

Cst8916final

Create resource group

Microsoft Azure

Search resources, services, and docs (G+/I)

Copilot

fan00079@algonquiniv...  
ALGONQUIN COLLEGE

Home > Resource groups >

Create a resource group

Basics

Tags

Review + create

**Resource group** - A container that holds related resources for an Azure solution. The resource group can include all the resources for the solution, or only those resources that you want to manage as a group. You decide how you want to allocate resources to resource groups based on what makes the most sense for your organization. [Learn more](#)

Subscription \*

Azure for Students

Resource group name \*

cst8916final

Region \*

(Canada) Canada Central

Previous

Next

Review + create

Activate Windows  
Go to Settings to activate Windows.

Create lot hub

Microsoft Azure

Search resources, services, and docs (G+/I)

Copilot

fan00079@algonquiniv...  
ALGONQUIN COLLEGE

Home > IoT Hub >

IoT hub

Microsoft

Basics

Networking

Management

Add-ons

Tags

Review + create

⚠ Pricing information is unavailable for one or more tier editions in the selected region.

Create an IoT hub to help you connect, monitor, and manage billions of your IoT assets. [Learn more](#)

**Project details**

Choose the subscription you'll use to manage deployments and costs. Use resource groups like folders to help you organize and manage resources.

Subscription \*

Azure for Students

Resource group \*

cst8916final

Create new

**Instance details**

IoT hub name \*

cst8916finaliothub

Region \*

Canada Central

Tier \*

Free

Free trial explores the app with live data. Trials cannot scale or be upgraded later.  
[Compare tiers](#)

Daily message limit \*

8,000 (\$0/month)

Review + create

< Previous

Next: Networking >

Activate Windows  
Go to Settings to activate Windows.

Create device

Microsoft Azure

Search resources, services, and docs (G+/I)

Copilot

fan00079@algonquiniv...  
ALGONQUIN COLLEGE

Home > IoT Hub > cst8916finaliothub | Devices >

Create a device

X

Find Certified for Azure IoT devices in the Device Catalog

Device ID \*

sensor1

X

☐ IoT Edge Device

Authentication type

Symmetric keyX.509 Self-SignedX.509 CA Signed

Auto-generate keys

☒

Connect this device to an IoT hub

EnableDisable

Parent device

No parent device

Set a parent device

Save

Activate Windows

Go to Settings to activate Windows.

Microsoft Azure

Search resources, services, and docs (G+/I)

Copilot

fan00079@algonquiniv...  
ALGONQUIN COLLEGE

Home > IoT Hub > cst8916finaliothub | Devices >

Create a device

X

Find Certified for Azure IoT devices in the Device Catalog

Device ID \*

sensor2

X

☐ IoT Edge Device

Authentication type

Symmetric keyX.509 Self-SignedX.509 CA Signed

Auto-generate keys

☒

Connect this device to an IoT hub

EnableDisable

Parent device

No parent device

Set a parent device

Save

Activate Windows

Go to Settings to activate Windows.

Microsoft Azure

Search resources, services, and docs (G+/I)

Copilot

fan00079@algonquiniv...  
ALGONQUIN COLLEGE

Home > IoT Hub > cst8916finaltothub | Devices >

Create a device

Find Certified for Azure IoT devices in the Device Catalog

Device ID \*

sensor

IoT Edge Device

Authentication type

Symmetric keyX.509 Self-SignedX.509 CA Signed

Auto-generate keys

☒

Connect this device to an IoT hub

EnableDisable

Parent device

No parent device  
Set a parent device

Save

Activate Windows

Go to Settings to activate Windows.

## Create storage for lot

Microsoft Azure

Search resources, services, and docs (G+/I)

Copilot

fan00079@algonquiniv...  
ALGONQUIN COLLEGE

Home > Storage accounts >

Create a storage account

BasicsAdvancedNetworkingData protectionEncryptionTagsReview + create

Azure Storage is a Microsoft-managed service providing cloud storage that is highly available, secure, durable, scalable, and redundant. Azure Storage includes Azure Blobs (objects), Azure Data Lake Storage Gen2, Azure Files, Azure Queues, and Azure Tables. The cost of your storage account depends on the usage and the options you choose below. [Learn more about Azure storage accounts](#)

Project details

Select the subscription in which to create the new storage account. Choose a new or existing resource group to organize and manage your storage account together with other resources.

