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Cloud Transition

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Introduction

In today's rapidly evolving educational landscape, institutions face the challenge of effectively managing their IT infrastructure to meet the increasing demands of online learning. Global Learning Institute (GLI), a medium-sized educational institution, is no exception. As GLI strives to provide high-quality online courses and certifications to its students, it is confronted with the limitations and drawbacks of its current on-premises servers.

The existing on-premises infrastructure at GLI poses significant challenges, ranging from high maintenance costs to vulnerability to hardware failures and natural disasters. Moreover, the limited storage and processing capacity of these servers hinder GLI's ability to accommodate the growing demand for its online courses and certifications. Recognizing the need for scalability and cost-efficiency, GLI is exploring the possibility of transitioning its IT infrastructure to the Azure cloud.

As a Cloud Architect tasked with addressing GLI's IT challenges, the focus is on demonstrating how migrating GLI's file storage system and databases to Azure cloud services can alleviate these issues. By leveraging Azure's robust and scalable solutions, such as Azure File Storage and Azure Databases, GLI aims to overcome the limitations of its current infrastructure while optimizing costs.[3]

However, GLI operates within a constrained budget, necessitating a strategic approach to the migration process. To support the preliminary phase of migration, the utilization of Azure's free services is imperative. This not only aligns with GLI's budgetary constraints but also lays the groundwork for a seamless transition to the Azure cloud.

In this report, we will delve into the specifics of GLI's IT challenges, explore the benefits of migrating to Azure cloud services, and outline a comprehensive migration strategy. Additionally, we will demonstrate the utilization of Azure's free services to support the preliminary phase of migration, ensuring a cost-effective and efficient transition for GLI.

Overall, this report serves as a roadmap for GLI's journey towards modernizing its IT infrastructure, enabling scalability, resilience, and cost-efficiency in the delivery of online education.

A) Cost Evaluation and Comparison with Azure Total Cost of Ownership (TCO) Calculator

As part of the migration process to Azure cloud services, the initial step is to conduct a thorough cost evaluation using the Azure Total Cost of Ownership (TCO) Calculator. This assessment aims to estimate the potential cost savings that GLI can achieve by migrating its data from on-premises servers to Azure cloud services. To facilitate this evaluation, assumptions will be made regarding on-premise server, database, storage, and network usage. Subsequently, the findings of the TCO evaluation will inform further decision-making and planning for the migration project.

With the Total Cost of Ownership (TCO) Calculator report provided for Global Learning Institute (GLI), we have quantified evidence supporting the migration from on-premises servers to Azure cloud services. Below, I'll dissect the information from the report to illustrate the cost savings and then provide further detail on tasks (b) and (c) related to Azure File Storage and Azure database options.

This cost analysis serves as a robust foundation for advocating the transition to Azure, given the substantial cost savings and the enhanced capabilities that cloud services offer.

Azure Total Cost of Ownership (TCO)

A calculator to estimate the cost savings we can achieve by migrating our data from an on-premises location servers to Azure cloud services.

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

Operating System License

VMs

Virtualization

Windows/Linux Server

Virtual Machines

Windows

Datacenter

50

Hyper-V

Core(s)

RAM (GB)

Optimize by

Windows Server 2008/2008 R2

8

16

CPU

☒

(1 - 32)

(1 - 448)

(1 - 9999)

Workload 2

Workload

Environment

Operating system

VMs

Virtualization

Core(s)

Windows/Linux Server

Virtual Machines

Linux

50

VMware

8

RAM (GB)

Optimize by

16

CPU

(1 - 448)

Fig.1 Servers Settings

Initially, configurations necessary for computation are set up. For tasks 2 and 4, which require Windows OS, the OS license category is marked as "Server Center" (referring to Fig. 1). Within the cost assessment, "Server Hub" and "Basic" represent distinct versions of the operating system software. "Server Hub" is tailored for extensive server farms and larger setups. This version prioritizes efficiency, scalability, and advanced features. It offers significant virtualization capabilities, allowing multiple virtual environments to operate on a single physical server. It boasts features such as real-time transfers, multi-storage, and enhanced network settings. On the other hand, the "Basic" version is designed for smaller-scale enterprises with fewer requirements. It has limitations on scalability and elite features. Overall, the "Server Hub" is preferred due to its enhanced attributes and broader virtualization capabilities, despite its cost, as it aligns with the business scale, server architecture, and software skills.

When selecting internal storage, assessments are influenced by the organization's size and data volume (see Fig. 2).

Storage

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

Storage 1

Storage type ⓘ

Local Disk/SAN

Disk type ⓘ

HDD

Capacity ⓘ

60

TB

(1 - 5000)

Backup ⓘ

120

TB

(0 - 5000)

Archive ⓘ

1

TB

(0 - 5000)

+ Add storage

Networking

Enter the amount of network bandwidth you currently consume in your on-premises environment.

Outbound bandwidth ⓘ

1

GB

(1 - 2000000)

Destination Region

North Europe

Fig. 2 Storage settings

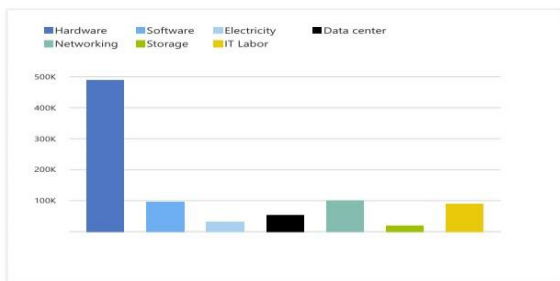
The next few pictures show the Graphical Analysis that highlights the cost differences between traditional and cloud services based systems over a period of three years.

Total on-premises cost breakdown

In Azure, several of the cost categories from the on-premises environment are consolidated and decrease with the efficiency that comes with the cloud.

Total Azure cost breakdown

In Azure, several of the cost categories from the on-premises environment are consolidated and decrease with the efficiency that comes with the cloud.



£957,991
Cost over 3 year(s)



£465,511
Cost over 3 year(s)

Fig. 3 Price compares

Database 2 (5 - 4000) (0 - 5000000)

Source

Database: SQL Server APS (1 - 99999)

Data warehouses (DWs): 3 (1 - 99999)

Compute servers per DW: 2 (2 - 56)

Uncompressed DB Capacity: 8 TB (1 - 99999)

Backup: 3 TB (1 - 99999)

Archive: 1 TB (1 - 99999)

Destination

Service: Azure Synapse Analytics

Include Threat Detection: ☐

Fig. 4

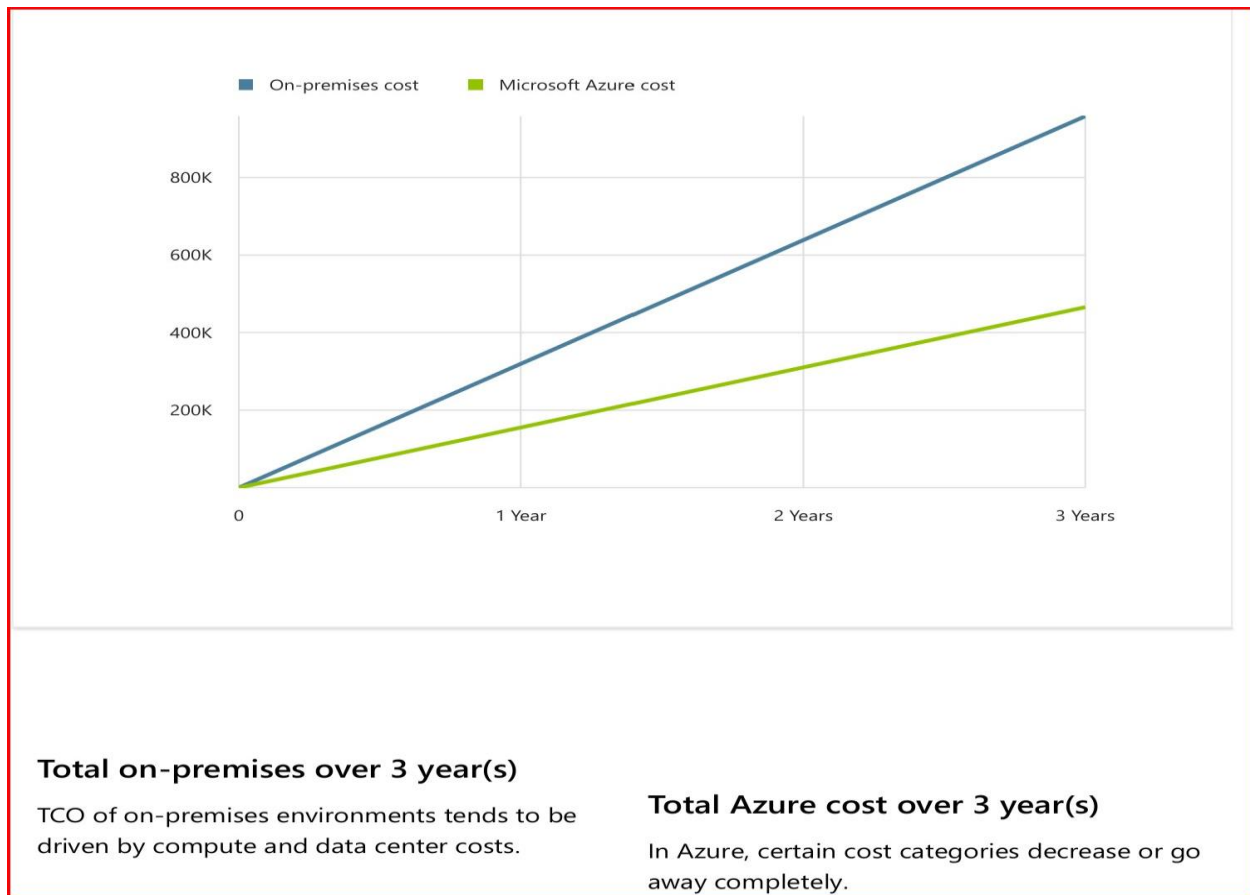


Fig. 5

Total Cost of Ownership (TCO) Calculator

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

 My saved reports

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Over 3 year(s) with Microsoft Azure, your estimated cost savings could be as much as **£492,480**

Fig. 6

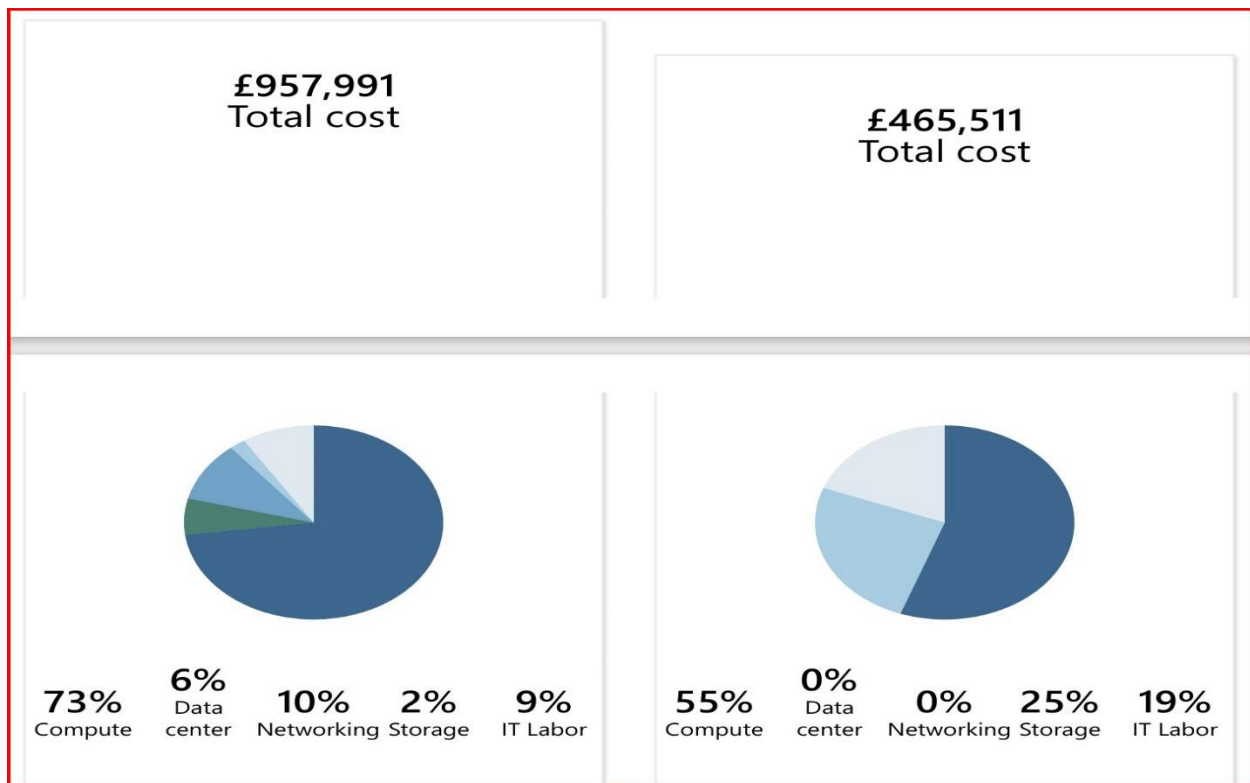


Fig. 7

IT Labor: Remains roughly the same at about £88,768, indicating that managing IT infrastructure in Azure is as resource-intensive as on-premises, likely due to the need for ongoing administration and optimization in the cloud environment.

Cost Breakdown:

Compute: A major reduction from £697,053 on-premises to £258,216 in Azure.

Data Center: Elimination of all data center costs, down from £53,194.

Networking: Networking costs are reduced to zero in Azure from £100,571.

