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# Microsoft Azure Developer Associate (AZ-204)

# COURSE OUTLINE
# MODULE 08

- Introduction to Azure IaaS Compute Solutions
- Implementing Azure Batch Service and Disk Encryption
- Designing and Developing Applications That Use Containers
- Implementing Azure App Service Web Apps and Mobile Apps
- Implementing Azure App Service API Apps and Azure Functions
- Developing Solutions That Use Azure Table Storage and Cosmos DB

- Developing Solutions That Use Relational Database and Azure Blob Storage
- **Implementing Authentication and Access Control in Azure**
- Implementing Secure Data Solutions and Integrate Caching & CDN
- Instrument Monitoring, Logging and Scalability Of Apps & Services
- Connecting to and Consuming Azure and Third-party Services
- Developing Event-based and Message-based Solutions in Azure

# Module 8 – Implementing Authentication and Access Control in Azure

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# Topics

- Access Control
- Role-based access control (RBAC)
- Azure Active Directory (AD)
- Azure AD Licenses
- Multi-Factor Authentication (MFA)
- Manage Multiple Directories In Azure
- Azure AD Identity Management Capabilities
- Access Reviews In Azure
- Authentication In Azure Active Directory
- Claim-Based Architecture
- Azure AD – Authentication Frameworks
- Azure Managed Service Identity
- Implement OAuth 2.0 Authorization

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# Objectives

After completing this module, you should be able to:

- Understand the architecture of the Microsoft identity platform
- Implement OAuth2 authentication
- Implement managed identities for Azure resources
- Implement authentication by using certificates, forms-based authentication, or tokens
- Implement multi-factor authentication
- Learn how to use Claims-based and Role-based authorization in the development solutions

# Access Control

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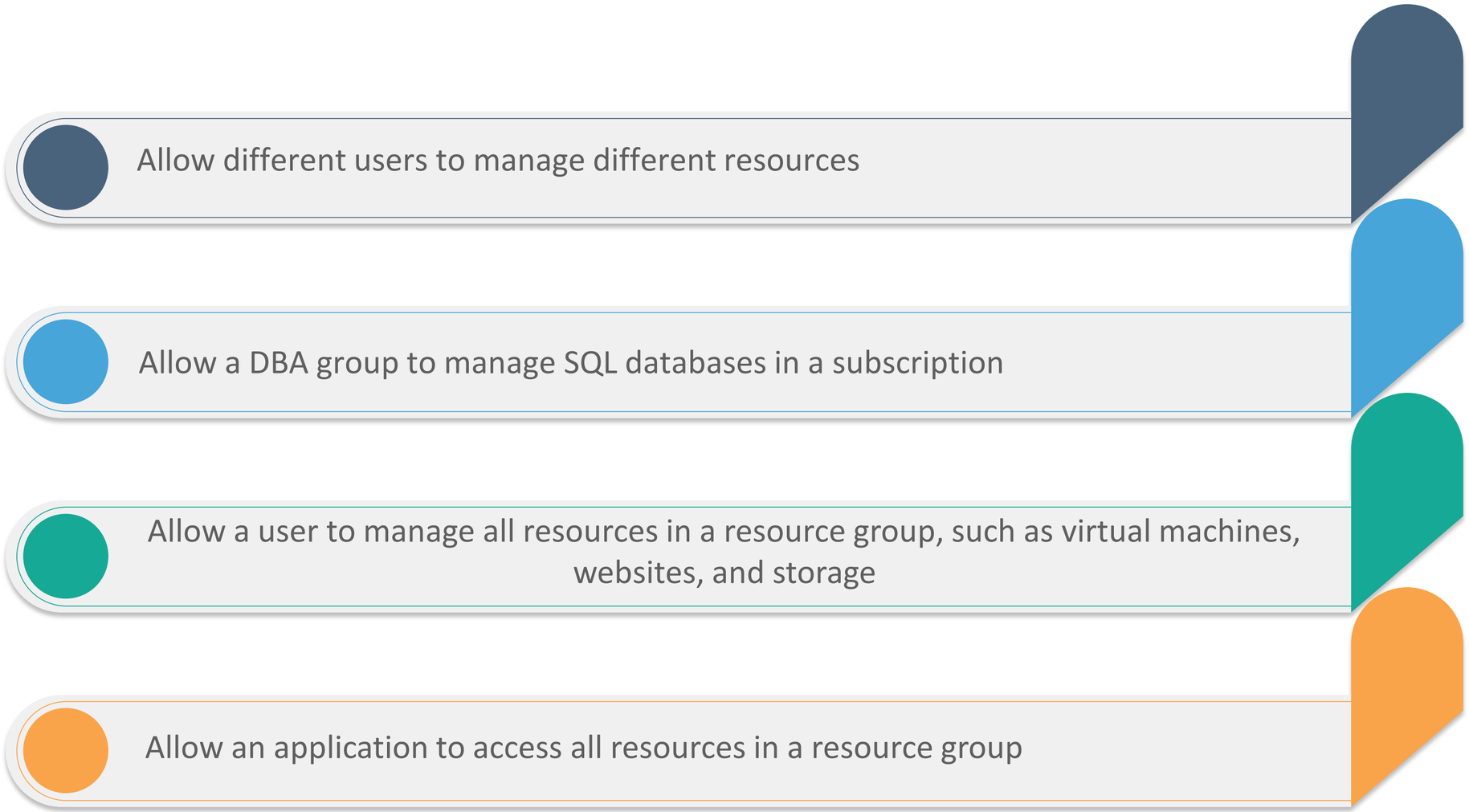
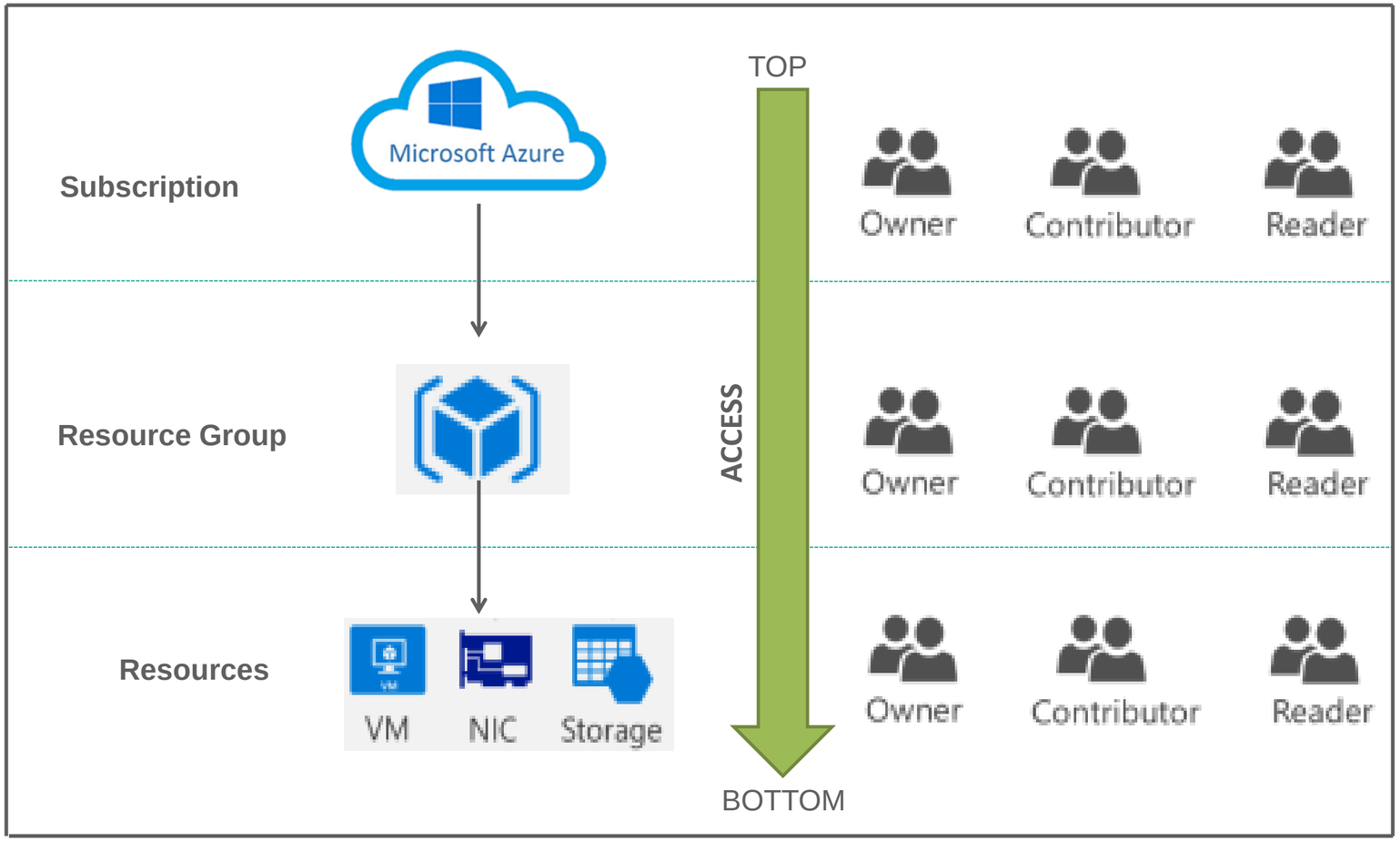
# Access Control

- Resource Manager enables access control to specific actions for your organization
- **Role-based access control** (RBAC) is integrated into the management platform and applies that access control to all services in your resource group
- There are two main concepts to understand when working with role-based access control:
  - ***Activity logs*** – for monitoring changes to role assignments and definitions
  - ***ized policies*** – for providing differing roles for different resources or resource groups
- **Role definitions** - Describe a set of permissions and can be used in many assignments
- **Role assignments** - Associate a definition with an identity (user or group) for a particular scope (subscription, resource group, or resource). The assignment is inherited by lower scopes

# What Can RBAC Do?



# High-level Overview of RBAC



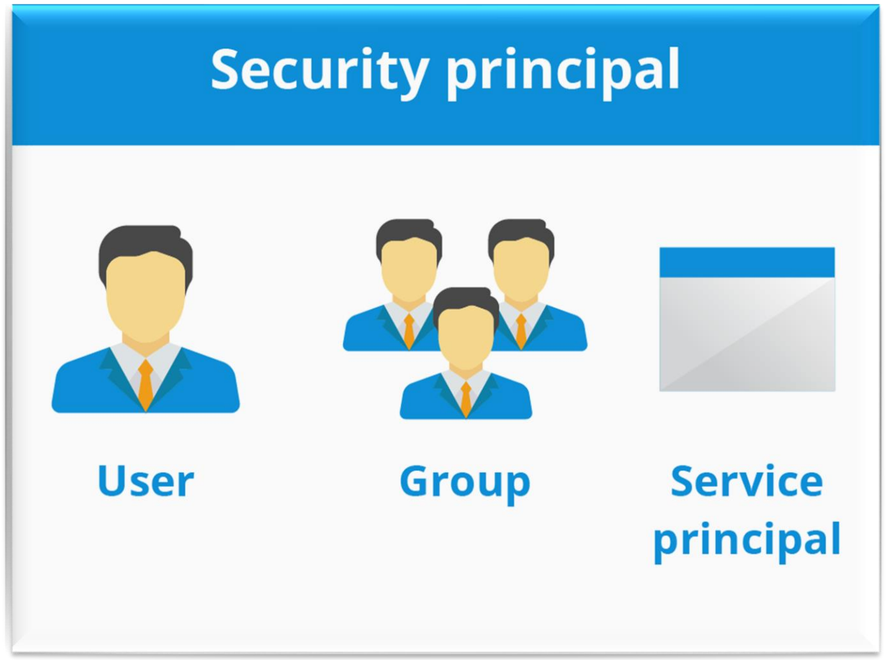

**Note:** Azure RBAC is inherited by the child once provided at the parent level.

# How Does RBAC Work?

- RBAC works by the practice of assigning the **Least Privilege** to help improve overall security
- RBAC controls access to resources using **Role Assignments**
- **Role Assignments** are used to enforce permissions for your organization
- A role assignment consists of three elements:
  - Security Principal
  - Role Definition
  - Scope

# RBAC – Security Principal

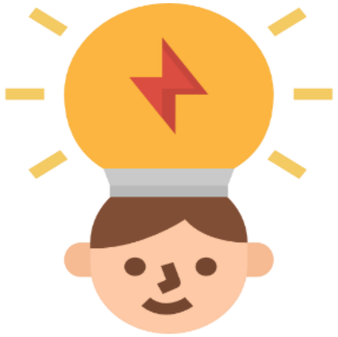
- A **Security Principal** is an object that represents a user, group, or service principal that is requesting access to Azure resources
  - **User** - An individual who has a profile in Azure Active Directory. Roles can be assigned to users in other tenants
  - **Group** - A set of users created in Azure Active Directory. When you assign a role to a group, all users within that group have that role
  - **Service Principal** - A security identity used by applications or services to access specific Azure resources. It functions as a user ID for an application



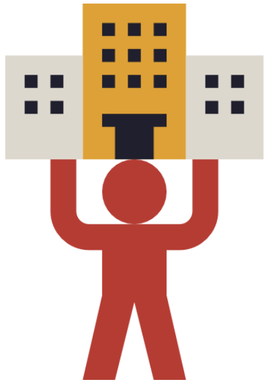
# RBAC – Role Definition

- A **Role Definition** is a collection of permissions; it lists the operations that can be performed, such as read, write, and delete.

  Azure includes several built-in_roles –

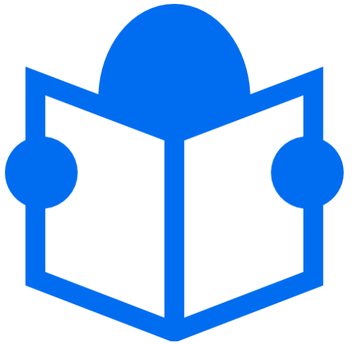


**Contributor**
Can create & manage all types of Azure resources but can't grant access to others



**Owner**
Has full access to all resources and delegates access to others

**User Access Administrator** Lets you manage user access to Azure resources



**Reader**
Can view existing Azure resources

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# RBAC – Other Platform Roles

Azure provides the other platform roles such as:

### Network Contributor

Can manage all network resources, but not grant access to them

### Storage Account Contributor

Can manage storage accounts, but not grant access to them

### SQL Server Contributor

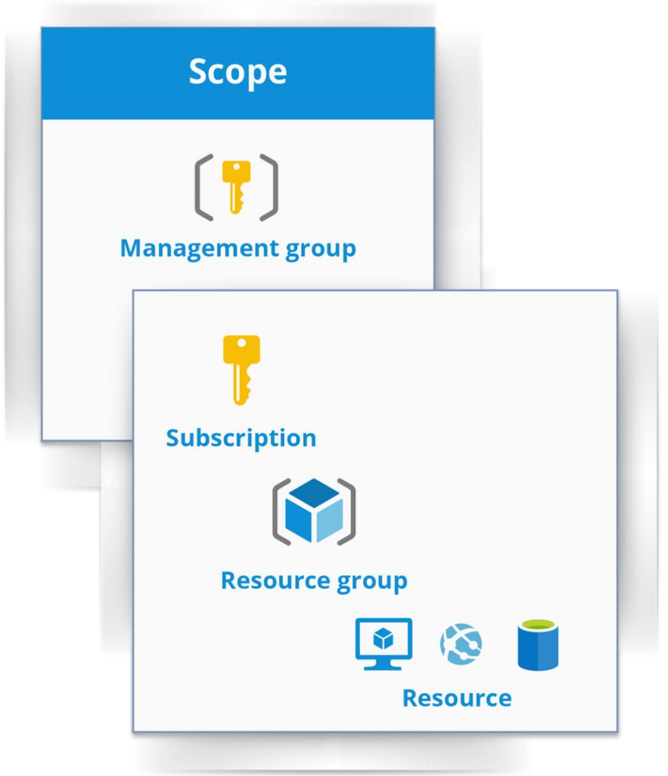
Can manage SQL servers and databases, but not their security related policies

