

# CST8921 – Cloud Industry Trends

## Lab 3 Report

### Title

Cosmos DB Change Feed Integration with Azure Functions.

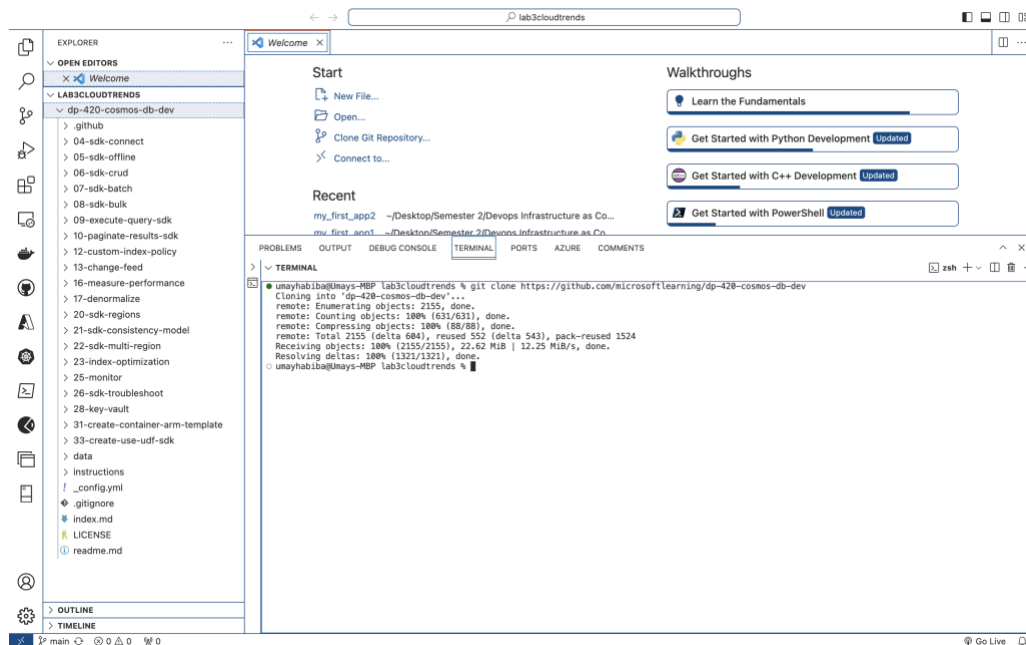
### Introduction

In Lab 3, students delve into Azure Cosmos DB's capabilities, exploring its multi-model database with a focus on change feed functionality. Leveraging Azure Functions, this lab guides users through creating an application that reacts to create or update operations on items in a specified container, showcasing real-time data integration.

### Steps

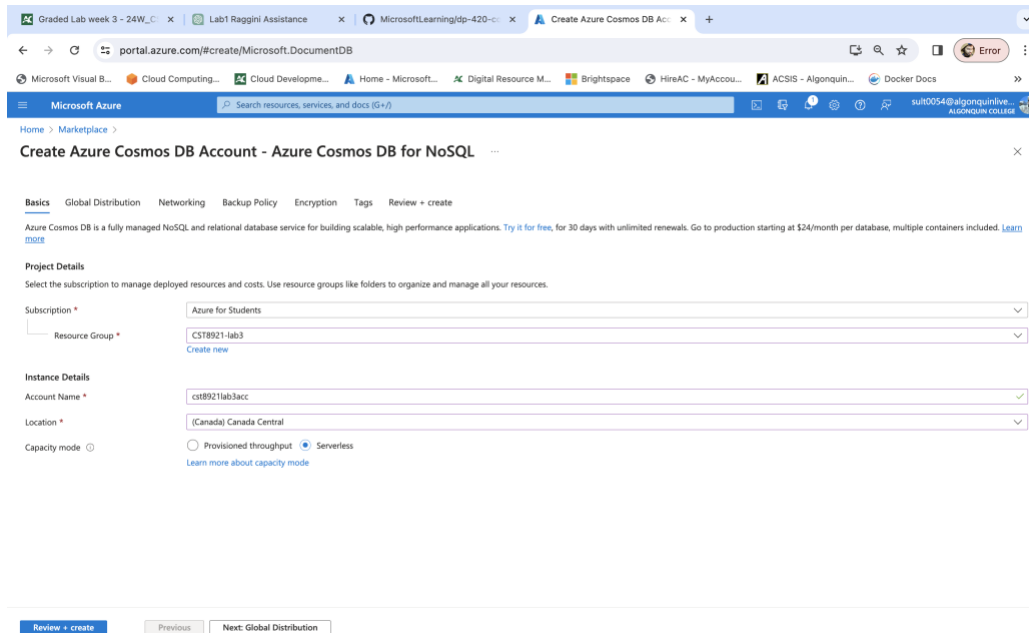
#### 1. Clone Repository:

- Start Visual Studio Code.
- Open the command palette and run Git: Clone to clone the [GitHub repository](#) in a local folder. Open the local folder in Visual Studio Code.



## 2. Create Azure Cosmos DB Account:

- Create an Azure Cosmos DB for NoSQL account with serverless capacity mode.
- Review keys pane in Cosmos DB account for connection details.



portal.azure.com/#create/Microsoft.DocumentDB

Microsoft Azure

Home > Marketplace >

### Create Azure Cosmos DB Account - Azure Cosmos DB for NoSQL

Basics Global Distribution Networking Backup Policy Encryption Tags Review + create

Azure Cosmos DB is a fully managed NoSQL and relational database service for building scalable, high performance applications. [Try it for free](#), for 30 days with unlimited renewals. Go to production starting at \$24/month per database, multiple containers included. [Learn more](#)

**Project Details**  
Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription \* Azure for Students

Resource Group \* CST8921-lab3

[Create new](#)

