



PSI3541 2023

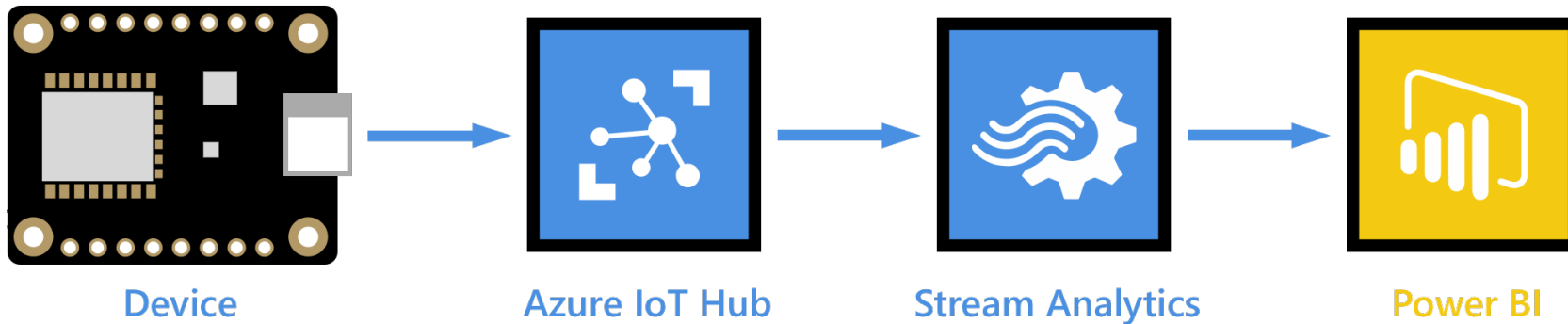
SISTEMAS EMBARCADOS DISTRIBUIDOS

AULA 13 23/05/2023

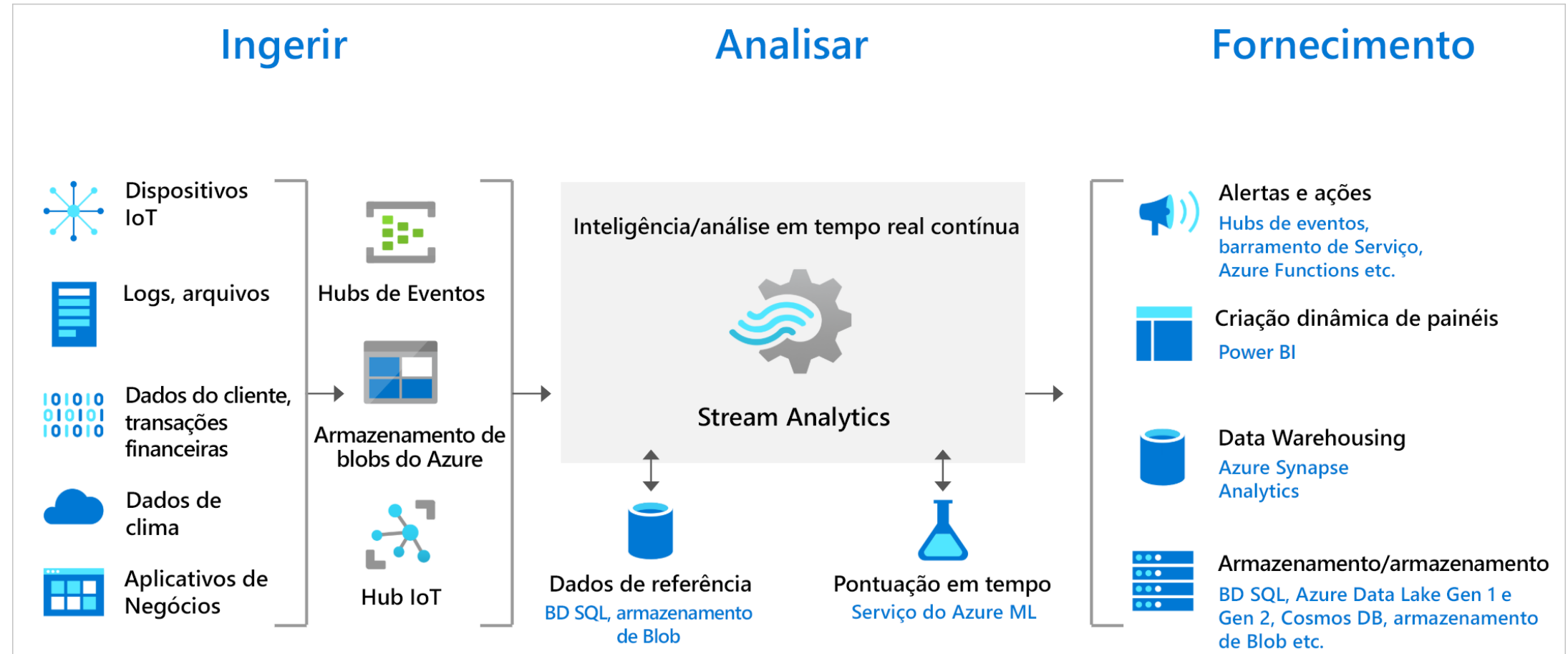
ATIVIDADE 11 IOTHUB MICROSOFTSQL POWERBI

