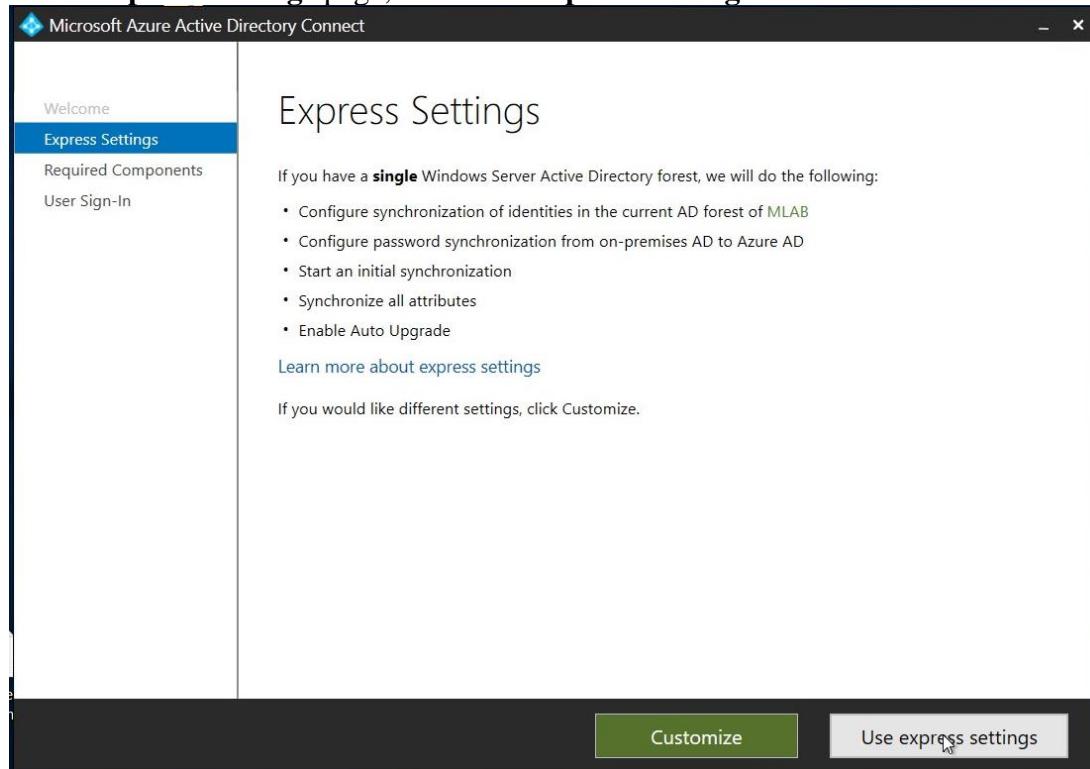
1. Download [AD-Connect tool](#), then click **Run**.



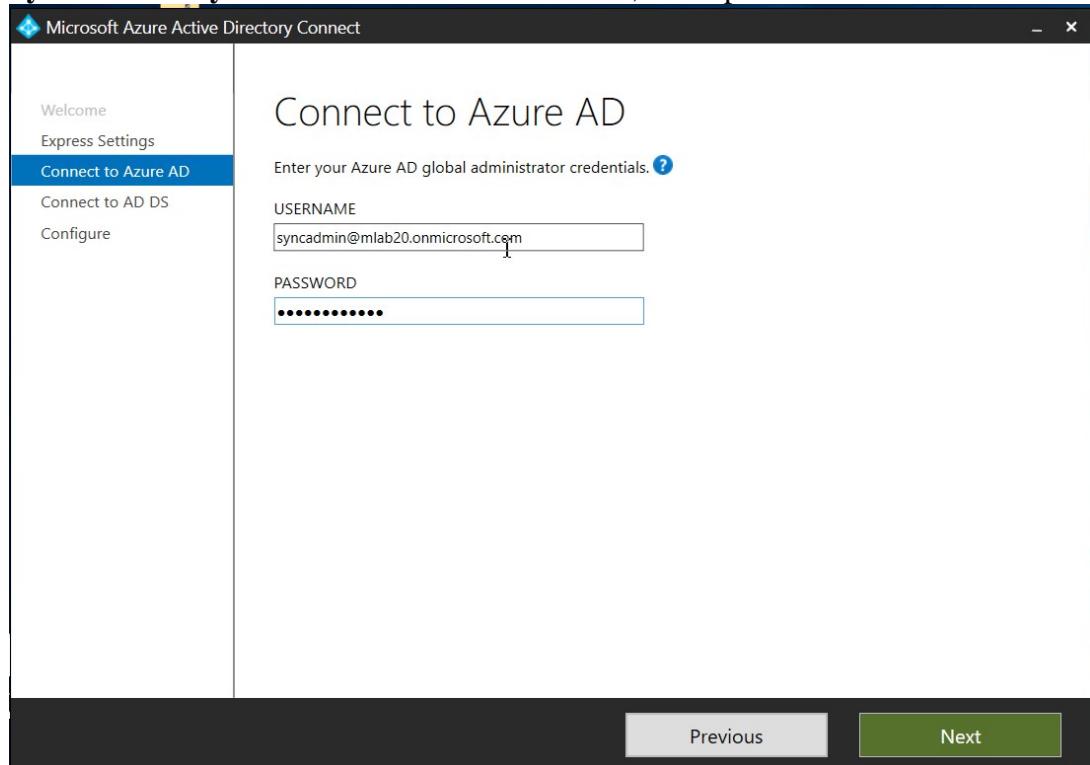
2. In the **Welcome** page, click **I accept** and then click **Continue**.



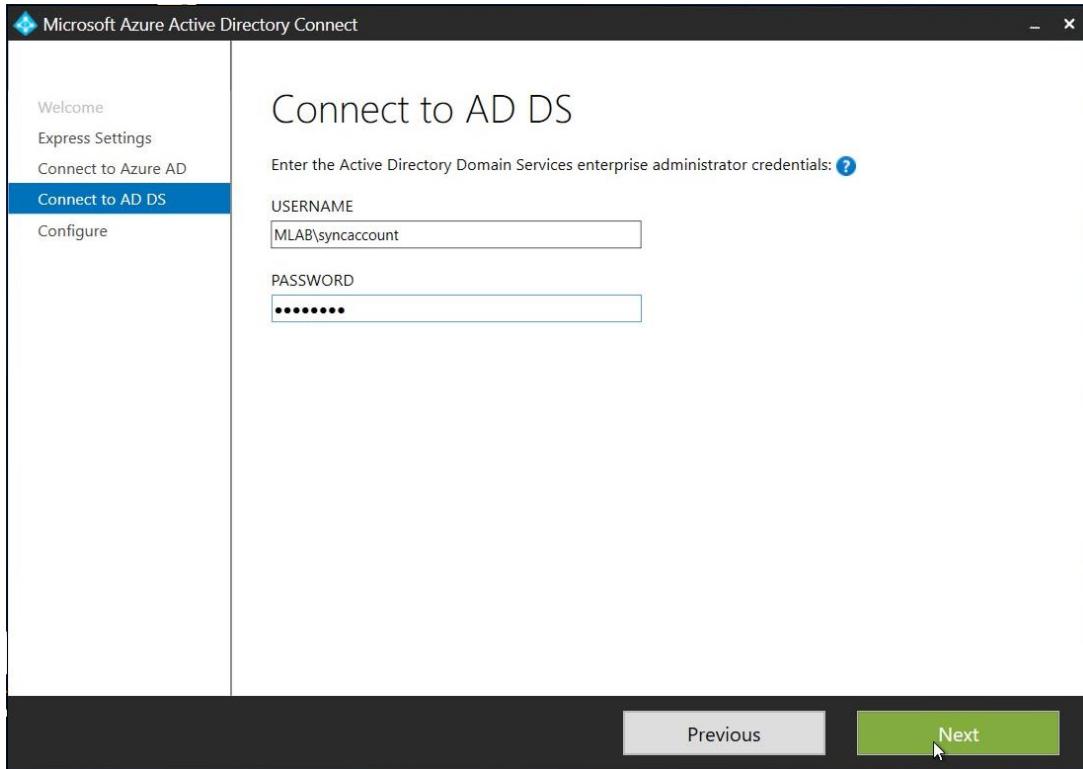
3. In the **Express Settings** page, click **Use Express Settings**.



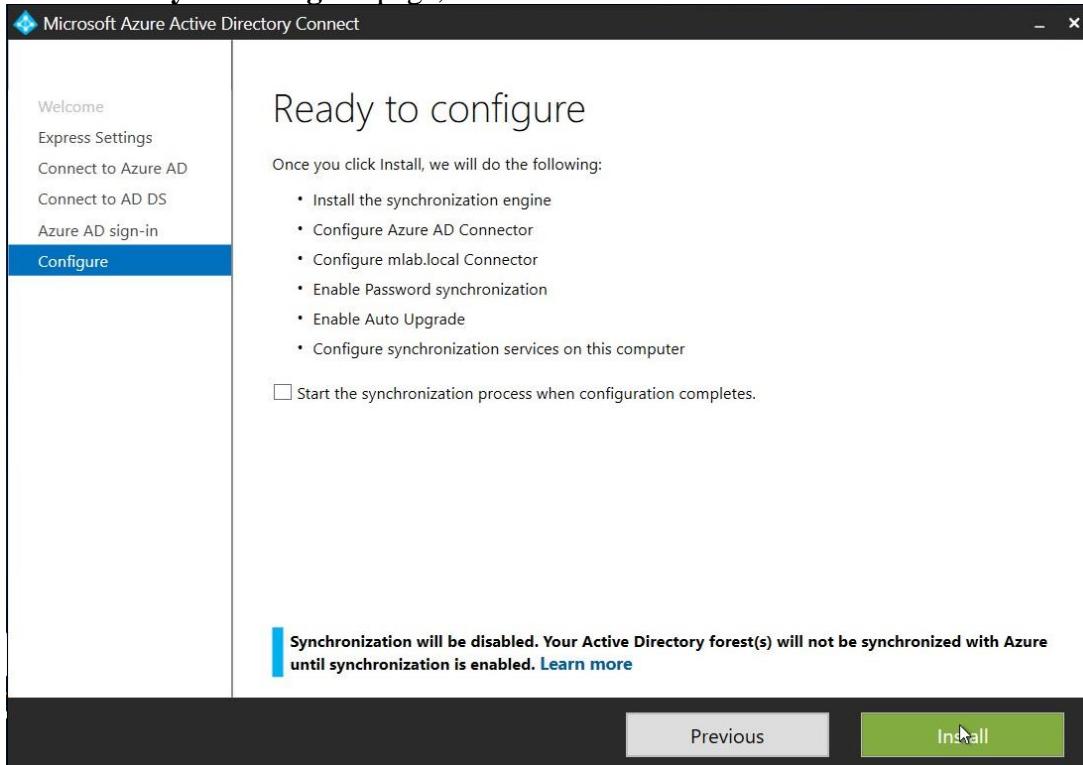
4. In the **Connect to Azure AD** page, enter **Syncadmin@<yourdomain.onmicrosoft.com>**, and a password then click **Next**.



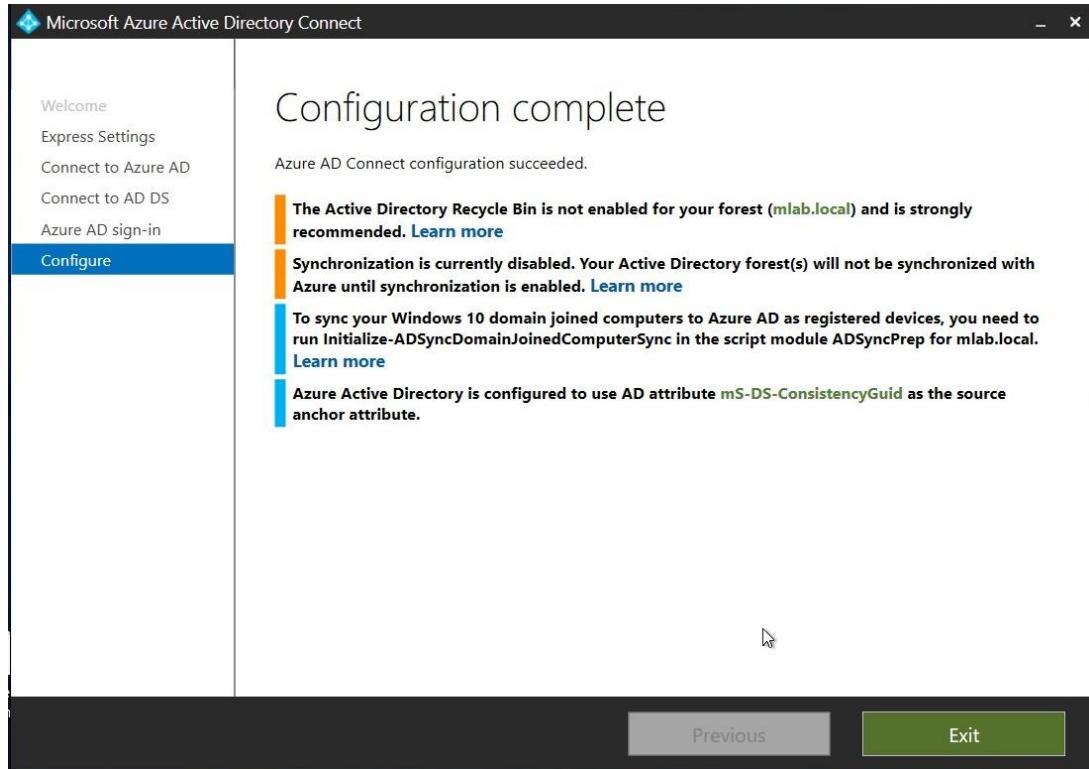
5. In the **Connect to ADDS** page, under **User name**, enter **Mlab\Sync**, and click **Next**.



6. On the **Ready to Configure** page, click **Install**.



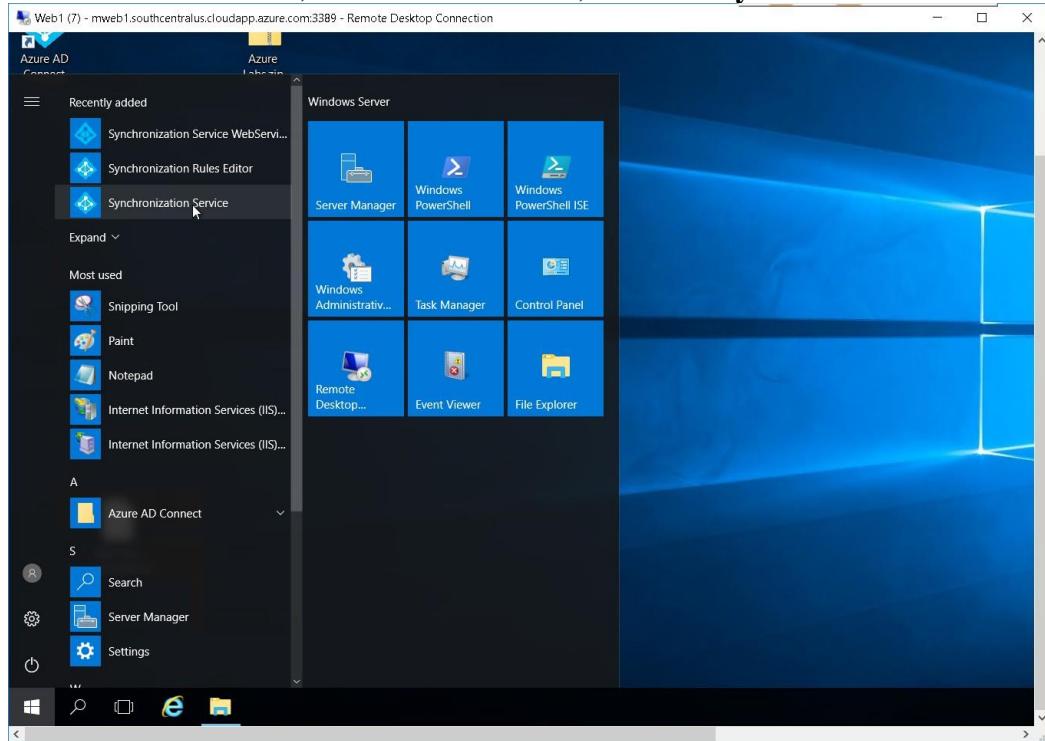
7. On the **Configuration Complete** page, click **Exit**.



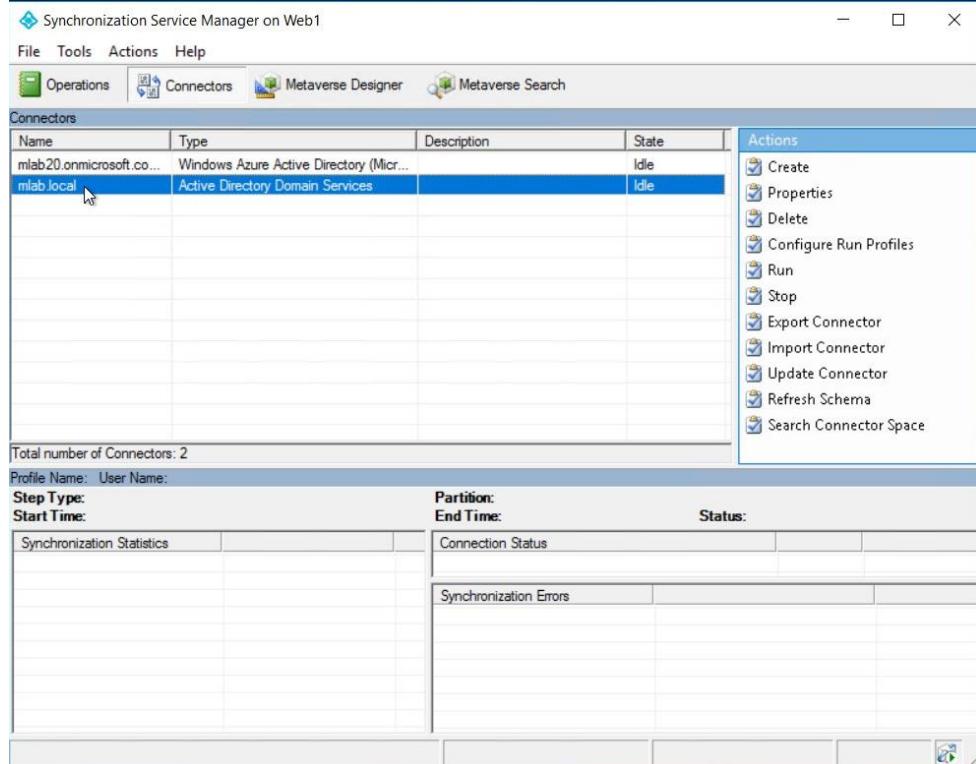
Task 3: Configure OU Filtering

To configure OU filtering, following this procedure

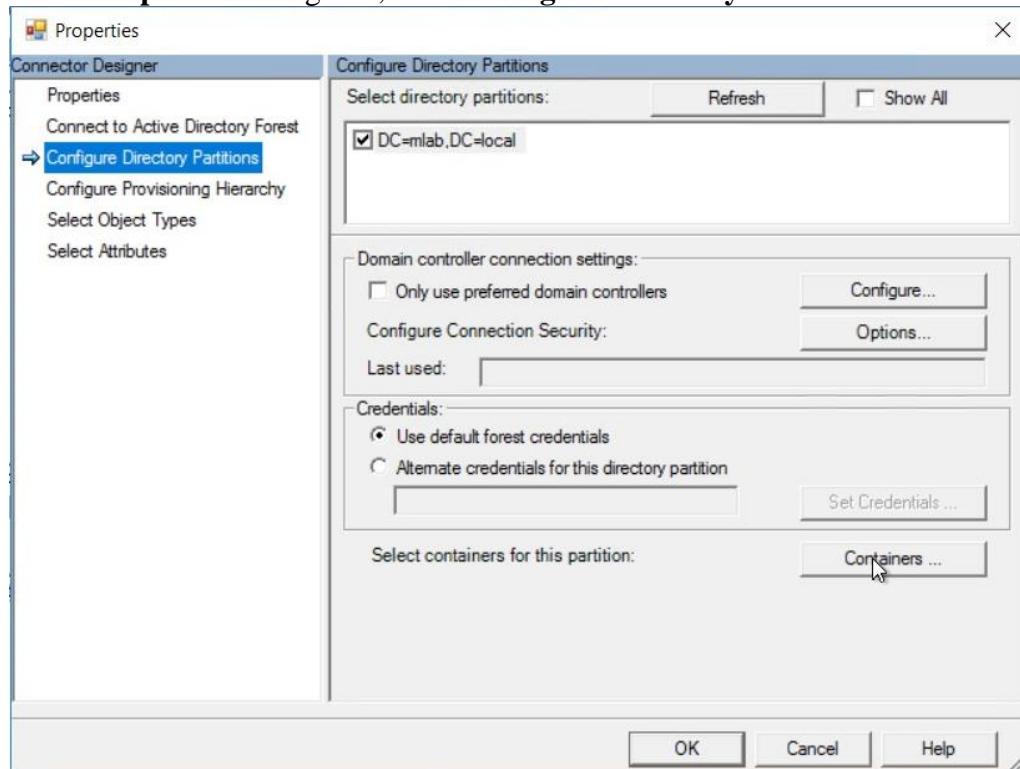
1. On AD-Connect Sever, click on Start Menu, and click **Synchronization Service**



2. In **Synchronization Service Manager**, click the **Connectors** tab.

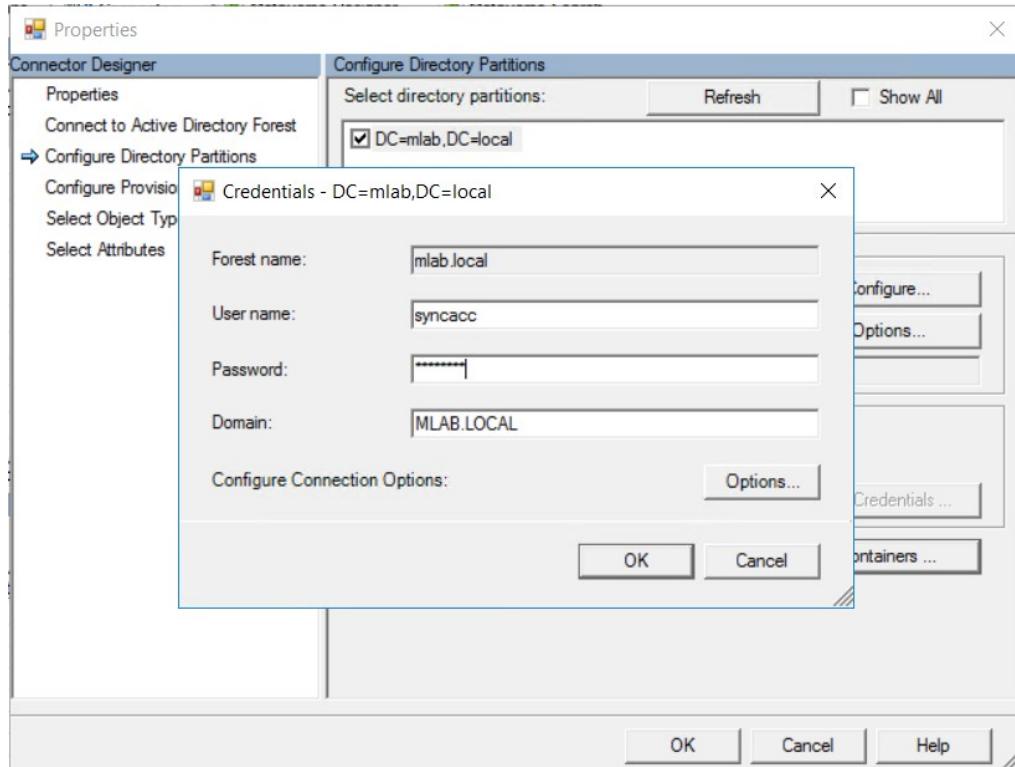


3. In the **Connector** tab, double-click **Active Directory Connector**.
 4. In the **Properties** dialog box, click **Configure Directory Partitions**. Click **Containers**.

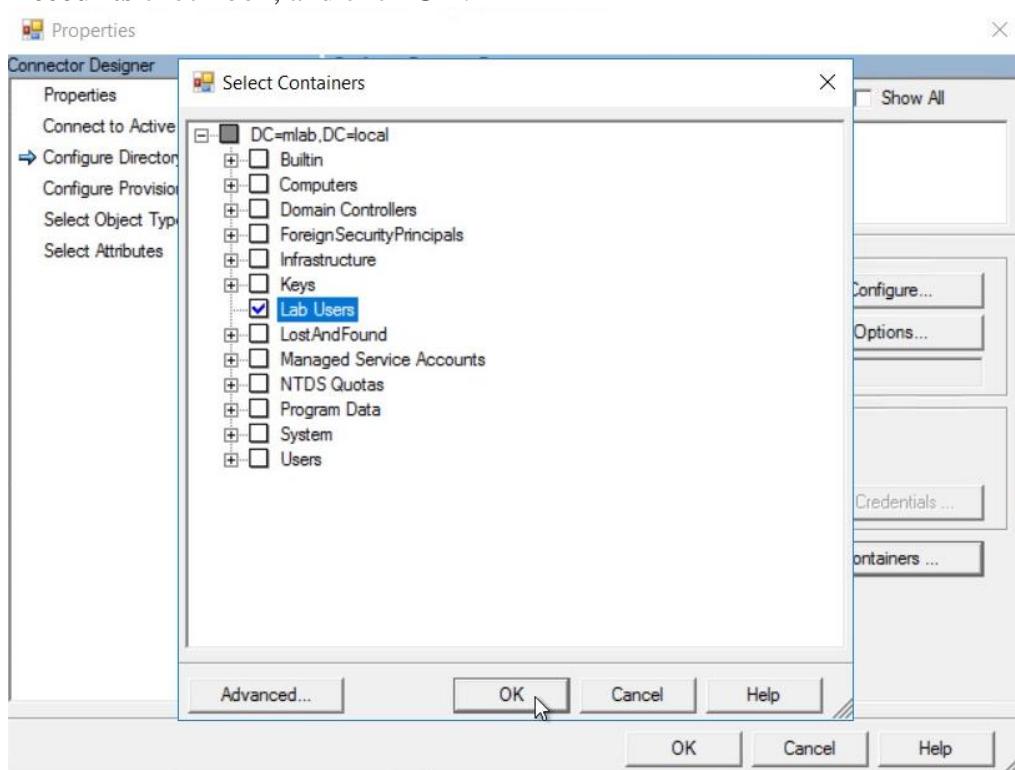


5. In the **Credentials** dialog box, enter the following credentials, and click **OK**:
- User name: **SyncAccount**

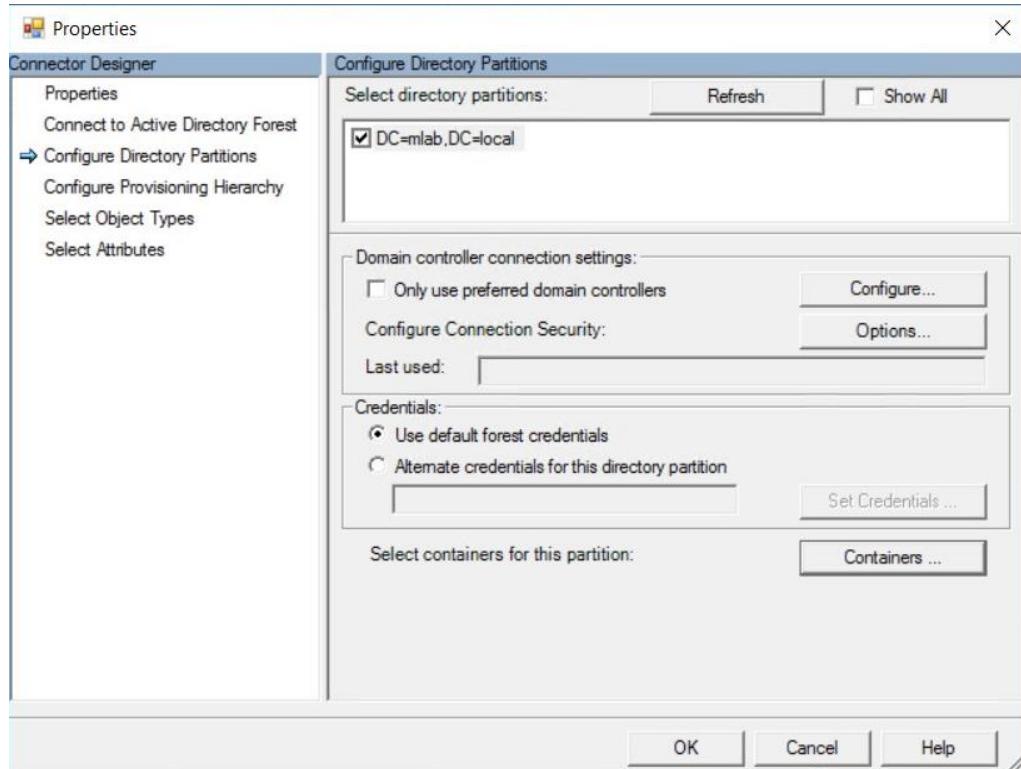
- Password: **Pa\$\$w0rd123**
- Domain: **Mlab**



6. In the **Select Containers** dialog box, clear the root level check box, then select only the **Accounts** check box, and click **OK**.



