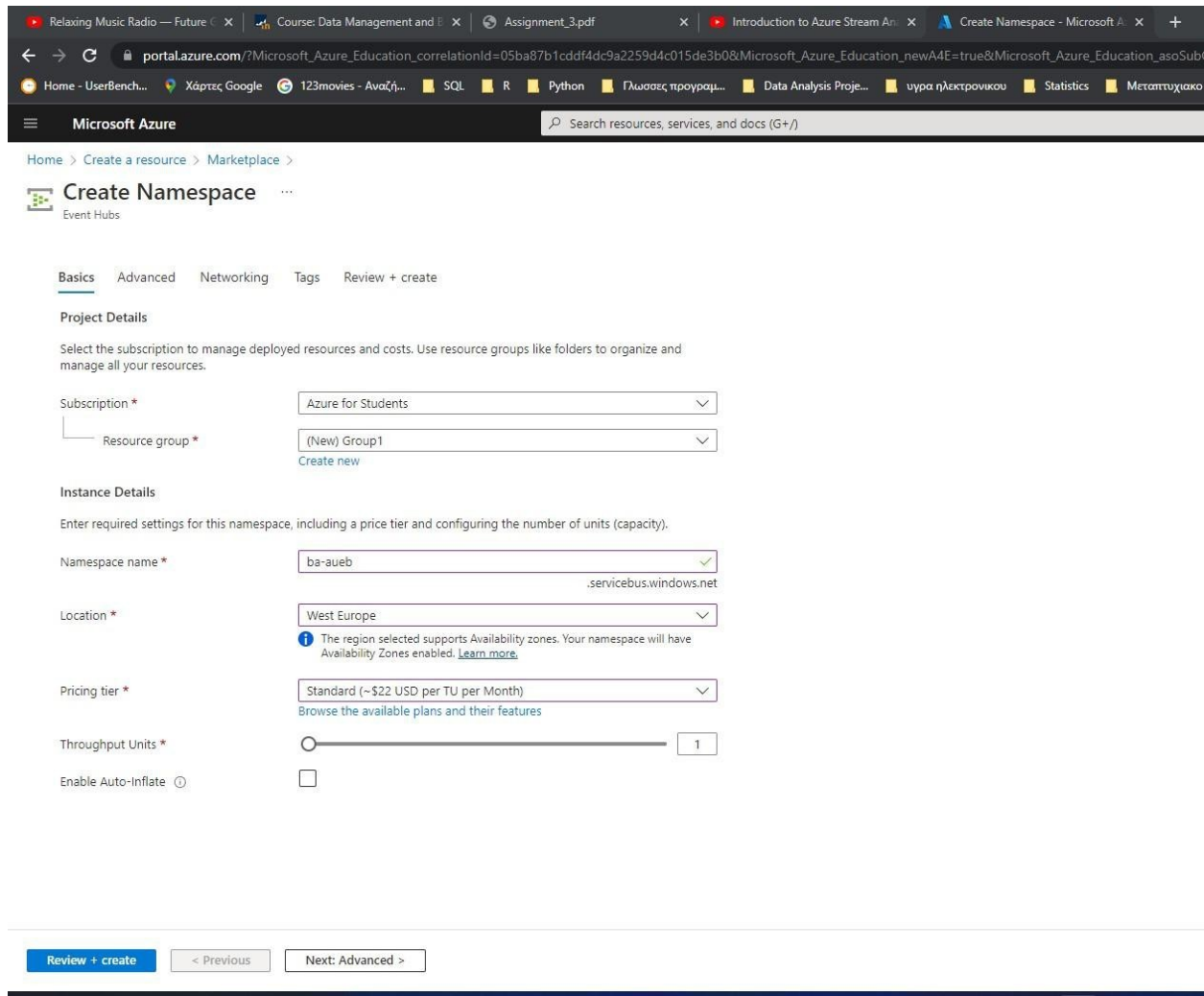


# Assignment 3, Data Streaming with Azure.

## Vlassis Christos

### Part 1 Setting up the Azure:


Firstly we create a NameSpace to have out event hub. We also create a resource group(group1) to be used for other purposes also:



The screenshot shows the Microsoft Azure portal interface for creating a new Event Hubs namespace. The browser tabs at the top include 'Relaxing Music Radio', 'Future', 'Course: Data Management and', 'Assignment\_3.pdf', 'Introduction to Azure Stream An', and 'Create Namespace - Microsoft'. The address bar shows the URL: [portal.azure.com/?Microsoft\\_Azure\\_Education\\_correlationId=05ba87b1cdd4dc9a2259d4c015de3b0&Microsoft\\_Azure\\_Education\\_newA4E=true&Microsoft\\_Azure\\_Education\\_asoSub](https://portal.azure.com/?Microsoft_Azure_Education_correlationId=05ba87b1cdd4dc9a2259d4c015de3b0&Microsoft_Azure_Education_newA4E=true&Microsoft_Azure_Education_asoSub). The page title is 'Create Namespace' with a sub-header 'Event Hubs'. The 'Basics' tab is selected, showing 'Project Details' and 'Instance Details' sections. In 'Project Details', the 'Subscription' is set to 'Azure for Students' and the 'Resource group' is '(New) Group1' with a 'Create new' link. In 'Instance Details', the 'Namespace name' is 'ba-aueb' with a green checkmark and '.servicebus.windows.net' suffix. The 'Location' is 'West Europe' with a note about Availability Zones. The 'Pricing tier' is 'Standard (~\$22 USD per TU per Month)' with a 'Browse the available plans and their features' link. The 'Throughput Units' are set to 1 using a slider. The 'Enable Auto-Inflate' checkbox is unchecked. At the bottom, there are three buttons: 'Review + create' (blue), '< Previous' (grey), and 'Next: Advanced >' (grey).

## Operation Succeeded:

[Home](#) > [Create a resource](#) > [Marketplace](#) >

 **Create Namespace** ...

Event Hubs

✓ Validation succeeded.