Storage: Costs increase slightly in Azure to £118,528 from £18,405, reflecting the shift to more scalable and secure cloud storage.

An effective case is made by the visual data. The fact that database infrastructures require significant upfront costs is clear, particularly from Fig. 8. In addition, the costs associated with establishing and maintaining an on-site structure quadruple over a three-year period in comparison with Azure.

On-premises cost breakdown summary		Azure cost breakdown summary	
Category	Cost	Category	Cost
Compute	£697,053.21		
Hardware	£487,980.96	Compute	£258,215.94
Software	£95,014.30	Data Center	£0.00
Electricity	£32,537.83	Networking	£0.00
Virtualization	£81,520.12	Storage	£118,527.61
Data Center	£53,193.68	IT Labor	£88,767.6479
Networking	£100,570.95		
Storage	£18,405.32		
IT Labor	£88,767.64		
Total	£957,991.05	Total	£465,511.34

Fig. 8

Total on-premises cost over three year(s)	£957,991.05	Total Azure cost over three year(s)	£465,511.34
A total savings of £492,479.71 with Microsoft Azure			

Fig. 9

Figure 4 through 9 show similar research with database integrations for a three-year projection in similar scenarios.

Closing Remarks

The TCO Calculator streamlines the assessment of investments for on-premises and cloud-based options, serving as a valuable time-saving resource.

The TCO Calculator report highlights a potential savings of £492,480 over three years by transitioning to Azure. The detailed breakdown of costs in the report indicates significant reductions in various categories including compute, data center, networking, and IT labor costs.

B) Critically analyse how Azure File Storage and its associated features, security measure will help GLI

Azure File Storage offers a managed file storage service provided by Microsoft Azure, which allows for the creation and use of file shares in the cloud. This service is part of Azure's broader storage solutions and offers several key features and benefits that make it attractive for various applications and business scenarios.

Key Features

Access Protocols: Azure File Storage supports the standard SMB (Server Message Block) protocol, enabling files to be accessed from Windows, Linux, and macOS machines. Additionally, file shares can be directly mounted on virtual machines in Azure, as well as accessed via the NFS (Network File System) protocol, offering flexibility for different operating systems and platforms.

Mounting File Shares: Files can be mounted as network drives on any machine that supports SMB or NFS. This allows easy access to files from both cloud and on-premises machines, which is particularly useful for hybrid environments.

Integration with Active Directory: Azure File Storage can be integrated with Azure Active Directory Domain Services for access management to file shares, providing better access rights management and security. [1]

Flexible Scaling Options: The service offers automatic scaling of capacity and performance, allowing users to increase or decrease resources according to their current needs without service interruption.

Azure File Storage provides a robust and multifunctional cloud file storage solution with a wide range of features that support flexible use scenarios. Its ability to support various protocols and integrate with existing identity management systems makes it ideal for enterprises looking for a sustainable, scalable, and easily managed file storage solution.[2]

Features beneficial for GLI

Scalability - Azure File Storage scales automatically, allowing GLI to handle increasing amounts of data as more courses and students are added, without the need for physical hardware expansion.

Accessibility - Files can be accessed from anywhere, which is critical for online educational platforms where students and teachers need to access educational materials from various geographical areas.

Integration - Integrates seamlessly with existing Windows and Linux environments, which can help GLI transition to the cloud without disrupting existing workflows.

Security Measures:

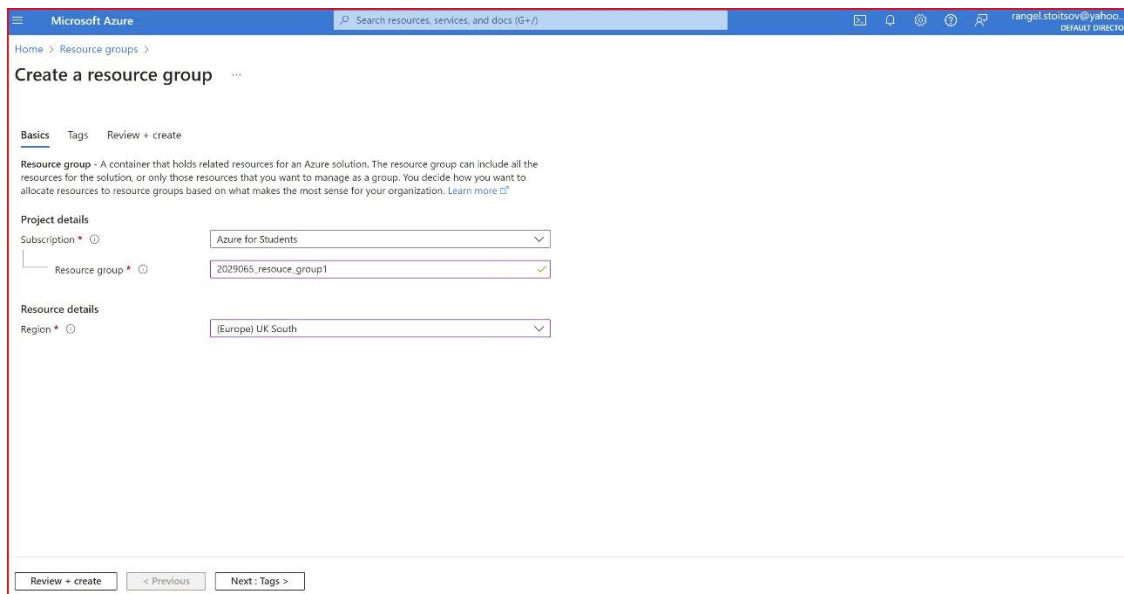
Encryption - Data is encrypted at rest using the Advanced Encryption Standard (AES) and during transfer with SMB 3.0, ensuring that the data of students and teachers is protected from unauthorized access.

Access Control - Azure Active Directory (AD) can be used to manage permissions, ensuring secure access to file shares based on user roles at GLI.

Protection Against Advanced Threats - Real-time monitoring and machine learning capabilities for rapid detection and response to potential threats.

Let's take a look at the sequence of images that illustrate the Azure services and resource groups for the Global Learning Institute (GLI).

The Fig. 1 shows the Azure services homepage where various service categories are available such as 'Storage accounts', 'SQL databases', 'Resource groups', and more. Here, we can also see a list of resources like storage accounts and a SQL database that have been recently viewed or worked on, providing quick access to commonly used resources.



The screenshot displays the Microsoft Azure portal interface for creating a new resource group. The top navigation bar includes the 'Microsoft Azure' logo, a search bar, and user information for 'rangel.stoitsov@yahoo...'. The main heading is 'Create a resource group'. Below this, there are tabs for 'Basics', 'Tags', and 'Review + create'. The 'Basics' tab is active, showing a description of a resource group and a form with the following fields:

- Project details:**
 - Subscription *: Azure for Students
 - Resource group *: 2029065_resource_group1
- Resource details:**
 - Region *: (Europe) UK South

At the bottom of the form, there are three buttons: 'Review + create', '< Previous', and 'Next: Tags >'. The 'Review + create' button is highlighted.

Fig.1

Moving to next Fig. 2, it indicates that a deployment has been successfully completed. The deployment name, subscription details, and associated resource group are displayed. This signifies the finalization of a process that provisions one or more services or resources within Azure.

Microsoft Azure

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

Home > Resource groups >

Create a resource group

Validation passed.

Basics Tags **Review + create**

Basics

Subscription: Azure for Students

Resource group: 2029065_resource_group1

Region: UK South

Tags

None

Create < Previous Next > Download a template for automation

Fig. 2

In the Fig. 3, we see the creation form for a storage account within the Azure portal. The essential fields like subscription, resource group, and region are populated, and it's at the step just before the review and creation phase. This is crucial for defining where and how the data will be stored within the Azure environment, impacting performance and access.

Home >

Resource groups

Default Directory

+ Create Manage view Refresh Export to CSV Open query Assign tags

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

Showing 1 to 3 of 3 records.

Name	Subscription	Location
2029065_resource_group1	Azure for Students	UK South
2029065rangel	Azure for Students	UK South
NetworkWatcherRG	Azure for Students	UK South

Fig.3

The fourth Fig. 4 highlights the access control (IAM) page within a specific resource group. It displays the types of roles assigned and to whom they are assigned within the resource group, showing us how access and permissions are managed.

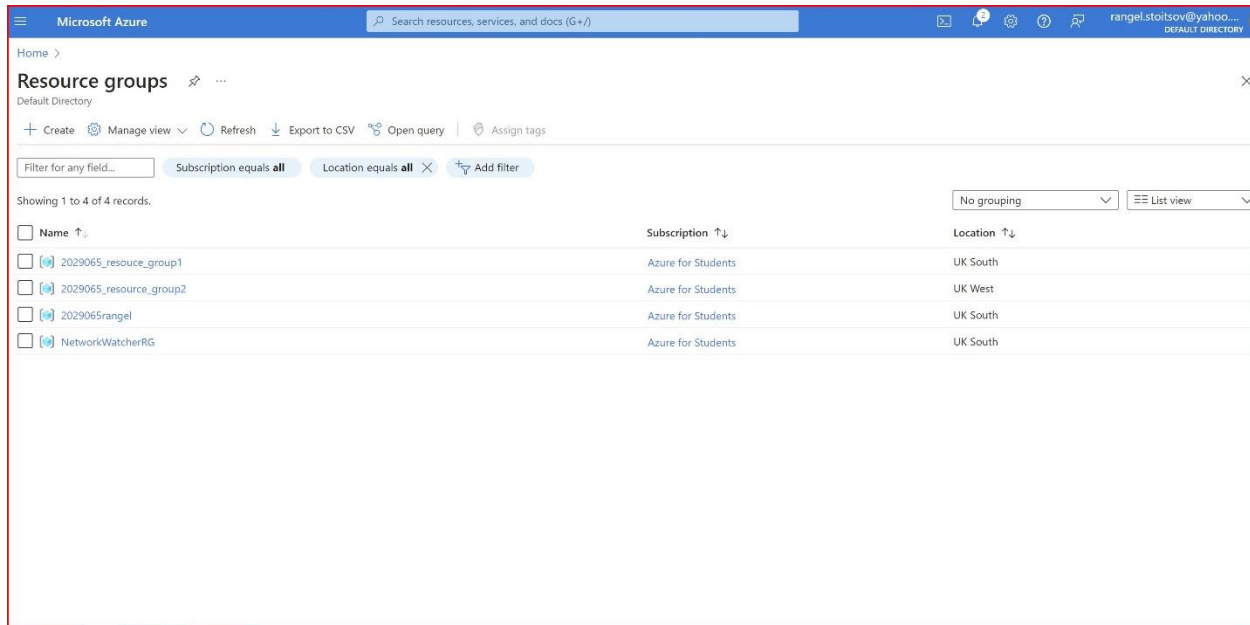


Fig.4

The image on Fig. 5 presents the process of adding a new role assignment. This is a security measure ensuring that only authorized personnel have the correct level of access to resources within Azure, enhancing security and governance.

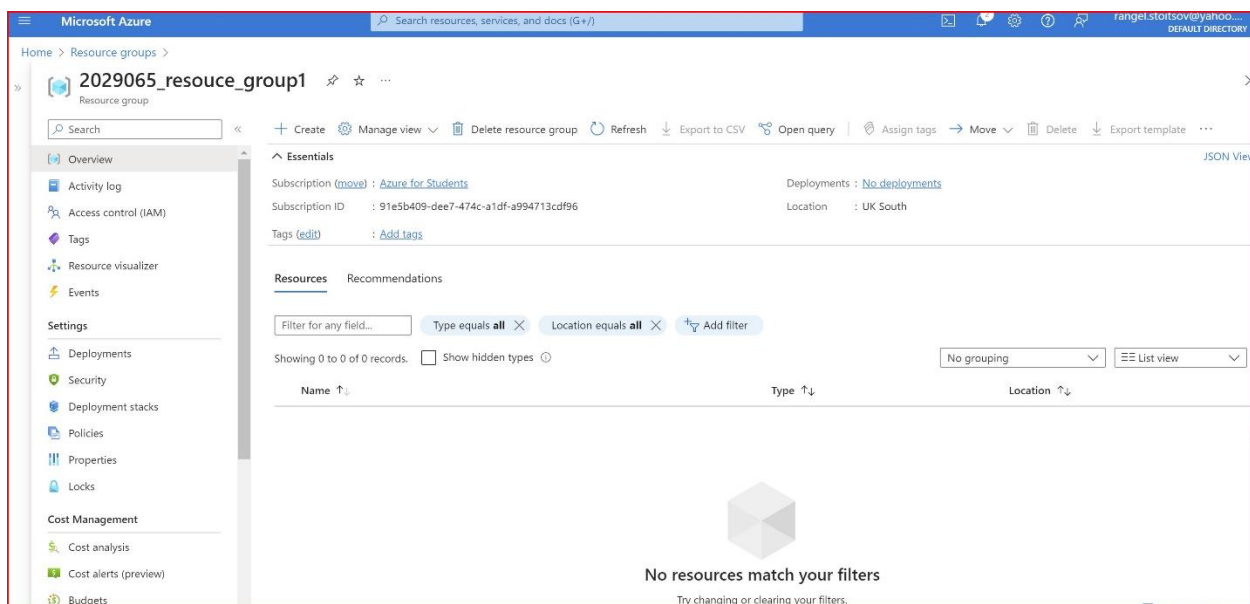


Fig. 5

The Fig. 6 sixth and Fig. 7 images return to the resource groups view, where we now see the newly created resource groups listed alongside the previously existing ones. This illustrates the outcome of our actions—newly organized sets of resources that are ready for use.

