



Microsoft Azure Fundamentals

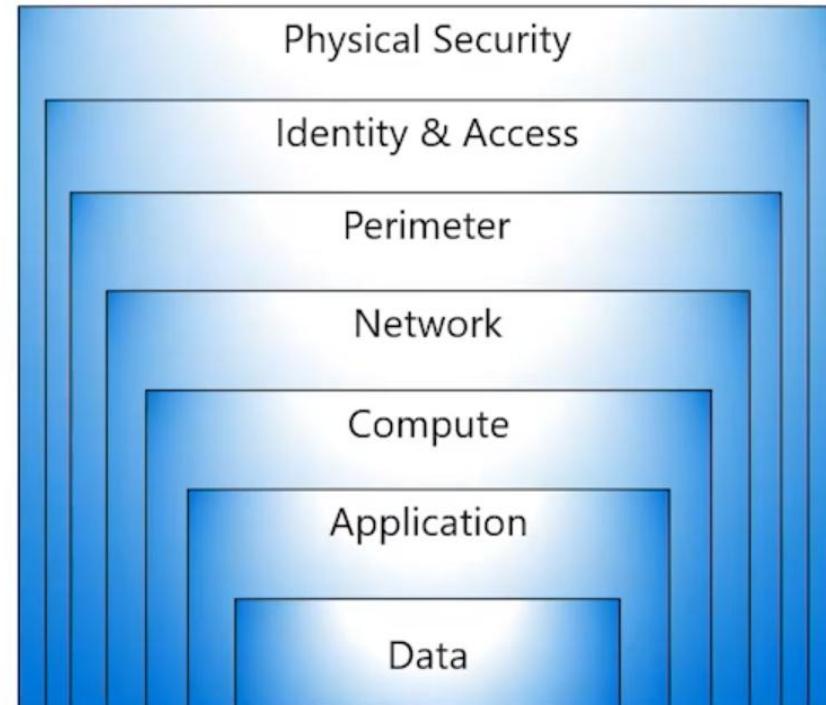


Module 3 – Learning objectives

- Understand and describe how to secure network connectivity in Microsoft Azure.
- Understand and describe core Azure identity services.
- Understand and describe security tools and features.
- Understand and describe Azure governance methodologies.
- Understand and describe monitoring and reporting in Azure.
- Understand and describe privacy, compliance, and data protection standards in Azure.

Defense in depth

- A layered approach to securing computer systems.
- Provides multiple levels of protection.
- Attacks against one layer are isolated from subsequent layers.



Shared security

- Migrating from customer-controlled to cloud-based datacenters shifts the responsibility for security.
- Security becomes a shared concern between cloud providers and customers.

Responsibility	On-Premises	IaaS	PaaS	SaaS
Data governance and Rights Management	Customer	Customer	Customer	Customer
Client endpoints	Customer	Customer	Customer	Customer
Account and access management	Customer	Customer	Customer	Customer
Identity and directory infrastructure	Customer	Customer	Microsoft/ Customer	Microsoft/ Customer
Application	Customer	Customer	Microsoft/ Customer	Microsoft
Network controls	Customer	Customer	Microsoft/ Customer	Microsoft
Operating system	Customer	Customer	Microsoft	Microsoft
Physical hosts	Customer	Microsoft	Microsoft	Microsoft
Physical network	Customer	Microsoft	Microsoft	Microsoft
Physical datacenter	Customer	Microsoft	Microsoft	Microsoft

Authentication vs Authorization

Authentication

- Establishes an identity
- Challenges access for credentials

Authorization

- Assumes successful **authentication**
- Establishes appropriate level of access



Azure Active Directory (AD)

Microsoft Azure's cloud-based identity and access management service.

- Authentication (employees sign-in to access resources).
- Single sign-on (SSO).
- Application management.
- Business to Business (B2B).
- Business to Customer (B2C) identity services.
- Device management.



Directory Differences

Azure Active Directory

- Cloud
- Designed for HTTP and HTTPS
- Queried via Rest API's
- Uses SAML, WS-Federation, or OpenID for authentication
- Uses OAuth for authorization
- Includes federation services
- Flat Structure

Active Directory

- On-Prem
- Query via LDAP
- Uses Kerberos for Authentication
- No Federation Services
- Organizational Units (OU's)
- Group Policy (GPO's)

Azure Multi-Factor Authentication

Provides additional security for your identities by requiring two or more elements for full authentication.

- Something you know.
- Something you possess.
- Something you are.



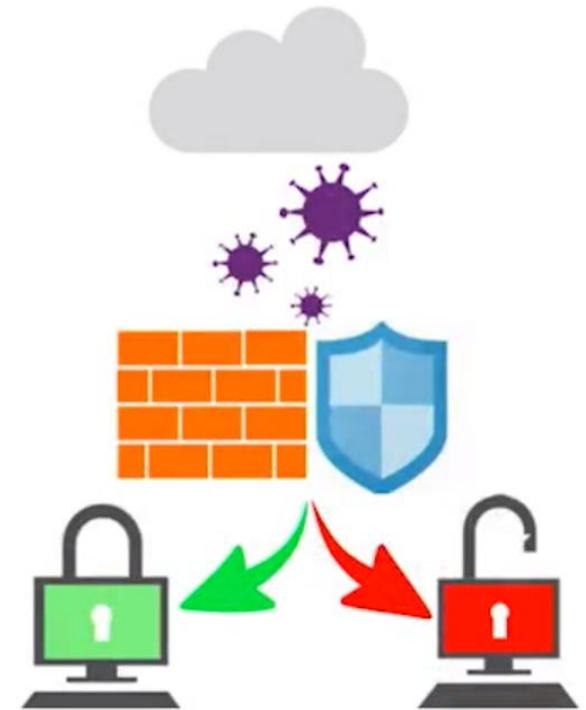
Lesson 03: Securing network connectivity



Choosing Azure network security solutions

Azure supports combined network security solutions. For example, NSGs with Azure Firewall; Web Application Firewall (WAF) with Azure Firewall.

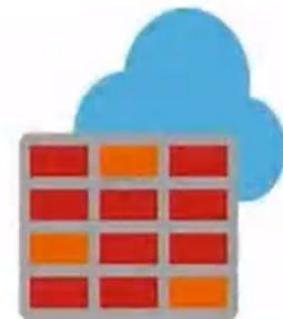
- **Perimeter layer** protects your networks' boundaries with Azure DDoS Protection and Azure Firewall.
- **Networking layer** only permits traffic to pass between networked resources with Network Security Group (NSG) inbound and outbound rules.



Azure Firewall

Stateful, managed, Firewall as a Service (FaaS) that grants/ denies server access based on originating IP address, to protect network resources.

- Applies inbound and outbound traffic filtering rules.
- Built-in high availability.
- Unrestricted cloud scalability.
- Uses Azure Monitor logging.



- ✓ Azure Application Gateway also provides a firewall, Web Application Firewall (WAF). WAF provides centralized, inbound protection for your web applications.

Azure Distributed Denial of Service (DDoS) protection

DDoS attacks overwhelm and exhaust network resources, making apps slow or unresponsive.

- Sanitizes unwanted network traffic, before it impacts service availability.
- Basic service tier is automatically enabled in Azure.
- Standard service tier adds mitigation capabilities, tuned to protect Azure Virtual Network resources.



Network Security Groups (NSGs)

Filters network traffic to, and from, Azure resources on Azure Virtual Networks.

- Set inbound and outbound rules to filter by source and destination IP address, port, and protocol.
- Add multiple rules, as needed, within subscription limits.
- Azure applies default, baseline, security rules to new NSGs.
- Override default rules with new, higher priority, rules.



Application Security Groups (ASGs)

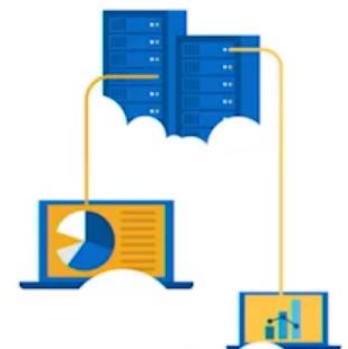
Provides for the grouping of servers with similar port filtering requirements, and group together servers with similar functions, such as web servers.

- Allows you to reuse your security policy at scale without manual maintenance of explicit IP addresses.
- Handles the complexity of explicit IP addresses and multiple rule sets, allowing you to focus on your business logic.



Let's Take A Look:

Network Security Groups





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Key vaults

Network security groups

Contoso MOD830600

[Add](#) [Edit columns](#) [Refresh](#) [Try preview](#)[Assign tags](#)**Subscriptions:** Windows Azure MSDN - Visual Studio Ultimate – Don't see a subscription? [Open Directory](#) [+](#)[Subscription settings](#)

<input type="text"/> Filter by name...	All resource groups	All locations	All tags	No grouping
--	---------------------	---------------	----------	-------------

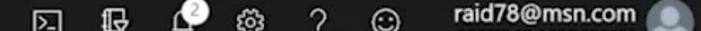
3 items

<input type="checkbox"/> Name ↑↓	Resource group ↑↓	Location ↑↓	Subscription ↑↓
<input type="checkbox"/> FunVM2-nsg	AzFUN	South Central US	Windows Azure MSDN - Visual Studio U... ...
<input type="checkbox"/> RBACTestVM-nsg	AZ900RBACTest	East US	Windows Azure MSDN - Visual Studio U... ...
<input type="checkbox"/> VMFun1-nsg	AzFUN	West US 2	Windows Azure MSDN - Visual Studio U... ...

[←](#) [→](#) [⟳](#)<https://portal.azure.com/#@MOD830600.onmicrosoft.com/resource/subscriptions/5abe05c6-b60d-45df-9817-2254e05ed4a7/resourceGroups/FunVM2-nsg/providers/Microsoft.Network/networkSecurityGroups/FunVM2-nsg/inboundSecurityRules>

Microsoft Azure

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FunVM2-nsg - Inbound security rules

Network security group

Search (Ctrl+/-)

[Add](#) [Default rules](#) [Refresh](#)

Priority	Name	Port	Protocol	Source
No results.				

[Overview](#)[Activity log](#)[Access control \(IAM\)](#)[Tags](#)[Diagnose and solve problems](#)

Settings

[Inbound security rules](#)[Outbound security rules](#)[Network interfaces](#)[Subnets](#)[Properties](#)[Locks](#)[Export template](#)

Monitoring



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Home > Network security groups > FunVM2-nsg - Inbound security rules

FunVM2-nsg - Inbound security rules

Network security group

Search (Ctrl+/-)

Add Default rules



Priority	Name
300	RI
65000	Allow
65001	Allow
65500	Deny

Settings

Inbound security rules

Outbound security rules

Network interfaces

Subnets

Properties

Locks

Export template

Monitoring

Add inbound security rule

FunVM2-nsg

Basic

Source * ⓘ

Any

Source port ranges * ⓘ

*

Destination * ⓘ

Any

Destination port ranges * ⓘ

8080

Protocol *

Any TCP UDP ICMP

Action *

Allow Deny

Priority * ⓘ

310

Add



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FunVM2-nsg - Inbound security rules

Network security group

Search (Ctrl+ /)

Add Default rules

- Overview
- Activity log
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- Tags
- Diagnose and solve problems

Settings

- Inbound security rules
- Outbound security rules
- Network interfaces
- Subnets
- Properties
- Locks
- Export template

Monitoring

Add inbound security rule

FunVM2-nsg

Basic

Source *

IP Addresses

Any

IP Addresses

Service Tag

Application security group

Destination *

Any

Destination port ranges *

8080

Protocol *

Any TCP UDP ICMP

Action *

Allow Deny

Add



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- Outbound security rules
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- Properties
- Locks
- Export template

Monitoring

Add inbound security rule

FunVM2-nsg

Basic

Source *

Service Tag

Source service tag *

Internet

Internet

VirtualNetwork

AzureLoadBalancer

ApiManagement

GatewayManager

AzureActiveDirectory

AzureMonitor

BatchNodeManagement

AzureActiveDirectoryDomainServices

Add

[←](#) [→](#) [⟳](#)[https://portal.azure.com/#@MOD830600.onmicrosoft.com/resource/subscriptions/5abe05c6-b60d-45df-9817-2254e05ed4a7/res...](https://portal.azure.com/#@MOD830600.onmicrosoft.com/resource/subscriptions/5abe05c6-b60d-45df-9817-2254e05ed4a7/resourceGroups/FunVM2-nsg/providers/Microsoft.Network/networkSecurityGroups/FunVM2-nsg/inboundSecurityRules)raid78@msn.com
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FunVM2-nsg - Inbound security rules

Network security group

[Add](#)[Default rules](#)[Refresh](#)

Priority	Name	Port	Protocol	Source	Destination	Action
300	⚠️ RDP	3389	TCP	Any	Any	Allow
310	⚠️ RDP2	3389	TCP	Any	Any	Deny
65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
65001	AllowAzureLoadBalancerInBound	Any	Any	AzureLoadBalancer	Any	Allow
65500	DenyAllInBound	Any	Any	Any	Any	Deny

✓ **Created security rule**

Successfully created security rule 'RDP2'.



