

## Azure Administrator (AZ-104) | Lab Guide

Version 22.9

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## Contents

Identity in the Cloud.....	4
The Azure Active Directory (Microsoft identity as a service solution) .....	4
Creating a new directory (Tenant).....	4
Creating a new user.....	5
Bulk User Creation.....	6
Managing user options and permissions .....	6
Upgrade Azure AD to Premium P2 .....	8
Governance and Compliance.....	11
Azure subscription types .....	11
Cost Management .....	11
Resource Tags (Azure resources to logically organize) .....	11
Azure Policy .....	12
Role-based access control (RBAC) .....	14
All members of Global admins.....	14
Azure Virtual Machines .....	16
Creating Virtual Machines in the Portal.....	16
Creating a Virtual Machine with PowerShell .....	23
Azure Administration.....	26
Azure Resource Manager .....	26
Managing Resources from ARM .....	26
Resource Manager Locks.....	26
Moving Resources .....	27
Removing Resources and Resource Groups .....	28
Resource Limits .....	29
Manage Azure Resources using cloud shell.....	29
connect from local PowerShell.....	29
Through cloud shell .....	30
Azure CLI and Working with Azure CLI Locally.....	30
ARM Templates .....	31
Intersite Connectivity .....	37

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# Azure Administrator (AZ-104) | Lab Guide

---

Peering lab.....	37
Network Traffic Management .....	39
Network Routing .....	39
Configuring Azure Firewall.....	39
Network Routing and Endpoints.....	44
System Routes .....	44
Creating User defined Route .....	44
Azure Load Balancers .....	47
Azure Storage .....	55
Creating an Azure Storage account .....	55
Data Protection .....	61
Backup Azure VMs.....	61
Backup files and folders.....	68
Azure Site Recovery.....	79
Configuring ASR for on-premises resources .....	79
Failover and migrating the VM .....	87

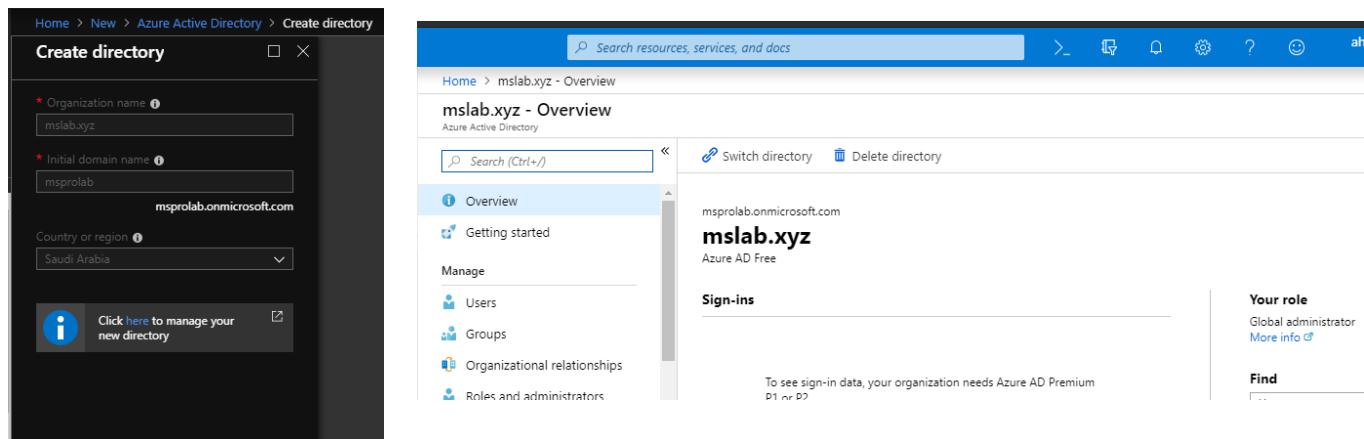
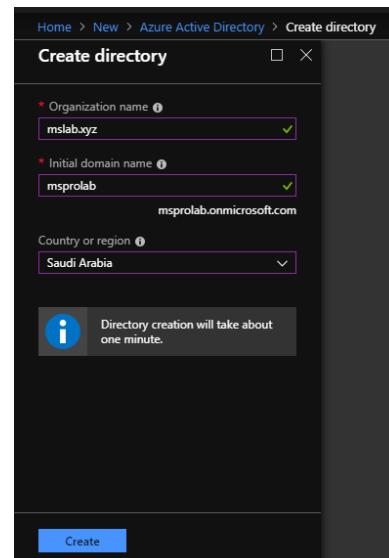
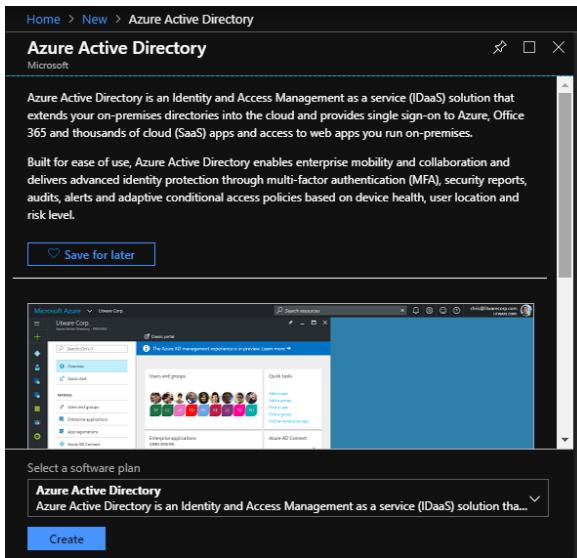
## Identity in the Cloud

**Important Note:** As of now, everything related to Azure AD has been updated to Microsoft Entra ID. The configurations and functionalities remain the same.

AAD is a cloud-based directory and identity management service that provides application access management and identity protection. It's often referred to as **IaaS**.

- **Azure Active Directory Free:** Basic identity and access management features for users and groups.
- **Azure Active Directory Basic:** Enhanced user productivity with application access and self-service capabilities.
- **Azure Active Directory Premium P1:** Advanced identity protection, self-service, and access management features.
- **Azure Active Directory Premium P2:** Comprehensive identity protection, advanced monitoring, and security governance.

### Creating a new directory (Tenant)



# Azure Administrator (AZ-104) | Lab Guide

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Now you can switch to the new tenant

The screenshot shows the Microsoft Azure portal interface. On the left, there's a sidebar with options like 'Create a resource', 'Home', 'Dashboard', 'All services', 'FAVORITES', 'All resources', 'Resource groups', and 'App Services'. The main content area has a title 'Switch directories' and a message stating: 'You are currently signed into the 'mslab.xyz' directory which does not have any subscriptions. You have other directories you can switch to or you can sign up for a new subscription.' There are several small, semi-transparent icons floating around the page.

## Creating a new user

The first screenshot shows the 'Users - All users' page in the Azure portal. It lists four existing users: 'ahmed' (Azure Active Directory), 'ahmed\_a' (Microsoft Account), 'Exchange' (Windows Server AD), and 'ubin' (Unknown). The second screenshot shows the 'User' configuration page for creating a new user named 'ahmed' with the email 'ahmed@bigitlab.onmicrosoft.com'. The 'Create' button is visible at the bottom.

# Azure Administrator (AZ-104) | Lab Guide

## Bulk User Creation

Home > Default Directory > Users | All users (Preview)

Default Directory - Azure Active Directory

All users (Preview)

Bulk operations: Bulk create, Bulk invite, Bulk delete, Download users, Add filters

This page includes previews available for your evaluation. View previews →

4 users found

Name	User principal name	User type	Directory synced	Identity issuer	Company name	Creation type
AB abdelwahed	abdelwahed@ahmedabd...	Member	No	ahmedabdulwahedoutlook		
AH ahd_abdelwahed...	ahd_abdelwahed_hottmai...	Guest	No	ahmedabdulwahedoutlook		Invitation
AA Ahmed Abdelwahed	ahmed_abdulwahed_outl...	Member	No	ahmedabdulwahedoutlook		
AH ahmedxxabdelwahed_g...	ahmedxxabdelwahed_g...	Guest	No	ahmedabdulwahedoutlook		Invitation

Home > Default Directory > Users | All users (Preview)

Default Directory - Azure Active Directory

All users (Preview)

Bulk operations: Bulk create, Bulk invite, Bulk delete, Download users, Add filters

This page includes previews available for your evaluation. View previews →

4 users found

Name	User principal name	User type	Directory synced	Identity issuer	Company name
AB abdelwahed	abdelwahed@ahmedabd...	Member	No	ahmedabdulwahedoutlook	

**Bulk create user**

1. Download csv template (optional)  
Download
2. Edit your csv file
3. Upload your csv file  
Select a file

Learn more about bulk import users

## Managing user options and permissions

Home > BIG IT Lab > Users - All users > ahmed - Profile

ahmed - Profile

Manage

- Profile
- Directory role
- Groups
- Applications
- Licenses
- Devices
- Azure resources
- Authentication methods

Activity

- Sign-ins
- Audit logs

Troubleshooting + Support

- Troubleshoot
- New support request

ahmed

ahmed@bigitlab.onmicrosoft.com

User Sign-ins: 100 (Feb 3, Feb 10, Feb 17, Feb 24)

Group memberships: 0

**Identity edit**

Name	First name	Last name
ahmed	---	---
User name	User type	
ahmed@bigitlab.onmicrosoft.com	Member	
Object ID	Source	
b34b27e1-8c13-4774-ab05-16...	Azure Active Directory	

**Job info**

# Azure Administrator (AZ-104) | Lab Guide

Home > BIG IT Lab > Users - All users > ahmed - Groups

**ahmed - Groups**  
User

Manage

- Profile
- Directory role
- Groups**
- Applications
- Licenses
- Devices
- Azure resources
- Authentication methods

Activity

« **Add** **Refresh**

NAME	GROUP TYPE
Not a member of any groups	

**Select Group**

Select **?**  
Search by name or email address

DN	DnsAdmins
DN	DnsUpdateProxy
EI	Exchange Install Domain Servers
ES	Exchange Servers

Selected group:  
**No group selected**

---

Home > BIG IT Lab > Users - All users > ahmed - Directory role

**ahmed - Directory role**  
User

Manage

- Profile
- Directory role**
- Groups
- Applications
- Licenses
- Devices
- Azure resources
- Authentication methods

Activity

- Sign-ins
- Audit logs

Troubleshooting + Support

- Troubleshoot
- New support request

« **Add role** **Remove**

**ROLE**

No directory roles assigned

**Directory roles**

ROLE	DESCRIPTION
Application administrator	Can create and manage all aspects of app registrations and enterprise apps.
Application developer	Can create application registrations independent of the 'Users can register applications' setting.
Authentication administrator	Can access to view, set and reset authentication method information for any non-admin user.
Billing administrator	Can perform common billing related tasks like updating payment information.
Cloud application administrator	Can create and manage all aspects of app registrations and enterprise apps except App Protection.
Cloud device administrator	Full access to manage devices in Azure AD.
Compliance administrator	Can read and manage compliance configuration and reports in Azure AD and Office 365.
Conditional Access administrator	Can manage conditional access capabilities.
Customer LockBox access approver	Can approve Microsoft support requests to access customer organizational data.
Desktop Analytics administrator	Can access and manage Desktop management tools and services.
Dynamics 365 administrator	Can manage all aspects of the Dynamics 365 product.
Exchange administrator	Can manage all aspects of the Exchange product.
Global administrator	Can manage all aspects of Azure AD and Microsoft services that use Azure AD identities.
Guest inviter	Can invite guest users independent of the 'members can invite guests' setting.
Information Protection administrator	Can manage all aspects of the Azure Information Protection product.

**Select**

# Azure Administrator (AZ-104) | Lab Guide

## Upgrade Azure AD to Premium P2

The screenshot shows the Azure Active Directory - Overview page for the directory 'ahmedabdulwahedoutlook179 (Default Directory)'. The left sidebar includes links for Overview, Getting started, Manage (Users, Groups, Organizational relationships, Roles and administrators, Enterprise applications, Devices, App registrations, App registrations (Preview), Application proxy, Licenses, Azure AD Connect, Custom domain names, Mobility (MDM and MAM)), and Help & support.

The main content area displays the 'Sign-ins' section, which states: 'To see sign-in data, your organization needs Azure AD Premium P1 or P2. Start a free trial.' Below this, there's a 'What's new in Azure AD' section listing 16 entries since November 15, 2018, with a link to view the archive. A list of changes includes: All services (16), Access Control (2), 3rd Party Integration (2), Identity Security & Protection (2), and Privileged Identity Management (2). A note indicates 'New Azure AD Application Proxy cookie settings'.

On the right side, there's a 'Your role' section stating 'Global administrator and 2 other roles' with a 'More info' link. It also shows 'Find' search fields for 'Users' and 'Search'. Under 'Azure AD Connect sync', it shows 'Status: Not enabled' and 'Last sync: Sync has never run'. A 'Create' section provides options for User, Guest user, Group, Enterprise application, and App registration. Finally, an 'Other capabilities' section lists Identity Protection, Privileged Identity Management, and Tenant restrictions.

The screenshot shows the Azure Marketplace 'New' page. The left sidebar lists categories: Get started, Recently created, Compute, Networking, Storage, Web, Mobile, Containers, Databases, Analytics, AI + Machine Learning, Internet of Things, Integration, Security, and Identity. The 'Identity' category is currently selected, indicated by a dashed blue border around its icon.

The main content area shows the 'Featured' section with several items: Azure Active Directory (Learn more), Azure AD Connect Health (Quickstart tutorial), Azure AD Cloud App Discovery (Quickstart tutorial), Azure AD Privileged Identity Management (Quickstart tutorial), Azure AD Identity Protection (Quickstart tutorial), Azure Information Protection (Quickstart tutorial), and Azure AD Domain Services (Quickstart tutorial).

The screenshot shows the 'Azure AD Identity Protection' blade. At the top, it says 'Home > New > Azure AD Identity Protection'. The main content area starts with a 'Directory' section for 'Scott's Test Account'. A note states: 'Scott's Test Account is already using Azure AD Identity Protection. Click here to access the dashboard. Select "Pin to dashboard" and click "Create" to pin Azure AD Identity Protection to your startboard.' Below this, a list of benefits is provided:

- Get a consolidated view of flagged users and risk events detected using machine learning algorithms
- Set risk-based Conditional Access policies to automatically protect your users
- Improve security posture by acting on vulnerabilities

At the bottom, there's a 'Blog post' link and a large blue 'Create' button.

# Azure Administrator (AZ-104) | Lab Guide

The screenshot shows the Azure AD Identity Protection - Overview page. The left sidebar includes sections for GENERAL (Overview, Getting started), INVESTIGATE (Users flagged for risk, Risk events, Vulnerabilities), CONFIGURE (MFA registration, User risk policy, Sign-in risk policy), and SETTINGS (Alerts, Weekly Digest, Pin to dashboard). The main area displays a summary: "Users flagged for risk" (0), "Risk events" (No risk events detected for the selected date range, 0 events from 08/25 to 10/24 across High, Medium, Low, and Closed levels), and "Vulnerabilities" (0).

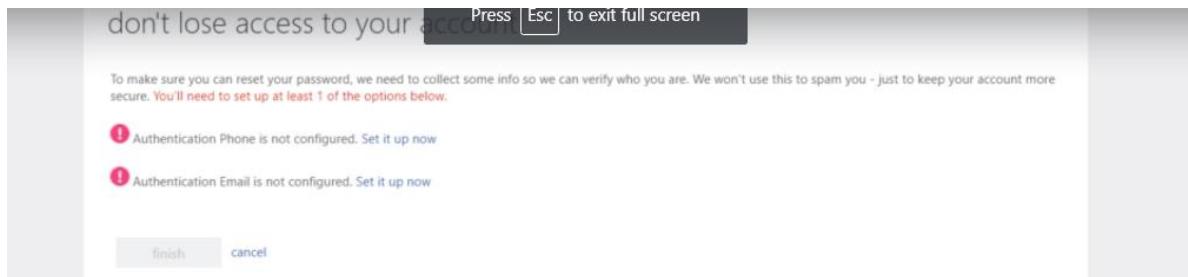
The screenshot shows the "Password reset - Authentication methods" configuration page. The left sidebar includes sections for Manage (Properties, Authentication methods, Registration, Notifications, Customization, On-premises integration), Activity (Audit logs), and Troubleshooting + Support (Troubleshoot). The main area shows the "Number of methods required to reset" set to 2, with a tooltip explaining it defines the number of alternate methods of identification a user must have to reset their password. Below this, a list of methods available to users is shown: Mobile app notification (preview), Mobile app code (preview), Email (selected), Mobile phone (selected), Office phone, and Security questions.

This screenshot is identical to the one above, showing the "Password reset - Authentication methods" configuration page with the "Number of methods required to reset" set to 2 and the same list of available methods (Email and Mobile phone selected).

# Azure Administrator (AZ-104) | Lab Guide

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First time you try to access with that user , you asked to setup MFA



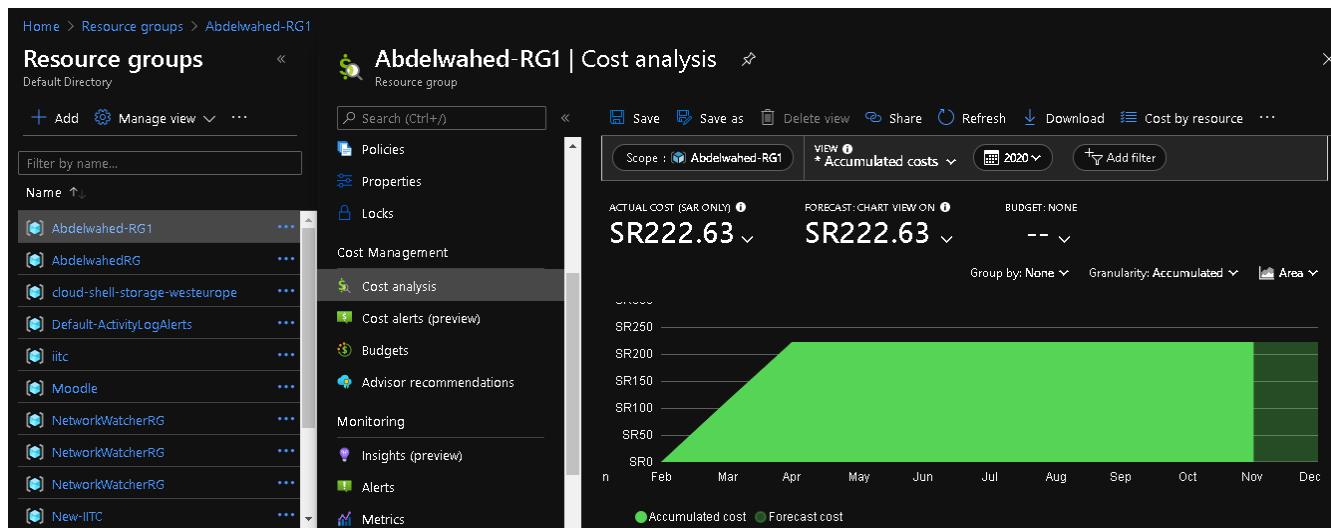
# Azure Administrator (AZ-104) | Lab Guide

## Governance and Compliance

### Azure subscription types

- Sponsored subscriptions
- Pay as you go
- Enterprise subscriptions
- Azure for Students subscription (100\$ per month for 12 months)

### Cost Management



### Resource Tags (Azure resources to logically organize)

The screenshot shows the Azure Tags blade, specifically the 'Resources with tag Environment : Test' section. It lists six resources that have been tagged with 'Environment : Test'. The resources include an App Service, an App Service Certificate, a Key vault, a Notification Hub, a Notification Hub Namespace, and a Service Plan. Each resource is categorized by its type, resource group, location, and subscription.

Name	Type	Resource group	Location	Subscription
abdelwahed	App Service	RG	Central US	MSDN Platforms
AbdelwahedCert	App Service Certificate	RG	Global	MSDN Platforms
AbdelwahedCertVault	Key vault	RG	Central US	MSDN Platforms
AbdelwahedHub (abdelwahednoti/Abdelwahed...)	Notification Hub	RG	Central US	MSDN Platforms
abdelwahednoti	Notification Hub Namespace	RG	Central US	MSDN Platforms
ServicePlan10a1fc46-a829	Service Plan	RG	Central US	MSDN Platforms

# Azure Administrator (AZ-104) | Lab Guide

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## Azure Policy

add your company governance through azure policies so you can detect any non-compliant resource easily.

The screenshot shows the 'Policy | Definitions' page in the Azure portal. The left sidebar includes links for Overview, Getting started, Compliance, Remediation, Authoring (with 'Definitions' selected), Exemptions, Related Services, Blueprints (preview), Resource Graph, and User privacy. The main area displays a table of policy definitions with columns for Name, Definition location, Policies, Type, and Category. A search bar at the top right is set to 'tag'. The 'Add a tag to resources' definition is highlighted with a red box.

Name	Definition location	Policies	Type	Category
Configure backup on VMs without a...			Built-in	Policy
Require a tag and its value on resou...			Built-in	Policy
Append a tag and its value to resou...			Built-in	Policy
[Preview]: Configure backup on VMs...			Built-in	Policy
Inherit a tag from the subscription if...			Built-in	Policy
Append a tag and its value to resou...			Built-in	Policy
Add a tag to resources			Built-in	Policy
Add or replace a tag on resources			Built-in	Policy
Add or replace a tag on subscriptio...			Built-in	Policy

The screenshot shows the 'Policy | Definitions' page with a search bar set to 'virtual machine'. The left sidebar includes links for Overview, Getting started, Compliance, Remediation, Authoring (with 'Definitions' selected), Exemptions, Related Services, Blueprints (preview), Resource Graph, and User privacy. The main area displays a table of policy definitions for virtual machines, with one definition highlighted by a red box.