Basics | Advanced | Networking | Tags | Review + create

Event Hubs Namespace  
by Microsoft

Basics

Namespace name	ba-aueb
Subscription	Azure for Students
Resource group	Group1
Location	West Europe
Pricing tier	Standard
Throughput Units	1
Availability Zones (Zone Redundancy)	Enabled
Auto-Inflate Maximum Throughput Units	Disabled

Networking

Connectivity method	Public access
---------------------	---------------

Security

Minimum TLS version	1.2
Local Authentication	Enabled

Create < Previous Next >

## Deployment succeeded:

 Deployment name: ba-aueb  
Subscription: Azure for Students  
Resource group: Group1

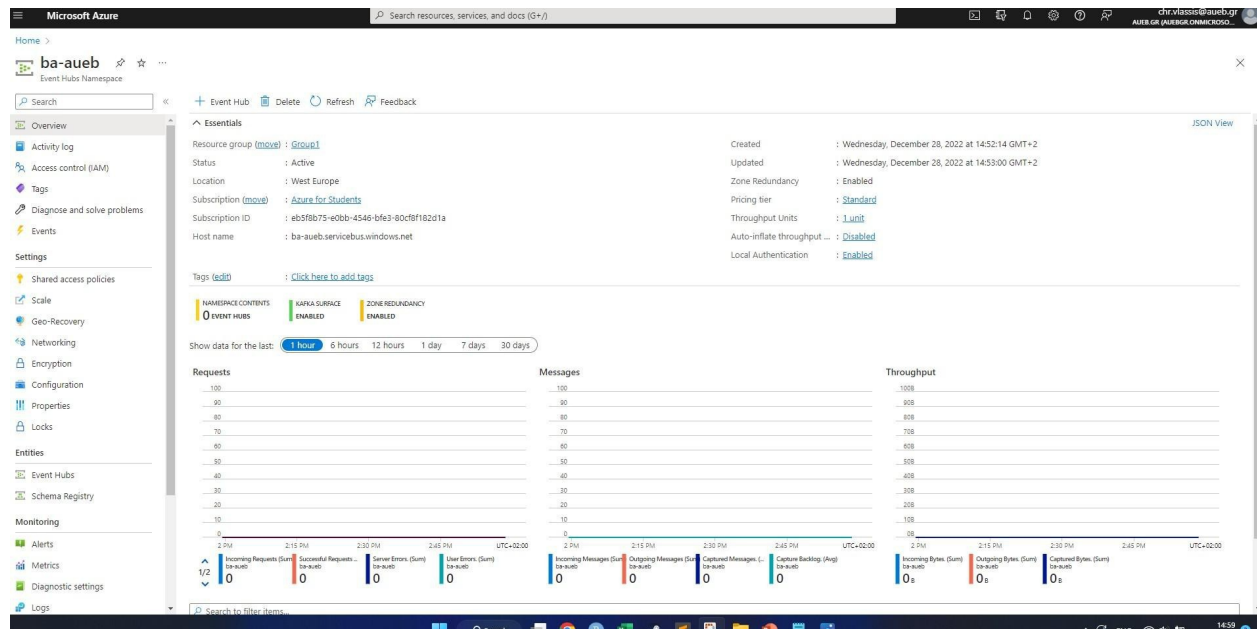
Start time: 12/28/2022, 2:52:12 PM  
Correlation ID: 40822433-1eaf-432a-a914-2b8eeb6171fc 

✓ Deployment details

^ Next steps

Go to resource

## View of the workspace:



Now, we have to create the Event hub in order to bring the data from the application:

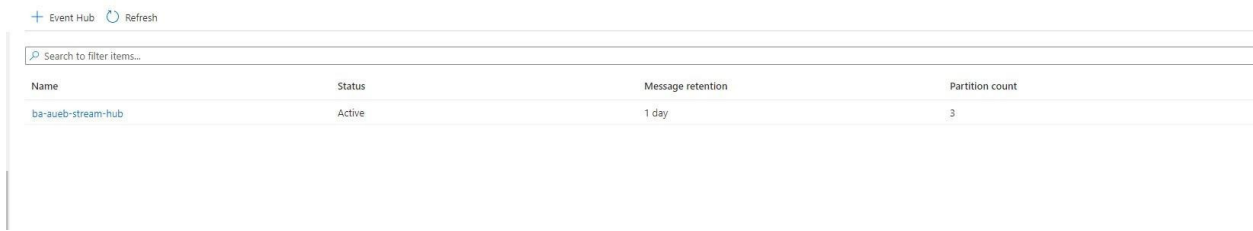
Basics	
Name	ba-aueb-stream-hub
Partition count	3
Retention	
Cleanup policy	Delete
Retention time (hrs)	1
Capture	
Capture Status	Off

Create

< Previous

Next >

## The event hub View:



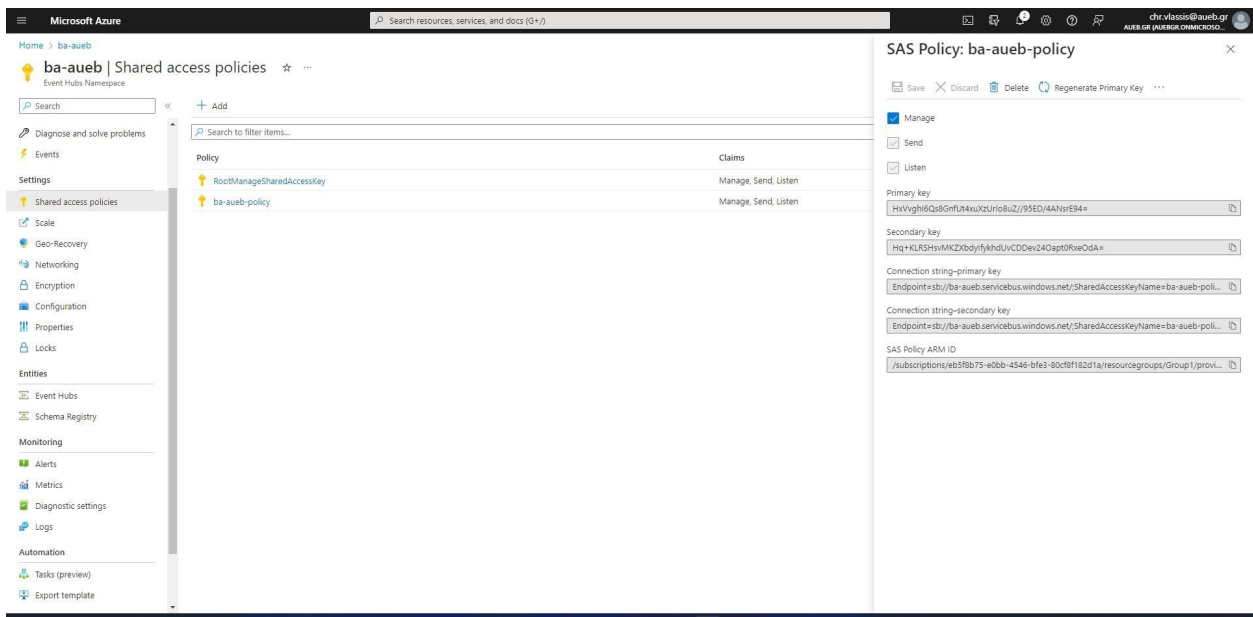
Event Hub Refresh

Search to filter items...