### Website Contributor

Can manage websites, but not the web plans to which they are connected

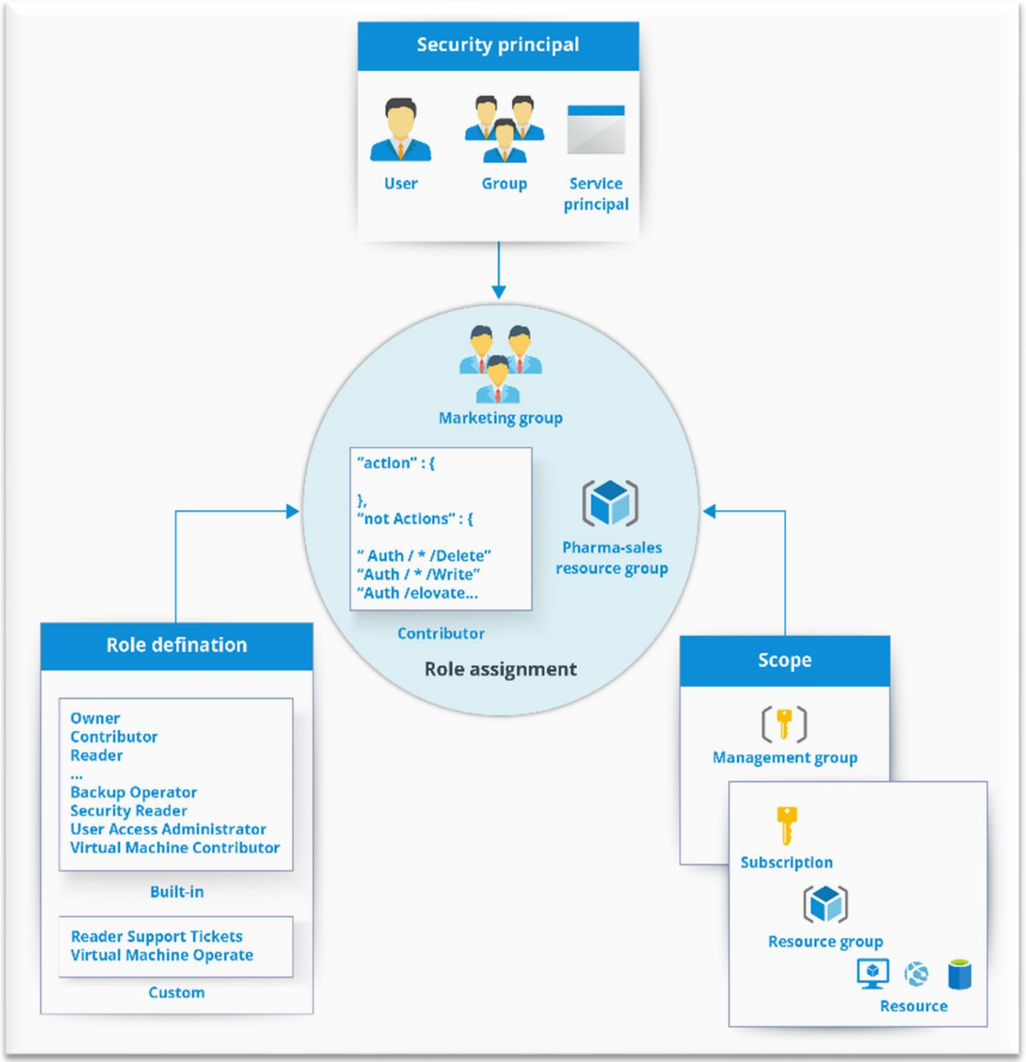
# RBAC – Scope

- *Scope* is the boundary applied to the access
- When a role has been assigned, it's actions can be limited by defining a scope
- Scope can be specified at multiple levels: **subscription**, **resource group**, or **resource**
- Scopes are structured in a parent-child relationship where every child will have only one parent



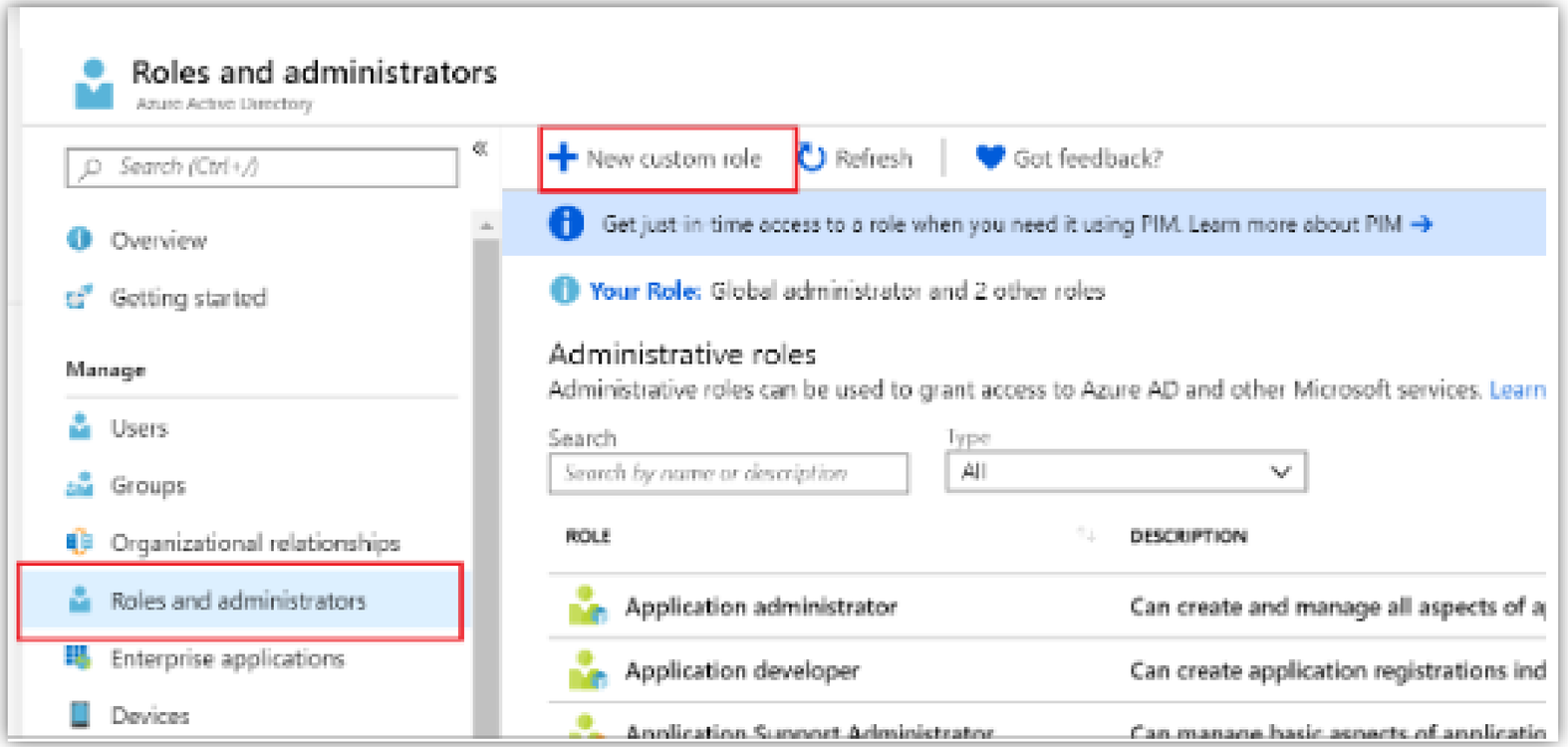
# RBAC – Role Assignment

- A **Role Assignment** is the process of binding a role definition to a user, group, or service principal at a particular scope for the purpose of granting access.
- Access is granted by creating a role assignment, and access is revoked by removing a role assignment.



# Custom Roles in Azure AD

We can create custom roles and define the properties and rules for the roles according to our business requirements. Custom roles can be assigned at the directory level or at an app registration scope level. Once the custom role is created, it will be added in the Roles section of the page.



# Custom Role Example

Below is the json template example used to define custom roles :

```
$role = Get-AzureRmRoleDefinition "Virtual Machine Contributor"
$role.Id=$null
$role.Name= "Custom Role- Virtual Machine Operator Demo01"
$role.Description= "Can Monitor and Restart VMs"
$role.actions.clear()
$role.actions.Add("Microsoft.Storage/*/read")
$role.actions.Add("Microsoft.Network/*/read")
$role.actions.Add("Microsoft.Compute/*/read")
$role.actions.Add("Microsoft.Compute/virtualMachines/start/action")
$role.actions.Add("Microsoft.Compute/virtualMachines/restart/action")
$role.actions.Add("Microsoft.Resources/Subscriptions/resourceGroups/read")
$role.actions.Add("Microsoft.Insights/alertRules/*")
$role.actions.Add("Microsoft.Support/*")
$role.AssignableScopes.Clear()
$role.AssignableScopes.Add("/subscriptions/9fbfa342-4255-485e-932f-6f05ad268486")
New-AzureRmRoleDefinition -Role $role
```


Below is the script to create a custom role using azure Powershell and above template:

```
New-AzureRmRoleDefinition -InputFile  C:\Users\Admin\templates\CustomRoles.json
```

# Managing Access for Resource Groups

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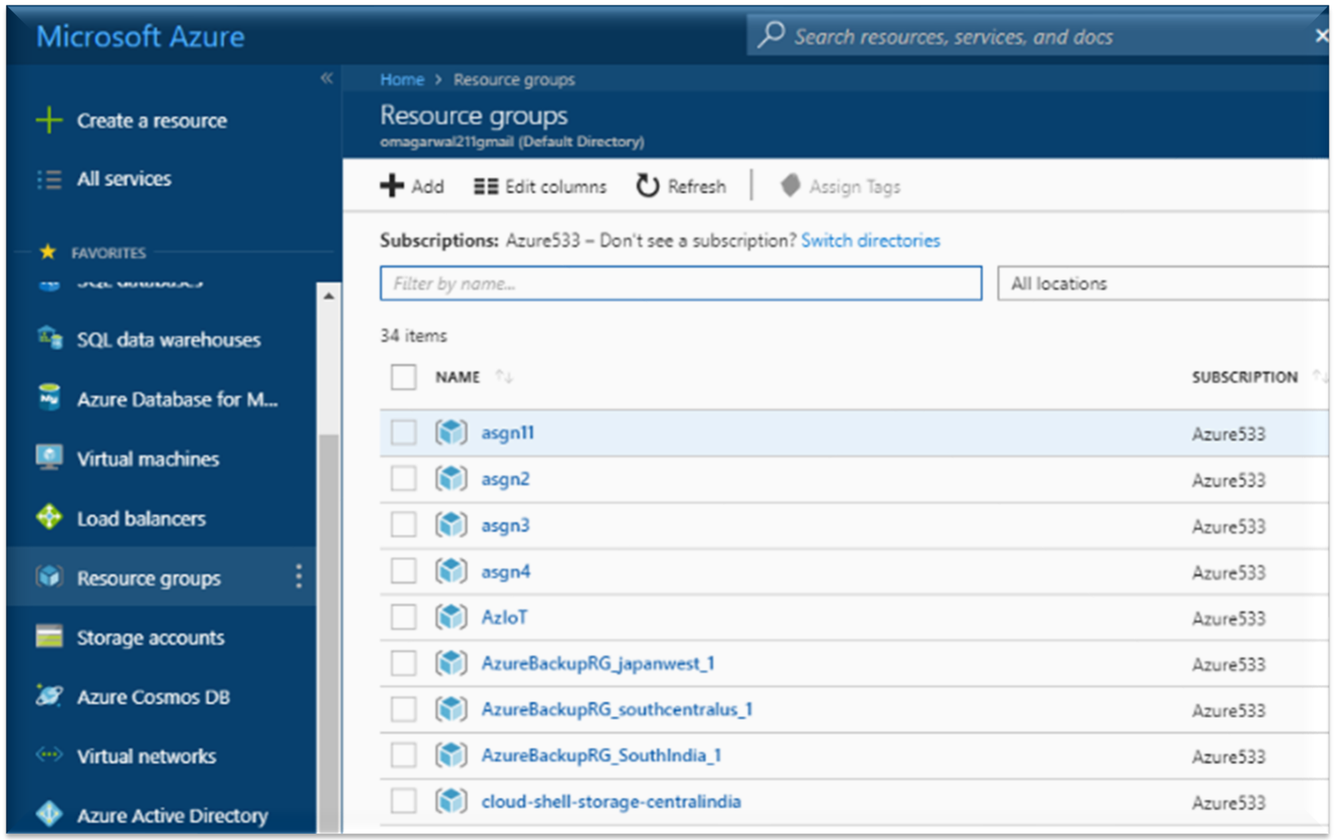
# RBAC – View Access

1. Select **Resource Groups** in the navigation bar on the left

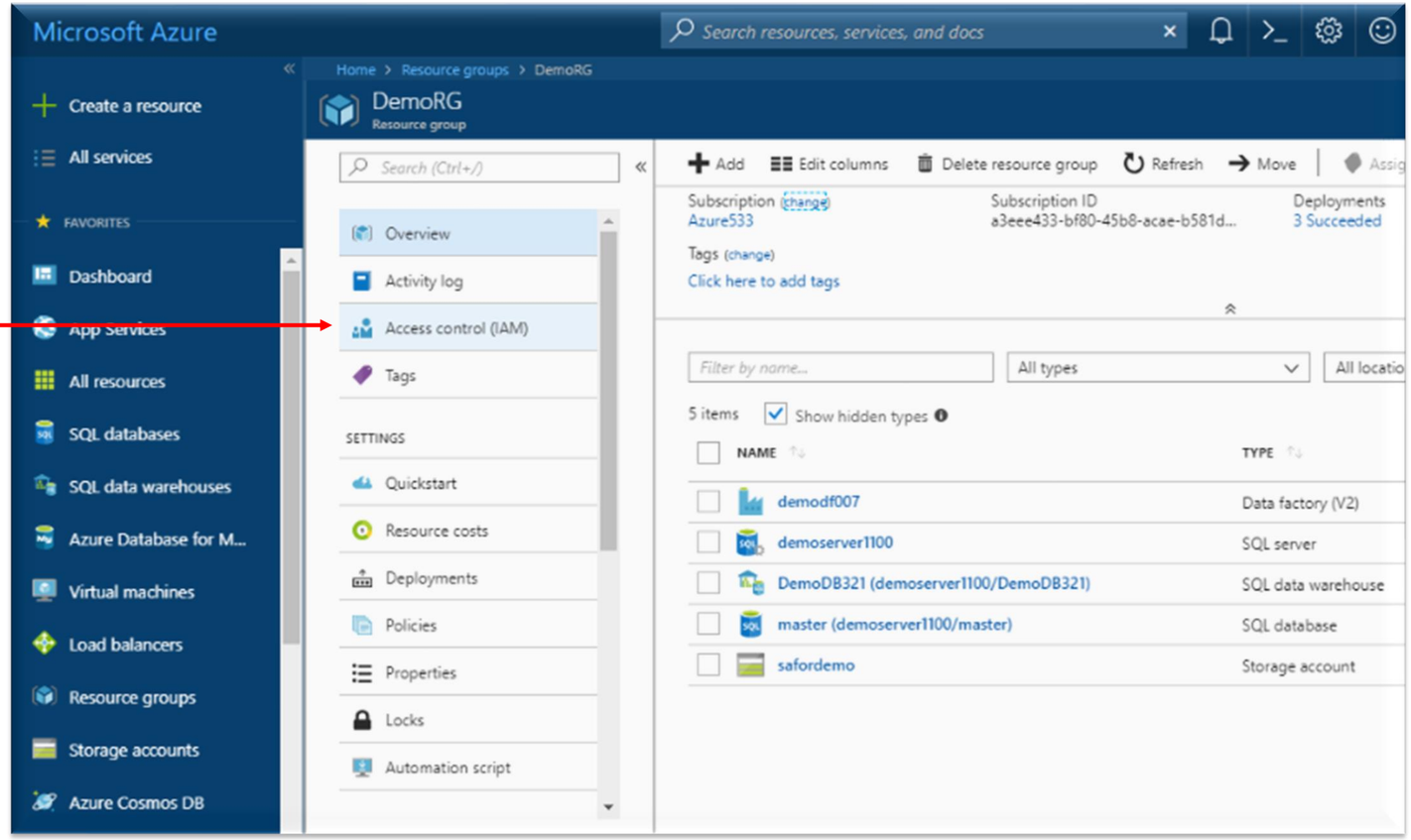
2. Select the name of the resource group from the **Resource groups** blade



