

Lab 01 - Manage Microsoft Entra ID Identities

Lab introduction

This is the first in a series of labs for Azure Administrators. In this lab, you learn about users and groups. Users and groups are the basic building blocks for an identity solution.

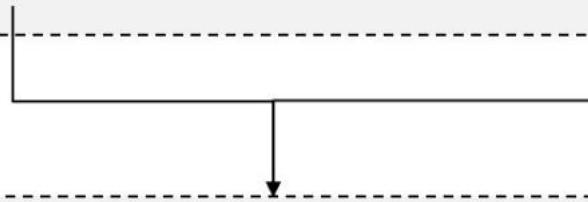
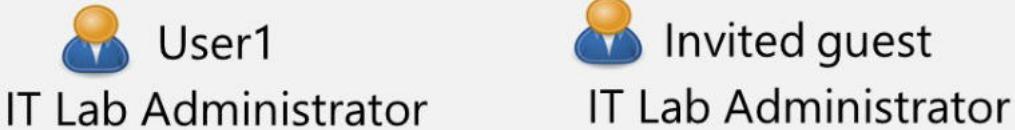
This lab requires an Azure subscription. Your subscription type may affect the availability of features in this lab. You may change the region, but the steps are written using **East US**.

Estimated timing: 30 minutes

Lab scenario

Your organization is building a new lab environment for pre-production testing of apps and services. A few engineers are being hired to manage the lab environment, including the virtual machines. To allow the engineers to authenticate by using Microsoft Entra ID, you have been tasked with provisioning users and groups. To minimize administrative overhead, membership of the groups should be updated automatically based on job titles.

Task 1



Task 2



IT Lab
Administrators

Job skills

- Task 1: Create and configure user accounts.

- Task 2: Create groups and add members.

Microsoft Entra ID

Task 1: Create and configure user accounts

Creating a New User

The screenshot shows the 'Create new user' page in the Microsoft Azure portal. The 'Identity' tab is selected. The 'User principal name' field contains 'az104-user1'. The 'Mail nickname' field also contains 'az104-user1' and has a checked checkbox for 'Derive from user principal name'. The 'Display name' field contains 'az104-user1'. The 'Password' field contains a masked password. The 'Account enabled' checkbox is checked. At the bottom, there are 'Review + create' and 'Next: Properties >' buttons.

On the **Properties** tab noticed all the different types of information that can be included in the user account

The screenshot shows the 'Properties' tab of the 'Create new user' page. The 'Job Information' section is visible, containing fields for Job title (IT Lab Administrator), Company name, Department (IT), Employee ID, Employee type, Employee hire date, Office location, and Manager. There is a '+ Add manager' button. At the bottom, there are 'Review + create' and 'Next: Assignments >' buttons.

New User Created

Inviting External User

[Home](#) > [Users](#) >

Invite external user

Invite an external user to collaborate with your organization

[Basics](#) [Properties](#) [Assignments](#) [Review + invite](#)

 Invite a new guest user to collaborate with your organization. The user will be emailed an invitation they can accept in order to begin collaborating. [Learn more](#)

Identity

 Email *

Display name

Invitation message

 Send invite message

Message

[Review + invite](#)
[Previous](#)
[Next: Properties >](#)
[Give feedback](#)
[Home](#) > [Users](#) >

Invite external user

Invite an external user to collaborate with your organization

Identity

First name

Last name

User type

Authorization info

[Edit Certificate user IDs](#)

Job Information

Job title

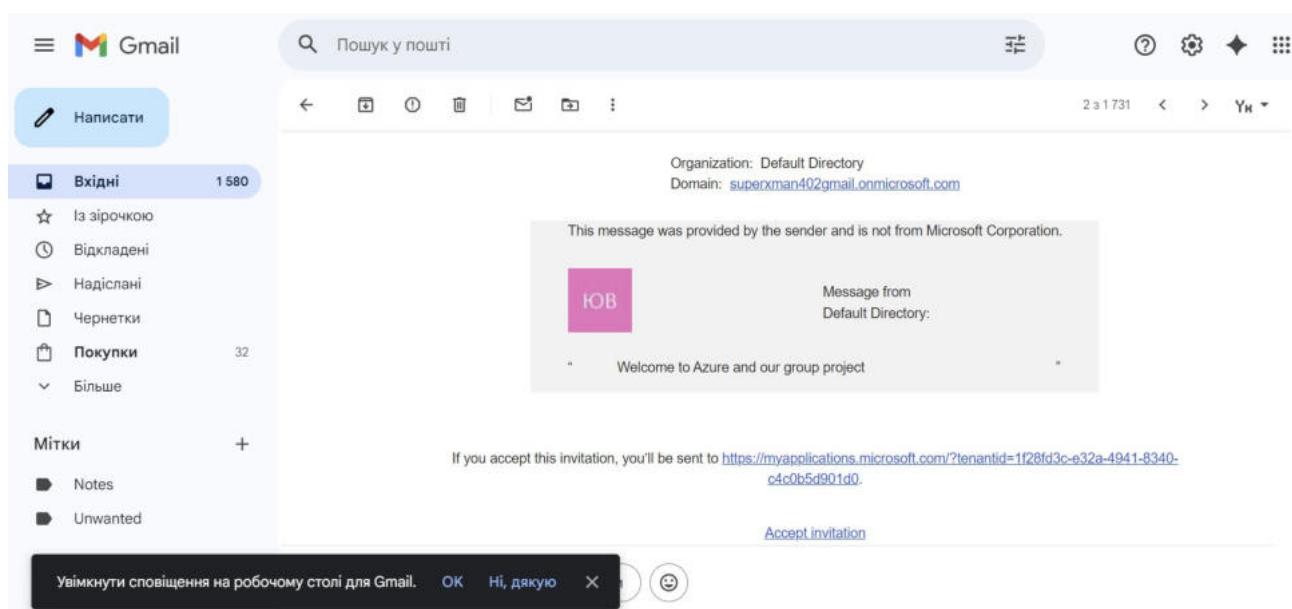
Company name

Department

Employee ID

[Review + invite](#)
[Previous](#)
[Next: Assignments >](#)
[Give feedback](#)

External User Invited



The screenshot shows the Gmail inbox with the following details:

- Inbox Summary:** Вхідні (1 580 messages).
- Sender:** Default Directory (Domain: superxman402@gmail.onmicrosoft.com).
- Subject:** This message was provided by the sender and is not from Microsoft Corporation.
- Content Preview:** ЮВ (Yellow square logo), Message from Default Directory: Welcome to Azure and our group project!
- Message Action:** If you accept this invitation, you'll be sent to <https://myapplications.microsoft.com/?tenantid=1f28fd3c-e32a-4941-8340-c4c0b5d901d0>.
- Accept Invitation Button:** Accept invitation.
- Bottom Bar:** Увімкнути сповіщення на робочому столі для Gmail. OK Ні, дякую X.

We have two users created, including external

Microsoft Azure | Search resources, services, and docs (G+/) | Copilot | Home > Users

All users

Audit logs | Sign-in logs | Diagnose and solve problems | Deleted users | Password reset | User settings | Bulk operation results | Bulk operation results (Preview) | New support request

Search | Add filter

2 users found

Display name ↑	User principal name ↓	User type	Is Agent	On-premises sync status	Identities
Az104-user1	az104-user1@superx... Юрий Василишин	Member	No	No	superxman402@gmail.com
Юрий Василишин	superxman402_g... az104-user1@superx... Юрий Василишин	Member	No	No	MicrosoftAccount

Add or remove favorites by pressing Ctrl+Shift+F

Task 2: Create groups and add members

Creating a New Group

Microsoft Azure | Search resources, services, and docs (G+/) | Copilot | Home > Default Directory | Groups | Groups | All groups | New Group

Got feedback?

Group type * Security

Group name * IT Lab Administrators

Group description Administrators that manage the IT lab

Membership type Assigned

Owners
No owners selected

Members

Create

Microsoft Azure | Search resources, services, and docs (G+/) | Copilot | Home > Groups

Groups | All groups

Overview | All groups | Deleted groups | Diagnose and solve problems | Settings | General | Expiration | Naming policy | Activity | Troubleshooting + Support

New group | Download groups | Refresh | Manage view | Delete | Got feedback?

Microsoft Entra has a simpler, integrated experience for managing all your Identity and Access Management needs. Try the new Microsoft Entra admin center! [Learn more](#)

Search | Add filter

Search mode Contains

1 group found

Name ↑	Object Id	Group type	Membership
IT Lab Administrators	796378f1-d6e1-4587-9391-f4276b65d3a2	Security	Assigned

Adding myself as an owner

The screenshot shows the 'Add owners' page for the 'IT Lab Admin' group in the Microsoft Azure portal. The left sidebar shows navigation options like Overview, Diagnose and solve, Manage, Properties, Members, Owners, Roles and administrators, Administrative units, Group memberships, Applications, Licenses, and Azure role assignments. The 'Owners' tab is selected. The main area displays a search bar and a table with two users: 'Юрій Василюшин' (superxman402@gmail.com) and 'az104-user1'. A 'Select' button is at the bottom. On the right, a sidebar titled 'Owners (1)' shows the selected user.

Name	User principal name
Юрій Василюшин	superxman402@gmail.com
az104-user1	az104-user1@superxman402@gmail.onmicrosoft.com

Adding az104-user1 as a member

The screenshot shows the 'Add members' page for the 'IT Lab Admin' group in the Microsoft Azure portal. The left sidebar shows navigation options like Overview, Diagnose and solve, Manage, Properties, Members, Owners, Roles and administrators, Administrative units, Group memberships, Applications, Licenses, and Azure role assignments. The 'Members' tab is selected. The main area displays a search bar and a table with various entities: AR (Enterprise application), IT Lab Administrators (Group), az104-user1 (User), and AADReportina (Enterprise application). A 'Select' button is at the bottom. On the right, a sidebar titled 'Selected (1)' shows the selected user.

Name	Type	Details
AR	Enterprise application	c728155f-7b2a-4502-a08b-b8af9b269319
IT Lab Administrators	Group	
az104-user1	User	az104-user1@superxman402@gmail.onmicrosoft.com
AADReportina	Enterprise application	1b912ec3-a9dd-4c4d-a53e-76aa7adb28d7

Adding invited user as a member

The screenshot shows the 'Members' page for the 'IT Lab Administrators' group in the Microsoft Azure portal. The left sidebar shows navigation options like Overview, Diagnose and solve problems, Manage, Properties, Members, Owners, Roles and administrators, Administrative units, Group memberships, Applications, Licenses, and Azure role assignments. The 'Members' tab is selected. The main area displays a search bar and a table with three group members: 'az104-user1' (User) and 'Юрій Василюшин' (User). A 'Direct members' tab is selected. A 'Search' bar and an 'Add filter' button are at the top of the table.

Name	Type	Email
az104-user1	User	az104-user1@superxman402@gmail.onmicrosoft.com
Юрій Василюшин	User	superxman402@gmail.com

The screenshot shows the Microsoft Azure Groups Overview page. At the top, there's a navigation bar with 'Microsoft Azure', a search bar, and various icons. Below it, a banner says 'Microsoft Entra has a simpler, integrated experience for managing all your Identity and Access Management needs. Try the new Microsoft Entra admin center!' with a link. The main area is titled 'All groups' with a '... more' button. It includes buttons for 'New group', 'Download groups', 'Refresh', 'Manage view', 'Delete', and 'Got feedback?'. A search bar with placeholder 'Search' and a 'Group type : Security' filter are present. The results table shows one group: 'IT Lab Administrators' (Object ID: 796378f1-d6e1-4587-9391-f4276b65d3a2), which is a 'Security' group type and 'Assigned' membership type. The table has columns for Name, Object Id, Group type, Membership type, and Email.

Lab 02a - Manage Subscriptions and RBAC

Lab introduction

In this lab, you learn about role-based access control. You learn how to use permissions and scopes to control what actions identities can and cannot perform. You also learn how to make subscription management easier using management groups.

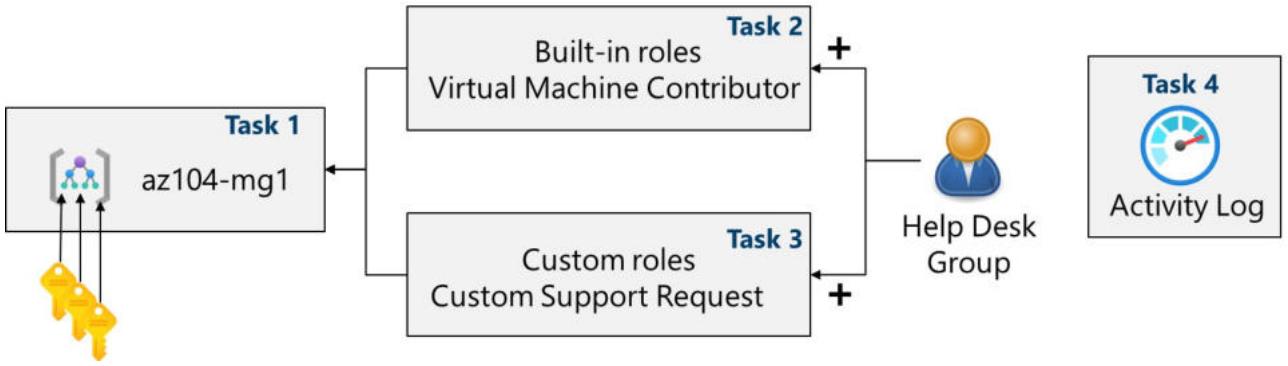
This lab requires an Azure subscription. Your subscription type may affect the availability of features in this lab. You may change the region, but the steps are written using **East US**.

Estimated timing: 20 minutes

Lab scenario

To simplify management of Azure resources in your organization, you have been tasked with implementing the following functionality:

- Creating a management group that includes all your Azure subscriptions.
- Granting permissions to submit support requests for all subscriptions in the management group. The permissions should be limited only to:
 - Create and manage virtual machines
 - Create support request tickets (do not include adding Azure providers)



Job skills

- Task 1: Implement management groups.
- Task 2: Review and assign a built-in Azure role.
- Task 3: Create a custom RBAC role.
- Task 4: Monitor role assignments with the Activity Log.

Task 1: Implement Management Groups

In this task, you will create and configure management groups. Management groups are used to logically organize and segment subscriptions. They allow for RBAC and Azure Policy to be assigned and inherited to other management groups and subscriptions. For example, if your organization has a dedicated support team for Europe, you can organize European subscriptions into a management group to provide the support staff access to those subscriptions (without providing individual access to all subscriptions). In our scenario everyone at the Help Desk will need to create a support request across all subscriptions.

Noticed that I can manage access to all Azure subscriptions and management groups in the tenant

Creating a management group

The screenshot shows the Microsoft Azure portal interface. On the left, there is a navigation sidebar with various options like Resource Manager, All resources, and Management groups. The 'Management groups' option is currently selected. The main content area is titled 'Create management group' and contains fields for 'Management group ID' (set to 'az104-mg123') and 'Management group display name' (set to 'az104-mg1'). There are also tabs for 'Overview', 'Getting started', and 'Settings'. At the bottom, there are 'Submit' and 'Cancel' buttons.

As we can see, a management group is created

The screenshot shows the Microsoft Azure portal interface. The left sidebar is identical to the previous screenshot, with 'Management groups' selected. The main content area is titled 'Resource Manager | Management groups' and displays a list of management groups. It shows one entry under 'Tenant Root Group': 'az104-mg1' (Type: Management group, ID: az104-mg123). There are buttons for 'Create', 'Add subscription', 'Refresh', 'Expand / Collapse all', 'Export to CSV', and 'Feedback'.

Task 2: Review and assign a built-in Azure role

In this task, you will review the built-in roles and assign the VM Contributor role to a member of the Help Desk. Azure provides a large number of [built-in roles](#).

Adding a role assignment via IAM (Access control). Selecting VM contributor. The Virtual machine contributor role lets you manage virtual machines, but not access their operating system or manage the virtual network and storage account they are connected to. This is a good role for the Help Desk.

Add role assignment

Role	Description	Type	Compliance	View
Desktop Virtualization Power On C...	Provide permission to the Azure Virtual Desktop Resource Provider to start virtual machines.	BuiltInRole	None	View
Desktop Virtualization Power On Of...	Provide permission to the Azure Virtual Desktop Resource Provider to start and stop virtual ...	BuiltInRole	None	View
Desktop Virtualization Virtual Mach...	This role is in preview and subject to change. Provide permission to the Azure Virtual Deskt...	BuiltInRole	None	View
DevTest Labs User	Lets you connect, start, restart, and shutdown your virtual machines in your Azure DevTest L...	BuiltInRole	DevOps	View
Service Fabric Cluster Contributor	Manage your Service Fabric Cluster resources. Includes clusters, application types, applicati...	BuiltInRole	None	View
Virtual Machine Administrator Login	View Virtual Machines in the portal and login as administrator	BuiltInRole	Compute	View
Virtual Machine Contributor	Lets you manage virtual machines, but not access to them, and not the virtual network or st...	BuiltInRole	Compute	View
Virtual Machine Data Access Admin...	Manage access to Virtual Machines by adding or removing role assignments for the Virtual ...	BuiltInRole	None	View
Virtual Machine Local User Login	View Virtual Machines in the portal and login as a local user configured on the arc server	BuiltInRole	None	View
Virtual Machine User Login	View Virtual Machines in the portal and login as a regular user.	BuiltInRole	Compute	View

Showing 1 - 12 of 12 results.

Adding role to the group

Microsoft Azure Copilot Feedback

Home > Resource Manager | Management groups > az104-mg1 | Access control (IAM) >

Add role assignment

Role
Members
Conditions
Review + assign

Selected role Virtual Machine Contributor

Assign access to User, group, or service principal Managed identity

Members [+ Select members](#)

Name	Object ID	Type
IT Lab Administrators	796378f1-d6e1-4587-9391-f4276b65d3...	Group

Description

Review + assign
Previous
Next
Feedback

As we can see, our group has role VM contributor

Microsoft Azure Copilot Feedback

Home > Resource Manager | Management groups > az104-mg1

az104-mg1 | Access control (IAM)

Management group

Subscriptions
Resource Groups
Resources
Activity Log
Access control (IAM)

Action required: 1 user has elevated access in your tenant. You should take immediate action and remove all role assignments with elevated access. [View role assignments](#)

Role assignments

All (3) Job function roles (1) Privileged administrator roles (2)

Name ↑ Type ↑ Role ↑ Scope ↑ Condition ↑

Virtual Machine Contributor (1)

IT Lab Administrators Group Virtual Machine Contributor This resource Add

Showing 1 - 1 of 1 results.

Task 3: Create a custom RBAC role

In this task, you will create a custom RBAC role. Custom roles are a core part of implementing the principle of least privilege for an environment. Built-in roles might have too many permissions for your scenario. We will also create a new role and remove permissions that are not necessary. Do you have a plan for managing overlapping permissions?

Creating a custom role “Custom support request”

The screenshot shows the 'Create a custom role' page in the Microsoft Azure portal. The 'Basics' tab is selected. The 'Custom role name' field contains 'Custom support request'. The 'Description' field contains 'A custom contributor role for support requests.' The 'Baseline permissions' section has 'Clone a role' selected. The 'Role to clone' dropdown is set to 'Support Request Contributor'. At the bottom, there are 'Review + create', 'Previous', and 'Next' buttons.

Excluding Microsoft support permissions

The screenshot shows the 'Microsoft.Support permissions' page in the Microsoft Azure portal. The 'Permissions' tab is selected. A note explains that exclude permissions enable subtracting specific permissions from a wildcard (*) permission. The search bar shows 'support'. Under 'Permission', 'Not Actions' is selected. The 'Microsoft.Support' section contains four permissions: 'Other : Registers Support Resource Provider', 'Other : Look Up Resource Id', 'Other : Check Name Availability', and 'Other : List Classify Services'. The 'Microsoft.Support/operationresults' section is collapsed. At the bottom, there are 'Review + create', 'Add', and 'Cancel' buttons.

Microsoft Azure Search resources, services, and docs (G+/)

Home > Resource Manager | Management groups > az104-mg1 | Access control (IAM) >

Create a custom role

Permissions

+ Add permissions + Exclude permissions

Click Add permissions to select the permissions you want to add to this custom role. To add a wildcard (*) permission, you must manually add the permission on the JSON tab. [Learn more](#). To exclude specific permissions from a wildcard permission, click Exclude permissions. [Learn more](#).

Permission	Description	Permission type
Microsoft.Authorization/*/read	--	Action
Microsoft.Resources/subscriptions/resourceGroups/read	Gets or lists resource groups.	Action
Microsoft.Support/*	--	Action
Microsoft.Support/register/action	Registers Support Resource Provider	NotAction

Definitions

Control plane
Actions specify the operations that a role is allowed to perform. NotActions specify the operations that are excluded from the allowed Actions (this is useful if a role has wildcards).

Data plane
DataActions specify the operations that a role is allowed to perform to the data within an object. NotDataActions specify the operations that are excluded from the allowed DataActions (this is useful if a role has wildcards).

Review + create **Previous** **Next** **Feedback**

Making sure that our management group is listed in Assinable scopes

Home > Resource Manager | Management groups > az104-mg1 | Access control (IAM) >

Create a custom role

Assignable scopes

Reviewing JSON

Home > Resource Manager | Management groups > az104-mg1 | Access control (IAM) >

Create a custom role

```

4   "description": "A custom contributor role for support requests.",
5   "assignableScopes": [
6     "/providers/Microsoft.Management/managementGroups/az104-mg123"
7   ],
8   "permissions": [
9     {
10       "actions": [
11         "Microsoft.Authorization/*/read",
12         "Microsoft.Resources/subscriptions/resourceGroups/read",
13         "Microsoft.Support/*"
14       ],
15       "notActions": [
16         "Microsoft.Support/register/action"
17       ],
18       "dataActions": [],
19       "notDataActions": []
20     }
21   ]
22 }
23 
```

use the format {CompanyName}.(ProviderName)/(resourceType)/(action).

Add wildcards (*)

Add wildcards (*) to a permission string to include all permissions that match the string. For example, if you specify Microsoft.Compute/* as an Action, your role can perform all management operations in Microsoft.Compute.

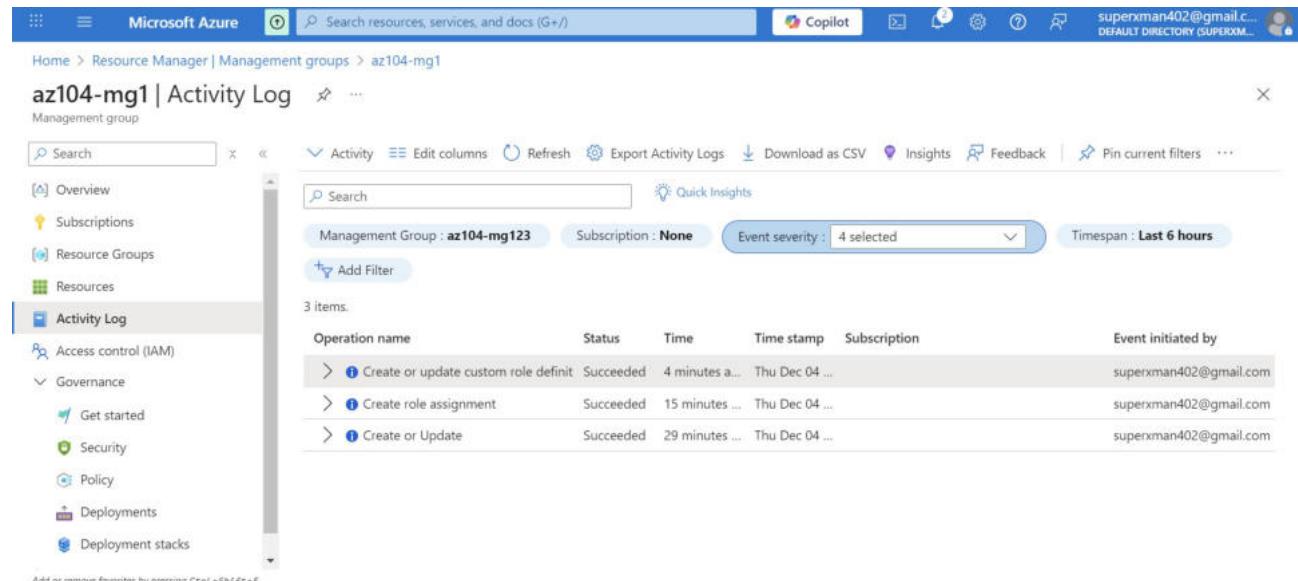
Add assignable scopes

Management group scope has the format /providers/Microsoft.Management/managementGroups/(managementGroupName). Subscription scope has the format /subscriptions/(subscriptionId). Resource group scope has the format /subscriptions/(subscriptionId)/resourceGroups/(resourceGroupName).

At this point, I have created a custom role and assigned it to the management group.

Task 4: Monitor role assignments with the Activity Log

In this task, you view the activity log to determine if anyone has created a new role.



Operation name	Status	Time	Time stamp	Subscription	Event initiated by
> Create or update custom role definition	Succeeded	4 minutes ago	Thu Dec 04 ...		superxman402@gmail.com
> Create role assignment	Succeeded	15 minutes ago	Thu Dec 04 ...		superxman402@gmail.com
> Create or Update	Succeeded	29 minutes ago	Thu Dec 04 ...		superxman402@gmail.com

Lab 02b - Manage Governance via Azure Policy

Lab introduction

In this lab, you learn how to implement your organization's governance plans. You learn how Azure policies can ensure operational decisions are enforced across the organization. You learn how to use resource tagging to improve reporting.

This lab requires an Azure subscription. Your subscription type may affect the availability of features in this lab. You may change the region, but the steps are written using **East US**.

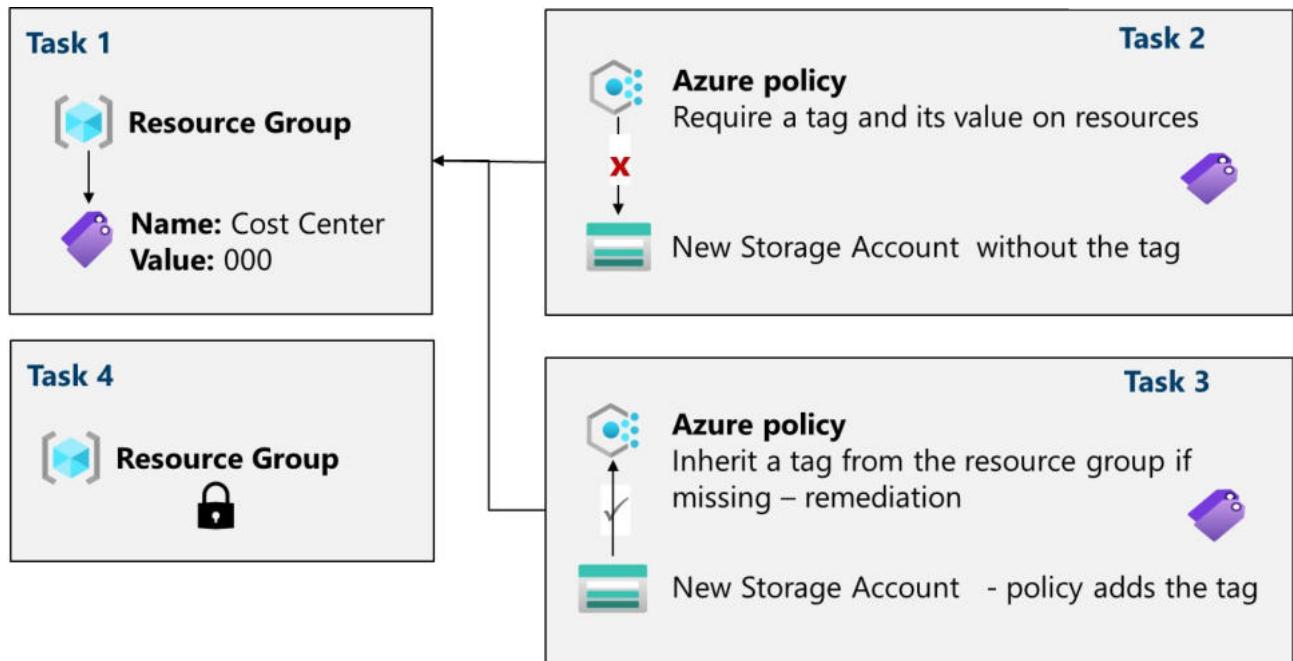
Estimated timing: 30 minutes

Lab scenario

Your organization's cloud footprint has grown considerably in the last year. During a recent audit, you discovered a substantial number of resources that do not have a defined owner, project, or cost center. In order to improve management of Azure resources in your organization, you decide to implement the following functionality:

- apply resource tags to attach important metadata to Azure resources
- enforce the use of resource tags for new resources by using Azure policy
- update existing resources with resource tags

- use resource locks to protect configured resources



Job skills

- Task 1: Create and assign tags via the Azure portal.
- Task 2: Enforce tagging via an Azure Policy.
- Task 3: Apply tagging via an Azure Policy.
- Task 4: Configure and test resource locks.

Task 1: Assign tags via the Azure portal

In this task, you will create and assign a tag to an Azure resource group via the Azure portal. Tags are a critical component of a governance strategy as outlined by the Microsoft Well-Architected Framework and Cloud Adoption Framework. Tags can allow you to quickly identify resource owners, sunset dates, group contacts, and other name/value pairs that your organization deems important. For this task, you assign a tag identifying the resource Cost Center.

Creating a resource group

Microsoft Azure Search resources, services, and docs (G+) Copilot DEFAULT DIRECTORY (SUPERXMAN... superxman402@gmail.c...

Home > Create a resource > Marketplace >

Create a resource group

Basics Tags Review + create

Resource group - A container that holds related resources for an Azure solution. The resource group can include all the resources for the solution, or only those resources that you want to manage as a group. You decide how you want to allocate resources to resource groups based on what makes the most sense for your organization. [Learn more](#)

Subscription * (Disabled) Azure subscription 1

Resource group name * az104-rg2

Region * (US) East US

Previous Next Review + create

Creating tags

Microsoft Azure Search resources, services, and docs (G+) Copilot Yurii.Vasylyshyn KN.202... НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ...

Home > Create a resource > Marketplace >

Create a resource group

Basics Tags Review + create

Apply tags to your Azure resources to logically organize them by categories. A tag consists of a key (name) and a value. Tag names are case-insensitive and tag values are case-sensitive. [Learn more](#)

Name	Value	Resource
Cost Center	000	Resource group
		Resource group

Previous Next Review + create

Created

Microsoft Azure Search resources, services, and docs (G+) Copilot Yurii.Vasylyshyn KN.202... НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ...

Home >

az104-rg2

Resource group

Search Create Manage view Delete resource group Refresh Export to CSV Open query ... Group by none JSON View

Overview Essentials

Activity log Access control (IAM) Tags Resource visualizer Events Settings Cost Management Monitoring Automation Help

Resources Recommendations

Filter for any field... Type equals all Location equals all Add filter

No resources match your filters Try changing or clearing your filters.