Name	Status	Message retention	Partition count
ba-aueb-stream-hub	Active	1 day	3

Also, we have to create a policy:

## Policy View:



Microsoft Azure Search resources, services, and docs (5+)

Home > ba-aueb

ba-aueb | Shared access policies

Event Hubs Namespace

Search

Diagnose and solve problems

Events

Settings

Shared access policies

Scale

Geo-Recovery

Networking

Encryption

Configuration

Properties

Locks

Entities

Event Hubs

Schema Registry

Monitoring

Alerts

Metrics

Diagnostic settings

Logs

Automation

Tasks (preview)

Export template

Policy	Claims
RootManageSharedAccessKey	Manage, Send, Listen
ba-aueb-policy	Manage, Send, Listen

SAS Policy: ba-aueb-policy

Save Discard Delete Regenerate Primary Key

Manage

Send

Listen

Primary key

HvVvgh6Qs8GmfUkxuZUic8uZ//95ED/4ANrE94+

Secondary key

Hq+KLRS8vMKZ8dyfYkh0UvCDDev24Oap0Rve0da+

Connection string-primary key

Endpoint=sb://ba-aueb.servicebus.windows.net/SharedAccessKey/Name=ba-aueb-poli...

Connection string-secondary key

Endpoint=sb://ba-aueb.servicebus.windows.net/SharedAccessKey/Name=ba-aueb-poli...

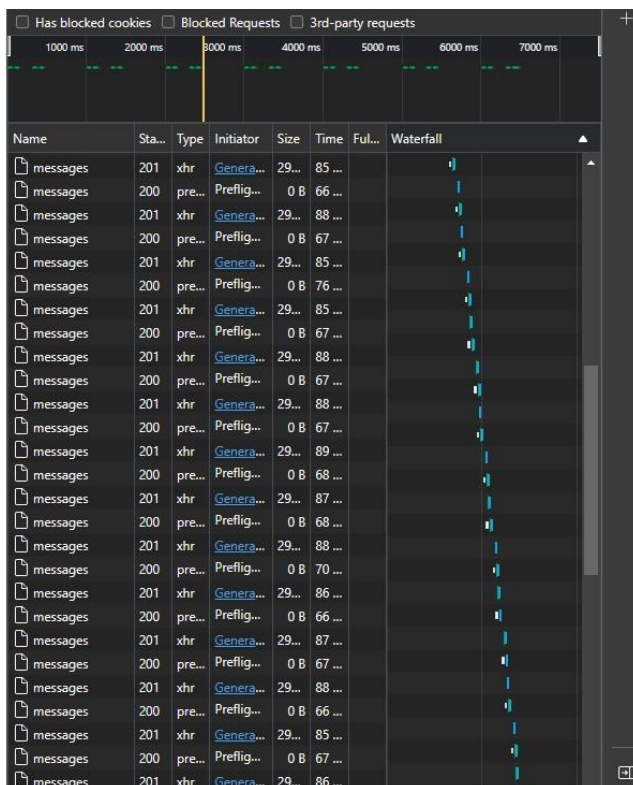
SAS Policy ARM ID

/subscriptions/eb5fb75-e0bb-4546-bfe3-60cfb182d1a/resourcegroups/Group1/provi...

```
//Use the signature generator: https://github.com/sandrinodimattia/RedDog/releases
var sas = "SharedAccessSignature sr=https%3A%2F%2Fba-aueb.servicebus.windows.net%3Fba-aueb-stream-hub%2Fpublishers%2Fvlass%2Fmessages&sig=v6%2D501%2B1XXIE16KCaEhn57ghUJ4L07FY8mAcFr%2FhbEK3d8se-7672236592&skn=ba-aueb-policy";
var serviceNameSpace = "ba-aueb";
var hubName = "ba-aueb-stream-hub";
var deviceName = "vlass";
```

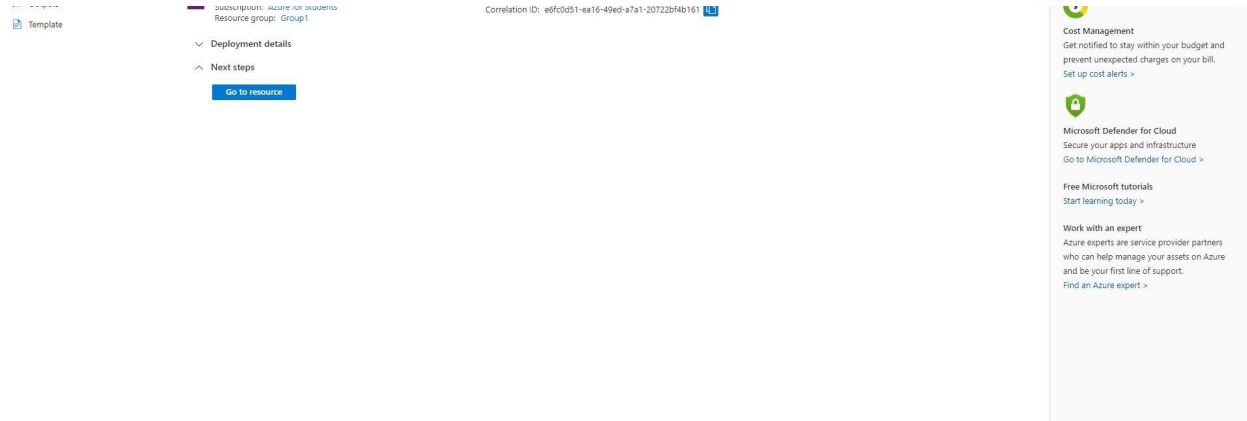
Send Data Sent: { "ATMCode": 15, "CardNumber": 3534633361736454, "Type": 1, "Amount": 10 }

Application works fine:



After the connecting the application to the event hub we have to create a storage an a stream analytics job:

## Creating the stream analytics job:



## Creating the inputs of the stream:

### Event Hub

New input

Input alias \*  
call-stream ✓

☐ Provide Event Hub settings manually  
☒ Select Event Hub from your subscriptions

Subscription  
Azure for Students ▼

Event Hub namespace \* ⓘ  
ba-aueb ▼

Event Hub name \* ⓘ  
☐ Create new ☒ Use existing  
ba-aueb-stream-hub ▼

Event Hub consumer group \* ⓘ  
☒ Create new ☐ Use existing  
✓

Authentication mode  
Connection string ▼

Event Hub policy name \* ⓘ  
☐ Create new ☒ Use existing  
ba-aueb-policy ▼

Event Hub policy key  
.....

