GLOBAL LEARNING INSTITUTE CLOUD TRANSITION

Student: Asan Rafail (2112905)

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Lecturer: Renuga Jayakumar

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1. Introduction

Global Learning Institute (GLI) is at a critical juncture in its evolution as a leading provider of online courses and certifications. With an ever-expanding student base and growing demand for accessible, high-quality education, GLI recognizes the need to modernize its IT infrastructure to meet the challenges and opportunities of the digital age.

Currently, GLI relies on traditional on-premises servers to host user profiles, course materials, and administrative systems. While this setup has served the institution well in the past, it is becoming increasingly evident that it may not be sustainable in the long term. Scalability limitations, rising operational costs, and the need for enhanced flexibility and agility are driving GLI to explore alternative solutions [1].

After careful consideration and thorough evaluation of various options, GLI is considering a strategic transition to the Microsoft Azure cloud platform. Azure offers a comprehensive suite of services tailored to the needs of educational institutions like GLI, including scalable infrastructure, advanced security features, and cost-effective pricing models.

In this report, we will delve into the rationale behind GLI's decision to migrate to Azure, the benefits it stands to gain from this transition, and the key considerations and challenges involved in the process. By embracing Azure, GLI aims to not only address its current IT infrastructure challenges but also position itself for future growth and innovation in the rapidly evolving online education landscape [1].

2. Current Challenges

Global Learning Institute (GLI) faces several challenges with its existing on-premises server infrastructure, hindering its ability to meet the evolving needs of its online education platform [1]:

The on-premises servers incur significant expenses for maintenance and upgrades. These costs include hardware replacements, software updates, and skilled personnel to manage the infrastructure. As GLI continues to expand its offerings and student base, the expenses associated with maintaining and upgrading the servers become increasingly burdensome.

The servers are susceptible to various disruptions, including hardware failures, power outages, and natural disasters. These disruptions can lead to downtime and data loss, impacting the availability and reliability of GLI's online courses and certifications. Ensuring high availability and disaster recovery capabilities with infrastructure requires significant investment and complexity [2].

The current servers have finite storage and processing capacity, constraining GLI's ability to accommodate the growing demand for its online courses and certifications. As the institution attracts more students and expands its course offerings, the servers struggle to handle the increased workload efficiently. This limitation inhibits GLI's agility and scalability, hindering its ability to adapt to changing market dynamics and capitalize on growth opportunities [2].

Addressing these challenges requires a strategic approach that not only mitigates the immediate issues but also lays the foundation for long-term success and sustainability. Transitioning to the cloud presents an opportunity for GLI to overcome these challenges effectively and position itself for future growth and innovation in the competitive online education landscape.

3. TCO Calc to mitigate to Azure

As a Cloud Architect, my first step is to utilise the Azure TCO Calculator to estimate the cost savings achievable by migrating GLI's data from on-premises servers to Azure cloud services. Given GLI's limited budget, it's essential to identify potential cost reductions through this migration process [3].

On-Premises Infrastructure:

On-premises server: GLI currently operates two physical servers hosting file storage and databases.

Database: GLI uses Microsoft SQL Server as its primary database management system.

Storage: The institution utilizes Network Attached Storage (NAS) for file storage, with a total capacity of 5TB.

Network: 1GB Bandwidth and data transfer costs are included in the on-premises infrastructure expenses.

Additionally, it will provide insights into potential cost savings achievable by migrating to Azure cloud services, considering factors such as infrastructure, storage, database, and network costs.

The analysis will help demonstrate to GLI management the financial benefits of migrating to Azure, including potential cost reductions and improved cost predictability [3].

Utilize Azure Free Services:

During the preliminary phase of migration, leverage Azure's free services wherever possible to minimize costs.

Azure offers various free services, including Azure File Storage (up to 5 GB), Azure SQL Database (up to 250 GB), and limited bandwidth/data transfer allowances.

By taking advantage of these free services, GLI can kickstart the migration process without incurring significant expenses, allowing for a cost-effective transition to the Azure cloud platform [3].

By utilising the Azure TCO Calculator and leveraging Azure's free services, GLI can gain valuable insights into the potential cost savings and benefits of migrating its file storage system and databases to Azure cloud services, laying the groundwork for a successful migration strategy within the constraints of its limited budget [3].

Over 5 year(s) with Microsoft Azure, your estimated cost savings could be as much as [4] £54,319.

Total on-premises vs Azure cost over time

Savings from running workloads in Azure accrue over time. The following shows how those savings add up over years.

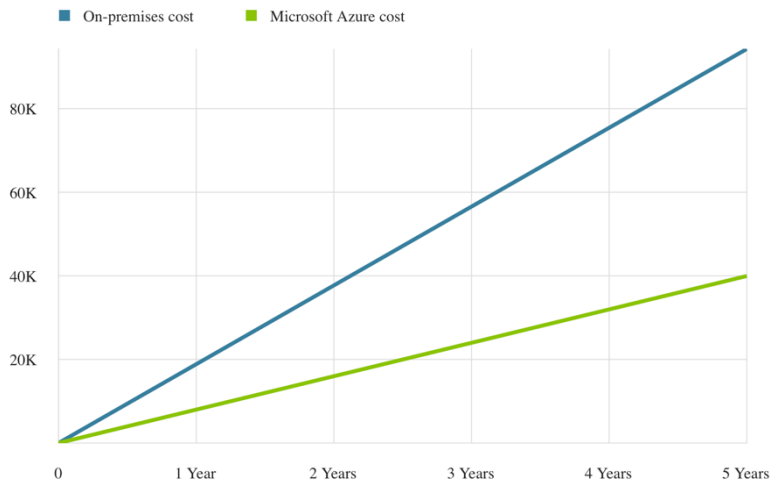


Figure 1 Cost diagram over 5 years

Total on-premises over 5 year(s) [4]

TCO of on-premises environments tends to be driven by compute and data centre costs.

