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Student Club  
KFS

# Project #2: Serverless File Processing with Azure Functions and Blob Storage

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**Student Code:** CCB071

**Submission Date:** 31/3/2025

## Instructions:

- Complete the steps for building a serverless file processing system using Azure Functions and Blob Storage.
- For each step below, provide a brief description of what you did and insert a screenshot showing the result (e.g., Azure Portal, code, storage containers).
- Export this document as a PDF named **YourID\_ProjectNumber.pdf** and submit it using this [link](#).

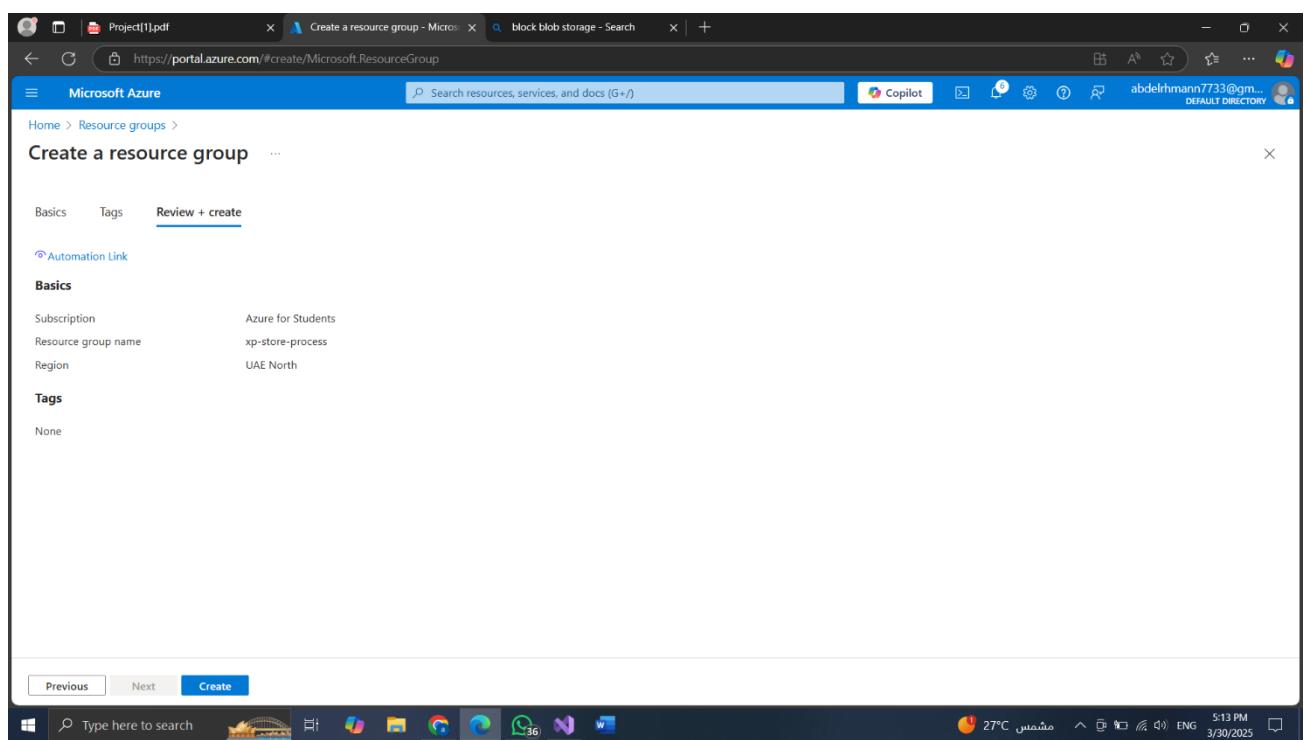
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# Project Steps

## Step 1: Set Up Azure Environment

- **Description:** Created a resource group, **xp-store-process**, to manage all project resources, you can choose any region, but I chose UAE North and keep in mind the region benefits and costs.
- **Screenshot:**  
[resource group creation]



## Step 2: Create Azure Blob Storage

- **Description:** Set up a storage account and created input/output containers for file processing.
- **Screenshot:**