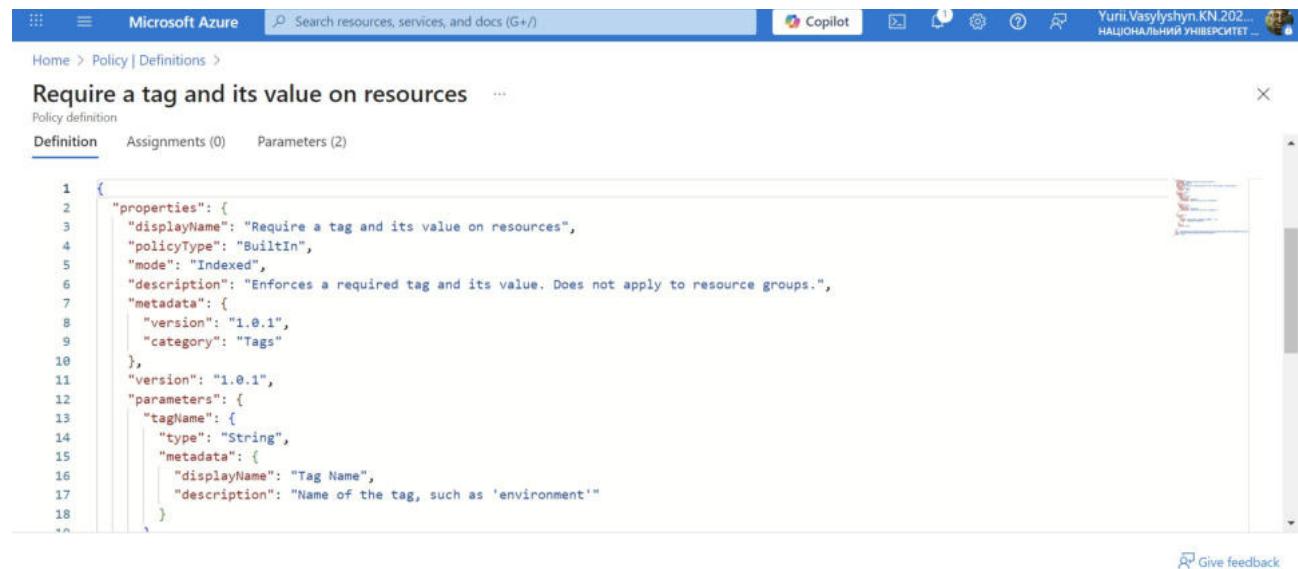
Create Clear filters

Add or remove favorites by pressing **Ctrl+Shift+F**

Task 2: Enforce tagging via an Azure Policy

In this task, you will assign the built-in *Require a tag and its value on resources* policy to the resource group and evaluate the outcome. Azure Policy can be used to enforce configuration, and in this case, governance, to your Azure resources.

Reviewing a built-in policy

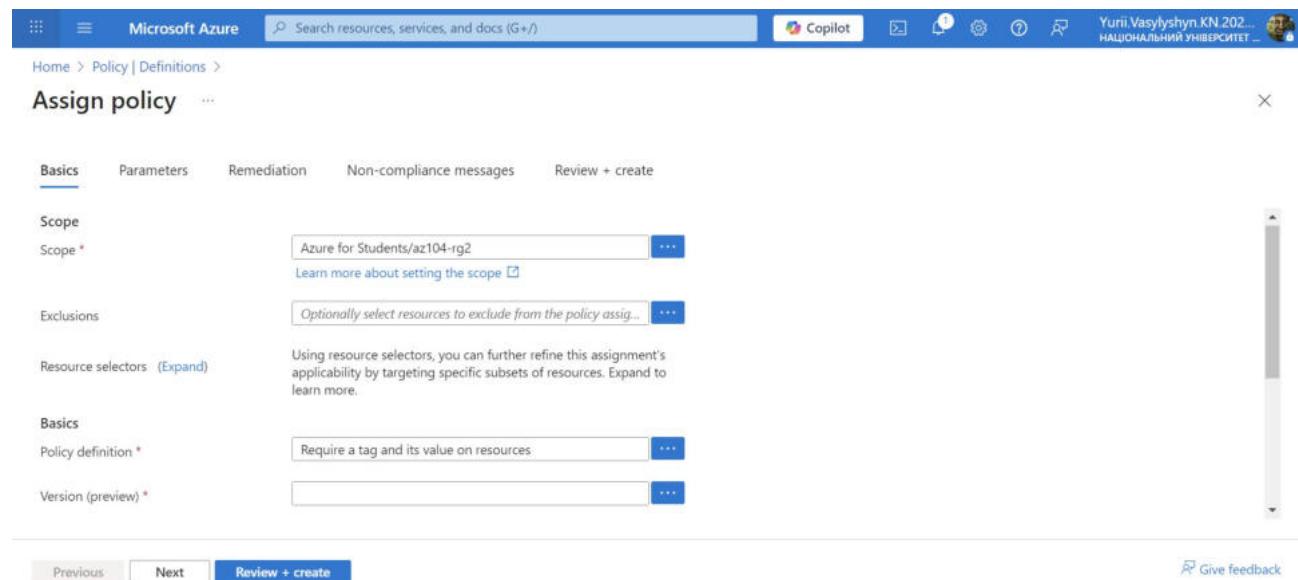


The screenshot shows the Microsoft Azure Policy Definition page. The title is "Require a tag and its value on resources". Below it, there are tabs for "Definition", "Assignments (0)", and "Parameters (2)". The "Definition" tab is selected, displaying the following JSON code:

```
1 {
2   "properties": {
3     "displayName": "Require a tag and its value on resources",
4     "policyType": "BuiltIn",
5     "mode": "Indexed",
6     "description": "Enforces a required tag and its value. Does not apply to resource groups.",
7     "metadata": {
8       "version": "1.0.1",
9       "category": "Tags"
10    },
11    "version": "1.0.1",
12    "parameters": {
13      "tagName": {
14        "type": "String",
15        "metadata": {
16          "displayName": "Tag Name",
17          "description": "Name of the tag, such as 'environment'"
18        }
19      }
20    }
21 }
```

At the bottom right of the code editor, there is a "Give feedback" link.

Assigning policy



The screenshot shows the Microsoft Azure Assign policy page. The title is "Assign policy". Below it, there are tabs for "Basics", "Parameters", "Remediation", "Non-compliance messages", and "Review + create". The "Basics" tab is selected. The configuration includes:

- Scope:** Azure for Students/az104-rg2
- Exclusions:** Optionally select resources to exclude from the policy assignment
- Resource selectors:** (Expand) Using resource selectors, you can further refine this assignment's applicability by targeting specific subsets of resources. Expand to learn more.
- Basics:**
 - Policy definition:** Require a tag and its value on resources
 - Version (preview):** (empty)

At the bottom, there are "Previous" and "Next" buttons, and a "Review + create" button.

The policy was created.

Creating a storage account

Home > Storage center | Blob Storage >

Create a storage account

Basics Advanced Networking Data protection Encryption Tags Review + create

Azure Storage is a Microsoft-managed service providing cloud storage that is highly available, secure, durable, scalable, and redundant. Azure Storage includes Azure Blobs (objects), Azure Data Lake Storage Gen2, Azure Files, Azure Queues, and Azure Tables. The cost of your storage account depends on the usage and the options you choose below. [Learn more about Azure storage accounts](#)

Project details

Select the subscription in which to create the new storage account. Choose a new or existing resource group to organize and manage your storage account together with other resources.

Subscription *	Azure for Students
Resource group *	az104-rg2
	Create new

Instance details

Storage account name *

[Previous](#) [Next](#) [Review + create](#) [Give feedback](#)

Cannot create storage acc (This policy maintains a set of best available regions where your subscription can deploy resources. The objective of this policy is to ensure that your subscription has full access to Azure services with optimal performance. Should you need additional or different regions, contact support.)

Home > Storage center | Blob Storage >

Create a storage account

Basics Advanced Networking Data protection Encryption Tags Review + create

Subscription *	Azure for Students
Resource group *	az104-rg2
	Create new

Instance details

Storage account name * storageacclabwork

Region *  [\(Europe\) France Central](#)
 This policy maintains a set of best available regions where your subscription can deploy resources. The objective of this policy is to ensure that your subscription has full access to Azure services with optimal performance. Should you need additional or different regions, contact support.

Preferred storage type 
 Choose preferred storage type
This helps us provide relevant guidance. It doesn't restrict your storage to this.

[Previous](#) [Next](#) [Review + create](#) [Give feedback](#)

Task 3: Apply tagging via an Azure policy

In this task, we will use the new policy definition to remediate any non-compliant resources. In this scenario, we will make any child resources of a resource group inherit the **Cost Center** tag that was defined on the resource group.

1. In the Azure portal, search for and select **Policy**.
2. In the **Authoring** section, click **Assignments**.
3. In the list of assignments, click the ellipsis icon in the row representing the **Require a tag and its value on resources** policy assignment and use the **Delete assignment** menu item to delete the assignment.

Deleting policy

The screenshot shows the Microsoft Azure Policy Assignments page. A success message at the top right states: "Successfully deleted 'Require Cost Center tag and its value on resources' from 'Azure for Students/az104-rg2'. Please note that the change takes around 30 minutes to take effect." On the left, a navigation menu includes options like Overview, Compliance, Remediation, Events, Authoring, Definitions, Assignments (which is selected), Machine Configuration, and Exemptions. The main area displays statistics: Total Assignments (2), Initiative Assignments (1), and Policy Assignments (1). Below this is a table with two rows of assignment details. At the bottom right are "Edit columns" and "Export to CSV" buttons.

Assigning new policy

The screenshot shows the "Assign policy" wizard's "Basics" step. It has tabs for Basics, Parameters, Remediation, Non-compliance messages, and Review + create. Under Basics, there are fields for "Policy definition" (set to "Inherit a tag from the resource group if missing") and "Version (preview)" (set to "1.*"). There is also an "Overrides" section with a link to "Expand". Below these are fields for "Assignment name" (set to "Inherit a tag from the resource group if missing") and "Description" (set to "Inherit the Cost Center tag and its value 000 from the resource group if missing"). At the bottom are "Previous", "Next", and "Review + create" buttons.

Configuring following settings

The screenshot shows the "Assign policy" wizard's "Remediation" step. It has tabs for Basics, Parameters, Remediation (which is selected), Non-compliance messages, and Review + create. A note states: "By default, this assignment will only take effect on newly created resources. Existing resources can be updated via a remediation task after the policy is assigned. For deployIfNotExists policies, the remediation task will deploy the specified template. For modify policies, the remediation task will edit tags on the existing resources." Below this is a checkbox for "Create a remediation task" which is checked. A dropdown menu for "Policy to remediate" is set to "Inherit a tag from the resource group if missing". There is a "Managed Identity" section with a note about deploying or modifying policies. At the bottom are "Previous", "Next", and "Review + create" buttons.

I have no subscription

Microsoft Azure Search resources, services, and docs (G+) Copilot Home > Storage center | Blob Storage > Create a storage account

Subscription * Azure for Students

Resource group * az104-rg2 Create new

Instance details

Storage account name * (South America) Chile Central Deploy to an Azure Extended Zone

This policy maintains a set of best available regions where your subscription can deploy resources. The objective of this policy is to ensure that your subscription has full access to Azure services with optimal performance. Should you need additional or different regions, contact support.

Preferred storage type Choose preferred storage type

This helps us provide relevant guidance. It doesn't restrict your storage to this resource type. Learn more

Previous Next Review + create Give feedback

Task 4: Configure and test resource locks

In this task, you configure and test a resource lock. Locks prevent either deletions or modifications of a resource.

Adding lock to resource group

Microsoft Azure Search resources, services, and docs (G+) Copilot Home > az104-rg2 | Locks Copilot Can a resource locked for 'ReadOnly' be modified? How do locks prevent accidental deletion of Azure resources? +1

az104-rg2 | Locks Resource group

Search Tags Add Refresh Feedback

Lock name Lock type Scope Notes

This resource has no locks.

Tags

Resource visualizer

Events

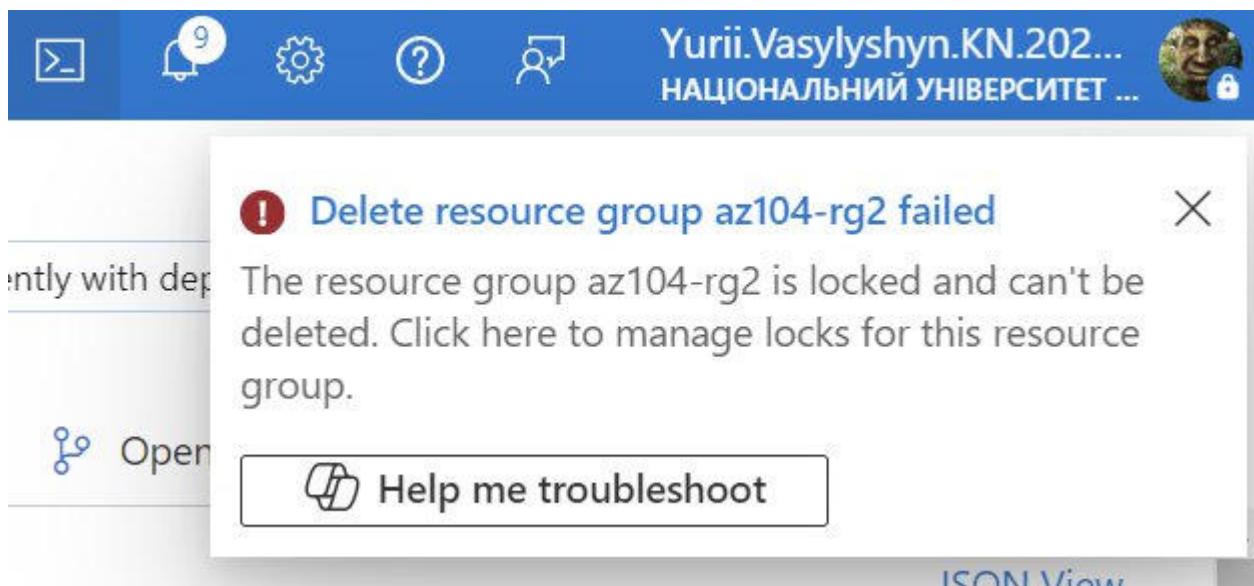
Settings

- Deployments
- Security
- Deployment stacks
- Policies
- Properties
- Locks
- Cost Management
- Monitoring
- Automation

Add or remove favorites by pressing Ctrl+Shift+F

The screenshot shows the Microsoft Azure portal interface. The left sidebar is collapsed, and the main area displays the 'az104-rg2 | Locks' page under the 'Resource group' section. A modal window titled 'Add lock' is centered over the page. It contains fields for 'Lock name' (set to 'rg-lock') and 'Lock type' (set to 'Delete'). There is also a 'Notes' field which is currently empty. At the bottom of the modal are two buttons: 'OK' and 'Cancel'. The overall layout is clean and follows the standard Azure design principles.

And now trying to delete



Lab 03 - Manage Azure resources by using Azure Resource Manager Templates

Lab introduction

In this lab, you learn how to automate resource deployments. You learn about Azure Resource Manager templates and Bicep templates. You learn about the different ways of deploying the templates.

This lab requires an Azure subscription. Your subscription type may affect the availability of features in this lab. You may change the region, but the steps are written using **East US**.

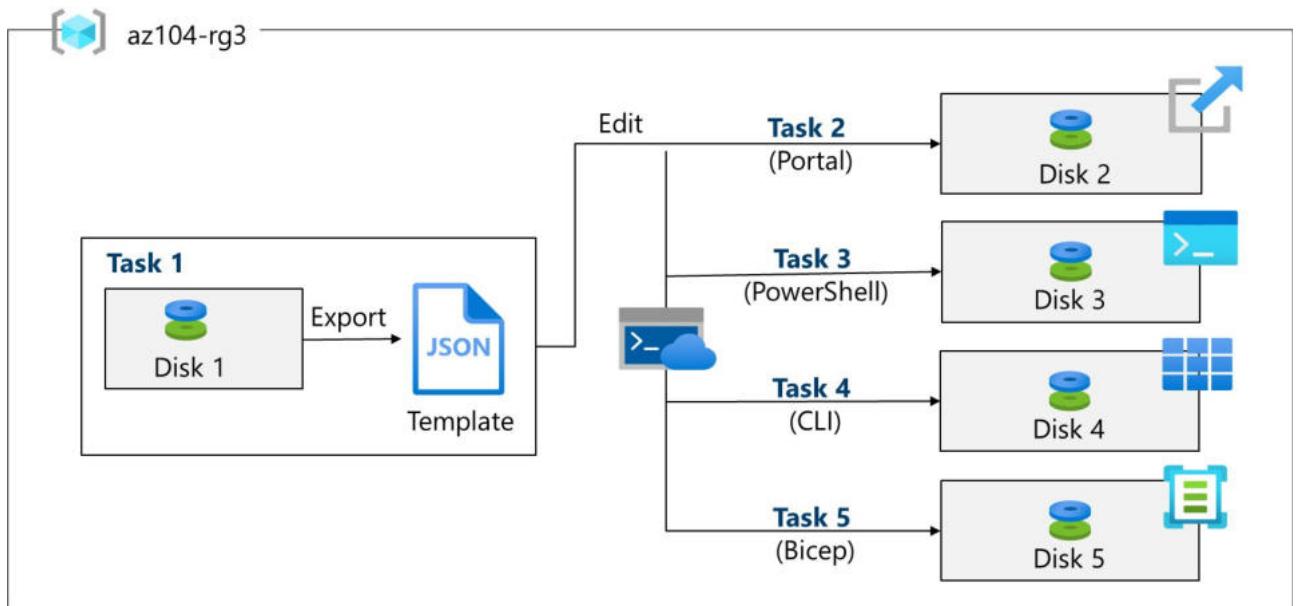
Estimated timing: 50 minutes

Lab scenario

Your team wants to look at ways to automate and simplify resource deployments. Your organization is looking for ways to reduce administrative overhead, reduce human error and increase consistency.

Job skills

- Task 1: Create an Azure Resource Manager template.
- Task 2: Edit an Azure Resource Manager template and redeploy the template.
- Task 3: Configure the Cloud Shell and deploy a template with Azure PowerShell.
- Task 4: Deploy a template with the CLI.
- Task 5: Deploy a resource by using Azure Bicep.



Creating a managed disk

Microsoft Azure | Search resources, services, and docs (G+/-) | Copilot | Home > Storage center | Azure Disks > Create a managed disk ...

Resource group * (New) az104-rg3 Create new

Disk details

- Disk name * az104-disk1
- Region * (Europe) Spain Central
- Availability zone Zone 1
- Source type None
- Size * 32 GiB (E4 performance tier)
Standard SSD LRS
Change size

Review + create < Previous Next : Encryption > Give feedback

Disk deployed

Microsoft Azure | Search resources, services, and docs (G+/-) | Copilot | Home > CreateDiskBlade-20251204154432 | Overview ...

Deployment

Search X < > Delete Cancel Redeploy Download Refresh

Overview

Your deployment is complete

Deployment name : CreateDiskBlade-20251204154... Start time : 12/4/2025, 3:49:21 PM
Subscription : Azure for Students Correlation ID : 91ef2481-3d1a-4a6b-995c-918...
Resource group : az104-rg3

Deployment details

Next steps

Go to resource

Give feedback Tell us about your experience with deployment

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

Microsoft Defender for Cloud Secure your apps and infrastructure Go to Microsoft Defender for Cloud >

Free Microsoft tutorials Start learning today >

Exporting Template

Microsoft Azure | Search resources, services, and docs (G+/-) | Copilot | Home > CreateDiskBlade-20251204154432 | Overview > az104-disk1

az104-disk1 | Export template Disk

Search Download Copy content Deploy Feedback

ARM Template Bicep Terraform

Include parameters

Template Parameters

To export all resources in this resource group, navigate to the "Export template" experience under "Automation" on the left menu of the resource group.

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

```
$schema: "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
"contentVersion": "1.0.0.0",
"parameters": {
```

Export template Help

Downloaded and extracted zip file with template and parameters

template.json	04.12.2025 15:51	JSON
parameters.json	04.12.2025 15:51	JSON

Task 2: Edit an Azure Resource Manager template and then redeploy the template

In this task, you use the downloaded template to deploy a new managed disk. This task outlines how to quickly and easily repeat deployments.

Building custom template in editor

The screenshot shows the Microsoft Azure portal's 'Custom deployment' blade. At the top, there are tabs for 'Select a template', 'Basics', and 'Review + create'. Below these, a section titled 'Automate deploying resources with Azure Resource Manager templates in a single, coordinated operation. Create or select a template below to get started.' includes links to 'Generate a Powershell script to deploy a resource', 'Difference between ARM Template, Terraform & Bicep', and 'How do ARM templates work?'. A large central area is labeled 'Build your own template in the editor' with a pencil icon. Under 'Common templates', there are icons for 'Create a Linux virtual machine', 'Create a Windows virtual machine', 'Create a web app', 'Create a SQL database', and 'Azure landing zone'. At the bottom, there are sections for 'Start with a quickstart template or template spec' and 'Template source' with a radio button for 'Quickstart template'.

The screenshot shows the Microsoft Azure portal's 'Edit template' blade. At the top, it says 'Edit template' and 'Edit your Azure Resource Manager template'. Below this are buttons for '+ Add resource', 'Quickstart template', 'Load file', and 'Download'. On the left, there are sections for 'Parameters (0)', 'Variables (0)', and 'Resources (0)'. The main area contains a code editor with the following JSON template:

```
1 {  
2   "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",  
3   "contentVersion": "1.0.0.0",  
4   "parameters": {},  
5   "resources": []  
6 }
```

At the bottom, there are 'Save' and 'Discard' buttons, and a URL 'https://portal.azure.com/#'

Uploading template JSON

```

1  {
2      "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
3      "contentVersion": "1.0.0.0",
4      "parameters": {
5          "disks_az104_disk1_name": {
6              "defaultValue": "az104-disk1",
7              "type": "String"
8          }
9      },
10     "variables": {},
11     "resources": [
12         {
13             "type": "Microsoft.Compute/disks",
14             "apiVersion": "2025-01-02",
15             "name": "[parameters('disks_az104_disk1_name')]",
16             "location": "spaincentral",
17             "sku": {

```

Save **Discard**

Edited template: changed name

```

1  {
2      "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
3      "contentVersion": "1.0.0.0",
4      "parameters": {
5          "disk_name": {
6              "defaultValue": "az104-disk2",
7              "type": "String"
8          }
9      },
10     "variables": {},
11     "resources": [
12         {
13             "type": "Microsoft.Compute/disks",
14             "apiVersion": "2025-01-02",
15             "name": "[parameters('disk_name')]",
16             "location": "spaincentral",
17             "sku": {
18                 "name": "StandardSSD_LRS",

```

Save **Discard**

Also edited name in parameters:

```

1  {
2      "$schema": "https://schema.management.azure.com/schemas/2015-01-01/deploymentParameters.json#",
3      "contentVersion": "1.0.0.0",
4      "parameters": {
5          "disk_name": {
6              "value": null
7          }
8      }
9  }

```

Save **Discard**

Deploying disk with custom deployment:

The screenshot shows the 'Custom deployment' wizard in the Microsoft Azure portal. It's step 2 of 3, titled 'Project details'. The user has selected 'Subscription' as 'Azure for Students' and 'Resource group' as 'az104-rg3'. Under 'Instance details', the 'Region' is set to '(Europe) Spain Central' and the 'Disk_name' is 'az104-disk2'. At the bottom, there are 'Previous', 'Next', and 'Review + create' buttons.

Deployed

The screenshot shows the 'Overview' page for the deployment 'Microsoft.Template-20251204161407'. A green checkmark indicates 'Deployment succeeded'. Deployment details show the name, start time (12/4/2025, 4:14:09 PM), subscription (Azure for Students), correlation ID, and resource group (az104-rg3). There are sections for 'Deployment details' and 'Next steps', along with links to 'Go to resource' and 'Give feedback'. On the right, there are promotional cards for 'Cost management', 'Microsoft Defender for Cloud', and 'Free Microsoft tutorials'.

As we can see, disk is successfully deployed:

The screenshot shows the 'Overview' page for the resource group 'az104-rg3'. The left sidebar includes options like Activity log, Access control (IAM), Tags, Resource visualizer, Events, Settings, Deployments, Security, Deployment stacks, Policies, and Properties. The main area displays the 'Essentials' section with a table of resources. The table has columns for Name, Type, and Location. It lists two disks: 'az104-disk1' and 'az104-disk2', both of which are 'Disk' type and located in 'Spain Central'.

Reviewing input and template blades

The screenshot shows two views of the Azure portal for a deployment named "Microsoft.Template-20251204161407".

Deployment Inputs Blade: This blade is titled "Microsoft.Template-20251204161407 | Inputs". It displays a search bar with the query "disk_name" and a result "az104-disk2". The left sidebar includes links for Overview, Inputs (selected), Outputs, and Template.

Template Blade: This blade is titled "Microsoft.Template-20251204161407 | Template". It features a "Download" button, a "Copy content" button, a "Deploy" button, and a "Feedback" link. A checkbox labeled "Include parameters" is checked. The "Template" tab is selected, showing a code editor with the following JSON template content:

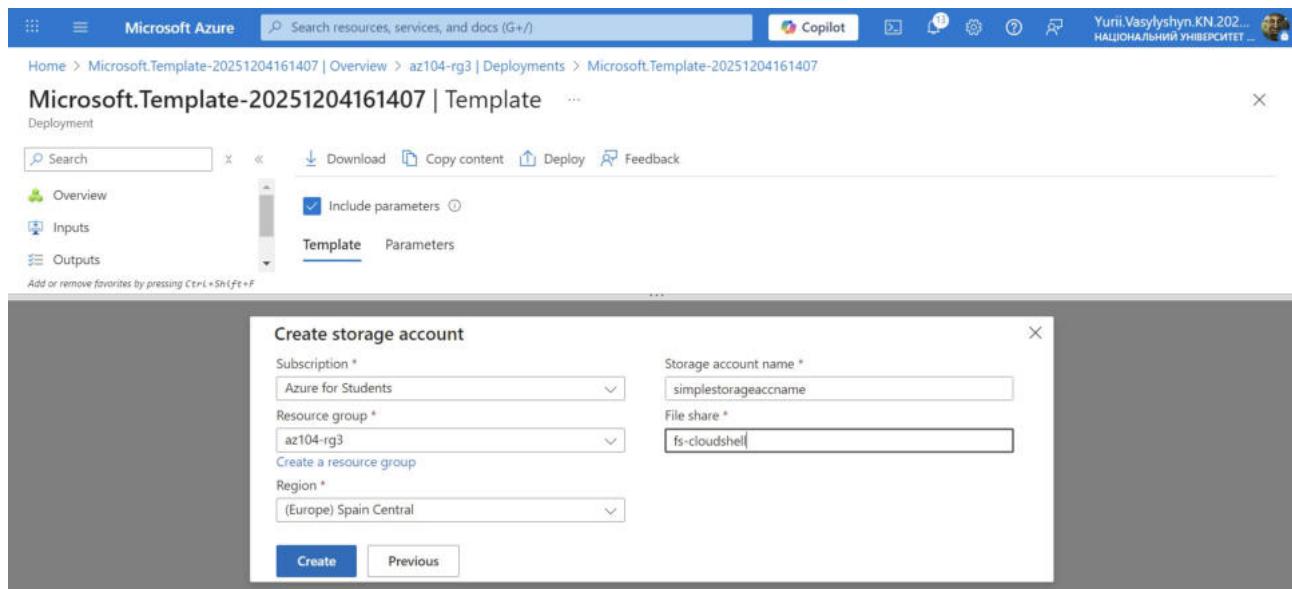
```
$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
contentVersion": "1.0.0.0",
parameters": {
  "disk_name": {
    "defaultValue": "az104-disk2",
```

The URL for this blade is <https://portal.azure.com/#view/HubsExtension/DeploymentDetailsBlade/~/t...>

Task 3: Configure the Cloud Shell and deploy a template with PowerShell

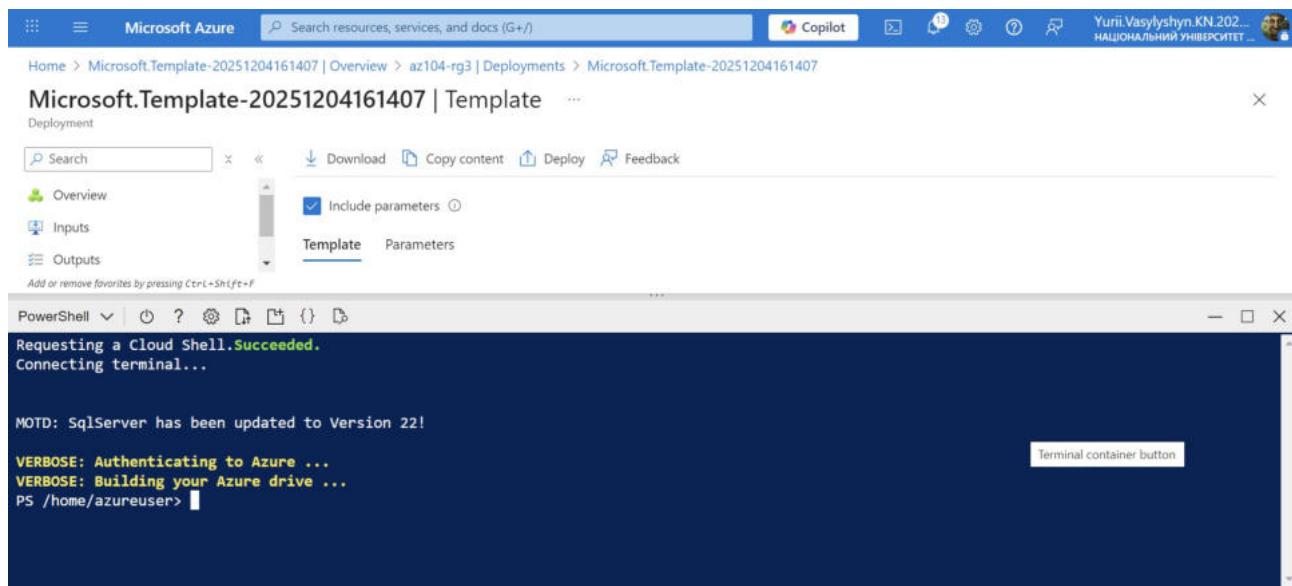
In this task, you work with the Azure Cloud Shell and Azure PowerShell. Azure Cloud Shell is an interactive, authenticated, browser-accessible terminal for managing Azure resources. It provides the flexibility of choosing the shell experience that best suits the way you work, either Bash or PowerShell. In this task, you use PowerShell to deploy a template.