Name	Definition location	Policies	Type
Deploy Dependency agent for Linux virtual machine scale sets			Built-in
Diagnostic logs in Virtual Machine Scale Sets should be enabled			Built-in
All network ports should be restricted on network security groups associated to your virtual machine			Built-in
Log Analytics agent should be installed on your virtual machine scale sets for Azure Security Center ...			Built-in
Log Analytics agent should be installed on your virtual machine for Azure Security Center monitoring			Built-in
The Log Analytics agent should be installed on virtual machines			Built-in
Management ports of virtual machines should be protected with just-in-time network access control			Built-in
Non-internet-facing virtual machines should be protected with network security groups			Built-in

The screenshot shows the 'Assign policy' step of the Azure Policy creation wizard. The 'Scope' field is set to 'MSDN Platforms/OHIRG03'. The 'Exclusions' field contains 'MSDN Platforms/OHIRG03/ohivm1'. The 'Assignment name' field is populated with the policy name. The 'Description' field is empty. At the bottom, there are 'Review + create', 'Cancel', 'Previous', and 'Next' buttons.

# Azure Administrator (AZ-104) | Lab Guide

Now you can see policy stat from resource portal

The screenshot shows the Azure Resource Portal interface. On the left, there's a sidebar for 'Virtual machines' with a message about the new resource browser. The main area is titled 'ohivm1 | Policies'. It displays an overall resource compliance of 0% (0 out of 1). A circular chart indicates 1 non-compliant resource. Below this, it shows 1 non-compliant initiative and 16 non-compliant policies. A detailed table lists one policy: 'ASC Default (sub...)' with scope 'MSDN Platforms', status 'Non-compliant', and 0% compliance (0 out of 1).

Also, from policy overview you can see summary for your all policies.

The screenshot shows the 'Policy' overview page. It displays an overall resource compliance of 0% (0 out of 14). A circular chart indicates 14 non-compliant resources. Below this, it shows 3 non-compliant initiatives and 61 non-compliant policies. A detailed table lists 61 policies under 'Non-compliant policies' with various scopes and statuses. There are also links to 'Learn about Policy' and 'Onboarding tutorial'.

# Azure Administrator (AZ-104) | Lab Guide

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## Role-based access control (RBAC)

is a system that provides fine-grained access management of Azure resources. Using Azure RBAC, you can segregate duties within your team and grant only the amount of access to users that they need to perform their jobs.

The screenshot shows the 'ahmedabdulwahedoutlook179 (Default Directory) - Roles and administrators' page. The left sidebar has 'Roles and administrators' selected. The main area displays a table of roles with columns 'ROLE' and 'DESCRIPTION'. The roles listed are: Application administrator, Application developer, Authentication administrator, Billing administrator, Cloud application administrator, Cloud device administrator, Compliance administrator, Conditional Access administrator, Customer LockBox access approver, Desktop Analytics administrator, Dynamics 365 administrator, Exchange administrator, Global administrator, and Guest inviter. Each role has a small yellow ribbon icon next to its name.

ROLE	DESCRIPTION
Application administrator	Can create and manage all aspects of app registrations and enterprise apps.
Application developer	Can create application registrations independent of the 'Users can register applications' setting.
Authentication administrator	Has access to view, set, and reset authentication method information for any non-admin user.
Billing administrator	Can perform common billing related tasks like updating payment information.
Cloud application administrator	Can create and manage all aspects of app registrations and enterprise apps except App Proxy.
Cloud device administrator	Full access to manage devices in Azure AD.
Compliance administrator	Can read and manage compliance configuration and reports in Azure AD and Office 365.
Conditional Access administrator	Can manage conditional access capabilities.
Customer LockBox access approver	Can approve Microsoft support requests to access customer organizational data.
Desktop Analytics administrator	Can access and manage Desktop management tools and services.
Dynamics 365 administrator	Can manage all aspects of the Dynamics 365 product.
Exchange administrator	Can manage all aspects of the Exchange product.
Global administrator	Can manage all aspects of Azure AD and Microsoft services that use Azure AD identities.
Guest inviter	Can invite guest users independent of the 'members can invite guests' setting.

All members of Global admins

The screenshot shows the 'Default Directory | Roles and administrators' page. The left sidebar has 'Roles and administrators' selected. The main area shows administrative roles. A search bar at the top right contains 'globa'. Below it, a table lists 'Role' and 'Description'. The 'Global administrator' row is highlighted with a red box and has a checked checkbox in the 'Role' column. The 'Global reader' row has an unchecked checkbox in the 'Role' column.

Role	Description
<input checked="" type="checkbox"/> Global administrator	Can manage all aspects of Azur
<input type="checkbox"/> Global reader	Can read everything that a glob

# Azure Administrator (AZ-104) | Lab Guide

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through assignments tab you can see which user has this role.

The screenshot shows the Azure portal interface for managing roles. The URL is Home > Default Directory > Global administrator. The title is "Global administrator | Assignments". On the left, there's a sidebar with "Manage" and "Assignments" selected. The main area has a search bar and a dropdown for "Type" (set to "All"). A table lists a single assignment: "Ahmed Abdulwahed" (UserName: ahmed\_abdulwahed@outlook.com, Type: User, Scope: Directory). The entire row for this assignment is highlighted with a red box.

## Assign RBAC using Azure PowerShell and CLI

When you have large numbers of role assignments, you may prefer to use Azure PowerShell or the CLI.

```
#Role assignment properties
$roleName = "Contributor"
$assigneeName = ahmed@abdelwahed.me
$resourceGroupName = "DBRG"
```

### Azure PowerShell

```
New-AzureRmRoleAssignment -RoleDefinitionName $roleName -SignInName $assigneeName -
ResourceGroupName $resourceGroupName
```

### CLI

```
az role assignment create --role $roleName --assignee $assigneeName --resource-group $resourceGroupName
```

## Azure Virtual Machines

Creating Virtual Machines in the Portal

The screenshot shows the Microsoft Azure portal interface. At the top, there's a dark header bar with the 'Azure services' section containing icons for 'Create a resource', 'Azure Active Directory', 'App Services', 'Virtual machines', 'Subscriptions', 'App Service Certificates', 'Resource groups', 'Storage accounts', 'SQL databases', and 'More services'. Below this is a 'Recent resources' section with columns for 'NAME', 'TYPE', and 'LAST VIEWED'. The main content area has a dark background and features a search bar at the top right labeled 'Search resources,'. Below the search bar, the word 'New' is displayed in large white letters. A secondary search bar says 'Search the Marketplace'. On the left, there's a sidebar with categories like 'Azure Marketplace' (with 'See all'), 'Get started', 'Recently created', 'Recently created', 'AI + Machine Learning', 'Analytics', 'Blockchain', 'Compute' (which is highlighted with a blue border), 'Containers', 'Databases', 'Developer Tools', and 'DevOps'. On the right, there's a 'Featured' section with cards for 'Virtual machine' (with 'Learn more'), 'SQL Server 2017 Enterprise Windows Server 2016' (with 'Learn more'), 'Reserved VM Instances' (with 'Quickstart tutorial'), 'Kubernetes Service' (with 'Quickstart tutorial'), and 'Service Fabric Cluster' (with 'Quickstart tutorial').

# Azure Administrator (AZ-104) | Lab Guide

in first page fill the requested info starting with resource group, VM name, Image source, user name and password to access and VM size

VM Size	Offering	Family	vCPUs	RAM	Data disks	Max IOPS	Temporary storage	Premium disk support	Cost/month
B1ls	Standard	General purpose	1	0.5	2	200	1	Yes	SAR 17.41
B1ms	Standard	General purpose	1	2	2	640	4	Yes	SAR 69.75
B1s	Standard	General purpose	1	1	2	3200	2	Yes	SAR 34.88
B2ms	Standard	General purpose	2	8	4	1920	16	Yes	SAR 278.44
B2s	Standard	General purpose	2	4	4	1280	8	Yes	SAR 139.22

# Azure Administrator (AZ-104) | Lab Guide

Home > New > Create a virtual machine

## Create a virtual machine

Virtual machine name \* ⓘ  ✓

Region \* ⓘ  ▾

Availability options ⓘ  ▾

Image \* ⓘ  ▾  
[Browse all public and private images](#)

Size \* ⓘ   
1 vcpu, 2 GiB memory  
[Change size](#)

**Administrator account**

Username \* ⓘ  ✓

Password \* ⓘ  ✓

Confirm password \* ⓘ  ✓

Home > New > Create a virtual machine

## Create a virtual machine

Inbound port rules

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

Public inbound ports \* ⓘ  None  Allow selected ports

Select inbound ports \*  ▾

**⚠️ This will allow all IP addresses to access your virtual machine. This is only recommended for testing. Use the Advanced controls in the Networking tab to create rules to limit inbound traffic to known IP addresses.**

**Save money**

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

Already have a Windows Server license? \*  Yes  No

[Review + create](#) [< Previous](#) [Next : Disks >](#)

# Azure Administrator (AZ-104) | Lab Guide

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Next Page its related for Disks options, you can add data disk from here or you can add it later

**Create a virtual machine**

**Disk options**

OS disk type \* ⓘ  ^

Enable Ultra Disk compatibility ⓘ

Standard HDD

Standard SSD

Premium SSD Premium SSD

**Data disks**

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

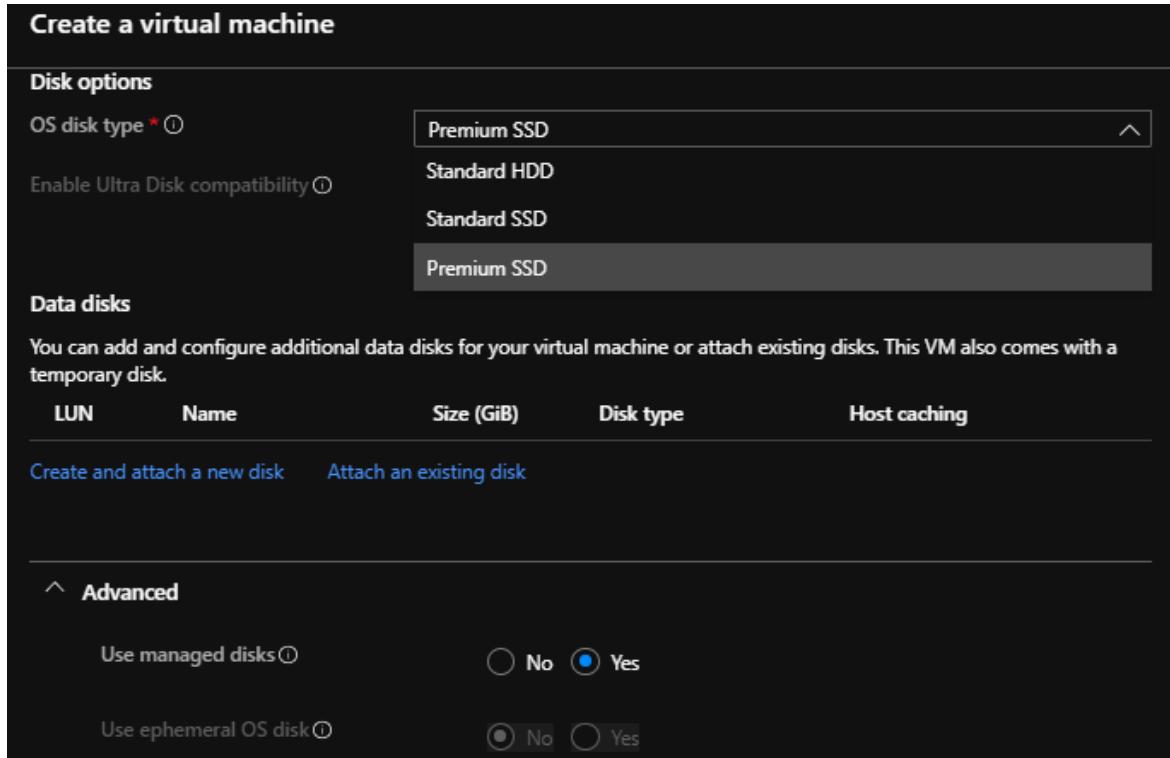
LUN	Name	Size (GiB)	Disk type	Host caching

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

^ Advanced

Use managed disks ⓘ  No  Yes

Use ephemeral OS disk ⓘ  No  Yes



Next page for network options

**Network interface**

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

Virtual network \* ⓘ  ▼

[Create new](#)

Subnet \* ⓘ  ▼

Public IP ⓘ  ▼

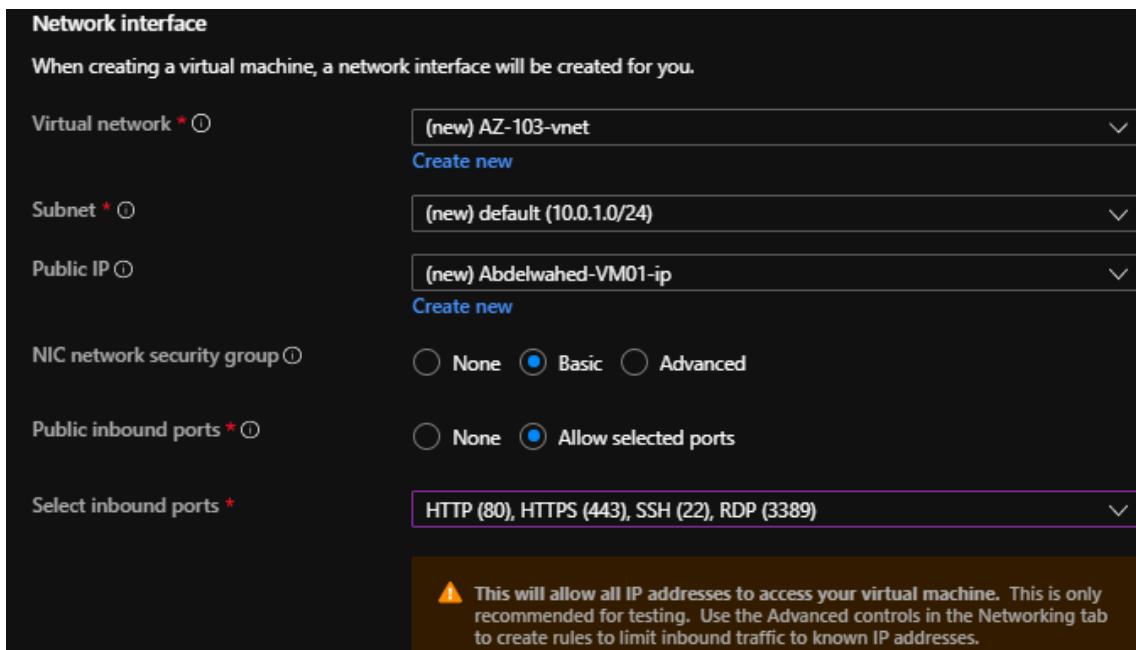
[Create new](#)

NIC network security group ⓘ  None  Basic  Advanced

Public inbound ports \* ⓘ  None  Allow selected ports

Select inbound ports \*  ▼

⚠ This will allow all IP addresses to access your virtual machine. This is only recommended for testing. Use the Advanced controls in the Networking tab to create rules to limit inbound traffic to known IP addresses.



Accelerated networking ⓘ  On  Off  
The selected VM size does not support accelerated networking.

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

Place this virtual machine behind an existing load balancing solution?  Yes  No

Next page is to add some management options like automatic shutdown machine

Home > New > Create a virtual machine

## Create a virtual machine

Basics Disks Networking Management Advanced Tags Review + create

Configure monitoring and management options for your VM.

**Azure Security Center**  
Azure Security Center provides unified security management and advanced threat protection across hybrid cloud workloads. [Learn more](#)

Your subscription is protected by Azure Security Center basic plan.

**Monitoring**

Boot diagnostics ⓘ  On  Off

OS guest diagnostics ⓘ  On  Off

Diagnostics storage account \* ⓘ

**Identity**

System assigned managed identity ⓘ  On  Off

**Identity**

System assigned managed identity  On  Off

**Auto-shutdown**

Enable auto-shutdown  On  Off

Shutdown time

Time zone

Notification before shutdown  On  Off

Email \*

**Backup**

Enable backup  On  Off

Now you can go direct to review your configuration and start deployment

Home > New > Create a virtual machine

### Create a virtual machine

✓ Validation passed

**Basics**

Subscription	MSDN Platforms
Resource group	(new) AZ-103
Virtual machine name	Abdelwahed-VM01
Region	(US) Central US
Availability options	No infrastructure redundancy required
Username	aabdelwahed
Public inbound ports	RDP, HTTP, HTTPS, SSH
Already have a Windows Server license?	No

**Disks**

OS disk type	Premium SSD
Use managed disks	Yes
Use ephemeral OS disk	No

**Networking**

Virtual network	(new) AZ-103-vnet
Subnet	(new) default (10.0.1.0/24)

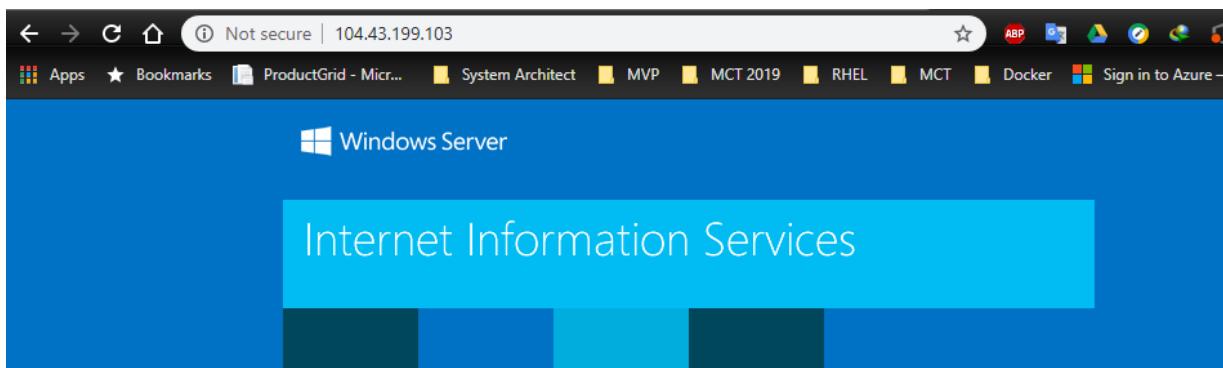
[Create](#) [< Previous](#) [Next >](#) [Download a template for automation](#)

# Azure Administrator (AZ-104) | Lab Guide

The screenshot shows two Azure management pages. The top page is titled 'CreateVm-MicrosoftWindowsServer.WindowsServer-201-20191123150855 - Overview' under 'Deployment'. It displays deployment details: Deployment name: CreateVm-MicrosoftWindowsServer.WindowsS...; Subscription: MSDN Platforms (b15d766f-8021-4866-bb33-5aad0...); Start time: 11/23/2019, 3:39:01 PM; Correlation ID: 839a182d-1815-4957-9...; Resource group: AZ-103. Below this, a table lists resources: abdelwahed-vm01442 (Microsoft.Network/network...), Abdelwahed-VM01-ip (Microsoft.Network/publicIP...), AZ-103-vnet (Microsoft.Network/virtualNetwork...), Abdelwahed-VM01-nsg (Microsoft.Network/networkSecurityGroup...), and az103diag591 (Microsoft.Storage/storageAccount...). The bottom page is titled 'Abdelwahed-VM01' under 'Virtual machines'. It shows the VM's status as 'Running' in 'AZ-103' resource group, with details like Public IP address 104.43.199.103, Private IP address 10.0.1.4, and DNS name Abdelwahed-VM01. The VM was created on 11/23/2019 at 3:39:01 PM.

now you can connect to it by RDP and install different services you need, in the following example will add web server role

```
Install-WindowsFeature -name Web-Server -IncludeManagementTools
```



# Azure Administrator (AZ-104) | Lab Guide

---

## Creating a Virtual Machine with PowerShell

First connect to your account using `Connect-AzAccount` and select specific subscription

```
[Administrator: Windows PowerShell]
Windows PowerShell
Copyright © Microsoft Corporation. All rights reserved.

Try the new cross-platform PowerShell https://aka.ms/pscore6
PS C:\WINDOWS\system32> Connect-AzAccount
Account          SubscriptionName TenantId          Environment
ahmed_abdulwahed@outlook.com MSDN Platforms [REDACTED] AzureCloud

PS C:\WINDOWS\system32> Get-AzResourceGroup

ResourceGroupName : AbdelwahedRG
Location         : centralus
ProvisioningState: Succeeded
Tags             :
ResourceId       : /subscriptions/[REDACTED]/resourceGroups/AbdelwahedRG

PS C:\WINDOWS\system32> Get-AzSubscription

Name          Id          TenantId          State
MSDN Platforms 61 [REDACTED] 0 [REDACTED] Enabled
MSDN Platforms a7 [REDACTED] 0 [REDACTED] Enabled
MSDN Platforms b1 [REDACTED] 0 [REDACTED] Enabled

PS C:\WINDOWS\system32> Connect-AzAccount -Subscription b1
Account          SubscriptionName TenantId          Environment
ahmed_ab [REDACTED] MSDN Platforms 061 [REDACTED] AzureCloud

PS C:\WINDOWS\system32> Connect-AzAccount -Tenant
```

```
$cred = Get-Credential
$vm = New-AzVMConfig -VMName az103vm -VMSize Standard_D1
$vm = Set-AzVMOperatingSystem ` 
>> -VM $vm ` 
>> -Windows ` 
>> -ComputerName az103vm ` 
>> -Credential $cred ` 
>> -ProvisionVMAgent -EnableAutoUpdate
$vm = Set-AzVMSourceImage ` 
>> -VM $vm ` 
>> -PublisherName MicrosoftWindowsServer ` 
>> -Offer WindowsServer ` 
>> -Skus 2016-Datacenter ` 
>> -Version latest

New-AzVm ` 
>> -ResourceGroupName "az103RG" ` 
>> -Name "az103vm" ` 
>> -Location "East US" ` 
>> -VirtualNetworkName "az103vnet" ` 
>> -SubnetName "az103subnet" ` 
>> -SecurityGroupName "az103SG" ` 
>> -PublicIpAddressName "az103PublicAddress" `
```

