



University of East London

SCHOOL OF ARCHITECTURE, COMPUTING &
ENGINEERING

Education - Analytics

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Module Code: CN7026

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Introduction

XYZ University is going to adopt the cloud service for education analytics purposes where the university can store and sort out the details of the students, like personal info, students who have completed their course, how many of them dropped the course without completion and to see academic performance as well, also the university can predict the student performance and change the syllabus accordingly in the future. Currently, XYZ University is using Local storage in the University and now they are planning to shift it to the Cloud by understanding its benefits.

The following are some issues they are currently facing.

- Not Scalability
- Not Cost-effective
- Less Data storage
- Challenges to internal Collaboration
- Challenges in Analytics

Project Plan

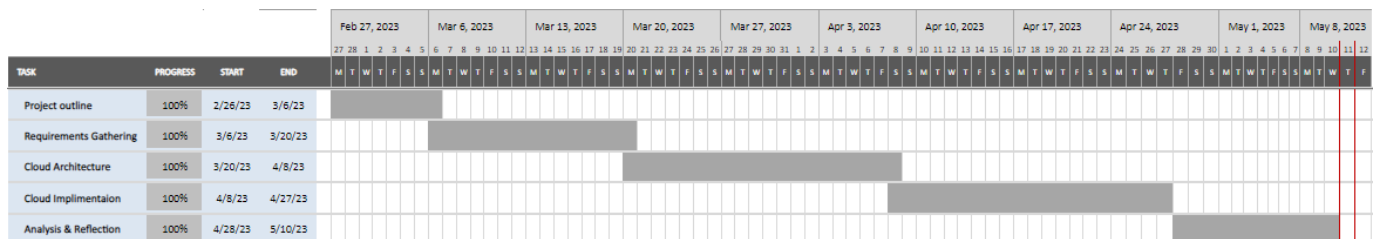


FIGURE 1 GANTT CHART

Project outline: on this, I tried to structure the way how my project should be developed.

Requirements Gathering: I gathered the requirements, finalised the service am going to use and, I figured out the functional and non-functional requirements.

Cloud Architecture: I researched and made my Architecture by choosing the required Azure services for the tasks.

Cloud implementation: At this stage, I implemented the project as per the services I choose.

Analysis & Reflection: I briefed about the task done to make service on cloud for the XYZ University and briefed about the future requirements.

Requirement gathering

Functional and non-functional requirements:

The following are the functional and non-functional requirements for the process.

TABLE 1: FUNCTIONAL REQUIREMENTS

Functional requirements	
Scalability	The cloud system must be scalable to meet the dynamic requirements of the University.
Storage	The system should have huge storage enough to store all the data related to the whole students' academics
Data processing	The Cloud system should have the ability to process and analyse the data in real-time to generate meaningful insights.
Reporting & Visualisation	The system should be able to generate easy-to-understand Visualisation of the data also it should generate customised reports.
Security	The system should ensure the security of data to protect it from the unauthorised access.

TABLE 2: NON-FUNCTIONAL REQUIREMENTS

Non-Functional requirements	
Availability	The system should be highly reliable & available 24x7 with minimum downtime to enable
Performance	<p>The system should provide fast and efficient data processing to make sure the smooth operation</p> <p>Also, the system should be able to process large volume of data without compromising the performance</p>
Useability	The system should have a user-friendly interface which should be easy to understand even for non-technical users.
Compliance	The system should have all relevant regulations and standards which includes industry-specific regulations and data privacy laws like GDPR, FERPA and HIPAA which keeps universities education analytics data secure and compliant with regulations.
Cost-effective	The system should be developed to optimise the expense by making cloud resources on a pay-as-you-go basis so that the universities don't want to break their bank.

Choice of Cloud platform (Azure)

Azure Cloud Services provide secure, cost-effective, machine learning capabilities, and great support service which is highly modifiable according to the future requirements

The following are the few benefits of using Azure as the cloud service for education analytics at XYZ University.

Data visualization

- It provides analytical tools like Power Bi
- It has pre-build connectors for seamless integration with the existing data system.

Global presence

- Azure's global data centre network enables localised data storage for universities
- It can drop the latency and increase performance for Data-intensive workloads.

Security

- Azure's robust security feature ensures the utmost protection of sensitive data secure.
- It provides role-based access control, encryption, and compliance certification

Choice of Datacenter and standards

For XYZ University the cloud solution is taken as the Managed and the main reason for that is.

