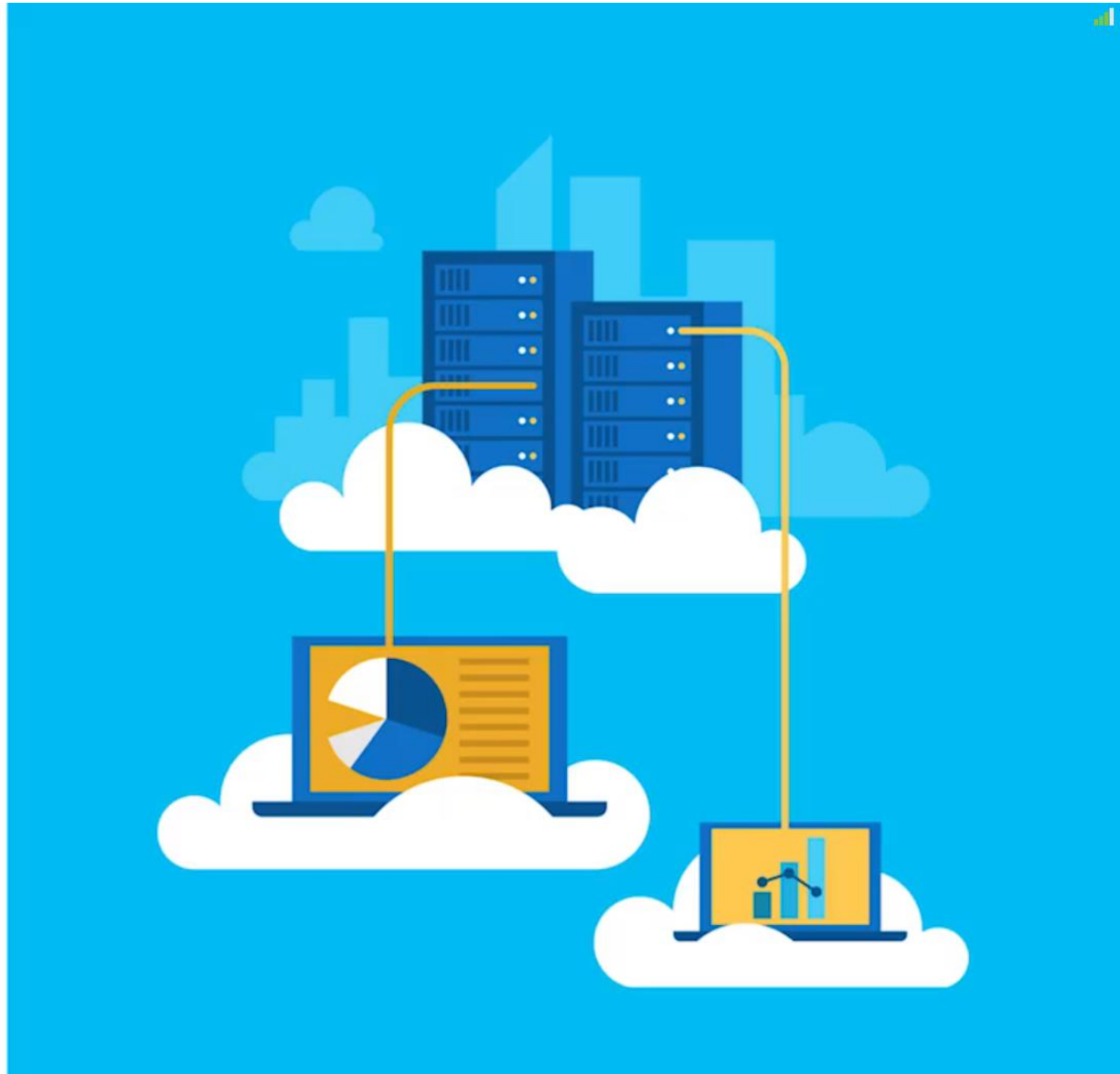


# Microsoft Azure Fundamentals



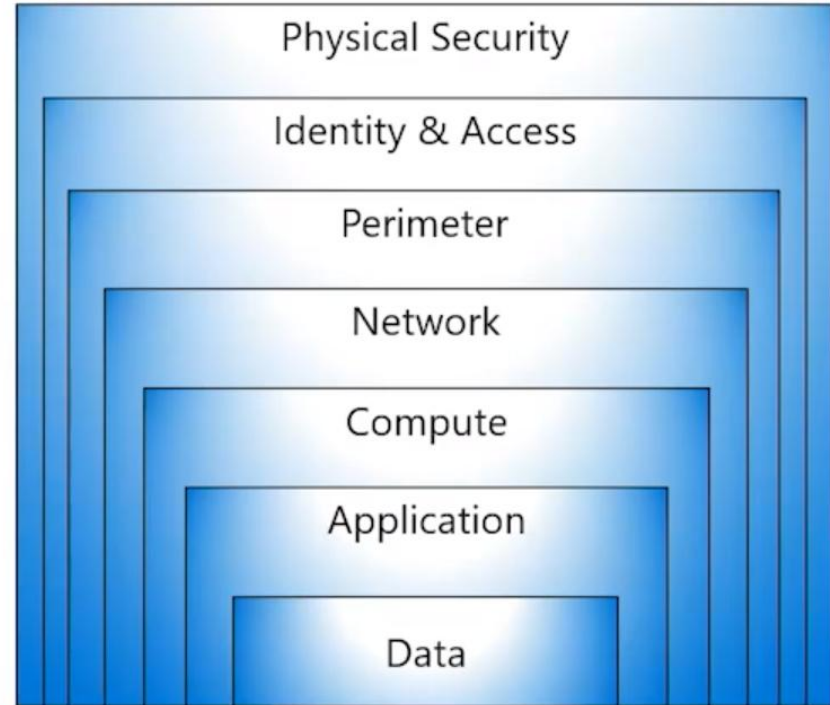


## Module 3 – Learning objectives

- 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)

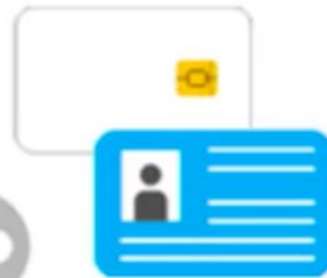
# Azure Multi-Factor Authentication

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

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

Username  
user@example.com

Password  
\*\*\*\*\*





# 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.

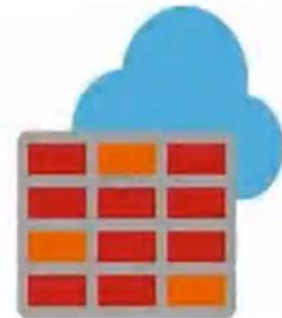
- **Perimeter layer** protects your networks' boundaries with Azure DDoS Protection and Azure Firewall.
- **Networking layer** only permits traffic to pass between networked resources with Network Security Group (NSG) inbound and outbound rules.