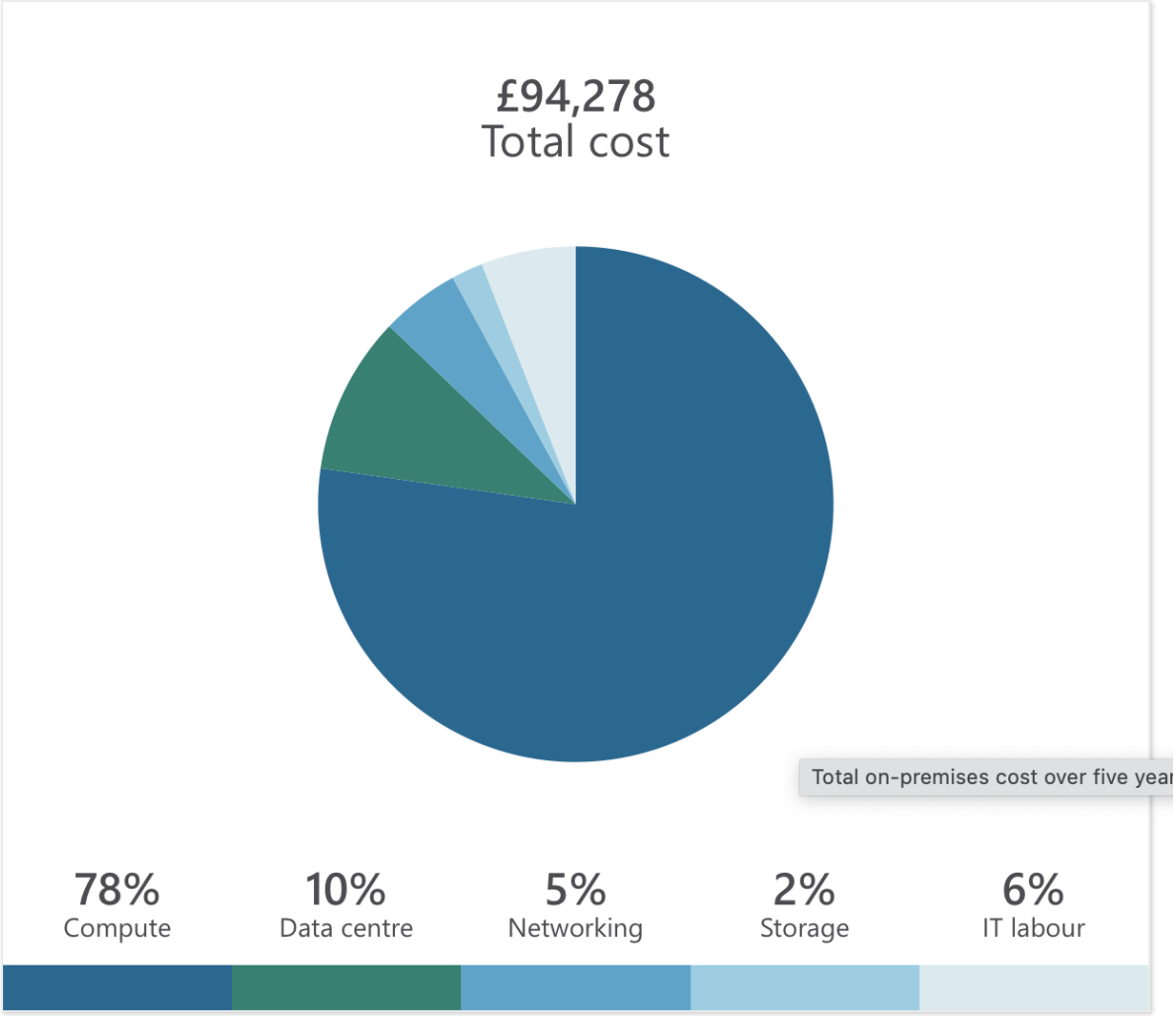


Figure 2 Total on-premises cost over 5 years

Total Azure cost over 5 year(s) [4]

In Azure, certain cost categories decrease or go away completely.

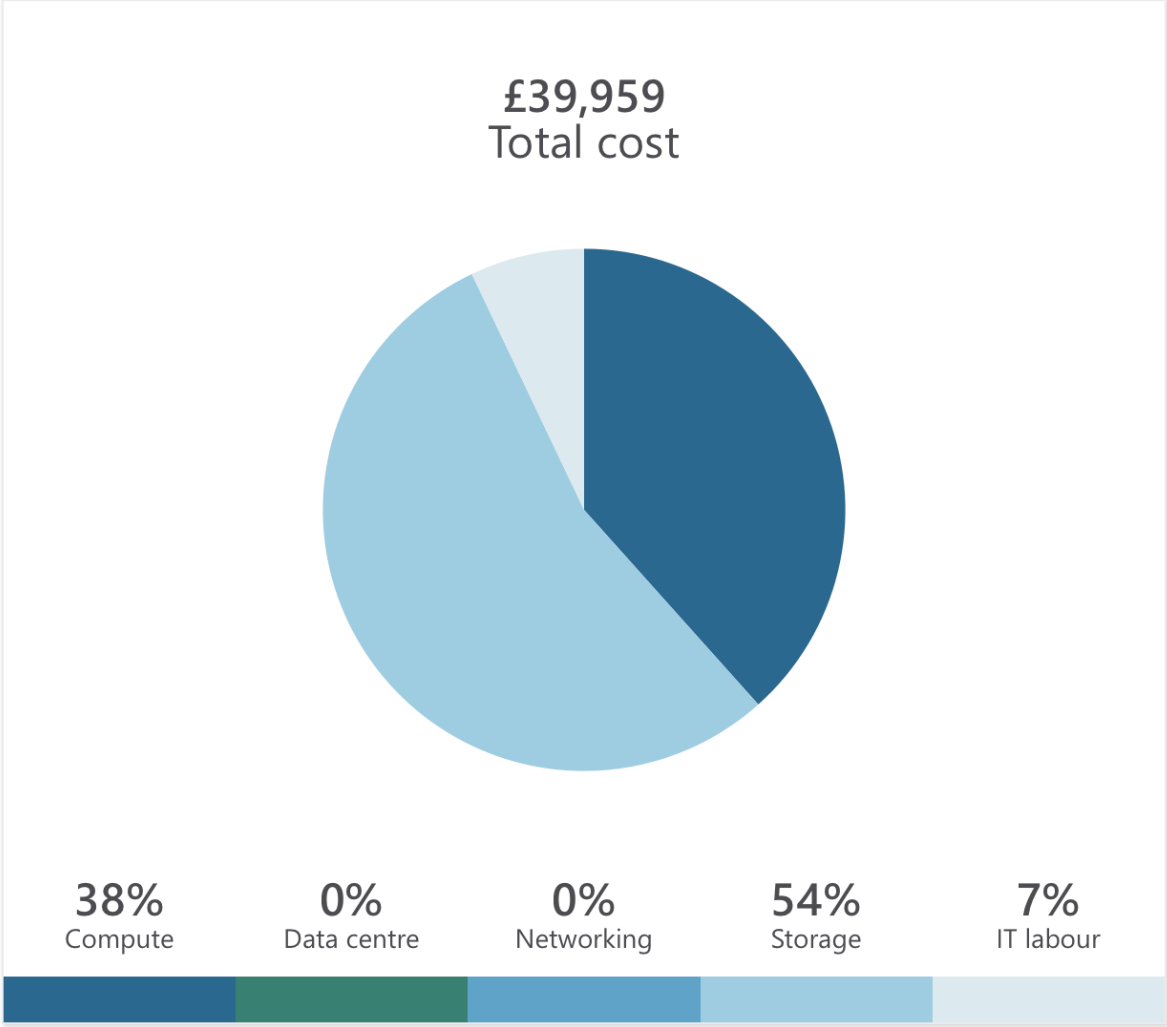
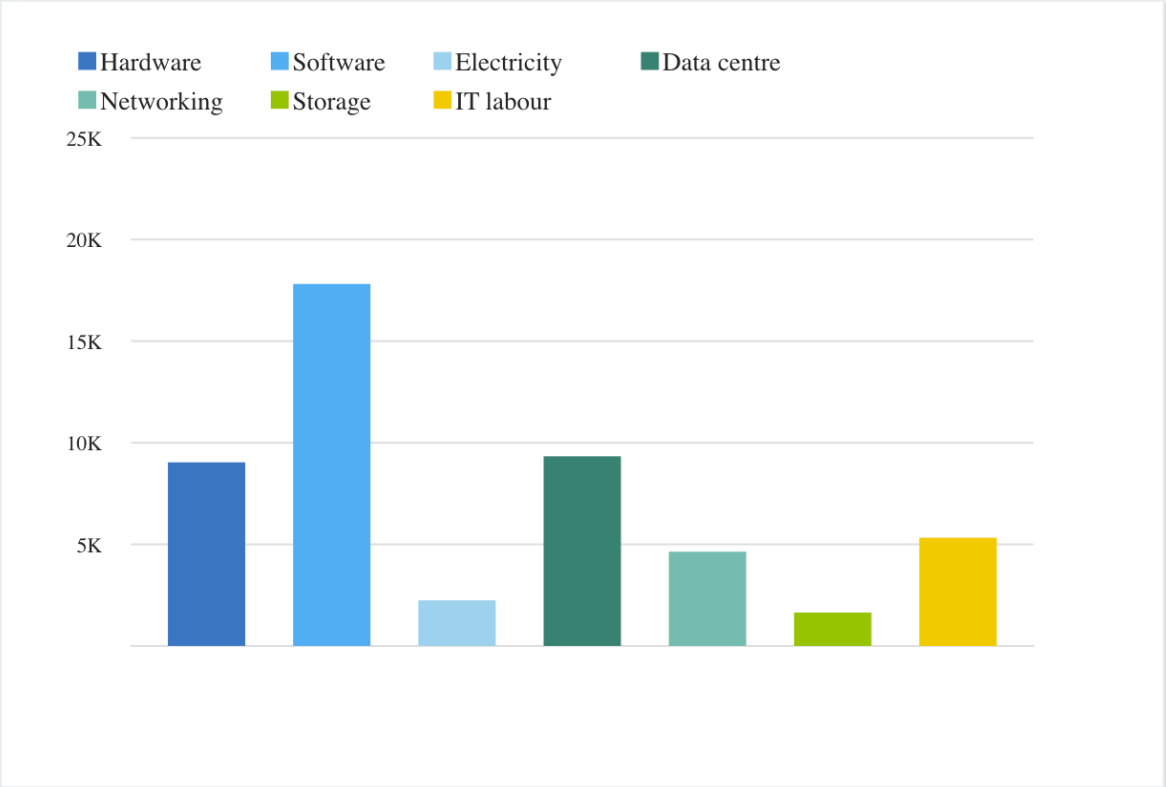