PROF. SERGIO TAKEO KOFUJI - KOFUJI@USP.BR

Visualizar dados de sensor em tempo real do Hub IoT usando o Power BI



STREAM ANALYTICS



ETAPAS

- CRIAR UMA CONTA GRATUITA NO POWERBI.
- CRIAR UM WORKSPACE NO POWERBI
- CRIAR UM IOTHUB no AZURECLOUD
- CRIAR UM DISPOSITIVO
- EXECUTAR O RASPBERRY PI SIMULATOR
- CRIAR UM STREAM ANALYTICS JOB
- CRIAR UM DASHBOARD NO POWERBI

CONTA NO POWERBI

POWERBI: ROTEIRO

- Se voce não tiver a conta corporativa da USP (entre no site www.office.com), siga os passos abaixo:
 - https://www.hashtagtreinamentos.com/conta-gratuita-no-power-bi?gad=1&gclid=CjwKCAjw67ajBhAVEiwA2g_jEG9_97STmcT5BFY226HkjZxAwdAueKKRICQMCjQSI0TP1sg6hw3MhRoCtBcQAvD_BwE
- Crie um Workspace no PowerBI atividade1323052023

<https://powerbi.microsoft.com/pt-br/>

Transforme os dados em impacto imediato

Faça mais com menos usando uma plataforma de BI de ponta a ponta para criar uma única fonte de verdade, obter insights mais poderosos e transformá-los em impacto.

Comece gratuitamente >

Já tem uma conta? **Entrar >**



Criar um Workspace

Power BI Home

Trial 59 days left Search

+ New report

Favorites + frequents

My workspace 81151 atividade13

Recent Favorites My apps

Name	Type	Opened	Location
atividade13	Dashboard	46 minutes ago	81151
81151	Workspace	52 minutes ago	Workspaces
Dashboard Usage Metrics Report	Report	8 hours ago	81151
My workspace	Workspace	10 hours ago	Workspaces
Report Usage Metrics Report	Report	11 months ago	My workspace

Create a workspace

Workspace image

Workspace name *

atividade13_81151

Available

Description

Describe this workspace

[Learn more about workspace settings](#)

Advanced

Save Cancel

Criar um IoT hub

Entre no Portal Azure Cloud. Crie um novo Recurso IoT hub

Microsoft Azure stkofuji@gmail.com DEFAULT DIRECTORY

Home > Create a resource >

IoT hub

Microsoft

Basics Networking Management Add-ons Tags Review + create

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 *

Resource group * [Create new](#)

Instance details

IoT hub name *

Region *

Tier * [Compare tiers](#)




Daily message limit * [See all options](#)

[Review + create](#) [< Previous](#) [Next: Networking >](#)






Configurar o IoT hub





Microsoft Azure


Home >


 **iothubatividade1381151-522201247** | Overview  


Deployment

<<  Delete  Cancel  Redeploy  Download  Refresh

-  Overview
-  Inputs
-  Outputs
-  Template

 **Your deployment is complete**

 Deployment name: [iothubatividade1381151-522201247](#)
Subscription: [Azure for Students](#)
Resource group: [psi3541atividade1381151](#)