Creating storage account in powershell

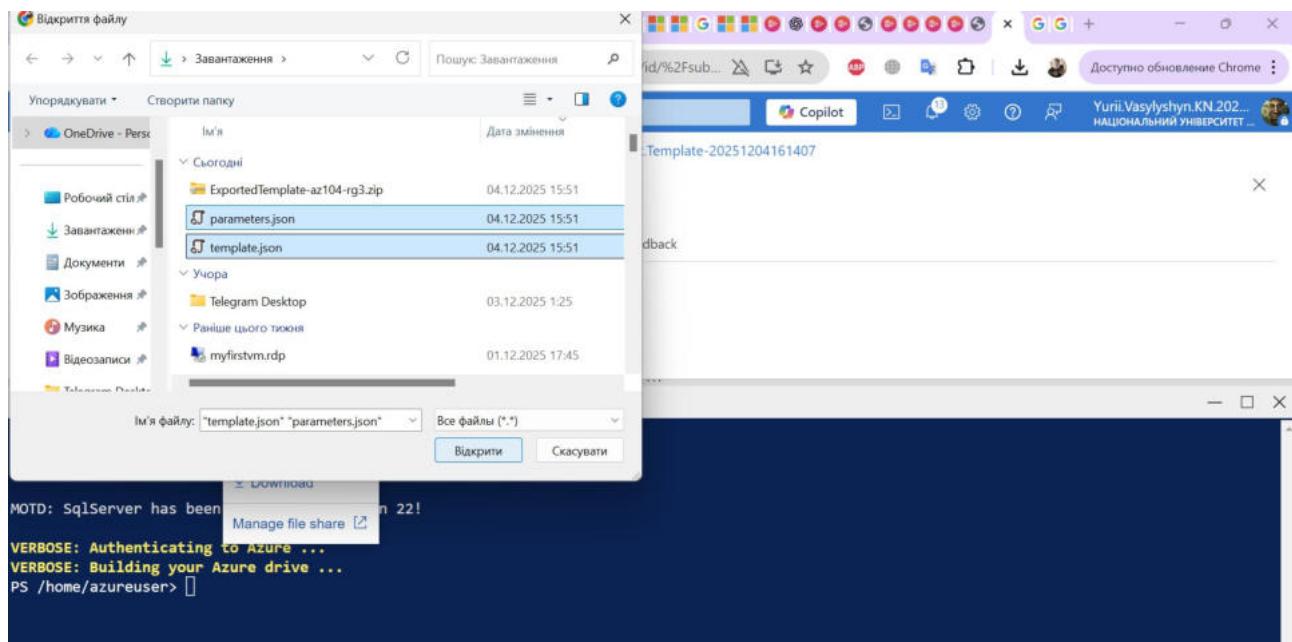


Created!

Switching to classic version



Selecting and uploading template and parameters into our cloud fileshare



Changing template via editor

```

$schema: "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#"
contentVersion: "1.0.0.0"
parameters: {
    "disk_name": {
        "defaultValue": "az104-disk1",
        "type": "String"
    }
},
  
```

Changed disk name to az104-disk3

```

$schema: "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#"
contentVersion: "1.0.0.0"
parameters: {
    "disk_name": {
        "defaultValue": "az104-disk3",
        "type": "String"
    }
},
  
```

Deployed a new disk through terminal

The screenshot shows the Microsoft Azure portal interface. At the top, it displays the URL: Home > Microsoft.Template-20251204161407 | Overview > az104-rg3 | Deployments > Microsoft.Template-20251204161407. Below this, the title is "Microsoft.Template-20251204161407 | Template". The "Template" tab is selected. A PowerShell terminal window is open, showing the command: `New-AzResourceGroupDeployment -ResourceGroupName az104-rg3 -TemplateFile template.json -TemplateParameterFile parameters.json`. The output of the command is displayed, showing deployment details like DeploymentName, ResourceGroupName, ProvisioningState, Timestamp, Mode, TemplateLink, and Parameters. It also lists a parameter named "disk_name" with a value of "az104-disk3".

The screenshot shows the Microsoft Azure portal interface for the resource group "az104-rg3". The title bar says "az104-rg3 | Resource group". The left sidebar shows navigation options: Overview, Activity log, Access control (IAM), Tags, Resource visualizer, Events, Settings (with Deployments selected), Security, Deployment stacks, Policies, and Properties. The main content area is titled "Essentials" and "Resources". It lists resources: az104-disk1, az104-disk2, az104-disk3, and simplestorageaccname. All resources are of type "Disk" and located in "Spain Central". There is a "Filter for any field..." search bar and a "Type equals all" filter applied.

The screenshot shows the Microsoft Azure portal interface for the resource group "az104-rg3". The title bar says "az104-rg3 | Resource group". The left sidebar shows navigation options: Overview, Activity log, Access control (IAM), Tags, Resource visualizer, Events, Settings (with Deployments selected), Security, Deployment stacks, Policies, and Properties. The main content area is titled "Essentials" and "Resources". It lists resources: az104-disk1, az104-disk2, az104-disk3, and simplestorageaccname. All resources are of type "Disk" and located in "Spain Central". There is a "Filter for any field..." search bar and a "Type equals all" filter applied. Below the main content, there is a terminal session window titled "Switch to Bash". The terminal output shows the command: `Get-AzDisk | ft`. The results table lists disk details: ResourceGroupName, ManagedBy, ManagedByExtended, SKU, Zones, TimeCreated, OsType, and HyperVGeneration. The disks listed are AZ104-RG3, AZ104-RG3, and AZ104-RG3, all created on 12/4/2025 at different times (1:49:28 PM, 2:14:14 PM, and 2:36:38 PM).

Switching to bash

The screenshot shows the Microsoft Azure Cloud Shell interface. At the top, there's a navigation bar with 'Microsoft Azure' and a search bar. Below it is a resource group overview for 'az104-rg3'. A terminal window is open, displaying a success message: 'Requesting a Cloud Shell. Succeeded.' followed by 'Connecting terminal...'. The terminal prompt is 'azureuser [~]\$'. There are tabs for 'Overview', 'Activity log', and 'Access control (IAM)'.

```
Requesting a Cloud Shell. Succeeded.
Connecting terminal...
azureuser [ ~ ]$
```

We have our files in cloud shell storage

This screenshot shows the same Cloud Shell interface. The terminal command 'ls' is run, showing files like 'clouddrive', 'Microsoft', 'parameters.json', and 'template.json'. The terminal prompt is 'azureuser [~]\$'.

```
Requesting a Cloud Shell. Succeeded.
Connecting terminal...
azureuser [ ~ ]$ ls
clouddrive Microsoft parameters.json template.json
azureuser [ ~ ]$
```

Changing name in editor

This screenshot shows the Cloud Shell interface with a code editor open. The file 'template.json' is displayed, showing a deployment template with a 'parameters' section. The file list on the left includes 'bash_logout', 'bash_profile', 'bashrc', 'tmux.conf', 'zshrc', 'parameters.json', and 'template.json'. The terminal prompt is 'azureuser [~]\$'.

```
template.json
1
2   "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
3   "contentVersion": "1.0.0.0",
4   "parameters": {
5     "disk_name": {
6       "defaultValue": "az104-disk4",
7       "type": "String"
8     }
9   },
10  "resources": []
```

Disk4 was created

The screenshot shows the Microsoft Azure portal interface. The top navigation bar includes 'Microsoft Azure', a search bar, and various icons. The main title is 'az104-rg3' under 'Resource group'. The 'Overview' tab is selected. A terminal window is open at the bottom, showing a Bash session. The session starts with a JSON snippet defining a resource group, followed by the command 'az disk list --resource-group az104-rg3 --output table'. The output table lists four disks: az104-disk1, az104-disk2, az104-disk3, and az104-disk4, all located in 'spaincentral' with 'StandardSSD_LRS' SKU and 32 GiB size, all in 'Succeeded' state.

```
},
  "resourceGroup": "az104-rg3",
  "tags": null,
  "type": "Microsoft.Resources/deployments"
}
azureuser [ ~ ]$ az disk list --resource-group az104-rg3 --output table
Name      ResourceGroup   Location    Zones   Sku        SizeGb  ProvisioningState
az104-disk1  az104-rg3  spaincentral  1   StandardSSD_LRS  32     Succeeded
az104-disk2  az104-rg3  spaincentral  1   StandardSSD_LRS  32     Succeeded
az104-disk3  az104-rg3  spaincentral  1   StandardSSD_LRS  32     Succeeded
az104-disk4  az104-rg3  spaincentral  1   StandardSSD_LRS  32     Succeeded
azureuser [ ~ ]$
```

Task 5: Deploy a resource by using Azure Bicep

In this task, you will use a Bicep file to deploy a managed disk. Bicep is a declarative automation tool that is built on ARM templates.

Upload .bicep file, changed name, disksize and SKU

The screenshot shows the Microsoft Azure portal interface. The top navigation bar includes 'Microsoft Azure', a search bar, and various icons. The main title is 'az104-rg3' under 'Resource group'. The 'Overview' tab is selected. A terminal window is open at the bottom, showing a Bash session. The session shows a file named 'azuredisk.bicep' being viewed. The file contains ARM template code for a managed disk, specifying a name ('managedDiskName'), size ('diskSizeInGiB'), and IOPS ('diskIOPS'). The file also includes comments for 'description' and parameters for 'minValue', 'maxValue', and 'int' type.

```
azuredisk.bicep
1  #description('Name of the managed disk to be copied')
2  param managedDiskName string = 'az104-disk5'
3
4  #description('Disk size in GiB')
5  # minValue(4)
6  # maxValue(65536)
7  param diskSizeInGiB int = 32
8
9  #description('Disk IOPS value')
```

bash: cd: Allfiles: No such file or directory
azureuser [~]\$

Disk5 was deployed successfully via ARM template

The screenshot shows the Microsoft Azure portal interface. In the top navigation bar, there are icons for Home, Search resources, services, and docs (G+), Copilot, and user profile (Yuri Vasyllyshyn KN 202... НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ). Below the search bar, the resource group 'az104-rg3' is selected. The main content area shows the 'Overview' tab with sections for Activity log, Access control (IAM), and Resources. A terminal window is open in the bottom right, showing the command 'az disk list --resource-group az104-rg3 --output table' and its output:

```
"resourceGroup": "az104-rg3",
"tags": null,
"type": "Microsoft.Resources/deployments"
}
azureuser [ ~ ]$ az disk list --resource-group az104-rg3 --output table
Name      ResourceGroup   Location    Zones     Sku        SizeGb  ProvisioningState
az104-disk1  az104-rg3    spaincentral 1  StandardSSD_LRS 32       Succeeded
az104-disk2  az104-rg3    spaincentral 1  StandardSSD_LRS 32       Succeeded
az104-disk3  az104-rg3    spaincentral 1  StandardSSD_LRS 32       Succeeded
az104-disk4  az104-rg3    spaincentral 1  StandardSSD_LRS 32       Succeeded
az104-disk5  az104-rg3    spaincentral 1  StandardSSD_LRS 32       Succeeded
azureuser [ ~ ]$
```

So I have all 5 disks in my resource group

The screenshot shows the Microsoft Azure portal interface. In the top navigation bar, there are icons for Home, Search resources, services, and docs (G+), Copilot, and user profile (Yuri Vasyllyshyn KN 202... НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ). Below the search bar, the resource group 'az104-rg3' is selected. The main content area shows the 'Overview' tab with sections for Activity log, Access control (IAM), Tags, Resource visualizer, Events, Settings (Deployments, Security, Deployment stacks), Policies, and Properties. A table view is displayed under the Resources section, listing the following resources:

Name	Type	Location
az104-disk1	Disk	Spain Central
az104-disk2	Disk	Spain Central
az104-disk3	Disk	Spain Central
az104-disk4	Disk	Spain Central
az104-disk5	Disk	Spain Central
simplestorageaccname	Storage account	Spain Central

Lab 04 - Implement Virtual Networking

Lab introduction

This lab is the first of three labs that focuses on virtual networking. In this lab, you learn the basics of virtual networking and subnetting. You learn how to protect your network with network security groups and application security groups. You also learn about DNS zones and records.

This lab requires an Azure subscription. Your subscription type may affect the availability of features in this lab. You may change the region, but the steps are written using **East US**.

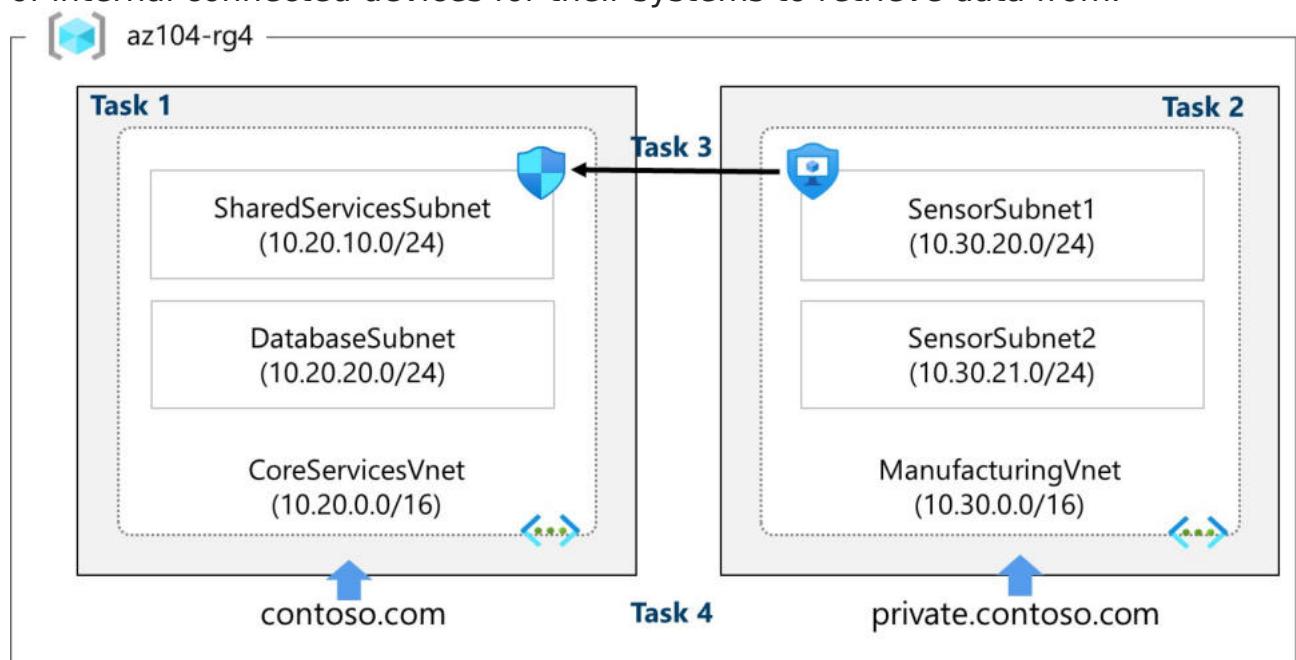
Estimated time: 50 minutes

Lab scenario

Your global organization plans to implement virtual networks. The immediate goal is to accommodate all the existing resources. However, the organization is in a growth phase and wants to ensure there is additional capacity for the growth.

The **CoreServicesVnet** virtual network has the largest number of resources. A large amount of growth is anticipated, so a large address space is necessary for this virtual network.

The **ManufacturingVnet** virtual network contains systems for the operations of the manufacturing facilities. The organization is anticipating a large number of internal connected devices for their systems to retrieve data from.



Job skills

- Task 1: Create a virtual network with subnets using the portal.
- Task 2: Create a virtual network and subnets using a template.
- Task 3: Create and configure communication between an Application Security Group and a Network Security Group.
- Task 4: Configure public and private Azure DNS zones.

Creating and configuring Vnet

Changing IP and adding a subnets, changing starting address for subnets

Home > Network foundation | Virtual networks >

Create virtual network ...

Basics Security IP addresses Tags Review + create

10.20.0.0/16			
Subnets	IP address range	Size	NAT gateway
default	10.20.0.0 - 10.20.0.255	/24 (256 addresses)	-

[Previous](#)[Next](#)[Review + create](#)

Add a subnet

Subnet purpose ⓘ

Default

Name * ⓘ

SharedServicesSubnet

IPv4

Include an IPv4 address space

IPv4 address range ⓘ

10.20.0.0/16

10.20.0.0 - 10.20.255.255

Starting address * ⓘ

10.20.10.0

Size ⓘ

/24 (256 addresses)

IPv6

Include an IPv6 address space

 This virtual network has no IPv6 address ranges.[Add](#)[Cancel](#)[Give feedback](#)

Home > Network foundation | Virtual networks >

Create virtual network ...

Basics Security IP addresses Tags Review + create

10.20.0.0/16			
Subnets	IP address range	Size	NAT gateway
SharedServicesSubnet	10.20.10.0 - 10.20.10.255	/24 (256 addresses)	-
DatabaseSubnet	10.20.20.0 - 10.20.20.255	/24 (256 addresses)	-

[Previous](#)[Next](#)[Review + create](#)[Give feedback](#)

Creating

Home > Network foundation | Virtual networks >

Create virtual network ...

Validation passed

Basics Security IP addresses Tags Review + create

[View automation template](#)

Basics

Subscription	Azure for Students
Resource Group	az104-rg4
Name	CoreServicesVnet
Region	Spain Central

Security

Azure Bastion	Disabled
---------------	----------

[Previous](#)[Next](#)[Create](#)[Download a template for automation](#)[Give feedback](#)

Deployed

The screenshot shows the Microsoft Azure CoreServicesVnet deployment overview page. The deployment is marked as complete with a green checkmark. Deployment details include the name: CoreServicesVnet-1764934268531, start time: 12/5/2025, 1:31:13 PM, subscription: Azure for Students, and resource group: az104-rg4. There are sections for deployment details and next steps, along with links to give feedback and tell about deployment experience. A sidebar on the right provides links to cost management, Microsoft Defender for Cloud, and free Microsoft tutorials.

Downloaded template

The screenshot shows the Windows File Explorer window titled "Завантаження" (Downloads). It displays a folder named "ExportedTemplate-az104-rg4" created on 05.12.2025 at 13:35. The file explorer interface includes standard navigation buttons, a search bar, and a toolbar with various icons.

Task 2: Create a virtual network and subnets using a template

In this task, you create the ManufacturingVnet virtual network and associated subnets. The organization anticipates growth for the manufacturing offices so the subnets are sized for the expected growth. For this task, you use a template to create the resources.

1. Locate the **template.json** file exported in the previous task. It should be in your **Downloads** folder.
2. Edit the file using the editor of your choice. Many editors have a *change all occurrences* feature. If you are using Visual Studio Code be sure you are working in a **trusted window** and not in the **restricted mode**. Consult the architecture diagram to verify the details.

Replacing all occurrences of **CoreServicesVnet** with **ManufacturingVnet**.

Change all occurrences of **10.20.10.0/24** to **10.30.20.0/24**.

Change all occurrences of **DatabaseSubnet** to [SensorSubnet2](#).

Change all occurrences of **10.20.20.0/24** to [10.30.21.0/24](#).

Changed Template:

{

```
  "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
  "contentVersion": "1.0.0.0",
  "parameters": {
    "virtualNetworks_ManufacturingVnet_name": {
      "defaultValue": "ManufacturingVnet",
      "type": "String"
    }
  },
  "variables": {},
  "resources": [
    {
      "type": "Microsoft.Network/virtualNetworks",
      "apiVersion": "2024-07-01",
      "name": "[parameters('virtualNetworks_ManufacturingVnet_name')]",
      "location": "spaincentral",
      "properties": {
        "addressSpace": {
          "addressPrefixes": [
            "10.30.0.0/16"
          ]
        },
        "encryption": {
          "enabled": false,

```

```
        "enforcement": "AllowUnencrypted"  
    },  
    "privateEndpointVNetPolicies": "Disabled",  
    "subnets": [  
        {  
            "name": "SensorSubnet1",  
            "id": "[resourceId('Microsoft.Network/virtualNetworks/subnets',  
parameters('virtualNetworks_ManufacturingVnet_name'), 'SensorSubnet1')]",  
            "properties": {  
                "addressPrefixes": [  
                    "10.30.20.0/24"  
                ],  
                "delegations": [],  
                "privateEndpointNetworkPolicies": "Disabled",  
                "privateLinkServiceNetworkPolicies": "Enabled"  
            },  
            "type": "Microsoft.Network/virtualNetworks/subnets"  
        },  
        {  
            "name": "SensorSubnet2",  
            "id": "[resourceId('Microsoft.Network/virtualNetworks/subnets',  
parameters('virtualNetworks_ManufacturingVnet_name'), 'SensorSubnet2')]",  
            "properties": {  
                "addressPrefixes": [  
                    "10.30.21.0/24"  
                ],  
                "delegations": [],  
                "privateEndpointNetworkPolicies": "Disabled",  
            }  
        }  
    ]  
}
```

```
        "privateLinkServiceNetworkPolicies": "Enabled"  
    },  
    "type": "Microsoft.Network/virtualNetworks/subnets"  
}  
],  
"virtualNetworkPeerings": [],  
"enableDdosProtection": false  
}  
},  
{  
    "type": "Microsoft.Network/virtualNetworks/subnets",  
    "apiVersion": "2024-07-01",  
    "name":  
"[concat(parameters('virtualNetworks_ManufacturingVnet_name'),  
'/SensorSubnet2')]",  
    "dependsOn": [  
        "[resourceId('Microsoft.Network/virtualNetworks',  
parameters('virtualNetworks_ManufacturingVnet_name'))]"  
    ],  
    "properties": {  
        "addressPrefixes": [  
            "10.30.21.0/24"  
        ],  
        "delegations": [],  
        "privateEndpointNetworkPolicies": "Disabled",  
        "privateLinkServiceNetworkPolicies": "Enabled"  
    }  
},  
{
```

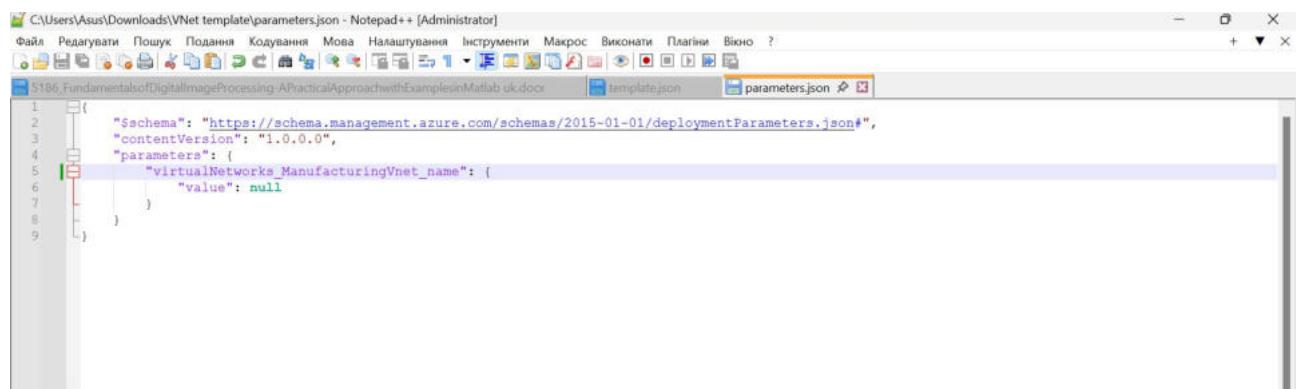
```

    "type": "Microsoft.Network/virtualNetworks/subnets",
    "apiVersion": "2024-07-01",
    "name": "[concat(parameters('virtualNetworks_ManufacturingVnet_name'),
    '/SensorSubnet1')]",
    "dependsOn": [
        "[resourceld('Microsoft.Network/virtualNetworks',
parameters('virtualNetworks_ManufacturingVnet_name'))]"
    ],
    "properties": {
        "addressPrefixes": [
            "10.30.20.0/24"
        ],
        "delegations": [],
        "privateEndpointNetworkPolicies": "Disabled",
        "privateLinkServiceNetworkPolicies": "Enabled"
    }
}
]
}

```

Replacing the one occurrence of **CoreServicesVnet** with **ManufacturingVnet** in parameters.json

Replaced:



Building own template in editor:

The screenshot shows the Microsoft Azure Resource Manager template editor. At the top, there's a navigation bar with 'Microsoft Azure' and a search bar. Below it, the page title is 'Edit template ...'. A sidebar on the left lists 'Parameters (1)', 'Variables (0)', and 'Resources (3)'. The main area contains a JSON code editor with the following template:

```
$schema: "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",  
contentVersion: "1.0.0.0",  
parameters: {  
    virtualNetworks_ManufacturingVnet_name: {  
        defaultValue: "ManufacturingVnet",  
        type: "String"  
    }  
},  
variables: {},  
resources: [  
    {  
        type: "Microsoft.Network/virtualNetworks",  
        apiVersion: "2024-07-01",  
        name: "[parameters('virtualNetworks_ManufacturingVnet_name')]",  
        location: "spaincentral",  
        properties: {  
            ...  
        }  
    }  
]
```

At the bottom, there are 'Save' and 'Discard' buttons.

Parameters:

The screenshot shows the Microsoft Azure deployment parameters editor. At the top, there's a navigation bar with 'Microsoft Azure' and a search bar. Below it, the page title is 'Edit parameters ...'. A sidebar on the left has 'Load file' and 'Download' buttons. The main area contains a JSON code editor with the following template:

```
$schema: "https://schema.management.azure.com/schemas/2019-04-01/deploymentParameters.json#",  
contentVersion: "1.0.0.0",  
parameters: {  
    virtualNetworks_ManufacturingVnet_name: {  
        value: "ManufacturingVnet"  
    }  
}
```

At the bottom, there are 'Save' and 'Discard' buttons.

Creating custom VNet deployment

Microsoft Azure Search resources, services, and docs (G+) Copilot Home > Custom deployment Can I deploy multiple resources within a single ARM template? Difference between ARM Template, Terraform & Bicep? +1

Custom deployment Deploy from a custom template

Select a template Basics Review + create

Summary

Customized template 3 resources

Terms

Azure Marketplace Terms | Azure Marketplace

By clicking "Create," I (a) agree to the applicable legal terms associated with the offering; (b) authorize Microsoft to charge or bill my current payment method for the fees associated with the offering(s), including applicable taxes, with the same billing frequency as my Azure subscription, until I discontinue use of the offering(s); and (c) agree that, if the deployment involves 3rd party offerings, Microsoft may share my contact information and other details of such deployment with the publisher of that offering.

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Previous Next Create

Manufacturing Vnet was deployed

Microsoft Azure Search resources, services, and docs (G+) Copilot Home > Microsoft.Template-20251205141006 | Overview >

az104-rg4 Resource group

How to manage these changes more efficiently with deployment tools? Generate Bicep code to duplicate this resource group. +1

+ Create Manage view Delete resource group Refresh Export to CSV Open query ... Group by none JSON View

Search

Overview

Activity log

Access control (IAM)

Tags

Resource visualizer

Events

Settings

Deployments

Security

Deployment stacks

Policies

Properties

Add or remove favorites by pressing Ctrl+Shift+F

Essentials

Resources Recommendations

Name ↑ Type Location

Name ↑	Type	Location
CoreServicesVnet	Virtual network	Spain Central
ManufacturingVnet	Virtual network	Spain Central

Task 3: Create and configure communication between an Application Security Group and a Network Security Group

In this task, we create an Application Security Group and a Network Security Group. The NSG will have an inbound security rule that allows traffic from the ASG. The NSG will also have an outbound rule that denies access to the internet.

Creating Application Security Group

Home > Network foundation | Application security groups >

Create an application security group ...

Basics Tags Review + create

Project details

Subscription *

Resource group * Create new

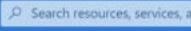
Instance details

Name *

Region *

Review + create < Previous Next : Tags > Download a template for automation

Creating NSG

 Microsoft Azure  Copilot      

Home > Network foundation | Network security groups >

Create network security group ...

Basics Tags Review + create

Project details

Subscription *

Resource group * Create new

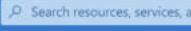
Instance details

Name *

Region *

Review + create < Previous Next : Tags > Download a template for automation

Associating NSG with subnet

 Microsoft Azure  Copilot      

Home > myNSGSecure

myNSGSecure | Subnets   ...

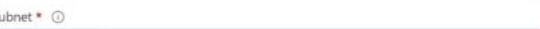
Network security group

Overview Activity log Access control (IAM) Tags Diagnose and solve problems Resource visualizer Settings Inbound security rules Outbound security rules Network interfaces Subnets Properties

Associate subnet

myNSGSecure

Virtual network  CoreServicesVnet (az104-rg4)

Subnet *  SharedServicesSubnet

No results.

OK

Add or remove favorites by pressing **Ctrl + Shift + F**

Adding inbound security rule

The screenshot shows the Microsoft Azure portal interface. On the left, there's a sidebar with options like Access control (IAM), Tags, Diagnose and solve problems, Resource visualizer, Settings, Inbound security rules (which is selected), Outbound security rules, Network interfaces, Subnets, Properties, Locks, and Monitoring. The main area shows 'myNSGSecure | Inbound security rules'. It has a search bar, buttons for Add, Hide default rules, Refresh, Delete, and a 'Filter by name' dropdown set to 'Port == all'. Below this is a table with columns: Priority ↑, Name ↑, and Port ↑. It lists three existing rules: 65000 (AllowVnetInBound), 65001 (AllowAzureLoadBalanc...), and 65500 (DenyAllInBound). To the right, a modal window titled 'Add inbound security rule' is open. It has fields for Destination port ranges (set to 80, 443), Protocol (TCP selected), Action (Allow selected), Priority (100), and Name (left empty). At the bottom are 'Add' and 'Cancel' buttons.

Adding outbound rule

The screenshot shows the Microsoft Azure portal interface. The sidebar is identical to the previous one. The main area shows 'myNSGSecure | Outbound security rules'. It has a search bar, buttons for Add, Hide default rules, Refresh, Delete, and a 'Filter by name' dropdown set to 'Port == all'. Below this is a table with columns: Priority ↑, Name ↑, and Port ↑. It lists three existing rules: 65000 (AllowVnetOutBound), 65001 (AllowInternetOutBound), and 65500 (DenyAllOutBound). To the right, a modal window titled 'Add outbound security rule' is open. It has fields for Protocol (Any selected), Action (Deny selected), Priority (4096), Name (DenyInternetOutbound), and a Description field (left empty). At the bottom are 'Add' and 'Cancel' buttons.