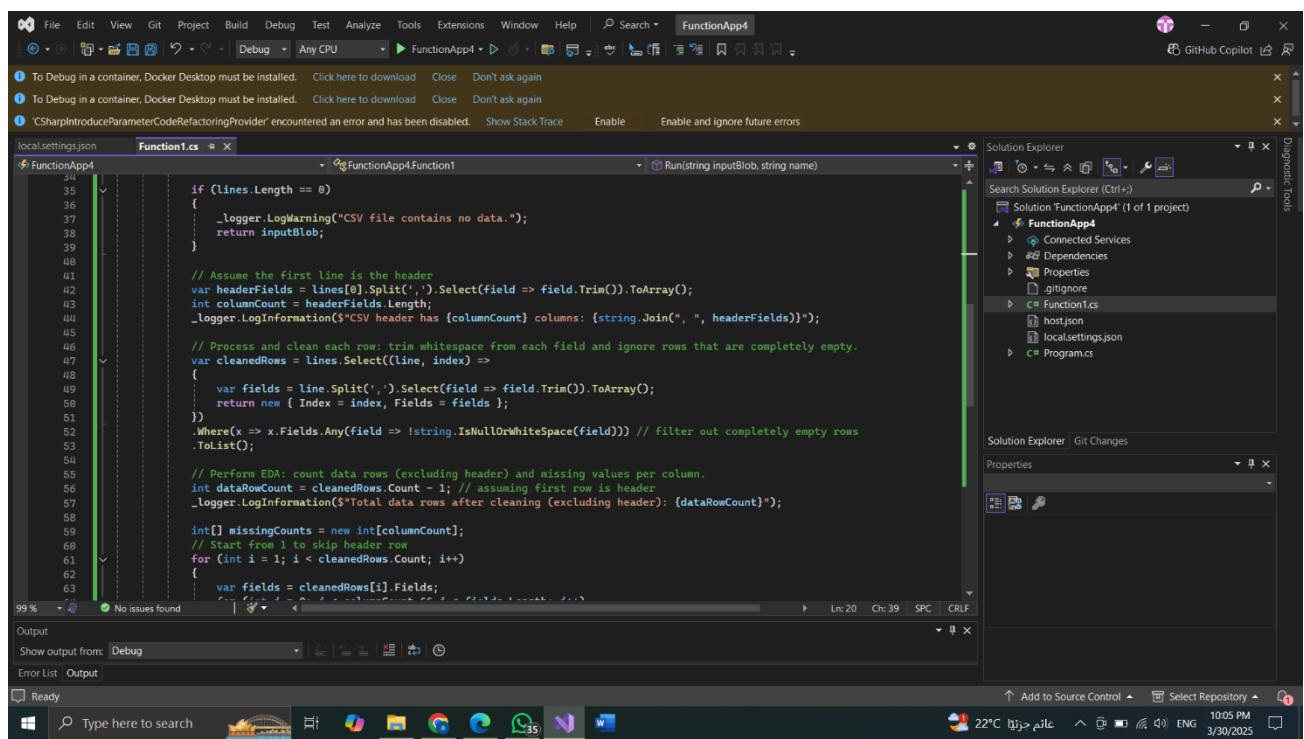
The image contains two screenshots of the Microsoft Azure portal. The top screenshot shows the 'Create a storage account' wizard. It has sections for 'Project details' (Subscription: Azure for Students, Resource group: xp-store-process), 'Instance details' (Storage account name: internalstorexp, Region: (Middle East) UAE North, Primary service: Select a primary service, Performance: Standard, Redundancy: Geo-redundant storage (GRS)), and a checkbox for 'Make read access to data available in the event of regional unavailability'. The bottom screenshot shows the 'Containers' blade for the 'internalstorexp' storage account. It lists five containers: 'logs', 'azure-webjobs-hosts', 'azure-webjobs-secrets', 'input', and 'output'. Each container is listed with its name, last modified date (3/30/2025), anonymous access level (Private), and lease state (Available). The sidebar on the left shows other storage-related services like Data migration, Events, Storage browser, and Partner solutions.



## Step 3: Develop the Azure Function

- **Description:** Azure Function processes CSV files from an Azure Blob Storage trigger, performs basic data cleaning and exploratory data analysis (EDA), and saves the cleaned version to another blob storage location. This can help in the automation of ETL(extract,transform,load) process.

- **Screenshot:**



```
File Edit View Git Project Build Debug Test Analyze Tools Extensions Window Help | Search | FunctionApp4
    To Debug in a container, Docker Desktop must be installed. Click here to download Close Don't ask again
    To Debug in a container, Docker Desktop must be installed. Click here to download Close Don't ask again
    'CSharpIntroduceParameterCodeRefactoringProvider' encountered an error and has been disabled. Show Stack Trace Enable Enable and ignore future errors
local.settings.json Function1.cs + x
FunctionApp4.csproj
    To Debug in a container, Docker Desktop must be installed. Click here to download Close Don't ask again
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Function1.cs + x
FunctionApp4.Function1
Run(string inputBlob, string name)
if (lines.Length == 0)
{
    _logger.LogWarning("CSV file contains no data.");
    return inputBlob;
}
// Assume the first line is the header
var headerFields = lines[0].Split(',') .Select(field => field.Trim()).ToArray();
int columnCount = headerFields.Length;
_logger.LogInformation($"CSV header has {columnCount} columns: {string.Join(", ", headerFields)}");
// Process and clean each row: trim whitespace from each field and ignore rows that are completely empty.
var cleanedRows = lines.Select((line, index) =>
{
    var fields = line.Split(',') .Select(field => field.Trim()).ToArray();
    return new { Index = index, Fields = fields };
})
.Where(x => x.Fields.Any(field => !string.IsNullOrWhiteSpace(field))) // filter out completely empty rows
.ToList();
// Perform EDA: count data rows (excluding header) and missing values per column.
int dataRowCount = cleanedRows.Count - 1; // assuming first row is header
_logger.LogInformation($"Total data rows after cleaning (excluding header): {dataRowCount}");
int[] missingCounts = new int[columnCount];
// Start from 1 to skip header row
for (int i = 1; i < cleanedRows.Count; i++)
{
    var fields = cleanedRows[i].Fields;
    foreach (var field in fields)
    {
        if (!string.IsNullOrWhiteSpace(field))
        {
            missingCounts[fields.Length - 1] += 1;
        }
    }
}
Output
Show output from: Debug
Error List Output
Ready
Type here to search
22°C 100% 1005 PM ENG 3/30/2025
Solution Explorer
Search Solution Explorer (Ctrl+Shift+F)
Solution FunctionApp4 (1 of 1 project)
    FunctionApp4
        Connected Services
        Dependencies
        Properties
            .gitignore
        Function1.cs
        host.json
        local.settings.json
        Program.cs
Properties
Diagnostic tools
```

The screenshot displays two instances of a Microsoft Visual Studio interface, each showing a different version of the same C# code for a Azure Function.