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Home > Network Watcher

Network Watcher

Microsoft

Search (Ctrl+ /)

Overview

Network Watcher is a regional service that enables you to monitor and diagnose conditions at a network scenario level.
[Learn more.](#)

Subscriptions: Windows Azure MSDN - Visual Studio Ultimate – Don't see a subscription? [Open Directory + Subscription settings](#)

Filter by name

Name	Region	Status	
Windows Azure MSDN - Visual Studio ...	> 33 regions	Partially enabled	...

Monitoring

Topology

Connection monitor

Connection monitor (Preview)

Network Performance Monitor

Network diagnostic tools

IP flow verify

Next hop

Effective security rules

VPN troubleshoot

Packet capture

Connection troubleshoot

Metrics

Details

https://portal.azure.com/#blade/Microsoft_Azure_Network/NetworkWatcherMenuBlade/topology

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Network Watcher - Topology

Microsoft

 Search (Ctrl+/-)[Download topology](#)[Overview](#)

Subscription

Resource Group

Windows Azure MSDN - Visual Stu...

Select resource group

[Monitoring](#)

Virtual Network

Waiting for resource group selection

[Topology](#)

- [Connection monitor](#)
- [Connection monitor \(Preview\)](#)
- [Network Performance Monitor](#)

Network diagnostic tools

- [IP flow verify](#)
- [Next hop](#)
- [Effective security rules](#)
- [VPN troubleshoot](#)
- [Packet capture](#)
- [Connection troubleshoot](#)

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Home > Network Watcher - Topology

Network Watcher - Topology

Search (Ctrl+ /)

Download topology

Subscription

Windows Azure MSDN - Visual Stu...

Resource Group

AzFUN

Virtual Network

Select virtual network

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Metrics

Network Watcher IP flow verify checks if a packet is allowed or denied to or from a virtual machine based on 5-tuple information. The security group decision and the name of the rule that denied the packet is returned.

[Learn more](#)

Specify a target virtual machine with associated network security groups, then run an inbound or outbound packet to see if access is allowed or denied.

Subscription *

Windows Azure MSDN - Visual Studio Ultimate

Resource group *

AZ900RBACTest

Virtual machine *

RBACTestVM

Network interface *

rbactestvm787

Packet details

Protocol

 TCP UDP

Direction



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Packet capture

Connection troubleshoot

Metrics

Next Hop provides the next hop from the target virtual machine to the destination IP address.

[Learn more](#)

Specify a target virtual machine and destination IP address to view the next hop.

Subscription *

Windows Azure MSDN - Visual Studio Ultimate

Resource group *

AZ900RBACTest

Virtual machine *

RBACTestVM

Network interface *

rbactestvm787

Source IP address *

10.0.2.4

Destination IP address *

Next hop

Azure Security Center

A monitoring service that provides threat protection across all your Azure, and on-premises, services.

- Provides security recommendations based on your configurations, resources, and networks.
- Monitors security settings across your on-premises and cloud workloads.
- Automatically applies your security policies to any new services you provision.



Azure Security Center usage scenarios

- You can use Security Center in the *Detect*, *Assess*, and *Diagnose* stages of an incident response.



- Use Security Center recommendations to enhance security.

Azure Key Vault

- Stores application secrets in a centralized cloud location, to securely control access permissions, and access logging.
 - Secrets management.
 - Key management.
 - Certificate management.
 - Storing secrets backed by hardware security modules (HSMs).





Microsoft Azure Backup



Microsoft Azure Backup supports scheduled backups of files and folders to an online location



Backups have not been configured for this server. Click "Schedule Backup" in the Actions pane to configure backup options and schedule a regular backup.

You can also Configure Notifications from Alerts blade to receive email alerts for backup failures. [Learn More](#).

Jobs

Jobs Alerts

Status	Time	Message	Description
		Recovery	Job completed.

Status

Last Backup

Status: -

Time: -

[View details](#)

Next Backup

Status: Not Scheduled

Time: -

Available Recovery Points

Total backups: None

Latest copy: -

[View details](#)

Last Recovery

Status: Successful

Time:

[View details](#)

Actions

Backup

Register Server

Schedule Backup

Recover Data

Change Properties

Open Portal

About Microsoft Azure Recovery ...

Privacy & Cookies

View

Help



Type here to search



 Microsoft Azure Backup Microsoft Azure Backup supports Backups have not been configured for this server.

You can also Configure Notifications from Alerts blade.

Jobs

Jobs

Alerts

Status Time Message Recovery

Status

Last Backup

Status: -

Time: -

 View details Recover Data Wizard

Getting Started

Getting Started

Select Recovery Mode

Select Volume and Date

Browse And Recover Files

You can use this wizard to recover files from a backup service and restore them to your server.

To get started, identify the server on which the backup was originally created.

 This server (vmfun1.) Another server

< Previous

Next >

Recover

Cancel



Actions

Backup

Register Server

 Schedule Backup Recover Data

Change Properties

Open Portal

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Type here to search



 Microsoft Azure Backup Microsoft Azure Backup support Backups have not been configured for this account.

You can also Configure Notifications from Alerts blade.

Jobs

Jobs

Alerts

Status

Time



Message

Recover

Status

Last Backup

Status: -

Time: -

View details

 Recover Data Wizard

Select Backup Server

Getting Started

Select Backup Server

Select Recovery Mode

Select Volume and Date

Browse And Recover Files

Files can be restored from a specific backup server or you can search for your files across backup servers.

Select Backup Server

desktop-0eq3iu.

jdavm1.

win10vm.

win10vm1.

To decrypt your backup from another server, please provide the passphrase used to create the backup.

Passphrase:

< Previous

Next >

Recover

Cancel



Actions

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Key vaults - Microsoft A X +

https://portal.azure.com/#blade/HubsExtension/BrowseResource/resourceType/Microsoft.KeyVault%2Fvaults

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Home > Key vaults

Key vaults
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Add Edit columns Refresh Export to CSV Assign tags Feedback

Filter by name... Subscription == all Resource group == all Location == all Add filter

No grouping

Name ↑↓	Type ↑↓	Resource group ↑↓	Location ↑↓	Subscription ↑↓	Tags
AZ103keyvault	Key vault	az103Ready	East US	Windows Azure MSD...	...

< Previous Page 1 of 1 Next >

https://portal.azure.com/#@MOD830600.onmicrosoft.com/resource/subscriptions/5abe05c6-b60d-45df-9817-2254e05

Type here to search

AZ103keyvault - Secrets

https://portal.azure.com/#@MOD830600.onmicrosoft.com/resource/subscriptions/5abe05c6-b60d-45df-9817-2254e05ed4a7/resourceGroups/

Microsoft Azure

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AZ103keyvault - Secrets

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- Monitor

Access control (IAM)

Tags

Diagnose and solve problems

Events (preview)

Settings

Keys

Secrets

Certificates

Access policies

Networking

Properties

Locks

Export template

Generate/Import

Refresh

Restore Backup

Name	Type	Status	Expiration Date
AZBackup		✓ Enabled	
azbackuplaptop		✓ Enabled	
JDAVMBackup	Backup secret from JDAVM	✓ Enabled	
ServerBackup		✓ Enabled	
test		✓ Enabled	
Win10vmBackup		✓ Enabled	

Type here to search

89afbd82cd0145b7bdfa X +

https://portal.azure.com/#@MOD830600.onmicrosoft.com/asset/Microsoft_Azure_KeyVault/Secret/https://az103keyvaul.vault.azure.net/secrets/89afbd82cd0145b7bdfa528cc04a0b0c

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Home > Key vaults > AZ103keyvaul - Secrets > azbackuplaptop > 89afbd82cd0145b7bdfa528cc04a0b0c

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89afbd82cd0145b7bdfa528cc04a0b0c Secret Version

Save Discard

Properties

Created 8/8/2019, 1:15:04 PM

Updated 8/8/2019, 1:15:04 PM

Secret Identifier <https://az103keyvaul.vault.azure.net/secrets/89afbd82cd0145b7bdfa528cc04a0b0c> Copy to clipboard

Settings

Set activation date?

Set expiration date?

Enabled? Yes No

Tags >

0 tags

Secret

Type here to search

e

89afbd82cd0145b7bdfa X +

https://portal.azure.com/#@MOD830600.onmicrosoft.com/asset/Microsoft_Azure_KeyVault/Secret/https://az103keyaul.vault.azure.net/secrets/89afbd82cd0145b7bdfa528cc04a0b0c

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Home > Key vaults > AZ103keyaul - Secrets > azbackuplaptop > 89afbd82cd0145b7bdfa528cc04a0b0c

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- Advisor
- Monitor

89afbd82cd0145b7bdfa528cc04a0b0c Secret Version

Save Discard

Set activation date?

Set expiration date?

Enabled? Yes No

Tags >

0 tags

Secret

Content type (optional)

Show Secret Value

Secret value  Copied

Type here to search

e



Microsoft Azure Backup support

⚠️ Backups have not been configured for this account.
You can also Configure Notifications from Alerts blade.

Jobs (Activity in the past 7 days, double click)

Jobs

Alerts

Status	Time	Messa...
✓	2/28/2020 6:26 PM	Recover...

Status

Last Backup

Status: -

Time: -

[View details](#)

Recover Data Wizard



Select Backup Server

Getting Started

Select Backup Server

Select Recovery Mode

Select Volume and Date

Browse And Recover Files

Files can be restored from a specific backup server or you can search for your files across backup servers.

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Passphrase:

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Next >

Recover

Cancel



Actions

Backup

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Azure Information Protection (AIP)

Classifies and protects documents, and emails, by applying labels.

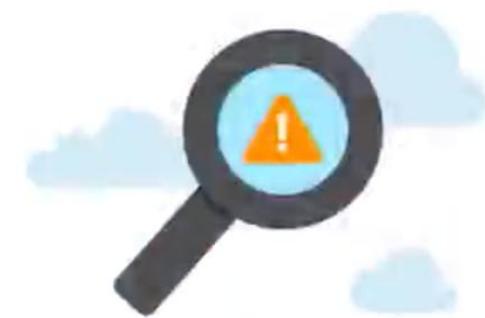
- Automatically using rules and conditions defined by administrators.
- Manually, by users.
- By combining automatic and manual methods, guided by recommendations.



Azure Advanced Threat Protection (Azure ATP)

Cloud-based security solution for identifying, detecting, and investigating advanced threats, compromised identities, and malicious insider actions.

- Dedicated portal for monitoring and responding to suspicious activity.
- Sensors installed directly onto your domain controllers.
- Cloud service runs on Azure infrastructure.



Lesson 05: Azure Governance methodologies



Azure Policy

Stay compliant with your corporate standards and service level agreements (SLAs) by using policy definitions to enforce rules and effects for your Azure resources.

- Evaluates and identifies Azure resources that do not comply with your policies.
- Provides built-in policy and initiative definitions, under categories such as Storage, Networking, Compute, Security Center, and Monitoring.