Added inbound and outbound rules:

Home > myNSGSecure

myNSGSecure | Inbound security rules

Network security group

Search Add Hide default rules Refresh Delete Give feedback

Network security group security rules are evaluated by priority using the combination of source, source port, destination, destination port, and protocol to allow or deny the traffic. A security rule can't have the same priority and direction as an existing rule. You can't delete default security rules, but you can override them with rules that have a higher priority. [Learn more](#)

<input type="checkbox"/>	Priority ↑↓	Name ↑↓	Port ↑↓	Protocol ↑↓	Source ↑↓	Destination ↑↓	Action ↑↓
<input type="checkbox"/>	100	AllowASG	80,443	TCP	ASG-WEB	Any	Allow
<input type="checkbox"/>	65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
<input type="checkbox"/>	65001	AllowAzureLoadBalanc...	Any	Any	AzureLoadBalancer	Any	Allow
<input type="checkbox"/>	65500	DenyAllInBound	Any	Any	Any	Any	Deny

Home > myNSGSecure

myNSGSecure | Outbound security rules

Network security group

Search Add Hide default rules Refresh Delete Give feedback

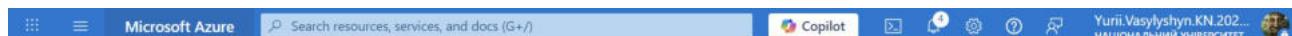
Network security group security rules are evaluated by priority using the combination of source, source port, destination, destination port, and protocol to allow or deny the traffic. A security rule can't have the same priority and direction as an existing rule. You can't delete default security rules, but you can override them with rules that have a higher priority. [Learn more](#)

<input type="checkbox"/>	Priority ↑↓	Name ↑↓	Port ↑↓	Protocol ↑↓	Source ↑↓	Destination ↑↓	Action ↑↓
<input type="checkbox"/>	4096	DenyInternetOutbound	Any	Any	Any	Internet	Deny
<input type="checkbox"/>	65000	AllowVnetOutBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
<input type="checkbox"/>	65001	AllowInternetOutBound	Any	Any	Any	Internet	Allow
<input type="checkbox"/>	65500	DenyAllOutBound	Any	Any	Any	Any	Deny

Task 4: Configure public and private Azure DNS zones

In this task, you will create and configure public and private DNS zones.

Creating DNS Zone



Instance details

This zone is a child of an existing zone already hosted in Azure DNS ⓘ

Name *

Resource group location * ⓘ (Europe) Spain Central

[Review + create](#)

< Previous

Next : DNS Zone Editor >

[Give feedback](#)

Adding recordset

This screenshot shows the 'Records' blade for the 'labwork.com' DNS zone. On the left, there's a sidebar with options like 'Create', 'Manage view', and 'DNS Management'. Under 'DNS Management', 'Records' is selected. The main pane shows a table with one record: '@' with IP address '10.1.1.4'. A modal window titled 'Add record set' is open, showing the configuration for a new record. The 'Type' is set to 'A - IPv4 Address records', 'Alias record set' is 'No', 'TTL' is '1', and 'IP address' is '10.1.1.4'. Buttons for 'Add', 'Cancel', and 'Give feedback' are at the bottom.

Nslookup

This screenshot shows the 'Cloud Shell' interface within the Azure portal. The command 'nslookup www.labwork.com ns1-08.azure-dns.com.' was run, resulting in the following output:

```
Type "az" to use Azure CLI
Type "help" to learn about Cloud Shell

Your Cloud Shell session will be ephemeral so no files or system changes will persist beyond your current session.
azureuser [ ~ ]$ nslookup www.labwork.com ns1-08.azure-dns.com.
Server:      ns1-08.azure-dns.com.
Address:    13.107.236.8#53

Name:  www.labwork.com
Address: 10.1.1.4

azureuser [ ~ ]$
```

Creating private DNS zone

The screenshot shows the 'Create Private DNS Zone' wizard in the Microsoft Azure portal. The current step is 'Basics'. The page includes fields for 'Subscription' (set to 'Azure for Students') and 'Resource group' (set to 'az104-rg4'). Below these, the 'Instance details' section shows 'Name' as 'private.labwork.com' and 'Resource group location' as '(Europe) Spain Central'. At the bottom, there are buttons for 'Review + create' and 'Next : Private DNS Zone Editor >'. A 'Give feedback' link is also present.

Adding link

The screenshot shows the 'Create Private DNS Zone' wizard in the Microsoft Azure portal, currently on the 'Virtual Network Links' step. On the left, there's a list of existing links: '+ Add Virtual Network Link' and 'Delete'. On the right, the 'Add Virtual Network Link' modal is open, titled 'Add Virtual Network Link' for 'private.labwork.com'. It has a 'Link name' field set to 'manufacturing-link'. The 'Virtual network details' section shows 'Subscription' as 'Azure for Students' and 'Virtual Network' as 'ManufacturingVnet (az104-rg4)'. The 'Configuration' section contains a 'Create' button and a 'Cancel' button. Navigation buttons at the bottom include 'Review + create', '< Previous', 'Next : Tags >', and 'Give feedback'.

Adding record set for private network

The screenshot shows the Microsoft Azure portal interface for a Private DNS zone named 'private.labwork.com'. On the left, a navigation sidebar includes links for Activity log, Access control (IAM), Tags, Diagnose and solve problems, Resource visualizer, Settings (Locks, Properties), DNS Management, and Records. The 'Records' link under DNS Management is currently selected. The main content area displays a table of existing record sets, with one entry for '@' of type SOA with TTL 36. A modal window titled 'Add record set' is open, prompting for a name ('sensorvm'), type ('A - IPv4 Address records'), TTL ('1'), and IP address ('10.1.1.4').

The screenshot shows the same Microsoft Azure Private DNS zone interface after the record set has been added. The 'Records' table now shows two entries: 'sensorvm' (A type, TTL 3600, IP 10.1.1.4) and '@' (SOA type, TTL 3600, with detailed properties listed). A toast notification in the top right corner indicates that the record set was successfully created.

Lab 05 - Implement Intersite Connectivity

Lab introduction

In this lab you explore communication between virtual networks. You implement virtual network peering and test connections. You will also create a custom route.

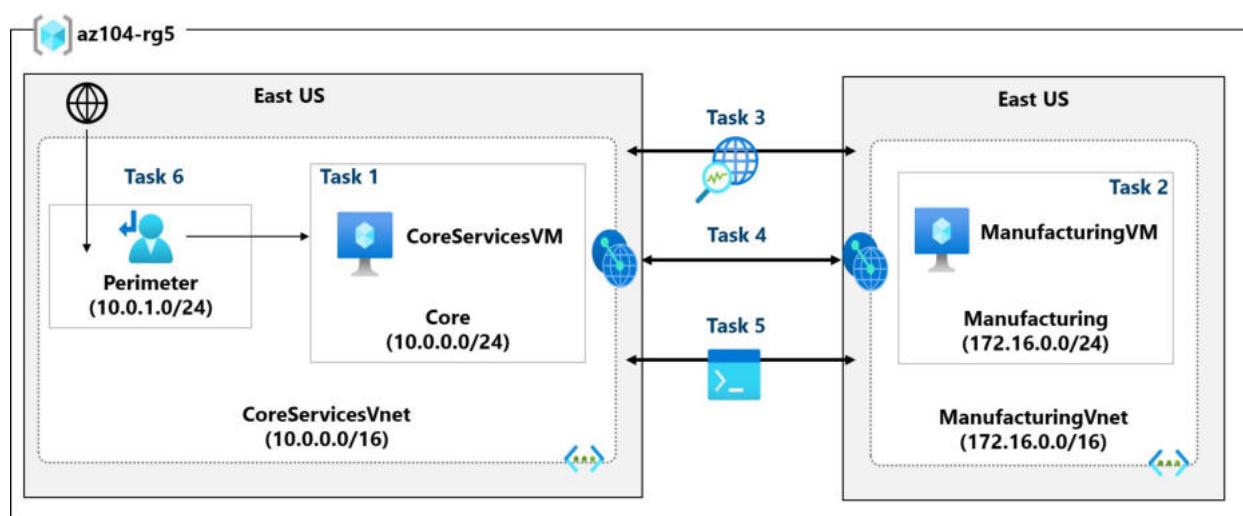
This lab requires an Azure subscription. Your subscription type may affect the availability of features in this lab. You may change the region, but the steps are written using **East US**.

Estimated time: 50 minutes

Lab scenario

Your organization segments core IT apps and services (such as DNS and security services) from other parts of the business, including your manufacturing department. However, in some scenarios, apps and services in the core area need to communicate with apps and services in the manufacturing area. In this lab, you configure connectivity between the segmented areas. This is a common scenario for separating production from development or separating one subsidiary from another.

Architecture diagram



Job skills

- Task 1: Create a virtual machine in a virtual network.
- Task 2: Create a virtual machine in a different virtual network.
- Task 3: Use Network Watcher to test the connection between virtual machines.
- Task 4: Configure virtual network peerings between different virtual networks.
- Task 5: Use Azure PowerShell to test the connection between virtual machines.
- Task 6: Create a custom route.

Task 1: Create a core services virtual machine and virtual network

In this task, you create a core services virtual network with a virtual machine.

Creating VM

Microsoft Azure Search resources, services, and docs (G+/-) Copilot Home > Compute infrastructure | Virtual machines > Create a virtual machine ... Help me choose the right VM size for my workload Help me create a VM optimized for high availability Help me create a low cost VM

Choose up to 3 availability zones, one VM per zone

Azure-selected zone (Preview)
Let Azure assign the best zone for your needs

Availability zone *

You can now select multiple zones. Selecting multiple zones will create one VM per zone. [Learn more](#)

Security type

Image *

See all images | Configure VM generation

This image is compatible with additional security features. [Click here to swap to the Trusted launch security type.](#)

VM architecture

< Previous Next : Disks > Review + create Give feedback

Configuring networking

Microsoft Azure Search resources, services, and docs (G+/-) Copilot Home > Compute infrastructure | Virtual machines > Create a virtual machine ... Create virtual network

Name * CoreServicesVnet

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

Address range *	Addresses	Overlap
10.0.0.0/16	10.0.0.0 - 10.0.255.255 (65536 addresses)	None
	(0 Addresses)	None

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

Subnet name	Address range	Addresses
Core	10.0.0.0/24	10.0.0.0 - 10.0.0.255 (256 addresses)
		(0 Addresses)

< Previous Next : Management > Review + create OK Discard

Disabling boot diagnostics

Microsoft Azure Search resources, services, and docs (G+/-) Copilot Home > Compute infrastructure | Virtual machines > Create a virtual machine ... Help me choose the right VM size for my workload Help me create a VM optimized for high availability Help me create a low cost VM

Alerts
Enable recommended alert rules

Diagnostics
Boot diagnostics Enable with managed storage account (recommended)
 Enable with custom storage account
 Disable

Enable OS guest diagnostics

Health
Enable application health monitoring

< Previous Next : Advanced > Review + create Give feedback

VM created

The screenshot shows the Microsoft Azure portal interface. At the top, there's a navigation bar with 'Microsoft Azure' and a search bar. On the right, there are user profile icons for 'Yuriii.Vasylyshyn.KN.202...' and 'НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ ...'. Below the navigation bar, the main content area shows a virtual machine named 'CoreServicesVM'. The left sidebar has a 'Overview' section with various management links like Activity log, Access control (IAM), Tags, Diagnose and solve problems, Resource visualizer, Connect, Networking, Settings, Availability + scale, Security, Backup + disaster recovery, and a 'Help me copy this VM in any region' button. The main panel displays the 'Essentials' section with detailed information: Resource group (az104-rg5), Status (Running), Location (Switzerland North (Zone 1)), Subscription (Azure for Students), Subscription ID (bbbfb37aa-0bd5-495e-96f6-f34404654305), Availability zone (1), Operating system (Windows), Size (Standard D2s v3 (2 vcpus, 8 GiB memory)), Primary NIC public IP (74.242.218.66), 1 associated public IPs, Virtual network/subnet (CoreServicesVnet/Core), and DNS name (Not configured). There's also a 'Health state' section. A 'JSON View' link is at the top right of the essentials table.

Task 2: Create a virtual machine in a different virtual network

In this task, you create a manufacturing services virtual network with a virtual machine.

Creating another virtual machine

The screenshot shows the 'Create a virtual machine' wizard in the Microsoft Azure portal. The title bar says 'Create a virtual machine' and includes buttons for 'Help me choose the right VM size for my workload', 'Help me create a VM optimized for high availability', and 'Help me create a low cost VM'. A warning message at the top states: '⚠️ Changing Basic options may reset selections you have made. Review all options prior to creating the virtual machine.' Below this, there are three tabs: 'Help me create a low cost VM' (selected), 'Help me create a VM optimized for high availability', and 'Help me choose the right VM size for my workload'. The 'Subscription' dropdown is set to 'Azure for Students'. The 'Resource group' dropdown is set to 'az104-rg5' with a 'Create new' option. Under 'Instance details', the 'Virtual machine name' is 'ManufacturingVM', 'Region' is '(Europe) Switzerland North', and 'Availability options' is 'Availability zone'. At the bottom, there are buttons for '< Previous', 'Next : Disks >', 'Review + create', and 'Give feedback'.

Configuring Network, creating new vnet

Create virtual network

premises network. [Learn more](#)

Name * ManufacturingVnet

Address space

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

Address range *	Addresses	Overlap
172.16.0.0/16	172.16.0.0 - 172.16.255.255 (65536 addresses)	None
	(0 Addresses)	

Subnets

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

Subnet name	Address range	Addresses
Manufacturing	172.16.0.0/24	172.16.0.0 - 172.16.0.255 (256 addresses)
		(0 Addresses)

< Previous Next : Management > Review + create OK Discard

VM created

ManufacturingVM Virtual machine

Help me copy this VM in any region Manage this VM with Azure CLI

Search

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Resource visualizer

Connect

Networking

Settings

Availability + scale

Security

Backup + disaster recovery

Help me copy this VM in any region

Connect Start Stop Hibernate Capture Delete Refresh Open in mobile Feedback

Essentials

Resource group [\(move\)](#) az104-rg5 Operating system Windows

Status Running Size Standard D2s v3 (2 vcpus, 8 GiB memory)

Location Switzerland North (Zone 1) Primary NIC public IP 74.161.162.6

Subscription [\(move\)](#) Azure for Students 1 associated public IPs

Subscription ID bbbf37aa-0bd5-495e-96f6-f34404654305 Virtual network/subnet ManufacturingVnet/Manufacturing

Availability zone 1 DNS name Not configured

Health state

Add or remove favorites by pressing **Ctrl+L+Shift+F**

Connection troubleshoot for VM's with Network Watcher

Network Watcher | Connection troubleshoot

Source type * Virtual machine

Virtual machine * CoreServicesVM

Destination type Select a virtual machine

Virtual machine * ManufacturingVM

Probe settings

Metrics Logs

Give feedback

The screenshot shows the Microsoft Azure Network Watcher Connection troubleshoot interface. On the left, a sidebar lists various diagnostic tools: Connection monitor, Traffic Analytics, Network diagnostic tools (IP flow verify, NSG diagnostics, Next hop, Effective security rules, VPN troubleshoot, Packet capture), and Connection troubleshoot (which is selected). Below this are Metrics and Logs. The main pane displays the results of a connectivity test between CoreServicesVM and ManufacturingVM. It shows four tests: Connectivity test (Unreachable), Outbound NSG diagnostic (Deny), Inbound NSG diagnostic (Allow), and Next hop (from source) (Success). The Outbound NSG diagnostic result indicates failed tests due to CoreServicesVM-nsg.

Connectivity test shows **Unreachable**. This makes sense because the virtual machines are in different virtual networks.

Task 4: Configure virtual network peerings between virtual networks

In this task, you create a virtual network peering to enable communications between resources in the virtual networks.

Connecting vnets through peering

The screenshot shows the Microsoft Azure Add peering configuration page. It starts with a header for CoreServicesVnet. The 'Peering link name' field is set to 'ManufacturingVnet-to-CoreServicesVnet'. Under 'Remote virtual network peering settings', two checkboxes are checked: 'Allow 'ManufacturingVnet' to access 'CoreServicesVnet'' and 'Allow 'ManufacturingVnet' to receive forwarded traffic from 'CoreServicesVnet''. At the bottom are 'Add' and 'Cancel' buttons.

Microsoft Azure | Search resources, services, and docs (G+/-) | Copilot | Home > CoreServicesVnet | Peerings > Add peering ... | Local virtual network summary | Peering link name * CoreServicesVnet-to-ManufacturingVnet | Local virtual network peering settings | Allow 'CoreServicesVnet' to access 'ManufacturingVnet' | Allow 'CoreServicesVnet' to receive forwarded traffic from 'ManufacturingVnet' | Allow gateway or route server in 'CoreServicesVnet' to forward traffic to 'ManufacturingVnet' | Add | Cancel | Give feedback

The screenshot shows the 'Add peering' dialog for 'CoreServicesVnet'. It includes fields for the peering link name ('CoreServicesVnet-to-ManufacturingVnet'), checkboxes for network access and traffic forwarding, and buttons for 'Add' and 'Cancel'.

Connected

Microsoft Azure | Search resources, services, and docs (G+/-) | Copilot | Home > CoreServicesVnet | Peerings | Virtual network | Connected devices | Subnets | Bastion | DDoS protection | Firewall | Microsoft Defender for Cloud | Network manager | DNS | Peerings | Service endpoints | Private endpoints | Filter by name... | + Add | Refresh | Export to CSV | Delete | Sync | Virtual network peering enables you to seamlessly connect two or more virtual networks in Azure. The virtual networks appear as one for connectivity purposes. Learn more | Showing all 1 items | Name | Peering sync status | Peering sync status | Remote VNet | Virtu... | Cross-tenant | Name | Peering sync status | Remote VNet | Virtu... | Cross-tenant | CoreServicesVnet-to-ManufacturingVnet | Fully Synchronized | Connected | Manufact... | Disabled | No | Give feedback

The screenshot shows the 'Peerings' blade for 'CoreServicesVnet'. It lists a single peering connection named 'CoreServicesVnet-to-ManufacturingVnet' which is 'Fully Synchronized' and 'Connected'.

Task 5: Use Azure PowerShell to test the connection between virtual machines

In this task, you retest the connection between the virtual machines in different virtual networks.

Testing a connection between VMs via private ip through vm's shell

Test-NetConnection 10.0.0.4 -port 3389

The screenshot shows the Microsoft Azure portal interface. On the left, a sidebar for the 'ManufacturingVM' virtual machine lists various management options like Connect, Networking, Settings, and Run command. The 'Run command' option is selected. A sub-menu under 'Run command' includes 'RunPowerShellScript', 'DisableNLA', 'DisableWindowsUpdate', 'EnableAdminAccount', 'EnableEMS', 'EnableRemotePS', 'EnableWindowsUpdate', and 'FleetDiagnosticsWindow'. The main panel displays a 'Run Command Script' dialog titled 'RunPowerShellScript'. It shows a message 'Script execution complete' and a list of command-line parameters and their values:

```
ComputerName : 10.0.0.4
RemoteAddress : 10.0.0.4
RemotePort : 3389
InterfaceAlias : Ethernet
SourceAddress : 172.16.0.4
TcpTestSucceeded : True
```

Task 6: Create a custom route

In this task, you want to control network traffic between the perimeter subnet and the internal core services subnet. A virtual network appliance will be installed in the perimeter subnet and all traffic should be routed there.

Adding a perimeter subnet

The screenshot shows the Microsoft Azure portal interface for managing subnets in the 'CoreServicesVnet' virtual network. The left sidebar includes options like Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Resource visualizer, Settings, Address space, Connected devices, Subnets (which is selected), Bastion, and DDoS protection. The main content area shows the 'Subnets' page with a search bar and buttons for Subnet, Refresh, Manage users, Delete, and Export to CSV. A descriptive text explains that subnets segment the virtual network address space. Below this, a table lists the existing subnets:

Name	IPv4	IPv6	Available IPs	Delegated to	Security group	Route table
Core	10.0.0.0/24	-	250	-	-	-
perimeter	10.0.1.0/24	-	251	-	-	-

Creating route table

Microsoft Azure | Search resources, services, and docs (G+/)

Home > Network foundation | Route tables >

Create Route table

Project details

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

Subscription * Resource group *

Region * Name *

Propagate gateway routes * Yes No

[Previous](#) [Next](#) [Review + create](#) [Give feedback](#)

Adding route

Microsoft Azure | Search resources, services, and docs (G+/)

Home > Microsoft.RouteTable-20251205163722 | Overview > az104-rg5 > rt-CoreServices

rt-CoreServices | Routes

[Overview](#) [Activity log](#) [Access control \(IAM\)](#) [Tags](#) [Diagnose and solve problems](#) [Resource visualizer](#) [Settings](#) [Configuration](#) [Routes](#) [Subnets](#) [Properties](#) [Locks](#) [Monitoring](#)

+ Add Refresh Give feedback

Name ↑	Address prefix ↑
No results.	

Add route

rt-CoreServices

PerimetertoCore

Destination type *

Destination IP addresses/CIDR ranges *

Next hop type *

Next hop address *

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.

[Add](#) [Give feedback](#)

Home > Microsoft.RouteTable-20251205163722 | Overview > az104-rg5 > rt-CoreServices

rt-CoreServices | Routes

- [Overview](#)
 - [Activity log](#)
 - [Access control \(IAM\)](#)
 - [Tags](#)
 - [Diagnose and solve problems](#)
 - [Resource visualizer](#)
 - [Settings](#)
 - [Configuration](#)
 - [Routes](#)
 - [Subnets](#)
 - [Properties](#)
 - [Locks](#)
 - [Monitoring](#)
- Add or remove favorites by pressing **Ctrl+Shift+F**

+ Add Refresh Give feedback

Name ↑	Address prefix ↑	Next hop type ↑	Next hop IP address ↑	...
PerimetertoCore	10.0.0.0/16	VirtualAppliance	10.0.1.7	...

Lab 06 - Implement Network Traffic Management

Lab introduction

In this lab, you learn how to configure and test a public Load Balancer and an Application Gateway.

This lab requires an Azure subscription. Your subscription type may affect the availability of features in this lab. You may change the region, but the steps are written using **East US**.

Estimated timing: 50 minutes

Lab scenario

Your organization has a public website. You need to load balance incoming public requests across different virtual machines. You also need to provide images and videos from different virtual machines. You plan on implementing an Azure Load Balancer and an Azure Application Gateway. All resources are in the same region.

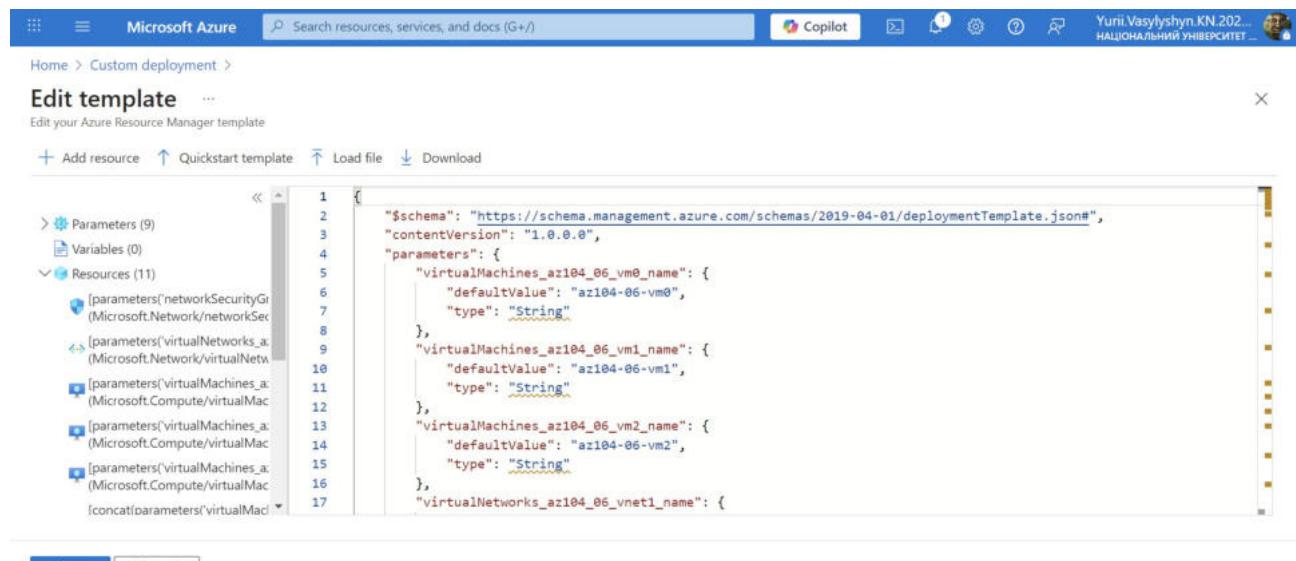
Job skills

- Task 1: Use a template to provision an infrastructure.
- Task 2: Configure an Azure Load Balancer.
- Task 3: Configure an Azure Application Gateway.

Task 1: Use a template to provision an infrastructure

In this task, you will use a template to deploy one virtual network, one network security group, and three virtual machines.

Using a custom template



```
1  {
2      "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
3      "contentVersion": "1.0.0.0",
4      "parameters": {
5          "virtualMachines_az104_06_vm0_name": {
6              "defaultValue": "az104-06-vm0",
7              "type": "String"
8          },
9          "virtualMachines_az104_06_vm1_name": {
10             "defaultValue": "az104-06-vm1",
11             "type": "String"
12         },
13         "virtualMachines_az104_06_vm2_name": {
14             "defaultValue": "az104-06-vm2",
15             "type": "String"
16         },
17         "virtualNetworks_az104_06_vnet1_name": {
```

Creating with custom deployment

Microsoft Azure Copilot      

Home >

Custom deployment

Where can I find sample ARM templates? Summarize the deployment methods Azure offers How do large organizations automate deployments?

New! Deployment Stacks let you manage the lifecycle of your deployments. Try it now →

Virtual Machines_az104_06_vm1_name	az104-06-vm1	✓
Virtual Machines_az104_06_vm2_name	az104-06-vm2	✓
Virtual Networks_az104_06_vnet1_name	az104-06-vnet1	✓
Network Interfaces_az104_06_nic0_name	az104-06-nic0	✓
Network Interfaces_az104_06_nic1_name	az104-06-nic1	✓
Network Interfaces_az104_06_nic2_name	az104-06-nic2	✓
Network Security Groups_az104_06_nsg1_name	az104-06-nsg1	✓
Admin Password *	*****	✓

[Previous](#) [Next](#) [Review + create](#)

Tried all regions in policy of my university account, cant do this lab because of quota limits

Lab 07 - Manage Azure Storage

Lab introduction

In this lab you learn to create storage accounts for Azure blobs and Azure files. You learn to configure and secure blob containers. You also learn to use Storage Browser to configure and secure Azure file shares.

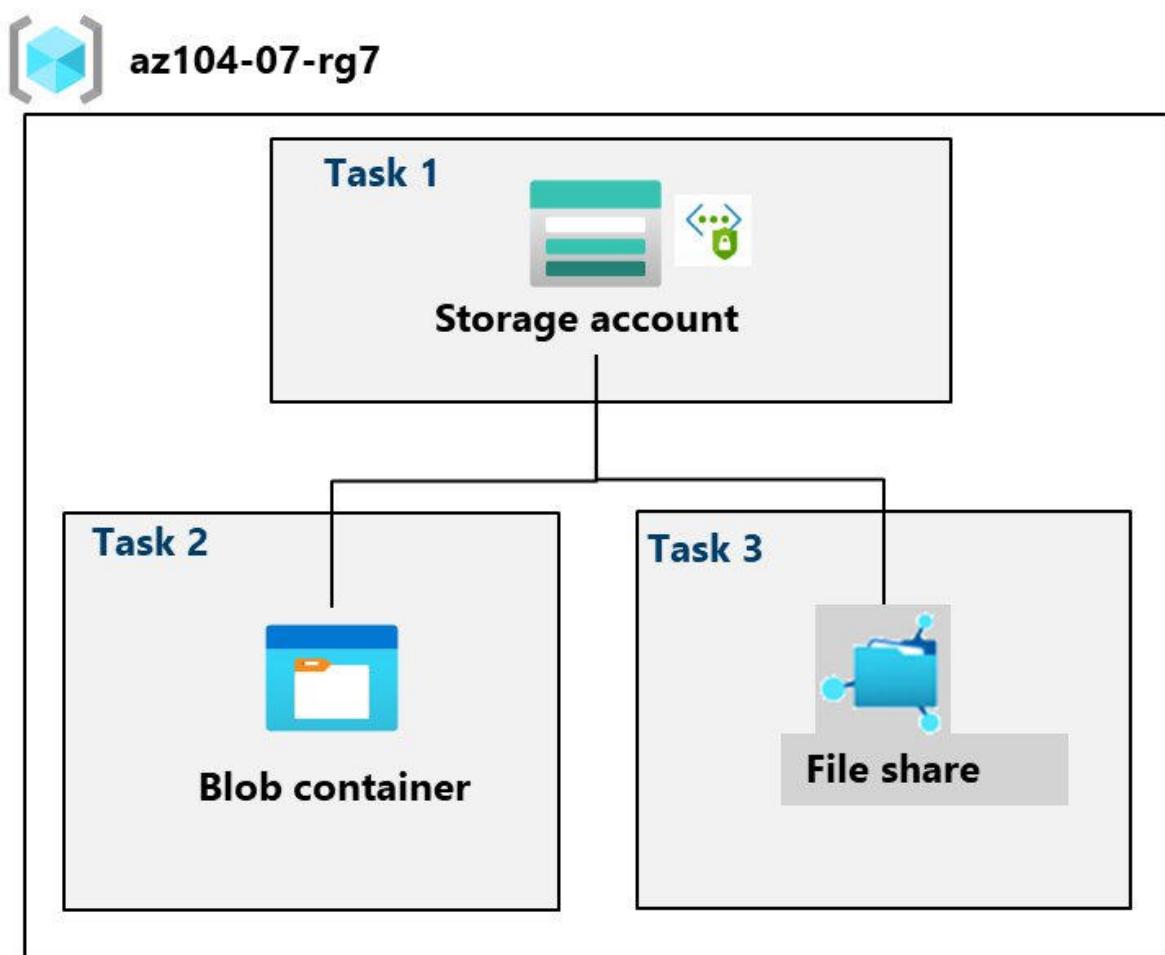
This lab requires an Azure subscription. Your subscription type may affect the availability of features in this lab. You may change the region, but the steps are written using **East US**.

Estimated timing: 50 minutes

Lab scenario

Your organization is currently storing data in on-premises data stores. Most of these files are not accessed frequently. You would like to minimize the cost of storage by placing infrequently accessed files in lower-priced storage tiers. You also plan to explore different protection mechanisms that Azure Storage offers, including network access, authentication, authorization, and replication. Finally, you want to determine to what extent Azure Files is suitable for hosting your on-premises file shares.

Architecture diagram



Job skills

- Task 1: Create and configure a storage account.
- Task 2: Create and configure secure blob storage.
- Task 3: Create and configure secure Azure file storage.

Task 1: Create and configure a storage account.

In this task, you will create and configure a storage account. The storage account will use geo-redundant storage and will not have public access.

Creating storage acc

The screenshot shows the 'Create a storage account' wizard in the Microsoft Azure portal. The user is on the first step, 'Set instance details'. The 'Subscription' dropdown is set to 'Azure for Students'. The 'Resource group' dropdown shows '(New) az104-rg7' with a 'Create new' option below it. Under 'Instance details', the 'Storage account name' is 'simplestorageacc1', 'Region' is '(Europe) Switzerland North', and 'Preferred storage type' is set to 'Choose preferred storage type'. A note below the storage type says: 'This helps us provide relevant guidance. It doesn't restrict your storage to this resource type.' At the bottom, there are 'Previous' and 'Next' buttons, and a 'Review + create' button which is highlighted in blue.