**Instance Details**

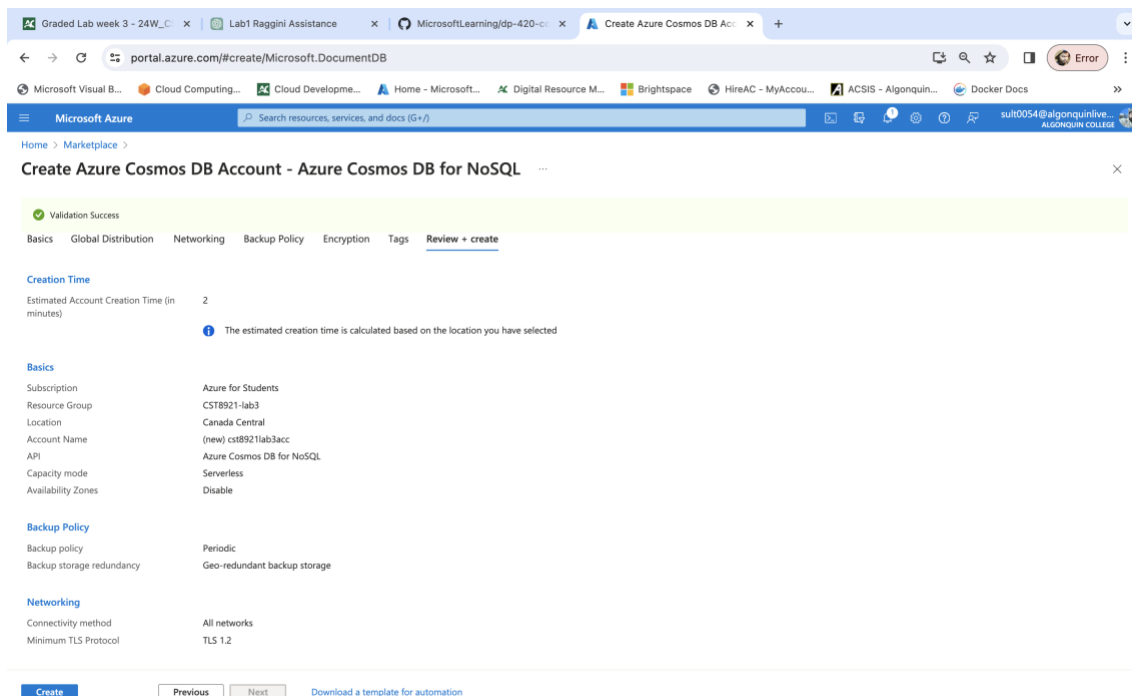
Account Name \* cst8921lab3acc

Location \* (Canada) Canada Central

Capacity mode ☐ Provisioned throughput ☒ Serverless

[Learn more about capacity mode](#)

[Review + create](#) [Previous](#) [Next: Global Distribution](#)



portal.azure.com/#create/Microsoft.DocumentDB

Microsoft Azure

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### Create Azure Cosmos DB Account - Azure Cosmos DB for NoSQL

Basics Global Distribution Networking Backup Policy Encryption Tags [Review + create](#)

**Validation Success**

**Creation Time**  
Estimated Account Creation Time (in minutes) 2

The estimated creation time is calculated based on the location you have selected

**Basics**

Subscription	Azure for Students
Resource Group	CST8921-lab3
Location	Canada Central
Account Name	(new) cst8921lab3acc
API	Azure Cosmos DB for NoSQL
Capacity mode	Serverless
Availability Zones	Disable

**Backup Policy**

Backup policy	Periodic
Backup storage redundancy	Geo-redundant backup storage

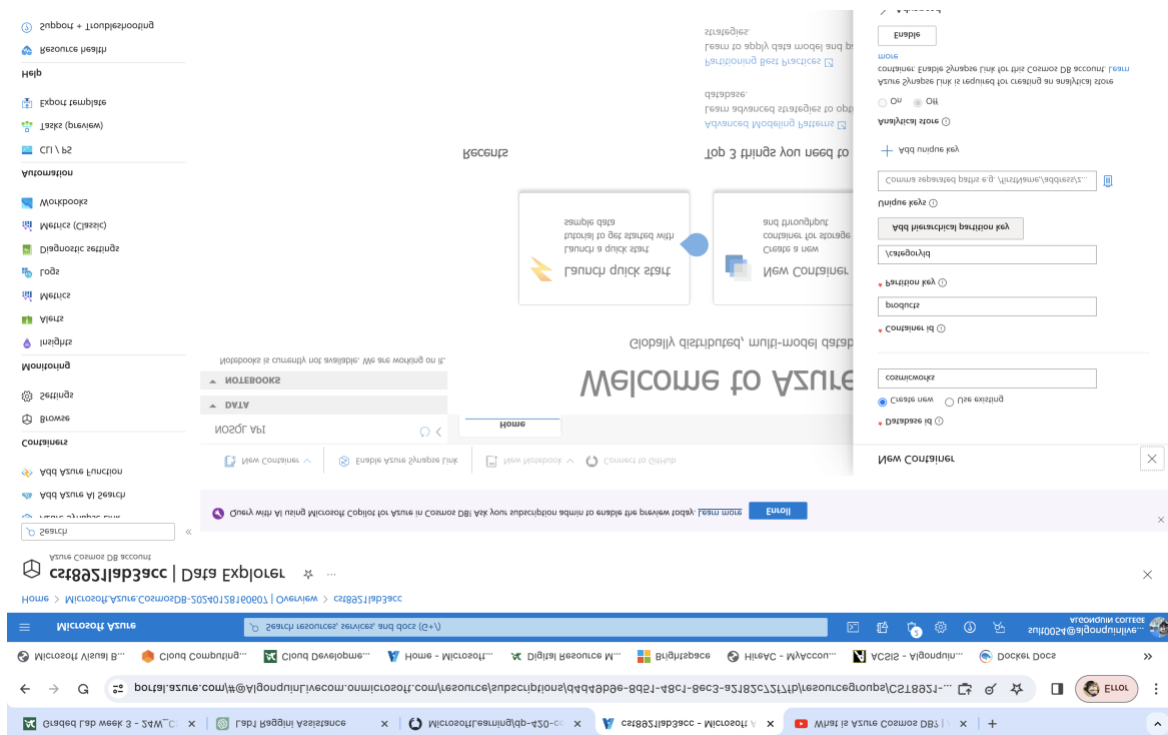
**Networking**

Connectivity method	All networks
Minimum TLS Protocol	TLS 1.2

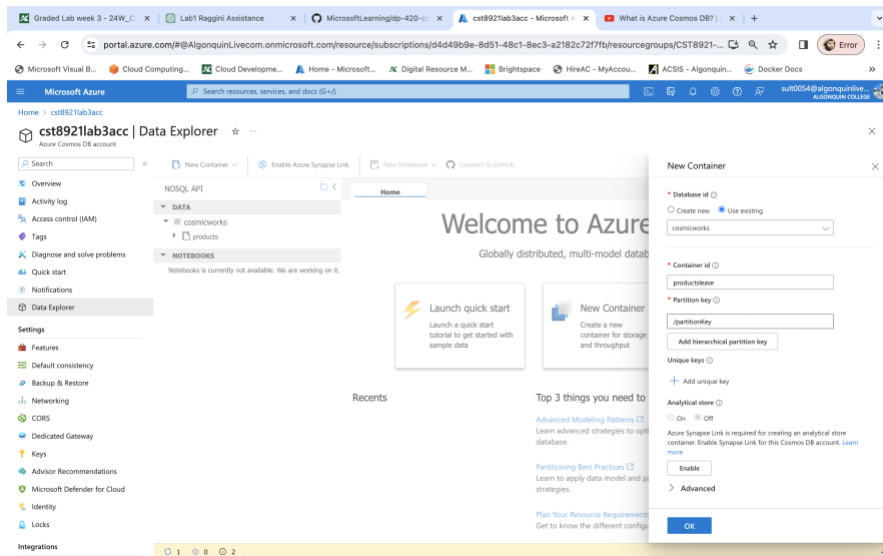
[Create](#) [Previous](#) [Next](#) [Download a template for automation](#)

- In Data Explorer, create a new database "cosmicworks" and containers "products" and "productslease" with specified settings.