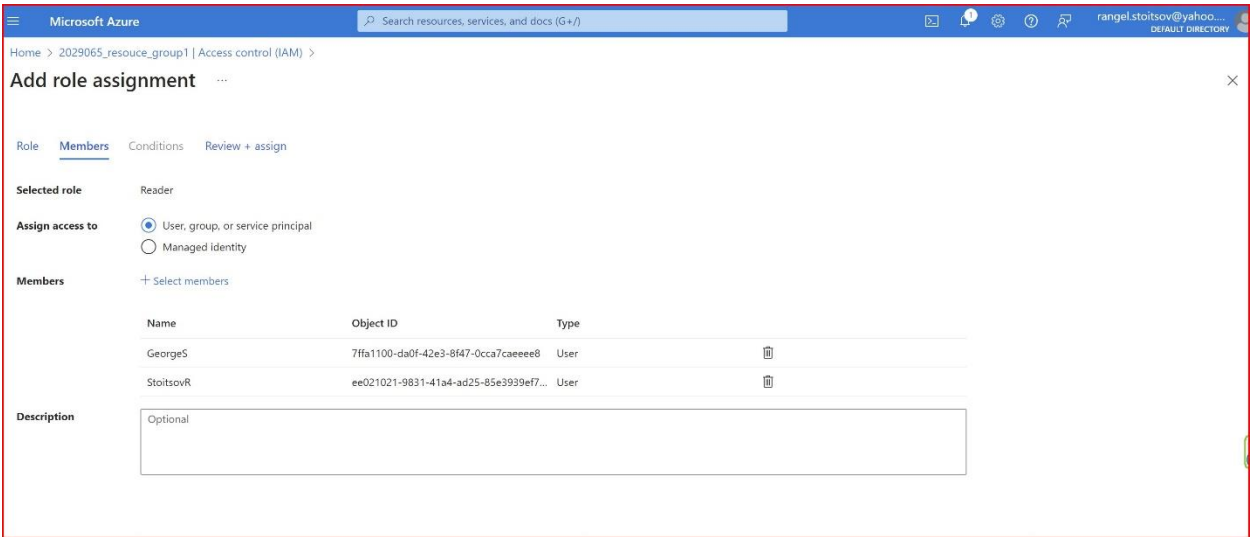


Fig. 6

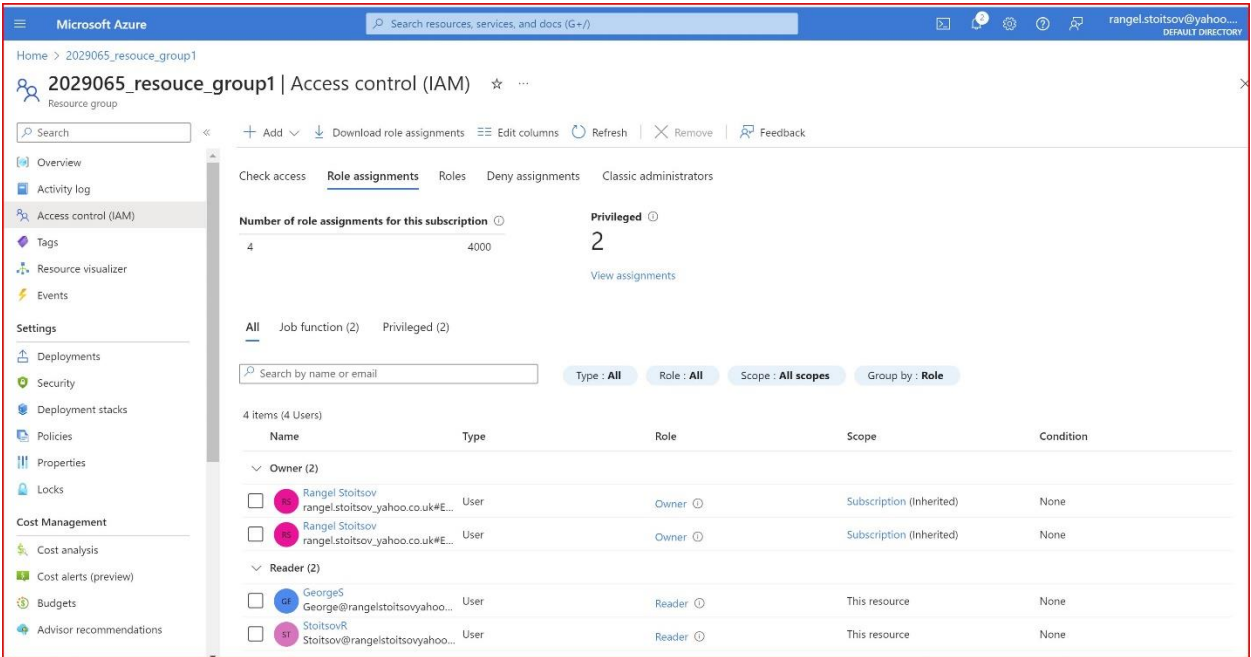
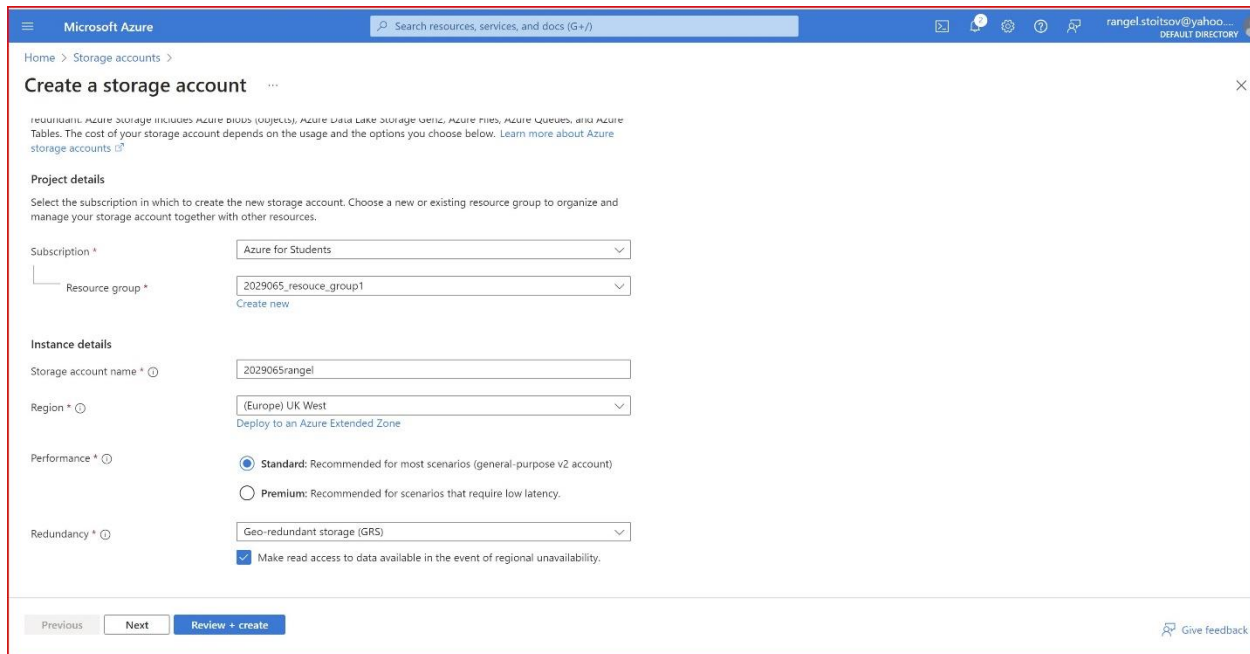


Fig. 7

On Fig. 8 , we see the basic overview of Azure services in the Azure Portal. The screen lists the last resources that have been viewed or edited. We can note that the creation of 'Storage Account' is the last activity performed just a few seconds ago. This is part of our effort to set up and configure Azure file storage for GLI, which is critical to their cloud services infrastructure.



The screenshot shows the 'Create a storage account' page in the Microsoft Azure portal. The page is titled 'Create a storage account' and includes a brief introduction about storage accounts. It is divided into two main sections: 'Project details' and 'Instance details'.

Project details:

- Subscription ***: A dropdown menu showing 'Azure for Students'.
- Resource group ***: A dropdown menu showing '2029065_resource_group1'. Below it is a link to 'Create new'.

Instance details:

- Storage account name ***: A text input field containing '2029065rangel'.
- Region ***: A dropdown menu showing '(Europe) UK West'. Below it is a link to 'Deploy to an Azure Extended Zone'.
- Performance ***: Two radio button options: 'Standard: Recommended for most scenarios (general-purpose v2 account)' (selected) and 'Premium: Recommended for scenarios that require low latency'.
- Redundancy ***: A dropdown menu showing 'Geo-redundant storage (GRS)'. Below it is a checked checkbox for 'Make read access to data available in the event of regional unavailability'.

At the bottom of the page, there are three buttons: 'Previous', 'Next', and 'Review + create'. A 'Give feedback' link is also present in the bottom right corner.

Fig. 8

This is the screen Fig. 9, that confirms that the deployment of the new resource has successfully completed. We see the details of the deployment, including the name, subscription, and resource group it belongs to. This step is key to ensuring that our file stores are properly allocated and ready for use by GLI.

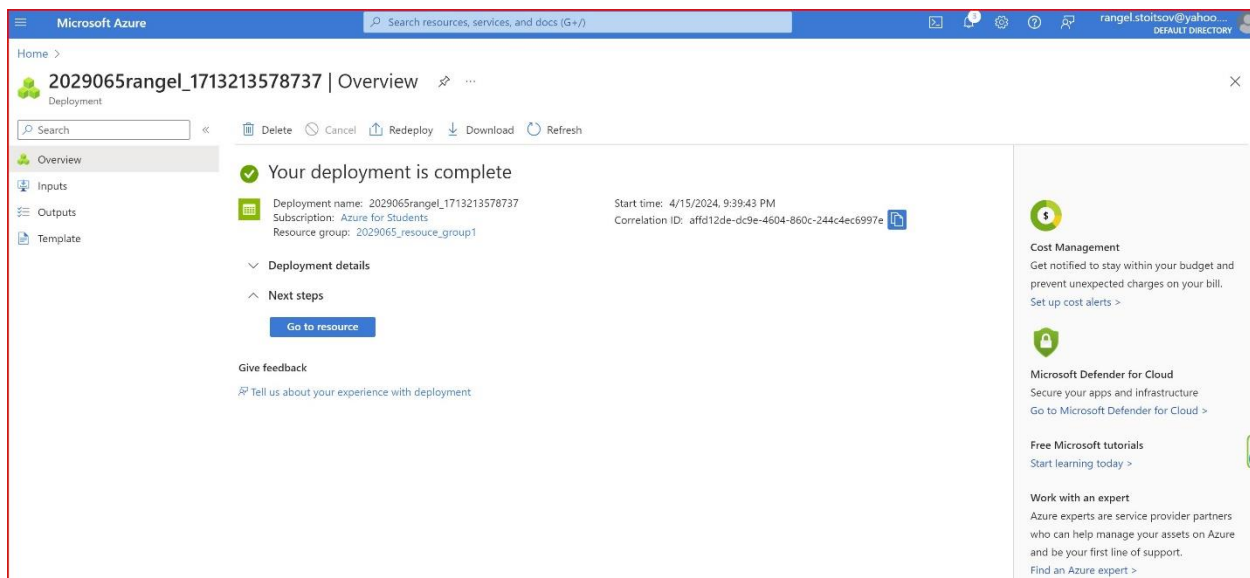


Fig. 9

Here in Fig. 10 is the specific process of creating a 'Storage Account'. The subscription program 'Azure for Students' is selected and the resource group we created earlier is set. The region is 'UK West' and it is important to note that the choice of region may have an impact on the speed of data access. Additionally, we have selected performance and durability options that meet GLI's requirements for data reliability and availability.

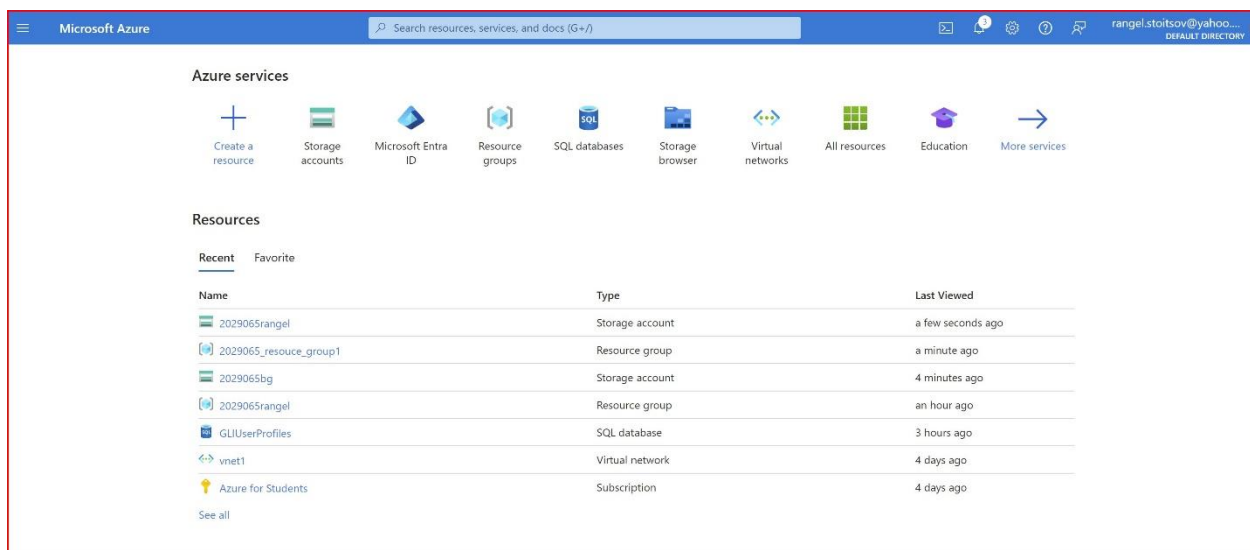


Fig. 10

These steps demonstrate GLI's commitment to building an efficient and secure cloud infrastructure using Azure File Storage. Azure file storage offers flexibility,

scalability, and data management capabilities that are vital for educational institutions that provide distance learning.