Figure 3 Total Azure cost over 5 years

Total on-premises cost breakdown [4]

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



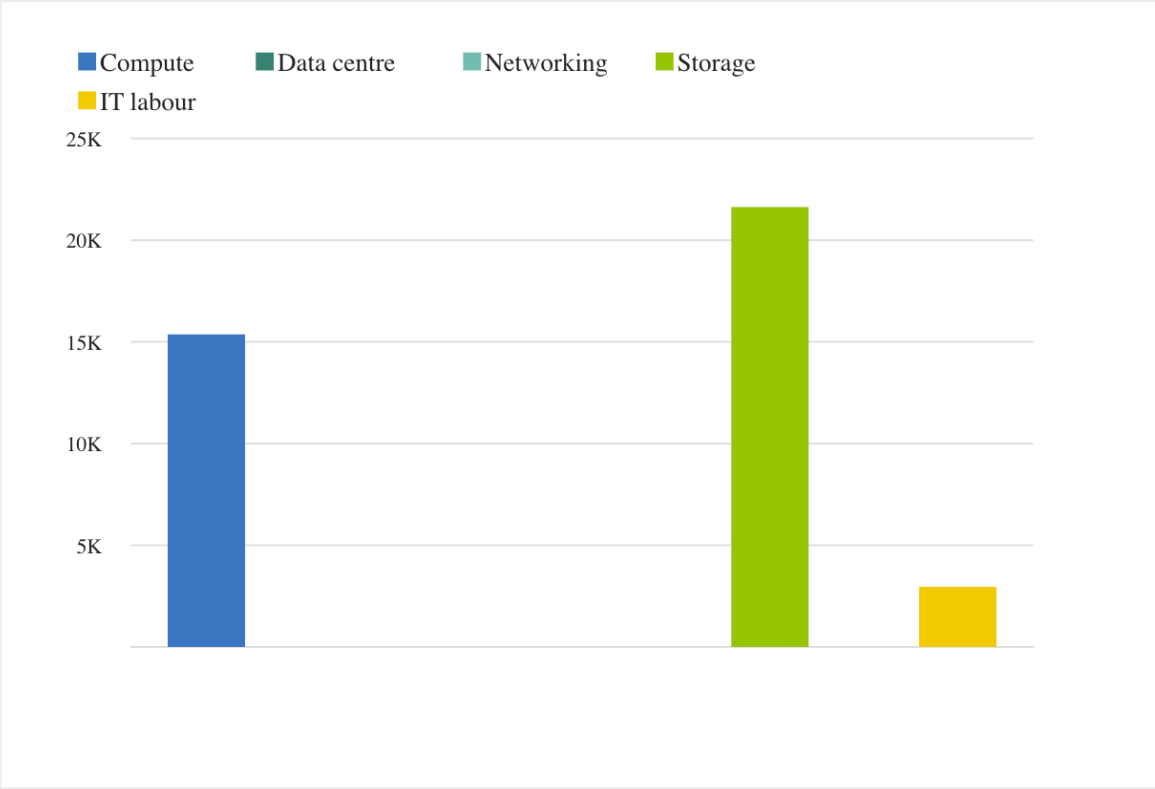
£94,278

Cost over 5 year(s)

Figure 4 Total on-premises cost breakdown

Total Azure cost breakdown [4]

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



£39,959

Cost over 5 year(s)

Figure 5 Total Azure cost breakdown

On-premises cost breakdown summary [4]

Category	Cost
Compute	£73,337.18
Hardware	£9,035.30
Software	£17,815.20
Electricity	£2,244.92
Database	£44,241.80
Data centre	£9,332.20
Networking	£4,638.83
Storage	£1,643.87
IT labour	£5,326.05
Total	**£94,278.02**

Figure 6 On-premises breakdown summary

Azure cost breakdown summary

Category	Cost
Compute	£15,367.24
Data centre	£0.00
Networking	£0.00
Storage	£21,632.68
IT labour	£2,958.6198
Total	**£39,958.82**

Figure 7 Azure cost breakdown summary

Estimated on-premises cost (5 year(s)) Breakdown [4]

Compute cost

Hardware cost

Cost per 1 proc 4 core, 7 GB RAM physical server for Windows£1,505.88
Number of servers required1
Cost per 1 proc 4 core, 7 GB RAM physical server for Windows£1,505.88
Number of servers required1
Cost per 1 proc 4 core, 7 GB RAM physical server for Windows£1,505.88
Number of servers required1
Total cost for physical server(s)£4,517.60
Cost of maintaining physical server(s) - 20% of cost of physical server(s)£903.53
Total cost of maintaining server(s) over five year(s)£4,517.60
Total hardware cost over five year(s)£9,035.30

Software cost

Cost of Windows datacenter licence per 1 proc, 4 core, 7 GB RAM physical machine£4,750.71
Number of licences needed1
Cost of Windows datacenter licence per 1 proc, 4 core, 7 GB RAM physical machine£4,750.71
Number of licences needed1
Cost of Windows datacenter licence per 1 proc, 4 core, 7 GB RAM physical machine£4,750.71
Number of licences needed1
Total software licence cost£14,252.14
Total Software Assurance cost£3,563.04
Total software cost over five year(s)£17,815.20

Electricity cost

Price of electricity per kWh£0.10
Power rating of 4 core, 7 GB RAM server166 Watts
Total electricity cost consumed by 1 server(s) - 4 core, 7 GB RAM server per month£12.47
Power rating of 4 core, 7 GB RAM server166 Watts
Total electricity cost consumed by 1 server(s) - 4 core, 7 GB RAM server per month£12.47
Power rating of 4 core, 7 GB RAM server166 Watts
Total electricity cost consumed by 1 server(s) - 4 core, 7 GB RAM server per month£12.47
Total electricity cost over five year(s)£2,244.92

SQL Database cost

Total CPU cores4
SQL Server Enterprise Licence cost per 2 cores£11,003.47
Enterprise cores4
Total licence cost£22,006.94
Enterprise Software Assurance cost per 2 cores£2,223.49
Enterprise cores4
Total Software Assurance cost£22,234.90
Total SQL Database cost over five year(s)£44,241.80

Total cost over five year(s)£73,337.18

Estimated Azure cost (5 year(s)) Breakdown [4]

Azure compute cost

Virtual Machines cost

Number of hours per month 730

A4mv2 Standard (4 core, 32 GB RAM) Windows (Azure Hybrid Benefit)SKU# AAA-33458

Number of virtual machines1

Total virtual machine cost per month£69.776

A4mv2 Standard (4 core, 32 GB RAM) Windows (Azure Hybrid Benefit)SKU# AAA-33458

Number of virtual machines1

Total virtual machine cost per month£69.776

Total Azure Virtual Machines cost£8,373.06

NOTE: For Azure compute costs, 3 year Reserved VM and two 1 year Reserved VM in use.