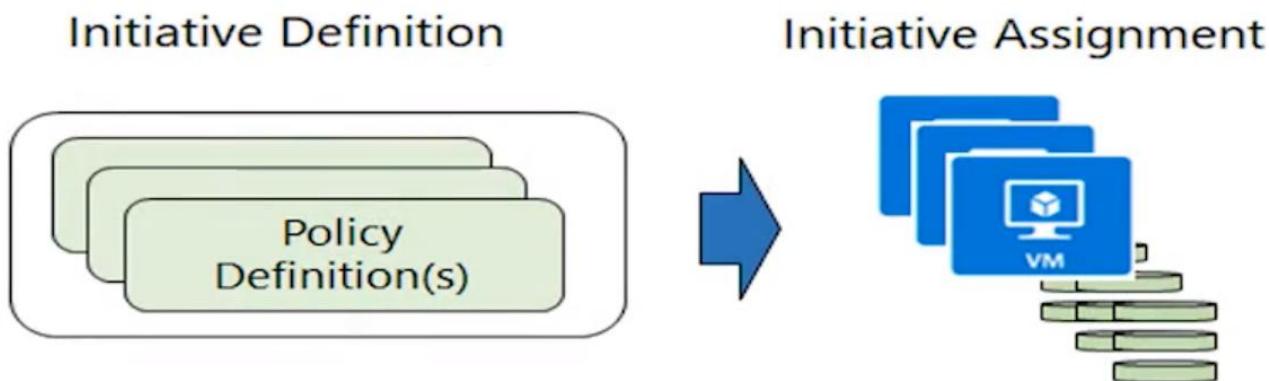


Implementing Azure Policy

Create a policy definition → Assign the definition to resources → Review the evaluation results

- A policy definition expresses what to evaluate and what action to take.
- Implement your policy definition by assigning it to a group of resources.
- Review the results. Results are either compliant or non-compliant.

Policy Initiatives

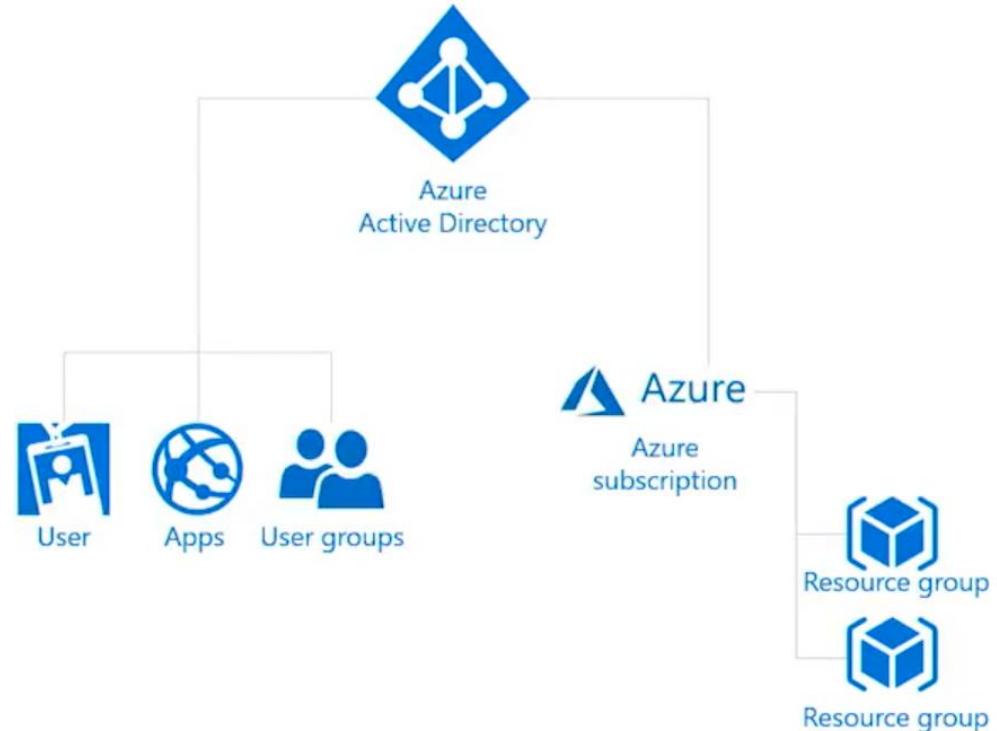


Policy Initiatives work with Azure Policies

- **Initiative definitions** group multiple policy definitions into a single unit, to track compliance at a higher scope. For example, one initiative can monitor all your Azure Security Center recommendations.
- **Initiative assignments** are assigned to a specific scope and reduce the need to make an initiative definition for each scope.

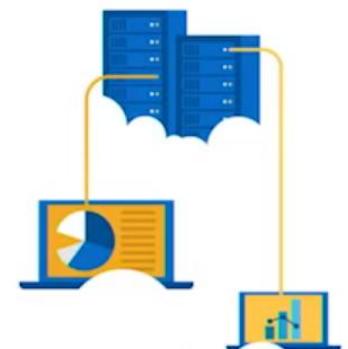
Role-based access control (RBAC)

- Fine-grained access management
- Segregate duties within your team and grant only the amount of access to users that they need to perform their jobs.
- Enables allowing or disallowing access to the Azure portal, and controlling access to resources.



Let's Take A Look:

Role-Based Access Control (RBAC)



Resource groups - Microsoft Azure +

https://portal.azure.com/#blade/HubsExtension/BrowseResourceGroups

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

InPrivate admin2@MOD830600.o...
CONTOSO MOD830600

Create a resource Home > Resource groups

Resource groups

Contoso MOD830600

Add Manage view Refresh Export to CSV Assign tags Feedback

Filter by name... Subscription == all Location == all Add filter

No grouping

Showing 1 to 1 of 1 records.

Name	Subscription	Location
AZ900RBACTest	Windows Azure MSDN - Visual Studio U...	Central US

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Add



Manage view



Refresh



Export to CSV



Assign tags



Feedback

Filter by name...

Subscription == all

Location == all

+ Add filter

Showing 1 to 6 of 6 records.

No grouping

 Name ↑↓

Subscription ↑↓

Location ↑↓

 az103Ready

Windows Azure MSDN - Visual Studio U... West US 2

...

 AZ900RBACTest

Windows Azure MSDN - Visual Studio U... Central US

...

 AzFUN

Windows Azure MSDN - Visual Studio U... West US 2

...

 CloudShell

Windows Azure MSDN - Visual Studio U... South Central US

...

 Default-ActivityLogAlerts

Windows Azure MSDN - Visual Studio U... East Asia

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AzFUN - Access control (IAM)

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Search (Ctrl+ /)



Add

Edit columns



Refresh



Remove



Got feedback?



Overview



Activity log



Access control (IAM)



Tags



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Policies



Properties



Locks



Export template

Cost Management



Cost analysis

Check access

Review the level of access a user, group, service principal, or managed identity has to this resource. [Learn more](#)

Find

Search by name or email address



Add a role assignment

Grant access to resources at this scope by assigning a role to a user, group, service principal, or managed identity.

[Add](#)[Learn more](#)

View role assignments

View the users, groups, service principals and managed identities that have role assignments granting them access at this scope.

[View](#)[Learn more](#)



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Search (Ctrl+ /)

Add

Edit columns



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Got feedback?



Settings



Cost Management



Check access

Role assignments

Deny assignments

Classic administrators

Roles

Manage access to Azure resources for users, groups, service principals and managed identities at this scope by creating role assignments.

Number of role assignments for this subscription ⓘ

9

2000

Name ⓘ

Search by name or email

Type ⓘ

All

Role ⓘ

2 selected

Scope ⓘ

All scopes

Group by ⓘ

Role

7 items (1 Users, 3 Service Principals, 3 Unknown)

Name	Type	Role	Scope
Contributor			
<input type="checkbox"/> ASRVault-9ca-asr-automat	App	Contributor ⓘ	Subscription (
<input type="checkbox"/> CustomPlan_J3LbyK20NTy	App	Contributor ⓘ	Subscription (

[←](#) [→](#) [⟳](#)<https://portal.azure.com/#@MOD830600.onmicrosoft.com/resource/subscriptions/5abe05c6-b60d-45df-9817-2254e05ed4a7/resourceGroups/AzFUN-Access-control-IAM/providers/Microsoft.Authorization/roleAssignments>raid78@msn.com
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Home > Resource groups > AzFUN - Access control (IAM)

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Add

Edit columns



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<input type="checkbox"/>	ASRVault-9ca-asr-automat	App	Contributor	Subscription (
<input type="checkbox"/>	CustomPlan_J3LbyK20NTy	App	Contributor	Subscription (
<input type="checkbox"/>	Identity deleted. Identity no longer exists.	Unknown	Contributor	Subscription (
<input type="checkbox"/>	Identity deleted. Identity no longer exists.	Unknown	Contributor	Subscription (
<input type="checkbox"/>	Identity deleted. Identity no longer exists.	Unknown	Contributor	Subscription (
<input type="checkbox"/>	vaultaz10-fx9-asr-automat	App	Contributor	Subscription (
User Access Administrator				
<input type="checkbox"/>	raid78 (Guest) raid78@msn.com	User	User Access Administrator	Root (Inherit)

[User Access Administrator](#)

User Access Administrator

[←](#) [→](#) [⟳](#)<https://portal.azure.com/#@MOD830600.onmicrosoft.com/resource/subscriptions/5abe05c6-b60d-45df-9817-2254e05ed4a7/resourceGroups/AzFUN-Access-control-IAM/providers/Microsoft.Authorization/roleAssignments>

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All

[Role](#)

2 selected

[Scope](#)

All scopes

7 items (1 Users, 3 Service Principals, 3 Unknown)

Name	Type	Role	Scope
Contributor			
<input type="checkbox"/> ASRVault-9ca-asr-automat	App	Contributor	Subscription (
<input type="checkbox"/> CustomPlan_J3LbyK20NTyf	App	Contributor	Subscription (
<input type="checkbox"/> Identity deleted. Identity no longer exists.	Unknown	Contributor	Subscription (
<input type="checkbox"/> Identity deleted. Identity no longer exists.	Unknown	Contributor	Subscription (
<input type="checkbox"/> Identity deleted.			



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Name Type

Search by name or email

All

Group by

Role

7 items (1 Users, 3 Service Principals, 3 Unknown)

 Name Type

Contributor

 ASRVault-9ca-asr-automat App CustomPlan_J3LbyK20NTyf App Identity deleted. Identity no longer exists. Unknown Identity deleted. Identity no longer exists. Unknown Identity deleted.

Add role assignment

Role

Select a role

Select a role

Owner

Contributor

Reader

AcrDelete

AcrImageSigner

AcrPull

AcrPush

AcrQuarantineReader

AcrQuarantineWriter

API Management Service Contributor

API Management Service Operator Role

API Management Service Reader Role

Save

Discard



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Name Type

Search by name or email

All

Group by

Role

7 items (1 Users, 3 Service Principals, 3 Unknown)

 Name Type

Contributor

  ASRVault-9ca-asr-automat App  CustomPlan_J3LbyK20NTy App  Identity deleted. Identity no longer exists. Unknown  Identity deleted. Identity no longer exists. Unknown  Identity deleted.

Add role assignment

Role

Owner

Assign access to

Azure AD user, group, or service principal

Select

admin2

No users, groups, or service principals found.

Selected members:

admin2
admin2@MOD830600.onmicrosoft.com Remove

Save

Discard

[←](#) [→](#) [⟳](#)[https://portal.azure.com/#@MOD830600.onmicrosoft.com/resource/subscriptions/5abe05c6-b60d-45df-9817-2254e05ed4a7/resourceGroups/AzFUN%20-%20Access%20control%20\(IAM\)/providers/Microsoft.Authorization/roleAssignments](https://portal.azure.com/#@MOD830600.onmicrosoft.com/resource/subscriptions/5abe05c6-b60d-45df-9817-2254e05ed4a7/resourceGroups/AzFUN%20-%20Access%20control%20(IAM)/providers/Microsoft.Authorization/roleAssignments)raid78@msn.com
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5:10 PM

Added Role assignment

admin2 was added as Owner for AzFUN.

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<input type="checkbox"/>	CustomPlan_J3LbyK20NTy	App	Contributor	Subscription (
<input type="checkbox"/>	Identity deleted.	Identity no longer exists.	Unknown	Contributor
<input type="checkbox"/>	Identity deleted.	Identity no longer exists.	Unknown	Contributor
<input type="checkbox"/>	Identity deleted.	Identity no longer exists.	Unknown	Contributor
<input type="checkbox"/>	vaultaz10-fx9-asr-automat	App	Contributor	Subscription (
Owner				
<input type="checkbox"/>	admin2	admin2@MOD830600.o...	User	Owner
User Access Administrator				
<input type="checkbox"/>	raid78 (Guest)	raid78@msn.com	User	User Access Administrator

Resource groups - Microsoft Azure +

https://portal.azure.com/#blade/HubsExtension/BrowseResourceGroups

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Create a resource Home > Resource groups

Resource groups Contoso MOD830600

Add Manage view Refresh Export to CSV Assign tags Feedback

Filter by name... Subscription == all Location == all Add filter

No grouping

Showing 1 to 2 of 2 records.