Setting	Value
Database id	<i>Use existing   cosmicworks</i>
Container id	<i>products</i>
Partition key	<i>/categoryId</i>

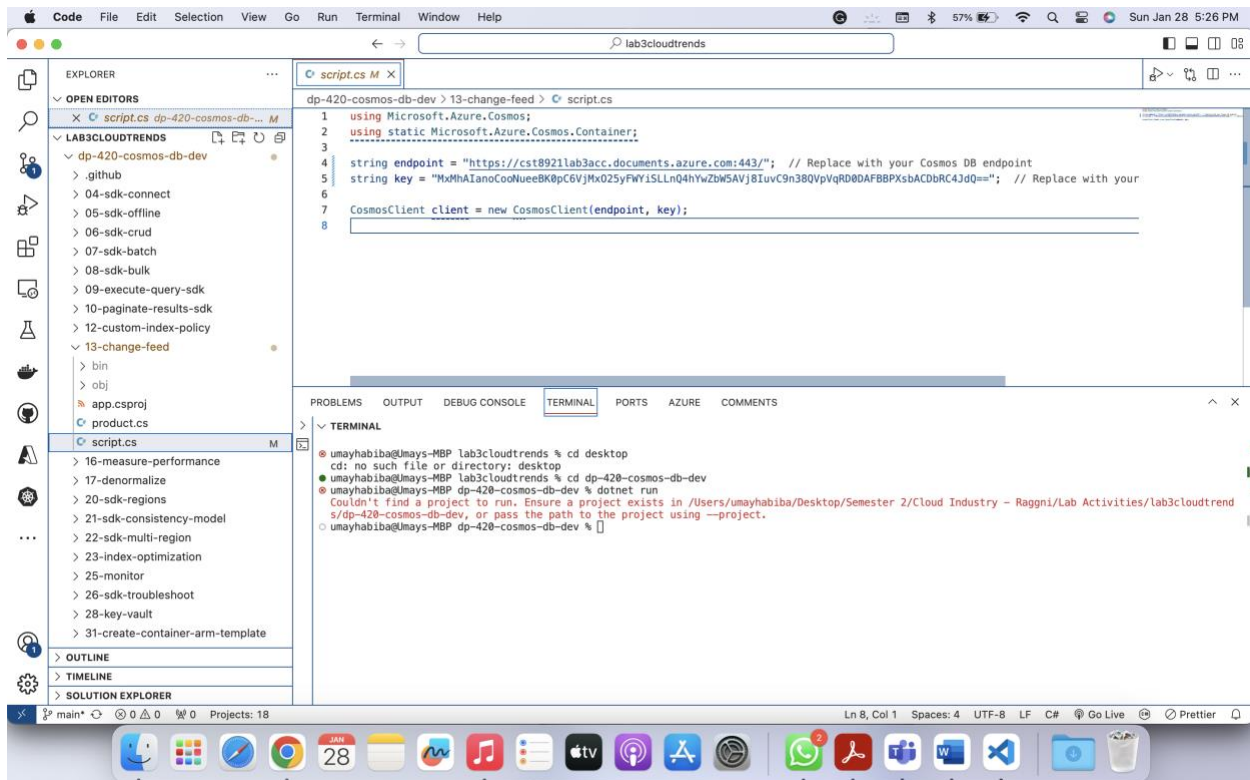


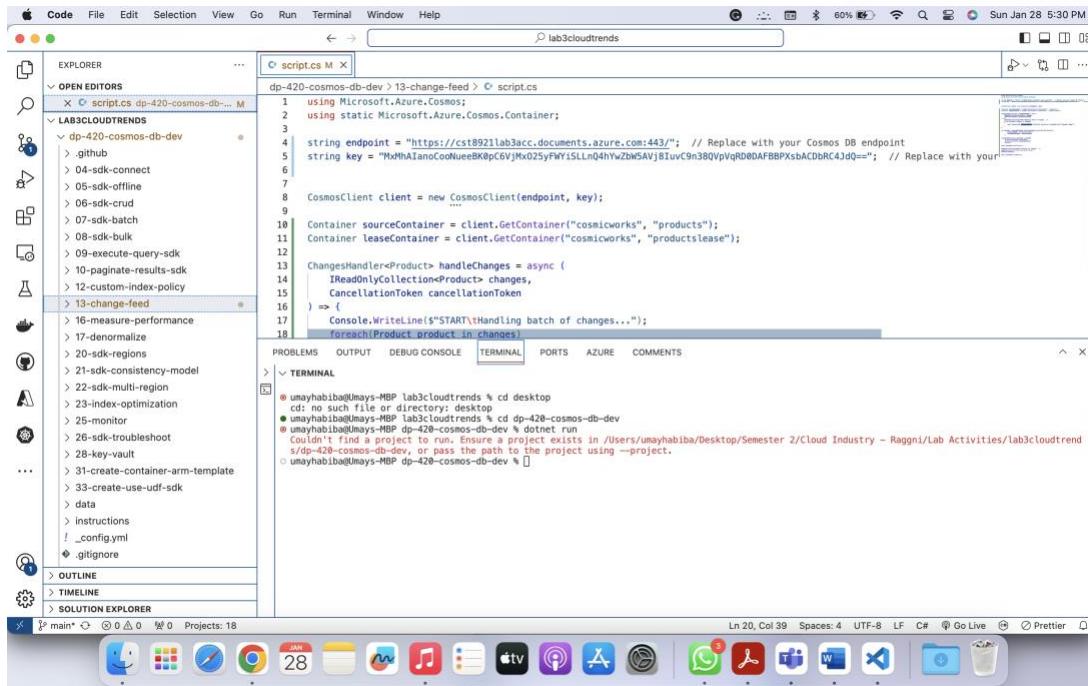
Setting	Value
Database id	<i>Use existing   cosmicworks</i>
Container id	<i>productslease</i>
Partition key	<i>/partitionKey</i>