# Azure Administrator (AZ-104) | Lab Guide

>> -OpenPorts 80,3389

Finally, you will ask to provide login credential

```
Administrator: Windows PowerShell
Credential
PS C:\WINDOWS\system32> $vm = New-AzVMConfig -VMName az103vm -VMSize Standard_D1
Creating Azure resources
26% / [ooooooooooooooooooooooo]
Creating virtualMachines/az103vm.

>> -VM $vm
>> -PublisherName MicrosoftWindowsServer
>> -OfferWindowsServer
>> -Sku 2019-Datacenter
>> -Version latest
PS C:\WINDOWS\system32> New-AzVM
    ResourceGroupName : az103RG
    Name              : az103vm
    Location          : East US
    VirtualNetworkName : az103vnet
    SubnetName        : az103subnet
    SecurityGroupName : az103SG
    PublicIpAddressName : az103PublicAddress
    OpenPorts         : 80,3389

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

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

ResourceGroupName      : az103RG
Id                   : /subscriptions/b15d766f-8021-4866-bb33-5aad096ed079/resourceGroups/az103RG/providers/Microsoft.Compute/virtualMachines/az103vm
VmId                : 552f8344-5793-492a-9a8b-5363ae90bd98
Name                : az103vm
Type                : Microsoft.Compute/virtualMachines
Location            : eastus
Tags                : {}
HardwareProfile     : <VmSize>
NetworkProfile       : <NetworkInterfaces>
OSProfile            : <ComputerName, AdminUsername, WindowsConfiguration, Secrets, AllowExtensionOperations>
ProvisioningState    : Succeeded
StorageProfile       : <ImageReference, OsDisk, DataDisks>
FullyQualifiedDomainName : az103vm-685fe9.East US.cloudapp.azure.com
```

# Azure Administrator (AZ-104) | Lab Guide

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try to connect vm using `mstsc /v:PublicIP`

The screenshot shows the Azure portal interface for a virtual machine named "az103vm". The left sidebar contains navigation links: Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Settings, and Networking. The main content area displays the following details:

Setting	Value
Resource group (change)	: az103RG
Status	: Running
Location	: East US
Subscription (change)	: MSDN Platforms
Subscription ID	: b15 [REDACTED]
Computer name	: az103vm
Operating system	: Windows (Windows Server 2016 Datacenter)
Tags (change)	: Click here to add tags
Size	: Standard DS1 v2 (1 vcpus, 3.5 GiB memory)
Public IP address	: 40.76. [REDACTED]
Private IP address	: 192.168.1.4
Virtual network/subnet	: az103vnet/az103subnet
DNS name	: az103vm-cbe4d2.eastus.cloudapp.azure.com
Scale Set	: N/A

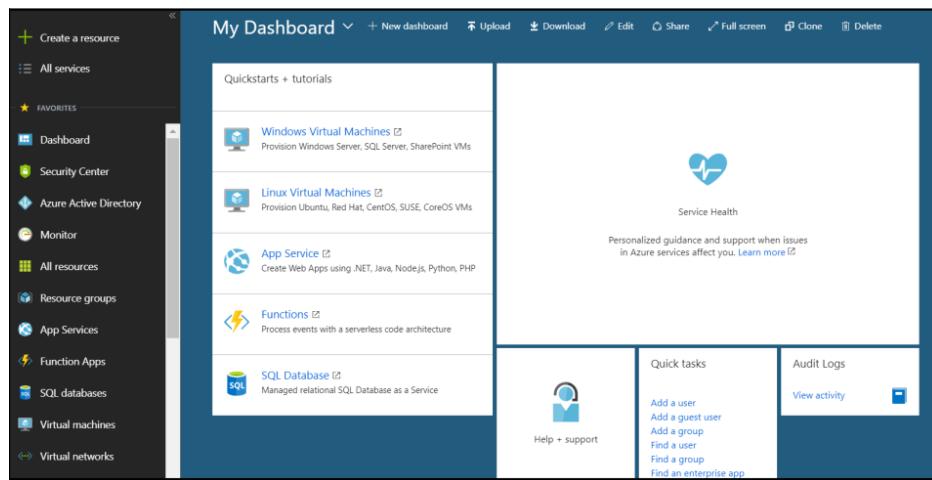
to clean up your resources use `Remove-AzResourceGroup -Name AZ103RG`

## Azure Administration

### Azure Resource Manager

Azure Resource Manager enables you to work with the resources in your solution as a group. You can deploy, update, or delete all the resources for your solution in a single, coordinated operation. You use a template for deployment and that template can work for different environments such as testing, staging, and production. Resource Manager provides security, auditing, and tagging features to help you manage your resources after deployment.

<https://portal.azure.com>



[ARM templates](#), Microsoft stepped up and really changed cloud business. In the cloud and in DevOps, the **Infrastructure as code (IaC)** concept is very important and that was exactly what ARM templates were. You are able to create an ARM template and **reuse it multiple times to create similar environments**. By doing so, you automated your infrastructure deployment steps and removed possible mistakes in the deployment and configuration process.

### Managing Resources from ARM

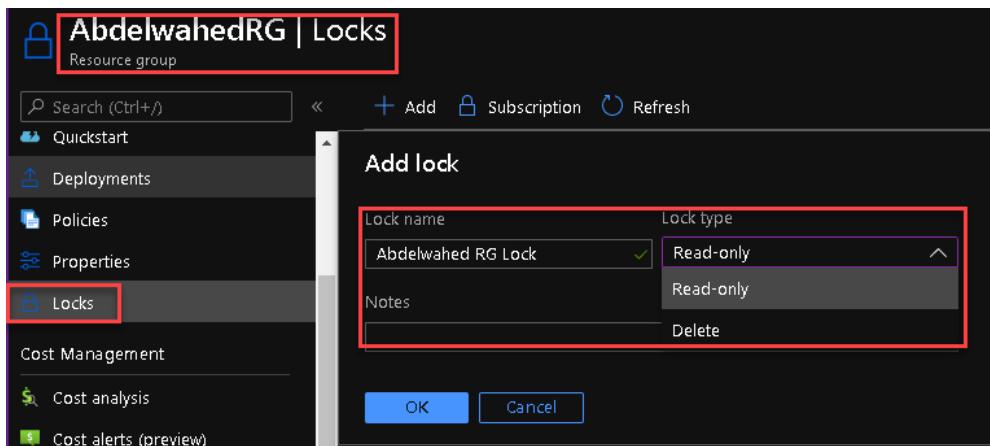
#### Resource Manager Locks

##### Lock types

There are two types of resource locks.

- **Read-Only locks**, which prevent any changes to the resource.
- **Delete locks**, which prevent deletion.

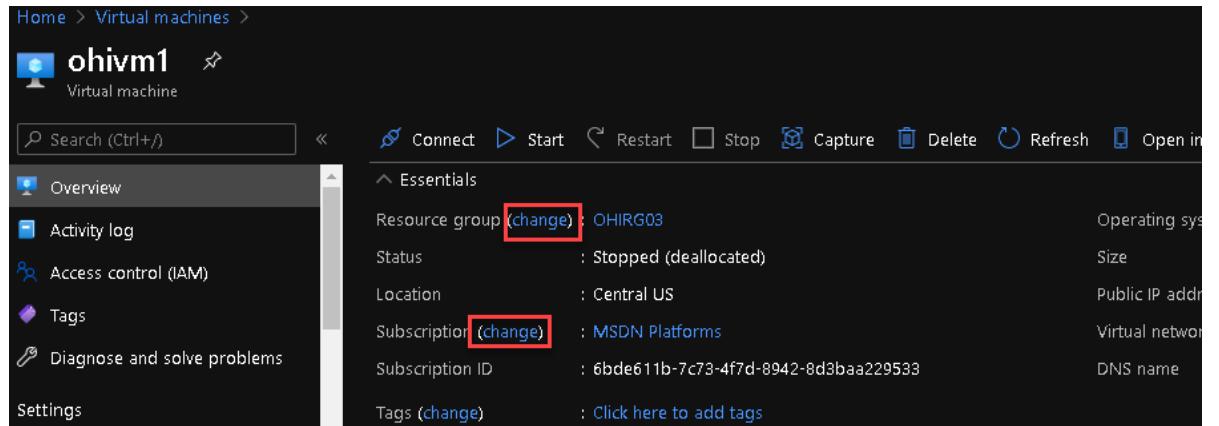
✓ Only the Owner and User Access Administrator roles can create or delete management locks.



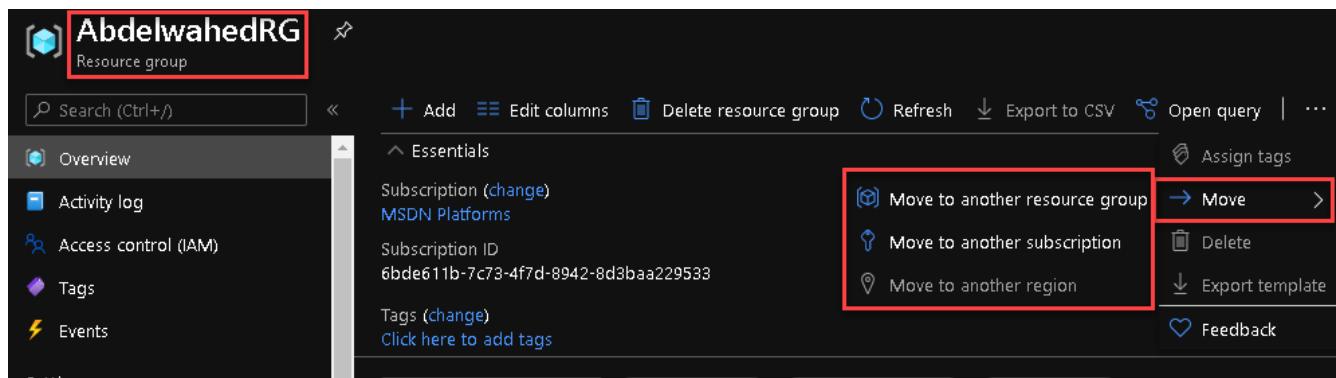
## Moving Resources

Sometimes you may need to move resources to either a new subscription or a new resource group in the same subscription.

The following way from resource.



Another way from resource group as shown down.



# Azure Administrator (AZ-104) | Lab Guide

---

## Removing Resources and Resource Groups

If you delete RG all resources included will removed also. Or you can delete some resources inside resource group.

The screenshot shows two separate operations in the Azure portal:

**Top Window (VM Deletion):**

- URL: Home > Abdelwahed-RG1 > TestVM2-ip
- Resource Type: Public IP address
- Action Bar: Associate, Dissociate, Move, Delete (Delete button highlighted with a red box)
- Essentials Panel:
  - Resource group (change): Abdelwahed-RG1
  - Location: West Central US
  - Subscription (change): MSDN Platforms
  - Subscription ID: b15d766f-8021-4866-bb33-5aad096ed079
  - Tags (change): Click here to add tags

**Bottom Window (Resource Group Deletion):**

- URL: Home > Resource groups > AbdelwahedRG
- Resource Group Name: AbdelwahedRG
- Action Bar: Add, Edit columns, Delete resource group (Delete button highlighted with a red box), Refresh
- Essentials Panel:
  - Subscription (change): MSDN Platforms
  - Subscription ID: 6bde611b-7c73-4f7d-8d3baa229533
  - Tags (change): Click here to add tags
- Modal Confirmation Dialog:
  - Question: Are you sure you want to delete "Abdel..."
  - Warning: Deleting the "AbdelwahedRG" resource group is irreversible. The action you're about to take can't be undone. Going further will delete this resource group and all the resources in it permanently.
  - Input Field: TYPE THE RESOURCE GROUP NAME: AbdelwahedRG (highlighted with a red box)
  - Affected Resources: There are 0 resources in this resource group that will be deleted.
  - Buttons: Delete (Delete button highlighted with a red box), Cancel

# Azure Administrator (AZ-104) | Lab Guide

## Resource Limits

You can use each Microsoft Azure resource up to its quota. Each subscription has separate quotas and usage is tracked per subscription. If you reach a quota cap, you can request an increase via [Help + Support](#).

The screenshot shows the 'Usage + quotas' section of the Azure portal. The left sidebar includes 'Programmatic deployment', 'Resource groups', 'Resources', 'Preview features', 'Usage + quotas' (which is selected and highlighted with a red box), 'Policies', 'Management certificates', 'My permissions', and 'Resource providers'. The main content area displays a table of quotas for 'Central US' location. The columns are 'Quota', 'Provider', 'Location', 'Usage', and 'Request Increase' (a button). Red boxes highlight the 'Request Quota Increase' button at the top, the 'Request Increase' button in the top right of the table header, the '8 services' dropdown, the 'Central US' location dropdown, and the entire table row for 'Storage Accounts'.

## Manage Azure Resources using cloud shell

connect from local PowerShell

The screenshot shows a Windows PowerShell ISE session. The code editor contains the following PowerShell commands:

```
1 Install-Module -name azuread
2 Get-Module azuread
3 Connect-AzureAD
```

The PowerShell window shows the execution of these commands:

```
PS C:\WINDOWS\system32> Install-Module -name azuread
Get-Module azuread
PS C:\WINDOWS\system32> Get-Module azuread
PS C:\WINDOWS\system32> Connect-AzureAD
```

The 'Commands' pane on the right lists available cmdlets, and the 'Output' pane shows the results of the 'Get-AzureADUser' command:

```
1 Get-AzureADUser
```

The screenshot shows the results of the 'Get-AzureADUser' command in a PowerShell window:

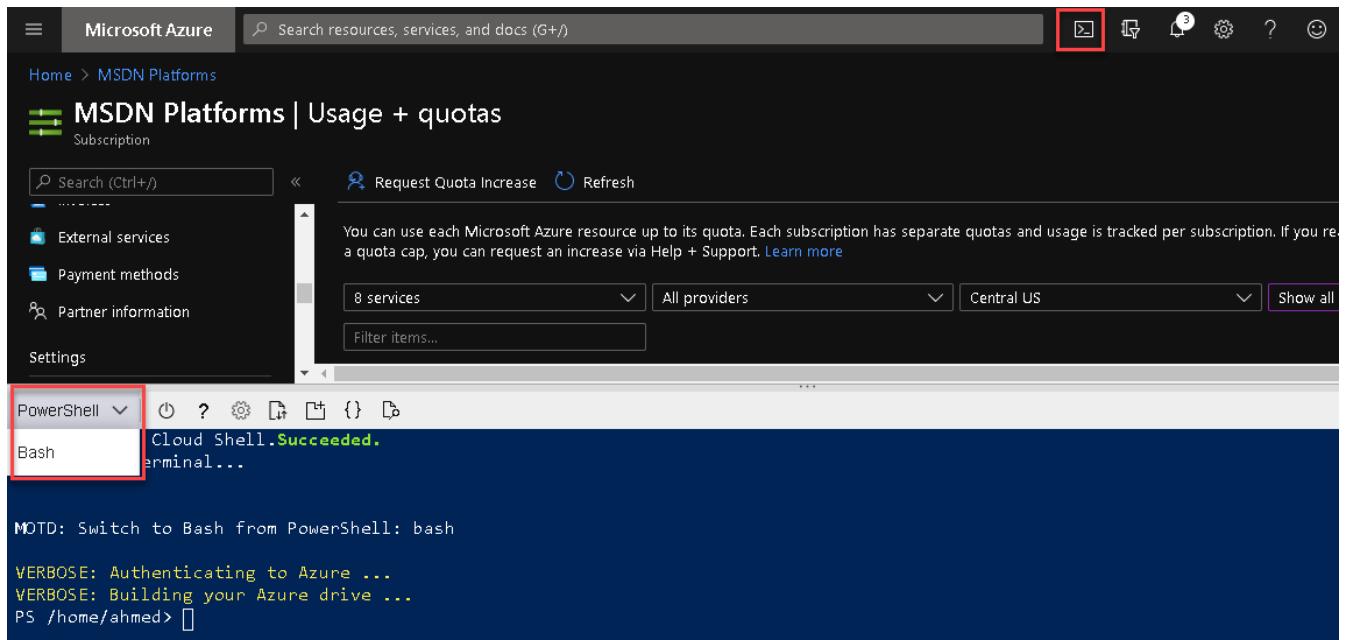
```
PS C:\WINDOWS\system32> Get-AzureADUser
ObjectID DisplayName UserPrincipalName
----- -----
ca351d00-8ca5-4b96-a431-95f40a7ca56 Ahmed Abdelwahed ahmed@IITCLab10.onmicrosoft.com
00d5b105-24fb-47f1-989b-74dd423f7ed0 A1i Mohamed a1i@iitc1Lab10.onmicrosoft.com
584875fc-38a2-4e88-bea3-0c251164d46c HR01 hr01@IITCLab10.onmicrosoft.com
498bd341-1f0b-40fa-898f-1a06dc73d8a HR02 hr02@IITCLab10.onmicrosoft.com
a7243505-6756-43ce-b76a-57d9e89c6054 HR03 hr03@IITCLab10.onmicrosoft.com
a7ff0ce1-c34c-4a17-8b3a-ce26777f402 HR04 hr04@IITCLab10.onmicrosoft.com
8039effb-4b54-45c1-89b4-c78f4831393f HR05 hr05@IITCLab10.onmicrosoft.com
a5e45c1a-57e6-4a63-96df-e6b0854ee2b IT01 it01@IITCLab10.onmicrosoft.com
3d90cbc5-a650-4dd0-8237-a84a95a96939 IT02 it02@IITCLab10.onmicrosoft.com
b86f1ba9-f514-49d5-9fa-f53c87946fb2 IT03 it03@IITCLab10.onmicrosoft.com
da051d88-2cba-4628-bc5a-b9195336f20c IT04 it04@IITCLab10.onmicrosoft.com
5e0a20d4-d15e-4b1e-a917-04e54dc272a5 IT05 it05@IITCLab10.onmicrosoft.com
```

# Azure Administrator (AZ-104) | Lab Guide

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- Get-AzureRmSubscription| gm
- help Get-AzureRmTenant -examples
- Get-AzureRmTenant
- Get-AzureRmNetworkUsage
- Get-Module -ListAvailable
- **Get-azurerm, commands start with azureRm**
- Install-Module az, install azure module
- Login-azureRmAccount

Through cloud shell



- az account list

## Azure CLI and Working with Azure CLI Locally

Azure CLI is a command-line program to connect to Azure and execute administrative commands on Azure resources. It runs on Linux, macOS, and Windows, and allows administrators and developers to execute their commands through a terminal or a command-line prompt, (or script!) instead of a web browser. For example, to restart a VM, you would use a command such as the following:

You can download this tool <https://aka.ms/installazurecliwindows> and install it.

- Az login
- Az account list
- az group list
- az vm list
- Az storage list
- Az vm create
- Az group create

# Azure Administrator (AZ-104) | Lab Guide

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## ARM Templates

There are two ways to deploy resource using ARM template

- 1- Download resource template and follow instruction below

```
Install-Module AzureRM
```

```
Install-Module Azure
```

```
Download and install Azure Cli
```

```
Set-ExecutionPolicy -Scope process -ExecutionPolicy Bypass
```

```
cd E:\ExportedTemplate
```

```
.\deploy.ps1 -subscriptionId a7632f95-7f0d-4342-adda-dbc286dbe45c -resourceGroupName AZ300RG - deploymentName az300deploy1
```

```
PS E:\ExportedTemplate>CreateVm-MicrosoftWindowsServer.WindowsServer-200-20190317161336> .\deploy.ps1 -subscriptionId a7632f95-7f0d-4342-adda-dbc286dbe45c -resourceGroupName AZ300 -deploymentName az300deploy1
Logging in...
Selecting subscription 'a7632f95-7f0d-4342-adda-dbc286dbe45c'
Account          SubscriptionName TenantId           Environment
-----          -----
ahmed_abdulwahed@outlook.com  MSDN Platforms   06163712-12c2-4ae9-8e69-73d879a0e896 AzureCloud

Name      : MSDN Platforms (a7632f95-7f0d-4342-adda-dbc286dbe45c) - ahmed_abdulwahed@outlook.com
Account   : ahmed_abdulwahed@outlook.com
Environment : AzureCloud
Subscription : a7632f95-7f0d-4342-adda-dbc286dbe45c
Tenant    : 06163712-12c2-4ae9-8e69-73d879a0e896
TokenCache : Microsoft.Azure.Commands.Common.Authentication.ProtectedFileTokenCache
VersionProfile :
ExtendedProperties : {}

Registering resource providers
Registering resource provider 'microsoft.network'

ProviderNamespace : Microsoft.Network
RegistrationState : Registered
ResourceTypes   : {virtualNetworks, natGateways, publicIPAddresses, networkInterfaces...}
Locations       : {West US, East US, North Europe, West Europe...}
ZoneMappings    :

Registering resource provider 'microsoft.compute'

ProviderNamespace : Microsoft.Compute
RegistrationState : Registered
ResourceTypes   : {availabilitySets, virtualMachines, virtualMachines/extensions, virtualMachineScaleSets...}
Locations       : {East US, East US 2, West US, Central US...}
ZoneMappings    :

Registering resource provider 'microsoft.devtestlab'

ProviderNamespace : Microsoft.DevTestLab
RegistrationState : Registered
ResourceTypes   : {labs, schedules, labs/virtualMachines, labs/serviceRunners...}
Locations       : {West Central US, Japan East, West US, Australia Central...}
ZoneMappings    :

Using existing resource group 'AZ300'
Starting deployment...
```

DEPLOYMENT NAME	STATUS	LAST MODIFIED	DURATION	RELATED EVENTS
az300deploy1	Deploying	3/17/2019, 10:31:42 PM	3 minutes 25 seconds	Related events
CreateVm-MicrosoftWindowsServer	Succeeded	3/17/2019, 4:20:08 PM	4 minutes 46 seconds	Related events