7. Click **OK** to close the **Properties** dialog box.



Synchronizing Directories

In this exercise, you will have synchronized a specific OU within Active Directory into Microsoft Azure Active Directory, changed attributes on user accounts, and forced synchronization.

To run full synchronization, following this procedure

1. On DC, switch back to Active Directory Administration Center.
2. In Mlab (local), in **Accounts**, double-click a user's name.
3. Make changes to the following fields:
 - **Job Title**
 - **Department**
4. In the taskbar, right-click PowerShell and select **Run as Administrator**; if you do not get the Run as Administrator option, click PowerShell on the taskbar, then close PowerShell, and try again.
5. In the PowerShell session, type **Start-ADSyncSyncCycle -PolicyType Initial** and press Enter. (This command is using to run full sync. But if you need to run delta replace initial with delta)

Microsoft Azure Infrastructure step by step

```
PS Select Administrator: Windows PowerShell
Copyright (C) 2016 Microsoft Corporation. All rights reserved.

PS C:\Users\Labadmin> Start-ADSyncSyncCycle -PolicyType Initial
Result
-----
Success

PS C:\Users\Labadmin>
```

6. Check that the changes you made earlier have propagated to Microsoft Azure; if you do not see any changes, wait a few minutes and refresh the page. I add new account and sync

The screenshot shows the Microsoft Azure portal interface. On the left, there's a sidebar with various service icons like App Services, Function Apps, and Azure Active Directory. The main area is titled 'Users - All users' under 'mlab20 - Azure Active Directory'. It features a search bar and filters for 'New user', 'New guest user', 'Reset password', 'Delete user', and 'Multi-Factor Authentication'. The table lists users with columns for Name, User Name, User Type, and Source. The 'Automation User' is listed as a Member from Azure Active Directory.

Name	User Name	User Type	Source
All	Automation User	AutomationUser@mlab20.onmicrosoft.c...	Member
KG	Karen Gruber	kgruber@mlab20.onmicrosoft.com	Member
ML	Mario Ledford	miedford@mlab20.onmicrosoft.com	Member
MA	[REDACTED]	[REDACTED]	Member
OD	On-Premises Directory Synchron	Sync_Web1.253102edff2@mlab20.onm...	Member
RD	Remi Desforges	rdesforges@mlab20.onmicrosoft.com	Member
SA	Sync Admin.	Syncadmin@mlab20.onmicrosoft.com	Member
U1	U1	U1@mlab20.onmicrosoft.com	Member
U2	U2	U2@mlab20.onmicrosoft.com	Member
U3	U3	U3@mlab20.onmicrosoft.com	Member

Chapter 10

Azure Automation

[Azure Automation](#) is an Azure service that provides a way for users to automate the manual, long-running, error-prone, and frequently repeated tasks that are commonly performed in a cloud and enterprise environment. It saves time and increases the reliability of regular administrative tasks and even schedules them to be automatically performed at regular intervals. You can automate processes using runbooks or automate configuration management using Desired State Configuration.

Here some common automation tasks.

- **Disaster recovery.** Deploy quickly, new instances of Azure resources within an alternative Azure datacenter after a disaster occurs. Resources might include Azure VMs, virtual networks, or cloud services, along with database servers.
- **Provisioning.** Perform initial and subsequent provisioning of a complete deployment, for example, a virtual network, where you assign VMs to it, create cloud services, and join the services to the same virtual network.
- **Managing Virtual Machines.** Azure Automation can help manage the life cycle of your VMs. For instance, you might want to provision VMs, or shut down VMs at a specific time each day.
- **Running backups.** Azure Automation is great for running regular backups of non-database systems, such as backing up Blob storage at certain intervals.
- **Deploying patches.** Azure Automation allows you to develop a runbook to manage the updates at scheduled times to manage patch remediation. Ensure machines continually align with configured security policy.

Implementing Azure Automation

Azure Automation uses runbooks, which are implemented as Windows PowerShell Workflows.

A workflow is a sequence of steps optimized for long-running tasks, or multiple steps across multiple endpoints (such as virtual machines). Workflows can automatically recover from failures. You write a workflow using Windows PowerShell syntax, but it is actually processed by Windows Workflow Foundation.

In order to use PowerShell-based scripting, Azure Automation uses Integration Modules. An Integration Module contains a Windows PowerShell Module, and can be imported into Azure Automation; these Windows PowerShell Modules contain the cmdlets and workflows that can be used in an Automation runbook. Note that not all regular Windows PowerShell cmdlets are available in the Windows PowerShell Integration Modules.

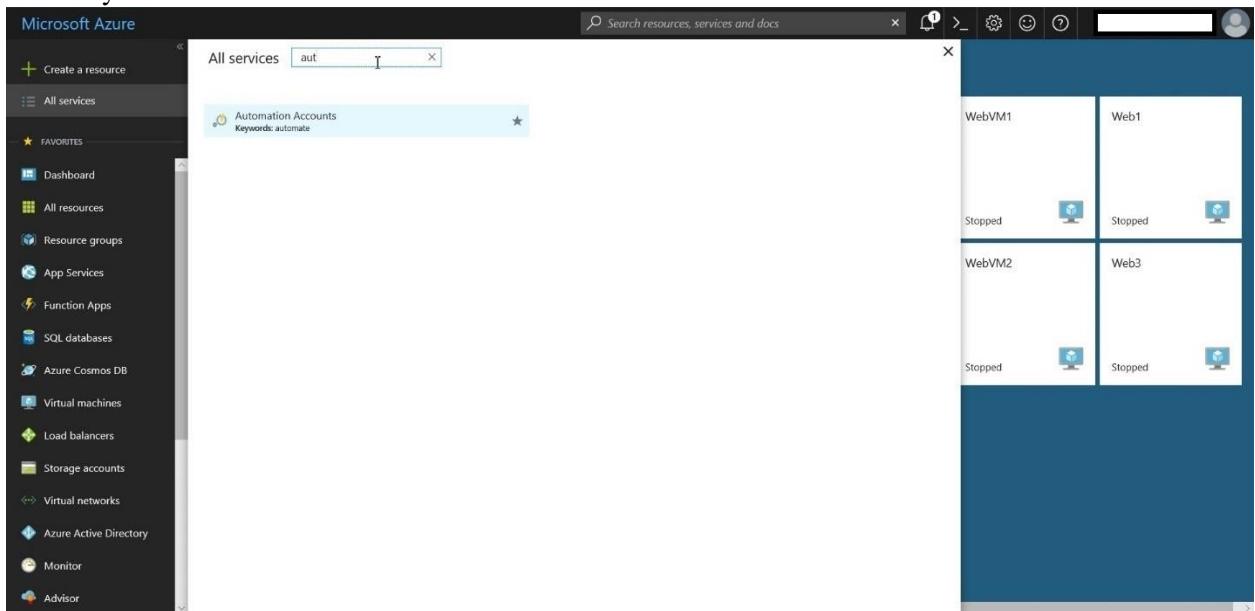
Microsoft Azure Infrastructure step by step

Azure Automation is similar to the features that the Service Management Automation (SMA) engine provides for on-premises private cloud resources via the Windows Azure Pack and System Center 2012 R2 Orchestrator, but without needing to manually build and manage automation servers. Azure Automation provides scalability and high availability automatically through the Microsoft Azure cloud platform.

Configuring Automation Accounts

In this exercise, you will have configured a new Azure Automation account to use with Azure Automation. To create automation account, following this procedure

1. Browse to the new Azure Portal at <https://portal.azure.com> and sign in.
2. Click **Automation Accounts** on the Hub menu.
 - If you do not see Automation Accounts on the Hub menu, click **More Services**.
 - Type **automation** in the filter and mark **Automation Accounts** as a favorite to pin it to your Hub menu.



3. Click the **Automation Accounts** blade, notice you can filter the list of accounts by subscription.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, there's a sidebar with various service icons like App Services, Function Apps, SQL databases, etc. The main content area is titled 'Automation Accounts' under 'mohammedfawzy36@hotmail (Default Directory)'. It displays a message 'No Automation Accounts to display' with a gear icon. Below this, there's a 'Create Automation Accounts' button. At the top, there are search and filter options for 'Subscriptions', 'All subscriptions', 'All resource groups', 'All locations', and 'No grouping'.

4. Click **Add** and fill in the following values to create a new automation account. Click **Create** when you are finished entering the information. As you enter the information take a moment to use the **Information** icon to view details about the required information.
 - Name: **AutomationLab**
 - Subscription: <your subscription>
 - Resource Group: Create new one **AutomationLabRG** or select existing RG.
 - Location: <your closest location>
 - Create Azure Run As Account: **Yes**

This screenshot shows the 'Add Automation Account' dialog box overlaid on the Azure portal. The dialog has fields for 'Name' (set to 'AutomationLab'), 'Subscription' (set to 'MSDN Platforms'), 'Resource group' (radio button set to 'Use existing' with 'Server-VNET' selected), 'Location' (set to 'South Central US'), and 'Create Azure Run As account' (radio button set to 'Yes'). A note below explains the Run As account creation process. At the bottom, there's a 'Create' button with a cursor hovering over it, and a 'Pin to dashboard' checkbox checked.

5. Click **Automation accounts** and confirm that the new automation account has been created.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes 'Automation Accounts'. The main area displays a table titled 'Automation Accounts' with one item: 'AutomationLab' (Automation Account, Server-VNET, South Central US, MSDN Platforms). A tooltip at the top right shows a message: 'New Azure Classic Run As account created 12:08 AM' and 'Creating Azure Run As account (service principal) for account 'AutomationLab''. The status bar at the bottom right shows 'Creating Azure Run As account (service principal) for account 'AutomationLab''. The status bar also shows 'MSDN Platforms (2b1c5659-ba44...)'.

6. Double-click your automation account and take a few minutes to browse through the options.
7. On the **Settings** blade, click **Run As Accounts** and notice that there are two entries – **Azure Run As Account** and **Azure Classic Run As Account**.

The screenshot shows the 'AutomationLab - Run as accounts' settings blade. The left sidebar lists 'AutomationLab' under 'NAME'. The right pane shows 'RELATED RESOURCES' (Workspace, Event grid), 'ACCOUNT SETTINGS' (Properties, Keys, Pricing, Source control, Run as accounts), 'SETTINGS' (Locks, Automation script), and 'SUPPORT + TROUBLESHOOTING' (New support request). Two entries are listed under 'Run as accounts': 'Azure Run As Account' (Expires 3/18/2019 2:00 AM) and 'Azure Classic Run As Account' (Expires 3/18/2019 2:00 AM).

8. In the **Resources** area notice tiles for Solutions, Runbooks, Jobs, Assets, Hybrid Worker Groups, DSC Configurations, and DSC nodes.

Name	Authoring Status	Last Modified	Tags
AzureAutomationTutorial	✓ Published	3/19/2018 12:08 AM	
AzureAutomationTutorialPython2	✓ Published	3/19/2018 12:08 AM	
AzureAutomationTutorialScript	✓ Published	3/19/2018 12:08 AM	
AzureClassicAutomationTutorial	✓ Published	3/19/2018 12:08 AM	
AzureClassicAutomationTutorialScript	✓ Published	3/19/2018 12:08 AM	

Creating Runbooks

In this exercise, you will have authored, tested, and run a new runbook to deploy two virtual machines.

Task 1: Create Automation Graphical Runbook

To create automation graphical runbook, following this procedure

Step 1: Create Automation Assets

In this exercise, you will create Automation assets by using the Azure portal.

1. Browse to the new Azure Portal at <https://portal.azure.com> and sign in.
2. Navigate to the **AutomationLab** Automation account and, on the **AutomationLab** blade, click the **Shared Resource** tile.
3. On the **Shared Resource** blade, click **Variables**.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes 'Create a resource', 'All services', and various Azure services like Storage accounts, Virtual networks, Azure Active Directory, Monitor, Advisor, Security Center, Cost Management + B..., Help + support, DNS zones, Recovery Services vaults, Cloud services (classic), CDN profiles, Media services, and Automation Accounts. The main content area is titled 'Automation Accounts' and shows 'AutomationLab' (mohamedfawzy@hotmail.com (Default Directory)). The 'Variables' section is currently selected. A monitoring chart displays job statistics: Queued (0), Running (0), Completed (0), Failed (0), Suspended (0), and Stopped (0). The status bar at the bottom right indicates 'Status: Active', 'Last modified: 3/19/2018 12:08 AM', and 'MSDN Platforms'.

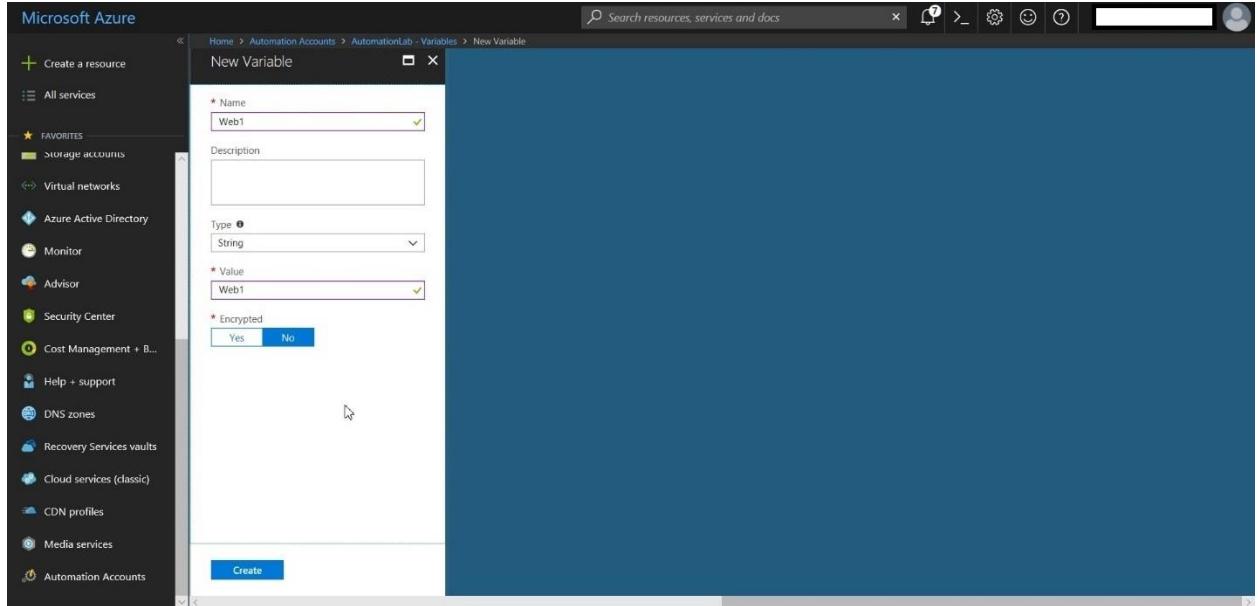
4. On the Variables blade, click Add a variable.

The screenshot shows the 'AutomationLab - Variables' blade. The 'Variables' section is selected. A large 'Add a variable' button is highlighted with a cursor. Below it, a table lists variables: NAME, TYPE, VALUE, and LAST MODIFIED. The table shows 'No variables found.'

5. On the New Variable blade, specify the following and click Create:

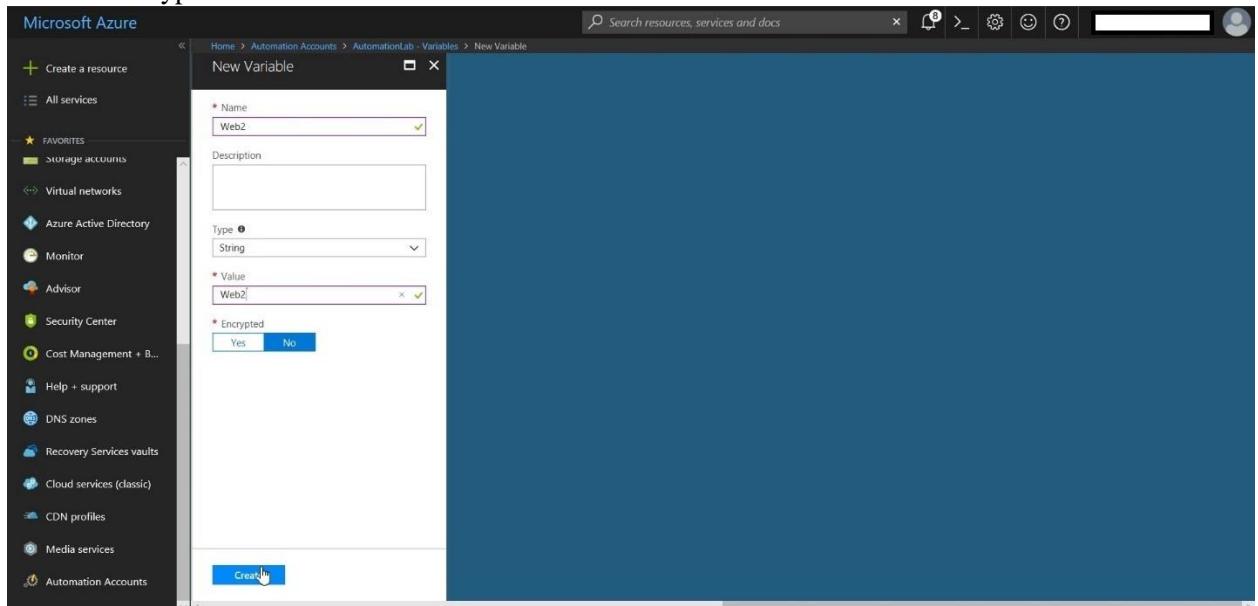
- Name: **Web1**
- Description: leave blank
- Type: **String** {notice other types in the drop-down}
- Value: **Web1**
- Encrypted: **No**

Microsoft Azure Infrastructure step by step



6. Add another variable with the following settings:

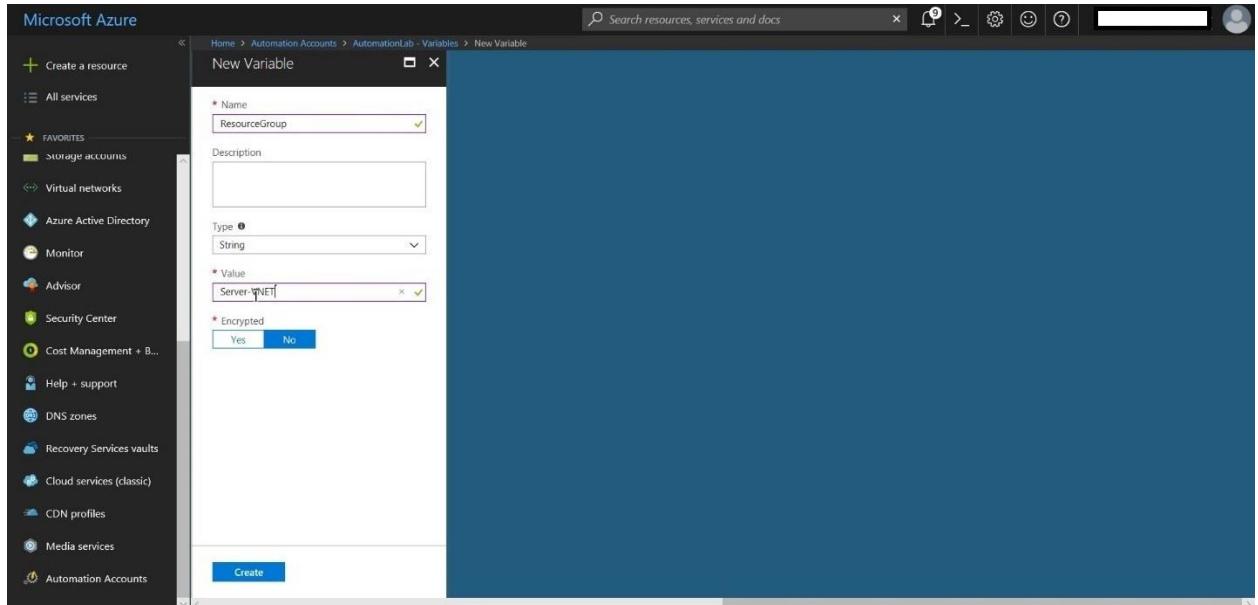
- Name: **Web2**
- Description: leave blank
- Type: **String**
- Value: **Web2**
- Encrypted: **No**



7. Add another variable with the following settings:

- Name: **ResourceGroup**
- Description: leave blank
- Type: **String**
- Value: **Server-VNET**
- Encrypted: **No**

Microsoft Azure Infrastructure step by step



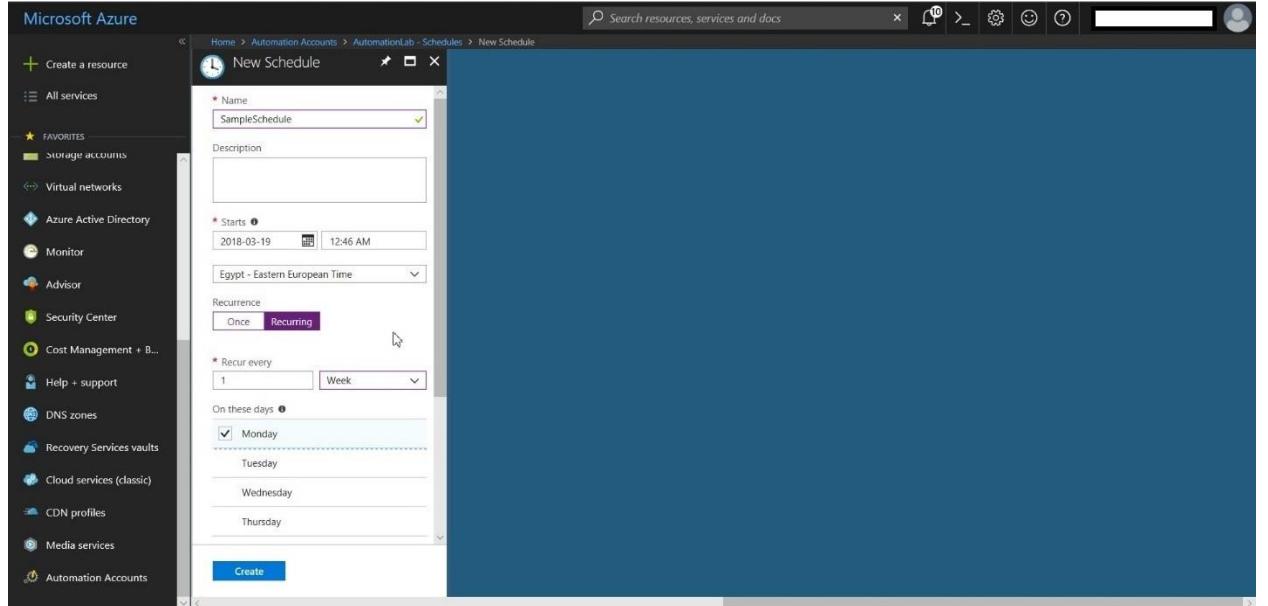
8. Select Schedules

A screenshot of the Microsoft Azure portal showing the 'AutomationLab - Variables' page. The left sidebar has the same list of services as before. The main area shows a table of variables. The 'Schedules' link under 'SHARED RESOURCES' is highlighted. The table data is as follows:

9. Click **Schedules**, and then click **Add Schedule**.

- Give your schedule a descriptive name, **SampleSchedule**.
- Hover over the information icon about the **Starts** setting. Start your schedule today, and choose your time zone.
- Select **Recurring**, and configure your schedule to run once a week.
- In **Recurrence options**, notice you can specify the days of the week.
- Ensure your schedule never expires.

Microsoft Azure Infrastructure step by step



10. Now Sample schedule is created

This screenshot shows the 'AutomationLab - Schedules' blade within the Azure portal. The left sidebar is identical to the previous screenshot. The main area has a header 'Automation Accounts' and a sub-header 'AutomationLab - Schedules'. Below this is a search bar and a toolbar with '+ Add', 'Edit columns', and 'More'. A table lists the schedule details. The table has columns for 'NAME', 'NEXT RUN', and 'STATUS'. There is one row for 'SampleSchedule', which is scheduled to run on '3/19/2018 12:46 AM (Egypt Time)' and is marked as 'On'. To the right of the table is a sidebar with sections for 'PROCESS AUTOMATION' (Runbooks, Jobs, Runbooks gallery, Hybrid worker groups, Watcher tasks) and 'SHARED RESOURCES' (Schedules, Modules, Modules gallery, Credentials, Connections, Certificates, Variables).

Step 2: Create your runbook using the Graphical method

1. If you are not signed in to the Azure Portal, then browse to the new Azure Portal at <https://portal.azure.com> and sign in.
2. Navigate to the **AutomationLab** Automation account and, on the **AutomationLab** blade, click the **Runbooks** tile.

Microsoft Azure Infrastructure step by step

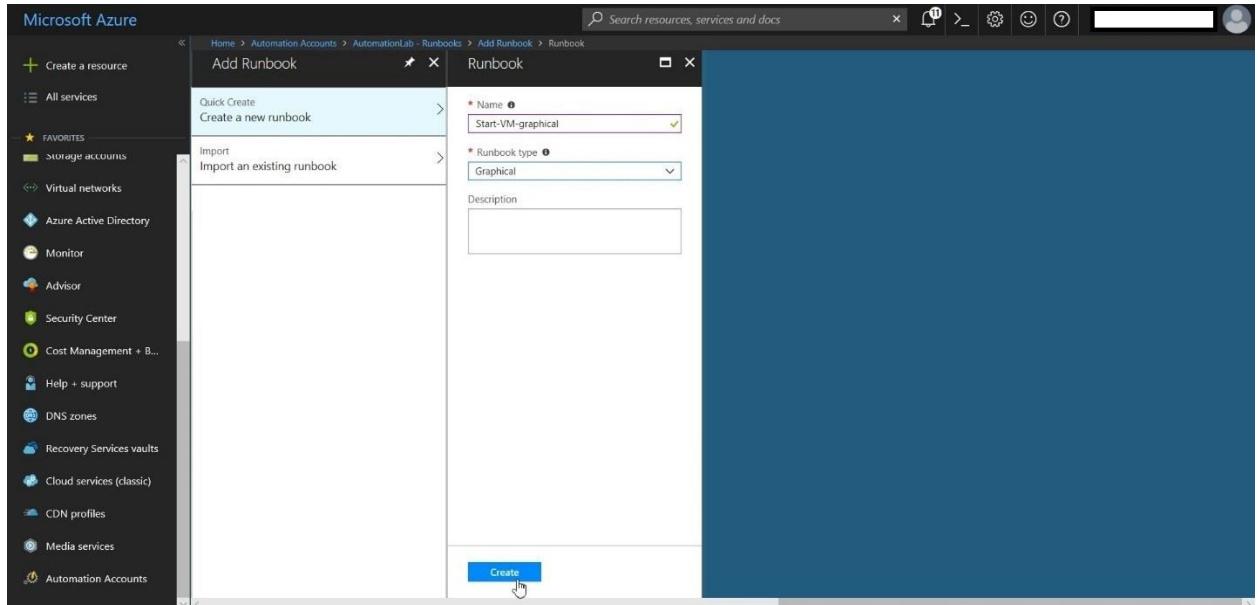
NAME	NEXT RUN	STATUS
SampleSchedule	3/19/2018 12:46 AM (Egypt Time)	On

3. Click **Add a runbook**, and then **Quick Create**. Notice you have two choices: **Quick Create** and **Import**.

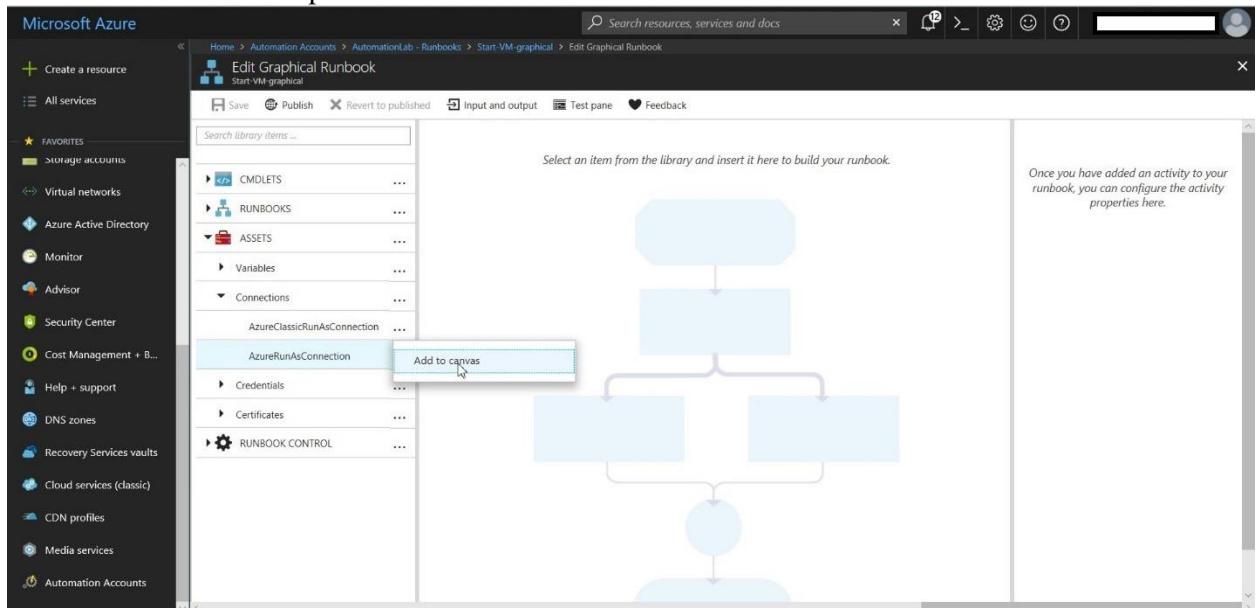
4. Click **Create** when you are finished entering the following information.