# RBAC – View Access (Cont.)

3. Select **Access control** from the left menu

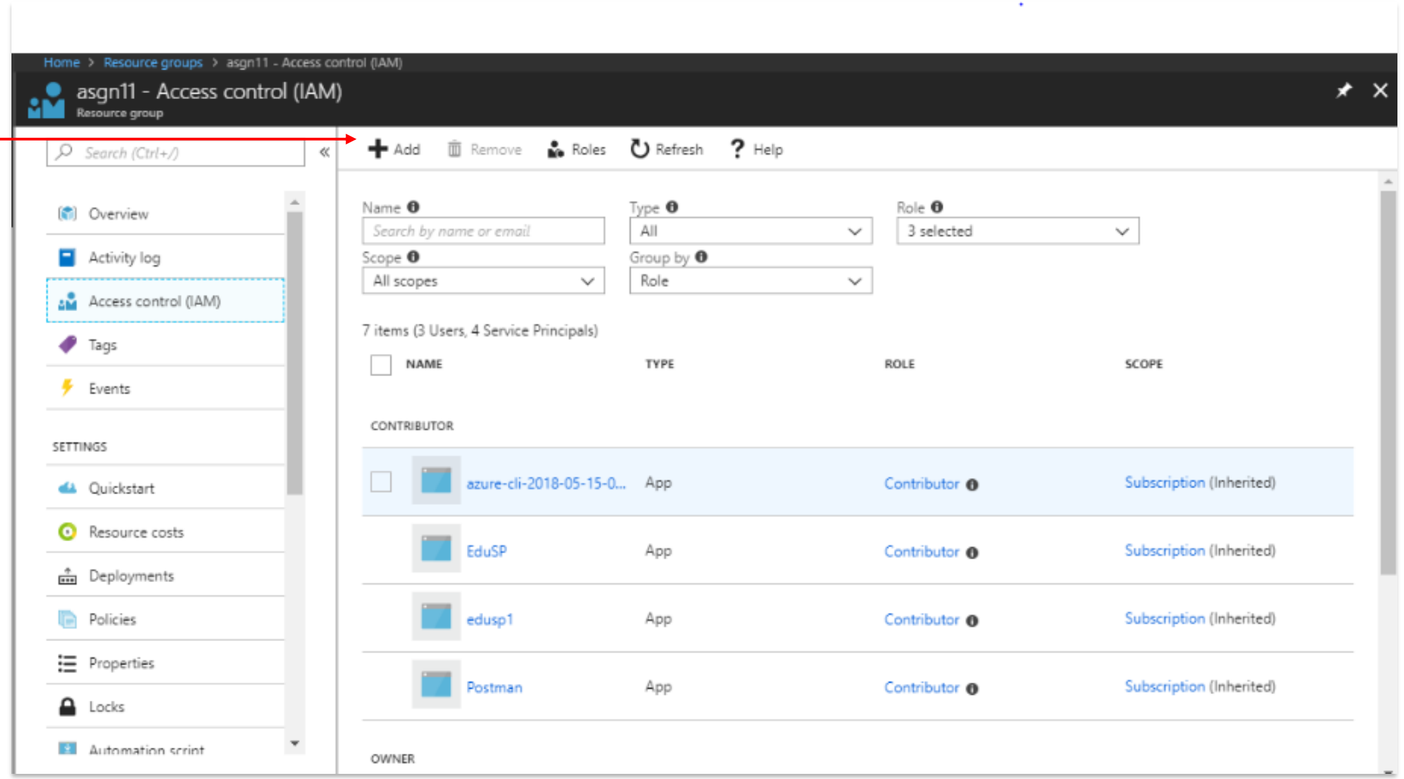
4. The **Access control** blade lists all users, groups, and applications that have been granted access to the resource group



# RBAC – Add Access

5. Access can be provided from within a resource, resource group, or subscription that is the scope of the role assignment

6. Select **Add** on the Access control blade and select a role that is to be assigned access

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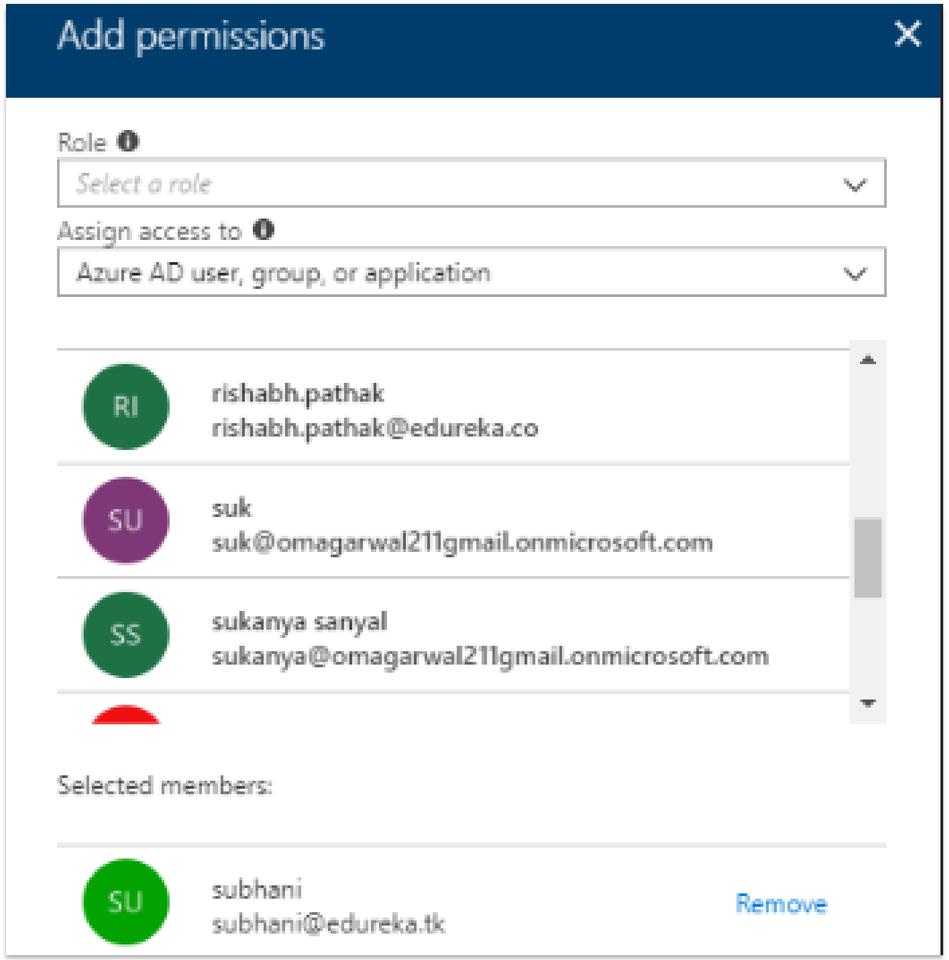
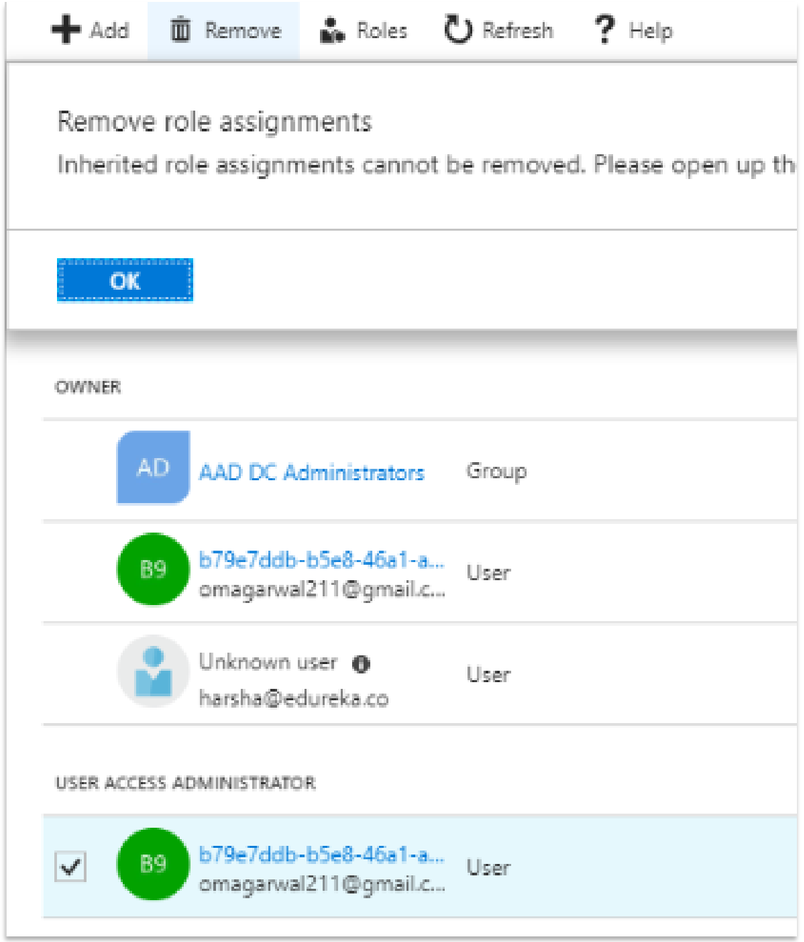
# RBAC – Add Access (Cont.)

7. Select the user, group, or application in your directory that is to be granted access
8. Select **OK** to create the assignment
9. After successfully adding a role assignment, it will appear on the **Users** blade



# RBAC – Remove Access

10. Hover your cursor over the name of the assignment that you want to remove. A check box appears next to the name.
11. Use the check boxes to select one or more role assignments.
12. Select **Remove**.
13. Select **Yes** to confirm the removal.



# Demo 1 – Implement Role Based Access Control

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# Azure Active Directory

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# Azure Active Directory (Azure AD)

Azure AD is Microsoft's multi-tenant, cloud-based directory and identity-management service that combines core directory services, application access management, and identity protection into a single solution

- If you already have an on-premises directory, it can be extended to the cloud using the directory integration capabilities of Azure AD
- Azure AD helps users to sign in and access external resources in Azure portal and many other SaaS applications
- It also allows internal access to apps on your corporate network and intranet, along with any cloud apps developed by your own organization

Azure Active Directory

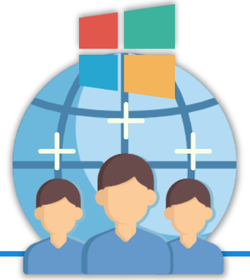
# Applications Of Azure AD

### IT Administrators

- As an IT admin, you can use Azure AD to control access to your apps and your app resources, based on your business requirements
- Azure AD meets your access governance requirements by protecting user identities and credentials

### Application Developers

- As an app developer, Azure AD allows single sign-on (SSO) to your app to enable working with a user's pre-existing credentials
- Azure AD also provides APIs to help you build personalized app experiences leveraging existing organizational data



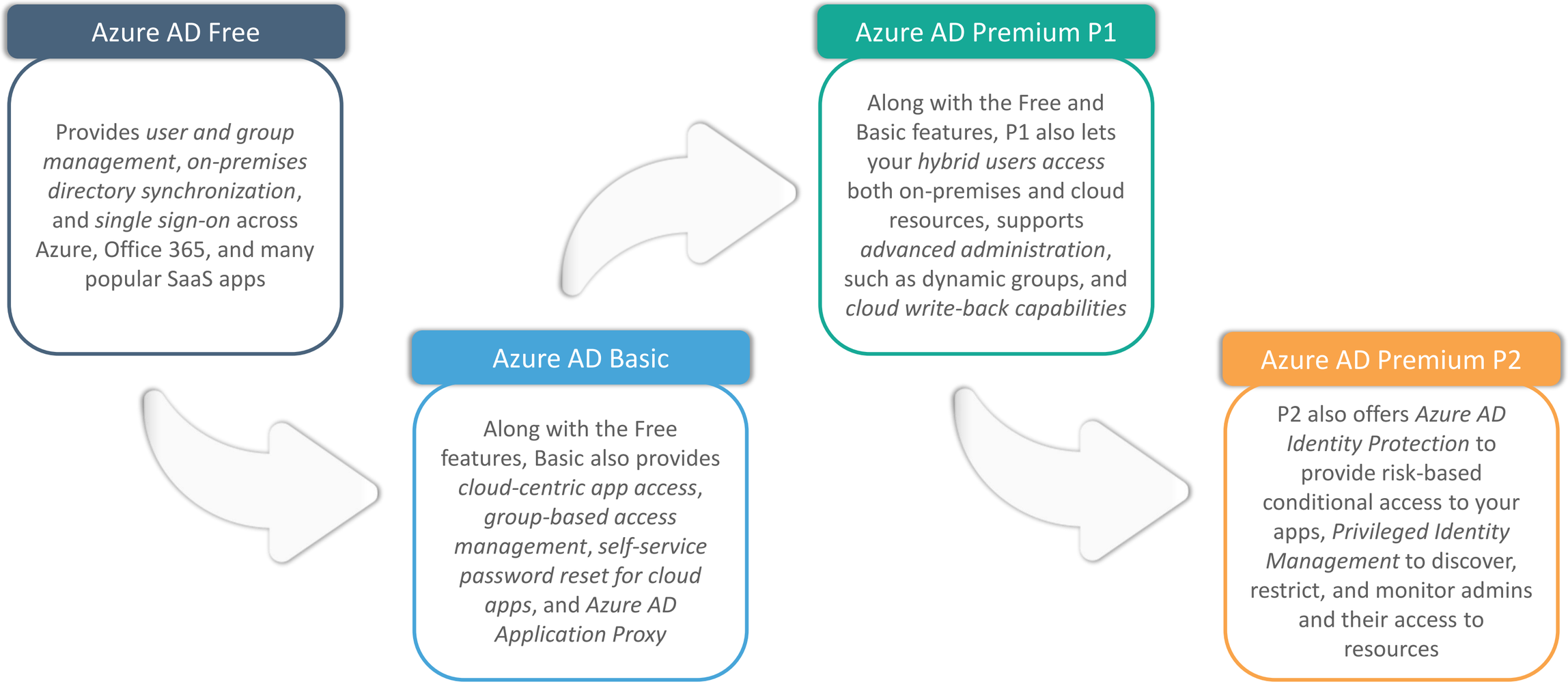
### Microsoft Online Subscribers

- Each Microsoft 365, Office 365, Azure, and Dynamics CRM Online tenant is automatically an Azure AD tenant
- One can immediately start managing access to integrated cloud apps

# Azure AD Licenses

- If you subscribe to any Microsoft Online business service, you automatically get Azure AD with access to all the free features
- Azure AD paid licenses are built on top of your existing free directory, providing enhanced monitoring, security reporting, and secure access for your mobile workforce
- To enhance your Azure AD implementation, you can add paid capabilities by upgrading from Azure Free AD to *Azure Active Directory Basic*, *Premium P1*, or *Premium P2* licenses
- **Pay-as-you-go feature licenses** such as *Azure AD Business-to-Customer (B2C)* can help you provide identity and access management solutions for your customer-facing apps

# Azure AD Licenses (Cont.)



# Azure AD Authentication Methods

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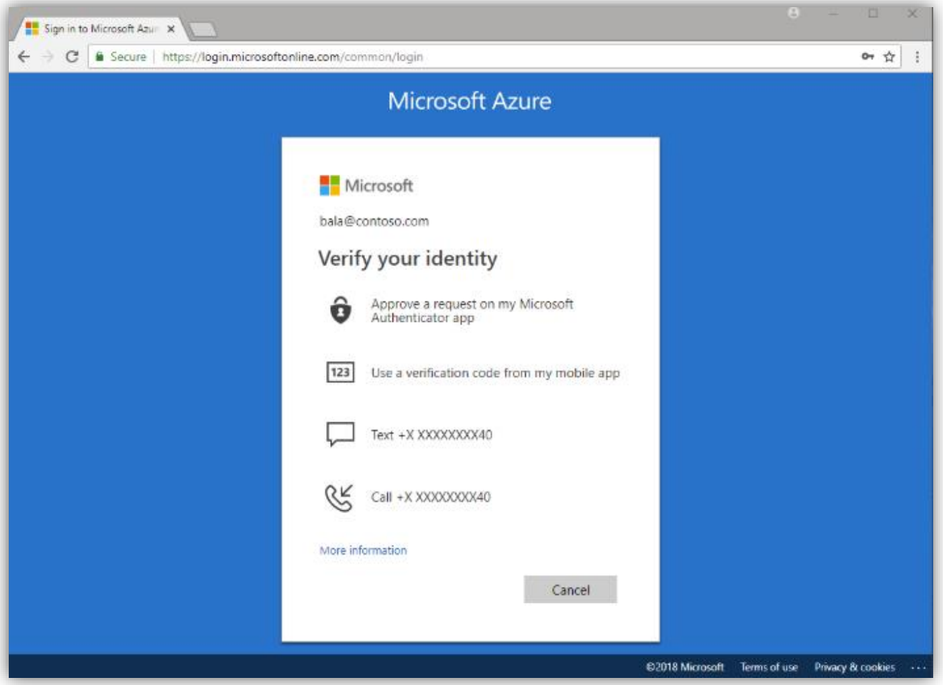
# Authentication Methods

- Microsoft Azure AD includes features, **like Azure Multi-Factor Authentication (Azure MFA)** and **Azure AD self-service password reset (SSPR)**, to help administrators protect their organizations and users with additional authentication methods

- Azure MFA and Azure AD SSPR give admins control over configuration, policy, monitoring, and reporting using Azure AD and the Azure portal to protect their organizations

- Additional verification may come in the form of authentication methods such as:

  - A code provided in an email or text message
  - A phone call
  - A notification or code on their phone
  - Answers to security questions

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# Azure Multi-Factor Authentication (MFA)

Azure MFA is Microsoft's two-step verification solution that helps safeguard your access to data and applications, while meeting the demand for a simple sign-in process

It is recommended that you require Azure MFA for user sign-ins because:

- It delivers strong authentication with a range of easy verification options
- It enables your organization to protect and recover from account compromises

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# How Multi-Factor Authentication Works?