Name ↑	Subscription ↑↓	Location ↑↓
AZ900RBACTest	Windows Azure MSDN - Visual Studio U...	Central US
AzFUN	Windows Azure MSDN - Visual Studio U...	West US 2

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Resource locks

Lock Types	Read	Update	Delete
CanNotDelete	Yes	Yes	No
ReadOnly	Yes	No	No

- Protect your Azure resources from accidental deletion or modification.
- Manage locks at subscription, resource group, or individual resource levels within Azure Portal.



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Subscription (change)

Windows Azure MSDN - Visual S...

Subscription ID

5abe05c6-b60d-45df-9817-2254e05ed4a7

Tags (change)

Click here to add tags

Filter by name...

Showing 1 to 16 of 16 records.

 Name ↑↓ AzFUN-vnet azfundiag640 azfundiag743 AzFUNvnet913

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Are you sure you want to delete "AzFUN"?



Warning! Deleting the "AzFUN" resource group is irreversible. The action you're about to take can't be undone. Going further will delete this resource group and all the resources in it permanently.

TYPE THE RESOURCE GROUP NAME:

AzFUN

AFFECTED RESOURCES

There are 16 resources in this resource group that will be deleted.

Name	Type	Location
azfundiag640	Storage account	South Central US
azfundiag743	Storage account	West US 2
AzFUN-vnet	Virtual network	West US 2
AzFUNvnet913	Virtual network	South Central US
funset1	Availability set	South Central US
funstorage1	Storage account	Central US
FunVM2	Virtual machine	South Central US
FunVM2_OsDisk_1_3ce101...	Disk	South Central US

Delete

Cancel

[←](#) [→](#) [⟳](#)<https://portal.azure.com/#@MOD830600.onmicrosoft.com/resource/subscriptions/5abe05c6-b60d-45df-9817-2254e05ed4a7/resourceGroups/AzFUN/providers/Microsoft.Network/virtualNetworks/AzFUN-vnet?view=ResourceGroup-Blade>raid78@msn.com
CONTOSO MOD830600**Microsoft Azure**[Search resources, services, and docs \(G/+\)](#)[Home > Resource groups > AzFUN](#)**AzFUN**
Resource group[Search \(Ctrl+ /\)](#)[Add](#)[Edit columns](#)[Delete resource group](#)[Refresh](#)[Move](#)[Export](#)[CSV](#)[...](#)**1 Delete resource group AzFUN failed**The resource group **AzFUN is locked** and can't be deleted.
Click here to manage locks for this resource group.[Overview](#)[Activity log](#)[Access control \(IAM\)](#)[Tags](#)[Events](#)[Settings](#)[Quickstart](#)[Deployments](#)[Policies](#)[Properties](#)[Locks](#)[Export template](#)[Cost Management](#)[Cost analysis](#)[Subscription \(change\)](#)

Windows Azure MSDN - Visual Studio Ultimate

[Deployments](#)

3 Succeeded

[Subscription ID](#)

5abe05c6-b60d-45df-9817-2254e05ed4a7

[Tags \(change\)](#)[Click here to add tags](#)[Filter by name...](#)[Type == all](#)[Location == all](#)[Add filter](#)Showing 1 to 16 of 16 records. Show hidden types[No grouping](#) Name ↑

Type ↑

Location ↑

 AzFUN-vnet

Virtual network

West US 2

 azfundiag640

Storage account

South Central US

 azfundiag743

Storage account

West US 2

 AzFUNvnet913

Virtual network

South Central US

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AzFUN - Locks

Resource group

[🔍 Search \(Ctrl+/-\)](#)[+ Add](#) [🔒 Subscription](#) [⟳ Refresh](#)[Overview](#)[Activity log](#)[Access control \(IAM\)](#)[Tags](#)[Events](#)

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Lock name	Lock type	Scope	Notes
Cantchange	Read-only	funvm2	Edit
cantdelete	Delete	azfun	Edit

[←](#) [→](#) [⟳](#)

X

<https://portal.azure.com/#@MOD830600.onmicrosoft.com/resource/subscriptions/5abe05c6-b60d-45df-9817-2254e05ed4a7/resourceGroups/AzFUN/providers/Microsoft.Compute/virtualMachines/FunVM2>

...

**Microsoft Azure**

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CONTOSO MOD830600[Home > Resource groups > AzFUN - Locks > FunVM2](#)[+ Create a resource](#)[Home](#)[Dashboard](#)[All services](#)[★ FAVORITES](#)[All resources](#)[Templates](#)[Azure Active Directory](#)[Resource groups](#)[Virtual networks](#)[Network security groups](#)[Load balancers](#)[Network Watcher](#)[Storage accounts](#)[Virtual machines](#)[Virtual machine scale sets](#)[Recovery Services vaults](#)[Key vaults](#)**FunVM2**

Virtual machine

[Search \(Ctrl+ /\)](#)[Overview](#)[Activity log](#)[Access control \(IAM\)](#)[Tags](#)[Diagnose and solve problems](#)[Settings](#)[Networking](#)[Connect](#)[Disks](#)[Size](#)[Security](#)[Extensions](#)[Continuous delivery](#)[Availability + scaling](#)[Connect](#)[Start](#)[Restart](#)[Stop](#)[Capture](#)[Delete](#)[Refresh](#)[Stop](#)Azure Spot
N/APublic IP address
13.84.182.112Private IP address
10.0.1.4Public IP address (IPv6)
-Private IP address (IPv6)
-Virtual network/subnet
AzFUNvnet913/defaultDNS name
[Configure](#)Scale Set
N/AResource group ([change](#))

azfun

Status

Running

Location

South Central US

Subscription ([change](#))

Windows Azure MSDN - Visual Studio Ultimate

Subscription ID

5abe05c6-b60d-45df-9817-2254e05ed4a7

Computer name

FunVM2

Operating system

Windows (Windows Server 2016 Datacenter)

Size

Standard D2s v3 (2 vcpus, 8 GiB memory)

Tags ([change](#))[Click here to add tags](#)[Show data for locks](#)

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Availability + scaling

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azfun

Status

Running

Location

South Central US

Subscription (change)

Windows Azure MSDN - Visual Studio Ultimate

Subscription ID

5abe05c6-b60d-45df-9817-2254e05ed4a7

Computer name

FunVM2

Operating system

Windows (Windows Server 2016 Datacenter)

Size

Standard D2s v3 (2 vcpus, 8 GiB memory)

Tags (change)

[Click here to add tags](#)

Failed to stop virtual machine

Failed to stop the virtual machine 'FunVM2'. Error: The scope 'FunVM2' cannot perform write operation because following scope(s) are locked: '/subscriptions/5abe05c6-b60d-45df-9817-2254e05ed4a7/resourceGroups/AzFUN/providers/Microsoft...'. Please remove the lock and try again.

Public IP address

13.84.182.112

Private IP address

10.0.1.4

Public IP address (IPv6)

-

Private IP address (IPv6)

-

Virtual network/subnet

AzFUNvnet913/default

DNS name

[Configure](#)

Scale Set

N/A

Azure Blueprints

Create reusable environment definitions that can recreate your Azure resources and apply your policies instantly.

- Help audit and trace your deployments, and maintain compliance using built-in tools and artifacts.
- Associate blueprints with specific Azure DevOps build artifacts, and release pipelines, for rigorous tracking.



Subscription Governance

There are mainly three aspects to consider in relation to creating and managing subscriptions.

- **Billing.** Reports and chargeback can be generated per subscriptions
- **Access Control.** A subscription is a deployment boundary for Azure resources and can set up role-based access control.
- **Subscription Limits.** Subscriptions are also bound to some hard limitations. If there is a need to go over those limits, then additional subscriptions may be needed. If you hit a hard limit, there is no flexibility.

Tags

- Provides metadata for your Azure resources.
- Logically organizes resources into a taxonomy.
- Consists of a name-value pair.
- Very useful for rolling up billing information.



cost-center: marketing

Azure Monitor

Collect, analyze, and act on telemetry from cloud and on-premises environments, to maximize your applications' availability and performance.

- Starts collecting data as soon as you create an Azure subscription and add resources.
- **Activity Logs** record all resource creation and modification events.
- Metrics measure resource performance and consumption.
- Add an Azure monitor agent to collect operational data for a resource.



Monitoring applications and services

Integrate Azure Monitor with other Azure services to improve your data monitoring capabilities and gain better insights into your operations.

Analyze	Use variants of Azure Monitor for resources (containers, virtual machines, etc.), with Azure Application Insights for applications.
Respond	Azure Alerts can respond proactively to critical conditions identified in your monitor data and use Auto-scale with Azure Monitor Metrics.
Visualize	Use Azure Monitor data to create interactive visualizations, charts, and tables with Power BI.
Integrate	Integrate Azure Monitor with other systems to build customized solutions to suit your needs and requirements.

Azure Service Health

Evaluate the impact of Azure service issues with personalized guidance and support, notifications, and issue resolution updates.

Components of Azure service health :

- Azure Status provides a global overview Azure services' state of health.
- Service Health has a customizable dashboard for tracking the state of services in the regions you use.
- Azure Resource Health can diagnose and obtain support for Azure service issues affecting your resources.



Azure Advisor



- Analyzes your deployed Azure resources and recommends ways to improve availability, security, performance, and costs.
- Get proactive, actionable, and personalized best practice recommendations.
- Improve the performance, security, and availability of your resources.
- Identify opportunities to reduce your Azure costs.

Lesson 07: Privacy, compliance, and data protection standards



Compliance Terms and Requirements

Microsoft provides the most comprehensive set of compliance offerings (including certifications and attestations) of any cloud service provider. Some compliance offerings include.

CJIS (Criminal Justice Information Services)	HIPAA (Health Insurance Portability and Accountability Act)
CSA STAR Certification	ISO/IEC 27018
General Data Protection Regulation (GDPR)	National Institute of Standards and Technology (NIST)

<https://azure.microsoft.com/en-us/overview/trusted-cloud/>[Contact Sales](#)[Search](#)[My account](#)[Portal](#)[Sign in](#)[Overview](#)[Solutions](#)[Products](#) ▾[Documentation](#)[Pricing](#)[Training](#)[Marketplace](#) ▾[Partners](#) ▾[Support](#) ▾[Blog](#)[More](#) ▾[Free account](#) >

Trust your cloud

Get security from the ground up—backed by a team of experts, and proactive compliance trusted by enterprises, governments, and startups.

