National College of Ireland

Configuration Manual

MSc Research Project
MSc in Cyber Security

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National College of Ireland

MSc Project Submission Sheet

School of Computing

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Programme:	Cyber Security **Year:** 2024
Module:	Practicum Part 2
Lecturer:	Michael Prior
Submission Due Date:	12.12.2024
Project Title:	Optimizing IOT Secure data processing and using Azure Edge Computing Solutions
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Signature:	Raju Burolla
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Configuration Manual

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1 Introduction

This configuration manual will walk the user through the steps involved in the deployment and configuration of components for the project "Optimizing IoT Secure Data Processing Using Azure Edge Computing Solutions." The project shall utilize Azure IoT Hub, Azure Edge devices, and complementary tools to provide a secure and efficient edge computing framework for IoT applications. To this end, this document provides reproducibility and helps an implementer set up the solution with minimal errors.

2 Prerequisites

2.1 Hardware Requirements

- Edge device (e.g., Raspberry Pi, virtual machine, or physical server), this project used vitual machine.
- Minimum 4 GB RAM and 40 GB disk space.
- Reliable network connection.

2.2 Software Requirements

- Azure Subscription with access to IoT Hub, Storage Accounts, and Logic Apps.

Azure services

Create a resource | Logic apps | Log Analytics workspaces | Storage accounts | Microsoft Defender for... | Microsoft Defender for... | IoT Assets | Security | IoT Hub | More services

Resources

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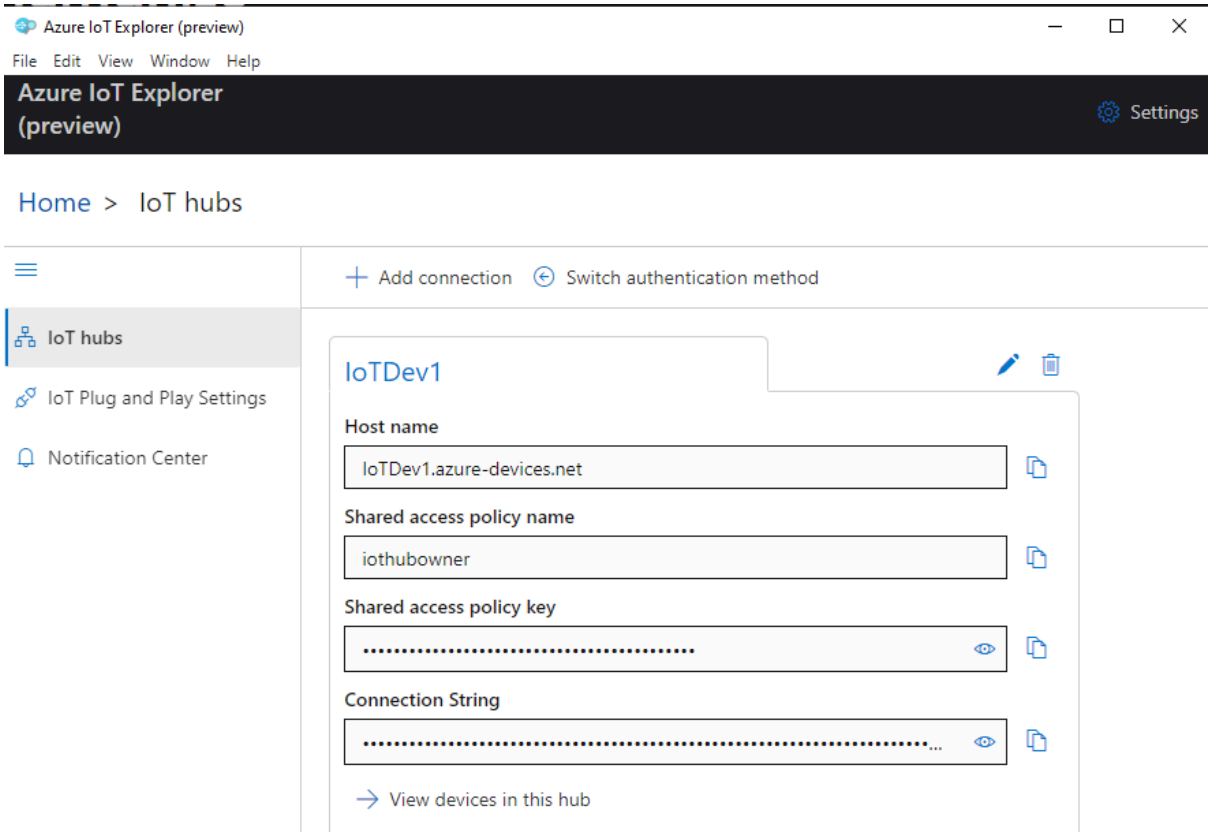
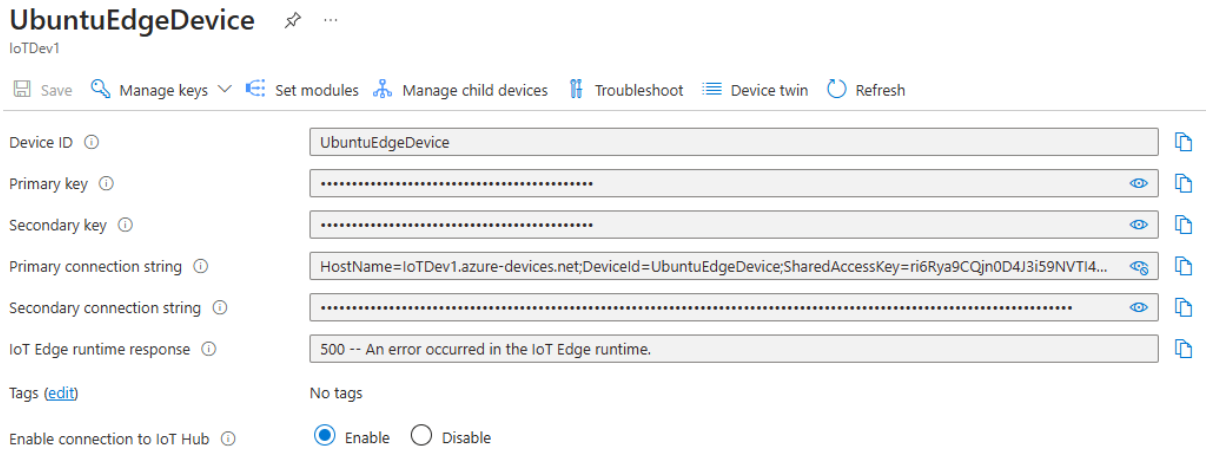
Name	Type	Last Viewed
IoTDev1	IoT Hub	2 days ago
IoTlogicapptest	Logic App (Standard)	2 days ago
EdgeNode_group	Resource group	2 days ago
IoTedgeLogs	Log Analytics workspace	2 days ago
storageaccount050	Storage account	2 days ago
EdgeMachine2	Virtual machine	2 days ago
Hub0	IoT Hub	2 days ago
EdgeMachine2-ip	Public IP address	4 days ago
EdgeMachine2_group	Resource group	4 days ago
EdgeNode-ip	Public IP address	4 days ago
NetworkWatcherRG	Resource group	3 weeks ago