Because of Azure MFA’s layered approach, even if an attacker manages to learn the user's password, it is useless without also having possession of the additional authentication method

It works by requiring two or more of the following authentication methods:

- Something you know, such as a password

- Something you have - a trusted device that is not easily duplicated, like a phone

- Something you are - biometrics

# Azure Multi-Factor Authentication Limitations

Following are the limitations of the MFA authentication method:

# Demo 2 – Implement Multi-factor Authentication (MFA)

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# Managing Multiple Directories in Azure

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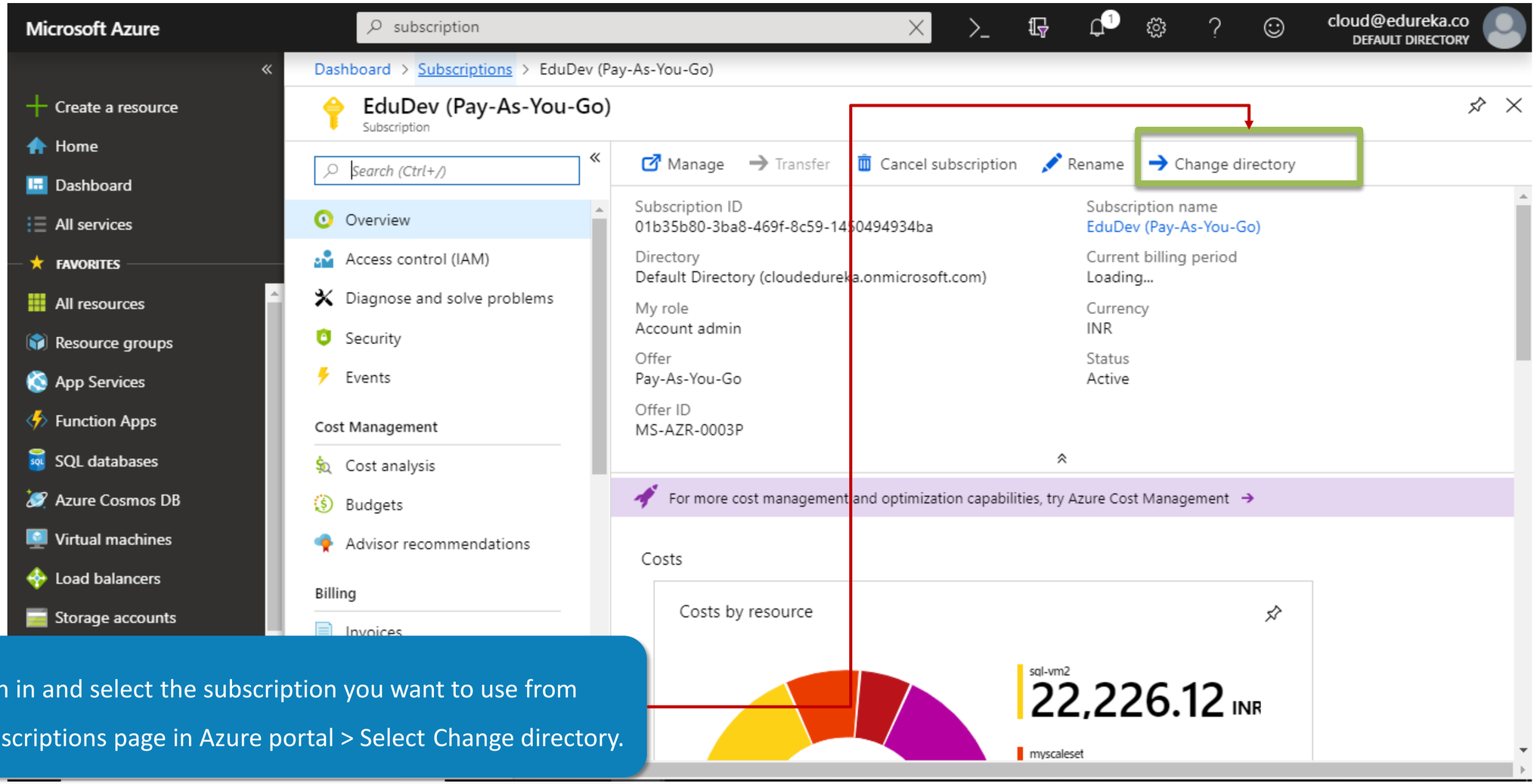
# Adding Sub-directories in Azure : Pre-Requisite

Before you can associate or add your subscription, you must perform the following tasks:

1. Sign in using an account that:
   - Has RBAC Owner access to the subscription
   - Exists in both the current directory that's associated with the subscription and in the new directory that's where you want to associate the subscription going forward
2. Make sure you're not using an Azure Cloud Service Providers (CSP) subscription (MS-AZR-0145P, MS-AZR-0146P, MS-AZR-159P), a Microsoft Internal subscription (MS-AZR-0015P), or a Microsoft Imagine subscription (MS-AZR-0144P).

# Changing Directory




Sign in and select the subscription you want to use from the Subscriptions page in Azure portal > Select Change directory.

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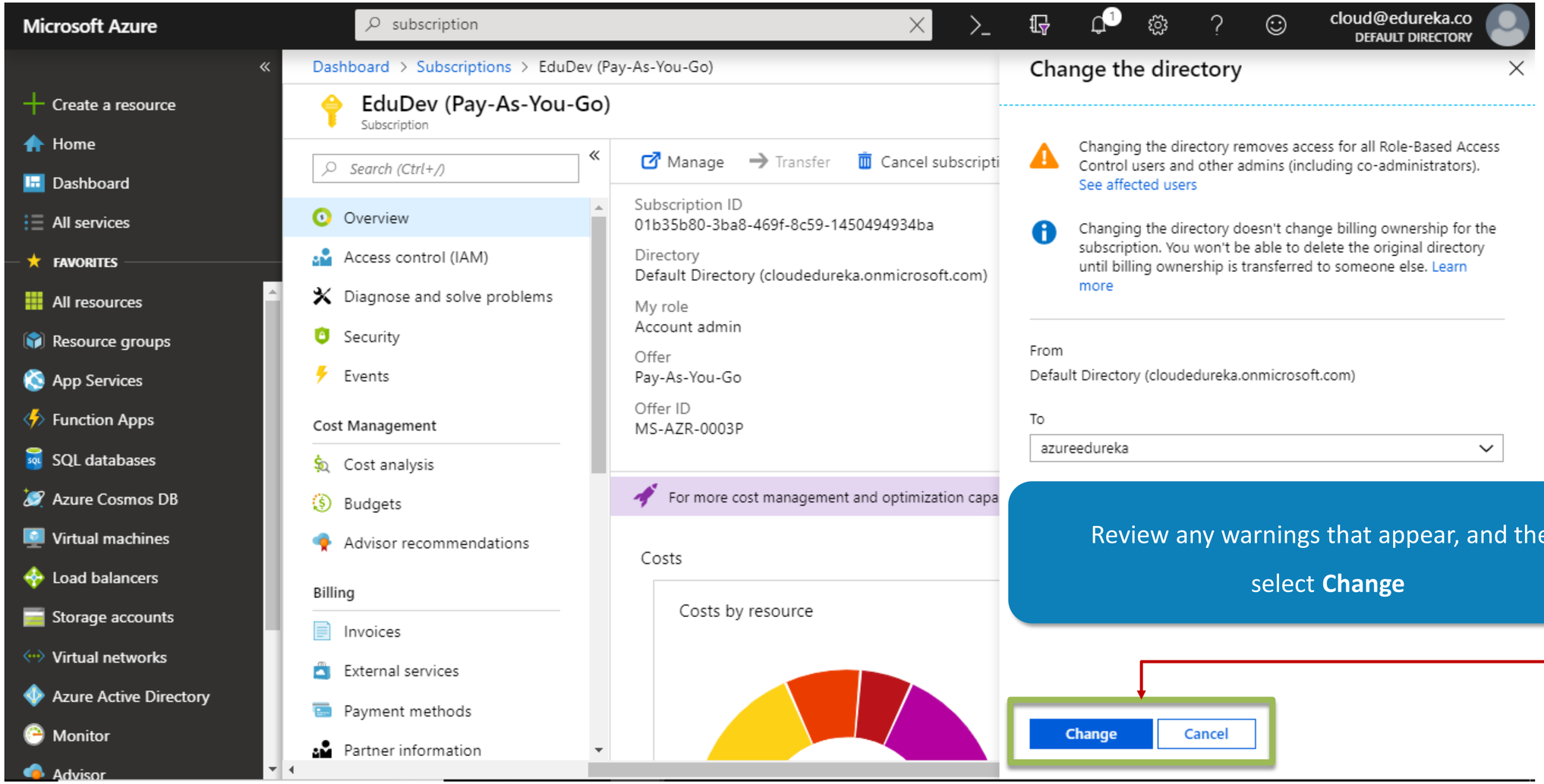
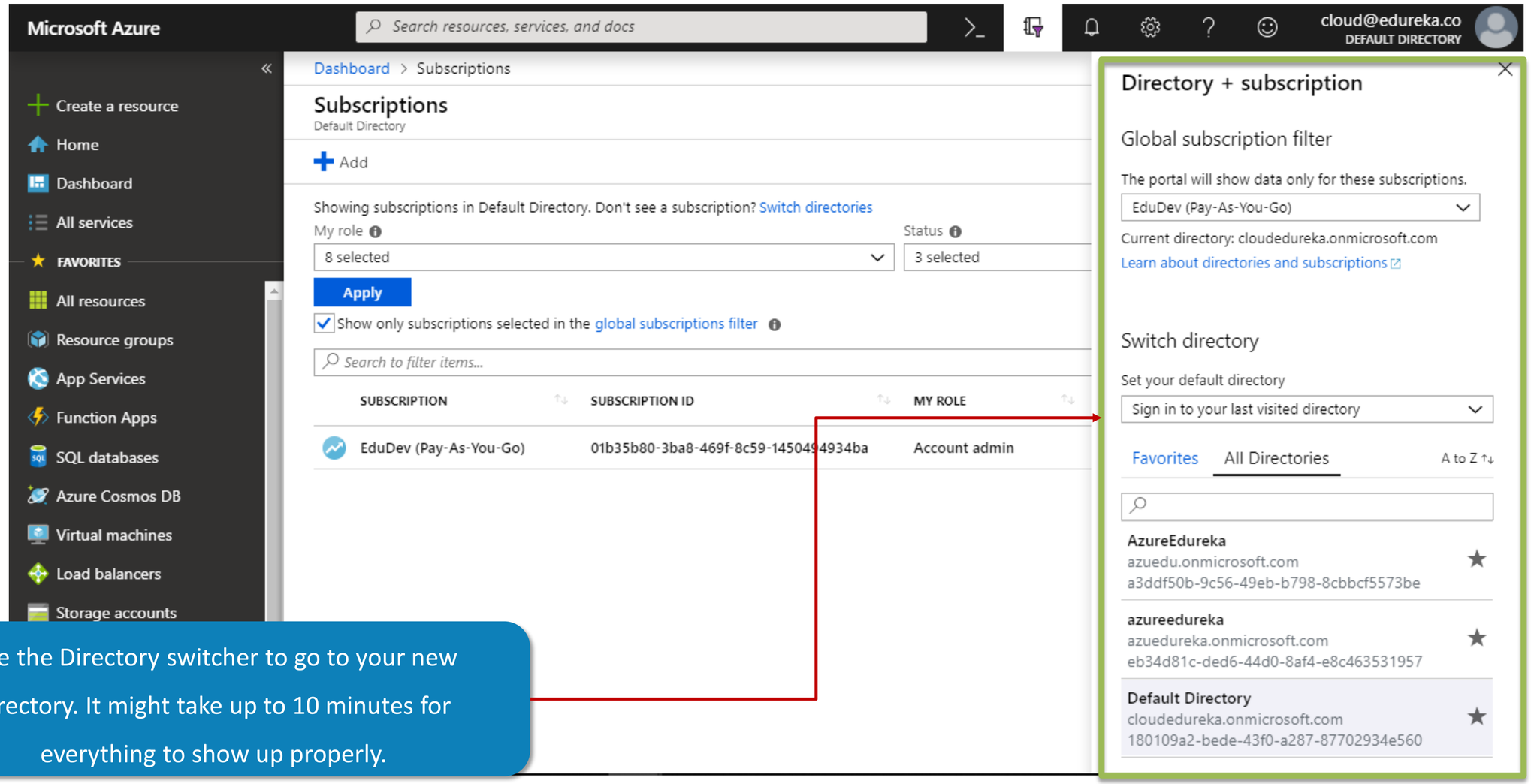
# Changing Directory (Cont.)



# Updated Directory in Portal




Use the Directory switcher to go to your new directory. It might take up to 10 minutes for everything to show up properly.

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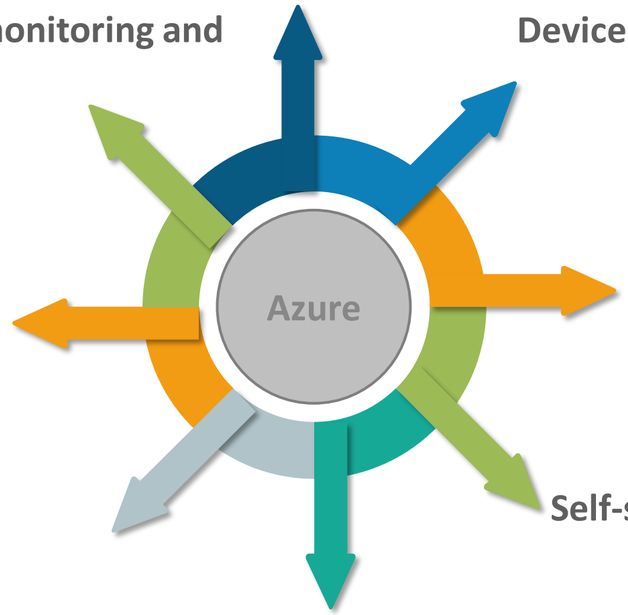
# Azure AD Identity Management Capabilities

Multi-factor authentication

Rich auditing and security monitoring and alerting

Device registration




Application usage monitoring

Self-service password management

Role based access control

Self-service group management

Privileged account management

These capabilities can help secure cloud based applications, streamline IT processes, cut costs and help ensure that corporate compliance goals are met.

