Data extraction & processing while maintaining security, monitoring & standard on azure platform.

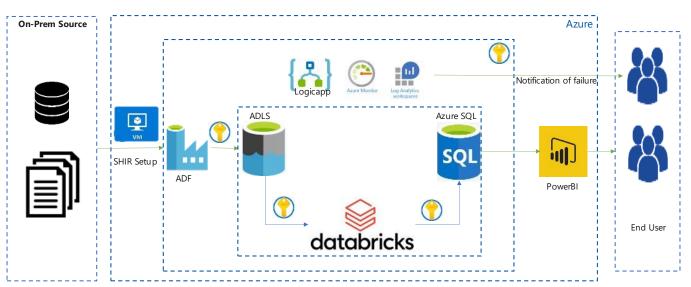
Problem statements: As data engineer usually will get different requirement for data processing & transformation of various sources, Azure offers a wide range of services and tools to help you achieve this.

We received requirement to pick up files from on premises to azure cloud platform & perform checks on data quality while maintaining security, monitoring & data lake transformation layers before loading data in Data warehouse.

Services use:

- 1. Azure account: For using cloud platform
- 2. Azure Data lake : For storing data & maintaining transformation layer
- 3. Azure DataFactory:- For data ingestion from onprem to azure & data processing
- 4. Azure Databricks: For data transformation & delta tables
- 5. Azure Synapse: For DWH & data modelling purpose
- 6. Azure Keyvualt: For maintaining credentials & secrets at centralize location.
- 7. Azure monitor : For monitor Azure resources
- 8. Azure log analytics: For querying logs
- 9. Logic Apps: For sending email on failure & success
- 10. Azure VM : For setup SHIR

Architecture Diagram:



Logical architecture

Technical Requirement:

Setup azure environment with listed services

•	Azure Data lake setup & maintain 3 different layer in ADLS					
	RAW: Stora raw data from source					
	Refined: store cleansed data after processing					
	Processed : store transformed data					
	Carting A characteristic b Datas antista					
	+ Container 🔒 Change access level 🤌 Restore containers					
	Search containers by prefix					
	Name					
	¢lara					
	\$logs					
	proccesssed					
	raw					
	refined					

2. Setup vm for selfhosted IR to connect on prem server to pickup file

Name ↑↓	Type ↑↓	Sub-type \uparrow_{\downarrow}	Status ↑↓
👆 AutoResolveIntegrationR	Azure	Public	🗸 Running
integrationRuntime1	Self-Hosted		🗸 Running

3. <u>Setup Azure data factory</u> for data ingestion & proccesessing :

		ForEach	אל	2
Get Metadata	~	ForEach_1		Notebook
Get Metadata_1		Activities	Ø	Notebook1
		$ \begin{array}{c} (\chi) \\ \text{Set} \\ \text{variable1} \end{array} \longrightarrow \begin{array}{c} \textcircled{1} \\ \text{Get} \\ \text{Metadata2} \end{array} \longrightarrow \begin{array}{c} \cancel{1} \\ \text{If} \\ \text{Condition1} \end{array} \longrightarrow \textcircled{+} \end{array} $		

Below checks has been performed in ADF for data consistency:

• Check if the file is available in the path. If it's not available, there should be timeout after 1 minute:

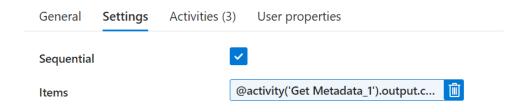
General Settings User pro	perties	
Name *	Get Metadata_1	Learn more 🖸
Description	fetch from blob storage	
Activity state (preview) $^{(\mathrm{i})}$	Active Inactive	
Timeout ⁽ⁱ⁾	0.00:01:00	
Retry ^①	10	

• Check if the file size is greater than 20b or not. If the file size is greater than 20b then needs to process:

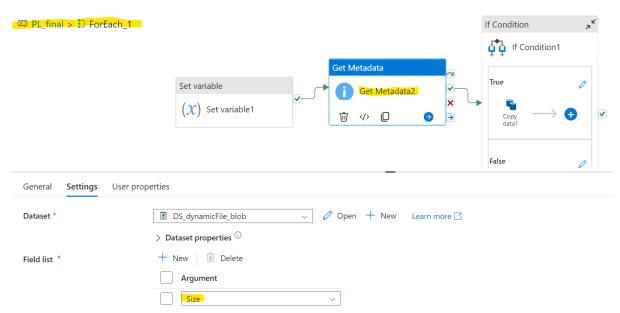
We have used 2 get metadata to check first list of files & then stored file name in variable to check size of each file

(ForEach	
Get Metadata Get Metadata_1	ForEach_1	
ŵ □ 🥯	Activities	v
	$ \begin{array}{c} (\chi) \\ \text{Set} \\ \text{variable1} \end{array} \longrightarrow \begin{array}{c} \textcircled{\bullet} \\ \text{Get} \\ \text{Metadata2} \end{array} \longrightarrow \begin{array}{c} \swarrow \\ \text{If} \\ \text{Condition1} \end{array} \longrightarrow \begin{array}{c} \textcircled{\bullet} \end{array} $	
General Settings User prop	erties	
Dataset *	🗈 DS_capstone_blob_getmatadata1 🗸 🖉 Open 🕂 New Learn more 🛛	
Field list *	+ New Delete	
	Argument	
	Child items ~	

Get metadata output passed to foreach loop activity to run loop for every file



Inside for each loop used variable to store file name & with help of 2nd getmetadata pick size of file.