[Learn more](#)



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CSA STAR Attestation	CNSSI	C5 (Germany)	LOPD (Spain)	AFM/DNB (Netherlands)	GxP (US)
CSA STAR Certification	DFARS	CS Mark Gold (Japan)	MeitY (India)	AMF/ACPR (France)	HIPAA (US)
CSA STAR Self-Assessment	DoD L 2,4,5	Cyber Essentials Plus (US)	MTCS Level 3 (Singapore)	APRA (Australia)	HITRUST (US)
ISO 20000	DoE 10	DJCP (China)	My Number Act (Japan)	CDSA	KNF (Poland)
ISO 22301	EAR	EN 301 549 (EU)	New Zealand CC Framework	CFTC 131 (US)	MARS-E (US)
ISO 27001	FDA CFR Title 21	ENISA IAF (EU)	PASF (UK)	DPP (UK)	MAS/ABS (Singapore)
ISO 27017	FedRAMP	ENS (Spain)	PIPEDA (Canada)	EBA (EU)	MPAA (US)
ISO 27018	FIPS 140-2	EU Model Clauses	PDPA (Argentina)	FACT (UK)	NBB/FSMA (Belgium)
ISO 9001	IRS 1075	EU-US Privacy Shield	TISAX (Germany)	FCA/PRA (UK)	NEN 7510 (Netherlands)
SOC 1,2,3	ITAR	GB 18030 (China)	TRUCS (China)	FERPA (US)	NHS IG (UK)
WCAG 2.0	NIST CSF	G-Cloud OFFICIAL (UK)	TruSight	FFIEC (US)	OSFI (Canada)
	NIST 800-171	GDPR		FINMA (Switzerland)	PCI DSS

<https://portal.azure.com/#@MOD830600.onmicrosoft.com/resource/subscriptions/5abe05c6-b60d-45df-9817-2254e05ed4a7/res...>raid78@msn.com
CONTOSO MOD830600

Microsoft Azure



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



Home > Resource groups > AzFUN - Locks > FunVM2



Create a resource

Home

Dashboard

All services

FAVORITES

All resources

Templates

Azure Active Directory

Resource groups

Virtual networks

Network security groups

Load balancers

Network Watcher

Storage accounts

Virtual machines

Virtual machine scale sets

Recovery Services vaults

Key vaults

FunVM2

Virtual machine

Search (Ctrl+ /)

[Connect](#) [Start](#) [Restart](#) [Stop](#) [Capture](#) [Delete](#) [Refresh](#)

Resource group (change)

azfun

Azure Spot

N/A

Status

Running

Public IP address

13.84.182.112

Location

South Central US

Private IP address

10.0.1.4

Subscription (change)

Windows Azure MSDN - Visual Studio Ultimate

Public IP address (IPv6)

-

Subscription ID

5abe05c6-b60d-45df-9817-2254e05ed4a7

Private IP address (IPv6)

-

Computer name

FunVM2

Virtual network/subnet

AzFUNvnet913/default

Operating system

Windows (Windows Server 2016 Datacenter)

DNS name

Configure

Size

Standard D2s v3 (2 vcpus, 8 GiB memory)

Scale Set

N/A

Tags (change)

[Click here to add tags](#)[Show data for locks](#)

[Home](#)[Search resources, services, and docs \(G+\)](#)[Star](#) [Star](#) [File](#) [Help](#) [?](#) [Smiley](#) [Gear](#) [Feedback](#) [Refresh](#) [User](#) [More](#)[Microsoft Azure](#)raid78@msn.com
CONTOSO MOD830600[Home > Advisor](#)

Advisor

[Search \(Ctrl+/\)](#)[Feedback](#) [Download as CSV](#) [Download as PDF](#)[Refreshing recommendations](#)

Refreshing Recommendations for Azure Advisor

We're updating recommendations for your subscriptions. This could take some time... [View details →](#)



High Availability



2 Recommendations



1 Impacted resource



Security



0 Recommendation



0 Impacted resource



Performance



0 Recommendation



Operational Excellence



1 Recommendation

[Is Advisor helpful?](#)



Advisor - High Availability

[Documentation](#)

Search (Ctrl+ /)

Feedback

Download as CSV

Download as PDF

Create alert

Manage alert rules

Overview

Recommendations

High Availability

Security

Performance

Operational Excellence

Cost

All recommendations

Monitoring

Alerts (Preview)

Settings

Configuration

Your recommendations have been loaded

Subscriptions: Windows Azure MSDN - Visual Studio Ultimate – Don't see a subscription? [Open Directory + Subscription settings](#)

All types

Active

No grouping



Total recommendations

2

Recommendations by impact



Impacted resources

1



IMPACT	DESCRIPTION	POTENTIAL BENEFITS	IMPACTED RESOURC...	UPDATED AT
Medium	Enable virtual machine backup to protect your data from corruption and accidental deletion	Improved data resilience and performance	1 Virtual machine	
Medium	Use availability sets for improved fault tolerance	Ensure business continuity through virtual machine resilience	1 Virtual machine	

Are these recommendations helpful?

Microsoft Azure

Search resources, services, and docs (G+)

Documentation X

Home > Advisor - Operational Excellence

Advisor - Operational Excellence

Search (Ctrl+/)

Feedback

Download as CSV

Download as PDF

Create alert

Manage alert rules

Overview

Recommendations

High Availability

Security

Performance

Operational Excellence

Cost

All recommendations

Monitoring

Alerts (Preview)

Settings

Configuration

Create Advisor Alerts to get notified for new recommendations. Create an alert →

Subscriptions: Windows Azure MSDN - Visual Studio Ultimate – Don't see a subscription? [Open Directory + Subscription settings](#)

All types

▼

Active

▼

No grouping

▼

Total recommendations
1Recommendations by impact
0 High impact 0 Medium impact 1 Low impactImpacted resources
1

IMPACT	DESCRIPTION	POTENTIAL BENEFITS	IMPACTED RESOURC...	UPDATED AT
Low	Create an Azure service health alert	Get notified when Azure service issues affect you	1 Subscription	

Are these recommendations helpful?



Add action group

Action group name * ⓘ

test

Short name * ⓘ

test

Subscription * ⓘ

Windows Azure MSDN - Visual Studio Ultimate

Resource group * ⓘ

Default-ActivityLogAlerts

Actions

Action group name *

email

Action Type *

Email/SMS/Push/Voice

Status

Unique name for the acti...

Select an action type

[Privacy Statement](#)[Pricing](#)

OK

Email/SMS/Push/Voice

Add or edit an Email/SMS/Push/Voice action



Email

Email * email@example.com



SMS (Carrier charges may apply)

Country code * 1

Phone number * 1234567890



Azure app Push Notifications

Azure account email ⓘ email@example.com



Voice

Country code 1

Phone number 1234567890

Enable the common alert schema. [Learn more](#)

Yes

No

OK

Azure Government services

Meets the security and compliance needs of US federal agencies, state and local governments, and their solution providers.

Azure Government :



- Separate instance of Azure.
- Physically isolated from non-US government deployments.
- Accessible only to screened, authorized personnel.

Examples of compliant standards : FedRAMP, NIST 800.171 (DIB), ITAR, IRS 1075, DoD L2, L4 & L5, and CJIS.

Azure China 21Vianet

China's first foreign public cloud service provider, in compliance with government regulations.

10101
01010
00100

Azure China 21Vianet features:

10101
01010
00100

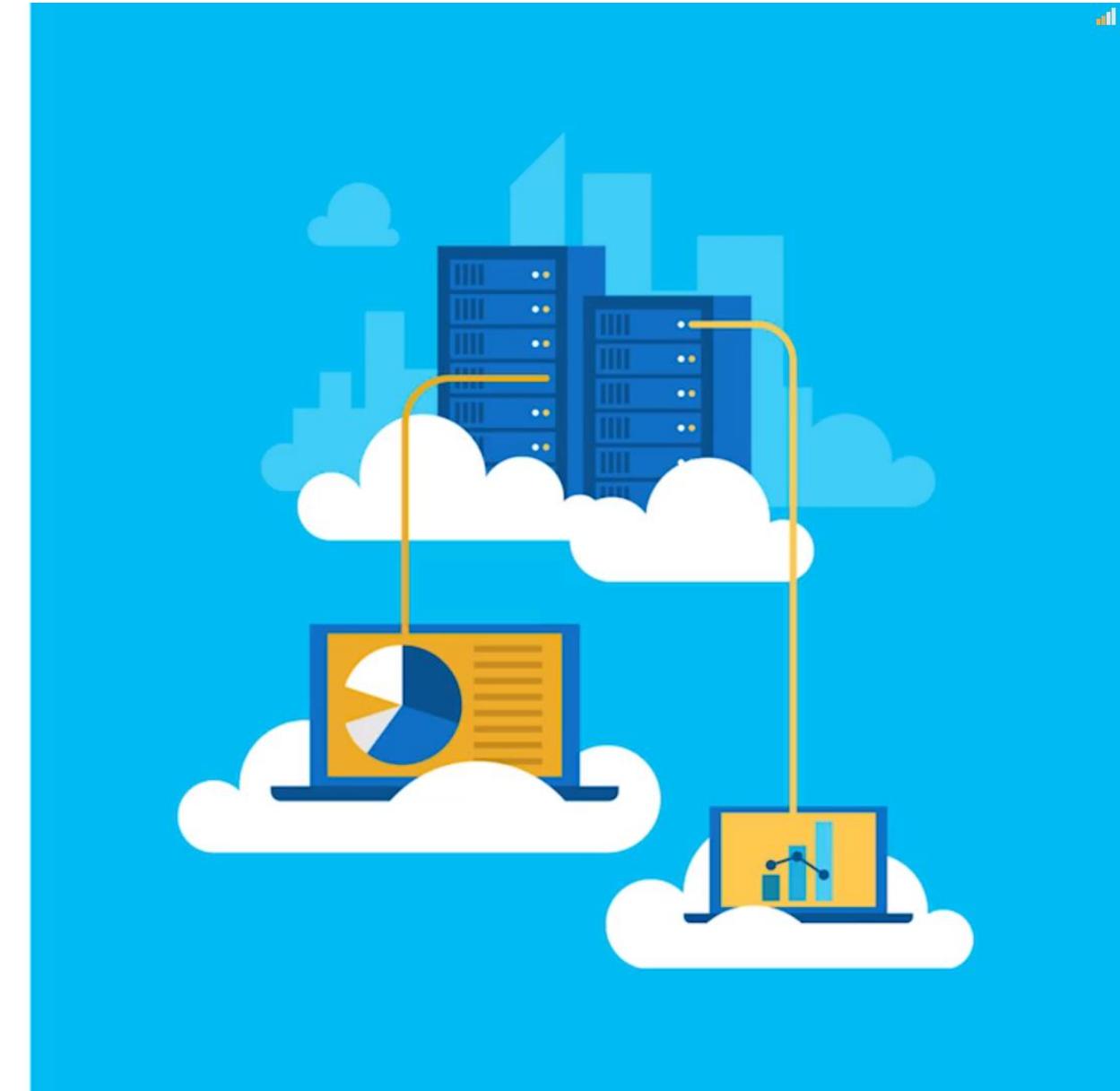
- Physically separated instance of Azure cloud services, located in China.
- Operated by 21Vianet (Azure China 21Vianet).

10101
01010
00100



Microsoft Azure Fundamentals

We will be back in 10
minutes!



Module 4 – Learning objectives

- Understand and describe Microsoft Azure subscriptions and management groups.
- Recognize ways to plan and manage Azure costs.
- Understand Azure support options.
- Understand and describe features of Azure Service Level Agreements (SLAs).
- Understand and describe the service lifecycle in Azure.

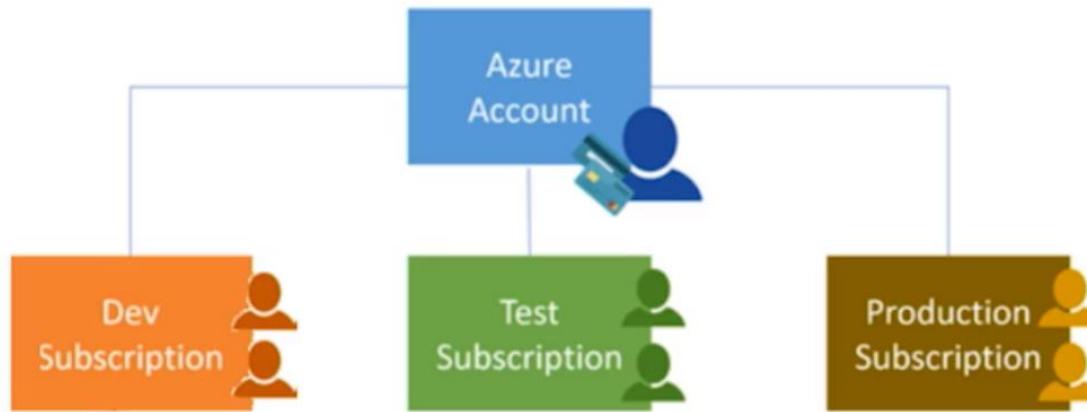
Azure subscriptions

Lesson 02: Azure subscriptions

- An Azure subscription provides you with authenticated and authorized access to Azure accounts.
- Subscriptions can provide billing and access control boundaries.
- An account can have one subscription or multiple subscriptions.