Subscription \*

Azure for Students

Resource group \*

cst8916final  
Create new

Instance details

Storage account name \*

cst8916finalotstorage

Region \*

(Canada) Canada Central  
Deploy to an Azure Extended Zone

Primary service

Azure Blob Storage or Azure Data Lake Storage Gen 2

Performance \*

☒ Standard: Recommended for most scenarios (general-purpose v2 account)  
☐ Premium: Recommended for scenarios that require low latency.

Redundancy \*

Locally-redundant storage (LRS)

PreviousNextReview + create

Activate Windows

Go to Settings to activate Windows.

Give feedback

## Create iot output container



fan00079@algonquinliv...  
ALGONQUIN COLLEGE



## New container



Name \*

iotoutput



Anonymous access level ⓘ

Private (no anonymous access)



The access level is set to private because anonymous access is disabled on this storage account.

▼ Advanced

Activate Windows

Go to Settings to activate Windows.

Create

Give feedback

## Create stream analytics job

Microsoft Azure

Search resources, services, and docs (G+)

Copilot

fan00079@algonquiniv...  
ALGONQUIN COLLEGE

Home > Stream Analytics jobs >

New Stream Analytics job

BasicsStorageTagsManaged IdentityReview + create

Azure Stream Analytics is a fully managed, SQL-based stream processing engine designed to help you tackle scenarios like streaming ETL to Azure Data Lake Storage, real-time dashboarding with Power BI, event driven applications with Azure SQL DB & Cosmos DB, remote monitoring, predictive maintenance, and more. [Learn more about Azure Stream Analytics](#)

**Project details**

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

Subscription \*

Resource group \*   
[Create new](#)

**Instance details**

Name \*

Region \*

Hosting environment \* ☒ Cloud  
☐ Edge

**Streaming unit details**

Streaming units (SU) represents the computing resources that are allocated to execute a Stream Analytics job. The higher the number of SUs, the more CPU and memory resources are allocated for your job. The number of SUs can be modified once you create the job. You will be charged for the job's Streaming Units only when the job runs. [Learn more about streaming units](#)

All new Stream Analytics jobs created through the portal use Standard V2 pricing. [Visit Stream Analytics's pricing page](#) to

Activate Windows  
Go to Settings to activate Windows.