- Scalability: It can quickly and easily scaleup the resources as per the requirements
- Cost saving: Also, saves expenses a lot as because the University does not need to spend huge amount for the equipment's and its spaces as well as its maintenance.
- Reduce complexity: It will be complex and time-consuming to manage an in-house data centre, so with managed service the University can simplify their IT operations.
- Improve security: It provides more advanced security measures so that Institution doesn't need to worry about the cyber threats.

The Data center should be architecture as private as because the data is only required to be accessed by the administration of the Institution. The location selected for the data centre is UK south as because it is the closest one.

Accreditation and certification



Covers security controls related to data confidentiality, integrity, and availability.



Evaluates internal control and processes related to financial reporting, data security and data privacy.



Assures that services are properly developed



Audits technology organisations based on security, processing integrity, availability, privacy and confidentiality



Self-regulatory data centre standards to enable IXPs.

Cloud Architecture design

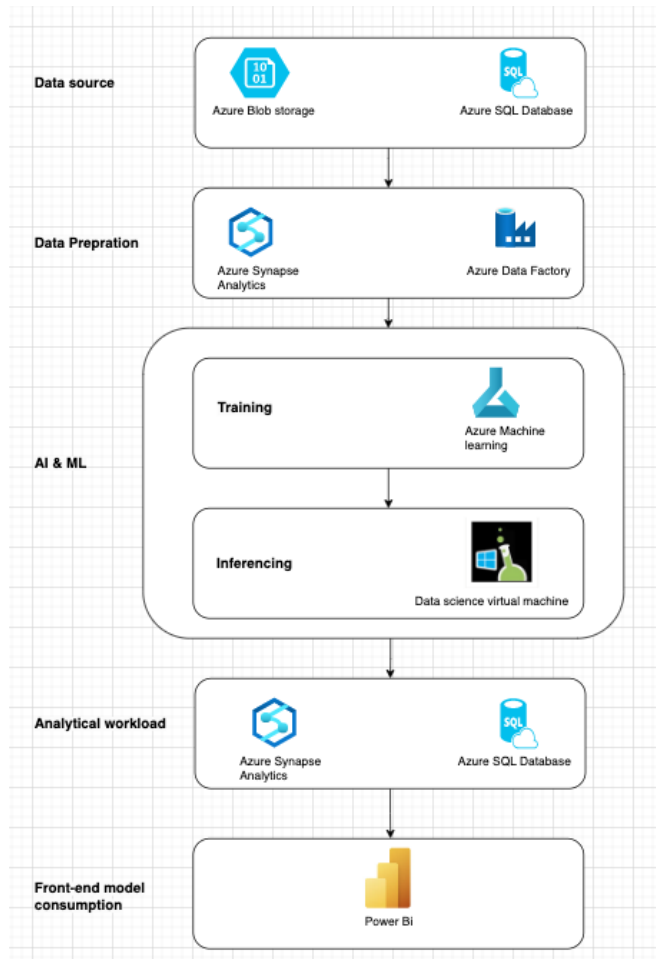


FIGURE 2 CLOUD ARCHITECTURE DESIGN

Data sources: The services we used are Azure storage blob for scalable storage of unstructured data (e.g., student records, research data) and SQL for structured data (e.g., enrolment, attendance, grades)

Data preparations: Data gathered, integration, and organisation are facilitated by Azure Synapse Analytics for data warehousing, exploration, ML, and Business intelligence, seamlessly integrating with Azure Power BI.

Azure data factory efficiently moves and transforms data from various sources (e.g., enrolment system, learning management systems, feedback surveys) to a centralised location like Synapse Analytics.

AI & ML:

AI Machine learning training: It is the process of constructing and training machine learning models. On which Azure Machine learning is a service that allows to create, train and deploy models.

Inferencing: It helps to enable the prediction of student attrition and performance, allowing the University to make informed syllabus changes accordingly. The Data science Virtual Machine facilitates the deployment of machine learning models for inference on fresh data.

Analytical workload: The results of the model score are saved in Azure synapse Analytics and Azure SQL Database. The findings are then ready for use in the front end.

Front-end model consumption: MS Power bi is the tool used to view the analytical of students which are very user-friendly.