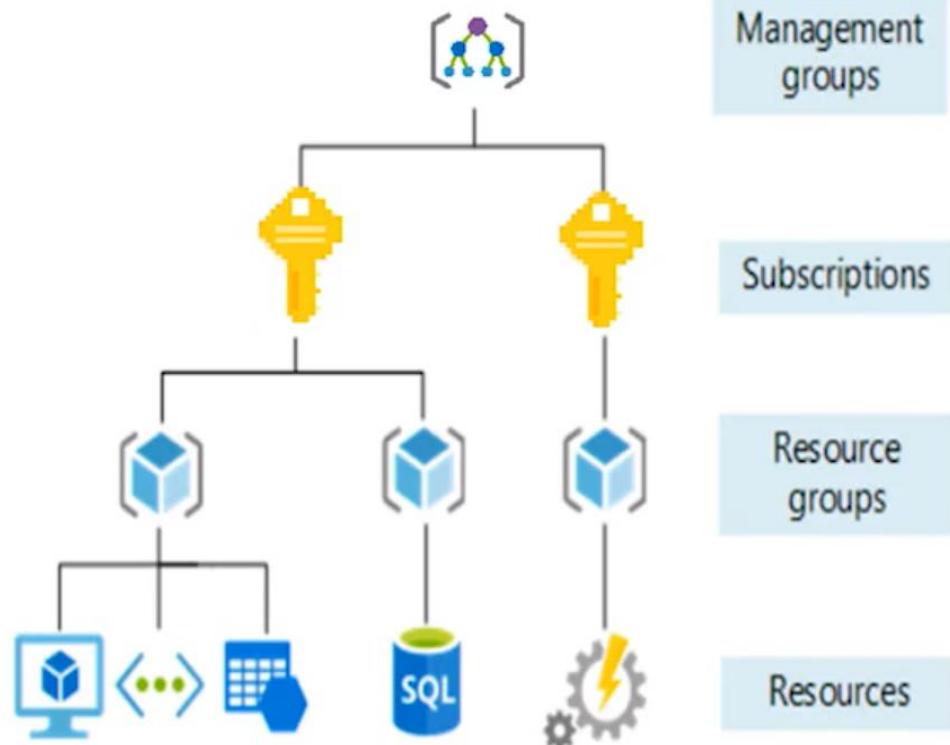
Azure subscriptions



- An Azure subscription provides you with authenticated and authorized access to Azure accounts.
- Subscriptions can provide billing and access control boundaries.
- An account can have one subscription or multiple subscriptions.

Management Groups

- Management groups can include multiple Azure subscriptions.
- Subscriptions inherit conditions applied to the management group.
- 10,000 management groups can be supported in a single directory.
- A management group tree can support up to six levels of depth.



Subscription offers

- Free (next slide)
- Pay-as-you-go
- Enterprise Agreement
- Student
- An account can have one subscription or multiple subscriptions.

SELECT AN OFFER

 Pay-As-You-Go Dev/Test
This offer is for teams of active Visual Studio subscribers to run dev/test workloads on Microsoft Azure, providing discounted rates on Windows virtual machines and access to exclusive images in the Azure Gallery.
[Learn more](#)

 Visual Studio Enterprise: BizSpark
Enjoy monthly credits and lower rates.
Use MSDN software at no additional charge.
[Learn more](#)

 Visual Studio Professional
Enjoy monthly credits and lower rates.
Use MSDN software for development and test at no additional charge.
[Learn more](#)



Azure free account

What do I get?

With your Azure free account, you get all of this—and you won't be charged until you choose to upgrade.

12 months + \$200 credit + Always free

of popular free services

to explore any Azure
service for 30 days

25+ services

- Provides 12 months of our most popular services, a \$200 credit to explore any Azure service for 30 days, and over 25 services are free.
- At the end of the trial you can upgrade to pay-as-you-go pricing.



Free services



Services free for 12 months with the Azure free account

Services that are included for free with your Azure free account. You can use these services within the limits listed below without getting charged. To learn more, see the [Azure free account FAQ](#)



Windows Virtual Machine

COMPUTE

750 hours

B1S

Create Windows virtual machines with on-demand capacity in seconds. [Learn more](#)

[Create](#)

Linux Virtual Machine

COMPUTE

750 hours

B1S

Create Linux virtual machines with on-demand capacity in seconds. [Learn more](#)

[Create](#)

Azure Managed Disks

STORAGE

64 GB x 2

Get premium, secured disk storage for Azure Virtual Machines with simplified management. [Learn more](#)



Azure Blob Storage

STORAGE

5 GB

LRS hot block



Azure File Storage

STORAGE

5 GB

LRS File Storage



SQL Database

DATABASES

250 GB

Free services

Always free services

Services that are always free. You can use these services within the limits listed below without getting charged.



10

Web, mobile or API apps

Quickly create powerful apps for any platform or device using your choice of tools including Node.js and PHP. [Learn more](#)

[Create](#)

1,000,000

requests per month

Process events with a serverless code architecture. [Learn more](#)

[Create](#)

500,000

objects

Enable one-click sign-in to any cloud or on-premises web app for secured identity and access management. [Learn more](#)



50,000



Free



Unlimited

Lesson 03: Planning and managing costs



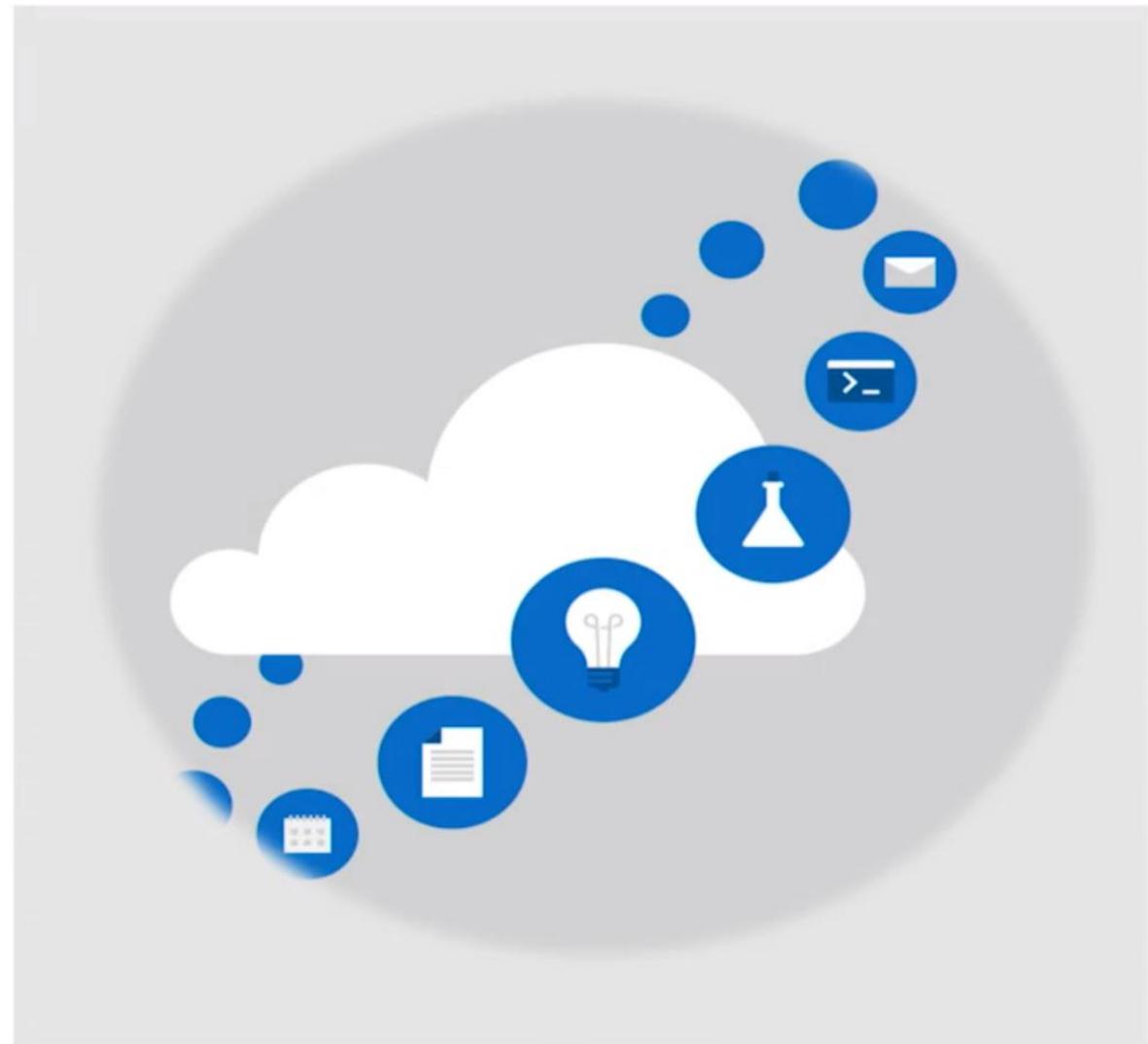
Pricing and purchasing

It depends.

- Enterprise
- CSP
- Web direct

Pricing factors

- Resource type
- Service
- Region



Zones for Billing Purposes

- *Bandwidth* refers to data moving in and out of Azure datacenters. Some inbound data transfers are free, such as data going into Azure datacenters. For outbound data transfers—such as data going out of Azure datacenters—pricing is based on Zones.
- Zone 1 - West US, East US, West Europe, and others.
- Zone 2 - Australia Central, Japan West, Central India, and others.
- Zone 3. - Brazil South only.
- DE Zone 1- Includes Germany Central and Germany Northeast.



Pricing calculator

- Provides a detailed *estimate* of the costs associated with your infrastructure configuration.

Your Estimate



Virtual Machines



1 D2 v3 (2 vCPU(s), 8 GB RAM) x 730 Hours;

\$188.57



Virtual Machines

REGION: West US OPERATING SYSTEM: Windows TYPE: (OS Only)

TIER: Standard

INSTANCE: D2 v3: 2 vCPU(s), 8 GB RAM, 50 GB Temporary storage, \$0.209/hour

Clone

Delete

More info

Pricing details

Product details

Documentation



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Select a product to include it in your estimate.

Search products

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Compute

Networking

Storage

Web

Mobile

Containers

Databases

Analytics

AI + Machine Learning

Internet of Things

Integration

Virtual Machines

Provision Windows and Linux virtual machines in seconds

Virtual Machine Scale Sets

Manage and scale up to thousands of Linux and Windows virtual machines

Azure Kubernetes Service (AKS)

Simplify the deployment, management, and operations of Kubernetes

Azure Functions

Process events with serverless code

Service Fabric

Develop microservices and orchestrate containers on Windows or Linux

App Service

Quickly create powerful cloud apps for web and mobile

Container Instances

Easily run containers on Azure without managing servers

Batch

Cloud-scale job scheduling and compute management

Cloud Services

Create highly-available, infinitely-scalable cloud applications and APIs

Azure VMware Solution by CloudSimple

Windows Virtual Desktop

The best virtual desktop experience,

Azure Spring Cloud

A fully managed Spring Cl

Chat with Sales

<https://azure.microsoft.com/en-us/pricing/calculator/>

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Select a product to include it in your estimate.

Search products

Featured[Compute](#)[Networking](#)[Storage](#)[Web](#)[Mobile](#)[Containers](#)[Databases](#)[Analytics](#)[AI + Machine Learning](#)[Internet of Things](#)[Integration](#)**Virtual Machines**

Provision Windows and Linux virtual machines in seconds

Storage Accounts

Durable, highly available, and massively scalable cloud storage

Azure SQL Database

Managed, intelligent SQL in the cloud

App Service

Quickly create powerful cloud apps for web and mobile

Azure Cosmos DB

Globally distributed, multi-model database for any scale

Azure Kubernetes Service (AKS)

Simplify the deployment, management, and operations of Kubernetes

Azure Functions

Process events with serverless code

Cognitive Services

Add smart API capabilities to enable contextual interactions

Cost Management + Billing

Optimize what you spend on the cloud, while maximizing cloud potential

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Virtual Machines



1 D2 v3 (2 vCPU(s), 8 GB RAM) x 730 Hours; Windows...

\$1,247.62



Virtual Machines

REGION:

West US

OPERATING SYSTEM:

Windows

TYPE:

SQL Server

TIER:

Standard

LICENSE:

SQL Enterprise

INSTANCE:

D2 v3: 2 Cores(s), 8 GB RAM, 50 GB Temporary storage, \$1.709/hour

[Clone](#)[Delete](#)

More info

[Pricing details](#)[Product details](#)[Documentation](#)

Billing Option

Save up to 72% on pay-as-you-go prices with 1-year or 3-year Reserved Virtual Machine Instances. Reserved Instances are great for applications with steady-state usage and applications that require reserved capacity. [Learn more about Reserved VM Instances pricing.](#)

[Chat with Sales](#)



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Free account >

Virtual Machines



1 D2 v3 (2 vCPU(s), 8 GB RAM) x 730 Hours; Windows...

\$152.62



Virtual Machines

REGION:

West US

OPERATING SYSTEM:

Windows

TYPE:

(OS Only)

TIER:

Standard

Basic

Low Priority

Standard

Temporary storage, \$0.209/hour

Clone

Delete

More info

Pricing details

Product details

Documentation

Billing Option

Save up to 72% on pay-as-you-go prices with 1-year or 3-year Reserved Virtual Machine Instances. Reserved Instances are great for applications with steady-state usage and applications that require reserved capacity. [Learn more about Reserved VM Instances pricing.](#)

Chat with Sales

[←](#)[→](#)

https://azure.microsoft.com/en-us/pricing/calculator/#virtual-machines0304b91d-9a9d-46c9-abf8-2ad21ca891cc



...