Partition key ⓘ

Save

## Testing the stream query:

The screenshot shows the Microsoft Azure portal interface for a Stream Analytics job named 'ba-aueb-stream-analytics-jobb'. The 'Query' tab is selected, displaying a SQL query:

```
SELECT  
FROM  
[call-stream]
```

The 'Test results' tab is active, showing a table with 50 rows of data. The table has the following columns:

ATMCode	CardNumber	Type	Amount	EventProcessedUtcTime	PartitionId	EventEnqueuedUtcTime
16	3583257214000023	1	39	*2022-12-28T14:51:57.17657...	0	*2022-12-28T14:19:02.64400...
15	30487898026193	1	42	*2022-12-28T14:51:57.17657...	0	*2022-12-28T14:19:02.34700...
17	3549670931669297	1	48	*2022-12-28T14:51:57.17657...	0	*2022-12-28T14:19:01.65900...
16	3583257214000023	0	40	*2022-12-28T14:51:57.17657...	0	*2022-12-28T14:19:01.33100...
20	5200253312538103	0	26	*2022-12-28T14:51:57.17657...	0	*2022-12-28T14:19:00.64400...
19	50384191807294800	1	10	*2022-12-28T14:51:57.17657...	0	*2022-12-28T14:19:00.34700...
16	3583257214000023	0	16	*2022-12-28T14:51:57.17657...	0	*2022-12-28T14:18:59.64400...
15	3542024987623740	0	38	*2022-12-28T14:51:57.17657...	0	*2022-12-28T14:18:59.34700...
19	5200253312538103	0	24	*2022-12-28T14:51:57.17657...	0	*2022-12-28T14:18:58.64400...
10	4026567514157759	0	26	*2022-12-28T14:51:57.17657...	0	*2022-12-28T14:18:58.34700...
17	3549670931669297	0	39	*2022-12-28T14:51:57.17657...	0	*2022-12-28T14:18:57.64300...
19	3535766537597043	1	47	*2022-12-28T14:51:57.17657...	0	*2022-12-28T14:18:57.33000...

The status at the bottom indicates 'Success'.

Our stream works fine. Now we have to create the storage account in order to store our output data. Creating the storage:

The screenshot shows the Microsoft Azure portal interface for a deployment named 'ba1aueb1storage1account\_1672241727574'. The 'Overview' tab is selected, displaying the deployment details:

- Deployment name: ba1aueb1storage1account\_1672241727574
- Subscription: Azure for Students
- Resource group: Group1
- Start time: 12/28/2022, 5:35:37 PM
- Correlation ID: 9c84a86d-81b7-41aa-b99c-c026aa759c51

The status is 'Your deployment is complete'. A 'Go to resource' button is available. A 'Deployment succeeded' notification is shown in the top right corner.



Now we want to upload our static data into the storage account. I will not put them in the same container as the output values, a different one will be used. Uploading the data:

✔ Successfully created storage container

Successfully created storage container 'container1'.

Upload

Current uploads

Dismiss: Completed All

Customer.json	✔ 3 KiB / 3 KiB	...
Atm.json	✔ 1 KiB / 1 KiB	...
Area.json	✔ 990 B / 990 B	...

iting

## A snapshot of the static data:

Authentication method: Access key ([Switch to Azure AD User Account](#))  
Location: container1

Search blobs by prefix (case-...)  
☐ Show deleted blobs

+ Add filter

Name
<input type="checkbox"/> Area.json ...
<input type="checkbox"/> Atm.json ...
<input type="checkbox"/> Customer.json ...

### Area.json

Blob

Save Discard Download Refresh Delete

Overview Versions Snapshots Edit Generate SAS

```
1  [
2
3    {
4      "area_code": 1,
5      "area_country": "United States",
6      "area_city": "Springfield"
7    },
8    {
9      "area_code": 2,
10     "area_country": "United States",
11     "area_city": "Omaha"
12   },
13   {
14     "area_code": 3,
15     "area_country": "United States",
16     "area_city": "Vancouver"
17   },
18   {
19     "area_code": 4,
20     "area_country": "United States",
21     "area_city": "Memphis"
22   },
23   {
24     "area_code": 5,
25     "area_country": "United States",
26     "area_city": "Schaumburg"
27   },
28   {
29     "area_code": 6,
30     "area_country": "United States",
31     "area_city": "Dayton"
32   }
33 ]
```

Json Preview

We create the output container of the stream analytics job:

The screenshot shows the 'Blob storage/ADLS Gen2' configuration window for a new output. The window has a title bar with a close button (X) and a header 'New output'. The configuration fields are as follows:

- Output alias \***: A text input field containing 'output-values' with a green checkmark icon on the right.
- Subscription selection**: Two radio buttons. The first is 'Provide Blob storage/ADLS Gen2 settings manually'. The second is 'Select Blob storage/ADLS Gen2 from your subscriptions', which is selected.
- Subscription**: A dropdown menu showing 'Azure for Students'.
- Storage account \***: A dropdown menu showing 'ba1aueb1storage1account'.
- Container \***: Two radio buttons. The first is 'Create new', which is selected. The second is 'Use existing'.
- Container \***: A text input field containing 'container-output' with a green checkmark icon on the right.
- Authentication mode**: A dropdown menu showing 'Create system assigned managed identity'.
- Authentication note**: A text block stating: 'The Storage Blob Data Contributor role will be granted to the Managed Identity for this Stream Analytics job when you click Save. If grant fails follow the manual grant steps [here](#).'.
- Event serialization format \***: A dropdown menu showing 'JSON'.
- Format**: A dropdown menu showing 'Line separated'.
- Encoding**: A dropdown menu showing 'UTF-8'.
- Write mode \***: Two radio buttons. The first is 'Append as results arrive', which is selected.

At the bottom of the window is a blue 'Save' button.

Testing the combination of stream data (from the application level) with the static data (from our storage account). Everything works:

The screenshot shows the Azure Data Studio interface with a SQL query and its results. The query is a SELECT statement that joins four inputs: Area, Atm, call-stream, and Customer. The results are displayed in a table with 44 rows.

```
1 SELECT
2   cs.*, at.*, ar.*, cu.*
3 INTO
4   [output-values]
5 FROM
6   [call-stream] cs
7 JOIN Atm at ON cs.ATMcode = at.atm_code
8 JOIN Area ar ON ar.area_code = at.area_code
9 JOIN Customer cu ON cu.card_number = cs.CardNumber
```

Input preview Test results

Showing 44 rows from 'output-values':

ATMCode bigint	CardNumber bigint	Type bigint	Amount bigint	EventProcessedUtcTime datetime	PartitionId bigint	EventEnqueuedUtcTime datetime	atm_code bigint	area_code bigint
20	50384191807294800	0	19	"2022-12-29T08:49:15....	0	"2022-12-29T08:39:13....	20	1
12	5893112367133403000	1	22	"2022-12-29T08:49:15....	0	"2022-12-29T08:39:13....	12	9
18	604513436397576	0	25	"2022-12-29T08:49:15....	0	"2022-12-29T08:39:14....	18	4
19	50384191807294800	0	27	"2022-12-29T08:49:15....	0	"2022-12-29T08:39:14....	19	2
20	5602246755688900	1	46	"2022-12-29T08:49:15....	0	"2022-12-29T08:39:15....	20	1
20	5200253312538103	1	28	"2022-12-29T08:49:15....	0	"2022-12-29T08:39:15....	20	1
15	201634601435467	1	22	"2022-12-29T08:49:15....	0	"2022-12-29T08:39:16....	15	5

4 inputs and 1 output:

The screenshot shows the Azure Data Studio interface with the query editor and outputs. The query editor shows the query, and the outputs section shows the output values.