**Top Instance (Original Code):**

```

59     int[] missingCounts = new int[columnCount];
60     // Start from 1 to skip header row
61     for (int i = 1; i < cleanedRows.Count; i++)
62     {
63         var fields = cleanedRows[i].Fields;
64         for (int j = 0; j < columnCount && j < fields.Length; j++)
65         {
66             if (string.IsNullOrEmpty(fields[j]))
67             {
68                 missingCounts[j]++;
69             }
70         }
71     }
72
73     for (int j = 0; j < columnCount; j++)
74     {
75         _logger.LogInformation($"Column '{headerFields[j]}' has {missingCounts[j]} missing values.");
76     }
77
78     // Reassemble the cleaned CSV content
79     var cleanedCsv = string.Join("\n", cleanedRows.Select(row => string.Join(", ", row.Fields)));
80
81     _logger.LogInformation("CSV cleaning and EDA complete. Returning cleaned CSV content.");
82     return await Task.FromResult(cleanedCsv);
83 }
84
85 }
86

```

**Bottom Instance (Corrected Code):**

```

14     _logger = loggerFactory.CreateLogger<Function1>();
15
16
17
18 [Function("Function1")]
19 [BlobOutput("output/{name}", Connection = "")]
20 1 reference
21 public async Task<string> Run(
22     [BlobTrigger("input/{name}", Connection = "")] string inputBlob,
23     string name)
24 {
25     _logger.LogInformation($"Function triggered for CSV blob: {name}");
26
27     if (string.IsNullOrWhiteSpace(inputBlob))
28     {
29         _logger.LogWarning("Input blob is empty or null.");
30         return inputBlob;
31     }
32
33     // Split CSV content into lines (handling both Windows and Unix line breaks)
34     var lines = inputBlob.Split(new[] { "\r\n", "\n" }, StringSplitOptions.RemoveEmptyEntries);
35
36     if (lines.Length == 0)
37     {
38         _logger.LogWarning("CSV file contains no data.");
39         return inputBlob;
40     }
41
42     // Assume the first line is the header
43     var headerFields = lines[0].Select(field => field.Trim()).ToArray();

```

The visual difference is the removal of the header row count logic (lines 61-76) and the addition of a check for an empty input blob (line 27).

## Step 4: Configure Blob Trigger

- **Description:** Linked the Azure Function to Blob Storage to trigger on file uploads. Test it with a sample txt file, then with the CSV files.
  - **Screenshot:**



```

Core Tools Version: 4.0.7030 Commit hash: N/A +bb4c949899cd5659d6bfe8b92cc923453a2e8f88 (64-bit)
Function Runtime Version: 4.1037.0.23568

[2025-03-30T19:38:16.946Z] Found C:\Users\dell\source\repos\FunctionApp4\FunctionApp4\FunctionApp4.csproj. Using for user secrets file configuration.
[2025-03-30T19:38:23.298Z] Azure Functions .NET Worker (PID: 4208) initialized in debug mode. Waiting for debugger to attach...
[2025-03-30T19:38:23.345Z] Worker process started and initialized.

Functions:

Function1: blobTrigger

For detailed output, run func with --verbose flag.
[2025-03-30T19:38:30.069Z] Host lock lease acquired by instance ID '000000000000000000000000000000008E1B3ACC'.
[2025-03-30T19:39:17.292Z] Executing 'functions.Function1' (Reason='New blob detected(LogAndContainerScan): input/New Text Document.txt', Id=967b1cae-3000-4c3f-b8cd-983c59a68930)
[2025-03-30T19:39:17.295Z] Trigger Details: MessageId: 514a3c4c-1e2d-4a2d-902d-5252bdfaab78, DequeueCount: 1, InsertedOn: 2025-03-30T19:39:08.000+00:00, BlobLastModified: 2025-03-30T19:39:08.000+00:00, BlobCreated: 2025-03-30T19:39:08.000+00:00, BlobLastModified: 2025-03-30T19:39:08.000+00:00, BlobCreated: 2025-03-30T19:39:08.000+00:00, Duration=3130ms)

[2025-03-30T19:39:17.450Z] Processed blob: New Text Document.txt with content: ALOO hello
[2025-03-30T19:39:19.581Z] Executed 'functions.Function1' (Succeeded, Id=967b1cae-3000-4c3f-b8cd-983c59a68930, Duration=3130ms)

Break lease View snapshots Create snapshot Give feedback
Show deleted blobs
Archive status Blob type Size Lease state
Block blob 10 B Available ...

```

```

Core Tools Version: 4.0.7030 Commit hash: N/A +bb4c949899cd5659d6bfe8b92cc923453a2e8f88 (64-bit)
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[2025-03-30T19:38:16.946Z] Found C:\Users\dell\source\repos\FunctionApp4\FunctionApp4\FunctionApp4.csproj. Using for user secrets file configuration.
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[2025-03-30T19:39:17.295Z] Trigger Details: MessageId: 514a3c4c-1e2d-4a2d-902d-5252bdfaab78, DequeueCount: 1, InsertedOn: 2025-03-30T19:39:15.000+00:00, BlobLastModified: 2025-03-30T19:39:08.000+00:00, BlobCreated: 2025-03-30T19:39:08.000+00:00, BlobLastModified: 2025-03-30T19:39:08.000+00:00, BlobCreated: 2025-03-30T19:39:08.000+00:00, Duration=3130ms)

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CPU Usage
Events | Memory Usage | CPU Usage
Events (0 of 0)
CPU Usage
Take Snapshot
Call Stack
Search (Ctrl+E)
Name
Call Stack | Breakpoints | Exception Settings | Command Window | Immediate Window | Output
Autos | Locals | Watch 1
Item(s) Saved

```



File Edit View Git Project Build Debug Test Analyze Tools Extensions Window Help Search Application Insights GitHub Copilot

Process: [15816] FunctionApp4.exe Lifecycle Events Thread Stack Frame

To Debug in a container, Docker Desktop must be installed. Click here to download Close Don't ask again