- Name: **Start-VM-graphical** (hover over the information icon and review the name requirements)
- Runbook type: **Graphical**

Microsoft Azure Infrastructure step by step

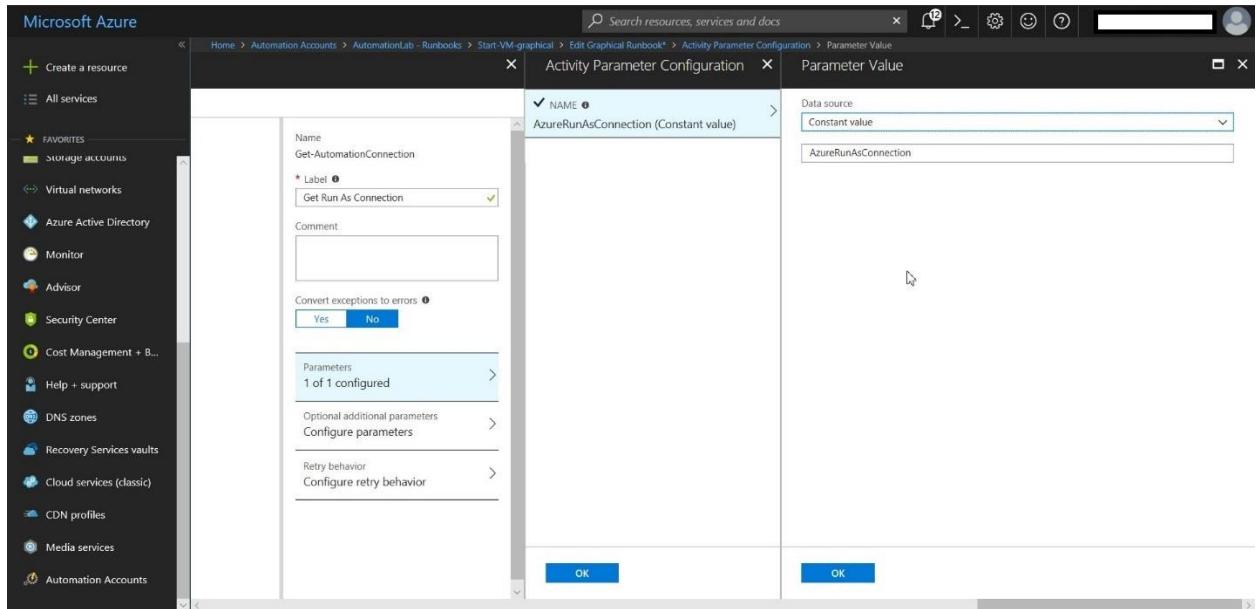


5. On the **Edit Graphical Runbook** blade, in the **ASSETS** section, expand the **Connections** subsection, click the ellipsis symbol (...) next to **AzureRunAsConnection**, and, in the context-sensitive menu, click **Add to canvas**. This will automatically open another blade displaying Get-AzureAutomation settings. In the new blade, specify the following:
 - Label: **Get Run As Connection**
 - Convert exceptions to errors: **No**

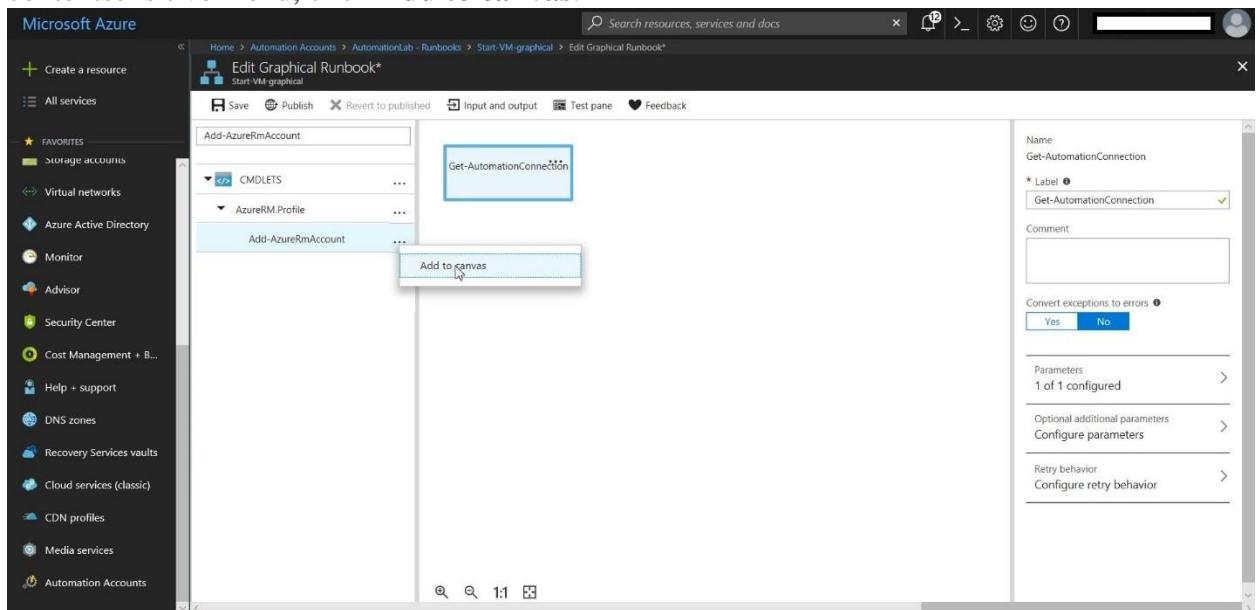


6. Note that the **Parameters** section is automatically configured for you and it contains the constant value referencing the **AzureRunAsConnection**.

Microsoft Azure Infrastructure step by step

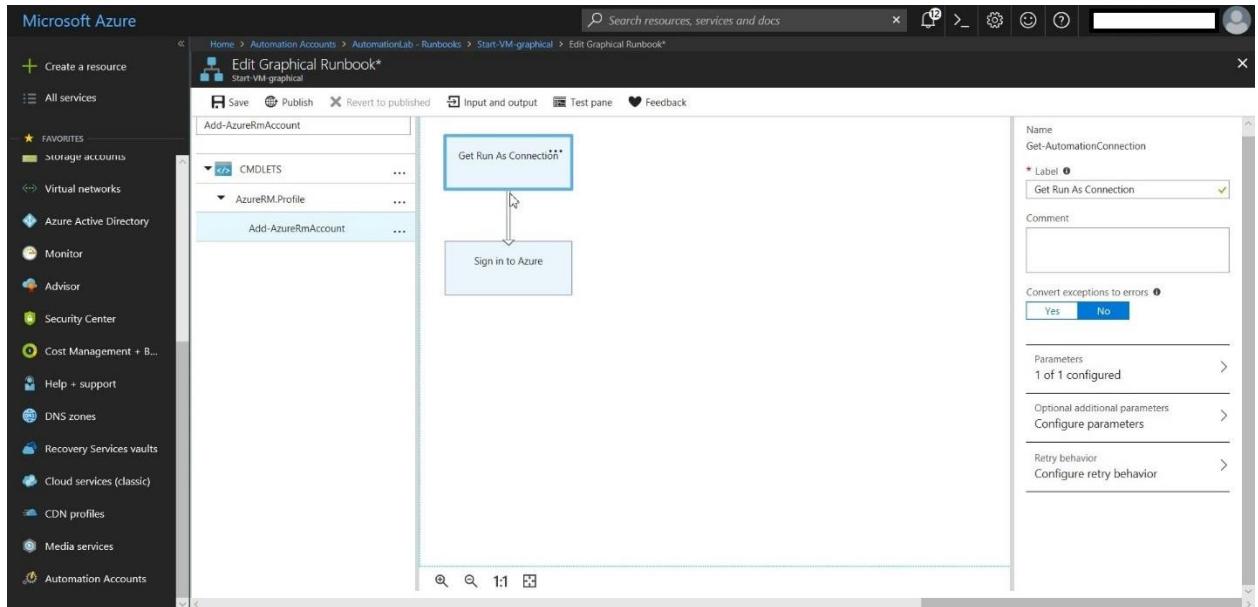


7. On the **Edit Graphical Runbook** blade, in the **Search library items** textbox, type **Add-AzureRmAccount**. In the list of results, click the ellipsis symbol (...) and, in the context-sensitive menu, click **Add to canvas**.



6. Move the rectangle representing the newly added activity directly below the rectangle representing the **Get Run As Connection** activity.

Microsoft Azure Infrastructure step by step

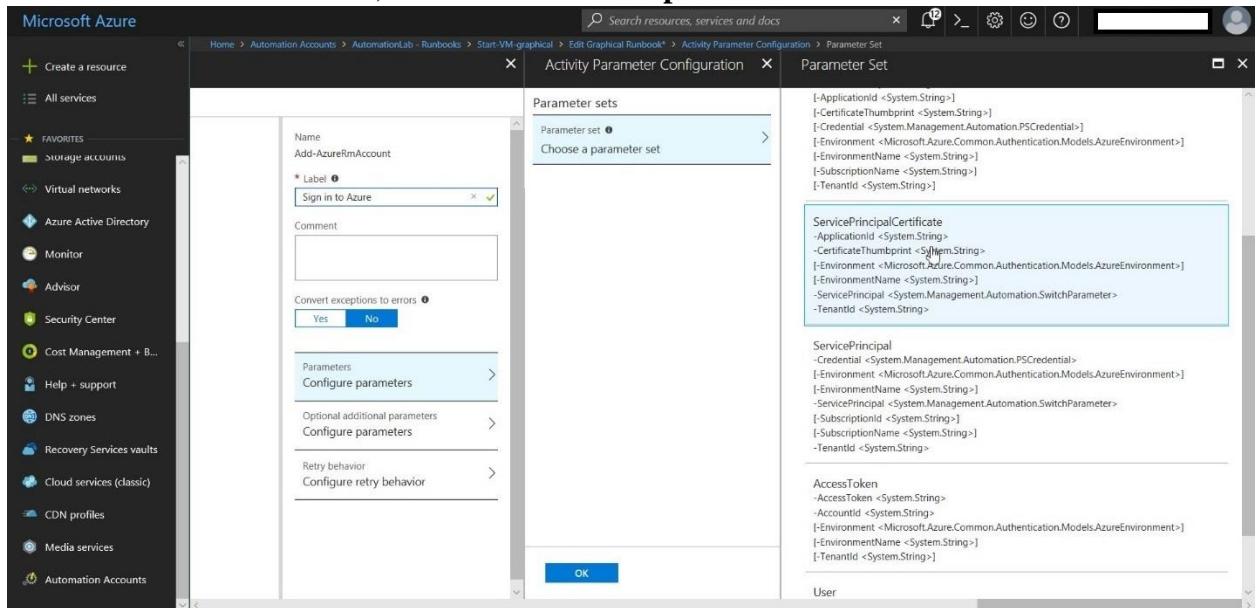


7. On the **Add-AzureRmAccount** blade, specify the following:

- Label: **Sign in to Azure**
- Convert exceptions to errors: **No**

8. Click **Configure parameters** and next, click **Choose a parameter set**.

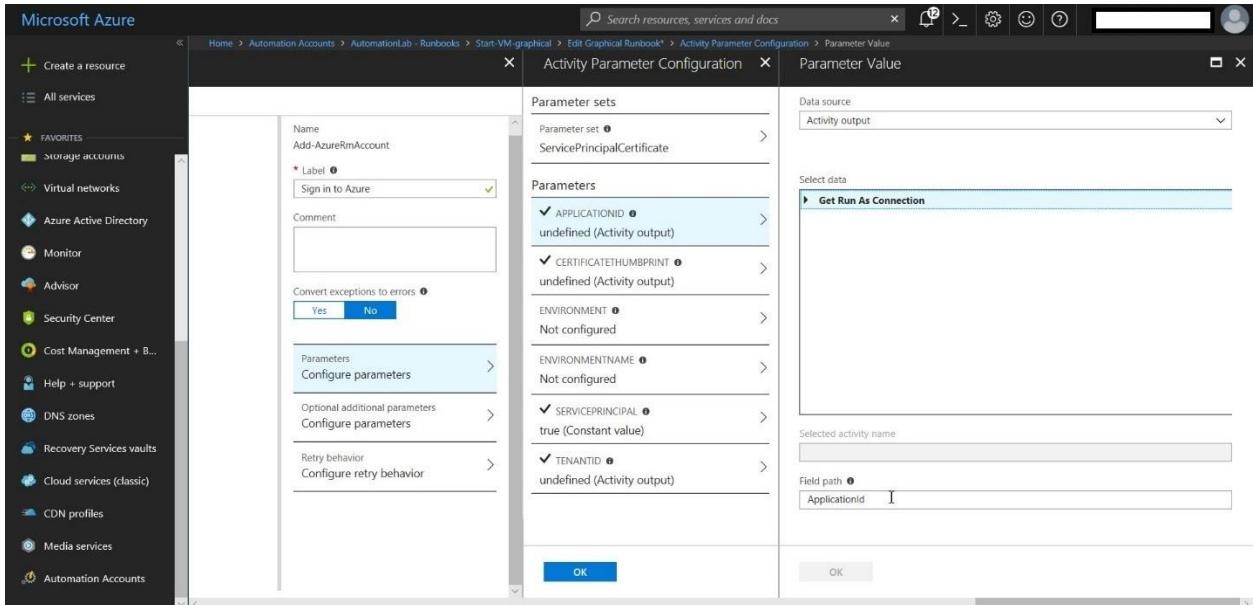
9. On the **Parameter Set** blade, select **Service Principal Certificate**.



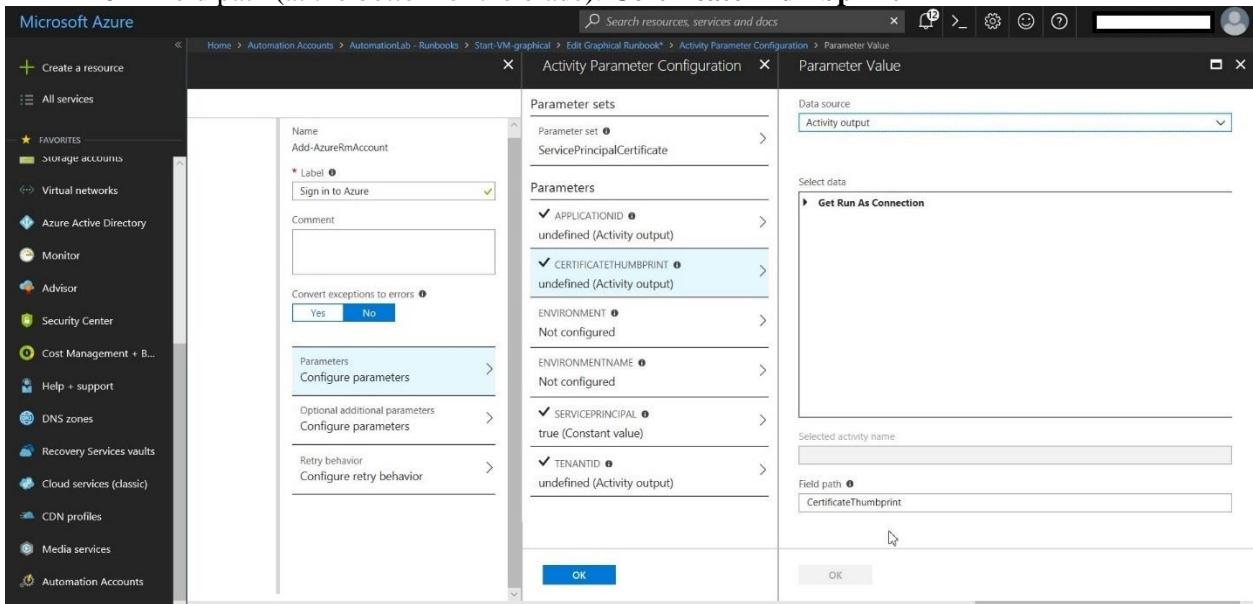
10. On the **Activity Parameter Configuration** blade, click the following entries, for each, specify the following, and click **OK**. You are configuring the parameters for **AddAzureRmAccount** command.

- **APPLICATIONID:**
 - Data source: **Activity output**
 - Select data: **Get Run As Connection**
 - Field path (at the bottom of the blade): **ApplicationId**

Microsoft Azure Infrastructure step by step

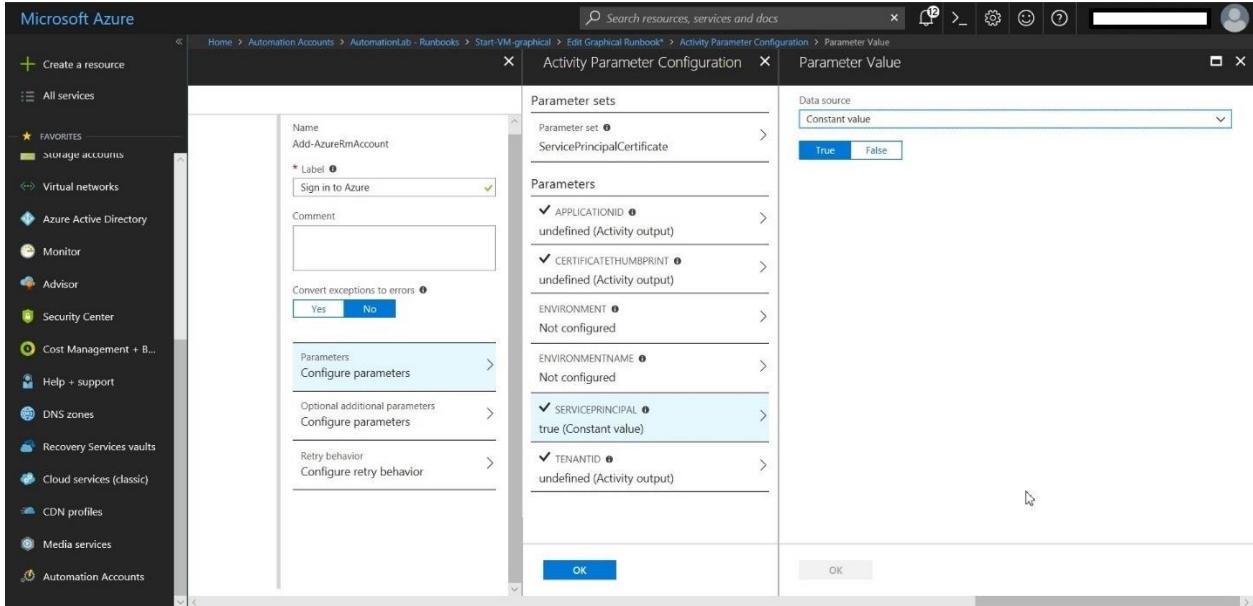


- **CERTIFICATETHUMBPRINT:**
 - Data source: **Activity output**
 - Select data: **Get Run As Connection**
 - Field path (at the bottom of the blade): **CertificateThumbprint**

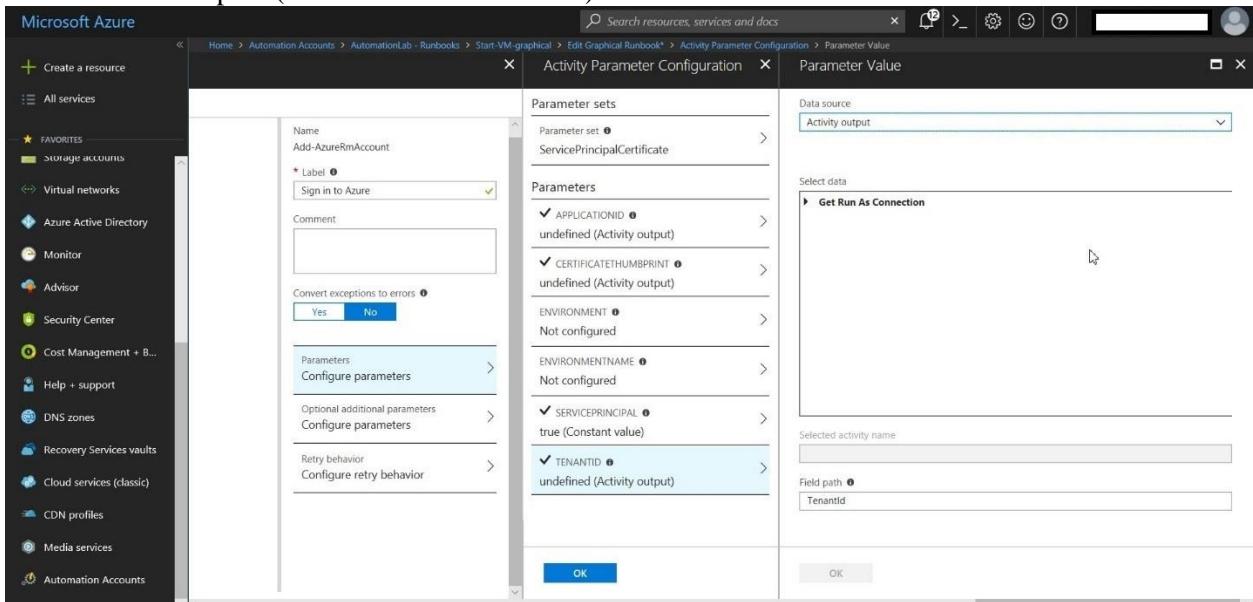


- **ENVIRONMENT:** leave Not configured
- **ENVIRONMENTNAME:** leave Not configured
- **SERVICEPRINCIPAL:**
 - Data source: Constant value set to **True**

Microsoft Azure Infrastructure step by step

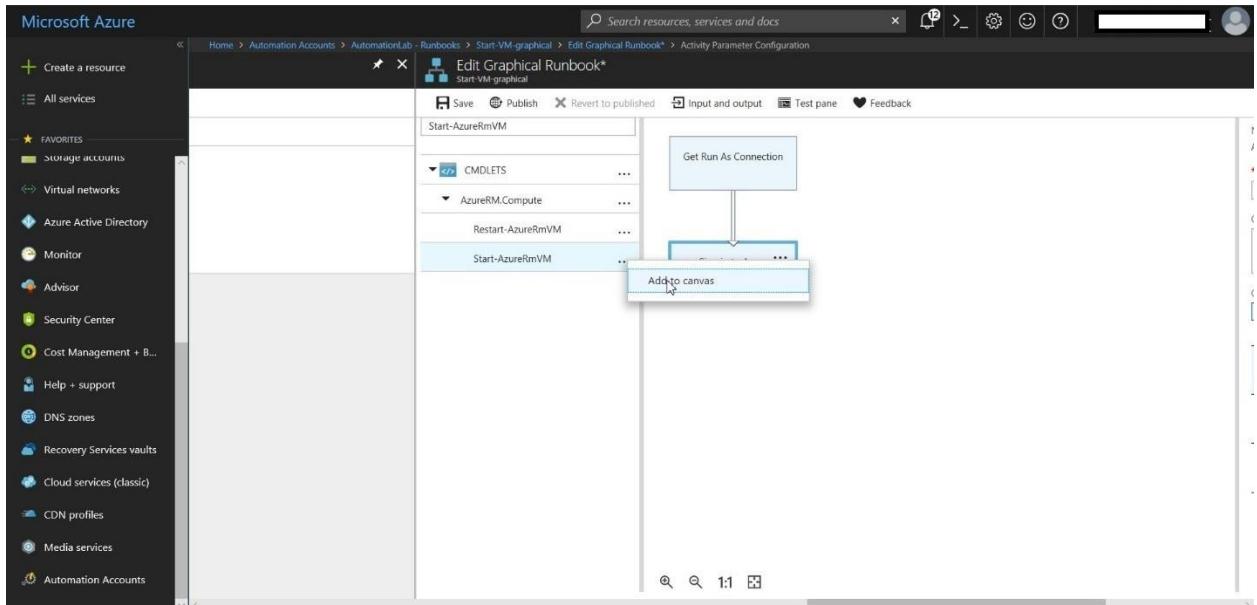


- **TENANTID:**
 - Data source: **Activity output**
 - Select data: **Get Run As Connection**
 - Field path (at the bottom of the blade): **TenantId**

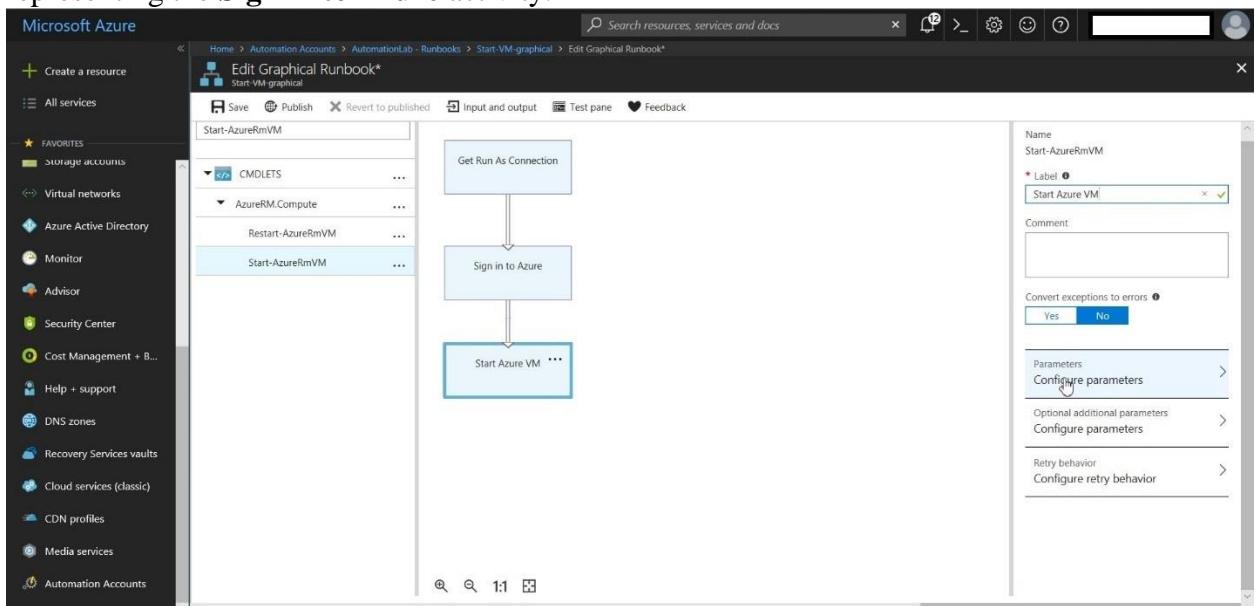


11. Click **OK**.
12. On the **Edit Graphical Runbook** blade, in the **Search library items** textbox, type **StartAzureRmVM**. In the list of results, click the ellipsis symbol (...) and, in the context-sensitive menu, click **Add to canvas**.

Microsoft Azure Infrastructure step by step



13. Move the rectangle representing the newly added activity directly below the rectangle representing the **Sign in to Azure** activity.