Start time: 5/22/2023, 8:13:11 PM
Correlation ID: [fa50045e-920c-43ed-8534-7a822ce9d077](#) 

∨ Deployment details

∧ Next steps

- [Add and configure IoT Devices](#) Recommended
- [Configure routing rules for device messaging](#) Recommended

[Go to resource](#)

Página do IoT Hub

The screenshot shows the Microsoft Azure portal interface for an IoT Hub. At the top, there's a navigation bar with the Microsoft Azure logo, a search bar, and user information (stkofuji@gmail.com). Below the navigation bar, the breadcrumb trail reads 'Home > iothubatividade1381151-522201247 | Overview >'. The main header displays the IoT Hub name 'iothubatividade1381151' with a search icon, a star, and a close button. A search bar and action buttons (Move, Delete, Refresh, Feedback) are located below the header.

The left sidebar contains a navigation menu with categories: Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Events, Device management (Devices, IoT Edge, Configurations + Deployments, Updates, Queries), Hub settings (Built-in endpoints, Message routing, File upload, Failover, Pricing and scale, Properties, Locks), and Security settings (Identity, Shared access policies).

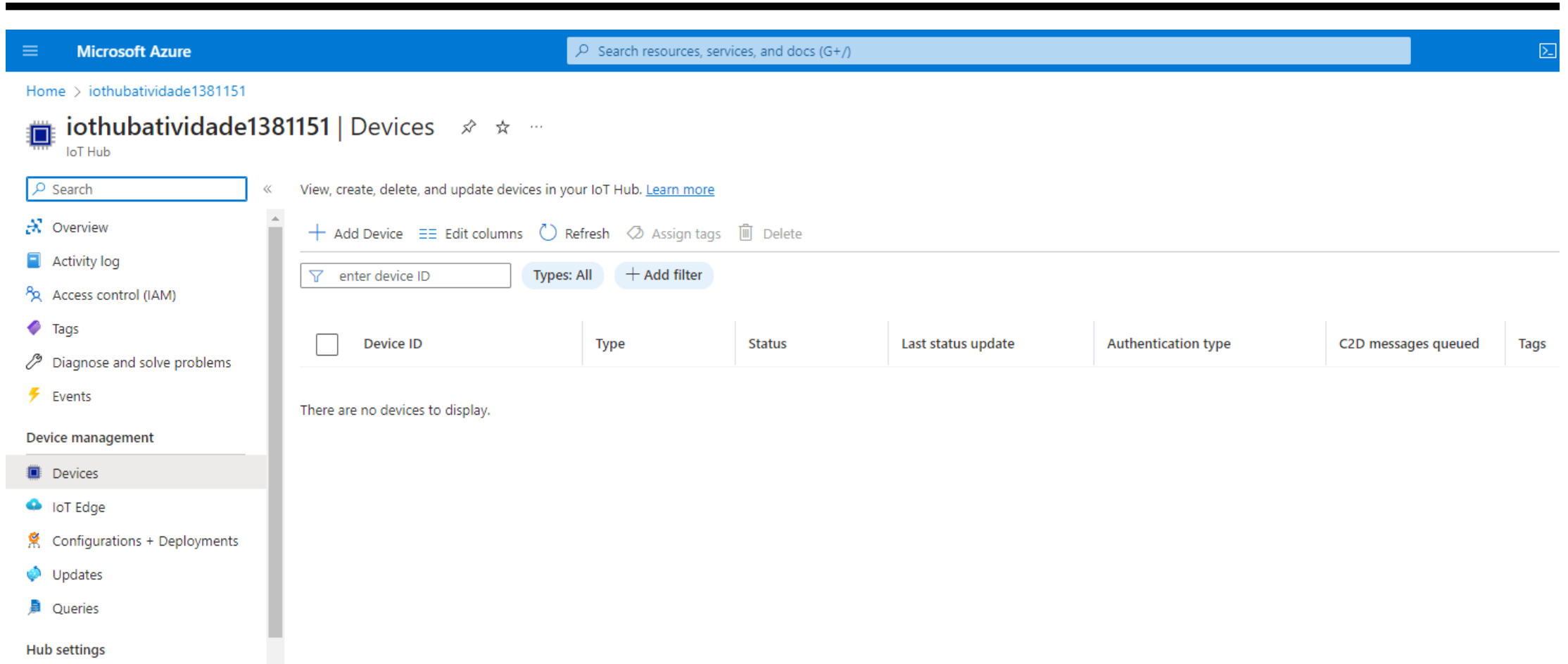
The main content area features a warning banner: 'This resource uses a certificate on the Baltimore CyberTrust Root which will expire in 2025 and must be updated to the DigiCert Global G2 root. What do I need to do?'. Below this is the 'Essentials' section, which includes a 'JSON View' link and a table of key properties:

Resource group (move)	: psi3541atividade1381151	Hostname	: iothubatividade1381151.azure-devices.net
Status	: Active	Tier	: Standard
Location	: East US	Daily message limit	: 400,000
Service region	: East US	Minimum TLS Version	: 1.0
Subscription (move)	: Azure for Students		
Tags (edit)	: Click here to add tags		

Below the Essentials section is the 'Usage' section, which includes a 'Get started' link and a 'Show data for last:' filter set to '1 Day'. The usage section contains three panels:

- IoT Hub Usage**: A summary box showing 'Messages used today: 0', 'Daily messages quota: 400000', and 'IoT Devices: 0'.
- Number of messages used**: A line chart showing message usage over time, with the y-axis ranging from 0 to 100 and the x-axis showing 'May 22' with markers for 6 AM and 12 PM UTC-03:00.
- Device to cloud messages**: A line chart showing device-to-cloud message usage over time, with the y-axis ranging from 0 to 100 and the x-axis showing 'May 22' with markers for 6 AM and 12 PM UTC-03:00.

Adicionar um Dispostivo



Microsoft Azure

Search resources, services, and docs (G+)

Home > iothubatividade1381151

iothubatividade1381151 | Devices IoT Hub

Search

View, create, delete, and update devices in your IoT Hub. [Learn more](#)

+ Add Device Edit columns Refresh Assign tags Delete

enter device ID Types: All + Add filter

Device ID	Type	Status	Last status update	Authentication type	C2D messages queued	Tags
There are no devices to display.						

Criar um Dispositivo

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

Home > iotubatividade1381151 | Devices >

Create a device

[Find Certified for Azure IoT devices in the Device Catalog](#)

Device ID *

IoT Edge Device

Authentication type Symmetric key X.509 Self-Signed X.509 CA Signed

Auto-generate keys

Connect this device to an IoT hub Enable Disable

Parent device **No parent device**
[Set a parent device](#)

Conectar um Dispositivo

Microsoft Azure

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

Home > iothubatividade1381151

iothubatividade1381151 | Devices

IoT Hub

Search

View, create, delete, and update devices in your IoT Hub. [Learn more](#)

+ Add Device Edit columns Refresh Assign tags Delete

enter device ID Types: All + Add filter

<input type="checkbox"/>	Device ID	Type	Status	Last status update	Authentication type	C2D messag
<input type="checkbox"/>	iotdevice_atividade13_81151	IoT Device	Enabled	--	Shared Access Signature	0

Device management

- Devices
- IoT Edge
- Configurations + Deployments
- Updates
- Queries

Hub settings

Conectar um Dispositivo

Copiar o Primary connection string

Microsoft Azure

Search resources, services, and docs (G+)

Home > iothubatividade1381151 | Devices >

iotdevice_atividade13_81151

iothubatividade1381151

Save Message to Device Direct method Add Module Identity Device twin Refresh

Device ID

Primary key

Secondary key

Primary connection string **copiar**

Secondary connection string

Tags [\(edit\)](#) No tags

Enable connection to IoT Hub Enable Disable

Parent device

Module Identities [Configurations](#)

Module ID	Connection State	Connection State Last Updated ...	Last Activity Time (UTC)
There are no module identities for this device.			

Criar um Consumer Group

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

Home > iothubatividade1381151

iothubatividade1381151 | Built-in endpoints

Search Save Undo

Each IoT hub comes with built-in system endpoints to handle system and device messages. When you create new endpoints and routes, messages stop flowing to the built-in endpoint unless

Event Hub Details

Partitions 4

Event Hub-compatible name iothubatividade1381151

Retain for 1 Days

Consumer Groups

Consumer Groups

\$Default

consumergroup_atividade13_81151

Create new consumer group

Event Hub compatible endpoint

Only policies that allow service connect permissions can be selected. These permissions are applied to the built-in endpoint.