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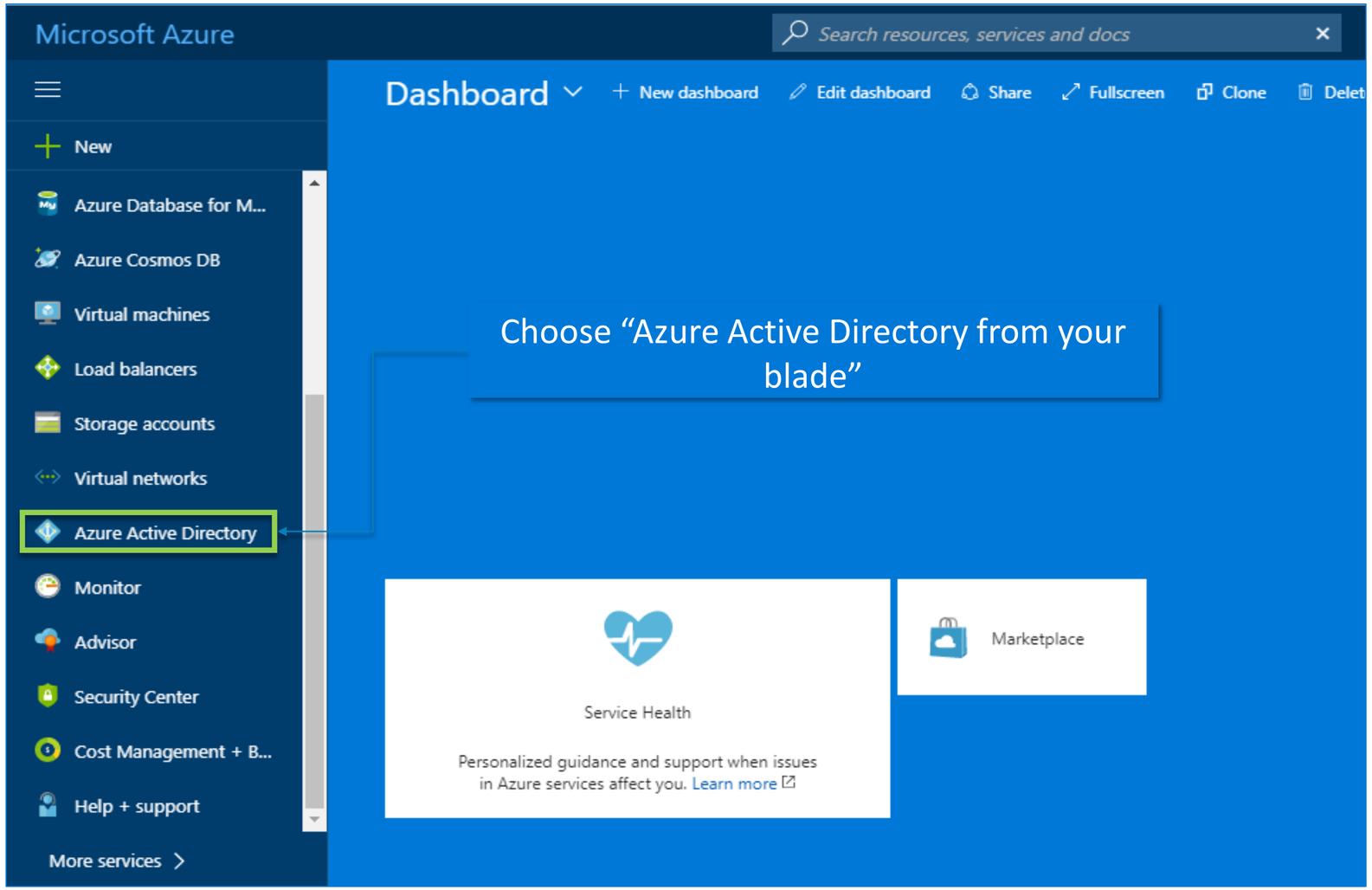
# Azure AD

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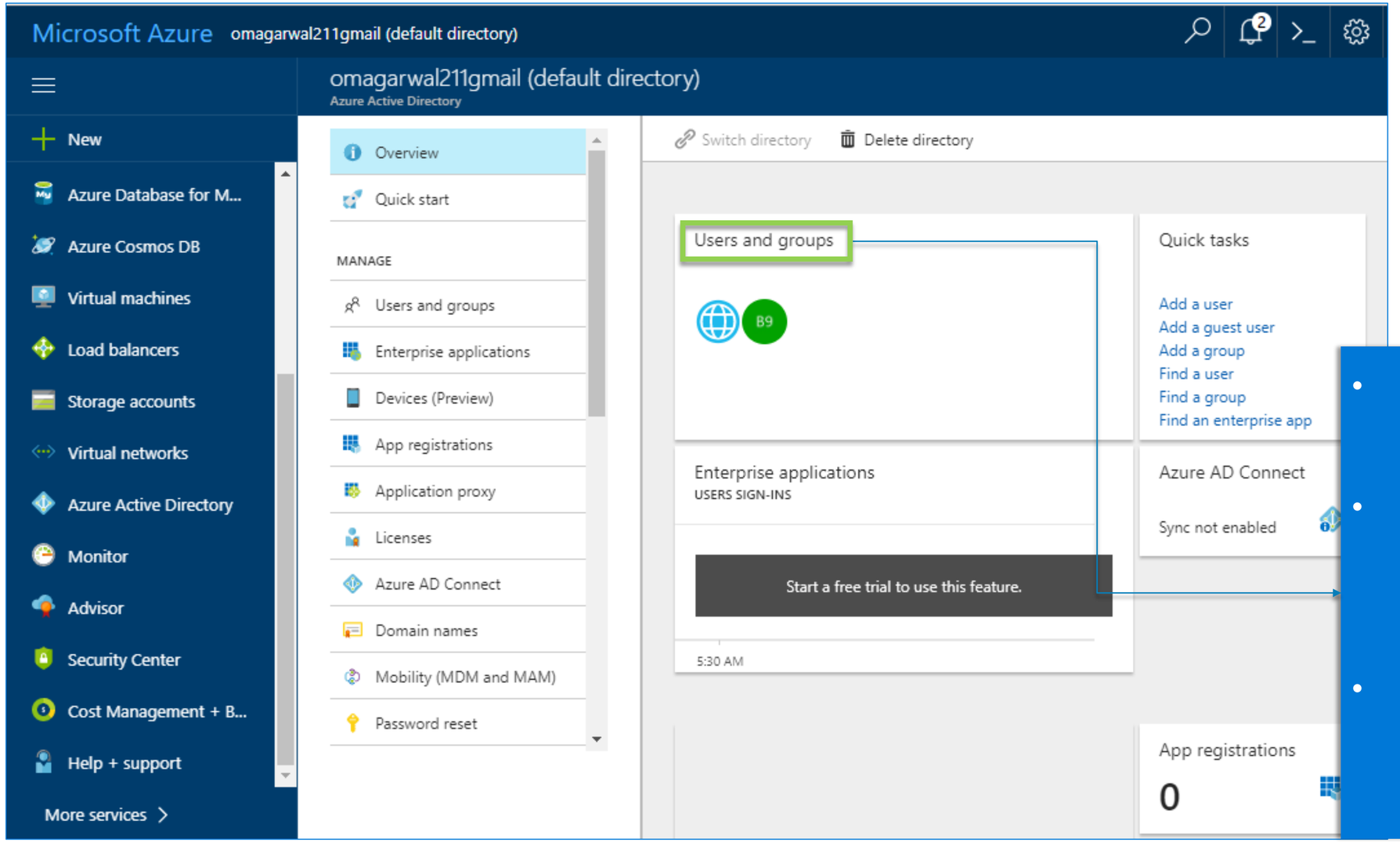
# Azure AD – Users and Groups Overview




- Azure AD follows “Identity as a service” model
- In management of users you can arrange those users in groups
- Then based on the roles you can assign those permissions to those groups

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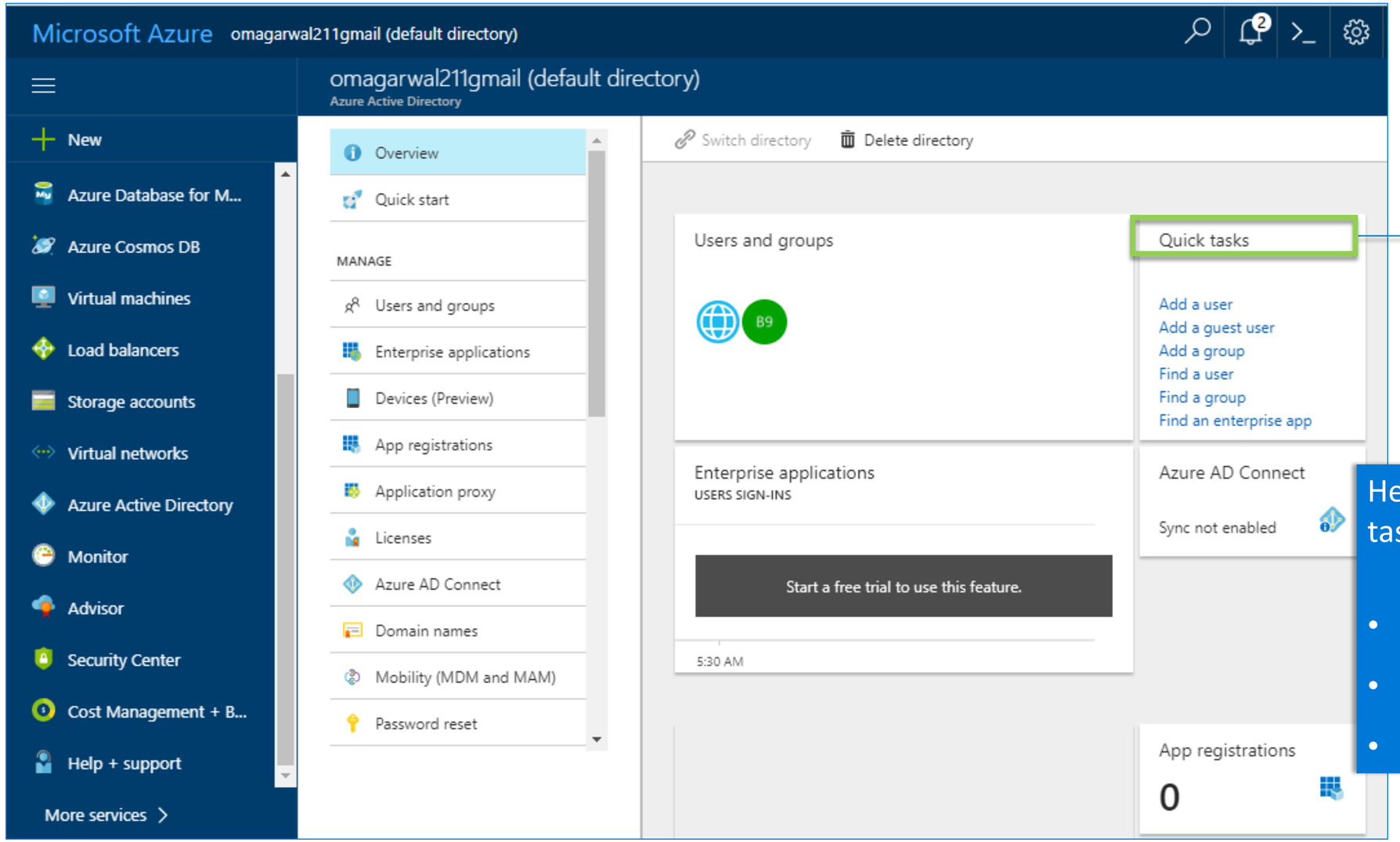
# Azure AD – Quick Task Overview




Here you can perform Quick tasks like:

- Add User, Guest user
- Add a Group
- Perform search

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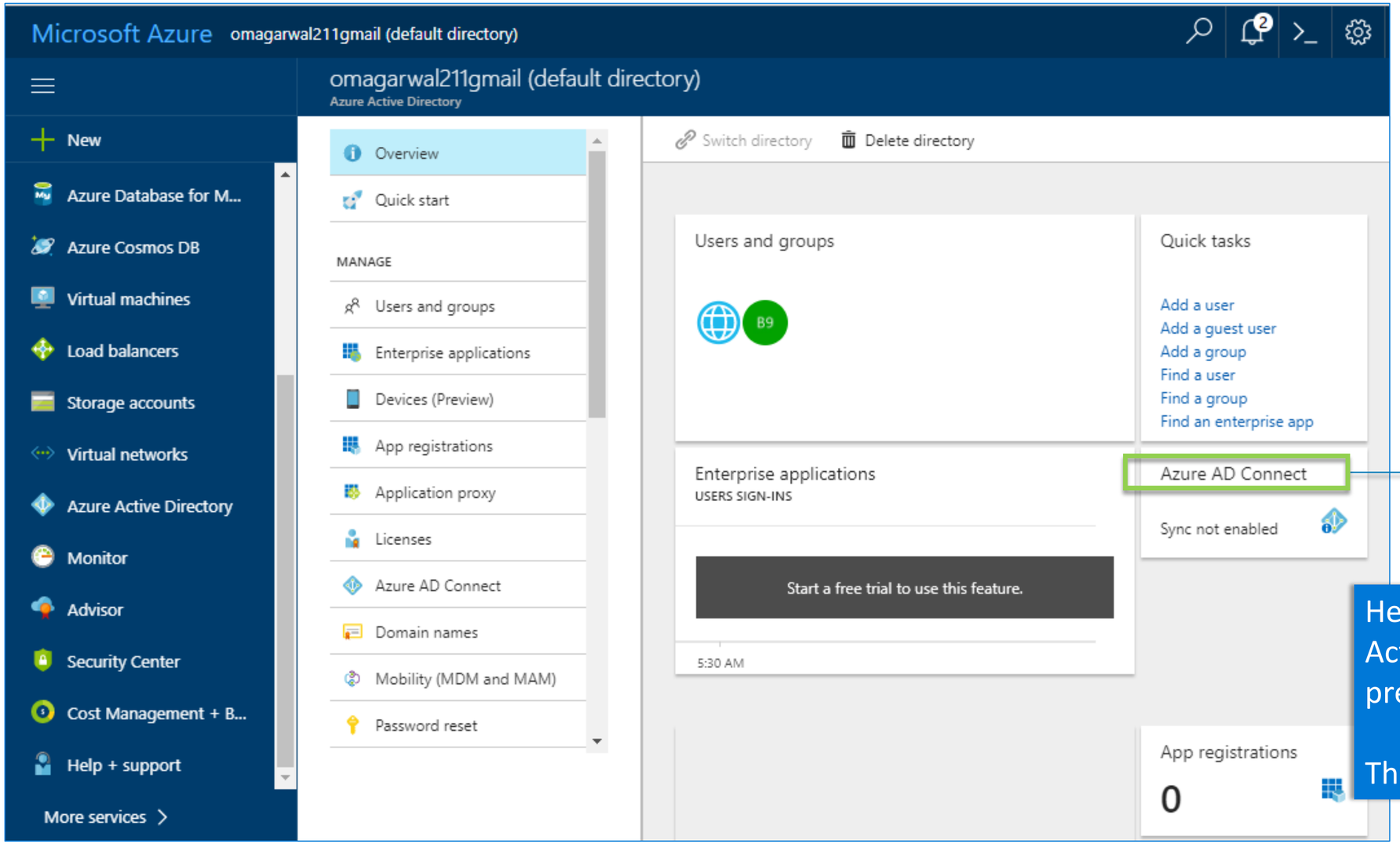
# Azure AD Connect




Here we can connect Azure Active Directory and on premises Active Directory

This is the Synchronization

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# Adding New User to AD

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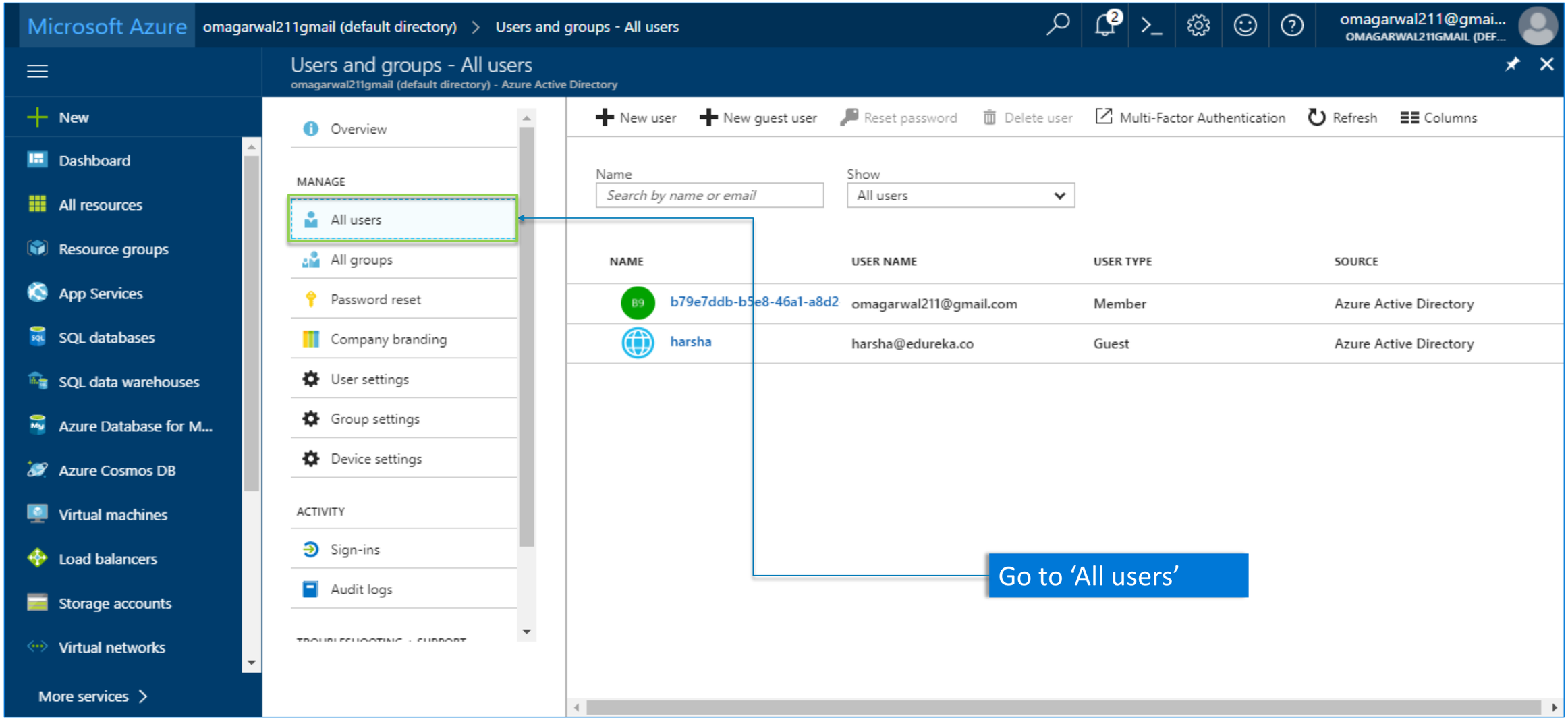
# Adding New User to AD