- Docker installed on the edge device.
- Azure CLI and Azure IoT Explorer installed on the administrator's system.



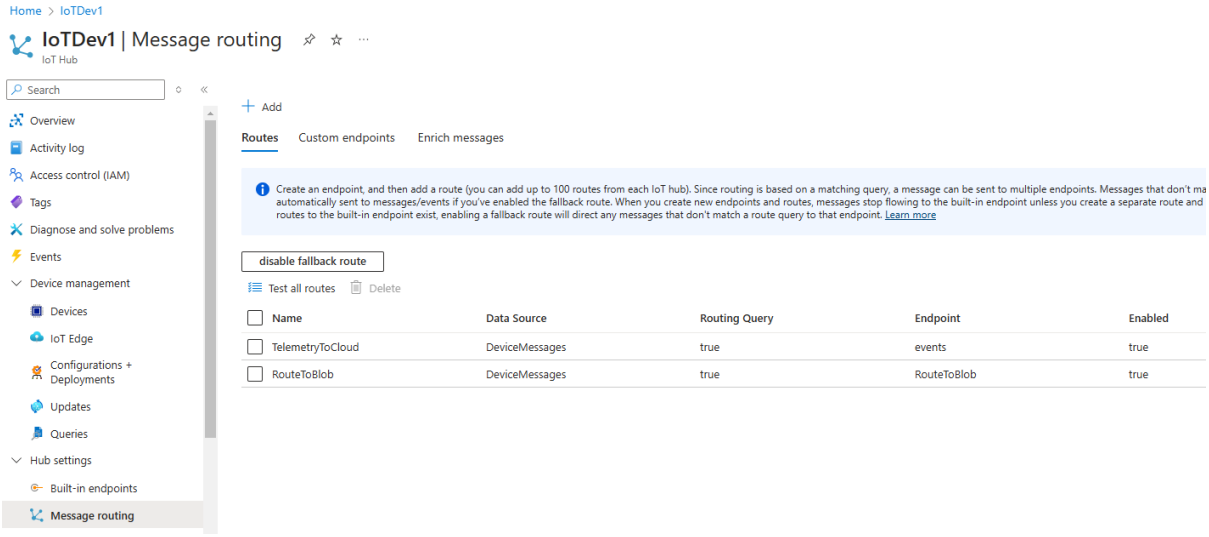
2.3 Credentials

- Azure account credentials.
- IoT Hub connection strings.