SQL Database cost

General Purpose Single Gen5 2 vCores (Azure Hybrid Benefit)£0.13560 /hr

SKU#

Instance Count1

Cost Per Month£116.57

Total SQL Database cost over five year(s)£6,994.20

Total Azure compute cost over five year(s)£15,367.24

Data centre cost

Compute cost

Number of rack units per rack42

Rack units required per 4 core, 7 GB RAM server1

Number of 4 core, 7 GB RAM server1

Total number of rack units required£0.79

Rack units required per 4 core, 7 GB RAM server1

Number of 4 core, 7 GB RAM server1

Total number of rack units required£0.79

Rack units required per 4 core, 7 GB RAM server1

Number of 4 core, 7 GB RAM server1

Total number of rack units required£0.79

Total number of rack units required for all server(s)£2.38

Data centre construction cost per rack unit amortised over 20 years£233.31

Data centre compute cost£699.92

Total data centre compute cost over five year(s)£3,499.58

Storage cost

Total number of rack units required for all storage5

Number of rack units for NAS5

Rack mounting/installation cost£1,166.53

Total data centre storage cost over five year(s)£5,832.64

Total data centre cost over five year(s)£9,332.20

Azure data centre cost [4]

Total Azure data centre cost over five year(s)£0.00

Networking cost [4]

Total hardware + software cost over five year(s)£26,850.50

Network hardware and software cost assumed to be 15% of hardware and software cost over five year(s)£4,027.57

Network maintenance cost assumed to be 15% of network hardware and software cost over five year(s)£604.13

Service provider cost/GB per month£0.12

Amount of bandwidth needed (GB) per month1

Total service provider cost per month£0.12

Total networking cost over five year(s)£4,638.83

Azure networking cost [4]

Total outgoing bandwidth needed per month1 GB

Total outgoing bandwidth cost per month£0.00

Total Azure networking cost over five year(s)£0.00

Storage cost [4]

Hardware

NAS/File Share

Cost per GB£0.20

Storage (RAID 10 configuration) volume in GB (GRS enabled Storage volume doubled to provide geo-redundant capability)5,120

Total storage procurement cost£1,013.58

Back up

Total back up and archive volume in GB2,048

HP LTO-7

BB873A

Back up volume per tape in TB6

Number of Tape drives required1

Cost per Tape Drive£123.50

Back up and archive cost over five year(s)£123.50

Storage Maintenance

Storage maintenance cost (10% of storage procurement cost) over five year(s)£506.79

Total storage maintenance cost over five year(s)£506.79

Total storage cost over five year(s)£1,643.87

Azure storage cost [4]

File storage

Usable storage volume in GB2,560

Storage cost per GB£0.105

Annual storage cost per usable volume£3,230.79

Total File storage GRS maintenance cost over five year(s)£16,153.94

Back up

Total back up and archive volume in GB2,048

Storage cost per GB£0.044

SKU# AAA-70228

Back up and archive maintenance cost over five year(s)£5,449.01

SQL Database Server storage

Usable storage volume in GB3

Price per GB/Month£0.035

Active DB Storage Cost/Month£0.105

Annual storage cost per usable volume£3.76

Total SQL Database Server Storage cost over five year(s)£18.81

SQL Database Backup storage

Billable back up storage volume in GB1

Price per GB/Month£0.18

Back up storage cost/month£0.18

Annual storage cost per usable volume£2.19

Total SQL database back up storage cost over five year(s)£10.90

Total Azure storage cost over five year(s)£21,632.68

IT labour cost [4]

Number of IT admin hour(s) needed per year 60

Hourly rate for IT administrator£17.75

Total IT labour cost over five year(s)£5,326.05

Azure IT labour cost [4]

Hourly rate for IT administrator£17.75

Number of IT admin hour(s) needed per year 33.33

Total Azure IT labour cost over five year(s)£2,958.620

A total **savings** of **£54,319.20** with **Microsoft Azure** [4]

The utilization of the Azure Total Cost of Ownership (TCO) Calculator and the strategic use of Azure's free services provide valuable insights and opportunities for Global Learning Institute (GLI) as it considers migrating its file storage system and databases to the Azure cloud platform [5].

Through the TCO analysis, GLI can better understand the financial implications of maintaining its current on-premises infrastructure versus migrating to Azure [5]. This analysis highlights potential cost savings, improved cost predictability, and enhanced scalability offered by Azure cloud services, aligning with GLI's goals of optimizing operational efficiency and addressing budget constraints .

Leveraging Azure's free services during the preliminary phase of migration enables GLI to kickstart the migration process without significant upfront costs. By taking advantage of offerings such as Azure File Storage and Azure SQL Database, GLI can begin transitioning its data to the cloud while minimizing financial risks and maximizing resource utilization [5].

The combination of TCO analysis and the strategic use of Azure's free services empowers GLI to make informed decisions and lay the groundwork for a successful migration to the Azure cloud platform [5]. This approach not only addresses GLI's immediate challenges with its file storage system and databases but also positions the institution for long-term scalability, reliability, and cost-effectiveness in delivering high-quality online education to its students worldwide.

4. Analysis, Security & Implementation

Analysis & Security

Azure File Storage offers scalable storage capacity, enabling GLI to accommodate the increasing volume of user profiles, course materials, and administrative data. As GLI expands its online education offerings, Azure File Storage can seamlessly scale to meet growing storage demands without the need for manual intervention or infrastructure upgrades. This scalability ensures that GLI can efficiently manage its data growth while maintaining optimal performance and accessibility for its users.

Azure File Storage operates on a pay-as-you-go pricing model, allowing GLI to optimize costs by paying only for the storage capacity and resources consumed. This cost-effectiveness eliminates the need for upfront hardware investments and enables GLI to align its storage expenses with actual usage patterns. Additionally, Azure File Storage offers tiered storage options, enabling GLI to leverage lower-cost storage tiers for infrequently accessed data, further reducing storage costs over time.

Azure File Storage provides a centralized storage solution accessible from anywhere with an internet connection, facilitating collaboration and data sharing among GLI's staff and students. With support for SMB and NFS protocols, Azure File Storage seamlessly integrates with existing applications and workflows, enabling users to access and modify files using familiar tools and interfaces. This accessibility enhances productivity and collaboration within GLI's learning community, driving academic success and innovation.

Azure File Storage incorporates robust security measures to protect GLI's data against unauthorized access, data breaches, and cyber threats. These security features include encryption at rest and in transit, role-based access control (RBAC), and integration with Azure Active Directory (Azure AD) for identity management. By implementing granular access controls and encryption mechanisms, Azure File Storage helps ensure the confidentiality, integrity, and availability of GLI's sensitive data, safeguarding against potential security vulnerabilities and compliance risks.

Azure File Storage provides built-in redundancy and data replication across multiple data centres within a region, ensuring high availability and durability of GLI's data. By automatically replicating data across fault-tolerant storage nodes, Azure File Storage mitigates the risk of data loss due to hardware failures or unexpected outages. This inherent redundancy enhances the reliability of GLI's storage infrastructure and minimizes the likelihood of service disruptions, thereby maintaining uninterrupted access to critical course materials and administrative data for students and staff.

Azure File Storage seamlessly integrates with a wide range of Azure services and solutions, enabling GLI to leverage additional capabilities for data management,

analytics, and application development. For example, GLI can use Azure Backup to create automated backups of file shares, Azure Monitor for monitoring storage performance and health, and Azure Data Lake Storage for scalable data analytics and processing. By integrating Azure File Storage with these complementary services, GLI can unlock new opportunities for data-driven insights, workflow automation, and innovation in online education delivery.

Azure File Storage offers global reach with datacentres located in regions around the world, allowing GLI to store data closer to its users and comply with local data residency requirements. With Azure's extensive global footprint, GLI can deliver low-latency access to course materials and applications for students and educators worldwide, enhancing the overall user experience and satisfaction. Additionally, Azure maintains industry-leading compliance certifications and adherence to data protection regulations, providing GLI with assurance and peace of mind regarding data sovereignty, privacy, and regulatory compliance.