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'CsharpIntroduceParamer' C:\Program Files\dotnet\dotnetexe local.settings.json

```
FunctionApp4.cs
14 [2025-03-30T20:03:01.000+00:00, BlobCreated: 2025-03-30T20:02:54.000+00:00, BlobLastModified: 2025-03-30T20:02:54.000+00:00]
15 [2025-03-30T20:03:03.848Z] Function triggered for CSV blob: supermarket_sales - Sheet1.csv
16 [2025-03-30T20:03:03.851Z] CSV header has 17 columns: Invoice ID, Branch, City, Customer type, Gender, Product line, Uni
17 t price, Quantity, Tax %, Total, Date, Time, Payment, cogs, gross margin percentage, gross income, Rating
18 [2025-03-30T20:03:03.852Z] total data rows after cleaning (excluding header): 1000
19 [2025-03-30T20:03:03.854Z] column 'Invoice ID' has 0 missing values.
20 [2025-03-30T20:03:03.854Z] column 'Branch' has 0 missing values.
21 [2025-03-30T20:03:03.856Z] column 'City' has 0 missing values.
22 [2025-03-30T20:03:03.857Z] column 'Customer type' has 0 missing values.
23 [2025-03-30T20:03:03.857Z] column 'Gender' has 0 missing values.
24 [2025-03-30T20:03:03.857Z] column 'Product line' has 0 missing values.
25 [2025-03-30T20:03:03.857Z] column 'Unit price' has 0 missing values.
26 [2025-03-30T20:03:03.857Z] column 'Quantity' has 0 missing values.
27 [2025-03-30T20:03:03.861Z] column 'Tax %' has 0 missing values.
28 [2025-03-30T20:03:03.862Z] column 'Total' has 0 missing values.
29 [2025-03-30T20:03:03.862Z] column 'Date' has 0 missing values.
30 [2025-03-30T20:03:03.862Z] column 'Time' has 0 missing values.
31 [2025-03-30T20:03:03.862Z] column 'Payment' has 0 missing values.
32 [2025-03-30T20:03:03.862Z] column 'cogs' has 0 missing values.
33 [2025-03-30T20:03:03.862Z] column 'gross margin percentage' has 0 missing values.
34 [2025-03-30T20:03:03.870Z] CSV cleaning and EDA complete. Returning cleaned CSV content.
35 [2025-03-30T20:03:08.747Z] Executed 'Functions.Function1' (Succeeded, Id=a11a4a0-2545-424a-8d8b-a419a9a6f38f, Duration=6442ms)
```

// Assume the first line is the header  
var headerFields = lines[0].Split(',').Select(field => field.Trim()).ToArray();  
int columnCount = headerFields.Length;

No issues found

Call Stack Breakpoints Exception Settings Command Window Immediate Window Output

Diagnostic Tools

Diagnostics session: 3:57 minutes 3:50min

Events

Process Memory (MB) S P.. 58

CPU (% of all processors) 100 0

Summary Events Memory Usage CPU Usage

Events

Show Events (0 of 0)

Memory Usage Take Snapshot

CPU Usage Record CPU Profile

22°C 1004 PM 3/30/2025

File Edit View Git Project Build Debug Test Analyze Tools Extensions Window Help Search Application Insights GitHub Copilot

Process: [15816] FunctionApp4.exe Lifecycle Events Thread Stack Frame

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16 [2025-03-30T20:03:03.863Z] trigger details: MessageId: 37ab01a0-0223-4109-9f70-3bc55415e3ba, DequeueCount: 1, InsertedOn: 2025-03-30T20:03:01.000+00:00, BlobCreated: 2025-03-30T20:02:54.000+00:00, BlobLastModified: 2025-03-30T20:02:54.000+00:00
17 [2025-03-30T20:03:03.867Z] For detailed_output, run func --verbose flag.
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int columnCount = headerFields.Length;

No issues found

Call Stack Breakpoints Exception Settings Command Window Immediate Window Output

Diagnostic Tools

Diagnostics session: 4:14 minutes 4:10min

Events

Process Memory (MB) S P.. 58

CPU (% of all processors) 100 0

Summary Events Memory Usage CPU Usage

Events

Show Events (0 of 0)

Memory Usage Take Snapshot

CPU Usage Record CPU Profile

22°C 1004 PM 3/30/2025

File Edit View Git Project Build Debug Test Analyze Tools Extensions Window Help Search Application Insights GitHub Copilot

Process: [15816] FunctionApp4.exe Lifecycle Events Thread Stack Frame

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No issues found

Call Stack Breakpoints Exception Settings Command Window Immediate Window Output

Diagnostic Tools

Diagnostics session: 4:14 minutes 4:10min

Events

Process Memory (MB) S P.. 58

CPU (% of all processors) 100 0

Summary Events Memory Usage CPU Usage

Events

Show Events (0 of 0)