Disabling public network access

The screenshot shows the 'Create a storage account' wizard in the Microsoft Azure portal. The user is on the second step, 'Set public access'. The 'PUBLIC ACCESS' section has three options: 'Enable', 'Disable', and 'Secure by perimeter (Most restricted)'. The 'Disable' option is selected. A note above the options says: 'Access your resource from anywhere through a public network.' Another note below says: 'Note: Allowing access to your resource through a public network increases security risk. [Learn more](#)' with a small 'i' icon. Below the options, there are two sections for 'Public network access scope': 'Enable from all networks' and 'Enable from selected virtual networks and IP addresses'. At the bottom, there are 'Previous' and 'Next' buttons, and a 'Review + create' button which is highlighted in blue.

Storage acc deployed

Microsoft Azure Search resources, services, and docs (G+/) Copilot Home > simplestorageacc1_1764957619756 | Overview

Your deployment is complete

Deployment name: simplestorageacc1_1764957619756 Start time: 12/5/2025, 8:01:51 PM Subscription: Azure for Students Correlation ID: eb6846d1-7c9f-4168-9edd-c35b7dc4a Resource group: az104-rg7

Deployment details Next steps Go to resource Give feedback Tell us about your experience with deployment

Add or remove favorites by pressing Ctrl+Shift+F

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

Microsoft Defender for Cloud Secure your apps and infrastructure Go to Microsoft Defender for Cloud >

Free Microsoft tutorials Start learning today >

Configuring public network access

Microsoft Azure Search resources, services, and docs (G+/) Copilot Home > simplestorageacc1_1764957619756 | Overview > simplestorageacc1 | Networking

Public network access

Virtual Networks Allow select virtual networks to connect to your resource using service endpoints. Learn more Add a virtual network

Virtual Network	Subnet	Address Range	Endpoint Status	Resource Group	Subscription

IPv4 Addresses Allow select public internet IP addresses to access your resource. Learn more

213.174.10.23
IPv4 address or CIDR

Save Cancel

Adding lifecycle rule

Microsoft Azure Search resources, services, and docs (G+/) Copilot Home > simplestorageacc1_1764957619756 | Overview > simplestorageacc1 | Lifecycle management

Add a rule

Lifecycle management uses your rules to automatically move blobs to cooler tiers or to delete them. If you create multiple rules, the associated actions must be implemented in tier order (from hot to cool storage, then archive, then deletion).

If

Base blobs were *
 Last modified
 Created

More than (days ago) *
30

Then

Move to cool storage

Previous Add

The screenshot shows the Microsoft Azure Storage Lifecycle management settings for the storage account 'simplestorageacc1'. The left sidebar lists various storage management options like Data management, Lifecycle management, and Settings. The main pane displays a table of lifecycle rules. One rule named 'Movetocool' is listed, which moves blobs to the 'cool' access tier. The table includes columns for Name, Status, and Blob type.

Name	Status	Blob type
Movetocool	Enabled	Block

Task 2: Create and configure secure blob storage

In this task, you will create a blob container and upload an image. Blob containers are directory-like structures that store unstructured data.

Creating a blob container

The screenshot shows the Microsoft Azure Storage Containers page for the storage account 'simplestorageacc1'. The left sidebar has 'Containers' selected. The main pane shows a list of existing containers, including '\$logs'. On the right, a 'New container' dialog is open, prompting for a name ('data') and an anonymous access level ('Private'). Advanced settings like encryption and immutability are also visible.

Adding immutable storage retention policy

Microsoft Azure | Search resources, services, and docs (G+)

Home > simplestorageacc1_1764957619756 | Overview > simplestorageacc1

simplestorageacc1 | Containers

Storage account

Add container Upload Refresh Delete

Search containers by prefix

Showing all 2 items

Name
\$logs
data

Policy type: Time-based retention

Set retention period for * 180 days

Enable version-level immutability

In order to enable version-level immutability support, your storage account must have versioning turned on.

Allow protected append writes to: None

Save Cancel

Uploading file to blob container

Microsoft Azure | Search resources, services, and docs (G+)

Home > simplestorageacc1_1764957619756 | Overview > simplestorageacc1 | Containers >

data

Container

Overview

Add Directory Upload Change access level Refresh

Authentication method: Access key (Switch to Microsoft Entra user account)

Add filter

Search blobs by prefix (case-sensitive)

Showing all 0 items

Name	Last modified	Access
------	---------------	--------

No items found

Overwrite if files already exist

Advanced

Upload Give feedback

Microsoft Azure | Search resources, services, and docs (G+)

Home > simplestorageacc1_1764957619756 | Overview > simplestorageacc1 | Containers >

data

Container

Overview

Add Directory Upload Change access level Refresh Delete Copy Paste Rename Acquire lease ...

Authentication method: Access key (Switch to Microsoft Entra user account)

Add filter

Search blobs by prefix (case-sensitive)

Only show active blobs

Showing all 2 items

Name	Last modified	Access tier	Blob type	Size	Lease state
securitytest	05.12.2025, 20:37:30	Hot (Inferred)	Block blob	33.08 KiB	Available
az104-lab07-arch...	05.12.2025, 20:37:30	Hot (Inferred)	Block blob	33.08 KiB	Available

Copying url and pasting in browser:

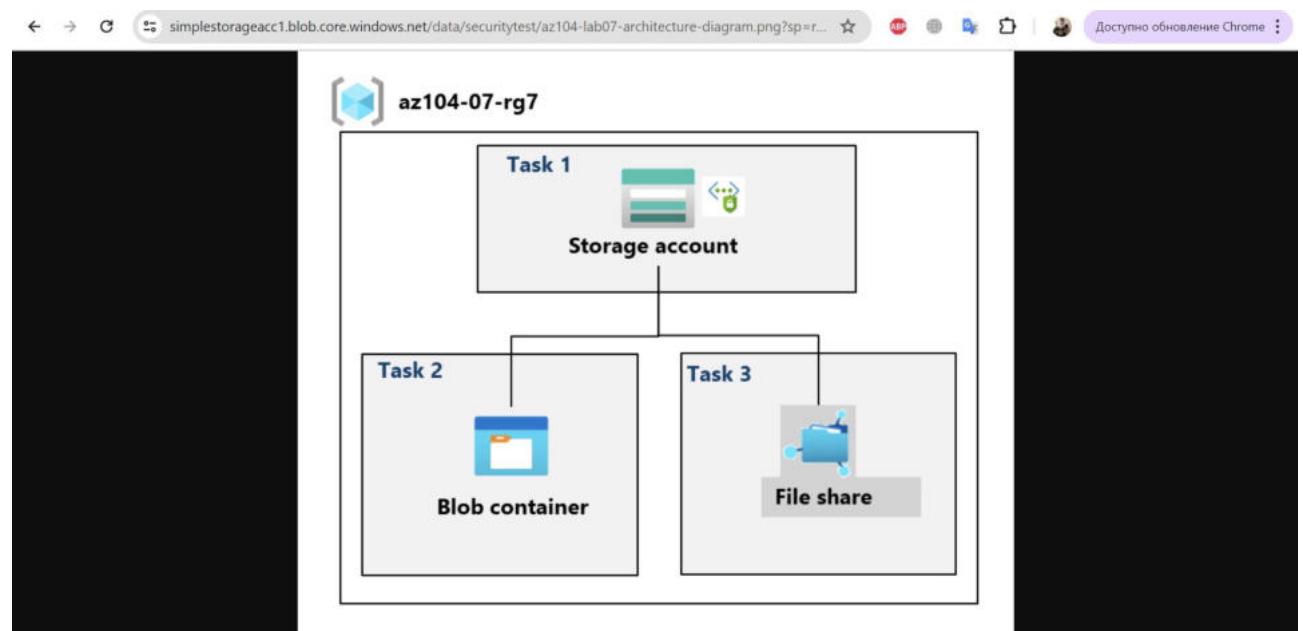
This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
<Error>
<Code>PublicAccessNotPermitted</Code>
<Message>Public access is not permitted on this storage account. RequestId:01fd45f8-b01e-006e-0817-6675ec000000 Time:2025-12-05T18:43:39.5144771Z</Message>
</Error>
```

Generating SAS for limited access in storage

The screenshot shows the Microsoft Azure Storage Explorer interface. On the left, there's a sidebar with options like 'Overview', 'Diagnose and solve problems', 'Access Control (IAM)', 'Settings', 'Shared access tokens', 'Access policy', 'Properties', and 'Metadata'. The main area shows a container named 'data' with a blob named 'az104-lab07-arch...'. On the right, a 'Generate SAS' dialog box is open, allowing configuration of permissions (set to 'Read'), start and expiry times (set to 12/06/2025 at 8:46:28 AM), allowed IP addresses (empty), and allowed protocols (set to 'HTTPS only'). A 'Generate SAS token and URL' button is at the bottom.

Opening generated URL:



Task 3: Create and configure an Azure File storage

In this task, you will create and configure Azure File shares. You will use Storage Browser to manage the file share.

Creating a File Share

The screenshot shows the 'New file share' creation wizard in the Microsoft Azure portal. The 'Basics' tab is selected. The 'Name' field contains 'share1'. The 'Access tier' dropdown is set to 'Transaction optimized'. In the 'Performance' section, 'Maximum IO/s' is 20000 and 'Maximum capacity' is 100 TiB. At the bottom, there are 'Review + create' and 'Next : Backup >' buttons.

File share share1 in a storage browser:

The screenshot shows the 'simplestorageacc1 | Storage browser' page. The left sidebar has 'Storage browser' selected. The main area shows a list of 'File shares' under 'simplestorageacc1'. One item, 'share1', is listed with details: Name: share1, Tier: Transaction optimized, Modified: 05.12.2025, 20:51:12, Quota: 100 TiB.

Uploaded a file in a file share

The screenshot shows the 'simplestorageacc1 | Storage browser' page. The left sidebar has 'Storage browser' selected. The main area shows a list of files in 'share1'. One file is listed: 'az104-lab07-architecture-diagram.png' (File, 33.08 KIB).

Creating Vnet to restrict access to storage acc

Microsoft Azure | Search resources, services, and docs (G+/)

Home > Network foundation | Virtual networks >

Create virtual network

Basics Security IP addresses Tags Review + create

Resource group * az104-rg7 Create new

Instance details

Virtual network name * vnet1

Region * (Europe) Switzerland North Deploy to an Azure Extended Zone

Previous Next Review + create Give feedback

Selecting service endpoints for network

Microsoft Azure | Search resources, services, and docs (G+/)

Home > vnet1

vnet1 | Service endpoints

Virtual network

Search Add Refresh

Network manager DNS Peering Service endpoints Private endpoints Properties Locks Monitoring Automation CLI / PS Tasks Export template

Service	Subnet	Status	Locations
Microsoft.Storage	1		***

Give feedback

Adding a network with endpoint

Microsoft Azure | Search resources, services, and docs (G+/)

Home > Storage center | Blob Storage > simplestorageacc1 | Networking >

Public network access

Restrict inbound and outbound access using a network security perimeter. Secure by perimeter offers the greatest level of inbound resource.

⚠️ Enabling public network access will make this resource available publicly. Unless public access is required, consider using Learn more

Public network access scope * Enable from all networks (radio button) Enable from selected networks (radio button)

Virtual Networks

Allow select virtual networks to connect to your resource using service endpoints. Learn more

Add a virtual network

Virtual Network	Subnet	Address Range	Endpoint Status	Resource Group
-----------------	--------	---------------	-----------------	----------------

Save Cancel Add

Trying to reach our network:

The screenshot shows the Microsoft Azure Storage browser interface for a storage account named 'simplestorageacc1'. The left sidebar lists various options like Tags, Diagnose and solve problems, Access Control (IAM), Data migration, Events, Storage browser (which is selected), Storage Mover, Partner solutions, Resource visualizer, Data storage, Containers, and File shares. The main pane displays a summary of a failed operation. The message 'This request is not authorized to perform this operation.' is prominently displayed. Below it, the 'Summary' section provides details: Session ID: 11c30e710b9c4825b1b2ea507a3d372a, Extension: Microsoft_Azure_Storage, Error code: 403. The 'Details' section contains two bullet points: 'This request is not authorized to perform this operation. RequestId:a2d58a76-901a-0046-7319-661444000000 Time:2025-12-05T19:00:10.145Z' and 'This storage account's 'Firewalls and virtual networks' settings may be blocking access to storage services. Try adding your client IP address (213.174.10.23) to the firewall exceptions, or by allowing access from 'all networks' instead of 'selected networks'. Learn more'.

Lab 08 - Manage Virtual Machines

Lab introduction

In this lab, you create and compare virtual machines to virtual machine scale sets. You learn how to create, configure and resize a single virtual machine. You learn how to create a virtual machine scale set and configure autoscaling.

This lab requires an Azure subscription. Your subscription type may affect the availability of features in this lab. You may change the region, but the steps are written using **East US**.

Estimated timing: 50 minutes

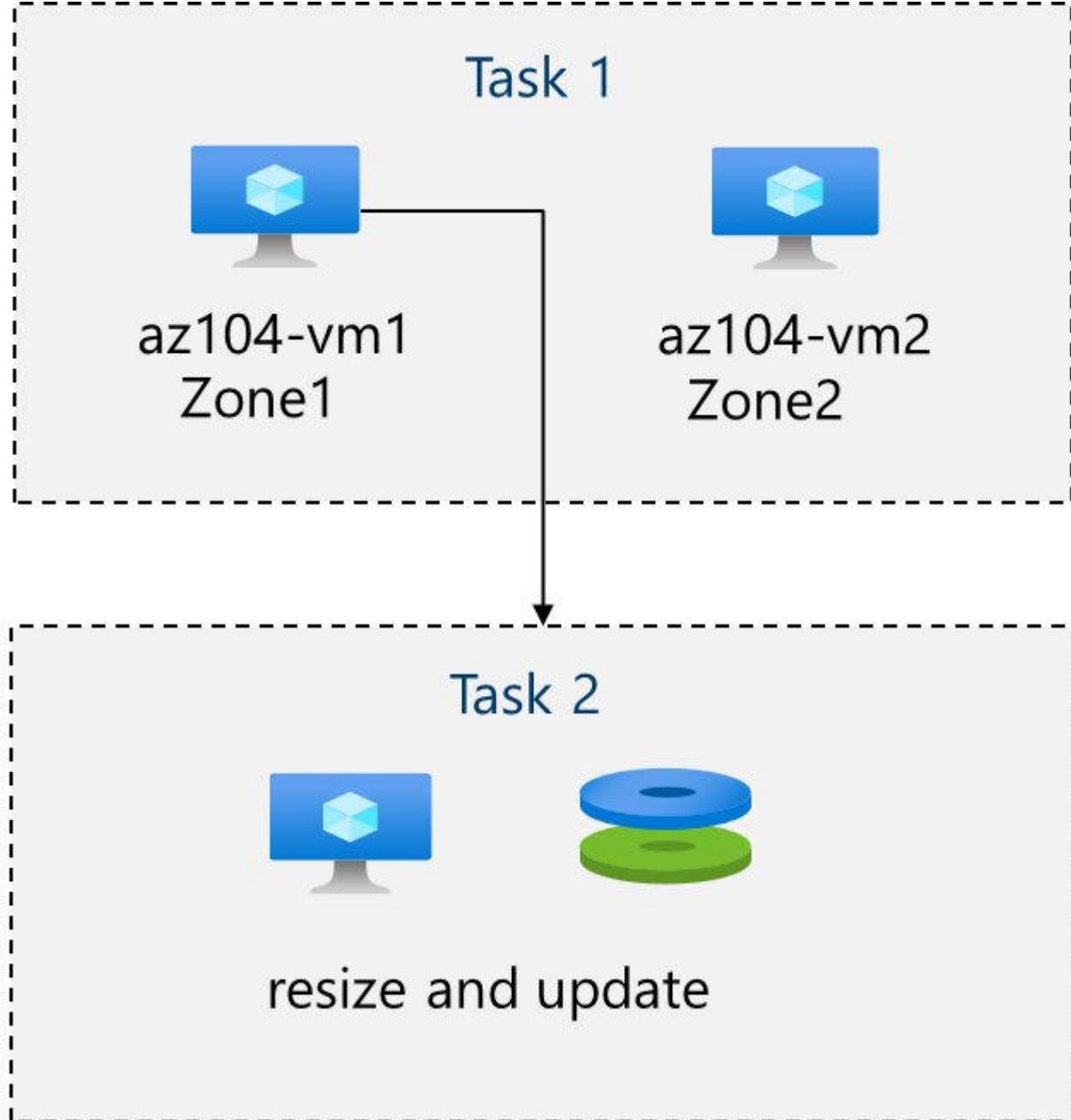
Lab scenario

Your organization wants to explore deploying and configuring Azure virtual machines. First, you implement an Azure virtual machine with manual scaling. Next, you implement a Virtual Machine Scale Set and explore autoscaling.

Job skills

- Task 1: Deploy zone-resilient Azure virtual machines by using the Azure portal.
- Task 2: Manage compute and storage scaling for virtual machines.
- Task 3: Create and configure Azure Virtual Machine Scale Sets.
- Task 4: Scale Azure Virtual Machine Scale Sets.
- Task 5: Create a virtual machine using Azure PowerShell (optional 1).
- Task 6: Create a virtual machine using the CLI (optional 2).

Azure Virtual Machines Architecture Diagram



Creating and configuring VMs

Home > Compute infrastructure | Virtual machines >

Create a virtual machine ...   

Based on the number of availability zones selected, 2 virtual machines will be created. The following settings will be applied to each virtual machine unless specified otherwise.

Help me create a low cost VM  

Subscription *  Resource group * 
Create new

Instance details

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

Region * 
Deploy to an Azure Extended Zone

< Previous   Give feedback

Microsoft Azure | Search resources, services, and docs (G+/-) | Copilot | Home > Compute infrastructure | Virtual machines > Create a virtual machine

Based on the number of availability zones selected, 2 virtual machines will be created. The following settings will be applied to each virtual machine unless specified otherwise.

Help me create a low cost VM | Help me choose the right VM size for my workload | Help me create a VM optimized for high availability | Help me create a low cost VM

Availability zone * Zones 1, 2

Based on your zone selection, we will place 2 virtual machines, one in each selected zone. You may want to create this resource as a Virtual Machine Scale Set (VMSS) instead which allows you to manage, configure and scale load balanced virtual machines. [Create as VMSS](#)

Security type Standard

Image Windows Server 2025 Datacenter - x64 Gen2

This image is compatible with additional security features. [Click here to swap to the Trusted launch security type.](#)

Review + create

Give feedback

Choosing disks

Home > Compute infrastructure | Virtual machines > Create a virtual machine

Based on the number of availability zones selected, 2 virtual machines will be created. The following settings will be applied to each virtual machine unless specified otherwise.

Help me create a low cost VM | Help me choose the right VM size for my workload | Help me create a VM optimized for high availability | Help me create a low cost VM

OS disk size Image default (127 GiB)

OS disk type Premium SSD (locally-redundant storage)

Delete with VM

Key management Platform-managed key

Enable Ultra Disk compatibility

Data disks for az104-vm1

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

LUN	Name	Size (GiB)	Disk type	Host caching	Delete with VM
< Previous	Next : Networking >	Review + create	go.microsoft.com/fwlink/?LinkId=2012733	Give feedback	

Networking, checking delete IP and NIC when VM is deleted

Microsoft Azure | Search resources, services, and docs (G+/-) | Copilot | Home > Compute infrastructure | Virtual machines > Create a virtual machine

Based on the number of availability zones selected, 2 virtual machines will be created. The following settings will be applied to each virtual machine unless specified otherwise.

Help me create a low cost VM | Help me choose the right VM size for my workload | Help me create a VM optimized for high availability | Help me create a low cost VM

Select inbound ports Select one or more ports

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

Delete public IP and NIC when VM is deleted

Enable accelerated networking

Load balancing

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

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

https://portal.azure.com/#

Give feedback

Created

The screenshot shows the Microsoft Azure Overview page for a deployment named "CreateVm-MicrosoftWindowsServer.WindowsServer-202-20251206192214". The status is "Your deployment is complete". Deployment details include a name, subscription ("Azure for Students"), resource group ("az104-rg8"), start time (12/6/2025, 7:51:16 PM), and correlation ID (354677bd-9f80-4420-9e). Below this, sections for "Deployment details" and "Next steps" are shown, along with links to "Go to resource" and "Create another VM". A sidebar on the right provides links to "Cost Management", "Microsoft Defender for Cloud", and "Free Microsoft tutorials".

Task 2: Manage compute and storage scaling for virtual machines

In this task, you will scale a virtual machine by adjusting its size to a different SKU. Azure provides flexibility in VM size selection so that you can adjust a VM for periods of time if it needs more (or less) compute and memory allocated. This concept is extended to disks, where you can modify the performance of the disk, or increase the allocated capacity.

Resizing VM size

The screenshot shows the Microsoft Azure VM Size selection page for a virtual machine named "az104-vm1". The current size is "Standard_D2ds_v4". The page lists 392 VM sizes, filtered by "D-Series v4". It includes columns for VM Size, Type, vCPUs, RAM (GiB), Data disks, and Max IOPS. A "Resize" button is visible at the bottom left. A note at the bottom states that prices are estimates in USD and do not include software costs.

Changed size

Microsoft Azure | Search resources, services, and docs (G+/-) | Copilot | Home > az104-vm1 | az104-vm1 | Size

Virtual machine

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

Showing 392 VM sizes. Subscription: Azure for Students Region: Switzerland North Current size: Standard_D2ds_v4 Learn more about VM sizes Group by series

VM Size ↑↓	Type ↑↓	vCPUs ↑↓	RAM (GiB) ↑↓	Data disks ↑↓	Max IOPS ↑↓
D-Series v4 The 4th generation D family sizes for your general purpose needs					
D2as_v4	General purpose	2	8	4	3200
D2ds_v4	General purpose	2	8	4	3200
D4as_v4	General purpose	4	16	8	6400
D4ds_v4	General purpose	4	16	8	6400

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

Add or remove favorites by pressing **Ctrl+Shift+F**

Attaching a new disk

Microsoft Azure | Search resources, services, and docs (G+/-) | Copilot | Home > az104-vm1 | az104-vm1 | Disks

Virtual machine

Refresh Additional settings Feedback Troubleshoot

Swap OS disk

Disk name	Storage type	Size (GiB)	Max IOPS	Max throughput (...)	Encryption
az104-vm1_OsDisk_1_439b81858e1e4a	Premium SSD LRS	127	500	100	SSE with PMK

Data disks

Filter by name Showing 1 of 1 attached data disks

+ Create and attach a new disk Attach existing disks

LUN	Disk name	Storage type	Size (GiB)	Max IOPS	Max throughput (...)	Encryption
0	vm1-disk1	Standard HDD (...)	32	500	60	Platform

Apply Discard changes

Detaching a disk

Microsoft Azure | Search resources, services, and docs (G+/-) | Copilot | Home > az104-vm1 | az104-vm1 | Disks

Virtual machine

Refresh Additional settings Feedback Troubleshoot

Swap OS disk

Disk name	Storage type	Size (GiB)	Max IOPS	Max throughput (...)	Encryption
az104-vm1_OsDisk_1_439b81858e1e4a	Premium SSD LRS	127	500	100	SSE with PMK

Data disks

Filter by name Showing 0 of 0 attached data disks

+ Create and attach a new disk Attach existing disks

LUN	Disk name	Storage type	Size (GiB)	Max IOPS	Max throughput (...)	Encryption
No data disks attached						

Apply Discard changes

Changing disk after deallocating a vm

az104-vm1_OsDisk_1_439b81858e1e4a3cb9145007164afca2 | Size + performance

Storage type: Standard SSD (locally-redundant storage)

Size	Disk tier	Provisioned IOPS	Provisioned thro...	Max Shares	Max burst IOPS	Max burst throughpu
4 GiB	E1	500	100	3	600	150
8 GiB	E2	500	100	3	600	150
16 GiB	E3	500	100	3	600	150
32 GiB	E4	500	100	3	600	150
64 GiB	E6	500	100	3	600	150
128 GiB	E10	500	100	3	600	150
256 GiB	E15	500	100	3	600	150

Save Discard Give feedback

Experimenting and changing OS existing disk to standard after deallocated

az104-vm1_OsDisk_1_439b81858e1e4a3cb9145007164afca2

Resource group (move): AZ104-RGB

Disk state: Attached

Last ownership update time: 12/6/2025, 8:28:39 PM

Location: Switzerland North

Subscription (move): Azure for Students

Subscription ID: bbbf37aa-0bd5-495e-96f6-f34404654305

Time created: 12/6/2025, 7:51:37 PM

Disk size: 127 GiB

Storage type: Standard SSD LRS

Managed by: az104-vm1

Operating system: Windows

Max shares: 0

Availability zone: 1

Security type: Standard

Show protection details for this disk

Changing created disk to standard ssd

vm1-disk1 | Size + performance

Storage type: Standard SSD (locally-redundant storage)

Size	Disk tier	Provisioned IOPS	Provisioned thro...	Max Shares	Max burst IOPS	Max burst throughpu
4 GiB	E1	500	100	3	600	150
8 GiB	E2	500	100	3	600	150
16 GiB	E3	500	100	3	600	150
32 GiB	E4	500	100	3	600	150
64 GiB	E6	500	100	3	600	150
128 GiB	E10	500	100	3	600	150
256 GiB	E15	500	100	3	600	150

Save Discard Give feedback

Attaching new changed disk Standard SSD

Microsoft Azure | Search resources, services, and docs (G+)

Home > az104-vm1

az104-vm1 | Disks Virtual machine

Disks

Extensions + applications
Operating system
Configuration
Advisor recommendations
Properties
Locks

Availability + scale

Size
Availability + scaling

Security
Backup + disaster recovery

Add or remove favorites by pressing **Ctrl+Shift+F**

*** Updating virtual machine
Updating virtual machine 'az104-vm1'...

Disk name	Storage type	Size (GiB)	Max IOPS	Max throughput (MB/s)	Encryption
az104-vm1_OsDisk_1_439b81858e1e4a	Standard SSD LRS	127	500	100	SSE with PMK

Data disks

Filter by name
Showing 1 of 1 attached data disks

+ Create and attach a new disk Attach existing disks

LUN	Disk name	Storage type	Size (GiB)	Max IOPS	Max throughput (MB/s)	Encryption
0	vm1-disk1	Standard SSD LRS	32	500	100	SSE with PMK

Apply Discard changes

Azure Virtual Machine Scale Sets Architecture Diagram

Task 3



vmss1

Zone 1, 2, 3



Task 4



Custom auto scale rules

Task 3: Create and configure Azure Virtual Machine Scale Sets

In this task, you will deploy an Azure virtual machine scale set across availability zones. VM Scale Sets reduce the administrative overhead of automation by enabling you to configure metrics or conditions that allow the scale set to horizontally scale, scale in or scale out.

Creating and comnfiguring VMSS

Home > Compute infrastructure | Virtual Machine Scale Set (VMSS) >

Create a Virtual Machine Scale Set (VMSS)

Subscription * Azure for Students

Resource group * az104-rg8

Scale set details

Virtual machine scale set name * vmss1

Region * (Europe) Switzerland North

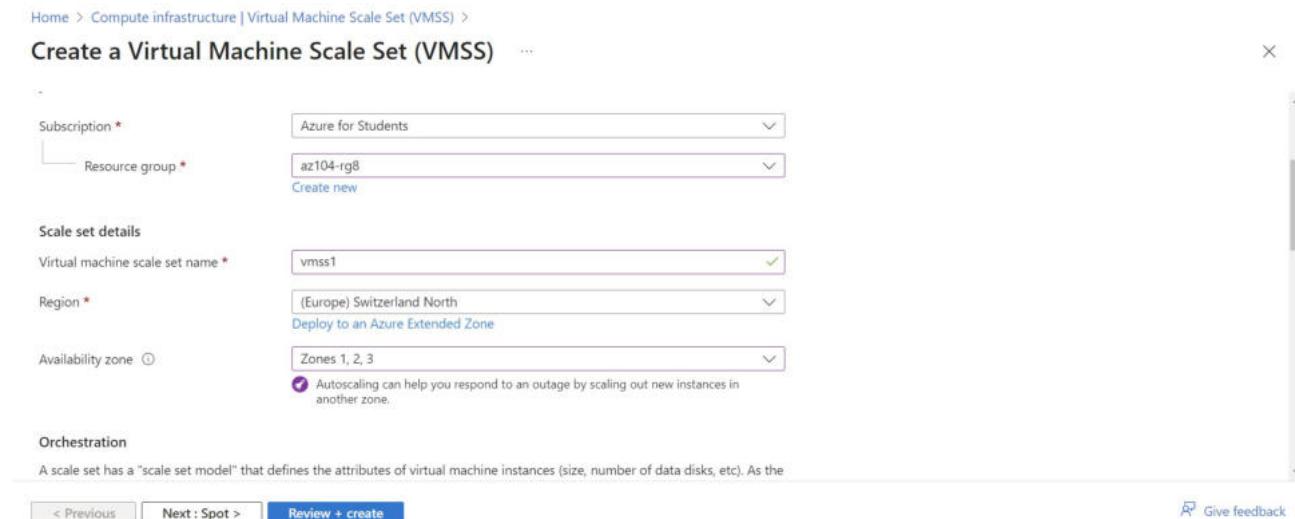
Availability zone Zones 1, 2, 3

Autoscaling can help you respond to an outage by scaling out new instances in another zone.

Orchestration

A scale set has a "scale set model" that defines the attributes of virtual machine instances (size, number of data disks, etc). As the

< Previous Next : Spot > Review + create Give feedback



Microsoft Azure Search resources, services, and docs (G+) Copilot Home > Compute infrastructure | Virtual Machine Scale Set (VMSS) >

Create a Virtual Machine Scale Set (VMSS)

Learn more about the scale set model [View](#)

Orchestration mode * Uniform: optimized for large scale stateless workloads

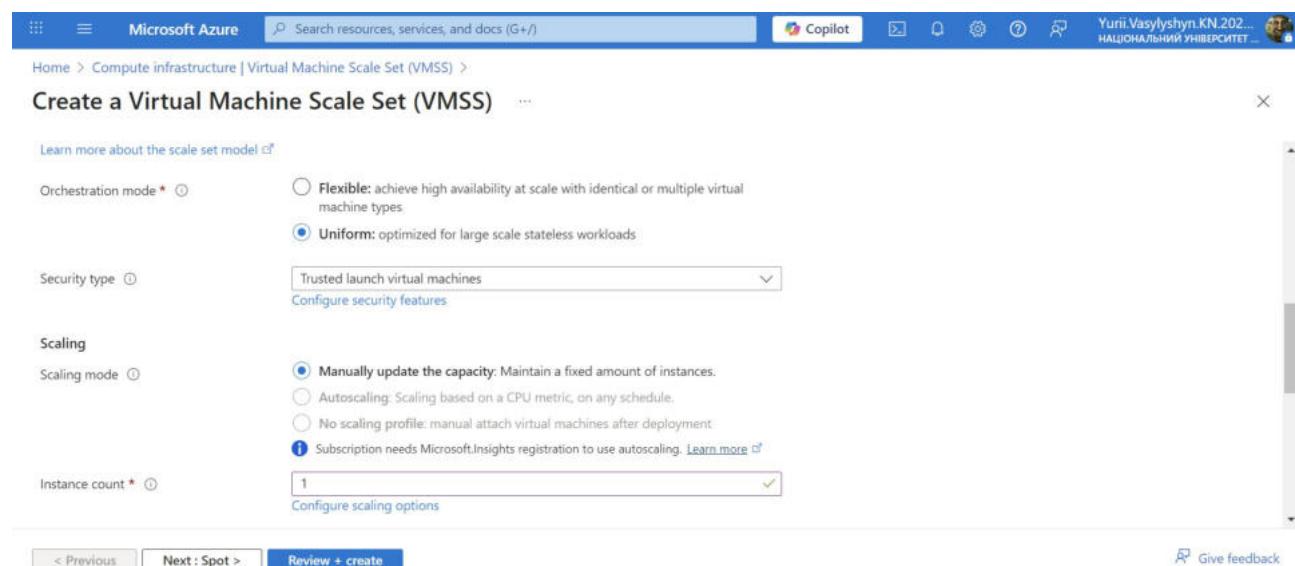
Security type Trusted launch virtual machines

Scaling

Scaling mode Manually update the capacity: Maintain a fixed amount of instances.

Instance count * 1

< Previous Next : Spot > Review + create Give feedback



Configuring networking, adding a subnet, range, subnet range

Microsoft Azure | Search resources, services, and docs (G+/-)

Home > Compute infrastructure | Virtual Machine Scale Set (VMSS) > Create a Virtual Machine Scale Set (VMSS) vnet-switzerlandnorth

Add a subnet

Name *

IPv4

Include an IPv4 address space

IPv4 address range

Starting address *

Size

Subnet address range

IPv6

Include an IPv6 address space This virtual network has no IPv6 address ranges.

Private subnet

Add Cancel Give feedback

Save **Cancel**

You must add at least one subnet to the virtual network.

Microsoft Azure | Search resources, services, and docs (G+/-)

Home > Compute infrastructure | Virtual Machine Scale Set (VMSS) > Create a Virtual Machine Scale Set (VMSS) vnet-switzerlandnorth

Create a Virtual Machine Scale Set (VMSS)

Virtual network

Subnet *

Network interface

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

+ Create new nic Delete

NAME	CREATE PUBL...	SUBNET	NETWORK SECUR...	ACCELERATED N...
vmss-vnet-nic01	No	subnet0 (10.82.0.0/24)	Basic	On

Load balancing

< Previous Next : Management > Review + create Give feedback

Adding inbound security rule while creating NSG to NIC

Microsoft Azure | Search resources, services, and docs (G+/-)

Home > Compute infrastructure | Virtual Machine Scale Set (VMSS) > Create a Virtual Machine Scale Set (VMSS) vnet-switzerlandnorth

Create network security group

Name *

Inbound rules

Outbound rules

Add inbound security rule

vms1-nsg

ICMPv4

ICMPv6

Action Allow

Deny

Priority *

Name *

Description

OK Add Cancel Give feedback

Creating load balancer

Microsoft Azure Search resources, services, and docs (G+/)

Copilot Home > Compute infrastructure | Virtual Machine Scale Set (VMSS) > Create a Virtual Machine Scale Set (VMSS) ...

Load balancing

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

Load balancing options

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

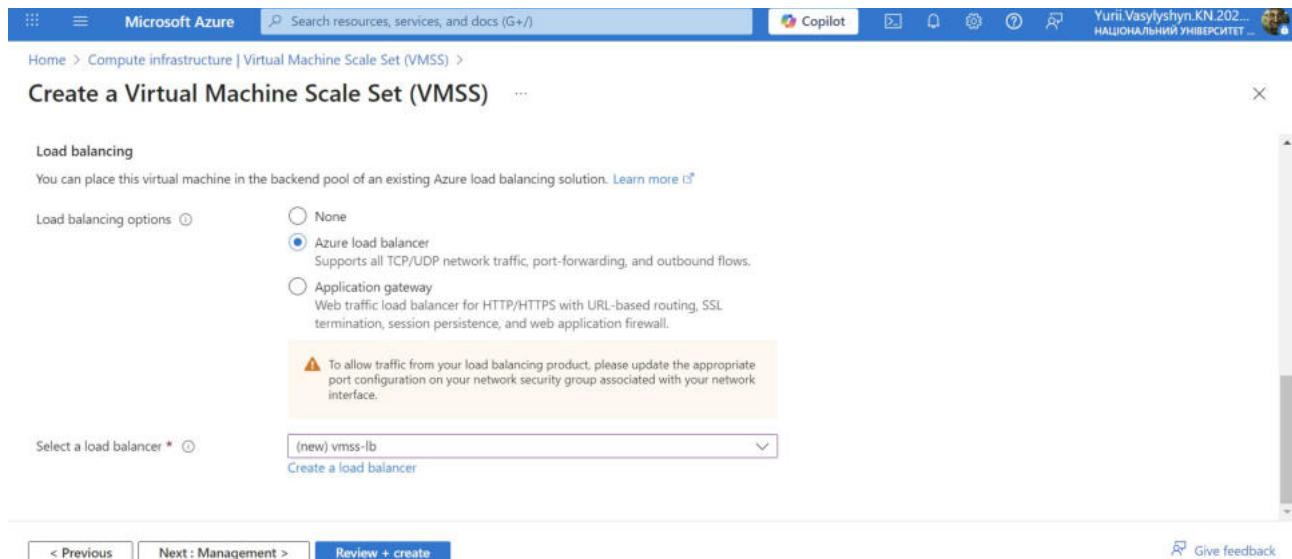
To allow traffic from your load balancing product, please update the appropriate port configuration on your network security group associated with your network interface.

Select a load balancer *

(new) vmss-lb

Create a load balancer

< Previous Next : Management > Review + create Give feedback



At this point, I have configured the virtual machine scale set with disks and networking. In the network configuration I have created a network security group and allowed HTTP. I have also created a load balancer with a public IP address.

Adding scaling and scale rule:

Microsoft Azure Search resources, services, and docs (G+/)

Copilot Home > CreateVmss-MicrosoftWindowsServer.WindowsServer-2-20251206204131 | Overview > vmss1

vmss1 | Scaling Virtual machine scale set

Scaling

Save Discard Refresh Logs Feedback

Default * Auto created default scale condition

Delete warning

The very last or de off autoscale.

Scale mode

Scale based on a m

Rules

Scale is based on example: 'Add a rule if a specific metric is defined, th

Instance limits

Minimum * 1

Schedule

This scale condition is

+ Add a scale condition

Percentage CPU (Average) 52.79 %

Enable metric divide by instance count

Operator * Greater than Metric threshold to trigger scale action * 70 %

Duration (minutes) * 10 Time grain (minutes) * 1

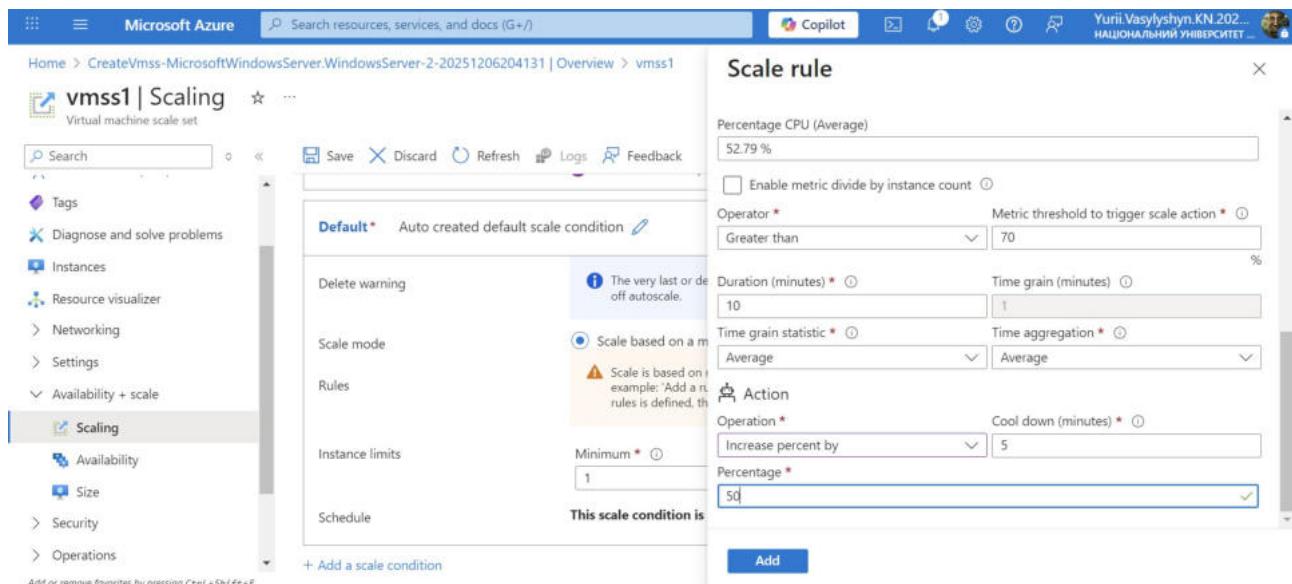
Time grain statistic * Average Time aggregation * Average

Action

Operation * Increase percent by Cool down (minutes) * 5

Percentage * 50

Add



Adding another rule

The number of instances should decrease when the average CPU load drops below 30% over a 10-minute period. When the rule triggers, the number of VM instances is decreased by 20%.

Scale rule

Percentage CPU (Average) 31.65 %

Enable metric divide by instance count

Operator * Less than Metric threshold to trigger scale action * 30

Duration (minutes) * 10 Time grain (minutes) * 1

Time grain statistic * Average Time aggregation * Average

Action Operation * Cool down (minutes) * 5

Decrease percent by Percentage * 20

This scale condition is

Update Delete

Adding minimum and maximum number of instances

Scaling

Scale mode: Scale based on a metric

Rules:

- Scale out: When vmss1 (Average) Percentage CPU > 70 Increase percent by 50
- Scale in: When vmss1 (Average) Percentage CPU < 30 Decrease percent by 20

Instance limits: Minimum * 1 Maximum * 10 Default * 1

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

+ Add a scale condition

Instances:

Instances

Instance	Computer name	Status	Protection policy	Provisioning sta...	Health state	Latest model
vmss1_0	vmss1lclm000000	Running	Succeeded		Yes	

Actions: Start, Restart, Stop, Hibernate, Reimage, Delete, Upgrade, Refresh, Protection

Search virtual machine instances

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Instances

Resource visualizer

Networking

Settings

Availability + scale

Scaling

Availability

<https://portal.azure.com/#> using Ctrl+Shift+F11

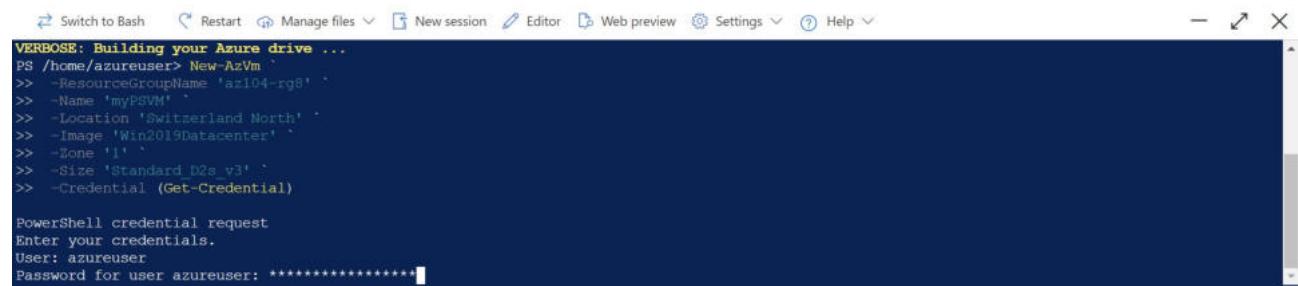
Give feedback

Task 5: Create a virtual machine using Azure PowerShell (option 1)

1. Use the icon (top right) to launch a **Cloud Shell** session. Alternately, navigate directly to <https://shell.azure.com>.
2. Be sure to select **PowerShell**. If necessary, configure the shell storage.
3. Run the following command to create a virtual machine. When prompted, provide a username and password for the VM. While you wait check out the [New-AzVM](#) command reference for all the parameters associated with creating a virtual machine.