As a cloud architect explaining this to an audience, I would highlight how Azure's organizational and security features empower GLI to efficiently manage their cloud infrastructure. Azure File Storage is a critical component of this setup, offering scalable and secure storage solutions. Its integration into resource groups, paired with careful IAM configurations, ensures that GLI's educational content and user data are well-organized and safeguarded against unauthorized.

Create a file shares.

Create a new file share: The last screenshots show you are either creating a new file share with the same name ("file123") or viewing the settings of the current file share. Access shared files in an Azure storage account: In the first screenshot Fig. 1 you are viewing the shared files in a specific storage account (named "2029065rangel").

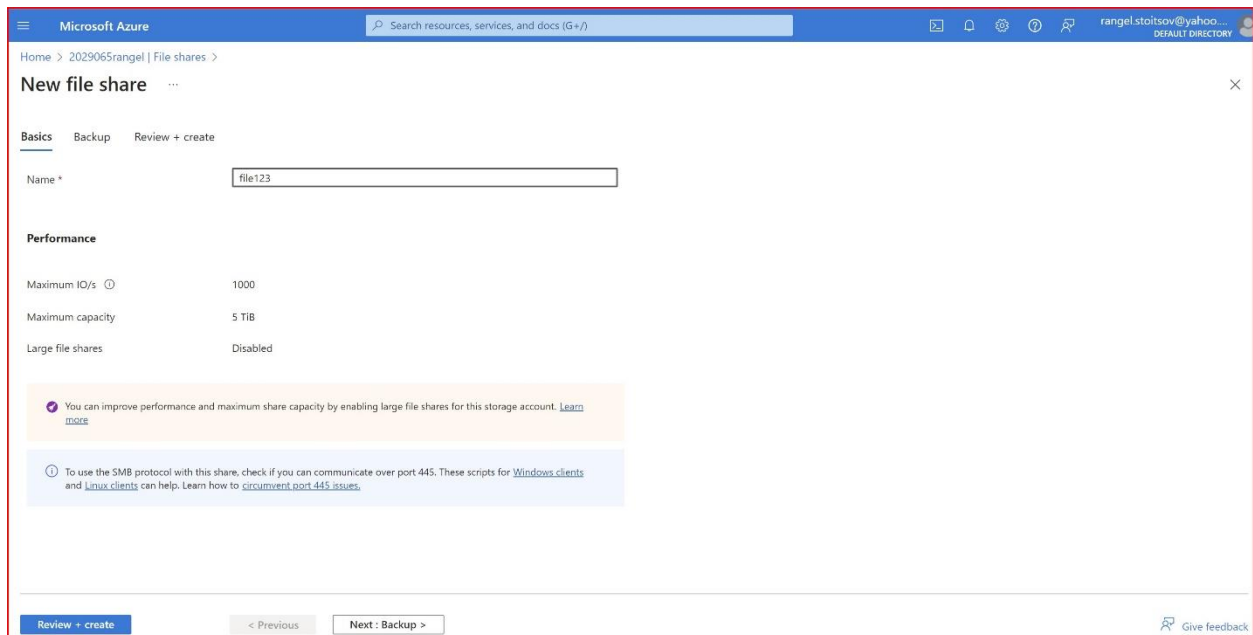


Fig.1

Here you can see the list of all the shared files that I have created such as "file1", "file123" and "file2". Each file share has settings such as level and quota

indicating its performance and size limits. You may have accessed this area to manage shared files, view existing files, or plan to add new files.

Microsoft Azure

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

Home > 2029065rangel | File shares >

New file share

Basics Backup Review + create

Azure Backup protects your file shares from accidental deletion or modification with granular restore and at-scale capabilities. [Learn more](#)

Enable backup ☒

Backup policy [Create a new policy](#)

Policy details

Review + create < Previous Next: Review >

Create policy

Azure File Share

Policy name

Backup schedule

Frequency * Time * Timezone *

Snapshot retention

☒ Retention of daily backup point

At For Day(s)

☐ Retention of weekly backup point

Not Configured

☐ Retention of monthly backup point

Not Configured

☐ Retention of yearly backup point

Not Configured

OK

Fig.2

Microsoft Azure

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

Home > 2029065rangel | File shares >

New file share

Validation passed

Basics Backup Review + create

Basics

File share name

Access Tier

Protocol

Create < Previous Next > Download a template for automation Give feedback

Fig. 3

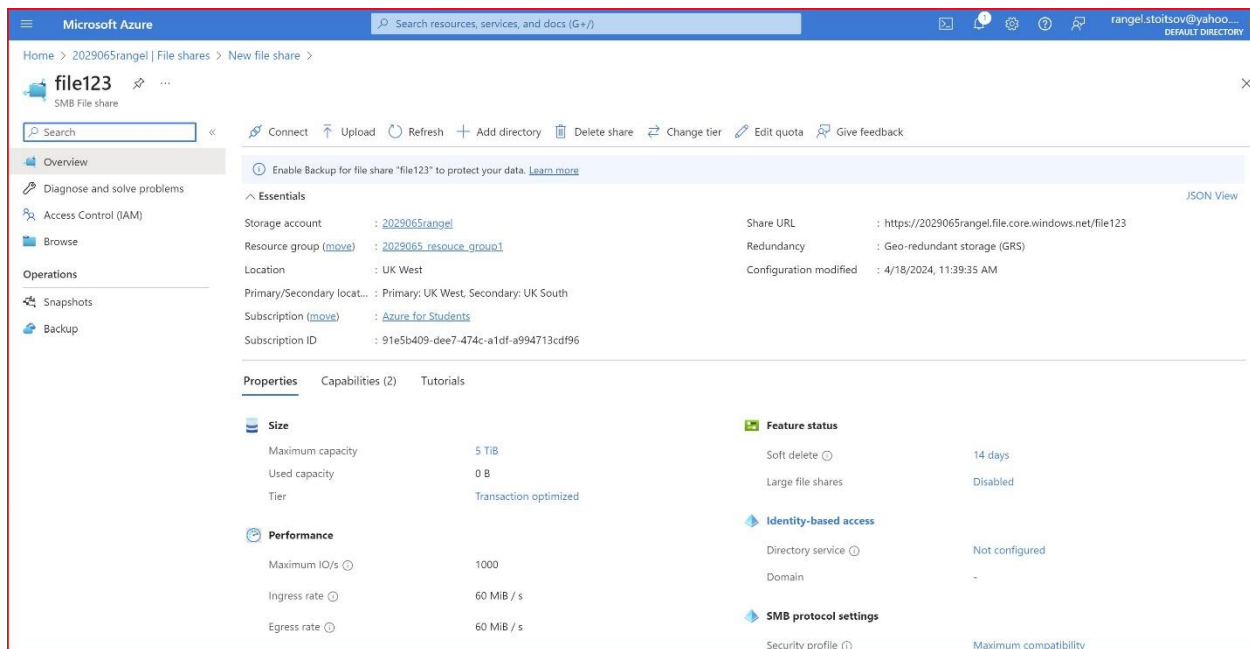


Fig. 4

Shared File Details: In the following images, I have selected a specific shared file named "file123". You're looking at the most important things about this file share, such as its access URL, the subscription it belongs to, and its geographic location (UK West). This screen is useful for getting an overview of the share's properties and for accessing key operations such as Connect, Upload, and Refresh.

File Upload: Here on Fig. 5 I continued to upload files to the shared name "file123". At this point, files can be dragged and dropped or viewed from the local computer. This step is critical for populating the file share with the data or resources that need to be accessed from the cloud.

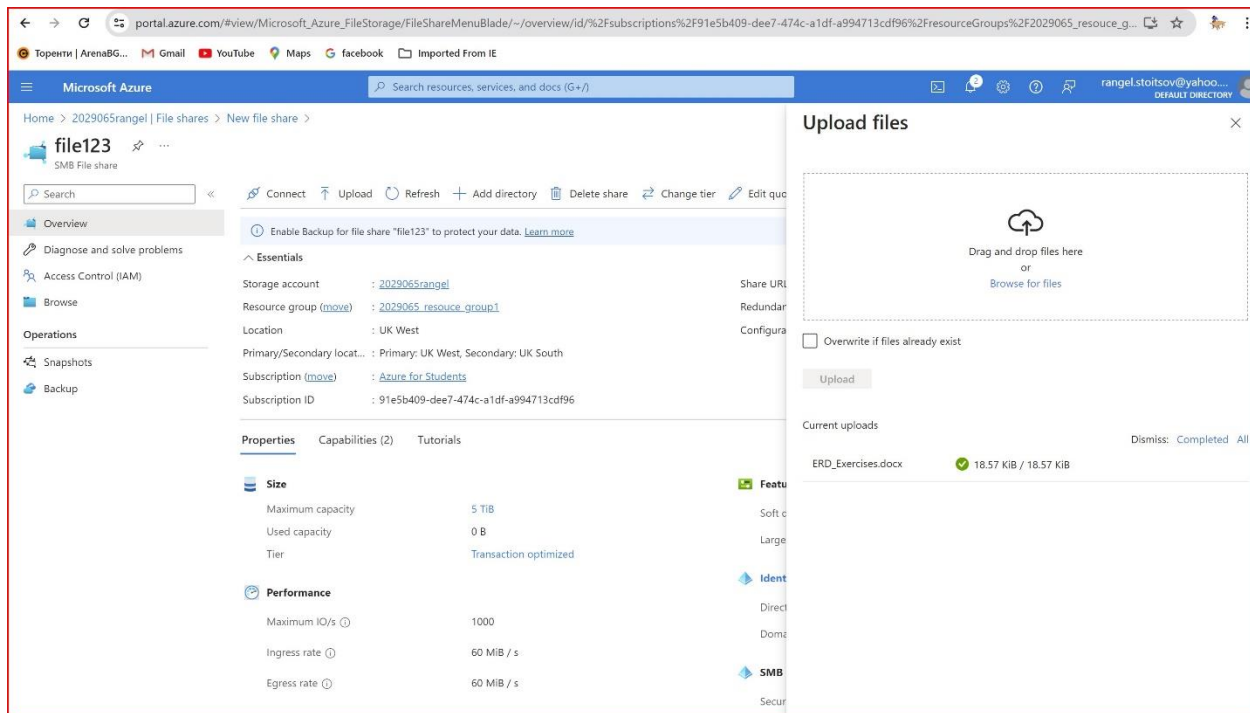


Fig. 5

Configure Backup Policy: I can also be navigated to the "Backup" section where I have configured or was in the process of configuring a backup policy for "file123". Creating a backup policy is important for data protection and recovery, allowing you to set the frequency, timing, and details of keeping your backups.