# Azure Administrator (AZ-104) | Lab Guide

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```
        "name": "RDP",
        "properties": {
            "priority": 360,
            "protocol": "TCP",
            "access": "Allow",
            "direction": "Inbound",
            "sourceAddressPrefix": "*",
            "sourcePortRange": "*",
            "destinationAddressPrefix": "*",
            "destinationPortRange": "3389"
        }
    }
]
subnetName String default AZ300-vnet
virtualNetworkName String
addressPrefixes Array [
    "10.0.0.0/24"
]
subnets Array [
{
    "name": "default",
    "properties": {
        "addressPrefix": "10.0.0.0/24"
    }
}
]
publicIpAddressName String AZ300-VM02-ip
publicIpAddressType String Dynamic
publicIpAddressSku String Basic
virtualMachineName String AZ300-VM02
virtualMachineRG String AZ300
osDiskType String Standard_LRS
virtualMachineSize String Standard_B1ms
adminUsername String aabdelwahed
adminPassword SecureString
autoShutdownStatus String Enabled
autoShutdownTime String 19:00
autoShutdownTimeZone String UTC
autoShutdownNotificationStatus String Disabled
autoShutdownNotificationLocale String en

outputs : {[adminUsername,
Microsoft.Azure.Commands.ResourceManager.Cmdlets.SdkModels.DeploymentVariable]}

outputsString :
Name Type Value
===== =====
adminUsername String aabdelwahed
```

Home > Resource groups > AZ300 - Deployments

**AZ300 - Deployments** Resource group

Search (Ctrl+)

Delete Cancel Redeploy View template Refresh

Filter by deployment name or resources in the deployment...

DEPLOYMENT NAME	STATUS	LAST MODIFIED	DURATION	RELATED EVENTS
az300deploy1	Succeeded	3/17/2019, 10:33:05 PM	4 minutes 42 seconds	Related events
CreateVm-MicrosoftWindowsServer	Succeeded	3/17/2019, 4:20:08 PM	4 minutes 46 seconds	Related events

az vm image list --output table

Home > Virtual machines

**Virtual machines** ahmedabdulwahed@outlook179 (Default Directory)

Add Reservations Edit columns Refresh Assign tags Start Restart Stop Delete Services

Subscriptions: All 3 selected - Don't see a subscription? Open Directory + Subscription settings

NAME	TYPE	STATUS	RESOURCE GROUP	LOCATION	MAINTENANCE STATUS	SUBSCRIPTION
AZ300-VM01	Virtual machine	Stopped (deallocated)	AZ300	Central US	-	MSDN Platforms (a7...)
AZ300-VM02	Virtual machine	Running	AZ300	Central US	-	MSDN Platforms (a7...)

# Azure Administrator (AZ-104) | Lab Guide

---

2- after deploy resource follow the instruction below

The screenshot shows the Azure Resource Groups blade. On the left, a list of resource groups is displayed, with 'AZ104' selected and highlighted by a red box. On the right, the 'AZ104 | Deployments' blade is shown, featuring a table of deployments. Two recent deployments are listed: 'CreateVm-MicrosoftWindowsServer.WindowsServer-201-20210103092521' with a status of 'Succeeded' and another deployment with the same name and status. A red box highlights the 'Deployments' link in the bottom navigation bar.

The screenshot shows the Azure Resource Manager template blade for the deployment 'CreateVm-MicrosoftWindowsServer.WindowsServer-201-20210103092521'. The 'Template' tab is selected and highlighted by a red box. A red box also highlights the 'Download' button. The blade displays the template structure with sections for Parameters, Variables, and Resources, and a large preview area showing the JSON code.

edit your Json file

# Azure Administrator (AZ-104) | Lab Guide

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search for **Custom deployment** in azure portal

Home >  
**Custom deployment**  
Deploy from a custom template

Select a template   Basics   Review + create

Automate deploying resources with Azure Resource Manager templates in a single, coordinated operation. Create or select a template below to get started. [Learn more about template deployment](#)

**Build your own template in the editor**

Common templates

- Create a Linux virtual machine
- Create a Windows virtual machine

Home > Custom deployment >  
**Edit template**  
Edit your Azure Resource Manager template

+ Add resource   ↑ Quickstart template   **Load file**   Download

Parameters (0)  
Variables (0)  
Resources (0)

```
1: {
2:   "$schema": "https://schema.management.azure.com/schemas/2015-01-01/deploymentTemplate.json#",
3:   "contentVersion": "1.0.0.0",
4:   "parameters": {},
5:   "resources": []}
```

And upload the .Json file and edit it

# Azure Administrator (AZ-104) | Lab Guide

## 3- Using QuickStart Templates

are Resource Manager templates provided by the Azure community?

[Azure Quickstart Templates \(microsoft.com\)](https://azure.microsoft.com/en-us/resources/templates/)

Select template

The screenshot shows the Azure Quickstart Templates gallery. At the top, a search bar and a 'See All' button are visible. Below, a message states '966 Quickstart templates are currently in the gallery.' A red box highlights this message. The page then displays four popular templates in cards:

- Create ssh-keys and store in KeyVault**: This template uses the deploymentScript resource to generate ssh keys and stores the private key in keyVault. It was created by Brian Moore.
- SAS Viya Quickstart Template for Azure**: This template deploys SAS Viya products on Azure, including SAS Visual Analytics 8.5 on Linux, SAS Visual Statistics 8.5 on Linux, and SA... It was created by SAS Software.
- VM Scale Set with autoscale running an IIS WebApp**: This template deploys a Windows VM Scale Set running IIS and a basic .NET MVC web app. It leverages the VMSS PowerShell DSC Extension. It was created by Jason Boeshart.
- DNS Forwarder VM**: This template shows how to create a DNS server that forwards queries to Azure's internal DNS servers. It is useful for setting up DNS resolution between virtual... It was last updated on 9/19/2020.

At the bottom of the page, a terminal window shows the command PS C:\Users\Anand> New-AzResourceGroupDeployment -Name NewVmDeployment -ResourceGroupName Prod\_IT -TemplateUri "C:\Users\Anand\Desktop\ARM Templates\NewVM.json". The command is part of a pipeline, and it prompts for values for parameters like adminUsername.

deploy directly to azure

[Templates](#) / Create a VM from Image Version

## Create a VM from Image Version

by Akshay Joshi  
Last updated: 3/2/2020

[Deploy to Azure](#)

[Browse on GitHub](#)

This template allows you to create Virtual Machines from an Image Version in a Shared Image Gallery. This template also deploys a Virtual Network, Public IP address, and a Network Interface. Please ensure that you have created an Image Version using Image Version 101 Template first.

This Azure Resource Manager template was created by a member of the community and not by Microsoft. Each Resource Manager template is licensed to you under a license agreement by its owner, who is not responsible for Resource Manager templates provided and licensed by community members and does not screen for security, compatibility, or performance. Community Resource Manager templates are provided AS IS without warranty of any kind.

### Parameters

PARAMETER NAME	DESCRIPTION
----------------	-------------

[Templates](#) / Create a VM from Image Version

## Create a VM from Image Version



by Akshay Joshi

Last updated: 3/2/2020

[Deploy to Azure](#)

[Browse on GitHub](#)

This template allows you to create a Virtual Machines from an Image Version in a Shared Image Gallery. This template also deploys a Interface. Please ensure that you have created an Image Version using Image Version 101 Template first.

This Azure Resource Manager template was created by a member of the community and not by Microsoft. Each Resource Manager template is licensed to you not responsible for Resource Manager templates provided and licensed by community members and does not screen for security, compatibility, or performance under any Microsoft support program or service, and are made available AS IS without warranty of any kind.

### Parameters

PARAMETER NAME	DESCRIPTION
adminUsername	Username for the Virtual Machine.

Also, you can edit the selected template to meet your goal.

The screenshot shows the 'Create a VM from Image Version' quickstart template in the Azure portal. It's a 'Basics' step. The template '101-vm-from-sig' is selected, showing 5 resources. The 'Edit template' button is highlighted with a red box. In the 'Deployment scope' section, the subscription 'MSDN Platforms (6bde611b-7c73-4f7d-8942-8d3baa229533)' is chosen. The 'Resource group' dropdown is empty, with 'Create new' as an option. In the 'Parameters' section, the region 'West US 2' is selected. At the bottom, the 'Review + create' button is highlighted with a red box, and there are navigation buttons for 'Previous' and 'Next'.

## Intersite Connectivity

### **Virtual Network Peering – VNet Peering**

You can connect virtual networks to each other with virtual network peering. Once virtual networks are peered, resources in both virtual networks can communicate with each other, with the same latency and bandwidth as if the resources were in the same virtual network.

#### **Peering lab**

Create 2 subnets inside one virtual network

Virtual network: 192.168.0.0/16

Subnet1: 192.168.10.0/24

Subnet2: 192.168.20.0/24

Now create 2 VMs:

VM1: is webserver1 connected to subnet1

VM2: is webserver2 connected to subnet2

Now test connectivity between both VMs (connected), this because the default NSG rule (check NSG rules)

**There is default routing between all subnets in same VNet**

There are two types of VNet peering.

- **Regional VNet peering** connects Azure virtual networks in the same region.
- **Global VNet peering** connects Azure virtual networks in different regions.

VNet1: 192.168.0.0/24

Subnet1: 192.168.10.0/24

Location: CentralUS

VNet2: 10.0.0.0/8

Subnet1: 10.0.0.0/8

Location: South Africa

You can connect these VNets using VNet peering as explained below

# Azure Administrator (AZ-104) | Lab Guide

The screenshot shows the Azure portal interface for managing a virtual network named "Abdelwahed-RG1-vnet". The left sidebar contains navigation links for Access control (IAM), Tags, Diagnose and solve problems, Settings (Address space, Connected devices, Subnets, DDoS protection, Firewall, Security, DNS servers), and Peerings. The main content area is titled "Abdelwahed-RG1-vnet | Peerings" and displays a table with one row: "Add a peering to get started". A red box highlights the "Peerings" link in the sidebar and the "Add" button at the top of the main content area.

The screenshot shows the "Add peering" configuration page for a virtual network named "Peeringlab-vnet". The form is divided into several sections:

- Peering link name \***: VNet1-VNet2-Peer
- Traffic to remote virtual network**:
  - Allow (default)
  - Block all traffic to the remote virtual network
- Traffic forwarded from remote virtual network**:
  - Allow (default)
  - Block traffic that originates from outside this virtual network
- Virtual network gateway or Route Server**:
  - Use this virtual network's gateway or Route Server
  - Use the remote virtual network's gateway or Route Server
  - None (default)
- Remote virtual network**
  - Peering link name \***: VNet1-VNet2-Peer
  - Virtual network deployment model**:
    - Resource manager
    - Classic
  - I know my resource ID
- Subscription \***: MSDN SC
- Virtual network \***: PeeringVnet2
- Traffic to remote virtual network**:
  - Allow (default)

A red box highlights the "Peering link name" field and the "Add" button at the bottom left.

## Network Traffic Management

### Network Routing

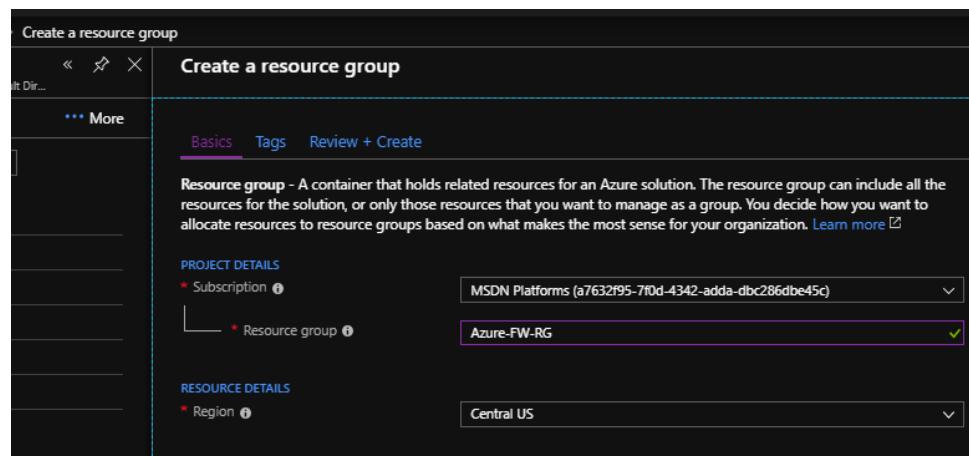
First, we will create firewall as a virtual appliance then we will learn how to route all traffic to it

**Azure Firewall** is a managed, cloud-based network security service that protects Azure Virtual Network resources. It is **Firewall as a Service** with built-in high availability and scalability. With Azure Firewall, you can create, enforce, and log application and network connectivity policies. Static public IP addresses for your virtual network resources allow outside firewalls to identify traffic originating from your virtual network. The service is integrated with Azure Monitor for logging and analytics.

### Configuring Azure Firewall

- Set up a network environment (Create Resource group, VNet and VM)
- Deploy a firewall
- Create a default route
- Configure RDP and internet through the firewall rules

#### Create a resource group

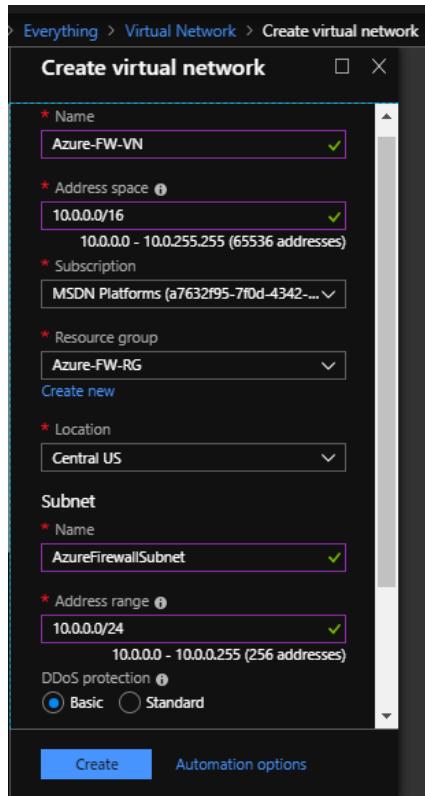


# Azure Administrator (AZ-104) | Lab Guide

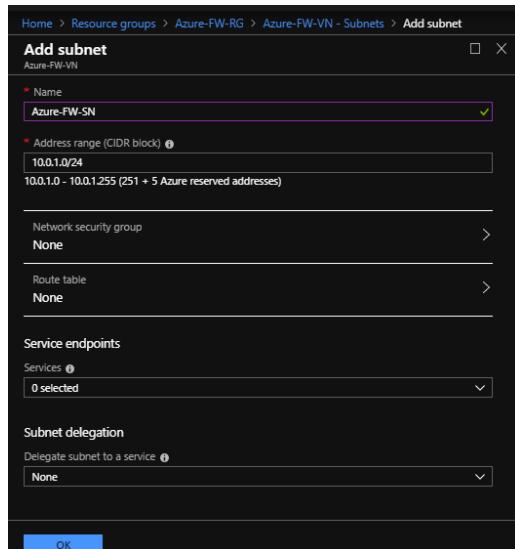
---

## Create a VNet

The minimum size of the AzureFirewallSubnet subnet is /26.



## Create additional subnets to associate it with firewall



# Azure Administrator (AZ-104) | Lab Guide

NAME	ADDRESS RANGE	AVAILABLE ADDRESSES	SECURITY GROUP
AzureFirewallSubnet	10.0.0.0/24	251	-
Azure-FW-SN	10.0.1.0/24	251	-

## Create virtual machines

Subscription: MSDN Platforms (a7632f95-710d-4342-adda-dbc286dbe45c)  
Resource group: Azure-FW-RG  
Virtual machine name: Azure-FW-VM  
Region: Central US  
Availability options: No infrastructure redundancy required  
Image: Windows Server 2016 Datacenter  
Size: Standard DS1 v2  
Administrator account: Username and Password  
Buttons: Review + create, Previous, Next : Disks >

Virtual network: Azure-FW-VN  
Subnet: Azure-FW-SN (10.0.1.0/24)  
Public IP: (new) Azure-FW-VM-PIP  
NIC network security group: Basic  
Public inbound ports: Allow selected ports (RDP, HTTP, HTTPS)  
Buttons: Review + create, Previous, Next : Management >

Note the private IP address. You'll use it later when you create the default route.

## Deploy the firewall

Subscription: MSDN Platforms (a7632f95-710d-4342-adda-dbc286dbe45c)  
Resource group: Azure-FW-RG  
Name: Azure-FW  
Region: Central US  
Virtual network: Azure-FW-VN (Azure-FW-RG)  
Public IP address: Create new  
Public IP address name: AzureFirewalls-PIP  
Public IP address SKU: Standard  
Buttons: Review + create, Previous, Next : Tags >, Download a template for automation

Subscription: MSDN Platforms  
Resource group: Azure-FW-RG  
Region: Central US  
Virtual network: Azure-FW-VN  
Address space: 10.0.0.0/16  
Public IP address: AzureFirewalls-PIP  
Buttons: Create, Previous, Download a template for automation

# Azure Administrator (AZ-104) | Lab Guide

The screenshot shows the Azure Firewall Overview page for the resource group 'Azure-FW-RG'. The left sidebar includes options like Overview, Activity log, Access control (IAM), Tags, Settings (Rules, Threat intelligence, Properties, Locks, Automation script), and Monitoring (Metrics). The main pane displays basic resource details: Location (Central US), Subscription (MSDN Platforms), Subscription ID (a7632f95-710d-4342-adda-dbc286dbe45c), and Tags (Click here to add tags). It also shows network information: Virtual network/subnet (Azure-FW-VN/AzureFirewallSubnet), Private IP address (10.0.0.4), Public IP address (AzureFirewalls-PIP), and Provisioning state (Succeeded).

Create a default route

From all services search for route table and after create Click **Refresh** then Click **Subnets > Associate**

The screenshot shows the Azure Route Table Overview page for the resource group 'Azure-FW-RG'. The left sidebar includes options like Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Settings (Configuration, Routes, Subnets, Properties, Locks, Automation script), Support + troubleshooting (Effective routes, New support request), and Metrics. The main pane displays basic resource details: Location (Central US), Subscription (MSDN Platforms), Subscription ID (a7632f95-710d-4342-adda-dbc286dbe45c), and Tags (Click here to add tags). It also shows sections for Routes (Search routes, NAME, ADDRESS PREFIX) and Subnets (Search subnets, NAME, ADDRESS RANGE). A separate dialog box titled 'Associate subnet' shows two items: '1 Virtual network Azure-FW-VN' and '2 Subnet Azure-FW-SN', both marked with green checkmarks.

Now all incoming traffic will be forwarded to the firewall so, now you can allow or deny network traffic coming to that subnet.

# Azure Administrator (AZ-104) | Lab Guide

Click **Routes > Add.**

The left screenshot shows the 'Add route' dialog for 'Azure-FW-RT'. It includes fields for Route name ('Azure-FW-Route'), Address prefix ('0.0.0.0/0'), Next hop type ('Virtual appliance'), and Next hop address ('10.0.0.4'). A note at the bottom says: 'Ensure you have IP forwarding enabled on your virtual appliance. You can enable this by navigating to the respective network interface's IP address settings.'

The right screenshot shows the 'Create route table' dialog for 'Azure-FW-RG'. It includes fields for Name ('Azure-FW-RT'), Subscription ('MSDN Platforms'), Resource group ('Azure-FW-RG'), Location ('Central US'), and Virtual network gateway route propagation ('Enabled').

Configure an application rule

From firewall under setting select Rules, n this lab allows incoming RDP. Also change rdp port from 3389 to 5555

The screenshot shows the 'Edit NAT rule collection' dialog for 'allow-rdp'. It has a priority of 100 and an action of Destination Network Address Translation (DNAT). The rules table lists two entries: 'allow-rdp' (TCP, port 3389 to 10.0.1.4 port 3389) and 'allow-rdp2' (TCP, port 5555 to 10.0.1.4 port 3389).

also

internet is  
blocked,

so we

have to

alloe

httpa nd https  
traffic.

The screenshot shows the 'Add application rule collection' dialog for 'allow-internet'. It has a priority of 200 and an action of Allow. The FQDN tags section shows 'allow-internet' with source addresses '\* 192.168.10.1, 192.168.10.0/24, 192.168.10.2 – 192.168.10.254' and target FQDNs 'www.microsoft.com, \* microsoft.com' with protocol http/https.

## Network Routing and Endpoints

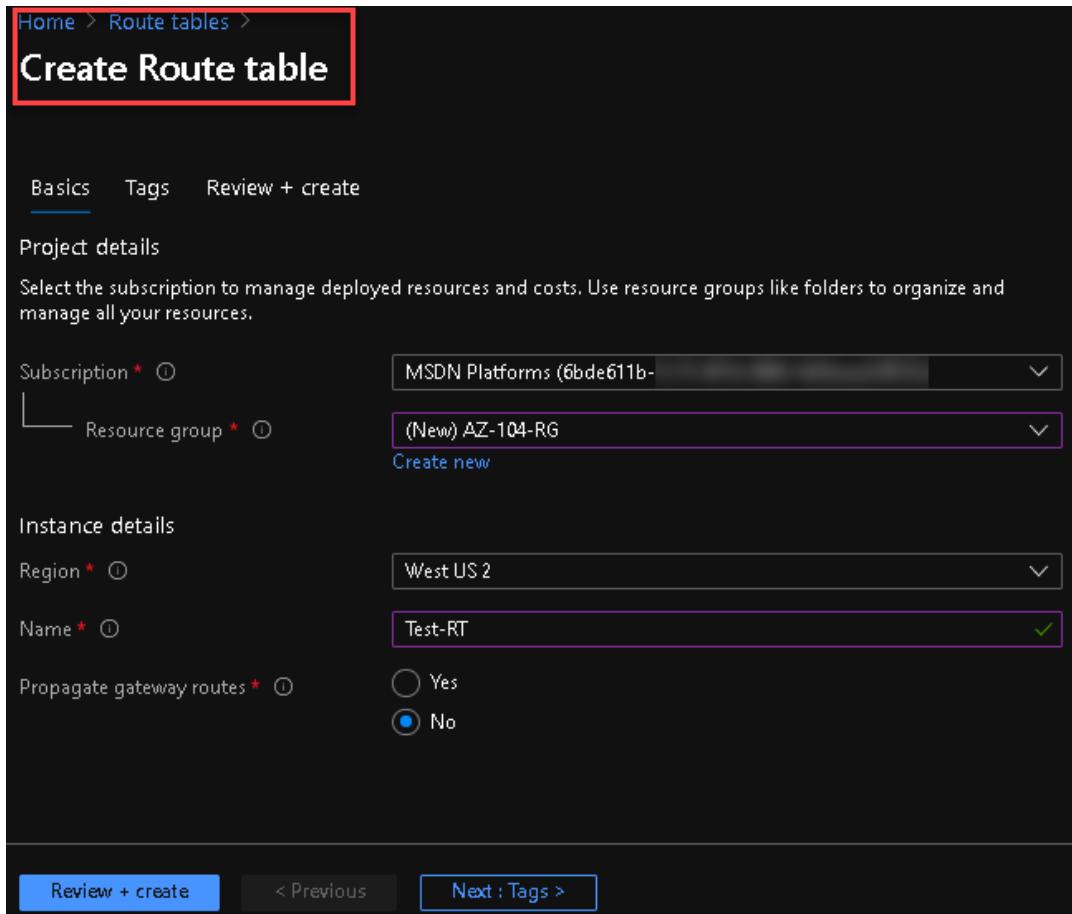
### System Routes

Azure uses **system routes** to direct network traffic between virtual machines, on-premises networks, and the Internet. The following situations are managed by these system routes:

- Traffic between VMs in the same subnet.
- Between VMs in different subnets in the same virtual network.
- Data flow from VMs to the Internet.
- Site-to-Site and ExpressRoute communication through the VPN gateway.

### Creating User defined Route

- 1- First create the routing table
- 2- Create routes



# Azure Administrator (AZ-104) | Lab Guide

Home > Microsoft.RouteTable-20201202170743 >

**Test-RT** Route table

Search (Ctrl+ /) Move Delete Refresh

Overview Activity log Access control (IAM) Tags Diagnose and solve problems

Configuration Routes Subnets Properties Locks

Automation Tasks (preview)

**Essentials**

Resource group (change) : AZ-104-RG  
Location : West US 2  
Subscription (change) : MSDN Platforms  
Subscription ID : 6bde611b-7c73-4f7d-8942-8d3baa229533  
Tags (change) : Click here to add tags

Associations : 0 subnet associations

**Routes**

Search routes

Name	Address prefix	Next hop type
No results.		

**Subnets**

Search subnets

Name	Address range	Virtual network
No results.		

Home > Test-RT >

## Add route

Test-RT

Route name \*

 ✓

Address prefix \* ⓘ

 ✓

Next hop type ⓘ

Virtual appliance

Virtual network gateway

Virtual network

Internet

Virtual appliance

None

# Azure Administrator (AZ-104) | Lab Guide

The screenshot shows the Azure portal interface for managing subnets. On the left, there's a sidebar with various navigation options like Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Configuration, Routes, and Subnets. The 'Subnets' option is selected and highlighted with a red box. The main content area is titled 'Test-RT | Subnets' and shows a table with one row: 'No results.' A large red box highlights the '+ Associate' button at the top right of the table.

or from VNet select subnet you want to associate to the new custom route

This screenshot shows the Azure portal interface for managing subnets within a specific virtual network named 'Mysite-vnet'. The sidebar on the left shows various resource categories. The 'Subnets' option under 'Virtual networks' is selected and highlighted with a red box. The main content area shows a table with one row: 'default' (Address range: 10.0.0.0/24, Available addresses: 250). A large red box highlights the '+ Associate' button at the top right of the table.

This screenshot shows the Azure portal interface for configuring a specific subnet named 'default' within a virtual network. The sidebar on the left shows various resource categories. The 'Subnets' option under 'Virtual networks' is selected. The main content area shows the subnet configuration details: Address range (CIDR block): 10.0.0.0/24 (10.0.0.0 - 10.0.0.255 (256 addresses)), Available addresses: 250, and Network security group: None. A dropdown menu labeled 'Associate' is open, showing options: 'None' (selected) and 'customroute'. This dropdown is highlighted with a red box.

# Azure Administrator (AZ-104) | Lab Guide

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## Azure Load Balancers

Create 3 VMs to host web server

Home > Virtual machines >

### Create a virtual machine

Based on the number of availability zones selected, 3 virtual machines will be created. The following settings will be applied to each virtual machine unless specified otherwise.

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

Create a virtual machine that runs Linux or Windows. Select an image from Azure marketplace or use your own customized image. Complete the Basics tab then Review + create to provision a virtual machine with default parameters or review each tab for full customization. [Learn more](#)

**Project details**

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

Subscription \* ⓘ MSDN 5C

Resource group \* ⓘ (New) LBLabs [Create new](#)

**Instance details**

Virtual machine names ⓘ web-1, web-2, web-3

3 virtual machines will be created with the names shown above. [Edit names](#)

Region \* ⓘ (US) Central US

**Availability options** ⓘ Availability zone

**Availability zone** \* ⓘ Zones 1, 2, 3

Based on your zone selection, we will place 3 virtual machines, one in each selected zone. It is highly recommended to place them behind a load balancing solution to make your configuration resilient. You can do this in the 'Networking' tab

Security type ⓘ Standard

Image \* ⓘ Windows Server 2019 Datacenter - Gen2

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

VM architecture ⓘ  x64  Arm64

Arm64 is not supported with the selected image.

Run with Azure Spot discount ⓘ

Size \* ⓘ Standard\_DS2\_v2 - 2 vcpus, 7 GiB memory (SAR 399.67/month)

[See all sizes](#)

# Azure Administrator (AZ-104) | Lab Guide

**Administrator account**

Username \* ⓘ ahmed ✓

Password \* ⓘ ..... ✓

Confirm password \* ⓘ ..... ✓

**Inbound port rules**

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

Public inbound ports \* ⓘ

None  
 Allow selected ports

Select inbound ports \* HTTP (80), RDP (3389)

**⚠️ This will allow all IP addresses to access your virtual machine.** This is only recommended for testing. Use the Advanced controls in the Networking tab to create rules to limit inbound traffic to known IP addresses.

Basics Disks Networking Management Monitoring Advanced Tags Review + create

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

#### Disk options

OS disk type \* ⓘ

Standard SSD (locally-redundant storage) ✓

If performance is critical for your workloads, choose Premium SSD disks for lower latency, higher IOPS and bandwidth, and bursting. [Learn more ↗](#)

Delete with VM ⓘ



Enable encryption at host ⓘ



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

Encryption type \*

(Default) Encryption at-rest with a platform-managed key ✓

Enable Ultra Disk compatibility ⓘ



Ultra disk is not supported for the selected VM size Standard DS2 v2 in Central US.

# Azure Administrator (AZ-104) | Lab Guide

---

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

Define network connectivity for your virtual machine by configuring network interface card (NIC) settings. You can control ports, inbound and outbound connectivity with security group rules, or place behind an existing load balancing solution.

[Learn more ↗](#)

## Network interface

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

Virtual network \* ⓘ

(new) LBLabs-vnet

[Create new](#)

Subnet \* ⓘ

(new) default (10.2.0.0/24)

Public IP ⓘ

(new) web-1-ip, web-2-ip, web-3-ip

[Configure IP address](#)

i 3 public IPs will be created with the names shown above.

NIC network security group ⓘ

None

Basic

Advanced

Delete public IP and NIC when VM is deleted ⓘ



Enable accelerated networking ⓘ



## Load balancing

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

Load balancing options ⓘ

None

Azure load balancer

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

Application gateway

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

Select a load balancer \* ⓘ

No existing load balancers in current subscription and location.

[Create a load balancer](#)

## Create a load balancer

X

Load balancer name \*

Type \* ⓘ

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

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

Protocol \* ⓘ

**TCP**

UDP

### Rules

- Rules
- Load balancer rule
  - Inbound NAT rule

#### Load balancer rule

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

Port \* ⓘ

Backend port \* ⓘ

#### Inbound NAT rule

An inbound NAT rule forwards incoming traffic sent to a selected IP address and port combination to a specific virtual machine.

Frontend port range start \* ⓘ

Backend port \* ⓘ

**Create**

Cancel

# Azure Administrator (AZ-104) | Lab Guide

---

Delete public IP and NIC when VM is deleted

Enable accelerated networking

## Load balancing

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

Load balancing options (1)

- None
- Azure load balancer
  - Supports all TCP/UDP network traffic, port-forwarding, and outbound flows.
- Application gateway
  - Web traffic load balancer for HTTP/HTTPS with URL-based routing, SSL termination, session persistence, and web application firewall.

Select a load balancer (1)

▼

[Create a load balancer](#)

[Review + create](#)

< Previous

Next : Management >

## Virtual machines ↗ ...

Default Directory (ahmedabdulwahedoutlook179.onmicrosoft.com)

[+ Create](#) [Switch to classic](#) [Reservations](#) [Manage view](#) [Refresh](#) [Export to CSV](#) [Open query](#) [Assign tags](#)

[Filter for any field...](#)

Subscription equals **all**

Type equals **all**

Resource group equals **all**

Location equals **all**

[+ Add filter](#)

<input type="checkbox"/> Name ↑↓	Type ↑↓	Subscription ↑↓	Resource group ↑↓	Location ↑↓	Status ↑↓
<input type="checkbox"/> web-1	Virtual machine	MSDN 5C	LBLabs	Central US	Running
<input type="checkbox"/> web-2	Virtual machine	MSDN 5C	LBLabs	Central US	Running
<input type="checkbox"/> web-3	Virtual machine	MSDN 5C	LBLabs	Central US	Running

# Azure Administrator (AZ-104) | Lab Guide

Now, access each server to add and configure web server (iis) using default installation settings.

The screenshot shows the 'Add Roles and Features Wizard' window. On the left, the 'Server Roles' tab is selected. In the main pane, under 'Roles', the 'Web Server (IIS)' checkbox is checked and highlighted with a red box. Below it, under 'Management Tools', the '[Tools] IIS Management Console' checkbox is also checked and highlighted with a red box. At the bottom right of the wizard window, the 'Add Features' button is also highlighted with a red box.

The screenshot shows a Windows File Explorer window with the path 'This PC > Windows (C:) > inetpub > wwwroot'. Inside this folder, there are two files: 'iisstart.htm' and 'iisstart.png'. A context menu is open over 'iisstart.htm', with the 'Open with' option highlighted and a red box around it. A secondary context menu is displayed, listing 'Internet Explorer', 'Microsoft Edge', and 'Notepad', with 'Notepad' also highlighted and a red box around it.

The screenshot shows a Notepad window titled 'iisstart - Notepad'. The content of the file is an HTML document with the following code:

```
<!DOCTYPE html>
<html>
<body style="background-color:gray;">
<br>
<br>
<h1 style="text-align:center;">WELCOME TO Abdelwahed.ME (WEB-1)</h1>
<br>
<h4 style="text-align:center;">NICE TO JOIN US</h4>
<br>
</body>
</html>
```

[www.abdelwahed.me](http://www.abdelwahed.me)

# Azure Administrator (AZ-104) | Lab Guide

Using Load balancer public IP address, you can access web service in these 3 servers

The screenshot shows the Azure portal interface for managing a Load Balancer named "Ahmed-LB01".

**Frontend IP configuration:**

- Shows one entry: Ahmed-LB01-frontendconfig01 with IP address 20.221.117.223.

**Backend pools:**

- Shows one pool: Ahmed-LB01-backendpool01 with three backend servers:
  - web-1 (IP: 10.2.0.4, Zone: 1)
  - web-3 (IP: 10.2.0.5, Zone: 3)
  - web-2 (IP: 10.2.0.6, Zone: 2)

**Browsing to the Public IP:**

The browser address bar shows the public IP 20.221.117.223. The page content is:

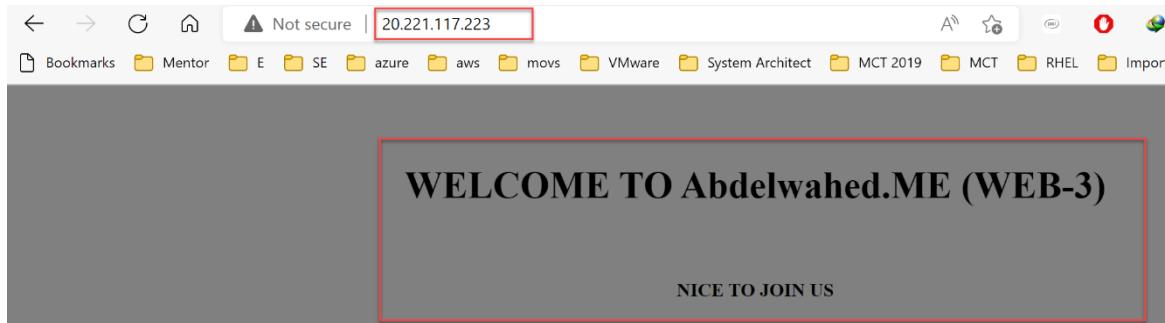
**WELCOME TO Abdelwahed.ME (WEB-2)**

NICE TO JOIN US

## Azure Administrator (AZ-104) | Lab Guide

---

To test load balancer refresh or shutdown web-2 and try to access using load balancer IP address



## Azure Storage

Azure Storage is a service that you can use to store files, messages, tables, and other types of information. You can use Azure storage on its own—for example as a file share—but it is often used by developers as a store for working data. Such stores can be used by websites, mobile apps, desktop applications, and many other types of custom solutions. Azure storage is also used by IaaS virtual machines, and PaaS cloud services. You can generally think of Azure storage in three categories.

### Storage for Virtual Machines

This includes disks and files. Disks are persistent block storage for Azure IaaS virtual machines. Files are fully managed file shares in the cloud.

### Unstructured Data

This includes Blobs and Data Lake Store. Blobs are highly scaleable, REST based cloud object store. Data Lake Store is Hadoop Distributed File System (HDFS) as a service.

### Structured Data

This includes Tables, Cosmos DB, and Azure SQL DB. Tables are a key/value, auto-scaling NoSQL store. Cosmos DB is a globally distributed database service. Azure SQL DB is a fully managed database-as-a-service built on SQL.

## Creating an Azure Storage account

Home > Storage accounts >

### Create a storage account

Basics Advanced Networking Data protection Encryption Tags Review

Resource group \* StorageRG Create new

**Instance details**

If you need to create a legacy storage account type, please click [here](#).

Storage account name ⓘ \*

 (highlighted with a red box)

Region ⓘ \*

Performance ⓘ \*

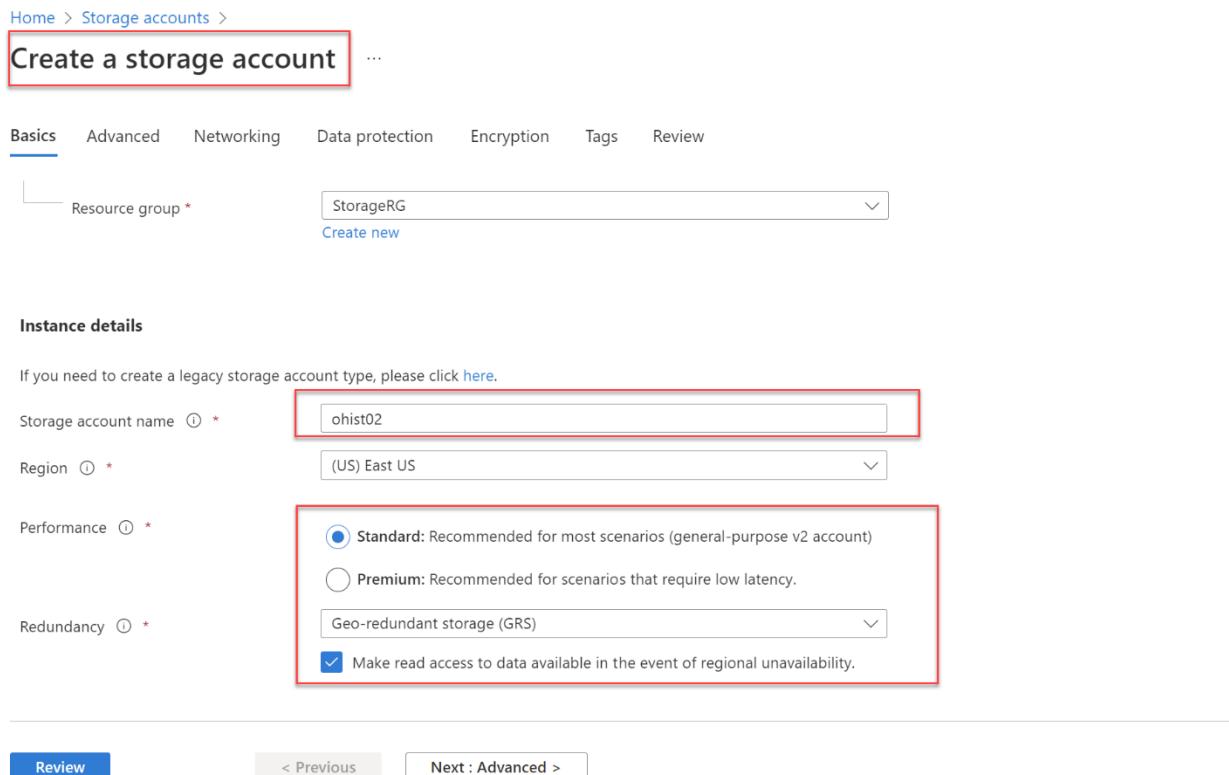
Standard: Recommended for most scenarios (general-purpose v2 account)  
 Premium: Recommended for scenarios that require low latency.

Redundancy ⓘ \*

Geo-redundant storage (GRS)

Make read access to data available in the event of regional unavailability.

Review < Previous Next : Advanced >



# Azure Administrator (AZ-104) | Lab Guide

Home > Storage accounts >

## Create a storage account ...

Basics Advanced **Networking** Data protection Encryption Tags Review

### Network connectivity

You can connect to your storage account either publicly, via public IP addresses or service endpoints, or privately, using a private endpoint.

Network access \*

Enable public access from all networks

Enable public access from selected virtual networks and IP addresses

Disable public access and use private access

i Enabling public access from all networks might make this resource available publicly. Unless public access is required, we recommend using a more restricted access type. [Learn more](#)

## Create a storage account ...

Basics Advanced Networking **Data protection** Encryption Tags Review

Enable soft delete for blobs

Soft delete enables you to recover blobs that were previously marked for deletion, including blobs that were overwritten. [Learn more](#)

Days to retain deleted blobs ⓘ

7

Enable soft delete for containers

Soft delete enables you to recover containers that were previously marked for deletion. [Learn more](#)

Days to retain deleted containers ⓘ

7

Enable soft delete for file shares

Soft delete enables you to recover file shares that were previously marked for deletion. [Learn more](#)

Days to retain deleted file shares ⓘ

7

### Tracking

Manage versions and keep track of changes made to your blob data.

Enable versioning for blobs

Use versioning to automatically maintain previous versions of your blobs. [Learn more](#)

**Review**

< Previous

Next : Encryption >

# Azure Administrator (AZ-104) | Lab Guide

The screenshot shows the Azure Storage account overview for 'ohist01'. The left sidebar includes links for Activity log, Tags, Diagnose and solve problems, Access Control (IAM), Data migration, Events, and Storage browser. The main content area has tabs for Overview, Essentials, Properties, Monitoring, Capabilities (7), Recommendations, Tutorials, and Developer Tools. Under 'Essentials', details include Resource group (StorageRG), Location (East US), Primary/Secondary Location (Primary: East US, Secondary: West US), Subscription (MSDN 5C), Subscription ID (a7632f95-7f0d-4342-adda-dbc286dbe45c), Disk state (Primary: Available, Secondary: Available), and Tags (Click here to add tags). The 'Properties' tab is selected, showing Blob service settings like Hierarchical namespace (Disabled), Default access tier (Hot), Blob public access (Enabled), Blob soft delete (Disabled), Container soft delete (Disabled), Versioning (Disabled), Change feed (Disabled), and NFS v3 (Disabled). It also shows Security settings (Require secure transfer for REST API operations Enabled, Storage account key access Enabled, Minimum TLS version Version 1.2, Infrastructure encryption Disabled) and Networking settings (Allow access from All networks).

## Create Container and File Share

The screenshot shows the 'Containers' page for the 'ohist01' storage account. The left sidebar includes links for Overview, Activity log, Tags, Diagnose and solve problems, Access Control (IAM), Data migration, Events, and Storage browser. The 'Containers' link in the Data storage section is highlighted with a red box. The main content area shows a table of containers. A new container named 'ahmed-container' is highlighted with a red box. Other containers listed are '\$logs' (Last modified 9/29/2022, 9:00:59 AM, Public access level Private, Lease state Available) and 'ahmed-container' (Last modified 9/29/2022, 9:03:56 AM, Public access level Container, Lease state Available). The table columns are Name, Last modified, Public access level, and Lease state.

# Azure Administrator (AZ-104) | Lab Guide

Home > ohist01

**ohist01 | File shares** ⚡ ...

Storage account

Search

+ File share Refresh

File share settings

Active Directory: Not configured Soft delete: Disabled Maximum capacity: 5 TiB Security: Maximum compatibility

Search file shares by prefix (case-sensitive)

Show deleted shares

Name	Modified	Tier	Quota
archive-data	9/29/2022, 9:12:50 AM	Cool	100 GiB
hr-share	9/29/2022, 9:11:25 AM	Hot	5 TiB
it-share	9/29/2022, 9:11:05 AM	Transaction optimized	5 TiB

Overview

Activity log

Tags

Diagnose and solve problems

Access Control (IAM)

Data migration

Events

Storage browser

Data storage

Containers

**File shares**

Queues

## Connect to file share

Home > Storage accounts > ohist01 | File shares >

**archive-data** File share

Search

Connect Upload + Add directory Refresh Delete share Change tier Edit quota

Search files by prefix

Name	Type
HR	Directory
IT	Directory
Sales	Directory

Connect

archive-data authentication methods and run the PowerShell commands from a normal (not elevated) PowerShell terminal:

Drive letter: Z

Authentication method: Active Directory (radio button)

Connecting to a share using the storage account key is only appropriate for admin access. Learn more

Hide Script

```
$connectTestResult = Test-NetConnection -ComputerName ohist01.file.core.windows.net -Port 445
if ($connectTestResult.TcpTestSucceeded) {
    # Save the password so the drive will persist on reboot
    cmd.exe /C "cmdkey /add:'ohist01.file.core.windows.net' /user:'localhost\ohist01' /pass:'lbkNPZfh6wvTRD6FKHOTnCiOwaCNSQKDd3v0RwvMhU7QXABUvEpV3kMaD4x+TNMzDMSJWj+A5kvWSxE='"
    # Mount the drive
    New-PSDrive -Name Z -PSProvider FileSystem -Root "\\ohist01.file.core.windows.net\archive-data" -Persist
}
else {
    Write-Error -Message "Unable to reach the Azure storage account via port 445. Check to make sure your organization or ISP is not blocking port 445, or use Azure P2S VPN, Azure S2S VPN, or Express Route to tunnel SMB traffic over a different port."
}
```

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

Form PowerShell https://aka.ms/pscore6

PS C:\Windows\system32> $connectTestResult = Test-NetConnection -ComputerName ohist01.file.core.windows.net -Port 445
PS C:\Windows\system32> if ($connectTestResult.TcpTestSucceeded) {
>>     # Save the password so the drive will persist on reboot
>>     cmd.exe /C "cmdkey /add:'ohist01.file.core.windows.net' /user:'localhost\ohist01' /pass:'lbkNPZfh6wvTRD6FKHOTnCiOwaCNSQKDd3v0RwvMhU7QXABUvEpV3kMaD4x+TNMzDMSJWj+A5kvWSxE='"
>>     # Mount the drive
>>     New-PSDrive -Name Z -PSProvider FileSystem -Root "\\ohist01.file.core.windows.net\archive-data" -Persist
>> } else {
>>     Write-Error -Message "Unable to reach the Azure storage account via port 445. Check to make sure your organization or ISP is not blocking port 445, or use Azure P2S VPN, Azure S2S VPN, or Express Route to tunnel SMB traffic over a different port."
>> }

CMDKEY: Credential added successfully.

Name      Used (GB)   Free (GB) Provider      Root                                         CurrentLocation
----      -----       -----   -----      -----
Z          0.00        100.00  FileSystem   \\ohist01.file.core.windows.net\...
```

# Azure Administrator (AZ-104) | Lab Guide

---

Home > Storage accounts > ohist01 | File shares > archive-data

**archive-data | Properties** ...

File share

Search <>

Overview

Diagnose and solve problems

Access Control (IAM)

Settings

Properties

Operations

Snapshots

Backup

**NAME**  
archive-data

**URL**  
`https://ohist01.file.core.windows.net/archive-data`

**LAST MODIFIED**  
9/29/2022, 9:12:50 AM

**ETAG**  
0x8DAA1D94172E4DF

**QUOTA**  
100 GiB

**USAGE**  
472.61 KiB

**TIER**  
Cool

X

← Map Network Drive

What network folder would you like to map?