# 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



+ 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

Home > Network security groups

## 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](#)

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... ⋮



- 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

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

+ Add Default rules Refresh

Priority	Name	Port	Protocol	Source	
No results.					

- Create a resource
- Home
- Dashboard
- All services
- FAVORITES
- All resources
- Templates
- Azure Active Directory
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- Network security groups
- Load balancers
- Network Watcher
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- Virtual machines
- Virtual machine scale sets
- Recovery Services vaults
- Key vaults

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

- Create a resource
- Home
- Dashboard
- All services
- FAVORITES
- All resources
- Templates
- Azure Active Directory
- Resource groups
- Virtual networks
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- Storage accounts
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- Virtual machine scale sets
- Recovery Services vaults
- Key vaults

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 \* ⓘ

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

- Create a resource
- Home
- Dashboard
- All services
- FAVORITES
- All resources
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- Recovery Services vaults
- Key vaults

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 \* ⓘ

Service Tag

Source service tag \* ⓘ

Internet

- Internet
- VirtualNetwork
- AzureLoadBalancer
- ApiManagement
- GatewayManager
- AzureActiveDirectory
- AzureMonitor
- BatchNodeManagement
- AzureActiveDirectoryDomainServices

Add

- + 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-nsg - Inbound security rules

Network security group

✔️ Created security rule  
Successfully created security rule 'RDP2'.

+ 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

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

- Home > Network Watcher
- ### Network Watcher
- Microsoft
- 
- Overview
  - 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

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](#)

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

Details

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

- Home > Network Watcher - Topology
- ### Network Watcher - Topology
- Search (Ctrl+)
- Overview
  - 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

Download topology

Subscription ⓘ Windows Azure MSDN - Visual Stu...  
Resource Group ⓘ Select resource group

Virtual Network ⓘ Waiting for resource group selection

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

Home > Network Watcher - Topology

## Network Watcher - Topology

Search (Ctrl+)

Overview

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

Download topology

Subscription

Windows Azure MSDN - Visual Stu...

Resource Group

AzFUN

Virtual Network

Select virtual network





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

Home > Network Watcher - IP flow verify

## Network Watcher - IP flow verify

Microsoft

Search (Ctrl+)

Overview

### 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

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

- Create a resource
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- Load balancers
- Network Watcher
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- Virtual machines
- Virtual machine scale sets
- Recovery Services vaults

- Home > Network Watcher - Next hop
- Search (Ctrl+)
- Overview
- 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

### Network Watcher - Next hop

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: -  
Oldest 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



# Microsoft Azure Backup

Microsoft Azure Backup support

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

### Jobs

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
- About Microsoft Azure Recovery ...
- Privacy & Cookies
- View
- Help

### Microsoft Azure Backup

Microsoft Azure Backup support

**⚠ 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

## 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-0oeg3iu.

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

- Backup
  - Register Server
  - Schedule Backup
  - Recover Data
  - Change Properties
  - Open Portal
  - About Microsoft Azure Recovery ...
- Privacy & Cookies
- View
- Help



- Create a resource
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- Network security groups
- Load balancers
- Network Watcher
- Storage accounts
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- Virtual machine scale sets
- Recovery Services vaults
- Key vaults
- Advisor
- Monitor

Home > Key vaults

## Key vaults

Contoso MOD830600

+ Add Edit columns Refresh Export to CSV Assign tags Feedback

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

Showing 1 to 1 of 1 records. No grouping

<input type="checkbox"/>	Name ↑↓	Type ↑↓	Resource group ↑↓	Location ↑↓	Subscription ↑↓	Tags
<input type="checkbox"/>	<a href="#">AZ103keyvault</a>	Key vault	az103Ready	East US	Windows Azure MSD...	...

- Create a resource
- Home
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- Virtual networks
- Network security groups
- Load balancers
- Network Watcher
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- Virtual machine scale sets
- Recovery Services vaults
- Key vaults
- Advisor
- Monitor

Home > Key vaults > AZ103keyvault - Secrets

### AZ103keyvault - Secrets

Key vault

- Search (Ctrl+/)
- 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	
azbacklaptop		✓ Enabled	
JDAVMBBackup	Backup secret from JDAVM	✓ Enabled	
ServerBackup		✓ Enabled	
test		✓ Enabled	
Win10vmBackup		✓ Enabled	

- Create a resource
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- Virtual machine scale sets
- Recovery Services vaults
- Key vaults
- Advisor
- Monitor

Home > Key vaults > AZ103keyvault - Secrets > azbackuplaptop > 89afb82cd0145b7bdfa528cc04a0b0c

## 89afb82cd0145b7bdfa528cc04a0b0c

Secret Version

Save Discard

### Properties

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

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

### Secret Identifier

https://az103keyvault.vault.azure....

Copy to clipboard

### Settings

Set activation date?

Set expiration date?

Enabled?  Yes  No

Tags >

0 tags

### Secret

- Create a resource
- Home
- Dashboard
- All services
- FAVORITES
- Resource groups
- Virtual networks
- Network security groups
- Load balancers
- Network Watcher
- Storage accounts
- Virtual machines
- Virtual machine scale sets
- Recovery Services vaults
- Key vaults
- Advisor
- Monitor

Home > Key vaults > AZ103keyvault - Secrets > azbackuptaptop > 89afb82cd0145b7bdfa528cc04a0b0c

### 89afb82cd0145b7bdfa528cc04a0b0c Secret Version

Save Discard

Settings

Set activation date?

Set expiration date?

Enabled? **Yes**  
No

Tags

0 tags

Secret

Content type (optional)

Show Secret Value

Secret value

.....

Copied

# Microsoft Azure Backup

Microsoft Azure Backup support

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

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

Jobs Alerts

Status	Time	Message
	2/28/2020 6:26 PM	Recovery...

### 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-0oeq3iu.
- jdavm1.
- win10vm.
- win10vm1.

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

Passphrase:

### Actions

- Backup
  - Register Server
  - Schedule Backup
  - Recover Data
  - Change Properties
  - Open Portal
  - About Microsoft Azure Recovery ...
- Privacy & Cookies
- View
- Help

# Azure Information Protection (AIP)

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

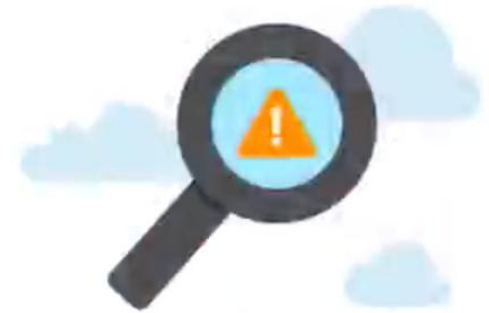
- Automatically using rules and conditions defined by administrators.
- Manually, by users.
- By combining automatic and manual methods, guided by recommendations.