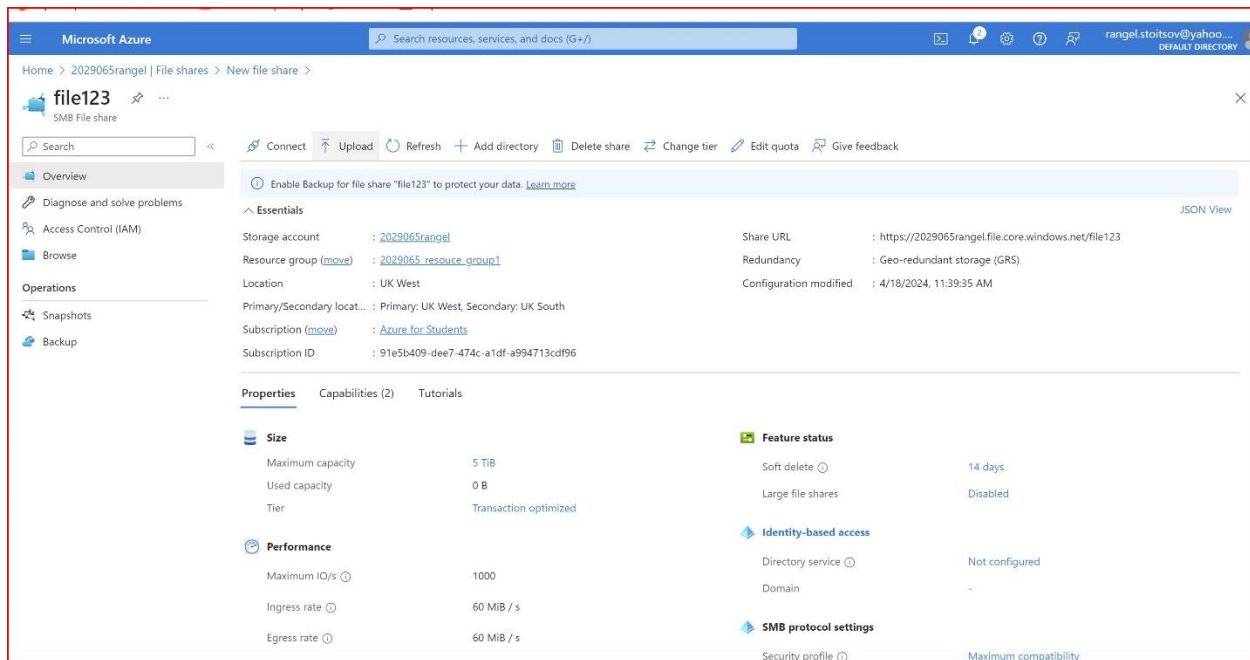


Fig. 6

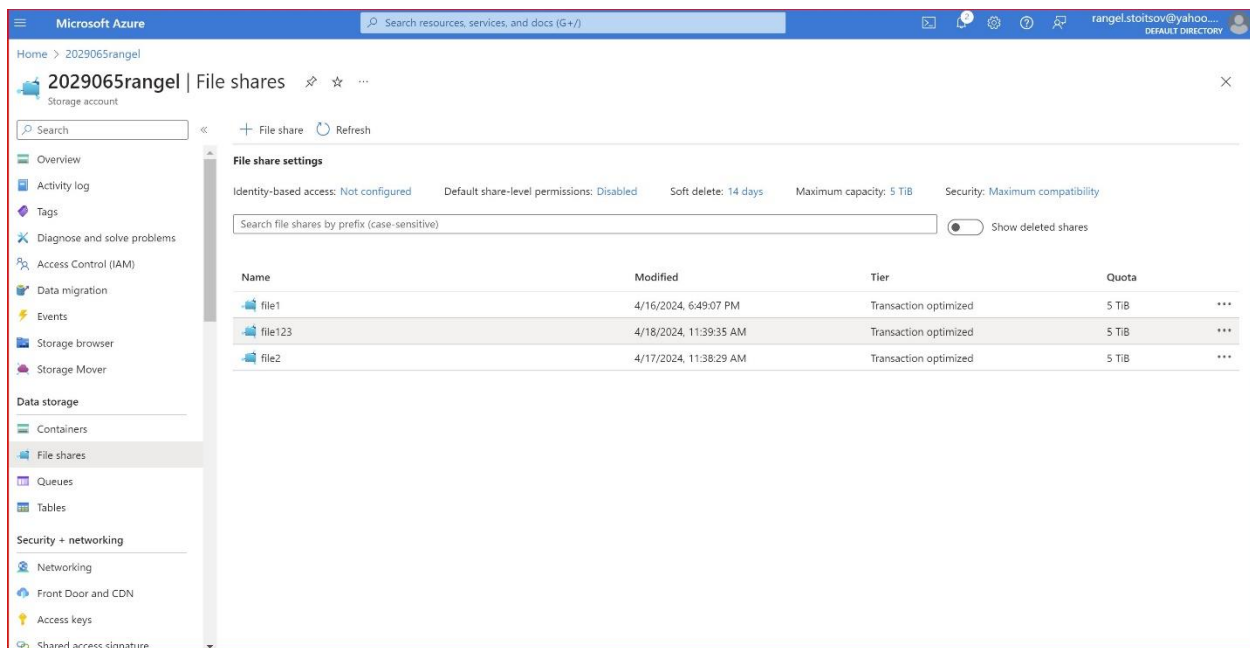


Fig. 8

Here you looked at performance and large file sharing settings, considering enabling large file sharing for improved performance.

By doing this, we essentially ensure that our data is organized, accessible and secure in the cloud environment, I also demonstrated managing file shares within an Azure storage account, a key cloud storage management skill useful for scenarios where data must be shared between different services or accessed by applications hosted in the cloud.

C) Evaluate different Azure database options (Azure SQL Database, Azure Database for MySQL, Azure Database for PostgreSQL)

At this task as a cloud architect for a Global Education Institute (GLI) looking at moving to the Azure cloud, the top priority is to evaluate the latest database options that Azure offers and choose the most suitable one for storing user profiles.

Evaluating Azure Database Options

Azure SQL Database

Azure SQL Database: offers several advantages and disadvantages that are important to consider when deciding to use this platform as part of your data infrastructure.

Advantages

Support for Complex SQL Queries and Transactions: Azure SQL Database supports the full range of SQL functionality, including complex queries and transactions, making it suitable for applications requiring complex data processing.[4]

High Performance and Reliability: This database is optimized for high performance and offers built-in solutions for performance management and automatic scaling.

Integration with Microsoft Products: Azure SQL Database integrates seamlessly with other Microsoft services and products, such as Azure Functions, Azure Logic Apps, and Microsoft Power BI, facilitating the development and expansion of applications within the Microsoft ecosystem.

Disadvantages

Cost: While basic plans can be affordable, costs can significantly increase, especially if you require higher levels of performance or additional features. This can be financially impractical for small projects or those that do not utilize the full range of features offered by SQL Server.

Dependency on the Microsoft Platform: Using Azure SQL Database may limit your ability to transition to other cloud platforms, as it is heavily integrated with other Microsoft services and may not integrate as well with products outside this ecosystem.

In conclusion, Azure SQL Database is a powerful tool for managing relational data that offers excellent integration in the Microsoft cloud and high performance. However, costs can be a concern for some projects that do not require all the complex features offered by the platform. It is important to evaluate how these factors impact the specific needs of your application before planning.

Azure Database for MySQL

Azure Database for MySQL is a managed cloud service offered by Microsoft, allowing users to deploy MySQL databases in the cloud without needing to manage their own infrastructure. Here are some of the advantages and disadvantages you mentioned:

Advantages

Ideal for Applications Already Using MySQL: This service is very convenient for companies already utilizing MySQL as their database and do not want to switch to a different system, such as Microsoft SQL Server. This ensures smooth integration with existing systems.

Easy Migration: Azure Database for MySQL provides tools and services that facilitate the migration process from on-premises or other cloud environments to Azure. This includes support for standard tools like MySQL Workbench and other third-party tools.

Supports Open Source: Compatibility with MySQL's open source nature ensures that users can use a wide array of existing applications and tools developed for MySQL without needing any modifications.

Relatively Inexpensive: Azure Database for MySQL generally offers competitive pricing compared to other managed MySQL services in the cloud. This makes it an attractive choice for small to medium-sized businesses looking for a cost-effective solution.

Disadvantages

Limited Set of Features Compared to Azure SQL Database: Although Azure Database for MySQL offers many of MySQL's key features, it may not offer all the advanced features and optimizations available in Azure SQL Database. This can include certain aspects of performance, security, and scalability that are more developed in other Microsoft products.

MySQL lacks security compared to Azure SQL Database

Azure SQL Database provides advanced security features such as transparent data encryption, active geo-replication, and Azure Active Directory integration. These features are designed to enhance data protection and compliance with minimal configuration. MySQL offers a robust security system too, but advanced features like encryption and Active Directory integration may require additional setup and management. [5]

In summary, Azure Database for MySQL is a good choice for organizations looking for an easy way to use MySQL in the cloud, especially if they already rely on this technology. However, for more specialized or high-performance requirements, other options, including other Microsoft products, might need to be considered.

Azure Database for PostgreSQL

Azure Database for PostgreSQL offers a few advantages and disadvantages that can be important when choosing the right database for your application.

Advantages

Support for Complex Queries: PostgreSQL is a powerful relational database that supports complex queries, making it ideal for applications that require complex data logic.

Support for JSON and Geospatial Data: Azure Database for PostgreSQL includes excellent support for JSON, allowing easy storage and manipulation of JSON data. This is especially useful for modern web applications that use JSON for data exchange. Additionally, support for geospatial data is crucial for mapping and geolocation-related applications.

Disadvantages

Complexity in Configuration and Management: Compared to Azure SQL Database, Azure Database for PostgreSQL may present more complexity in configuration and management. This may require additional technical knowledge and experience to optimize performance and manage resources.

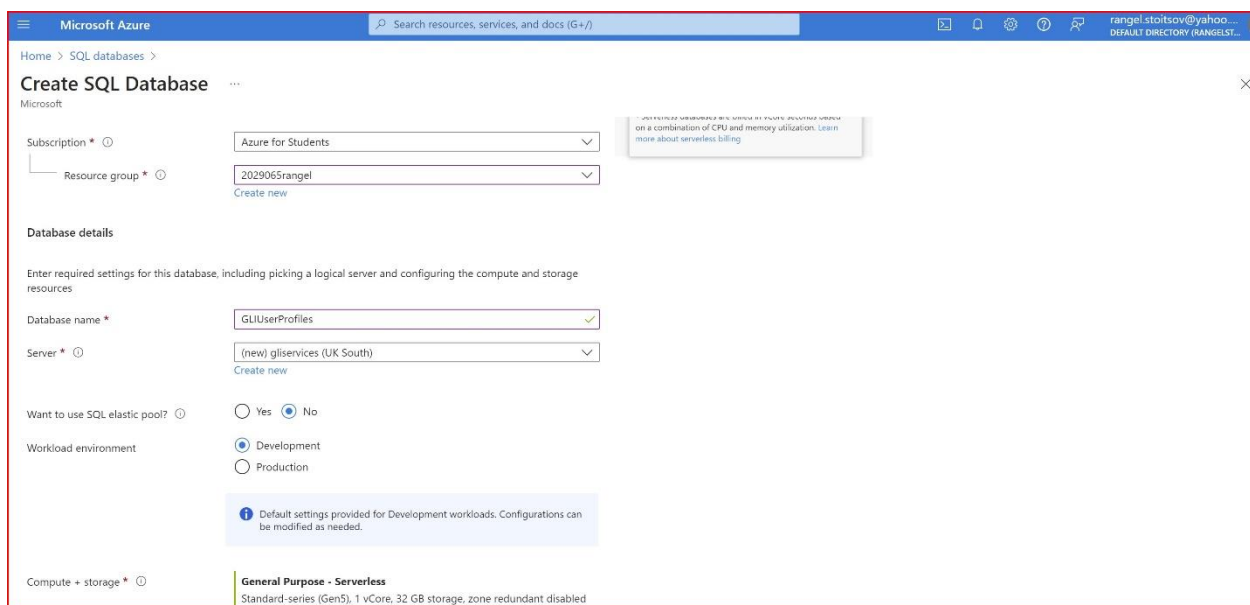
Maintenance Requirements: Due to its open base and complexity, PostgreSQL may require more resources for maintenance compared to other databases that are more automated and easier to manage.

Azure Database for PostgreSQL is a strong option for developers who want the flexibility and power of PostgreSQL in the cloud. It is particularly recommended for applications that require complex queries and the handling of specific data types such as JSON and geospatial information. However, the potential complexity in configuration and management may require additional technical efforts for optimization and maintenance.

Conclusion

In conclusion my recommendation for storing user profiles that are likely to include structured data and may benefit from complex SQL queries for analysis and processing, Azure SQL Database is best suited. Combine the flexibility, cost-efficiency and scale of data lakes with the structure and management capabilities of data warehouses. The data mesh approach involves modern distributed architectures for analytical data management.[6] It offers an optimal combination of performance, scalability, and integration with other Azure services, making it an ideal choice for GLI.

Steps to create a database in Azure SQL Database



The screenshot displays the 'Create SQL Database' wizard in the Microsoft Azure portal. The interface includes a search bar at the top and a navigation pane on the left. The main content area shows the following fields and options:

- Subscription:** Azure for Students
- Resource group:** 2029065rangel
- Database details:**
 - Database name:** GLIUserProfiles
 - Server:** (new) gliservices (UK South)
 - Want to use SQL elastic pool?** No
 - Workload environment:** Development
- Compute + storage:** General Purpose - Serverless

Fig.1

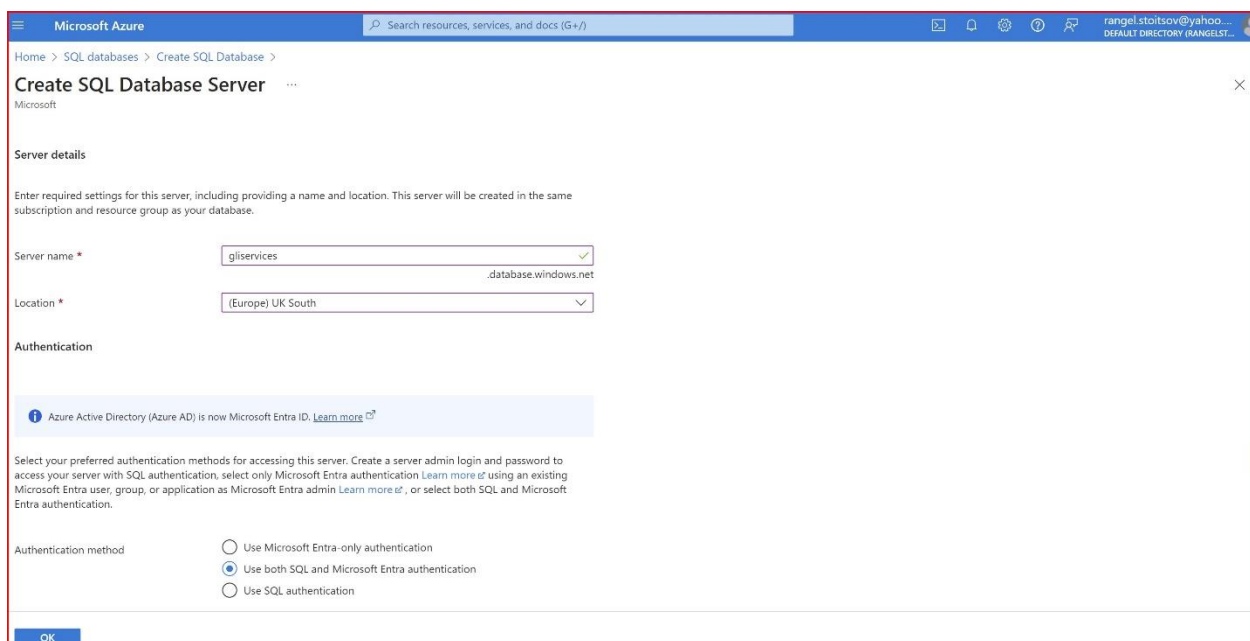
In the picture above that I am presenting, I am in the process of creating a SQL database in the Azure Portal.