PreviousNextReview + create

Give feedback

## Create sensor python code

```
sensor1.py > ...
1 import time
2 import random
3 from datetime import datetime, timezone
4 from azure.iot.device import IoTHubDeviceClient, Message
5
6 CONNECTION_STRING = "HostName=cst8916finaliothub.azure-devices.net;DeviceId=sensor1;SharedAccessKey=2zjeT7Sq0ZTI50qIkkMGaZzHGQ0A8Mm0Z3YPQm+8dNg="
7
8 def get_telemetry():
9     return {
10         "location": "Dow's Lake",
11         "iceThickness": random.randint(20, 40), # cm
12         "surfaceTemperature": round(random.uniform(-10, 0), 1), # °C
13         "snowAccumulation": random.randint(0, 15), # cm
14         "externalTemperature": round(random.uniform(-15, 5), 1), # °C
15         "timestamp": datetime.now(timezone.utc).isoformat()
16     }
17
18 def main():
19     client = IoTHubDeviceClient.create_from_connection_string(CONNECTION_STRING)
20
21     print("Sending telemetry to IoT Hub...")
22     try:
23         while True:
24             telemetry = get_telemetry()
25             message = Message(str(telemetry))
26             client.send_message(message)
27             print(f"Sent message: {message}")
28             time.sleep(10)
29     except KeyboardInterrupt:
30         print("Stopped sending messages.")
31     finally:
32         client.disconnect()
33
34 if __name__ == "__main__":
35     main()
```

```

sensor2.py > main
1 import time
2 import random
3 from datetime import datetime, timezone
4 from azure.iot.device import IoTHubDeviceClient, Message
5
6 CONNECTION_STRING = "HostName=cst8916finaliothub.azure-devices.net;DeviceId=sensor2;SharedAccessKey=NeQr8fVvhRdEa5+B2NQ5zX3QkQw3GbbahZrN8yMTTS8="
7
8 def get_telemetry():
9     return {
10         "location": "Fifth Avenue",
11         "iceThickness": random.randint(20, 40), # cm
12         "surfaceTemperature": round(random.uniform(-10, 0), 1), # °C
13         "snowAccumulation": random.randint(0, 15), # cm
14         "externalTemperature": round(random.uniform(-15, 5), 1), # °C
15         "timestamp": datetime.now(timezone.utc).isoformat()
16     }
17
18 def main():
19     client = IoTHubDeviceClient.create_from_connection_string(CONNECTION_STRING)
20
21     print("Sending telemetry to IoT Hub...")
22     try:
23         while True:
24             telemetry = get_telemetry()
25             message = Message(str(telemetry))
26             client.send_message(message)
27             print(f"Sent message: {message}")
28             time.sleep(10)
29     except KeyboardInterrupt:
30         print("Stopped sending messages.")
31     finally:
32         client.disconnect()
33
34 if __name__ == "__main__":
35     main()

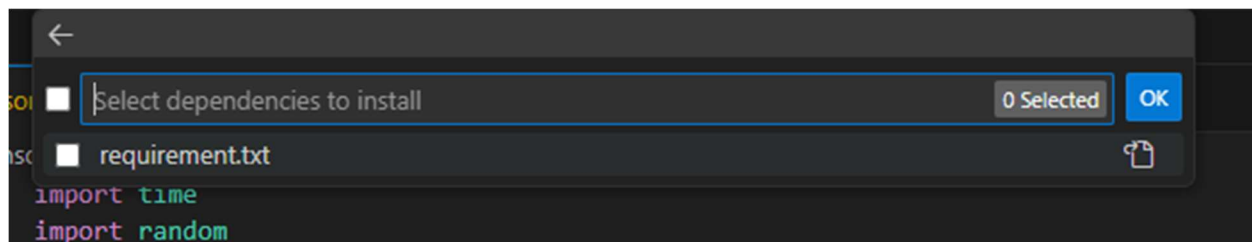
```

```

sensor3.py > ...
1 import time
2 import random
3 from datetime import datetime, timezone
4 from azure.iot.device import IoTHubDeviceClient, Message
5
6 CONNECTION_STRING = "HostName=cst8916finaliothub.azure-devices.net;DeviceId=sensor3;SharedAccessKey=FFjeHcwUPatkn0XhVgUeJvCv5KbaaKqeT0k+iIev+p8-"
7
8 def get_telemetry():
9     return {
10         "location": "NAC",
11         "iceThickness": random.randint(20, 40), # cm
12         "surfaceTemperature": round(random.uniform(-10, 0), 1), # °C
13         "snowAccumulation": random.randint(0, 15), # cm
14         "externalTemperature": round(random.uniform(-15, 5), 1), # °C
15         "timestamp": datetime.now(timezone.utc).isoformat()
16     }
17
18 def main():
19     client = IoTHubDeviceClient.create_from_connection_string(CONNECTION_STRING)
20
21     print("Sending telemetry to IoT Hub...")
22     try:
23         while True:
24             telemetry = get_telemetry()
25             message = Message(str(telemetry))
26             client.send_message(message)
27             print(f"Sent message: {message}")
28             time.sleep(10)
29     except KeyboardInterrupt:
30         print("Stopped sending messages.")
31     finally:
32         client.disconnect()
33
34 if __name__ == "__main__":
35     main()