# 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.

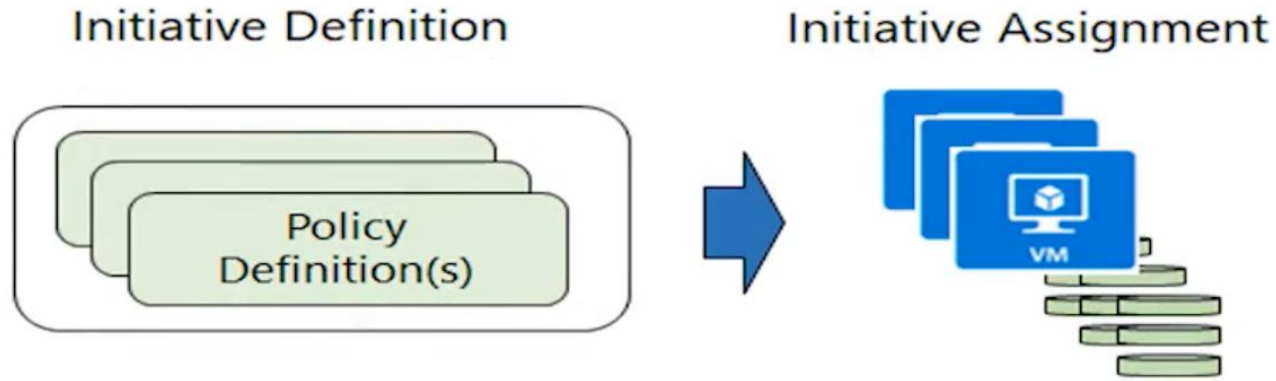


# Implementing Azure Policy



- 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

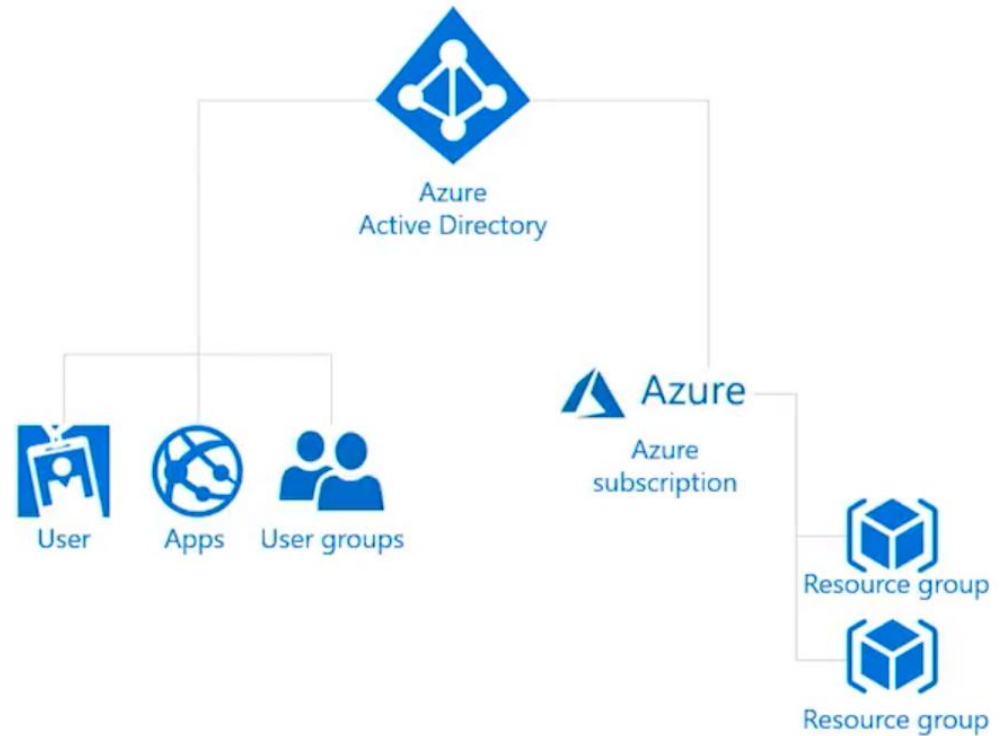


Policy Initiatives work with Azure Policies

- **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)



- Create a resource
- Home
- Dashboard
- All services
- FAVORITES
- All resources
- Resource groups
- App Services
- Function App
- SQL databases
- Azure Cosmos DB
- Virtual machines
- Load balancers
- Storage accounts
- Virtual networks
- Azure Active Directory
- Monitor
- Advisor

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

Showing 1 to 1 of 1 records. | No grouping

<input type="checkbox"/> Name ↑↓	Subscription ↑↓	Location ↑↓	
<input type="checkbox"/> AZ900RBACTest	Windows Azure MSDN - Visual Studio U...	Central US	...

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## Resource groups

Contoso MOD830600

+ 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

<input type="checkbox"/> Name ↑↓	Subscription ↑↓	Location ↑↓	
<input type="checkbox"/> az103Ready	Windows Azure MSDN - Visual Studio U...	West US 2	...
<input type="checkbox"/> AZ900RBACTest	Windows Azure MSDN - Visual Studio U...	Central US	...
<input type="checkbox"/> AzFUN	Windows Azure MSDN - Visual Studio U...	West US 2	...
<input type="checkbox"/> CloudShell	Windows Azure MSDN - Visual Studio U...	South Central US	...
<input type="checkbox"/> Default-ActivityLogAlerts	Windows Azure MSDN - Visual Studio U...	East Asia	...
<input type="checkbox"/> NetworkWatcherRG	Windows Azure MSDN - Visual Studio U...	Central US	...

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### AzFUN - Access control (IAM)

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Cost Management

- Cost analysis

+ Add Edit columns Refresh Remove Got feedback?

Check access Role assignments Deny assignments Classic administrators Roles

#### 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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### AzFUN - Access control (IAM)

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+ Add Edit columns Refresh Remove Got feedback?

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 Type Role Scope

Search by name or email All 2 selected All scopes

Group by

Role

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

<input type="checkbox"/>	Name	Type	Role	Scope
<input type="checkbox"/>	ASRVault-9ca-asr-automat	App	Contributor	Subscription
<input type="checkbox"/>	CustomPlan_J3LbyK20NTyr	App	Contributor	Subscription

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### AzFUN - Access control (IAM)

Resource group

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**Access control (IAM)**  
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Events








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+ Add Edit columns Refresh Remove Got feedback?

<input type="checkbox"/>	 ASRVault-9ca-asr-automat	App	Contributor ⓘ	Subscription (
<input type="checkbox"/>	 CustomPlan_J3LbyK20NTyt	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 (
<b>User Access Administrator</b>				
<input type="checkbox"/>	 raid78 (Guest) raid78@msn.com	User	User Access Administrator ⓘ	Root (Inherite

User Access Administrator

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### AzFUN - Access control (IAM)

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+ Add Edit columns Refresh Remove Got feedback?