Azure File Storage provides comprehensive monitoring and management tools through the Azure Portal, PowerShell, and Azure CLI, enabling GLI to monitor storage usage, performance metrics, and access controls in real time. With features such as Azure Storage Analytics and Azure Storage Explorer, GLI can gain insights into storage activity, identify usage trends, and optimize storage configurations for cost efficiency and performance optimization. These management tools empower GLI's IT administrators to proactively manage and optimize their storage infrastructure, ensuring seamless operations and user satisfaction.

Azure File Storage offers seamless integration with on-premises infrastructure through Azure File Sync. This allows GLI to synchronize files between on-premises servers and Azure File Shares, enabling hybrid cloud scenarios. With Azure File Sync, GLI can leverage the scalability and durability of Azure File Storage while retaining fast access to frequently used files on-premises. This hybrid approach enables GLI to extend its existing infrastructure to the cloud gradually, minimizing disruption and maximizing flexibility.

Azure File Storage provides advanced data management features, such as file snapshots, versioning, and access tiering. File snapshots enable GLI to capture point-in-time copies of files, facilitating data protection and recovery in case of accidental deletion or corruption. Versioning allows GLI to maintain multiple versions of files, enabling rollback to previous states and supporting collaboration workflows. Access tiering enables GLI to optimize storage costs by automatically moving infrequently accessed files to lower-cost storage tiers, such as Azure Cool or Archive Storage, while ensuring fast access to frequently accessed data.

Azure File Storage integrates seamlessly with DevOps workflows, enabling GLI to streamline application development, deployment, and testing processes. With Azure File Storage, GLI can store application artifacts, configuration files, and development assets in shared file shares accessible to development teams. This simplifies collaboration, version control, and continuous integration/continuous deployment (CI/CD) pipelines, accelerating time-to-market for new educational applications and services. Additionally, Azure DevOps Services provides built-in integration with Azure File Storage, enabling automated build and release pipelines for cloud-native and hybrid applications.

Azure File Storage supports disaster recovery and business continuity strategies by offering built-in replication, backup, and failover capabilities. GLI can leverage Azure File Storage's geo-redundancy and asynchronous replication features to replicate data across multiple Azure regions, ensuring data availability and durability in the event of a regional outage or disaster. Additionally, Azure Backup provides automated backups of Azure File Shares, enabling GLI to restore files and recover from data loss scenarios quickly. These disaster recovery capabilities help minimize downtime and data loss, safeguarding GLI's critical educational resources and operations.

Azure File Storage facilitates seamless collaboration and sharing of files and documents among GLI's staff and students. With shared file shares hosted on Azure, GLI can centralize its resources and enable users to access and collaborate on files from any location and device with internet connectivity. This promotes productivity, teamwork, and knowledge sharing across the institution, fostering a collaborative learning environment.

Azure File Storage can be integrated with Azure Content Delivery Network (CDN) to accelerate the delivery of course materials and multimedia content to users worldwide. By caching content in edge locations closer to end-users, Azure CDN reduces latency and improves the responsiveness of GLI's online learning platform, enhancing the overall user experience. This ensures fast and reliable access to course materials, videos, and interactive content, regardless of users' geographical locations.

Azure File Storage offers support for archival and compliance requirements through features such as Immutable Blob Storage and Legal Hold. GLI can leverage Immutable Blob Storage to protect critical files and records from deletion or modification for a specified retention period, ensuring data integrity and compliance with regulatory requirements. Additionally, Legal Hold allows GLI to place legal holds on files to prevent them from being modified or deleted, supporting eDiscovery and compliance initiatives.

Azure File Storage provides integration with Azure Data Lake Storage and Azure Synapse Analytics for advanced analytics and insights into GLI's data. By consolidating data from multiple sources into Azure Data Lake Storage, GLI can analyse and derive actionable

insights from its educational data, including student performance, course effectiveness, and learning trends. Azure Synapse Analytics enables GLI to perform real-time analytics, predictive modelling, and data visualization to drive informed decision-making and improve educational outcomes.

Azure File Storage offers comprehensive monitoring and reporting capabilities through Azure Monitor and Azure Security Centre. GLI can monitor storage performance, usage trends, and security events in real time, enabling proactive management and optimization of its storage infrastructure. Azure Security Centre provides threat detection, vulnerability assessment, and compliance monitoring for Azure File Storage, helping GLI identify and mitigate security risks and ensure regulatory compliance.

Azure File Storage offers a comprehensive set of features and security measures that address GLI's storage needs while supporting scalability, cost-effectiveness, accessibility, and data security. By leveraging Azure File Storage, GLI can effectively manage its growing volume of data, enhance collaboration and productivity, and mitigate risks associated with data storage and management, ultimately enabling the institution to achieve its educational objectives and drive innovation in online education.

By leveraging these additional benefits and features of Azure File Storage, GLI can enhance its storage capabilities, optimize collaboration, and content delivery, ensure compliance and data protection, and gain valuable insights from its educational data. Azure File Storage provides a flexible and scalable storage solution that empowers GLI to deliver exceptional online education experiences while maintaining data security, compliance, and cost-effectiveness.

Implementation

Creating a storage account for GLI. Log in to the Azure Portal and navigate to the Storage Accounts service. Click on "Create a storage account" and provide the necessary details such as subscription, resource group, and storage account name. Choose the appropriate performance and redundancy options based on GLI's requirements [4].

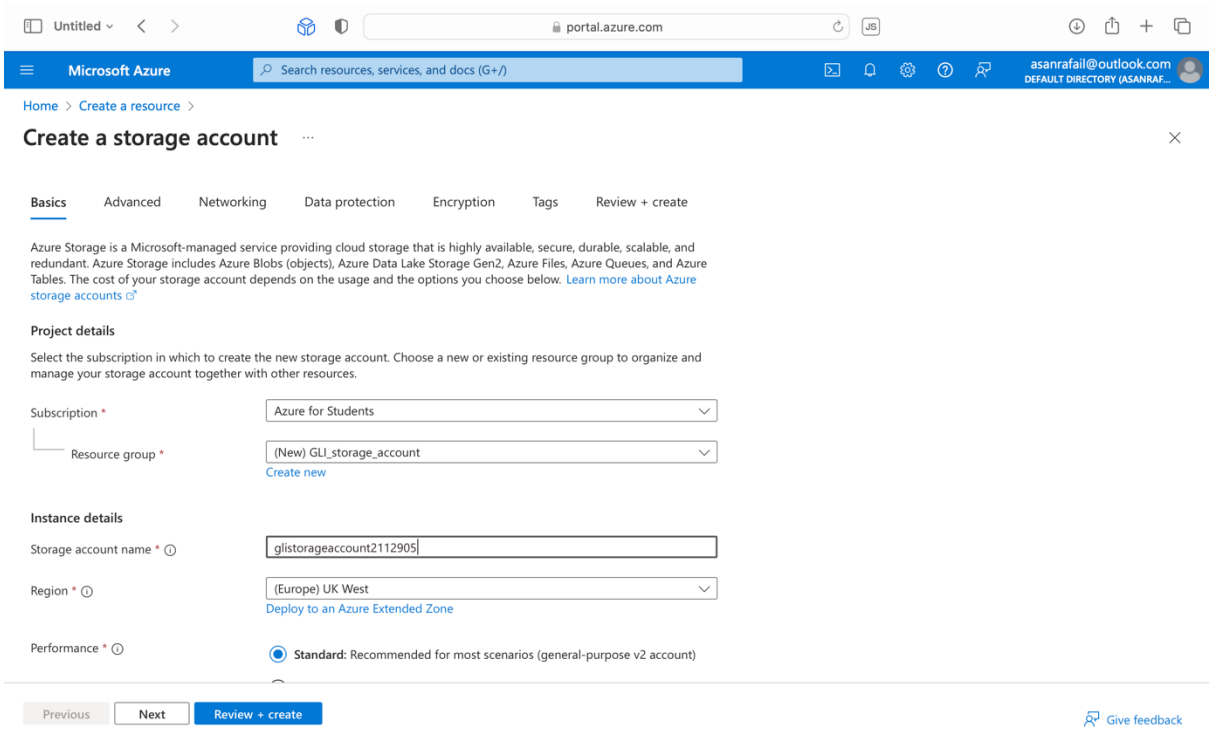


Figure 8 Creating a storage account.