#### 4. Update Visual Studio Code:

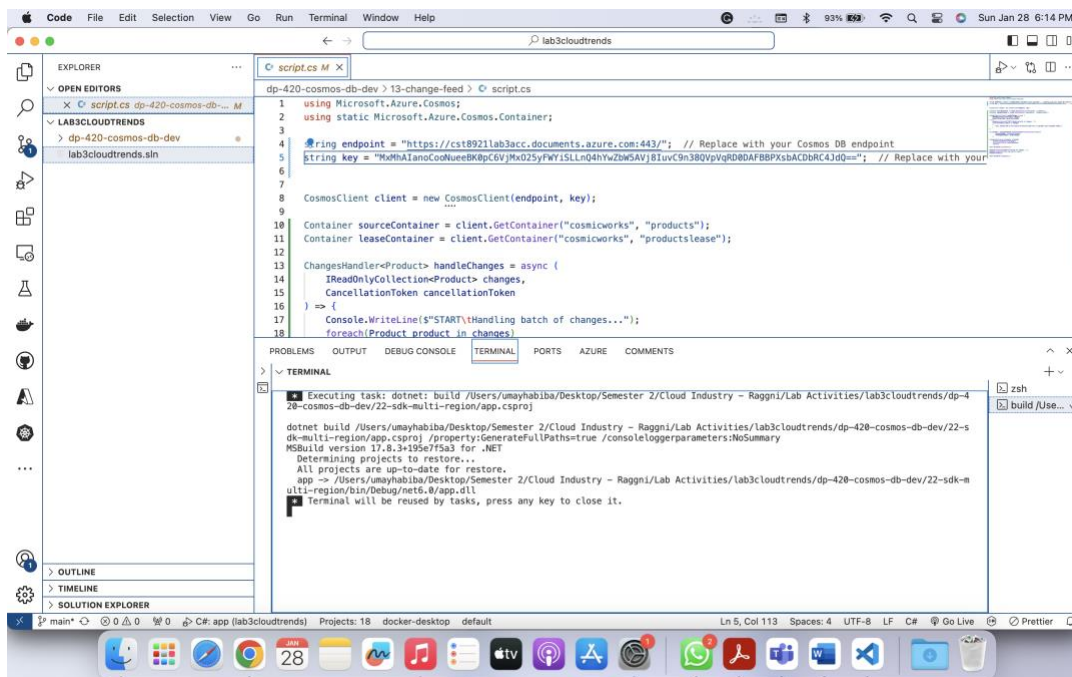
- Open the **product.cs** and **script.cs** code files.
- Update the variables **endpoint** and **key** with Cosmos DB account details.
- Implement the provided code in **script.cs**.



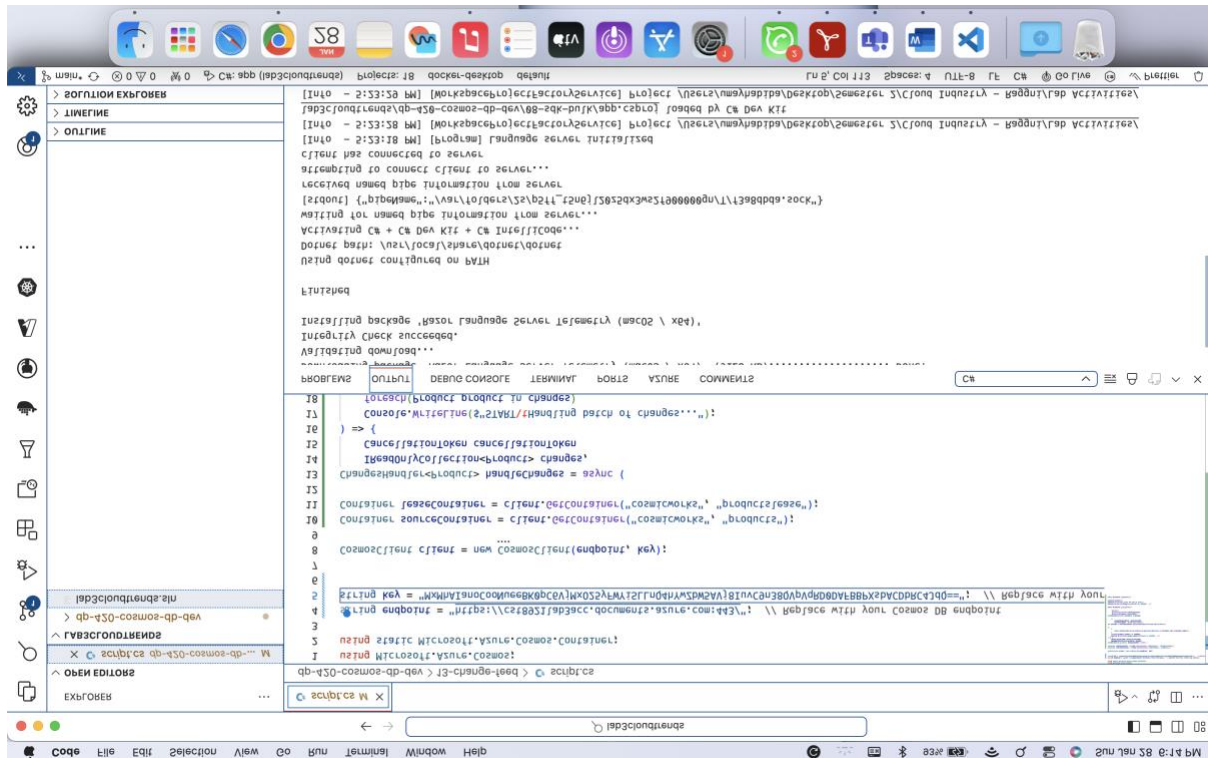


## 5. Build and Run Application:

- Open an integrated terminal in Visual Studio Code.
- Build and run the project using the command: `bashCopy code dotnet run`



- Observe the terminal output.



```

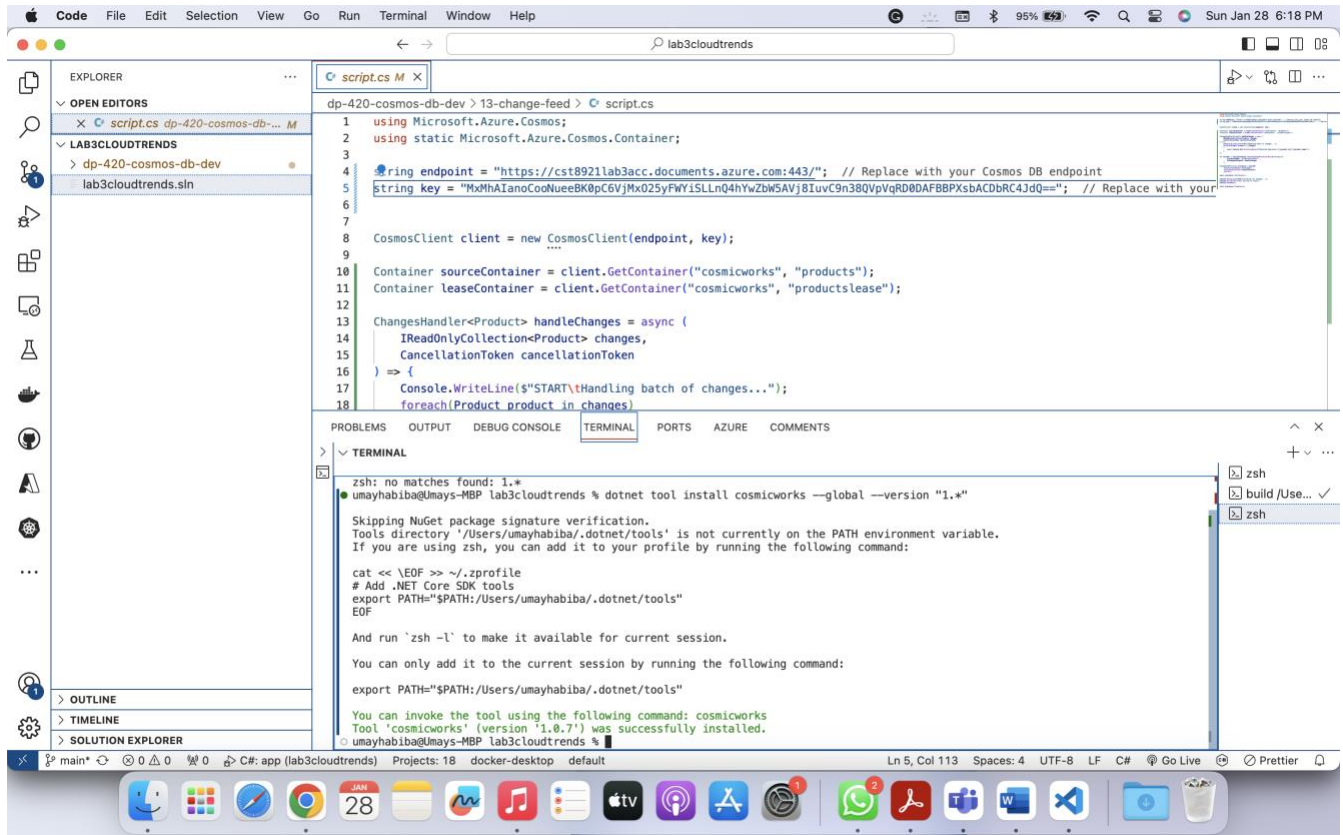
1  // Подключение к WebSocket серверу
2  const socket = new WebSocket('ws://localhost:8080');
3
4  // Обработка сообщения от сервера
5  socket.onmessage = function(event) {
6    // console.log('Получено сообщение: ' + event.data);
7    // Обработка сообщения
8  };
9
10 // Отправка сообщения на сервер
11 socket.send('Hello, WebSocket!');
12
13 // Закрытие соединения
14 socket.close();
  