Specify the drive letter for the connection and the folder that you want to connect to:

Drive: Z:

Folder: `\ohist01.file.core.windows.net\archive-data`

Example: \server\share

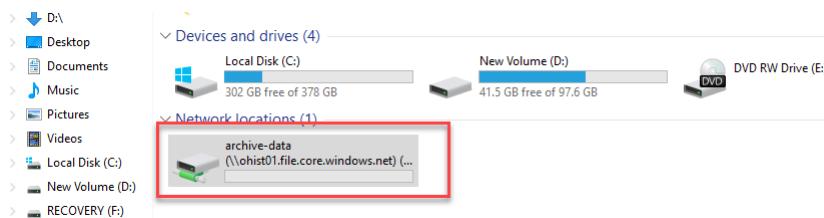
Reconnect at sign-in

Connect using different credentials

[Connect to a Web site that you can use to store your documents and pictures.](#)

Finish Cancel

# Azure Administrator (AZ-104) | Lab Guide



## Access all storage account items using Microsoft storage explorer

A screenshot of the Microsoft Azure Storage Explorer application. The title bar says 'Microsoft Azure Storage Explorer'. The left sidebar has a 'Search for resources' bar and sections for 'Quick Access', 'Emulator & Attached', 'Storage Accounts', and 'Data Lake Storage Gen1 (deprecated)'. A red box highlights the 'Storage Accounts' section, which is expanded to show 'Attached Containers' (Blob Containers, File Shares, Queues, Tables), '(Emulator - Default Ports) (Key)', and 'Ahmed Storage (Key)' (Blob Containers, File Shares, Queues, Tables). The main pane shows a list of containers under 'archive-data': HR, IT, and Sales. At the bottom, the 'Activities' pane shows two completed tasks: 'Deletion of 'E0100JM4LW\_Invoice.pdf' from 'ahmed-container/'' and 'Transfer of 'D:\Admin Profile\BitLocker Recovery Key F1184065-F9E6-4D44-BA32-104278DB2449.TXT' to 'ahmed-container/ITDATA/''. Both tasks include 'Copy AzCopy Command to Clipboard' links.

## Data Protection

### Backup Azure VMs

We have to create recovery service vault

Home > Recovery Services vaults >

### Create Recovery Services vault

\* Basics Tags Review + create

#### Project Details

Select the subscription and the resource group in which you want to create the vault.

Subscription \* ⓘ

MSDN 5C

Resource group \* ⓘ

LBLabs

[Create new](#)

#### Instance Details

Vault name \* ⓘ

AhmedRSV

Region \* ⓘ

Central US

[Review + create](#)

[Next: Tags](#)

# Azure Administrator (AZ-104) | Lab Guide

Go for properties to check vault configuration

Azure Recovery Services Vault - AhmedRSV

For backups, try our new Backup Center. It offers Azure Backup customers a unified view of Recovery Services Vaults used for backup in Azure. It also includes new governance capabilities. Click here to get the new experience.

**Essentials**

Overview    Backup    Site Recovery

**What's new**

- Azure Backup Metrics are now in public preview →
- Multi-user authorization for Azure Backup is now generally available →
- Multiple backups a day for Azure Files is now in public preview →
- Enhanced experience for archive is now generally available →
- Backup for Azure Managed Disk is now Generally Available →
- A new and improved way to enable Azure Site Recovery on your VMware machines is in public preview →

**Backup**    **Site Recovery**

AhmedRSV | Properties

Backup Configuration

Storage replication type

- Locally-redundant
- Zone-redundant
- Geo-redundant**

This option cannot be changed after protecting items. Geo-Redundant Storage (GRS) provides a higher level of data availability than Zonal-Redundant Storage and Local-Redundant Storage. Zonal-Redundant Storage helps to replicate the data in the availability zones of the same region. Review the trade-offs between lower cost and higher cost availability [here](#).

Cross Region Restore

Note:

- This allows you to **restore in the secondary region** for both BCDR drills and outage scenarios.
- This is **available for Azure Virtual Machines** and SQL/SAP HANA databases running inside Azure VMs in this vault. No support for classic VMs.
- Cross Region Restore is currently **non-reversible** storage property.

# Azure Administrator (AZ-104) | Lab Guide

The screenshot shows the 'Properties' page for a Recovery Services vault named 'AhmedRSV'. In the left sidebar, under 'Getting started', the 'Backup' option is selected and highlighted with a red box. In the main content area, there is a 'Security Settings' section with a red box around it. This section contains two settings: 'Soft Delete' and 'Security Features'. Both settings have 'Enabled' buttons highlighted with red boxes.

Start VM backup

The screenshot shows the 'Backup' configuration page for the 'AhmedRSV' vault. In the left sidebar, the 'Backup' option is selected and highlighted with a red box. The main area shows a 'Step: Configure Backup' section with three fields: 'Where is your workload running?' (set to 'Azure'), 'What do you want to backup?' (set to 'Virtual machine'), and a 'Backup' button. All three fields and the button are highlighted with red boxes.

# Azure Administrator (AZ-104) | Lab Guide

Home > Microsoft.RecoveryServicesV2-1664425538893 | Overview > AhmedRSV | Backup >

## Configure Backup ...

AhmedRSV

Policy sub type \*

Standard  
Once a day backup  
1-5 days operational tier  
Vault tier  
ZRS resilient snapshot tier  
Support for Trusted Azure VM

Enhanced  
Multiple backups per day (Preview)  
1-30 days operational tier  
Vault tier  
ZRS resilient snapshot tier  
Support for Trusted Azure VM

Backup policy \*

**Info** Protection operations are based on the OS disk type selected for Azure VM. Enhanced Policy takes the first snapshot as configuration. Pricing of Standard policy and enhanced policy varies. [Learn more.](#)

Policy Details

Full Backup

**Backup Frequency**  
Every 4 hour(s) starting 8:00 AM UTC for 12 Hour(s)

**Instant Restore**  
Retain instant recovery snapshot(s) for 2 day(s)

**Retention of daily backup point**  
Retain backup taken every day for 30 Day(s)

Virtual Machines

Name  
No Virtual machines selected.

Add  Download a template for automation

Create policy

Azure Virtual Machine

Policy name  ✓ The value has a length of at least 3.  
✓ The value has a length of at most 150.  
✓ Characters are valid.  
✓ Policy name is available.

Backup schedule

Frequency \*  Start time \*  Schedule \*  Duration \*  Timezone \*

Instant Restore

Retain instant recovery snapshot(s) for  Day(s) (Azure Backup transfers the data from instant restore point to vault once a day. [Learn more.](#))

Retention range

**Info** Azure Backup transfers the data from instant restore point to vault once a day. [Learn more.](#)

Retention of daily backup point  
For  Day(s)

Retention of weekly backup point  
Not Configured

Retention of monthly backup point  
Not Configured

Retention of yearly backup point

OK

Home > Microsoft.RecoveryServicesV2-1664425538893 | Overview > AhmedRSV | Backup >

## Configure Backup ...

AhmedRSV

Backup policy \*

**Info** Protection operations are based on the OS disk type selected for Azure VM. Enhanced Policy takes the first snapshot as configuration. Pricing of Standard policy and enhanced policy varies. [Learn more.](#)

Policy Details

Full Backup

**Backup Frequency**  
Every 4 hour(s) starting 8:00 AM UTC for 12 Hour(s)

**Instant Restore**  
Retain instant recovery snapshot(s) for 7 day(s)

**Retention of daily backup point**  
Retain backup taken every day for 30 Day(s)

Virtual Machines

Name  
No Virtual machines selected.

Add  Download a template for automation

Select virtual machines

Discovering virtual machines that can be backed up, are in the same region as vault and not protected by another vault.

Filter items by name

Virtual machine name	Resource Group
<input checked="" type="checkbox"/> web-1	LBLabs
<input type="checkbox"/> web-2	LBLabs
<input type="checkbox"/> web-3	LBLabs

< Previous Page 1 of 1 Next >

OK Cancel

# Azure Administrator (AZ-104) | Lab Guide

Home > ConfigureProtection-1664426939480 | Overview > AhmedRSV

**AhmedRSV | Backup items** ...

Recovery Services vault

Search Refresh

For backups, try our new Backup Center. It offers Azure Backup customers a unified view of Recovery Services Vaults used fo  
Click here to get the new experience.

Primary Region Secondary Region

BACKUP MANAGEMENT TYPE	BACKUP ITEM COUNT
Azure Virtual Machine	1
Azure Backup Agent	0
Azure Backup Server	0
DPM	0
Azure Storage (Azure Files)	0
SQL in Azure VM	0
SAP HANA in Azure VM	0

Settings

- Identity
- Private endpoint connections
- Properties
- Locks

Getting started

- Backup
- Site Recovery

Protected items

**Backup items** (highlighted with a red box)

Replicated items

Home > ConfigureProtection-1664426939480 | Overview > AhmedRSV | Backup items >

## Backup Items (Azure Virtual Machine) ...

AhmedRSV

Refresh Add Filter

With Backup center, you can view all your IaaSVM items across vaults, subscriptions and regions in a single pane of glass. Click here to use the new experience. →

All data fetched from the service.

Filter items ...

Name ↑↓	Resource Group ↑↓	Backup Pre-Check	Last Backup Status	Latest restore point ↑↓
web-1	LBLabs	Passed	Warning (Initial backup pending)	

< Previous Page 1 of 1 Next >

# Azure Administrator (AZ-104) | Lab Guide

The screenshot shows the Azure Backup Center interface. At the top, there's a navigation bar with a cloud icon labeled 'web-1', a 'Backup item' link, and several action buttons: 'Backup now' (highlighted with a red box), 'Restore VM', 'File Recovery', 'Stop backup', 'Resume backup', 'Delete backup data', 'Restore to Secondary Region', and 'Undelete'. Below the navigation bar is a message: 'For backups, try our new Backup Center. It offers Azure Backup customers a unified view of Recovery Services Vaults used for backup in Azure. It also provides improved sorting and filtering along with new governance capa...'. The main area is divided into sections: 'Essentials' (Recovery services vault: AhmedRSV, Subscription: MSDN 5C, Subscription ID: a7632f95-7fd-4342-adda-dbc286dbe45c, Alerts: View alerts, Jobs: View jobs), 'Backup Pre-Check' (Passed), 'Last backup status' (Warning (Initial backup pending)), 'Backup policy' (AhmedBKPolicy), and 'Oldest restore point' (-). Below this is a 'Recovery points' section with three bars: 'CRASH CONSISTENT' (0), 'APPLICATION CONSISTENT' (0), and 'FILE-SYSTEM CONSISTENT' (0). A legend indicates: Time ↑↓ (blue arrow), Consistency (green arrow), and Recovery type (yellow arrow). A note says 'No restore points available.'

The screenshot shows the 'Backup Jobs' page for the 'AhmedRSV' vault. The left sidebar includes links for 'Backup items', 'Replicated items', 'Manage' (Backup policies, Backup Infrastructure, Site Recovery infrastructure, Recovery Plans (Site Recovery)), 'Backup Reports', 'Monitoring' (Alerts, Metrics, Diagnostic settings, Logs, Advisor recommendations), and 'Backup Jobs' (highlighted with a red box). The main content area shows a table of backup jobs:

Workload name ↑↓	Operation	Status	Type	Start time ↑↓	Total Duration ↑↓	Details
web-1	Backup	⌚ In progress	Azure Virtual Machine	9/29/2022, 10:52:30 AM	00:00:11	<a href="#">View details</a>
web-1	Backup	⌚ In progress	Azure Virtual Machine	9/29/2022, 10:31:53 AM	00:20:48	<a href="#">View details</a>
web-1	Configure backup	✓ Completed	Azure Virtual Machine	9/29/2022, 8:49:11 AM	00:00:30	<a href="#">View details</a>

Below the table are navigation buttons: '< Previous', 'Page 1 of 1', and 'Next >'.

# Azure Administrator (AZ-104) | Lab Guide

Now you can restore and stop the backup

Home > AhmedRSV | Backup items > Backup Items (Azure Virtual Machine) >

**web-1** ...  
Backup Item

Backup now  Restore VM  File Recovery  Stop backup  Resume backup  Delete backup data  Restore to Secondary Region  Undelete

**⚠️** Backup pre-checks for this item point to issues that may lead to backup failures. Click here to resolve them →

**Essentials**

Recovery services vault : <a href="#">AhmedRSV</a>	Backup Pre-Check : <b>⚠️ Warning</b>
Subscription (move) : <a href="#">MSDN 5C</a>	Last backup status : <b>Success</b> 9/29/2022, 10:52:30 AM
Subscription ID : a7632f95-7f0d-4342-adda-dbc286dbe45c	Backup policy : <a href="#">AhmedBKPolicy</a>
Alerts (in last 24 hours) : <a href="#">View alerts</a>	Oldest restore point : 9/29/2022, 10:31:57 AM (37 minute(s) ago)
Jobs (in last 24 hours) : <a href="#">View jobs</a>	

**Recovery points**

This list is filtered for last 30 days of recovery points. To recover from recovery point older than 30 days, as well as vault-archive, click here.

Long term recovery points can be moved to vault-archive. To move all 'recommended recovery points' to vault-archive tier, click here.

CRASH CONSISTENT	APPLICATION CONSISTENT	FILE-SYSTEM CONSISTENT
0	2	0

Time ↑↓

Time	Consistency	Recovery type
9/29/2022, 10:52:33 AM	Application Consistent	Snapshot
9/29/2022, 10:31:57 AM	Application Consistent	Snapshot

Home > AhmedRSV | Backup items > Backup Items (Azure Virtual Machine) > web-1 >

## Restore Virtual Machine ...

web-1

Restore allows you to restore VM/disks from a selected Restore Point.

Restore point \*

9/29/2022, 10:31:57 AM

Select

Data Store

Snapshot

### Restore Configuration

- Create new  
 Replace existing

**i** To create an alternate configuration when restoring your VM (from the following menus), use PowerShell cmdlets.

Restore Type \* ⓘ

Create new virtual machine

Virtual machine name \* ⓘ

Create new virtual machine

Resource group \* ⓘ

Restore disks

LBLADS

Virtual network \* ⓘ

Select an option

Subnet \* ⓘ

Select an option

Staging Location \* ⓘ

Select an option

[Can't find your storage account?](#)

**Restore**

# Azure Administrator (AZ-104) | Lab Guide

---

## Backup files and folders

Home > Recovery Services vaults > AhmedRSV

The screenshot shows the 'AhmedRSV | Backup' page in the Azure portal. On the left, a sidebar lists options like Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Settings (Identity, Private endpoint connections, Properties, Locks), and Getting started (Backup, Site Recovery). The 'Backup' option under 'Getting started' is highlighted with a red box. The main area is titled 'Where is your workload running?' with 'On-Premises' selected. Below it, 'What do you want to backup?' has 'Files and folders' selected, also highlighted with a red box. A list of other backup types is shown with checkboxes: Hyper-V Virtual Machine, VMWare Virtual Machine, Microsoft SQL Server, Microsoft SharePoint, Microsoft Exchange, System State, and Bare Metal Recovery. The 'Files and folders' checkbox is checked.

The screenshot shows the same 'AhmedRSV | Backup' page. The 'Backup' option in the sidebar is again highlighted with a red box. The main area displays the 'Step: Prepare Infrastructure' section, which includes a 'Prepare Infrastructure' button highlighted with a red box.

Download both of backup agent and vault credentials to the server you want to backup (I'll use web-2 VM)

Home > Recovery Services vaults > AhmedRSV | Backup >

## Prepare infrastructure ...

### Recovery Services Agent

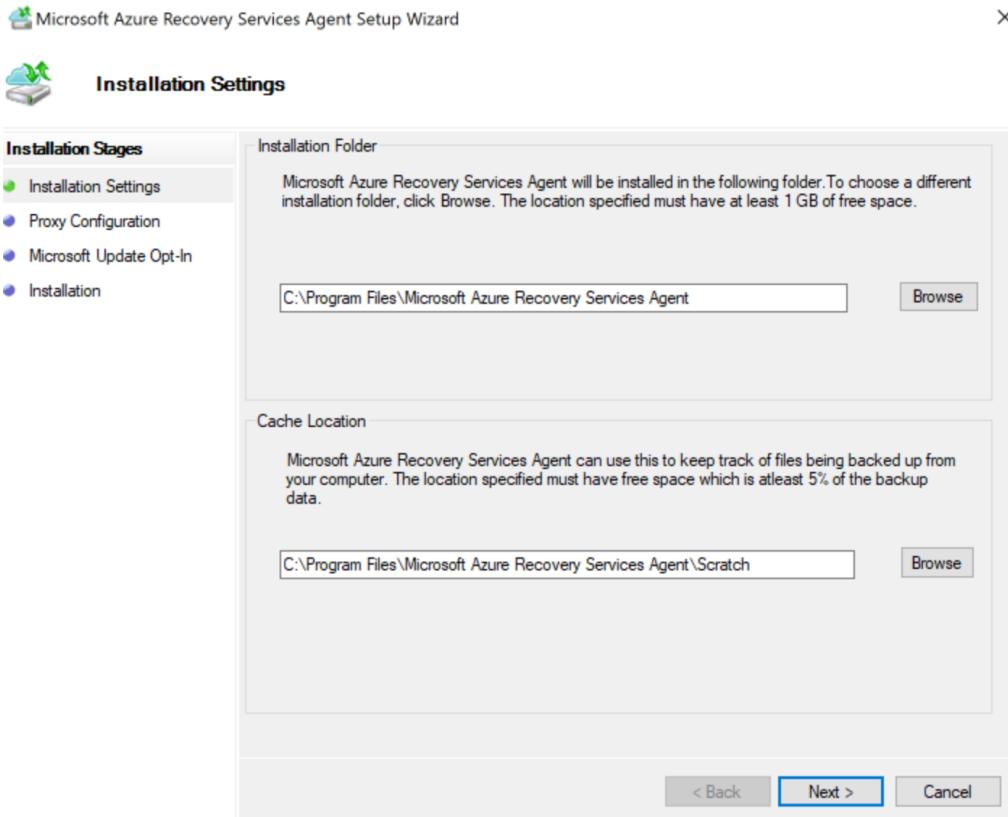
Please follow the steps mentioned below.