<> Query  
Edit query

Outputs (1)  
output-values

Functions (0)  
Add function



## Output photos for the select \*:

Overview Versions Snapshots Edit Generate SAS

1	{ "ATMCode":18,"CardNumber":5602238863017460,"Type":0,"Amount":44,"EventProcessedUtcTime":"2022-12-29T08:55:25.6987630Z","PartitionId":0,"EventEnqueuedUtcTime":
2	{ "ATMCode":12,"CardNumber":5893112367133403000,"Type":1,"Amount":33,"EventProcessedUtcTime":"2022-12-29T08:58:21.3034335Z","PartitionId":0,"EventEnqueuedUtcTime":
3	{ "ATMCode":20,"CardNumber":50384191807294800,"Type":1,"Amount":16,"EventProcessedUtcTime":"2022-12-29T08:59:21.2094784Z","PartitionId":0,"EventEnqueuedUtcTime":
4	{ "ATMCode":17,"CardNumber":3549670931669297,"Type":1,"Amount":35,"EventProcessedUtcTime":"2022-12-29T09:00:21.2303033Z","PartitionId":0,"EventEnqueuedUtcTime":
5	{ "ATMCode":21,"CardNumber":50383945269330136,"Type":1,"Amount":26,"EventProcessedUtcTime":"2022-12-29T09:01:21.3244995Z","PartitionId":0,"EventEnqueuedUtcTime":
6	{ "ATMCode":18,"CardNumber":604513436397576,"Type":0,"Amount":31,"EventProcessedUtcTime":"2022-12-29T09:04:21.2782199Z","PartitionId":0,"EventEnqueuedUtcTime":
7	{ "ATMCode":18,"CardNumber":56022176913710210,"Type":0,"Amount":14,"EventProcessedUtcTime":"2022-12-29T09:06:21.7195409Z","PartitionId":0,"EventEnqueuedUtcTime":
8	{ "ATMCode":18,"CardNumber":5602238863017460,"Type":1,"Amount":14,"EventProcessedUtcTime":"2022-12-29T09:13:21.7025778Z","PartitionId":0,"EventEnqueuedUtcTime":
9	{ "ATMCode":12,"CardNumber":5893112367133403000,"Type":0,"Amount":40,"EventProcessedUtcTime":"2022-12-29T09:14:21.1583047Z","PartitionId":0,"EventEnqueuedUtcTime":
10	{ "ATMCode":21,"CardNumber":5610827137784218,"Type":1,"Amount":31,"EventProcessedUtcTime":"2022-12-29T09:15:21.2805428Z","PartitionId":0,"EventEnqueuedUtcTime":
11	{ "ATMCode":18,"CardNumber":604513436397576,"Type":1,"Amount":25,"EventProcessedUtcTime":"2022-12-29T09:16:21.2339491Z","PartitionId":0,"EventEnqueuedUtcTime":
12	{ "ATMCode":19,"CardNumber":5200253312538103,"Type":1,"Amount":21,"EventProcessedUtcTime":"2022-12-29T09:17:21.2339676Z","PartitionId":0,"EventEnqueuedUtcTime":
13	{ "ATMCode":17,"CardNumber":3549670931669297,"Type":1,"Amount":23,"EventProcessedUtcTime":"2022-12-29T09:18:23.8771599Z","PartitionId":0,"EventEnqueuedUtcTime":
14	{ "ATMCode":17,"CardNumber":3549670931669297,"Type":0,"Amount":42,"EventProcessedUtcTime":"2022-12-29T09:19:21.4692755Z","PartitionId":0,"EventEnqueuedUtcTime":
15	{ "ATMCode":16,"CardNumber":3583257214000023,"Type":0,"Amount":11,"EventProcessedUtcTime":"2022-12-29T09:20:21.5566451Z","PartitionId":0,"EventEnqueuedUtcTime":
16	{ "ATMCode":15,"CardNumber":3542024987623740,"Type":0,"Amount":31,"EventProcessedUtcTime":"2022-12-29T09:21:21.5256157Z","PartitionId":0,"EventEnqueuedUtcTime":
17	{ "ATMCode":18,"CardNumber":604513436397576,"Type":1,"Amount":50,"EventProcessedUtcTime":"2022-12-29T09:22:21.5115341Z","PartitionId":0,"EventEnqueuedUtcTime":
18	{ "ATMCode":15,"CardNumber":3534633361736454,"Type":0,"Amount":30,"EventProcessedUtcTime":"2022-12-29T09:23:21.4645971Z","PartitionId":0,"EventEnqueuedUtcTime":
19	{ "ATMCode":19,"CardNumber":3554025590595485,"Type":0,"Amount":50,"EventProcessedUtcTime":"2022-12-29T09:24:21.5482790Z","PartitionId":0,"EventEnqueuedUtcTime":
20	{ "ATMCode":19,"CardNumber":5602246755688900,"Type":0,"Amount":49,"EventProcessedUtcTime":"2022-12-29T09:25:21.5485191Z","PartitionId":0,"EventEnqueuedUtcTime":
21	{ "ATMCode":19,"CardNumber":5602246755688900,"Type":0,"Amount":33,"EventProcessedUtcTime":"2022-12-29T09:26:21.4513229Z","PartitionId":0,"EventEnqueuedUtcTime":
22	{ "ATMCode":15,"CardNumber":3534633361736454,"Type":1,"Amount":35,"EventProcessedUtcTime":"2022-12-29T09:27:21.4671450Z","PartitionId":0,"EventEnqueuedUtcTime":
23	{ "ATMCode":15,"CardNumber":201634601435467,"Type":0,"Amount":45,"EventProcessedUtcTime":"2022-12-29T09:28:21.3427824Z","PartitionId":0,"EventEnqueuedUtcTime":
24	{ "ATMCode":12,"CardNumber":5893112367133403000,"Type":1,"Amount":40,"EventProcessedUtcTime":"2022-12-29T09:29:21.4003104Z","PartitionId":0,"EventEnqueuedUtcTime":
25	{ "ATMCode":19,"CardNumber":3535766537597043,"Type":1,"Amount":11,"EventProcessedUtcTime":"2022-12-29T09:30:21.4016782Z","PartitionId":0,"EventEnqueuedUtcTime":
26	{ "ATMCode":18,"CardNumber":5602238863017460,"Type":1,"Amount":34,"EventProcessedUtcTime":"2022-12-29T09:31:21.3707372Z","PartitionId":0,"EventEnqueuedUtcTime":
27	{ "ATMCode":15,"CardNumber":3534633361736454,"Type":0,"Amount":23,"EventProcessedUtcTime":"2022-12-29T09:33:21.4694689Z","PartitionId":0,"EventEnqueuedUtcTime":
28	{ "ATMCode":15,"CardNumber":3542024987623740,"Type":0,"Amount":16,"EventProcessedUtcTime":"2022-12-29T09:34:21.5165379Z","PartitionId":0,"EventEnqueuedUtcTime":
29	{ "ATMCode":21,"CardNumber":5610827137784218,"Type":1,"Amount":25,"EventProcessedUtcTime":"2022-12-29T09:35:21.4384957Z","PartitionId":0,"EventEnqueuedUtcTime":
30	{ "ATMCode":19,"CardNumber":3554025590595485,"Type":1,"Amount":47,"EventProcessedUtcTime":"2022-12-29T09:36:21.4545122Z","PartitionId":0,"EventEnqueuedUtcTime":
31	{ "ATMCode":16,"CardNumber":3583257214000023,"Type":0,"Amount":11,"EventProcessedUtcTime":"2022-12-29T09:37:21.4073057Z","PartitionId":0,"EventEnqueuedUtcTime":