Here are the steps I have done: Select subscription and resource group. I have selected "Azure for Students", which implies that you are using Azure's special terms designed for educational purposes. Resource Group: Selected an

existing resource group named "2029065rangel" that helps organize related resources in Azure.

Configure database details: Database Name: I have given the name "GLIUserProfiles", which directly corresponds to the purpose of the database - to store GLI user profiles. Server: I've chosen to create a new server (labeled "new") in the "UK South" region, which may be due to a desire to minimize delays for users based in that geographic region.

Step 3: Database Options SQL Elastic Pool: You have decided that you do not want to use SQL Elastic Pool because now I am creating a single database with a specific purpose, not multiple databases that need to share resources. I have selected "Development" as the working environment, which implies that the database is under development and not intended for production use at this time.



The screenshot displays the 'Create SQL Database Server' page in the Microsoft Azure portal. The page is titled 'Create SQL Database Server' and includes a breadcrumb trail: 'Home > SQL databases > Create SQL Database >'. Below the title, there is a section for 'Server details' with the following information:

- Server name ***: gliservices (with a dropdown arrow and a checkmark icon)
- Location ***: (Europe) UK South (with a dropdown arrow)

Below the server details, there is an 'Authentication' section. It includes a message: 'Azure Active Directory (Azure AD) is now Microsoft Entra ID. [Learn more](#)'. Below this, there is a text block: 'Select your preferred authentication methods for accessing this server. Create a server admin login and password to access your server with SQL authentication, select only Microsoft Entra authentication [Learn more](#) or using an existing Microsoft Entra user, group, or application as Microsoft Entra admin [Learn more](#) or, select both SQL and Microsoft Entra authentication.' Below this, there are three radio button options for the 'Authentication method':

- ☐ Use Microsoft Entra-only authentication
- ☒ Use both SQL and Microsoft Entra authentication
- ☐ Use SQL authentication

At the bottom of the page, there is an 'OK' button.

Fig. 2

The screenshot shows the 'Create SQL Database Server' page in the Microsoft Azure portal. The breadcrumb navigation at the top indicates the path: Home > SQL databases > Create SQL Database. The page title is 'Create SQL Database Server'. Below the title, there's a 'Location' dropdown menu set to '(Europe) UK South'. The 'Authentication' section is highlighted, showing a message: 'Azure Active Directory (Azure AD) is now Microsoft Entra ID. Learn more'. Below this, a paragraph explains the authentication options. The 'Authentication method' section has three radio buttons: 'Use Microsoft Entra-only authentication', 'Use both SQL and Microsoft Entra authentication' (which is selected), and 'Use SQL authentication'. The 'Set Microsoft Entra admin' section shows the 'Windows Azure Service Management API' with its Admin Object/App ID. Below this, there are three input fields: 'Server admin login' with the value 'gli2029065', 'Password', and 'Confirm password', all with green checkmarks indicating they are valid. An 'OK' button is at the bottom left.

Fig. 3

The above two pictures Fig.2 and 3 show different stages of the server setup.

Here I am in the initial phase of creating the database server server name is gliservices which is a unique identifier for the server within Azure.

A server location that can be close to GLI's core user base and provide the best performance and minimum latency.

In Fig. 2, I have shown an expanded view of the authentication section of the first image.

Authentication method: Here you can choose between different authentication methods, including Microsoft Entra-only authentication (formerly known as Azure Active Directory), SQL and Microsoft Entra authentication, or traditional SQL authentication.

In Fig.3 This image shows the authentication method and I have set up the server admin. I've selected Use SQL authentication, which is a standard method for managing access to SQL servers that requires a username and password.

Server admin username: gli2029065, which probably combines the institute name (GLI) with a unique identifier.

I have entered and confirmed a password that is required to secure the server and authenticate the administrator.

In this way, I have successfully configured the basic settings to create a server for the GLI database in Azure, having provided administrative access to manage and maintain the server.

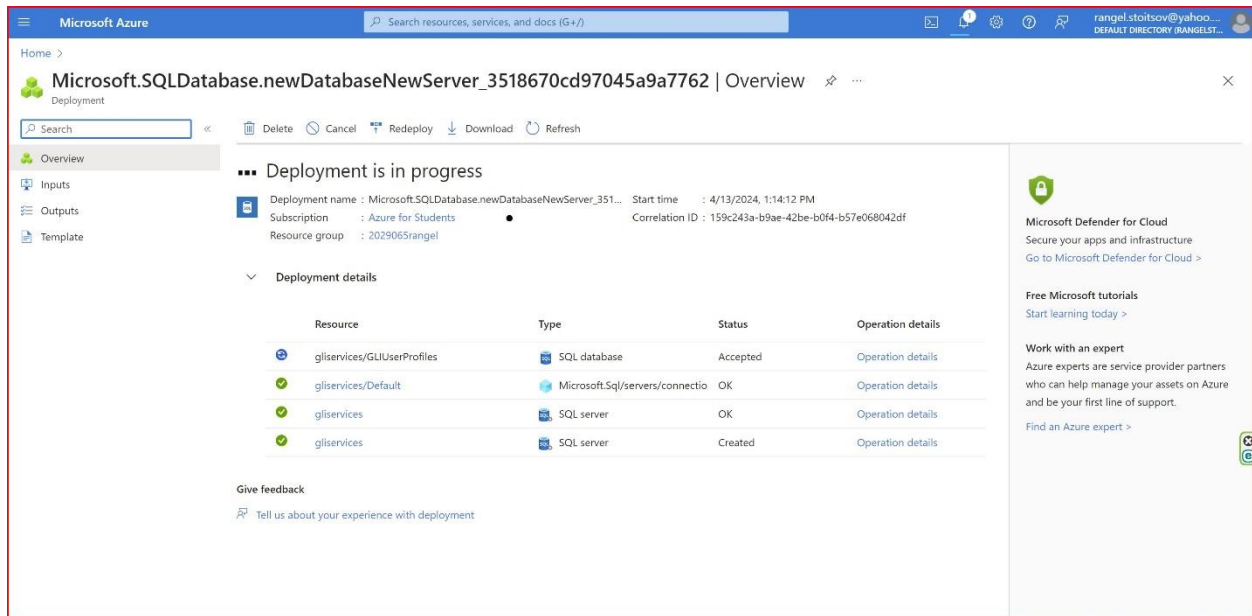


Fig. 4

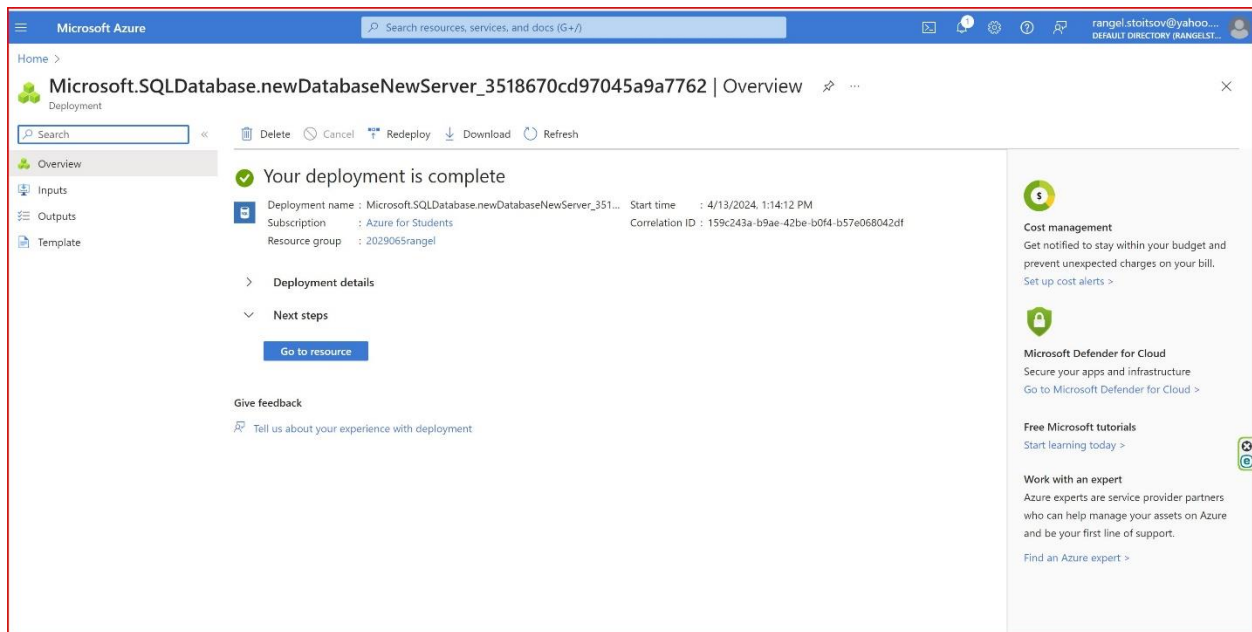


Fig. 5

In the first image fig. 5 you see a successfully completed deployment of the SQL server in Azure. This means that you have created a new SQL server called "gliservices" and it is ready to be used. The deployment was made in the "2029065rangel" resource group and within the "Azure for Students" subscription. This indicates that you have a basic server configuration ready to go.

In the second image, Fig. 6g, you can see the SQL database already created with the name "GLIUserProfiles". The database is created in the same resource group and subscription as the server and is located in the 'UK South' region. The settings shown confirm that the database is set to run in serverless mode with a "General Purpose - Serverless" configuration, which is effective for managing resources and costs, allowing you to pay only for the computations you actually use. It shows that you can connect to the database, set up network access, connect to an application, or start development using your preferred tools, such as Azure Data Studio or Visual Studio.

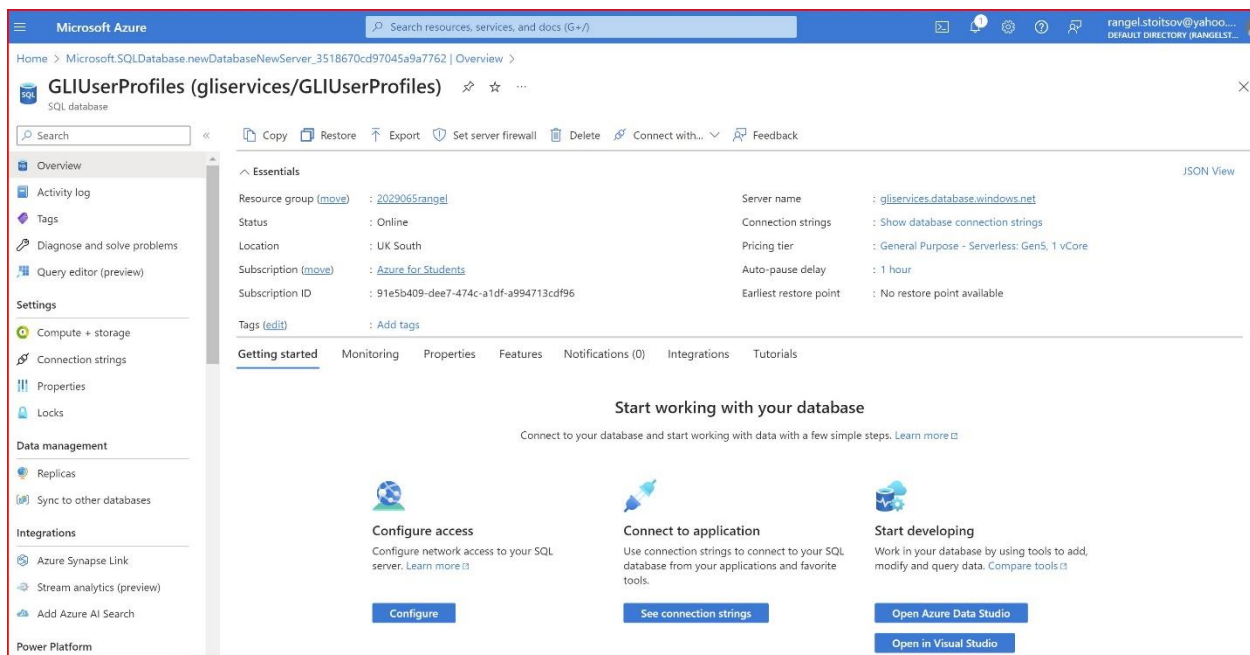


Fig. 6

In the second image, Fig. 6g, you can see the SQL database already created with the name "GLIUserProfiles". The database is created in the same resource group and subscription as the server and is located in the 'UK South' region. The settings shown confirm that the database is set to run in serverless mode with a "General Purpose - Serverless" configuration, which is effective for managing resources and costs, allowing you to pay only for the computations you actually use. It shows that you can connect to the database, set up network access, connect to an application, or start development using your preferred tools, such as Azure Data Studio or Visual Studio.

The purpose of these steps is to prepare us for the next phases of database development—ingesting data, configuring schemas, running queries, and integrating the database with other Azure applications or services.

D) Task D: Analysis of Backup Schedules and Retention Policies Using Azure Backup for GLI

This task focuses on a key aspect of GLI's migration to the cloud, specifically using Azure Backup to ensure the integrity and availability of their data. Azure Backup offers a cohesive and secure backup solution for shared files and databases, an integral part of GLI's IT infrastructure, which contains user profiles, training materials and administrative records.

This analysis delves into the nuances of configuring Azure Backup retention schedules and policies, which play an important role in maintaining data sovereignty and compliance with data protection regulations. It addresses the pressing need for GLI to implement a robust data recovery strategy, ensuring that the educational services they provide remain uninterrupted in the face of potential data loss scenarios.