```



## 6. Seed Cosmos DB Account:

- In a new terminal, install the cosmicworks command-line tool:

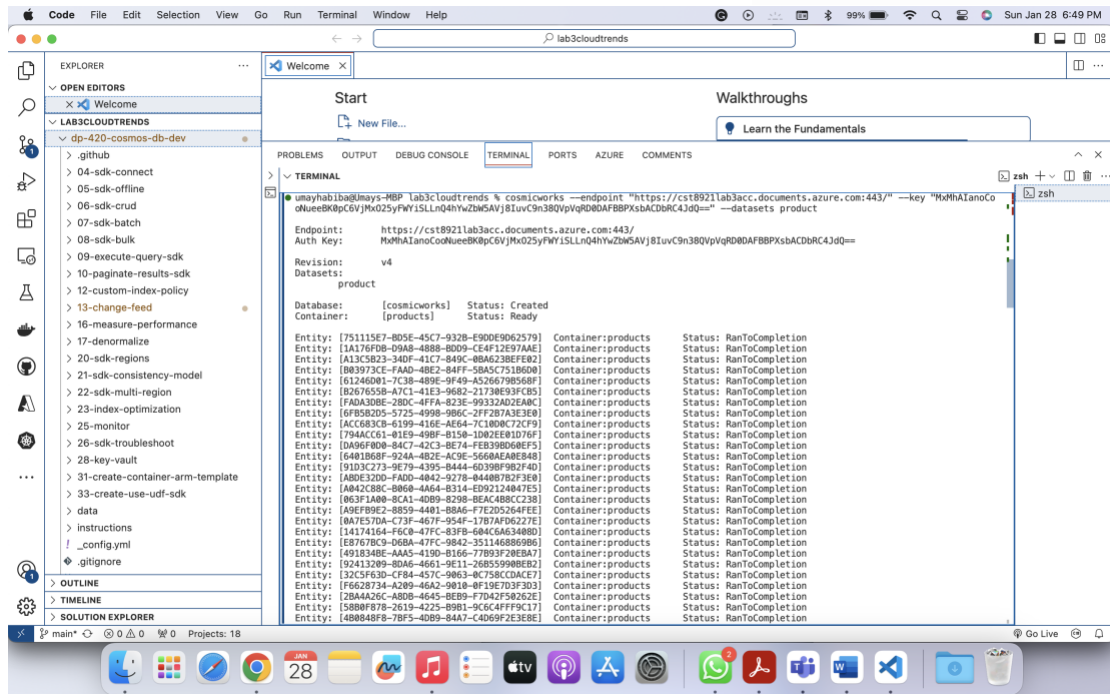
bashCopy code : `dotnet tool install cosmicworks --global --version 1.*`



- Seed the Cosmos DB account with sample data:

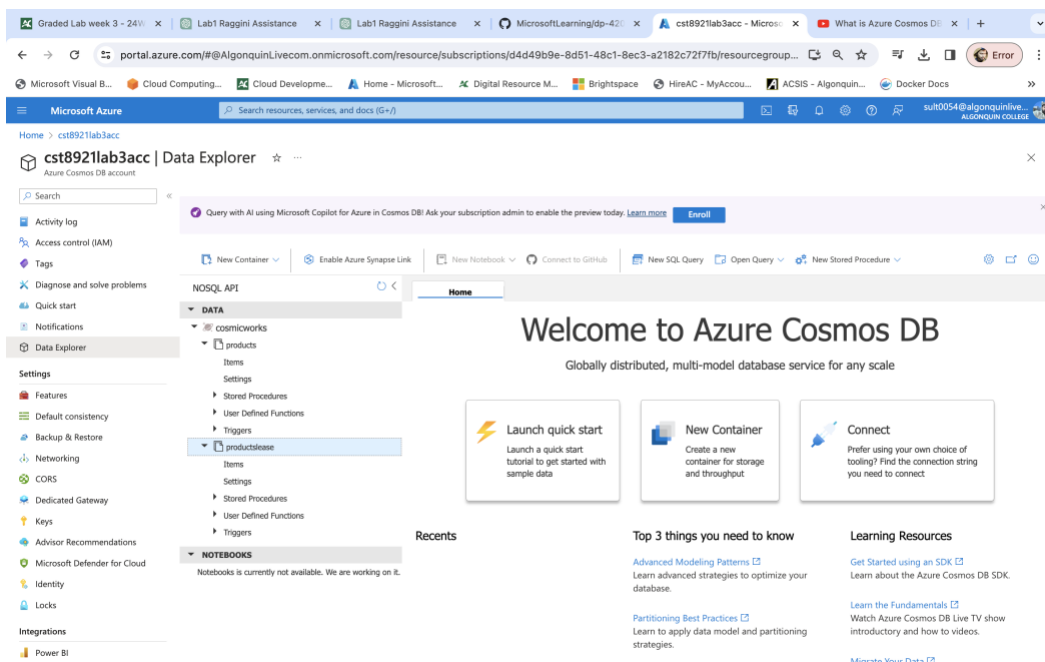
bashCopy code

- `cosmicworks --endpoint "https://cst8921lab3acc.documents.azure.com:443/" --key "MxMhAIanoCooNueeBK0pC6VjMxO25yFWYiSLLnQ4hYwZbW5AVj8IuvC9n38QVpVqRD0DAFBPXsbACDbRC4JdQ==" --datasets productWait for the command to finish populating the account.`