Shared access policy iothubowner

Event Hub-compatible endpoint Endpoint=sbj//iothub-ns-iothubativ-25043423-96fd06ae1d.servicebus.windows.net;/SharedAccessKeyName=iothubowner;SharedA...

Cloud to device messaging

Simulador Raspberry Pi

Executar o simulador online

<https://azure-samples.github.io/raspberry-pi-web-simulator/>

Raspberry Pi Azure IoT Online Simulator

Help English

```
1 /*
2  * IoT Hub Raspberry Pi NodeJS - Microsoft Sample Code - Copyright (c) 2017 - Licensed MIT
3  */
4  const wpi = require('wiring-pi');
5  const Client = require('azure-iot-device').Client;
6  const Message = require('azure-iot-device').Message;
7  const Protocol = require('azure-iot-device-mqtt').Mqtt;
8  const BME280 = require('bme280-sensor');
9
10 const BME280_OPTION = {
11   i2cBusNo: 1, // defaults to 1
12   i2cAddress: BME280.BME280_DEFAULT_I2C_ADDRESS() // defaults to 0x77
13 };
14
15 const connectionString = 'HostName=iotechatividade1381151.azure-devices.net;DeviceId=iotechatividade1381151;SharedAccessKey=40f';
16 const LEDPin = 4;
17
18 var sendingMessage = false;
19 var messageId = 0;
20 var client, sensor;
21 var blinkLEDTIMEOUT = null;
22
23 function getMessage(cb) {
24   messageId++;
25   sensor.readSensorData()
26     .then(function (data) {
27       cb(JSON.stringify({
28         messageId: messageId,
29         deviceId: 'Raspberry Pi Web Client',
30         temperature: data.temperature_C,
31         humidity: data.humidity
32       }));
33     })
34     .catch(function (err) {
35       console.error('Failed to read out sensor data: ' + err);
36     });
37 }
38
39 function sendMessage() {
40   if (!sendingMessage) { return; }
41   getMessage(function (content, temperatureAlert) {
42     // ...
43   });
44 }
45
46 Run Reset
```

substituir

executar

fritzing

Verificar no IoT Hub a recepção das mensagens de telemetria

Microsoft Azure

Search resources, services, and docs (G+)

stkofuji@gmail.com
DEFAULT DIRECTORY

Home > iothubatividade1381151-522201247 | Overview >

iohubatividade1381151
IoT Hub

Search

Move Delete Refresh Feedback

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Events

Device management

Devices

IoT Edge

Configurations + Deployments

Updates

Queries

Hub settings

Built-in endpoints

Message routing

File upload

Failover

Pricing and scale

Properties

Locks

Security settings

Identity

Shared access policies

This resource uses a certificate on the Baltimore CyberTrust Root which will expire in 2025 and must be updated to the DigiCert Global G2 root. [What do I need to do?](#)

Essentials

Resource group (move): [psi3541atividade1381151](#)

Status: Active

Location: East US

Service region: East US

Subscription (move): [Azure for Students](#)

Tags (edit): [Click here to add tags](#)

See more

Hostname: iothubatividade1381151.azure-devices.net

Tier: Standard

Daily message limit: [400,000](#)

Minimum TLS Version: 1.0

JSON View

Usage Get started

Show data for last: 1 Hour 6 Hours 12 Hours 1 Day 7 Days 30 Days

IoT Hub Usage

- Messages used today: 0
- Daily messages quota: 400000
- IoT Devices: 0

Number of messages used

Device to cloud messages

Criar um Stream Analytic Job

Criar PowerBIVisualizationJob

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

Home > Stream Analytics job >

New Stream Analytics job

Basics Storage Tags Review + 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.

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 (SUs) 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](#)

Streaming units *

[Review + create](#) [< Previous](#) [Next : Storage >](#)

Configurar a Entrada – IoT Hub

The screenshot shows the Microsoft Azure portal interface. At the top, the navigation bar includes the Microsoft Azure logo and a search bar. Below the navigation bar, the breadcrumb trail reads: Home > CreateForm-20230522214528 | Overview > powerbi_atividade13_81151. The main heading is "powerbi_atividade13_81151 | Inputs" with a star icon and a menu icon. Below the heading, it says "Stream Analytics job".