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REGION:

[West US](#)

OPERATING SYSTEM:

[Windows](#)

TYPE:

(OS Only)

TIER:

[Standard](#)

INSTANCE:

[D2 v3: 2 vCPU\(s\), 8 GB RAM, 50 GB Temporary storage, \\$0.209/hour](#)

More info

[\\$ Pricing details](#)[i Product details](#)[Documentation](#)

Billing Option

Save up to 72% on pay-as-you-go prices with 1-year or 3-year Reserved Virtual Machine Instances. Reserved Instances are great for applications with steady-state usage and applications that require reserved capacity. [Learn more about Reserved VM Instances pricing.](#)



- Pay as you go
- 1 year reserved (~18% savings)
- 3 year reserved (~32% savings)

Save up to 40% with Windows Server Licenses you already own. [Learn more about Azure Hybrid Benefit to save compute costs.](#)

[Chat with Sales](#)

Billing Option

Save up to 72% on pay-as-you-go prices with 1-year or 3-year Reserved Virtual Machine Instances. Reserved Instances are great for applications with steady-state usage and applications that require reserved capacity. [Learn more about Reserved VM Instances pricing.](#)

- Pay as you go
- 1 year reserved (~18% savings)
- 3 year reserved (~32% savings)

Save up to 40% with Windows Server Licenses you already own. [Learn more about Azure Hybrid Benefit to save compute costs.](#)



1
Virtual machines

= \$104.21

Effective cost per month

Reservation will be charged upfront for the entire 3 year duration

Virtual Machines are billed per-second. [Learn more about Virtual Machines pricing.](#)

Billing Option

Save up to 72% on pay-as-you-go prices with 1-year or 3-year Reserved Virtual Machine Instances. Reserved Instances are great for applications with steady-state usage and applications that require reserved capacity. [Learn more about Reserved VM Instances pricing.](#)

- Pay as you go
- 1 year reserved (~18% savings)
- 3 year reserved (~32% savings)

Save up to 40% with Windows Server Licenses you already own. [Learn more about Azure Hybrid Benefit to save compute costs.](#)



1
Virtual machines

= \$37.05

Effective cost per month

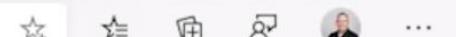
Reservation will be charged upfront for the entire 3 year duration

(~76% savings)



Virtual Machines are billed per-second. [Learn more about Virtual Machines pricing.](#)

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[←](#) [→](#) [⟳](#)<https://azure.microsoft.com/en-us/pricing/calculator/>[Overview](#) [Solutions](#) [Products](#) [Documentation](#) [Pricing](#) [Training](#) [Marketplace](#) [Partners](#) [Support](#) [Blog](#) [More](#)[Portal](#)[Free account >](#)[Included](#)

\$0.00

Programs and Offers

LICENSING PROGRAM:

[Microsoft Online Services Agreement](#)[Microsoft Online Services Agreement](#)[Enterprise Agreement \(EA\)](#)[Microsoft Customer Agreement \(MCA\)](#)

Estimated monthly cost

\$37.10

[Export](#)[Save](#)[Save as](#)[Share](#)

US Dollar (\$)

 DISPLAY SKUs [i](#) DISPLAY RESOURCE IDS [i](#)

Prices are estimates and are not intended as actual price quotes. Actual prices may vary depending upon the date of purchase, currency of payment, and type of agreement you enter with Microsoft. Contact a Microsoft sales representative for additional information on pricing.

[Purchase options >](#)[Chat with Sales](#)

<https://azure.microsoft.com/en-us/pricing/tco/calculator/>[Contact Sales](#) [Search](#) [My account](#)[Portal](#)[Sign in](#)[Overview](#) [Solutions](#) [Products](#) [Documentation](#) [Pricing](#) [Training](#) [Marketplace](#) [Partners](#) [Support](#) [Blog](#) [More](#)[Free account](#) >

Total Cost of Ownership (TCO) Calculator

Estimate the cost savings you can realize by migrating your workloads to Azure

1

[Define your workloads](#)

2

[Adjust assumptions](#)

3

[View report](#)

Define your workloads

Enter the details of your on-premises workloads. This information will be used to understand your current TCO and recommended services in Azure.

Servers

Enter the details of your on-premises server infrastructure. After adding a workload, select the workload type and enter the remaining details.



Workload 1



Workload

[Windows/Linux Server](#)

Environment

[Physical Servers](#)

Operating system

[Windows](#)

Servers

 1
(1 - 9999)

Procs per server

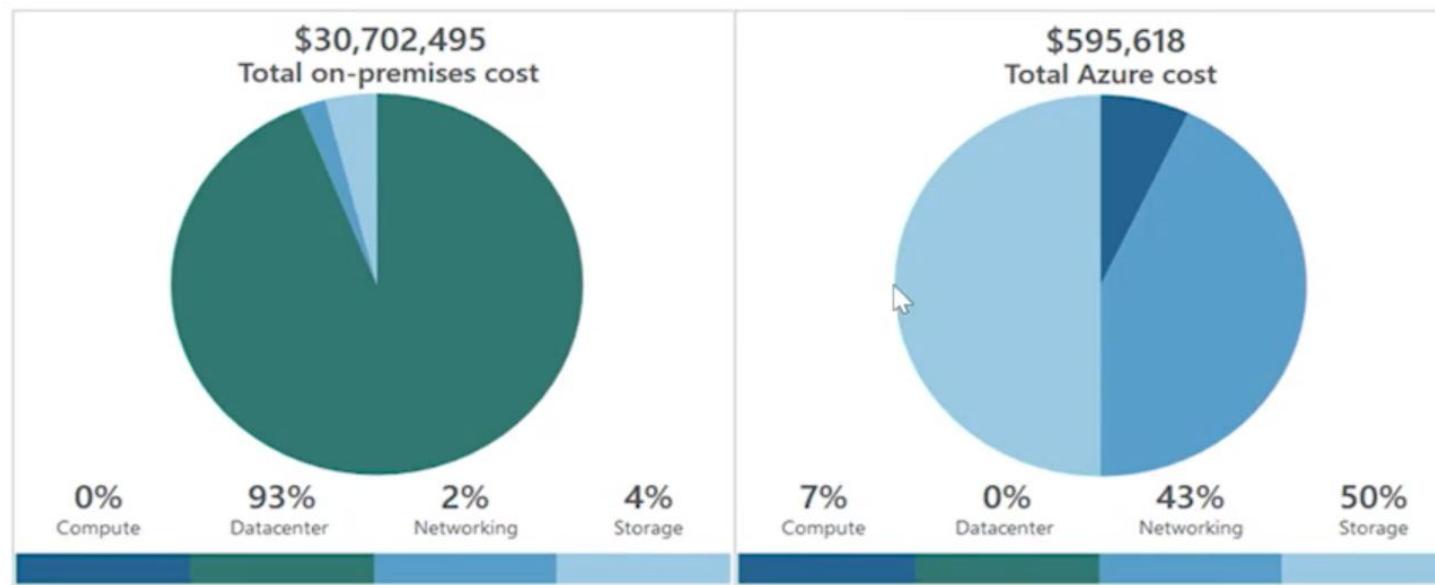
 1
(1 - 4)

Core(s) per proc

[Chat with Sales](#)

Total cost of ownership calculator

- A tool to estimate cost savings you can realize by migrating to Azure.
- A report compares the costs of on-premises infrastructures with the costs of using Azure products and services in the cloud.

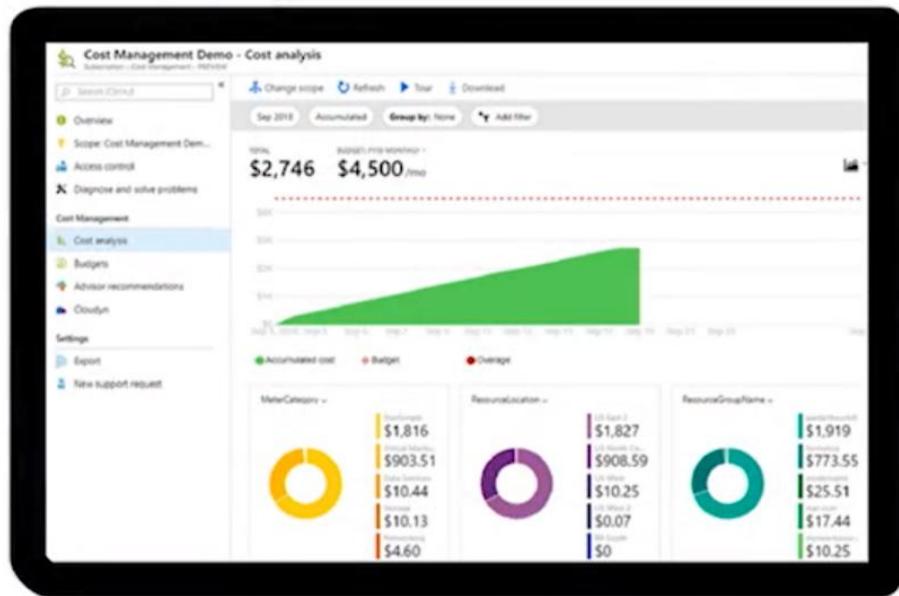


Minimizing costs



Azure Cost Management

- Reporting
- Data enrichment
- Budgets
- Alerting
- Recommendations



Lesson 04: Azure support options



Support plan options

Every Azure subscription includes free access to billing and subscription support

	Basic	Developer	Standard	Professional Direct	Premier
Scope	Available to all Microsoft Azure accounts	Trial and non-production environments	Production workload environments	Business-critical dependence	Substantial dependence across multiple products
Technical Support		Business hours access to Support Engineers via email	24x7 access to Support Engineers via email and phone	24x7 access to Support Engineers via email and phone	24x7 access to Support Engineers via email and phone
Operations Support				Onboarding services, service reviews, Azure Advisor consultations	Technical account manager-led service reviews and reporting

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Training

Azure Engineering-led
web seminarsAzure Engineering-led
web seminars, on-
demand training

Proactive Guidance

ProDirect Delivery
ManagerDesignated Technical
Account Manager

Launch Support

Azure Event
Management
(available for
additional fee)

Pricing

\$29/mo

\$100/mo

\$1,000/mo

[Contact us](#)

¹ For most countries and regions, business hours are from 9:00 AM to 5:00 PM (local time) Monday through Friday, excluding holidays. For North America, business hours are from 6:00 AM to 6:00 PM (Pacific time), Monday through Friday, excluding holidays. In Japan, business hours are from 9:00 AM to 5:30 PM, Monday through Friday, excluding holidays.

Looking for Azure DevOps specific resources? [Explore now](#) >[Chat with Sales](#)

Alternative support channels

-  · Microsoft Developer Network (MSDN) Azure Forums
-  · Stack Overflow
-  · Server Fault
-  · Microsoft Azure general feedback
-  · @AzureSupport

Knowledge Center

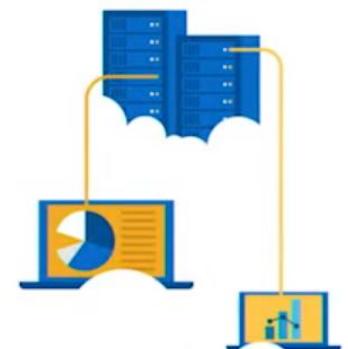
A searchable database that contains support questions and answers from a community of Azure experts, developers, customers, and users.