3 Setting Up Azure IoT Hub

1. **Create an IoT Hub:**
   - Log in to the Azure portal and create a new IoT Hub.
   - Define a unique name, region, and pricing tier.
2. **Register an Edge Device:**
   - Navigate to the IoT Hub, select "IoT devices," and add a new device with edge capabilities enabled.
   - Note the device connection string for later use.
3. **Add Routes and Endpoints:**
   - Set up routing rules to direct telemetry data to a storage account and other endpoints.



4 Configuring the Edge Device

4.1 Install IoT Edge Runtime:

- Use the Azure IoT Edge installation guide for your specific operating system.
- Verify the runtime installation with `iotedge check` and resolve any warnings or errors.

4.2 Provision the Device:

- Update the `config.yaml` file with the IoT Hub device connection string.
- Configure DNS and storage settings for persistent module operations.

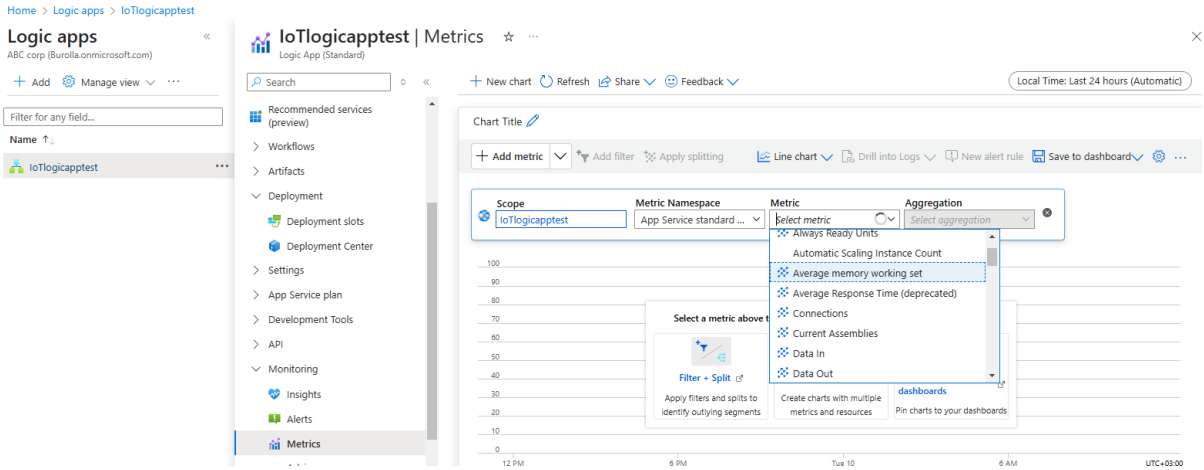
4.3 Deploy Edge Modules:

- Use prebuilt Azure IoT Edge modules for telemetry simulation, edge processing, and security monitoring.
- Configure module routes and environment variables in the IoT Hub deployment JSON file