Memory Usage Take Snapshot

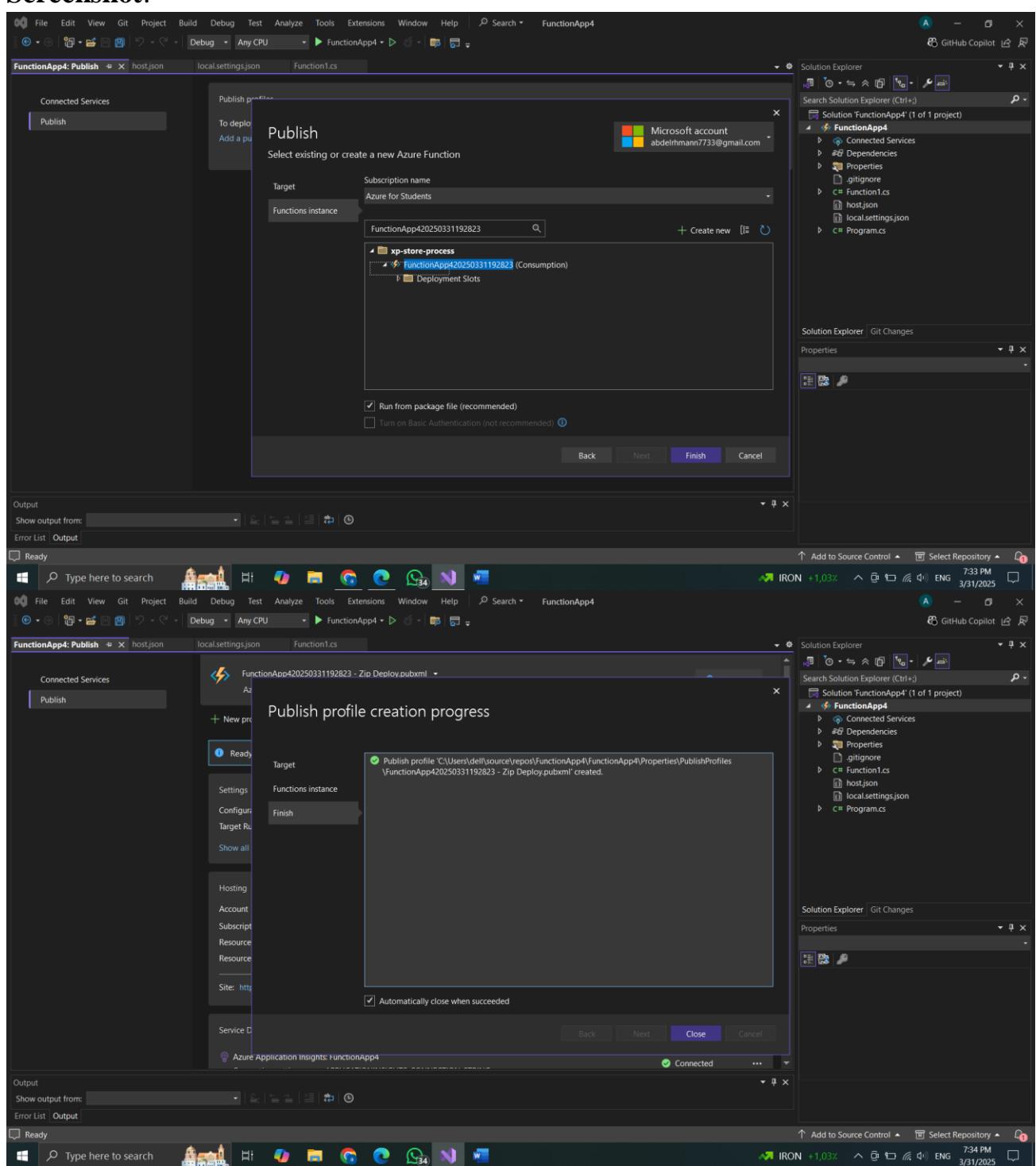
CPU Usage Record CPU Profile

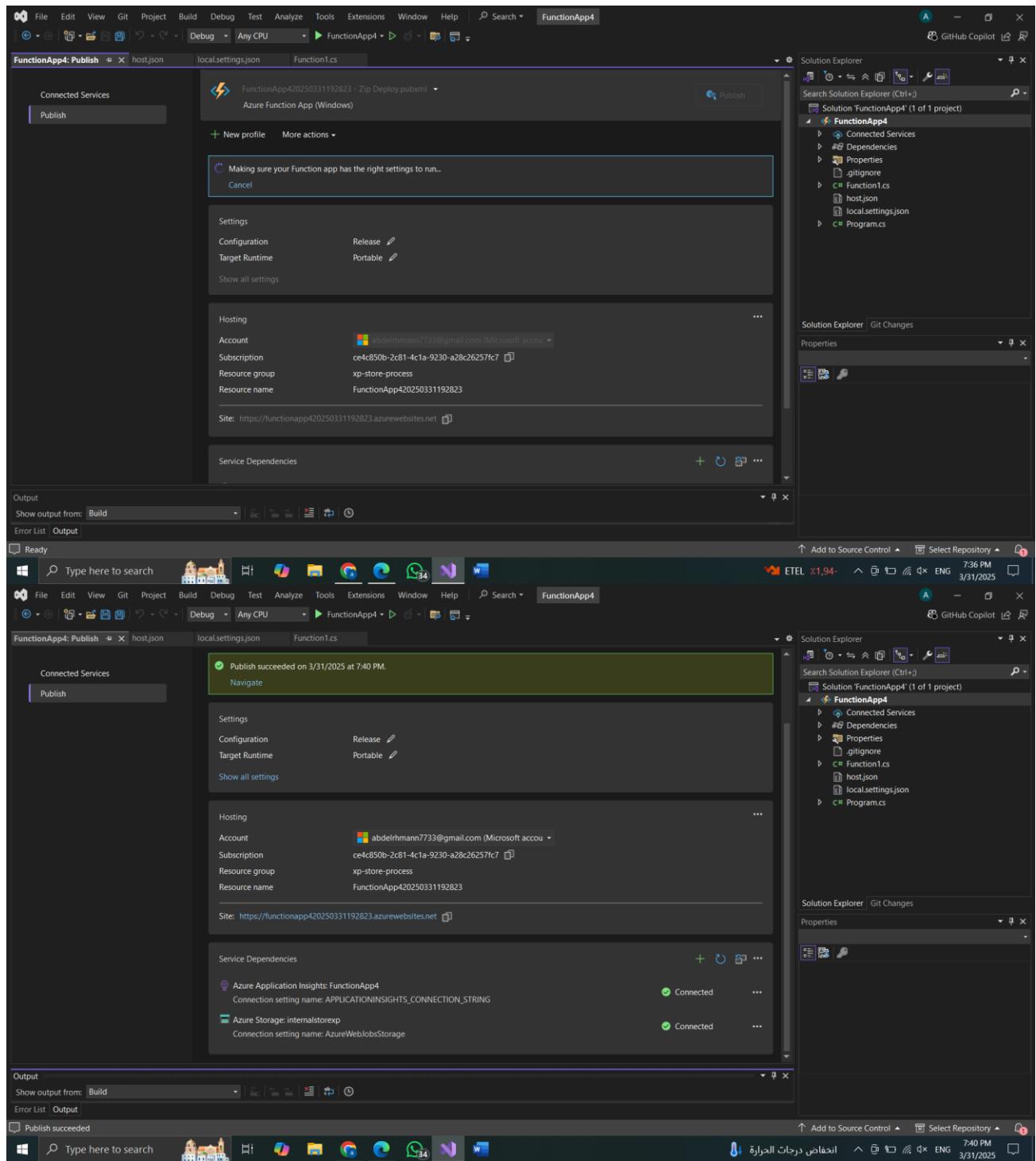
22°C 1004 PM 3/30/2025

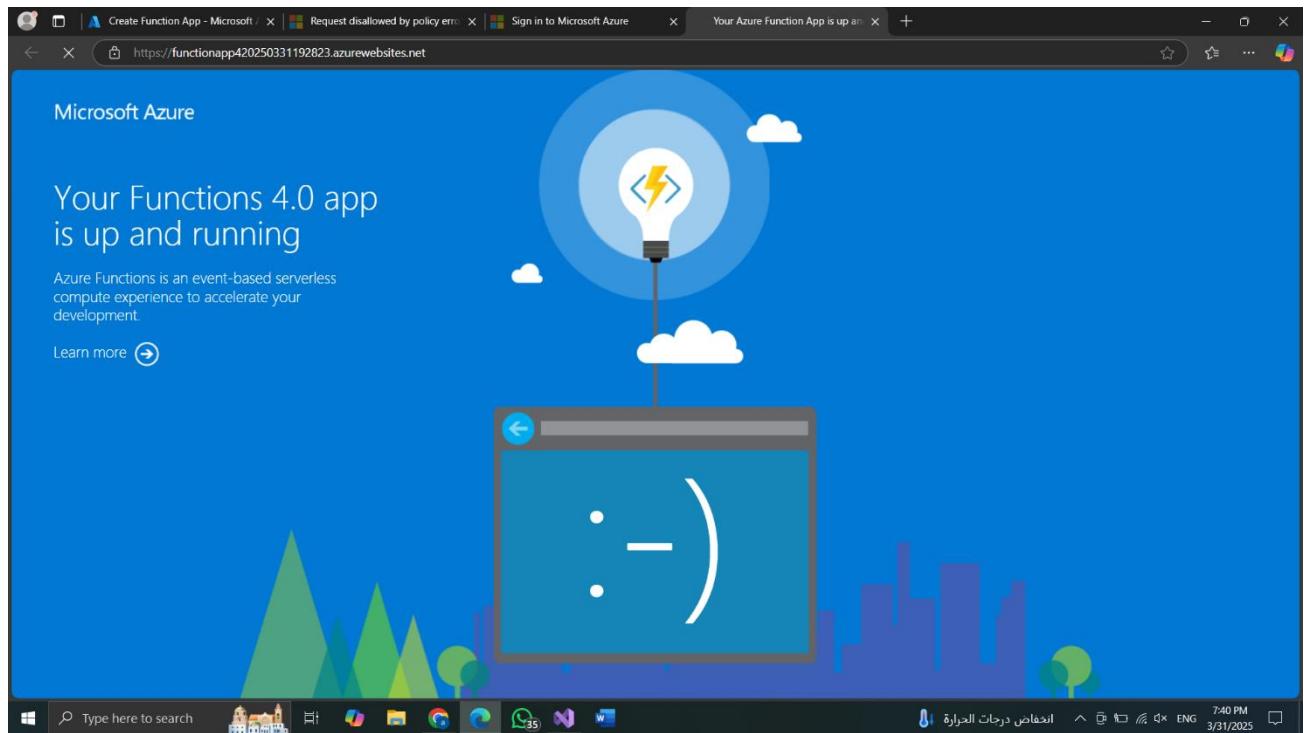


## Step 5: Deploy the Azure Function

- **Description:** Deployed the Azure Function to Azure using VS code publish deployment method.
- **Screenshot:**







---

## Step 6: Process and Move Files

- **Description:** Tested file processing and moved processed files to different container, you can look at the uploading in the input container with the file annual-enterprise-survey-2023, and then look at the output container, the file is automatically uploaded to the output container with EDA and Cleaning script using azure function
- **Screenshot:**

Microsoft Azure

internalstorexp Storage account

Upload blob

1 file(s) selected: annual-enterprise-survey-2023-financial-year-provisio... Drag and drop files here or Browse for files

Select an existing container

Create new

Overwrite if files already exist

Advanced

Upload

Give feedback

Microsoft Azure

internalstorexp Storage account

Upload blob

1 file(s) selected: annual-enterprise-survey-2023-financial-year-provisio... Drag and drop files here or Browse for files

Select an existing container

input

Create new

Overwrite if files already exist

Advanced

Upload

Give feedback

# Microsoft Learn Student Ambassadors



The image consists of three vertically stacked screenshots of the Microsoft Azure Storage Container Overview page. Each screenshot shows a list of blobs in a container named 'input' or 'output'. The top two screenshots are identical, showing the 'input' container with the following blob details:

Name	Modified	Access tier	Archive status	Blob type	Size	Lease state
annual-enterprise-survey-2023-financial-year-pro...	3/31/2025, 7:45:04 PM	Hot (Inferred)		Block blob	1.68 MiB	Available
Hospital.xlsx	3/30/2025, 9:14:18 PM	Hot (Inferred)		Block blob	7.02 KiB	Available
Lab 06.pdf	3/30/2025, 9:12:53 PM	Hot (Inferred)		Block blob	616.44 KiB	Available
New Text Document.txt	3/30/2025, 9:54:44 PM	Hot (Inferred)		Block blob	4 B	Available
supermarket_sales - Sheet1.csv	3/30/2025, 10:02:54 ...	Hot (Inferred)		Block blob	128.45 KiB	Available
Supermarket.xlsx	3/31/2025, 7:42:55 PM	Hot (Inferred)		Block blob	16.03 KiB	Available

The bottom screenshot shows the 'output' container with the same set of blobs, indicating they have been copied.

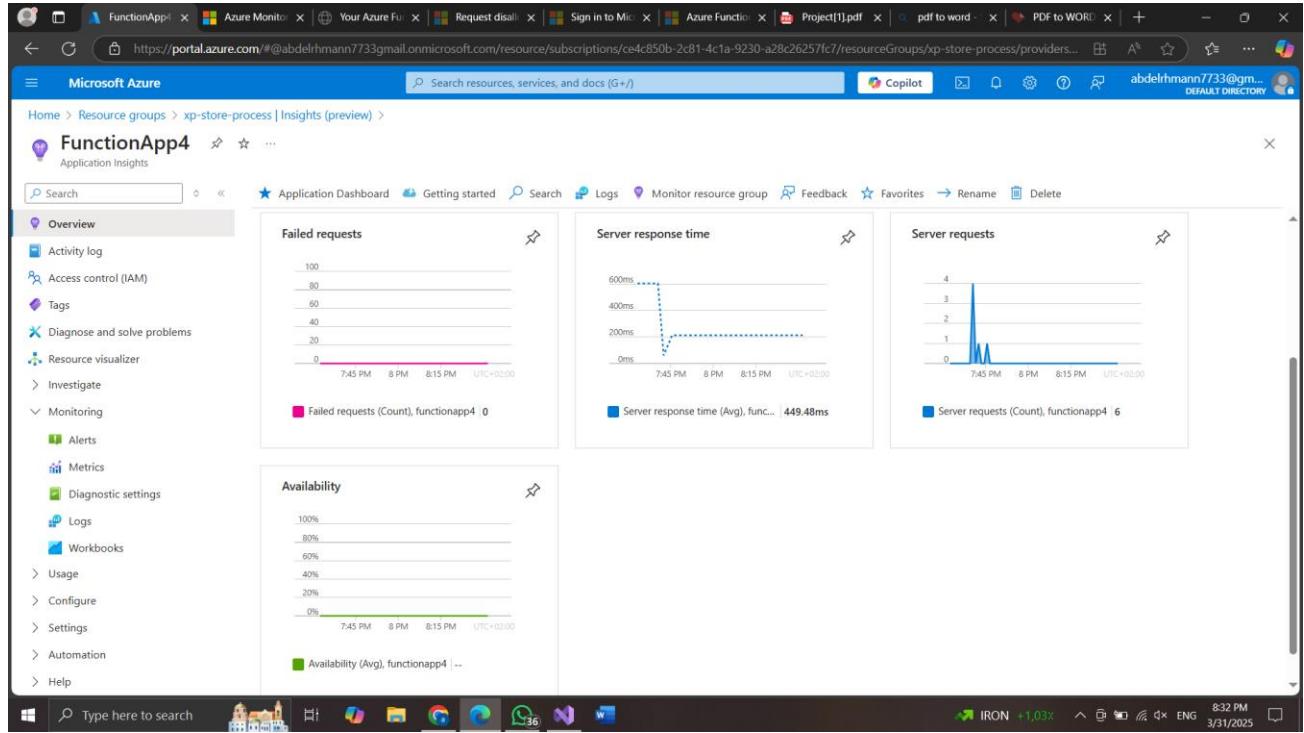
## Step 7: Add Monitoring and Logging

- Description:** Integrated Azure Monitor and Application Insights to log function activities.

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- **Screenshot:**



# Final Notes

## Screenshots of Final Output:

The screenshot shows the Microsoft Azure Resource groups page. The left sidebar lists several resource groups: DefaultResourceGroup-CCAN, DefaultResourceGroup-EAU, DefaultResourceGroup-EUS2, DefaultResourceGroup-null, and xp-store-process. The xp-store-process group is selected. The main pane displays the 'Essentials' section with a table of resources. The table includes columns for Name, Type, Location, and more. Resources listed include Application Insights Smart Detection, b7423a12-6e01-49ab-889d-74e5144d8c22-dashboard (FunctionApp), FunctionApp4, FunctionApp420250331192823, internalstorexp, and UAENorthPlan.