Json Preview

Overview Versions Snapshots Edit Generate SAS


1	":18,"area_code":4,"area_country":"United States","area_city":"Memphis","card_number":5602238863017460,"first_name":"Aaron","last_name":"Mitchell","age":44,"gend
2	de":12,"area_code":9,"area_country":"United States","area_city":"Canton","card_number":5893112367133403000,"first_name":"Arthur","last_name":"Cooper","age":72,"
3	":20,"area_code":1,"area_country":"United States","area_city":"Springfield","card_number":50384191807294800,"first_name":"Gerald","last_name":"Young","age":23,
4	":17,"area_code":3,"area_country":"United States","area_city":"Vancouver","card_number":3549670931669297,"first_name":"Jose","last_name":"Snyder","age":41,"gend
5	":21,"area_code":1,"area_country":"United States","area_city":"Springfield","card_number":50383945269330136,"first_name":"Derry","last_name":"Hansen","age":42,
6	18,"area_code":4,"area_country":"United States","area_city":"Memphis","card_number":604513436397576,"first_name":"Patrick","last_name":"Lee","age":69,"gender":
7	":18,"area_code":4,"area_country":"United States","area_city":"Memphis","card_number":56022176913710210,"first_name":"Lisa","last_name":"Perez","age":74,"gende
8	":18,"area_code":4,"area_country":"United States","area_city":"Memphis","card_number":5602238863017460,"first_name":"Aaron","last_name":"Mitchell","age":44,"gen
9	de":12,"area_code":9,"area_country":"United States","area_city":"Canton","card_number":5893112367133403000,"first_name":"Arthur","last_name":"Cooper","age":72,
10	":21,"area_code":1,"area_country":"United States","area_city":"Springfield","card_number":5610827137784218,"first_name":"Julia","last_name":"Fuller","age":74,"g
11	18,"area_code":4,"area_country":"United States","area_city":"Memphis","card_number":604513436397576,"first_name":"Patrick","last_name":"Lee","age":69,"gender":
12	":19,"area_code":2,"area_country":"United States","area_city":"Omaha","card_number":5200253312538103,"first_name":"Richard","last_name":"Russell","age":73,"gend
13	":17,"area_code":3,"area_country":"United States","area_city":"Vancouver","card_number":3549670931669297,"first_name":"Jose","last_name":"Snyder","age":41,"gend
14	":17,"area_code":3,"area_country":"United States","area_city":"Vancouver","card_number":3549670931669297,"first_name":"Jose","last_name":"Snyder","age":41,"gend
15	":16,"area_code":7,"area_country":"United States","area_city":"Tacoma","card_number":3583257214000023,"first_name":"Ruth","last_name":"Sims","age":61,"gender":
16	":15,"area_code":5,"area_country":"United States","area_city":"Schaumburg","card_number":3542024987623740,"first_name":"Jesse","last_name":"Bradley","age":26,"g
17	18,"area_code":4,"area_country":"United States","area_city":"Memphis","card_number":604513436397576,"first_name":"Patrick","last_name":"Lee","age":69,"gender":
18	":15,"area_code":5,"area_country":"United States","area_city":"Schaumburg","card_number":3534633361736454,"first_name":"Angela","last_name":"Moreno","age":61,"g
19	":19,"area_code":2,"area_country":"United States","area_city":"Omaha","card_number":3554025590595485,"first_name":"Walter","last_name":"Stone","age":27,"gender"
20	":19,"area_code":2,"area_country":"United States","area_city":"Omaha","card_number":5602246755688900,"first_name":"Bruce","last_name":"Morrison","age":54,"gende
21	":19,"area_code":2,"area_country":"United States","area_city":"Omaha","card_number":5602246755688900,"first_name":"Bruce","last_name":"Morrison","age":54,"gende
22	":15,"area_code":5,"area_country":"United States","area_city":"Schaumburg","card_number":3534633361736454,"first_name":"Angela","last_name":"Moreno","age":61,"g
23	15,"area_code":5,"area_country":"United States","area_city":"Schaumburg","card_number":201634601435467,"first_name":"Kelly","last_name":"Simpson","age":54,"gen
24	de":12,"area_code":9,"area_country":"United States","area_city":"Canton","card_number":5893112367133403000,"first_name":"Arthur","last_name":"Cooper","age":72,
25	":19,"area_code":2,"area_country":"United States","area_city":"Omaha","card_number":3535766537597043,"first_name":"Martha","last_name":"Day","age":32,"gender":
26	":18,"area_code":4,"area_country":"United States","area_city":"Memphis","card_number":5602238863017460,"first_name":"Aaron","last_name":"Mitchell","age":44,"gen
27	":15,"area_code":5,"area_country":"United States","area_city":"Schaumburg","card_number":3534633361736454,"first_name":"Angela","last_name":"Moreno","age":61,"g
28	":15,"area_code":5,"area_country":"United States","area_city":"Schaumburg","card_number":3542024987623740,"first_name":"Jesse","last_name":"Bradley","age":26,"g
29	":21,"area_code":1,"area_country":"United States","area_city":"Springfield","card_number":5610827137784218,"first_name":"Julia","last_name":"Fuller","age":74,"g
30	":19,"area_code":2,"area_country":"United States","area_city":"Omaha","card_number":3554025590595485,"first_name":"Walter","last_name":"Stone","age":27,"gender"
31	":15,"area_code":5,"area_country":"United States","area_city":"Schaumburg","card_number":3542024987623740,"first_name":"Jesse","last_name":"Bradley","age":26,"gend

Json Preview

## Part 2 Analysis and Queries:

Now that we have tested and we are certain that our stream works with the static data and we storage our output we can start our analysis:

**Query 1:** Show the total “Amount” of “Type = 0” transactions at “ATM Code = 21” of the last 10 minutes. Repeat as new events keep flowing in (use a sliding window).