```

## Create Python Environment



## Run example output

```
(.venv) nealfan@DESKTOP-08GRR53:~/CST8916Final$ python sensor1.py
Sending telemetry to IoT Hub...
Sent message: {'location': 'Dow's Lake', 'iceThickness': 33, 'surfaceTemperature': -0.5, 'snowAccumulation': 3, 'externalTemperature': -6.2, 'timestamp': '2025-04-14T21:46:45.238751+00:00'}
Sent message: {'location': 'Dow's Lake', 'iceThickness': 28, 'surfaceTemperature': -6.8, 'snowAccumulation': 10, 'externalTemperature': -7.4, 'timestamp': '2025-04-14T21:46:55.796148+00:00'}
Sent message: {'location': 'Dow's Lake', 'iceThickness': 34, 'surfaceTemperature': -3.2, 'snowAccumulation': 4, 'externalTemperature': -12.5, 'timestamp': '2025-04-14T21:47:05.938535+00:00'}
Sent message: {'location': 'Dow's Lake', 'iceThickness': 23, 'surfaceTemperature': -0.3, 'snowAccumulation': 14, 'externalTemperature': -11.5, 'timestamp': '2025-04-14T21:47:16.069183+00:00'}
}
Sent message: {'location': 'Dow's Lake', 'iceThickness': 35, 'surfaceTemperature': -4.9, 'snowAccumulation': 11, 'externalTemperature': -7.9, 'timestamp': '2025-04-14T21:47:26.228971+00:00'}
Sent message: {'location': 'Dow's Lake', 'iceThickness': 27, 'surfaceTemperature': -5.6, 'snowAccumulation': 2, 'externalTemperature': -1.8, 'timestamp': '2025-04-14T21:47:36.369578+00:00'}
}

(.venv) nealfan@DESKTOP-08GRR53:~/CST8916Final$ python sensor2.py
Sending telemetry to IoT Hub...
Sent message: {'location': 'Fifth Avenue', 'iceThickness': 29, 'surfaceTemperature': -5.9, 'snowAccumulation': 11, 'externalTemperature': -11.0, 'timestamp': '2025-04-14T21:48:10.417283+00:00'}
Sent message: {'location': 'Fifth Avenue', 'iceThickness': 38, 'surfaceTemperature': -3.3, 'snowAccumulation': 13, 'externalTemperature': -2.6, 'timestamp': '2025-04-14T21:48:20.946072+00:00'}
Sent message: {'location': 'Fifth Avenue', 'iceThickness': 28, 'surfaceTemperature': -8.0, 'snowAccumulation': 11, 'externalTemperature': -13.1, 'timestamp': '2025-04-14T21:48:31.099395+00:00'}
Sent message: {'location': 'Fifth Avenue', 'iceThickness': 38, 'surfaceTemperature': -2.9, 'snowAccumulation': 3, 'externalTemperature': -7.3, 'timestamp': '2025-04-14T21:48:41.240431+00:00'}
}

(.venv) nealfan@DESKTOP-08GRR53:~/CST8916Final$ python sensor3.py
Sending telemetry to IoT Hub...
Sent message: {'location': 'NAC', 'iceThickness': 33, 'surfaceTemperature': -9.1, 'snowAccumulation': 11, 'externalTemperature': -4.4, 'timestamp': '2025-04-14T21:49:03.453889+00:00'}
Sent message: {'location': 'NAC', 'iceThickness': 34, 'surfaceTemperature': -5.3, 'snowAccumulation': 0, 'externalTemperature': -1.5, 'timestamp': '2025-04-14T21:49:14.044801+00:00'}
Sent message: {'location': 'NAC', 'iceThickness': 40, 'surfaceTemperature': -2.8, 'snowAccumulation': 10, 'externalTemperature': -9.6, 'timestamp': '2025-04-14T21:49:24.176088+00:00'}
Sent message: {'location': 'NAC', 'iceThickness': 25, 'surfaceTemperature': -7.0, 'snowAccumulation': 4, 'externalTemperature': -2.5, 'timestamp': '2025-04-14T21:49:34.318763+00:00'}
Sent message: {'location': 'NAC', 'iceThickness': 32, 'surfaceTemperature': -2.9, 'snowAccumulation': 9, 'externalTemperature': -12.6, 'timestamp': '2025-04-14T21:49:44.471344+00:00'}
Sent message: {'location': 'NAC', 'iceThickness': 30, 'surfaceTemperature': -0.0, 'snowAccumulation': 3, 'externalTemperature': 3.7, 'timestamp': '2025-04-14T21:49:54.608247+00:00'}
Sent message: {'location': 'NAC', 'iceThickness': 31, 'surfaceTemperature': -3.6, 'snowAccumulation': 9, 'externalTemperature': -5.5, 'timestamp': '2025-04-14T21:50:04.745450+00:00'}
Sent message: {'location': 'NAC', 'iceThickness': 40, 'surfaceTemperature': -8.9, 'snowAccumulation': 11, 'externalTemperature': -6.1, 'timestamp': '2025-04-14T21:50:14.890221+00:00'}
Sent message: {'location': 'NAC', 'iceThickness': 39, 'surfaceTemperature': -0.1, 'snowAccumulation': 9, 'externalTemperature': 3.8, 'timestamp': '2025-04-14T21:50:25.018172+00:00'}
}
```

## Create stream analytics job input

# IoT Hub



New input

Input alias \*

iotinput ✓

- ☐ Provide IoT Hub settings manually
- ☒ Select IoT Hub from your subscriptions

Subscription

Azure for Students ✓

IoT Hub \* ⓘ

cst8916finallohub ✓

Consumer group \* ⓘ

\$Default ✓

Shared access policy name \* ⓘ

iohubowner ✓

Shared access policy key ⓘ

.....