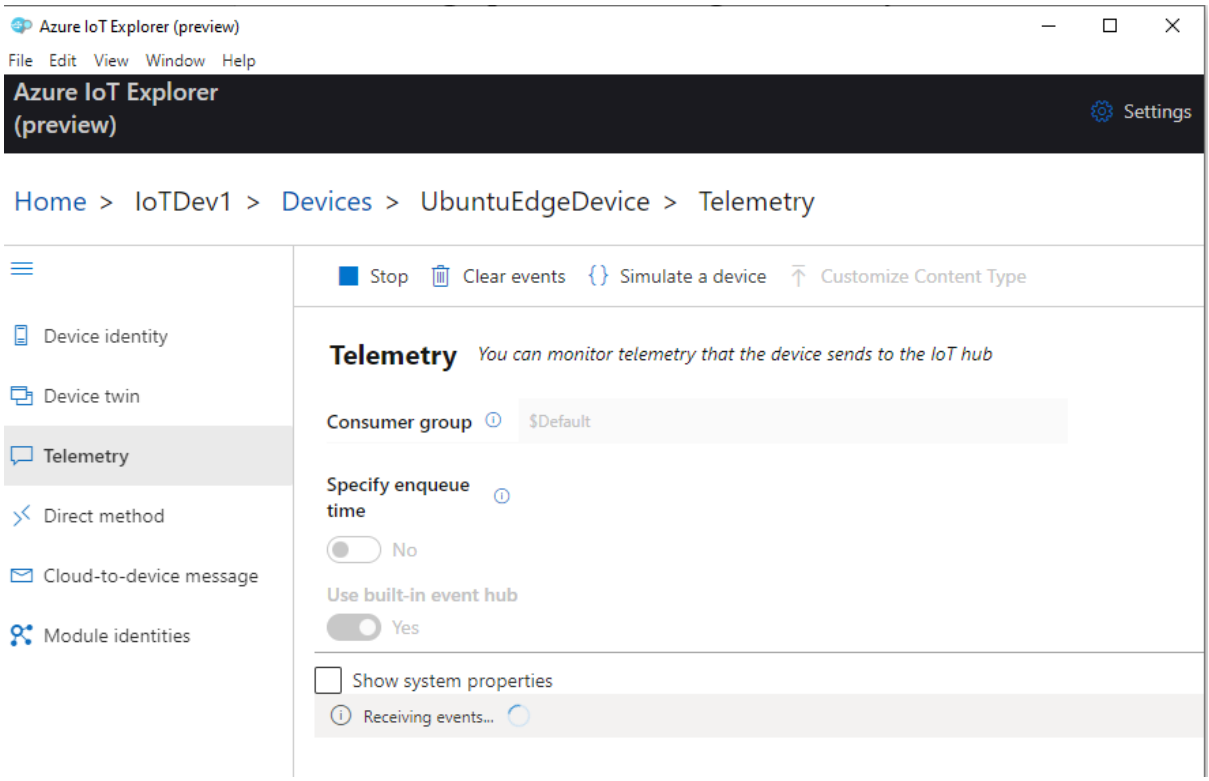
5 Setting Up Data Processing and Security

5.1 Data Ingestion and Routing:

- Ensure telemetry data is routed to Azure Storage and Logic Apps for further analysis.



- Validate data flow using Azure IoT Explorer.



2. **Security Configuration:**
    - Enable Azure Defender for IoT to monitor edge devices for threats.
    - Configure Azure Security Center policies to enforce compliance and log security events.

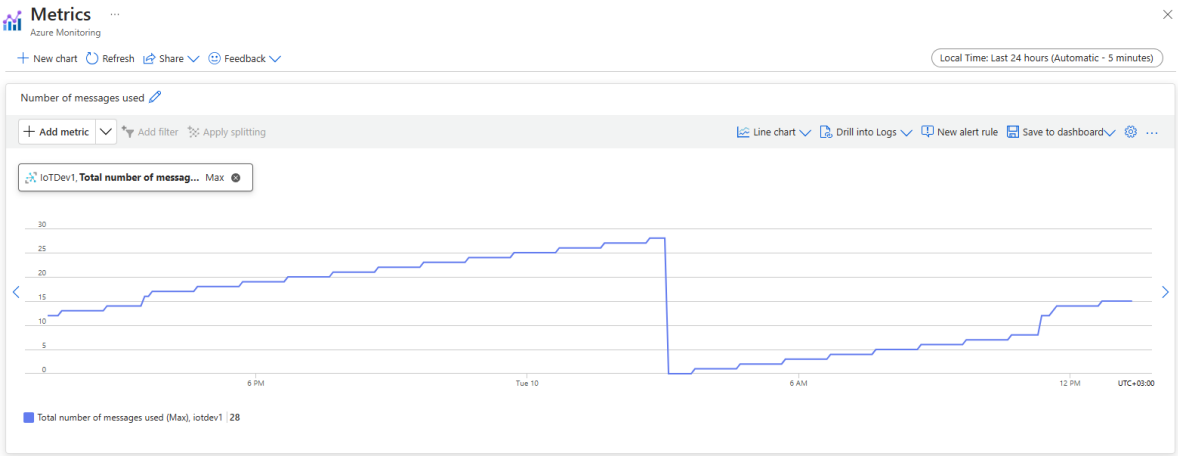
6 Testing and Validation

6.1 Simulate Telemetry Data:

- Use Azure IoT tools to send test messages to IoT Hub.
- Verify that the messages are processed and stored in the configured Azure Storage.

6.2 Performance Metrics:

- Monitor latency, bandwidth usage, and device-to-cloud communication using Azure Monitor.


Metrics
Azure Monitoring
New chart
Refresh
Share
Feedback
Local Time: Last 24 hours (Automatic - 5 minutes)
Number of messages used
Add metric
Add filter
Apply splitting
Line chart
Drill into Logs
New alert rule
Save to dashboard
IoTDev1, Total number of messag... Max
30
25
20
15
10
5
0
6 PM
Tue 10
6 AM
12 PM
UTC+03:00
Total number of messages used (Max), iotdev1 28