```
New-AzVm ` 
-ResourceGroupName 'az104-rg8' ` 
-Name 'myPSVM' ` 
-Location 'Switzerland North' ` 
-Image 'Win2019Datacenter' ` 
-Zone '1' ` 
-Size 'Standard_D2s_v3' ` 
-Credential (Get-Credential)
```

Creating via PowerShell



```
Switch to Bash Restart Manage files New session Editor Web preview Settings Help 
VERBOSE: Building your Azure drive ...
PS /home/azureuser> New-AzVm : 
>> -ResourceGroupName 'az104-rg8' : 
>> -Name 'myPSVM' : 
>> -Location 'Switzerland North' : 
>> -Image 'Win2019Datacenter' : 
>> -Zone '1' : 
>> -Size 'Standard_D2s_v3' : 
>> -Credential (Get-Credential)

PowerShell credential request
Enter your credentials.
User: azureuser
Password for user azureuser: *****
```

VM created via powershell:

```
Name          : myPSVM
Type          : Microsoft.Compute/virtualMachines
Location      : switzerlandnorth
Tags          : {}
HardwareProfile : {VmSize}
NetworkProfile   : {NetworkInterfaces}
OSProfile       : {ComputerName, AdminUsername, WindowsConfiguration, Secrets, AllowExtensionOperations, RequireGuestProvisionSignal}
ProvisioningState : Succeeded
StorageProfile    : {ImageReference, OsDisk, DataDisks, AlignRegionalDisksToVMZone}
Zones          : {1}
FullyQualifiedDomainName : mypsvm-dd189e.Switzerland North.cloudapp.azure.com
TimeCreated     : 12/6/2025 8:48:57 PM
Etag           : "2"
```

```
PS /home/azureuser> Get-AzVm : 
>> -ResourceGroupName 'az104-rg8' : 
>> -Status

ResourceGroupName Name Location VmSize OsType NIC Provisioning Zone PowerState MaintenanceAllowed
----- 
az104-rg8 az104-vm1 switzerlandnorth Standard_D2ds_v4 Windows az104-vm1297_z1 Succeeded 1 VM running
az104-rg8 az104-vm2 switzerlandnorth Standard_D2s_v3 Windows az104-vm186_z2 Succeeded 2 VM running
az104-rg8 myPSVM switzerlandnorth Standard_D2s_v3 Windows myPSVM Succeeded 1 VM running

PS /home/azureuser>
```

VM stopped

```
Virtual machine stopping operation
This cmdlet will stop the specified virtual machine. Do you want to continue?
[Y] Yes [N] No [S] Suspend [?] Help (default is "Y"): H
[Y] Yes [N] No [S] Suspend [?] Help (default is "Y"): Y

OperationId : e0552591-7237-4187-9321-2427ca0e477b
Status       : Succeeded
StartTime    : 12/6/2025 9:02:26 PM
EndTime      : 12/6/2025 9:03:14 PM
Error        :