1. Install Recovery Services agent  
[Download Agent for Windows Server or Windows Client](#)
  
2. Download vault credentials to register the server to the vault. Vault credentials will expire after 10 days.

Already downloaded or using the [latest Recovery Services Agent](#)

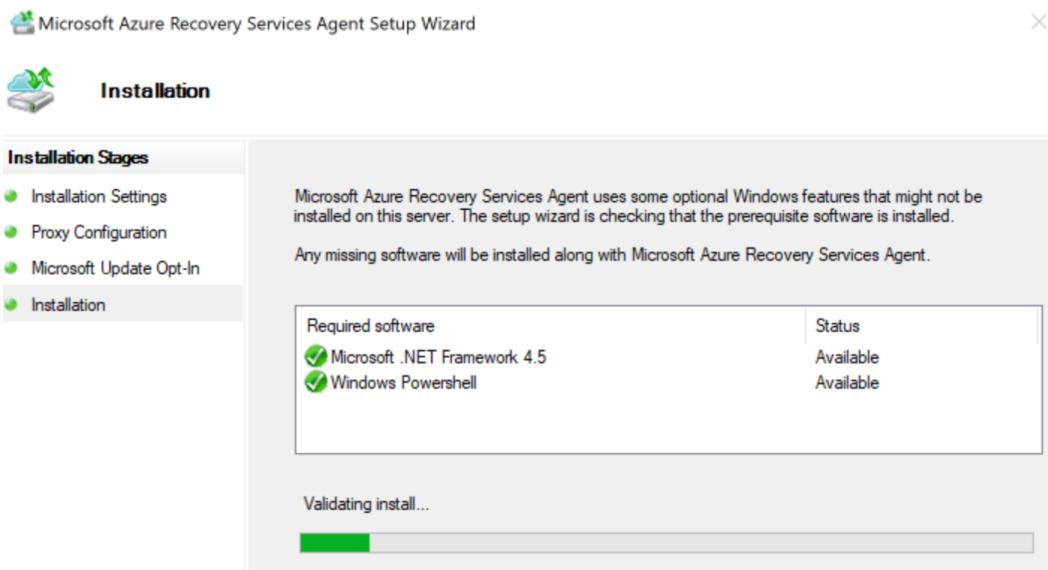
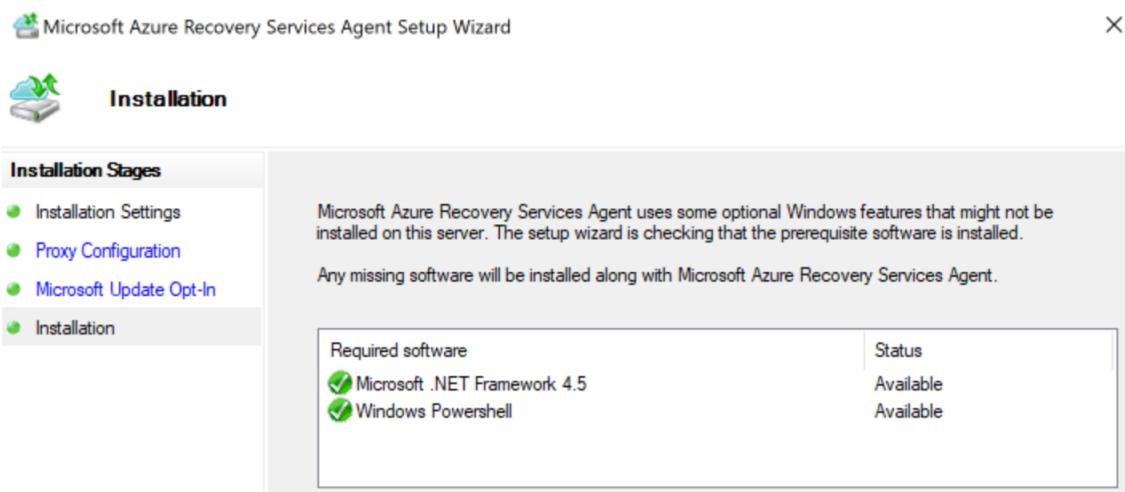
[Download](#)

3. Schedule backup using Recovery Services Agent UI. [Learn More](#)
  
4. Once the backups are scheduled, you can use backup jobs page to monitor the backups. [Browse jobs page](#)
  
5. You can also Configure Notifications from alerts page to receive email alerts for backup failures. [Browse alerts page](#)

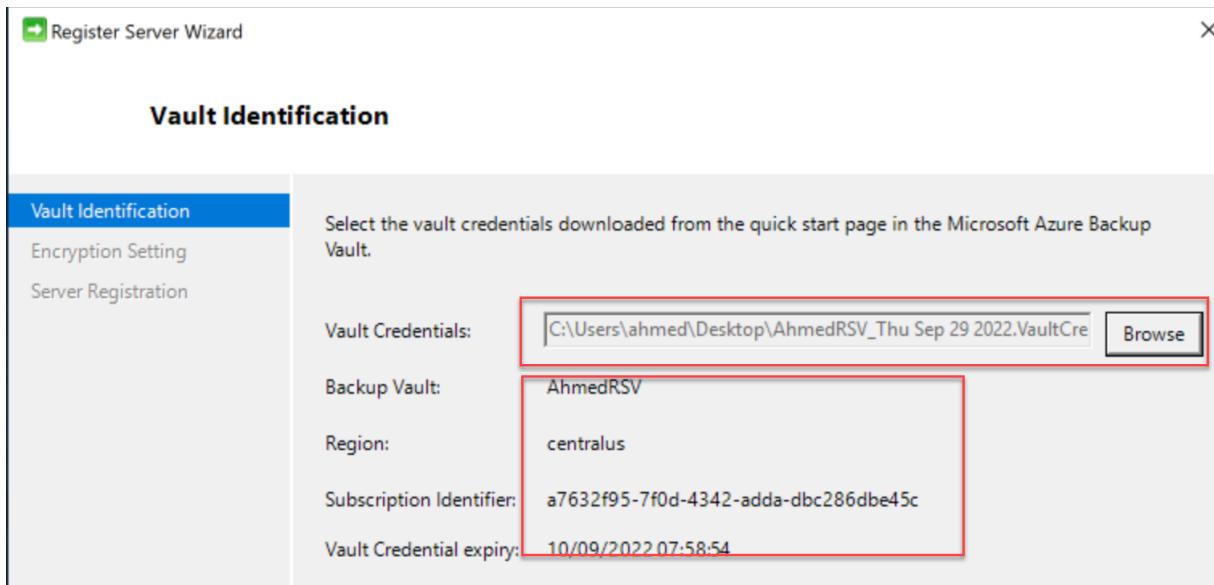
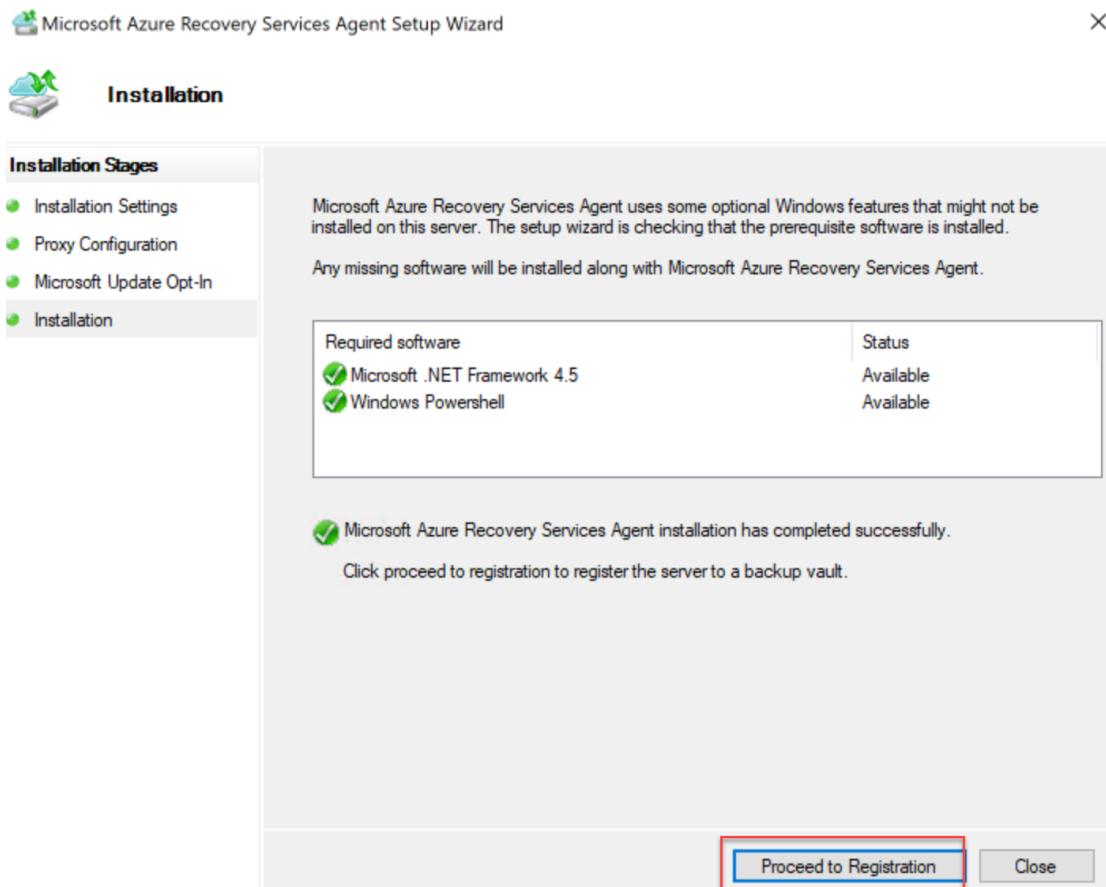


# Azure Administrator (AZ-104) | Lab Guide

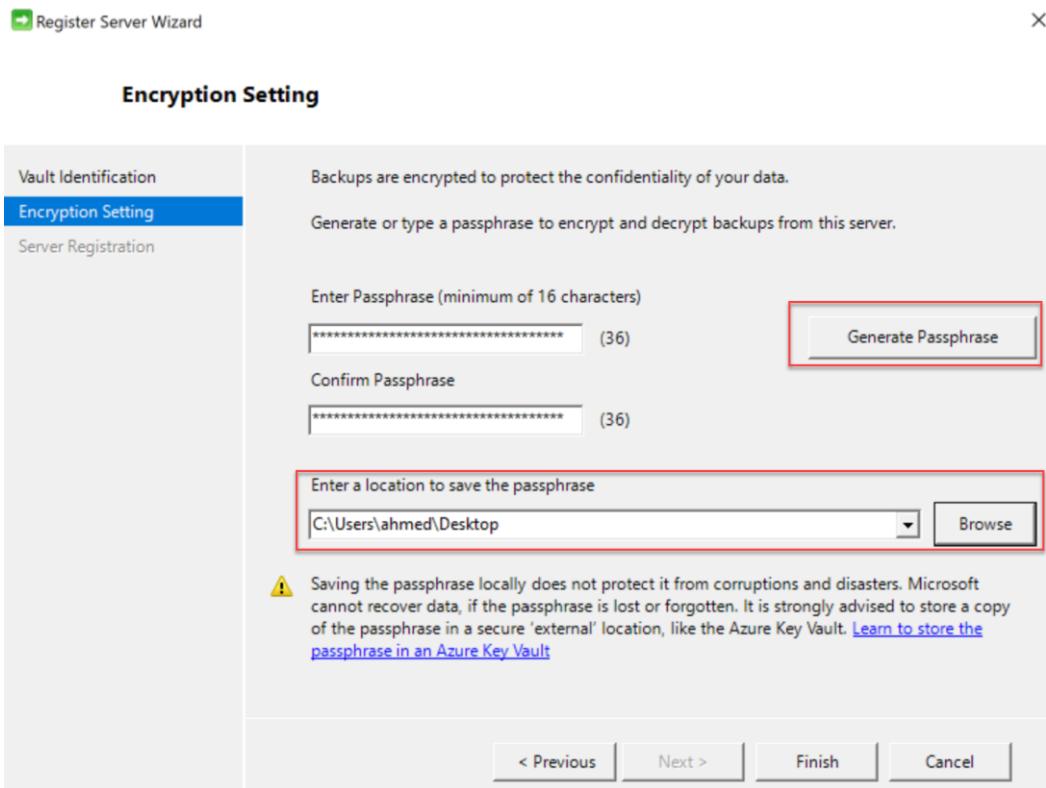
---



# Azure Administrator (AZ-104) | Lab Guide



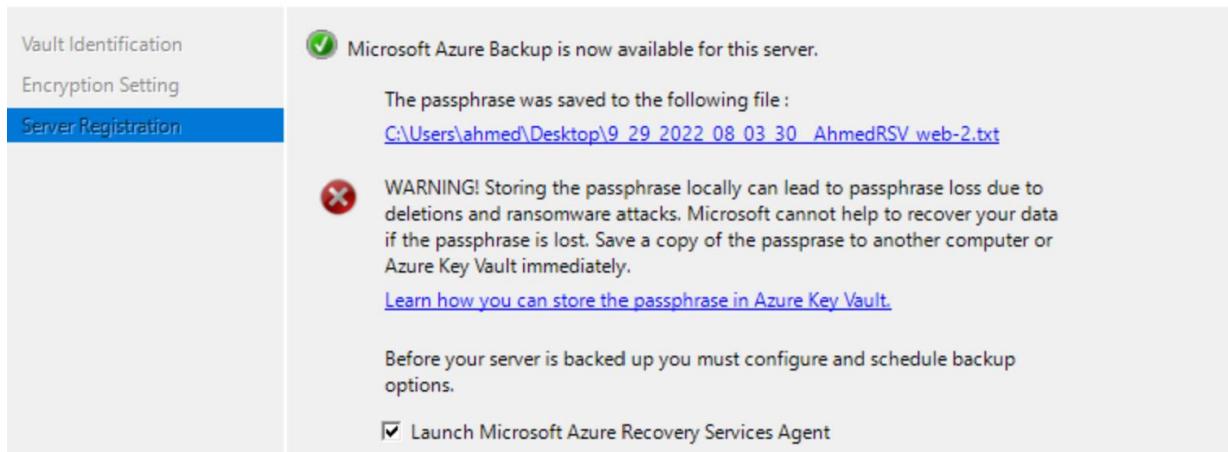
# Azure Administrator (AZ-104) | Lab Guide



Now server registered and we can back up our files

Register Server Wizard

## Server Registration



# Azure Administrator (AZ-104) | Lab Guide

Now going to back up user documents

The screenshot shows the Microsoft Azure Backup interface. On the right, a sidebar titled 'Actions' has a red box around the 'Schedule Backup' option. The main area displays a summary of backup status: 'Last Backup' (Status: -, Time: -), 'Next Backup' (Status: Not Scheduled, Time: -), 'Available Recovery Points' (Total backups: None, Latest copy: -, Oldest copy: -), and 'Last Recovery' (Status: -, Time: -). A link to 'View details' is present for each section.

The screenshot shows the 'Select Items to Backup' wizard. The left sidebar lists steps: 'Getting started', 'Select Items to Backup' (which is selected and highlighted in blue), 'Specify Backup Schedule ...', 'Select Retention Policy (F...)', 'Choose Initial Backup Ty...', 'Confirmation', and 'Modify Backup Progress'. The main area shows a file explorer window with the path 'This PC > Documents'. A red box highlights the 'Documents' folder. To its right is a preview pane showing files: '9\_29\_2022\_08\_03\_30\_AhmedRSV\_web-2' and 'AhmedRSV\_Thu Sep 29 2022.VaultCredentials'. Below these are buttons for 'Add Items' (highlighted with a red box) and 'Remove Items', and a link to 'Exclusion Settings'.

# Azure Administrator (AZ-104) | Lab Guide

Schedule Backup Wizard

## Specify Backup Schedule (Files and Folders)

Getting started  
Select Items to Backup  
**Specify Backup Schedule ...**  
Select Retention Policy (F...  
Choose Initial Backup Ty...  
Confirmation  
Modify Backup Progress

Define a schedule when you want to create a backup copy for selected files and folders

Schedule a backup every

Day       Week

At following times (Maximum allowed is three times a day)

11:30 PM    4:00 PM    8:30 PM

Schedule Backup Wizard

## Select Retention Policy (Files and Folders)

Getting started  
Select Items to Backup  
Specify Backup Schedule ...  
**Select Retention Policy (F...)**  
Choose Initial Backup Ty...  
Confirmation  
Modify Backup Progress

Specify the retention policy for the backup copy of files and folders

Daily Retention Policy

Retain backup copies taken At 11:30 PM  
for 180 Days

Weekly Retention Policy

Retain backup copies taken on Saturday At 11:30 PM  
for 104 Weeks

Monthly Retention Policy

Retain backup copies taken on Saturday of Last Week At 11:30 PM  
for 60 Months

Yearly Retention Policy

Retain backup copies taken on Saturday of Last Week of March At 11:30 PM  
for 10 Years

Schedule Backup Wizard

## Choose Initial Backup Type (Files and Folders)

Getting started  
Select Items to Backup  
Specify Backup Schedule ...  
Select Retention Policy (F...  
**Choose Initial Backup Ty...**  
Confirmation  
Modify Backup Progress

Initial Backup transfers a full backup of your data to Azure. Subsequent backups transfer only changes in your data.

Specify the option for transferring the Initial Backup. [Help me choose](#).

**Online**

Transfer over the network  
Uses your network to move the initial backup data to Azure

**Offline**

Seed initial backup using storage devices without using network. Recommended for limited network bandwidth environments. Subsequent backups are done over the network.

Transfer using Microsoft Azure Data Box disks  
Order an Azure Data Box (up to 100TB) or a single Data Box disk (up to 8TB) to transfer data from this server to Azure. Saves effort to procure and ship disks. Ensure you have already ordered your Data Box device. To order go to Azure > [Data Box](#). [Learn more](#).

Transfer using my own disks  
To transfer initial backup using this option, you must use Azure-compatible disks, connectors and shipping partners. Refer to our Offline Backup documentation for more details. [Learn more](#).

# Azure Administrator (AZ-104) | Lab Guide

Schedule Backup Wizard

## Confirmation

Getting started  
Select Items to Backup  
Specify Backup Schedule ...  
Select Retention Policy (F...  
Choose Initial Backup Ty...  
**Confirmation**  
Modify Backup Progress

You are about to save the following backup schedule and initiate initial backup.

Policy Type	Files and Folders
Files and Folders	Backup Items: Selected items (C:\)
	File(s) Excluded: None
	Backup Time: 11:30 PM, 4:00 PM, 8:30 PM
	Backup Days: Everyday
	Weekly frequency: Every 1 week(s)
	Retention Days: 180
	Initial Backup Creation: Network

Schedule Backup Wizard

Cloud icon with a clock and arrow

## Modify Backup Progress

Getting started  
Select Items to Backup  
Specify Backup Schedule ...  
Select Retention Policy (F...  
Choose Initial Backup Ty...  
Confirmation  
**Modify Backup Progress**

Status:

✓ You have successfully created a backup schedule.

Action	Status
Create backup schedule for Files and Folders	Success

You can also backup now

Back Up Now Wizard

## Confirmation

Select Backup Item  
Retain Backup Till  
**Confirmation**  
Backup progress

Backup Now will backup this server using the following settings:

Backup Items: C:\Users\ahmed\Documents\ (highlighted with a red box)

Files excluded: None  
Retain Backup Till: 10/29/2022

Server Settings  
Network throttling settings: Not Configured  
Proxy server settings: Not Configured  
[Change Properties](#)

< Previous Next > **Back Up** Cancel

Backup menu:  
Register Server  
Schedule Backup  
**Back Up Now** (highlighted with a red box)  
Recover Data  
Change Properties  
Open Portal  
About Microsoft Azure  
Privacy & Cookies  
View  
Help

# Azure Administrator (AZ-104) | Lab Guide

---

Home > Recovery Services vaults > AhmedRSV

**AhmedRSV | Backup items** Backup items ...

Recovery Services vault

Search   Refresh

Overview Activity log Access control (IAM) Tags Diagnose and solve problems

Settings Identity

For backups, try our new Backup Center. It offers Azure Backup customers a unified view of Recovery Services V along with new governance capabilities. Click here to get the new experience.

Primary Region Secondary Region

BACKUP MANAGEMENT TYPE	BACKUP ITEM COUNT
Azure Virtual Machine	1
Azure Backup Agent	1

---

Home > Recovery Services vaults > AhmedRSV | Backup items > Backup Items (Azure Backup Agent) >

**C:\ on web-2.** Backup Item ...

Essentials

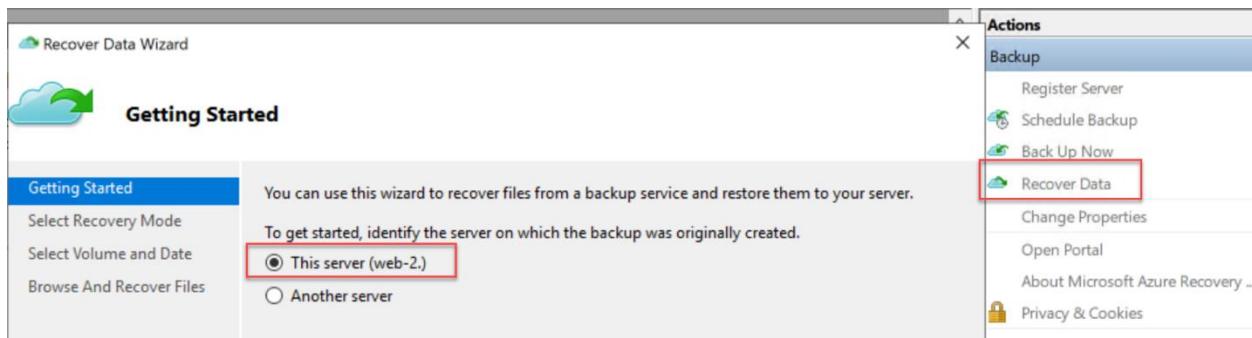
Recovery services vault : [AhmedRSV](#) Last backup status : ✓ Success  
Computer name : [web-2.](#) Last refreshed at : 9/29/2022, 1:24:05 PM  
Item Type : File-Folders

Monitoring

Recovery points	
Latest	9/29/2022, 1:22:12 PM
Oldest	9/29/2022, 1:22:12 PM
Total	1

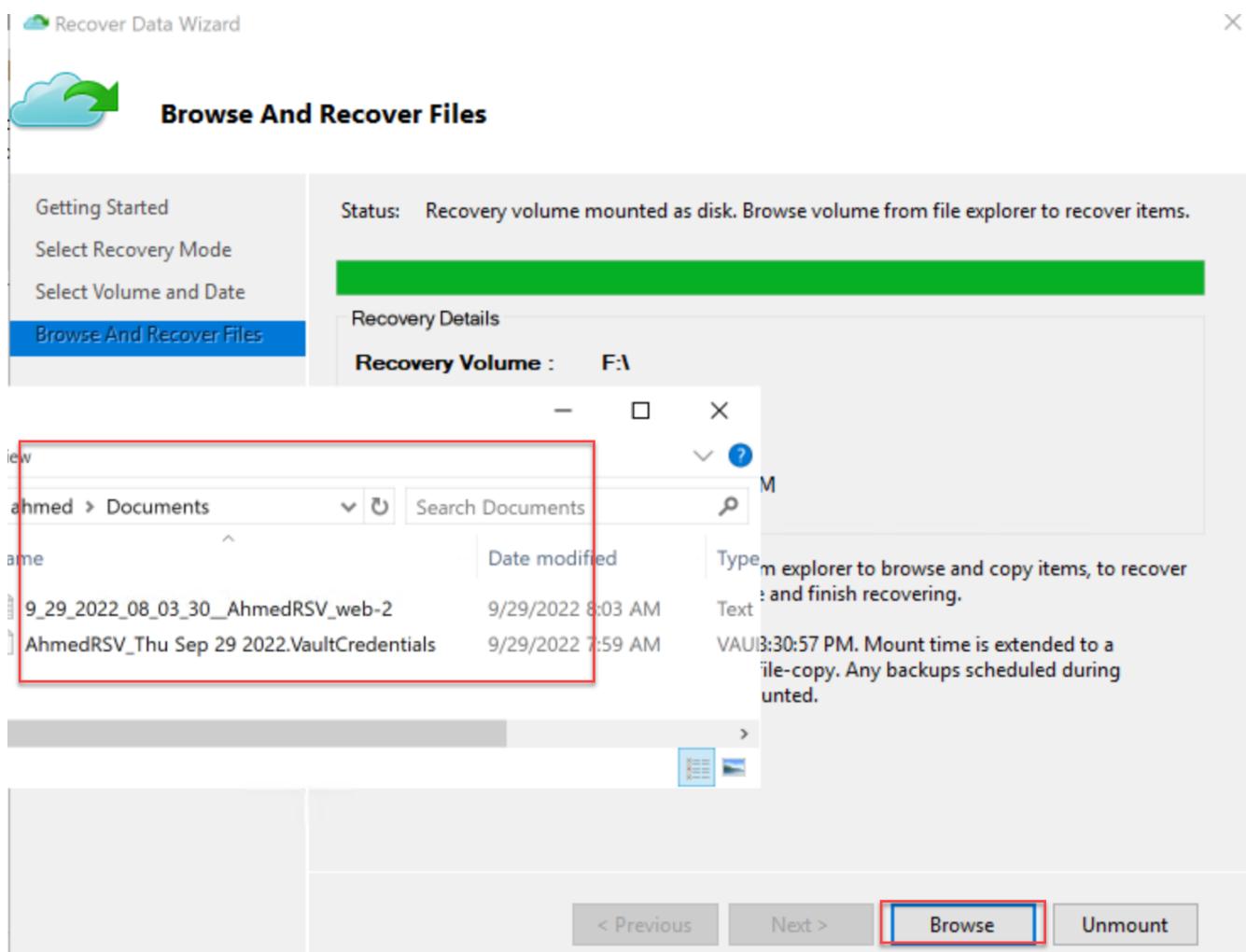
# Azure Administrator (AZ-104) | Lab Guide

To recover these data, you have to recover from azure backup agent



The screenshot shows the 'Select Recovery Mode' step of the 'Recover Data Wizard'. The sidebar shows 'Select Recovery Mode' is selected. The main area asks 'What do you want to recover?' and shows a radio button for 'Individual files and folders' (highlighted with a red box). Below it, text states: 'Mounts a backup of the selected volume that can be used to browse and recover individual files and folders. This option is best suited for recovering files and folders up to 80 GB in size.'