- Add role assignment
- Add co-administrator
- Add custom role (preview)

Type: All | Role: 2 selected | Scope: All scopes

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

<input type="checkbox"/>	Name	Type	Role	Scope
<b>Contributor</b>				
<input type="checkbox"/>	ASRVault-9ca-asr-automat	App	Contributor	Subscription
<input type="checkbox"/>	CustomPlan_J3LbyK20NTyr	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.			

Microsoft Azure

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### AzFUN - Access control (IAM)

Resource group

Search (Ctrl+/)

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+ Add Edit columns Refresh

Name Type

Search by name or email All

Group by

Role

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

<input type="checkbox"/>	Name	Type
<input type="checkbox"/>	ASRVault-9ca-asr-automat	App
<input type="checkbox"/>	CustomPlan_J3LbyK20NTyr	App
<input type="checkbox"/>	Identity deleted. Identity no longer exists.	Unknown
<input type="checkbox"/>	Identity deleted. Identity no longer exists.	Unknown
<input type="checkbox"/>	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

**Microsoft Azure**

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+ Add Edit columns Refresh

Name Type  
Search by name or email All

Group by  
Role

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

<input type="checkbox"/>	Name	Type
<input type="checkbox"/>	ASRVault-9ca-asr-automat	App
<input type="checkbox"/>	CustomPlan_J3LbyK20NTyr	App
<input type="checkbox"/>	Identity deleted. Identity no longer exists.	Unknown
<input type="checkbox"/>	Identity deleted. Identity no longer exists.	Unknown
<input type="checkbox"/>	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](#)

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Added Role assignment  
admin2 was added as Owner for AzFUN.  
5:10 PM

	+	Add	Edit columns	Refresh	Remove	Got feedback?
<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	
<b>Owner</b>						
<input type="checkbox"/>		admin2 admin2@MOD830600.o...	User	Owner	This resource	
<b>User Access Administrator</b>						
<input type="checkbox"/>		raid78 (Guest) raid78@msn.com	User	User Access Administrator	Root (Inherite	

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## Resource groups

Contoso MOD830600

+ Add | Manage view | Refresh | Export to CSV | Assign tags | Feedback

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

Showing 1 to 2 of 2 records. | No grouping

<input type="checkbox"/>	Name ↑↓	Subscription ↑↓	Location ↑↓	
<input type="checkbox"/>	AZ900RBACTest	Windows Azure MSDN - Visual Studio U...	Central US	...
<input type="checkbox"/>	AzFUN	Windows Azure MSDN - Visual Studio U...	West US 2	...

# 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.



+ Create a resource

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### AzFUN

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Subscription (change)  
Windows Azure MSDN - Visual S

Subscription ID  
5abe05c6-b60d-45df-9817-2254

Tags (change)  
Click here to add tags

Filter by name...

Showing 1 to 16 of 16 records.

<input type="checkbox"/> Name
<input type="checkbox"/> AzFUN-vnet
<input type="checkbox"/> azfunddiag640
<input type="checkbox"/> azfunddiag743
<input type="checkbox"/> 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
azfunddiag640	Storage account	South Central US
azfunddiag743	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

+ Create a resource

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AzFUN

Resource group

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+ Add Edit columns Delete resource group Refresh Move Export CSV

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

<input type="checkbox"/> Name ↑↓	Type ↑↓	Location ↑↓	
<input type="checkbox"/> <> AzFUN-vnet	Virtual network	West US 2	...
<input type="checkbox"/> azfunddiag640	Storage account	South Central US	...
<input type="checkbox"/> azfunddiag743	Storage account	West US 2	...
<input type="checkbox"/> <> AzFUNvnet913	Virtual network	South Central US	...

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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.

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### AzFUN - Locks

Resource group

Search (Ctrl+/) << + Add Subscription Refresh

Lock name	Lock type	Scope	Notes
<a href="#">cantchange</a>	Read-only	funvm2	<a href="#">Edit</a>
<a href="#">cantdelete</a>	Delete	azfun	<a href="#">Edit</a>

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### 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](#)

Settings

- Networking
- Connect
- Disks
- Size
- Security
- Extensions
- Continuous delivery
- Availability + scaling

+ Create a resource

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### FunVM2

Virtual machine

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- Diagnose and solve problems

#### Settings

- Networking
- Connect
- Disks
- Size
- Security
- Extensions
- Continuous delivery
- Availability + scaling

Connect Start Restart Stop Capture

Resource 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](#)

**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/Micro... 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.





# 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.

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



# 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](#)

<a href="#">CIS Benchmark</a>	<a href="#">CJIS</a>	<a href="#">BIR 2012 (Netherlands)</a>	<a href="#">IT-Grundschutz (Germany)</a>	<a href="#">23 NYCRR 500 (US)</a>	<a href="#">GLBA (US)</a>
<a href="#">CSA STAR Attestation</a>	<a href="#">CNSSI</a>	<a href="#">C5 (Germany)</a>	<a href="#">LOPD (Spain)</a>	<a href="#">AFM/DNB (Netherlands)</a>	<a href="#">GxP (US)</a>
<a href="#">CSA STAR Certification</a>	<a href="#">DFARS</a>	<a href="#">CS Mark Gold (Japan)</a>	<a href="#">MeitY (India)</a>	<a href="#">AMF/ACPR (France)</a>	<a href="#">HIPAA (US)</a>
<a href="#">CSA STAR Self-Assessment</a>	<a href="#">DoD L 2,4,5</a>	<a href="#">Cyber Essentials Plus (US)</a>	<a href="#">MTCS Level 3 (Singapore)</a>	<a href="#">APRA (Australia)</a>	<a href="#">HITRUST (US)</a>
<a href="#">ISO 20000</a>	<a href="#">DoE 10</a>	<a href="#">DJCP (China)</a>	<a href="#">My Number Act (Japan)</a>	<a href="#">CDSA</a>	<a href="#">KNF (Poland)</a>
<a href="#">ISO 22301</a>	<a href="#">EAR</a>	<a href="#">EN 301 549 (EU)</a>	<a href="#">New Zealand CC Framework</a>	<a href="#">CFTC 131 (US)</a>	<a href="#">MARS-E (US)</a>
<a href="#">ISO 27001</a>	<a href="#">FDA CFR Title 21</a>	<a href="#">ENISA IAF (EU)</a>	<a href="#">PASF (UK)</a>	<a href="#">DPP (UK)</a>	<a href="#">MAS/ABS (Singapore)</a>
<a href="#">ISO 27017</a>	<a href="#">FedRAMP</a>	<a href="#">ENS (Spain)</a>	<a href="#">PIPEDA (Canada)</a>	<a href="#">EBA (EU)</a>	<a href="#">MPAA (US)</a>
<a href="#">ISO 27018</a>	<a href="#">FIPS 140-2</a>	<a href="#">EU Model Clauses</a>	<a href="#">PDPA (Argentina)</a>	<a href="#">FACT (UK)</a>	<a href="#">NBB/FSMA (Belgium)</a>
<a href="#">ISO 9001</a>	<a href="#">IRS 1075</a>	<a href="#">EU-US Privacy Shield</a>	<a href="#">TISAX (Germany)</a>	<a href="#">FCA/PRA (UK)</a>	<a href="#">NEN 7510 (Netherlands)</a>
<a href="#">SOC 1,2,3</a>	<a href="#">ITAR</a>	<a href="#">GB 18030 (China)</a>	<a href="#">TRUCS (China)</a>	<a href="#">FERPA (US)</a>	<a href="#">NHS IG (UK)</a>
<a href="#">WCAG 2.0</a>	<a href="#">NIST CSF</a>	<a href="#">G-Cloud OFFICIAL (UK)</a>	<a href="#">TruSight</a>	<a href="#">FFIEC (US)</a>	<a href="#">OSFI (Canada)</a>
	<a href="#">NIST 800-171</a>	<a href="#">GDPR</a>		<a href="#">FINMA (Switzerland)</a>	<a href="#">PCI DSS</a>