On the left side, there is a navigation pane with the following sections:

- Overview
- Activity log
- Access control (IAM)
- Tags
- Diagnose and solve problems
- Job topology
 - Inputs (highlighted)
 - Functions
 - Query
 - Outputs
- Settings
 - Environment
 - Storage account settings
 - Scale
 - Locale
 - Event ordering
 - Error policy
 - Compatibility level
 - Managed Identity
 - Properties
 - Locks
- Developer tools
 - Visual Studio Code

In the main content area, there is a search bar and a "Refresh" button. Below these, there is a "Stream input" section with a table. The table has three columns: "Source type", "Type", and "Authentication mode". The "IoT Hub" option is highlighted with a red arrow pointing to it.

Source type	Type	Authentication mode
Blob storage/ADLS Gen2		
Event Hub		
IoT Hub		

Below the "Stream input" section, there is a "Reference input" section with a table. The table has three columns: "Source type", "Type", and "Authentication mode". The "SQL Database" option is highlighted.

Source type	Type	Authentication mode
Blob storage/ADLS Gen2		
SQL Database		

Configurar a Entrada...

The screenshot shows the Microsoft Azure portal interface for configuring a new IoT Hub input. The main area displays a table with columns for Alias, Source type, Type, Authentication mode, and Resource. A blue box with the text "PowerBIVisualizationInput" has a red arrow pointing to the "Input alias" field in the "New input" configuration panel on the right. The configuration panel includes fields for Input alias, Subscription, IoT Hub, Consumer group, Shared access policy name, Shared access policy key, Endpoint, Partition key, Event serialization format, Encoding, and Event compression type. The "Save" button is highlighted with a red box.

Microsoft Azure

Home > CreateForm-20230522214528 | Overview > powerbi_atividade13_81151

powerbi_atividade13_81151 | Inputs

Stream Analytics job

Search

+ Add input Refresh

Alias ↑	Source type	Type	Authentication mode	Resource
---------	-------------	------	---------------------	----------

PowerBIVisualizationInput

IoT Hub

New input

Input alias *
PowerBIVisualizationInput ✓

Provide IoT Hub settings manually
 Select IoT Hub from your subscriptions

Subscription
Azure for Students

IoT Hub *
iohubatividade1381151

Consumer group *
\$Default

Shared access policy name *
iohubowner

Shared access policy key

Endpoint
Messaging

Partition key

Event serialization format *
JSON

Encoding
UTF-8

Event compression type

Save

Salvar e esperar a
conclusão do teste

Configurar a Saída - PowerBI

The screenshot shows the Microsoft Azure portal interface. At the top, there is a blue header with the Microsoft Azure logo and a search bar. Below the header, the breadcrumb navigation shows: Home > CreateForm-20230522214528 | Overview > powerbi_atividade13_81151. The main content area is titled "powerbi_atividade13_81151 | Outputs" and is identified as a "Stream Analytics job".

On the left side, there is a navigation pane with a search box and several menu items: Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Job topology, Inputs, Functions, Query, Outputs (highlighted), Settings, Environment, Storage account settings, and Scale.

In the center, there is a dropdown menu for "Add output" with a "Refresh" button. The dropdown list includes the following options: Azure Data Explorer (preview), Azure Function, Azure Synapse Analytics, Blob storage/ADLS Gen2, Cosmos DB, Data Lake Storage Gen1, Event Hub, PostgreSQL database, Power BI (highlighted with a red arrow), Service Bus queue, Service Bus topic, SQL Database, and Table storage.

On the right side, there is a table with two columns: "Type" and "Authentication mode". The table is currently empty.

Configurar a Saída...

Microsoft Azure

Home > CreateForm-20230522214528 | Overview > powerbi_atividade13_81151

powerbi_atividade13_81151 | Outputs

Stream Analytics job

Search

+ Add output Refresh

Alias 1	Type	Authentication mode	Re

PowerBIVisualizationOutput

Power BI
New output

Output alias *
PowerBIVisualizationOutput ✓

Provide Power BI settings manually
 Select Power BI from your subscriptions

Group workspace
Failed to load your Power BI workspaces. Unknown error.