The screenshot shows the 'Select Volume and Date' step of the 'Recover Data Wizard'. The sidebar shows 'Select Volume and Date' is selected. The main area shows 'Select the volume: C\'. Below it, a calendar displays September 2022, with the date 29 highlighted (highlighted with a red box). To the right, it says 'Backup date: 9/29/2022' and 'Time: 9:22 AM'. At the bottom, a note says: 'Clicking 'Mount' will mount the selected recovery point as a volume. This might take a few minutes.' The 'Mount' button at the bottom right is highlighted with a red box.



## Azure Site Recovery

### Configuring ASR for on-premises resources

1. Prepare Infrastructure
2. Replicate Application
3. Manage Recovery Plans

The screenshot shows the Azure portal interface for managing Recovery Services vaults. On the left, there's a list of vaults: 'AbdelwahedRSV01' (selected) and 'AbdelwahedRSV02'. On the right, under 'AbdelwahedRSV01 - Site Recovery', there are sections for 'Settings' (Properties, Locks, Automation script), 'Getting started' (Backup), and 'FOR ON-PREMISES MACHINES' (Prepare Infrastructure, Step 1: Replicate Application, Step 2: Manage Recovery Plans). The 'Prepare Infrastructure' link is underlined.

The screenshot shows the 'Site Recovery' wizard in progress. The current step is 'Prepare infrastructure'. The process consists of five steps: 1. Protection goal (Select), 2. Deployment planning (Select), 3. Source (Prepare), 4. Target (Prepare), and 5. Replication settings (Prepare). The 'Protection goal' step is currently selected. To the right, a configuration pane titled 'Protection goal' is open, asking where machines are located (On-premises), where they are replicated to (To Azure), if they are virtualized (Yes, with Hyper-V), and if System Center VMM is used to manage hosts (No). The 'Activate Windows' watermark is visible at the bottom right.

# Azure Administrator (AZ-104) | Lab Guide

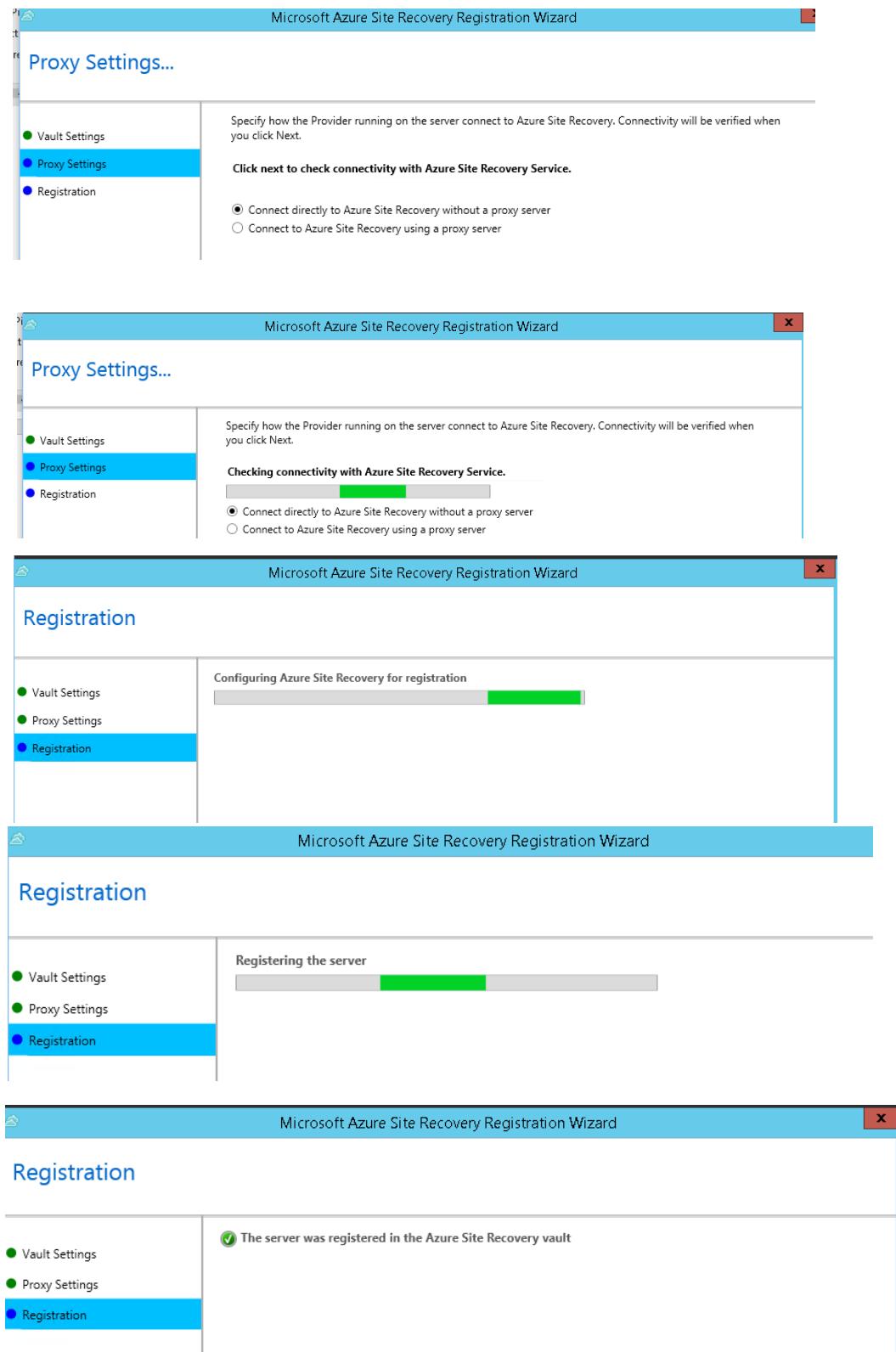
The screenshot shows the Azure portal interface for site recovery. On the left, the navigation menu includes 'Create a resource', 'Home', 'Dashboard', 'All services', 'FAVORITES' (with 'Recovery Services vaults' selected), 'Resource groups', 'All resources', 'Recent', 'App Services', 'SQL databases', 'Virtual machines (classic)', 'Virtual machines', 'Cloud services (classic)', 'Subscriptions', and 'Azure Active Directory'. The main area displays the 'AbdelwahedRSV01 - Site Recovery' blade, which lists 'Tasks' such as 'Automation script', 'started', 'Backup', 'Recovery', 'Backup items', 'Selected items', and 'Backup policies'. Below this is the 'Prepare infrastructure' step, which shows a 'FOR ON-PREMISES MACHINES' section with 'Prepare Infrastructure' and 'Step 1: Replicate Application' and 'Step 2: Manage Recovery Plans' options. To the right is the 'Deployment planning' blade, which contains a message about optimal performance, a note about download and run the deployment planner, and a dropdown menu for completed deployment planning.

The screenshot shows the 'Provider Installation' step of the 'Azure Site Recovery Provider Setup (Hyper-V server)' wizard. The left sidebar has two tabs: 'Microsoft Update' (selected) and 'Installation' (highlighted). The main pane specifies the installation location as 'C:\Program Files\Microsoft Azure Site Recovery Provider' and provides a 'Browse' button. A list of completed steps is shown: 'Configuring Service', 'Installation of Azure Recovery Services Agent completed', and 'Installation of Azure Site Recovery Provider completed'. A note at the bottom encourages continuing to register the server in an Azure Site Recovery vault.

The screenshot shows the 'Vault Settings...' step of the 'Microsoft Azure Site Recovery Registration Wizard'. The left sidebar has three tabs: 'Vault Settings' (selected), 'Proxy Settings', and 'Registration'. The main pane asks to select a registration key file from the Azure Site Recovery portal and specifies vault settings. It shows fields for 'Key file' (AbdelwahedRSV01\_AbdelwahedSite\_Tue Jan 08 2019.VaultCredentials), 'Subscription' (a7632f95-7f0d-4342-adda-dbc286dbe45c), 'Vault name' (AbdelwahedRSV01), and 'Hyper-V site name' (AbdelwahedSite).

# Azure Administrator (AZ-104) | Lab Guide

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# Azure Administrator (AZ-104) | Lab Guide

The screenshot shows the Azure Site Recovery interface with the following steps:

- Recovery**: Shows a 'Prepare Infrastructure' button under 'FOR ON-PREMISES MACHINES'.
- Prepare infrastructure**: Step 1: Protection goal (Hyper-V VMs to Azure) completed. Step 2: Deployment planning (I have done it) completed. Step 3: Source (Prepare) selected. Step 4: Target (Prepare) selected. Step 5: Replication settings (Prepare) selected.
- Prepare source**: Step 1: Select Hyper-V site (AbdelwahedSite). Step 2: Ensure Hyper-V servers are added (BNZShare.Binzafrah.com).
- Add Server**: Server type set to Hyper-V server. Information: Adding Hyper-V server may take 15 minutes to 30 minutes. Steps:
  - Make sure the host is running Windows Server 2012 R2 or above.
  - Configure Proxy setting and ensure each host can access the Service URLs.
  - Download the installer for the Microsoft Azure Site Recovery Provider.
  - Download the vault registration key to register the host in a Hyper-V site (AbdelwahedSite).
  - Install the Provider on the Hyper-V host and use the registration key to register.

The screenshot shows the Azure Site Recovery interface with the following steps:

- AbdelwahedRSV01 - Site Recovery**: Recovery Services vault. Navigation pane includes Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Properties, Locks, Automation script, Backup, Site Recovery (selected), and Protected items.
- Prepare infrastructure**: Step 1: Protection goal (Hyper-V VMs to Azure) completed. Step 2: Deployment planning (I have done it) completed. Step 3: Source (AbdelwahedSite). Step 4: Target (Prepare) selected. Step 5: Replication settings (Prepare) selected.
- Target**: Storage account (MSDN Platforms) and Network (Resource Manager) selected. Information: Subscription (MSDN Platforms), Select the deployment model used after failover (Resource Manager). Steps:
  - Ensure that at least one compatible Azure storage account exists.
  - Found abdelwahedstrg01diag (Standard) storage account.
  - Ensure that at least one compatible Azure virtual network exists.
  - Network(s): abdelwahedstrg01-vnet.

# Azure Administrator (AZ-104) | Lab Guide

This screenshot shows the 'Create and associate policy' step in the Azure Site Recovery interface. On the left, a sidebar lists tasks: 1. Protection goal (Hyper-V VMs to Azure), 2. Deployment planning (I have done it), 3. Source (AbdelwahedSite), 4. Target (Azure), and 5. Replication settings (Prepare). The main area shows a 'Replication policy' dialog with a 'Create and Associate' button. A message box says: 'Step 1: Ensure 'AbdelwahedSite' is associated to at least one replication policy'. The right panel shows configuration for a new policy: Name (AbdelwahedPolicy), Source type (Hyper-V), Target type (Azure), Copy frequency (5 Minutes), Recovery point retention in hours (2), App-consistent snapshot frequency in hours (1), and Initial replication start time (Immediately). Associated Hyper-V site is set to AbdelwahedSite.

This screenshot shows the 'Prepare infrastructure' step in the Azure Site Recovery interface. On the left, a sidebar lists tasks: 1. Prepare Infrastructure (highlighted in grey), 2. Step 1: Replicate Application, and 3. Step 2: Manage Recovery Plans. The main area shows a 'Prepare infrastructure' dialog with a 'Create and Associate' button. A message box says: 'Step 1: Ensure 'AbdelwahedSite' is associated to at least one replication policy'. Below it, a success message says: 'Successfully created replication policy (View job)' and a progress message says: 'Associating 'AbdelwahedSite' to replication policy (View job in progress)'. The right panel shows the same configuration as the previous screenshot: Name (AbdelwahedPolicy), Source type (Hyper-V), Target type (Azure), Copy frequency (5 Minutes), Recovery point retention in hours (2), App-consistent snapshot frequency in hours (1), and Initial replication start time (Immediately). Associated Hyper-V site is set to AbdelwahedSite.

# Azure Administrator (AZ-104) | Lab Guide

The screenshot shows the 'Replication policy' step in the 'Prepare infrastructure' wizard. It lists five steps: 1. Protection goal (Hyper-V VMs to Azure), 2. Deployment planning (I have done it), 3. Source (testsite), 4. Target (Azure), and 5. Replication settings (Prepare). Step 1 is completed with a green checkmark. Step 2 is also completed. Step 3 is completed. Step 4 is completed. Step 5 is in progress. A success message at the top right says 'Successfully completed the operation.' and 'Associating 'testsite' to 'ahmedreplicate' 8:20 PM'.

The screenshot shows the 'Source' configuration step in the 'Enable replication' wizard. It lists three steps: 1. Source (Configure), 2. Virtual machines (Select), and 3. Replication settings (Configure replication settings). Step 1 is completed. Step 2 is in progress. Step 3 is in progress. The 'Source' dropdown is set to 'On-premises' and the 'Source location' dropdown is set to 'testsite'.

The screenshot shows the 'Target' configuration step in the 'Enable replication' wizard. It lists five steps: 1. Source (testsite), 2. Target (Configure), 3. Virtual machines (Select), 4. Properties (Configure properties), and 5. Replication settings (Configure replication settings). Step 1 is completed with a green checkmark. Step 2 is completed. Step 3 is in progress. Step 4 is in progress. Step 5 is in progress. The 'Target' dropdown is set to 'Azure' and the 'Subscription' dropdown is set to 'MSDN Platforms (a7632f95-7fd0-4342-...)'.

# Azure Administrator (AZ-104) | Lab Guide

Recovery Services vaults > AbdelwahedRSV - Site Recovery > Enable replication > Select virtual machines

**AbdelwahedRSV - Site Recovery**

- Settings
- Properties
- Locks
- Automation script
- Getting started
- Backup
- Site Recovery**
- Protected items
- Backup items
- Replicated items
- Manage
- Backup policies
- Backup Infrastructure
- Site Recovery infrastructure

**Enable replication**

AbdelwahedRSV

- Source testsite ✓
- Target Azure ✓
- Virtual machines Select**
- Properties Configure properties
- Replication settings Configure replication settings

**Select virtual machines**

Finished retrieving data.

Filter items... BNZVDC

OK

Recovery Services vaults > AbdelwahedRSV - Site Recovery > Enable replication > Configure properties

**Enable replication**

AbdelwahedRSV

- Source testsite ✓
- Target Azure ✓
- Virtual machines 1 Selected ✓
- Properties Configure properties**
- Replication settings Configure replication settings

**Configure properties**

NAME	OS TYPE	OS DISK	DISKS TO REPLICATE
Defaults	Select	Need to select per VM.	Need to select per VM.
BNZVDC	Windows	BNZVDC	All Disks [1]

OK

set replication policy

Recovery Services vaults > AbdelwahedRSV - Site Recovery > Enable replication > Configure replication settings

**Enable replication**

AbdelwahedRSV

- Source testsite ✓
- Target Azure ✓
- Virtual machines 1 Selected ✓
- Properties Configured**
- Replication settings Configure replication settings

**Configure replication settings**

Replication policy ahmedreplicate

Copy frequency	5 Minutes
Recovery point retention	2 Hours
App consistent snapshot frequency	1 Hour
Initial replication start time	Immediately
Encrypt data stored on Azure	Off
VMM settings	Not configured

**Enable replication**

AbdelwahedRSV

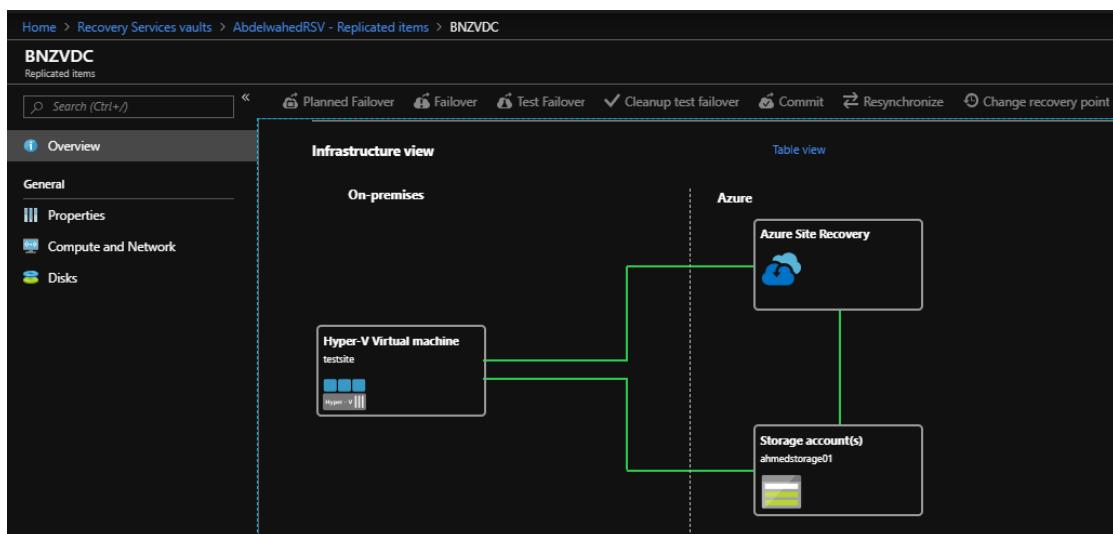
- Source testsite ✓
- Target Azure ✓
- Virtual machines 1 Selected ✓
- Properties Configured ✓
- Replication settings ahmedreplicate ✓

Activate Windows

# Azure Administrator (AZ-104) | Lab Guide

The screenshot shows the Azure Recovery Services vaults interface. The left sidebar shows 'BNZVDC' under 'Replicated items'. The main area displays the 'Overview' tab for the 'BNZVDC' replicated item. The 'Essentials' section includes 'Health and status' (Replication Health: Healthy, Status: 1% synchronized), 'Failover readiness' (Last successful Test Failover), and a 'Latest recovery points' section. Below this is an 'Errors(0)' section and an 'Events - Last 72 hours(0)' table.

The screenshot shows the 'Recovery Services vaults' list. The 'AbdelwahedRSV' vault is selected. The 'Replicated items' section is highlighted in the left sidebar. The main area shows a table with one item: BNZVDC, which is healthy and 1% synchronized. A note at the top right says: 'You can run your machines on managed disks after a failover or migration from on-premises to Azure. Set the option to use managed disks in Replicated item -> Settings -> Compute and Network.'



# Azure Administrator (AZ-104) | Lab Guide

## Failover and migrating the VM

The screenshot illustrates the process of failover and migration for a virtual machine named DC1.

**Failover Step:** A modal window titled "Failover" is open, showing the "Failover direction" from "VMM" to "Azure". It includes a "Recovery Point" section and a checkbox for "Shut down virtual machine and synchronize the latest data". The "OK" button is visible at the bottom right.

**VM Overview:** The main pane shows the VM details: Resource group (PacktRecovery), Status (Running), Location (West Europe), Subscription (Microsoft Azure Sponsorship), and Subscription ID (cb638267-a366-463c-bfe5-7a49311c27a8). It also displays CPU and Network usage charts.

**Migration Step:** A modal window titled "Complete Migration" for DC1 is open, asking if the user is sure about the migration. It states that the machine will be removed from protection, configuration will be cleaned up, and billing will stop. The "OK" button is visible at the bottom right.