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### FunVM2

Virtual machine

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- Activity log
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- Tags
- Diagnose and solve problems

#### Settings

- Networking
- Connect
- Disks
- Size
- Security
- Extensions
- Continuous delivery
- Availability + scaling

Connect Start Restart Stop Capture Delete Refresh

Resource group (change)	Azure Spot
<a href="#">azfun</a>	N/A
Status	Public IP address
Running	<a href="#">13.84.182.112</a>
Location	Private IP address
South Central US	10.0.1.4
Subscription (change)	Public IP address (IPv6)
<a href="#">Windows Azure MSDN - Visual Studio Ultimate</a>	-
Subscription ID	Private IP address (IPv6)
5abe05c6-b60d-45df-9817-2254e05ed4a7	-
Computer name	Virtual network/subnet
FunVM2	<a href="#">AzFUNvnet913/default</a>
Operating system	DNS name
Windows (Windows Server 2016 Datacenter)	<a href="#">Configure</a>
Size	Scale Set
Standard D2s v3 (2 vcpus, 8 GiB memory)	N/A
Tags (change)	
<a href="#">Click here to add tags</a>	

Home > Advisor

# Advisor

Search (Ctrl+)

Feedback | Download as CSV | Download as PDF

Overview

## Recommendations

- High Availability
- Security
- Performance
- Operational Excellence
- Cost
- All recommendations

## Monitoring

Alerts (Preview)

## Settings

Configuration

We're updating recommendations for your subscriptions. This could take some time... View details →

### High Availability

2 Recommendations

0 High impact | 2 Medium impact | 0 Low impact

1 Impacted resource

### Security

0 Recommendation

0 High impact | 0 Medium impact | 0 Low impact

0 Impacted resource

### Performance

0 Recommendation

### Operational Excellence

1 Recommendation

Refreshing recommendations  
Refreshing Recommendations for Azure Advisor

# Advisor - High Availability

[Documentation](#)

Search (Ctrl+/)

Feedback | Download as CSV | Download as PDF | Create alert | Manage alert rules

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



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

Are these recommendations helpful?

# Advisor - Operational Excellence

[Documentation](#)

Search (Ctrl+/)

Feedback | Download as CSV | Download as PDF | Create alert | Manage alert rules

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



IMPACT	DESCRIPTION	POTENTIAL BENEFITS	IMPACTED RESOURC...	UPDATED AT
Low	<a href="#">Create an Azure service health alert</a>	Get notified when Azure service issues affect you	1 Subscription	

### 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 \*      Action Type \*      Status

email ✓      Email/SMS/Push/Voice ▼

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.



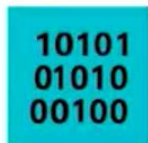
Azure Government :

- 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.



Azure China 21Vianet features:

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



# 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.



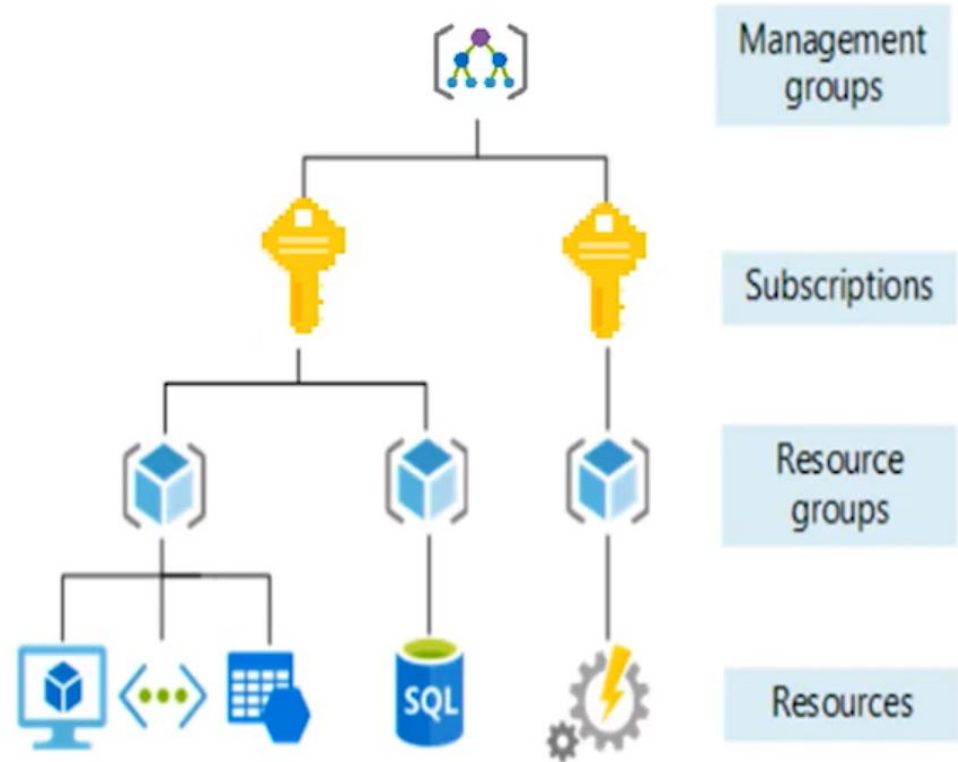
# Azure subscriptions



- 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.