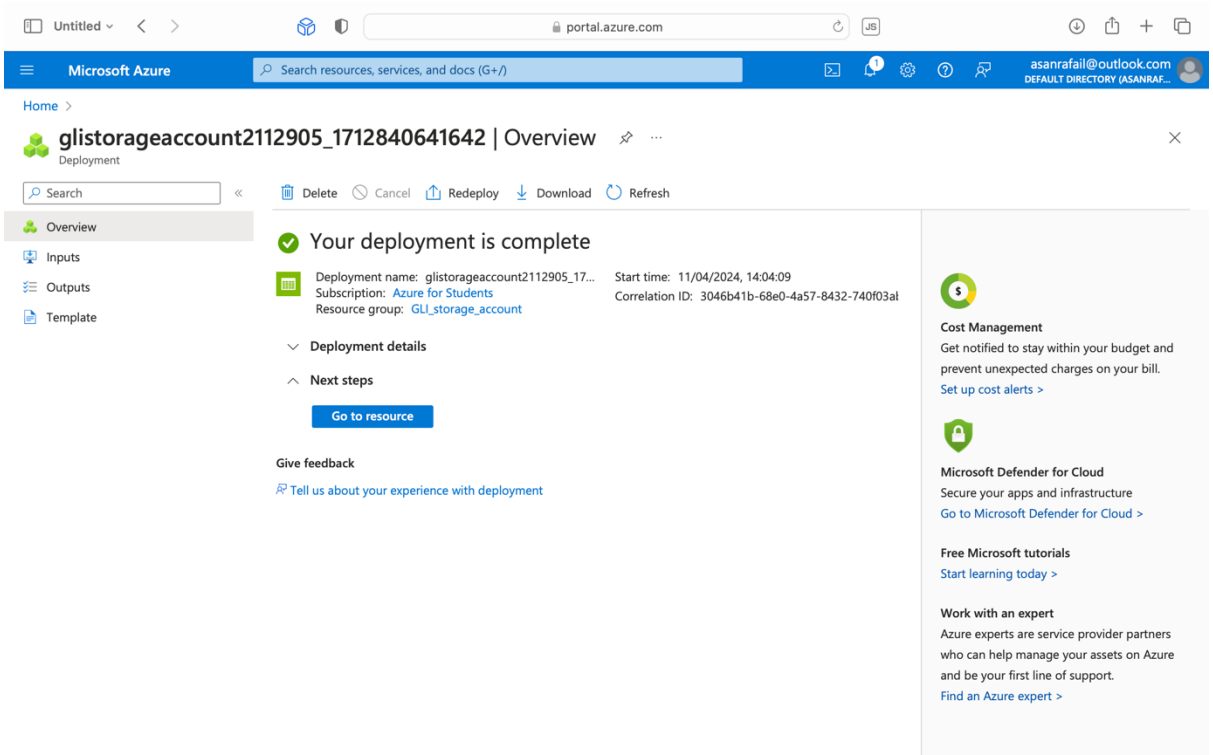


Figure 9 Storage account has been created.

5. Evaluation

To evaluate the different Azure database options (Azure SQL Database, Azure Database for MySQL, Azure Database for PostgreSQL) and recommend the most suitable one for storing user profiles, we need to consider various factors such as features, performance, scalability, compatibility, and specific requirements of storing user profiles.

Azure SQL Database:

Features: Azure SQL Database is a fully managed relational database service based on Microsoft SQL Server. It offers features like high availability, automatic backups, advanced security (encryption, threat detection), scalability options, and built-in intelligence [6].

Suitability for User Profiles: Azure SQL Database is well-suited for storing user profiles, especially if the data structure is relational and requires transactions and complex queries. It provides excellent performance and reliability for handling structured data like user profiles efficiently [7].

Advantages: Seamless integration with Azure services, comprehensive security features, support for T-SQL, and compatibility with existing SQL Server applications [7].

Considerations: May have higher costs compared to open-source database options, and there might be a learning curve for managing SQL Server-based databases [7].

Azure Database for MySQL:

Features: Azure Database for MySQL is a managed MySQL database service offering high availability, automatic backups, security features, scalability options, and compatibility with MySQL applications and tools [7].

Suitability for User Profiles: Azure Database for MySQL is suitable for storing user profiles if the application relies on MySQL database engine-specific features or if there is a preference for using MySQL in the environment [7]t.

Advantages: Fully managed service, compatibility with MySQL ecosystem, built-in monitoring and performance tuning capabilities, and support for popular MySQL features [7].

Considerations: Limited scalability compared to Azure SQL Database and may not provide as comprehensive integration with Azure services [7].

Azure Database for PostgreSQL:

Features: Azure Database for PostgreSQL is a fully managed PostgreSQL database service offering high availability, automatic backups, security features, scalability options, and compatibility with PostgreSQL applications and tools [7].

Suitability for User Profiles: Azure Database for PostgreSQL is suitable for storing user profiles if the application requires PostgreSQL-specific features or if there is a preference for using PostgreSQL in the environment [7].

Advantages: Fully managed service, support for advanced PostgreSQL features, extensions, and data types, scalability options, and integration with Azure services [7].

Considerations: May require additional configuration for compatibility with certain PostgreSQL extensions or customizations [7].

Recommendation: Based on the evaluation, the most suitable option for storing user profiles would be Azure SQL Database.

Here's why:

Azure SQL Database offers comprehensive relational database capabilities, including scalability, security, and integration with Azure services.

It is well-suited for handling structured data like user profiles efficiently and securely.

Azure SQL Database provides excellent performance and reliability for transactional and relational data, which is typically the case for user profiles.

The seamless integration with Azure services, comprehensive security features, and compatibility with existing SQL Server applications make it a strong choice for storing user profiles.

In summary, Azure SQL Database is recommended for storing user profiles due to its robust features, performance, scalability, and compatibility with relational data requirements.

Implementing Azure SQL Database [4]