Azure Backup enables data protection for various workloads (on-premises and cloud). It's a secure and reliable built-in data protection mechanism in Azure. It can seamlessly scale its protection across multiple workloads without any management overhead for you. There are multiple automation channels as well

to enable this (via PowerShell, CLI, Azure Resource Manager templates, and REST APIs.) [7]

The following images will provide a detailed view of the backup and retention strategies adopted, the rationale behind the choices made, and the step-by-step implementation process within the Azure portal, supplemented by appropriate screenshots for overall understanding.

Link for video:

I provide a short video demonstrating the creation of a file store in Azure, Azure Databases and creating an Azure backup and restore schedule:

<https://youtu.be/QwC8U0NDC6U>

E) Evaluate how Azure Site Recovery would assist GLI in disaster recovery to protect their storage and databases.

Azure Site Recovery (ASR) is a pivotal component of Microsoft Azure's business continuity and disaster recovery (BCDR) strategy. For an institution like GLI that prioritizes minimal downtime and robust data protection, ASR provides an orchestrated and automated replication, failover, and recovery process that ensures data stored in Azure Storage and databases are reliably protected and quickly recoverable in the event of a disaster.

Critically evaluate how ASR would assist GLI:

Automated Replication: ASR automates the replication of the data being stored in Azure. For GLI, this means that all educational content, user profiles, and administrative databases are continuously copied to a secondary location, which GLI can preselect based on their preference or regulatory needs.

RTO and RPO Objectives: GLI can define their Recovery Time Objectives (RTOs) and Recovery Point Objectives (RPOs). ASR ensures that GLI can achieve minimal RTOs, reducing the time to get systems running post-disaster, and RPOs, minimizing the data loss in case of such events.

Customizable DR Plans: GLI can create custom disaster recovery plans within ASR that are tailored to their operational needs. These plans can include not just the databases and file storage but also the critical applications and workloads. [3]

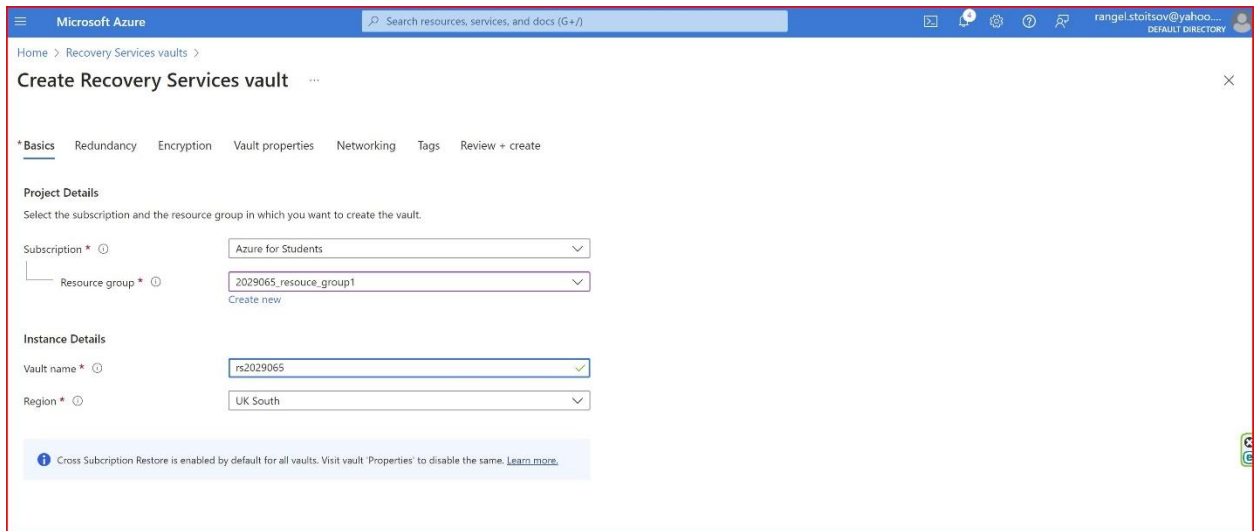
Multi-Tier Applications: Many of GLI's services may be multi-tiered applications with complex dependencies. ASR allows for the coordinated recovery of interdependent systems, which is essential for restoring complex educational platforms.

Testing Without Disruption: GLI can perform disaster recovery drills without impacting the live services, ensuring that their recovery plans are effective and up to date without interrupting the educational services.

Like a conclusion: Azure Site Recovery is an essential component of GLI's disaster recovery strategy, aligning with their need to maintain operational continuity, minimize downtime, and protect critical educational services and data. The usage of ASR can fortify their resilience and provide peace of mind for both the institution and its stakeholders.

Create "Recovery Services vault"

This picture Fig. 1 shows the initial screen for creating a new "Recovery Services vault". It can be seen that the selected subscription is (Azure for Students), the resource group (2029065_resouce_group1), and the vault name (rs2029065), as well as the region (UK South). This is the first step where the parameters of the vault that will store the backup information are set.



Microsoft Azure

Search resources, services, and docs (G+)

Home > Recovery Services vaults >

Create Recovery Services vault

Basics Redundancy Encryption Vault properties Networking Tags Review + create

Project Details

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

Subscription * Azure for Students

Resource group * 2029065_resource_group1

Create new

Instance Details

Vault name * rs2029065

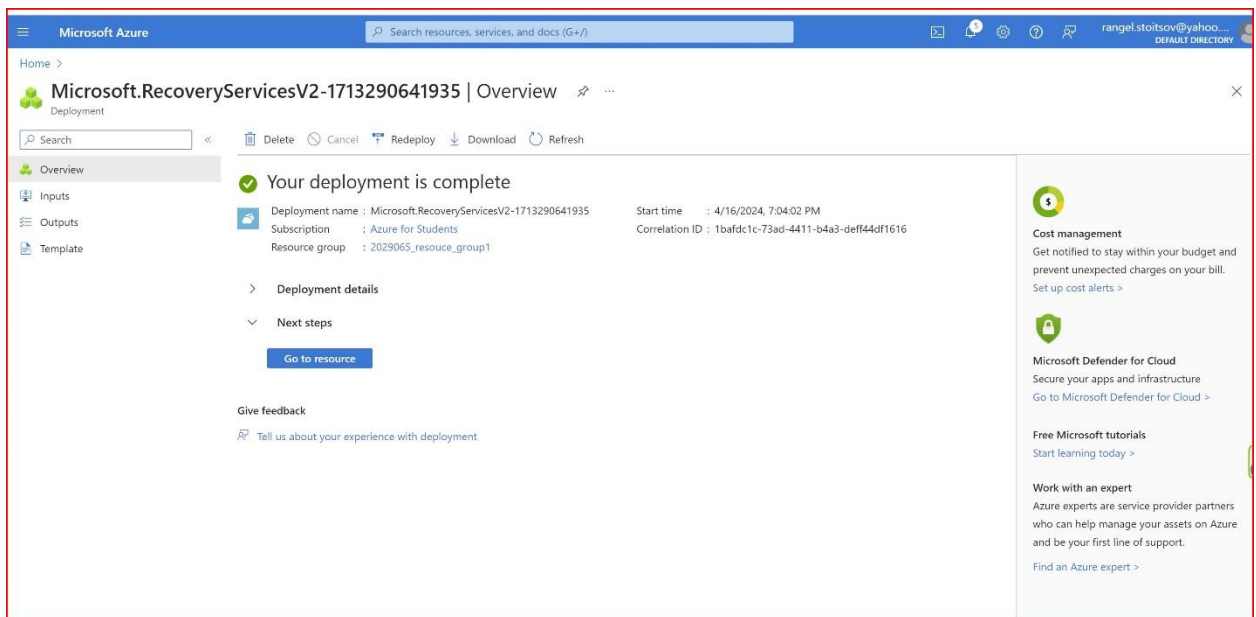
Region * UK South

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

Fig. 1

Successful vault creation

The second picture Fig. 2 shows confirmation that the "Recovery Services vault" deployment has completed successfully. "Deployment complete" means the vault is ready for use.



Microsoft Azure

Search resources, services, and docs (G+)

Home >

Microsoft.RecoveryServicesV2-1713290641935 | Overview

Deployment

Search

Delete Cancel Redeploy Download Refresh

Overview

Inputs

Outputs

Template

✓ Your deployment is complete

Deployment name : Microsoft.RecoveryServicesV2-1713290641935 Start time : 4/16/2024, 7:04:02 PM

Subscription : Azure for Students Correlation ID : 1bafdc1c-73ad-4411-b4a3-def44df1616

Resource group : 2029065_resource_group1

> Deployment details

Next steps

[Go to resource](#)

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Fig. 2

Configuring the backup target (Backup Target)

The third picture Fig.3 shows the interface where the backup target is configured. It is selected that the workload runs in Azure and that you want to create an Azure File Share backup, which is a core component of the backup setup process.

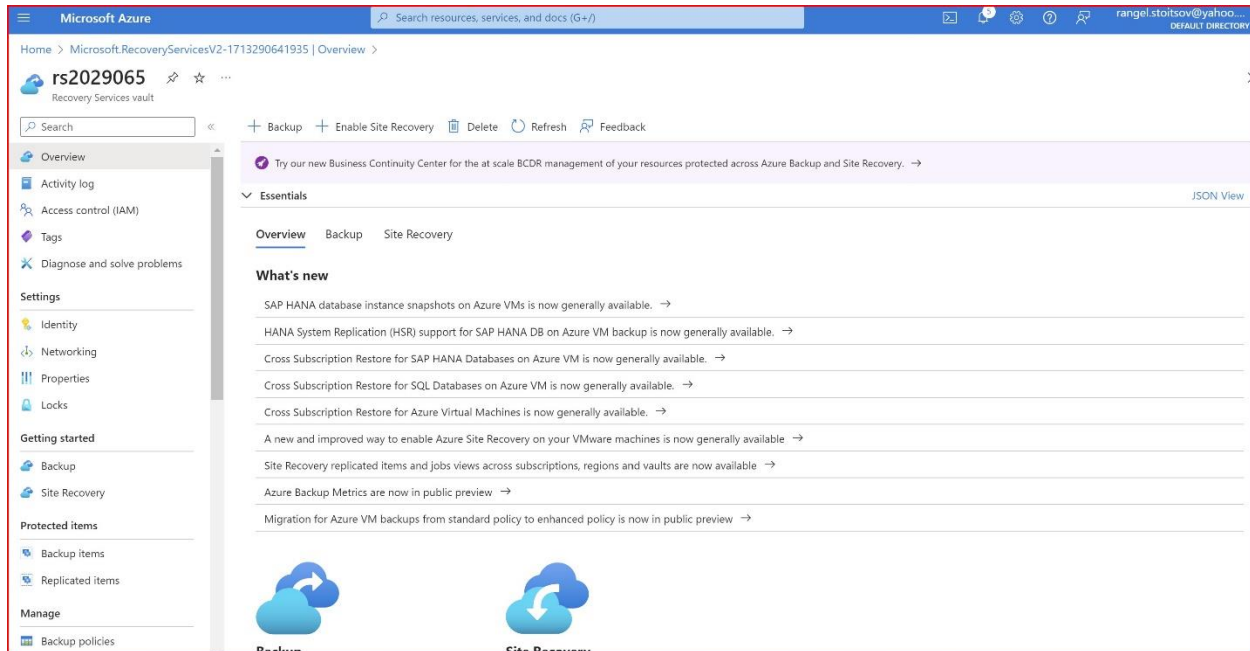


Fig. 3

Configure backup for the selected file share

The fourth and fifth Fig.4 and Fig. 5 screenshots illustrate the backup configuration for the chosen Azure File Share named "glishare." This involves specifying the storage account to be used for the backup and defining the backup policy details. A new backup policy is created and assigned to the file share, indicating the backup frequency (daily at 7:30 PM UTC) and the retention period for the backup points (30 days). This is a critical step as it determines how often the data is backed up and how long each backup version is retained.