## 7. Verify Changes:

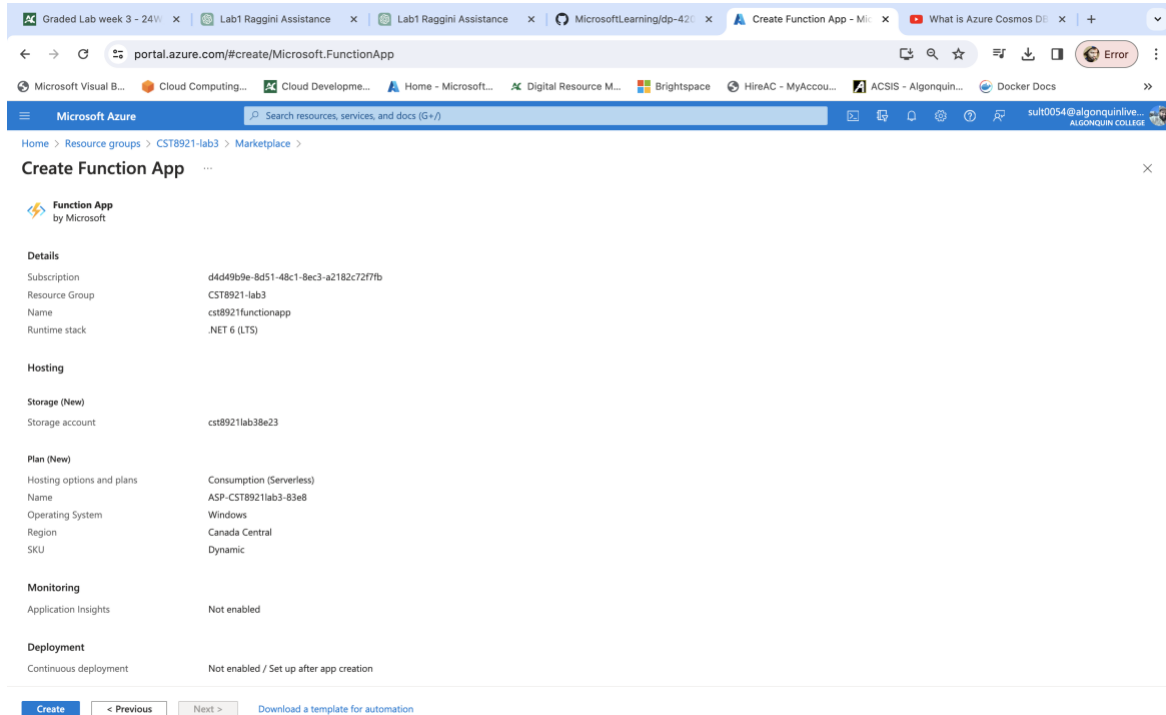
- Observe the terminal output from the .NET application for Detected Operation messages.
- Verify changes in "products" and "productslease" containers in Cosmos DB.





## 8. Create Azure Function App:

- Create a new Azure Function app with specified configurations.



**Create Function App**

**Details**

Subscription	d4d49b9e-8d51-48c1-8ec3-a2182c7277fb
Resource Group	CST8921-lab3
Name	cst8921functionapp
Runtime stack	.NET 6 (LTS)

**Hosting**

Storage (New)	
Storage account	cst8921lab38e23

**Plan (New)**

Hosting options and plans	Consumption (Serverless)
Name	ASP-CST8921lab3-83e8
Operating System	Windows
Region	Canada Central
SKU	Dynamic

**Monitoring**

Application Insights	Not enabled
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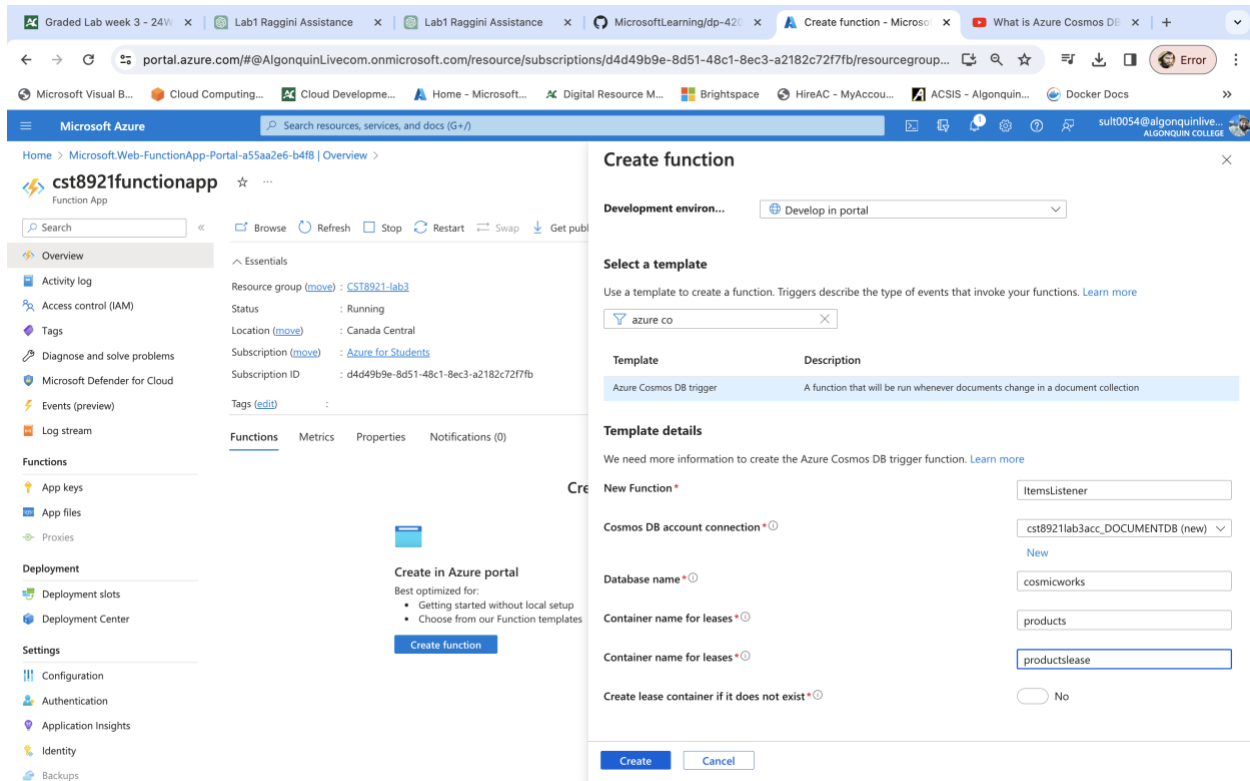
**Deployment**

Continuous deployment	Not enabled / Set up after app creation
-----------------------	---

**Create** < Previous Next > Download a template for automation

- Navigate to Functions pane and create a new function "ItemsListener" using Azure Cosmos DB trigger template.