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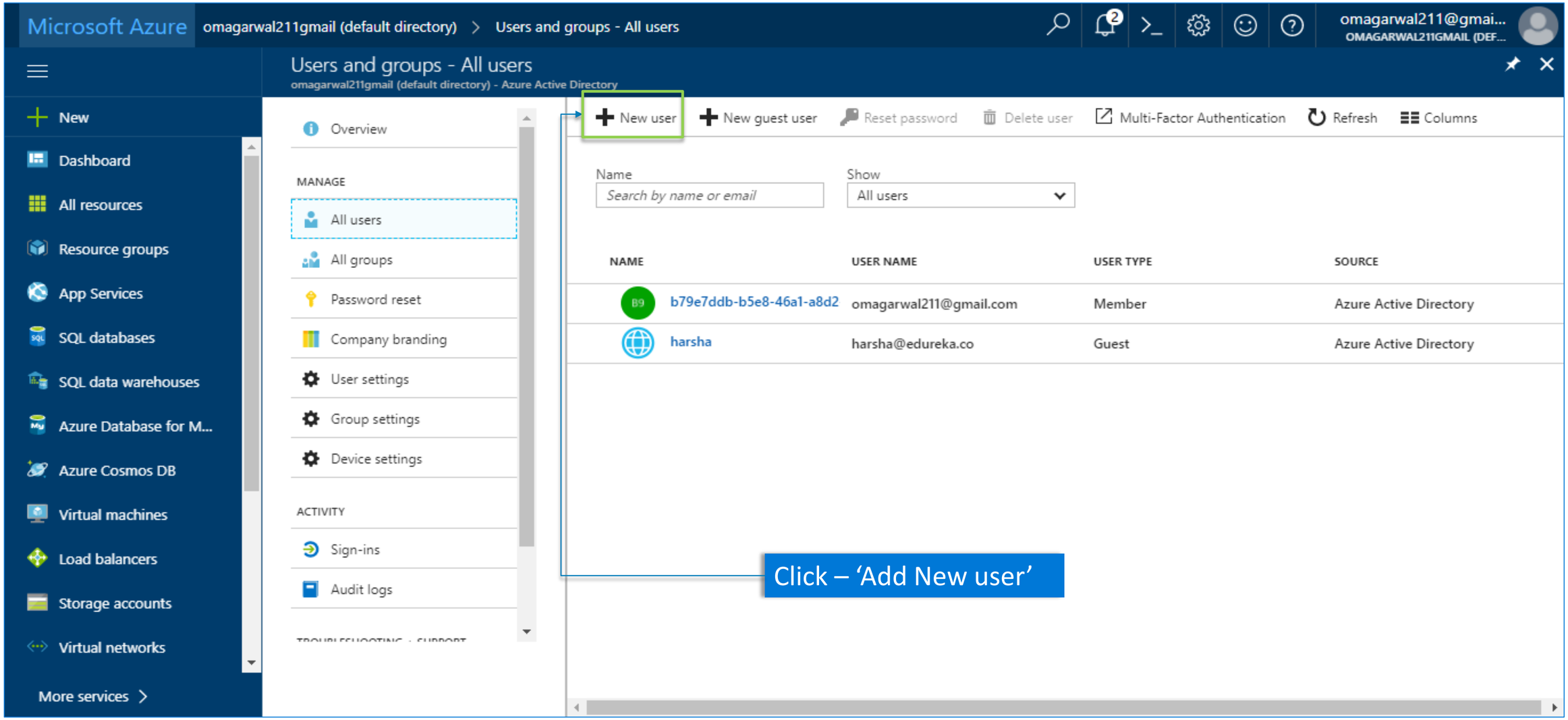
# Adding New User to AD (Cont.)

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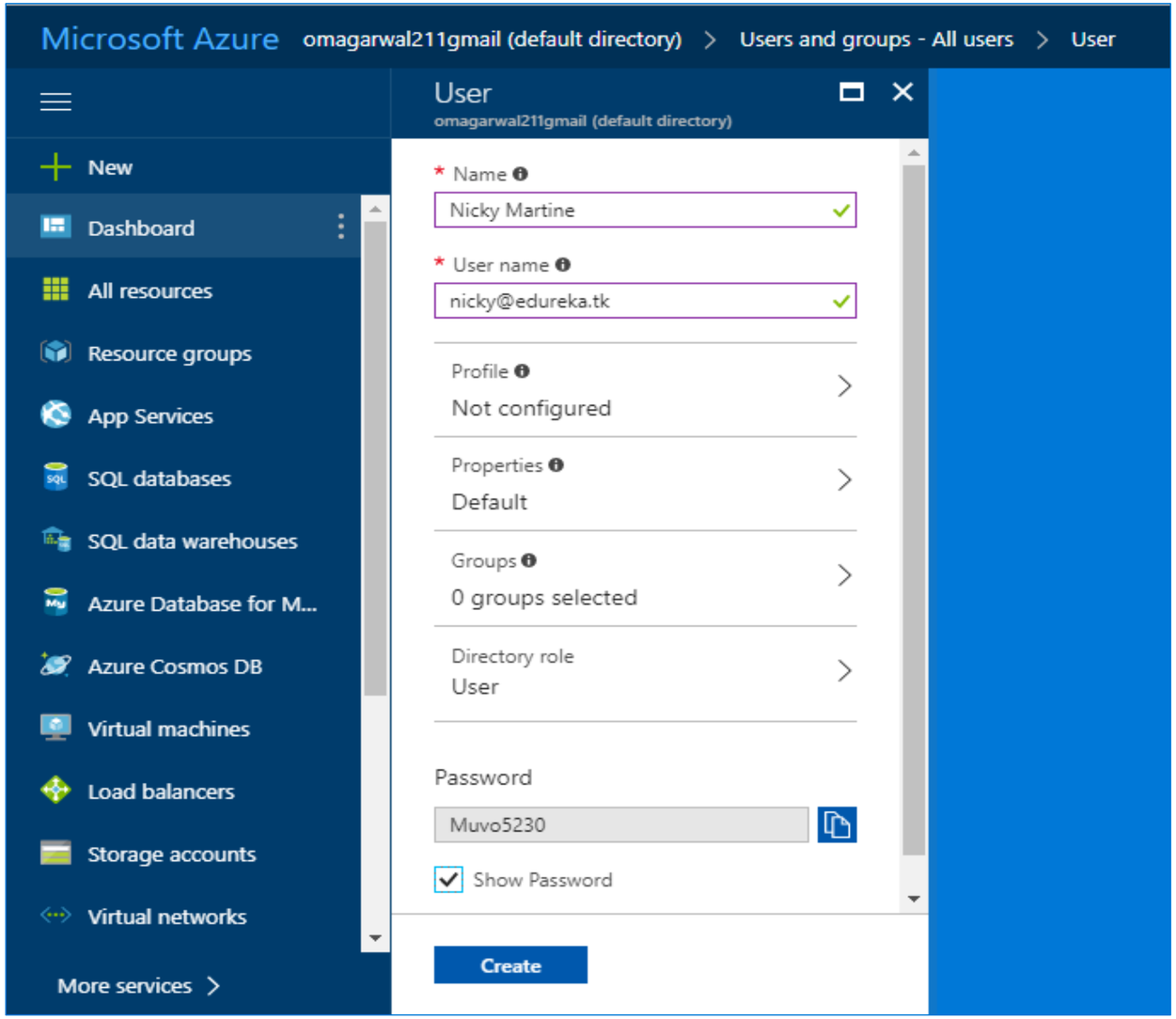
# Registering New User

Register new user here and click – ‘Create’

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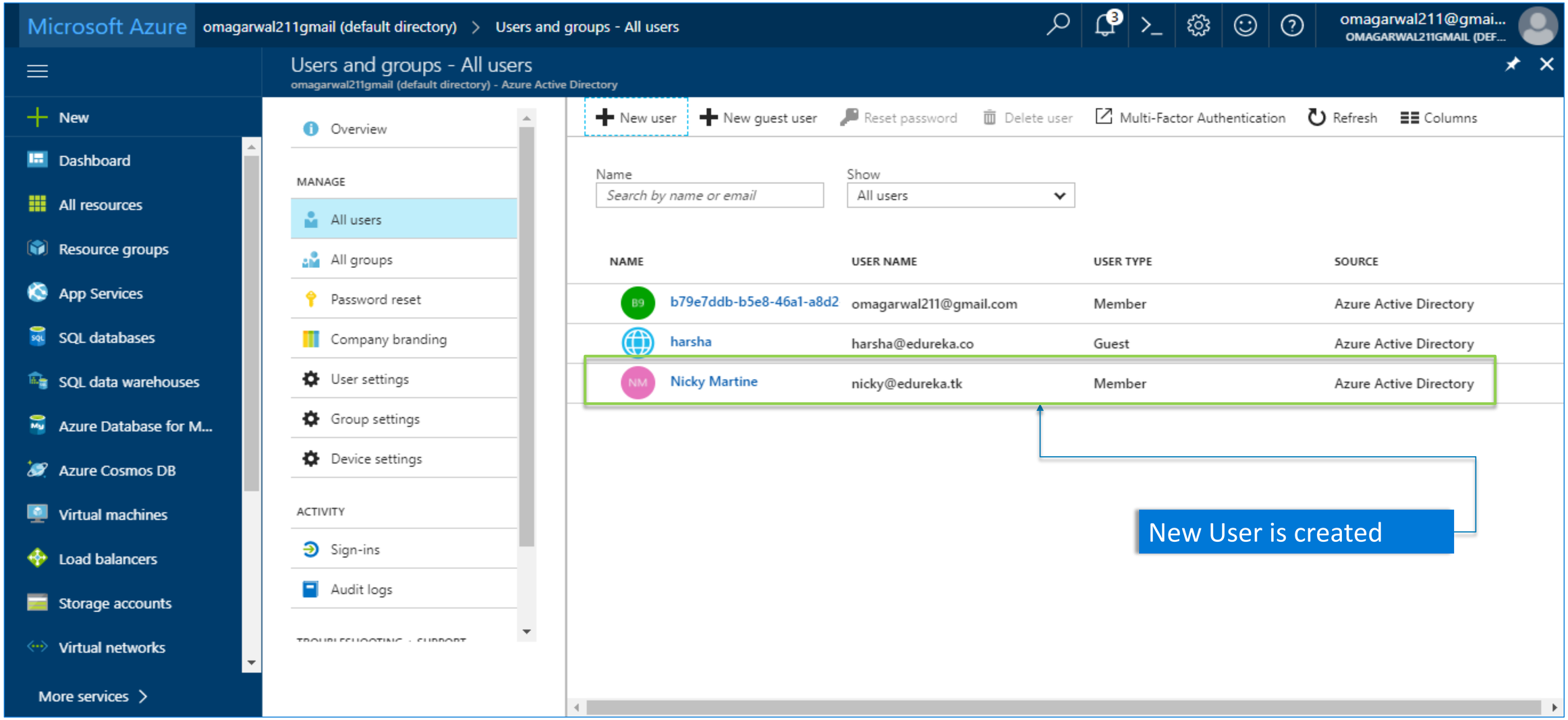
# Successfully Added New User

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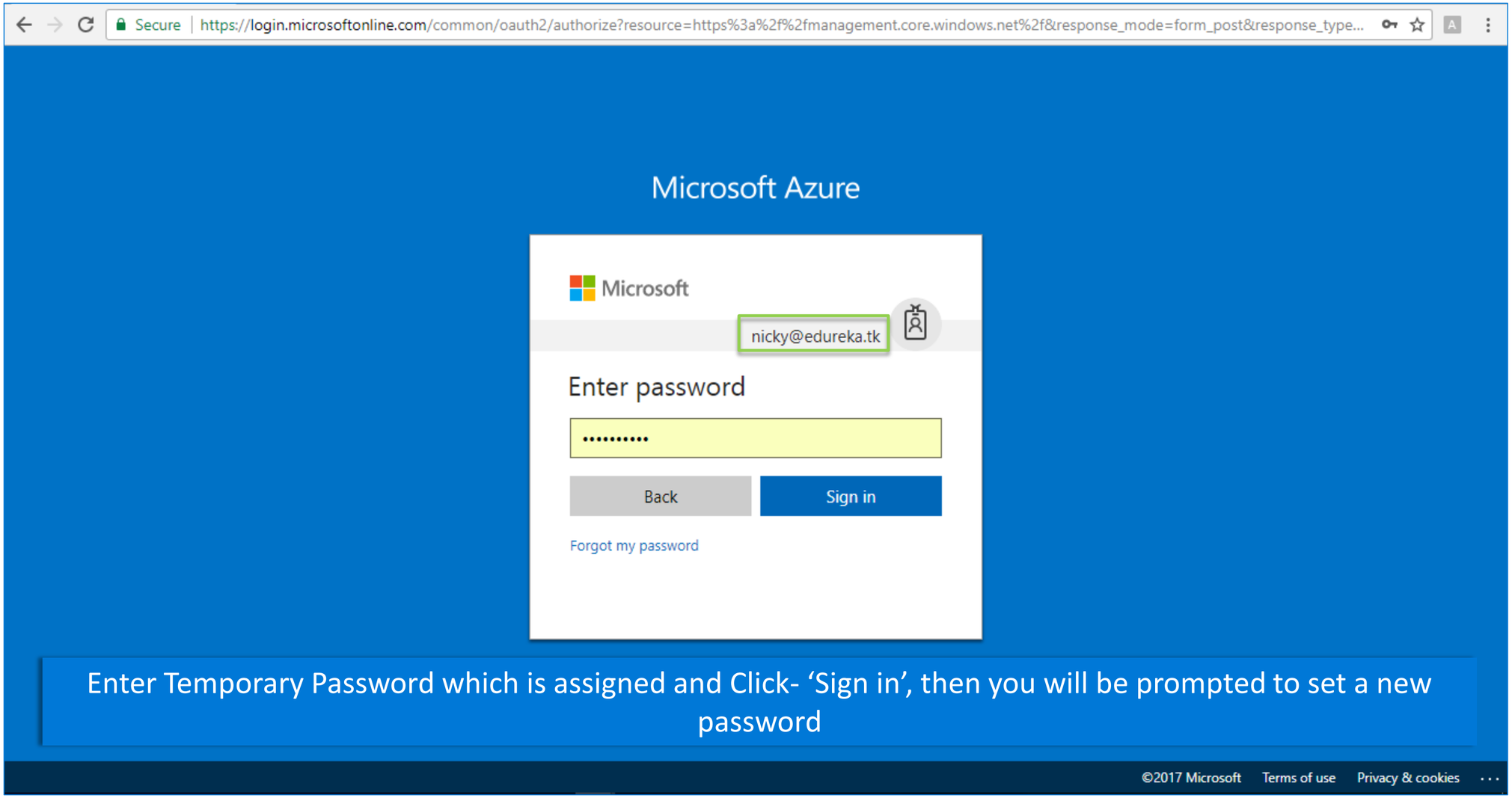
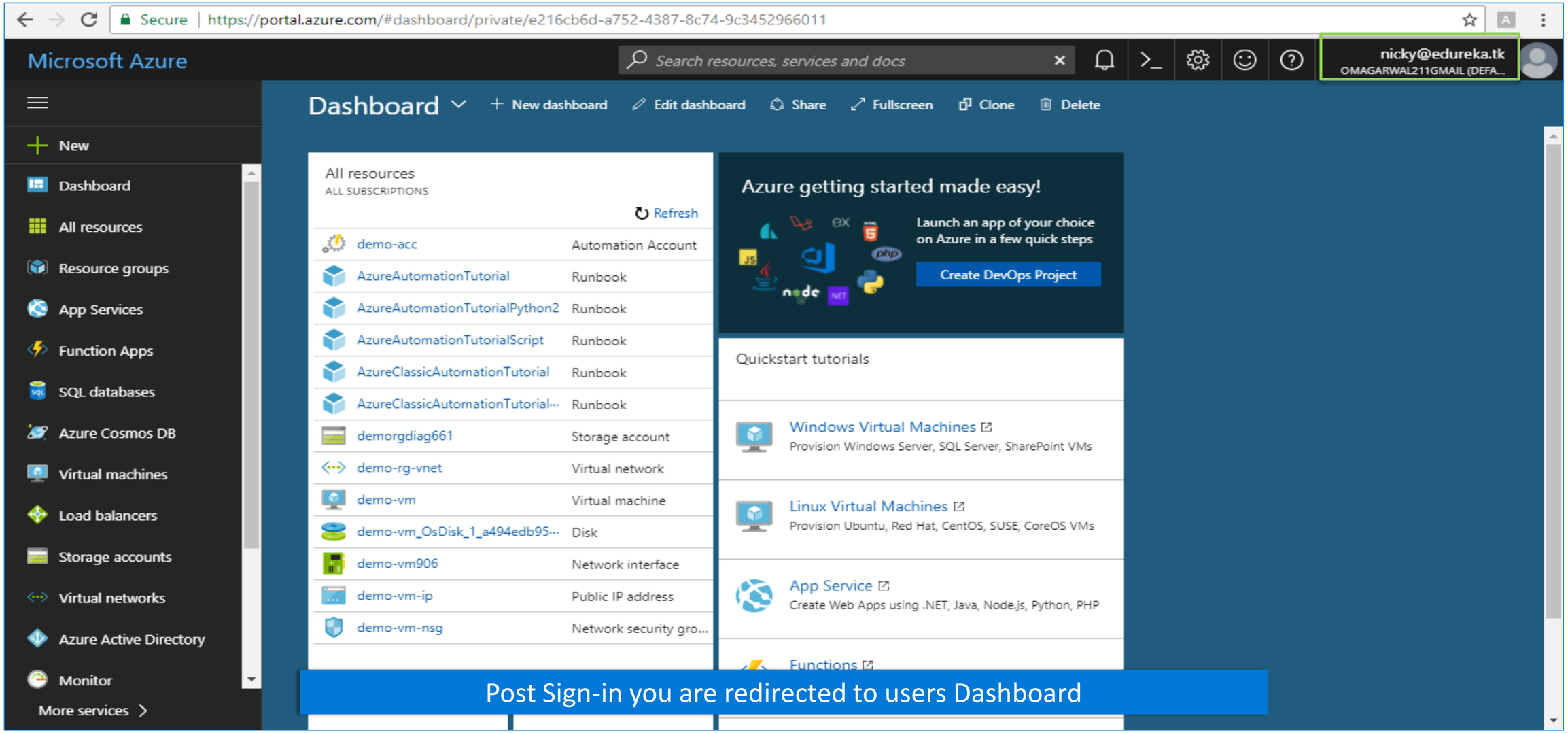
# Successfully Added New User (Cont.)