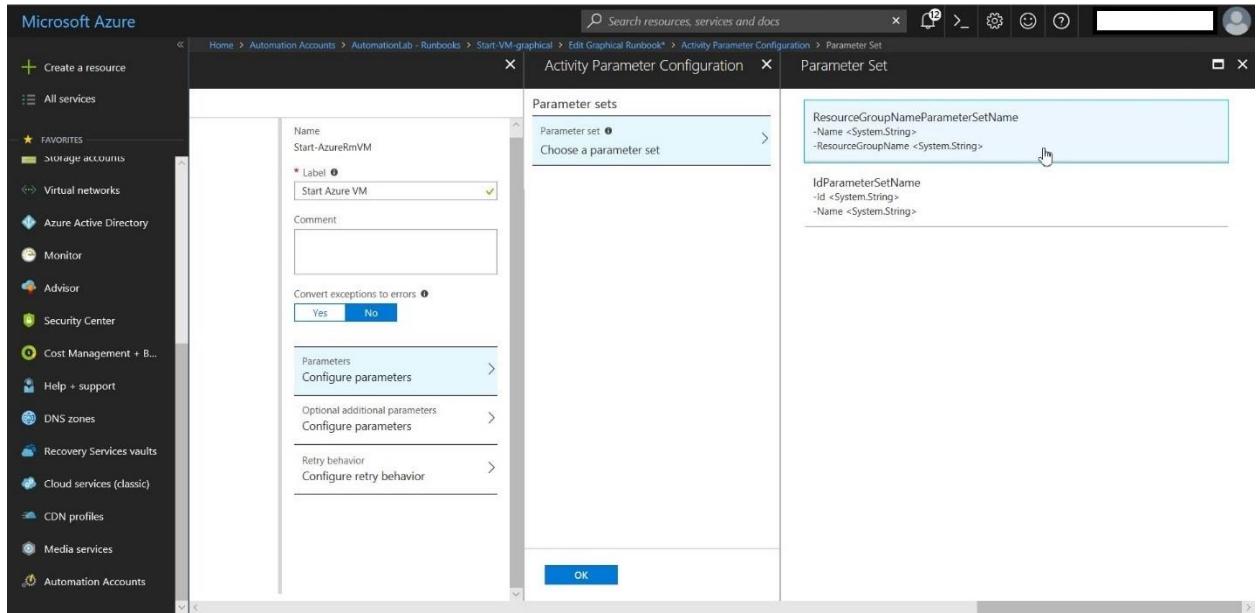
14. On the **Start-AzureRmVM** blade, specify the following:

- Label: **Start Azure VM**
- Convert exceptions to errors: **No**

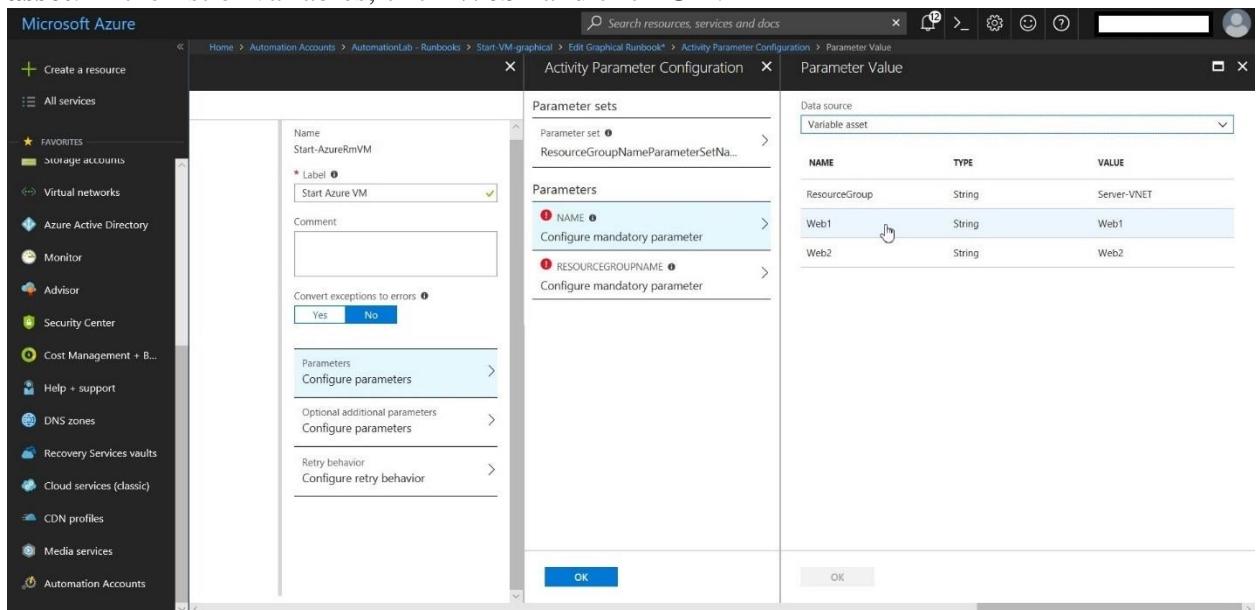
15. Click **Configure parameters**. On the **Parameter sets** blade, click **Choose a parameter set**.

16. On the **Parameter Set** blade, click the **ResourceGroupNameParameterSetName**.

Microsoft Azure Infrastructure step by step

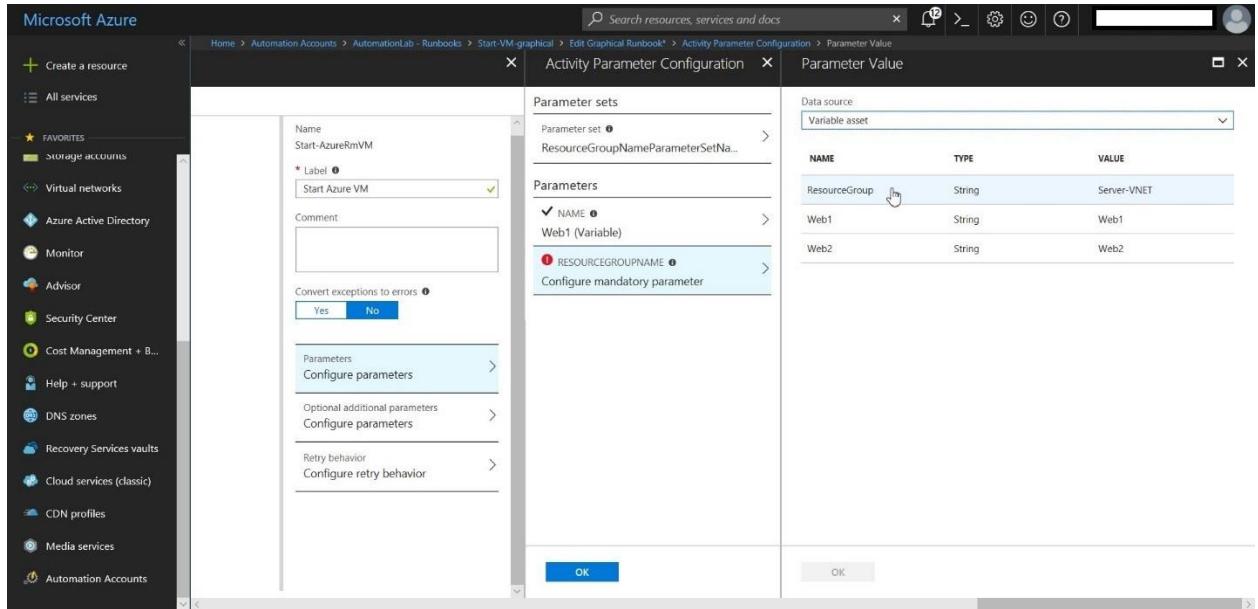


17. On the **Activity Parameter Configuration** blade, click **NAME**.
18. On the **Parameter Value** blade, in the **Data source** drop down list, select **Variable asset**. In the list of variables, click **Web1** and click **OK**.

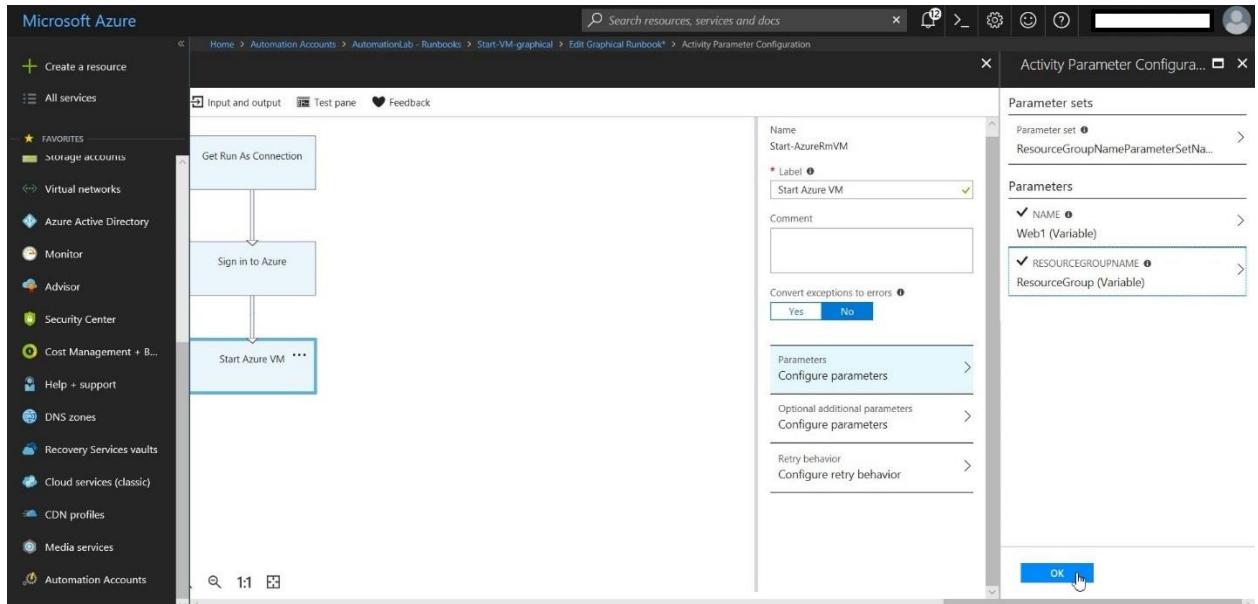


19. On the **Activity Parameter Configuration** blade, click **RESOURCEGROUPNAME**.
20. On the **Parameter Value** blade, in the **Data source** drop down list, select **Variable asset**. In the list of variables, click **ResourceGroup** and click **OK**.

Microsoft Azure Infrastructure step by step

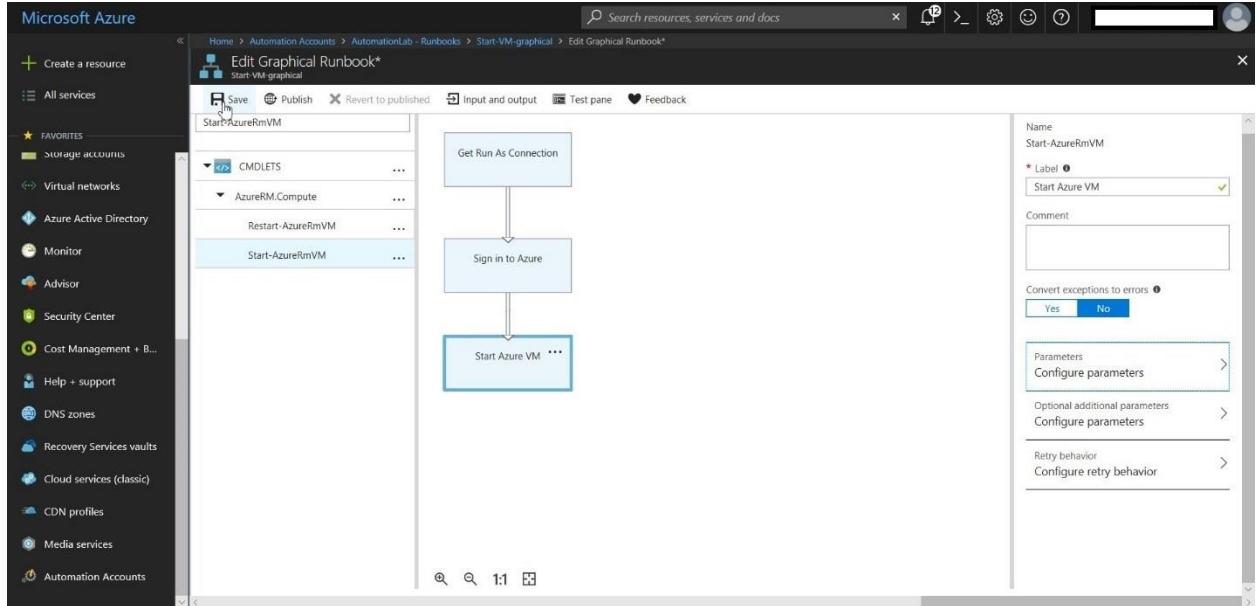


21. Click OK.

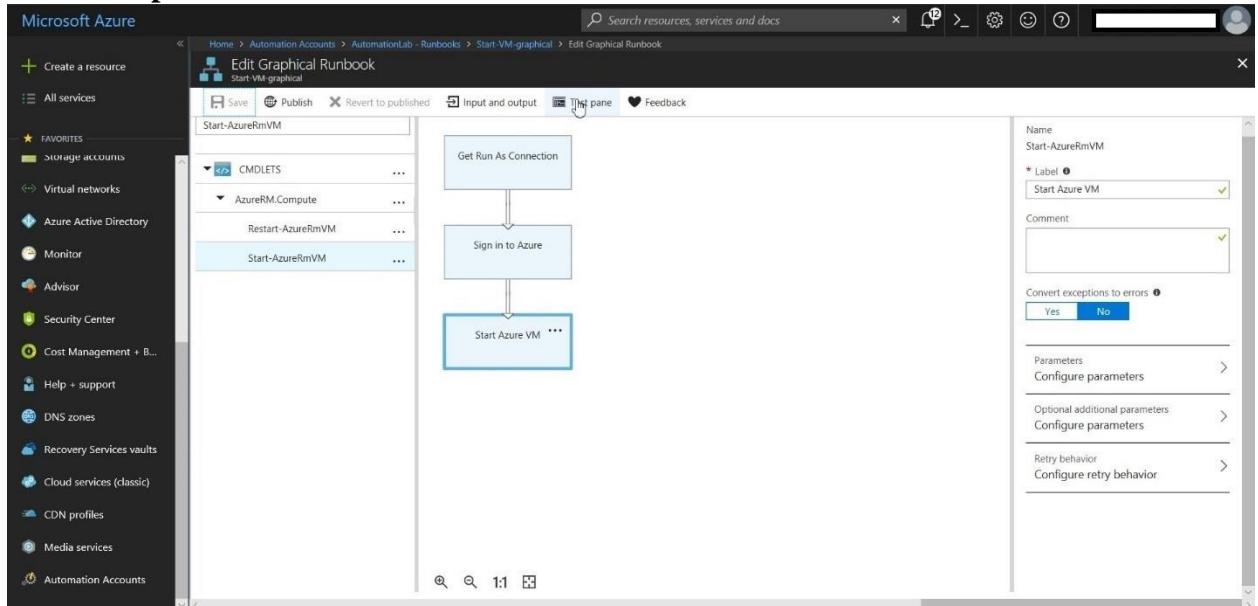


22. On the Edit Graphical Runbook blade, click Save.

Microsoft Azure Infrastructure step by step

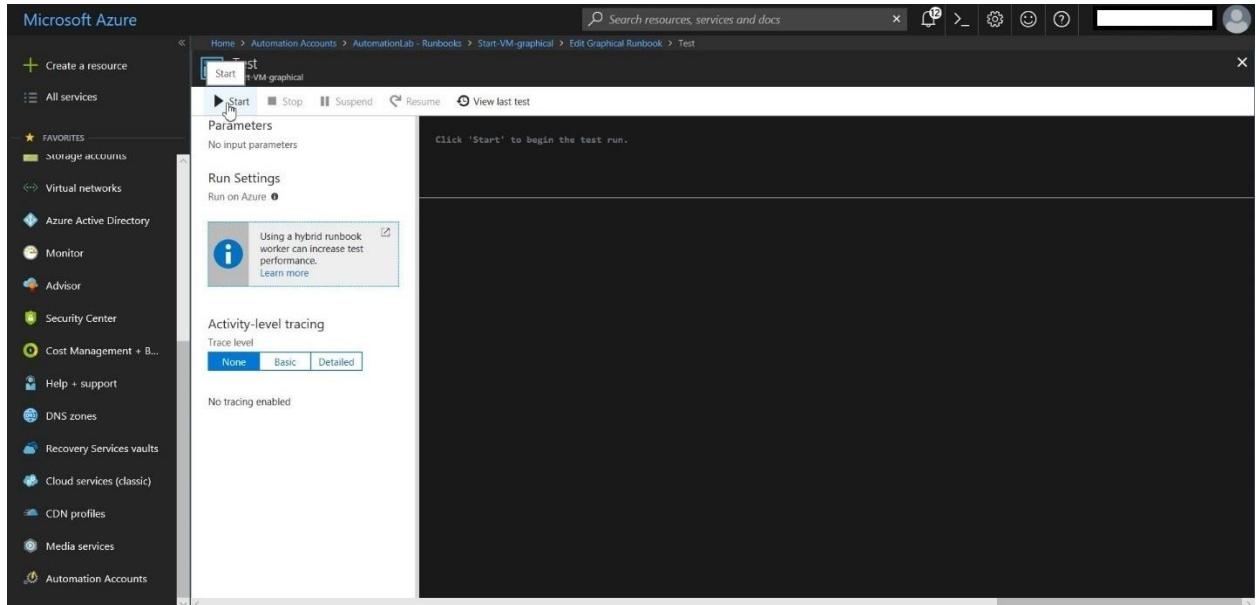


23. Click Test pane.



24. On the Test blade, click Start.

Microsoft Azure Infrastructure step by step

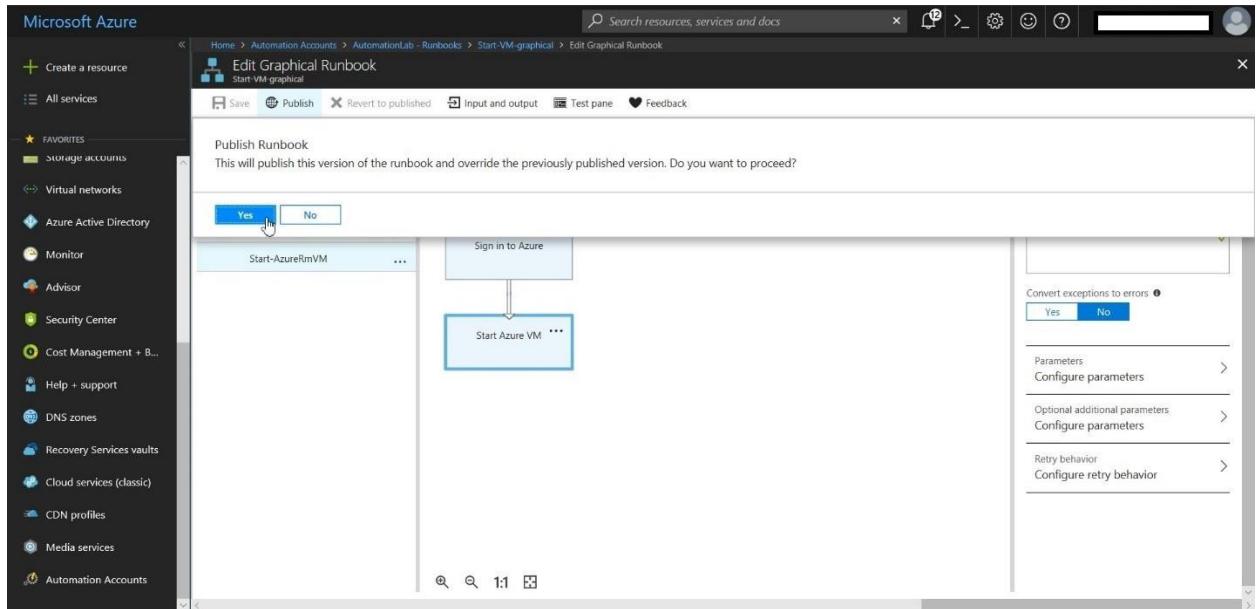


25. Monitor the progress of the Automation job and verify that it completes successfully.
Confirm your virtual machine was started.

NAME	TYPE	STATUS	RESOURCE GROUP	LOCATION	MAINTENANCE	SUBSCRIPTION
LinuxVM1	Virtual machine (classic)	Stopped (deallocated)	uniquecloudservicename	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
mLab2017-dc	Virtual machine	Stopped (deallocated)	Mlab2017	West Europe	Not scheduled	MSDN Platforms (2b1c5...)
Server-01	Virtual machine	Stopped (deallocated)	Server2012R2-RG	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
Server-02	Virtual machine	Running	Server-VNET	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
Web1	Virtual machine	Starting	Server-VNET	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
Web2	Virtual machine	Stopped (deallocated)	Server-VNET	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
Web3	Virtual machine	Stopped (deallocated)	Server-VNET	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
WebVM1	Virtual machine	Stopped (deallocated)	Server-VNET	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
WebVM2	Virtual machine	Stopped (deallocated)	Server-DNS	South Central US	Not scheduled	MSDN Platforms (2b1c5...)

26. Scroll back to the **Edit Graphical Runbook** blade and click **Publish**. Click **Yes** when prompted.

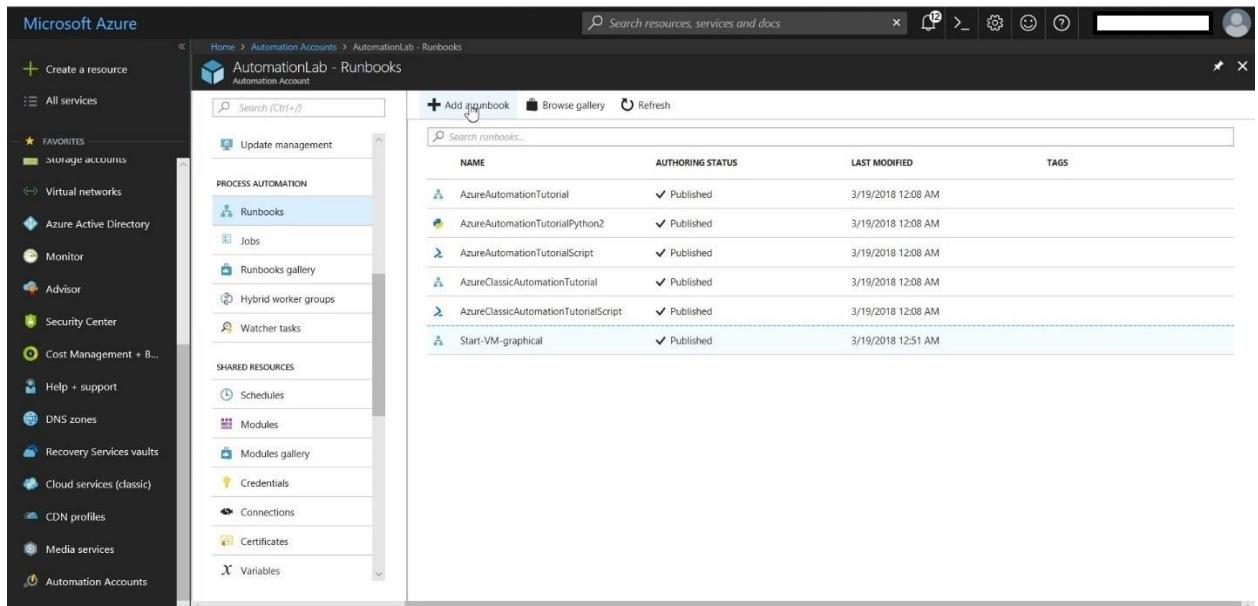
Microsoft Azure Infrastructure step by step



Task 2: Create Automation Windows PowerShell script-based textual Runbook

To create & publish Windows PowerShell script-based runbook, following this procedure

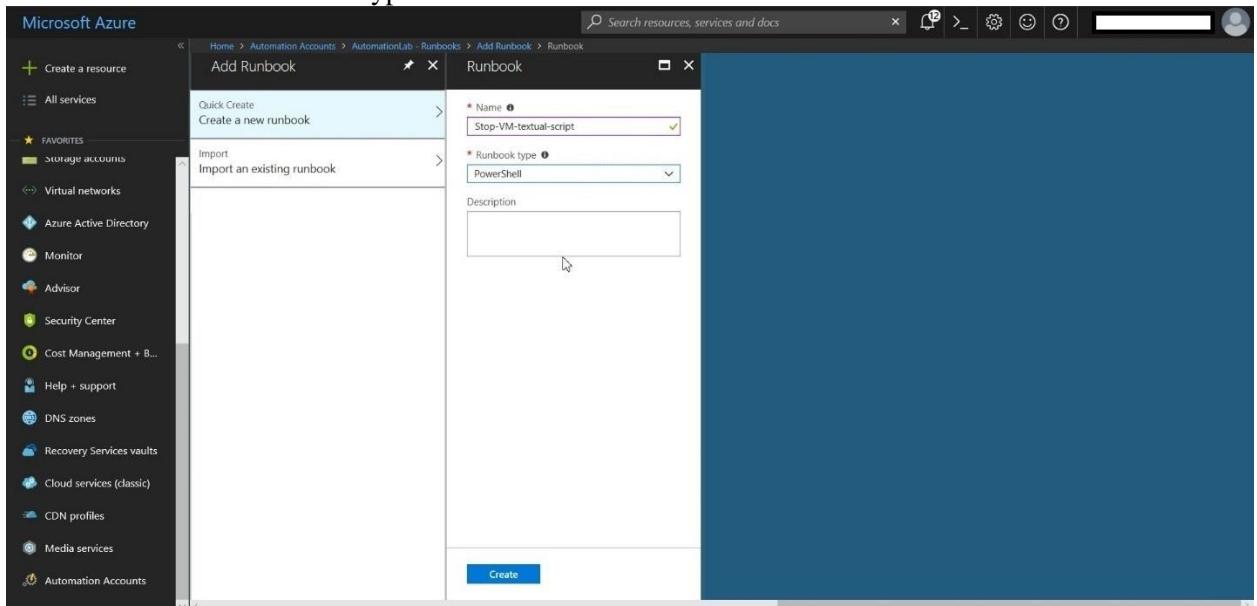
1. If you are not signed in to the Azure Portal, then browse to the new Azure Portal at <https://portal.azure.com> and sign in.
2. Navigate to the **AutomationLab** Automation account and, on the **AutomationLab** blade, click the **Runbooks** tile.



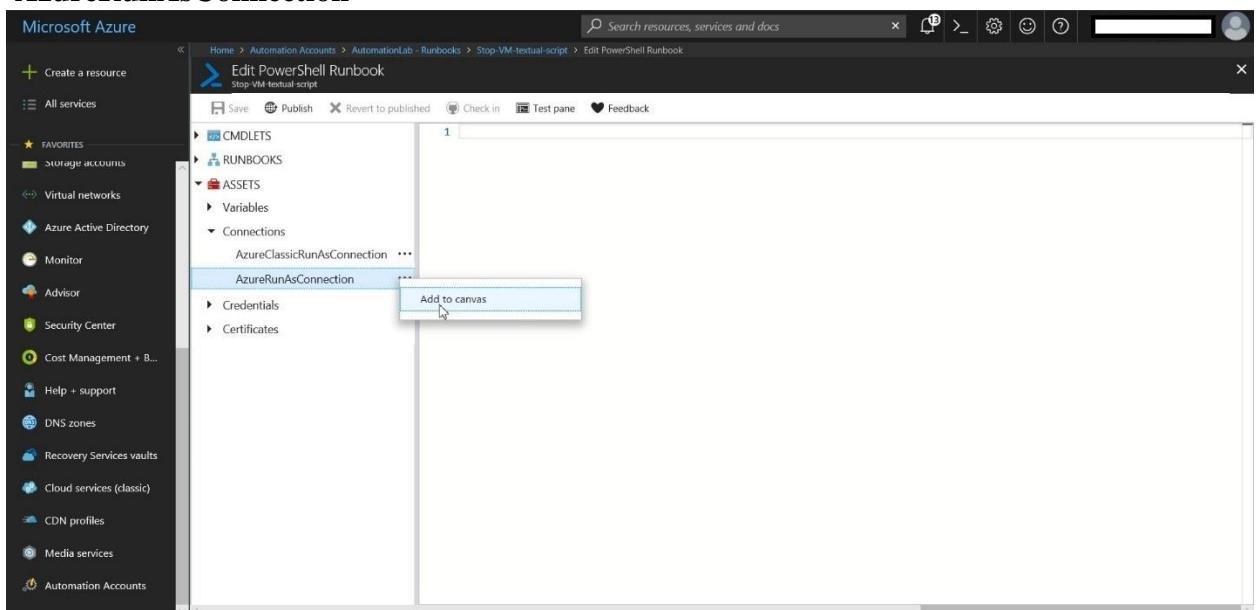
3. Click **+Add a runbook**, and then **Quick Create**. Click **Create** when you are finished entering the following information.