Home > Free services

## 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



**Azure File Storage**  
STORAGE

5 GB



**SQL Database**  
DATABASES


250 GB

Home > Free services

## Free services

### Always free services

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




**App Service**  
COMPUTE

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](#)




**Functions**  
COMPUTE

1,000,000

requests per month

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

[Create](#)



**Active Directory**  
SECURITY + IDENTITY

500,000

objects

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



**Active Directory B2C**  
SECURITY + IDENTITY



**Service Fabric**  
CONTAINERS



**Azure DevOps**  
DEVELOPER TOOLS



# Lesson 03: Planning and managing costs



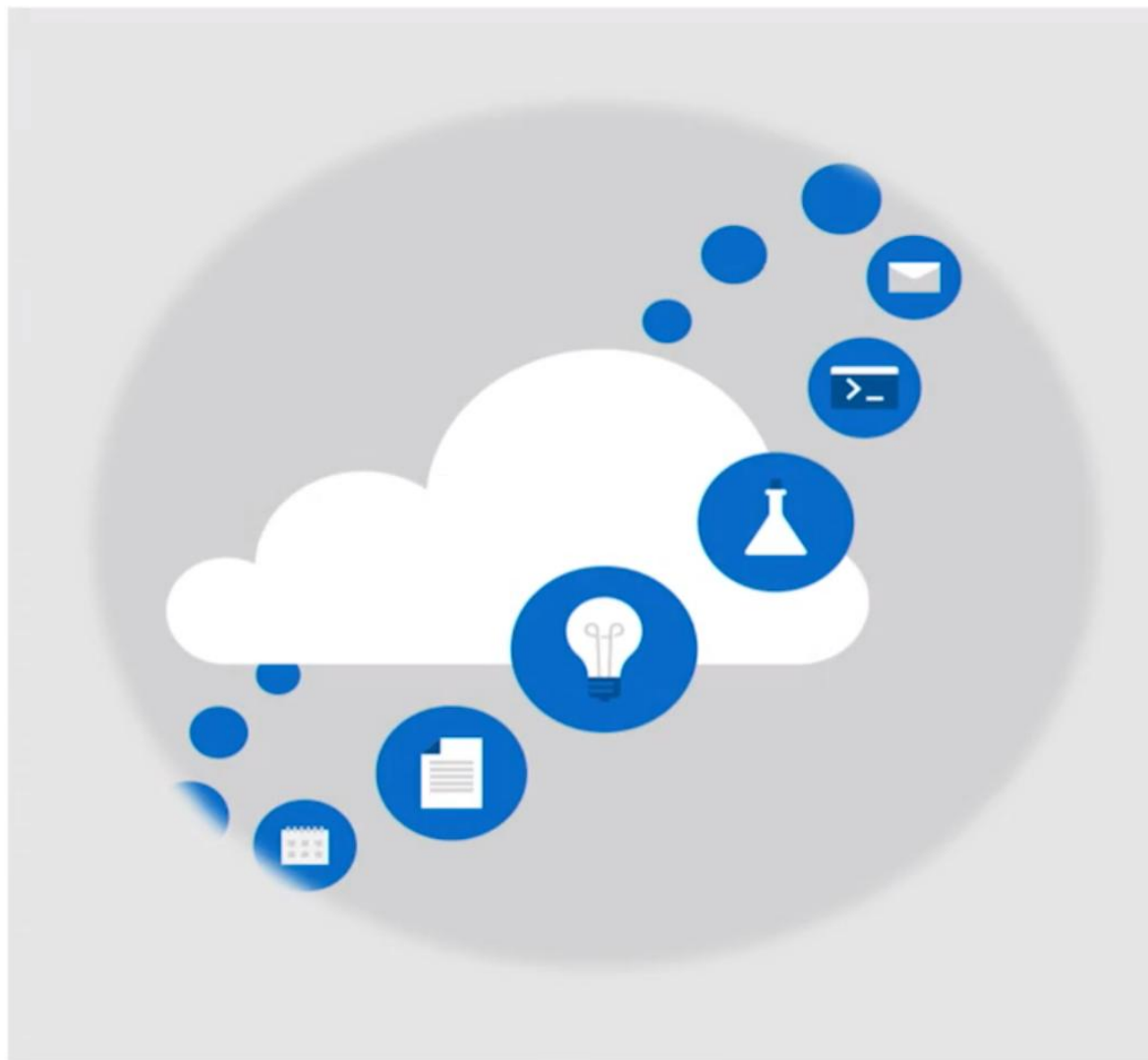
# Pricing and purchasing

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

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

**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

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

Chat with Sales

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

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



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
- 📘 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.](#)



## 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.](#)

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

**= \$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.](#)

Chat with Sales

Included v ⓘ

\$0.00

### Programs and Offers

LICENSING PROGRAM:

Microsoft Online Services Agreement v ⓘ

Microsoft Online Services Agreement

**Enterprise Agreement (EA)**

Microsoft Customer Agreement (MCA)

### Estimated monthly cost

\$37.10

Export

Save

Save as

Share

US Dollar (\$) v

DISPLAY SKUS ⓘ

DISPLAY RESOURCE IDS ⓘ

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](#)

# 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.

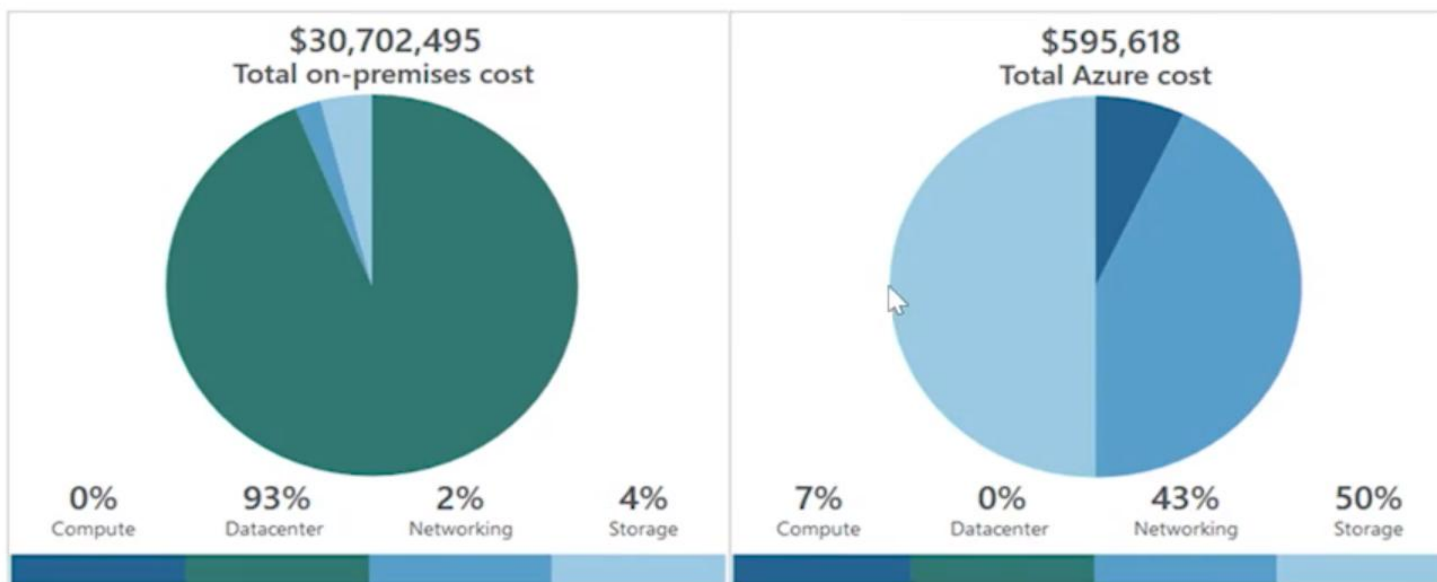
Workload 1

Workload ⓘ	Environment ⓘ	Operating system ⓘ	Servers ⓘ	Procs per server ⓘ	Core(s) per proc ⓘ
Windows/Linux Server	Physical Servers	Windows	1	1	
			(1 - 9999)	(1 - 4)	

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.