# Successfully Added New User (Cont.)




Post Sign-in you are redirected to users Dashboard

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# Access Reviews in Azure

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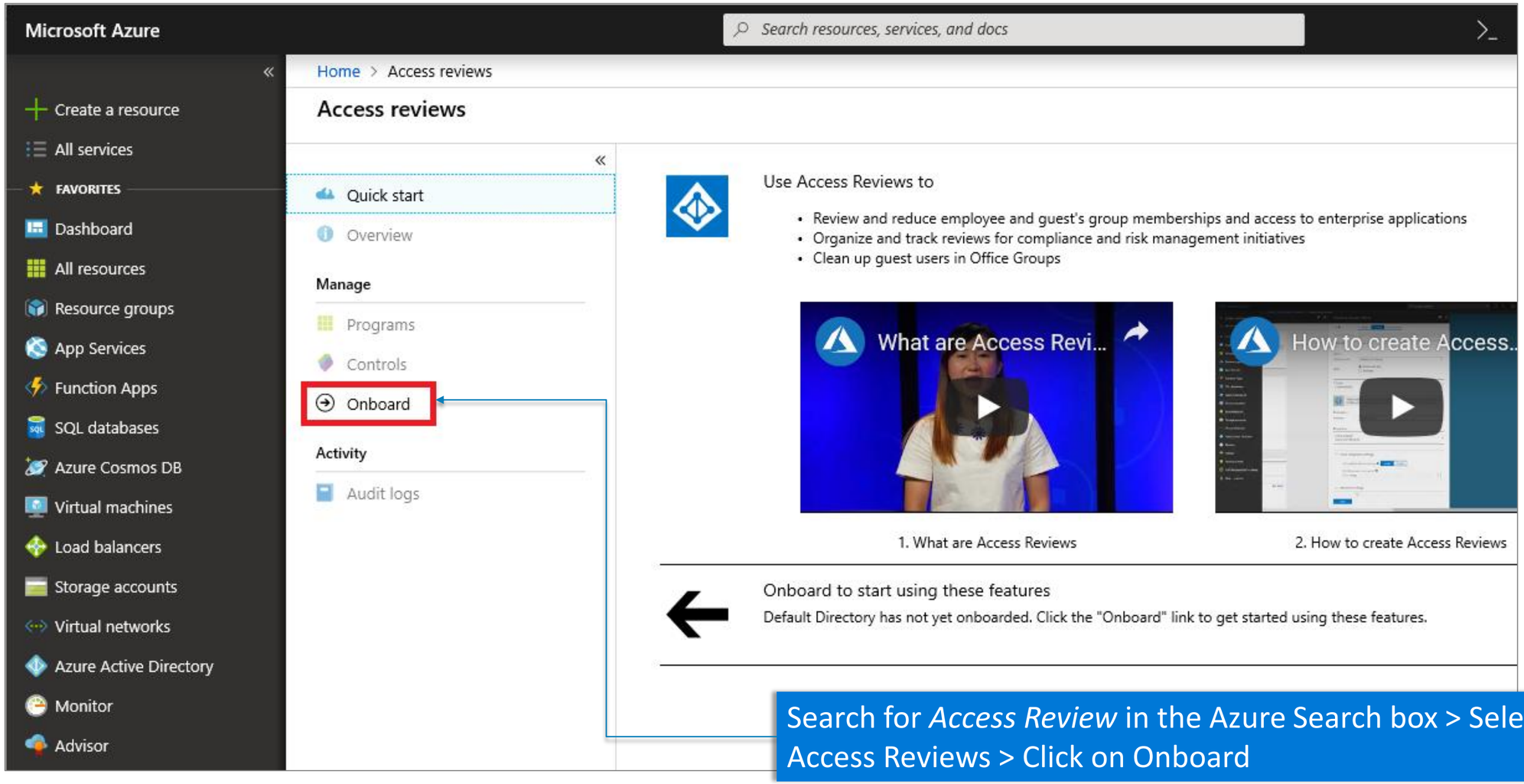
# Introduction to Access Review

- To reduce the risk associated with stale access assignments, administrators can use Azure AD to create access reviews for group members or application access
- Azure Active Directory (Azure AD) Access Reviews enable organizations to efficiently manage group memberships, access to enterprise applications, and role assignments
- User's access can be reviewed on a regular basis to make sure only the right people have continued access
- Access to groups and applications for employees and guests changes over time and If you need to routinely review access, you can also create recurring access reviews

# Enable Access Review




Search for *Access Review* in the Azure Search box > Select Access Reviews > Click on Onboard

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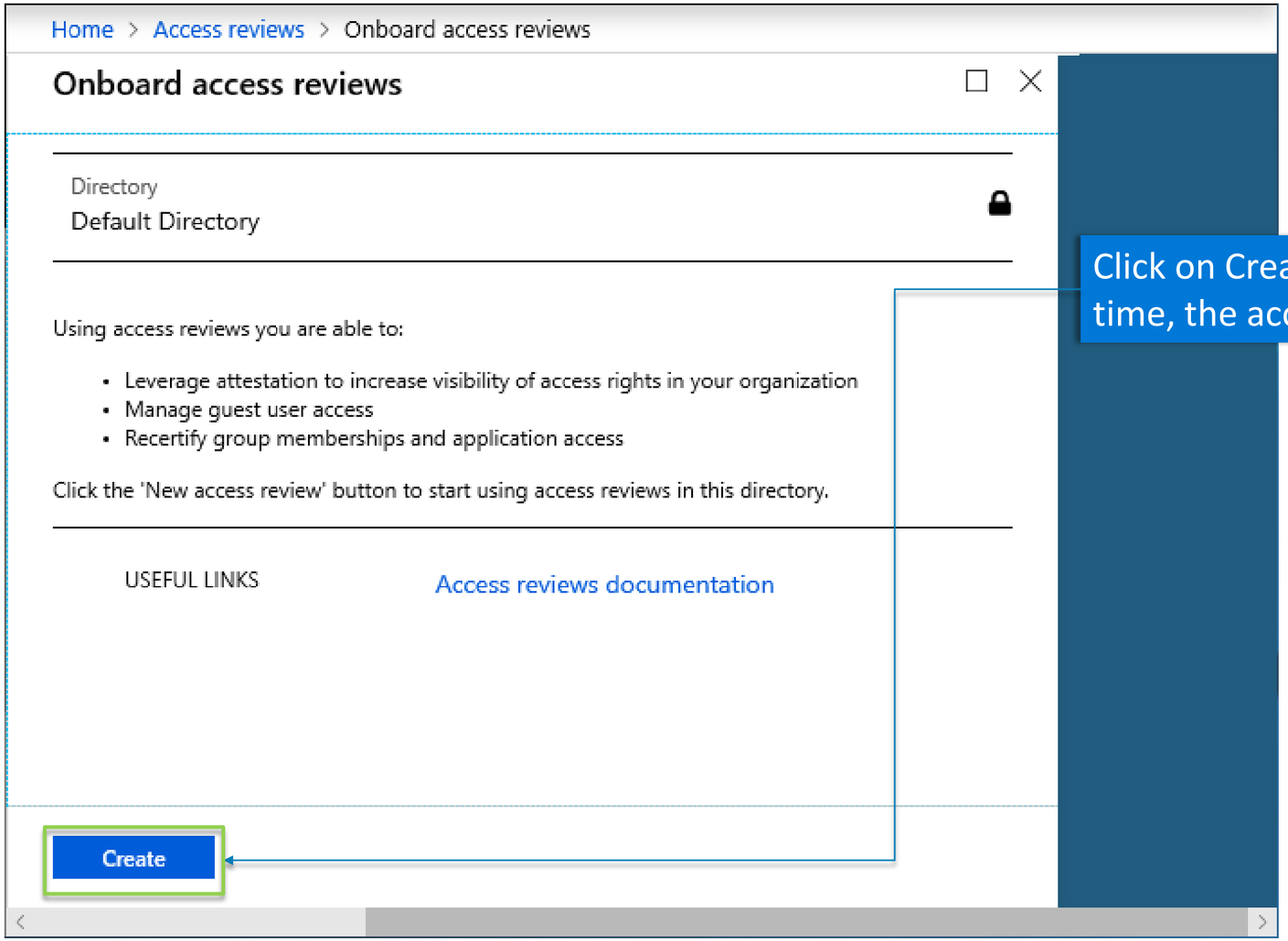
# Enable Access Review (Cont.)




Click on Create > When you open the Access Review tab next time, the access review options will be enabled

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# Authentication

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# Understanding Authentication

1. Authentication is about validating your credentials such as Username/User ID and password to verify your identity
2. The system then checks whether you are what you say you are using your credentials and when it comes to security at least two or all the three authentication factors must be verified in order to grant someone permission to the system
3. Whether in public or private networks, the system authenticates the user identity through login passwords
4. Authentication factors determine the many different elements the system uses to verify one's identity before granting the individual access to anything

# Authorization

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# Understanding Authorization

1. Authorization occurs after your identity is successfully authenticated by the system, which therefore gives you full access to resources such as information, files, databases, funds, etc.

2. Authorization verifies your rights to grant you access to resources only after determining your ability to access the system and up to what extent

3. Authorization is the process to determine whether the authenticated user has access to the particular resources

4. A good example of this is, once verifying and confirming employee ID and passwords through authentication, the next step would be determining which employee has access to which floor and that is done through authorization

# Authentication in Azure Active Directory

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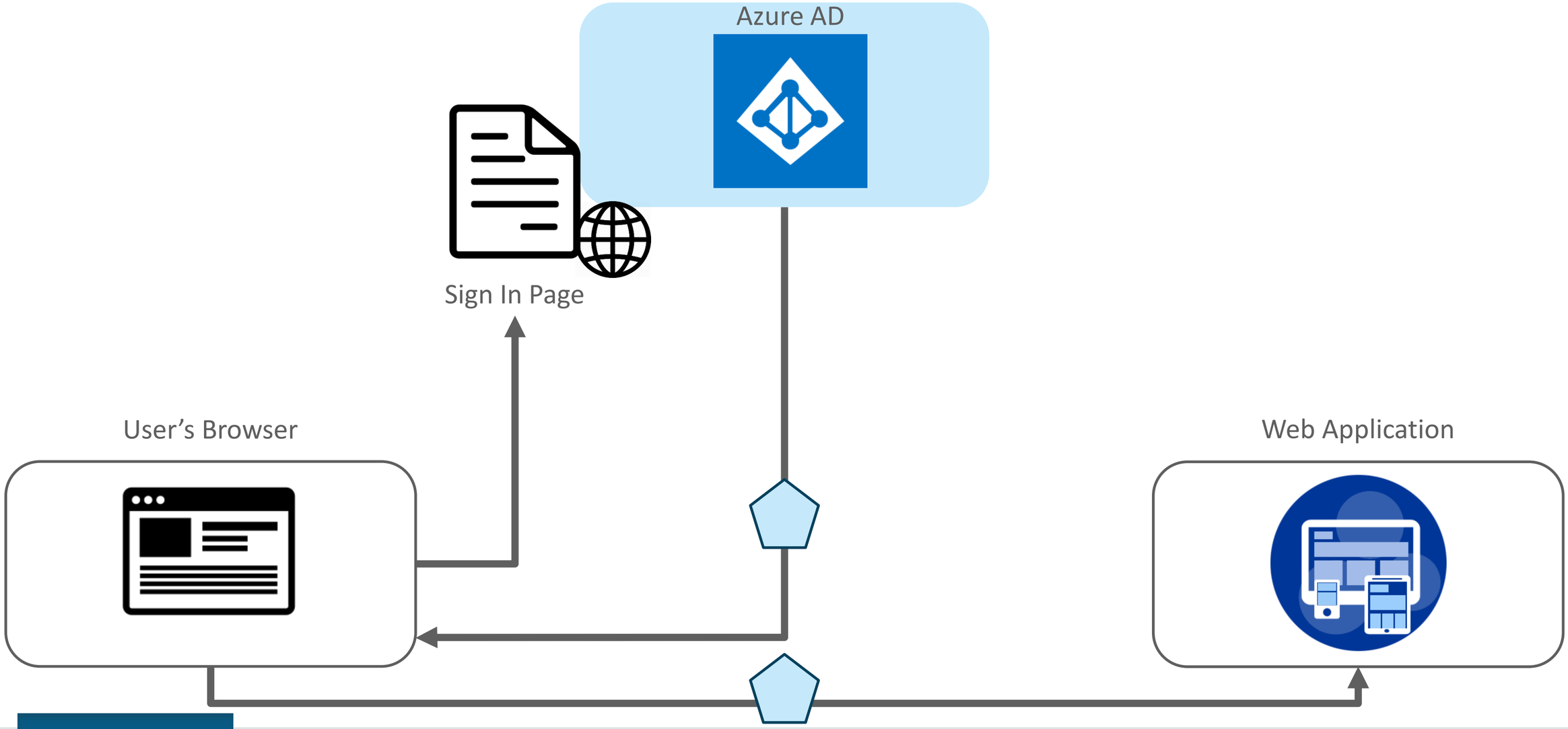
# Authentication in Azure AD

*Authentication* is the act of challenging a party for legitimate credentials, providing the basis for creation of a security principal to be used for identity and access control. In simpler terms, it's the process of proving you are who you say you are. Authentication is sometimes shortened to AuthN. Azure Active Directory (Azure AD) simplifies authentication for application developers by providing identity as a service, with support for industry-standard protocols such as OAuth 2.0 and OpenID Connect, as well as open-source libraries for different platforms to help you start coding quickly.