- Name: **Stop-VM-textual-script**

▪ Runbook type: PowerShell



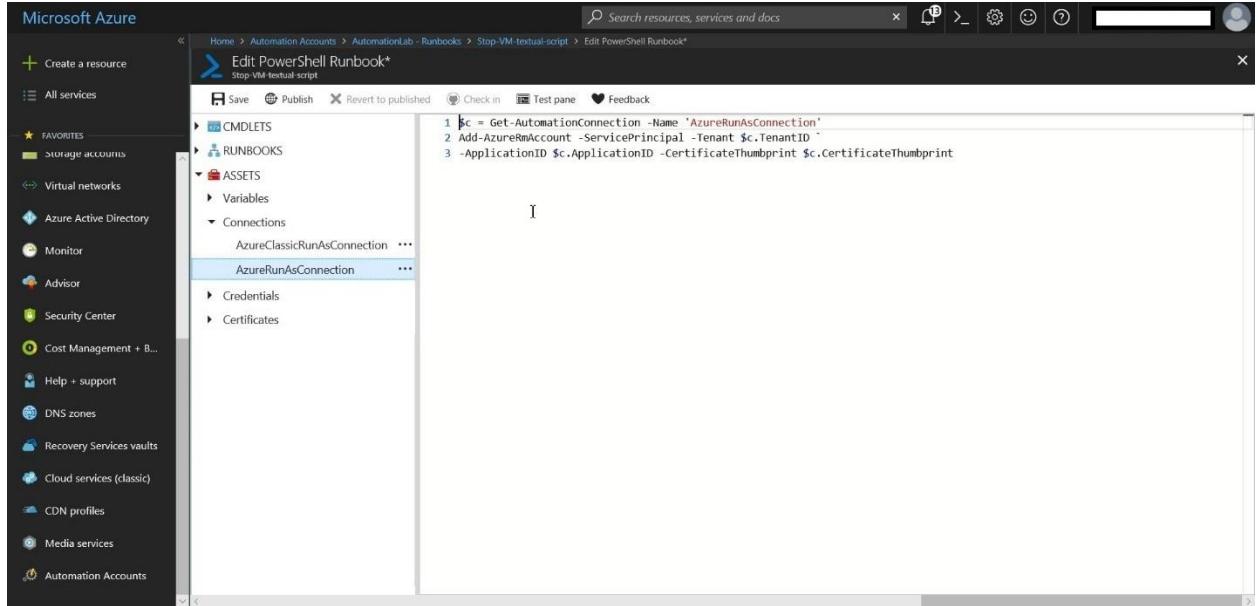
- On the **Edit PowerShell Runbook** blade, click **ASSETS** and expand the **Connections** section. Click ellipsis (...) next to the **AzureRunAsConnection** and click **Add to canvas**. This will add the following code to the runbook: **Get-AutomationConnection -Name 'AzureRunAsConnection'**



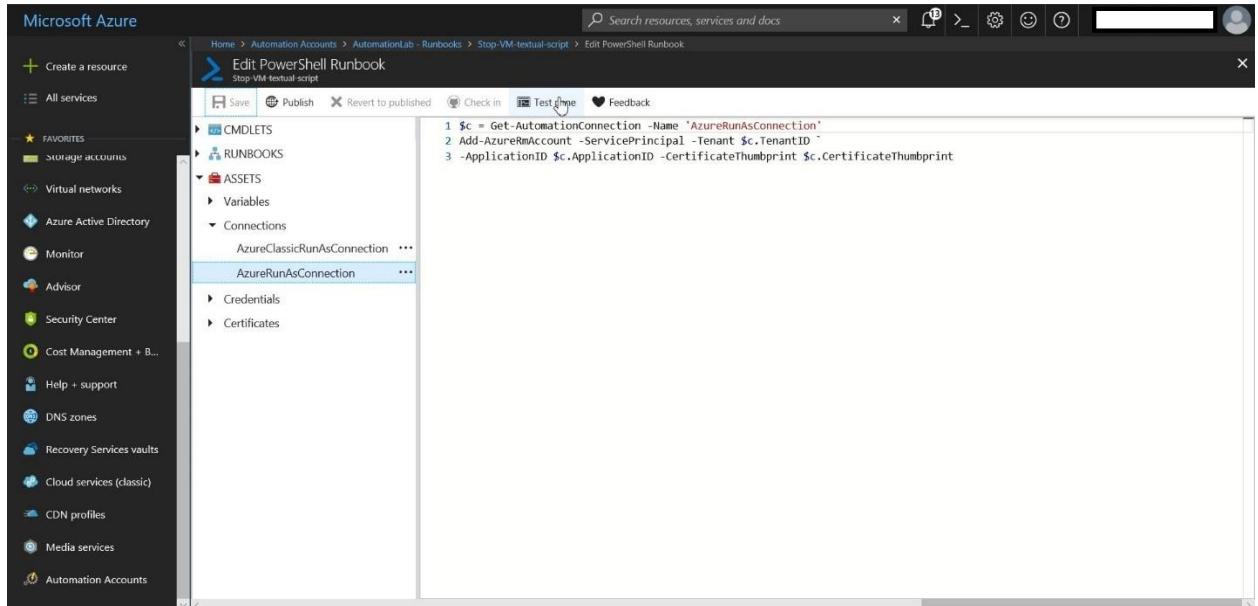
- Modify the script so it contains the following content:

```
$c = Get-AutomationConnection -Name 'AzureRunAsConnection'
Add-AzureRmAccount -ServicePrincipal -Tenant $c.TenantID `
-AccountID $c.ApplicationID -CertificateThumbprint $c.CertificateThumbprint
```

Microsoft Azure Infrastructure step by step

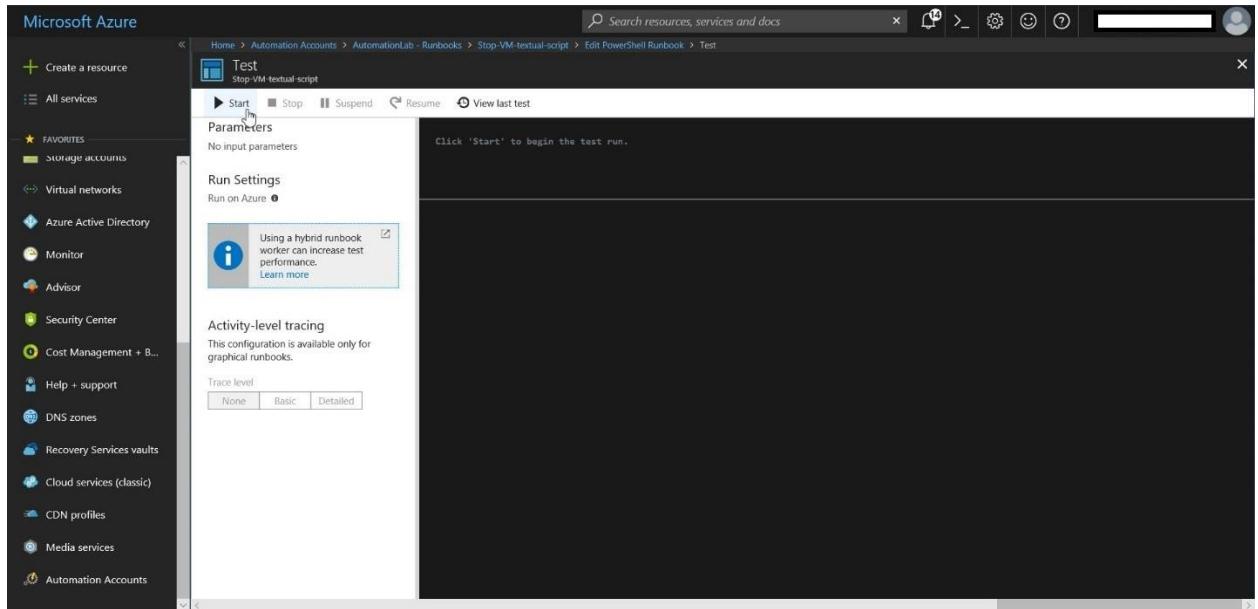


6. Click Save, then Click Test Pane.

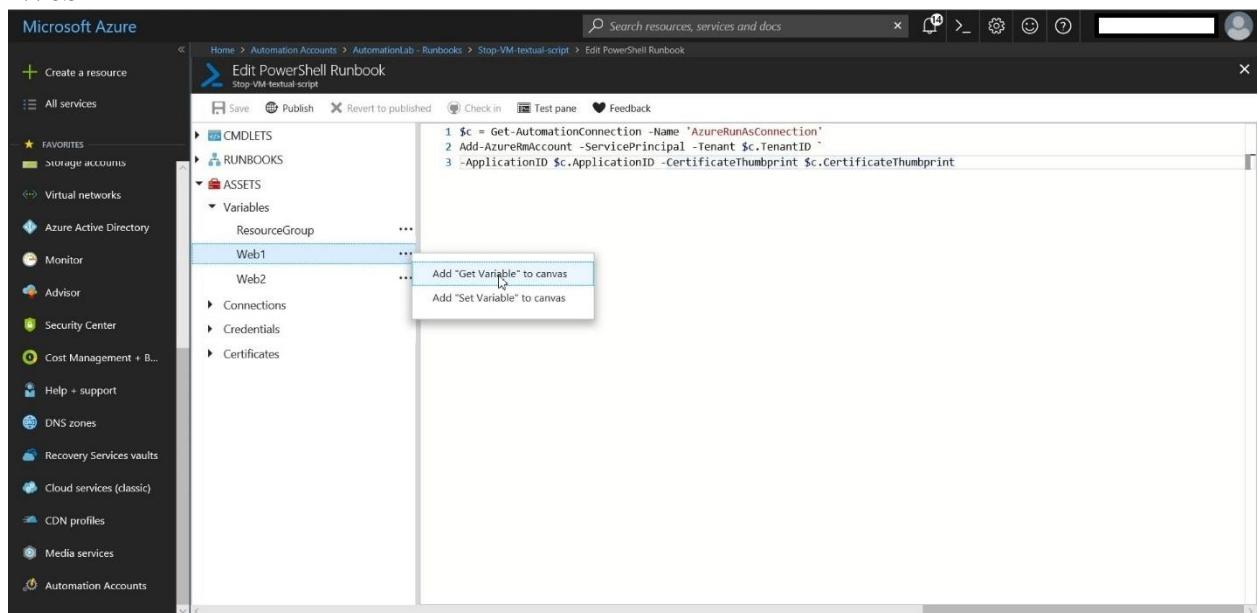


7. On the Test blade, click Start.

Microsoft Azure Infrastructure step by step



8. Monitor the progress of the Automation job and verify that it completes successfully.
9. Add another line to the script and place the cursor at the beginning of the new line.
10. On the **Edit PowerShell Runbook** blade, click **ASSETS** and expand the **Variables** section. Click ellipsis (...) next to the **Web1** and click **Add “Get Variable” to canvas**. This will add the following code to the runbook: **Get-AutomationVariable -Name 'Web1'**



11. On the **Edit PowerShell Runbook** blade, click **ASSETS** and expand the **Variables** section. Click ellipsis (...) next to the **ResourceGroup** and click **Add “Get Variable” to canvas**. This will add the following code to the runbook: **Get-AutomationVariable -Name 'ResourceGroup'**

```

1 $c = Get-AutomationConnection -Name 'AzureRunAsConnection'
2 Add-AzureRmAccount -ServicePrincipal -Tenant $c.TenantID
3 -ApplicationID $c.ApplicationID -CertificateThumbprint $c.CertificateThumbprint
4 Get-AutomationVariable -Name 'Web1'
5

```

12. Modify your Get-AutomationVariable lines to use a variable.

\$vm = Get-AutomationVariable -Name 'Web1'

\$rg = Get-AutomationVariable -Name 'ResourceGroup'

```

1 $c = Get-AutomationConnection -Name 'AzureRunAsConnection'
2 Add-AzureRmAccount -ServicePrincipal -Tenant $c.TenantID
3 -ApplicationID $c.ApplicationID -CertificateThumbprint $c.CertificateThumbprint
4 $vm = Get-AutomationVariable -Name 'Web1'
5 $rg = Get-AutomationVariable -Name 'ResourceGroup'
6

```

13. Add the line to stop the virtual machine.

Stop-AzureRmVM -Name \$vm -ResourceGroupName \$rg -Force

14. Your finished script should look like this:

\$c = Get-AutomationConnection -Name 'AzureRunAsConnection'

Add-AzureRmAccount -ServicePrincipal -Tenant \$c.TenantID `

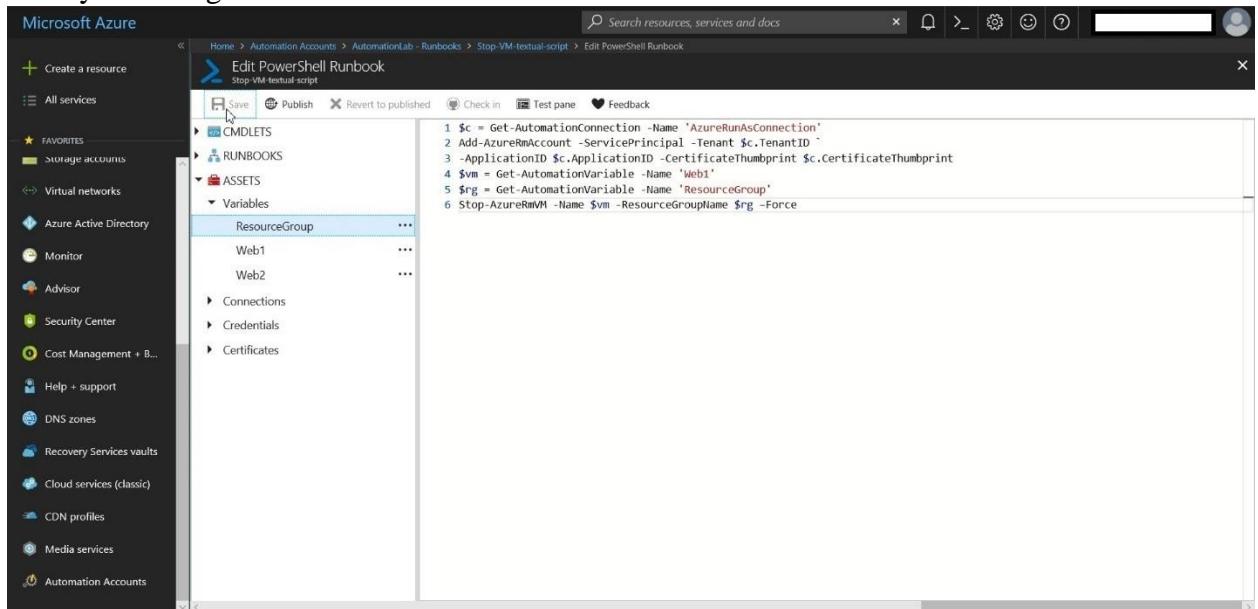
-ApplicationID \$c.ApplicationID -CertificateThumbprint \$c.CertificateThumbprint

\$vm = Get-AutomationVariable -Name 'VM0'

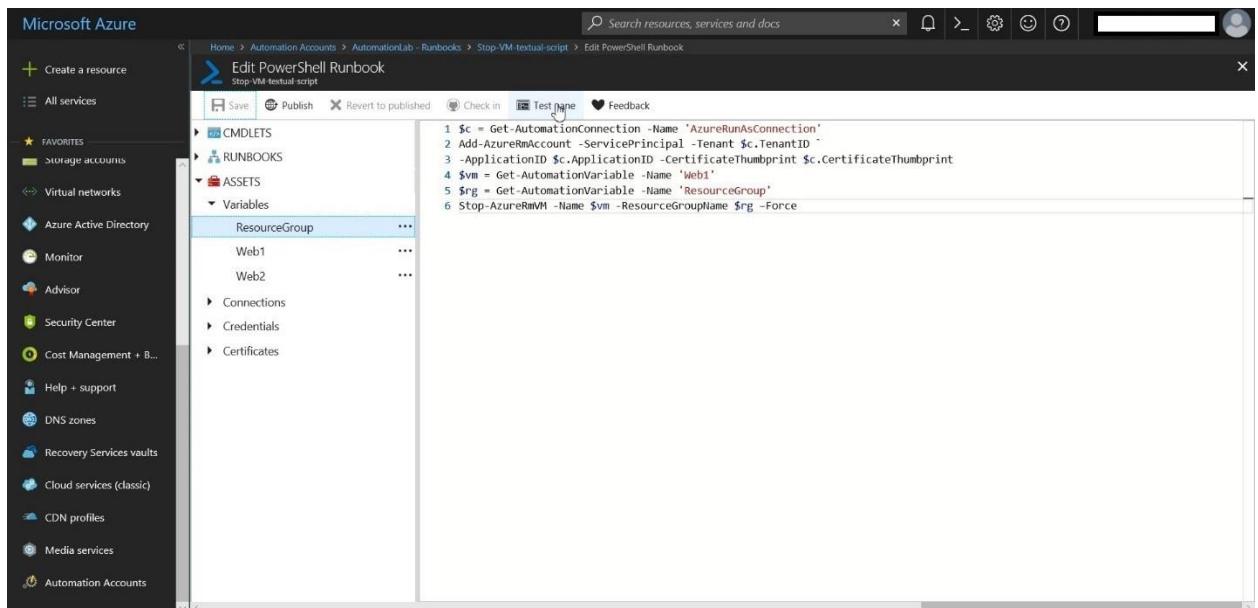
\$rg = Get-AutomationVariable -Name 'ResourceGroup' Stop-AzureRmVM

-Name \$vm -ResourceGroupName \$rg -Force

15. Save your changes.

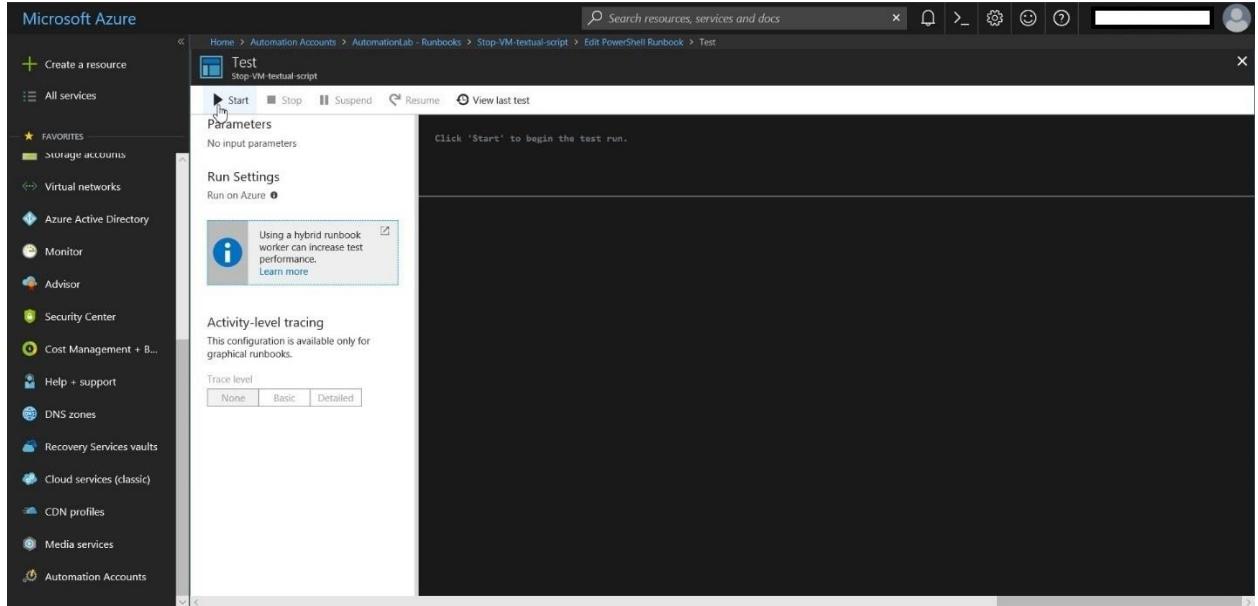


16. Click Test Pane.



17. On the Test blade, click Start.

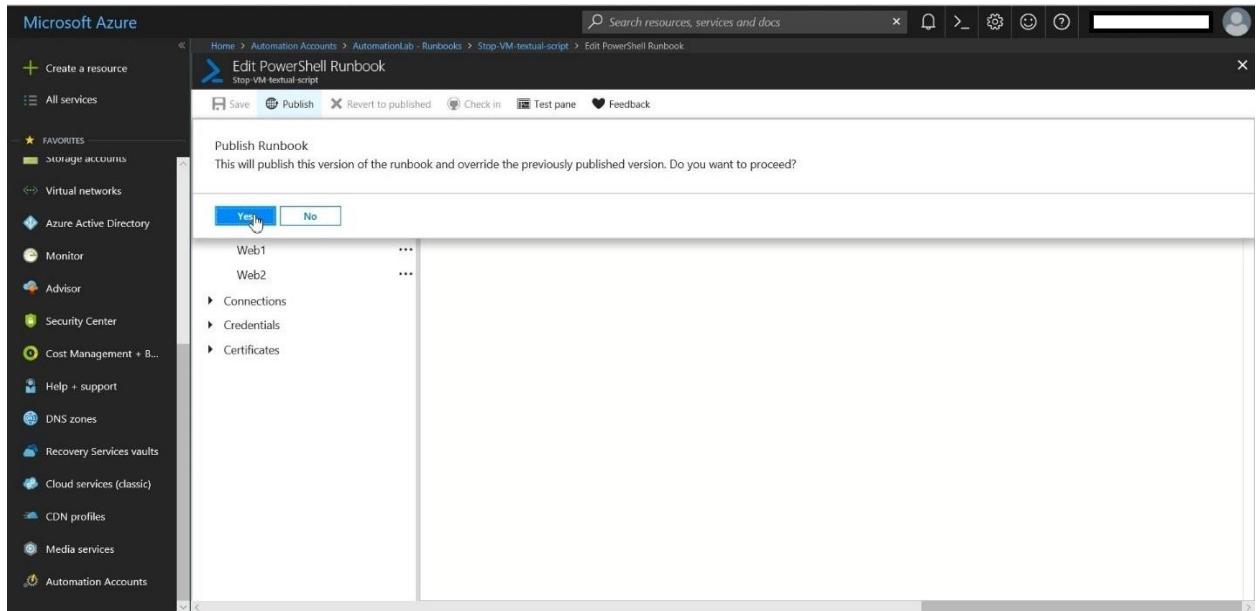
Microsoft Azure Infrastructure step by step



18. Monitor the progress of the Automation job and verify that it completes successfully.
Confirm your virtual machine was stopped.

NAME	TYPE	STATUS	RESOURCE GROUP	LOCATION	Maintenance	Subscription
LinuxVM1	Virtual machine (classic)	Stopped (deallocated)	uniquecloudservicename	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
mlab2017-dc	Virtual machine	Stopped (deallocated)	Mlab2017	West Europe	Not scheduled	MSDN Platforms (2b1c5...)
Server-01	Virtual machine	Stopped (deallocated)	Server2012R2-RG	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
Server-02	Virtual machine	Deallocating	Server-VNET	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
Web1	Virtual machine	Deallocating	Server-VNET	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
Web2	Virtual machine	Stopped (deallocated)	Server-VNET	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
Web3	Virtual machine	Stopped (deallocated)	Server-VNET	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
WebVM1	Virtual machine	Stopped (deallocated)	Server-VNET	South Central US	Not scheduled	MSDN Platforms (2b1c5...)
WebVM2	Virtual machine	Stopped (deallocated)	Server-DNS	South Central US	Not scheduled	MSDN Platforms (2b1c5...)

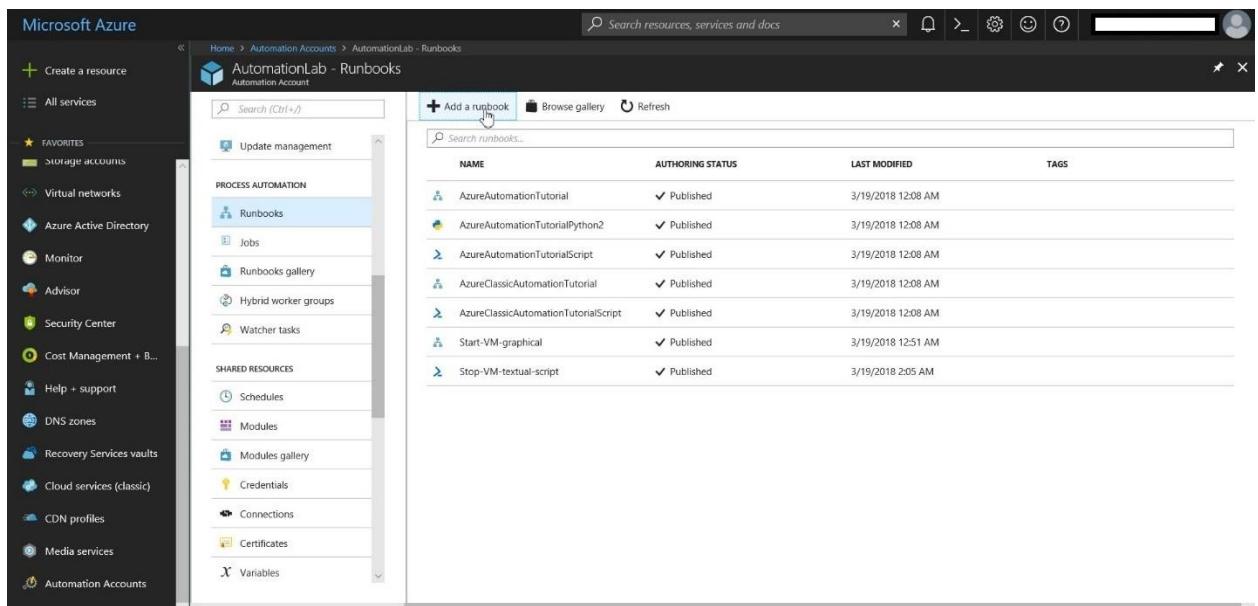
19. Scroll back to the **Edit PowerShell Runbook** blade and click **Publish**. Click **Yes** when prompted.



Task 3: Create Automation Windows PowerShell workflow-based textual Runbook

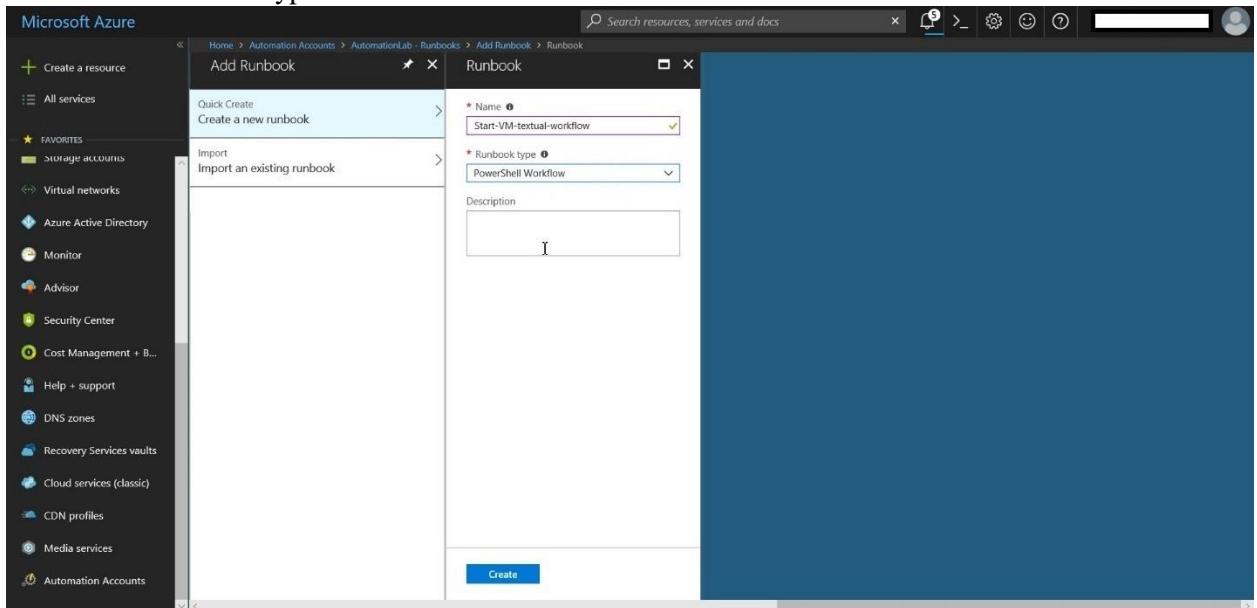
To create & publish automation windows PowerShell workflow-based runbook, following this procedure

1. If you are not signed in to the Azure Portal, then browse to the new Azure Portal at <https://portal.azure.com> and sign in.
2. Navigate to the **AutomationLab** Automation account and, on the **AutomationLab** blade, click the **Runbooks** tile.



3. Click **+Add a runbook**, and then **Quick Create**. Click **Create** when you are finished entering the following information.