PS /home/azureuser>
```

Lab 09a - Implement Web Apps

Lab introduction

In this lab, you learn about Azure web apps. You learn to configure a web app to display a Hello World application in an external GitHub repository. You learn to create a staging slot and swap with the production slot. You also learn about autoscaling to accommodate demand changes.

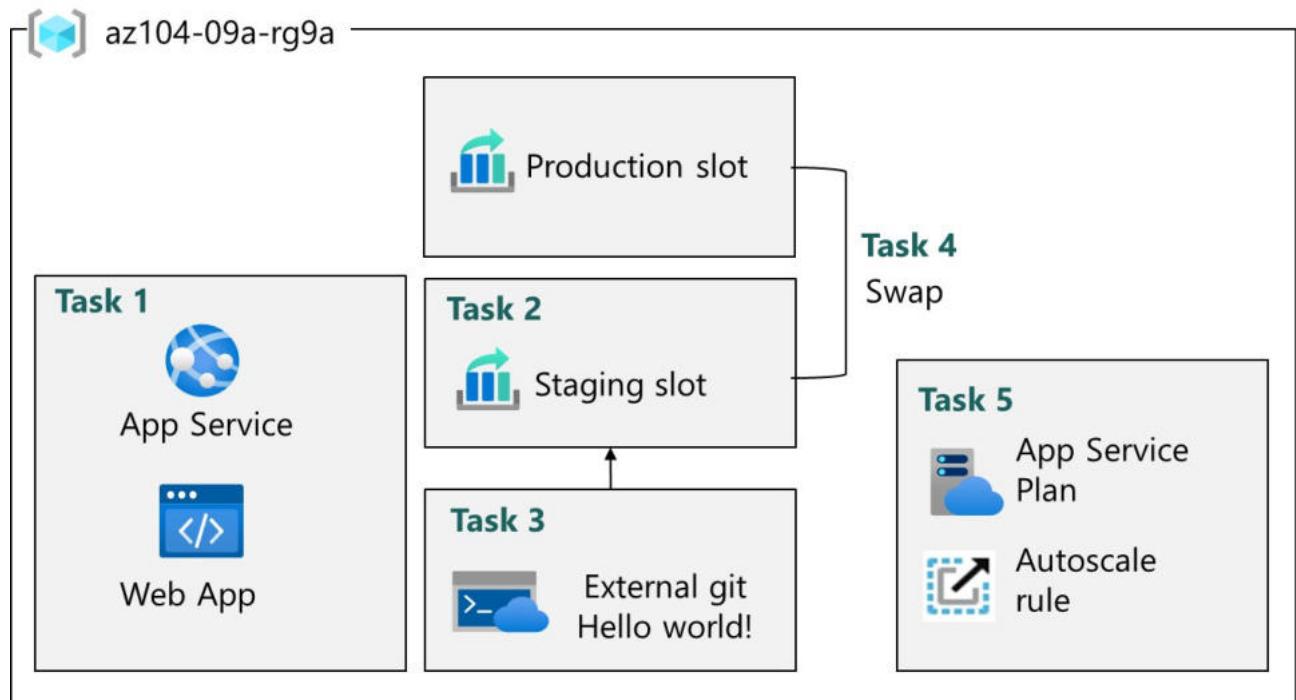
This lab requires an Azure subscription. Your subscription type may affect the availability of features in this lab. You may change the region, but the steps are written using East US.

Estimated timing: 20 minutes

Lab scenario

Your organization is interested in Azure Web apps for hosting your company websites. The websites are currently hosted in an on-premises data center. The websites are running on Windows servers using the PHP runtime stack. The hardware is nearing end-of-life and will soon need to be replaced. Your organization wants to avoid new hardware costs by using Azure to host the websites.

Architecture diagram



Job skills

- Task 1: Create and configure an Azure web app.
- Task 2: Create and configure a deployment slot.
- Task 3: Configure web app deployment settings.
- Task 4: Swap deployment slots.
- Task 5: Configure and test autoscaling of the Azure web app.

Task 1: Create and configure an Azure web app

In this task, you create an Azure web app. Azure App Services is a Platform As a Service (PAAS) solution for web, mobile, and other web-based applications. Azure web apps is part Azure App Services hosting most runtime environments, such as PHP, Java, and .NET. The app service plan that you select determines the web app compute, storage, and features.

Creating web app via app services



Home > App Services >

Create Web App



Subscription * ⓘ Azure for Students

Resource Group * ⓘ (New) az104-rg9

Create new

Instance Details

Name: labsazure -ebcmhwfze5g5ctdy.switzerlandnorth-01.azurewebsites.net

Secure unique default hostname on. [More about this update](#)

Publish * Code Container

Runtime stack * PHP 8.2

Operating System * Linux Windows

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

Task 2: Create and configure a deployment slot

In this task, you will create a staging deployment slot. Deployment slots enable you to perform testing prior to making your app available to the public (or your end users). After you have performed testing, you can swap the slot from development or staging to production. Many organizations use slots to perform pre-production testing. Additionally, many organizations run multiple slots for every application (for example, development, QA, test, and production).

Web app

Name	labsazure
Publishing model	Code
Runtime Stack	PHP - 8.2

Domains

Default domain	labsazure-ebcmhwfze5g5ctdy.switzerlandnorth-01.azurewebsites.net
Custom domain	Add custom domain

Hosting

Plan Type	App Service plan
Name	ASP-az104rg9-b5e1
Operating System	Linux

Your web app is running and waiting for your content

Your web app is live, but we don't have your content yet. If you've already deployed, it could take up to 5 minutes for your content to show up, so come back soon.



php Built with PHP

Haven't deployed yet?
Use the deployment center to publish code or set up continuous deployment.

Starting a new web site?
Follow our Quickstart guide to get a web app ready quickly.

[Deployment center](#) [Quickstart](#)

Adding deployment slot

Add Slot

Name: labsazure-staging-hvc4fzbrfqhwdhf8.switzerlandnorth-01.azurewebsites.net

Clone settings from:

No slots found. Deployment slots are live apps with their own hostnames. App content and configurations elements can be swapped between two deployment slots, including the production slot.

[Add](#) [Close](#)

labsazure | Deployment slots

Name	Status	App service plan	Traffic %
labsazure PRODUCTION	Running	ASP-az104rg9-b5e1	100
labsazure-staging	Running	ASP-az104rg9-b5e1	0

Deployment slots are live apps with their own hostnames. App content and configurations elements can be swapped between two deployment slots, including the production slot.

[Add](#) [Swap](#) [Logs](#) [Refresh](#)

Task 3: Configure Web App deployment settings

In this task, you will configure Web App deployment settings. Deployment settings allow for continuous deployment. This ensures that the app service has the latest version of the application.

Turning on SCM to add external git

The screenshot shows the Microsoft Azure portal configuration interface for a 'Web App' named 'labsazure'. In the left sidebar, 'Configuration' is selected. Under 'Platform settings', the 'SCM Basic Auth Publishing...' option is set to 'On'. A message box at the top right says 'Updating web app settings' and 'Successfully updated web app settings'. Other settings shown include 'FTP Basic Auth Publishing...', 'FTP state' (set to 'FTPS only'), 'Inbound IP mode (previous)', and 'HTTP version' (set to '1.1').

Configured staging deployment slot

The screenshot shows the Microsoft Azure portal 'Overview' page for the 'staging (labsazure/staging)' deployment slot. The left sidebar shows 'Overview' is selected. The main pane displays basic information: Resource group (az104-rg9), Status (Running), Location (Switzerland North), and other details like Default domain, App Service Plan, Operating System (Linux), and Health Check status. Navigation tabs at the bottom include Properties, Monitoring, Logs, Capabilities, Notifications (0), and Recommendations.

My web app is working



Task 4: Swap deployment slots

In this task, you will swap the staging slot with the production slot. Swapping a slot allows you to use the code that you have tested in your staging slot, and move it to production. The Azure portal will also prompt you if you need to move other application settings that you have customized for the slot. Swapping slots is a common task for application teams and application support teams, especially those deploying routine app updates and bug fixes.

Swapping deployment slots

Name	Status	App service plan	Traffic %
labsazure PRODUCTION	Running	ASP-az104rg9-b5e1	100
labsazure-staging	Running	ASP-az104rg9-b5e1	0

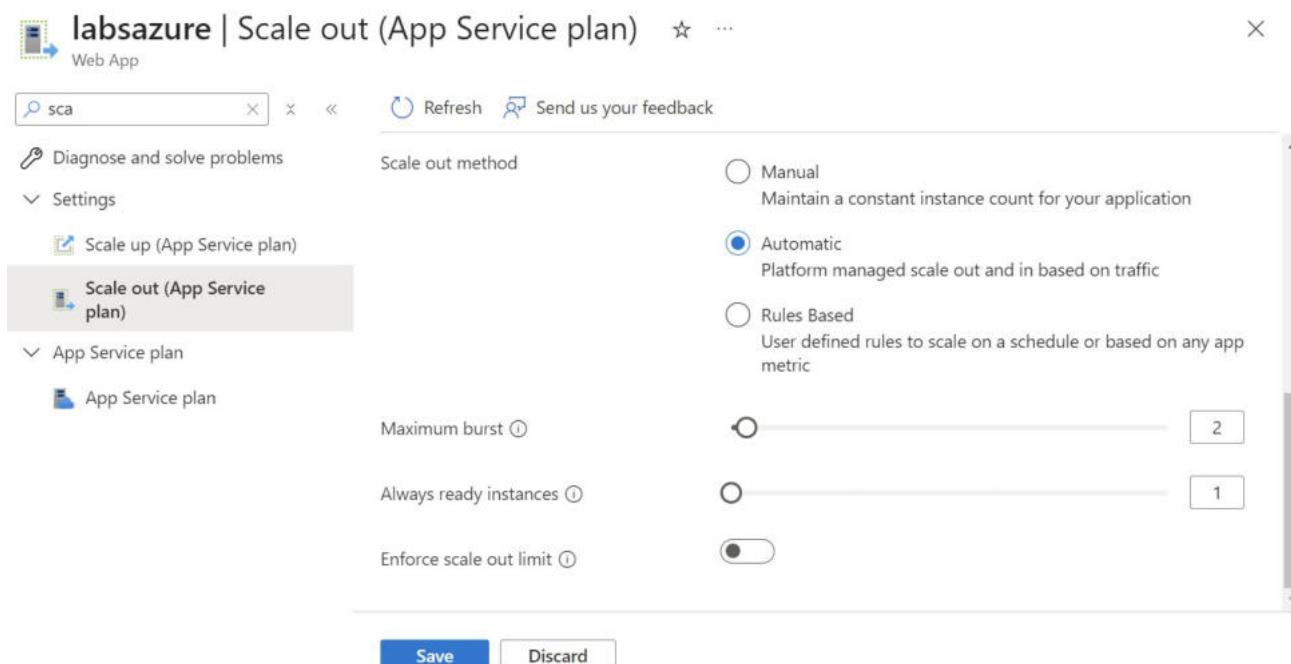
Web app is working

Hello World!

Task 5: Configure and test autoscaling of the Azure Web App

In this task, you will configure autoscaling of Azure Web App. Autoscaling enables you to maintain optimal performance for your web app when traffic to the web app increases. To determine when the app should scale you can monitor metrics like CPU usage, memory, or bandwidth.

Scaling out app



The screenshot shows the 'Scale out (App Service plan)' configuration page for a 'Web App'. The 'Automatic' scaling method is selected. Maximum burst is set to 2 and Always ready instances to 1. The 'Enforce scale out limit' toggle is off. Buttons at the bottom are 'Save' and 'Discard'.

Creating a load test resource

The screenshot shows the Microsoft Azure Cloud Shell interface. At the top, there's a search bar and a Copilot button. On the right, there are user profile icons and the text "Yuri.Vasylyshyn.KN 202... НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ...". Below the header, a deployment titled "Microsoft.CloudNativeTesting1765059591423 | Overview" is shown. The deployment status is "Deployment is in progress". It lists the deployment name, subscription, correlation ID, and resource group. A table shows deployment details for a single item named "webappuploadtest123" of type "Azure Load Testing", which was created. To the right, there are promotional links for Microsoft Defender for Cloud, free tutorials, and working with experts.

Creating URL-Based test

Home > Microsoft.CloudNativeTesting1765059591423 | Overview > webappuploadtest123 >

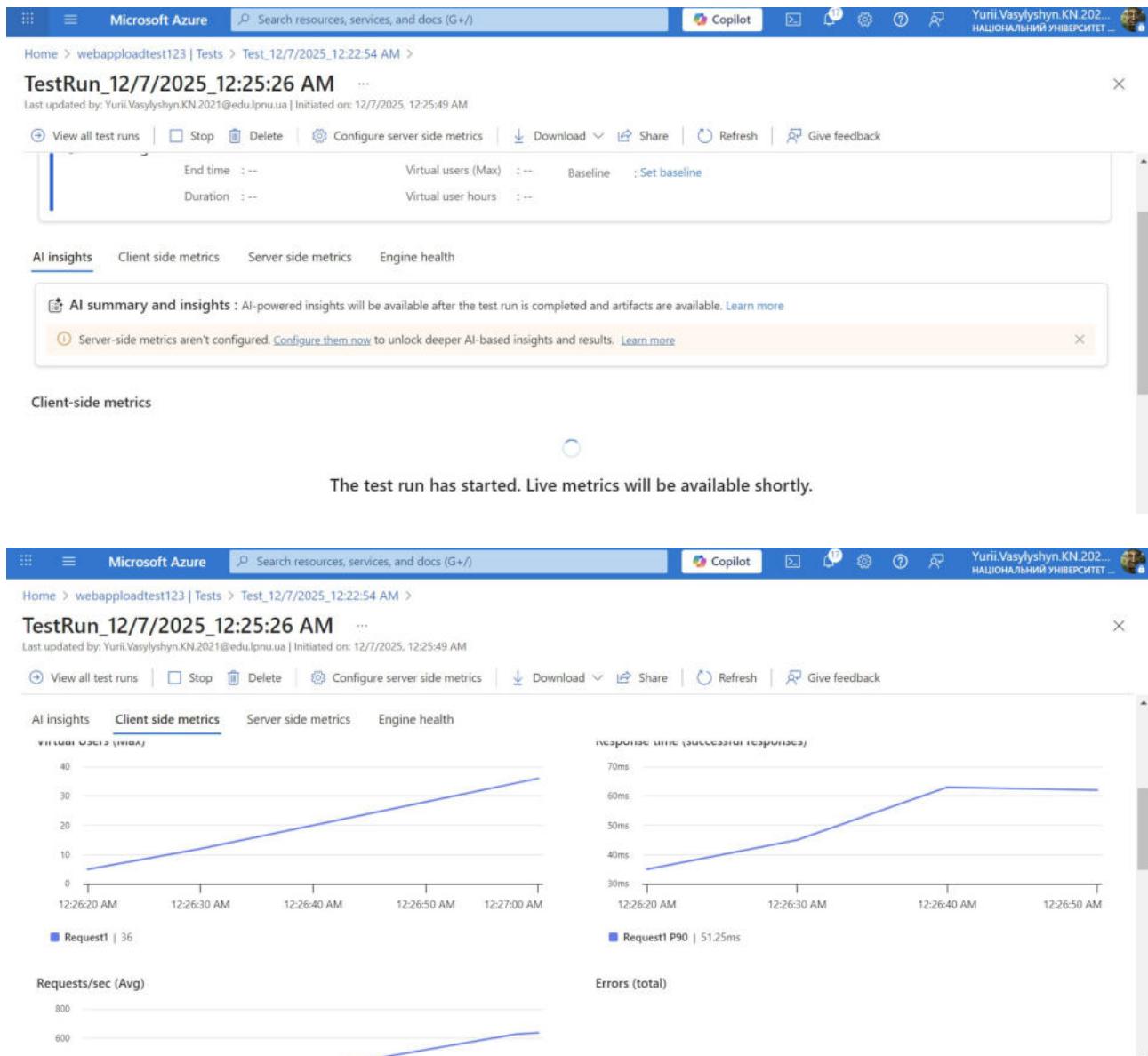
Create a URL-based test

This screenshot shows the "Basics" step of the "Create a URL-based test" wizard. The tabs at the top include Basics, Test plan, Parameters, Load, Monitoring, Test criteria, and Review + create. The Basics tab is selected. The page instructions say to get started by creating a test for a URL or configuring an advanced load test. It asks for a test name and description. The "Test name" field contains "Test_12/7/2025_12:22:54 AM". The "Test description" field has "Enter purpose of test". An info tooltip says to configure a test with multiple requests in the 'Test plan' tab. At the bottom are Previous, Next, and Review + create buttons.

Adding a request

This screenshot shows the "Add request" dialog. It's a modal window with the title "Add request". The instructions say to enter request details like URL, method, headers and body or add a cURL command. It supports up to 20 headers and extracting response variables. The Request format is set to "Add input in UI". The Request name is "Request1". The URL is "https://labsazure-ebcmhwfe5g5ctdy.switzerlandnorth-01.azurewebsites.net/" and the HTTP method is "GET". The Query parameters, Headers, and Response variables tabs are visible. At the bottom are Add and Cancel buttons.

Lets run a test



Lab 09b - Implement Azure Container Instances

Lab introduction

In this lab, you learn how to implement and deploy Azure Container Instances.

This lab requires an Azure subscription. Your subscription type may affect the availability of features in this lab. You may change the region, but the steps are written using **East US**.

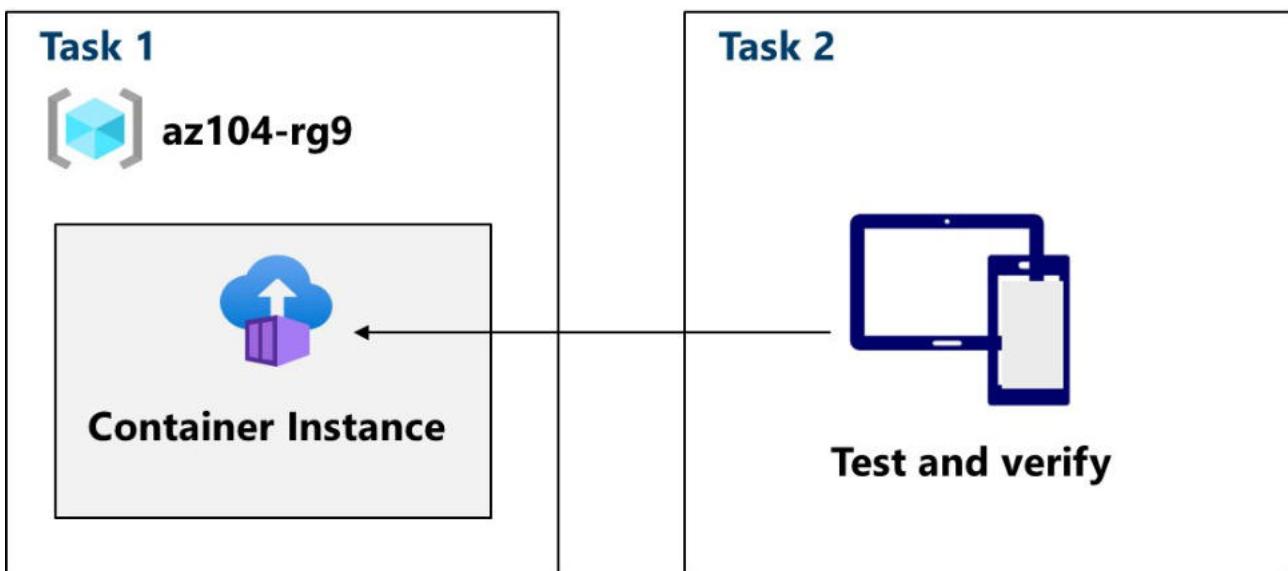
Estimated timing: 15 minutes

Lab scenario

Your organization has a web application that runs on a virtual machine in your on-premises data center. The organization wants to move all applications to

the cloud but doesn't want to have a large number of servers to manage. You decide to evaluate Azure Container Instances and Docker.

Architecture diagram



Job skills

- Task 1: Deploy an Azure Container Instance using a Docker image.
- Task 2: Test and verify deployment of an Azure Container Instance.

Creating container instance

Screenshot of the Microsoft Azure portal showing the 'Create container instance' wizard. The page includes fields for Container name (az104-c1), Region ((Europe) Switzerland North), Availability zones (None), SKU (Standard), Image source (Quickstart images selected), Run with Azure Spot discount (unchecked), and Image (mcr.microsoft.com/azuredocs/aci-helloworld:latest (Linux)). Buttons at the bottom include 'Review + create' (highlighted in blue), '< Previous', 'Next : Networking >', and 'Give feedback'.

Deployment complete

The screenshot shows the Microsoft Azure Container Instances Overview page for a deployment named "Microsoft.ContainerInstances-20251207003440". The deployment status is marked as "complete" with a green checkmark. Key details include:

- Deployment name: Microsoft.ContainerInstances-20251207003440
- Start time: 12/7/2025, 12:40:48 AM
- Subscription: Azure for Students
- Correlation ID: 31eec039-502f-44f7-a204-845e...
- Resource group: az104-rg9

Next steps include "Go to resource", "Give feedback", and "Tell us about your experience with deployment". A sidebar on the right provides links to Cost management, Microsoft Defender for Cloud, and Free Microsoft tutorials.

Task 2: Test and verify deployment of an Azure Container Instance

In this task, you review the deployment of the container instance. By default, the Azure Container Instance is accessible over port 80. After the instance has been deployed, you can navigate to the container using the DNS name that you provided in the previous task.

Container instance is running

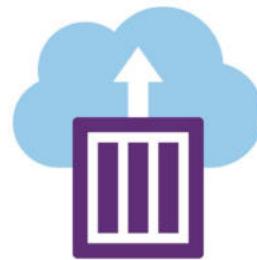
The screenshot shows the Microsoft Azure Container Instances Overview page for an instance named "az104-c1". The instance status is "Running". Key details include:

- Resource group: az104-rg9
- Status: Running
- Location: Switzerland North
- Subscription: Azure for Students
- Subscription ID: bbbf37aa-0bd5-495e-96f6-f34404654305
- Tags: Tags (edit), Add tags

Performance metrics shown are CPU (millicores) and Memory (25MB).

Reached via fqdn and working

Welcome to Azure Container Instances!



Logs:

Microsoft Azure Search resources, services, and docs (G+/)

Home > Microsoft.ContainerInstances-20251207003440 | Overview > az104-c1

az104-c1 | Containers

Container instances

Search Refresh Give feedback

1 container and 0 init containers

Name	Image	State	Previous state	Start time	Restart count
az104-c1	mcr.microsoft.com/azureudo...	Running	-	2025-12-06T22:48:40.859Z	0

listening on port 80
::ffff:10.92.0.9 - - [06/Dec/2025:22:49:15 +0000] "GET / HTTP/1.1" 200 1696 "-" "Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/122.0.0.0 Safari/537.36"
::ffff:10.92.0.9 - - [06/Dec/2025:22:49:15 +0000] "GET /favicon.ico HTTP/1.1" 404 150 "http://basic test container image.e5befwc5geh8byf8.switzerlandnorth.azurecontainer.io/" "Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/122.0.0.0 Safari/537.36"
::ffff:10.92.0.10 - - [06/Dec/2025:22:49:32 +0000] "GET / HTTP/1.1" 304 - "-" "Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/122.0.0.0 Safari/537.36"
::ffff:10.92.0.10 - - [06/Dec/2025:22:49:35 +0000] "GET / HTTP/1.1" 304 - "-" "Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/122.0.0.0 Safari/537.36"

Lab 09c - Implement Azure Container Apps

Lab introduction

In this lab, you learn how to implement and deploy Azure Container Apps.

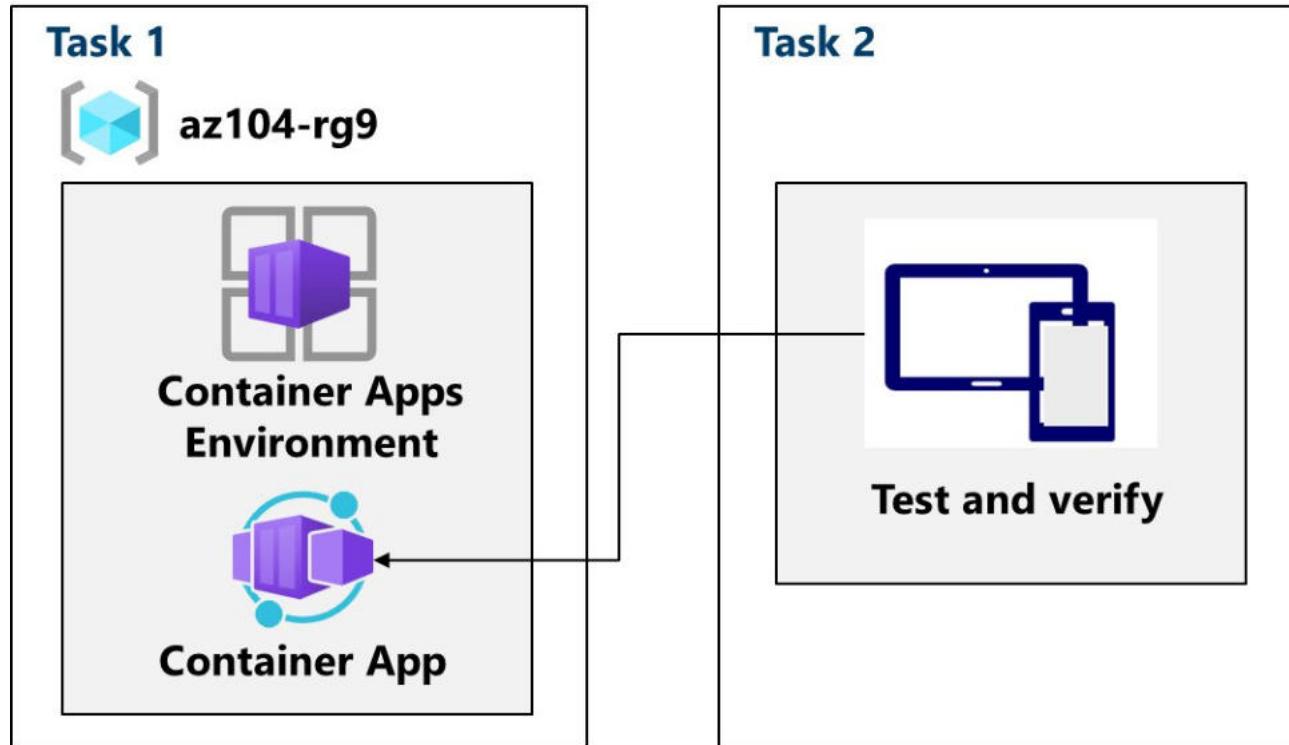
This lab requires an Azure subscription. Your subscription type may affect the availability of features in this lab. You may change the region, but the steps are written using **East US**.

Estimated timing: 15 minutes

Lab scenario

Your organization has a web application that runs on a virtual machine in your on-premises data center. The organization wants to move all applications to the cloud but doesn't want to have a large number of servers to manage. You decide to evaluate Azure Container Apps.

Architecture diagram



Job skills

- Task 1: Create and configure an Azure Container App and environment.
- Task 2: Test and verify deployment of the Azure Container App.

Task 1: Create and configure an Azure Container App and environment

Azure Container Apps take the concept of a managed Kubernetes cluster a step further and manages the cluster environment as well as provides other managed services on top of the cluster. Unlike an Azure Kubernetes cluster, where you must still manage the cluster, an Azure Container Apps instance removes some of the complexity to setting up a Kubernetes cluster.

Creating container app and setting name for environment

Home > Container Apps >

Create Container app ...

Deployment source *

- Container image
Bring your own container registry or build a container from Dockerfile.
- Source code or artifact
Build and deploy your code without using a Dockerfile.

Container Apps environment

An environment is a secure boundary around a group of container apps. [Container Apps Pricing](#)

Show environments in all regions

Region *

Switzerland North

Container Apps environment *

(new) my-environment (az104-rg9)

[Create new environment](#)

[Review + create](#)

[< Previous](#)

[Next : Container >](#)

Microsoft Azure  Copilot

Yuriii.Vasylyshyn.KN.202...
НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ ...

Home > Container Apps >

Create Container app ...

Quickstart image *

Simple hello world container

Container resource allocation

Workload profile type	Consumption
Number of CPU cores	0.25
Memory size (Gi)	0.5

Application ingress settings

Enable ingress for applications that need an HTTP or TCP endpoint.

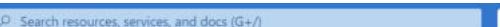
Ingress 	Enabled
Ingress traffic	Accepting traffic from anywhere
Target port 	80

[Review + create](#)

[< Previous](#)

[Next : Tags >](#)

Created

Microsoft Azure  Copilot

Yuriii.Vasylyshyn.KN.202...
НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ ...

Home >

 Microsoft.App-ContainerApp-Portal-8ac128d4-863b | Overview

X

 Delete  Redeploy  Refresh

 Overview

 Inputs

 Outputs

 Template

Your deployment is complete

 Deployment name : Microsoft.App-ContainerApp-P... Start time : 12/7/2025, 2:40:56 AM
Subscription : Azure for Students Correlation ID : 7c4a8dea-dd8f-4b96-b237-4fef...
Resource group : az104-rg9

Deployment details

Next steps

[Go to resource](#)



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Task 2: Test and verify deployment of the Azure Container App

By default, the Azure container app that you create will accept traffic on port 80 using the sample Hello World application. Azure Container Apps will provide a DNS name for the application. Copy and navigate to this URL to ensure that the application is up and running.

Container app is running

The screenshot shows the Microsoft Azure portal interface. At the top left is the Microsoft Azure logo. Below it, a banner displays the text "Your container app is running with a Hello World image". Underneath the banner, there is descriptive text about Azure Container Apps and a bulleted list of benefits:

- Simplify your container deployments
- Manage less infrastructure
- Scale automatically on demand

Below the benefits, there is a link "Learn more." and a section titled "Next steps" with two options: "Explore sample templates you can leverage for your Container app" and "Follow our Quickstart guide and deploy your own app". To the right of the text area is a large, stylized icon of a purple cube with a blue circular arrow around it, representing a container or deployment process.

Lab 10 - Implement Data Protection

Lab introduction

In this lab, you learn about backup and recovery of Azure virtual machines. You learn to create a Recovery Service vault and a backup policy for Azure virtual machines. You learn about disaster recovery with Azure Site Recovery.

This lab requires an Azure subscription. Your subscription type may affect the availability of features in this lab. You may change the regions, but the steps are written using **East US** and **West US**.

Estimated timing: 50 minutes

Lab scenario

Your organization is evaluating how to backup and restore Azure virtual machines from accidental or malicious data loss. Additionally, the organization wants to explore using Azure Site Recovery for disaster recovery scenarios.

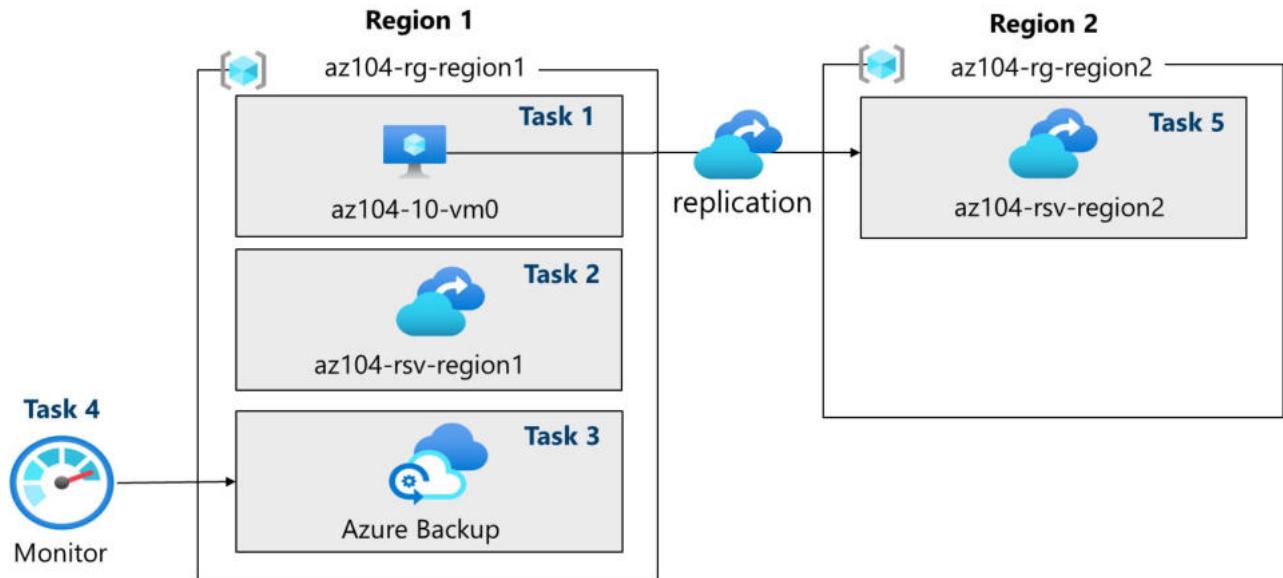
Job skills

- Task 1: Use a template to provision an infrastructure.
- Task 2: Create and configure a Recovery Services vault.

- Task 3: Configure Azure virtual machine-level backup.
 - Task 4: Monitor Azure Backup.
 - Task 5: Enable virtual machine replication.

Estimated timing: 40 minutes

Architecture diagram



Task 1: Use a template to provision an infrastructure

In this task, you will use a template to deploy a virtual machine. The virtual machine will be used to test different backup scenarios.

Deploying custom template

Microsoft Azure Copilot        Yuri Vasylshyn KN 202... НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ ...

Home > Custom deployment >

Edit template

Edit your Azure Resource Manager template

+ Add resource  Quickstart template  

<< >>  

> Parameters (15) 

> Variables (5) 

Resources (5) 

- [concat(parameters('nicNameP<...))]
 copyIndex()])
(Microsoft.Network/networkInt...)
- [parameters('virtualNetworkNar<...))]
 (Microsoft.Network/virtualNetw...)
- [concat(parameters('pipNameP<...))]
 copyIndex()])
(Microsoft.Network/publicIpAd...)
- [parameters('nsgName')]
(Microsoft.Network/networkSe...)
- [concat(parameters('vmNamePi<...))]


```
1 {  
2   "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",  
3   "contentVersion": "1.0.0.0",  
4   "parameters": {  
5     "adminUsername": {  
6       "type": "string",  
7       "metadata": {  
8         "description": "Admin username"  
9       }  
10    },  
11    "adminPassword": {  
12      "type": "securestring",  
13      "metadata": {  
14        "description": "Admin password"  
15      }  
16    },  
17    "vmNamePrefix": {  
18      "type": "string",  
19      "metadata": {  
20        "description": "VM name prefix"  
21      }  
22    }  
23  },  
24  "resources": [  
25    {  
26      "type": "Microsoft.Network/networkInterfaces",  
27      "name": "[concat(parameters('nicNameP...))]",  
28      "apiVersion": "2019-04-01",  
29      "location": "[parameters('location')]",  
30      "dependsOn": [  
31        "[concat(parameters('virtualNetworkNar...))]"  
32      ],  
33      "properties": {  
34        "ipConfigurations": [  
35          {  
36            "name": "[concat(parameters('vmNamePi...))]",  
37            "properties": {  
38              "privateIPAllocationMethod": "Dynamic",  
39              "subnetId": "[concat(parameters('virtualNetworkNar...))]/subnets/[parameters('subnetName')]"  
40            }  
41          }  
42        ]  
43      }  
44    },  
45    {  
46      "type": "Microsoft.Network/publicIpAddresses",  
47      "name": "[concat(parameters('vmNamePi...))]",  
48      "apiVersion": "2019-04-01",  
49      "location": "[parameters('location')]",  
50      "dependsOn": [  
51        "[concat(parameters('virtualNetworkNar...))]"  
52      ],  
53      "properties": {  
54        "publicIpAllocationMethod": "Dynamic"  
55      }  
56    },  
57    {  
58      "type": "Microsoft.Network/networkSecurityGroups",  
59      "name": "[parameters('nsgName')]",  
60      "apiVersion": "2019-04-01",  
61      "location": "[parameters('location')]",  
62      "dependsOn": [  
63        "[concat(parameters('virtualNetworkNar...))]"  
64      ],  
65      "properties": {  
66        "securityRules": [  
67          {  
68            "name": "Allow-SSH",  
69            "priority": 100,  
70            "sourceAddressPrefix": "*",  
71            "destinationAddressPrefix": "*",  
72            "sourcePortRange": "22",  
73            "destinationPortRange": "22",  
74            "access": "Allow",  
75            "protocol": "TCP",  
76            "direction": "Inbound"  
77          }  
78        ]  
79      }  
80    },  
81    {  
82      "type": "Microsoft.Compute/virtualMachines",  
83      "name": "[concat(parameters('vmNamePi...))]",  
84      "apiVersion": "2019-04-01",  
85      "location": "[parameters('location')]",  
86      "dependsOn": [  
87        "[concat(parameters('virtualNetworkNar...))]",  
88        "[concat(parameters('publicIpNamePi...))]",  
89        "[parameters('nsgName')]"  
90      ],  
91      "properties": {  
92        "osProfile": {  
93          "computerName": "[concat(parameters('vmNamePi...))]",  
94          "adminUsername": "[parameters('adminUsername')]",  
95          "adminPassword": "[parameters('adminPassword')]",  
96          "linuxConfiguration": {  
97            "disablePasswordAuthentication": false  
98          }  
99        }  
100       },  
101       "tags": {  
102         "environment": "Production"  
103       }  
104     }  
105   ]  
106 }
```

Save Discard

Adding custom parameters

Microsoft Azure | Search resources, services, and docs (G+)

Home > Edit parameters

Load file Download