Cloud Implementation

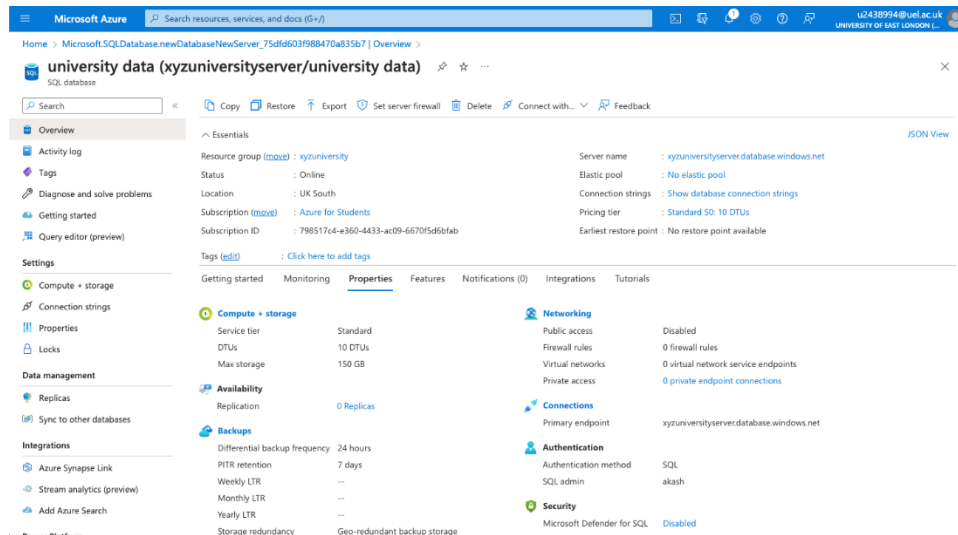


FIGURE 3 AZURE SQL DATABASE IMPLEMENTATION

Above I have implemented a SQL database called university data.

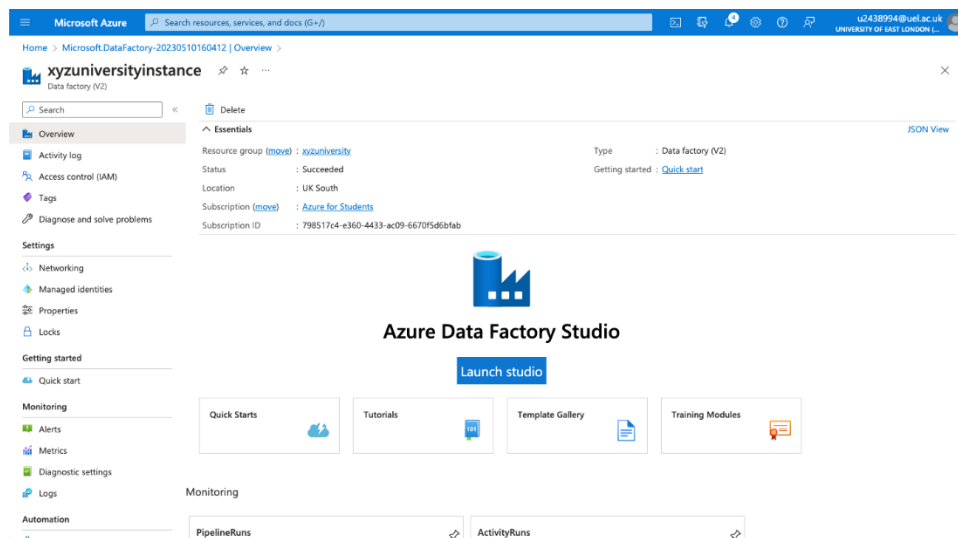


FIGURE 4: AZURE DATA FACTORY STUDIO IMPLEMENTATION

Here I have implemented a Data factory studio called xyzuniversityinstance.