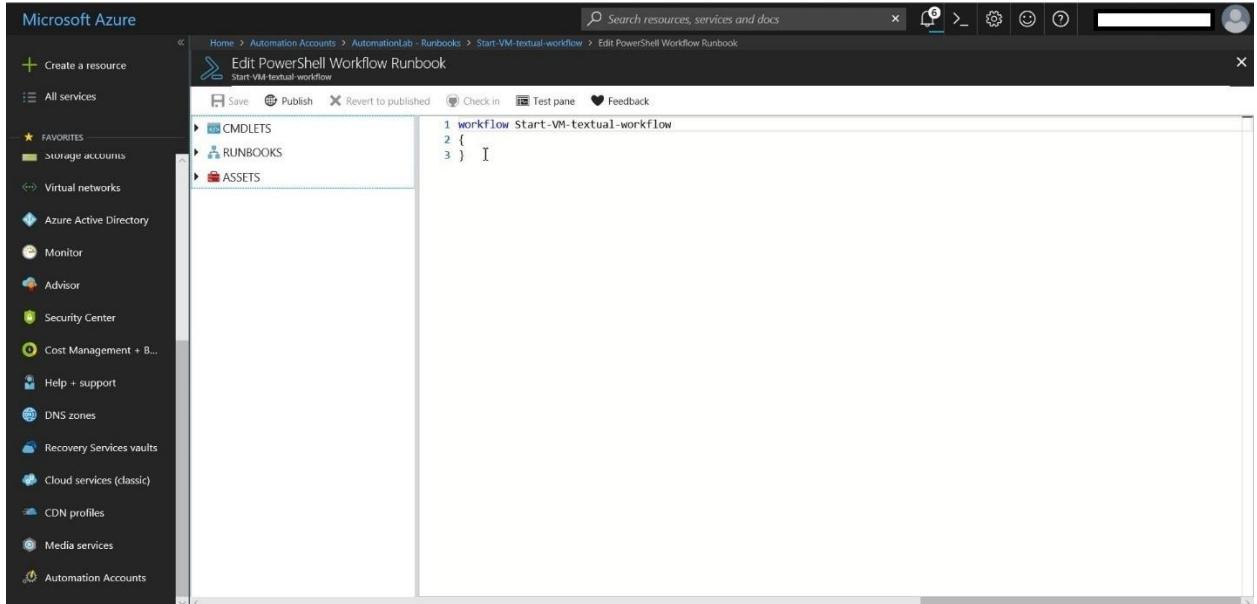
- Name: **Start-VM-textual-workflow**
- Runbook type: **PowerShell Workflow**



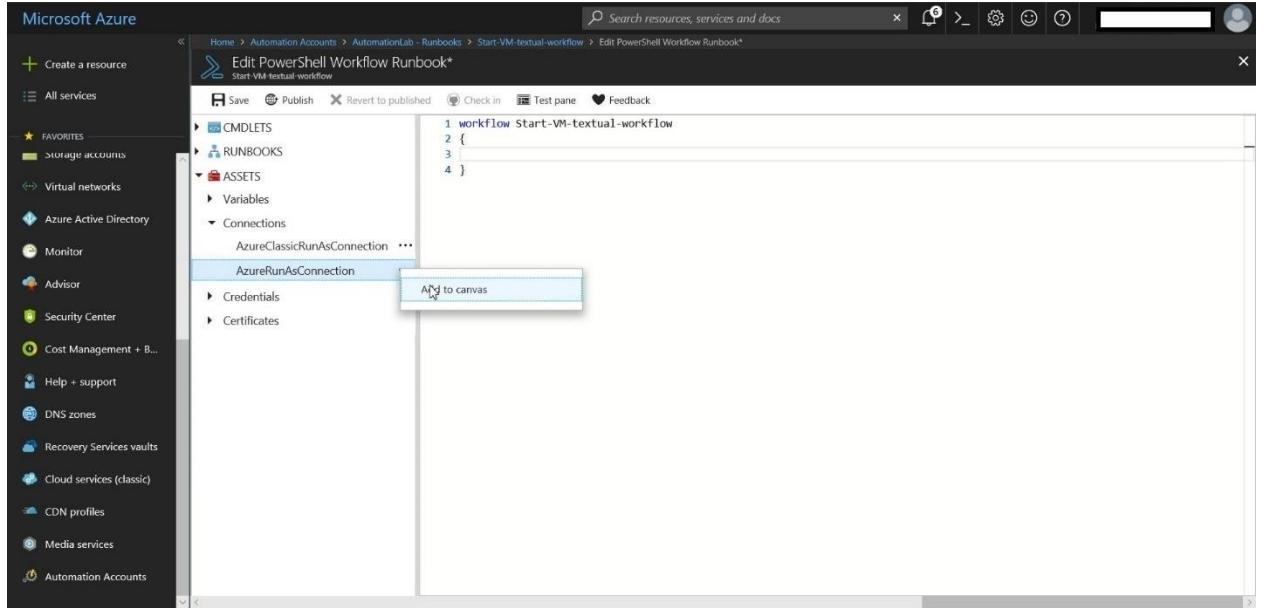
4. On the **Edit PowerShell Workflow Runbook** blade, add an extra line to the workflow between the set of braces so the content of the workflow looks as follows:

workflow Start-VM-textual-workflow

```
{
}
```



Microsoft Azure Infrastructure step by step

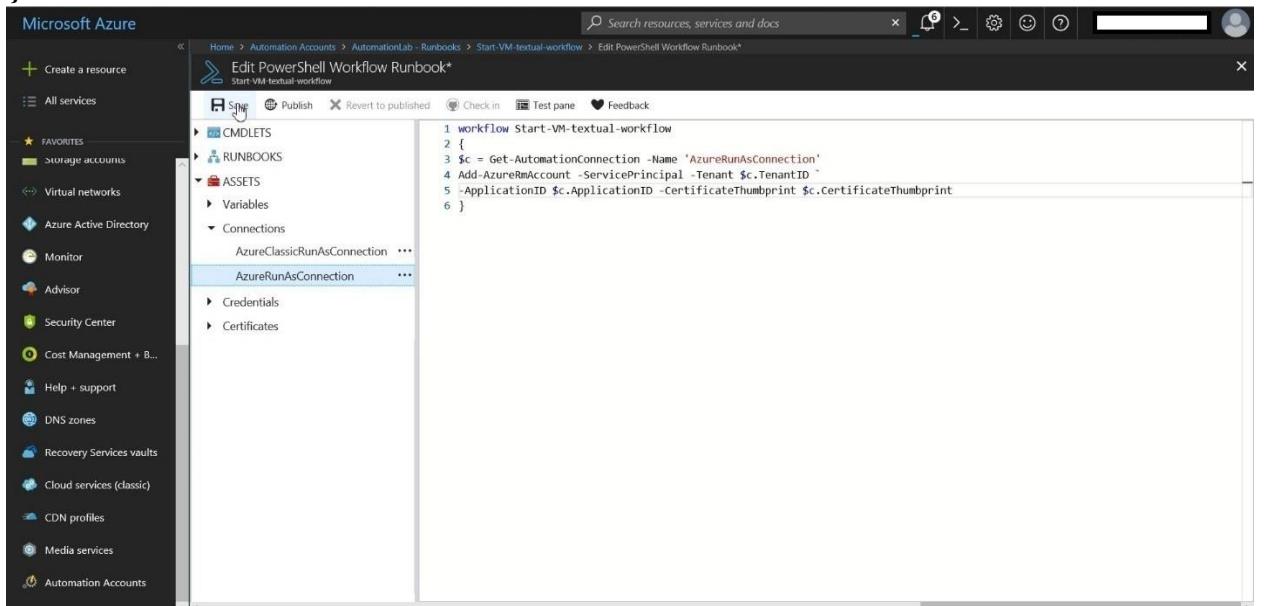


```
workflow Start-VM-textual-workflow
{
}
```

6. Create a variable for the connection information and connect to Azure. Your finished code will look like this:

workflow Start-VM-textual-workflow

```
{  
    $c = Get-AutomationConnection -Name 'AzureRunAsConnection'  
    Add-AzureRmAccount -ServicePrincipal -Tenant $c.TenantID `  
        -ApplicationID $c.ApplicationID -CertificateThumbprint $c.CertificateThumbprint  
}
```



```
workflow Start-VM-textual-workflow
{
    $c = Get-AutomationConnection -Name 'AzureRunAsConnection'  
    Add-AzureRmAccount -ServicePrincipal -Tenant $c.TenantID `  
        -ApplicationID $c.ApplicationID -CertificateThumbprint $c.CertificateThumbprint
}
```

7. Click **Save**, then Click **Test Pane**.

Microsoft Azure Infrastructure step by step

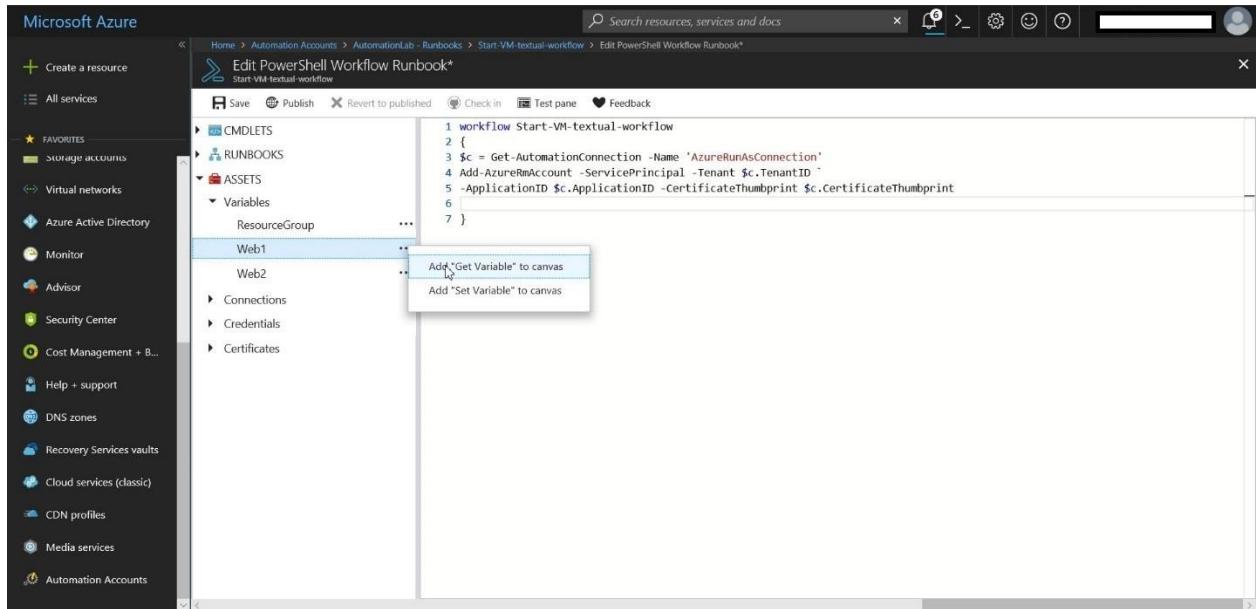
```
1 workflow Start-VM-textual-workflow
2 {
3 $c = Get-AutomationConnection -Name 'AzureRunAsConnection'
4 Add-AzureRmAccount -ServicePrincipal -Tenant $c.TenantID -
5 -ApplicationID $c.ApplicationID -CertificateThumbprint $c.CertificateThumbprint
6 }
```

8. On the Test blade, click **Start**.
9. Monitor the progress of the Automation job and verify that it completes successfully.

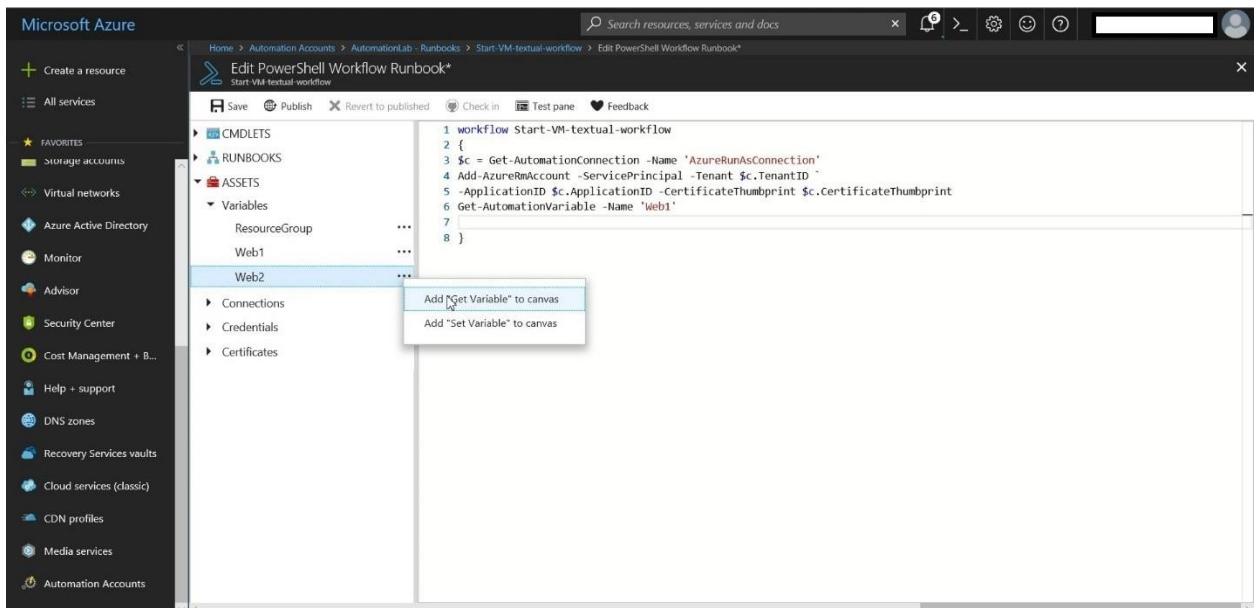
```
PSComputerName : localhost
PSSourceJobInstanceId : 73b07e24-356c-47f3-88e9-4a56d4e9e4a3
Environments : {AzureCloud, AzureChinaCloud, AzureUSGovernment}
Context : Microsoft.Azure.Commands.Profile.Models.PSAzureContext
```

10. On the **Edit PowerShell Workflow Runbook** blade, click **ASSETS** and expand the **Variables** section. Click ellipsis (...) next to the **Web1** and click **Add “Get Variable” to canvas**. This will add the following code to the runbook:
Get-AutomationVariable -Name 'Web1'

Microsoft Azure Infrastructure step by step

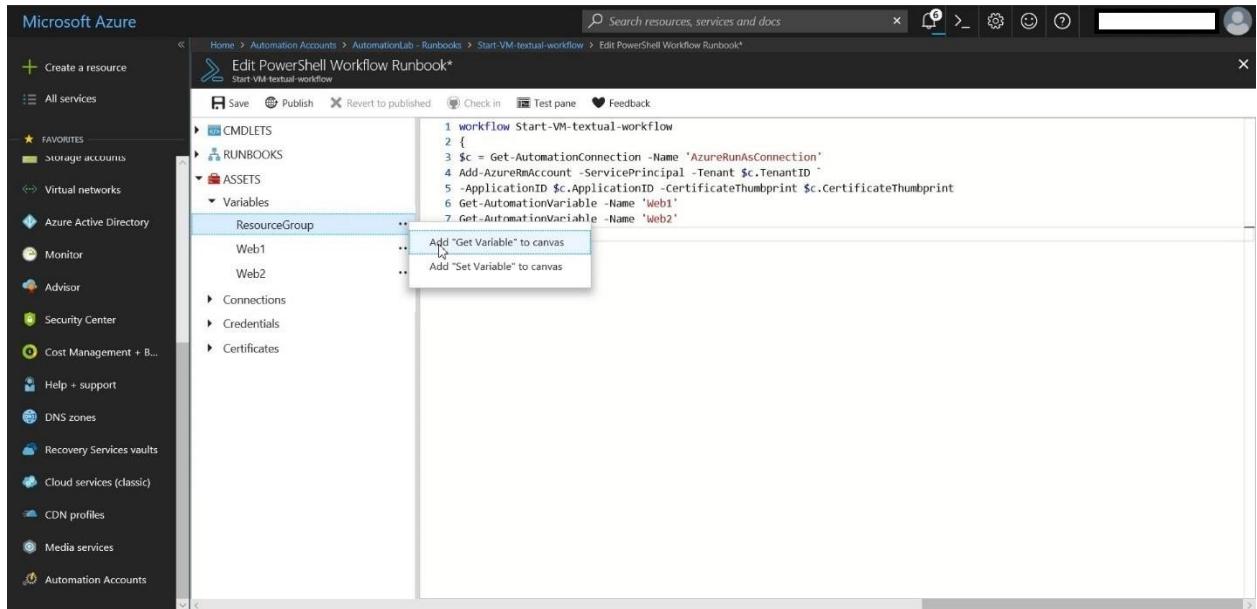


11. On the **Edit PowerShell Workflow Runbook** blade, click **ASSETS** and expand the **Variables** section. Click ellipsis (...) next to the **Web2** and click **Add “Get Variable” to canvas**. This will add the following code to the runbook: **Get-AutomationVariable -Name 'Web2'**



12. On the **Edit PowerShell Workflow Runbook** blade, click **ASSETS** and expand the **Variables** section. Click ellipsis (...) next to the **ResourceGroup** and click **Add “Get Variable” to canvas**. This will add the following code to the runbook: **Get-AutomationVariable -Name 'ResourceGroup'**

Microsoft Azure Infrastructure step by step



13. Modify the workflow so it contains the following content:

```
workflow Start-VM-textual-workflow
{
    $c = Get-AutomationConnection -Name 'AzureRunAsConnection'
    Add-AzureRmAccount -ServicePrincipal -Tenant $c.TenantID ` 
        -ApplicationID $c.ApplicationID -CertificateThumbprint $c.CertificateThumbprint
    $vm0 = Get-AutomationVariable -Name 'VM0'
    $vm1 = Get-AutomationVariable -Name 'VM1'
    $rg = Get-AutomationVariable -Name 'ResourceGroup'
    Parallel
    {
        Start-AzureRmVM -Name $vm0 -ResourceGroupName $rg
        Start-AzureRmVM -Name $vm1 -ResourceGroupName $rg
    }
}
```

Microsoft Azure Infrastructure step by step

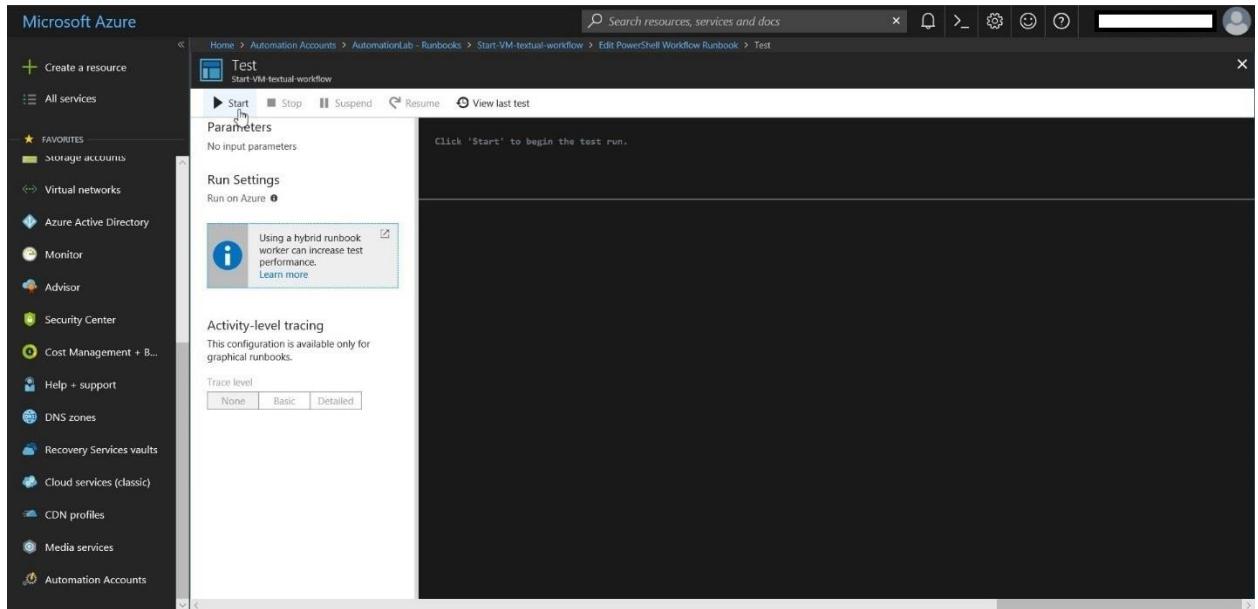
```
1 workflow Start-VM-textual-workflow
2 {
3 $c = Get-AutomationConnection -Name 'AzureRunAsConnection'
4 Add-AzureRmAccount -ServicePrincipal -Tenant $c.TenantID -
5 -ApplicationID $c.ApplicationID -CertificateThumbprint $c.CertificateThumbprint
6 $vmb = Get-AutomationVariable -Name 'Web1'
7 $vm1 = Get-AutomationVariable -Name 'Web2'
8 $rg = Get-AutomationVariable -Name 'ResourceGroup'
9 Parallel
10 [
11 Start-AzureRmVM -Name $vmb -ResourceGroupName $rg
12 Start-AzureRmVM -Name $vm1 -ResourceGroupName $rg
13 ]
14 }
```

14. Click Test Pane

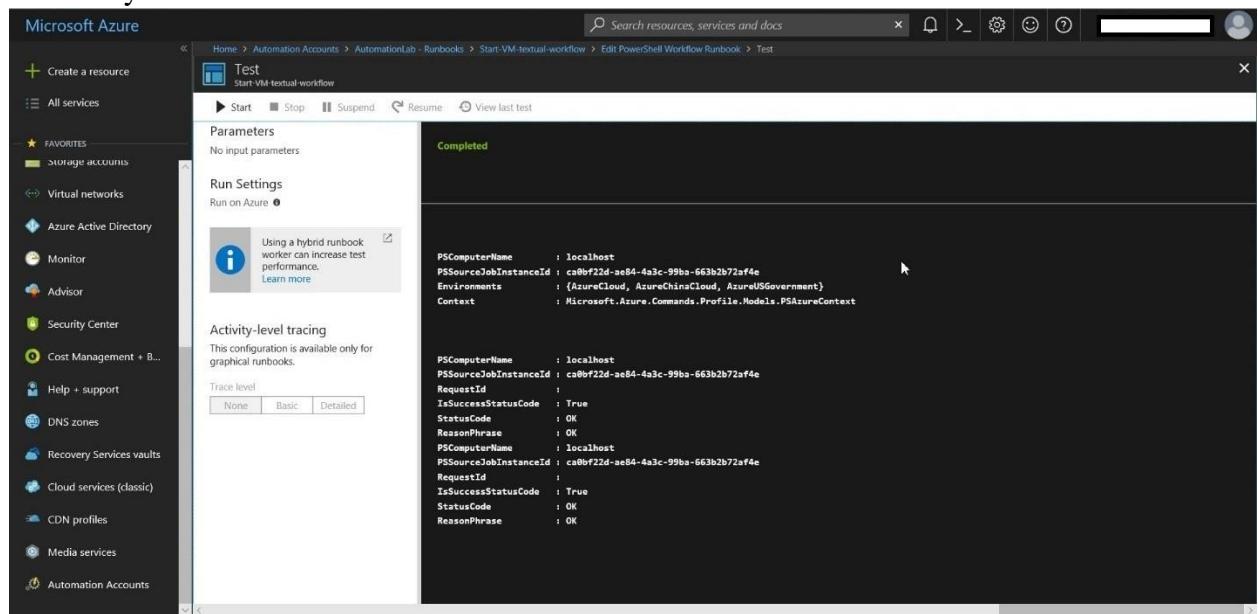
```
1 workflow Start-VM-textual-workflow
2 {
3 $c = Get-AutomationConnection -Name 'AzureRunAsConnection'
4 Add-AzureRmAccount -ServicePrincipal -Tenant $c.TenantID -
5 -ApplicationID $c.ApplicationID -CertificateThumbprint $c.CertificateThumbprint
6 $vmb = Get-AutomationVariable -Name 'Web1'
7 $vm1 = Get-AutomationVariable -Name 'Web2'
8 $rg = Get-AutomationVariable -Name 'ResourceGroup'
9 Parallel
10 [
11 Start-AzureRmVM -Name $vmb -ResourceGroupName $rg
12 Start-AzureRmVM -Name $vm1 -ResourceGroupName $rg
13 ]
14 }
```

15. On the Test blade, click Start.

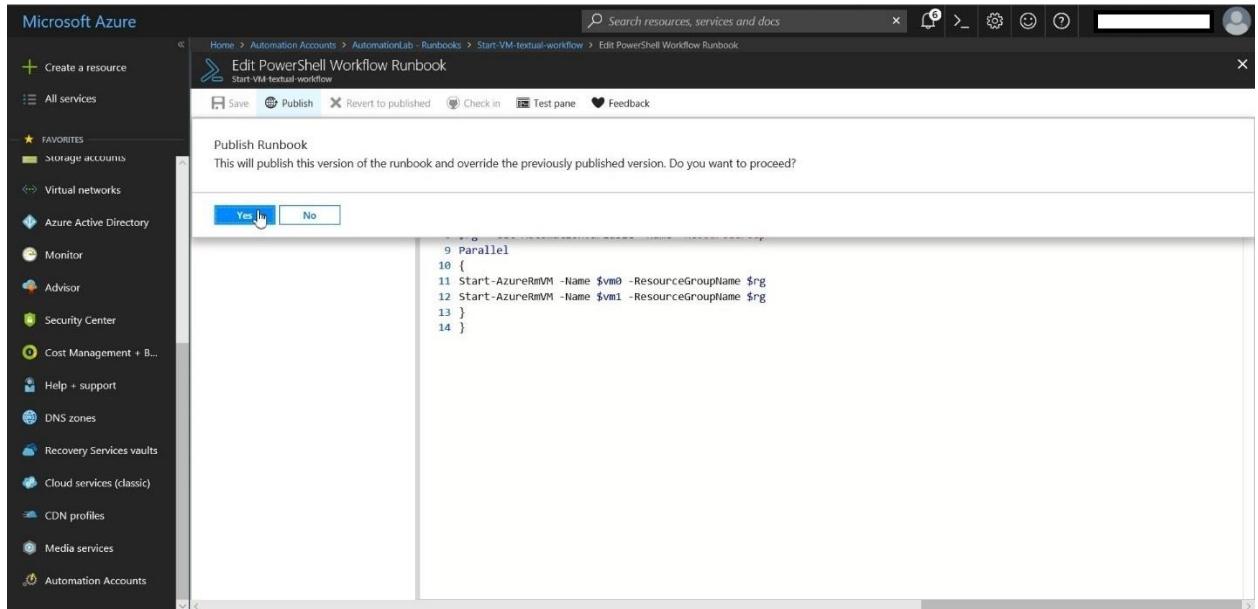
Microsoft Azure Infrastructure step by step



16. Monitor the progress of the Automation job and verify that it completes successfully.
Confirm your virtual machines are now started.



17. Scroll back to the **Edit PowerShell Workflow Runbook** blade and click **Publish**. Click **Yes** when prompted.



Creating Automation Desired State Configuration (DSC)

In this exercise, you will create and compile a DSC-based configuration by using Azure Automation & Deploy it.

Task 1: Create and compile a DSC-based configuration by using Azure Automation

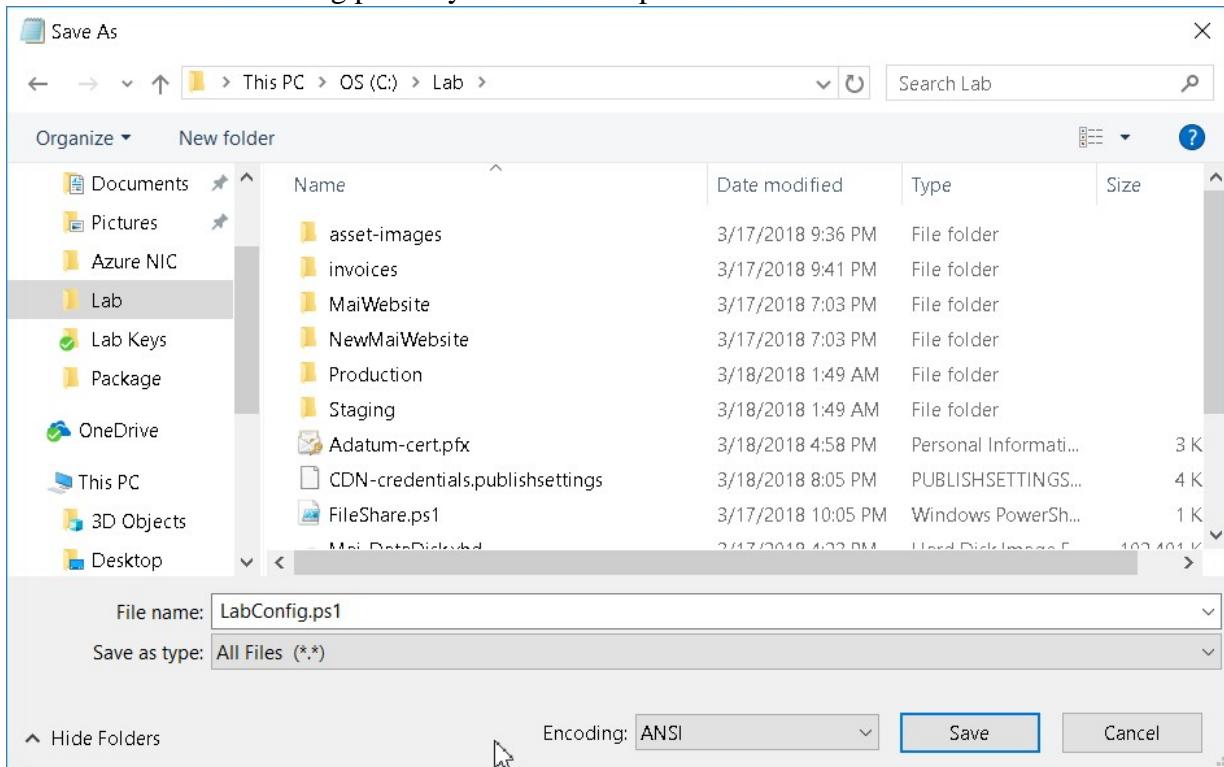
In this exercise, you will create and compile a DSC-based configuration by using Azure Automation.