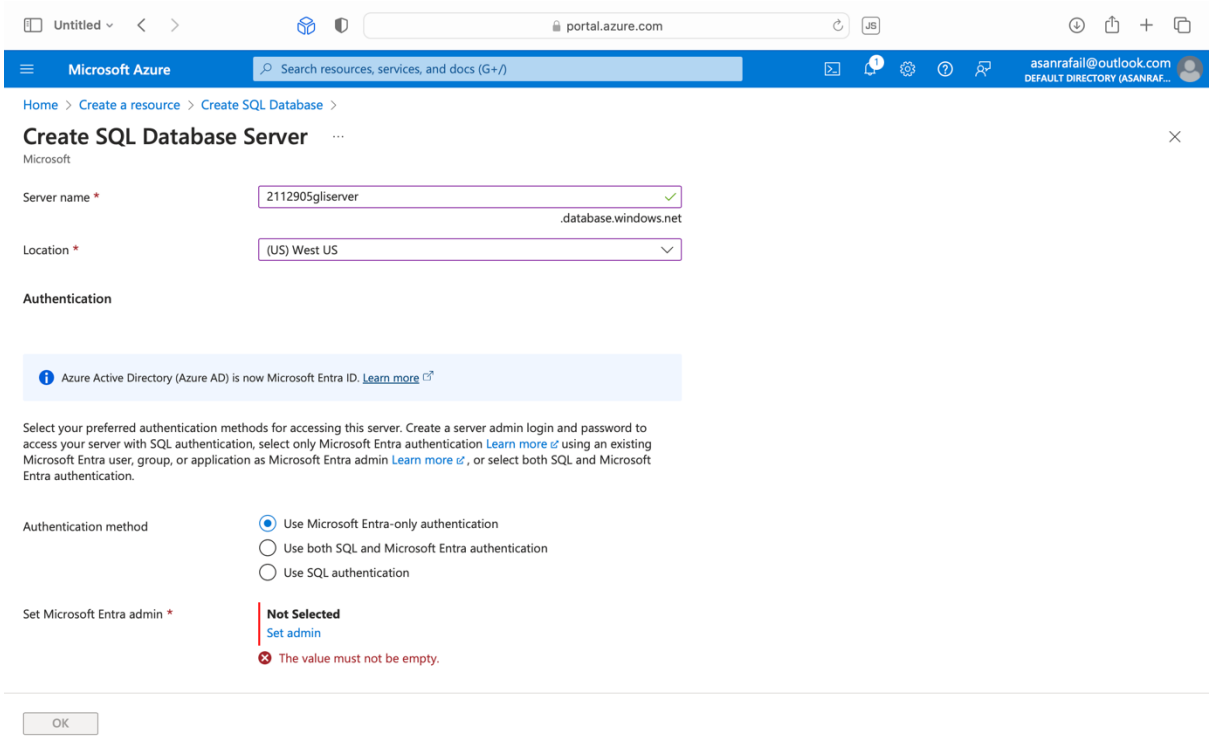


Figure 10 Creating database server

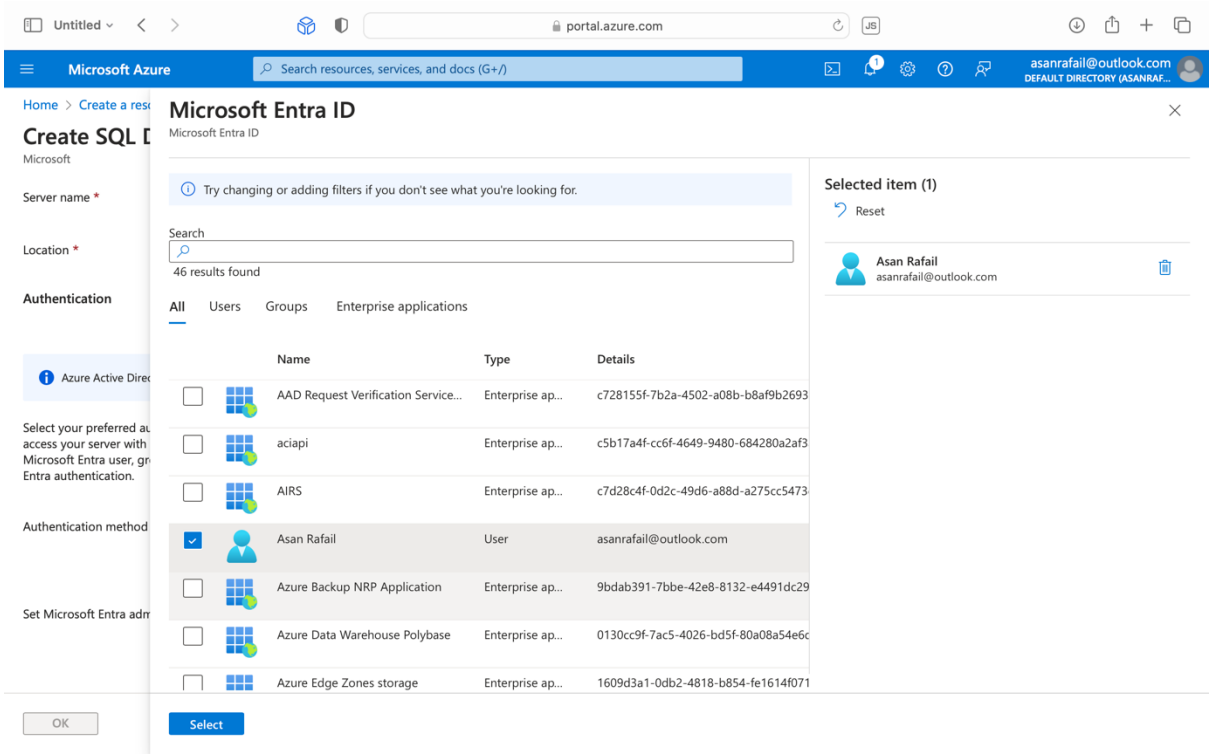


Figure 11 Selecting admin for the server

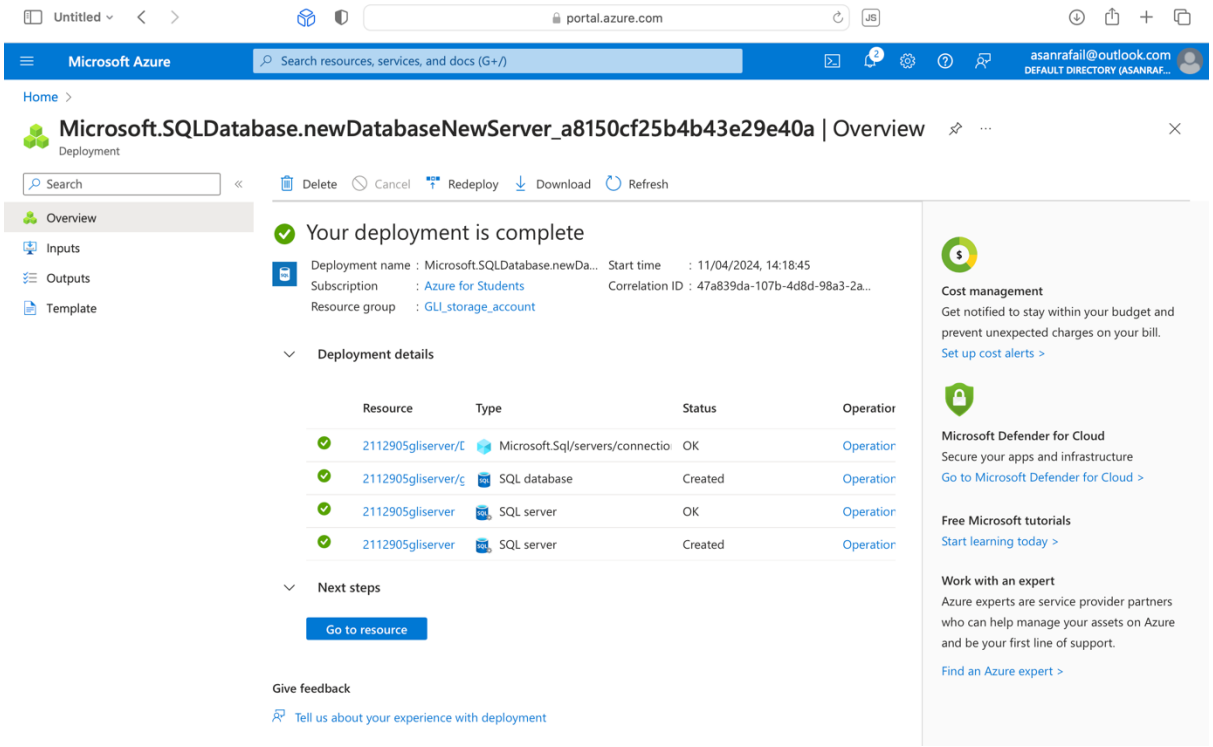


Figure 12 SQL database server is created.

6. Backup configuration

Global Learning Institute (GLI) can configure backup schedules and retention policies using Azure Backup options for both file shares and databases to ensure data protection and compliance. Here's how GLI can achieve this:

Azure Backup for File Shares

Backup Schedule: GLI can configure backup schedules for file shares using Azure Backup. This includes defining the frequency of backups (daily, weekly, monthly) and the time of day when backups should occur. GLI can schedule backups to align with low-usage periods to minimize performance impact.