```
1 {  
2     "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentParameters.json#",  
3     "contentVersion": "1.0.0.0",  
4     "parameters": {  
5         "adminUsername": {  
6             "value": "localadmin"  
7         },  
8         "vmNamePrefix": {  
9             "value": "az104-10-vm"  
10        },  
11         "nicNamePrefix": {  
12             "value": "az104-10-nic"  
13        },  
14         "imagePublisher": {  
15             "value": "MicrosoftWindowsServer"  
16        },  
17         "imageOffer": {  
18             "value": "WindowsServer-2022-Datacenter"  
19        }  
20    }  
21}
```

Save Discard

Deployed

Microsoft Azure | Search resources, services, and docs (G+)

Home > Microsoft.Template-20251207031143 | Overview

Deployment

Search X < Delete Cancel Redeploy Download Refresh

Overview

Inputs Outputs Template

Your deployment is complete

Deployment name : Microsoft.Template-202512070... Start time : 12/7/2025, 3:11:47 AM
Subscription : Azure for Students Correlation ID : a38470e0-8088-4c1f-b97d-e12...
Resource group : az-rg-region1

Deployment details

Next steps Go to resource group

Give feedback Tell us about your experience with deployment

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

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Task 2: Create and configure a Recovery Services vault

In this task, you will create a Recovery Services vault. A Recovery Services vault provides storage for the virtual machine data.

Creating recovery services vault for our rg

Microsoft Azure | Search resources, services, and docs (G+/-) | Copilot | Home > Microsoft.RecoveryServicesV2-1765070055508 | Overview

Deployment

Search | Delete | Cancel | Redeploy | Download | Refresh

Overview

Your deployment is complete

Deployment name : Microsoft.RecoveryServicesV2-... Start time : 12/7/2025, 3:14:41 AM
Subscription : Azure for Students Correlation ID : 91f550bc-82cc-4f53-8d50-4a8e...
Resource group : az-rg-region1

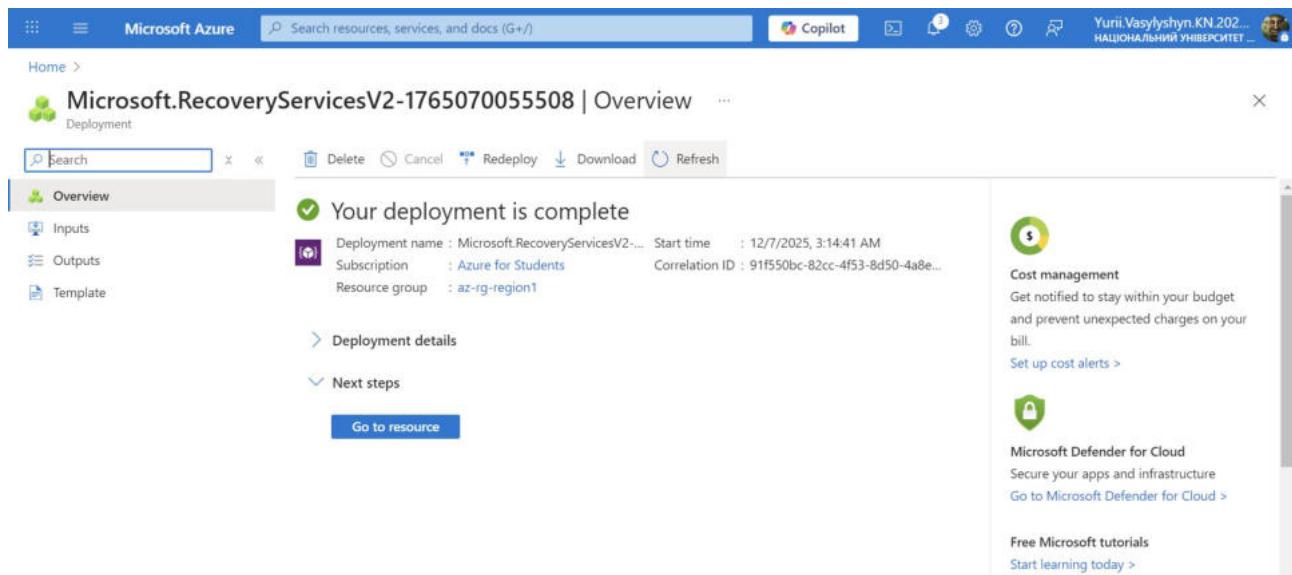
Deployment details | Next steps

Go to resource

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Reviewing backup configuration

Microsoft Azure | Search resources, services, and docs (G+/-) | Copilot | Home > Recovery Services vaults > az104-rsv-region1 | Recovery Service... | Yurii.Vasylyshyn.KN.202...

az104-rsv-region1 | Properties
Recovery Services vault

Name: az104-rsv-region1

You are viewing a new version of Browse experience. Click here to access the old experience.

Create ...

Storage replication type:

- Locally-redundant
- Zonally-redundant
- Geo-redundant**

This option cannot be changed after protecting items. Geo-redundant storage (GRS) provides a higher level of data durability than Locally redundant storage (LRS) and costs more. Review the trade-offs between lower cost and higher data durability that is best for your scenario. [Learn more](#).

Backup and S

Backup Config

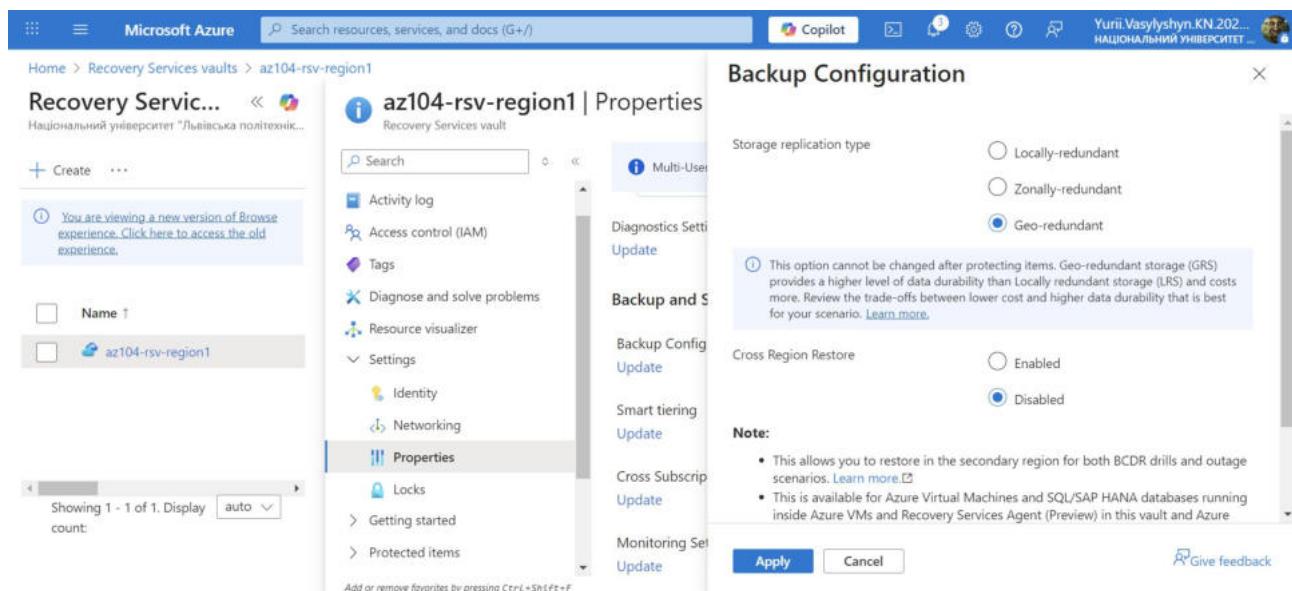
Cross Region Restore:

- Enabled
- Disabled**

Note:

- This allows you to restore in the secondary region for both BCDR drills and outage scenarios. [Learn more](#).
- This is available for Azure Virtual Machines and SQL/SAP HANA databases running inside Azure VMs and Recovery Services Agent (Preview) in this vault and Azure

Apply | Cancel | Give feedback



Reviewing soft delete settings

Home > Recovery Services vaults > az104-rsv-region1 | Recovery Service... | az104-rsv-region1 | Soft delete Settings | az104-rsv-region1

You are viewing a new version of Browse experience. Click here to access the old experience.

Name: az104-rsv-region1

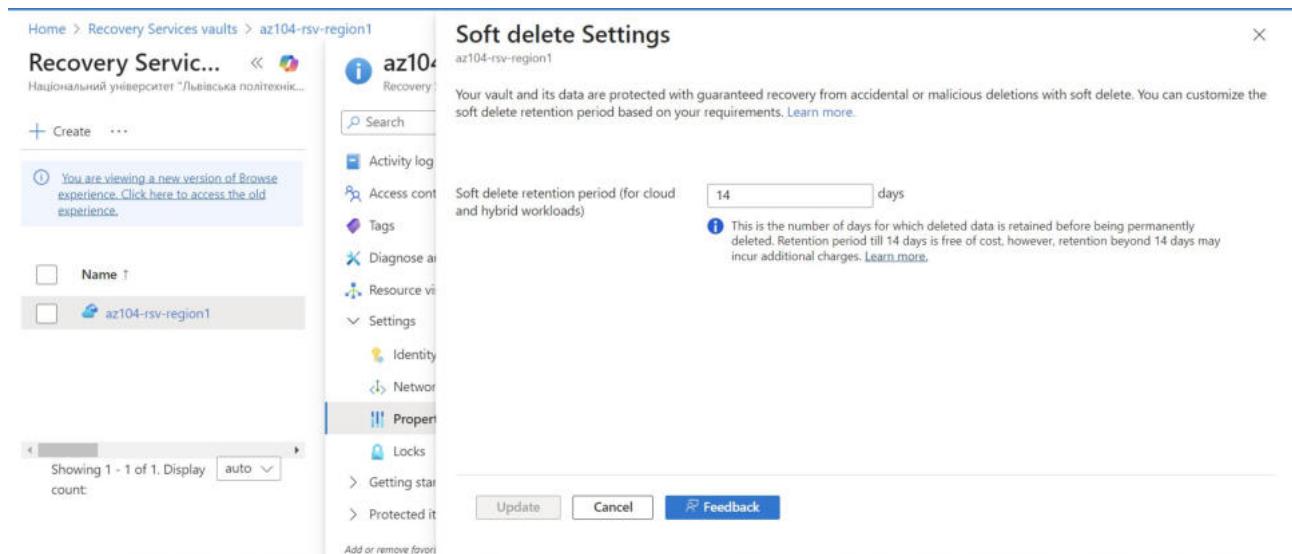
Show 1 - 1 of 1. Display auto count

Activity log | Access control (IAM) | Tags | Diagnose and solve problems | Resource visualizer | Settings | Identity | Networking | Properties | Locks | Getting started | Protected items

Soft delete retention period (for cloud and hybrid workloads): 14 days

This is the number of days for which deleted data is retained before being permanently deleted. Retention period till 14 days is free of cost; however, retention beyond 14 days may incur additional charges. [Learn more](#).

Update | Cancel | Feedback



Task 3: Configure Azure virtual machine-level backup

In this task, you will implement Azure virtual-machine level backup. As part of a VM backup, you will need to define the backup and retention policy that applies to the backup. Different VMs can have different backup and retention policies assigned to them.

Creating backup goal in our recovery services

The screenshot shows the Microsoft Azure portal interface for creating a backup goal. At the top, there's a navigation bar with 'Microsoft Azure', a search bar, and various icons. Below it, the URL 'https://portal.azure.com/#' is visible. The main content area is titled 'Backup Goal' with a sub-section 'Step: Configure Backup'. It includes dropdown menus for 'Where is your workload running?' (set to 'Azure') and 'What do you want to backup?' (set to 'Virtual machine'). A large blue button labeled 'Backup' is prominent. Below the main form, there's a 'Give feedback' section with a link to 'Help improve this page'.

Configuring backup and creating policy

The screenshot shows the 'Create policy' configuration page for an Azure Virtual Machine. The title bar says 'Create policy' and 'Azure Virtual Machine'. The left sidebar shows 'Configure backup' and 'az104-rsv-region1'. The main area has a section 'Policy sub type *' with a radio button for 'Enhanced' (selected) and a list of features: 'Multiple backups per day', 'Up to 30 days operation window', 'Support for Trusted', and 'Support for VMs with multiple disks'. Below this is a 'Backup policy *' section with a dropdown set to 'DefaultPolicy' and a link to 'Create a new policy'. A note says 'The list contains the policies pertaining to the selected policy sub type'. There are sections for 'Policy details', 'Full backup' (frequency: Daily at 11:00 AM UTC), 'Instant restore' (retain instant recovery snapshot(s) for 2 days), and 'Retention range' (checkbox for 'Retention of daily backup point'). At the bottom are buttons for 'Enable backup', 'Download a template for automation', and 'OK'.

Selecting virtual machine and adding backup

Microsoft Azure | Search resources, services, and docs (G+/)

Home > Recovery Services vaults > az104-rsv-region1 > Backup Goal >

Configure backup

az104-rsv-region1

Retain backup taken every day at 12:00 AM for 30 Day(s)

Consistency type: Application or file-system consistent

Virtual machines

Name	Resource group	Disks	Include future disks
az104-10-vm0	az-rg-region1	az104-10-vm0_OsDisk_1_8d7d...	<input checked="" type="checkbox"/>

Add

Selective disk backup option allows you to include or exclude specific data disks based on their LUN numbers. OS Disk exclusion is not supported. Know more about Selective Disk Backup feature, its limitation and pricing. [Learn more](#)

Selective disk backup with Standard policy incurs Snapshot cost which is always calculated for all the disks in the VM (both the included and excluded disks). This snapshot cost of excluded disks is **not** incurred if **Enhanced policy** is chosen.

Enable backup Download a template for automation Give feedback

Reviewing values of backup pre-check and last backup status

Microsoft Azure | Search resources, services, and docs (G+/)

Home > ConfigureProtection-1765070621660 | Overview > az104-rsv-region1 | Backup items > Backup Items (Azure Virtual Machine) >

az104-10-vm0

Backup Item

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

Essentials

Recovery services vault : az104-rsv-region1	Backup Pre-Check : Passed
Subscription (move) : Azure for Students	Last backup status : Warning (Initial backup pending)
Subscription ID : bbbf37aa-0bd5-495e-96f6-f34404654305	Backup policy : az104-policy (Standard)
Alerts (in last 24 hours) : View alerts	Oldest restore point : -
Jobs (in last 24 hours) : View jobs	Included disk(s) : All disks
Source scan integration : Not configured	Source scan summary : -

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 0	APPLICATION CONSISTENT 0	FILE-SYSTEM CONSISTENT 0
Creation time ↑↓	Consistency	Recovery type
		Recent scan status

Triggering backup

Microsoft Azure | Search resources, services, and docs (G+/)

Home > ConfigureProtection-1765070621660 | Overview > az104-rsv-region1 | Backup items > Backup Items (Azure Virtual Machine) > az104-10-vm0 >

Backup now

az104-10-vm0

Retain backup till * 01/06/2026

OK Give feedback

Task 4: Monitor Azure Backup

In this task, you will deploy an Azure storage account. Then you will configure the vault to send the logs and metrics to the storage account. This repository can then be used with Log Analytics or other third-party monitoring solutions.

Creating storage account for backup logs

The screenshot shows the 'Create a storage account' wizard in the Microsoft Azure portal. The 'Subscription' dropdown is set to 'Azure for Students'. The 'Resource group' dropdown is set to 'az-rg-region1'. Under 'Instance details', the 'Storage account name' is 'storageaccbackupslogs', 'Region' is '(Europe) Switzerland North', and 'Preferred storage type' is 'Choose preferred storage type'. A note below the storage type says: 'This helps us provide relevant guidance. It doesn't restrict your storage to this resource type.' At the bottom, there are 'Previous', 'Next', and 'Review + create' buttons, along with a 'Give feedback' link.

Adding diagnostic setting

The screenshot shows the 'az104-rsv-region1 | Diagnostic settings' page in the Microsoft Azure portal. The left sidebar includes options like Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Resource visualizer, Settings (Identity, Networking, Properties, Locks), and Getting started. The main area displays diagnostic settings for a Recovery Services vault. It shows a table with columns: Name, Storage account, Event hub, Log Analytics workspace, Partner solution, and Edit setting. There are no diagnostic settings defined yet. Below the table, it says 'Click 'Add Diagnostic setting' above to configure the collection of the following data:' followed by a list of data types: Azure Backup Reporting Data, Core Azure Backup Data, Addon Azure Backup Job Data, Addon Azure Backup Alert Data, Addon Azure Backup Policy Data, Addon Azure Backup Storage Data, Addon Azure Backup Protected Instance Data, Azure Site Recovery Jobs, Azure Site Recovery Events, Azure Site Recovery Replicated Items, and Azure Site Recovery Replication Stats.

Configuring

Microsoft Azure | Search resources, services, and docs (G+/)

Home > az104-rsv-region1 | Diagnostic settings >

Diagnostic setting

Save Discard Delete Feedback

Addon Azure Backup Job Data

Addon Azure Backup Alert Data

Addon Azure Backup Policy Data

Addon Azure Backup Storage Data

Addon Azure Backup Protected Instance Data

Azure Site Recovery Jobs

Azure Site Recovery Events

Azure Site Recovery Replicated Items

Showing all storage accounts including classic storage accounts

Location: Switzerland North

Subscription: Azure for Students

Storage account *: storageaccbackuplogs

Stream to an event hub

Send to partner solution

Details of the backup job

Microsoft Azure | Search resources, services, and docs (G+/)

Home > az104-rsv-region1 | Backup Jobs >

Backup

az104-10-vm0

Refresh Cancel Resume Deploy Create VM Template Deploy Cleanup Template Feedback

Job details

VM Name	az104-10-vm0
Recovery Point Expiry Time in UTC	1/6/2026 1:27:11 AM
Activity ID	b7628028-bc84-4ce3-9377-b31608b7802f
Start time	12/7/2025, 3:27:12 AM

Sub tasks

Name	Status	Duration
Take Snapshot	Completed	00:07:38
Transfer data to vault	Not started	00:00:00

Task 5: Enable virtual machine replication

Creating another RSV

Microsoft Azure Search resources, services, and docs (G+) Copilot Home > Recovery Services vaults Create Recovery Services vault ...

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

Subscription * Resource group *

Instance Details
Vault name * Region *

ⓘ Cross Subscription Restore is enabled by default for all vaults. Visit vault 'Properties' to disable the same. [Learn more](#).

Creating Automation account in Disaster recovery blade in our VM

Microsoft Azure Search resources, services, and docs (G+) Copilot Home > az104-10-vm0 az104-10-vm0 | Disaster recovery Virtual machine

Storage settings

Diagnose and solve problems

Settings

Operations

Disks

Disaster recovery

Monitoring

Diagnostic settings

Help

Boot diagnostics

Performance diagnostics

Extension settings

Update settings Automation account

! Deployment validation failed

Deployment validation failed.
Additional details from the underlying API that might be helpful: The template deployment failed because of policy violation. Please see details for more information.

Can't end because of lack of subscription and policy violation because of my university subscription but I understood an assignments and ready to do this in real life scenarios.

Lab 11 - Implement Monitoring

Lab introduction

In this lab, you learn about Azure Monitor. You learn to create an alert and send it to an action group. You trigger and test the alert and check the activity log.

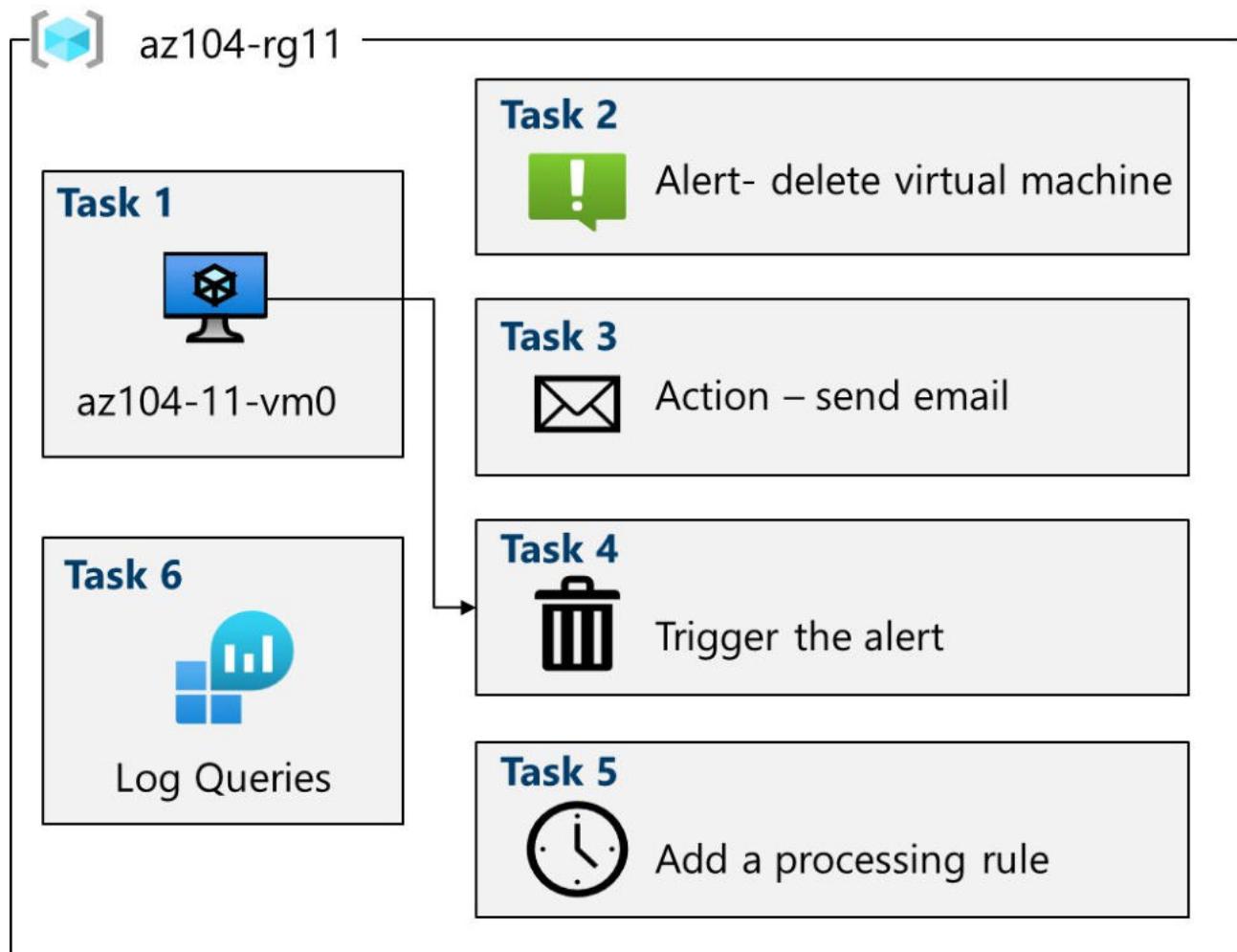
This lab requires an Azure subscription. Your subscription type may affect the availability of features in this lab. You may change the region, but the steps are written using **East US**.

Estimated timing: 40 minutes

Lab scenario

Your organization has migrated their infrastructure to Azure. It is important that Administrators are notified of any significant infrastructure changes. You plan to examine the capabilities of Azure Monitor, including Log Analytics.

Architecture diagram



Job skills

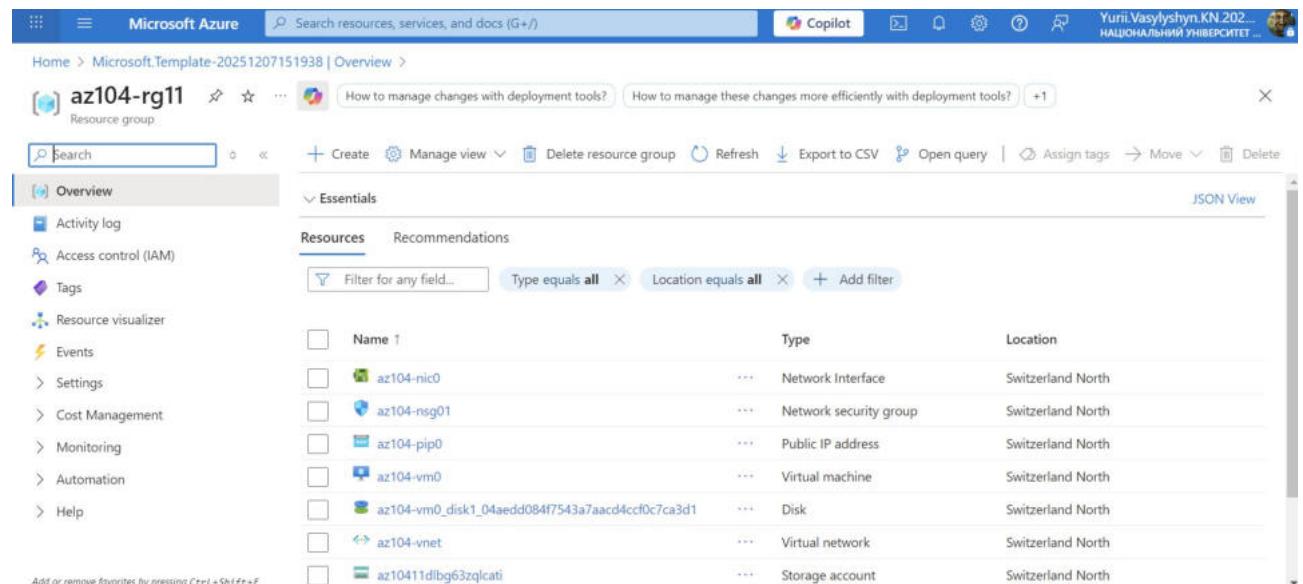
- Task 1: Use a template to provision an infrastructure.

- Task 2: Create an alert.
- Task 3: Configure action group notifications.
- Task 4: Trigger an alert and confirm it is working.
- Task 5: Configure an alert processing rule.
- Task 6: Use Azure Monitor log queries.

Task 1: Use a template to provision an infrastructure

In this task, you will deploy a virtual machine that will be used to test monitoring scenarios.

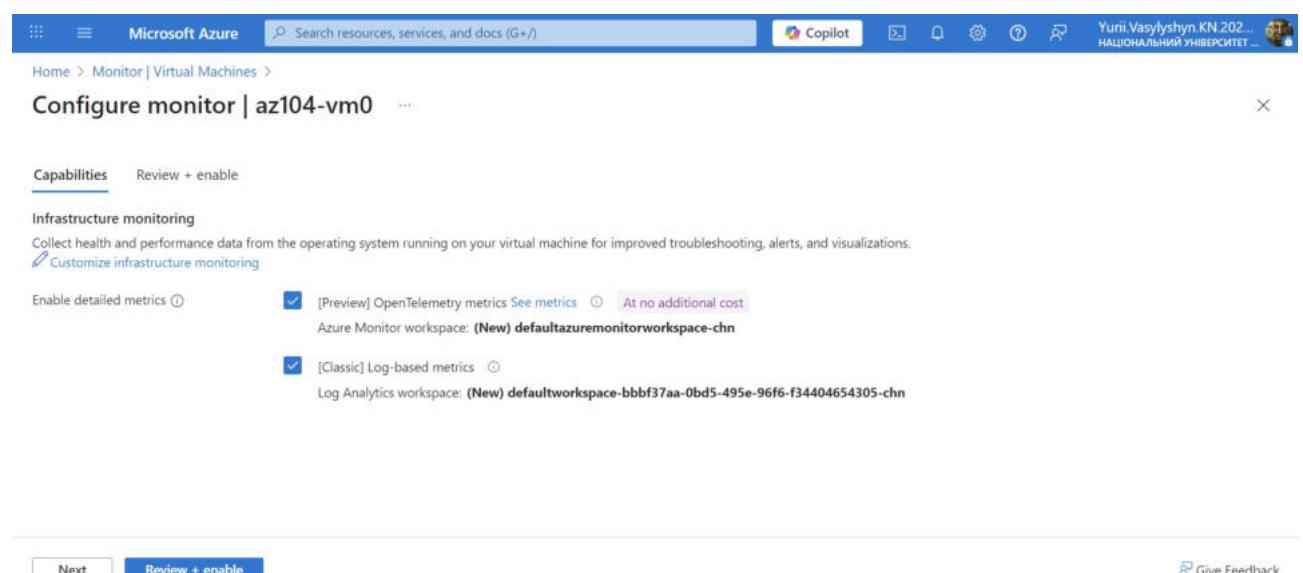
Resources deployed with template



The screenshot shows the Microsoft Azure Resource Group Overview page for the resource group 'az104-rg11'. The left sidebar includes links for Activity log, Access control (IAM), Tags, Resource visualizer, Events, Settings, Cost Management, Monitoring, Automation, and Help. The main area displays a table of resources with columns for Name, Type, and Location. The resources listed are:

Name	Type	Location
az104-nic0	Network Interface	Switzerland North
az104-nsg01	Network security group	Switzerland North
az104-pip0	Public IP address	Switzerland North
az104-vm0	Virtual machine	Switzerland North
az104-vm0_disk1_04ae0d084f7543a7aacd4ccf0c7ca3d1	Disk	Switzerland North
az104-vnet	Virtual network	Switzerland North
az10411dibg63zqlcati	Storage account	Switzerland North

Configuring and enabling insights for VM with monitor



The screenshot shows the 'Configure monitor' page for the virtual machine 'az104-vm0'. The 'Capabilities' section is selected, with a 'Review + enable' button at the top right. Under 'Infrastructure monitoring', there is a note about collecting health and performance data from the operating system. Two monitoring options are shown:

- [Preview] OpenTelemetry metrics**: Selected, with a note 'At no additional cost'. It points to the 'Azure Monitor workspace: (New) defaultazuremonitorworkspace-chn'.
- [Classic] Log-based metrics**: Unselected, with a note 'Log Analytics workspace: (New) defaultworkspace-bbbf37aa-0bd5-495e-96f6-f34404654305-chn'.

At the bottom, there are 'Next' and 'Review + enable' buttons, and a 'Give Feedback' link.

Onboarding environment

More events in the activity log → Dismiss all

*** Onboarding in progress Running X
Please wait while we are onboarding your environment.
a minute ago

Onboarding in progress X
Please wait while we are onboarding your environment.
a minute ago

Monitor Settings | az104-vm0

Capabilities

Infrastructure monitoring

Collect health and performance data from the operating system running on your virtual machine for improved troubleshooting, alerts, and visualizations.

Customize infrastructure monitoring

Enable detailed metrics

[Preview] OpenTelemetry metrics See metrics At no additional cost

Azure Monitor workspace: defaultazuremonitorworkspace-chn

[Classic] Log-based metrics

Log Analytics workspace: defaultworkspace-bbbf37aa-0bd5-495e-96f6-f34404654305-chn

Notifications

More events in the activity log → Dismiss all

Onboarding successful X

Your environment is now onboarded.

[View configuration](#)

2 minutes ago

Onboarding in progress X

Please wait while we are onboarding your environment.

5 minutes ago

Creating alert rule for subscription and selecting a signal for alert rule

Scope Condition Actions Details Tags Review +

Configure when the alert rule should trigger by selecting a signal and

Signal name * Select a signal [See all signals](#)

Activity log

- Delete Virtual Hub proxy (Virtual Hub Proxy) Administrative
- Delete Virtual Machine (Virtual Machines) Administrative
- Delete Virtual Machine and Virtual Machine scale sets in a Azure Fleet resource (Fle... Administrative
- Delete Virtual Machine Associated Network Security Group (Virtual Machine Associa... Administrative
- Delete Virtual Machine diagnostic run command (Virtual Machine Diagnostic RunCo... Administrative
- Delete Virtual Machine Extension (Virtual Machine Extensions) Administrative
- Delete Virtual Machine Image (Virtual Machine Image) Administrative

Review + create Previous Next: Actions > Apply Cancel

Alert rule created

The screenshot shows the Microsoft Azure portal with the 'Monitor | Alerts' section selected. A notification on the right side indicates that an 'Alert rule created' has been successfully created. The alert rule is named 'Alert rule customalarmrule'. The notification was received 'a few seconds ago'.

Task 3: Configure action group notifications

In this task, if the alert is triggered send an email notification to the operations team.

Creating and configuring Action group

The screenshot shows the 'Create action group' wizard. In the 'Project details' step, the subscription is set to 'Azure for Students' and the resource group is 'az104-rg11'. The region is set to 'Global'. In the 'Instance details' step, the action group name is 'Alert the operations team' and the display name is 'AlertOpsTeam'. The 'Review + create' button is visible at the bottom.

Creating notification

The screenshot shows the 'Create action group' wizard. In the 'Notifications' step, the 'Email/SMS message/Push/Voice' option is selected. Under 'Selected', the 'Email' checkbox is checked, and the email address 'superxman402@gmail.com' is entered. Other options like 'SMS', 'Azure mobile app notification', and 'Voice' are shown with their respective fields. The 'Review + create' button is visible at the bottom.

Action group created

The screenshot shows the Microsoft Azure Monitor Alerts interface. In the top right corner, there is a notifications panel titled "Notifications" with a message: "Create action group" and "Action group created successfully" "a few seconds ago".

Task 4: Trigger an alert and confirm it is working

In this task, you trigger the alert and confirm a notification is sent.

Trying to delete our VM

The screenshot shows the Microsoft Azure Compute Infrastructure Virtual machines page. A "Delete Resources" dialog is open, listing "az104-vm0" as the selected resource. The "Name" filter is set to "az104-vm0". The "Delete" button is highlighted in red at the bottom left of the dialog.

A have a triggered alerts after deleting VM

The screenshot shows the Microsoft Azure Monitor Alerts interface. The "Alerts" section is active, displaying two triggered alerts. Both alerts are named "customalererule" and are categorized as "4 - Verbose". They both affected the resource "az104-vm0" and were fired at "12/7/2025, 4:56 PM". The "User response" is listed as "New".

Task 5: Configure an alert processing rule

In this task, you create an alert rule to suppress notifications during a maintenance period.

Creating an alert processing rule

The screenshot shows the Microsoft Azure portal with the URL [https://portal.azure.com/#blade/Microsoft_Azure_Monitoring/AlertsBlade](#). The user is creating a new alert processing rule. The current step is 'Scope'. On the left, there's a sidebar with tabs: Scope (selected), Rule settings, Scheduling, Details, Tags, and Review + create. The main area shows a 'Select a scope' dialog. Under 'Resource types', 'All resource types' is selected. A search bar contains 'Search to filter items...'. Below is a list of scopes:

Scope	Resource type	Location
✓ Azure for Students	Subscription	-
> az-rg-region1	Resource group	-
> az-rg-region1-asr	Resource group	-
> az104-rg-region2	Resource group	-

At the bottom of the dialog, there's an 'Apply' button and a 'Clear all selections' link.

Enabling suppress notifications

The screenshot shows the Microsoft Azure portal with the URL [https://portal.azure.com/#blade/Microsoft_Azure_Monitoring/AlertsBlade](#). The user is creating a new alert processing rule. The current step is 'Rule settings'. On the left, there's a sidebar with tabs: Scope, Rule settings (selected), Scheduling, Details, Tags, and Review + create. The main area shows 'Rule type *' with two options: 'Suppress notifications' (selected) and 'Apply action group'. The 'Suppress notifications' option is described as: 'The alert will still fire, but the action groups won't be invoked so you won't receive any notifications when it fires.' The 'Apply action group' option is described as: 'An action group invokes a defined set of notifications and actions when an alert is triggered.' At the bottom, there are 'Review + create', 'Previous', and 'Next: Scheduling >' buttons.

Scheduling

Microsoft Azure | Search resources, services, and docs (G+) | Copilot | Home > Monitor | Alerts > Create an alert processing rule ...

Scope Rule settings **Scheduling** Details Tags Review + create

Define when you'd like to apply this rule.

Apply the rule

Always
 At a specific time
 Recurring

Start 10:00 PM

End 7:00 AM

Time zone

Preview From 07/12/2025 at 10:00 PM to 08/12/2025 at 7:00 AM (UTC+02:00 Helsinki, Kyiv, Riga, Sofia, Tallinn, Vilnius)

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

<https://portal.azure.com/#>

Adding details

Microsoft Azure | Search resources, services, and docs (G+) | Copilot | Home > Monitor | Alerts > Create an alert processing rule ...

Select the subscription and resource group in which to save the alert processing rule.

Project details

Subscription

Resource group *
[Create new](#)

Alert processing rule details

Rule name *

Description

Enable rule upon creation

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

<https://portal.azure.com/#create/Microsoft.Web/FunctionApp>

Created

Notifications

X

More events in the activity log → Dismiss all ▾

✓ Create alert processing rule X

Alert processing rule created successfully

a few seconds ago

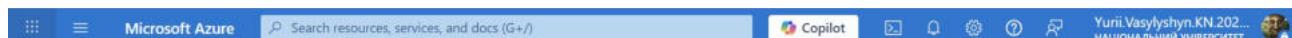
Task 6: Use Azure Monitor log queries

In this task, you will use Azure Monitor to query the data captured from the virtual machine.

Choosing scope

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu is visible with 'Logs' selected. In the center, a 'Select a scope' dialog is open, showing a warning message: '⚠ You may only choose items from the same resource type.' Below this are dropdown menus for 'Resource group' (set to 'All resource groups'), 'Resource types' (set to 'All resource types'), and 'Locations' (set to 'All locations'). A search bar labeled 'Search to filter items...' is present. Under the 'Scope' section, there is a tree view showing 'Azure for Students' under 'az-rg-region1'. This item is checked and highlighted in blue. Below the tree view, a section titled 'Selected scopes' shows '1 scope' selected. At the bottom of the dialog are 'Apply' and 'Cancel' buttons, and a 'Clear all selections' link. To the right of the dialog, the main workspace shows a notification about creating an alert processing rule, which was successful a few seconds ago. The notification includes a green checkmark icon and a 'Dismiss all' link.

Creating diagnostic setting because no data



Home > Azure for Students | Diagnostic settings >

Diagnostic setting

X

Save Discard Delete Feedback

A diagnostic setting specifies a list of categories of platform logs and/or metrics that you want to collect from a resource, and one or more destinations that you would stream them to. Normal usage charges for the destination will occur. Learn more about the different log categories and contents of those logs.

JSON View

A more flexible, faster, and robust way to collect metrics is in preview! Click here to configure platform metrics collection from microsoft.storage/storageaccounts to storage account, event hubs, and Log Analytics workspace. [Learn more](#).

Diagnostic setting name *

logForstorageacc



Metrics

Transaction

Destination details

Send to Log Analytics workspace

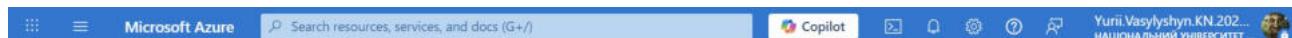
Subscription

Azure for Students

Log Analytics workspace

defaultworkspace-bbbf37aa-0bd5-495e-96f6-f34404654305-chn (switzerl...)

Running query



Home > Monitor

Monitor | Logs

X

Search

Overview

Activity log

Alerts

Issues (preview)

Metrics

Logs

Change Analysis

Service health

Workbooks

Dashboards with Grafana (preview)

Insights

Applications

Add or remove favorites by pressing **Ctrl+Shift+F**

New Query 1 * ... +

Save Share ... Queries hub

KQL mode

Cancel Time range : Last 24 hours Show : 1000 results

```
1 IngestionMetrics
2 where TimeGenerated > ago(1h)
3 where Name == "UtilizationPercentage"
4 summarize avg(Val) by bin(TimeGenerated, 5m), Computer //split up by computer
5 render timechart
```

No data found

This might happen if

• No logs are configured. Configure logs in diagnostic settings.

Labs done!