The screenshot shows the Microsoft Azure Knowledge Center homepage. At the top, there's a search bar with the query "virtual machines" and a "Filter by product" dropdown set to "Browse". Below the search bar, a heading says "Questions matching 'virtual machines'". There are three main sections of questions listed:

- About the features in Azure Backup**
Learn More | [Learn more >](#)
- Am I billed separately for local disk storage?**
No. All new virtual machines have an operating system disk and a local disk (or "resource disk"). We don't charge for local disk storage. The operating system disk is charged at the regular rate for disks.
See all virtual machines config... | [Learn more >](#)
- Are data transfers over the VPN connection charged separately?**
Data transfers over the VPN connections to your on-premises sites or the internet in general are charged separately at the regular data transfer rate.
[Learn more >](#)
- Are there additional diagnostics for Azure VM reboot issues?**
Learn More | [Learn more >](#)

Let's Take A Look:

Open a Support Request



Microsoft Azure

Search resources, services, and docs (G+)

[Create a resource](#)[Home](#)[Dashboard](#)[All services](#)

★ FAVORITES

[Virtual machine scale sets](#)[Recovery Services vaults](#)[Key vaults](#)[Advisor](#)[Monitor](#)[Security Center](#)[Blueprints](#)[Policy](#)[Tags](#)[Help + support](#)[Service Health](#)[Subscriptions](#)[Marketplace](#)[Home > Help + support](#)

Help + support

Search (Ctrl+ /)

[Overview](#)

Support

[New support request](#)[All support requests](#)[Support Plans](#)[Service Health](#)[Advisor](#)[Get started with Azure](#)

Have you tried one of these?

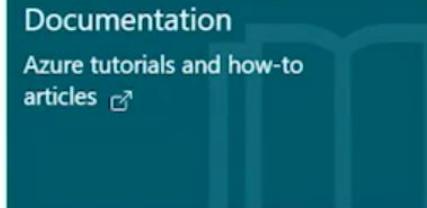
Get started

Learn about Azure's most-used features



Documentation

Azure tutorials and how-to articles



Learn about billing

Tips for monitoring usage and understanding your bill



Community



MSDN Forums

Information and discussion by Microsoft and the community

[MSDN forums](#)

Stack Overflow

Answers to a wide range of Azure programming issues

[Azure @ Stack Overflow](#)

@AzureSupport

Quickly connect with our problem solving experts

[Tweet @AzureSupport](#)

Recent support requests

[+ New support request](#) | Choose the right support plan

Title	ID	Created	Subscription	Resource type
-------	----	---------	--------------	---------------

Loading



Microsoft Azure



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

raid78@msn.com
CONTOSO MOD830600

Home > Virtual machines > FunVM2 - New support request

Create a resource

Home

Dashboard

All services

FAVORITES

All resources

Templates

Azure Active Directory

Resource groups

Virtual networks

Network security groups

Load balancers

Network Watcher

Storage accounts

Virtual machines

Virtual machine scale sets

Recovery Services vaults

Key vaults

FunVM2 - New support request

Search (Ctrl+ /)

Basics

Solutions

Details

Review + create

- Metrics
- Diagnostic settings
- Advisor recommendations
- Logs
- Connection monitor

Support + troubleshooting

- Resource health
- Boot diagnostics
- Performance diagnostics (Pr...)
- Reset password
- Redeploy
- Serial console
- Connection troubleshoot

New support request

Create a new support request to get assistance with billing, subscription, technical (including advisory) or quota management issues.

Complete the Basics tab by selecting the options that best describe your problem. Providing detailed, accurate information can help to solve your issues faster.

* Issue type

Technical

* Subscription

Windows Azure MSDN - Visual Studio Ult...

Can't find your subscription? [Show more](#) My services All services

Virtual Machine running Windows

FunVM2

In a few words, describe your issue

Loading...

Next: Solutions >>

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New support request

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Create a new support request to get assistance with billing, subscription, technical (including advisory) or quota management issues.

Complete the Basics tab by selecting the options that best describe your problem. Providing detailed, accurate information can help to solve your issues faster.

* Issue type

- Select an issue type
- Billing
 - Service and subscription limits (quotas)
 - Subscription management
 - Technical

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New support request

Basics Solutions Details

Create a new support request to get assistance with management issues. Complete the Basics tab by selecting the options that information can help to solve your issues faster.

* Issue type

* Subscription

* Service

Azure Active Directory

- Azure Active Directory Domain Services (VM – Domain Controllers)

Compute

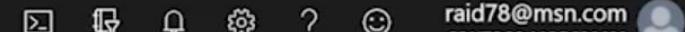
- Cloud Services (Web roles/Worker roles)
- Container Service
- Dedicated Host
- Function App
- Kubernetes Service (AKS)
- Virtual Machine running Linux

Select a service

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Complete the Basics tab by selecting the options that best describe your problem. Providing detailed, accurate information can help to solve your issues faster.

* Issue type

* Subscription

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* Service

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* Resource

* Summary

* Problem type

* Problem subtype

Stopped and deallocated

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Want a solution right now?
Try following the recommended steps below. These solutions are written by Azure engineers, and will solve most common issues.

The virtual machine is not running [Download](#)

We have detected that the virtual machine (VM) RBACTestVM is not currently running. To run additional diagnostic tests, the VM must be running.

Recommended Steps

- Please [start](#) the VM RBACTestVM, so that we may run additional diagnostic tests

Was this helpful? Yes No

Recommended Solution

4 out of 5 customers resolved their VM connectivity issue using the steps listed below.

Recommended Steps

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With your current support plan, you can create requests for billing, subscription management and quota increase.

For technical support, upgrade to a paid support plan or explore our free resources.

Get expert technical support



From \$29/month, our support plans provide access to expert 1:1 technical support.

[View plans](#)

Ask our community



Whether you have a technical support plan or not, you have access to a large community of experts and Microsoft engineers who can help you.

[Azure Community Support](#)

ADDITIONAL RESOURCES

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Service Level Agreements (SLAs)

- SLAs document the specific terms that define Azure performance standards.
- SLAs define Microsoft's commitment to an Azure service or product.
- Individual SLAs are available for each Azure product and service.
- SLAs also define what happens if a service or product fails to meet the designated availability commitments.



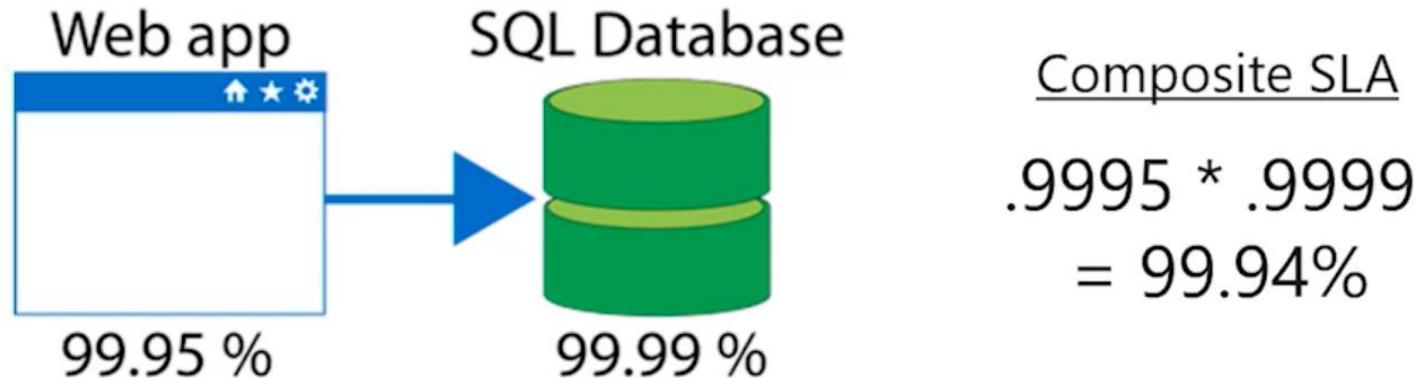
SLAs for Azure products and services

- Performance targets are expressed as uptime and connectivity guarantees.
- Performance-targets range from 99.9% (three nines) to 99.99% (four nines).
- If a service fails to meet the guarantees, a percentage of the monthly service fees can be credited to you.

SLA	Downtime per month	Downtime per year
99.9%	43.2 minutes	8.76 hours
99.95	21.6 minutes	4.38 hours
99.99	4.32 minutes	52.56 minutes

Composite SLAs

- If the App Service has a 99.95% SLA, and the Azure SQL Database has a 99.99% SLA, what is the composite SLA for your application?



- Notice the composite SLA is lower than the individual SLAs.
- Improve the SLA by creating independent fallback paths.

Application SLAs

- Customers should determine what SLA is needed for their application.
- Know your workload requirements and usage patterns.
- Design for resiliency and availability.
- Establish availability metrics — mean time to recovery (MTTR) and mean time between failures (MTBF).
- Establish recovery metrics — recovery time objective and recovery point objective (RPO).
- Implement resiliency strategies.
- Build in availability requirements.

Lesson 06: Service lifecycle in Azure



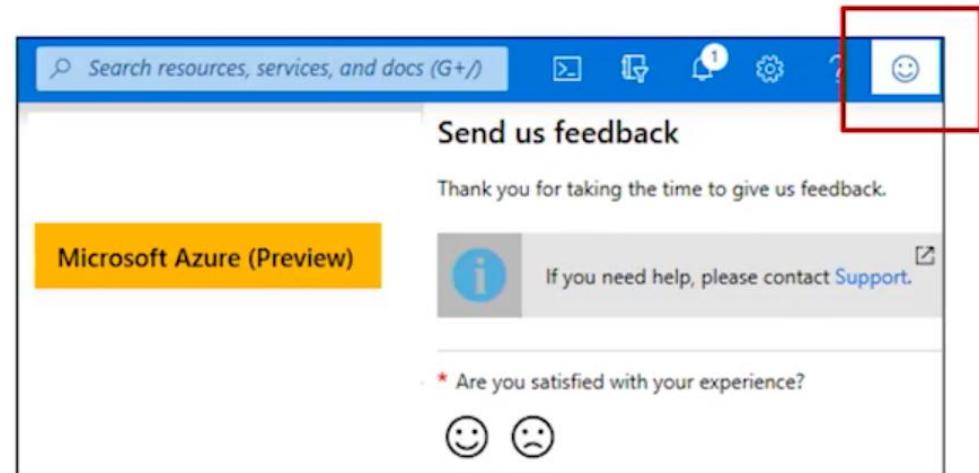
Service Lifecycle

- Cost
- SLA
- Support

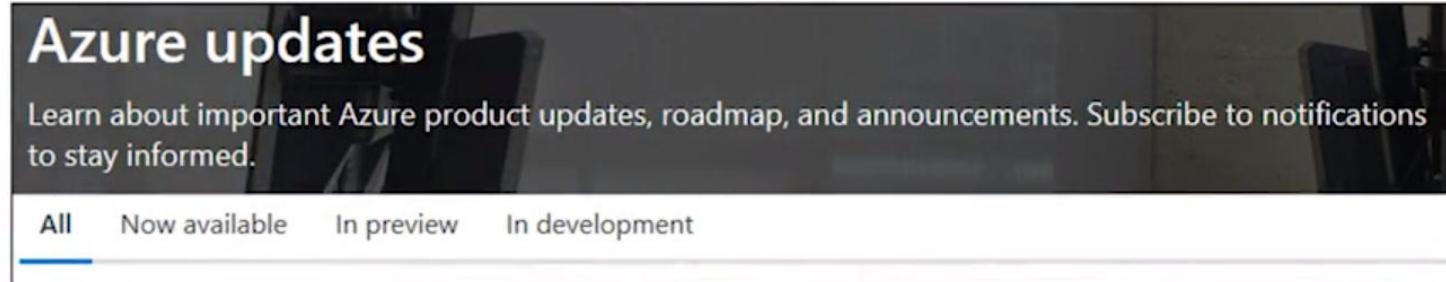


Accessing Azure Portal preview

- Access the Azure Portal (Preview) - <https://preview.portal.azure.com>.
- Provide feedback on new features such as full-screen blades, performance, navigation, notifications, and accessibility improvements.
- Check out the Azure Portal feedback forum.



Monitoring service and feature updates



- Azure updates provides information about the Azure products, services, and features, and product roadmaps, and availability.
- View details about all Azure updates and their status.
- Browse and search for updates.
- Subscribe to Azure update notifications by RSS.



Microsoft Azure Fundamentals

Thank you for joining us today!