The screenshot shows the Visual Studio IDE. The top menu bar includes File, Edit, View, Git, Project, Build, Debug, Test, Analyze, Tools, Extensions, Window, Help, and Search. The title bar says 'FunctionApp4'. The code editor shows C# code for a function named 'Function1'. The right side of the screen features the 'Diagnostic Tools' window, which displays a 'Diagnostics session: 3:57 minutes' timeline. It includes sections for Events, Process Memory (MB), and CPU Usage. The Events tab shows 0 events. The Memory Usage tab has a 'Take Snapshot' button. The CPU Usage tab has a 'Record CPU Profile' button. The status bar at the bottom shows '27°C' and 'ENG 8:52 PM 3/31/2025'.

```
Process: [15816]FunctionApp4.exe | Lifecycle Events + Thread: | Stack Frame: | Application Insights | GitHub Copilot | X
```

① To Debug in a container, Docker Desktop must be installed. Click here to download Close Don't ask again

② To Debug in a container, Docker Desktop must be installed. Click here to download Close Don't ask again

③ 'CSharpIntroParameters' has been added to your local.settings.json file.

local.settings.json

FunctionApp4

C:\Program Files\dotnet\dotnet.exe

```
[for detailed output, run func with --verbose flag.  
[2025-03-30T20:00:35.411Z] Most lock lease acquired by instance ID '00000000000000000000000000000008E1B3ACC'.  
[2025-03-30T20:00:33.670Z] Executing 'Functions.Function1' (Reason='New blob detected(LogsAndContainerScan): input/supermarket_sales - Sheet1.csv')  
[2025-03-30T20:00:33.673Z] Trigger Details: MessageId: 37b151540-d223-4109-9f78-3b5541e5bba, DequeueCount: 1, InsertedOn : 2025-03-30T20:03:01.000+00:00, BlobCreated: 2025-03-30T20:02:54.000+00:00, BlobLastModified: 2025-03-30T20:02:54.000+00:00  
[2025-03-30T20:03:03.848Z] Function triggered for CSV blob: supermarket_sales - Sheet1.csv  
[2025-03-30T20:03:03.851Z] CSV header has 17 columns: Invoice ID, Branch, City, Customer type, Gender, Product line, Unit price, Quantity, Tax %, Total, Date, Time, Payment, cogs, gross margin percentage, gross income, Rating  
[2025-03-30T20:03:03.852Z] Total data rows after cleaning (excluding header): 1000  
[2025-03-30T20:03:03.854Z] Column 'Invoice ID' has 0 missing values.  
[2025-03-30T20:03:03.854Z] Column 'Branch' has 0 missing values.  
[2025-03-30T20:03:03.855Z] Column 'City' has 0 missing values.  
[2025-03-30T20:03:03.856Z] Column 'Customer type' has 0 missing values.  
[2025-03-30T20:03:03.857Z] Column 'Gender' has 0 missing values.  
[2025-03-30T20:03:03.858Z] Column 'Product line' has 0 missing values.  
[2025-03-30T20:03:03.859Z] Column 'Unit price' has 0 missing values.  
[2025-03-30T20:03:03.860Z] Column 'Quantity' has 0 missing values.  
[2025-03-30T20:03:03.861Z] Column 'Tax %' has 0 missing values.  
[2025-03-30T20:03:03.862Z] Column 'Total' has 0 missing values.  
[2025-03-30T20:03:03.863Z] Column 'Date' has 0 missing values.  
[2025-03-30T20:03:03.864Z] Column 'Time' has 0 missing values.  
[2025-03-30T20:03:03.865Z] Column 'Payment' has 0 missing values.  
[2025-03-30T20:03:03.866Z] Column 'cogs' has 0 missing values.  
[2025-03-30T20:03:03.867Z] Column 'gross margin percentage' has 0 missing values.  
[2025-03-30T20:03:03.868Z] Column 'gross income' has 0 missing values.  
[2025-03-30T20:03:03.869Z] Column 'Rating' has 0 missing values.  
[2025-03-30T20:03:03.870Z] CSV cleaning and EDA complete. Returning cleaned CSV content.  
[2025-03-30T20:03:08.747Z] Executed 'Functions.Function1' (Succeeded, Id:a1ca14a0-2545-424a-8d8b-a419a9a6f38f, Duration= ~
```

// Assume the first line is the header  
var headerFields = lines[0].Split(',').Select(field => field.Trim()).ToArray();  
int rowCount = headerFields.Length;

99 %

No issues found

Call Stack Breakpoints Exception Settings Command Window Immediate Window Output

Autos Locals Watch 1

Item(s) Saved

Type here to search

22°C 🌤️ file ⏪ ⏵ ⏵ ENG 10:04 PM 3/30/2025

## **Important Links:**

- GitHub Repo Link: <https://github.com/Abdelrhamn-salah/Azure Blob Storage Automation>

## **Challenges Faced:**

- **Connection String Configuration:**

Initially, the function's binding attributes for both the Blob trigger and Blob output were left with empty Connection properties. This caused the function to fail at runtime because the runtime couldn't resolve the storage account connection string. The resolution involved updating these attributes to reference local host setting.json, setting (e.g., "AzureWebJobsStorage"), ensuring that the correct connection string is read from the container configuration.

- **Output Binding Code Problem:**

The function initially couldn't write data to the output container because the BlobOutput attribute lacked an explicit FileAccess mode, which prevented



write permissions. Updated the code to explicitly set FileAccess.Write in the BlobOutput attribute, ensuring the function had the necessary permissions to output data to the container.

- **Deployment Issues via Visual Studio Code:**

While using Visual Studio Code 2022 for deployment, we faced issues where the function app did not update correctly or failed to deploy. Ensuring that the latest version of the Azure Functions extension was installed and verifying that remote build was enabled helped mitigate these problems. All the function and region are the same as you initialized the resource group.

- **Region Restrictions:**

Some regions enforce policies that limit resource deployment to specific regions. Attempting to deploy resources outside these approved regions resulted in policy violations and deployment failures.

## Feedback:

- Tell us what you want to see next month?

I would like to see more practical tasks or projects that dive into real-world scenarios. For example, projects that integrate multiple Azure services (e.g., Azure Functions, Logic Apps, and Cosmos DB) or implement end-to-end solutions. This approach would provide hands-on experience with deployment, scaling, and monitoring.

## General Notes:

- More practical projects will help in understanding the complete workflow from development to production.
- Real-world examples with step-by-step guides, sample code, and troubleshooting tips would be highly beneficial.