1. Start Windows PowerShell ISE and, in the script pane, type in the following text. If you prefer, you can use a text editor like NotePad.

```
configuration LabConfig
{
    Node WebServer
    {
        WindowsFeature IIS
        {
            Ensure      = 'Present'
            Name       = 'Web-Server'
            IncludeAllSubFeature = $true
        }
    }
}
```

```
Untitled - Notepad
File Edit Format View Help
configuration LabConfig
{
Node WebServer
{
WindowsFeature IIS
{
Ensure = 'Present'
Name = 'Web-Server'
IncludeAllSubFeature = $true
}
}
}
```

2. Save the file as LabConfig.ps1 on your local computer.



3. If you are not signed in to the Azure Portal, then browse to the new Azure Portal at <https://portal.azure.com> and sign in.
4. Navigate to the **AutomationLab** Automation account and, on the **AutomationLab** blade, click the **DSC Configurations** tile.

Microsoft Azure Infrastructure step by step

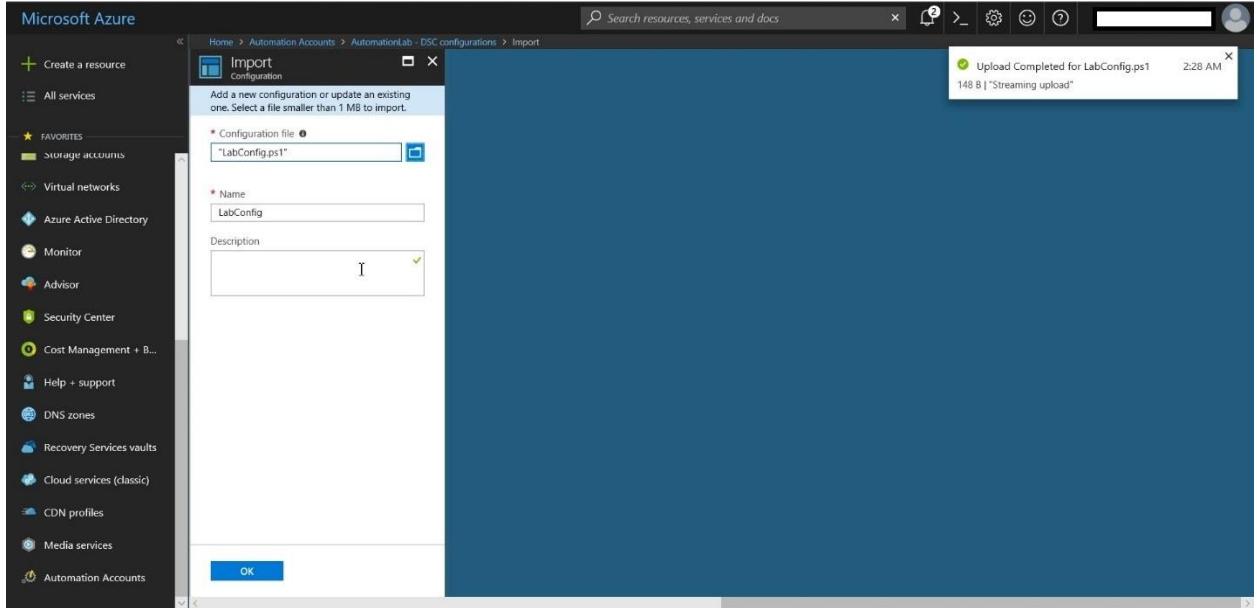
Name	Authoring Status	Last Modified	Tags
AzureAutomationTutorial	Published	3/19/2018 12:08 AM	
AzureAutomationTutorialPython2	Published	3/19/2018 12:08 AM	
AzureAutomationTutorialScript	Published	3/19/2018 12:08 AM	
AzureClassicAutomationTutorial	Published	3/19/2018 12:08 AM	
AzureClassicAutomationTutorialScript	Published	3/19/2018 12:08 AM	
Start-VM-graphical	Published	3/19/2018 12:51 AM	
Start-VM-textual-workflow	Published	3/19/2018 2:25 AM	
Stop-VM-textual-script	In edit	3/19/2018 2:15 AM	

5. Click +Add a configuration.

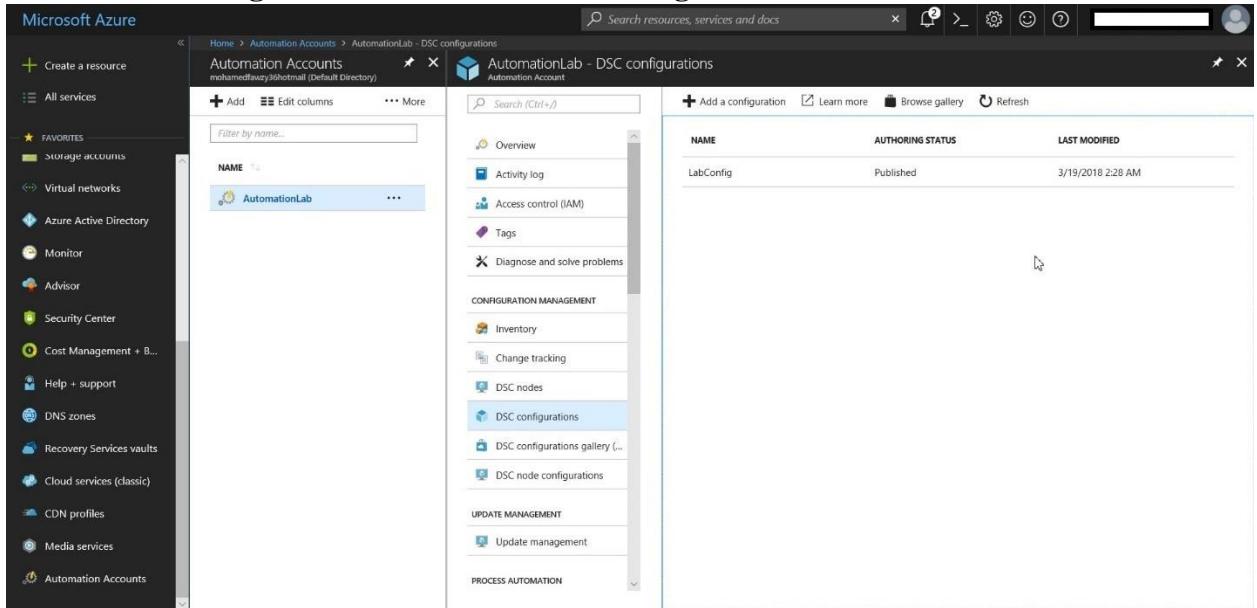
Name	Authoring Status	Last Modified
No DSC configurations found.		

6. On the Import blade, upload the LabConfig.ps1 configuration file from your computer and click OK. Note that this automatically publishes the configuration.

Microsoft Azure Infrastructure step by step

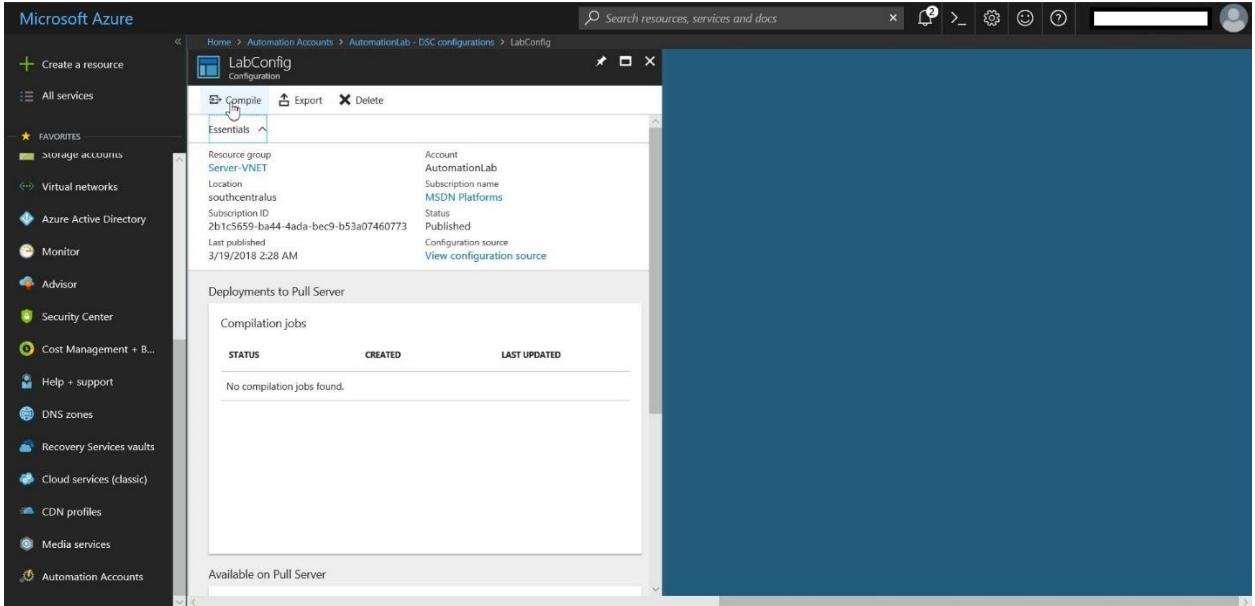


7. On the DSC Configurations blade, click **LabConfig**.



8. On the **LabConfig** blade, click **Compile**. Read the compilation information.

Microsoft Azure Infrastructure step by step

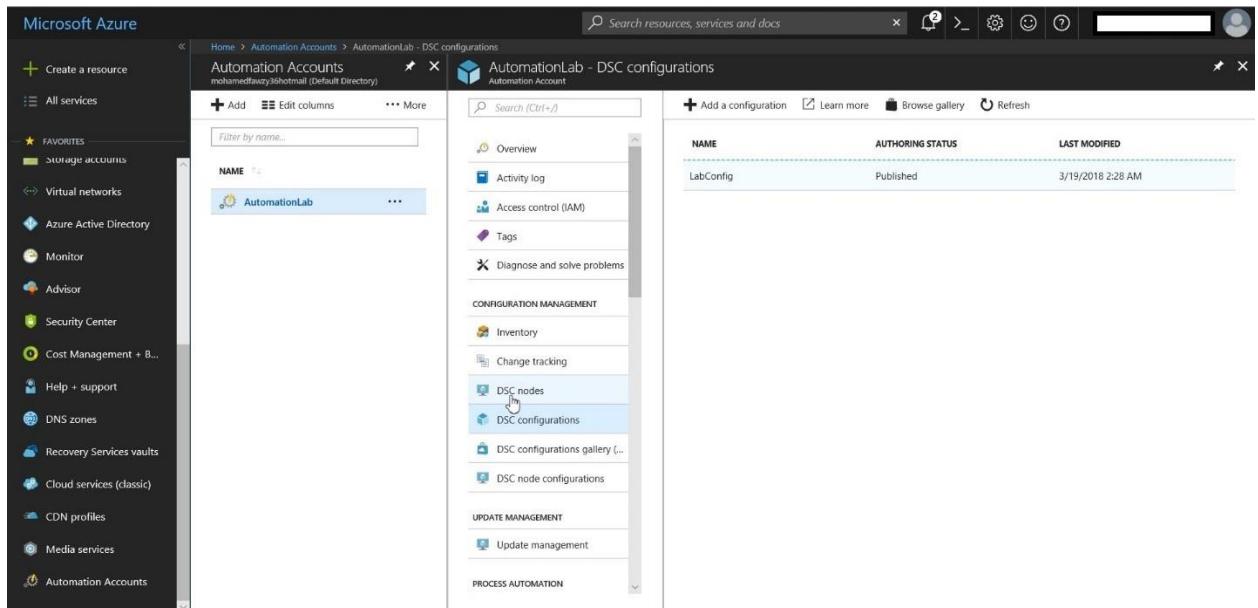


9. Click the compilation job and monitor its progress. Verify it completes successfully by checking its State on the compilation job blade. You can also monitor Errors and Warnings. Warnings are okay, and can be ignored.

Task 2: Deploy a DSC-based configuration by using Azure Automation

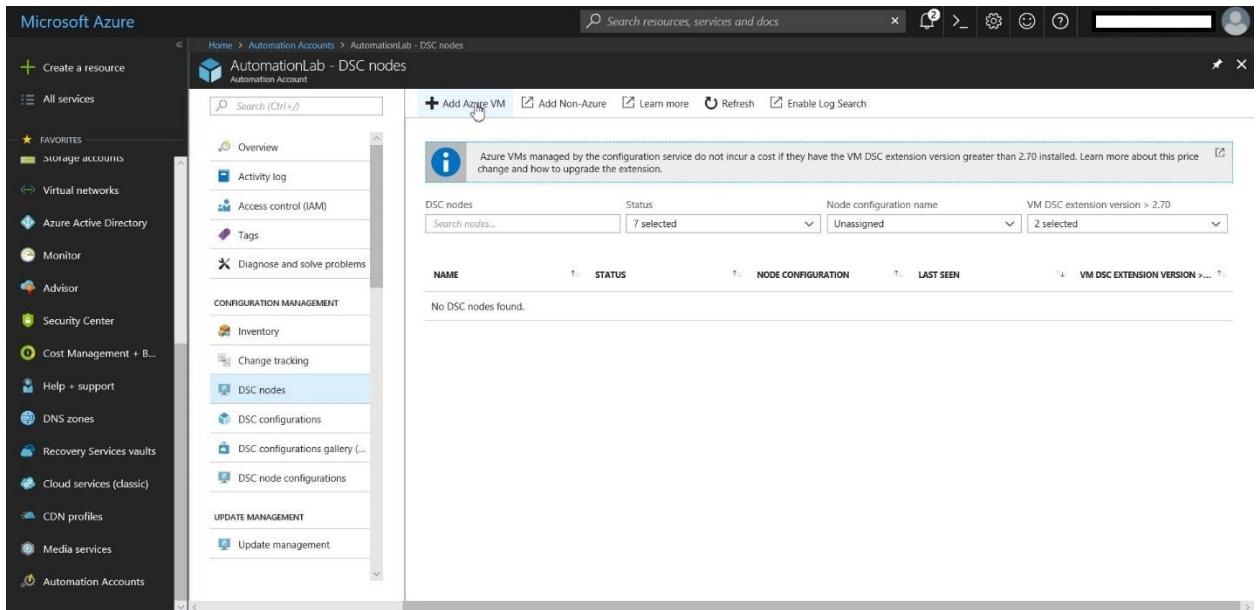
In this exercise, you will deploy the Web server role to Azure virtual machines.

1. If you are not signed in to the Azure Portal, then browse to the new Azure Portal at <https://portal.azure.com> and sign in.
2. Navigate to the **AutomationLab** Automation account and, on the **AutomationLab** blade, click the **DSC Nodes** tile.



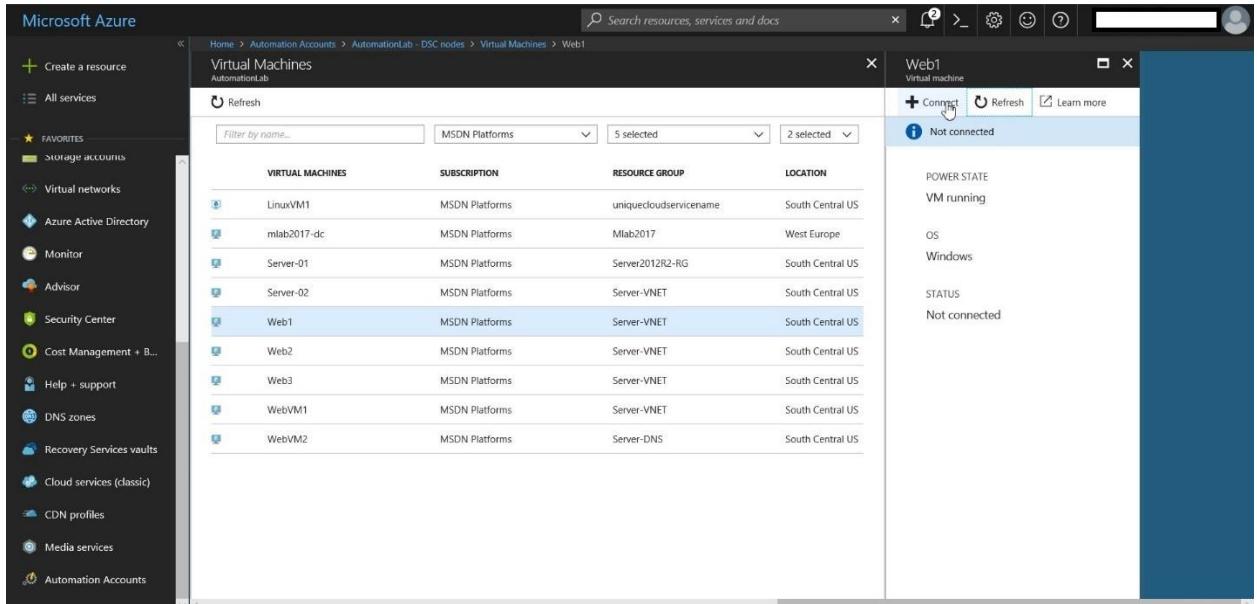
Microsoft Azure Infrastructure step by step

3. On the **DSC Nodes** blade, click **+Add Azure VM**. Notice the option to **+Add on-prem VM**.



The screenshot shows the 'AutomationLab - DSC nodes' blade in the Azure portal. The left sidebar lists various services like Storage accounts, Virtual networks, and Azure Active Directory. The main area has a search bar and navigation buttons. A prominent button labeled '+Add Azure VM' is highlighted with a mouse cursor. Below it, a message states: 'Azure VMs managed by the configuration service do not incur a cost if they have the VM DSC extension version greater than 2.70 installed. Learn more about this price change and how to upgrade the extension.' A table titled 'DSC nodes' shows columns for NAME, STATUS, NODE CONFIGURATION, LAST SEEN, and VM DSC EXTENSION VERSION. A note at the bottom says 'No DSC nodes found.'

4. On the **Add Azure VMs** blade, click **Select virtual machines to onboard**.
5. On the **Select VMs** blade, select **Web1** and click **Connect**.

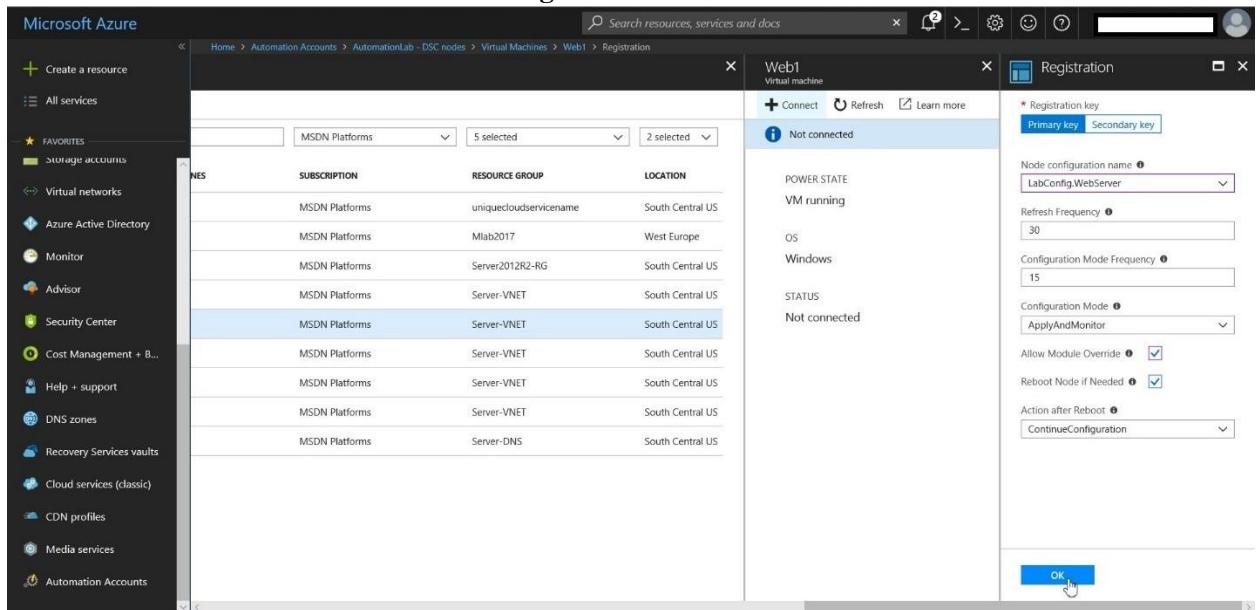


The screenshot shows the 'Virtual Machines' blade for the 'AutomationLab' account. The left sidebar is identical to the previous screenshot. The main area shows a list of virtual machines with columns for VIRTUAL MACHINES, SUBSCRIPTION, RESOURCE GROUP, and LOCATION. The 'Web1' machine is selected and highlighted. To the right, a detailed view for 'Web1' shows its status as 'Not connected'. It also displays 'POWER STATE: VM running', 'OS: Windows', and 'STATUS: Not connected'. A 'Connect' button is visible in the top right of this panel.

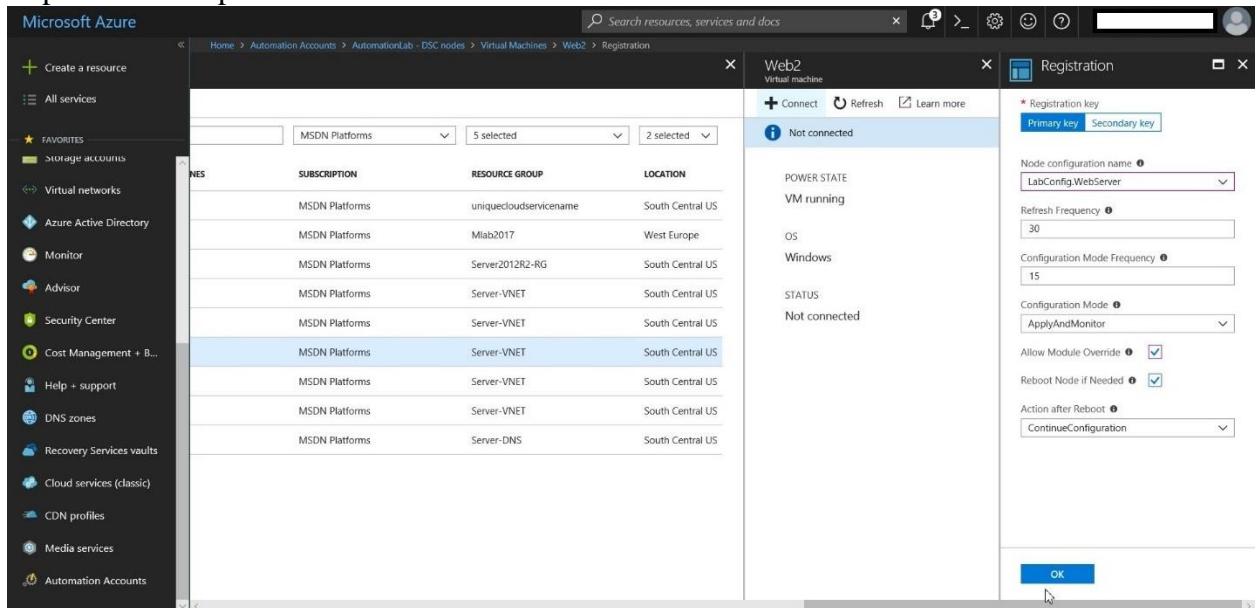
6. On the **Registration** blade, specify the following settings and click **OK** (use the **Information** icon to view details about the required information):
 - Registration key: **Primary key**
 - Node Configuration Name: **LabConfig.WebServer**
 - Refresh Frequency: **30**
 - Configuration Mode Frequency: **15**
 - Configuration Mode: **ApplyAndMonitor**
 - Allow Module Override: **enabled**

Microsoft Azure Infrastructure step by step

- Reboot Node if Needed: **enabled**
- Action after Reboot: **ContinueConfiguration**



7. Repeat Same steps and add Web2



8. Click **Create**.
9. Wait until both virtual machines appear on the **DSC Nodes** blade with the **Compliant** status. This indicates that they have been successfully onboarded for management by using Azure Automation DSC. This will take about 20 minutes.

Microsoft Azure Infrastructure step by step

NAME	STATUS	NODE CONFIGURATION	LAST SEEN	VM DSC EXTENSION VERSION
Web1	Compliant	LabConfig.WebServer	3/19/2018 2:46 AM	Yes
Web2	Compliant	LabConfig.WebServer	3/19/2018 2:42 AM	Yes

10. On the left side of the Azure portal, click **More services**. In the search box, type **Load balancers** and, in the list of results, click **Load balancers**.
11. On the **Load balancers** blade, click **myLB**. On the **myLB** blade, identify the value of the **Public IP address** entry.
12. From your computer, start Internet Explorer and browse to the IP address you identified in the previous step. Verify that you see the default Internet Information Services page. This indicates the Web Server was deployed and configured on the virtual machines.

Task 3: Remediate Azure virtual machine alerts by using Azure Automation

In this exercise, you will use Azure Automation to remediate alerts triggered by an Azure virtual machine.

Step 1: Add a webhook to Automation runbook

1. If you are not signed in to the Azure Portal, then browse to the new Azure Portal at <https://portal.azure.com> and sign in.
2. Navigate to the **AutomationLab** Automation account and, on the **AutomationLab** blade, click the **Runbooks** tile.
3. On the **Runbooks** blade, click **Stop-VM-textual-script**.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes 'Automation Accounts' under 'All services'. The main content area is titled 'AutomationLab - Runbooks' and shows a list of runbooks. A tooltip in the top right corner says 'Published runbook' with the timestamp '2:44 AM' and the message 'Published the runbook 'Start-VM-textual-workflow''. The table lists the following runbooks:

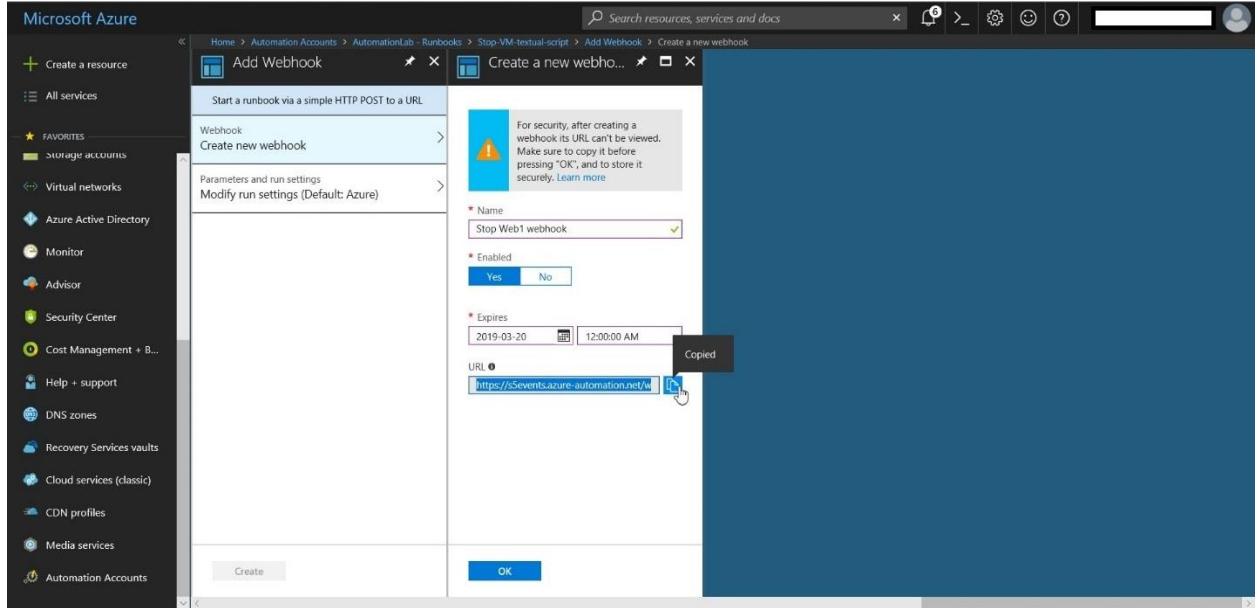
Name	Authoring Status	Last Modified	Tags
AzureAutomationTutorial	✓ Published	3/19/2018 12:08 AM	
AzureAutomationTutorialPython2	✓ Published	3/19/2018 12:08 AM	
AzureAutomationTutorialScript	✓ Published	3/19/2018 12:08 AM	
AzureClassicAutomationTutorial	✓ Published	3/19/2018 12:08 AM	
AzureClassicAutomationTutorialScript	✓ Published	3/19/2018 12:08 AM	
Start-VM-graphical	✓ Published	3/19/2018 12:51 AM	
Start-VM-textual-workflow	✓ Published	3/19/2018 2:44 AM	
Stop-VM-textual-script	✓ Published	3/19/2018 2:37 AM	

- On the **Stop-VM-textual-script** blade, click **Webhook**.