Authentication mode
User token

Failed to load powerBI workspaces, please try the following troubleshooting steps.

1. Confirm that you are signing into the portal and powerBI with the same user, in the same tenant.
2. If you only have the default workspace for powerBI please create a workspace with a name relevant to your business reports and usages.
3. Try to use Power BI Premium Per User (PPU) license then connect Azure stream analytics to Power BI.

Dataset name *
dataset_atividade13_81151 ✓

Table name *
table_atividade12_81151 ✓

Authorize connection
You'll need to authorize with Power BI to configure your output settings.

Authorize

Save

Se as contas do PowerBi e Azure Cloud forem as mesmas (@usp.br), então o workspace criado no PowerBI deve aparecer no Group Workspace. Caso contrário, configurar manualmente o PowerBI, inserindo o Workspace ID.

Salvar e esperar a conclusão do teste

Configurar a Consulta

PowerBIVisualizationJob | Query ☆ ...
Stream Analytics job

Search

Query language docs Open in VS Code Diagnostic settings Refresh Share feedback

Inputs (1)
PowerBIVisualizationInput

Outputs (1)
PowerBIVisualizationOutput

Functions (0)

Test query Save query Discard changes

```
1 SELECT
2 *
3 INTO
4 PowerBIVisualizationOutput
5 FROM
6 PowerBIVisualizationInput
7 WHERE
8 temperature IS NOT NULL
```

Input preview Test results

While sampling data, no data was received from '4' partitions.

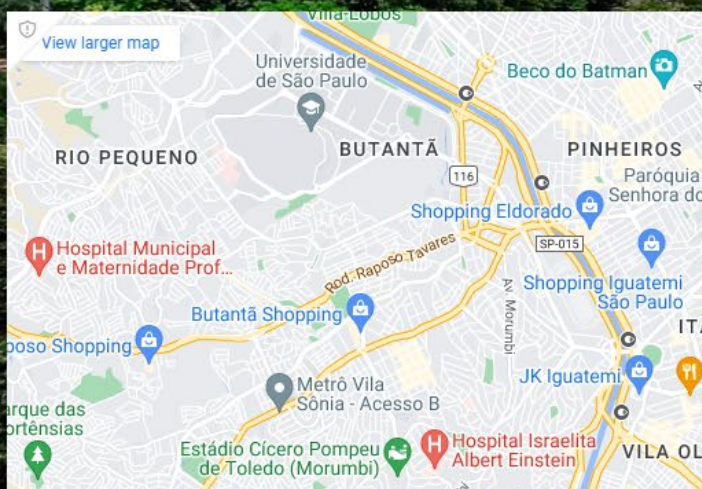
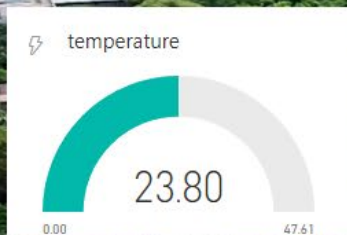
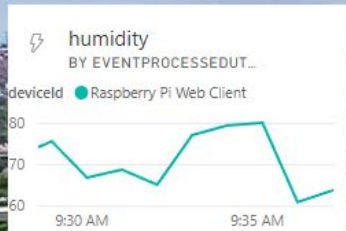
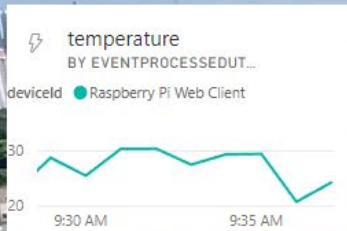
Depois de salvar o query, executar o teste. Verifique o resultado do teste (TEST RESULTS)

Criar um Dashboard no PowerBI

Dashboard no POWERBI

- Verifique no Woskpace anteriormente criado o Data Set criado no Stream Analytics Job
- Criar um Dashboard no Workspace
- Criar visualizações no Dashboard
 - Temperatura
 - Umidade
 - Mapa
 - Etc.

Ask a question about your data



DÚVIDAS?

KOFUJI@USP.BR