Setting	Value
Development environment	Develop in portal
Select a template	Azure Cosmos DB trigger
New Function	ItemsListener
Cosmos DB account connection	Select New   Select Azure Cosmos DB Account   Select the Azure Cosmos DB account you created earlier
Database name	cosmicworks
Collection name	products
Collection name for leases	productslease
Create lease collection if it does not exist	No



## 9. Implement Function Code:

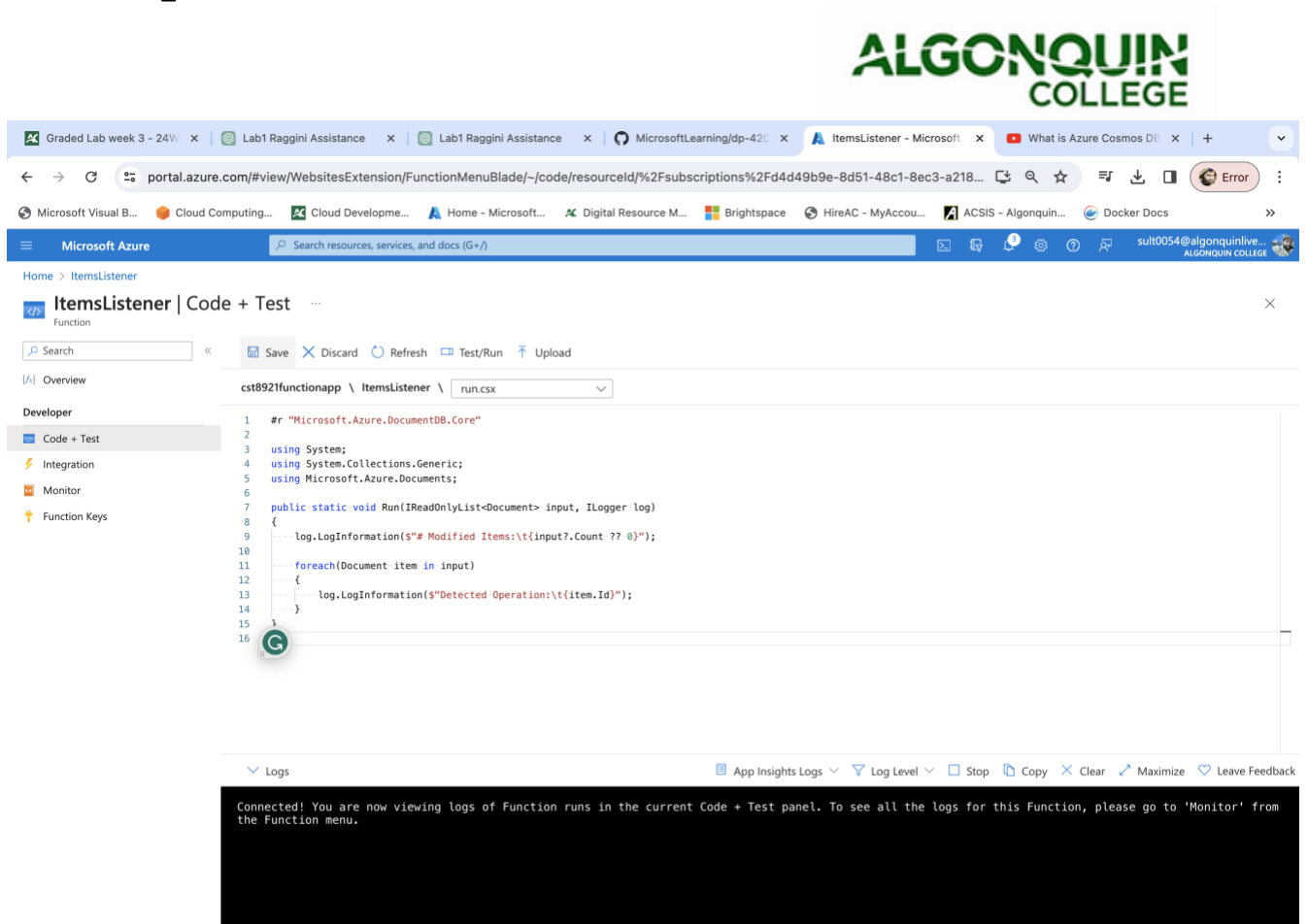
- In the Function pane, navigate to Code + Test.
- Delete the existing code and use the provided C# code.

```
#r "Microsoft.Azure.DocumentDB.Core"
```

```
using System;
using System.Collections.Generic;
using Microsoft.Azure.Documents;
```

```
public static void Run(IReadOnlyList<Document> input, ILogger log)
{
    log.LogInformation($"# Modified Items:\t{input?.Count ?? 0}");

    foreach(Document item in input)
    {
        log.LogInformation($"Detected Operation:\t{item.Id}");
    }
}
```



**ALGONQUIN COLLEGE**

portal.azure.com/#view/WebsitesExtension/FunctionMenuBlade/~/\_code/resourceId/%2Fsubscriptions%2Fd4d49b9e-8d51-48c1-8ec3-a218...

Microsoft Azure

Home > ItemsListener

**ItemsListener** | Code + Test

Function

Search

Save Discard Refresh Test/Run Upload

Overview

Developer

- Code + Test
- Integration
- Monitor
- Function Keys

cst892functionapp \ ItemsListener \ run.csx

```

1  #r "Microsoft.Azure.DocumentDB.Core"
2
3  using System;
4  using System.Collections.Generic;
5  using Microsoft.Azure.Documents;
6
7  public static void Run(IEnumerable<Document> input, ILogger log)
8  {
9      log.LogInformation($"# Modified Items: {input.Count ?? 0}");
10
11      foreach (Document item in input)
12      {
13          log.LogInformation($"Detected Operation: {item.Id}");
14      }
15  }
16

```

Logs

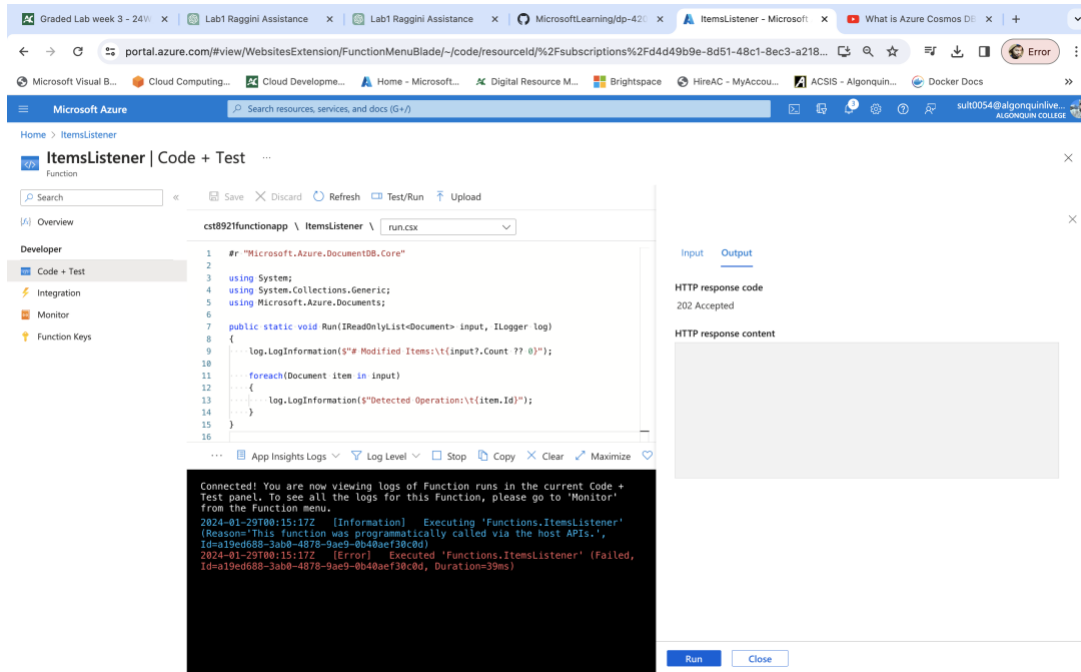
App Insights Logs Log Level Stop Copy Clear Maximize Leave Feedback