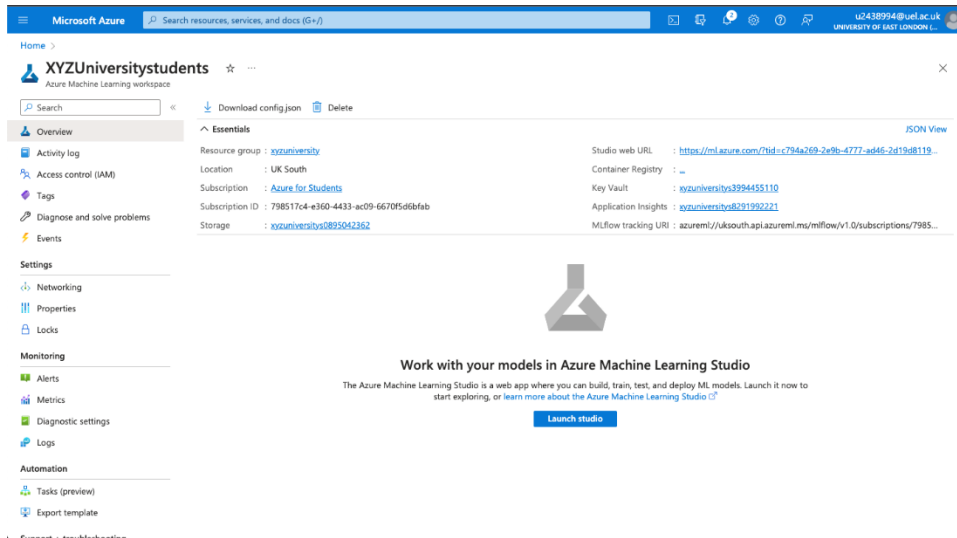


FIGURE 5: AZURE MACHINE LEARNING IMPLEMENTATION

Here an Machine learning studio is implemented with the name of XYZUniversitystudents.

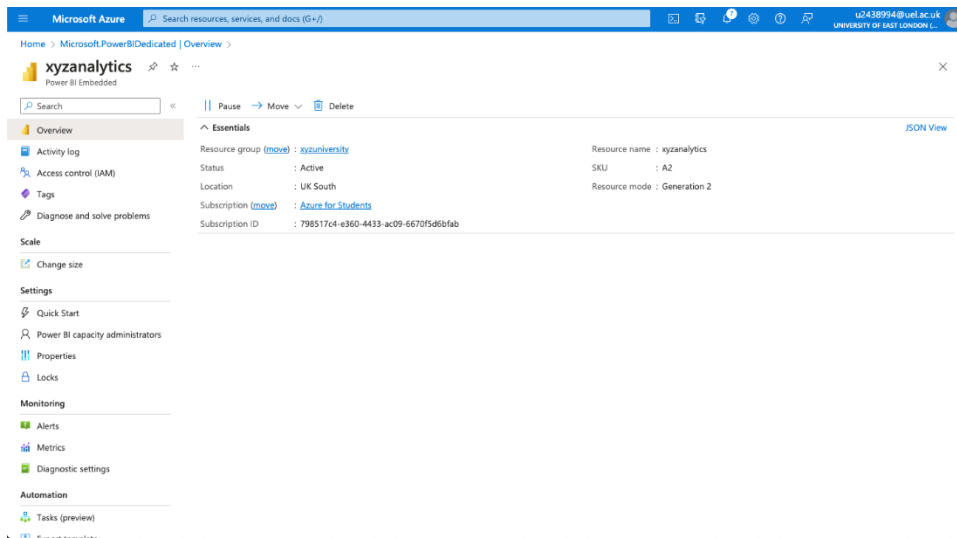


FIGURE 6: POWER BI IMPLEMENTATION

Here a Power BI embedded is implemented with the name of xyzanalytics.

Pricing

✓ Azure SQL Database	①	Single Database, vCore, General Purpose, Provision...	🔗 📄	Upfront: US\$0.00	Monthly: US\$858.50
✓ Azure Synapse Analytics	①	Tier: Compute Optimised Gen1, Dedicated SQL Pool...	🔗 📄	Upfront: US\$0.00	Monthly: US\$2,356.85
✓ Azure Data Factory	①	Azure Data Factory V2 Type, SQL Server Integration ...	🔗 📄	Upfront: US\$0.00	Monthly: US\$612.99
✓ Azure Machine Learning	①	1 D4ds v4 (4 Core(s), 16 GB RAM) x 1 Month, Pay as...	🔗 📄	Upfront: US\$0.00	Monthly: US\$191.26
✓ Power BI Embedded	①	1 node(s) x 730 Hours, Node type: A1, 1 Virtual Cor...	🔗 📄	Upfront: US\$0.00	Monthly: US\$735.91

FIGURE 7: PRICING OF ABOVE MENTIONED SERVICES

The total cost comes around US\$4,755.50 for the services mentioned above. Also, as per the requirements we can increase or decrease the same.

Analysis and Reflection

We have successfully deployed and tested effective way of storing and using the data for the university to check about the performance and to predict students' performance accordingly which they can improve their syllabus in the future. The university can access the data easily, cost-effectively and without any barrier in the proximity.

As because it is a university, there will be more storage requirement always as because we are regularly getting more data, so Azure was one of the best choice available currently. Because it is highly scalable and can optimize as per the requirements.

But still, all other university services need to be shifted to the Azure cloud services so that we can save more money and be more effective.

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