# Authentication Workflow in Azure AD



# Claim Based Architecture

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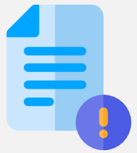
# Claim Based Architectural Aspects

## Securable Entity And Its Attributes

Refers to User, Application or service entity which makes **service** requests

## Claim



**Assertion** made on entity attribute

## Security Token

Collection of Claims which often signed, encrypted and transferred through **secured** channel

## Service Provider/ Relaying Party

Provides requested services and relies on **third-party** for identity management

## Identity Provider

Issues security token to Relaying Party and **authenticates** entity

## Trust

Relationship that ties Service Provider and Identity Provider together

## Authentication

Verifies whether an entity is indeed what it **claims** itself to be

## Authorization

Process to decide whether an **authenticated** user has access to certain functionalities

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# Azure Active Directory – Authentication Frameworks

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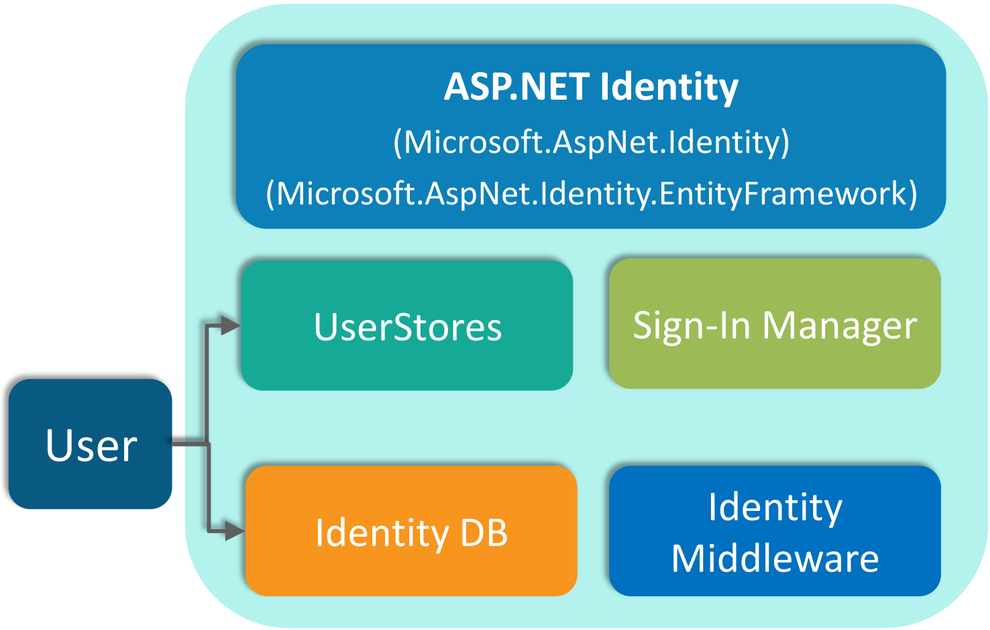
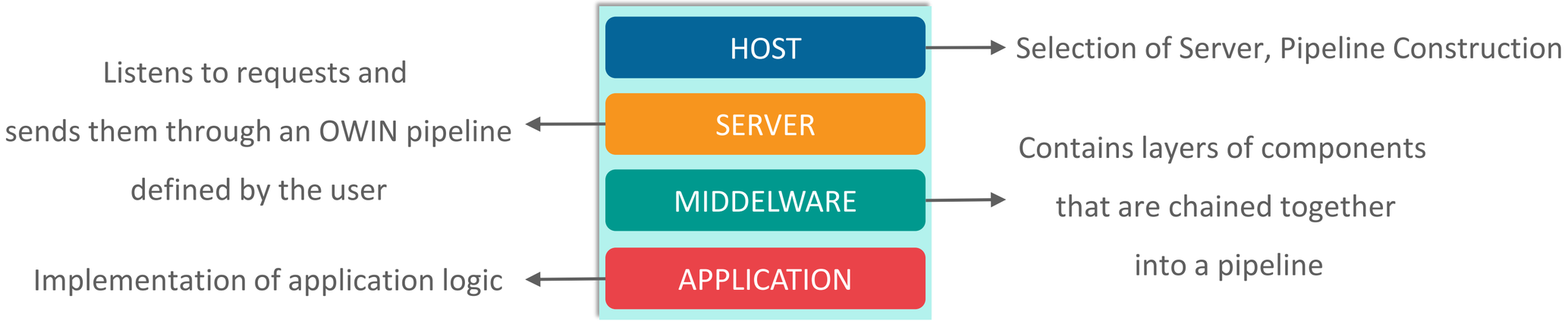
# ASP.NET Core Identity

- ASP.NET and ASP.NET Core uses different Authentication Frameworks
- ASP.NET 5 uses OWIN Authentication Middleware
- ASP.NET uses ASP.NET Core Identity
- **ASP.NET Core Identity**
  - Membership system
  - Allows built in support for Authentication and User Management
    - Need to configure a User Store such as a SQL Server database
  - Authentication with External Identity Providers
    - Need to configure User application to use the OAuth 2.0 protocol to work with selected Identity Provider



# Open Web Interface for .NET (OWIN)

- Defines an abstraction layer between web applications and web servers
- Decouples web applications and web server
- Katana is an implementation of  OWIN
- Katana has layered architecture




Katana’s architecture layers

For more information about Katana and OWIN click here

# Azure Managed Service Identity

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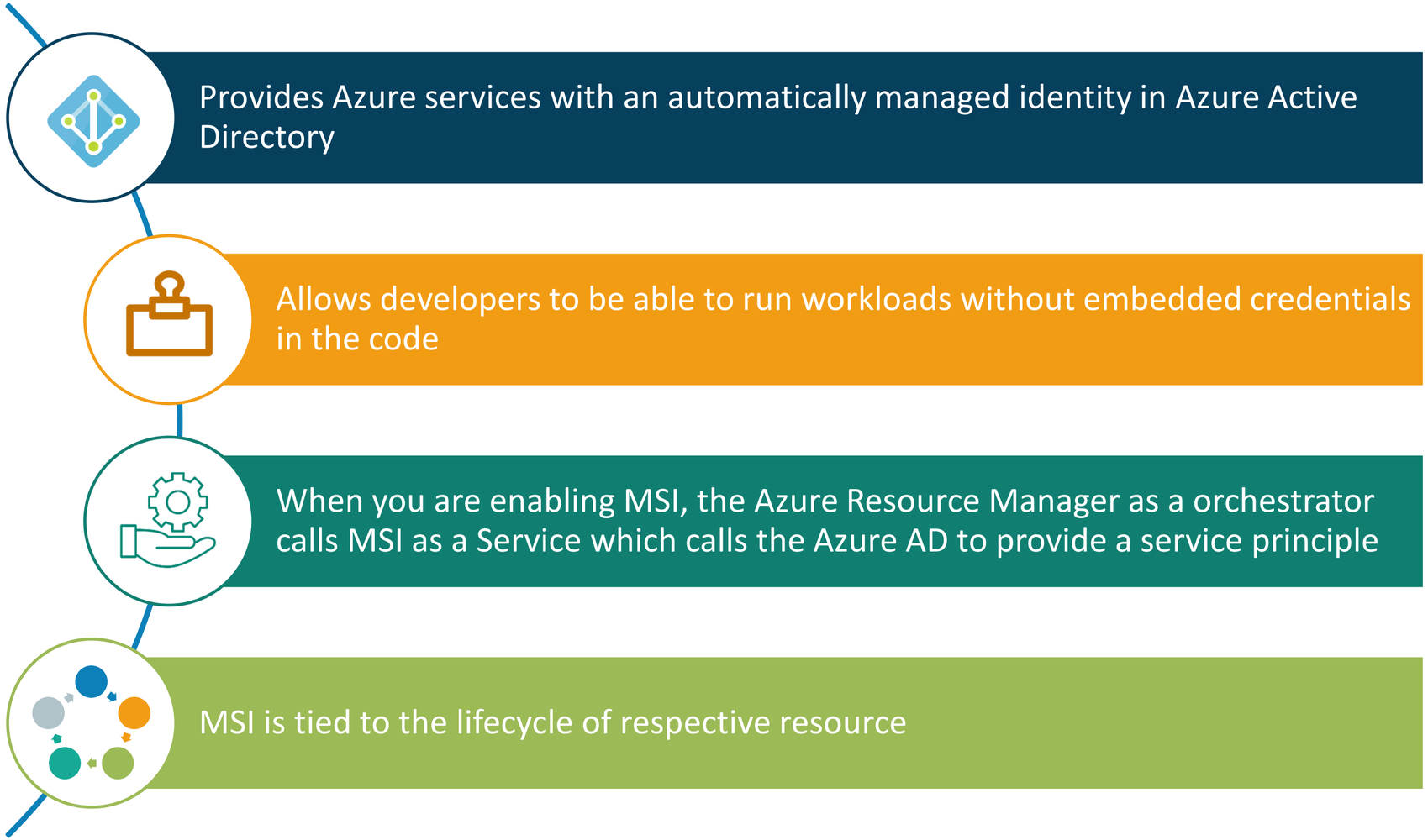
# Managed Service Identity (MSI)



# Demo 3 – Implement Managed Service Identity (MSI)

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# Implementing OAuth 2.0 Authorization

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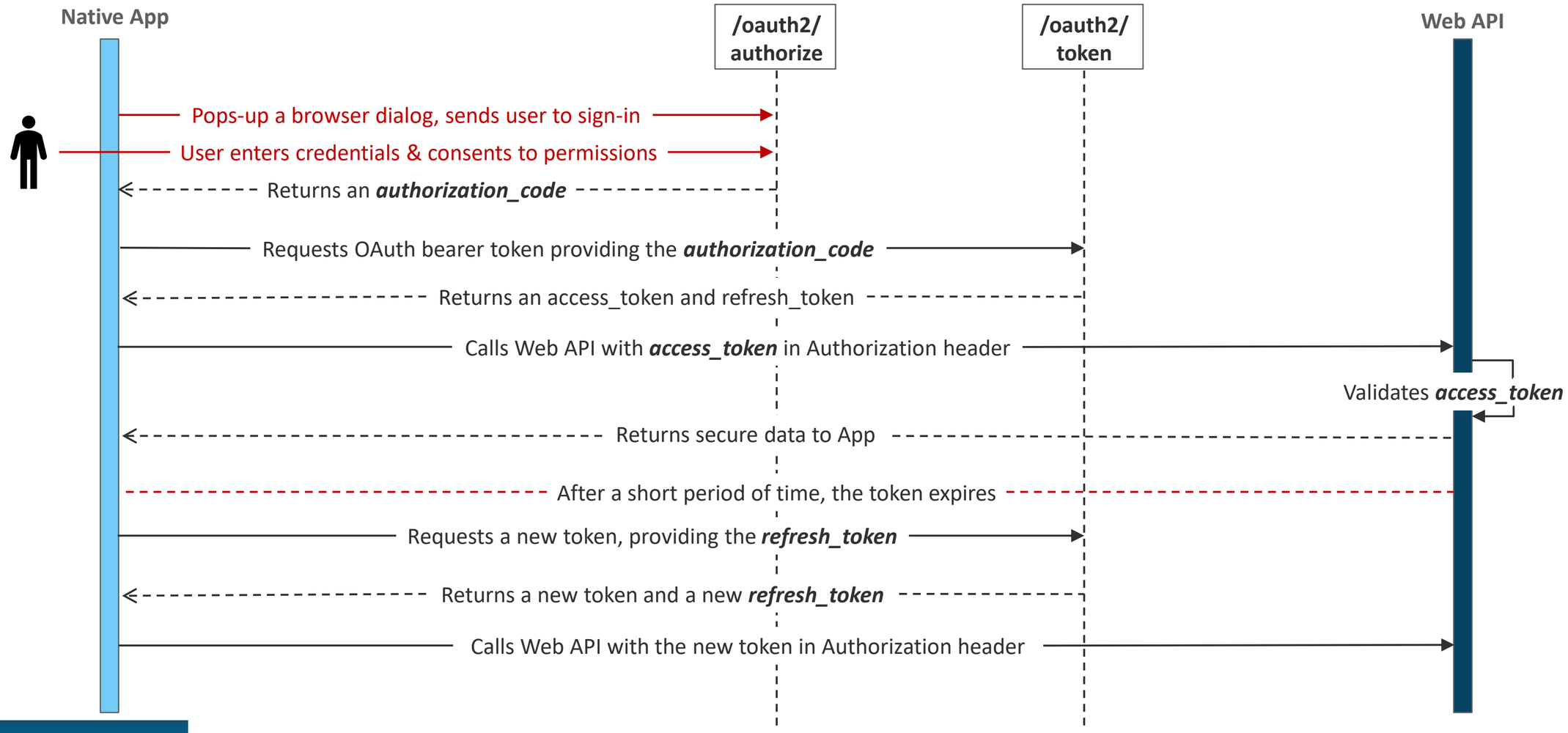
# Authorize Access to Azure AD Web Applications

- Azure Active Directory (Azure AD) uses OAuth 2.0 to enable you to ***authorize access*** to web applications and web APIs in your Azure AD tenant
- The OAuth 2.0 code grant flow is used to perform ***authentication*** and ***authorization*** in most application types, including web apps and natively installed apps

# OAuth 2.0 Authorization Flow

At a high level, the entire authorization flow for an application looks a bit like this:

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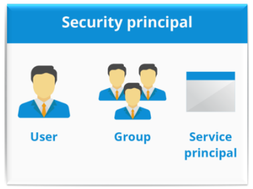
# Steps to Implement OAuth2 Authorization

1. Register your application with your AD tenant
2. Request an authorization code
3. Use the authorization code to request an access token
4. Use the access token to access the resource
5. Refreshing the access tokens

# Summary

## RBAC – Security Principal

- A **Security Principal** is an object that represents a user, group, or service principal that is requesting access to Azure resources
  - **User** - An individual who has a profile in Azure Active Directory. Roles can be assigned to users in other tenants
  - **Group** - A set of users created in Azure Active Directory. When you assign a role to a group, all users within that group have that role
  - **Service Principal** - A security identity used by applications or services to access specific Azure resources. It functions like a user ID for an application

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## Azure Active Directory (AD)

Azure AD is Microsoft's multi-tenant, cloud-based directory and identity-management service that combines core directory services, application access management, and identity protection into a single solution

- If you already have an on-premises directory, it can be extended to the cloud using the directory integration capabilities of Azure AD
- Azure AD helps users to sign in and access external resources in Azure portal and many other SaaS applications
- It also allows internal access to apps on your corporate network and intranet, along with any cloud apps developed by your own organization


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## Azure Multi-Factor Authentication (MFA)

Azure MFA is Microsoft's two-step verification solution that helps safeguard your access to data and applications, while meeting the demand for a simple sign-in process

It is recommended that you require Azure MFA for user sign-ins because:

- It delivers strong authentication with a range of easy verification options
- It enables your organization to protect and recover from account compromises

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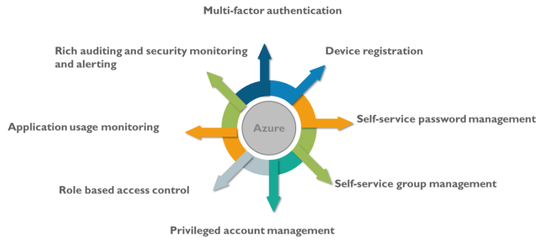
## Azure AD Identity Management Capabilities




These capabilities can help secure cloud based applications, streamline IT processes, cut costs and help ensure that corporate compliance goals are met.

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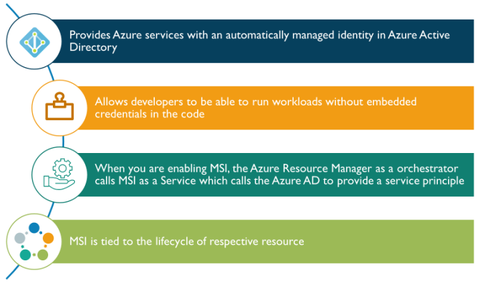
## Managed Service Identity (MSI)

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## OAuth 2.0 Authorization Flow

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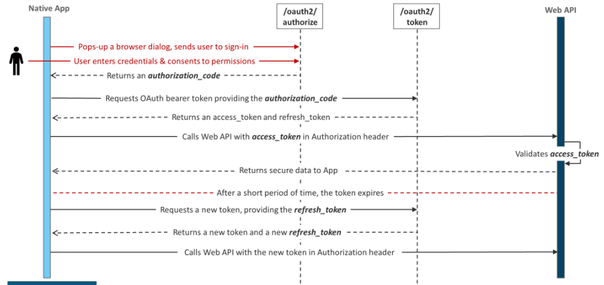


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# Thank You

For more information please visit our website
www.edureka.co