Retention Policies: GLI can define retention policies to determine how long backup data should be retained. Azure Backup allows setting retention periods ranging from a few days to several years. GLI can establish retention policies based on regulatory requirements, data sensitivity, and business needs.

Azure Backup for Databases

Backup Schedule: GLI can configure backup schedules for databases using Azure Backup. This involves specifying the frequency of backups (e.g., daily, hourly) and the

time intervals between backups. GLI can schedule backups to occur during off-peak hours to minimize impact on database performance.

Retention Policies: GLI can define retention policies for database backups to determine how long backup data should be retained. Azure Backup provides flexibility in setting retention periods, allowing GLI to comply with regulatory requirements and ensure data availability for recovery purposes.

Restoring Files from Azure Backup

To restore files from Azure Backup, GLI can navigate to the Azure Portal and access the Backup service.

Select the desired file share and the point-in-time backup from which to restore files.

Choose the files or folders to restore and specify the destination where the restored files should be saved.

Confirm the restore operation and initiate the restore process.

Once the restore process is complete, GLI can verify that the files have been successfully restored to the specified destination.

Restoring Databases from Azure Backup

To restore databases from Azure Backup, GLI can navigate to the Azure Portal and access the Backup service.

Select the desired database and the point-in-time backup from which to restore the database.

Specify the target server and database name for the restored database.

Configure additional options such as recovery mode and database encryption settings if necessary.

Confirm the restore operation and initiate the restore process.

Once the restore process is complete, GLI can verify that the database has been successfully restored and is accessible for use.

Screenshots

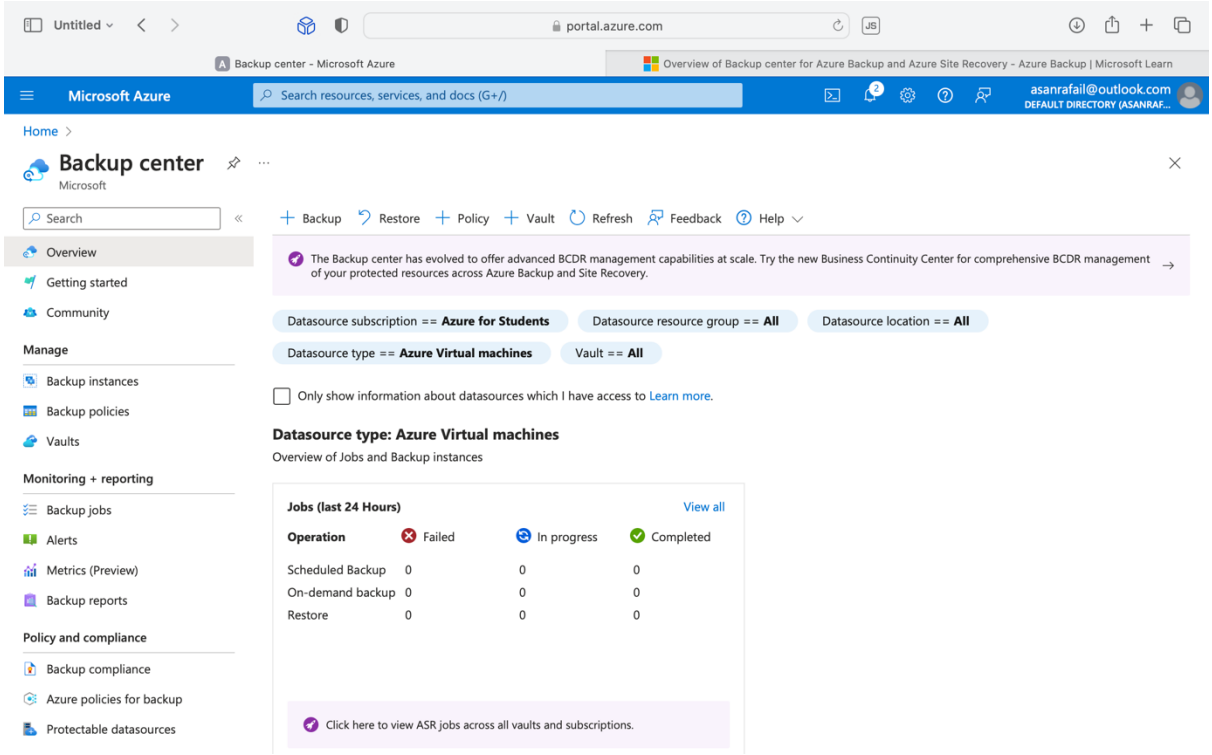


Figure 13 Backup center

7. Reliability and downtime

Azure Site Recovery (ASR) is a robust disaster recovery solution provided by Microsoft Azure that helps organizations like Global Logistics Inc. (GLI) ensure business continuity and minimize downtime in case of unexpected outages or disasters [8]. Let's evaluate how ASR would assist GLI in disaster recovery to protect their storage and databases:

ASR allows GLI to replicate their on-premises or Azure-based storage accounts and databases to a secondary Azure region. This continuous replication ensures that data is constantly synchronized between primary and secondary sites, minimizing data loss in the event of a disaster [8].

In the event of a disaster or outage at the primary site, ASR can automatically initiate failover to the secondary site. This automated failover process helps GLI minimize downtime and ensure that critical applications and data remain accessible to users, even during an outage [8].

ASR enables GLI to create customized recovery plans that define the sequence of actions to be taken during a failover scenario. These recovery plans can include steps to

failover storage accounts, databases, virtual machines, and other components in a coordinated manner, ensuring a smooth recovery process [8].

ASR ensures application consistency during failover by orchestrating the shutdown and start-up sequences of dependent services and applications. This helps prevent data corruption and ensures that applications resume normal operation without issues after failover [8].

GLI can use ASR to conduct regular disaster recovery drills and test failover scenarios without impacting production environments. This testing and validation process help ensure that the disaster recovery plan is effective and that all components are functioning as expected [8].

ASR provides monitoring and reporting capabilities that allow GLI to track the replication status, health, and performance of their disaster recovery infrastructure. This visibility helps GLI identify potential issues proactively and take corrective actions to ensure the availability of their storage and databases [9].

ASR seamlessly integrates with other Azure services, such as Azure Monitor and Azure Security Centre, allowing GLI to leverage additional monitoring, alerting, and security capabilities to enhance their disaster recovery strategy [9].

Implementing Azure Site Recovery for their storage and databases, GLI can significantly improve their disaster recovery capabilities, ensuring business continuity, minimizing downtime, and protecting their critical data and applications from unexpected outages or disasters [10].

8. Conclusion

In conclusion, the migration of GLI's file storage system and databases to Azure presents a strategic opportunity for the institution to overcome its current challenges with on-premises infrastructure. By leveraging Azure's robust and scalable cloud services, GLI can address issues related to maintenance costs, hardware vulnerabilities, and limited capacity while laying the foundation for future growth and innovation [11].

Throughout the migration process, careful planning, utilization of Azure's free services, and thorough testing are essential to ensure a smooth transition and minimize disruptions to operations. By embracing Azure File storage and Azure SQL Database, GLI can benefit from enhanced reliability, scalability, and cost-effectiveness while providing a seamless experience for students, faculty, and administrators [12].

As GLI continues its journey towards digital transformation, ongoing optimization and monitoring of Azure resources will be crucial to maximize efficiency and cost savings. Additionally, investing in staff training and documentation will empower GLI to

effectively manage and optimize its Azure environment, driving greater agility and competitiveness in the ever-evolving landscape of online education [12].

In summary, the migration to Azure represents a strategic investment for GLI, positioning the institution for long-term success and enabling it to deliver high-quality educational experiences to learners worldwide [13].

9. Reference:

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