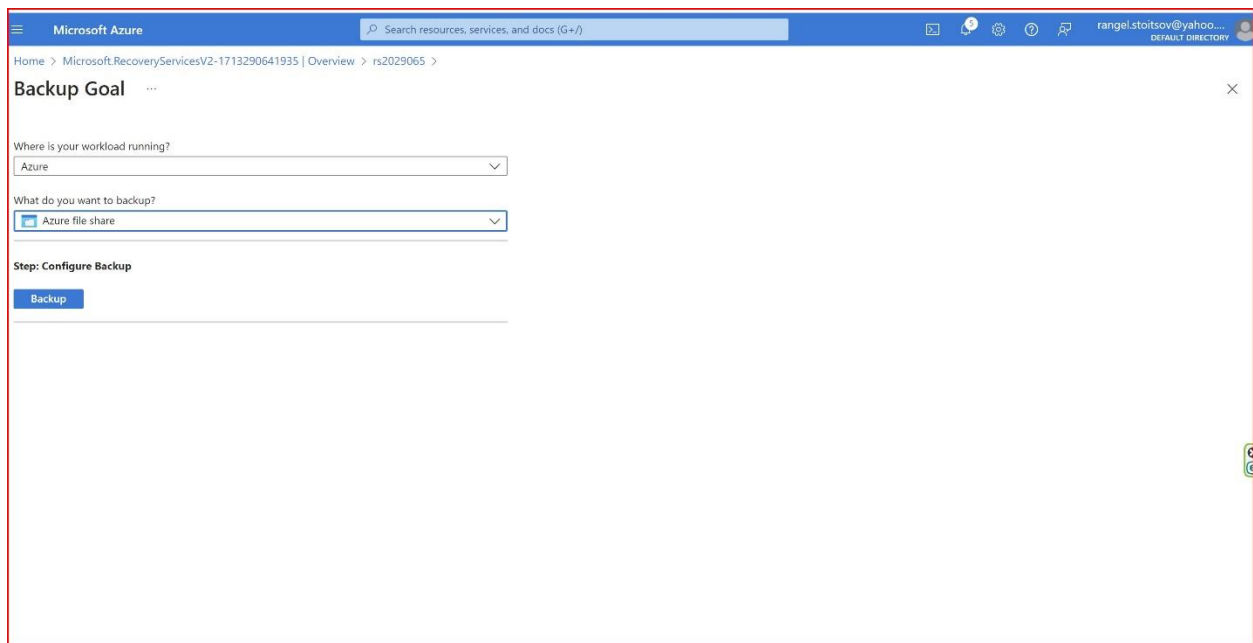


Fig. 4

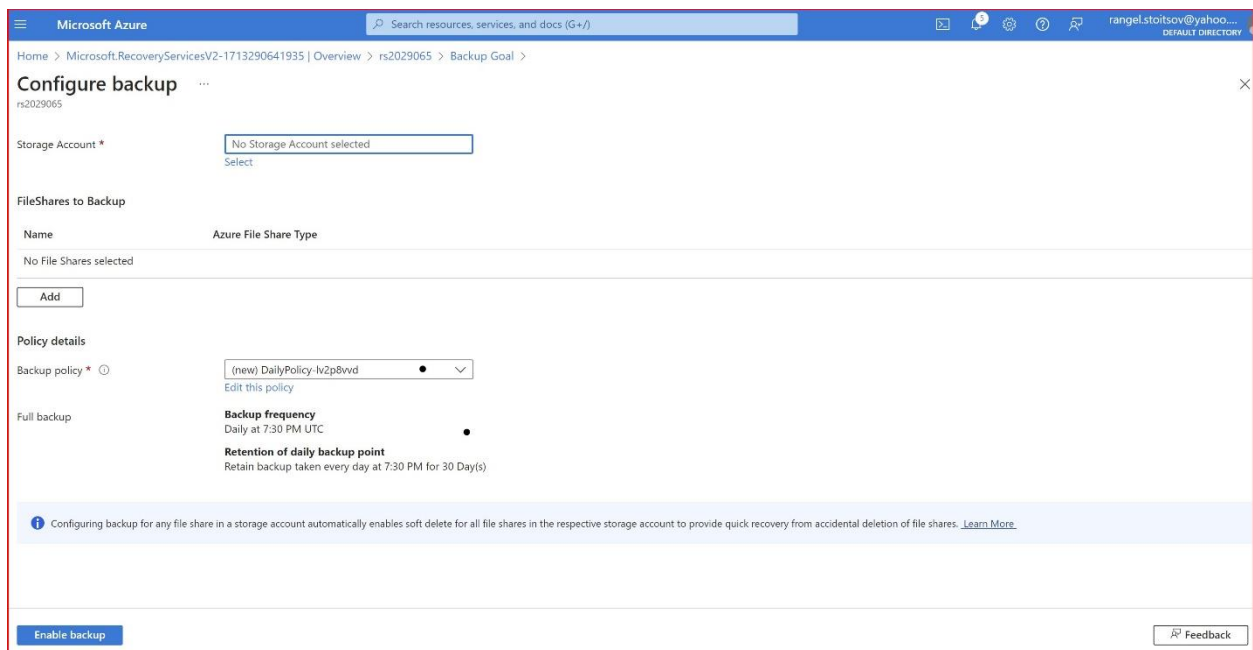


Fig. 5

Initiating the backup

This image Fig. 6 would typically show the "Enable backup" button being clicked, which signifies the final step in initiating the backup operation. It

indicates that all the backup parameters are set, and with this action, the backup policy is now active and will run as scheduled.

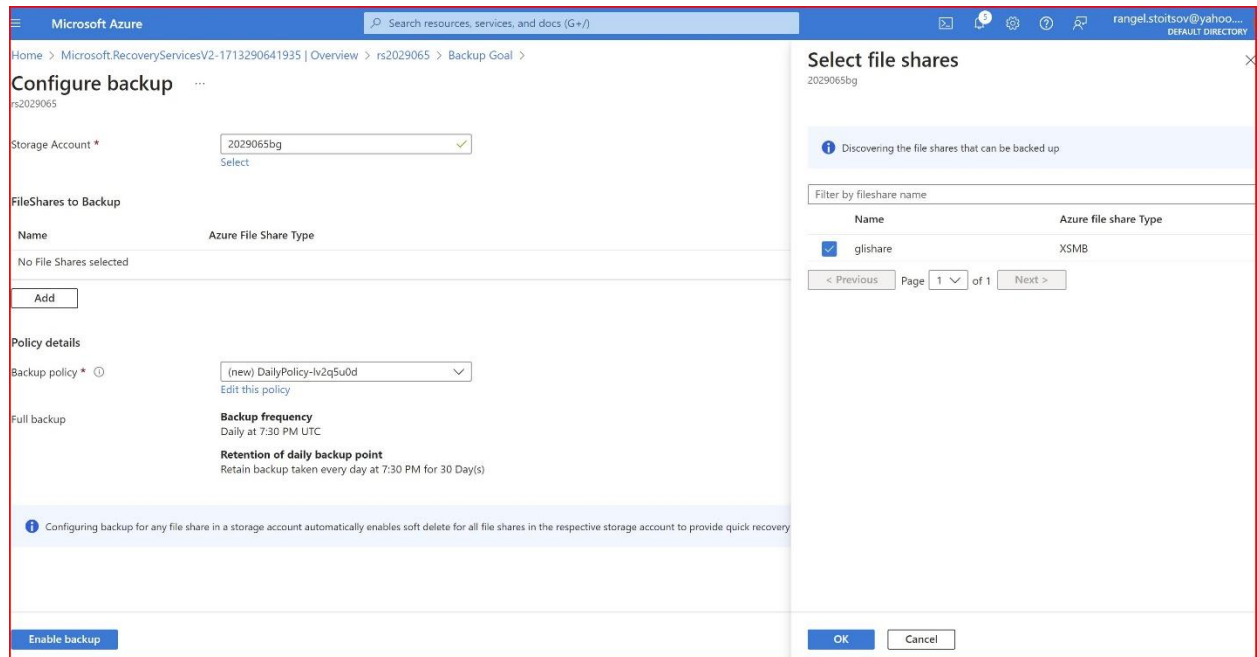


Fig. 6

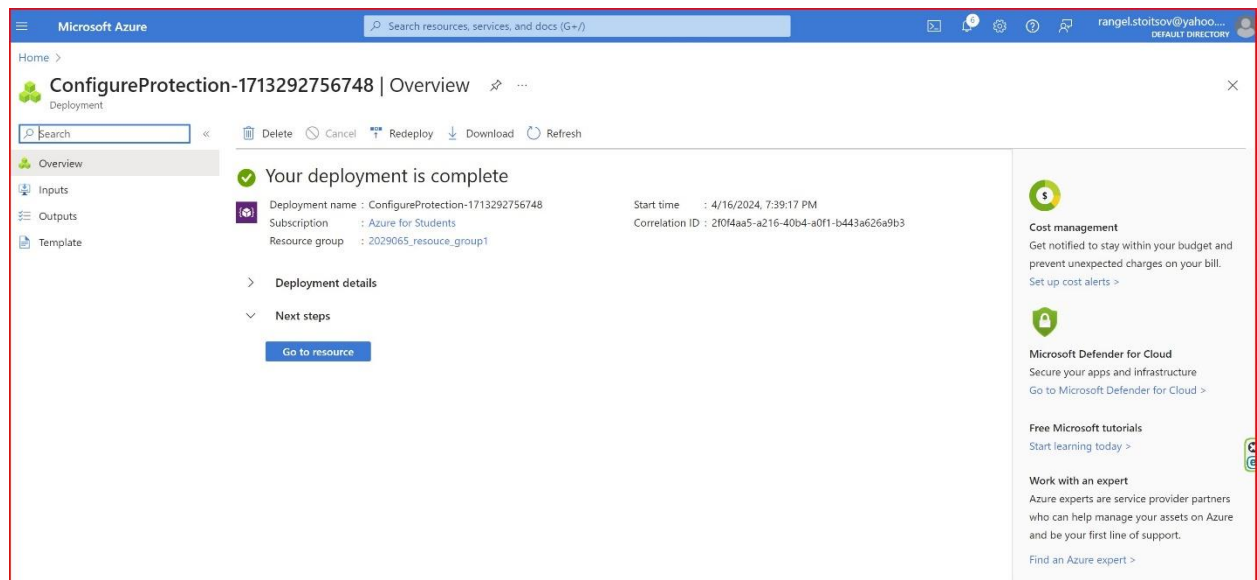


Fig. 7

This process is an important step in securing the data and ensuring that GLI can restore important content when needed. The user must click "Enable backup" to apply the settings and start the backup according to the selected policy.

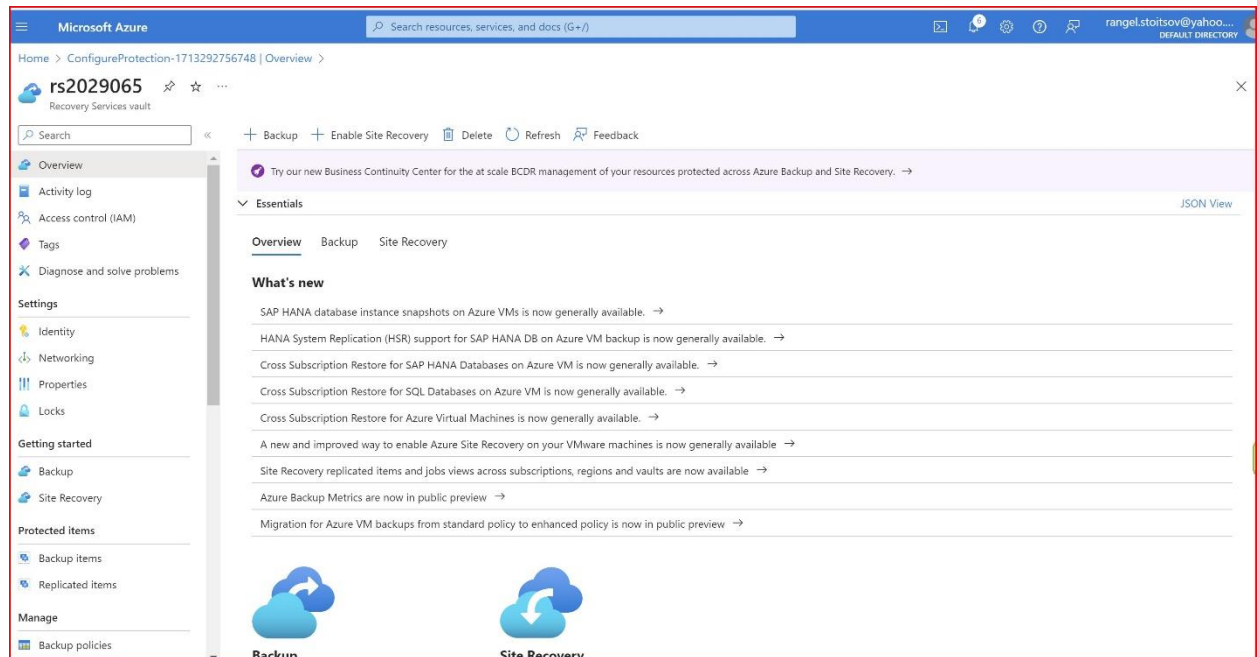


Fig. 8

Overall, these steps captured in the screenshots demonstrate the critical initial stages of securing GLI's data in the cloud using Azure's backup capabilities. They show the establishment of a Recovery Services vault, configuring a backup policy for file shares, and enabling the backup operation. These actions are foundational in protecting GLI's data from loss or corruption, and in ensuring that recovery operations can be performed effectively if necessary.

CONCLUSION

In conclusion, the comprehensive assessment of GLI's transition to Microsoft Azure has elucidated numerous benefits that align with the institute's strategic objectives for modernizing their IT infrastructure. The meticulous approach, as delineated through the report, focused on four critical components—cost evaluation, Azure File Storage, database options, and backup schedules, complemented by a critical evaluation of Azure Site Recovery for disaster recovery.

The Azure Total Cost of Ownership (TCO) analysis revealed significant cost savings, which serve as a compelling economic rationale for GLI's migration to the cloud. This transition promises to optimize their expenditure while accessing Azure's extensive capabilities.

The implementation of Azure File Storage and its security measures is set to provide GLI with a highly scalable, accessible, and secure environment for their data storage needs. This will support the institute's expansion and the growing demand for its online courses and certifications, providing a robust platform for GLI's diverse educational offerings.

The evaluation of Azure database options—Azure SQL Database, Azure Database for MySQL, and Azure Database for PostgreSQL—highlighted the flexibility of Azure's services to cater to different data management needs. For GLI's specific use case, the Azure SQL Database emerged as the preferred solution due to its seamless integration, scalability, and comprehensive support for complex SQL queries.

Task D's analysis of backup schedules and retention policies with Azure Backup emphasized the vital role of these mechanisms in safeguarding GLI's digital assets. This strategy ensures data integrity and availability, fortifying the institute's defences against potential data loss or corruption.

Finally, Azure Site Recovery (ASR) stood out as an indispensable tool for disaster recovery. It demonstrated GLI's commitment to maintaining uninterrupted educational services by providing efficient data replication, customizable recovery plans, and the ability to conduct non-disruptive testing of these contingencies.

Each of these components, carefully documented and illustrated through the sequential images, underscores GLI's judicious decision to leverage Azure's cloud services. The migration not only signifies a technical uplift but also a strategic enhancement to their educational delivery capabilities. In essence, this transition to Azure empowers GLI with resilience, agility, and a sustainable model for delivering high-quality education in the cloud era.

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