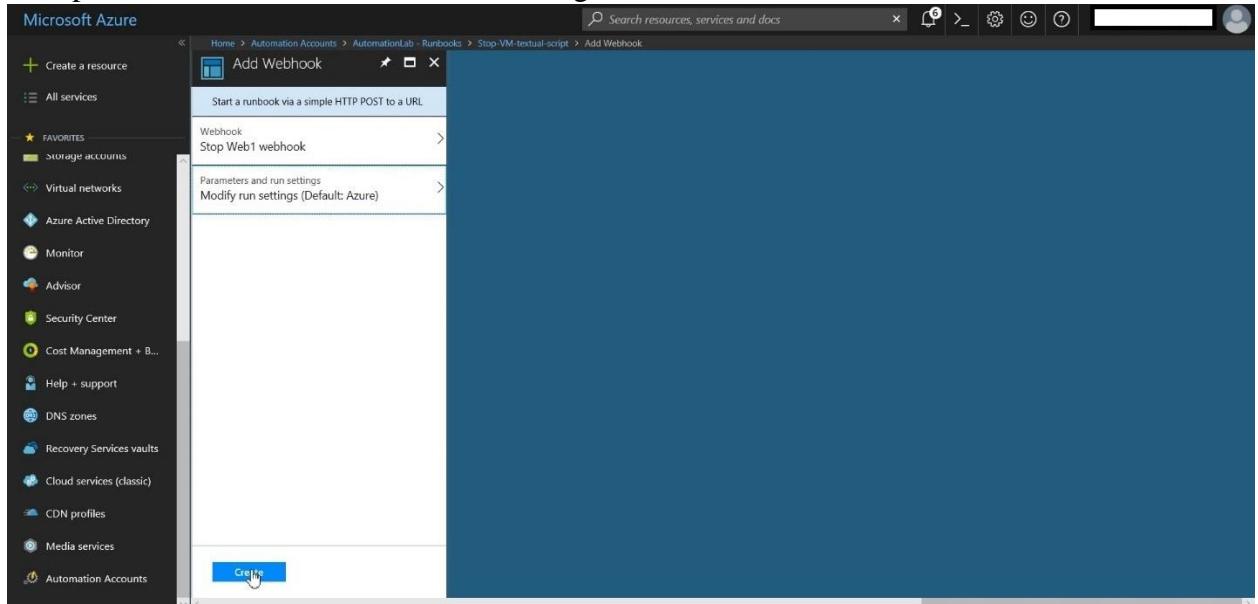
The screenshot shows the 'Stop-VM-textual-script' blade within the Azure portal. The left sidebar has 'Automation Accounts' selected. The top navigation bar includes a 'Webhook' button, which is highlighted. The main content area displays the 'Essentials' section and a 'Details' panel. The 'Essentials' section shows the runbook's status as 'Published' and its type as 'PowerShell Runbook'. The 'Details' panel shows a 'Jobs' section.

- On the **Add Webhook** blade, click **Create new webhook**.
- On the **Create a new webhook** blade, note the warning stating that For security, after creating a webhook, its URL can't be viewed. Make sure to copy it before pressing "OK", and to store it securely.
- On the **Create a new webhook** blade, specify the following settings:
 - Name: **Stop VM0 webhook**
 - Enabled: **Yes**
 - Expires: set the date to the **12:00 PM tomorrow**

Microsoft Azure Infrastructure step by step



8. Accept the default Parameters and run settings and click **Create**.



9. On the **Stop-VM-textual-script** blade, click **Edit**.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left is the classic navigation menu. The main area displays the 'Stop-VM-textual-script' Runbook under 'Automation Accounts'. The 'Overview' tab is selected. The runbook details include:

- Resource group: Server-VNET
- Account: AutomationLab
- Location: South Central US
- Subscription name: MSDN Platforms
- Status: Published
- Runbook type: PowerShell Runbook
- Last modified: 3/19/2018 2:37 AM

The 'Details' pane shows a single job entry.

10. At the top of the script, add the following:

```
param (
    [object]$WebhookData
)
if ($WebhookData -ne $null) {
    $WebhookName = $WebhookData.WebhookName
    Write-Output "Runbook started via $WebhookName"
}
```

The screenshot shows the 'Edit PowerShell Runbook' screen for the 'Stop-VM-textual-script' runbook. The left sidebar lists 'CMDLETS', 'RUNBOOKS', and 'ASSETS'. The main pane contains the PowerShell script code:

```
param (
    [object]$WebhookData
)
if ($WebhookData -ne $null) {
    $WebhookName = $WebhookData.WebhookName
    Write-Output "Runbook started via $WebhookName"
}
$c = Get-AutomationConnection -Name 'AzureRunAsConnection'
Add-AzurermAccount -ServicePrincipal -Tenant $c.TenantId `
    -ApplicationID $c.ApplicationId -CertificateThumbprint $c.CertificateThumbprint
$vm = Get-AutomationVariable -Name 'Web1'
$rg = Get-AutomationVariable -Name 'ResourceGroup'
Stop-AzureRMVM -Name $vm -ResourceGroupName $rg -Force
```

11. Verify that the script looks as follows and click **Publish**.

```
param (
    [object]$WebhookData
)
if ($WebhookData -ne $null) {
```

```

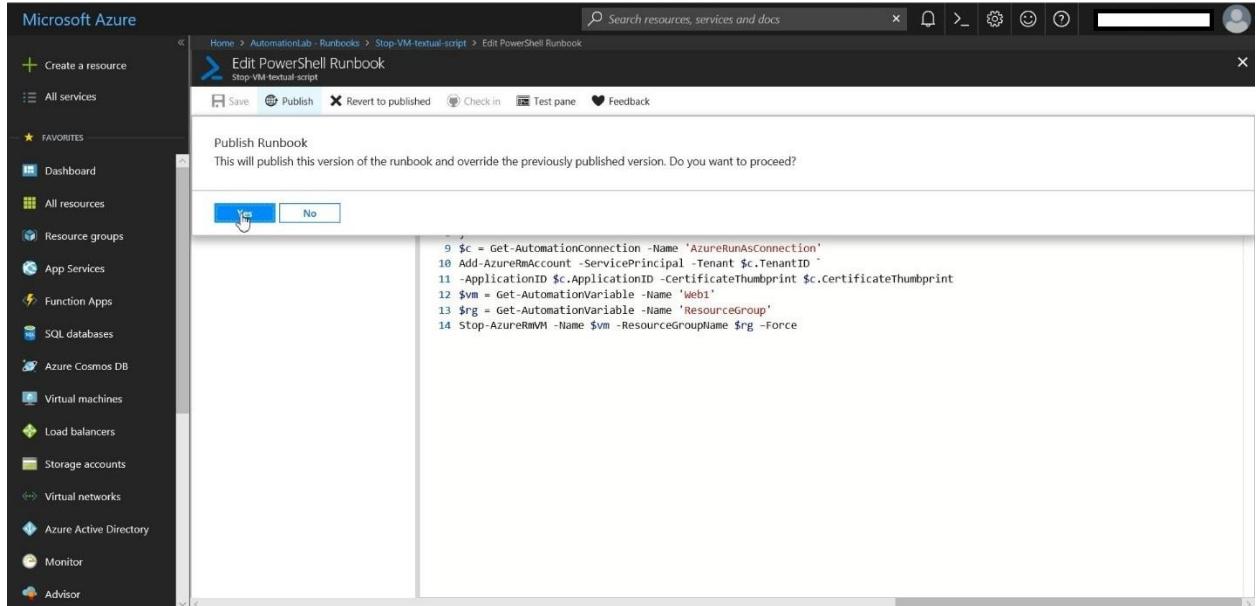
$WebhookName = $WebhookData.WebhookName
Write-Output "Runbook started via $WebhookName"

}

$c = Get-AutomationConnection -Name 'AzureRunAsConnection'
Add-AzureRmAccount -ServicePrincipal -Tenant $c.TenantID ` 
-ApplicationID $c.ApplicationID -CertificateThumbprint $c.CertificateThumbprint
$vm = Get-AutomationVariable -Name 'VM0'
$rg = Get-AutomationVariable -Name 'ResourceGroup'
Stop-AzureRmVM -Name $vm -ResourceGroupName $rg -Force

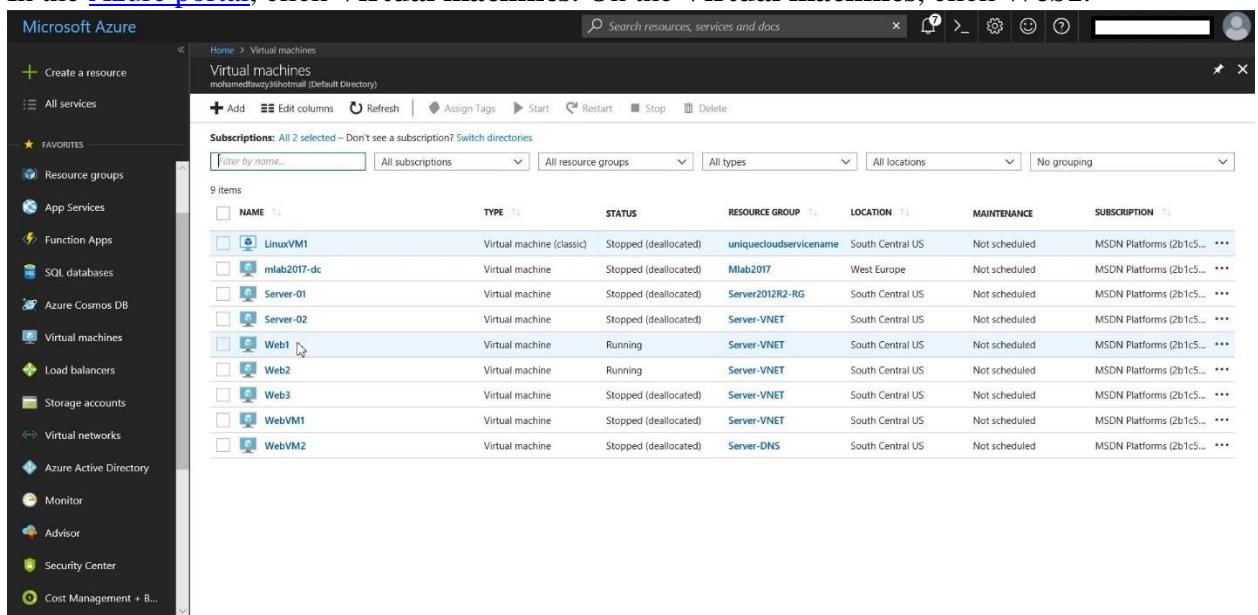
```

12. Click Publish. Click Yes when prompted to confirm.



Step 2: Configure alerts for Azure virtual machines

1. In the [Azure portal](#), click **Virtual machines**. On the **Virtual machines**, click **Web1**.



Microsoft Azure Infrastructure step by step

2. On the Web1 blade, click Alert rules.

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation bar includes 'Create a resource', 'All services', 'FAVORITES' (with 'Resource groups' selected), 'App Services', 'Function Apps', 'SQL databases', 'Azure Cosmos DB', 'Virtual machines' (selected), 'Load balancers', 'Storage accounts', 'Virtual networks', 'Azure Active Directory', 'Monitor', 'Advisor', 'Security Center', and 'Cost Management + B...'. The main content area is titled 'Web1' under 'Virtual machines'. It shows resource details: Resource group (change) Server-VNET, Status Running, Location South Central US, Subscription (change) MSDN Platforms, Subscription ID 2b1c5659-ba44-4ada-be9-b53a07460773, Computer name Web1, Operating system Windows, Size Standard A2 (2 vcpus, 3.5 GB memory), Public IP address 13.84.175.192, Virtual network/subnet Server-VNet/Server-Subnet, and DNS name mweb1.southcentralus.cloudapp.azure.com. Below these details are two line charts: 'CPU (average)' and 'Network (total)'. The 'CPU (average)' chart shows a peak around 2:45 AM at 13.97%. The 'Network (total)' chart shows a sharp spike in both 'NETWORK IN' and 'NETWORK OUT' at approximately 2:45 AM.

3. Click Add metric alert.

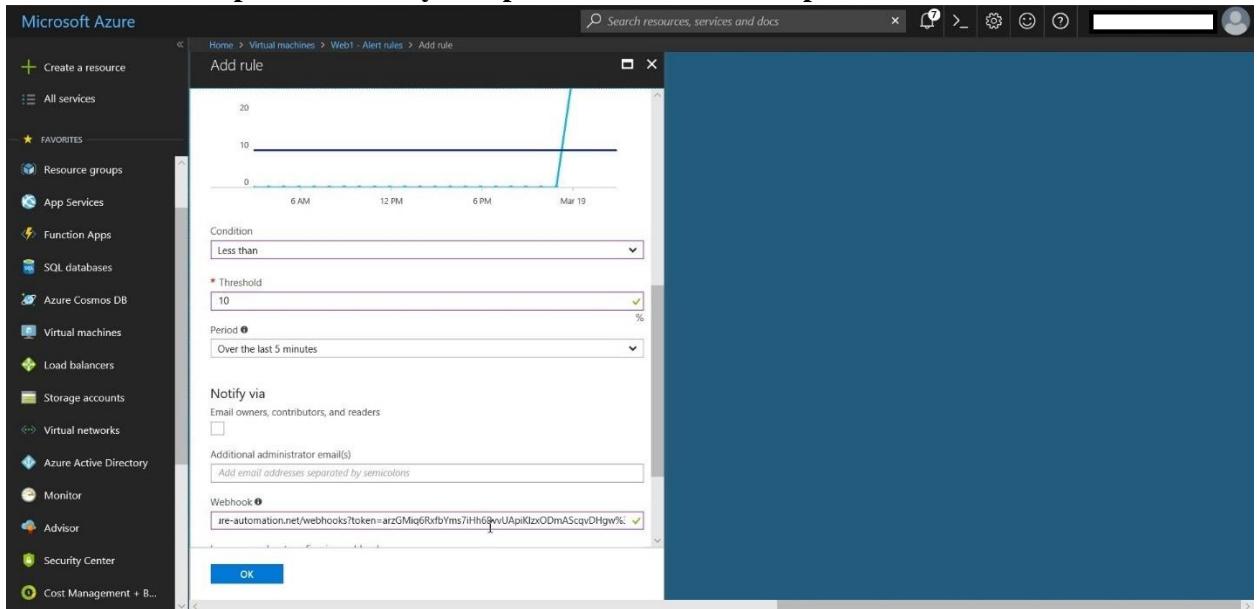
The screenshot shows the 'Web1 - Alert rules' blade. The left navigation menu is identical to the previous screenshot. The main content area is titled 'Web1 - Alert rules'. It features several buttons: '+ Add metric alert' (highlighted in blue), '+ Add activity log alert', '+ Near real time metrics alert (Preview)', '+ Add log search alert (Preview)', and 'Columns'. Below these are dropdown menus for 'Subscription' (MSDN Platforms), 'Source' (All sources), 'Resource group' (Server-VNET), 'Resource type' (Virtual machines), and 'Resource' (Web1). A table titled 'NAME STATUS CONDITION RESOURCE GROUP RESOURCE LAST FIRED' is present but contains no data. At the bottom, there is a message 'No results to display'.

4. On the Alert rule blade, specify the following and click OK:

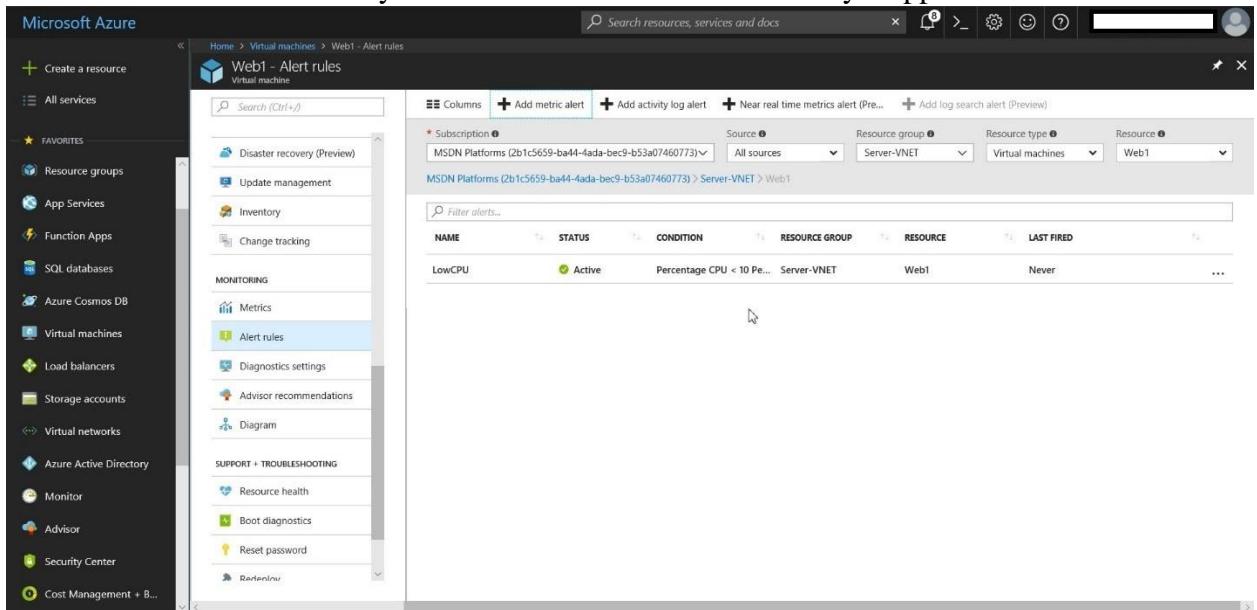
- Name: **LowCPU**
- Description: **blank**
- Alert on: **Metrics**
- Subscription: <your subscription name>
- Resource group: **Server-VNET**
- Resource: **Web1**
- Metric: **Percentage CPU**
- Condition: **Less than**
- Threshold: **10**
- Period: **Over the last 5 minutes**

Microsoft Azure Infrastructure step by step

- Email owners, contributors, and readers: *leave the checkbox cleared*
- Webhook: **paste the URL you copied into Windows Notepad earlier in this exercise**



5. Make sure that you are not using Web1 to ensure that its CPU utilization is below 10%. Wait a few minutes and verify that the VM has been automatically stopped.



6. You can verify that this was the result of the execution of an Automation runbook by navigating to the **Stop-VM-textual-script** blade and clicking the **Jobs** tile.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes 'Create a resource', 'All services', 'FAVORITES' (Storage accounts, Virtual networks, Azure Active Directory, Monitor, Advisor, Security Center, Cost Management + B..., Help + support, DNS zones, Recovery Services vaults, Cloud services (classic), CDN profiles, Media services, Automation Accounts), and 'Automation Accounts'. The main content area displays the 'Stop-VM-textual-script' Runbook under 'Automation Accounts > AutomationLab - Runbooks'. The 'Overview' tab is selected. The 'Essentials' section shows the runbook's status as 'Published', type as 'PowerShell Runbook', and last modified on '3/19/2018 2:49 AM'. The 'Details' section shows a single job entry.

7. On the **Jobs** blade, you should see the entry representing the job that was triggered by the alert. Click that entry to display its blade.

The screenshot shows the 'Jobs' blade for the 'Stop-VM-textual-script' runbook. The left sidebar has the same navigation as the previous screenshot. The main area lists one job entry:

STATUS	CREATED	LAST UPDATED
Running	3/19/2018 3:06 AM	3/19/2018 3:06 AM

8. On the job's blade, click the **Output** tile.

Microsoft Azure Infrastructure step by step

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes 'Create a resource', 'All services', 'FAVORITES' (Storage accounts, Virtual networks), 'Azure Active Directory', 'Monitor', 'Advisor', 'Security Center', 'Cost Management + B...', 'Help + support', 'DNS zones', 'Recovery Services vaults', 'Cloud services (classic)', 'CDN profiles', 'Media services', and 'Automation Accounts'. The main content area displays a job titled 'Stop-VM-textual-script 3/19/2018 3:06 AM'. The 'Essentials' tab is selected, showing the Job ID (9ffd59f4-e3ff-40d5-aa35-8ca55aa32989), Job status (Completed), Run As (User), and Run on (Azure). Below this is the 'Overview' section, which includes an 'Input' box (containing '1'), an 'Output' box (with a 'Logs' button), and summary counts for Errors (0) and Warnings (0). The 'Output' blade is open on the right, showing the message 'Runbook started from webhook Stop Web1'.

9. On the **Output** blade, view the messages, including the one stating **Runbook started from webhook Stop Web1**

This screenshot shows the 'Output' blade for the 'Stop-VM-textual-script' job. The blade header says 'Output Stop-VM-textual-script 3/19/2018 3:06 AM'. The main content area displays the message 'Runbook started from webhook Stop Web1'. To the right, there is a detailed log table:

RequestID	IsSuccess	StatusCode	StatusPhrase	ReasonPhrase
True	OK	OK		

APPENDIX

Firewall Ports & Protocols for Hybrid Identity

This is a [technical reference](#) on the required ports and protocols for implementing a hybrid identity solution. Use the following illustration and refer to the corresponding table.

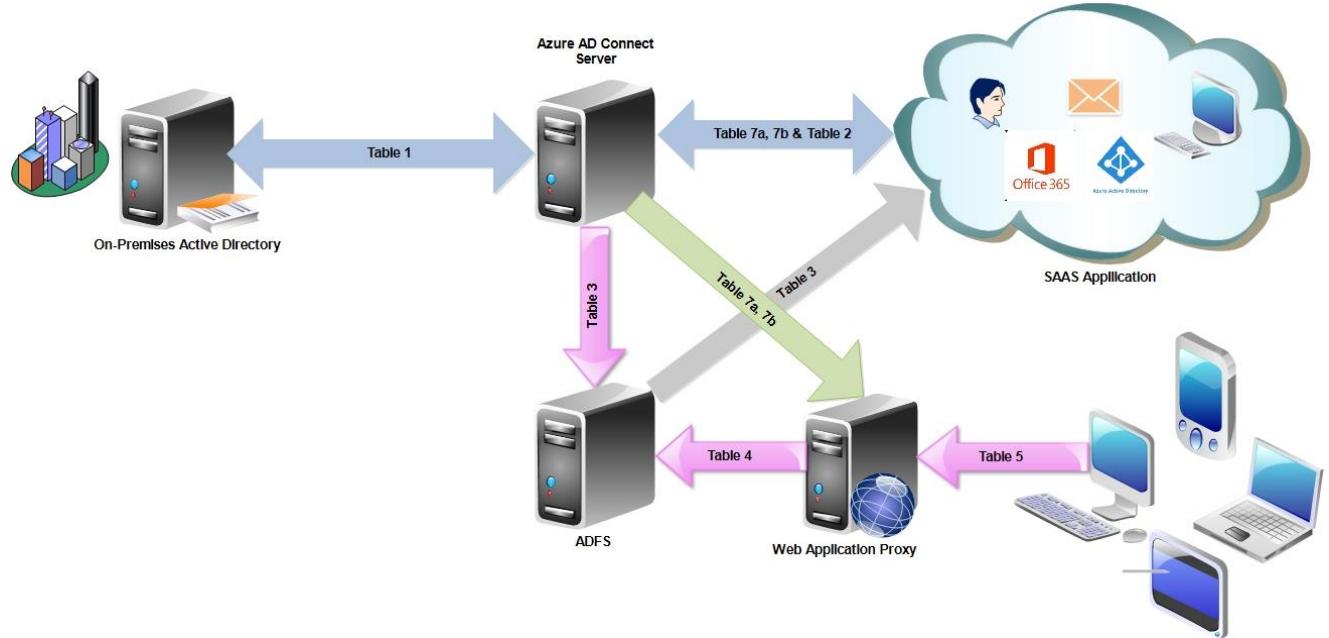


Table 1 - Azure AD Connect and On-premises AD

This table describes the ports and protocols that are required for communication between the Azure AD Connect server and on-premises AD.

Protocol	Ports	Description
DNS	53 (TCP/UDP)	DNS lookups on the destination forest.
Kerberos	88 (TCP/UDP)	Kerberos authentication to the AD forest.
MS-RPC	135 (TCP/UDP)	Used during the initial configuration of the Azure AD Connect wizard when it binds to the AD forest, and also during Password synchronization.
LDAP	389 (TCP/UDP)	Used for data import from AD. Data is encrypted with Kerberos Sign & Seal.
RPC	445 (TCP/UDP)	Used by Seamless SSO to create a computer account in the AD forest.
LDAP\SSL	636 (TCP/UDP)	Used for data import from AD. The data transfer is signed and encrypted. Only used if you are using SSL.
RPC	49152- 65535 (Random high RPC Port)(TCP/UDP)	Used during the initial configuration of Azure AD Connect when it binds to the AD forests, and during Password synchronization.

Table 2 - Azure AD Connect and Azure AD

This table describes the ports and protocols that are required for communication between the Azure AD Connect server and Azure AD.

Protocol	Ports	Description
HTTP	80 (TCP/UDP)	Used to download CRLs (Certificate Revocation Lists) to verify SSL certificates.
HTTPS	443(TCP/UDP)	Used to synchronize with Azure AD.

For a list of URLs and IP addresses you need to open in your firewall, see [Office 365 URLs and IP address ranges](#).

Table 3 - Azure AD Connect and AD FS Federation Servers/WAP

This table describes the ports and protocols that are required for communication between the Azure AD Connect server and AD FS Federation/WAP servers.

Protocol	Ports	Description
HTTP	80 (TCP/UDP)	Used to download CRLs (Certificate Revocation Lists) to verify SSL certificates.
HTTPS	443(TCP/UDP)	Used to synchronize with Azure AD.
WinRM	5985	WinRM Listener.

Table 4 - WAP and Federation Servers

This table describes the ports and protocols that are required for communication between the Federation servers and WAP servers.

Protocol	Ports	Description
HTTPS	443(TCP/UDP)	Used for authentication.

Table 5 - WAP and Users

This table describes the ports and protocols that are required for communication between users and the WAP servers.

Protocol	Ports	Description
HTTPS	443(TCP/UDP)	Used for device authentication.
TCP	49443(TCP)	Used for certificate authentication

Table 6a - Pass-through Authentication with SSO

The following tables describes the ports and protocols that are required for communication between the Azure AD Connect and Azure AD.

Protocol	Ports	Description
HTTP	80	Enable outbound HTTP traffic for security validation such as SSL. Also needed for the connector auto-update capability to function properly.
HTTPS	443	Enable outbound HTTPS traffic for operations such as enabling and disabling of the feature, registering connectors, downloading connector updates, and handling all user sign-in requests.

In addition, Azure AD Connect needs to be able to make direct IP connections to the [Azure data center IP ranges](#).

Table 6b - Password Hash Sync with SSO

The following tables describes the ports and protocols that are required for communication between the Azure AD Connect and Azure AD.

Protocol	Ports	Description
HTTPS	443(TCP/UDP)	Enable SSO registration (required only for the SSO registration process).

In addition, Azure AD Connect needs to be able to make direct IP connections to the [Azure data center IP ranges](#). Again, this is only required for the SSO registration process.

Table 7a - Ports and Protocols for Azure AD Connect Health agent for (AD FS/Sync) and Azure AD

The following tables describe the endpoints, ports, and protocols that are required for communication between Azure AD Connect Health agents and Azure AD

Protocol	Ports	Description
HTTPS	443(TCP/UDP)	Outbound
Azure Service Bus	5671(TCP/UDP)	Outbound

Table 7b - Endpoints for Azure AD Connect Health agent for (AD FS/Sync) and Azure AD

The following tables describe the endpoints, ports, and protocols that are required for communication between Azure AD Connect Health agents and Azure AD

For a list of endpoints, see [the Requirements section for the Azure AD Connect Health agent](#).

Firewall Ports for Windows Azure Pack

Windows Azure Pack for Windows Server is a hybrid cloud solution that brings Windows Azure technologies to your datacenter. It lets Microsoft customers offer a rich, self-service, multi-tenant cloud on your datacenter's hardware at no additional cost.

Windows Azure Pack automatically sets the following Windows firewall ports. If you use other firewall software, you must manually set the ports.

Windows Azure Pack services	Required firewall port	Scope
Admin API	30004	Any IP address
Management portal for administrators	30091	Any IP address
Authentication site (for management portal for tenants)	30071	Any IP address
Configuration site	30101	Local subnet
Monitoring	30020	Any IP address
MySQL resource provider	30012	Any IP address
SQL Server or MySQL resource provider	30010	Any IP address
Tenant API	30005	Any IP address
Tenant public API	30006	Any IP address
Management portal for tenants	30081	Any IP address
Usage	30022	Any IP address
WebAppGallery	30018	Any IP address
Windows authentication site (for management portal for administrators and Admin API)	30072	Any IP address

Reference

TechNet Microsoft

- <http://technet.microsoft.com/en-us/evalcenter/dn205297.aspx>
- <https://docs.microsoft.com/en-us/azure/>
- <https://azure.microsoft.com/en-us/>

Other articles

This eBook is part of a series of articles dedicated to Implementing Azure Solution and Cloud services.

They are written and hosted on Mai Ali's Blog <http://expertslab.wordpress.com>

- How to Install Operation Manager 2012R2 using PowerShell
- Clone an Azure Web App to a different Azure region
- Configure an Azure Web App Authentication
- Configure an Azure Web app
- Monitoring Lync Server using Operations Manager
- Enable Proxy Agent for all SCOM Agents
- Install and Import Management Pack from Disk