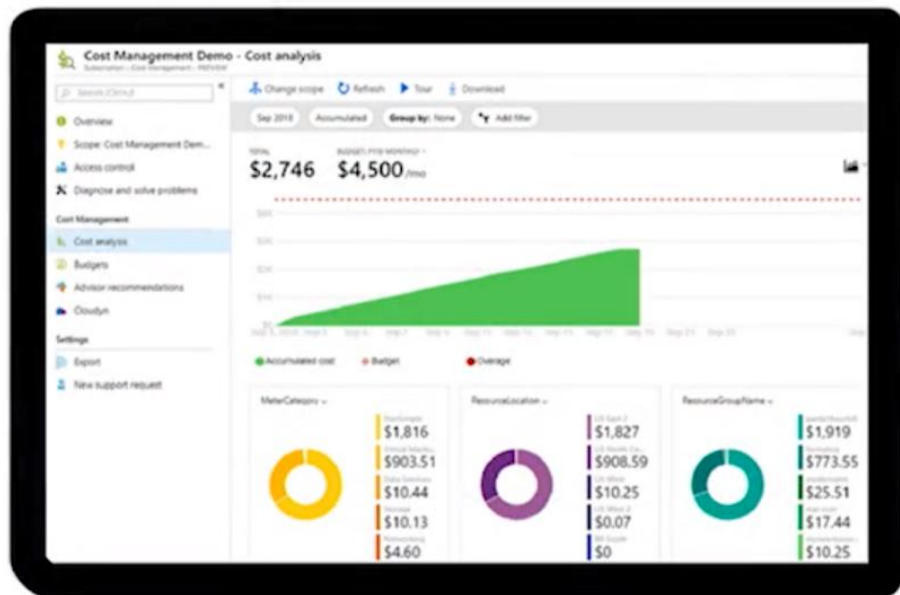


# Minimizing costs



# 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

	BASIC	DEVELOPER	STANDARD	PROFESSIONAL DIRECT	PREMIER
	<a href="#">Request support</a>	<a href="#">Purchase support</a>	<a href="#">Purchase support</a>	<a href="#">Purchase support</a>	<a href="#">Contact Premier</a>
Training				Azure Engineering-led web seminars	Azure Engineering-led web seminars, on-demand training
Proactive Guidance				ProDirect Delivery Manager	Designated Technical Account Manager
Launch Support					Azure Event Management (available for additional fee)
Pricing		\$29/mo	\$100/mo	\$1,000/mo	<a href="#">Contact us</a>

<sup>1</sup> 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.

# Alternative support channels



• Microsoft Developer Network (MSDN) Azure Forums



• Stack Overflow



• Server Fault



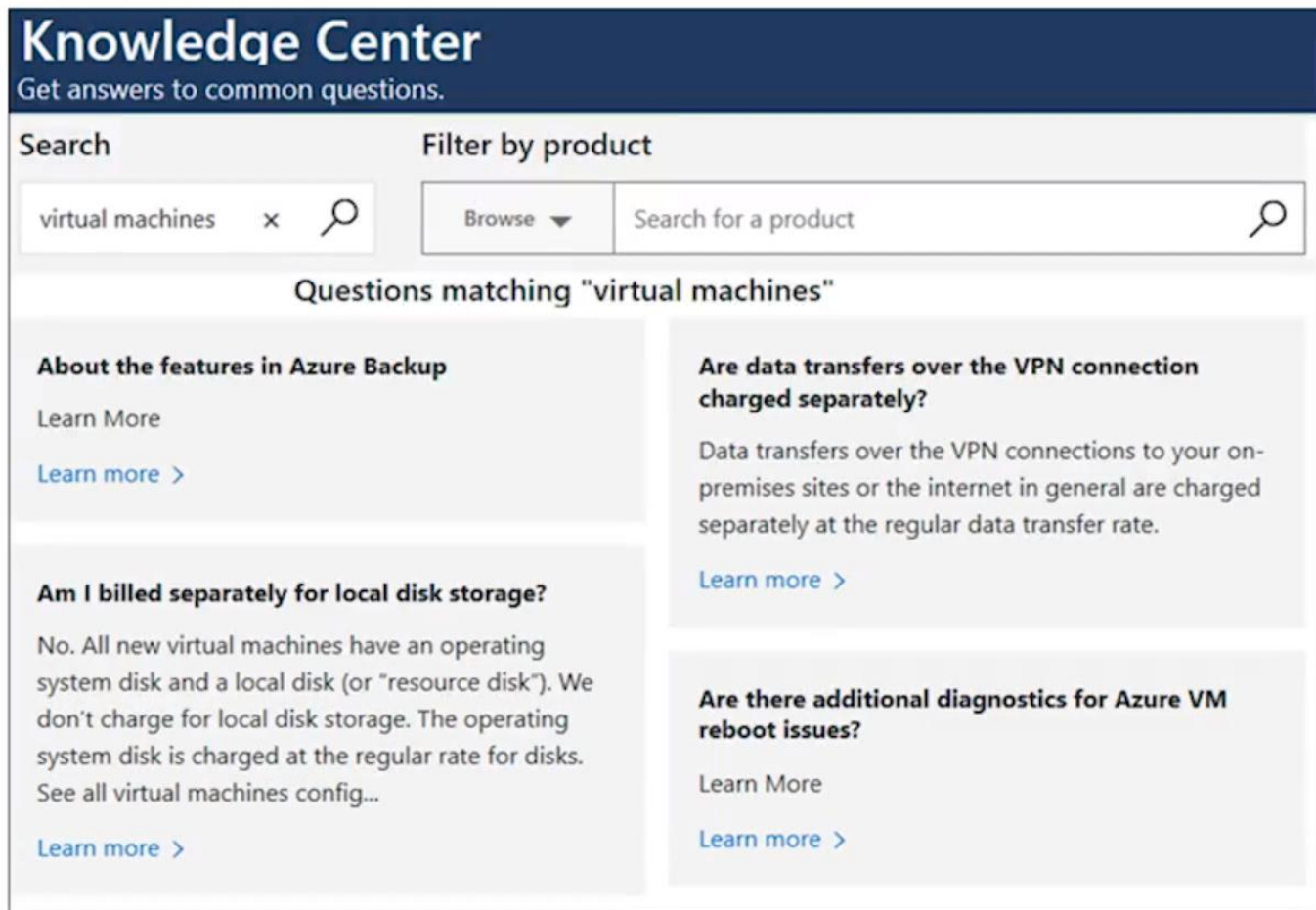
• Microsoft Azure general feedback



• @AzureSupport

# Knowledge Center

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



**Knowledge Center**  
Get answers to common questions.

**Search** virtual machines × 🔍 **Filter by product** Browse ▼ Search for a product 🔍

Questions matching "virtual machines"