Code  Share feedback  Refresh

 Test selected query  Save query  Discard changes

```
1 SELECT
2   ... Type, ATMCode, SUM(Amount)
3 INTO
4   ... [output-values]
5 FROM
6   ... [call-stream]
7 WHERE Type = 0 AND ATMCode = 21
8 GROUP BY Type, ATMCode, SlidingWindow(second,600)
```

## Output:

 Save  Discard  Download  Refresh |  Delete

Overview Versions Snapshots Edit Generate SAS

```
1 {"Type":0,"ATMCode":21,"SUM":205.0}
2 {"Type":0,"ATMCode":21,"SUM":250.0}
```

**Query 2:** Show the total “Amount” of “Type = 1” transactions at “ATM Code = 21” of the last hour. Repeat once every hour (use a tumbling window).

You can stop the job to edit the query.

```
Test selected query Save query Discard changes
1 SELECT
2   ... Type, ATMCode, SUM(Amount)
3 INTO
4   ... [output-values]
5 FROM
6   ... [call-stream]
7 WHERE Type = 1 AND ATMCode = 21
8 GROUP BY Type, ATMCode, TumblingWindow(second,3600)
```

output:

0\_46de5e6cfb16440ea1de0b79577ed7a5\_1.json ...

Blob



Save Discard Download Refresh Delete


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```
1 [{"Type":1,"ATMCode":21,"SUM":827.0}]
```



**Query 3:** Show the total “Amount” of “Type = 1” transactions at “ATM Code = 21” of the last hour. Repeat once every 30 minutes (use a hopping window).

Code  Share feedback  Refresh

 Test query  Save query  Discard changes

```
1 SELECT
2   Type, ATMCode, SUM(Amount)
3 INTO
4   [output-values]
5 FROM
6   [call-stream]
7 WHERE Type = 1 AND ATMCode = 21
8 GROUP BY Type, ATMCode, HoppingWindow(second,3600,1800)
```

output:

0\_d6fa5a184a634764bfb12295102190c3\_1.json ...

Blob

 Save  Discard  Download  Refresh |  Delete

Overview Versions Snapshots Edit Generate SAS

```
1 [{"Type":1,"ATMCode":21,"SUM":467.0}]
```



**Query 4:** Show the total “Amount” of “Type = 1” transactions per “ATM Code” of the last one hour (use a sliding window).

Code 😊 Share feedback 🔄 Refresh

▶ Test selected query 💾 Save query ✕ Discard changes

```
1 SELECT
2   ... Type, ATMCode, SUM(Amount)
3 INTO
4   ... [output-values]
5 FROM
6   ... [call-stream]
7 WHERE Type = 1
8 GROUP BY Type, ATMCode, SlidingWindow(second,3600)
```

**Output:**

0\_bf85f262dd364d56ab0649079809812c\_1.json ...

Blob

📄 Save ✕ Discard ⬇ Download 🔄 Refresh 🗑 Delete


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```
10 {"Type":1,"ATMCode":13,"SUM":599.0}
11 {"Type":1,"ATMCode":15,"SUM":1639.0}
12 {"Type":1,"ATMCode":15,"SUM":1665.0}
13 {"Type":1,"ATMCode":18,"SUM":1219.0}
14 {"Type":1,"ATMCode":10,"SUM":1154.0}
15 {"Type":1,"ATMCode":13,"SUM":619.0}
16 {"Type":1,"ATMCode":10,"SUM":1189.0}
17 {"Type":1,"ATMCode":13,"SUM":632.0}
18 {"Type":1,"ATMCode":15,"SUM":1676.0}
19 {"Type":1,"ATMCode":10,"SUM":1216.0}
20 {"Type":1,"ATMCode":15,"SUM":1702.0}
21 {"Type":1,"ATMCode":18,"SUM":1245.0}
22 {"Type":1,"ATMCode":10,"SUM":1253.0}
23 {"Type":1,"ATMCode":12,"SUM":584.0}
24 {"Type":1,"ATMCode":18,"SUM":1256.0}
25 {"Type":1,"ATMCode":18,"SUM":1288.0}
26 {"Type":1,"ATMCode":10,"SUM":1286.0}
27 {"Type":1,"ATMCode":13,"SUM":666.0}
28 {"Type":1,"ATMCode":18,"SUM":1337.0}
29 {"Type":1,"ATMCode":18,"SUM":1368.0}
30 {"Type":1,"ATMCode":15,"SUM":1750.0}
31 {"Type":1,"ATMCode":15,"SUM":1780.0}
32 {"Type":1,"ATMCode":10,"SUM":1301.0}
33 {"Type":1,"ATMCode":10,"SUM":1315.0}
34 {"Type":1,"ATMCode":19,"SUM":1051.0}
35 {"Type":1,"ATMCode":10,"SUM":1348.0}
36 {"Type":1,"ATMCode":10,"SUM":1394.0}
37 {"Type":1,"ATMCode":18,"SUM":1402.0}
38 {"Type":1,"ATMCode":20,"SUM":1357.0}
39 {"Type":1,"ATMCode":13,"SUM":627.0}
```

Json

Preview

**Query 5:** Show the total “Amount” of “Type = 1” transactions per “Area Code” of the last hour. Repeat once every hour (use a tumbling window).

Code  Share feedback  Refresh

 Test selected query  Save query  Discard changes

```
1 SELECT
2   ... cs.Type, at.area_code, SUM(cs.Amount)
3 INTO
4   ... [output-values]
5 FROM
6   ... [call-stream] cs
7 JOIN Atm at ON at.atm_code = cs.ATMCode
8 WHERE cs.Type = 1
9 GROUP BY cs.Type, at.area_code, TumblingWindow(second,3600)
```

**Output:**

```
1 [{"Type":1,"area_code":15,"SUM":45.0}]
2 [{"Type":1,"area_code":5,"SUM":1132.0}]
3 [{"Type":1,"area_code":11,"SUM":721.0}]
4 [{"Type":1,"area_code":1,"SUM":832.0}]
5 [{"Type":1,"area_code":4,"SUM":906.0}]
6 [{"Type":1,"area_code":3,"SUM":382.0}]
7 [{"Type":1,"area_code":10,"SUM":208.0}]
8 [{"Type":1,"area_code":9,"SUM":350.0}]
9 [{"Type":1,"area_code":6,"SUM":71.0}]
10 [{"Type":1,"area_code":19,"SUM":31.0}]
11 [{"Type":1,"area_code":7,"SUM":51.0}]
12 [{"Type":1,"area_code":2,"SUM":737.0}]
```

**Query 6:** Show the total “Amount” per ATM’s “City” and Customer’s “Gender” of the last hour. Repeat once every hour (use a tumbling window).