Connected! You are now viewing logs of Function runs in the current Code + Test panel. To see all the logs for this Function, please go to 'Monitor' from the Function menu.

- Save the function code.

## 10. Generate Items and Observe:

- Use the cosmicworks command-line tool to seed Cosmos DB again.
- Observe the log output from the Azure Functions application.
- Detected Operation messages should appear in the log



The screenshot displays the Azure Portal interface for the 'ItemsListener' function. The 'Code + Test' tab is active, showing the following C# code:

```

1 #r "Microsoft.Azure.DocumentDB.Core"
2
3 using System;
4 using System.Collections.Generic;
5 using Microsoft.Azure.Documents;
6
7 public static void Run(IEnumerable<Document> input, ILogger log)
8 {
9     log.LogInformation($"# Modified Items: {input.Count ?? 0}");
10
11     foreach (Document item in input)
12     {
13         log.LogInformation($"Detected Operation: {item.Id}");
14     }
15 }

```

The 'Logs' section at the bottom shows the following output:

```

Connected! You are now viewing logs of Function runs in the current Code +
Test panel. To see all the logs for this Function, please go to 'Monitor'
from the Function menu.
2024-01-29T00:15:17Z [Information] Executing 'Functions.ItemsListener'
(Reason: 'This function was programmatically called via the host APIs.',
Id=a19ed668-3ab0-4878-9ae9-8b40aef30c0d)
2024-01-29T00:15:17Z [Error] Executed 'Functions.ItemsListener' (Failed,
Id=a19ed668-3ab0-4878-9ae9-8b40aef30c0d, Duration=39ms)

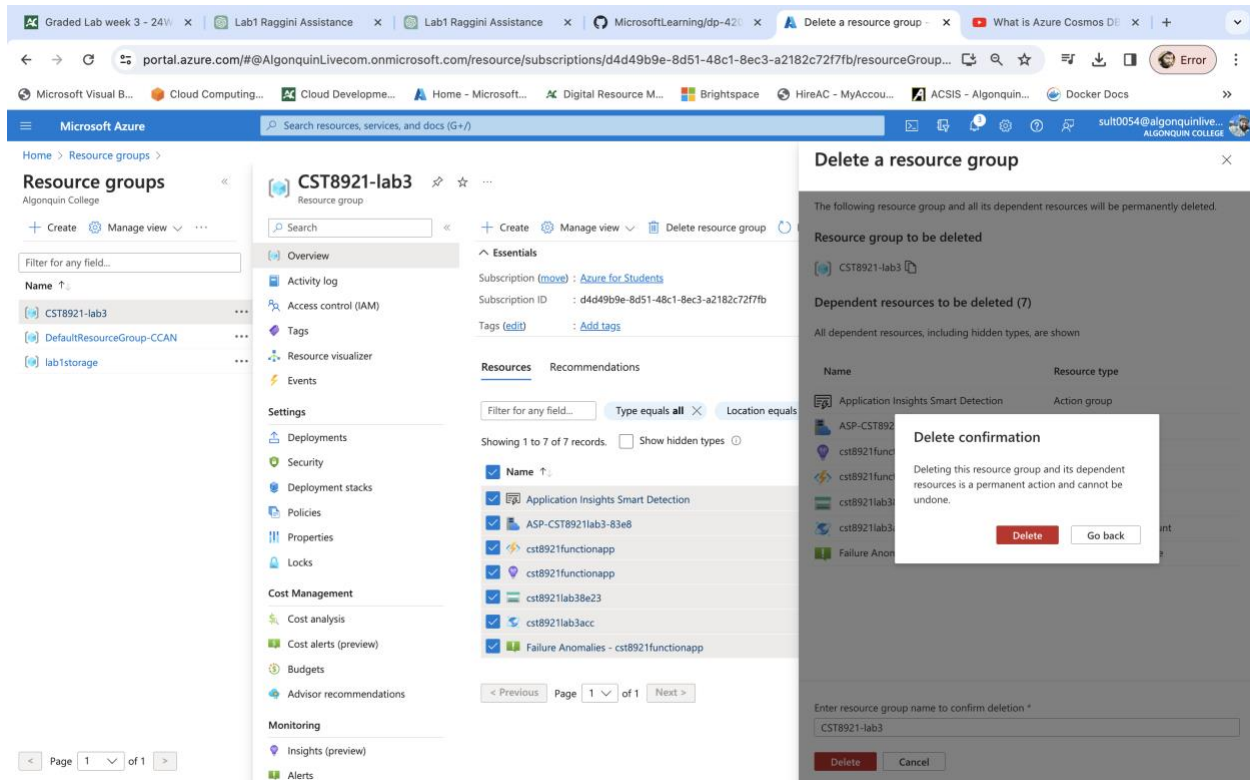
```

The 'Output' section on the right shows the HTTP response code '202 Accepted' and the HTTP response content.

Added another library `using Microsoft.Extensions.Logging;`

## 11. Clean Up:

- Delete all resources created during the lab.



The screenshot displays the Microsoft Azure portal interface. On the left, the 'Resource groups' section shows a list of resource groups, including 'CST8921-lab3'. The main pane shows the details for 'CST8921-lab3', including its subscription, ID, and a list of resources. A 'Delete resource group' button is visible. On the right, a modal window titled 'Delete a resource group' is open, showing a confirmation message: 'The following resource group and all its dependent resources will be permanently deleted.' It lists the resource group to be deleted and the dependent resources to be deleted (7). A 'Delete confirmation' dialog is also visible, asking for confirmation to delete the resource group and its dependent resources. At the bottom of the modal, there is a field to enter the resource group name to confirm deletion, with 'CST8921-lab3' entered.

## Results

Students successfully implemented a .NET application using Cosmos DB's change feed processor, demonstrating asynchronous and incremental processing of persistent changes.

Azure Functions were seamlessly integrated with Cosmos DB triggers, creating an "ItemsListener" function that reacts to modifications in the "products" container, showcasing dynamic response capabilities.

Through comprehensive testing, users observed the synchronization of change feed events, gaining practical insights into managing distributed, globally-available databases with high SLAs in a serverless capacity mode.