

Configuration Manual

MSc Research Project
MSc in Cyber Security

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Practicum Part 2
Module:
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Submission Due Date: 12.12.2024
Project Title: Optimizing IOT Secure data processing and using Azure Edge
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439 6
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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

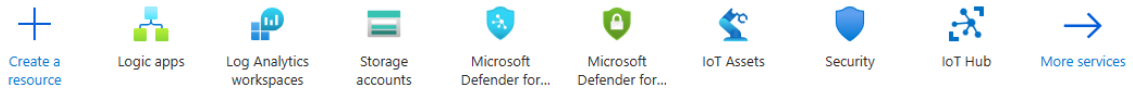
2.1 Hardware Requirements

- Edge device (e.g., Raspberry Pi, virtual machine, or physical server), this project used virtual 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



Resources

Recent Favorite

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
EdgeMachine2-action	Action	3 weeks ago

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

Azure IoT Explorer (preview)

File Edit View Window Help

Azure IoT Explorer (preview) Settings

Home > IoT hubs

IoT hubs

IoT Plug and Play Settings

Notification Center

+ Add connection + Switch authentication method

IoTDev1

Host name

IoTDev1.azure-devices.net

Shared access policy name

iothubowner

Shared access policy key

.....

Connection String

.....

→ View devices in this hub

2.3 Credentials

- Azure account credentials.
- IoT Hub connection strings.

UbuntuEdgeDevice

IoTDev1

Save Manage keys Set modules Manage child devices Troubleshoot Device twin Refresh

Device ID	UbuntuEdgeDevice
Primary key
Secondary key
Primary connection string	HostName=IoTDev1.azure-devices.net;DeviceId=UbuntuEdgeDevice;SharedAccessKey=ri6Rya9CQjn0D4J3i59NVTI4...
Secondary connection string
IoT Edge runtime response	500 -- An error occurred in the IoT Edge runtime.

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

Enable connection to IoT Hub ☒ Enable ☐ Disable

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.

Home > IoTDev1

IoTDev1 | Message routing

IoT Hub

Add

Routes Custom endpoints Enrich messages

Create an endpoint, and then add a route (you can add up to 100 routes from each IoT hub). Since routing is based on a matching query, a message can be sent to multiple endpoints. Messages that don't match a query are automatically sent to messages/events if you've enabled the fallback route. When you create new endpoints and routes, messages stop flowing to the built-in endpoint unless you create a separate route and routes to the built-in endpoint exist, enabling a fallback route will direct any messages that don't match a route query to that endpoint. [Learn more](#)

☐ disable fallback route

Test all routes Delete

<input type="checkbox"/> Name	Data Source	Routing Query	Endpoint	Enabled
<input type="checkbox"/> TelemetryToCloud	DeviceMessages	true	events	true
<input type="checkbox"/> RouteToBlob	DeviceMessages	true	RouteToBlob	true

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.

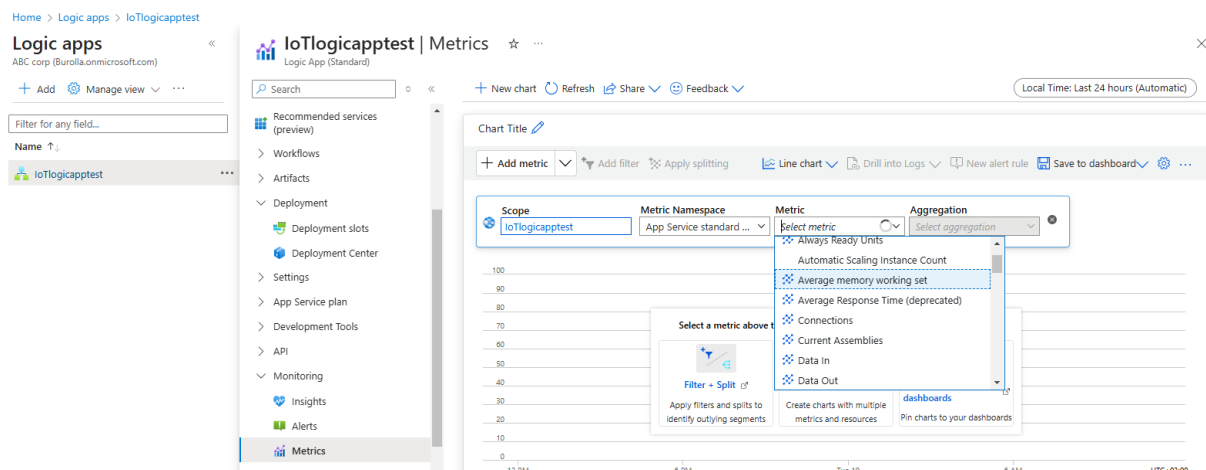
4.3 Deploy Edge Modules:

- 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

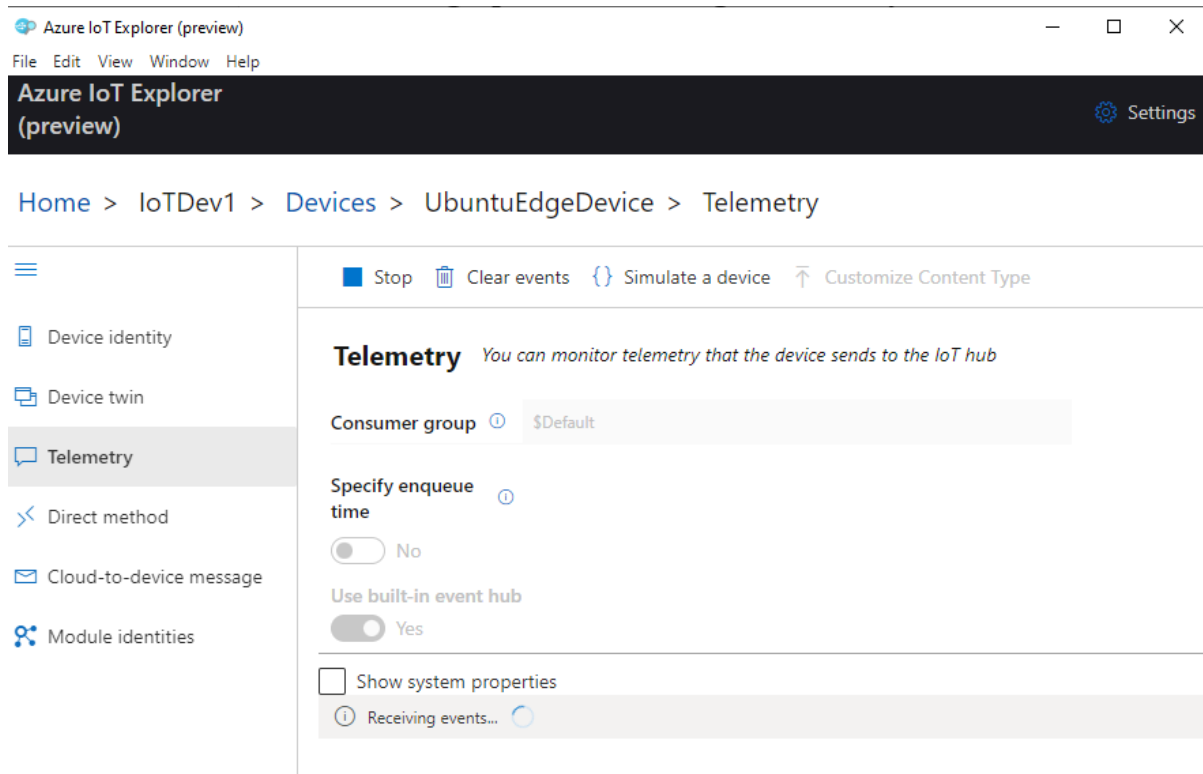
5 Setting Up Data Processing and Security

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:

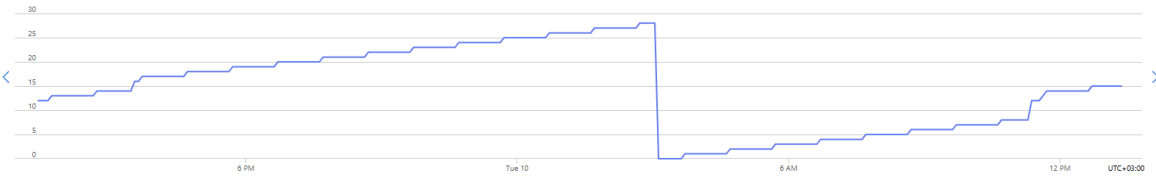
- Monitor latency, bandwidth usage, and device-to-cloud communication using Azure Monitor.

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



Total number of messages used (Max, IoTDev1 / 28)