Endpoint ⓘ

Messaging ✓

Partition key ⓘ

Event serialization format \* ⓘ

JSON ✓

Encoding ⓘ

UTF-8 ✓

Activate Windows  
Go to Settings to activate Windows.

Save



Create stream analytics job output

## Blob storage/ADLS Gen2



New output

Output alias \*

iotoutput



- ☐ Provide Blob storage/ADLS Gen2 settings manually
- ☒ Select Blob storage/ADLS Gen2 from your subscriptions

Subscription

Azure for Students



Storage account \*

cst8916finalotstorage



Container \* ⓘ

- ☐ Create new ☒ Use existing

iotoutput



Authentication mode

Connection string



Storage account key ⓘ

.....

Event serialization format \* ⓘ

JSON



Format ⓘ

Line separated



Encoding ⓘ

UTF-8



Write mode \* ⓘ

- ☐ Once, when all results for the time partition are available.

Save

Activate Windows.  
Go to Settings to activate Windows.

## Query

```
Test query Save query Discard changes

1 SELECT
2     location AS Location,
3     AVG(CAST(iceThickness AS float)) AS AvgIceThickness,
4     MAX(CAST(snowAccumulation AS float)) AS MaxSnowAccumulation,
5     System.Timestamp AS EventTime
6 INTO
7     [iotoutput]
8 FROM
9     [iotinput]
10 GROUP BY
11     location, TumblingWindow(minute, 5)
```

## Start stream analytics job

The screenshot shows the Microsoft Azure portal interface. The main pane displays the 'cst8916finalprocessjob' Stream Analytics job. The 'Overview' tab is selected, showing job details such as Resource group (cst8916final), Location (Canada Central), Status (Created), Subscription (Azure for Students), Subscription ID (e7ea1011-59fc-41b7-b54c-a8a448512f82), and Pricing plan (StandardV2). The 'Properties' tab is also visible, showing inputs (1) and outputs (1). On the right, the 'Start job' dialog is open, displaying a warning message: 'You have not configured the diagnostic settings for this job yet. Add diagnostic settings in the diagnostic settings pane.' Below the warning, the 'Streaming units' are set to 1, and the 'Environment' is set to Standard. The 'Job output start time' is set to 'Now'. The 'Start' button is visible at the bottom of the dialog.

cst8916finalprocessjob

Stream Analytics job

Search

Stop job Delete Move Refresh Share feedback

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Resource visualizer

Job topology

Inputs

Functions

Query

Outputs

No-code editor (preview)

Settings

Developer tools

Monitoring

Automation

Help

Running

Essentials

Resource group

cst8916final

Location

Canada Central

Status

Running

Subscription

Azure for Students

Subscription ID

e7ea1011-59fc-41b7-b54c-aba448512f82

Pricing plan

StandardV2 (manage)

Tags

Add tags

Created

Monday, April 14, 2025 5:20 PM

Started

Monday, April 14, 2025 6:01 PM

Output watermark

:

Cluster

Shared

Hosting environment

Cloud

Virtual Network

Disabled

JSON View

Get started Properties Monitoring Tutorials

Troubleshooting

Errors and warnings

No recent errors and warnings



Job diagram (preview)

Visualize job parallelism and gain insights into job performance



View all activity logs

View all the errors, warnings and operation logs.



Enable diagnostics

Turning on diagnostic settings to Log Analytics will allow you to easily troubleshoot any errors your job may encounter.

Key metrics See all metrics

Show data for : Last 1 hour

Resource utilization



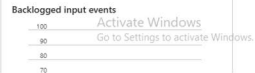
Events count



Watermark delay



Backlogged input events



Add or remove favorites by pressing Ctrl+L+Shift+F+F