**About the features in Azure Backup**  
Learn More  
[Learn more >](#)

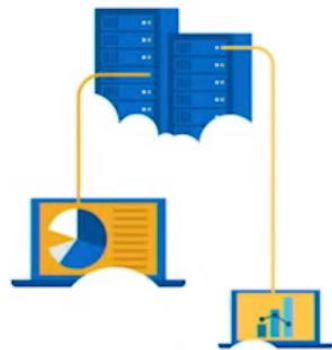
**Am I billed separately for local disk storage?**  
No. All new virtual machines have an operating system disk and a local disk (or "resource disk"). We don't charge for local disk storage. The operating system disk is charged at the regular rate for disks. See all virtual machines config...  
[Learn 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



- 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 professional 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+)

- 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

Virtual machine

Search (Ctrl+/) << Basics Solutions Details Review + create

Metrics

- Diagnostics 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:

\* Subscription:   
Can't find your subscription? [Show more](#) ⓘ

\* Service:  My services  All services

\* Resource:

\* Resource:

\* Summary:

\* Problem type:

Next: Solutions >>



- 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

## New support request

- Basics
- Solutions
- Details
- Review + create

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

Next: Solutions >>

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

## 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

Next: Solutions >>

+ 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 > New support request

## New support request

Basics Solutions Details Review + create

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  ▾  
Can't find your subscription? [Show more](#) ⓘ
- \* Service  My services  All services
- \* Resource  ▾
- \* Resource  ▾
- \* Summary  ✓
- \* Problem type  ▾
- \* Problem subtype  ▾

🛑 Stopped and deallocating

Next: Solutions >>

+ 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 > New support request

## New support request

Basics

Solutions

Details

Review + create

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

< Previous: Basics

Next: Details >>

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 > New support request

## New support request

Basics

Solutions

Details

Review + create

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

<< Previous: Solutions

Next: Review + create >>

# 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.



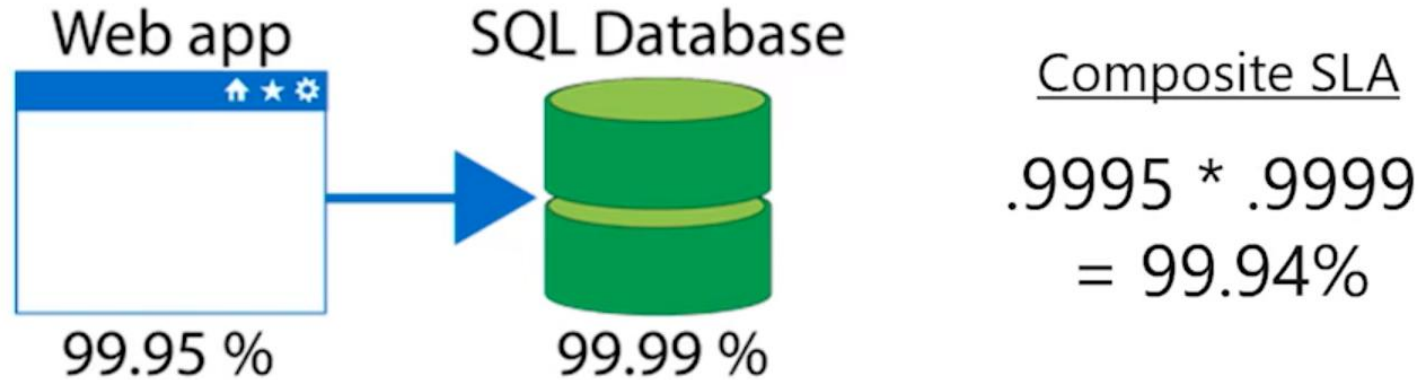
# SLAs for Azure products and services

- 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



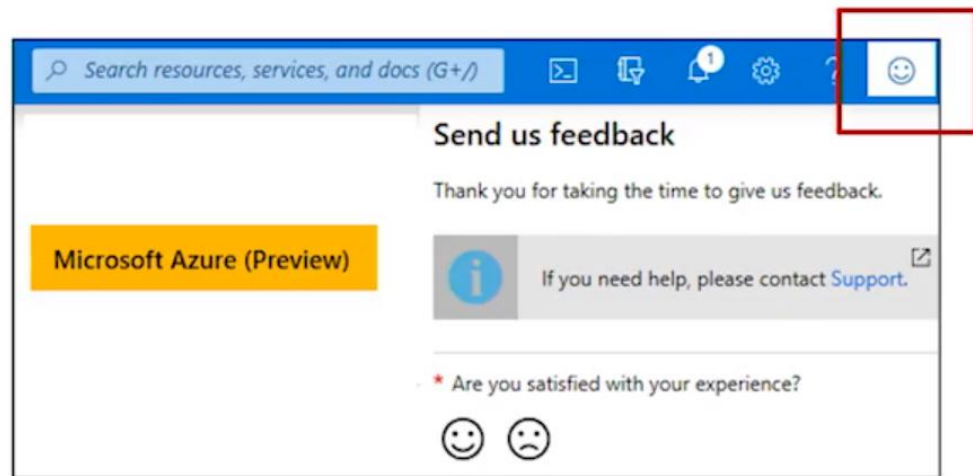
## Service Lifecycle

- Cost
- SLA
- Support

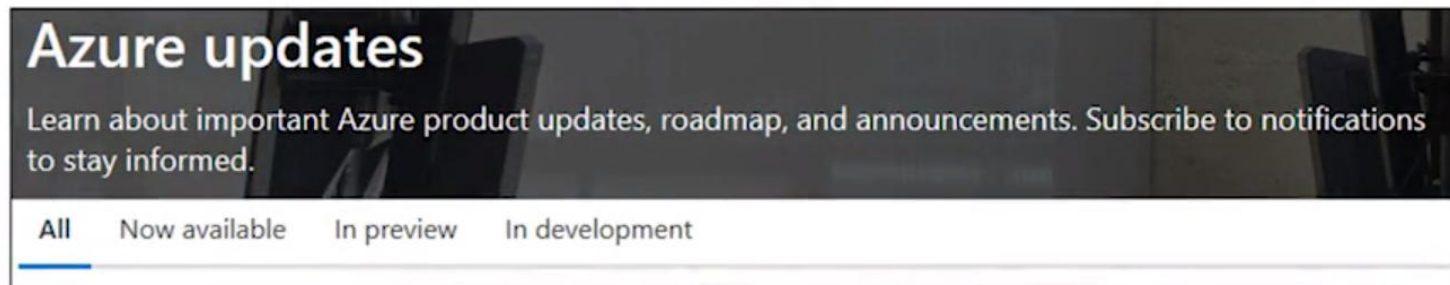


# Accessing Azure Portal preview

- 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!