Code  Share feedback  Refresh

 Test query  Save query  Discard changes

```
1 SELECT
2     ar.area_city, cs.ATMCode, cu.gender, SUM(cs.Amount)
3 INTO
4     [output-values]
5 FROM
6     [call-stream] cs
7 JOIN Atm at ON at.atm_code = cs.ATMCode
8 JOIN Area ar ON ar.area_code = at.area_code
9 JOIN Customer cu ON cu.card_number = cs.CardNumber
10 WHERE cs.Type = 1
11 GROUP BY cs.ATMCode, ar.area_city, cu.gender, TumblingWindow(second,3600)
```

## Output:

ntainers > container-output >

0\_f82589d7097d4a5eadad47b0a4df2175\_1.json ...

Blob

 Save  Discard  Download  Refresh  Delete

to

Overview Versions Snapshots Edit Generate SAS

```
1 {"area_city":"Baltimore","ATMCode":13,"gender":"Male","SUM":282.0}
2 {"area_city":"Memphis","ATMCode":18,"gender":"Male","SUM":592.0}
3 {"area_city":"Memphis","ATMCode":18,"gender":"Female","SUM":465.0}
4 {"area_city":"Tacoma","ATMCode":16,"gender":"Male","SUM":40.0}
5 {"area_city":"Schaumburg","ATMCode":15,"gender":"Female","SUM":1563.0}
6 {"area_city":"Omaha","ATMCode":19,"gender":"Male","SUM":1108.0}
7 {"area_city":"Canton","ATMCode":12,"gender":"Female","SUM":29.0}
8 {"area_city":"Springfield","ATMCode":20,"gender":"Female","SUM":284.0}
9 {"area_city":"Canton","ATMCode":12,"gender":"Male","SUM":678.0}
10 {"area_city":"Baltimore","ATMCode":13,"gender":"Female","SUM":292.0}
11 {"area_city":"Vancouver","ATMCode":17,"gender":"Male","SUM":603.0}
12 {"area_city":"Springfield","ATMCode":21,"gender":"Female","SUM":215.0}
13 {"area_city":"Tacoma","ATMCode":16,"gender":"Female","SUM":546.0}
14 {"area_city":"Springfield","ATMCode":20,"gender":"Male","SUM":746.0}
15 {"area_city":"Schaumburg","ATMCode":15,"gender":"Male","SUM":406.0}
16 {"area_city":"Omaha","ATMCode":19,"gender":"Female","SUM":377.0}
17 {"area_city":"Springfield","ATMCode":21,"gender":"Male","SUM":250.0}
```

**Query 7: Alert** (Do a simple SELECT “1”) if a Customer has performed two transactions of “Type = 1” in a window of an hour (use a sliding window).

Code Share feedback Refresh

▶ Test query Save query Discard changes

```
1
2 WITH Counter_Table AS (
3     SELECT
4         count(CardNumber) as Counter,CardNumber
5     FROM
6         [call-stream]
7     WHERE
8         Type = 1
9     GROUP BY
10        CardNumber, SlidingWindow(hour,1)
11 )
12
13 SELECT CardNumber,'1' as Alerter INTO [output-values] FROM Counter_Table WHERE Counter = 2
14 /* i have also selected the CardNumber. That way we will know which customer has made two transactions*/
15
16
17
```

Input preview Test results

Fetching events from 'call-stream'...

## Output:

```
1 [{"CardNumber":3542024987623740,"Alerter":"1"}]
2 {"CardNumber":3542024987623740,"Alerter":"1"}
3 {"CardNumber":56022176913710210,"Alerter":"1"}
4 {"CardNumber":4026567514157759,"Alerter":"1"}
5 {"CardNumber":201634601435467,"Alerter":"1"}
6 {"CardNumber":3535766537597043,"Alerter":"1"}
7 {"CardNumber":5446210381593272,"Alerter":"1"}
8 {"CardNumber":30487898026193,"Alerter":"1"}
9 {"CardNumber":50384191807294800,"Alerter":"1"}
10 {"CardNumber":5602246755688900,"Alerter":"1"}
11 {"CardNumber":5893112367133403000,"Alerter":"1"}
12 {"CardNumber":560222217915598000,"Alerter":"1"}
13 {"CardNumber":3549670931669297,"Alerter":"1"}
14 {"CardNumber":3534633361736454,"Alerter":"1"}
15 {"CardNumber":3583257214000023,"Alerter":"1"}
16 {"CardNumber":604513436397576,"Alerter":"1"}
17 {"CardNumber":3554025590595485,"Alerter":"1"}
18 {"CardNumber":50383945269330136,"Alerter":"1"}
19 {"CardNumber":5602238863017460,"Alerter":"1"}
20 {"CardNumber":5610827137784218,"Alerter":"1"}
21 {"CardNumber":5200253312538103,"Alerter":"1"}
```



**Query 8:** Alert (Do a simple SELECT “1”) if the “Area Code” of the ATM of the transaction is not the same as the “Area Code” of the “Card Number” (Customer’s Area Code) - (use a sliding window)

```
1 WITH Alert AS (
2   SELECT
3     SUM(CASE
4       WHEN a.area_code != c.area_code THEN 1 ELSE 0 END) AS equality
5   FROM
6     [call-stream] cs
7   JOIN [Atm] a ON a.atm_code = cs.ATMCode
8   JOIN [Customer] c ON cs.CardNumber = c.card_number
9   GROUP BY SlidingWindow(hour,1) )
10  /* επειδή δεν αναφέρθηκε χρόνος για το sliding window έβαλα 1 hour*/
11
12  SELECT '1' as Alerter INTO [output-values] FROM Alert where equality IS NOT NULL
13
14
15
16
17
```

Input preview   Test results

Blob storage/ADLS Gen2 reference inputs cannot be previewed. Upload a sample file to test the query.

Table   Raw   Upload sample input   Download sample data

## Output:

0\_6904e0e84850492a9d48eb42f919a3b8\_1.json ...

Blob

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```
1 [{"Alerter": "1"}]
2 {"Alerter": "1"}
3 {"Alerter": "1"}
4 {"Alerter": "1"}
5 {"Alerter": "1"}
6 {"Alerter": "1"}
7 {"Alerter": "1"}
8 {"Alerter": "1"}
9 {"Alerter": "1"}
10 {"Alerter": "1"}
11 {"Alerter": "1"}
```