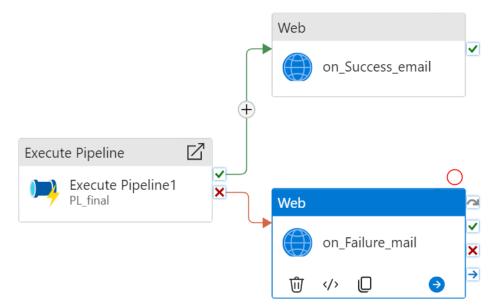


Passed size condition in ifcondition activity to pick files which are greater then 20b

@greaterOrEqua	ls(activity('Get Metadata2').output.size,21)	
ගා PL_final > :] ForEach_	1	If Condition1
	Set variable Get Metadata (\mathcal{X}) Set variable1 Get Metadata2	$ \begin{array}{c} \hline Copy \\ data \end{array} \longrightarrow \begin{array}{c} \bullet \\ \hline \end{array} \end{array} $
General Activities (1)	User properties	
Expression ⁽ⁱ⁾	@greaterOrEquals(activity('Get Meta	
Case	Activity	
True	Copy data1	

• Setup email configuration on failure & success of pipeline to get notify

Create master pipeline to call logic app to get notified on pipeline failure



4. **<u>Configured Logicapp to trigger email</u>** & passed logicapp url in be activity:

Validate Debu	g 续 Add trigger Web ① 小 D	<pre>{ "message" : "Pipeline with run ID @{pipeline().RunId} is successfully executed.", "dataFactoryName" : "@{pipeline().DataFactory}", "pipelineName" : "@{pipeline().Pipeline}", "receiver" : "@{pipeline().parameters.receiver}" }</pre>
General Settings	Execute Pipeline	Clear contents Activity outputs Parameters System variables Functions Variables P Search
URL * ⁽) Method * ⁽) Body	Https://prod-01.westus2-logic azure com:l. A Information will be sent to the URL specified. Please ensure you trust the URL entered. POST Yors ("message" : "Pipeline with run ID @	Execute Pipeline1 Execute Pipeline1 activity output Execute Pipeline1 Execute Pipeline1 pipeline return value
Authentication ${}^{\bigcirc}$	None ~	OK Cancel

5. Setup keyvault to store credentials

Kvnt Secrets ☆				
	« 🕂 Generate/In	nport 💍 Refresh Res	tore Backup View sampl	e code 🛛 😶
🗳 Tags	*			
🔀 Diagnose and solve problems	Name	Туре	Status	E
≸∃ Access policies	adbtoken		✓ Enabled	
🗲 Events				
Objects				
🕈 Keys				
Secrets				
Certificates				

count selection method ① From Azure subscription ④ Enter manually RL *	tnentication type	
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Secret version 🛈	AKV linked service * ① LS_kv_expectance Secret name * ① (**********************************	Azure Key Vault
	AKV linked service * ① LS_kv_expotence Secret name * ① Compatione-datalake Compatione-datalake Compatione-datalake	Azure Key Vault

Once all checks has performed databricks notebook will be executed from datafactory pipeline to maintain transformation layer in adls

Get Metadata Get Metadata_1	ForEach ForEach_1 Activities (χ) Set Variable1 Get G	x ⁴	Notebook Notebook1	
General Azure Databricks Setti Databricks linked service *		Edit + New		

Setup Azure databricks :

in Databricks couple of transformation applied , I am attaching some of them only as per confidentiality,

- If date is NULL or blank, give default date as '2020-11-28'. Format of date column should be YYYY-MM-DD.
- Remove the entries which has URL field value as 'ERROR'.
- Transform the values of column country with their acronyms. For eg: Austria would be replaced by 'AUST', Belgium by 'BELG' etc. Y

```
Python >
```

```
1 #read the parquet file from adls
2 source_file="abfss://refined@chaitanyacapastonelake.dfs.core.windows.net"
3 df_source=spark.read\
4         .format('parquet')\
5         .option('inferschema',True)\
6         .load(source_file)
7
8 adf=df_source
```

Cmd 3

1 # Apply transformations
2

```
3 target_df = adf.withColumn("date", when(col("date").isNull(), "2020-11-28").otherwise(col("date")))
4 target_df = target_df_filter(col("url") '= "FRROR")
```

```
4 target_df = target_df.filter(col("url") != "ERROR")
5
```

```
24 #run the loop
    for rows in table1.find_all('tr'):
25
26
      column=rows.find_all('td')
27
     if len(column)>=2:
28
       country_name=column[0].text.strip()
29
        acronym=column[1].text.strip()
30
        country_acronym[country_name]=acronym
31
    #covert the column 'country' of transformed table to upper-case
32
33
     target_adf=target_df.withColumn("country",upper(col("country")))
34
35
    # Create a DataFrame from the acronym data
     acronym_df = spark.createDataFrame(country_acronym.items(), ["country", "acronym"])
36
37
38
    # Join the original DataFrame with the acronym DataFrame to replace values
    adf1 = target_adf.join(acronym_df, "country", "left").select("*")
39
40
    # Interchange the positions of two columns (e.g., swap "Age" and "Country") and then drop country table
41
42
    result_df = adf1.withColumnRenamed("country", "temp").withColumnRenamed("acronym", "country").withColumnRenamed
     ("temp", "acronym").drop("acronym")
43
```

Complete code & ARM template added in github.

Once data transformation done loading data in sql to build pbi dashboard on so can be consumed be end user.

Challenges in implementing solution:

integrating all azure services together in secure way with help of vnet & keyvault so data can be processed from on prem to azure & load successfully in database to consume.

In while process criticality of data is key things to protect so overall flow will work smoothly as per architecture diagram.

Business Benefits:

In all project as data engineering will play a key role to perfoem various data operation & maintain security so its help of this high level flow can implement security best practices can be followed.

Github link:

https://github.com/deeksharm/azuredataengineer